CNC | ROBOT | ROBOMACHINE

FANUC

# CNC

## Functions
## Communication
## Software

Power Motion *i*-A

CNC Series
0*i* / 0*i* Mate-D

CNC Series
30*i*/31*i*/32*i*-B

CNC Series
35*i*-B

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# Foreword

You will find in this catalog an extensive selection of essential product information about FANUC components, functions and software.

There are many FANUC products available to help you build the most competitive machine or automated system. This catalog contains a lot of information but cannot cover all subjects extensively; use it as a guide and do not hesitate to call your local FANUC representative for further information and assistance.

## About controller functions

The descriptions of each function provided in this catalogue may contain information, descriptions, technical data as well as performance data which may not always apply as described. Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions.

The functions described are options and may not be installed on a given configuration. It is however mostly possible to purchase additional functions and hardware to retrofit an existing system to increase its productivity.

In case of doubt or if you need additional information on functions, compatibility and retrofit, contact your FANUC representative.

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## Notes

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Availability and technical specifications are subject to change without notice.

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# CNC

FANUC develops and manufactures state-of-the-art automation products and solutions. The CNC product range includes both entry-level and complex CNC products with high-speed functions, digitally controlled servo motors and spindle motors, and user-friendly operator interfaces.

The FANUC CNC system is installed in the machine in the form of a productive CNC package complete with CNC, amplifier, motors, I/O modules and operator panel. Such a complete CNC concept promises that the components are coordinated to optimum effect, offering the highest performance and productivity.

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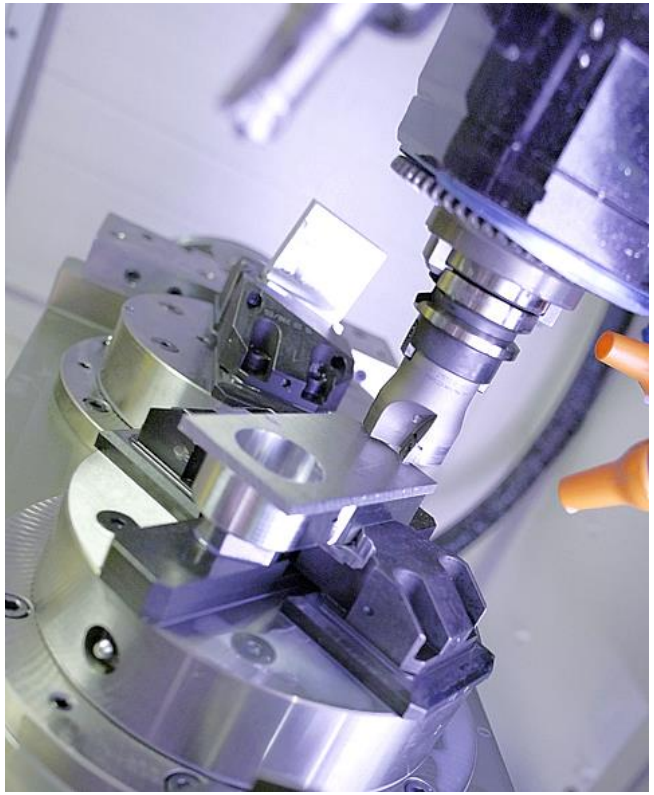
# 017
## CNC



# Functions

This section of the catalogue describes functions provided by the CNC software. They have ben grouped by relevance to provide a better overview.

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# 018
# Functions

## Controlled axis

This section of the catalogue contains the functions related to axis control in the CNC, from the number of axes, paths and axes groups, via many other synchronization and precision and safety functions.

Some of the functions detailed in the catalogue:

- Designation of controlled axes, machine groups, path and technology
- Cs contouring control
- Synchronous / Composite control
- Tandem control
- Chopping
- High precision learning control
- HRV Control
- Interference check functions
- Built-in 3D interference check
- Unexpected disturbance torque detection function
- Dual Check Safety (DCS)
- Etc.

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# 019

## Controlled axis

# Designation of controlled axes

This function specifies the maximum number of axes that the CNC can control. The number of maximum controlled axes is the sum of the number of machine controlled axes and the number of loader controlled axes.

The number of Cs and PMC axes is included in the number of machine controlled axes.

The maximum number of axes is also linked to the hardware configuration of the CNC.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J802#1 | 30i-A Designation of Number of Axes, 1 Axis |
| A02B-0303-J802#10 | 30i-A Designation of Number of Axes, 10 Axes |
| A02B-0303-J802#11 | 30i-A Designation of Number of Axes, 11 Axes |
| A02B-0303-J802#12 | 30i-A Designation of Number of Axes, 12 Axes |
| A02B-0303-J802#13 | 30i-A Designation of Number of Axes, 13 Axes |
| A02B-0303-J802#14 | 30i-A Designation of Number of Axes, 14 Axes |
| A02B-0303-J802#15 | 30i-A Designation of Number of Axes, 15 Axes |
| A02B-0303-J802#16 | 30i-A Designation of Number of Axes, 16 Axes |
| A02B-0303-J802#17 | 30i-A Designation of Number of Axes, 17 Axes |
| A02B-0303-J802#18 | 30i-A Designation of Number of Axes, 18 Axes |
| A02B-0303-J802#19 | 30i-A Designation of Number of Axes, 19 Axes |
| A02B-0303-J802#2 | 30i-A Designation of Number of Axes, 2 Axes |
| A02B-0303-J802#20 | 30i-A Designation of Number of Axes, 20 Axes |
| A02B-0303-J802#21 | 30i-A Designation of Number of Axes, 21 Axes |
| A02B-0303-J802#22 | 30i-A Designation of Number of Axes, 22 Axes |
| A02B-0303-J802#23 | 30i-A Designation of Number of Axes, 23 Axes |
| A02B-0303-J802#24 | 30i-A Designation of Number of Axes, 24 Axes |
| A02B-0303-J802#25 | 30i-A Designation of Number of Axes, 25 Axes |
| A02B-0303-J802#26 | 30i-A Designation of Number of Axes, 26 Axes |
| A02B-0303-J802#27 | 30i-A Designation of Number of Axes, 27 Axes |
| A02B-0303-J802#28 | 30i-A Designation of Number of Axes, 28 Axes |
| A02B-0303-J802#29 | 30i-A Designation of Number of Axes, 29 Axes |
| A02B-0303-J802#3 | 30i-A Designation of Number of Axes, 3 Axes |
| A02B-0303-J802#30 | 30i-A Designation of Number of Axes, 30 Axes |
| A02B-0303-J802#31 | 30i-A Designation of Number of Axes, 31 Axes |
| A02B-0303-J802#32 | 30i-A Designation of Number of Axes, 32 Axes |
| A02B-0303-J802#33 | 30i-A Designation of Number of Axes, 33 Axes |
| A02B-0303-J802#34 | 30i-A Designation of Number of Axes, 34 Axes |
| A02B-0303-J802#35 | 30i-A Designation of Number of Axes, 35 Axes |

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# 020

| Specification | Description |
|---|---|
| A02B-0303-J802#36 | 30i-A Designation of Number of Axes, 36 Axes |
| A02B-0303-J802#37 | 30i-A Designation of Number of Axes, 37 Axes |
| A02B-0303-J802#38 | 30i-A Designation of Number of Axes, 38 Axes |
| A02B-0303-J802#39 | 30i-A Designation of Number of Axes, 39 Axes |
| A02B-0303-J802#4 | 30i-A Designation of Number of Axes, 4 Axes |
| A02B-0303-J802#40 | 30i-A Designation of Number of Axes, 40 Axes |
| A02B-0303-J802#41 | 30i-A Designation of Number of Axes, 41 Axes |
| A02B-0303-J802#42 | 30i-A Designation of Number of Axes, 42 Axes |
| A02B-0303-J802#43 | 30i-A Designation of Number of Axes, 43 Axes |
| A02B-0303-J802#44 | 30i-A Designation of Number of Axes, 44 Axes |
| A02B-0303-J802#45 | 30i-A Designation of Number of Axes, 45 Axes |
| A02B-0303-J802#46 | 30i-A Designation of Number of Axes, 46 Axes |
| A02B-0303-J802#47 | 30i-A Designation of Number of Axes, 47 Axes |
| A02B-0303-J802#48 | 30i-A Designation of Number of Axes, 48 Axes |
| A02B-0303-J802#5 | 30i-A Designation of Number of Axes, 5 Axes |
| A02B-0303-J802#6 | 30i-A Designation of Number of Axes, 6 Axes |
| A02B-0303-J802#7 | 30i-A Designation of Number of Axes, 7 Axes |
| A02B-0303-J802#8 | 30i-A Designation of Number of Axes, 8 Axes |
| A02B-0303-J802#9 | 30i-A Designation of Number of Axes, 9 Axes |
| A02B-0306-J802#1 | 31i-A5 Designation of Number of Axes, 1 Axis |
| A02B-0306-J802#10 | 31i-A5 Designation of Number of Axes, 10 Axes |
| A02B-0306-J802#11 | 31i-A5 Designation of Number of Axes, 11 Axes |
| A02B-0306-J802#12 | 31i-A5 Designation of Number of Axes, 12 Axes |
| A02B-0306-J802#13 | 31i-A5 Designation of Number of Axes, 13 Axes |
| A02B-0306-J802#14 | 31i-A5 Designation of Number of Axes, 14 Axes |
| A02B-0306-J802#15 | 31i-A5 Designation of Number of Axes, 15 Axes |
| A02B-0306-J802#16 | 31i-A5 Designation of Number of Axes, 16 Axes |
| A02B-0306-J802#17 | 31i-A5 Designation of Number of Axes, 17 Axes |
| A02B-0306-J802#18 | 31i-A5 Designation of Number of Axes, 18 Axes |
| A02B-0306-J802#19 | 31i-A5 Designation of Number of Axes, 19 Axes |
| A02B-0306-J802#2 | 31i-A5 Designation of Number of Axes, 2 Axes |
| A02B-0306-J802#20 | 31i-A5 Designation of Number of Axes, 20 Axes |
| A02B-0306-J802#3 | 31i-A5 Designation of Number of Axes, 3 Axes |
| A02B-0306-J802#4 | 31i-A5 Designation of Number of Axes, 4 Axes |
| A02B-0306-J802#5 | 31i-A5 Designation of Number of Axes, 5 Axes |
| A02B-0306-J802#6 | 31i-A5 Designation of Number of Axes, 6 Axes |
| A02B-0306-J802#7 | 31i-A5 Designation of Number of Axes, 7 Axes |
| A02B-0306-J802#8 | 31i-A5 Designation of Number of Axes, 8 Axes |
| A02B-0306-J802#9 | 31i-A5 Designation of Number of Axes, 9 Axes |
| A02B-0307-J802#1 | 31i-A Designation of Number of Axes, 1 Axis |

**Notice**

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| Specification | Description |
|---|---|
| A02B-0307-J802#10 | 31i-A Designation of Number of Axes,10 Axes |
| A02B-0307-J802#11 | 31i-A Designation of Number of Axes,11 Axes |
| A02B-0307-J802#12 | 31i-A Designation of Number of Axes,12 Axes |
| A02B-0307-J802#13 | 31i-A Designation of Number of Axes, 13 Axes |
| A02B-0307-J802#14 | 31i-A Designation of Number of Axes, 14 Axes |
| A02B-0307-J802#15 | 31i-A Designation of Number of Axes, 15 Axes |
| A02B-0307-J802#16 | 31i-A Designation of Number of Axes, 16 Axes |
| A02B-0307-J802#17 | 31i-A Designation of Number of Axes, 17 Axes |
| A02B-0307-J802#18 | 31i-A Designation of Number of Axes, 18 Axes |
| A02B-0307-J802#19 | 31i-A Designation of Number of Axes, 19 Axes |
| A02B-0307-J802#2 | 31i-A Designation of Number of Axes, 2 Axes |
| A02B-0307-J802#20 | 31i-A Designation of Number of Axes, 20 Axes |
| A02B-0307-J802#3 | 31i-A Designation of Number of Axes, 3 Axes |
| A02B-0307-J802#4 | 31i-A Designation of Number of Axes, 4 Axes |
| A02B-0307-J802#5 | 31i-A Designation of Number of Axes, 5 Axes |
| A02B-0307-J802#6 | 31i-A Designation of Number of Axes, 6 Axes |
| A02B-0307-J802#7 | 31i-A Designation of Number of Axes,7 Axes |
| A02B-0307-J802#8 | 31i-A Designation of Number of Axes, 8 Axes |
| A02B-0307-J802#9 | 31i-A Designation of Number of Axes, 9 Axes |
| A02B-0308-J802#1 | 32i-A Designation of Number of Axes, 1 Axis |
| A02B-0308-J802#2 | 32i-A Designation of Number of Axes, 2 Axes |
| A02B-0308-J802#3 | 32i-A Designation of Number of Axes, 3 Axes |
| A02B-0308-J802#4 | 32i-A Designation of Number of Axes, 4 Axes |
| A02B-0308-J802#5 | 32i-A Designation of Number of Axes, 5 Axes |
| A02B-0308-J802#6 | 32i-A Designation of Number of Axes, 6 Axes |
| A02B-0308-J802#7 | 32i-A Designation of Number of Axes, 7 Axes |
| A02B-0308-J802#8 | 32i-A Designation of Number of Axes, 8 Axes |
| A02B-0308-J802#9 | 32i-A Designation of Number of Axes, 9 Axes |
| A02B-0323-J802#1 | 30i-B Designation of Number of Axes, 1 Axis |
| A02B-0323-J802#10 | 30i-B Designation of Number of Axes, 10 Axes |
| A02B-0323-J802#11 | 30i-B Designation of Number of Axes, 11 Axes |
| A02B-0323-J802#12 | 30i-B Designation of Number of Axes, 12 Axes |
| A02B-0323-J802#13 | 30i-B Designation of Number of Axes, 13 Axes |
| A02B-0323-J802#14 | 30i-B Designation of Number of Axes, 14 Axes |
| A02B-0323-J802#15 | 30i-B Designation of Number of Axes, 15 Axes |
| A02B-0323-J802#16 | 30i-B Designation of Number of Axes, 16 Axes |
| A02B-0323-J802#17 | 30i-B Designation of Number of Axes, 17 Axes |
| A02B-0323-J802#18 | 30i-B Designation of Number of Axes, 18 Axes |
| A02B-0323-J802#19 | 30i-B Designation of Number of Axes, 19 Axes |
| A02B-0323-J802#2 | 30i-B Designation of Number of Axes, 2 Axes |

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| Specification | Description |
|---|---|
| A02B-0323-J802#20 | 30i-B Designation of Number of Axes, 20 Axes |
| A02B-0323-J802#21 | 30i-B Designation of Number of Axes, 21 Axes |
| A02B-0323-J802#22 | 30i-B Designation of Number of Axes, 22 Axes |
| A02B-0323-J802#23 | 30i-B Designation of Number of Axes, 23 Axes |
| A02B-0323-J802#24 | 30i-B Designation of Number of Axes, 24 Axes |
| A02B-0323-J802#25 | 30i-B Designation of Number of Axes, 25 Axes |
| A02B-0323-J802#26 | 30i-B Designation of Number of Axes, 26 Axes |
| A02B-0323-J802#27 | 30i-B Designation of Number of Axes, 27 Axes |
| A02B-0323-J802#28 | 30i-B Designation of Number of Axes, 28 Axes |
| A02B-0323-J802#29 | 30i-B Designation of Number of Axes, 29 Axes |
| A02B-0323-J802#3 | 30i-B Designation of Number of Axes, 3 Axes |
| A02B-0323-J802#30 | 30i-B Designation of Number of Axes, 30 Axes |
| A02B-0323-J802#31 | 30i-B Designation of Number of Axes, 31 Axes |
| A02B-0323-J802#32 | 30i-B Designation of Number of Axes, 32 Axes |
| A02B-0323-J802#4 | 30i-B Designation of Number of Axes, 4 Axes |
| A02B-0323-J802#48 | 30i-B Designation of Number of Axes, 48 Axes |
| A02B-0323-J802#5 | 30i-B Designation of Number of Axes, 5 Axes |
| A02B-0323-J802#6 | 30i-B Designation of Number of Axes, 6 Axes |
| A02B-0323-J802#7 | 30i-B Designation of Number of Axes, 7 Axes |
| A02B-0323-J802#8 | 30i-B Designation of Number of Axes, 8 Axes |
| A02B-0323-J802#9 | 30i-B Designation of Number of Axes, 9 Axes |
| A02B-0326-J802#1 | 31i-B5 Designation of Number of Axes, 1 Axis |
| A02B-0326-J802#10 | 31i-B5 Designation of Number of Axes, 10 Axes |
| A02B-0326-J802#11 | 31i-B5 Designation of Number of Axes, 11 Axes |
| A02B-0326-J802#12 | 31i-B5 Designation of Number of Axes, 12 Axes |
| A02B-0326-J802#13 | 31i-B5 Designation of Number of Axes, 13 Axes |
| A02B-0326-J802#14 | 31i-B5 Designation of Number of Axes, 14 Axes |
| A02B-0326-J802#15 | 31i-B5 Designation of Number of Axes, 15 Axes |
| A02B-0326-J802#16 | 31i-B5 Designation of Number of Axes, 16 Axes |
| A02B-0326-J802#17 | 31i-B5 Designation of Number of Axes, 17 Axes |
| A02B-0326-J802#18 | 31i-B5 Designation of Number of Axes, 18 Axes |
| A02B-0326-J802#19 | 31i-B5 Designation of Number of Axes, 19 Axes |
| A02B-0326-J802#2 | 31i-B5 Designation of Number of Axes, 2 Axes |
| A02B-0326-J802#20 | 31i-B5 Designation of Number of Axes, 20 Axes |
| A02B-0326-J802#3 | 31i-B5 Designation of Number of Axes, 3 Axes |
| A02B-0326-J802#4 | 31i-B5 Designation of Number of Axes, 4 Axes |
| A02B-0326-J802#5 | 31i-B5 Designation of Number of Axes, 5 Axes |
| A02B-0326-J802#6 | 31i-B5 Designation of Number of Axes, 6 Axes |
| A02B-0326-J802#7 | 31i-B5 Designation of Number of Axes, 7 Axes |
| A02B-0326-J802#8 | 31i-B5 Designation of Number of Axes, 8 Axes |

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| Specification | Description |
|---|---|
| A02B-0326-J802#9 | 31i-B5 Designation of Number of Axes, 9 Axes |
| A02B-0327-J802#1 | 31i-B Designation of Number of Axes, 1 Axis |
| A02B-0327-J802#10 | 31i-B Designation of Number of Axes,10 Axes |
| A02B-0327-J802#11 | 31i-B Designation of Number of Axes,11 Axes |
| A02B-0327-J802#12 | 31i-B Designation of Number of Axes,12 Axes |
| A02B-0327-J802#13 | 31i-B Designation of Number of Axes, 13 Axes |
| A02B-0327-J802#14 | 31i-B Designation of Number of Axes, 14 Axes |
| A02B-0327-J802#15 | 31i-B Designation of Number of Axes, 15 Axes |
| A02B-0327-J802#16 | 31i-B Designation of Number of Axes, 16 Axes |
| A02B-0327-J802#17 | 31i-B Designation of Number of Axes, 17 Axes |
| A02B-0327-J802#18 | 31i-B Designation of Number of Axes, 18 Axes |
| A02B-0327-J802#19 | 31i-B Designation of Number of Axes, 19 Axes |
| A02B-0327-J802#2 | 31i-B Designation of Number of Axes, 2 Axes |
| A02B-0327-J802#20 | 31i-B Designation of Number of Axes, 20 Axes |
| A02B-0327-J802#3 | 31i-B Designation of Number of Axes, 3 Axes |
| A02B-0327-J802#4 | 31i-B Designation of Number of Axes, 4 Axes |
| A02B-0327-J802#5 | 31i-B Designation of Number of Axes, 5 Axes |
| A02B-0327-J802#6 | 31i-B Designation of Number of Axes, 6 Axes |
| A02B-0327-J802#7 | 31i-B Designation of Number of Axes,7 Axes |
| A02B-0327-J802#8 | 31i-B Designation of Number of Axes, 8 Axes |
| A02B-0327-J802#9 | 31i-B Designation of Number of Axes, 9 Axes |
| A02B-0328-J802#1 | 32i-B Designation of Number of Axes, 1 Axis |
| A02B-0328-J802#10 | 32i-B Designation of Number of Axes, 10 Axes |
| A02B-0328-J802#2 | 32i-B Designation of Number of Axes, 2 Axes |
| A02B-0328-J802#3 | 32i-B Designation of Number of Axes, 3 Axes |
| A02B-0328-J802#4 | 32i-B Designation of Number of Axes, 4 Axes |
| A02B-0328-J802#5 | 32i-B Designation of Number of Axes, 5 Axes |
| A02B-0328-J802#6 | 32i-B Designation of Number of Axes, 6 Axes |
| A02B-0328-J802#7 | 32i-B Designation of Number of Axes, 7 Axes |
| A02B-0328-J802#8 | 32i-B Designation of Number of Axes, 8 Axes |
| A02B-0328-J802#9 | 32i-B Designation of Number of Axes, 9 Axes |
| A02B-0329-J802#1 | 30i-LB Designation of Number of Axes, 1 Axes |
| A02B-0329-J802#10 | 30i-LB Designation of Number of Axes, 10 Axes |
| A02B-0329-J802#11 | 30i-LB Designation of Number of Axes, 11 Axes |
| A02B-0329-J802#12 | 30i-LB Designation of Number of Axes, 12 Axes |
| A02B-0329-J802#13 | 30i-LB Designation of Number of Axes, 13 Axes |
| A02B-0329-J802#14 | 30i-LB Designation of Number of Axes, 14 Axes |
| A02B-0329-J802#15 | 30i-LB Designation of Number of Axes, 15 Axes |
| A02B-0329-J802#16 | 30i-LB Designation of Number of Axes, 16 Axes |
| A02B-0329-J802#17 | 30i-LB Designation of Number of Axes, 17 Axes |

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| Specification | Description |
|---|---|
| A02B-0329-J802#18 | 30i-LB Designation of Number of Axes, 18 Axes |
| A02B-0329-J802#19 | 30i-LB Designation of Number of Axes, 19 Axes |
| A02B-0329-J802#2 | 30i-LB Designation of Number of Axes, 2 Axes |
| A02B-0329-J802#20 | 30i-LB Designation of Number of Axes, 20 Axes |
| A02B-0329-J802#21 | 30i-LB Designation of Number of Axes, 21 Axes |
| A02B-0329-J802#22 | 30i-LB Designation of Number of Axes, 22 Axes |
| A02B-0329-J802#23 | 30i-LB Designation of Number of Axes, 23 Axes |
| A02B-0329-J802#24 | 30i-LB Designation of Number of Axes, 24 Axes |
| A02B-0329-J802#25 | 30i-LB Designation of Number of Axes, 25 Axes |
| A02B-0329-J802#26 | 30i-LB Designation of Number of Axes, 26 Axes |
| A02B-0329-J802#27 | 30i-LB Designation of Number of Axes, 27 Axes |
| A02B-0329-J802#28 | 30i-LB Designation of Number of Axes, 28 Axes |
| A02B-0329-J802#29 | 30i-LB Designation of Number of Axes, 29 Axes |
| A02B-0329-J802#3 | 30i-LB Designation of Number of Axes, 3 Axes |
| A02B-0329-J802#30 | 30i-LB Designation of Number of Axes, 30 Axes |
| A02B-0329-J802#31 | 30i-LB Designation of Number of Axes, 31 Axes |
| A02B-0329-J802#32 | 30i-LB Designation of Number of Axes, 32 Axes |
| A02B-0329-J802#4 | 30i-LB Designation of Number of Axes, 4 Axes |
| A02B-0329-J802#5 | 30i-LB Designation of Number of Axes, 5 Axes |
| A02B-0329-J802#6 | 30i-LB Designation of Number of Axes, 6 Axes |
| A02B-0329-J802#7 | 30i-LB Designation of Number of Axes, 7 Axes |
| A02B-0329-J802#8 | 30i-LB Designation of Number of Axes, 8 Axes |
| A02B-0329-J802#9 | 30i-LB Designation of Number of Axes, 9 Axes |
| A02B-0331-J802#1 | 30i-PB Designation of Number of Axes, 1 Axes |
| A02B-0331-J802#10 | 30i-PB Designation of Number of Axes, 10 Axes |
| A02B-0331-J802#11 | 30i-PB Designation of Number of Axes, 11 Axes |
| A02B-0331-J802#12 | 30i-PB Designation of Number of Axes, 12 Axes |
| A02B-0331-J802#13 | 30i-PB Designation of Number of Axes, 13 Axes |
| A02B-0331-J802#14 | 30i-PB Designation of Number of Axes, 14 Axes |
| A02B-0331-J802#15 | 30i-PB Designation of Number of Axes, 15 Axes |
| A02B-0331-J802#16 | 30i-PB Designation of Number of Axes, 16 Axes |
| A02B-0331-J802#17 | 30i-PB Designation of Number of Axes, 17 Axes |
| A02B-0331-J802#18 | 30i-PB Designation of Number of Axes, 18 Axes |
| A02B-0331-J802#19 | 30i-PB Designation of Number of Axes, 19 Axes |
| A02B-0331-J802#2 | 30i-PB Designation of Number of Axes, 2 Axes |
| A02B-0331-J802#20 | 30i-PB Designation of Number of Axes, 20 Axes |
| A02B-0331-J802#21 | 30i-PB Designation of Number of Axes, 21 Axes |
| A02B-0331-J802#22 | 30i-PB Designation of Number of Axes, 22 Axes |
| A02B-0331-J802#23 | 30i-PB Designation of Number of Axes, 23 Axes |
| A02B-0331-J802#24 | 30i-PB Designation of Number of Axes, 24 Axes |

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| Specification | Description |
|---|---|
| A02B-0331-J802#25 | 30i-PB Designation of Number of Axes, 25 Axes |
| A02B-0331-J802#26 | 30i-PB Designation of Number of Axes, 26 Axes |
| A02B-0331-J802#27 | 30i-PB Designation of Number of Axes, 27 Axes |
| A02B-0331-J802#28 | 30i-PB Designation of Number of Axes, 28 Axes |
| A02B-0331-J802#29 | 30i-PB Designation of Number of Axes, 29 Axes |
| A02B-0331-J802#3 | 30i-PB Designation of Number of Axes, 3 Axes |
| A02B-0331-J802#30 | 30i-PB Designation of Number of Axes, 30 Axes |
| A02B-0331-J802#31 | 30i-PB Designation of Number of Axes, 31 Axes |
| A02B-0331-J802#32 | 30i-PB Designation of Number of Axes, 32 Axes |
| A02B-0331-J802#4 | 30i-PB Designation of Number of Axes, 4 Axes |
| A02B-0331-J802#5 | 30i-PB Designation of Number of Axes, 5 Axes |
| A02B-0331-J802#6 | 30i-PB Designation of Number of Axes, 6 Axes |
| A02B-0331-J802#7 | 30i-PB Designation of Number of Axes, 7 Axes |
| A02B-0331-J802#8 | 30i-PB Designation of Number of Axes, 8 Axes |
| A02B-0331-J802#9 | 30i-PB Designation of Number of Axes, 9 Axes |
| A02B-0333-J802#1 | 35i-B Designation of Number of Axes, 1 Axis |
| A02B-0333-J802#10 | 35i-B Designation of Control Axes, 10 Axes |
| A02B-0333-J802#11 | 35i-B Designation of Control Axes, 11 Axes |
| A02B-0333-J802#12 | 35i-B Designation of Control Axes, 12 Axes |
| A02B-0333-J802#13 | 35i-B Designation of Control Axes, 13 Axes |
| A02B-0333-J802#14 | 35i-B Designation of Control Axes, 14 Axes |
| A02B-0333-J802#15 | 35i-B Designation of Control Axes, 15 Axes |
| A02B-0333-J802#16 | 35i-B Designation of Control Axes, 16 Axes |
| A02B-0333-J802#2 | 35i-B Designation of Number of Axes, 2 Axes |
| A02B-0333-J802#3 | 35i-B Designation of Number of Axes, 3 Axes |
| A02B-0333-J802#4 | 35i-B Designation of Number of Axes, 4 Axes |
| A02B-0333-J802#5 | 35i-B Designation of Number of Axes, 5 Axes |
| A02B-0333-J802#6 | 35i-B Designation of Number of Axes, 6 Axes |
| A02B-0333-J802#7 | 35i-B Designation of Control Axes, 7 Axes |
| A02B-0333-J802#8 | 35i-B Designation of Control Axes, 8 Axes |
| A02B-0333-J802#9 | 35i-B Designation of Control Axes, 9 Axes |
| A02B-0334-J802#1 | PM i-A Designation of Number of Axes, 1 Axis |
| A02B-0334-J802#10 | PM i-A Designation of Number of Axes, 10 Axes |
| A02B-0334-J802#11 | PM i-A Designation of Number of Axes, 11 Axes |
| A02B-0334-J802#12 | PM i-A Designation of Number of Axes, 12 Axes |
| A02B-0334-J802#13 | PM i-A Designation of Number of Axes, 13 Axes |
| A02B-0334-J802#14 | PM i-A Designation of Number of Axes, 14 Axes |
| A02B-0334-J802#15 | PM i-A Designation of Number of Axes, 15 Axes |
| A02B-0334-J802#16 | PM i-A Designation of Number of Axes, 16 Axes |
| A02B-0334-J802#17 | PM i-A Designation of Number of Axes, 17 Axes |

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| Specification | Description |
|---|---|
| A02B-0334-J802#18 | PM i-A Designation of Number of Axes, 18 Axes |
| A02B-0334-J802#19 | PM i-A Designation of Number of Axes, 19 Axes |
| A02B-0334-J802#2 | PM i-A Designation of Number of Axes, 2 Axes |
| A02B-0334-J802#20 | PM i-A Designation of Number of Axes, 20 Axes |
| A02B-0334-J802#21 | PM i-A Designation of Number of Axes, 21 Axes |
| A02B-0334-J802#22 | PM i-A Designation of Number of Axes, 22 Axes |
| A02B-0334-J802#23 | PM i-A Designation of Number of Axes, 23 Axes |
| A02B-0334-J802#24 | PM i-A Designation of Number of Axes, 24 Axes |
| A02B-0334-J802#25 | PM i-A Designation of Number of Axes, 25 Axes |
| A02B-0334-J802#26 | PM i-A Designation of Number of Axes, 26 Axes |
| A02B-0334-J802#27 | PM i-A Designation of Number of Axes, 27 Axes |
| A02B-0334-J802#28 | PM i-A Designation of Number of Axes, 28 Axes |
| A02B-0334-J802#29 | PM i-A Designation of Number of Axes, 29 Axes |
| A02B-0334-J802#3 | PM i-A Designation of Number of Axes, 3 Axes |
| A02B-0334-J802#30 | PM i-A Designation of Number of Axes, 30 Axes |
| A02B-0334-J802#31 | PM i-A Designation of Number of Axes, 31 Axes |
| A02B-0334-J802#32 | PM i-A Designation of Number of Axes, 32 Axes |
| A02B-0334-J802#4 | PM i-A Designation of Number of Axes, 4 Axes |
| A02B-0334-J802#5 | PM i-A Designation of Number of Axes, 5 Axes |
| A02B-0334-J802#6 | PM i-A Designation of Number of Axes, 6 Axes |
| A02B-0334-J802#7 | PM i-A Designation of Number of Axes, 7 Axes |
| A02B-0334-J802#8 | PM i-A Designation of Number of Axes, 8 Axes |
| A02B-0334-J802#9 | PM i-A Designation of Number of Axes, 9 Axes |

**Notice**

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# 027

## Controlled axis

# Designation of machine groups

This function specifies the number of machine groups or axes groups that the CNC can control.

If multiple paths are used, several paths can be formed into a group. By doing so, the group can share data, and if an alarm is issued with a path, the other path(s) in the group can be stopped. A group of those paths is referred to as a machine group.

Up to three groups can be used, depending on the type of CNC.

The following items are impacted by the machine group configuration:

- Emergency stop signal
- RESET on the MDI
- Operation performed when an alarm is issued

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S836#1 | 30i-A Designation of Machine Groups, 1 Group |
| A02B-0303-S836#2 | 30i-A Designation of Machine Groups, 2 Groups |
| A02B-0303-S836#3 | 30i-A Designation of Machine Groups, 3 Groups |
| A02B-0306-S836#1 | 31i-A5 Designation of Machine Groups, 1 Group |
| A02B-0306-S836#2 | 31i-A5 Designation of Machine Groups, 2 Groups |
| A02B-0307-S836#1 | 31i-A Designation of Machine Groups, 1 Group |
| A02B-0307-S836#2 | 31i-A Designation of Machine Groups, 2 Groups |
| A02B-0307-S836#3 | 31i-A Designation of Machine Groups, 3 Groups |
| A02B-0308-S836#1 | 32i-A Designation of Machine Groups, 1 Group |
| A02B-0308-S836#2 | 32i-A Designation of Machine Groups, 2 Groups |
| A02B-0323-S836#1 | 30i-B Designation of Machine Groups, 1 Group |
| A02B-0323-S836#2 | 30i-B Designation of Machine Groups, 2 Groups |
| A02B-0323-S836#3 | 30i-B Designation of Machine Groups, 3 Groups |
| A02B-0326-S836#1 | 31i-B5 Designation of Machine Groups, 1 Group |
| A02B-0326-S836#2 | 31i-B5 Designation of Machine Groups, 2 Groups |
| A02B-0327-S836#1 | 31i-B Designation of Machine Groups, 1 Group |
| A02B-0327-S836#2 | 31i-B Designation of Machine Groups, 2 Groups |
| A02B-0327-S836#3 | 31i-B Designation of Machine Groups, 3 Groups |
| A02B-0328-S836#1 | 32i-B Designation of Machine Groups, 1 Group |
| A02B-0328-S836#2 | 32i-B Designation of Machine Groups, 2 Groups |

**Notice**

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# 028

## Controlled axis

# Designation of control path

This function specifies the number of controlled path for the CNC.

A path represents a group of axes that are controlled by the same NC program.

Up to 10 paths can be used, depending on the type of NC system. A path for loader control is also counted as a path.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S801#1 | 30i-A Designation of Control Paths, 1 Path |
| A02B-0303-S801#10 | 30i-A Designation of Control Paths, 10 Paths |
| A02B-0303-S801#2 | 30i-A Designation of Control Paths, 2 Paths |
| A02B-0303-S801#3 | 30i-A Designation of Control Paths, 3 Paths |
| A02B-0303-S801#4 | 30i-A Designation of Control Paths, 4 Paths |
| A02B-0303-S801#5 | 30i-A Designation of Control Paths, 5 Paths |
| A02B-0303-S801#6 | 30i-A Designation of Control Paths, 6 Paths |
| A02B-0303-S801#7 | 30i-A Designation of Control Paths, 7 Paths |
| A02B-0303-S801#8 | 30i-A Designation of Control Paths, 8 Paths |
| A02B-0303-S801#9 | 30i-A Designation of Control Paths, 9 Paths |
| A02B-0306-S801#1 | 31i-A5 Designation of Control Paths, 1 Path |
| A02B-0306-S801#2 | 31i-A5 Designation of Control Paths, 2 Paths |
| A02B-0306-S801#3 | 31i-A5 Designation of Control Paths, 3 Paths |
| A02B-0306-S801#4 | 31i-A5 Designation of Control Paths, 4 Paths |
| A02B-0307-S801#1 | 31i-A Designation of Control Paths, 1 Path |
| A02B-0307-S801#2 | 31i-A Designation of Control Paths, 2 Paths |
| A02B-0307-S801#3 | 31i-A Designation of Control Paths, 3 Paths |
| A02B-0307-S801#4 | 31i-A Designation of Control Paths, 4 Paths |
| A02B-0308-S801#1 | 32i-A Designation of Control Paths, 1 Path |
| A02B-0308-S801#2 | 32i-A Designation of Control Paths, 2 Paths |
| A02B-0319-S801#1 | 0i-TD Designation of Control Paths - 1 Path |
| A02B-0319-S801#2 | 0i-TD Designation of Control Paths - 2 Paths |
| A02B-0323-S801#1 | 30i-B Designation of Control Paths, 1 Path |
| A02B-0323-S801#10 | 30i-B Designation of Control Paths, 10 Paths |
| A02B-0323-S801#2 | 30i-B Designation of Control Paths, 2 Paths |
| A02B-0323-S801#3 | 30i-B Designation of Control Paths, 3 Paths |
| A02B-0323-S801#4 | 30i-B Designation of Control Paths, 4 Paths |
| A02B-0323-S801#5 | 30i-B Designation of Control Paths, 5 Paths |
| A02B-0323-S801#6 | 30i-B Designation of Control Paths, 6 Paths |

**Notice**

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# 029

| Specification | Description |
|---|---|
| A02B-0323-S801#7 | 30i-B Designation of Control Paths, 7 Paths |
| A02B-0323-S801#8 | 30i-B Designation of Control Paths, 8 Paths |
| A02B-0323-S801#9 | 30i-B Designation of Control Paths, 9 Paths |
| A02B-0326-S801#1 | 31i-B5 Designation of Control Paths, 1 Path |
| A02B-0326-S801#2 | 31i-B5 Designation of Control Paths, 2 Paths |
| A02B-0326-S801#3 | 31i-B5 Designation of Control Paths, 3 Paths |
| A02B-0326-S801#4 | 31i-B5 Designation of Control Paths, 4 Paths |
| A02B-0327-S801#1 | 31i-B Designation of Control Paths, 1 Path |
| A02B-0327-S801#2 | 31i-B Designation of Control Paths, 2 Paths |
| A02B-0327-S801#3 | 31i-B Designation of Control Paths, 3 Paths |
| A02B-0327-S801#4 | 31i-B Designation of Control Paths, 4 Paths |
| A02B-0328-S801#1 | 32i-B Designation of Control Paths, 1 Path |
| A02B-0328-S801#2 | 32i-B Designation of Control Paths, 2 Paths |

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# 030
## Controlled axis

# Designation of machine control type

This function defines the machine type as controlled by the CNC. It can be chosen between Machining Center, Lathe or Multiple System, i.e. combination of Lathe and Machining Center functions.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S838#C | 30i-A Designation of Machine Control Type, Multiple System - Selection of either Machining Center and Lathe for each Path |
| A02B-0303-S838#M | 30i-A Designation of Machine Control Type, Machining Center |
| A02B-0303-S838#T | 30i-A Designation of Machine Control Type, Lathe |
| A02B-0306-S838#C | 31i-A5 Designation of Machine Control Type, Multiple System - Selection of either Machining Center and Lathe for each Path |
| A02B-0306-S838#M | 31i-A5 Designation of Machine Control Type, Machining Center |
| A02B-0306-S838#T | 31i-A5 Designation of Machine Control Type, Lathe |
| A02B-0307-S838#C | 31i-A Designation of Machine Control Type, Multiple System - Selection of either Machining Center and Lathe for each Path |
| A02B-0307-S838#M | 31i-A Designation of Machine Control Type, Machining Center |
| A02B-0307-S838#T | 31i-A Designation of Machine Control Type, Lathe |
| A02B-0308-S838#C | 32i-A Designation of Machine Control Type, Multiple System - Selection of either Machining Center and Lathe for each Path |
| A02B-0308-S838#M | 32i-A Designation of Machine Control Type, Machining Center |
| A02B-0308-S838#T | 32i-A Designation of Machine Control Type, Lathe |
| A02B-0323-S838#C | 30i-B Designation of Machine Control Type, Multiple System - Selection of either Machining Center and Lathe for each Path |
| A02B-0323-S838#M | 30i-B Designation of Machine Control Type, Machining Center |
| A02B-0323-S838#T | 30i-B Designation of Machine Control Type, Lathe |
| A02B-0326-S838#C | 31i-B5 Designation of Machine Control Type, Multiple System - Selection of either Machining Center and Lathe for each Path |
| A02B-0326-S838#M | 31i-B5 Designation of Machine Control Type, Machining Center |
| A02B-0326-S838#T | 31i-B5 Designation of Machine Control Type, Lathe |
| A02B-0327-S838#C | 31i-B Designation of Machine Control Type, Multiple System - Selection of either Machining Center and Lathe for each Path |
| A02B-0327-S838#M | 31i-B Designation of Machine Control Type, Machining Center |
| A02B-0327-S838#T | 31i-B Designation of Machine Control Type, Lathe |
| A02B-0328-S838#C | 32i-B Designation of Machine Control Type, Multiple System - Selection of either Machining Center and Lathe for each Path |
| A02B-0328-S838#M | 32i-B Designation of Machine Control Type, Machining Center |
| A02B-0328-S838#T | 32i-B Designation of Machine Control Type, Lathe |

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# 031
## Controlled axis

# Controllable axes expansion

This function increases the maximum number of axes controllable by the CNC.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J801 | 30i-A Controlled Axes Expansion |
| A02B-0306-J801 | 31i-A5 Controlled Axes Expansion |
| A02B-0307-J801 | 31i-A Controlled Axes Expansion |
| A02B-0308-J801 | 32i-A Controlled Axes Expansion |
| A02B-0323-J801 | 30i-B Controlled Axes Expansion |
| A02B-0326-J801 | 31i-B5 Controlled Axes Expansion |
| A02B-0327-J801 | 31i-B Controlled Axes Expansion |
| A02B-0328-J801 | 32i-B Controlled Axes Expansion |
| A02B-0329-J801 | 30i-LB Controllable Axes Expansion |
| A02B-0331-J801 | 30i-PB Controllable Axes Expansion |

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# 032

## Controlled axis

# Simultaneously controlled axes expansion

This function defines the maximum number of axes that can be controlled simultaneously by the CNC.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J803 | 30i-A Simultaneously Controlled Axes Expansion |
| A02B-0306-J803 | 31i-A5 Simultaneously Controlled Axes Expansion |
| A02B-0307-J803 | 31i-A Simultaneously Controlled Axes Expansion |
| A02B-0308-J803 | 32i-A Simultaneously Controlled Axes Expansion |
| A02B-0321-J803 | 0i-Mate-TD Simultaneously Controlled Axes Expansion (for Simultaneously Control of Max 4 Axes) |
| A02B-0322-J803 | 0i-Mate-MD Simultaneously Controlled Axes Expansion (Max. 4 Axes) |
| A02B-0323-J803 | 30i-B Simultaneously Controlled Axes Expansion |
| A02B-0326-J803 | 31i-B5 Simultaneously Controlled Axes Expansion |
| A02B-0327-J803 | 31i-B Simultaneously Controlled Axes Expansion |
| A02B-0328-J803 | 32i-B Simultaneously Controlled Axes Expansion |
| A02B-0329-J803 | 30i-LB Simultaneously Controlled Axes Expansion |
| A02B-0331-J803 | 30i-PB Simultaneously Controlled Axes Expansion |
| A02B-0333-J803 | 35i-B Simultaneously Controlled Axes Expansion (Max. 4 Axes) |

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# 033

## Controlled axis

# Axis control by PMC

## Features

This function allows the ladder logic program of the Programmable Machine Controller (PMC) to control up to 4 axes per path as independent axes from the programmed axes of the CNC.

## Benefits

- Reduction of the machining cycle time by operating automation devices simultaneously with the part program execution
- Simple mean to add peripheral automation devices such as pallets changers, tool changers, turrets, conveyors, etc.
- Easy activation through M code or push button on the operator panel
- Up to 4 devices can be automated simultaneously
- Ladder logic program resides in non volatile ROM which is protected from accidental changes by the operator

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J804 | 30i-A Axis Control by PMC |
| A02B-0306-J804 | 31i-A5 Axis Control by PMC |
| A02B-0307-J804 | 31i-A Axis Control by PMC |
| A02B-0308-J804 | 32i-A Axis Control by PMC |
| A02B-0321-J804 | 0i-Mate-TD Axis Control by PMC (Not for CS Axis) |
| A02B-0322-J804 | 0i-Mate-MD Axis Control by PMC (Not for CS Axis) |
| A02B-0323-J804 | 30i-B Axis Control by PMC |
| A02B-0326-J804 | 31i-B5 Axis Control by PMC |
| A02B-0327-J804 | 31i-B Axis Control by PMC |
| A02B-0328-J804 | 32i-B Axis Control by PMC |

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# 034

## Controlled axis

# Designation of spindle axes

This function increases the total number of spindle axes that can be controlled by the CNC.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S837#1 | 30i-A Designation of Spindle Axes, 1 Spindle |
| A02B-0303-S837#16 | 30i-A Designation of Spindle Axes, 16 Spindles - Requires 2 x Additional Spindle Board B, A02B-0303-J131 |
| A02B-0303-S837#2 | 30i-A Designation of Spindle Axes, 2 Spindles |
| A02B-0303-S837#3 | 30i-A Designation of Spindle Axes, 3 Spindles |
| A02B-0303-S837#4 | 30i-A Designation of Spindle Axes, 4 Spindles |
| A02B-0303-S837#5 | 30i-A Designation of Spindle Axes, 5 Spindles |
| A02B-0303-S837#6 | 30i-A Designation of Spindle Axes, 6 Spindles |
| A02B-0303-S837#7 | 30i-A Designation of Spindle Axes, 7 Spindles - Requires Additional Spindle Board |
| A02B-0303-S837#8 | 30i-A Designation of Spindle Axes, 8 Spindles - Requires Additional Spindle Board |
| A02B-0306-S837#1 | 31i-A5 Designation of Spindle Axes, 1 Spindle |
| A02B-0306-S837#2 | 31i-A5 Designation of Spindle Axes, 2 Spindles |
| A02B-0306-S837#3 | 31i-A5 Designation of Spindle Axes, 3 Spindles |
| A02B-0306-S837#4 | 31i-A5 Designation of Spindle Axes, 4 Spindles |
| A02B-0306-S837#5 | 31i-A5 Designation of Spindle Axes, 5 Spindles |
| A02B-0306-S837#6 | 31i-A5 Designation of Spindle Axes, 6 Spindles |
| A02B-0307-S837#1 | 31i-A Designation of Spindle Axes, 1 Spindle |
| A02B-0307-S837#2 | 31i-A Designation of Spindle Axes, 2 Spindles |
| A02B-0307-S837#3 | 31i-A Designation of Spindle Axes, 3 Spindles |
| A02B-0307-S837#4 | 31i-A Designation of Spindle Axes, 4 Spindles |
| A02B-0307-S837#5 | 31i-A Designation of Spindle Axes, 5 Spindles |
| A02B-0307-S837#6 | 31i-A Designation of Spindle Axes, 6 Spindles |
| A02B-0308-S837#1 | 32i-A Designation of Spindle Axes, 1 Spindle |
| A02B-0308-S837#2 | 32i-A Designation of Spindle Axes, 2 Spindles |
| A02B-0308-S837#3 | 32i-A Designation of Spindle Axes, 3 Spindles - ONLY if 3rd Spindle is Life Tool (Driven Tool) |
| A02B-0323-S837#1 | 30i-B Designation of Spindle Axes, 1 Spindle |
| A02B-0323-S837#2 | 30i-B Designation of Spindle Axes, 2 Spindles |
| A02B-0323-S837#3 | 30i-B Designation of Spindle Axes, 3 Spindles |
| A02B-0323-S837#4 | 30i-B Designation of Spindle Axes, 4 Spindles |
| A02B-0323-S837#5 | 30i-B Designation of Spindle Axes, 5 Spindles |
| A02B-0323-S837#6 | 30i-B Designation of Spindle Axes, 6 Spindles |
| A02B-0323-S837#7 | 30i-B Designation of Spindle Axes, 7 Spindles |
| A02B-0323-S837#8 | 30i-B Designation of Spindle Axes, 8 Spindles |

**Notice**

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# 035

| Specification | Description |
|---|---|
| A02B-0326-S837#1 | 31i-B5 Designation of Spindle Axes, 1 Spindle |
| A02B-0326-S837#2 | 31i-B5 Designation of Spindle Axes, 2 Spindles |
| A02B-0326-S837#3 | 31i-B5 Designation of Spindle Axes, 3 Spindles |
| A02B-0326-S837#4 | 31i-B5 Designation of Spindle Axes, 4 Spindles |
| A02B-0326-S837#5 | 31i-B5 Designation of Spindle Axes, 5 Spindles |
| A02B-0326-S837#6 | 31i-B5 Designation of Spindle Axes, 6 Spindles |
| A02B-0327-S837#1 | 31i-B Designation of Spindle Axes, 1 Spindle |
| A02B-0327-S837#2 | 31i-B Designation of Spindle Axes, 2 Spindles |
| A02B-0327-S837#3 | 31i-B Designation of Spindle Axes, 3 Spindles |
| A02B-0327-S837#4 | 31i-B Designation of Spindle Axes, 4 Spindles |
| A02B-0327-S837#5 | 31i-B Designation of Spindle Axes, 5 Spindles |
| A02B-0327-S837#6 | 31i-B Designation of Spindle Axes, 6 Spindles |
| A02B-0328-S837#1 | 32i-B Designation of Spindle Axes, 1 Spindle |
| A02B-0328-S837#2 | 32i-B Designation of Spindle Axes, 2 Spindles |
| A02B-0328-S837#3 | 32i-B Designation of Spindle Axes, 3 Spindles |

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# 036

## Controlled axis

# Cs contouring control

## Features

The Cs Contouring function controls the position of the serial spindle using the spindle motor in conjunction with a dedicated detector mounted on the spindle.

The Cs contouring control function provides a higher precision than the spindle positioning function and enables positioning with other servo axes. Namely, the Cs contouring control function enables linear interpolation between the spindle and servo axes.

The speed of the serial spindle is controlled by the spindle speed control function, while the spindle positioning is controlled by the Cs contouring control function ("spindle contouring control"). Spindle speed control rotates the spindle using the velocity command, while the spindle contour control rotates the spindle using the move command.

Switching between spindle speed control and Cs contouring control is performed by signals set in the PMC. In the Cs contouring control mode, the Cs contouring control axis can be operated either manually or automatically, in the same way as normal servo axes.

## Benefits

- High-precision positioning of the spindle
- Interpolation between the spindle axis and the feed axes

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J852 | 30i-A CS Contour Control |
| A02B-0306-J852 | 31i-A5 CS Contour Control |
| A02B-0307-J852 | 31i-A CS Contour Control |
| A02B-0308-J852 | 32i-A CS Contour Control |
| A02B-0323-J852 | 30i-B CS Contour Control |
| A02B-0326-J852 | 31i-B5 CS Contour Control |
| A02B-0327-J852 | 31i-B CS Contour Control |
| A02B-0328-J852 | 32i-B CS Contour Control |

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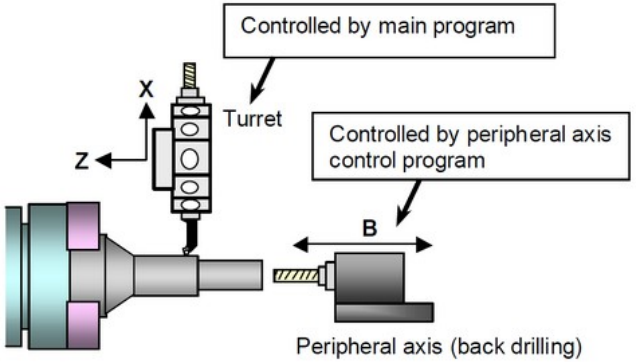
# 037

## Controlled axis




# Peripheral axis control

## Features

In addition to a main program, another program can execute during the automatic operation of the CNC. In this case, peripheral axes such as loader and back drilling can be controlled in parallel with a main program.

The Peripheral Axis Control function has three control groups:

- Peripheral axis control group 1
- Peripheral axis control group 2
- Peripheral axis control group 3

Each group can run independently. Therefore, in a multi-path system, peripheral axis control can be applied to each path independently by assigning different control groups for each path.

## Benefits

- Increase of machine efficiency and productivity
- Speed up programming and CNC commissioning
- Complex motion commands are easier and faster to programm

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0323-R725 | 30i-B Peripheral Axis Control |
| A02B-0326-R725 | 31i-B5 Peripheral Axis Control |
| A02B-0327-R725 | 31i-B Peripheral Axis Control |
| A02B-0328-R725 | 32i-B Peripheral Axis Control |

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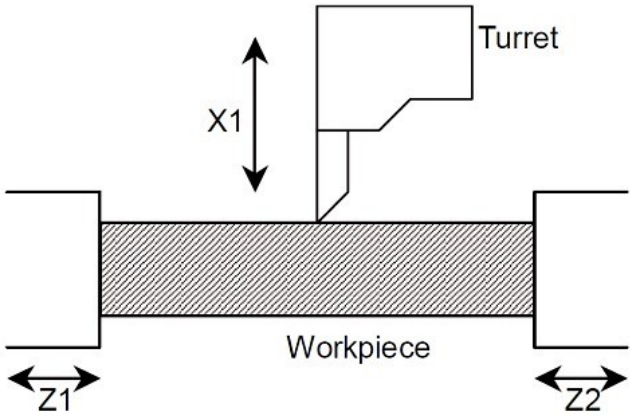
# 038

## Controlled axis




Synchronize Z2 in path 2 with Z1 in path1

# Synchronous / composite control

## Features

The Synchronous / Composite Control function enables an arbitrary axis of one path to be synchronized with an arbitrary axis of another path (synchronous control). In a multi-path control, movements are usually made on the axes of a path according to a move command for the path (independent control in each path).

With Synchronous / Composite Control, a move command for an arbitrary axis of one path and a move command for an arbitrary axis of another path can be exchanged with each other to make a movement on each axis (composite control).

By applying a move command for an axis (master axis) to a different arbitrary axis (slave axis), the movements on the two axes can be synchronized with each other. Whether to synchronize the movement on a slave axis with the move command for the master axis or make a movement on a slave according to the command for the slave can be chosen using the signal (synchronous control selection signal) from the PMC.

A move command for an arbitrary axis of one path and a move command for an arbitrary axis of another path can be exchanged with each other to make a movement on each axis.

## Benefits

- Increase of machine efficiency and productivity
- Speed up programming and CNC commissioning
- Easier and faster programming
- Allows complex commands and synchronization between paths

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S816 | 30i-A Synchronous and Composite Control for Multi-Path System |
| A02B-0306-S816 | 31i-A5 Synchronous and Composite Control for Multi-Path System |
| A02B-0307-S816 | 31i-A Synchronous and Composite Control for Multi-Path System |
| A02B-0308-S816 | 32i-A Synchronous and Composite Control for Multi-Path System |
| A02B-0319-S816 | 0i-TD Synchronous and Composite Control |
| A02B-0323-S816 | 30i-B Synchronous and Composite Control for Multi-Path System |
| A02B-0326-S816 | 31i-B5 Synchronous and Composite Control for Multi-Path System |
| A02B-0327-S816 | 31i-B Synchronous and Composite Control for Multi-Path System |
| A02B-0328-S816 | 32i-B Synchronous and Composite Control for Multi-Path System |

**Notice**

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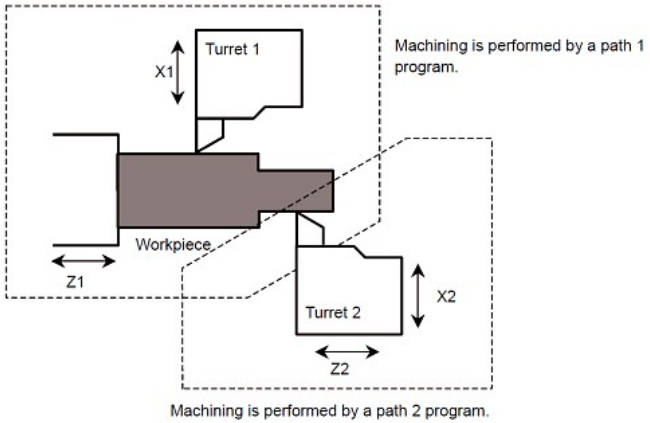
# 039

## Controlled axis




# Superimposed control

## Features

Superimposed Control enables the travel distance on an arbitrary axis of one path to be superimposed on the travel distance on an arbitrary axis of another path. In multi-path control, usually, movements are made on the axes of path 1 according to a move command for path 1, and movements are made on the axes of path 2 according to a move command for path 2 (independent control in each path).

Superimposed control is very similar to synchronous control. In superimposed control however, a movement on the slave axis can be specified with a command for the path to which the slave axis belongs. The master axis and slave axis may belong to the same path, or the master axis may belong to one axis and the slave axis may belong to another. Moreover, multiple slave axes can be specified for one master axis. WIth the help of parameter settings, the move directions on the master axis and slave axis can be reversed from each other.

Example: in the image a move command for the Z1 axis of path 1 is superimposed on the travel distance on the Z2 axis of path 2.

## Benefits

- Increase of machine efficiency and productivity
- Speed up programming and CNC commissioning
- Complex motion commands are easier and faster to programm

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S818 | 30i-A Superimposed Control |
| A02B-0306-S818 | 31i-A5 Superimposed Control |
| A02B-0307-S818 | 31i-A Superimposed Control |
| A02B-0308-S818 | 32i-A Superimposed Control |
| A02B-0319-S818 | 0i-TD Superimposed Control |
| A02B-0323-S818 | 30i-B Superimposed Control |
| A02B-0326-S818 | 31i-B5 Superimposed Control |
| A02B-0327-S818 | 31i-B Superimposed Control |
| A02B-0328-S818 | 32i-B Superimposed Control |

**Notice**

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# 040

## Controlled axis

# Superimposed control A

## Features

For a slave axis under superimposed control, a travel distance specified by the program for the master axis path is added to a travel distance specified by the program for the slave axis path.

As a consequence, the actual speed on a slave axis is significantly higher than the ordinary speed ("ordinary speed" means a speed such as a parameter-set rapid traverse rate).

To prevent this, feedrates and a linear acceleration / deceleration time constant in rapid traverse can be set for use only during superimposed control with this function.

## Benefits

- Simplifies the control in superimposed mode

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-R538 | 0i-TD Superimposed Control A |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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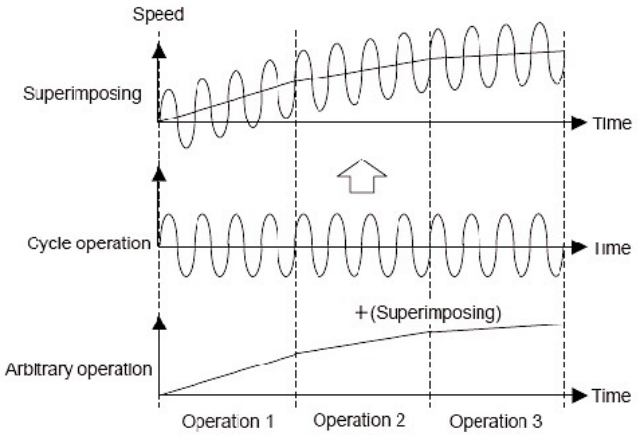
# 041

## Controlled axis




# Superimposed control for high-speed cycle machining

## Features

The Superimposed Control for High-Speed Cycle Machining function can perform superimposing upon an axis executing high-speed cycle machining or high-speed binary operation, from another path.

Independent arbitrary operation (cutting command) can be superimposed on a cycle operation that uses high-speed cycle machining (contour command or oscillation command).

Learning control can be used in high-speed cycle machining and high-speed binary operation.

## Benefits

- Increase of machine efficiency and productivity
- Speed up programming and CNC commissioning
- Easier and faster programming
- Allows complex movements issued from the superimposition of arbitrary moves with high-speed operations

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R554 | 30i-A High-Speed Cycle Machining - Superimposed Control |
| A02B-0306-R554 | 31i-A5 High-Speed Cycle Machining - Superimposed Control |
| A02B-0307-R554 | 31i-A High-Speed Cycle Machining - Superimposed Control |
| A02B-0323-R554 | 30i-B High-Speed Cycle Machining - Superimposed Control |
| A02B-0326-R554 | 31i-B5 High-Speed Cycle Machining - Superimposed Control |
| A02B-0327-R554 | 31i-B High-Speed Cycle Machining - Superimposed Control |

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# 042

## Controlled axis

# Synchronous, composite, superimposed control by program command

## Features

The Synchronous, Composite and Superimposed Control function can be started or canceled using G-codes in the part program instead of being activated through digital input signals.

It is also possible to perform these controls using digital input signals in addition.

## Example

- G51.4 P_ Q_ (L_); Start synchronous control
- G50.4 Q_ ; Cancel synchronous control
- G51.5 P_ Q_ ; Start composite control
- G50.5 P_ Q_ ; Cancel composite control
- G51.6 P_ Q_ ; Start superimposed control
- G50.6 Q_ ; Cancel superimposed control

## Benefits

- Flexibility of the machine configuration
- Behaviour change without writing a specific PMC program
- Compatibility with Series 16i function

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-S890 | 0i-TD Synchronous, Composite, and Superimposed Control by CNC Program |
| A02B-0323-S890 | 30i-B Synchronous, Composite and Superimposed Control by CNC Program |
| A02B-0326-S890 | 31i-B5 Synchronous, Composite and Superimposed control by CNC Program |
| A02B-0327-S890 | 31i-B Synchronous, Composite and Superimposed Control by CNC Program |
| A02B-0328-S890 | 32i-B Synchronous, Composite and Superimposed Control by CNC Program |

**Notice**

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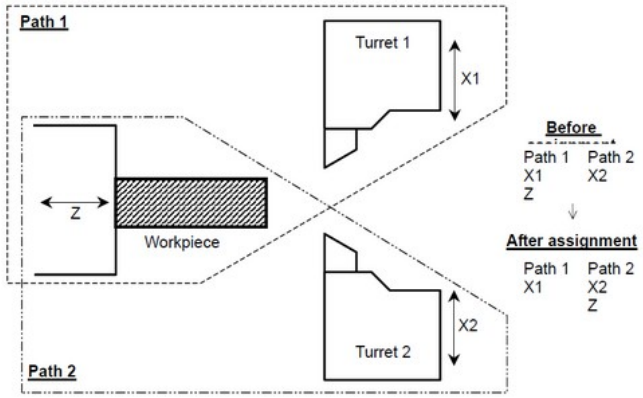
# 043

## Controlled axis




# Flexible path axis assignment

## Features

The Flexible Path Axis Assignment function enables to disconnect each control axis from the control of each path and to assign the axis as a controlled axis to other path.

When using this function, an axis can be controlled in multiple paths.

The use of a dummy axis as intermediate is not required when using this function, as axis configuration can be changed directly.

## Benefits

- High flexibility of the machine configuration and axis usage
- Increase of machine efficiency and productivity
- Speed up programming and CNC commissioning

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R607 | 30i-A Flexible Path Axis Assignment |
| A02B-0306-R607 | 31i-A5 Flexible Path Axis Assignment |
| A02B-0307-R607 | 31i-A Flexible Path Axis Assignment |
| A02B-0308-R607 | 32i-A Flexible Path Axis Assignment |
| A02B-0323-R607 | 30i-B Flexible Path Axis Assignment |
| A02B-0326-R607 | 31i-B5 Flexible Path Axis Assignment |
| A02B-0327-R607 | 31i-B Flexible Path Axis Assignment |
| A02B-0328-R607 | 32i-B Flexible Path Axis Assignment |

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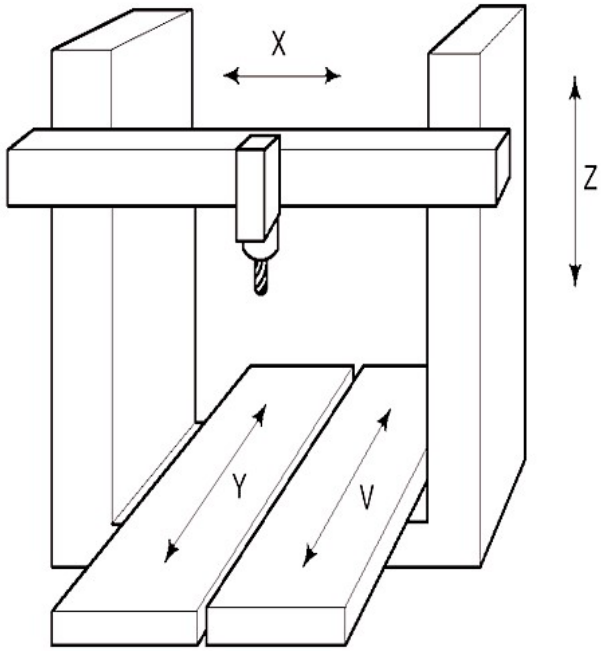
# 044

## Controlled axis




# Axis synchronous control

## Features

The Axis Synchronous function allows up to 4 master/slave servo motor pairs to perform synchronized motion. This feature is typically used on gantry or split table axes.

## Benefits

- Machining of large work piece
- Each table can also be independently or synchronized controlled during normal operation
- Up to four axis can be synchronously controlled

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J843 | 30i-A Axis Synchronous Control |
| A02B-0306-J843 | 31i-A5 Axis Synchronous Control |
| A02B-0307-J843 | 31i-A Axis Synchronous Control |
| A02B-0308-J843 | 32i-A Axis Synchronous Control |
| A02B-0321-J843 | 0i-Mate-TD Axis Synchronous Control |
| A02B-0322-J843 | 0i-Mate-MD Axis Synchronous Control |
| A02B-0323-J843 | 30i-B Axis Synchronous Control - Incl. Tandem Control |
| A02B-0326-J843 | 31i-B5 Axis Synchronous Control - Incl. Tandem Control |
| A02B-0327-J843 | 31i-B Axis Synchronous Control - Incl. Tandem Control |
| A02B-0328-J843 | 32i-B Axis Synchronous Control - Incl. Tandem Control |
| A02B-0333-J843 | 35i-B Axis Synchronous Control (Max. 8 Axis Pairs) - Incl. Tandem Control |
| A02B-0334-J843 | PM i-A Axis Synchronous Control - Incl. Tandem Control |

**Notice**

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# 045

## Controlled axis

# Twin table control

## Features

The Twin Table Control function allows two specified axes to be switched between synchronous, independent, or normal operation, using the appropriate switches on the machine operator's panel.

## Benefits

- Flexible operation selection
- Increase of machine efficiency and productivity
- Speed up programming and CNC comissioning

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J698 | 30i-A Twin Table Control |
| A02B-0306-J698 | 31i-A5 Twin Table Control |
| A02B-0307-J698 | 31i-A Twin Table Control |
| A02B-0308-J698 | 32i-A Twin Table Control |
| A02B-0323-J698 | 30i-B Twin Table Control |
| A02B-0326-J698 | 31i-B5 Twin Table Control |
| A02B-0327-J698 | 31i-B Twin Table Control |
| A02B-0328-J698 | 32i-B Twin Table Control |

**Notice**

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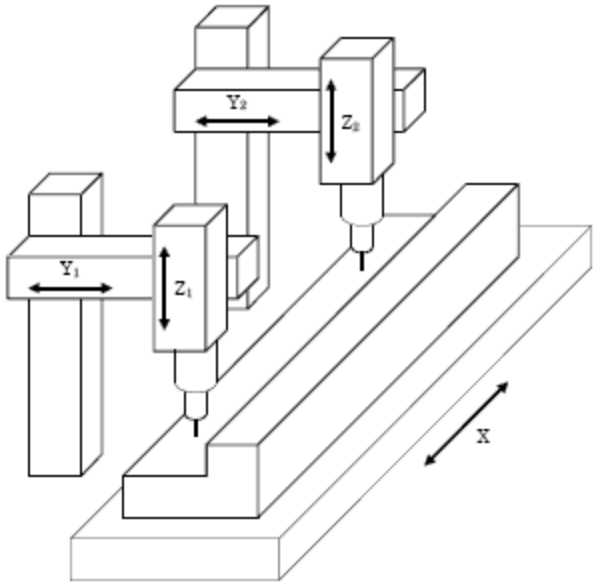
# 046

## Controlled axis




# Parallel axis control

## Features

When a machine tool is featuring multiple heads and multiple tables, machining multiple workpieces with the same shape at the same time on these multiple tables, multiple controlled axes having the same axis name can be operated at the same time by the use of a move command that specifies only one program axis.

This operation is called parallel operation. Two or more axes which operate in parallel at the same time upon the execution of a command that specifies only one program axis are called parallel axes.

The Parallel Axis Control function is effective in MEM mode, MDI mode, and manual numeric commands in machining center with one path. In manual operation, the parallel function can not be used. Each controlled axis operates independently.

In parallel operation, controlled axes related to one program axis operate in the same way. With the use of an input signal sent from the machine side, only the specified axis is selected among multiple parallel axes and operated (parking).

## Notes:

Parallel axis control function is limited to machining center with one path only.

Parallel axis control function does not support the following motion functions:

- Smooth interpolation
- Nano smoothing
- 3-dimensional coordinate system conversion
- 3-dimensional tool compensation
- Tool length compensation in tool axis direction
- Tool center point control
- Tool posture control
- 3-dimensional cutter compensation
- Tilted working plane indexing
- Nano smoothing 2
- Workpiece setting error compensation
- Tandem control
- Feed axis synchronization control
- Twin table control
- Synchronous / Composite control
- Superimposed Control

**Notice**

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## Benefits

- Simple and effective implementation of machines performing parallel machining or multiple boring / drilling stations
- Increase machine efficiency and productivity
- Simplified programming of the machining cycles
- Speeds up CNC and machine commissioning

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R509 | 30i-A Parallel Axis Control |
| A02B-0306-R509 | 31i-A5 Parallel Axis Control |
| A02B-0307-R509 | 31i-A Parallel Axis Control |
| A02B-0323-R509 | 30i-B Parallel Axis Control |
| A02B-0326-R509 | 31i-B5 Parallel Axis Control |
| A02B-0327-R509 | 31i-B Parallel Axis Control |

**Notice**

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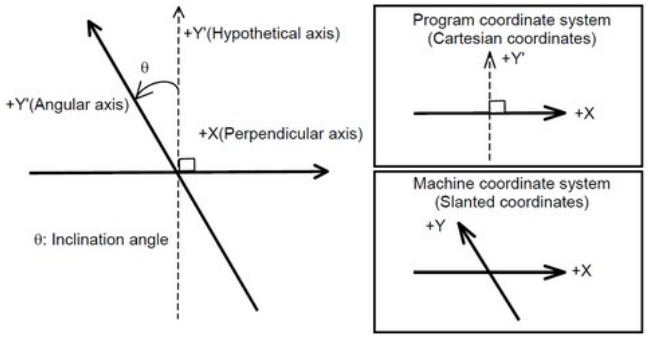
# 048

## Controlled axis




# Arbitrary angular axis control

## Features

When the angular axis installed makes an angle other than 90° with the perpendicular axis, the angular axis control function can control the distance traveled along each axis according to the inclination angle, as if the angular axis makes and angle of 90° with the perpendicular axis.

Arbitrary axes can be specified as a set of an angular axis and perpendicular axis by parameter setting. The actual distance traveled is controlled according to an inclination angle. However, a program, when created, assumes that the angular axis and perpendicular axis intersect at right angles.

## Benefits

- Increase machine efficiency and productivity
- Simplified programming of the machining cycles
- Speeds up CNC and machine commissioning

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J924 | 30i-A Arbitrary Angular Axis Control |
| A02B-0306-J924 | 31i-A5 Arbitrary Angular Axis Control |
| A02B-0307-J924 | 31i-A Arbitrary Angular Axis Control |
| A02B-0308-J924 | 32i-A Arbitrary Angular Axis Control |
| A02B-0319-J924 | 0i-TD Angular Axis Control |
| A02B-0320-J924 | 0i-MD Angular Axis Control |
| A02B-0323-J924 | 30i-B Arbitrary Angular Axis Control |
| A02B-0326-J924 | 31i-B5 Arbitrary Angular Axis Control |
| A02B-0327-J924 | 31i-B Arbitrary Angular Axis Control |
| A02B-0328-J924 | 32i-B Arbitrary Angular Axis Control |

**Notice**

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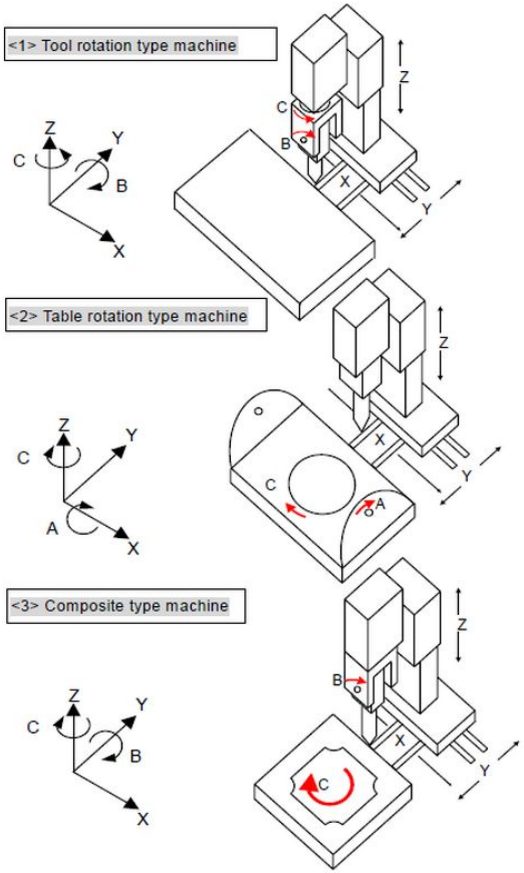
# 049

## Controlled axis




# Inclined rotary axis control

## Features

The Inclined Rotary Axis Control function provides the following 5-axes control capabilities:

- Tilted Working Plane Command (TWP)
- Tool Center Point Control (TCP)
- 3-Dimensional Cutter/Radius Compensation
- 3-Dimensional Manual Feed

This function can be used on machines where the tool rotation axis or the table rotation axis is inclined with respect to the X-Y plane, a Y-Z plane or a Z-X plane of the machine coordinate system.

## Benefits

- Supports 5-Axes functions on machines with non-orthogonal primary linear axes

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S688 | 30i-A Inclined Rotary Axis Control |
| A02B-0306-S688 | 31i-A5 Inclined Rotary Axis Control |
| A02B-0307-S688 | 31i-A Inclined Rotary Axis Control |
| A02B-0323-S688 | 30i-B Inclined Rotary Axis Control |
| A02B-0326-S688 | 31i-B5 Inclined Rotary Axis Control |
| A02B-0327-S688 | 31i-B Inclined Rotary Axis Control |

**Notice**

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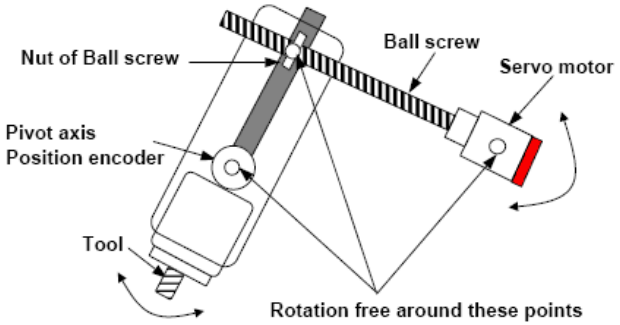
# 050

## Controlled axis




# Pivot axis control

## Features

The Pivot Axis Control function allows to control a pivot axis (B-axis) by a ball screw connected to a servo motor, which direction is free.

Generally, the relation between the rotating angle of motor and the position of rotation axis on the machine is proportional. When using this function, the rotation angle of the motor is not proportional to the rotation angle of the pivot axis (B-axis) on the machine.

The position command is output to drive the servo motor, and the position encoder is mounted to follow the rotation angle of pivot axis (B-axis). The speed of pivot axis (B-axis) may fluctuate; to decrease the fluctuation and keep the actual position gain constant, the function changes the position gain of the motor according to the position of pivot axis (B-axis).

## Benefits

- Simple and effective implementation of complex pivotal systems
- Increase machine efficiency and productivity
- Simplified programming of the machining cycles
- Speeds up CNC and machine commissioning

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S665 | 30i-A Pivot Axis Control |
| A02B-0306-S665 | 31i-A5 Pivot Axis Control |
| A02B-0307-S665 | 31i-A Pivot Axis Control |
| A02B-0323-S665 | 30i-B Pivot Axis Control |
| A02B-0326-S665 | 31i-B5 Pivot Axis Control |
| A02B-0327-S665 | 31i-B Pivot Axis Control |

**Notice**

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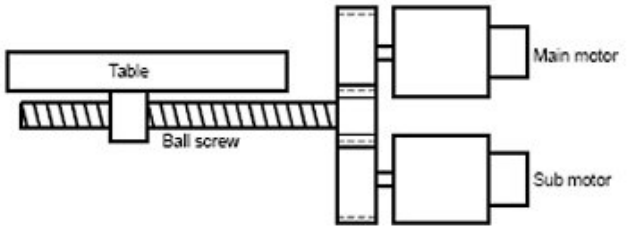
# 051

## Controlled axis




# Tandem control

## Features

If a single motor is not capable of producing sufficient torque to drive a large table or mechanical construction, the Tandem Control function allows to add the forces of two motors to produce a stronger torque to realize a combined movement along one axis.

A motor of the same specification is used for both the main motor and sub-motor.

Only the main motor is responsible for the positioning; the sub-motor only produces torque and the resulting torque produced is the double of the torque produced (load sharing mode). With a preload torque, a tension between the main motor and sub-motor is generated which reduces the backlash between gears (anti-backlash mode).

Tandem control is also used to increase the force of linked linear motors and motors with a winding tandem (for instance large servo motors such as ALPHA iS 300/2000, ALPHA iS 500/2000 or ALPHA iS 1000/2000HV).

## Benefits

- Realization of large force linear motor systems
- Realization of high torque systems to drive large mechanical units or machine tables
- Increase machine efficiency and productivity
- Simplified programming of the machining cycles
- Speeds up CNC and machine commissioning

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J733 | 30i-A Tandem Control |
| A02B-0306-J733 | 31i-A5 Tandem Control |
| A02B-0307-J733 | 31i-A Tandem Control |
| A02B-0308-J733 | 32i-A Tandem Control |

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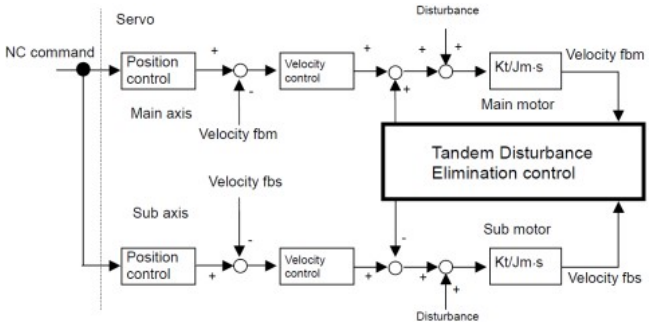
# 052

## Controlled axis




# Tandem disturbance elimination function

## Features

This function suppresses vibration caused by interferences between the main axis and the sub-axis in a position tandem control (feed axis synchronization).

## Note

The axis synchronous control function is required.

## Benefits

- Simple and effective implementation of vibration suppression on a tandem machine
- Increase machining quality, efficiency and productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S660 | 30i-A Tandem Disturbance Elimination Control |
| A02B-0306-S660 | 31i-A5 Tandem Disturbance Elimination Control |
| A02B-0307-S660 | 31i-A Tandem Disturbance Elimination Control |
| A02B-0308-S660 | 32i-A Tandem Disturbance Elimination Control |
| A02B-0319-S660 | 0i-TD Tandem Disturbance Elimination Control |
| A02B-0320-S660 | 0i-MD Tandem Disturbance Elimination Control |
| A02B-0323-S660 | 30i-B Tandem Disturbance Elimination Control |
| A02B-0326-S660 | 31i-B5 Tandem Disturbance Elimination Control |
| A02B-0327-S660 | 31i-B Tandem Disturbance Elimination Control |
| A02B-0328-S660 | 32i-B Tandem Disturbance Elimination Control |
| A02B-0333-S660 | 35i-B Tandem Disturbance Elimination Control |
| A02B-0334-S660 | PM i-A Tandem Disturbance Elimination Control |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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# 053

## Controlled axis

# Pole position detection function

## Features

When a 3rd party motor or FANUC DiS (torque) or LiS (linear) motors are driven by a FANUC servo system, the Pole Position Detection function allows the proper detection of the position of magnetic poles.

## Notes

- This function cannot be used with a vertical axis to which force is applied at all times
- This function cannot be used with an axis when the axis is completely locked

## Benefits

- Detection of magnetic poles of FANUC DiS (torque) and LiS (linear) servo motors
- Detection of magnetic poles of 3rd party servo motors with a FANUC servo amplifier system
- Speeds up CNC and machine commissioning

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S744 | 30i-A Pole Position Detection Function |
| A02B-0306-S744 | 31i-A5 Pole Position Detection Function |
| A02B-0307-S744 | 31i-A Pole Position Detection Function |
| A02B-0308-S744 | 32i-A Pole Position Detection Function |
| A02B-0319-S744 | 0i-TD Pole Position Detection Function |
| A02B-0320-S744 | 0i-MD Pole Position Detection Function |
| A02B-0323-S744 | 30i-B Pole Position Detection Function |
| A02B-0326-S744 | 31i-B5 Pole Position Detection Function |
| A02B-0327-S744 | 31i-B Pole Position Detection Function |
| A02B-0328-S744 | 32i-B Pole Position Detection Function |
| A02B-0333-S744 | 35i-B Pole Position Detection Function |
| A02B-0334-S744 | PM i-A Pole Position Detection Function |

**Notice**

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# 054

## Controlled axis

# Controlled axis detach

## Features

With the Controlled Axes Detach function, an entire axis, including servo motor and feedback, can be "detached" or disabled from the machine and the control system without creating any alarm.

## Benefits

- Typically used for fourth axis such as rotary table, right angle head
- Easy to implement a plug and play solution without operator intervention with the machine controller
- Position display shows the attached axis positions
- Easy to use for production adaptability and flexibility

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J807 | 30i-A Axes Detach |
| A02B-0306-J807 | 31i-A5 Axes Detach |
| A02B-0307-J807 | 31i-A Axes Detach |
| A02B-0308-J807 | 32i-A Axes Detach |
| A02B-0323-J807 | 30i-B Axes Detach |
| A02B-0326-J807 | 31i-B5 Axes Detach |
| A02B-0327-J807 | 31i-B Axes Detach |
| A02B-0328-J807 | 32i-B Axes Detach |

**Notice**

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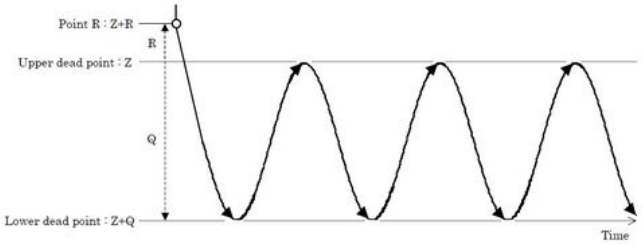
# 055

## Controlled axis




# High precision oscillation function

## Features

In this function, the feedrate of an oscillation axis (equivalent to a chopping axis that is moved vertically and repeatedly for grinding) changes along a sine curve.

This function is effective to improve the accuracy of movement between upper dead point and lower dead point.

In addition, the look-ahead feed forward function can be used with oscillation motion; in this case a higher accuracy can be achieved even if the oscillation feedrate or the upper or lower dead point are changed.

## Benefits

- Simplification of the programming
- Increase of the precision and productivity of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R662 | 30i-A High Precision Oscillation Function |
| A02B-0306-R662 | 31i-A5 High Precision Oscillation Function |
| A02B-0307-R662 | 31i-A High Precision Oscillation Function |
| A02B-0308-R662 | 32i-A High Precision Oscillation Function |
| A02B-0319-R662 | 0i-TD High Precision Oscillation Function |
| A02B-0320-R662 | 0i-MD High Precision Oscillation Function |
| A02B-0321-R662 | 0i-Mate-TD High Precision Oscillation Function |
| A02B-0322-R662 | 0i-Mate-MD High Precision Oscillation Function |
| A02B-0323-R662 | 30i-B High Precision Oscillation Function |
| A02B-0326-R662 | 31i-B5 High Precision Oscillation Function |
| A02B-0327-R662 | 31i-B High Precision Oscillation Function |
| A02B-0328-R662 | 32i-B High Precision Oscillation Function |

**Notice**

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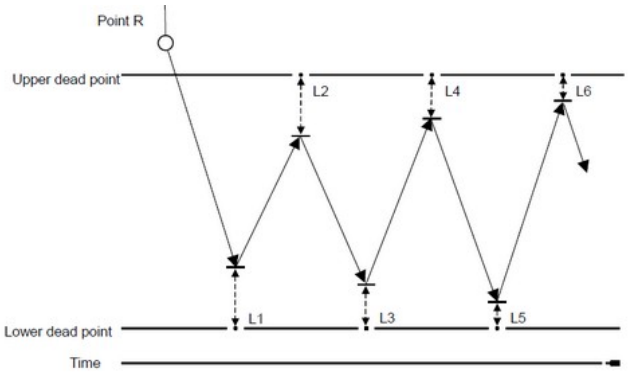
# 056

## Controlled axis




# Chopping

## Features

The Chopping function controls an up and down motion for side face grinding while servo delay compensation is used to minimize errors at upper and lower dead points (end points).

A chopping cycle is activated by the G81.1 command or a PMC signal; a G80 command cancels this chopping cycle. Parameters are used to specify the movement itself.

## Benefits

- Allows complex gear cutting/grinding operations
- Simplifies programming

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J707 | 30i-A Chopping Function |
| A02B-0306-J707 | 31i-A5 Chopping Function |
| A02B-0307-J707 | 31i-A Chopping Function |
| A02B-0308-J707 | 32i-A Chopping Function |
| A02B-0323-J707 | 30i-B Chopping Function |
| A02B-0326-J707 | 31i-B5 Chopping Function |
| A02B-0327-J707 | 31i-B Chopping Function |
| A02B-0328-J707 | 32i-B Chopping Function |

**Notice**

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# 057
## Controlled axis

# Increment system C

The Increment System C allows programming to 0.0001mm or 0.00001 inches or 0.0001 degrees.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J805 | 30i-A Increment System C |
| A02B-0306-J805 | 31i-A5 Increment System C |
| A02B-0307-J805 | 31i-A Increment System C |
| A02B-0308-J805 | 32i-A Increment System C |
| A02B-0323-J805 | 30i-B Increment System C |
| A02B-0326-J805 | 31i-B5 Increment System C |
| A02B-0327-J805 | 31i-B Increment System C |
| A02B-0328-J805 | 32i-B Increment System C |

**Notice**

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# 058

## Controlled axis

# Increment system D

The Increment System D allows programming to 0.00001mm or 0.000001 inches or 0.00001 degrees.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S694 | 30i-A Increment System D |
| A02B-0306-S694 | 31i-A5 Increment System D |
| A02B-0307-S694 | 31i-A Increment System D |
| A02B-0308-S694 | 32i-A Increment System D |
| A02B-0323-S694 | 30i-B Increment System D |
| A02B-0326-S694 | 31i-B5 Increment System D |
| A02B-0327-S694 | 31i-B Increment System D |
| A02B-0328-S694 | 32i-B Increment System D |

**Notice**

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# 059

## Controlled axis

# Increment system E

The Increment System E allows programming to 0.000001mm or 0.0000001 inches or 0.000001 degrees.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S805 | 30i-A Increment System E |
| A02B-0306-S805 | 31i-A5 Increment System E |
| A02B-0307-S805 | 31i-A Increment System E |
| A02B-0323-S805 | 30i-B Increment System E |
| A02B-0326-S805 | 31i-B5 Increment System E |
| A02B-0327-S805 | 31i-B Increment System E |

**Notice**

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# 060
## Controlled axis

# Arbitrary command multiply

## Features

The Arbitrary Command Multiply function provides the flexibility to set the gearing between the position feedback device and the motor for a given axis.

When the detection unit assumes a special value, an arbitrary command multiply can be set using a ratio of n:m. The setting range is 1/9999 to 9999/1.

## Benefits

- Increase of the flexibility and adpatation of the CNC to the machine structure
- Speeds up CNC and machine design and commissioning

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S806 | 30i-A Arbitrary Command Multiply |
| A02B-0306-S806 | 31i-A5 Arbitrary Command Multiply |
| A02B-0307-S806 | 31i-A Arbitrary Command Multiply |
| A02B-0308-S806 | 32i-A Arbitrary Command Multiply |
| A02B-0323-S806 | 30i-B Arbitrary Command Multiply |
| A02B-0326-S806 | 31i-B5 Arbitrary Command Multiply |
| A02B-0327-S806 | 31i-B Arbitrary Command Multiply |
| A02B-0328-S806 | 32i-B Arbitrary Command Multiply |

**Notice**

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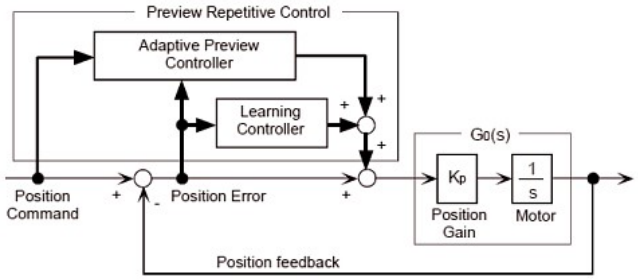
# 061

## Controlled axis




# High precision learning control A

## Features

The High-Precision Learning Control A function (formerly Preview Repetitive Control) is a function designed to allow high-speed and high-precision cutting by recovering previously saved cutting data from memory and utilizing that data during production for optimization purpose.

High-Precision Learning Control A, is used to increase the speed and accuracy of machining high volume parts.

Before employing this function in production, the axes involved in the prescribed machining operation must first be "taught" the desired path movements and related cutting data. This data is stored in memory and recovered for use as a template during production.

Compared to High-Precision Learning Control B (formerly Learning Control), this function reduces also the Following Error of the first cycle while using advanced previewing functionality of the control.

This function is ideal for camshaft grinding, crankshaft pin grinding, piston lathes or aspherical lens cutting applications.

## Benefits

- Increased speed and accuracy when machining high volume parts
- Higher accuracy than the High-Precision Learning Control B function as it reduces the position error much faster
- Replaces an expensive mechanical cam with an electronic template that causes the axes to follow a virtual cam

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J706 | 30i-A Preview Repetitive Control |
| A02B-0306-J706 | 31i-A5 Preview Repetitive Control |
| A02B-0307-J706 | 31i-A Preview Repetitive Control |
| A02B-0323-J706 | 30i-B High-Precision Learning Control A - Incl. Spindle Learning Control |
| A02B-0326-J706 | 31i-B5 High-Precision Learning Control A - Incl. Spindle Learning Control |
| A02B-0327-J706 | 31i-B High-Precision Learning Control A - Incl. Spindle Learning Control |

**Notice**

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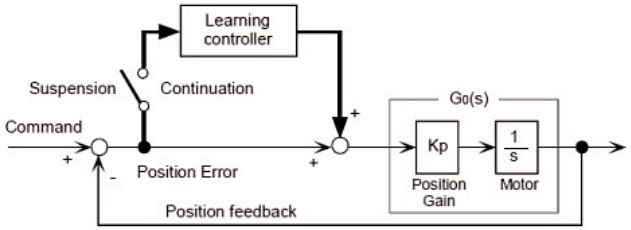
# 062

## Controlled axis




# High precision learning control B

## Features

The High-Precision Learning Control B function (formerly Learning Control) is a function designed to allow high-speed and high-precision cutting by recovering previously saved cutting data from memory and utilizing that data during production. The CNC works to eliminate the position error in the live cutting path versus the memorized data.

Before employing this function in production, the axes involved in the prescribed machining operation must first be "taught" the desired path movements and related cutting data. These are then stored in memory and recovered for use as a template during production.

Compared to the High-Precision Learning Function A, the High-Precision Learning Function B does not feature the Advanced Preview Control

This function is ideal for camshaft grinding, crankshaft pin grinding, piston lathes or aspherical lens cutting applications.

## Benefits

- Learning Control is used to increase the speed and accuracy of machining high volume parts.
- Replace an expensive mechanical cam with an electronic template that causes the axes to follow a virtual cam.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J705 | 30i-A Learning Control |
| A02B-0306-J705 | 31i-A5 Learning Control |
| A02B-0307-J705 | 31i-A Learning Control |
| A02B-0323-J705 | 30i-B High-Precision Learning Control B - Incl. Spindle Learning Control |
| A02B-0326-J705 | 31i-B5 High-Precision Learning Control B - Incl. Spindle Learning Control |
| A02B-0327-J705 | 31i-B High-Precision Learning Control B - Incl. Spindle Learning Control |

**Notice**

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# 063

## Controlled axis

# High precision learning control C

## Features

The High-Precision Learning Control C function (formerly Compact Learning Control) is a subset function of the High-Precision Learning Control B. It can be implemented on standard servo axis cards instead of the servo axes card with large memory (L24 servo cards).

This function provides an angle-base learning control for compact application without handling learning data.

The High-Precision Learning Control C function can be used for applications such as gear grinding, gear cutting and shaping as well as to control grinder oscillation.

## Benefits

- Learning Control increases the speed and accuracy of the machining when producing parts in high volume.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R692 | 30i-A Compact Learning Control |
| A02B-0306-R692 | 31i-A5 Compact Learning Control |
| A02B-0307-R692 | 31i-A Compact Learning Control |
| A02B-0323-R692 | 30i-B High-Precision Learning Control C |
| A02B-0326-R692 | 31i-B5 High-Precision Learning Control C |
| A02B-0327-R692 | 31i-B High-Precision Learning Control C |

**Notice**

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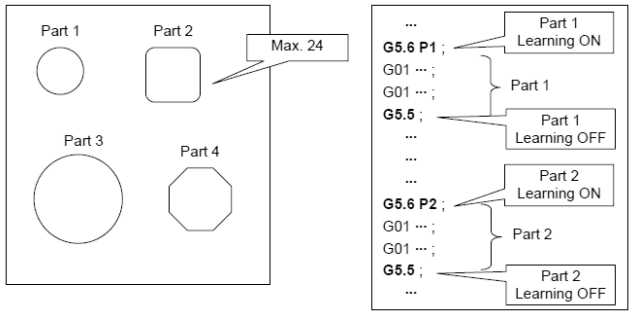
# 064

## Controlled axis




# Learning control for parts cutting A

## Features

The Learning Control for Parts Cutting A function (formerly Learning Control for Parts Cutting) can achieve high precision machining when producing many items with an identical profile.

While machining such an item, there may be multiple identical operations that may be applied to each work-piece in succession. Each repeated path element (such as a drilling sequence or a pocketing sequence) may be treated as a path element to which Learning Control for Parts Cutting may be applied.

## Benefits

- Allows the programmer to apply high-precision cutting to specified path elements within the part program.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R510 | 30i-A Learning Control for Parts Cutting |
| A02B-0306-R510 | 31i-A5 Learning Control for Parts Cutting |
| A02B-0307-R510 | 31i-A Learning Control for Parts Cutting |
| A02B-0308-R510 | 32i-A Learning Control for Parts Cutting |
| A02B-0323-R510 | 30i-B Learning Control for Parts Cutting A |
| A02B-0326-R510 | 31i-B5 Learning Control for Parts Cutting A |
| A02B-0327-R510 | 31i-B Learning Control for Parts Cutting A |
| A02B-0328-R510 | 32i-B Learning Control for Parts Cutting A |

**Notice**

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# 065

## Controlled axis

# Learning control for parts cutting B

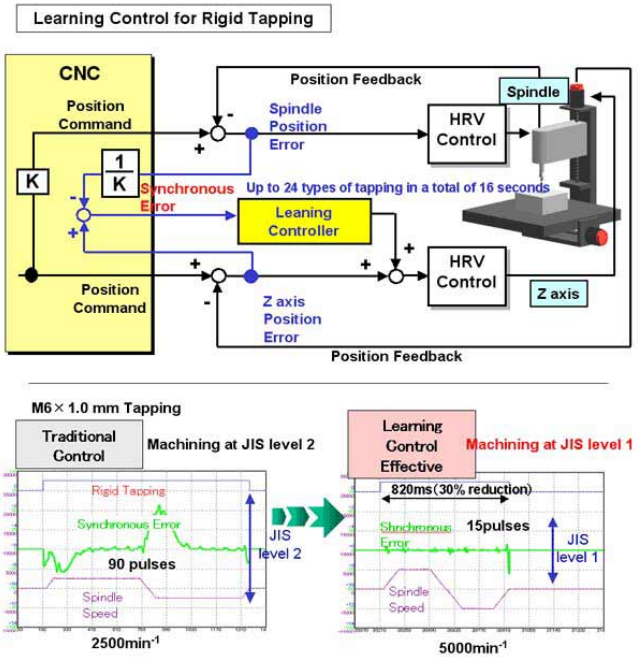
## Features

The Learning Control for Parts Cutting B (formerly Learning Control for Rigit Tapping) function provides a superior controllability in repetitive command for rigid-tapping operation.

It features capabilities to realize high-speed and high-precision machining sequences by minimizing the synchronous error between spindle and tap feed axis during Rigid Tapping.

## Benefits

- Synchronous error between the spindle axis and the z-axis learned at the z-axis to minimizes synchronous error, which enables the z-axis to follow the spindle axis completely, and produces higher precision in machining
- Does not require any special format programs. The only commands that have to be added to the rigid tapping program are Learning On (G5.6 P_ Q1) and Learning Off (G5.5 Q1)
- Uses standard servo cards for up to 24 types of tapping in a total of 16 seconds
- Maintains high precision while improving machining speed or reducing acceleration and deceleration time constant
- Most effective control to improve rigid tap precision and reduce cycle time




## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R539 | 30i-A Learning Control for Rigid Tapping |
| A02B-0306-R539 | 31i-A5 Learning Control for Rigid Tapping |
| A02B-0307-R539 | 31i-A Learning Control for Rigid Tapping |
| A02B-0308-R539 | 32i-A Learning Control for Rigid Tapping |
| A02B-0323-R539 | 30i-B Learning Control for Parts Cutting B (Needs Rigid Tapping) |
| A02B-0326-R539 | 31i-B5 Learning Control for Parts Cutting B (Needs Rigid Tapping) |
| A02B-0327-R539 | 31i-B Learning Control for Parts Cutting B (Needs Rigid Tapping) |
| A02B-0328-R539 | 32i-B Learning Control for Parts Cutting B (Needs Rigid Tapping) |

**Notice**

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# 066

## Controlled axis

# Spindle learning control

## Features

The Spindle Learning Control function is used to increase the speed and accuracy of machining high volume parts.

This function works like the servo-based Learning Control, except that the spindle control loop applies to the compensation mechanism instead of the servo control loop.

## Notes

- A special software is required in the spindle amplifier
- The Cs Contouring Control function is required in the CNC

## Benefits

- Increase the speed and accuracy of machining high volume parts

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S635 | 30i-A Spindle Learning Control |
| A02B-0306-S635 | 31i-A5 Spindle Learning Control |
| A02B-0307-S635 | 31i-A Spindle Learning Control |
| A02B-0323-S635 | 30i-B Spindle Learning Control |
| A02B-0326-S635 | 31i-B5 Spindle Learning Control |
| A02B-0327-S635 | 31i-B Spindle Learning Control |

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# 067

## Controlled axis

# Learning control - memory expansion

## Features

When using the High-Precision Learning Control function on the CNC, this function expands the maximum number of available profiles and learning steps.

| | Max. number of profiles | Max. number of learning steps |
|---|---|---|
| Standard | 5 | 2 |
| With this function | 24 | 5 |

## Benefits

- Increased Learning Memory for complex profiles or where a long learning period is required

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J976 | 30i-A Memory Expansion for Learning Control |
| A02B-0306-J976 | 31i-A5 Memory Expansion for Learning Control |
| A02B-0307-J976 | 31i-A Memory Expansion for Learning Control |
| A02B-0323-J976 | 30i-B Memory Expansion for Learning Control |
| A02B-0326-J976 | 31i-B5 Memory Expansion for Learning Control |
| A02B-0327-J976 | 31i-B Memory Expansion for Learning Control |

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# 068

## Controlled axis

# Learning memory size 10Mbyte

## Features

The standard learning memory for the High-Precision Learning Control of the Series 30i-31i-MODEL B and the Learning Control for Parts Cutting of the Series 30i/31i/32i-MODEL B can be expanded from 5 Mbyte to 10Mbyte.

## Benefits

- Expansion of the learning time or the combination learning time vs. number of learning axes

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0323-R720 | 30i-B Learning Memory Size 10 MB |
| A02B-0326-R720 | 31i-B5 Learning Memory Size 10 MB |
| A02B-0327-R720 | 31i-B Learning Memory Size 10 MB |
| A02B-0328-R720 | 32i-B Learning Memory Size 10 MB |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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# 069

## Controlled axis

# Position feedback dynamic switching function

## Features

The Position Feedback Dynamic Switching function used when a single rotary table with turning capability (hereafter called a rotary table) is controlled by two different operations such as one turning operation and one milling operation.

In case of a turning operation, the rotary table is turned by a spindle motor and a separate position detector.

In case of a milling operation, the rotary table is rotated by a servo motor and a built-in pulse coder.

This function enables the management of the coordinate of the rotary axis even if the position detector is switched. According to the state of control, the position feedback of the rotary axis is dynamically switched between the separate position detector attached with a rotary table and the built-in pulse coder of servo motor using PMC signals.

## Benefits

- Flexible configuration of machines
- Simpler control of advanced mill-turn machine architectures

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S747 | 30i-A Position Feedback Dynamic Switching |
| A02B-0306-S747 | 31i-A5 Position Feedback Dynamic Switching |
| A02B-0307-S747 | 31i-A Position Feedback Dynamic Switching |
| A02B-0323-S747 | 30i-B Position Feedback Dynamic Switching |
| A02B-0326-S747 | 31i-B5 Position Feedback Dynamic Switching |
| A02B-0327-S747 | 31i-B Position Feedback Dynamic Switching |

**Notice**

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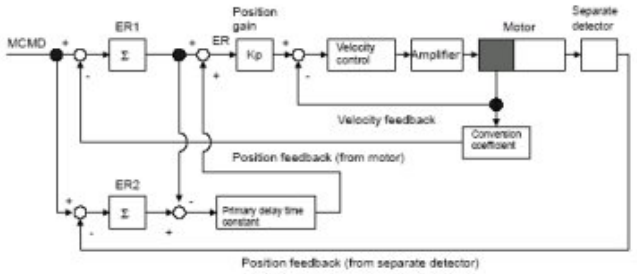
# 070
## Controlled axis




# Dual position feedback

## Features

In general, a machine with a large load inertia ratio or with a large backlash may operate stably with a semi-closed loop (motor feedback only) but may vibrate with a closed loop (separate encoder feedback).

The Dual Position Feedback function improves the control in such a way that a machine can operate stably with a closed loop as it would in the case of a semi-closed loop.

## Benefits

- Increase machine stability and precision

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J704 | 30i-A Dual Position Feedback |
| A02B-0306-J704 | 31i-A5 Dual Position Feedback |
| A02B-0307-J704 | 31i-A Dual Position Feedback |
| A02B-0308-J704 | 32i-A Dual Position Feedback |
| A02B-0319-J704 | 0i-TD Dual Position Feedback |
| A02B-0320-J704 | 0i-MD Dual Position Feedback |
| A02B-0323-J704 | 30i-B Dual Position Feedback |
| A02B-0326-J704 | 31i-B5 Dual Position Feedback |
| A02B-0327-J704 | 31i-B Dual Position Feedback |
| A02B-0328-J704 | 32i-B Dual Position Feedback |
| A02B-0333-J704 | 35i-B Dual Position Feedback |
| A02B-0334-J704 | PM i-A Dual Position Feedback |

**Notice**

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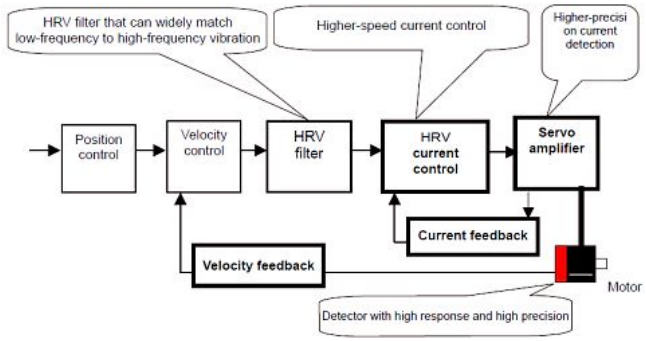
# 071

## Controlled axis




# HRV3 Control

## Features

SERVO HRV control is a digital servo current control methods. When using this method of control, higher speed, higher precision and higher acceleration can be achieved.

There are three types of SERVO HRV control available:

- SERVO HRV2 control
- SERVO HRV3 control
- SERVO HRV4 control

SERVO HRV control has three main features.

1. A disturbance elimination filter which eliminates the low-frequency vibration of a machine with low rigidity
2. Achievement of smooth feed with a high-precision servo amplifiers and detectors
3. The use of high-speed Digital Signal Processor (DSP) which allow a current control period much shorter than the conventional period achieved with standard systems (high-speed HRV current control)

SERVO HRV2 features a current loop of 125 µs and is standard on the Series 30i CNC and optional on the Series 0i.

SERVO HRV3 features a current loop of 62.5 µs and is particularly designed for demanding machining applications.

SERVO HRV4 features a current loop of 31.25 µs and has been designed for specific applications. It also features a faster position loop compared to the HRV2 and HRV3 functions.

## Benefits

- Very performant and scalable axis control

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J398 | 30i-A High-Speed HRV3 Function |
| A02B-0306-J398 | 31i-A5 High-Speed HRV3 Function |
| A02B-0307-J398 | 31i-A High-Speed HRV3 Function |
| A02B-0308-J398 | 32i-A High-Speed HRV3 Function |
| A02B-0323-J398 | 30i-B High-Speed HRV3 Function |
| A02B-0326-J398 | 31i-B5 High-Speed HRV3 Function |
| A02B-0327-J398 | 31i-B High-Speed HRV3 Function |
| A02B-0328-J398 | 32i-B High-Speed HRV3 Function |

**Notice**

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# 072

| Specification | Description |
|---|---|
| A02B-0333-J398 | 35i-B High-Speed HRV3 Function |
| A02B-0334-J398 | PM i-A High-Speed HRV3 Function |

**Notice**

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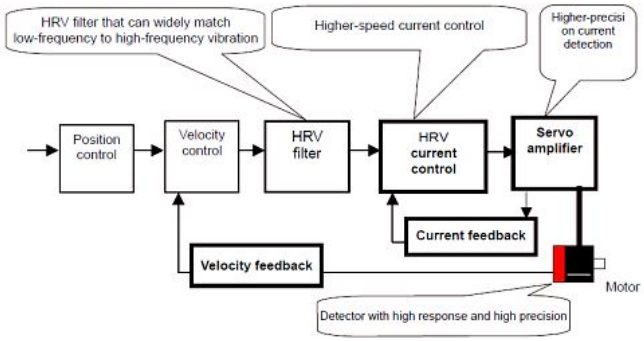
# 073

## Controlled axis




# HRV4 control

## Features

SERVO HRV control is a digital servo current control methods. When using this method of control, higher speed, higher precision and higher acceleration can be achieved.

There are three types of SERVO HRV control available:

- SERVO HRV2 control
- SERVO HRV3 control
- SERVO HRV4 control

SERVO HRV control has three main features.

1. A disturbance elimination filter which eliminates the low-frequency vibration of a machine with low rigidity
2. Achievement of smooth feed with a high-precision servo amplifiers and detectors
3. The use of high-speed Digital Signal Processor (DSP) which allow a current control period much shorter than the conventional period achieved with standard systems (high-speed HRV current control)

SERVO HRV2 features a current loop of 125 µs and is standard on the Series 30i CNC and optional on the Series 0i.

SERVO HRV3 features a current loop of 62.5 µs and is particularly designed for demanding machining applications.

SERVO HRV4 features a current loop of 31.25 µs and has been designed for specific applications. It also features a faster position loop compared to the HRV2 and HRV3 functions.

## Benefits

- Very performant and scalable axis control

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J399 | 30i-A High-Speed HRV4 Function |
| A02B-0306-J399 | 31i-A5 High-Speed HRV4 Function |
| A02B-0307-J399 | 31i-A High-Speed HRV4 Function |
| A02B-0323-J399 | 30i-B High-Speed HRV4 Function |
| A02B-0326-J399 | 31i-B5 High-Speed HRV4 Function |
| A02B-0327-J399 | 31i-B High-Speed HRV4 Function |

**Notice**

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# 074

## Controlled axis

# Inch / metric conversion

## Features

The Inch / Metric Conversion function provides the possibility to switch units between the metric and the inch system within a program directly using a G code.

## Benefits

- Very flexible programming

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J876 | 30i-A Inch/Metric Conversion |
| A02B-0306-J876 | 31i-A5 Inch/Metric Conversion |
| A02B-0307-J876 | 31i-A Inch/Metric Conversion |
| A02B-0308-J876 | 32i-A Inch/Metric Conversion |
| A02B-0323-J876 | 30i-B Inch/Metric Conversion |
| A02B-0326-J876 | 31i-B5 Inch/Metric Conversion |
| A02B-0327-J876 | 31i-B Inch/Metric Conversion |
| A02B-0328-J876 | 32i-B Inch/Metric Conversion |

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# 075

## Controlled axis

# Stored stroke check 1 area expansion

## Features

With the Stored Stroke Check function included in the Basic Function of the CNC, it is possible to switch the 2 checking areas with Digital Input signals.

The Stored Stroke Check 1 Area Expansion function expands the checking areas from 2 to 8.

It is easy to change the stored stroke check area in case of changes of the machine moving area such as during tool changing or tool measuring.

## Benefits

- Increase of the machine flexibility

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R552 | 30i-A Stored Stroke Check, 1 Area Expansion |
| A02B-0306-R552 | 31i-A5 Stored Stroke Check, 1 Area Expansion |
| A02B-0307-R552 | 31i-A Stored Stroke Check, 1 Area Expansion |
| A02B-0323-R552 | 30i-B Stored Stroke Check, 1 Area Expansion |
| A02B-0326-R552 | 31i-B5 Stored Stroke Check, 1 Area Expansion |
| A02B-0327-R552 | 31i-B Stored Stroke Check, 1 Area Expansion |

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# 076

## Controlled axis

# Stroke limit external setting

## Features

The Stroke Limit External Setting function allows the operator to set the desired stroke limit by moving the machine to a desired limit and use a push button to store values in stroke limit parameters.

When a new tool is mounted, the operator positions the tip of the tool on the two corners of the limit area and specifies the machine coordinates of the corners in the parameters for stroke limit 1. The machine coordinates are stored in the CNC as the limit positions.

The operator can then activate the input signals for setting the stroke limit. Stroke limit setting signals are provided for each axis and each direction.

Checking of the stroke limit can also be selected by turning on or off the limit release signal common to all axes.

## Benefits

- Simplifies machining zone setting

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J845 | 30i-A Stroke Limit External Setting |
| A02B-0306-J845 | 31i-A5 Stroke Limit External Setting |
| A02B-0307-J845 | 31i-A Stroke Limit External Setting |
| A02B-0308-J845 | 32i-A Stroke Limit External Setting |
| A02B-0323-J845 | 30i-B Stroke Limit External Setting |
| A02B-0326-J845 | 31i-B5 Stroke Limit External Setting |
| A02B-0327-J845 | 31i-B Stroke Limit External Setting |
| A02B-0328-J845 | 32i-B Stroke Limit External Setting |

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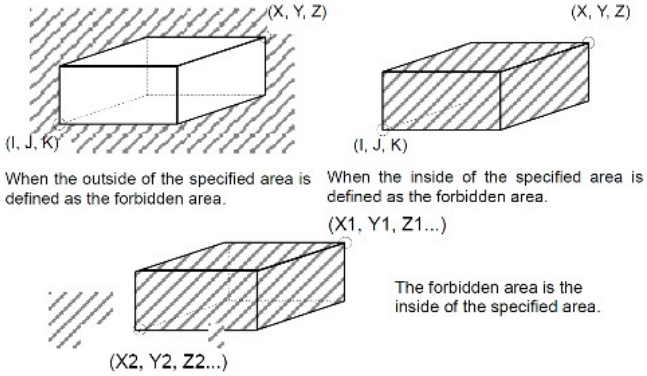
# 077

## Controlled axis




# Stored stroke check 2,3

## Features

The Stored Stroke Check 2 function allows the outside or inside of an area specified by parameters or a program to be defined as the forbidden area.

The operator specifies as a limit position a distance from the origin of the machine coordinate system. This function is enabled after manual reference position return is performed at power-on.

When the limits are specified in a program, they can be set for the X-, Y-, and Z-axes. For this reason, the forbidden area can be changed according to the workpiece. Whether to define the inside or outside of the specified area as the forbidden area is determined by setting the corresponding parameter.

Stored Stroke Check 3 defines the inside of a parameter- set area as a forbidden area.

When the Stored Stroke Check 2 or 3 functions and the Chuck/Tail Stock Barrier function are used at the same time, the Chuck/Tail Stock Barrier option is valid and the Stored Stroke Check 2 or 3 is ignored.

## Benefits

- Possibility to implement safe machining zones in a machine
- Protects equipment against collisions

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J840 | 30i-A Stored Stroke Check 2 and 3 |
| A02B-0306-J840 | 31i-A5 Stored Stroke Check 2 and 3 |
| A02B-0307-J840 | 31i-A Stored Stroke Check 2 and 3 |
| A02B-0308-J840 | 32i-A Stored Stroke Check 2 and 3 |
| A02B-0323-J840 | 30i-B Stored Stroke Check 2 and 3 |
| A02B-0326-J840 | 31i-B5 Stored Stroke Check 2 and 3 |
| A02B-0327-J840 | 31i-B Stored Stroke Check 2 and 3 |
| A02B-0328-J840 | 32i-B Stored Stroke Check 2 and 3 |

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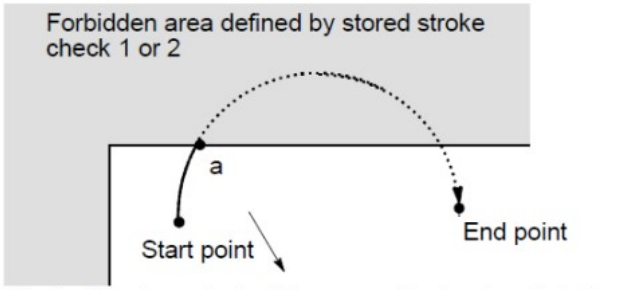
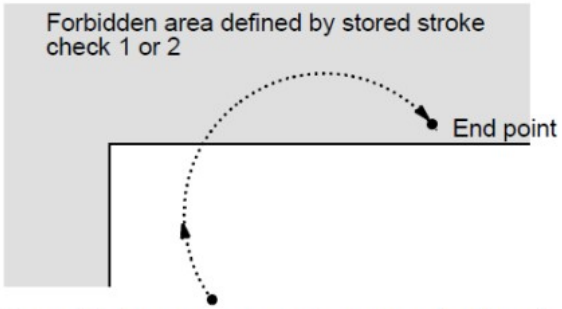
# 078

## Controlled axis




The tool is stopped at point a according to stored stroke check 1 or 2.




Immediately upon movement commencing from the start point, the tool is stopped to enable a stroke limit check before moving to be performed before movement.

# Stored stroke check before move

## Features

The Stored Stroke Check before Move function calculates the movement end point at the start of movement in a block, during automatic operation, based on the current machine position and the specified amount of travel, to check whether the end point falls within the inhibited area for stored stroke limit 1, 2, or 3.

If the end point falls within an inhibited area, the movement for that block is stopped immediately upon the start of movement and an alarm is issued.

## Benefits

- Avoid axis displacement if a movement is supposed to reach a prohibited machining zone

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J749 | 30i-A Stroke Limit Check before Move |
| A02B-0306-J749 | 31i-A5 Stroke Limit Check before Move |
| A02B-0307-J749 | 31i-A Stroke Limit Check before Move |
| A02B-0308-J749 | 32i-A Stroke Limit Check before Move |
| A02B-0323-J749 | 30i-B Stroke Limit Check before Move |
| A02B-0326-J749 | 31i-B5 Stroke Limit Check before Move |
| A02B-0327-J749 | 31i-B Stroke Limit Check before Move |
| A02B-0328-J749 | 32i-B Stroke Limit Check before Move |

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# 079

## Controlled axis

# Stroke limit area changing function

## Features

The Stroke Limit Area Changing function enables parameters setting that set the side boundary of the stroke limit during axis movement.

The setting of the parameters is available through the PMC window function (WINDW: SUB52), FOCAS2, and C language executor. The new forbidden area is enabled as soon as the writing parameters is completed.

## Note

The Stroke Limit Area Changing function is disabled when automatic slave axis parameter setting on feed axis synchronization is enabled. In this case, the parameters can only be written when all axes are stopped.

## Benefits

- The setting of the stroke limit can be customized, for instance through a specific HMI

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R585 | 30i-A Stroke Limit Area Changing Function |
| A02B-0306-R585 | 31i-A5 Stroke Limit Area Changing Function |
| A02B-0307-R585 | 31i-A Stroke Limit Area Changing Function |
| A02B-0308-R585 | 32i-A Stroke Limit Area Changing Function |
| A02B-0319-R585 | 0i-TD Stroke Limit Area Changing Function |
| A02B-0320-R585 | 0i-MD Stroke Limit Area Changing Function |
| A02B-0323-R585 | 30i-B Stroke Limit Area Changing Function |
| A02B-0326-R585 | 31i-B5 Stroke Limit Area Changing Function |
| A02B-0327-R585 | 31i-B Stroke Limit Area Changing Function |
| A02B-0328-R585 | 32i-B Stroke Limit Area Changing Function |

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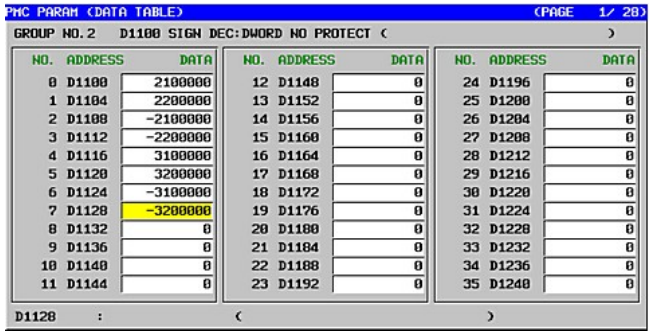
# 080

## Controlled axis




# Stored stroke limit range switching function by signal

## Features

With this function, the Range Stored Stroke Limit can be switched by an input signal of the PMC. It is then possible to set the limit easily.

The ranges are stored in data tables in the PMC and signals can be used for switching on and off the limits.

## Benefits

- Simplified management of multiple zones directly from the PMC
- Protection of the machine and asset against destructive movements
- Overall improvement of the machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0323-R849 | 30i-B Stored Stroke Limit Range Switching Function by Signal |
| A02B-0326-R849 | 31i-B5 Stored Stroke Limit Range Switching Function by Signal |
| A02B-0327-R849 | 31i-B Stored Stroke Limit Range Switching Function by Signal |
| A02B-0328-R849 | 32i-B Stored Stroke Limit Range Switching Function by Signal |

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# 081

## Controlled axis

# Chuck and tail stock barrier

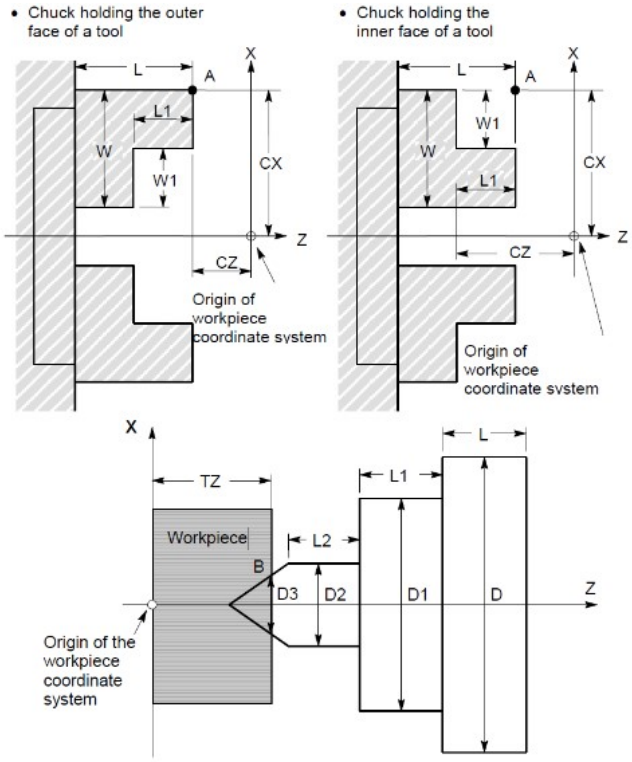
## Features

The Chuck and Tail Stock Barrier function prevents damages to the machine by checking whether the tool tip interferes with either the chuck or tail stock.

This is realized when specifying an area into which the tool may not enter (entry-prohibition area). This is done using a special setting screen, according to the shapes of the chuck and tail stock.

If the tool tip would enter the set area during a machining operation, this function stops the tool and outputs an alarm message. The tool can be removed from the prohibited area only by retracting it in the direction from which the tool entered the area.

Note: when Stored Stroke Check 2 or 3 option and Chuck / Tail Stock Barrier option are used at the same time, the Chuck / Tail Stock Barrier option is valid and Stored Stroke Check 2 or 3 is ignored.




## Benefits

- Protection of the machine work space
- Protection against programming errors

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J720 | 30i-A Chuck and Tail Stock Barrier |
| A02B-0306-J720 | 31i-A5 Chuck and Tail Stock Barrier |
| A02B-0307-J720 | 31i-A Chuck and Tail Stock Barrier |
| A02B-0308-J720 | 32i-A Chuck and Tail Stock Barrier |
| A02B-0323-J720 | 30i-B Chuck and Tail Stock Barrier |
| A02B-0326-J720 | 31i-B5 Chuck and Tail Stock Barrier |
| A02B-0327-J720 | 31i-B Chuck and Tail Stock Barrier |
| A02B-0328-J720 | 32i-B Chuck and Tail Stock Barrier |

**Notice**

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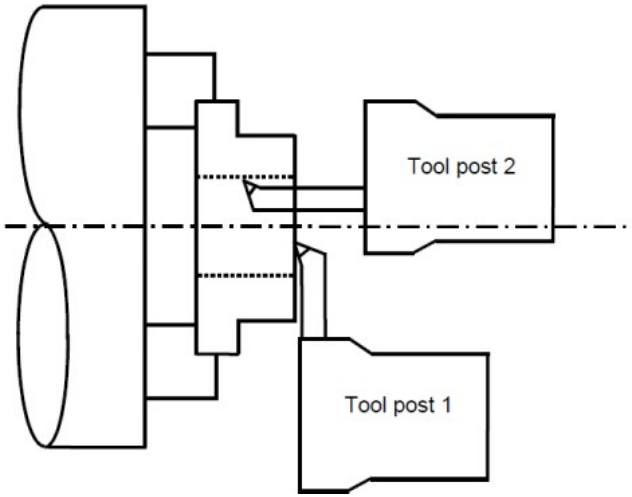
# 082

## Controlled axis




# Interference check for each path

## Features

The Interference Check function checks the tool posts of multiple paths for collision possibilities.

When tool posts on individual paths machine the same workpiece simultaneously, the tool posts can approach each other very closely. If the tool posts interfere with each other due to a program error or any other setting error, serious damage such as tool or machine destruction can occur.

If a command that could causes that the tool posts of paths to interfere with each other is specified, the function gradually stops the tool posts before the tool posts actually interfere with each other.

The contours and shapes of the tool posts on individual paths are checked to determine whether or not interference occurs.

This function enables an interference check between two paths or interference check among multiple paths. The number of paths to check can be determined by parameter setting.

## Benefits

- Protection of the machine
- Ease the programming of multi-path systems
- Reduction of the downtime

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J839 | 30i-A Interference Check for Each Path |
| A02B-0306-J839 | 31i-A5 Interference Check for Each Path |
| A02B-0307-J839 | 31i-A Interference Check for Each Path |
| A02B-0308-J839 | 32i-A Interference Check for Each Path |
| A02B-0319-J839 | 0i-TD Interference Check for Each Path |
| A02B-0323-J839 | 30i-B Interference Check for Each Path |
| A02B-0326-J839 | 31i-B5 Interference Check for Each Path |
| A02B-0327-J839 | 31i-B Interference Check for Each Path |
| A02B-0328-J839 | 32i-B Interference Check for Each Path |

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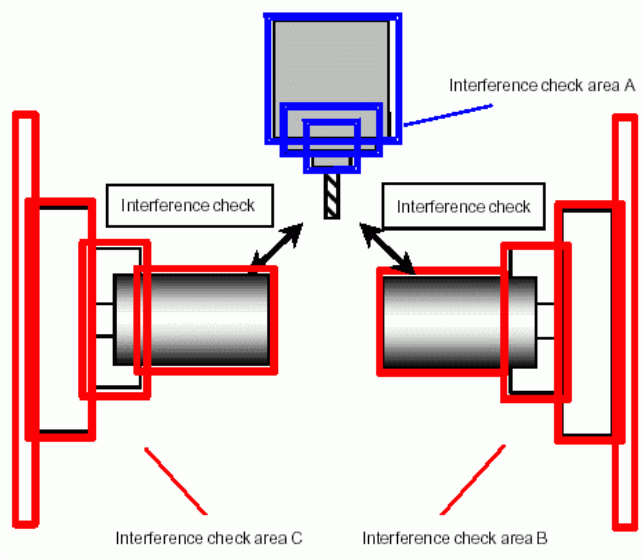
# 083

## Controlled axis




# Interference check for rotary area

## Features

This function checks for interference among the tool post and chucks and stops the machine safely. Three major interference check areas can be set, each of which is specified by using rectangles. Two of the three interference check areas can be moved and rotated.

The following interference check areas can be set:

- Interference check area A and interference check area B with up to 4 rectangles. The entire area moves according to the movement along parameter–set two axes. In addition, the entire area can be rotated according to the rotation on a parameter–set axis.
- Interference check area C with up to 4 rectangles. The area cannot be moved and rotated.

## Benefits

- Protection of the machine
- Reduction of the downtime

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S643 | 30i-A Interference Check for Rotary Area |
| A02B-0306-S643 | 31i-A5 Interference Check for Rotary Area |
| A02B-0307-S643 | 31i-A Interference Check for Rotary Area |
| A02B-0323-S643 | 30i-B Interference Check for Rotary Area |
| A02B-0326-S643 | 31i-B5 Interference Check for Rotary Area |
| A02B-0327-S643 | 31i-B Interference Check for Rotary Area |

**Notice**

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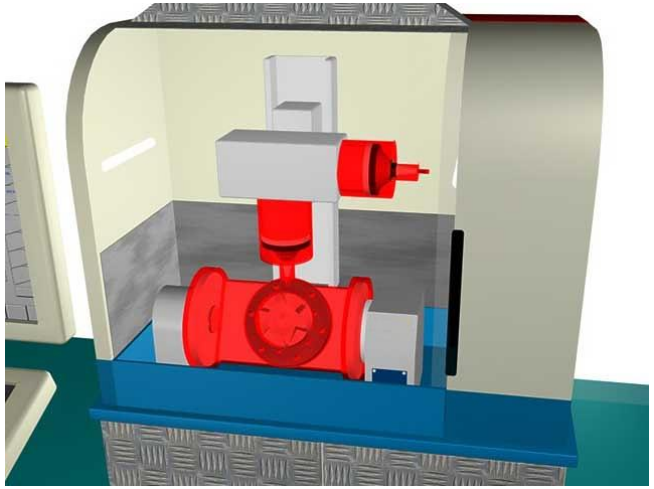
# 084

## Controlled axis

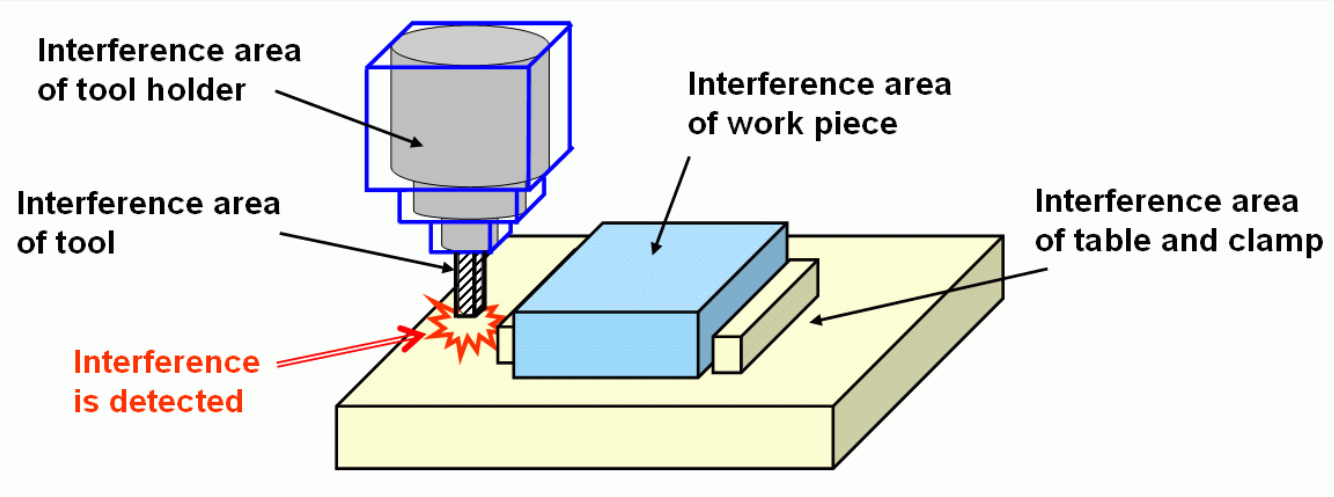


# Built-in 3D interference check

## Features

The 3D Interference Check function is an advanced anti collision function. The function is implemented directly into the CNC and has extremely rapid interference check in real time. The success in avoiding collisions is almost 100% - even when setting up or in manual mode. This function is available for both milling and turning machines and is particularly recommended for 5 axes machines or complex machines.

The critical working area of a machine can be emulated using geometric elements (planes, rectangular parallelepipedes and cylinders) that are defined using absolute dimensional data (to the micron) and work in conjunction with the programmed tool data taken from the normal CNC memory. The CNC will use this spatial data to determine whether any moving part of the machine may collide with fixed elements such as the table, fixtures and machine structure. All this occurs in realtime.




The collision can be checked by detecting the interference among machine parts such as tool, work-piece and table in three dimensional space in real time. This function is the measure for an expensive workpiece to be protected from being damaged. This function is also useful in manual operation, for example, for protection against malfunction during setup. Thus, the time required for setup can be reduced.

With the M series, the interference check targets include a tool, tool holder, workpiece, jig, and table. With the T series, the interference check targets include a single point tool + tip, tool post, workpiece, chuck, and spindle.

**Notice**

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# 085

## Key functions

- 3D Interference Check Among Objects Like Tool, Work Piece, Etc.
- Each Interference Area of Tool or Work Piece or Table, Etc. Consists of Rectangular Parallelepipeds
- The function is effective also with 5-axis Machining (Rotary Tool, Table, Etc.)
- The function is available in both Auto and Manual modes
- The function is embedded in the CNC Kernel (High-Speed CPU is required)
- Up to 4 paths are supported
- Easy definition of interference check figure on setting screen: each objects can be built up with up to 6 shapes (Parallelepipeds, Cylinders or Planes). The system provides database information for up to 150 Shapes, which can be arbitrary combined to built up to 10 registerable tool holder and 10 registerable objects
- Interference check figures can be switched by the Part Program
- Each tool specified by the Parts Program is automatically considered as rectangular parallelepiped or cylinder of the proper size
- Interference between tool and workpiece is checked in rapid traverse

The PC software "Built-in 3D Interference Check Setting Tool is available to create the shapes and the 3D model of the machine working zone, the tool, holders and workpieces. It can import 3D object from CAD-CAM systems as well as show the process in real-time when connected to the CNC over Ethernet.

## Benefits

- No negative influence on the machining time
- Protect the machine, the tools and fixtures
- Reduced downtime
- Quick and easy to configure
- Minimal set-up time
- Manual adaptability, also possible for the end user, e.g. for automated machinery

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R541 | 30i-A Built-in 3-D Interference Check Function |
| A02B-0306-R541 | 31i-A5 Built-in 3-D Interference Check Function |
| A02B-0307-R541 | 31i-A Built-in 3-D Interference Check Function |
| A02B-0323-R541 | 30i-B Built-in 3-D Interference Check Function |
| A02B-0326-R541 | 31i-B5 Built-in 3-D Interference Check Function |
| A02B-0327-R541 | 31i-B Built-in 3-D Interference Check Function |
| A02B-0328-R541 | 32i-B Built-in 3D Interference Check Function |

**Notice**

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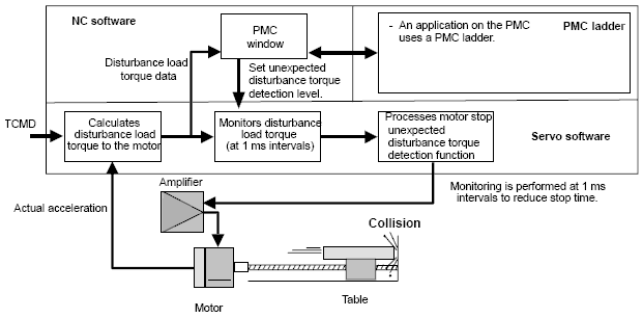
# 086

## Controlled axis




# Unexpected disturbance torque detection function

## Features

Machine collisions, as well as defective and damaged cutters impose a large load torque on the servo and spindle motors, compared with normal rapid traverse or cutting feed.

The Unexpected Disturbance Torque Detection function detects the disturbance torque on the motors and sends this value as an estimated load torque to the PMC.

If the detected disturbance torque value is outside of the specification / expected value (greater than the value specified in the corresponding parameter), the function either stops the servo motor as quickly as possible or reverses the motor by an appropriate value (as specified in another parameter), in order to minimize possible damage to the machine.

## Benefits

- Detection of possible machine collision situations as well as other situations where damage may arise

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J718 | 30i-A Unexpected Disturbance Torque Detection Function |
| A02B-0306-J718 | 31i-A5 Unexpected Disturbance Torque Detection Function |
| A02B-0307-J718 | 31i-A Unexpected Disturbance Torque Detection Function |
| A02B-0308-J718 | 32i-A Unexpected Disturbance Torque Detection Function |
| A02B-0323-J718 | 30i-B Unexpected Disturbance Torque Detection Function |
| A02B-0326-J718 | 31i-B5 Unexpected Disturbance Torque Detection Function |
| A02B-0327-J718 | 31i-B Unexpected Disturbance Torque Detection Function |
| A02B-0328-J718 | 32i-B Unexpected Disturbance Torque Detection Function |
| A02B-0333-J718 | 35i-B Unexpected Disturbance Torque Detection Function |
| A02B-0334-J718 | PM i-A Unexpected Disturbance Torque Detection Function |

**Notice**

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# 087

## Controlled axis

# Unexpected disturbance torque detection for BETA i I/O Link

## Features

Machine collisions, as well as defective and damaged cutters impose a large load torque on the servo and spindle motors, compared with normal rapid traverse or cutting feed.

The Unexpected Disturbance Torque Detection function for BETA i I/O Link provides this function on the separate amplifiers of the BETA i series which can be connected to the CNC using the I/O Link network.

## Benefits

- Detection of possible machine collision situations as well as other situations where damage may arise

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S812 | 30i-A BETA I/O LINK Unexpected Disturbance Torque Detection Function |
| A02B-0306-S812 | 31i-A5 BETA I/O LINK Unexpected Disturbance Torque Detection Function |
| A02B-0307-S812 | 31i-A BETA I/O LINK Unexpected Disturbance Torque Detection Function |
| A02B-0308-S812 | 32i-A BETA I/O LINK Unexpected Disturbance Torque Detection Function |
| A02B-0319-S812 | 0i-TD BETA I/O LINK Unexpected Disturbance Torque Detection Function |
| A02B-0320-S812 | 0i-MD BETA I/O LINK Unexpected Disturbance Torque Detection Function |
| A02B-0323-S812 | 30i-B BETA I/O LINK Unexpected Disturbance Torque Detection Function |
| A02B-0326-S812 | 31i-B5 BETA I/O LINK Unexpected Disturbance Torque Detection Function |
| A02B-0327-S812 | 31i-B BETA I/O LINK Unexpected Disturbance Torque Detection Function |
| A02B-0328-S812 | 32i-B BETA I/O LINK Unexpected Disturbance Torque Detection Function |
| A02B-0333-S812 | 35i-B BETA I/O LINK Unexpected Disturbance Torque Detection Function |
| A02B-0334-S812 | PM i-A BETA I/O LINK Unexpected Disturbance Torque Detection Function |

**Notice**

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# 088

## Controlled axis

# Fine torque sensing

## Features

The Fine Torque Sensing function stores the disturbance torque detected by a servo motor or a spindle motor in the internal memory of the CNC for later evaluation and analysis.

Following operations are available for the stored torque data:

- The stored torque data can be read via the window function of the PMC and be used in the PMC program for actions
- Statistics data (average, maximum, dispersion) of the stored torque is calculated by the CNC, and the results of these statistical calculation can also be read using the window function of the PMC
- The stored torque data can be displayed graphically on Torque Graph Screen of the CNC and displayed on the operation screen
- The detection level of the unexpected disturbance load torque alarm can be set on Torque Graph Screen. To use this capability, the Unexpected Disturbance Torque Detection function must be set in the CNC
- The stored torque data can be saved into the F-ROM memory of the CNC as sample data, and it is possible to compare this stored values graphically with other reference torque data.
- The stored torque data can also be saved to the memory card.

## Notes

- In the stand-alone type CNC and the 15 inch LCD mounted CNC of the Series 30i, this function and the communication to Personal Computer or Panel i via HSSB cannot be used at the same time.
- In the 7.2 inch, 8.4 inch and 10.4 inch LCD mounted type CNC Series, this function and the communication to Personal Computer or Panel i via the 2nd HSSB channel cannot be used at the same time.

## Benefits

- Advanced function to analyse the torque behaviour during machining
- Possibility to visualize and set limits for the Disturbance Load detection directly on the screen
- Possibility to monitor torque behaviour to find issues on the mechanical structure of the machine
- Analysis of the actual behaviour of the machine versus a stored reference profile

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J982 | 30i-A Fine Torque Sensing - Cannot be Specified with Open CNC PANEL i 15.0" LCD |
| A02B-0306-J982 | 31i-A5 Fine Torque Sensing - Cannot be Specified with Open CNC PANEL i 15.0" LCD |
| A02B-0307-J982 | 31i-A Fine Torque Sensing - Cannot be Specified with Open CNC PANEL i 15.0" LCD |
| A02B-0308-J982 | 32i-A Fine Torque Sensing - Cannot be Specified with Open CNC PANEL i 15.0" LCD |

**Notice**

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# 089

| Specification | Description |
|---|---|
| A02B-0323-J982 | 30i-B Fine Torque Sensing - Cannot be Specified with Open CNC PANEL i 15.0" LCD |
| A02B-0326-J982 | 31i-B5 Fine Torque Sensing - Cannot be Specified with Open CNC PANEL i 15.0" LCD |
| A02B-0327-J982 | 31i-B Fine Torque Sensing - Cannot be Specified with Open CNC PANEL i 15.0" LCD |

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# 090

## Controlled axis

# Rotary axis control

## Features

The Rotary Axis Control function controls a rotary axis as specified by an absolute command. With this function, the sign of the value specified in the command is interpreted as the direction of rotation, and the absolute value of the specified value is interpreted as the coordinates of the target end position.

This function is valid when rotary axis roll-over is enabled. If the parameter is set, an absolute command specified for the rollover rotary axis is interpreted as follows: the sign and absolute value of the value specified in the command represent the direction of rotation and the end position of movement respectively.

## Benefits

- Simplifies the management of rotary axes

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J743 | 30i-A Rotary Axis Control |
| A02B-0306-J743 | 31i-A5 Rotary Axis Control |
| A02B-0307-J743 | 31i-A Rotary Axis Control |
| A02B-0323-J743 | 30i-B Rotary Axis Control |
| A02B-0326-J743 | 31i-B5 Rotary Axis Control |
| A02B-0327-J743 | 31i-B Rotary Axis Control |

**Notice**

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# 091
## Controlled axis

# Position switch

## Features

The Position Switch function outputs signals to the PMC while the machine coordinates along a controlled axes are within a parameter-specified ranges. This creates a virtual "cam switch" function.

Using parameters, it is possible to specify arbitrary controlled axes and machine coordinate operating ranges for which position switch signals are output.

Up to 10 position switch signals can be output. Parameter can be set to use up to 16 position switch signals.

## Benefits

- A signal can be sent to machine at certain positions to initiate automatic actions
- No hardware to adjust to change "trip" positions of up to 10 switches - Just change coordinate value in parameters
- Improves machine reliability by simplifying machine wiring

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J846 | 30i-A Position Switch |
| A02B-0306-J846 | 31i-A5 Position Switch |
| A02B-0307-J846 | 31i-A Position Switch |
| A02B-0308-J846 | 32i-A Position Switch |
| A02B-0323-J846 | 30i-B Position Switch |
| A02B-0326-J846 | 31i-B5 Position Switch |
| A02B-0327-J846 | 31i-B Position Switch |
| A02B-0328-J846 | 32i-B Position Switch |

**Notice**

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# 092

## Controlled axis

# High speed position switch

## Features

The High-Speed Position Switch function monitors the current position at shorter intervals than the normal position switch function to output a high-speed precise position switch signal.

In the same way as for the normal position switch function, it is possible to set parameters to specify arbitrary controlled axes and machine coordinate operating ranges for which position switch signals are output.

Up to 6 high-speed position signals can be output. Additional settings are available to to use up to 16 high-speed position switch signals.

## Benefits

- A high-speed signal can be sent to the machine at certain positions to initiate automatic actions
- No hardware to adjust to change "trip" positions of up to 6 switches - Just change coordinate value in parameters
- Improves machine reliability by simplifying machine wiring

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J987 | 30i-A High-Speed Position Switch |
| A02B-0306-J987 | 31i-A5 High-Speed Position Switch |
| A02B-0307-J987 | 31i-A High-Speed Position Switch |
| A02B-0323-J987 | 30i-B High-Speed Position Switch |
| A02B-0326-J987 | 31i-B5 High-Speed Position Switch |
| A02B-0327-J987 | 31i-B High-Speed Position Switch |

**Notice**

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# 093

## Controlled axis

# Direction dependend type of high speed position switch

## Features

The High-Speed Position Switch function monitors the machine coordinates and move direction to output high-speed position switch signals to drive additional processes on the machine.

Two machine coordinates are monitored. When the tool passes through one coordinate in the specified direction, the high-speed position switch signal is set to 1. When it passes through the other coordinate in the specified direction, the signal is set to 0.

The output mode of high-speed position switch signals (normal type or direction-dependent type) is set using parameters.

## Benefits

- A high-speed signal can be sent to the machine at certain positions to initiate automatic actions
- Actions can be set depending on the movement direction
- No hardware to adjust to change "trip" positions of the switches
- Improves machine reliability by simplifying machine wiring

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S721 | 30i-A Direction-Dependent Type of High-Speed Position Switch |
| A02B-0306-S721 | 31i-A5 Direction-Dependent Type of High-Speed Position Switch |
| A02B-0307-S721 | 31i-A Direction-Dependent Type of High-Speed Position Switch |
| A02B-0323-S721 | 30i-B Direction-Dependent Type of High-Speed Position Switch |
| A02B-0326-S721 | 31i-B5 Direction-Dependent Type of High-Speed Position Switch |
| A02B-0327-S721 | 31i-B Direction-Dependent Type of High-Speed Position Switch |

**Notice**

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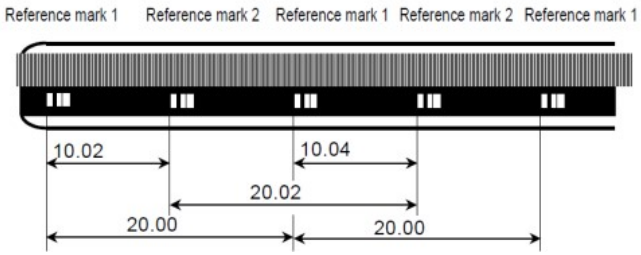
# 094

## Controlled axis




# Linear scale interface with absolute address reference mark

## Features

The Linear Scale Interface with Absolute Address (Distance Coded) Reference Mark function, an absolute position can be identified with a distance coded linear/rotary encoder.

For calculating the absolute position the axis must detect minimum 2 reference marks. In this case, a reference position can be established at any position of the axis by short distance movement.

## A/B-phase Interface - Absolute Address Referenced Mark

- The encoder with Absolute Address Referenced Mark (A/B-phase) interface requires the SDU (Separate Detector Unit).
- The encoder is then used as separate feedback
- In this case a fully closed system is created

## Serial type Interface - Distance Coded Reference Marks

- The encoder with Distance Coded Reference Marks and with sinusoidal 1Vpp interface requires the High Resolution Serial Output Circuit (type C)
- If the High Resolution Output Circuit is connected to the servo amplifier, then the encoder is used as motor feedback; in this case a semi-closed system is created
- If the High Resolution Output Circuit is connected to the SDU, then the encoder is used as separate feedback; in this case a fully closed system is created

Note for the Linear Scale with Absolute Address Reference Mark Expansion function: when a G00 command or a move command based on jog feed are specified, this function enables a reference mark interval measurement to be made automatically in order to establish a reference position.

## Benefits

- Simplified integration of distance coded scales
- Increase of the precision of the machine tool

**Notice**

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# Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J670 | 30i-A Linear Scale Interface with Absolute Address Reference Mark |
| A02B-0303-S730 | 30i-A Linear Scale Interface Expansion with Absolute Address Reference Mark |
| A02B-0306-J670 | 31i-A5 Linear Scale Interface with Absolute Address Reference Mark |
| A02B-0306-S730 | 31i-A5 Linear Scale Interface Expansion with Absolute Address Reference Mark |
| A02B-0307-J670 | 31i-A Linear Scale Interface with Absolute Address Reference Mark |
| A02B-0307-S730 | 31i-A Linear Scale Interface Expansion with Absolute Address Reference Mark |
| A02B-0308-J670 | 32i-A Linear Scale Interface with Absolute Address Reference Mark |
| A02B-0308-S730 | 32i-A Linear Scale Interface Expansion with Absolute Address Reference Mark |
| A02B-0319-J670 | 0i-TD Linear Scale Interface with Absolute Address Reference Mark |
| A02B-0319-S730 | 0i-TD Linear Scale Interface Expansion with Absolute Address Reference Mark |
| A02B-0320-J670 | 0i-MD Linear Scale Interface with Absolute Address Reference Mark |
| A02B-0320-S730 | 0i-MD Linear Scale Interface Expansion with Absolute Address Reference Mark |
| A02B-0323-J670 | 30i-B Linear Scale Interface with Absolute Address Reference Mark |
| A02B-0323-S730 | 30i-B Linear Scale Interface Expansion with Absolute Address Reference Mark |
| A02B-0326-J670 | 31i-B5 Linear Scale Interface with Absolute Address Reference Mark |
| A02B-0326-S730 | 31i-B5 Linear Scale Interface Expansion with Absolute Address Reference Mark |
| A02B-0327-J670 | 31i-B Linear Scale Interface with Absolute Address Reference Mark |
| A02B-0327-S730 | 31i-B Linear Scale Interface Expansion with Absolute Address Reference Mark |
| A02B-0328-J670 | 32i-B Linear Scale Interface with Absolute Address Reference Mark |
| A02B-0328-S730 | 32i-B Linear Scale Interface Expansion with Absolute Address Reference Mark |
| A02B-0333-J670 | 35i-B Linear Scale Interface with Absolute Address Reference Mark |
| A02B-0333-S730 | 35i-B Linear Scale Interface Expansion with Absolute Address Reference Mark |
| A02B-0334-J670 | PM i-A Linear Scale Interface with Absolute Address Reference Mark |
| A02B-0334-S730 | PM i-A Linear Scale Interface Expansion with Absolute Address Reference Mark |

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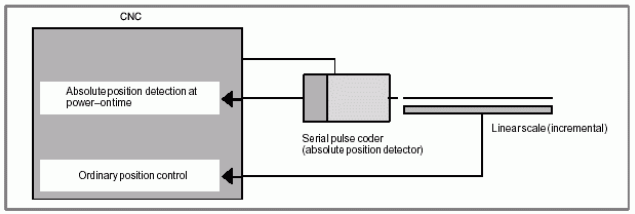
# 096

## Controlled axis




System using tentative absolute coordinate system setting

# Temporary absolute coordinate setting

## Features

In a full–closed system with a built–in absolute position detector (serial pulse coder) and incremental linear scale, a coordinate system can be set up using the absolute position data received from the built–in absolute position detector when the power is switched on.

After the startup procedure, the position control is carried out using the linear scale with incremental data.

Since the machine position obtained immediately after the power is switched on is tentative, obtaining the accurate machine position requires making a manual reference position return.

For safety reasons and before a reference position return is made, this function enables a stroke limit, although the machine position obtained when the power is switched on is approximate.

Note that this function does not substitute to the use of a real absolute detection system as the main position measurement remains incremental.

## Benefits

- Provides a simplified startup procedure for incremental scales

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J786 | 30i-A Temporary Absolute Coordinate Setting |
| A02B-0306-J786 | 31i-A5 Temporary Absolute Coordinate Setting |
| A02B-0307-J786 | 31i-A Temporary Absolute Coordinate Setting |
| A02B-0308-J786 | 32i-A Temporary Absolute Coordinate Setting |
| A02B-0319-J786 | 0i-TD Temporary Absolute Coordinate Setting |
| A02B-0320-J786 | 0i-MD Temporary Absolute Coordinate Setting |
| A02B-0323-J786 | 30i-B Temporary Absolute Coordinate Setting |
| A02B-0326-J786 | 31i-B5 Temporary Absolute Coordinate Setting |
| A02B-0327-J786 | 31i-B Temporary Absolute Coordinate Setting |
| A02B-0328-J786 | 32i-B Temporary Absolute Coordinate Setting |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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# 097

## Controlled axis

# Dual Check Safety (DCS)

## Features

The Dual Check Safety (DCS) function provides the necessary set of tools and function to design safe machine tools. A high level of safety to for the machine operator can be reached using this function, especially when the machine tool is open, power is still applied, and the physical security provided by the protective doors is no longer available.

Hardware redundancy and self tests allow the CNC to detect abnormal function and the Dual Check Safety function will quickly shut off power to protect the operator.

Dual Check Safety is certified by TÜV Süd Product Service GmbH in accordance to the following standards:

- 2006/42/EC Machinery Directive
- 2006/95/EC Low-Voltage Directive
- ISO 13849-1 Category 3, PL=d Machine Safety
- EN 60204-1:2006
- EN 61000-6-2:2005
- IEC 61508-1:1998 SIL 1-2
- IEC 61508-2:2000 SIL 1-2
- IEC 61508-3:1998 SIL 1-2
- IEC 61508-4:1998 SIL 1-2
- EN 501 78:1997

Following Dual Check Safety functions have been certified by TÜV SÜD Product Service GmbH:

- Safety Reduced Speed Check (Servo)
- Safety Reduced Speed Check (Spindle)
- Safe End Position Check
- Serial Data Transmission Check
- Emergency Stop
- Safe I/O Signal Check
- Safe Parameter Check
- Safe Servo Position Error Check
- Safe Position Switch Function
- Programmable Safe I/O Function
- Safe Brake Function
- Safe Servo Stop (STO) Function
- Safe Spindle Stop Function
- Safety Speed Zero Monitoring
- Safety Spindle Speed Limit Override (*)

The functions marked (*) are not available on the Series 0i-D CNC.

**Notice**

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Special function are also available to simplify the creation of the machine documentation; refer to the "Test Mode Function for Dual Check Safety" in the catalogue for more information.

## Benefits

- Provides a high level of safety for the operator during operations with protection opened while power is still applied
- Quick restart of the machine tool operation following operator intervention
- Fewer external safety circuits required
- Overall cost reduction of the safety solution
- Certified to comply to the actual safety standards

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S661 | 30i-A Dual Check Safety - ATTENTION: NOT Supporting Analog Spindle, Servos in I/O-Link, Spindle Motors with Built-in Sensor |
| A02B-0306-S661 | 31i-A5 Dual Check Safety - ATTENTION: NOT Supporting Analog Spindle, Servos in I/O-Link, Spindle Motors with Built-in Sensor |
| A02B-0307-S661 | 31i-A Dual Check Safety - ATTENTION: NOT Supporting Analog Spindle, Servos in I/O-Link, Spindle Motors with Built-in Sensor |
| A02B-0308-S661 | 32i-A Dual Check Safety - ATTENTION: NOT Supporting Analog Spindle, Servos in I/O-Link, Spindle Motors with Built-in Sensor |
| A02B-0319-S661 | 0i-TD Dual Check Safety - ATTENTION: NOT Supporting Analog Spindle, Servos in I/O-Link, Spindle Motors with Built-in Sensor |
| A02B-0320-S661 | 0i-MD Dual Check Safety - ATTENTION: NOT Supporting Analog Spindle, Servos in I/O-Link, Spindle Motors with Built-in Sensor |
| A02B-0323-S661 | 30i-B Dual Check Safety - ATTENTION: NOT Supporting Analog Spindle, Servos in I/O-Link, Spindle Motors with Built-in Sensor |
| A02B-0326-S661 | 31i-B5 Dual Check Safety - ATTENTION: NOT Supporting Analog Spindle, Servos in I/O-Link, Spindle Motors with Built-in Sensor |
| A02B-0327-S661 | 31i-B Dual Check Safety - ATTENTION: NOT Supporting Analog Spindle, Servos in I/O-Link, Spindle Motors with Built-in Sensor |
| A02B-0328-S661 | 32i-B Dual Check Safety - ATTENTION: NOT Supporting Analog Spindle, Servos in I/O-Link, Spindle Motors with Built-in Sensor |
| A02B-0333-S661 | 35i-B Dual Check Safety - ATTENTION: NOT Supporting Analog Spindle, Servos in I/O-Link, Spindle Motors with Built-in Sensor |
| A02B-0334-S661 | PM i-A Dual Check Safety - ATTENTION: NOT Supporting Analog Spindle, Servos in I/O-Link, Spindle Motors with Built-in Sensor |

**Notice**

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# 099

## Controlled axis

# Safety spindle speed limit override

## Features

In the safety speed monitoring function of Dual Check Safety Function, the safety speed for the spindle can be switched between 4 different values / steps by the Safety Speed Selection signal.

When several chucks are used or the safety speed is required to be selected corresponding to the diameter of work, a more detailed selection is required; in this case, the safety speed for the spindle can be overriden from 10% to 100% by the safety spindle speed limit override signal.

## Benefits

- Flexible safe spindle speed management
- Support of complex machine configuration without requiring programming or additional external hardware

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R626 | 30i-A Dual Check Safety - Safety Spindle Speed Limit Override Function |
| A02B-0306-R626 | 31i-A5 Dual Check Safety - Safety Spindle Speed Limit Override Function |
| A02B-0307-R626 | 31i-A Dual Check Safety - Safety Spindle Speed Limit Override Function |
| A02B-0308-R626 | 32i-A Dual Check Safety - Safety Spindle Speed Limit Override Function |
| A02B-0323-R626 | 30i-B Dual Check Safety - Safety Spindle Speed Limit Override Function |
| A02B-0326-R626 | 31i-B5 Dual Check Safety - Safety Spindle Speed Limit Override Function |
| A02B-0327-R626 | 31i-B Dual Check Safety - Safety Spindle Speed Limit Override Function |
| A02B-0328-R626 | 32i-B Dual Check Safety - Safety Spindle Speed Limit Override Function |
| A02B-0333-R626 | 35i-B Dual Check Safety - Safety Spindle Speed Limit Override Function |

**Notice**

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# 100
## Controlled axis

# Test mode function for Dual Check Safety acceptance test

## Features

When designing a machine, a machine builder must document the safety system. A safety confirmation test called "Acceptance Test" must be performed to confirm whether the safety function of a machine works correctly.

During the Acceptance Test, it must be confirmed that an alarm is generated correctly and a machine stops safely, when the machine is placed in not safe condition intentionally.

When the Acceptance Test is performed in a conventional manner, the power of CNC must be turned off and on every time a safety related alarm of Dual Check Safety function is generated and the safety parameter is rewritten. This requires a significant amount of time, especially when the power is turned on and off.

With the Test Mode Function, it is not required to turn the power on and off at each safety alarm generated. In this case, the time required to perform the Acceptance Test is greatly reduced.

Following functions are allowed in an Acceptance Test mode:

- When the safety parameter is changed, the changed parameter is effective without turning the power-off.
- Even if the safety related alarm is generated, the alarm state can be released by the reset operation without turning off and on the power of the CNC

## Benefits

- Faster process of Acceptance Test

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R671 | 30i-A Dual Check Safety - Test Mode Function for Acceptance Test |
| A02B-0306-R671 | 31i-A5 Dual Check Safety - Test Mode Function for Acceptance Test |
| A02B-0307-R671 | 31i-A Dual Check Safety - Test Mode Function for Acceptance Test |
| A02B-0308-R671 | 32i-A Dual Check Safety - Test Mode Function for Acceptance Test |
| A02B-0323-R671 | 30i-B Dual Check Safety - Test Mode Function for Acceptance Test |
| A02B-0326-R671 | 31i-B5 Dual Check Safety - Test Mode Function for Acceptance Test |
| A02B-0327-R671 | 31i-B Dual Check Safety - Test Mode Function for Acceptance Test |
| A02B-0328-R671 | 32i-B Dual Check Safety - Test Mode Function for Acceptance Test |
| A02B-0333-R671 | 35i-B Dual Check Safety - Test Mode Function for Acceptance Test |

**Notice**

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# 101

| Specification | Description |
|---|---|
| A02B-0334-R671 | PM i-A Dual Check Safety - Test Mode Function for Acceptance Test |

## Notice

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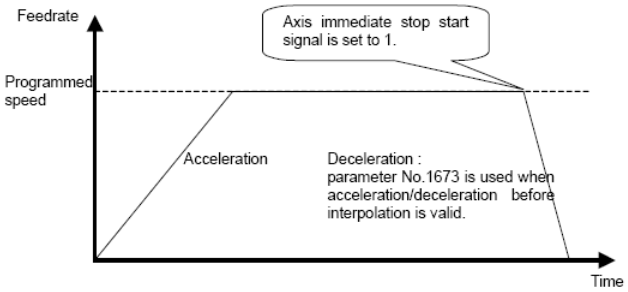
# 102
## Controlled axis




# Axis immediate stop function

## Features

The Axis Immediate Stop function can be used to stop motors immediately during AI Contour Control and control the position at the same time.

This mode of operation can be required on certain machine where the immediate stop by emergency stop is not sufficient, for instance since it does not control position.

## Procedure

- Change of acceleration / deceleration before interpolation in AI contour mode
- Feed axes stop
- Output of an alarm message

## Notes

- AI Contour Control I (S807) or AI Contour Control II (S808) option is required.

This function cannot be performed to an axis under the the control with following functions.

- PMC axis control
- Chopping function
- Polygon turning
- EGB function
- Live tool control with servo motor
- Spindle control of Cs contouring control

## Benefits

- Reduction of the stop distance by changing the acceleration rate of the acceleration/deceleration before interpolation
- The position control remains valid during a series of stop sequence
- Safer and controlled stop to protect the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R613 | 30i-A Axis Immediate Stop Function |

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| Specification | Description |
|---|---|
| A02B-0306-R613 | 31i-A5 Axis Immediate Stop Function |
| A02B-0307-R613 | 31i-A Axis Immediate Stop Function |
| A02B-0323-R613 | 30i-B Axis Immediate Stop Function |
| A02B-0326-R613 | 31i-B5 Axis Immediate Stop Function |
| A02B-0327-R613 | 31i-B Axis Immediate Stop Function |

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# 104
# Functions

## Operation

This section of the catalogue contains the functions related to operation or ease of operation of the CNC system.

The CNCs feature powerful functions for programming and/or operating the machine. Some of these functions are specifically designed for Turning Machines, some are for Machining Centers and some can be used in both applications.

Some of the operation functions detailed in the catalogue:

- Referencing
- Manual functions
- Assisted manual functions
- Program stop and restart
- Tool retract and recover
- 3-dimensional manual functions
- Etc.

**Notice**

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# Sequence number comparison and stop

## Features

The Sequence Number Comparison and Stop function can be used by the operator during the setup phase of a parts program.

The operator can set a sequence number through the MDI panel. When a block containing the specified sequence number appears in the program being executed, the machine operation enters the single block mode after the block is executed. This function is useful for checking a program, because the program can be stopped at a desired position without modifying the program.

## Benefits

- Simplifies program check
- Reduces the commissioning time and increases efficiency

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J844 | 30i-A Sequence Number Comparison & Stop |
| A02B-0306-J844 | 31i-A5 Sequence Number Comparison & Stop |
| A02B-0307-J844 | 31i-A Sequence Number Comparison & Stop |
| A02B-0308-J844 | 32i-A Sequence Number Comparison & Stop |
| A02B-0323-J844 | 30i-B Sequence Number Comparison & Stop |
| A02B-0326-J844 | 31i-B5 Sequence Number Comparison & Stop |
| A02B-0327-J844 | 31i-B Sequence Number Comparison & Stop |
| A02B-0328-J844 | 32i-B Sequence Number Comparison & Stop |

**Notice**

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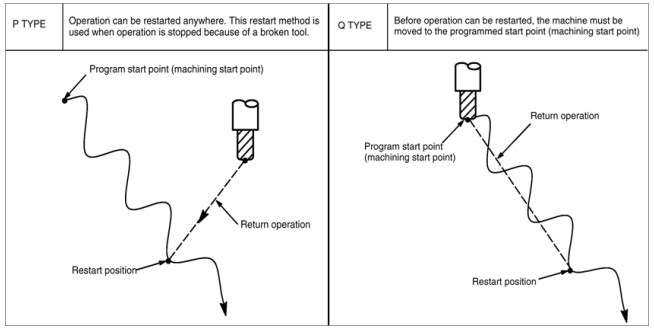


# Program restart

## Features

With the Program Restart function, the operator can restart machining from a desired block by specifying the sequence number of the desired block or by specifying the number of blocks from the beginning of the program to the block at which he wishes machining to restart.

## Benefits

- Enables the operator to restart the program following an interruption such as a tool break or a tool change, or following cancellation of an emergency-stop
- Allows for safe restarting of the program when the machine has been left in an unknown state – following a shift change or a vacation break, for instance
- A programmer or operator can use this function as a mechanism to check out a new or revised part program. By specifying the restart at that block in the program where changes have been made, for instance, he can test out precisely the affected portion

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J838 | 30i-A Program Restart |
| A02B-0306-J838 | 31i-A5 Program Restart |
| A02B-0307-J838 | 31i-A Program Restart |
| A02B-0308-J838 | 32i-A Program Restart |
| A02B-0323-J838 | 30i-B Program Restart |
| A02B-0326-J838 | 31i-B5 Program Restart |
| A02B-0327-J838 | 31i-B Program Restart |
| A02B-0328-J838 | 32i-B Program Restart |

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# 107
## Operation

# Auxiliary function output during program restart

## Features

The Auxiliary Function Output During Program Restart function intercepts the M/S/T/B codes encountered during Program Restart (i.e. between the start of the program and the specified Program Restart block) and outputs those codes to the MDI screen in the correct sequence.

## Benefits

- Relieves the operator of the task of re-keying the MDI codes currently displayed during Program Restart
- Ensures that all M/S/T/B codes encountered during Program Restart are output to MDI screen display and are executed in the correct sequence (current Program Restart function limits the number of codes displayed, which may cause the operator to miss some codes that may have fallen out of the display buffer)
- Macro call M-codes are executed properly when encountered

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R576 | 30i-A Output of Auxiliary Function in Program Restart Function |
| A02B-0306-R576 | 31i-A5 Output of Auxiliary Function in Program Restart Function |
| A02B-0307-R576 | 31i-A Output of Auxiliary Function in Program Restart Function |
| A02B-0308-R576 | 32i-A Output of Auxiliary Function in Program Restart Function |
| A02B-0323-R576 | 30i-B Output of Auxiliary Function in Program Restart Function |
| A02B-0326-R576 | 31i-B5 Output of Auxiliary Function in Program Restart Function |
| A02B-0327-R576 | 31i-B Output of Auxiliary Function in Program Restart Function |
| A02B-0328-R576 | 32i-B Output of Auxiliary Function in Program Restart Function |

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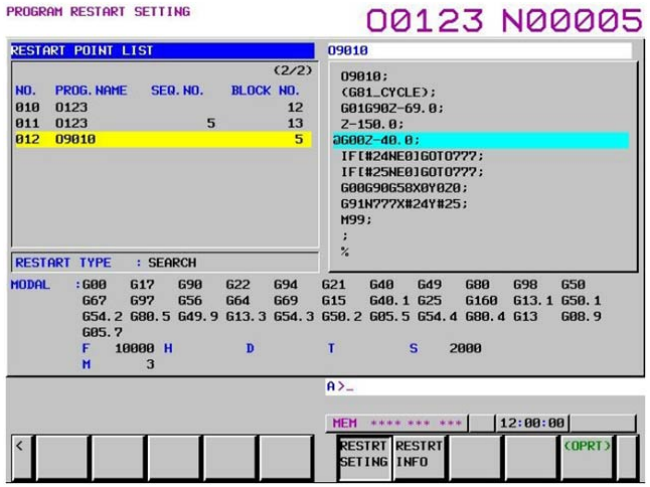


# Quick program restart

## Features

The Quick Program Restart function includes the conventional Program Restart functionality and provides additionally multiple ways of efficient program restart based on program restart memory.

Appropriate information on a dedicated screen helps the operator to select the restarting block easily.

## Benefits

- Enables the operator to restart the program following an interruption such as a tool break or a tool change, or following cancellation of an emergency-stop
- Allows for safe restarting of the program when the machine has been left in an unknown state – following a shift change or a vacation break, for instance
- Allows for efficient restarting of the program when operating with large part programs and the machine state can be easily preset manually
- A programmer or operator can use this function as a mechanism to check out a new or revised part program. By specifying the restart at that block in the program where changes have been made, for instance, he can test out precisely the affected portion

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R630 | 30i-A Quick Program Restart |
| A02B-0306-R630 | 31i-A5 Quick Program Restart |
| A02B-0307-R630 | 31i-A Quick Program Restart |
| A02B-0308-R630 | 32i-A Quick Program Restart |
| A02B-0323-R630 | 30i-B Quick Program Restart |
| A02B-0326-R630 | 31i-B5 Quick Program Restart |
| A02B-0327-R630 | 31i-B Quick Program Restart |
| A02B-0328-R630 | 32i-B Quick Program Restart |

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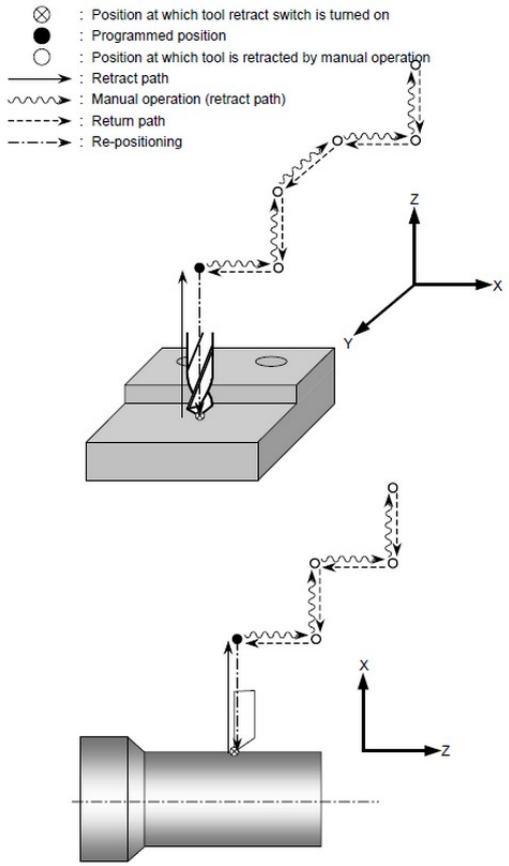
# 109
## Operation




**Notice**

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# Tool retract and recover

## Features

With the Tool Retract and Recover function the tool can be retracted from the workpiece when it is damaged, when it has to be replaced or when status of the machining has to be checked. The retraction position has to be specified with a program in advance. Afterwards the tool is returned to the workpiece and machining is restarted.

## Example of sequence

1. When tool retraction signal is set during the execution of an automatic operation, the retraction is performed up to the retraction position specified in the program.
2. The operator switches to manual mode and moves the tool in manual operation (jog feed, incremental feed, handle feed and manual numeric command). Up to ten movement paths are automatically stored.
3. When the tool recovery signal is set, the tool automatically returns to the retraction position, moving backward along the paths along which it has moved with manual operations.
4. With cycle start, a recovery (repositioning) is performed up to the position at which the tool retraction signal was set.

## Benefits

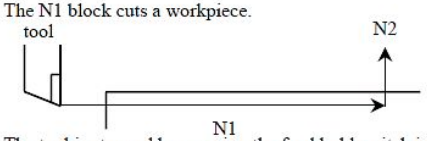
- Enables the operator to restart the program following an interruption such as a tool break or a tool change, or following cancellation of an emergency-stop
- Allows for safe restarting of the program when the machine has been left in an unknown state
- Reduction of time loss after tool break to restart operation

## Ordering Information

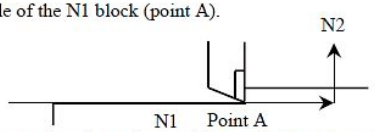
| Specification | Description |
|---|---|
| A02B-0303-J823 | 30i-A Tool Retract and Recover |
| A02B-0306-J823 | 31i-A5 Tool Retract and Recover |
| A02B-0307-J823 | 31i-A Tool Retract and Recover |
| A02B-0308-J823 | 32i-A Tool Retract and Recover |
| A02B-0323-J823 | 30i-B Tool Retract and Recover |
| A02B-0326-J823 | 31i-B5 Tool Retract and Recover |
| A02B-0327-J823 | 31i-B Tool Retract and Recover |
| A02B-0328-J823 | 32i-B Tool Retract and Recover |

# 110
## Operation

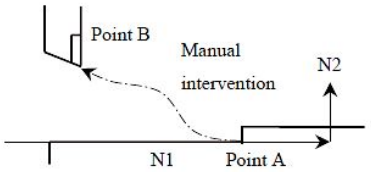
1. The N1 block cuts a workpiece.



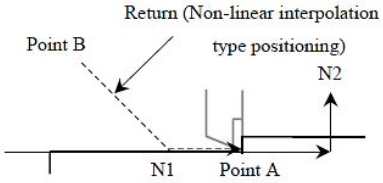

2. The tool is stopped by pressing the feed hold switch in the middle of the N1 block (point A).




3. After retracting the tool manually to point B, tool movement is restarted.




4. After automatic return to point A at the dry run feedrate by the non-linear interpolation type positioning, the remaining move command of the N1 block is executed.

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# Manual intervention and return

## Features

With the Manual Intervention and Return function, if the tool movement is stopped by a feed hold during automatic operation, then restarted after manual intervention for the confirmation of the cutting surface etc, the tool moves back to the point before intervention and automatic operation is resumed.

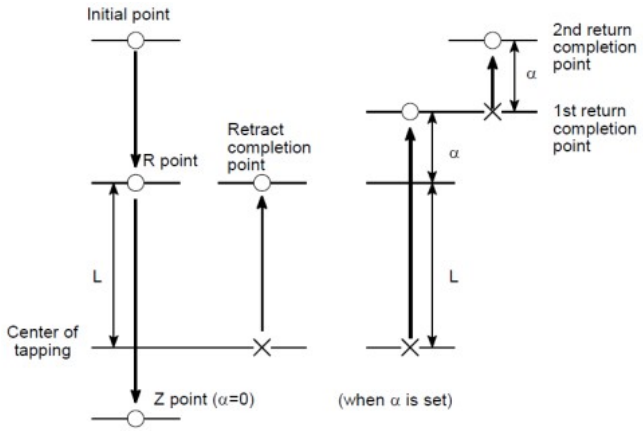
## Benefits

- Simplifies operator intervention
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R623 | 30i-A Manual Intervention and Return |
| A02B-0306-R623 | 31i-A5 Manual Intervention and Return |
| A02B-0307-R623 | 31i-A Manual Intervention and Return |
| A02B-0308-R623 | 32i-A Manual Intervention and Return |
| A02B-0323-R623 | 30i-B Manual Intervention and Return |
| A02B-0326-R623 | 31i-B5 Manual Intervention and Return |
| A02B-0327-R623 | 31i-B Manual Intervention and Return |
| A02B-0328-R623 | 32i-B Manual Intervention and Return |

# 111
## Operation




# Retraction for rigid tapping

## Features

The Retraction for Rigit Tapping function provides a way to restart a tapping operation.

When rigid tapping is stopped, either as a result of an emergency stop or a reset, the tap may cut into the workpiece. To avoid this, the tap can be drawn out using a PMC signal. The function automatically stores information related to the tapping executed most recently. Then, when a tap retraction signal is given, the tap is removed from the hole, based on the stored information. The tap is pulled toward the R point.

When a retract value ALPHA is given as parameter, the retraction distance can be increased by ALPHA.

## Benefits

- Simplifies operator intervention on tapping operations
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J664 | 30i-A Rigid Tapping Retract |
| A02B-0306-J664 | 31i-A5 Rigid Tapping Retract |
| A02B-0307-J664 | 31i-A Rigid Tapping Retract |
| A02B-0308-J664 | 32i-A Rigid Tapping Retract |
| A02B-0319-J664 | 0i-TD Rigid Tapping Retract |
| A02B-0321-J664 | 0i-Mate-TD Rigid Tapping Retract |
| A02B-0323-J664 | 30i-B Rigid Tapping Retract |
| A02B-0326-J664 | 31i-B5 Rigid Tapping Retract |
| A02B-0327-J664 | 31i-B Rigid Tapping Retract |
| A02B-0328-J664 | 32i-B Rigid Tapping Retract |

**Notice**

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# 112
## Operation

# Retraction for 3-dimentional rigid tapping

## Features

When the 3-dimensional rigid tapping or the rigid tapping during Tilted Working Plane (TWP) command is stopped by a result of the CNC power off, an emergency stop or a reset, the tap may cut into the workpiece. The tap can subsequently be drawn out by using a PMC signal or a program command.

This function automatically stores the information relating to the rigid tapping executed most recently. When a tap retraction signal is input or G30 program is commanded, the tap is removed from the hole, based on the stored information. The tap is pulled toward the R point.

When a retract value ALPHA is set in parameter, the retraction distance can be increased by ALPHA.

## Benefits

- Simplifies operator intervention on tapping operations
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-R575 | 0i-TD 3-D Rigid Tapping Retract |
| A02B-0320-R575 | 0i-MD 3-D Rigid Tapping Retract |
| A02B-0323-R575 | 30i-B 3-D Rigid Tapping Retract |
| A02B-0326-R575 | 31i-B5 3-D Rigid Tapping Retract |
| A02B-0327-R575 | 31i-B 3-D Rigid Tapping Retract |
| A02B-0328-R575 | 32i-B 3-D Rigid Tapping Retract |

**Notice**

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# 113
## Operation

# Manual 2nd/3rd/4th reference position return

## Features

The Manual 2nd/3rd/4th Reference Position Return function enables the 2nd, 3rd or 4th reference position return by JOG feed operation in manual reference position return mode.

## Benefits

- Simplifies operator intervention
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R558 | 30i-A Manual 2nd/3rd/4th Reference Position Return |
| A02B-0306-R558 | 31i-A5 Manual 2nd/3rd/4th Reference Position Return |
| A02B-0307-R558 | 31i-A Manual 2nd/3rd/4th Reference Position Return |
| A02B-0308-R558 | 32i-A Manual 2nd/3rd/4th Reference Position Return |
| A02B-0323-R558 | 30i-B Manual 2nd/3rd/4th Reference Position Return |
| A02B-0326-R558 | 31i-B5 Manual 2nd/3rd/4th Reference Position Return |
| A02B-0327-R558 | 31i-B Manual 2nd/3rd/4th Reference Position Return |
| A02B-0328-R558 | 32i-B Manual 2nd/3rd/4th Reference Position Return |

**Notice**

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# Reference point setting with mechanical stopper

## Features

This function automates the procedure of butting the tool against a mechanical stopper on an axis to set a reference position.

## Benefits

- Eliminate the variations in reference position setting that arise depending on the operator
- Minimize work required to make fine adjustments after reference position setting

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J729 | 30i-A Mechanical Stopper Referencing |
| A02B-0306-J729 | 31i-A5 Mechanical Stopper Referencing |
| A02B-0307-J729 | 31i-A Mechanical Stopper Referencing |
| A02B-0308-J729 | 32i-A Mechanical Stopper Referencing |
| A02B-0323-J729 | 30i-B Mechanical Stopper Referencing |
| A02B-0326-J729 | 31i-B5 Mechanical Stopper Referencing |
| A02B-0327-J729 | 31i-B Mechanical Stopper Referencing |
| A02B-0328-J729 | 32i-B Mechanical Stopper Referencing |

**Notice**

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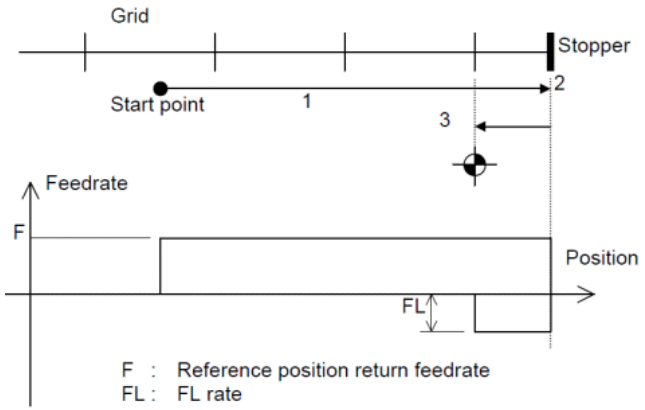
# 115
## Operation




# Reference point setting with mechanical stopper by grid method

## Features

A reference position return for an axis can be made by pushing the axis against the mechanical stopper without using a limit switch or deceleration dog.

As this reference position setting uses a grid method, its precision is on the same level as for a manual reference position return.

## Benefits

- Use with Absolute Pulse Encoders to quickly establish a reference point without slow-down switches

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S945 | 30i-A Reference Positon Setting with Mechanical Stopper by Grid Method |
| A02B-0306-S945 | 31i-A5 Reference Positon Setting with Mechanical Stopper by Grid Method |
| A02B-0307-S945 | 31i-A Reference Positon Setting with Mechanical Stopper by Grid Method |
| A02B-0308-S945 | 32i-A Reference Positon Setting with Mechanical Stopper by Grid Method |
| A02B-0323-S945 | 30i-B Reference Positon Setting with Mechanical Stopper by Grid Method |
| A02B-0326-S945 | 31i-B5 Reference Positon Setting with Mechanical Stopper by Grid Method |
| A02B-0327-S945 | 31i-B Reference Positon Setting with Mechanical Stopper by Grid Method |
| A02B-0328-S945 | 32i-B Reference Positon Setting with Mechanical Stopper by Grid Method |

**Notice**

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# Manual handle feed 1 unit

## Features

The Manual Handle Feed 1-Unit function allows a manual pulse generator to be connected in order to allow the operator to command machine moves by turning the manual handle.

By rotating the manual pulse generator on the machine operator's panel in handle mode, an axis feed corresponding to the amount of rotation can be performed. A desired axis can be selected using the handle axis selection switch.

Connection of the manual pulse generator requires an appropriate I/O device with an Manual Pulse Generator (MPG) connection.

## Benefits

- Simplifies operator intervention
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J835 | 30i-A Manual Handle Feed 1 Unit |
| A02B-0306-J835 | 31i-A5 Manual Handle Feed 1 Unit |
| A02B-0307-J835 | 31i-A Manual Handle Feed 1 Unit |
| A02B-0308-J835 | 32i-A Manual Handle Feed 1 Unit |
| A02B-0323-J835 | 30i-B Manual Handle Feed 1 Unit |
| A02B-0326-J835 | 31i-B5 Manual Handle Feed 1 Unit |
| A02B-0327-J835 | 31i-B Manual Handle Feed 1 Unit |
| A02B-0328-J835 | 32i-B Manual Handle Feed 1 Unit |

**Notice**

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# Manual handle feed 2/3 units

## Features

The Manual Handle Feed 2/3-Units function allows the connection of up to two additional manual pulse generators for the Manual Handle Feed function.

## Benefits

- Simplifies operator intervention
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J836 | 30i-A Manual Handle Feed 2/3 Units |
| A02B-0306-J836 | 31i-A5 Manual Handle Feed 2/3 Units |
| A02B-0307-J836 | 31i-A Manual Handle Feed 2/3 Units |
| A02B-0308-J836 | 32i-A Manual Handle Feed 2/3 Units |
| A02B-0319-R680 | 0i-TD Manual Handle Feed 3 Units |
| A02B-0323-J836 | 30i-B Manual Handle Feed 2/3 Units |
| A02B-0326-J836 | 31i-B5 Manual Handle Feed 2/3 Units |
| A02B-0327-J836 | 31i-B Manual Handle Feed 2/3 Units |
| A02B-0328-J836 | 32i-B Manual Handle Feed 2/3 Units |
| A02B-0333-J836 | 35i-B Manual Handle Feed 2/3 Units |
| A02B-0334-J836 | PM i-A Manual Handle Feed 2/3 Units |

**Notice**

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# Manual handle feed 4/5 units

## Features

The Manual Handle Feed 4/5-Units function allows the connection of up to two additional manual pulse generators for the Manual Handle Feed function.

## Benefits

- Simplifies operator intervention
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S858 | 30i-A Manual Handle Feed 4/5 Units |
| A02B-0306-S858 | 31i-A5 Manual Handle Feed 4/5 Units |
| A02B-0307-S858 | 31i-A Manual Handle Feed 4/5 Units |
| A02B-0308-S858 | 32i-A Manual Handle Feed 4/5 Units |
| A02B-0323-S858 | 30i-B Manual Handle Feed 4/5 Units |
| A02B-0326-S858 | 31i-B5 Manual Handle Feed 4/5 Units |
| A02B-0327-S858 | 31i-B Manual Handle Feed 4/5 Units |
| A02B-0328-S858 | 32i-B Manual Handle Feed 4/5 Units |

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# Manual handle feed multiple 10 million

## Features

With the Manual Handle Feed Multiple 10 Million, machines using small least input increment such as IS-D and IS-E can obtain more amounts of the movement when using manual handle feed.

This function extends the magnification of feed amount on manual handle feed, up to 10 million times of least input increment per pulse.

## Benefits

- High-precision coasting movements in manual mode
- Improves precision

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R600 | 30i-A Manual Handle Feed, Multiple 10 Million |
| A02B-0306-R600 | 31i-A5 Manual Handle Feed, Multiple 10 Million |
| A02B-0307-R600 | 31i-A Manual Handle Feed, Multiple 10 Million |
| A02B-0308-R600 | 32i-A Manual Handle Feed, Multiple 10 Million |
| A02B-0323-R600 | 30i-B Manual Handle Feed, Multiple 10 Million |
| A02B-0326-R600 | 31i-B5 Manual Handle Feed, Multiple 10 Million |
| A02B-0327-R600 | 31i-B Manual Handle Feed, Multiple 10 Million |
| A02B-0328-R600 | 32i-B Manual Handle Feed, Multiple 10 Million |

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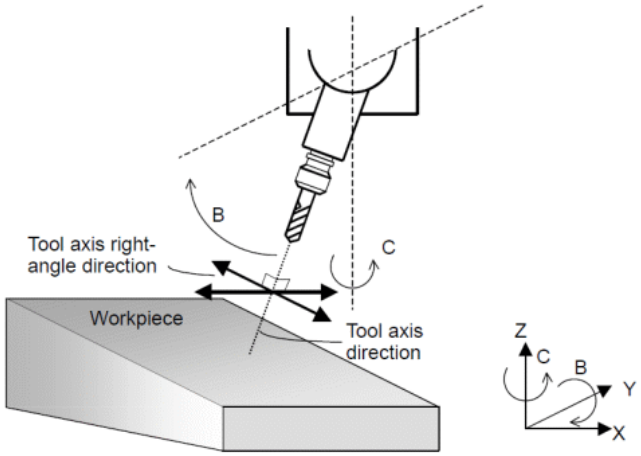
# 120
## Operation




# 3-dimensional manual feed

## Features

The function 3-Dimensional Manual Feed (previously Manual Handle Feed for 5-Axis Machining), allows the machine operator to retract the tool along its machining direction when pressing a button and even move the tool in parallel to the tilted working plane.

On a 3-axis machining process, it is realtively easy to move the Z-axis only to free the tool; on a 5-axis machining process, an smart solution such as the 3D Manual Feed function greatly helps the machine operator.

## Benefits

- Manual intervention options in the event of emergencies, for example, after a tool break
- Simplifies operation of 5-axis machine manual movements relative to the machining plane or tool direction vector
- Perform setup and adjustments of part location on machines with rotary axes that tilt the workpiece or rotate the tooling axis vector
- Safely remove the tool from a part when operating in 5-axis mode
- Broken tool recovery
- Manually move a tool normal to the feature coordinate system
- Ability to retract a tool on a vector
- Consolidated package of 5-axis features related to Manual Handle Feed usage

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S679 | 30i-A 3-Dimensional Manual Feed |
| A02B-0306-S679 | 31i-A5 3-Dimensional Manual Feed |
| A02B-0307-S679 | 31i-A 3-Dimensional Manual Feed |
| A02B-0320-S679 | 0i-MD 3-Dimensional Manual Feed |
| A02B-0323-S679 | 30i-B 3-Dimensional Manual Feed |
| A02B-0326-S679 | 31i-B5 3-Dimensional Manual Feed |
| A02B-0327-S679 | 31i-B 3-Dimensional Manual Feed |

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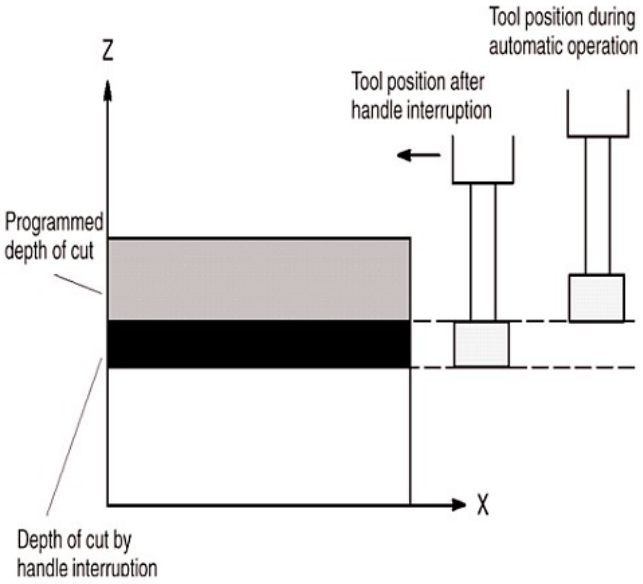
# 121
## Operation




# Handle interruption

## Features

With the Handle Interrupt function, it is possible with a handwheel to move any axis while cycle start is active.

When doing so, the handwheel movement is added to any programmed axis motion.

## Benefits

- Allows the operator to adjusts the axis position in automatic mode, without changing the part program
- Easy control of depth of cuts by operator using hand wheel
- Reduces set up
- Allows improvement by simple testing

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J837 | 30i-A Handle Interruption |
| A02B-0306-J837 | 31i-A5 Handle Interruption |
| A02B-0307-J837 | 31i-A Handle Interruption |
| A02B-0308-J837 | 32i-A Handle Interruption |
| A02B-0323-J837 | 30i-B Handle Interruption |
| A02B-0326-J837 | 31i-B5 Handle Interruption |
| A02B-0327-J837 | 31i-B Handle Interruption |
| A02B-0328-J837 | 32i-B Handle Interruption |

**Notice**

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# Manual handle interface for BETA i series with I/O-Link

## Features

The Manual Handle Interface for BETA i series amplifier function controls manual handle feed for BETA i servo amplifiers connected through I/O Link to the CNC with a manual pulse generator connected on the CNC directly (instead of on the amplifier).

Pulses from manual pulse generator are transferred from the CNC side to the BETA i servo amplifier through the I/O network. Furthermore, this function can control the magnification of pulses by changing the parameter.

## Note

Power Mate CNC manager (-J674) is required.

## Benefits

- Simplifies manual operator intervention
- Reduce wiring for remote servo amplifiers
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S722 | 30i-A BETA I/O LINK Manual Handle Interface (Peripheral Control) |
| A02B-0306-S722 | 31i-A5 BETA I/O LINK Manual Handle Interface (Peripheral Control) |
| A02B-0307-S722 | 31i-A BETA I/O LINK Manual Handle Interface (Peripheral Control) |
| A02B-0308-S722 | 32i-A BETA I/O LINK Manual Handle Interface (Peripheral Control) |
| A02B-0319-S722 | 0i-TD BETA I/O LINK Manual Handle Interface (Peripheral Control) |
| A02B-0320-S722 | 0i-MD BETA I/O LINK Manual Handle Interface (Peripheral Control) |
| A02B-0321-S722 | 0i-Mate-TD BETA I/O LINK Manual Handle Interface (Peripheral Control) |
| A02B-0322-S722 | 0i-Mate-MD BETA I/O LINK Manual Handle Interface (Peripheral Control) |
| A02B-0323-S722 | 30i-B BETA I/O LINK Manual Handle Interface (Peripheral Control) |
| A02B-0326-S722 | 31i-B5 BETA I/O LINK Manual Handle Interface (Peripheral Control) |
| A02B-0327-S722 | 31i-B BETA I/O LINK Manual Handle Interface (Peripheral Control) |
| A02B-0328-S722 | 32i-B BETA I/O LINK Manual Handle Interface (Peripheral Control) |
| A02B-0333-S722 | 35i-B BETA I/O LINK Manual Handle Interface (Peripheral Control) |

**Notice**

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| Specification | Description |
|---|---|
| A02B-0334-S722 | PM i-A BETA I/O LINK Manual Handle Interface (Peripheral Control) |

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# Manual numerical command

## Features

The Manual Numerical Command function allows the operator to execute data programmed through the MDI in jog mode. Whenever the system is ready for jog feed, a manual numerical command can be executed.

The following eight functions are supported:

1. Positioning (G00)
2. Linear interpolation (G01)
3. Automatic reference position return (G28)
4. 2nd/3rd/4th reference position return (G30)
5. M codes (miscellaneous functions)
6. S codes (spindle speed functions)
7. T codes (tool functions)
8. B codes (second auxiliary functions)

## Benefits

- Simplifies operator intervention
- Simplifies programming
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J667 | 30i-A Manual Numerical Command |
| A02B-0306-J667 | 31i-A5 Manual Numerical Command |
| A02B-0307-J667 | 31i-A Manual Numerical Command |
| A02B-0323-J667 | 30i-B Manual Numerical Command |
| A02B-0326-J667 | 31i-B5 Manual Numerical Command |
| A02B-0327-J667 | 31i-B Manual Numerical Command |

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# Reference position signal output

## Features

The Reference Position Signal Output function provides the capability for the CNC to output a signal to the PMC after the establishment of the reference position on each axis and when the coordinates in the machine coordinate system match the reference position.

In addition, if the coordinates in the machine coordinate system matches a second reference position, the function outputs an additional signal to the PMC.

## Benefits

- Simplifies operator intervention
- Simplifies programming
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S629 | 30i-A Reference position signal output |
| A02B-0306-S629 | 31i-A5 Reference position signal output |
| A02B-0307-S629 | 31i-A Reference Position Signal Output |
| A02B-0308-S629 | 32i-A Reference Position Signal Output |
| A02B-0323-S629 | 30i-B Reference position signal output |
| A02B-0326-S629 | 31i-B5 Reference Position Signal Output |
| A02B-0327-S629 | 31i-B Reference Position Signal Output |
| A02B-0328-S629 | 32i-B Reference Position Signal Output |

**Notice**

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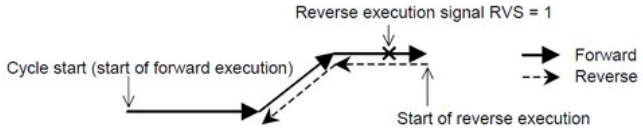


# Retrace

## Features

The Retrace Function is available for milling operations only. It provides a comfortable way for the operator to move the tool in the reverse direction, during automatic operation, using the REVERSE switch.

This causes the CNC to retrace (i.e. reverse) the programmed path. The tool may subsequently be moved forward again, along the programmed path, to resume cutting.

## Benefits

- Convenient mechanism for backing the tool up from the current position, should the need arise, then returning to that position and resuming cutting.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J730 | 30i-A Retrace Function |
| A02B-0306-J730 | 31i-A5 Retrace Function |
| A02B-0307-J730 | 31i-A Retrace Function |
| A02B-0308-J730 | 32i-A Retrace Function |
| A02B-0320-J730 | 0i-MD Retrace Function |
| A02B-0323-J730 | 30i-B Retrace Function |
| A02B-0326-J730 | 31i-B5 Retrace Function |
| A02B-0327-J730 | 31i-B Retrace Function |
| A02B-0328-J730 | 32i-B Retrace Function |

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# Manual handle retrace

## Features

The Manual Handle Retrace function allows, during automatic operation, that the operator debugs execution of the part program by simple and intuitive manipulation of the Manual Pulse Generator (MPG).

Using forward and reverse directions, the operator can isolate the problem area and observe the tool path; it can be done at a speed appropriate for accurate observation.

## Benefits

- Operating the machine via the MPG allows the operator to check for errors in the part program.
- The operator controls the speed of program execution via simple and intuitive manipulation of the MPG hand-wheel and multiplier switch, and controls direction of execution via the MPG polarity switch. This allows for close observation of the path at a suitable speed.
- Manual Handle Retrace may be used to isolate and check out a specific portion of the part program: it is not required that the entire program be subjected to Manual Handle Retrace operation.
- Manual Handle Retrace allows the operator to halt execution close to a problem spot in his program. It is not necessary to stop at a precise block, since forward and reverse execution is available to zone in on the problem.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J998 | 30i-A Manual Handle Retrace |
| A02B-0306-J998 | 31i-A5 Manual Handle Retrace |
| A02B-0307-J998 | 31i-A Manual Handle Retrace |
| A02B-0308-J998 | 32i-A Manual Handle Retrace |
| A02B-0319-J998 | 0i-TD Manual Handle Retrace |
| A02B-0320-J998 | 0i-MD Manual Handle Retrace |
| A02B-0323-J998 | 30i-B Manual Handle Retrace |
| A02B-0326-J998 | 31i-B5 Manual Handle Retrace |
| A02B-0327-J998 | 31i-B Manual Handle Retrace |
| A02B-0328-J998 | 32i-B Manual Handle Retrace |

**Notice**

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# Manual handle retrace for multi-path

## Features

In the Manual Handle Retrace for Multi-Path function, when the operation of re-forward movement is performed after backward movement, it is possible to adjust the timing of all path's movement to that of original forward movement.

In manual handle retrace function, when backward movement is prohibited to in a path, and other paths continue the backward movement, if re-forward movement is performed later, all paths start the re-forward movement immediately, therefore the timing of block movement in each path is different from original forward movement.

In this function, when re-forward movement is performed after backward movement, the path in which backward movement is prohibited doesn't start re-forward movement immediately. After other paths reach the position where the backward movement is prohibited, the re-forward movement of this path is performed. Therefore, in multi path, block movement of each path in re-forward movement can be performed at the same timing in forward movement.

## Benefits

- Provides the Manual Hande Retrace benefits to a complex Multi-Path system
- Operating the machine via the MPG allows the operator to check for errors in the part program.
- The operator controls the speed of program execution via simple and intuitive manipulation of the MPG hand-wheel and multiplier switch, and controls direction of execution via the MPG polarity switch. This allows for close observation of the path at a suitable speed.
- Manual Handle Retrace may be used to isolate and check out a specific portion of the part program: it is not required that the entire program be subjected to Manual Handle Retrace operation.
- Manual Handle Retrace allows the operator to halt execution close to a problem spot in his program. It is not necessary to stop at a precise block, since forward and reverse execution is available to zone in on the problem.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R606 | 30i-A Manual Handle Retrace Function for Multi-Path CNC |
| A02B-0306-R606 | 31i-A5 Manual Handle Retrace Function for Multi-Path CNC |
| A02B-0307-R606 | 31i-A Manual Handle Retrace Function for Multi-Path CNC |
| A02B-0308-R606 | 32i-A Manual Handle Retrace Function for Multi-Path CNC |
| A02B-0323-R606 | 30i-B Manual Handle Retrace Function for Multi-Path CNC |
| A02B-0326-R606 | 31i-B5 Manual Handle Retrace Function for Multi-Path CNC |
| A02B-0327-R606 | 31i-B Manual Handle Retrace Function for Multi-Path CNC |
| A02B-0328-R606 | 32i-B Manual Handle Retrace Function for Multi-Path CNC |

**Notice**

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# Direction change movement in auxiliary function output block function

## Features

With this function and in manual handle retrace mode, when movement command and auxiliary function (M,S,T,B-code) are commanded within the same block, the direction change movement can be evaluated within the PMC and appropriate action can be taken.

Parameter: it is possible to allow or prohibit direction change during manual handle retrace operation while setting the corresponding parameter accordingly.

Signal: in manual handle retrace, when both movement command and auxiliary function (M,S,T,B-code) are commanded in a block at a time, a signal notifies direction change of movement performed by the manual handle.

## Benefits

- Simplifies operator work and effectivity in manual / handle mode
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S628 | 30i-A Direction Change Movement in Auxiliary Function Output Block Function |
| A02B-0306-S628 | 31i-A5 Direction Change Movement in Auxiliary Function Output Block Function |
| A02B-0307-S628 | 31i-A Direction Change Movement in Auxiliary Function Output Block Function |
| A02B-0308-S628 | 32i-A Direction Change Movement in Auxiliary Function Output Block Function |
| A02B-0323-S628 | 30i-B Direction Change Movement in Auxiliary Function Output Block Function |
| A02B-0326-S628 | 31i-B5 Direction Change Movement in Auxiliary Function Output Block Function |
| A02B-0327-S628 | 31i-B Direction Change Movement in Auxiliary Function Output Block Function |
| A02B-0328-S628 | 32i-B Direction Change Movement in Auxiliary Function Output Block Function |

**Notice**

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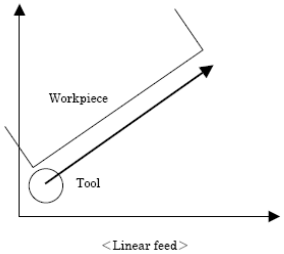
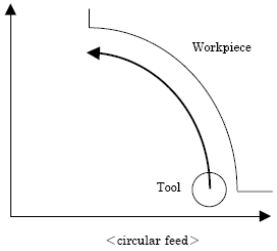


<Linear feed>



<circular feed>

# Manual linear / circular interpolation

## Features

In manual handle feed or jog feed, the following types of feed operations are enabled along with conventional single axis feed operation:

- Feed along a tilted straight line in the XY plane or YZ plane or ZX plane based on simultaneous 2-axis control (linear feed)
- Feed along a circle in the XY plane or YZ plane or ZX plane based on simultaneous 2-axis control (circular feed)

Note: when using the Manual Linear / Circular Interpolation function, the option 'Manual handle feed 1-unit' is required. When using 2nd or 3rd Manual handle, the option 'Manual handle feed 2/3-unit' or 'Manual handle feed 4/5-unit' is required. When using 4th or 5th Manual handle, the option 'Manual handle feed 4/5-unit' is required.

## Benefits

- Simplifies operator work and effectivity in manual / handle mode
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J774 | 30i-A Manual Linear / Circular Interpolation - Incl. Handle Synchronous Feed Function |
| A02B-0306-J774 | 31i-A5 Manual Linear / Circular Interpolation - Incl. Handle Synchronous Feed Function |
| A02B-0307-J774 | 31i-A Manual Linear / Circular Interpolation - Incl. Handle Synchronous Feed Function |
| A02B-0308-J774 | 32i-A Manual Linear / Circular Interpolation - Incl. Handle Synchronous Feed Function |
| A02B-0323-J774 | 30i-B Manual Linear / Circular Interpolation - Incl. Handle Synchronous Feed Function |
| A02B-0326-J774 | 31i-B5 Manual Linear / Circular Interpolation - Incl. Handle Synchronous Feed Function |
| A02B-0327-J774 | 31i-B Manual Linear / Circular Interpolation - Incl. Handle Synchronous Feed Function |
| A02B-0328-J774 | 32i-B Manual Linear / Circular Interpolation - Incl. Handle Synchronous Feed Function |

**Notice**

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# 131
## Operation

# Active block cancel

## Features

The Active Block Cancel function is used to cancel the executing block by a signal from the PMC, and to stop.

The distance remaining is cleared, and the execution is restarted from the next block of canceled block by cycle start.

## Benefits

- Possibility to check the part program for a short time.
- Simplifies operator work
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S627 | 30i-A Active Block Cancel |
| A02B-0306-S627 | 31i-A5 Active Block Cancel |
| A02B-0307-S627 | 31i-A Active Block Cancel |
| A02B-0308-S627 | 32i-A Active Block Cancel |
| A02B-0323-S627 | 30i-B Active Block Cancel |
| A02B-0326-S627 | 31i-B5 Active Block Cancel |
| A02B-0327-S627 | 31i-B Active Block Cancel |
| A02B-0328-S627 | 32i-B Active Block Cancel |

**Notice**

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# High speed program check

## Features

The High Speed Program Check function provides the following features:

- The program format check and the stroke limit check are available without axes movements.
- The program check is executed with the maximum feedrate of CNC system and without the acceleration / deceleration regardless of the specified data.
- After the program check is completed, the reference position return is not necessary because the workpiece coordinate system preset is executed automatically at the end of the high speed program check mode.
- In case that the parameter PGR (No.3454#3) is set to "1", the data, which are changed during the high speed program check mode, are restored to the data at the start of the high speed program check mode when ending the high speed program check mode. By this, after ending the high speed program check mode, the automatic operation can be executed with the data before the start of the high speed program check mode.

## Benefits

- Possibility to accelerate the check of the programs
- Time saving

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S880 | 30i-A High-Speed Program Check Function |
| A02B-0306-S880 | 31i-A5 High-Speed Program Check Function |
| A02B-0307-S880 | 31i-A High-Speed Program Check Function |
| A02B-0308-S880 | 32i-A High-Speed Program Check Function |
| A02B-0323-S880 | 30i-B High-Speed Program Check Function |
| A02B-0326-S880 | 31i-B5 High-Speed Program Check Function |
| A02B-0327-S880 | 31i-B High-Speed Program Check Function |
| A02B-0328-S880 | 32i-B High-Speed Program Check Function |

**Notice**

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# 133
## Operation

# Time override function for dwell / auxiliary function

## Features

The Time Override Function for Dwell / Auxiliary Function applies override to the dwell and auxiliary (M/S/T/B) function in the range of 0% to 100% in steps of 1%.

If the override is applied to auxiliary (M/S/T/B) function, the next block is executed after a shortage of time. The actual processing time is considered to be 100%, and the shortage is calculated from the time.

## Benefits

- Simplifies the operation of the machine
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R500 | 30i-A Dwell / Auxiliary Function Time Override Function |
| A02B-0306-R500 | 31i-A5 Dwell / Auxiliary Function Time Override Function |
| A02B-0307-R500 | 31i-A Dwell / Auxiliary Function Time Override Function |
| A02B-0308-R500 | 32i-A Dwell / Auxiliary Function Time Override Function |
| A02B-0323-R500 | 30i-B Dwell / Auxiliary Function Time Override Function |
| A02B-0326-R500 | 31i-B5 Dwell / Auxiliary Function Time Override Function |
| A02B-0327-R500 | 31i-B Dwell / Auxiliary Function Time Override Function |
| A02B-0328-R500 | 32i-B Dwell / Auxiliary Function Time Override Function |

**Notice**

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# Pulse superimposed function

## Features

The Pulse Superimposed Function enables pulse superimposed control in cutting mode that have been specified by the PMC in automatic operation mode (MDI operation, DNC operation, and memory operation) and in memory edit mode.

The maximum number of superimposed axes at the same time is two on each path (twice the number of paths in the entire system).

This function requires the following option:

- Manual handle interrupt
- Manual handle feed, 1 unit
- Manual handle feed, 2/3-units
- (or manual handle feed, 4/5-units)

## Benefits

- Simplifies the operation of the machine
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R559 | 30i-A Pulse Superimposed Function |
| A02B-0306-R559 | 31i-A5 Pulse Superimposed Function |
| A02B-0307-R559 | 31i-A Pulse Superimposed Function |
| A02B-0308-R559 | 32i-A Pulse Superimposed Function |
| A02B-0323-R559 | 30i-B Pulse Superimposed Function |
| A02B-0326-R559 | 31i-B5 Pulse Superimposed Function |
| A02B-0327-R559 | 31i-B Pulse Superimposed Function |
| A02B-0328-R559 | 32i-B Pulse Superimposed Function |

**Notice**

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# NC program conversion function

## Features

The cutting cycle made with TURN MATE i can be converted into standard ISO programs and output to the CNC program memory.

The following functionality is available:

- Selected cutting cycle can be converted into a standard ISO CNC program on the Base screen.
- Selected program can be batched-converted into CNC programs on a Process List screen.

## Benefits

- Simplifies the programming of the machine
- Simple conversion of programs generated with conversational tool to ISO code
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-S795 | 0i-TD TURN MATE i - NC Program Conversion Function |
| A02B-0321-S795 | 0i-Mate-TD TURN MATE i - NC Program Conversion Function |

**Notice**

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# 136
# Functions

# Interpolation functions

This section of the catalogue contains the functions related to the interpolation capabilities and functions of the CNC system.

Interpolation functions control how the CNC will move the axes. Simple positioning, linear and circular interpolation are standard features of the controllers. Other forms of interpolation are optional and depend on the purpose of the machine tool. They can ease drastically the programming of complex geometric shapes, as well as optimize the part programs size and improve the accuracy of the machine.

Some of the interpolation functions detailed in the catalogue:

- Exponential Interpolation
- Polar Coordinate Interpolation
- Cylindrical Interpolation
- Helical Interpolation
- Involute Interpolation
- Hypothetical Axes Interpolation
- Conical/Spiral Interpolation
- Smooth Interpolation
- Nano Smoothing
- Thread cutting, synchronous cutting, complex threading
- NURBS Interpolation
- 3 Dimensional Circular Interpolation
- High-speed cutting
- Path Table Operation
- High-speed binary program operation
- Etc.

**Notice**

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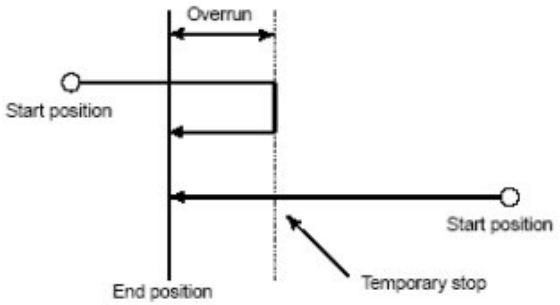
# 137

## Interpolation functions




# Single direction positioning

## Features

When using the Single Direction Positioning function, the CNC automatically approaches specific locations always from the same direction.

Accurate positioning without backlash can be performed and final positioning from one direction is possible as well.

## Benefits

- Minimize backlash error by using unidirectional positioning
- Improves accuracy in bolt hole patterns with minimized backlash error

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J812 | 30i-A Single Direction Positioning |
| A02B-0306-J812 | 31i-A5 Single Direction Positioning |
| A02B-0307-J812 | 31i-A Single Direction Positioning |
| A02B-0308-J812 | 32i-A Single Direction Positioning |
| A02B-0323-J812 | 30i-B Single Direction Positioning |
| A02B-0326-J812 | 31i-B5 Single Direction Positioning |
| A02B-0327-J812 | 31i-B Single Direction Positioning |
| A02B-0328-J812 | 32i-B Single Direction Positioning |

**Notice**

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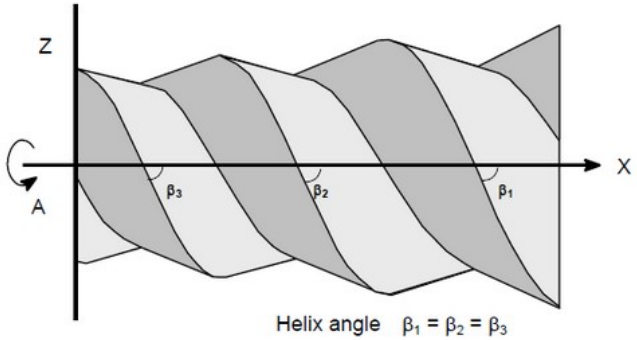
# 138

## Interpolation functions




# Exponential interpolation

## Features

The Exponential Interpolation function is used to coordinate linear and rotary axis movement.

Exponential interpolation exponentially changes the rotation of a workpiece with respect to movement on the rotary axis. Furthermore, exponential interpolation performs linear interpolation with respect to another axis.

This enables tapered groove machining with a constant helix angle (constant helix taper machining). This function is best suited for grooving and grinding tools such as taper end mills.

## Benefits

- Adds special interpolation type to the CNC
- Provides interpolation specialized for grooving and grinding tools
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J711 | 30i-A Exponential Interpolation |
| A02B-0306-J711 | 31i-A5 Exponential Interpolation |
| A02B-0307-J711 | 31i-A Exponential Interpolation |
| A02B-0323-J711 | 30i-B Exponential Interpolation |
| A02B-0326-J711 | 31i-B5 Exponential Interpolation |
| A02B-0327-J711 | 31i-B Exponential Interpolation |

**Notice**

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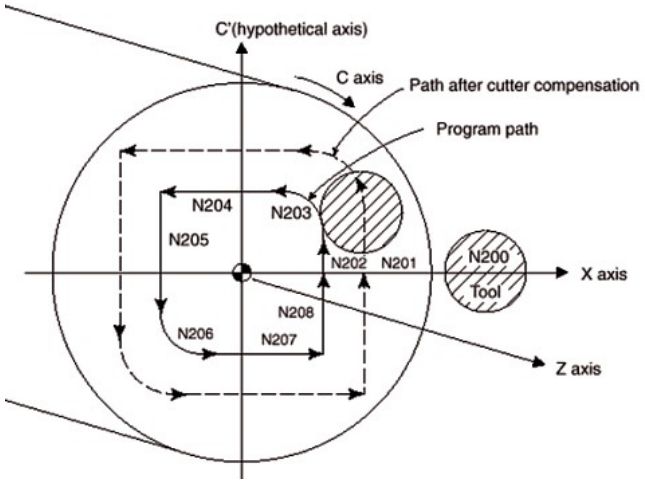
# 139

## Interpolation functions




# Polar coordinate interpolation

## Features

The Polar Coordinate Interpolation function allows a designated pair of axes (one rotary and one linear) to be programmed like two linear axes.

The function converts a command programmed in the Cartesian coordinate system to the movement of a linear axis (movement of a tool) and the movement of a rotary axis (rotation of a workpiece).

Examples of use include cutting grooves in face side of rotary workpiece and grinding a camshaft.

## Benefits

- Simplifies programming when a linear movement and a rotational movement have to be coordinated.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J815 | 30i-A Polar Coordinate Interpolation |
| A02B-0306-J815 | 31i-A5 Polar Coordinate Interpolation |
| A02B-0307-J815 | 31i-A Polar Coordinate Interpolation |
| A02B-0308-J815 | 32i-A Polar Coordinate Interpolation |
| A02B-0323-J815 | 30i-B Polar Coordinate Interpolation |
| A02B-0326-J815 | 31i-B5 Polar Coordinate Interpolation |
| A02B-0327-J815 | 31i-B Polar Coordinate Interpolation |
| A02B-0328-J815 | 32i-B Polar Coordinate Interpolation |
| A02B-0333-J815 | 35i-B Polar Coordinate Interpolation |
| A02B-0334-J815 | PM i-A Polar Coordinate Interpolation |

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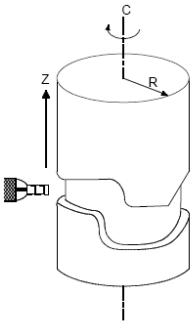
# 140

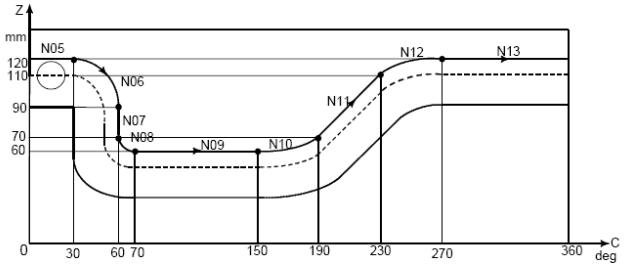
## Interpolation functions

Example of a cylindrical interpolation programs

```
O0001 (CYLINDRICAL INTERPOLATION);
N01 G00 G90 Z100.0 C0 ;
N02 G01 G91 G18 Z0 C0 ;
N03 G07.1 C57299 ;
N04 G90 G01 G42 Z120.0 D01 F250 ;
N05 C30.0 ;
N06 G03 Z90.0 C60.0 R30.0 ;
N07 G01 Z70.0 ;
N08 G02 Z60.0 C70.0 R10.0 ;
N09 G01 C150.0 ;
N10 G02 Z70.0 C190.0 R75.0 ;
N11 G01 Z110.0 C230.0 ;
N12 G03 Z120.0 C270.0 R75.0 ;
N13 G01 C360.0 ;
N14 G40 Z100.0 ;
N15 G07.1 C0 ;
N16 M30 ;
```

Note) Sample program where the C axis is parallel to the X-axis.




# Cylindrical interpolation

## Features

The Cylindrical Interpolation function allows the programmer to program a shape on the surface of a cylinder, using linear and circular interpolation commands.

The programmer can visualize the surface of the cylinder being worked as if it had been rolled out on a flat plane.

## Benefits

- Simplifies programming for machining the curved surface of a cylinder.
- Programs such as those for grooving cylindrical cams can be easily created.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J816 | 30i-A Cylindrical Interpolation |
| A02B-0306-J816 | 31i-A5 Cylindrical Interpolation |
| A02B-0307-J816 | 31i-A Cylindrical Interpolation |
| A02B-0308-J816 | 32i-A Cylindrical Interpolation |
| A02B-0322-J816 | 0i-Mate-MD Cylindrical Interpolation |
| A02B-0323-J816 | 30i-B Cylindrical Interpolation |
| A02B-0326-J816 | 31i-B5 Cylindrical Interpolation |
| A02B-0327-J816 | 31i-B Cylindrical Interpolation |
| A02B-0328-J816 | 32i-B Cylindrical Interpolation |

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# 141

## Interpolation functions

# Cylindrical interpolation by plane distance command

## Features

Normally, a program command for the rotary axis in the cylindrical interpolation was given by rotary angle of the rotary axis.

The Cylindrical Interpolation by Plane Distance Command function enables a command for the rotary axis in the cylindrical interpolation by the cylindrical plane distance according to a parameter setting.

## Benefits

- Provide an additional method of programming the cylindrical interpolation
- Increases the programming flexibility

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R578 | 30i-A Cylindrical Interpolation by Plane Distance Command |
| A02B-0306-R578 | 31i-A5 Cylindrical Interpolation by Plane Distance Command |
| A02B-0307-R578 | 31i-A Cylindrical Interpolation by Plane Distance Command |
| A02B-0308-R578 | 32i-A Cylindrical Interpolation by Plane Distance Command |
| A02B-0323-R578 | 30i-B Cylindrical Interpolation by Plane Distance Command |
| A02B-0326-R578 | 31i-B5 Cylindrical Interpolation by Plane Distance Command |
| A02B-0327-R578 | 31i-B Cylindrical Interpolation by Plane Distance Command |
| A02B-0328-R578 | 32i-B Cylindrical Interpolation by Plane Distance Command |

**Notice**

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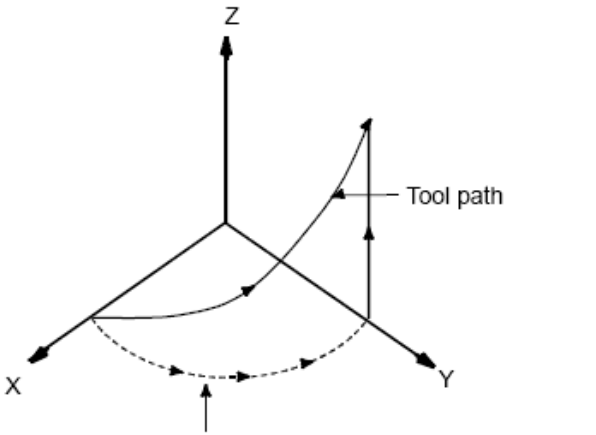
# 142

## Interpolation functions




The feedrate along the circumference of two circular interpolated axes is the specified feedrate.

# Helical interpolation

## Features

Helical Interpolation permits the programmer to command a move in which up to two axes are moved in a linear fashion at the same time as the basic two axes that are performing circular interpolation. This results in a helical cut.

## Benefits

- Provides a simple way to program helical cuts
- Increases the programming flexibility of the CNC

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J819 | 30i-A Helical Interpolation |
| A02B-0306-J819 | 31i-A5 Helical Interpolation |
| A02B-0307-J819 | 31i-A Helical Interpolation |
| A02B-0308-J819 | 32i-A Helical Interpolation |
| A02B-0319-J819 | 0i-TD Helical Interpolation |
| A02B-0323-J819 | 30i-B Helical Interpolation |
| A02B-0326-J819 | 31i-B5 Helical Interpolation |
| A02B-0327-J819 | 31i-B Helical Interpolation |
| A02B-0328-J819 | 32i-B Helical Interpolation |
| A02B-0333-J819 | 35i-B Helical Interpolation |
| A02B-0334-J819 | PM i-A Helical Interpolation |

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# 143

## Interpolation functions

# Helical interpolation B

## Features

Helical Interpolation B permits the programmer to command a move in which up to four axes are moved in a linear fashion at the same time as the basic two axes that are performing circular interpolation.

## Benefits

- Provides additional methods to realize advanced helical cuts
- Increases the programming flexibility of the CNC

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J655 | 30i-A Helical Interpolation B |
| A02B-0323-J655 | 30i-B Helical Interpolation B |

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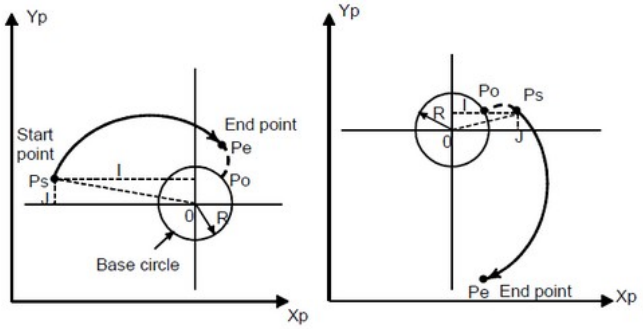
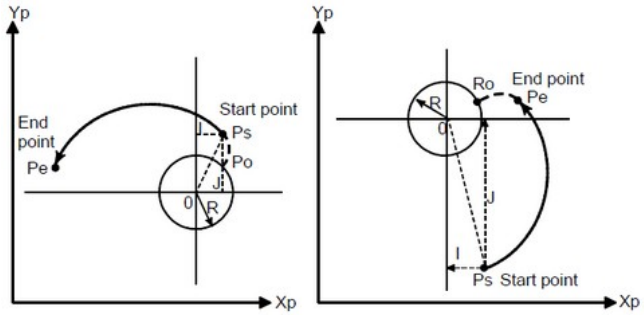
## Interpolation functions




Clockwise involute interpolation (G02.2)




Counterclockwise involute interpolation (G03.2)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# Involute interpolation

## Features

The Involutes Interpolation function performs the machining of complex involute curves. Involute interpolation eliminates the need for approximating an involute curve with minute segments or arcs, and continuous pulse distribution is ensured even in high-speed operation of small blocks.

Accordingly, high-speed operation can be performed smoothly. Furthermore, machining programs can be created easily and efficiently, reducing the required length of program. Involutes interpolation is useful for tool grinding.

The Helical Involute Interpolation function performs on two axes involute interpolation and on up to four other axes linear interpolation simultaneously.

When using only "Helical Involute Interpolation (S853)", this function performs two axes involute interpolation and up to two other axes linear interpolation simultaneously.

To enable the function to perform two axes involute interpolation and more than three other axes linear interpolation simultaneously, Helical Interpolation B (J655) option is required.

## Benefits

- Adds special interpolation type to the CNC
- Simplifies programming
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J710 | 30i-A Involute Interpolation |
| A02B-0303-S853 | 30i-A Helical Involute Interpolation |
| A02B-0306-J710 | 31i-A5 Involute Interpolation |
| A02B-0306-S853 | 31i-A5 Helical Involute Interpolation |
| A02B-0307-J710 | 31i-A Involute Interpolation |
| A02B-0307-S853 | 31i-A Helical Involute Interpolation |
| A02B-0323-J710 | 30i-B Involute Interpolation |
| A02B-0323-S853 | 30i-B Helical Involute Interpolation |
| A02B-0326-J710 | 31i-B5 Involute Interpolation |
| A02B-0326-S853 | 31i-B5 Helical Involute Interpolation |
| A02B-0327-J710 | 31i-B Involute Interpolation |
| A02B-0327-S853 | 31i-B Helical Involute Interpolation |

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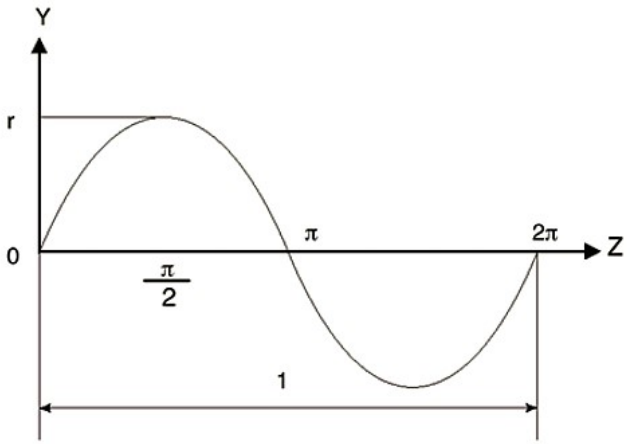
## Interpolation functions




# Hypothetical axes interpolation

## Features

In helical interpolation when one of the circular interpolation axes is defined as a hypothetical axis then the tool path follows a sinusoidal path.

The Hypothetical Interpolation function is used for threading with a fractional lead. The axis to be set as the hypothetical axis is specified with G07.

## Benefits

- Adds special interpolation type to the CNC
- Simplifies programming
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J652 | 30i-A Hypothetical Axes Interpolation |
| A02B-0306-J652 | 31i-A5 Hypothetical Axes Interpolation |
| A02B-0307-J652 | 31i-A Hypothetical Axes Interpolation |
| A02B-0323-J652 | 30i-B Hypothetical Axes Interpolation |
| A02B-0326-J652 | 31i-B5 Hypothetical Axes Interpolation |
| A02B-0327-J652 | 31i-B Hypothetical Axes Interpolation |

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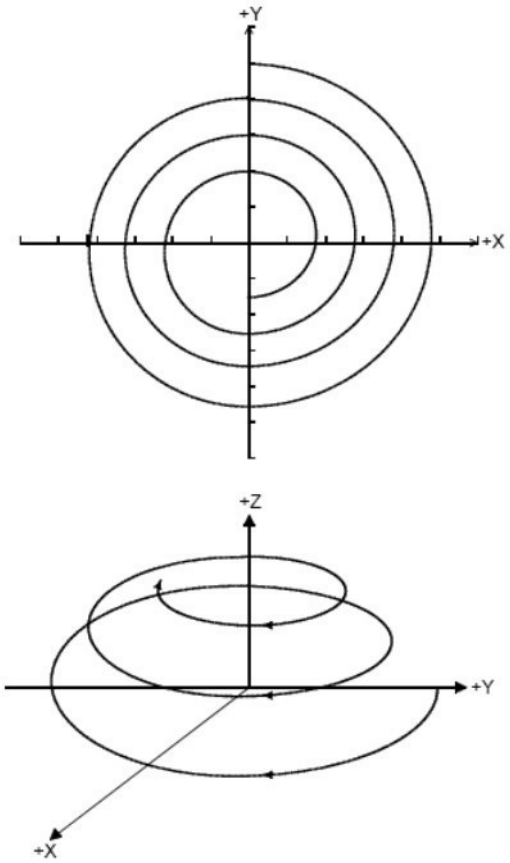
## Interpolation functions




# Conical/spiral interpolation

## Features

The Conical/Spiral Interpolation function allows the CNC programmer to command, in a single block, a spiral move in a plane (two axes) or a conical move in three dimensions.

## Benefits

- Simple command block for spiral interpolation.
- Simple command block for conical interpolation.
- Common command structure for conical/spiral interpolation.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J780 | 30i-A Conical/Spiral Interpolation |
| A02B-0306-J780 | 31i-A5 Conical/Spiral Interpolation |
| A02B-0307-J780 | 31i-A Conical/Spiral Interpolation |
| A02B-0323-J780 | 30i-B Conical/Spiral Interpolation |
| A02B-0326-J780 | 31i-B5 Conical/Spiral Interpolation |
| A02B-0327-J780 | 31i-B Conical/Spiral Interpolation |

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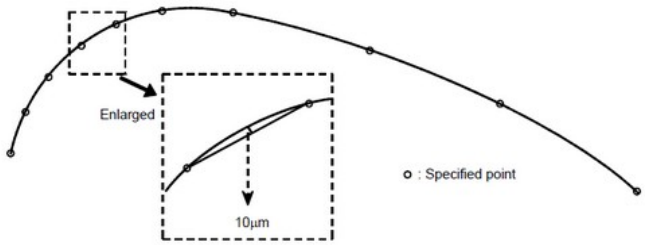
## Interpolation functions




# Smooth interpolation

## Features

The Smooth Interpolation function can be used to enhance the surface finish of the part being machined, such as die cutting, where the part program is typically large and consists of many small moves. The CNC automatically determines when to select one of two types of machining:

- For those portions where the accuracy of the figure is critical, such as at corners, machining will be performed exactly as specified by the program command.
- For those portions having a large radius of curvature, where a smooth figure is desired, points along the machining path will be interpolated with a smooth curve, calculated from the polygonal lines specified in successive program commands.

## Benefits

- Smooth surface finish, where dwell marks might otherwise have been a problem.
- Simple programming, with the CNC automatically determining when to apply smooth interpolation and when to ignore it.
- High-speed, high-precision machining can be performed.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J777 | 30i-A Smooth Interpolation |
| A02B-0306-J777 | 31i-A5 Smooth Interpolation |
| A02B-0307-J777 | 31i-A Smooth Interpolation |
| A02B-0323-J777 | 30i-B Smooth Interpolation |
| A02B-0326-J777 | 31i-B5 Smooth Interpolation |
| A02B-0327-J777 | 31i-B Smooth Interpolation |

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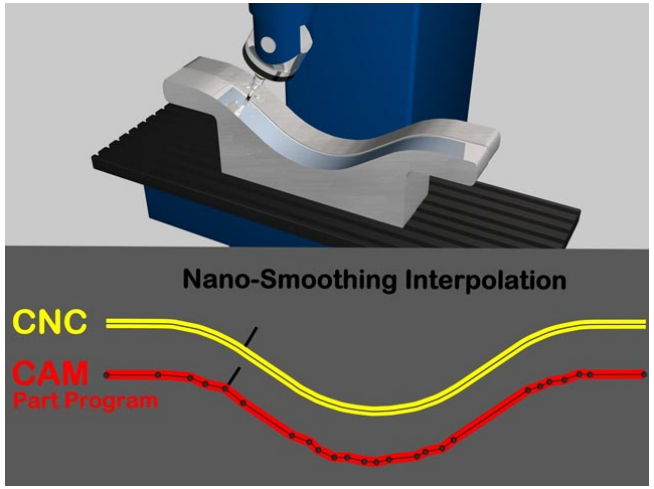
# 148

## Interpolation functions




# Nano smoothing

## Features

The Nano Smoothing function allows linear segmented programs developed either for 3-axis or 5-axis machines to be automatically converted into continuous free-forms using the CNCs inbuilt NURBS technology. When a desired, sculptured surface is approximated by minute segments, the nano smoothing function generates a smooth curve inferred from the programmed segments and performs the necessary interpolation.

The conventional Nano Smoothing function (S687) is limited to the three basic axes (X, Y, and Z) whereas the Nano Smoothing II function (R512), former Nano Smoothing for 5-Axis Machining, does additionally consider two rotary axes.

## Benefits

- Exceptional surface finish, better part quality
- Extremely "Fluid" motion, less tool wear
- Less requirement to process later the cut surface with grinding or polishing
- Significant increase of the machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R512 | 30i-A Nano Smoothing II |
| A02B-0303-S687 | 30i-A Nano Smoothing |
| A02B-0306-R512 | 31i-A5 Nano Smoothing II |
| A02B-0306-S687 | 31i-A5 Nano Smoothing |
| A02B-0307-S687 | 31i-A Nano Smoothing |
| A02B-0320-S687 | 0i-MD Nano Smoothing |
| A02B-0323-R512 | 30i-B Nano Smoothing II |
| A02B-0323-S687 | 30i-B Nano Smoothing |
| A02B-0326-R512 | 31i-B5 Nano Smoothing II |
| A02B-0326-S687 | 31i-B5 Nano Smoothing |
| A02B-0327-S687 | 31i-B Nano Smoothing |
| A02B-0328-S687 | 32i-B Nano Smoothing |

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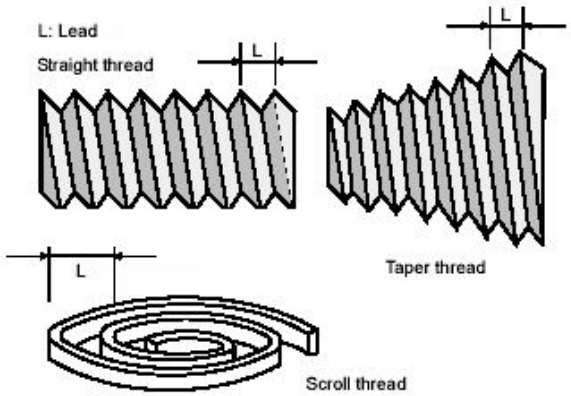
## Interpolation functions




# Thread cutting, synchronous cutting

## Features

When feeding the tool in synchronization with the spindle rotation a threading of the specified lead can be performed with the Thread Cutting / Synchronous Cutting function.

In addition to straight threads, taper threads and scroll threads can be cut with equal leads. The spindle encoder is used to accurately initiate axis motion.

## Benefits

- Allows thread cutting on large holes, with single point tooling
- Accurate machining on multiple threading passes

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J824 | 30i-A Thread Cutting, Synchronous Cutting |
| A02B-0306-J824 | 31i-A5 Thread Cutting, Synchronous Cutting |
| A02B-0307-J824 | 31i-A Thread Cutting, Synchronous Cutting |
| A02B-0308-J824 | 32i-A Thread Cutting, Synchronous Cutting |
| A02B-0323-J824 | 30i-B Thread Cutting, Synchronous Cutting |
| A02B-0326-J824 | 31i-B5 Thread Cutting, Synchronous Cutting |
| A02B-0327-J824 | 31i-B Thread Cutting, Synchronous Cutting |
| A02B-0328-J824 | 32i-B Thread Cutting, Synchronous Cutting |

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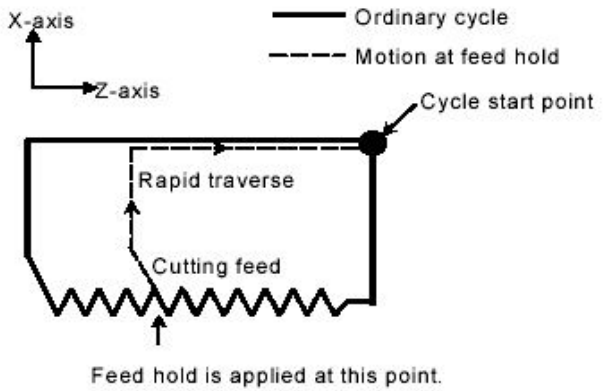
## Interpolation functions




# Thread cutting retract

## Features

Threading Retract (Canned Cycle)

Feed hold may be applied during threading. In this case, the tool immediately retracts with chamfering and returns to the start point on the second axis (X-axis), then the first axis (Z-axis) on the plane.

The amount of chamfering during retraction is the same as that of chamfering at the end point.

Threading Retract (Multiple Repetitive Cycle)

If feed hold is applied during threading in the multiple repetitive threading cycle (G76), chamfering for threading is performed and the tool returns to the threading cycle start point and stops. If a cycle start operation is performed here, machining restarts with the threading cycle to which feed hold was applied.

The amount of chamfering during retraction is the same as that of chamfering at the end point.

## Benefits

- Adds additional modes to the thread cutting operation
- Simplifies programming and restart
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J825 | 30i-A Thread Cutting Retract |
| A02B-0306-J825 | 31i-A5 Thread Cutting Retract |
| A02B-0307-J825 | 31i-A Thread Cutting Retract |
| A02B-0308-J825 | 32i-A Thread Cutting Retract |
| A02B-0323-J825 | 30i-B Thread Cutting Retract |
| A02B-0326-J825 | 31i-B5 Thread Cutting Retract |
| A02B-0327-J825 | 31i-B Thread Cutting Retract |
| A02B-0328-J825 | 32i-B Thread Cutting Retract |

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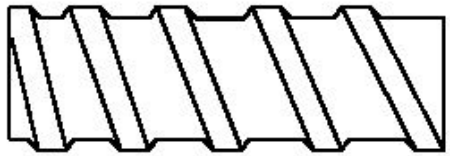
## Interpolation functions



Variable lead screw

# Variable lead thread cutting

## Features

This function allows while specifying an increment or a decrement value for a lead per screw revolution a variable lead threading to be performed.

## Benefits

- Adds additional advanced threading capabilities to the CNC
- Simplifies programming
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J827 | 30i-A Variable Lead Thread Cutting |
| A02B-0306-J827 | 31i-A5 Variable Lead Thread Cutting |
| A02B-0307-J827 | 31i-A Variable Lead Thread Cutting |
| A02B-0308-J827 | 32i-A Variable Lead Thread Cutting |
| A02B-0323-J827 | 30i-B Variable Lead Thread Cutting |
| A02B-0326-J827 | 31i-B5 Variable Lead Thread Cutting |
| A02B-0327-J827 | 31i-B Variable Lead Thread Cutting |
| A02B-0328-J827 | 32i-B Variable Lead Thread Cutting |

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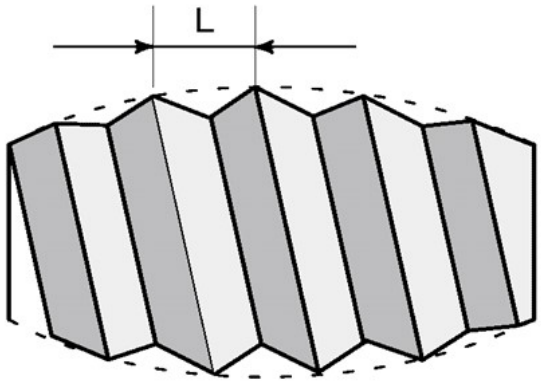
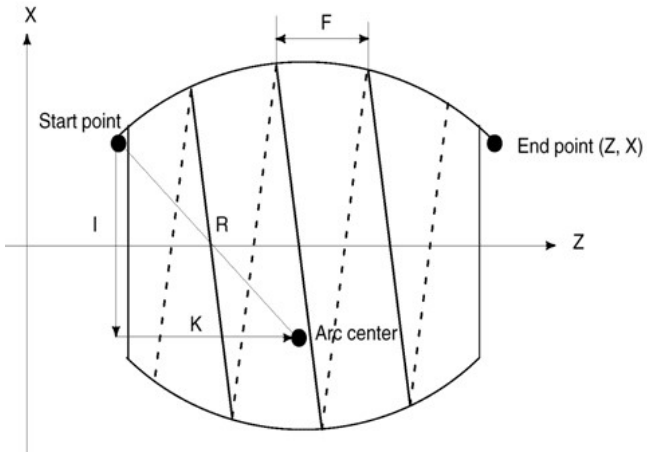
## Interpolation functions

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# Circular thread cutting

## Features

Allows threading of circular surfaces such as cylinder. Easy to program with simple G code (G35 and G36)

## Benefits

- Adds advanced capabilities for thread cutting to the CNC
- Simplifies programming
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J731 | 30i-A Circular Thread Cutting |
| A02B-0306-J731 | 31i-A5 Circular Thread Cutting |
| A02B-0307-J731 | 31i-A Circular Thread Cutting |
| A02B-0323-J731 | 30i-B Circular Thread Cutting |
| A02B-0326-J731 | 31i-B5 Circular Thread Cutting |
| A02B-0327-J731 | 31i-B Circular Thread Cutting |

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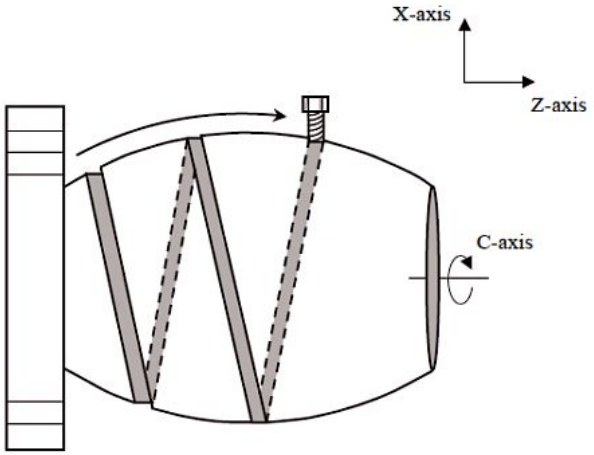
## Interpolation functions




# Circular thread cutting B

## Features

The Circular Thread Cutting B function performs circular interpolation according to the feed rate of the major axis, which has longer travelling distance. At the same time, up to two axes can be interpolated in proportion to the feed rate of the major axis.

This circular threading function does not move a tool in synchronization with the rotation of the spindle(workpiece) using the spindle motor.

This function controls workpiece rotation using a servo motor(rotation axis) to perform threading at equal pitches along cylindrical material, grooving, and tool grinding.

## Benefits

- Adds additional advanced thread cutting capabilities to the CNC
- Simplifies programming
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R631 | 30i-A Circular Thread Cutting B |
| A02B-0306-R631 | 31i-A5 Circular Thread Cutting B |
| A02B-0307-R631 | 31i-A Circular Thread Cutting B |
| A02B-0323-R631 | 30i-B Circular Thread Cutting B |
| A02B-0326-R631 | 31i-B5 Circular Thread Cutting B |
| A02B-0327-R631 | 31i-B Circular Thread Cutting B |

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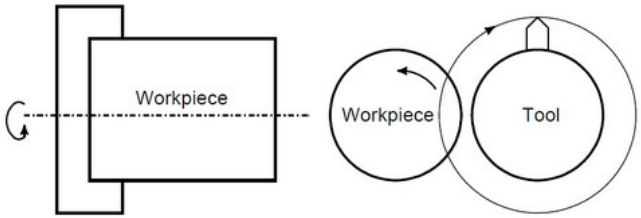
## Interpolation functions




# Polygon turning

## Features

The Polygon Turning function allows the programmer to machine (turn) a workpiece into a polygonal figure by rotating the workpiece (spindle axis) and tool (rotary tool axis) at a certain ratio.

## Benefits

- Provides the capability to machine square and / or hexagonal heads on bolts or hexagonal nuts.
- Simplifies programming
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J817 | 30i-A Polygon Turning |
| A02B-0306-J817 | 31i-A5 Polygon Turning |
| A02B-0307-J817 | 31i-A Polygon Turning |
| A02B-0308-J817 | 32i-A Polygon Turning |
| A02B-0323-J817 | 30i-B Polygon Turning |
| A02B-0326-J817 | 31i-B5 Polygon Turning |
| A02B-0327-J817 | 31i-B Polygon Turning |
| A02B-0328-J817 | 32i-B Polygon Turning |

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# Polygon machining with two spindles

## Features

The Polygon Turning with Two Spindles function allows the programmer to machine (turn) a workpiece into a polygonal figure by rotating the workpiece and the tool at a certain ratio. Both axes must be spindle axes, each controlled by a Serial Spindle.

## Benefits

- Polygon Turning with Two Spindles is used for machining square and/or hexagonal heads on bolts, or for hexagonal nuts, where the two synchronized axes are spindle axes
- Important feature on lathes with mill-turn capability
- With a multiple path system, polygon turning is possible on each path

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J708 | 30i-A Polygon Turning with Two Spindles |
| A02B-0306-J708 | 31i-A5 Polygon Turning with Two Spindles |
| A02B-0307-J708 | 31i-A Polygon Turning with Two Spindles |
| A02B-0308-J708 | 32i-A Polygon Turning with Two Spindles |
| A02B-0323-J708 | 30i-B Polygon Turning with Two Spindles |
| A02B-0326-J708 | 31i-B5 Polygon Turning with Two Spindles |
| A02B-0327-J708 | 31i-B Polygon Turning with Two Spindles |
| A02B-0328-J708 | 32i-B Polygon Turning with Two Spindles |

**Notice**

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# 156

## Interpolation functions

# Multi step skip function

## Features

The Multi Step Skip Function, activated in a block by specifying P1 to P4 after G31, stores coordinates in a custom macro variable, when a skip signal, (4-point or 8-point; 8-point when a high-speed skip signal is used) is turned on.

In the block where Q1 to Q4 are specified after G04, dwell can be skipped when skip signals (four or eight signals, or eight signals when high-speed skip signals are used) are input. A skip signal from equipment such as a fixed-dimension measuring instrument can be used to skip programs being executed.

In plunge grinding, for example, a series of operations from rough machining to spark-out can be performed automatically by applying a skip signal each time rough machining, semi-fine machining, fine-machining, or spark-out operation is completed.

## Note

The Multi Step Skip Function requires the Custom Macro B option to be able to access the stored variables.

## Benefits

- Adds special skip functions to the CNC
- Simplifies programming
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J849 | 30i-A Multi-Step Skip Function |
| A02B-0306-J849 | 31i-A5 Multi-Step Skip Function |
| A02B-0307-J849 | 31i-A Multi-Step Skip Function |
| A02B-0308-J849 | 32i-A Multi-Step Skip Function |
| A02B-0319-J849 | 0i-TD Multi-Step Skip Function |
| A02B-0320-J849 | 0i-MD Multi-Step Skip Function |
| A02B-0321-J849 | 0i-Mate-TD Multi-Step Skip Function |
| A02B-0322-J849 | 0i-Mate-MD Multi-Step Skip Function |
| A02B-0323-J849 | 30i-B Multi-Step Skip Function |
| A02B-0326-J849 | 31i-B5 Multi-Step Skip Function |
| A02B-0327-J849 | 31i-B Multi-Step Skip Function |
| A02B-0328-J849 | 32i-B Multi-Step Skip Function |

**Notice**

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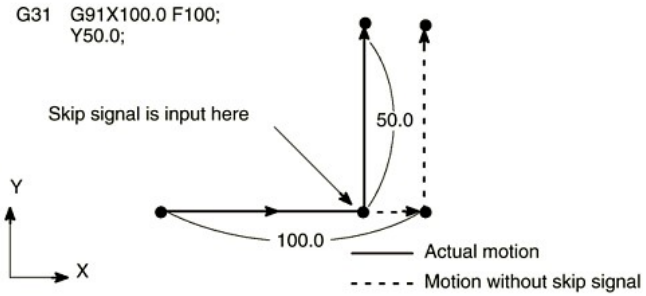
# 157

## Interpolation functions




# High speed skip function

## Features

The High Speed Skip Function allows the skip function to operate based on a high-speed skip input signal, connected directly to the CNC; not via the PMC like the ordinary skip signal.

Up to eight high speed signals can be input for the Series 30i CNC family.

The response time of the skip signal input is 2 msec at the CNC side (not considering those at the PMC side). The high-speed skip signal input function keeps this value to 0.1 msec or less, thus allowing high precision measurement.

## Benefits

- Faster response improves accuracy at higher feed rates
- Improves cycle time

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J848 | 30i-A High-Speed Skip |
| A02B-0306-J848 | 31i-A5 High-Speed Skip |
| A02B-0307-J848 | 31i-A High-Speed Skip |
| A02B-0308-J848 | 32i-A High-Speed Skip |
| A02B-0323-J848 | 30i-B High-Speed Skip |
| A02B-0326-J848 | 31i-B5 High-Speed Skip |
| A02B-0327-J848 | 31i-B High-Speed Skip |
| A02B-0328-J848 | 32i-B High-Speed Skip |
| A02B-0333-J848 | 35i-B High-Speed Skip |
| A02B-0334-J848 | PM i-A High-Speed Skip |

**Notice**

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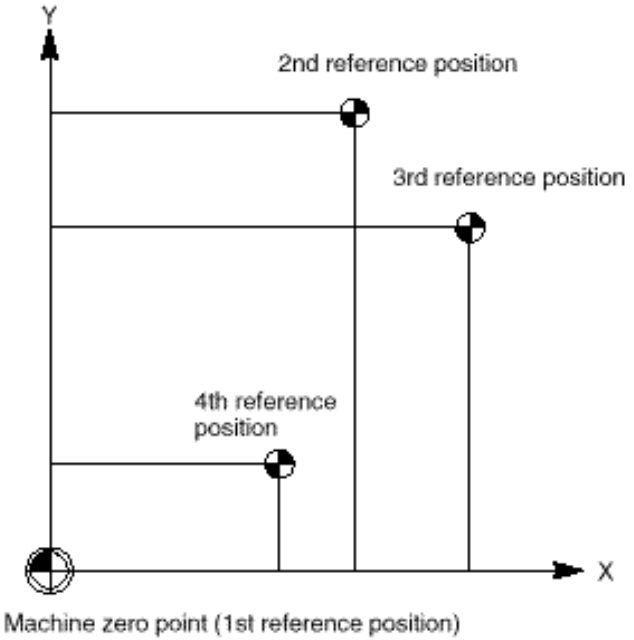
# 158

## Interpolation functions




# 3rd / 4th reference position return

## Features

The 3rd/4th Reference Position Return function provides two G-codes to position the machine to two fixed points in the machine coordinate system (regardless of the part zero location).

Fixed point locations can be easily changed in parameters.

## Benefits

- Reduced cycle or set up time
- Operator MDI's or programs a G-code, instead of manually moving the axis to a fixed position for part change, inspection, etc.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J830 | 30i-A 3rd / 4th Reference Point Return |
| A02B-0306-J830 | 31i-A5 3rd / 4th Reference Point Return |
| A02B-0307-J830 | 31i-A 3rd / 4th Reference Point Return |
| A02B-0308-J830 | 32i-A 3rd / 4th Reference Point Return |
| A02B-0323-J830 | 30i-B 3rd / 4th Reference Point Return |
| A02B-0326-J830 | 31i-B5 3rd / 4th Reference Point Return |
| A02B-0327-J830 | 31i-B 3rd / 4th Reference Point Return |
| A02B-0328-J830 | 32i-B 3rd / 4th Reference Point Return |

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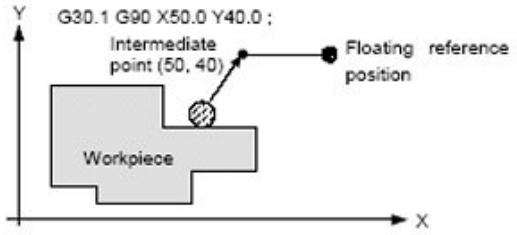
## Interpolation functions




# Floating reference position return

## Features

With the Floating Reference Position Return function, tools can be returned to the floating reference position.

A floating reference position is a position on a machine tool, and serves as a reference position for machine tool operation.

A floating reference position does not always need to be fixed, but can be moved as required.

## Benefits

- Adds flexibility to the machine
- Simplifies programming
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J831 | 30i-A Floating Reference Position Return |
| A02B-0306-J831 | 31i-A5 Floating Reference Position Return |
| A02B-0307-J831 | 31i-A Floating Reference Position Return |
| A02B-0323-J831 | 30i-B Floating Reference Position Return |
| A02B-0326-J831 | 31i-B5 Floating Reference Position Return |
| A02B-0327-J831 | 31i-B Floating Reference Position Return |

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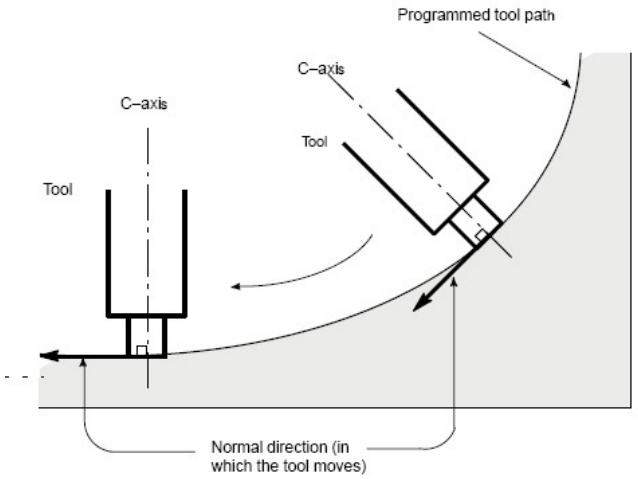
## Interpolation functions




# Normal direction control

## Features

In the Normal Direction Control, the rotary axis (C axis) can be commanded so that the tool constantly faces the advancing workpiece and is always perpendicular to the plane of the workpiece during cutting.

## Benefits

- Used on precision Jig Grinders to rotate the C Axis to keep it normal (perpendicular) to a position in the X-Y plane.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J813 | 30i-A Normal Direction Control |
| A02B-0306-J813 | 31i-A5 Normal Direction Control |
| A02B-0307-J813 | 31i-A Normal Direction Control |
| A02B-0308-J813 | 32i-A Normal Direction Control |
| A02B-0323-J813 | 30i-B Normal Direction Control |
| A02B-0326-J813 | 31i-B5 Normal Direction Control |
| A02B-0327-J813 | 31i-B Normal Direction Control |
| A02B-0328-J813 | 32i-B Normal Direction Control |

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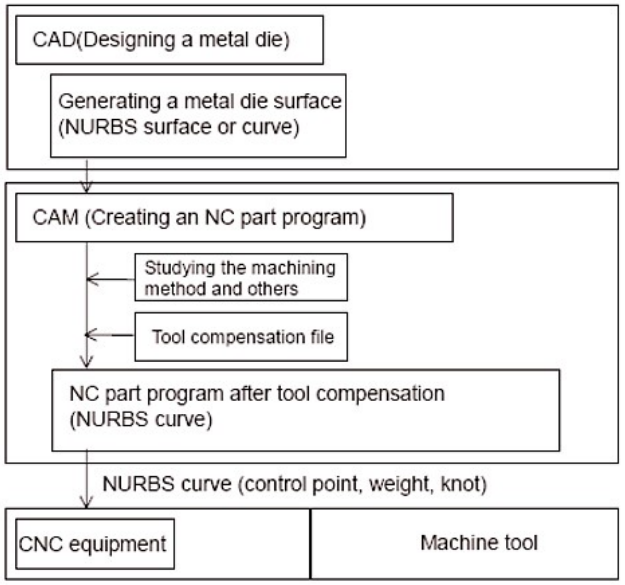
## Interpolation functions




# NURBS interpolation

## Features

Many Computer-Aided Design (CAD) systems used to design metal dies or complex shapes utilize Non-Uniform Rational B Spline (NURBS) to express a sculptured surface or curve for the metal dies.

The NURBS Interpolation function provides the operator with the ability to execute a NURBS program once it has been transferred to the CNC.

The CNC is capable of compensating for tool variations etc., then running the NURBS program.

## Benefits

- CNC compatibility with the widely accepted CAD/CAM NURBS format.
- NURBS part programs are smaller programs than the equivalent conventional piece-wise linear block segments, are processed more quickly by the CNC, and therefore reduce the likelihood of dwell marks in the workpiece.
- Due to the smaller NURBS part program size, the need for high-speed transfer between the CNC and an external PC may be avoided (normally required for conventional part programs of large size).

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J669 | 30i-A NURBS Interpolation |
| A02B-0306-J669 | 31i-A5 NURBS Interpolation |
| A02B-0307-J669 | 31i-A NURBS Interpolation |
| A02B-0323-J669 | 30i-B NURBS Interpolation |
| A02B-0326-J669 | 31i-B5 NURBS Interpolation |
| A02B-0327-J669 | 31i-B NURBS Interpolation |

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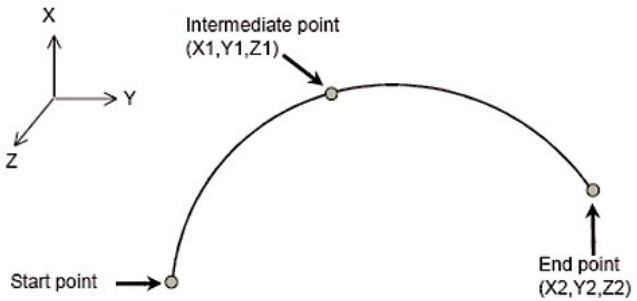
## Interpolation functions




# 3 dimensional circular interpolation

## Features

The 3-Dimensional Circular Interpolation function allows the programmer to specify an arc in 3-D space, using the current position as the start point.

## Benefits

- Permits the programmer to describe an arc, using the current position as the start point, and specifying any intermediate point, plus the end point.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S673 | 30i-A 3-Dimensional Circular Interpolation |
| A02B-0306-S673 | 31i-A5 3-Dimensional Circular Interpolation |
| A02B-0307-S673 | 31i-A 3-Dimensional Circular Interpolation |
| A02B-0323-S673 | 30i-B 3-Dimensional Circular Interpolation |
| A02B-0326-S673 | 31i-B5 3-Dimensional Circular Interpolation |
| A02B-0327-S673 | 31i-B 3-Dimensional Circular Interpolation |

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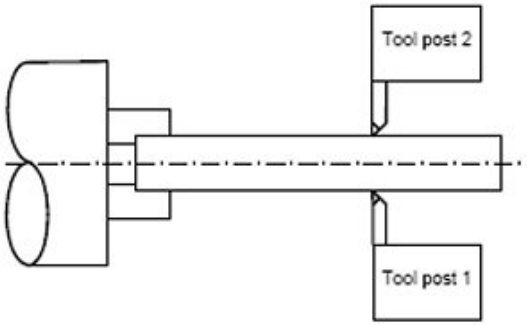
## Interpolation functions




# Balanced cutting

## Features

The Balanced Cutting function can be used when machining a single part with two turrets at the same time.

If a thin workpiece needs to be machined a precision machining can be achieved by machining each side of the workpiece with a tool simultaneously; this function can prevent the workpiece from warpage that can result when only one side is machined at a time (see the figure below).

When both sides are machined at the same time, the movement of one tool must be in phase with that of the other tool. Otherwise, the workpiece can vibrate, resulting in poor machining. With this function, the movement of one tool post can be easily synchronized with that of the other tool post.

## Benefits

- Adds special function to machine thin parts to the CNC
- Simplifies programming
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J834 | 30i-A Balanced Cutting |
| A02B-0306-J834 | 31i-A5 Balanced Cutting |
| A02B-0307-J834 | 31i-A Balanced Cutting |
| A02B-0308-J834 | 32i-A Balanced Cutting |
| A02B-0319-J834 | 0i-TD Balanced Cutting |
| A02B-0323-J834 | 30i-B Balanced Cutting |
| A02B-0326-J834 | 31i-B5 Balanced Cutting |
| A02B-0327-J834 | 31i-B Balanced Cutting |
| A02B-0328-J834 | 32i-B Balanced Cutting |

**Notice**

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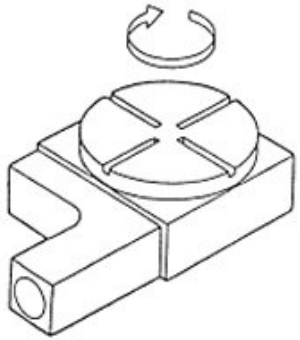

# Index table indexing

## Features

The Table Indexing function can be used to control rotary axes that index between predefined locations. By specifying indexing positions (angles) for the indexing axis (one arbitrary axis), the index table of the machining center can be indexed.

It is not necessary to command the exclusive M code in order to clamp or unclamp the table, the CNC will automatically send signals to the PMC to do this, and therefore programming will be easier.

## Benefits

- Simplifies the integration of a rotary table in the machine
- Simplifies programming
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J822 | 30i-A Index Table Indexing |
| A02B-0306-J822 | 31i-A5 Index Table Indexing |
| A02B-0307-J822 | 31i-A Index Table Indexing |
| A02B-0308-J822 | 32i-A Index Table Indexing |
| A02B-0323-J822 | 30i-B Index Table Indexing |
| A02B-0326-J822 | 31i-B5 Index Table Indexing |
| A02B-0327-J822 | 31i-B Index Table Indexing |
| A02B-0328-J822 | 32i-B Index Table Indexing |

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# 165

## Interpolation functions

**G31 P90 α__ F__**

α__: Skip axis address and amount of travel
Only one axis can be specified. G31 is a one–shot G code.

# Continuous high-speed skip

## Features

The Continuous High–Speed Skip function enables the reading of absolute coordinates by using the high–speed skip signal.

Once a high–speed skip signal has been input in a G31 P90 block, the absolute coordinates are read into custom macro variables #5061 to #5068.

The input of a skip signal does not stop axial movement, thus enabling reading of the coordinates of two or more points. The rising and falling edges of the high–speed skip signal can be used as a trigger, depending on the parameter setting.

## Benefits

- Adds advanced skip capabilities to the CNC
- Simplifies programming
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J770 | 30i-A Continuous High-Speed Skip |
| A02B-0306-J770 | 31i-A5 Continuous High-Speed Skip |
| A02B-0307-J770 | 31i-A Continuous High-Speed Skip |
| A02B-0323-J770 | 30i-B Continuous High-Speed Skip |
| A02B-0326-J770 | 31i-B5 Continuous High-Speed Skip |
| A02B-0327-J770 | 31i-B Continuous High-Speed Skip |

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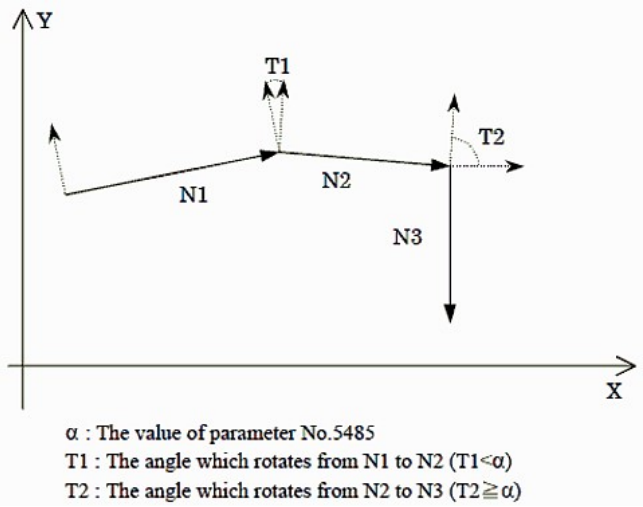
# Gentle normal direction control




α : The value of parameter No.5485
T1 : The angle which rotates from N1 to N2 (T1<α)
T2 : The angle which rotates from N2 to N3 (T2≧α)

## Features

On a machine where a rotary axis controls the tool direction (typically the C-axis) Normal Direction Control function will automatically position the 'C' tool-axis in order to maintain the same angular relationship of the tool with respect to any programmed path direction change in the X-Y coordinate system.

In regular normal-direction control mode (J813), the rotation of the normal-direction controlled tool-axis (C-axis) is inserted between any axes (X/Y axis) direction changes. The X/Y axes always stop while the C-axis rotates to the new normal position for the next program block.

Sometimes, for small angle X/Y direction changes, it is not desirable to stop the X/Y axes while the in C-axis (Tool-axis) rotates to position. In Gentle Normal Direction Control mode, providing the C-axis rotation angle is less than a parametrically set angle, the X/Y axes do not stop while the C-axis rotates to the new normal position.

## Benefits

- Used on precision Jig Grinders to rotate the C-Axis to keep it normal (perpendicular) to a position in the X-Y plane.
- Useful for servo-controlled grinding diamond wheel dresser. Maintains the angle of diamond tip angle with respect to grinding wheel dress form.
- Gentle function prevents dwells where over-cutting could occur.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J986 | 30i-A Gentle Normal Direction Control |
| A02B-0306-J986 | 31i-A5 Gentle Normal Direction Control |
| A02B-0307-J986 | 31i-A Gentle Normal Direction Control |
| A02B-0323-J986 | 30i-B Gentle Normal Direction Control |
| A02B-0326-J986 | 31i-B5 Gentle Normal Direction Control |
| A02B-0327-J986 | 31i-B Gentle Normal Direction Control |

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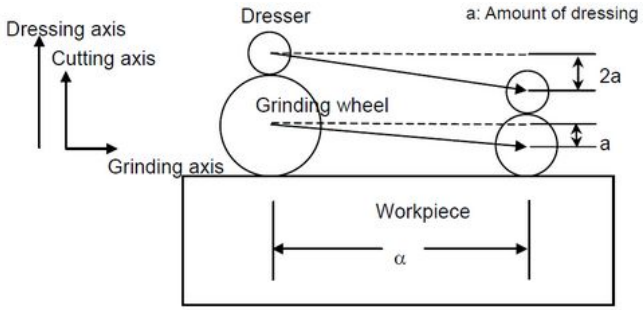
## Interpolation functions




# Continuous dressing

## Features

The Continuous Dressing function allows continuous dressing during grinding canned cycles (G75, G77, G78, G79).

Grinding and dresser cutting are compensated continuously according to the amount of continuous dressing set by parameters.

## Benefits

- Automated production for large volume grinding
- Simplifies programming
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J630 | 30i-A Continuous Dressing |
| A02B-0306-J630 | 31i-A5 Continuous Dressing |
| A02B-0307-J630 | 31i-A Continuous Dressing |
| A02B-0308-J630 | 32i-A Continuous Dressing |
| A02B-0323-J630 | 30i-B Continuous Dressing |
| A02B-0326-J630 | 31i-B5 Continuous Dressing |
| A02B-0327-J630 | 31i-B Continuous Dressing |
| A02B-0328-J630 | 32i-B Continuous Dressing |

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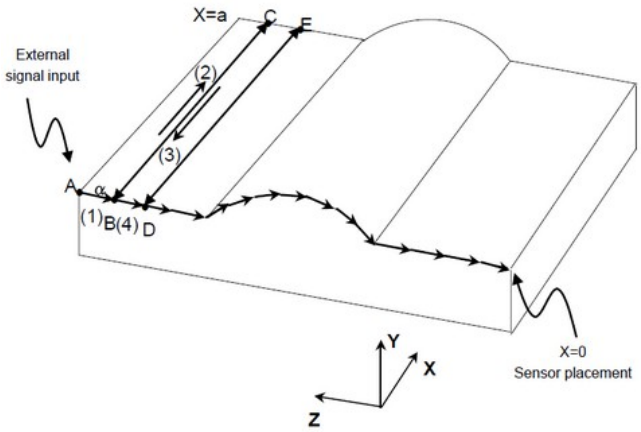
## Interpolation functions




# Infeed control

## Features

The Infeed Control function can be used on grinding machines. Every time an external signal is input, the machine is moved by a fixed amount along the programmed profile in the specified Y-Z plane.

## Benefits

- Automatically repeat cutting motion from an external signal such as push button from operator panel
- Simplifies programming
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J631 | 30i-A Infeed Control |
| A02B-0306-J631 | 31i-A5 Infeed Control |
| A02B-0307-J631 | 31i-A Infeed Control |
| A02B-0308-J631 | 32i-A Infeed Control |
| A02B-0323-J631 | 30i-B Infeed Control |
| A02B-0326-J631 | 31i-B5 Infeed Control |
| A02B-0327-J631 | 31i-B Infeed Control |
| A02B-0328-J631 | 32i-B Infeed Control |

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# High-speed cycle cutting

## Features

The High-Speed Cycle Machining function (also called High-Speed Cycle Cutting) is a function that accepts as input machining profil data consisting of command data for each involved axis based selected time interval, then distributes that data immediately to the motors controlling up to six designated axes.

Preparing the cycle data requires the use of the macro compiler and macro executor. The resulting cycle data must be operated on by the G05 command in the part program.

## Benefits

- By virtue of being command data without interpolation, the CNC needs minimal overhead to deliver the required cycle data to the affected axes.
- Faster execution of the part program results, leading to higher productivity for the machine tool.
- Simplifies programming
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J832 | 30i-A High-Speed Cycle Machining |
| A02B-0306-J832 | 31i-A5 High-Speed Cycle Machining |
| A02B-0307-J832 | 31i-A High-Speed Cycle Machining |
| A02B-0323-J832 | 30i-B High-Speed Cycle Machining |
| A02B-0326-J832 | 31i-B5 High-Speed Cycle Machining |
| A02B-0327-J832 | 31i-B High-Speed Cycle Machining |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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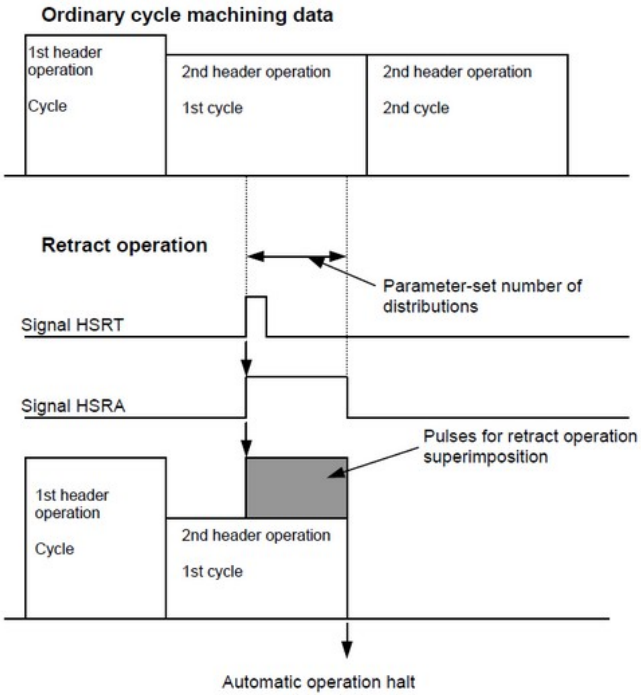
# 170

## Interpolation functions




# High-speed cycle machining retract function

## Features

When machining based on the high-speed cycle machining function needs to be stopped for a reason, the High-Speed Cycle Machining Retract function enables a retract operation to be performed by setting the retract selection signal HSRT (Gn065.3) to 1.

By registering a retract cycle in the high-speed cycle header, a cycle for performing an operation such as a special retract operation after a retract operation can be specified and executed.

## Benefits

- Simplifies repetitive cycle programming in the CNC
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J663 | 30i-A High-Speed Cycle Machining - Retract Function |
| A02B-0306-J663 | 31i-A5 High-Speed Cycle Machining - Retract Function |
| A02B-0307-J663 | 31i-A High-Speed Cycle Machining - Retract Function |
| A02B-0323-J663 | 30i-B High-Speed Cycle Machining - Retract Function |
| A02B-0326-J663 | 31i-B5 High-Speed Cycle Machining - Retract Function |
| A02B-0327-J663 | 31i-B High-Speed Cycle Machining - Retract Function |

**Notice**

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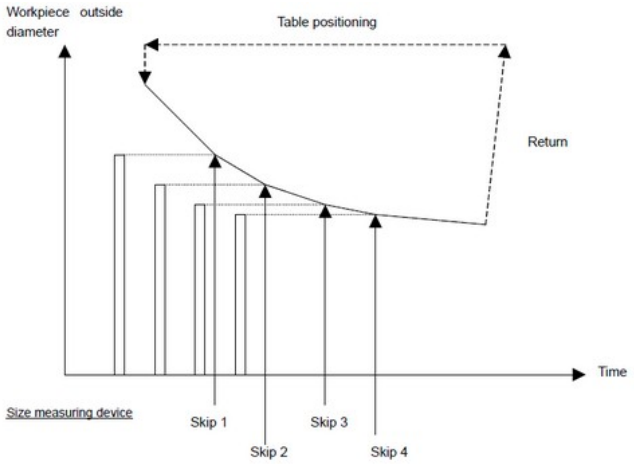
# 171

## Interpolation functions




# High-speed cycle machining skip function

## Features

The High-Speed Cycle Machining Skip function cancels a repetition cycle operation in high–speed cycle machining and causes a skip to the header information connected next.

Skip signals (HCSK1 to HCSK4) sent from a size measuring device (sensor) can be used to skip a currently executed machining cycle.

For continuous high–speed high–precision machining with a cylindrical grinding machine, for example, skip signals from the size measuring device are used when slight tool wear is detected.

## Benefits

- Adds advanced skip functions to the CNC
- Simplifies programming
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S662 | 30i-A High-Speed Cycle Machining - Skip Function |
| A02B-0306-S662 | 31i-A5 High-Speed Cycle Machining - Skip Function |
| A02B-0307-S662 | 31i-A High-Speed Cycle Machining - Skip Function |
| A02B-0323-S662 | 30i-B High-Speed Cycle Machining - Skip Function |
| A02B-0326-S662 | 31i-B5 High-Speed Cycle Machining - Skip Function |
| A02B-0327-S662 | 31i-B High-Speed Cycle Machining - Skip Function |

**Notice**

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# High-speed cycle cutting additional variables A

## Features

Variables #200000 to #331071 (131,072 points) are assigned to the High-Speed Cycle Machining function, and may not be used for any other purpose.

## Benefits

- Larger amounts of cycle data are made available to the High-Speed Cutting Command (G05).
- Enhances machine programming capabilities
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J745 | 30i-A High-Speed Cycle Machining - Additional Variables A |
| A02B-0306-J745 | 31i-A5 High-Speed Cycle Machining - Additional Variables A |
| A02B-0307-J745 | 31i-A High-Speed Cycle Machining - Additional Variables A |
| A02B-0323-J745 | 30i-B High-Speed Cycle Machining - Additional Variables A |
| A02B-0326-J745 | 31i-B5 High-Speed Cycle Machining - Additional Variables A |
| A02B-0327-J745 | 31i-B High-Speed Cycle Machining - Additional Variables A |

**Notice**

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## Interpolation functions

# High-speed cycle cutting additional variables B

## Features

Variables #200000 to #462143 (262,144 points) are assigned to the High-Speed Cycle Machining function, and may not be used for any other purpose.

## Benefits

- Larger amounts of cycle data are made available to the High-Speed Cutting Command (G05).
- Enhances machine programming capabilities
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J746 | 30i-A High-Speed Cycle Machining - Additional Variables B |
| A02B-0306-J746 | 31i-A5 High-Speed Cycle Machining - Additional Variables B |
| A02B-0307-J746 | 31i-A High-Speed Cycle Machining - Additional Variables B |
| A02B-0323-J746 | 30i-B High-Speed Cycle Machining - Additional Variables B |
| A02B-0326-J746 | 31i-B5 High-Speed Cycle Machining - Additional Variables B |
| A02B-0327-J746 | 31i-B High-Speed Cycle Machining - Additional Variables B |

**Notice**

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# High-speed cycle cutting additional variables C

## Features

Variables #200000 to #986431 (786,432 points) are assigned to the High-Speed Cycle Machining function, and may not be used for any other purpose.

## Benefits

- Larger amounts of cycle data are made available to the High-Speed Cutting Command (G05).
- Enhances machine programming capabilities
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S640 | 30i-A High-Speed Cycle Machining - Additional Variables C |
| A02B-0306-S640 | 31i-A5 High-Speed Cycle Machining - Additional Variables C |
| A02B-0307-S640 | 31i-A High-Speed Cycle Machining - Additional Variables C |
| A02B-0323-S640 | 30i-B High-Speed Cycle Machining - Additional Variables C |
| A02B-0326-S640 | 31i-B5 High-Speed Cycle Machining - Additional Variables C |
| A02B-0327-S640 | 31i-B High-Speed Cycle Machining - Additional Variables C |

**Notice**

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## Interpolation functions

# High-speed cycle cutting additional variables D

## Features

Variables #2000000 to #3999999 (2,000,000 points) are assigned to the High-Speed Cycle Machining function, and may not be used for any other purpose.

## Benefits

- Larger amounts of cycle data are made available to the High-Speed Cutting Command (G05).
- Enhances machine programming capabilities
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R513 | 30i-A High-Speed Cycle Machining - Additional Variables D |
| A02B-0306-R513 | 31i-A5 High-Speed Cycle Machining - Additional Variables D |
| A02B-0307-R513 | 31i-A High-Speed Cycle Machining - Additional Variables D |
| A02B-0323-R513 | 30i-B High-Speed Cycle Machining - Additional Variables D |
| A02B-0326-R513 | 31i-B5 High-Speed Cycle Machining - Additional Variables D |
| A02B-0327-R513 | 31i-B High-Speed Cycle Machining - Additional Variables D |

**Notice**

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# High-speed cycle cutting additional variables E

## Features

Variables #2000000 to #4999999 (3,000,000 points) are assigned to the High-Speed Cycle Machining function, and may not be used for any other purpose.

## Benefits

- Larger amounts of cycle data are made available to the High-Speed Cutting Command (G05).
- Enhances machine programming capabilities
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R469 | 30i-A High-Speed Cycle Machining - Additional Variables E |
| A02B-0306-R469 | 31i-A5 High-Speed Cycle Machining - Additional Variables E |
| A02B-0307-R469 | 31i-A High-Speed Cycle Machining - Additional Variables E |
| A02B-0323-R469 | 30i-B High-Speed Cycle Machining - Additional Variables E |
| A02B-0326-R469 | 31i-B5 High-Speed Cycle Machining - Additional Variables E |
| A02B-0327-R469 | 31i-B High-Speed Cycle Machining - Additional Variables E |

**Notice**

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## Interpolation functions

# General purpose retract

## Features

In automatic operation mode or in manual operation mode, setting the retract signal RTRCT to 1 causes the General Purpose Retract function to capture the rise of this signal, causing the tool to move (retract) along the axis for which a retract amount is specified by parameter. After the end of retraction, the retract completion signal RTRCTF is output.

This function is intended to retract the tool from the workpiece immediately when a tool breakage is detected.

## Benefits

- Adds special retract function to the CNC
- Simplifies programming
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J997 | 30i-A General Purpose Retract |
| A02B-0306-J997 | 31i-A5 General Purpose Retract |
| A02B-0307-J997 | 31i-A General Purpose Retract |
| A02B-0308-J997 | 32i-A General Purpose Retract |
| A02B-0323-J997 | 30i-B General Purpose Retract |
| A02B-0326-J997 | 31i-B5 General Purpose Retract |
| A02B-0327-J997 | 31i-B General Purpose Retract |
| A02B-0328-J997 | 32i-B General Purpose Retract |

**Notice**

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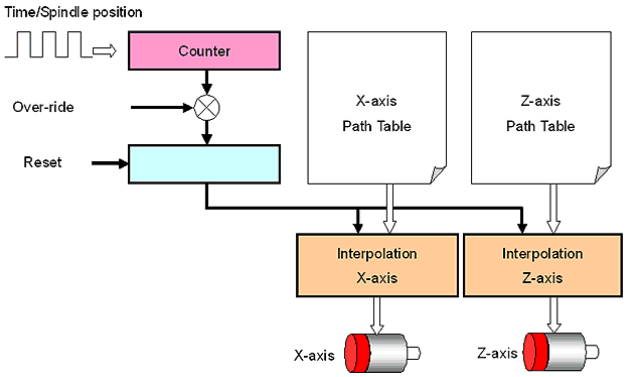
# 178

## Interpolation functions




# Path Table Operation (PTO)

## Features

The Path Table Operation function is an advanced machining method which interpolates each axis synchronized with the spindle, axis position or the time based on Tables.

It realizes free motions unbound from the NC program block, and can be used in applications such as swiss lathes or crankshaft pin-milling machines.

## Benefits

- Adds advanced Path Table Operation function to the CNC
- Allows complex interpolations for advanced machining operations
- Provides a high surface quality on complex parts
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S886 | 30i-A Path Table Operation (PTO) |
| A02B-0306-S886 | 31i-A5 Path Table Operation (PTO) |
| A02B-0307-S886 | 31i-A Path Table Operation (PTO) |
| A02B-0323-S886 | 30i-B Path Table Operation (PTO) |
| A02B-0326-S886 | 31i-B5 Path Table Operation (PTO) |
| A02B-0327-S886 | 31i-B Path Table Operation (PTO) |

**Notice**

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# Spindle speed fluctuation detection for Path Table Operation

## Features

The conventional spindle speed fluctuation detection can be enabled or disabled by G code when executing an NC program, but it cannot be switched in Path Table Operation.

The Spindle Speed Fluctuation Detection for Path Table Operation enables or disables spindle speed fluctuation detection by commanding G code. As a result, the cutting failure caused by spindle speed fluctuation in Path Table Operation can be prevented.

## Benefits

- Adds the capability to monitor spindle speed fluctuation to Path Table Operation
- Reduces the risk to produce bad parts without knowing it
- Simplifies startup and test of programs
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R605 | 30i-A Path Table Operation (PTO) - Spindle Speed Fluctuation Detection |
| A02B-0306-R605 | 31i-A5 Path Table Operation (PTO) - Spindle Speed Fluctuation Detection |
| A02B-0307-R605 | 31i-A Path Table Operation (PTO) - Spindle Speed Fluctuation Detection |
| A02B-0323-R605 | 30i-B Path Table Operation (PTO) - Spindle Speed Fluctuation Detection |
| A02B-0326-R605 | 31i-B5 Path Table Operation (PTO) - Spindle Speed Fluctuation Detection |
| A02B-0327-R605 | 31i-B Path Table Operation (PTO) - Spindle Speed Fluctuation Detection |

**Notice**

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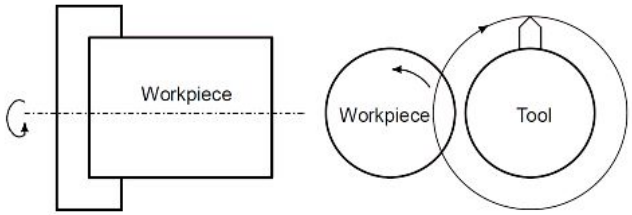
# 180

## Interpolation functions




# Polygon turning function for Path Table Operation

## Features

The Polygon Turning Function for Path Table Operation enables the polygon turning by the spindle and the tool rotating axis (servo axis).

Polygon turning means machining a workpiece to a polygonal figure by rotating the workpiece and tool at a certain ratio. By changing conditions that are rotation ratio of workpiece and tool and number of cutters, the workpiece can be machined to a square or hexagon. The machining time can be reduced as compared with polygonal figure machining using the polar coordinate interpolation. The machined figure, however, is not exactly polygonal.

Generally, polygon turning is used for the heads of square or hexagon bolts or nuts.

This function uses the spindle as the workpiece axis and the servo axis as the tool rotation axis.

## Benefits

- Provides the polygon turning function to a lathe using Path Table Operation
- Simplifies the programming of lathe producing bolts and nuts
- Increases the productivity of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R598 | 30i-A Path Table Operation (PTO) - Polygon Turning Function |
| A02B-0306-R598 | 31i-A5 Path Table Operation (PTO) - Polygon Turning Function |
| A02B-0307-R598 | 31i-A Path Table Operation (PTO) - Polygon Turning Function |
| A02B-0323-R598 | 30i-B Path Table Operation (PTO) - Polygon Turning Function |
| A02B-0326-R598 | 31i-B5 Path Table Operation (PTO) - Polygon Turning Function |
| A02B-0327-R598 | 31i-B Path Table Operation (PTO) - Polygon Turning Function |

**Notice**

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# 181

## Interpolation functions

# Threading start position shift function for Path Table Operation

## Features

In Path Table Operation, this function can command the spindle position at the start of threading with a custom macro common variable.

In this case, the spindle position can be changed simply by changing a variable value, and it is unnecessary to reconvert the Path Table programs.

## Benefits

- Adds the capability to use macro variable position the spindle on threading operation
- Simplifies programming and avoids the conversion of the table when a value is changed
- Increases productivity of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R599 | 30i-A Path Table Operation (PTO) - Threading Start Position Shift Function |
| A02B-0306-R599 | 31i-A5 Path Table Operation (PTO) - Threading Start Position Shift Function |
| A02B-0307-R599 | 31i-A Path Table Operation (PTO) - Threading Start Position Shift Function |
| A02B-0323-R599 | 30i-B Path Table Operation (PTO) - Threading Start Position Shift Function |
| A02B-0326-R599 | 31i-B5 Path Table Operation (PTO) - Threading Start Position Shift Function |
| A02B-0327-R599 | 31i-B Path Table Operation (PTO) - Threading Start Position Shift Function |

**Notice**

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# Tool offset function for Path Table Operation

## Features

This function provides the capability to specify Tool Offset with the path table operation of X-axis, Z-axis and Y-axis.

The value of tool geometry offset and tool wear offset in total is compensated when both tool geometry offset number and tool wear offset number are specified. When one side of the tool geometry offset number or the tool wear offset number is specified, only the specified tool offset is done.

## Benefits

- Provides tool offset function to Path Table Operation
- Simplifies the programming
- Increases the productivity of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R524 | 30i-A Path Table Operation (PTO) - Tool Offset Function |
| A02B-0306-R524 | 31i-A5 Path Table Operation (PTO) - Tool Offset Function |
| A02B-0307-R524 | 31i-A Path Table Operation (PTO) - Tool Offset Function |
| A02B-0323-R524 | 30i-B Path Table Operation (PTO) - Tool Offset Function |
| A02B-0326-R524 | 31i-B5 Path Table Operation (PTO) - Tool Offset Function |
| A02B-0327-R524 | 31i-B Path Table Operation (PTO) - Tool Offset Function |

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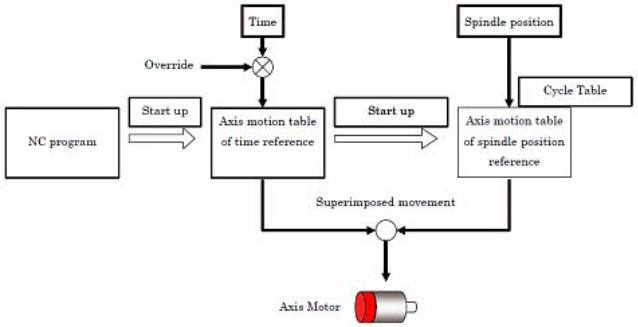
# Cycle table operation function for Path Table Operation




## Features

The axis motion table of spindle position reference can be started up as a "Cycle Table" from the axis motion table of time reference.

The movement commanded by the cycle table and the movement commended by the axis motion table of time reference are superimposed.

One cycle table can be specified in one axis motion table of time reference.

## Benefits

- Provides interaction between axis and spindle movements
- Simplifies the programming
- Increases the productivity of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R526 | 30i-A Path Table Operation (PTO) - Cycle Table Operation |
| A02B-0306-R526 | 31i-A5 Path Table Operation (PTO) - Cycle Table Operation |
| A02B-0307-R526 | 31i-A Path Table Operation (PTO) - Cycle Table Operation |
| A02B-0323-R526 | 30i-B Path Table Operation (PTO) - Cycle Table Operation |
| A02B-0326-R526 | 31i-B5 Path Table Operation (PTO) - Cycle Table Operation |
| A02B-0327-R526 | 31i-B Path Table Operation (PTO) - Cycle Table Operation |

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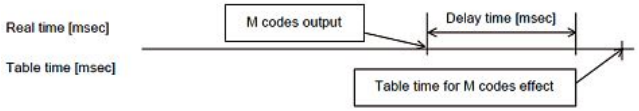
# 184

## Interpolation functions




# Delay time setting function of auxiliary function output for PTO

## Features

The Path Table Operation can output M codes, based on the Auxiliary Function Table synchronized with the time, the axis position or the spindle position.

When the Auxiliary Function Table is synchronized with the time, the output of the M codes are realized in real-time since the M codes outputted can be commanded with a "Delay Time".

The Path Table Operation outputs M codes earlier compared to the table time which takes in consideration the "Delay Time". Three M-codes can be output at once. The ordered M code is outputted according to each delay time.

## Benefits

- Provides additional time synchronization for the auxiliary function
- Simplifies the programming
- Increases the productivity of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R528 | 30i-A Path Table Operation (PTO) - Delay Time Setting Function of Auxiliary Function Output |
| A02B-0306-R528 | 31i-A5 Path Table Operation (PTO) - Delay Time Setting Function of Auxiliary Function Output |
| A02B-0307-R528 | 31i-A Path Table Operation (PTO) - Delay Time Setting Function of Auxiliary Function Output |
| A02B-0323-R528 | 30i-B Path Table Operation (PTO) - Delay Time Setting Function of Auxiliary Function Output |
| A02B-0326-R528 | 31i-B5 Path Table Operation (PTO) - Delay Time Setting Function of Auxiliary Function Output |
| A02B-0327-R528 | 31i-B Path Table Operation (PTO) - Delay Time Setting Function of Auxiliary Function Output |

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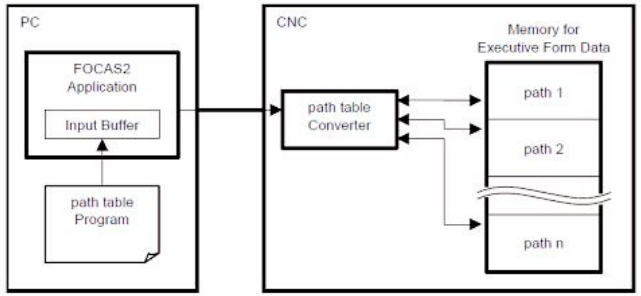


# Path Table direct conversion function

## Features

When a path table program in being executed on the machine, the Path Table Direct Conversion function can directly convert a path table program into another machining process.

It is not necessary to convert all path table programs for all planned machining process before the start of the operation; incremental path table programs can be converted at the same time the machining takes place. This reduces set-up time for the machine operation.

In addition, since it is also possible to delete path table program of a process that finished execution, the data memory of the CNC can be used efficiently.

## Benefits

- Efficient management of path programs
- Reduction of memory requirement in the CNC
- Increase of machine efficiency and productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R545 | 30i-A Path Table Operation (PTO) - Direct Conversion Function |
| A02B-0306-R545 | 31i-A5 Path Table Operation (PTO) - Direct Conversion Function |
| A02B-0307-R545 | 31i-A Path Table Operation (PTO) - Direct Conversion Function |
| A02B-0323-R545 | 30i-B Path Table Operation (PTO) - Direct Conversion Function |
| A02B-0326-R545 | 31i-B5 Path Table Operation (PTO) - Direct Conversion Function |
| A02B-0327-R545 | 31i-B Path Table Operation (PTO) - Direct Conversion Function |

**Notice**

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# High-speed signal output function for Path Table Operation

## Features

This function enables to control outputs at a 0.5msec intervals as high-speed signal to the external equipments connected with I/O Link i in Path Table Operation mode.

It is possible to control external equipments at high-speed in parallel to the Path Table Operation with this function.

| Items | Specification |
|---|---|
| Output cycle | 0.5 msec |
| Number of usable I/O Link i channels | 1 |
| Maximum number of output signals | 64 points in total for all paths |
| Maximum number of simultaneously output signals | 20 points for all paths |

## Benefits

- High-speed control of external devices during Path Table Operation
- Possibility to design complex system combining high-speed outputs with complex PTO cycles

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0323-R564 | 30i-B Path Table Operation (PTO) - High-Speed Signal Output Function |
| A02B-0326-R564 | 31i-B5 Path Table Operation (PTO) - High-Speed Signal Output Function |
| A02B-0327-R564 | 31i-B Path Table Operation (PTO) - High-Speed Signal Output Function |

**Notice**

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# 187

## Interpolation functions

# Incremental command for Path Table Operation

## Features

In Path Table Operation, reference value or axis position are only specified in absolute commands.

The Incremental Command for Path Table Operation function provides the possibility to specify the reference values and each axis position corresponding to the reference values (time, axis position or spindle position) in incremental commands.

## Benefits

- Possibility to change the mode of definition of the table
- Increases programming flexibility
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R580 | 30i-A Path Table Operation (PTO) - Incremental Command |
| A02B-0306-R580 | 31i-A5 Path Table Operation (PTO) - Incremental Command |
| A02B-0307-R580 | 31i-A Path Table Operation (PTO) - Incremental Command |
| A02B-0323-R580 | 30i-B Path Table Operation (PTO) - Incremental Command |
| A02B-0326-R580 | 31i-B5 Path Table Operation (PTO) - Incremental Command |
| A02B-0327-R580 | 31i-B Path Table Operation (PTO) - Incremental Command |

**Notice**

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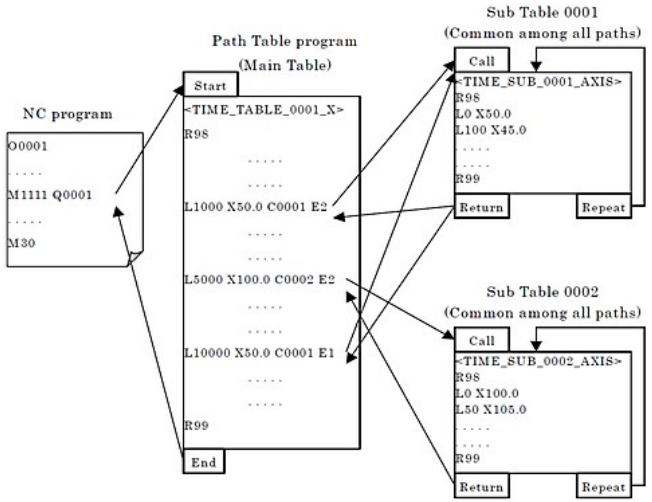
## Interpolation functions




# Sub-table call for Path Table Operation

## Features

When the same shape is machined repeatedly in Path Table Operation (PTO), it can be separated as a Sub Table by this function.

A Sub Table can be called from Path Table programs (Main Table) in arbitrary paths. Moreover, it is possible to execute the same Sub Table repeatedly by specifying the repeat count when the Sub Table is called.

The function simplifies the way Path Table programs are made and also reduces the memory usage allocated to Path Table programs.

## Benefits

- Reduction of the memory usage allocated to Path Tables
- Simplifies the programming of repetitive operations
- Increase of the flexibility of Path Table Operation for complex systems
- Increase of the productivity of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0323-R618 | 30i-B Path Table Operation (PTO) - Sub Table Call |
| A02B-0326-R618 | 31i-B5 Path Table Operation (PTO) - Sub Table Call |
| A02B-0327-R618 | 31i-B Path Table Operation (PTO) - Sub Table Call |

**Notice**

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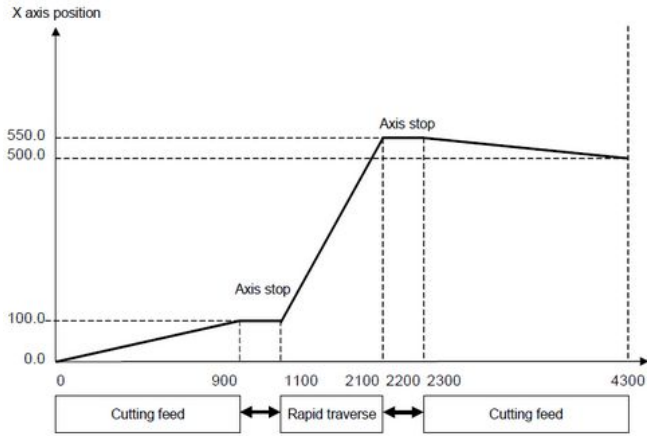
# 189

## Interpolation functions




# Cutting / rapid switching function for Path Table Operation

## Features

In a regular NC program, separate parameters can be used to define cutting feed and rapid traverse. The parameters are switched according to the state of cutting feed / rapid traverse.

In the standard Path Table Operation (PTO) mode, parameters cannot be switched between cutting fieed and rapid traverse since only one cutting feed is supported.

In Path Table Operation mode, this function enables a switching between cutting feed and rapid traverse.

In path table operation, parameters such as backlash compensation can be switched because this function enables switching between cutting feed and rapid traverse. Both high-accuracy in cutting feed and high-speed in rapid traverse can be achieved as a consequence of an optimal parameter settings.

Cutting feed is specified by R60 command, and rapid traverse is specified by R61 command.

## Example of program

```
TIME_TABLE_0001_X
R98;
L0 X0.0;
L900 X100.0;
L1100 X100.0 R61;
L2100 X550.0;
L2300 X550.0 R60;
L4300 X500.0;
:
R99;
```

## Benefits

- Higher accuracy in Path Table Operation mode
- Decrease of the cycle time in Path Table Operation
- Overall increase of the productivity

**Notice**

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# Ordering Information

| Specification | Description |
|---|---|
| A02B-0323-R668 | 30i-B Path Table Operation (PTO) - Cutting / Rapid Switching Function |
| A02B-0326-R668 | 31i-B5 Path Table Operation (PTO) - Cutting / Rapid Switching Function |
| A02B-0327-R668 | 31i-B Path Table Operation (PTO) - Cutting / Rapid Switching Function |

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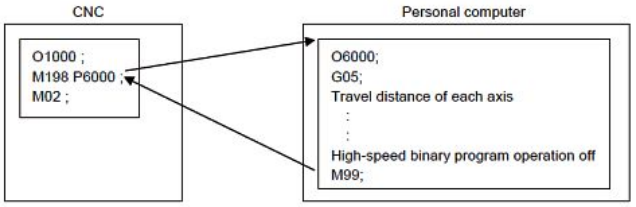
## Interpolation functions




# High-speed binary program operation

## Features

The high-speed binary program operation is the function to execute an external program written in binary format and stored on an external device (Data Server or a Personal Computer connected to the CNC via HSSB).

DNC operation or external subprogram call (M198) can be used to use the function.

The number of axes, paths and the execution time depend on the CNC type and configuration. Refer to the function manual for additional information.

## Benefits

- Provides the capability to execute binary programs
- Possibility to transfer complex shapes and programs with high-speed to the CNC
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R516 | 30i-A High-Speed Binary Mode Function (only 1 Path) |
| A02B-0306-R516 | 31i-A5 High-Speed Binary Mode Function (only 1 Path) |
| A02B-0307-R516 | 31i-A High-Speed Binary Mode Function (only 1 Path) |
| A02B-0323-R516 | 30i-B High-Speed Binary Mode Function (only 1 Path) |
| A02B-0326-R516 | 31i-B5 High-Speed Binary Mode Function (only 1 Path) |
| A02B-0327-R516 | 31i-B High-Speed Binary Mode Function (only 1 Path) |

**Notice**

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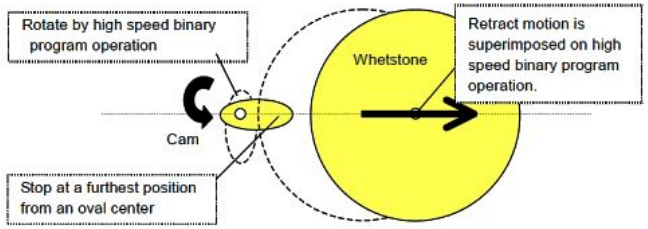
## Interpolation functions




# High-speed binary program operation retract function

## Features

This function allows, in case of sudden and unexpected machine problem, to stop the machining process safely during the execution of high-speed binary program.

The retract operation is done on each axis when the retract signal is received during execution of the high speed binary program operation; it forces the high speed binary program operation to stop with a controlled deceleration. After this, the program is reset after retraction.

## Benefits

- Provides the capability to stop safely and smoothly a high-speed binary operation
- Improves the protection of tools and fixtures
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S658 | 30i-A High-Speed Binary Program Operation Retract Function |
| A02B-0306-S658 | 31i-A5 High-Speed Binary Program Operation Retract Function |
| A02B-0307-S658 | 31i-A High-Speed Binary Program Operation Retract Function |
| A02B-0323-S658 | 30i-B High-Speed Binary Program Operation Retract Function |
| A02B-0326-S658 | 31i-B5 High-Speed Binary Program Operation Retract Function |
| A02B-0327-S658 | 31i-B High-Speed Binary Program Operation Retract Function |

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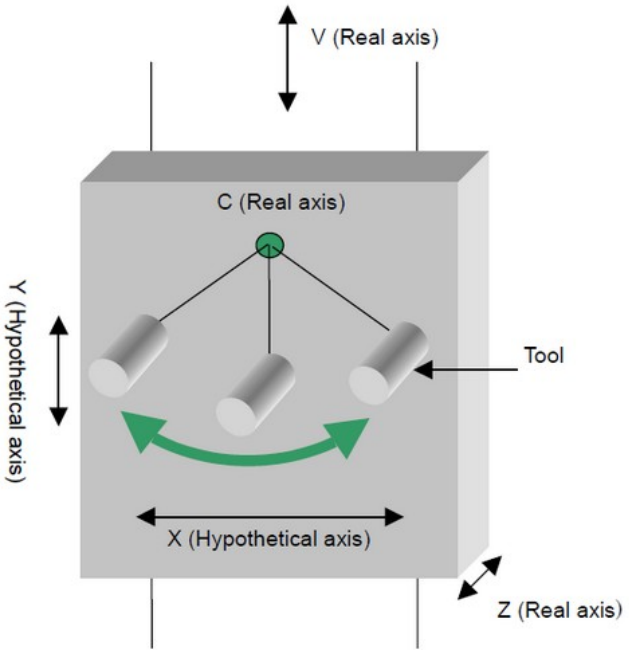
# 193

## Interpolation functions




# Hypothetical linear axis interpolation

## Features

With the Hypothetical Linear Axis Interpolation function, a machine having two linear axes and one rotary axis can be controlled as a normal X-Y-Z axes machine.

In this case, 3-dimensional positioning and interpolation functions are available. The linear axis not having a real axis becomes a hypothetical axis and it is necessary that hypothetical axis is set as one of CNC controlled axes.

## Example

On the figure, the machine pictured needs two hypothetical axes and three real axes, so the number of CNC control axes is five. X-Y-Z command in direct coordinate is available in the hypothetical axis command mode and the command for the real axis, for example V-Z-C command, is available in real axis command mode.

The hypothetical axis command mode signal IMMD provides the possibility to switch between the hypothetical axis command mode and real axis command mode. Both modes are effective in both automatic operation mode and manual mode. The rotation axis cannot be set to Cs contouring control axis.

## Benefits

- Simplifies the programming of complex machine configuration
- Overall increase of the machine productivity and effciency

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S968 | 30i-A Hypothetical Linear Axis Control Function |
| A02B-0306-S968 | 31i-A5 Hypothetical Linear Axis Control Function |
| A02B-0307-S968 | 31i-A Hypothetical Linear Axis Control Function |
| A02B-0323-S968 | 30i-B Hypothetical Linear Axis Control Function |
| A02B-0326-S968 | 31i-B5 Hypothetical Linear Axis Control Function |
| A02B-0327-S968 | 31i-B Hypothetical Linear Axis Control Function |

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# Feed functions

This section of the catalogue contains the functions related to the CNC motion (feed functions) enabling the control of the movement of the axes in the machine.

Feed functions, like Advanced Preview Control, AI Contour Control I and II provide high-speed contouring capabilities. Acceleration / deceleration options protect the machine from the shocks of sudden starts and stops. They work in concert with the AI Contour Control functions to provide high-speed, high-precision machining capabilities.

Some of the feed functions detailed in the catalogue:

- Optimum torque acceleration / deceleration
- Positioning by optimum acceleration
- Bell-shaped acc / dec after cutting feed interpolation
- Advanced Preview Control
- AI Contour Control
- High Speed Processing
- Jerk Control
- Etc.

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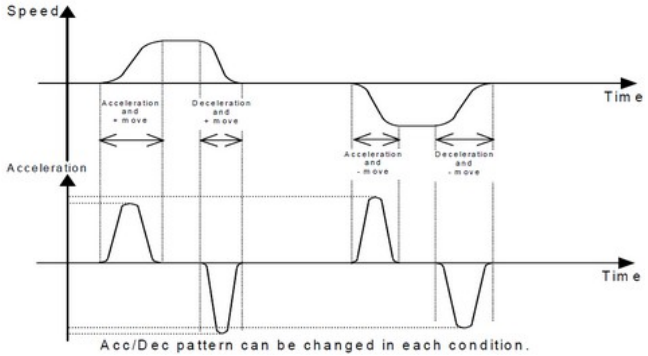
## Feed functions




# Optimum torque acceleration / deceleration

## Features

This Optimum Torque Acceleration / Deceleration function enables optimal Rapid Traverse acceleration / deceleration during AI Contour Control I (AICC-I), AI Contour Control II (AICC-II), AI High Precision Contour Control (AI HPCC) and AI Nano High Precision Contour Control (AI Nano HPCC) modes.

The machine axis friction, gravity, and servomotor characteristics all have an impact on the acceleration / deceleration performance of each machine axis. In addition, the servomotor torque required for axis acceleration / deceleration differs according to the axis movement direction and whether the axis is accelerating or decelerating.

With this function, it is possible to set appropriate CNC parameters defining individual axis direction-dependant acceleration and deceleration limits. During AICC-I, AICC-II, AI HPCC and AI NANO HPCC modes, the CNC automatically optimizes the rapid traverse acceleration and deceleration rates in accordance to these parameters settings, and the current direction and acceleration mode of the machine axes. The Optimum Torque Acceleration/ Deceleration function optimizes the capability of each motor / axis performance resulting in faster axis positioning (rapid traverse) and reduced overall cycle time.

## Benefits

- Optimization of the rapid traverse performance of each axis
- Reduction of the axis positioning time and overall machining time.
- Overall improvement of the machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S675 | 30i-A Optimum Torque Acceleration/Deceleration. |
| A02B-0306-S675 | 31i-A5 Optimum Torque Acceleration/Deceleration. |
| A02B-0307-S675 | 31i-A Optimum Torque Acceleration/Deceleration. |
| A02B-0308-S675 | 32i-A Optimum Torque Acceleration/Deceleration. |
| A02B-0323-S675 | 30i-B Optimum Torque Acceleration/Deceleration. |
| A02B-0326-S675 | 31i-B5 Optimum Torque Acceleration/Deceleration. |
| A02B-0327-S675 | 31i-B Optimum Torque Acceleration/Deceleration. |
| A02B-0328-S675 | 32i-B Optimum Torque Acceleration/Deceleration. |

**Notice**

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# Positioning by optimum acceleration

## Features

When a rapid traverse command is specified during automatic operation, the Positioning by Optimum Acceleration function can be used to adjust the rapid traverse rate, time constant, and loop gain, according to the amount of travel for the block.

This reduces the time required for positioning and position check, therefore reducing the overall cycle time.

## Benefits

- Optimization of rapid traverse (G00) positioning
- Reduction of machining cycle time
- Improvement of the productivity of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J693 | 30i-A Positioning by Optimal Acceleration |
| A02B-0306-J693 | 31i-A5 Positioning by Optimal Acceleration |
| A02B-0307-J693 | 31i-A Positioning by Optimal Acceleration |
| A02B-0308-J693 | 32i-A Positioning by Optimal Acceleration |
| A02B-0323-J693 | 30i-B Positioning by Optimal Acceleration |
| A02B-0326-J693 | 31i-B5 Positioning by Optimal Acceleration |
| A02B-0327-J693 | 31i-B Positioning by Optimal Acceleration |
| A02B-0328-J693 | 32i-B Positioning by Optimal Acceleration |
| A02B-0333-J693 | 35i-B Positioning by Optimal Acceleration |
| A02B-0334-J693 | PM i-A Positioning by Optimal Acceleration |

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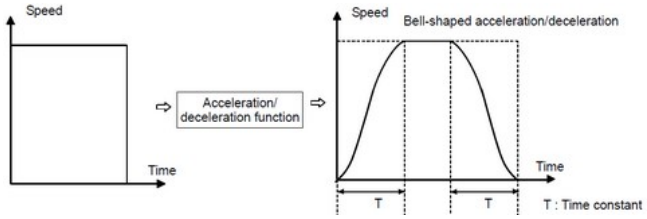
## Feed functions




# Bell-shaped acc / dec after cutting feed interpolation

## Features

The Bell-Shaped Acceleration / Deceleration after Cutting Feed Interpolation function is using bell-shaped cutting feedrate acceleration and deceleration profiles to reduce shock to the machine tool structure; it helps to eliminate vibration at the machine cutting point.

When applying bell-shaped acceleration, for a given acceleration rate, the overall time to accelerate to the programmed feedrate is generally shorter as compared to using the alternative linear or exponential acceleration profiles.

Any axes velocity changes (acc/dec) are applied AFTER the CNC has calculated the necessary velocity commands required for axes positioning.

## Benefits

- Improvement of the surface finish
- Reduction of shock to the machine tool and any consequential disturbance at the machine cutting point.
- Reduction of overall acceleration times compared to the equivalent linear or exponential acceleration profile.
- Reduction of position error due to servo delay compared to the equivalent exponential acceleration profile.
- Improvement of the machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J829 | 30i-A Bell-Shaped Acceleration/Deceleration after Cutting Feed Interpolation |
| A02B-0306-J829 | 31i-A5 Bell-Shaped Acceleration/Deceleration after Cutting Feed Interpolation |
| A02B-0307-J829 | 31i-A Bell-Shaped Acceleration/Deceleration after Cutting Feed Interpolation |
| A02B-0308-J829 | 32i-A Bell-Shaped Acceleration/Deceleration after Cutting Feed Interpolation |
| A02B-0320-J829 | 0i-MD Bell-Shaped Acceleration/Deceleration After Cutting Feed Interpolation |
| A02B-0323-J829 | 30i-B Bell-Shaped Acceleration/Deceleration after Cutting Feed Interpolation |
| A02B-0326-J829 | 31i-B5 Bell-Shaped Acceleration/Deceleration after Cutting Feed Interpolation |
| A02B-0327-J829 | 31i-B Bell-Shaped Acceleration/Deceleration after Cutting Feed Interpolation |
| A02B-0328-J829 | 32i-B Bell-Shaped Acceleration/Deceleration after Cutting Feed Interpolation |

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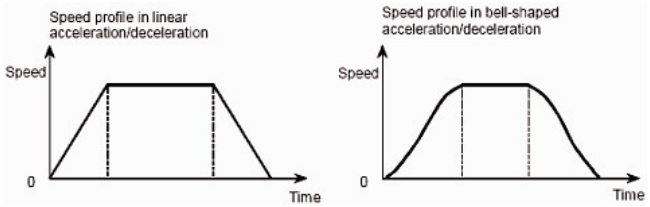
# 198

## Feed functions




# Bell-shaped acc / dec before look ahead interpolation

## Features

There are two elements to this function that help improve part contouring accuracy.

As a first step by producing a bell-shaped acceleration and deceleration profiles, this function reduces shock to the machine tool structure helping to eliminating vibration at the machine cutting point.

As a second step, the axes velocity commands are calculated taking into account BOTH positional and acceleration / deceleration requirements BEFORE the velocity commands are sent to the axes servo drives.

Traditionally axes velocity commands were calculated for positional requirements alone, then afterwards further modified to apply acceleration and deceleration constraints. Bell-Type Acceleration / Deceleration before Look Ahead Interpolation eliminates any minor potential positioning errors that are caused when axes velocity commands are modified for acceleration and deceleration AFTER the position commands are calculated.

## Benefits

- Elimination of machining errors due to delays in acceleration or deceleration
- Reduction of shocks to the machine tool structure
- Significant increase of the path accuracy of the cutting tool
- Overall improvement of the machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-J977 | 0i-TD Bell-Shaped Acceleration/Deceleeration Before Look-Ahead Interpolation |
| A02B-0320-J977 | 0i-MD Bell-Shaped Acceleration/Deceleration Before Look-Ahead Interpolation |
| A02B-0321-J977 | 0i-Mate-TD Bell-Shaped Acceleration/Deceleration Before Look-Ahead Interpolation |
| A02B-0322-J977 | 0i-Mate-MD Bell-Shaped Acceleration/Deceleration Before Look-Ahead Interpolation |

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# 2nd feedrate override

## Features

The Second Feedrate Override function allows cutting feedrates that have been overridden once to be overridden a second time.

The override is done in a percentage from 0 to 254% in increments of 1%. The value is set from the PMC. No override can be performed on functions such as threading and tapping in which override is inhibited. This function is used for controlling feedrate in adaptive control, etc.

## Benefits

- Adds additional override capabilities to the CNC
- Simplifies programming
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J810 | 30i-A 2nd Feedrate Override |
| A02B-0306-J810 | 31i-A5 2nd Feedrate Override |
| A02B-0307-J810 | 31i-A 2nd Feedrate Override |
| A02B-0323-J810 | 30i-B 2nd Feedrate Override |
| A02B-0326-J810 | 31i-B5 2nd Feedrate Override |
| A02B-0327-J810 | 31i-B 2nd Feedrate Override |

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# 200
## Feed functions

# One digit F code feed

## Features

The One Digit F Code Feed function provides the ability to preset 9 feed rates that are stored in parameters and activated by programming F1 through F9.

The feed rate corresponding to the specified number is set. When F0 is commanded, rapid traverse rate is set. If the manual pulse generator is rotated with the one-digit F code feed selection signal set to 1, the feed rate corresponding to the currently selected number is increased or decreased. A set or modified feed rate is preserved while the power is turned off.

The current feed rate is displayed on the screen.

## Benefits

- Adds preset capabilities to manage / control easily feedrates sets to the CNC
- Simplifies programming
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J820 | 30i-A F1 Digit Feed |
| A02B-0306-J820 | 31i-A5 F1 Digit Feed |
| A02B-0307-J820 | 31i-A F1 Digit Feed |
| A02B-0308-J820 | 32i-A F1 Digit Feed |
| A02B-0323-J820 | 30i-B F1 Digit Feed |
| A02B-0326-J820 | 31i-B5 F1 Digit Feed |
| A02B-0327-J820 | 31i-B F1 Digit Feed |
| A02B-0328-J820 | 32i-B F1 Digit Feed |

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# 201
## Feed functions

# Inverse time feed

## Features

The G code for inverse time feed is a modal G code and belongs to group 05 (includes G code for feed per revolution and G code for feed per minute). The Inverse Time Feed function (G93 mode) allows the feedrate of the tool to be specified by the move distance of the block and inverse time (FRN) where:

- Linear interpolation (G01)
  FRN=1/Time (min) = Speed/Distance
  Speed: mm/ min (metric input), inch/ min (inch input)
  Distance: mm (metric input), inch (inch input)
- Circular interpolation (G02, G03)
  FRN=1/Time (min) = Speed/Circle radius
  Speed: mm/ min (metric input), inch/ min (inch input)
  Circle radius: mm (metric input), inch (inch input)

## Benefits

- Adds inverse time capabilities to the CNC
- Simplifies programming
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J715 | 30i-A Inverse Time Feed for Lathe / Compound System |
| A02B-0306-J715 | 31i-A5 Inverse Time Feed for Lathe/Compound System |
| A02B-0307-J715 | 31i-A Inverse Time Feed for Lathe/Compound System |
| A02B-0308-J715 | 32i-A Inverse Time Feed for Lathe/Compound System |
| A02B-0323-J715 | 30i-B Inverse Time Feed for Lathe / Compound System |
| A02B-0326-J715 | 31i-B5 Inverse Time Feed for Lathe/Compound System |
| A02B-0327-J715 | 31i-B Inverse Time Feed for Lathe/Compound System |
| A02B-0328-J715 | 32i-B Inverse Time Feed for Lathe/Compound System |

**Notice**

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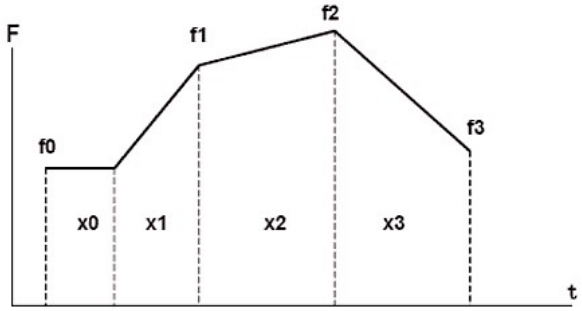
# 202

## Feed functions




```
N10   G01    Xx0   Ff0   ;
N20   G93.2  Xx1   Ff1   ;
N30          Xx2   Ff2   ;
N40          Xx3   Ff3   ;
```

# Rate feed

## Features

This function enables to continually increase / decrease (linear) the feedrate within a block. While considering the feedrate of the previous block as the start value and specifying the value of the feedrate at the end of the block, the feedrate is changed linearly from start value to the end value within the block commanded.

## Example of application

On water jet cutting machines, the water jet following error is essential to smoothly adjust the feedrate / to take corners and thus improve the cutting behaviour. Without this function it would be necessary to command a lot of tiny blocks to adapt the feedrate profile as needed.

**Notice**

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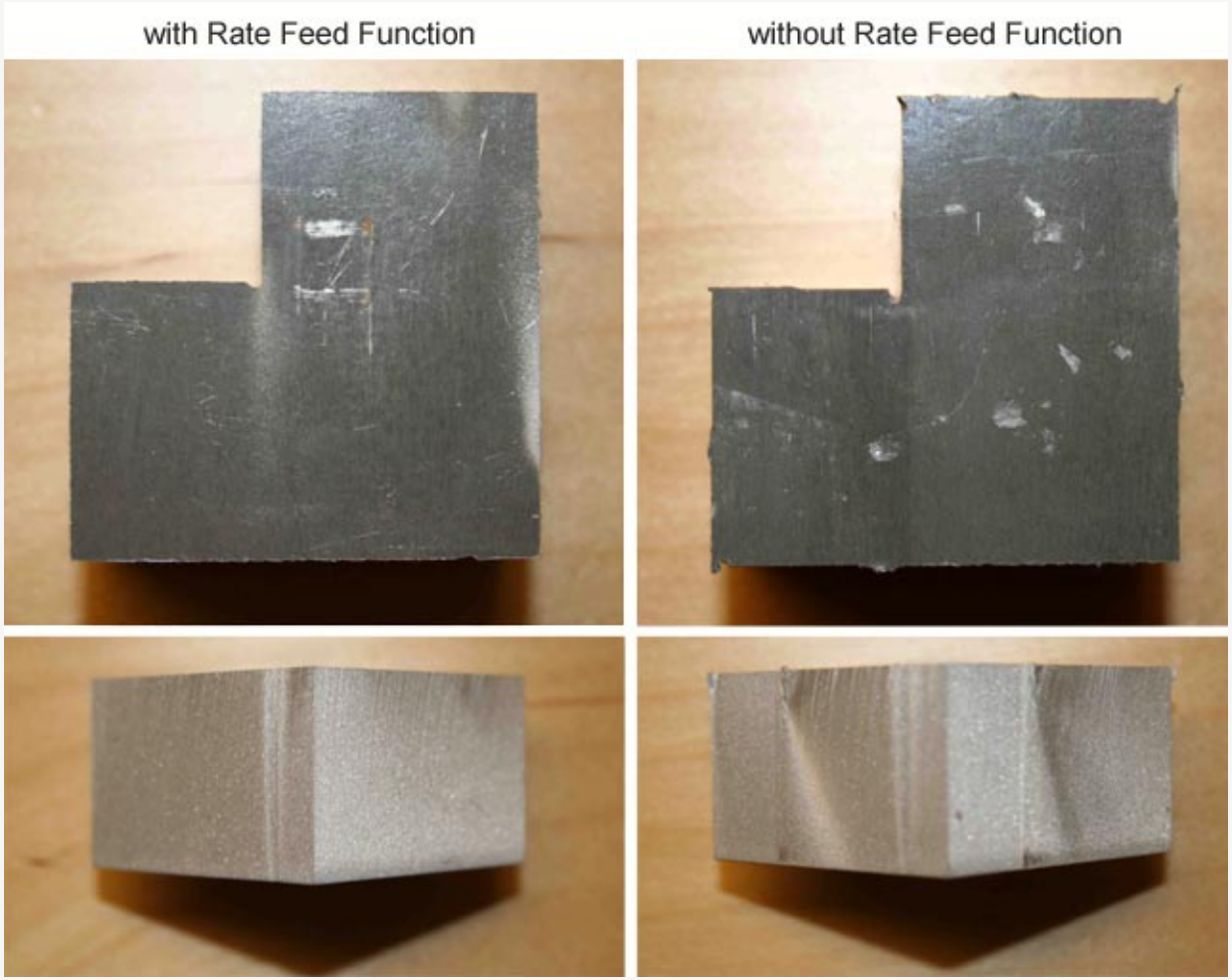


## Benefits

- Possibility to program continuously smooth speed characteristics depending on the curvature of the workpiece to be machined
- Improvement of the cutting behaviour for water jet applications
- Improvement of the slide motion resulting in bether part quality for press forming applications
- Improvement of the overall machining productivity

**Notice**

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# Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R635 | 30i-A Rate Feed Function |
| A02B-0306-R635 | 31i-A5 Rate Feed Function |
| A02B-0307-R635 | 31i-A Rate Feed Function |
| A02B-0308-R635 | 32i-A Rate Feed Function |
| A02B-0323-R635 | 30i-B Rate Feed Function |
| A02B-0326-R635 | 31i-B5 Rate Feed Function |
| A02B-0327-R635 | 31i-B Rate Feed Function |
| A02B-0328-R635 | 32i-B Rate Feed Function |

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# External deceleration

## Features

The External Deceleration function provides the ability for the PMC to decelerate a controlled axis.

The feed rate is decelerated by external deceleration signals from the machine. The deceleration rate is set by parameters. External deceleration signals are provided for each axis and direction. Three types of deceleration condition settings can be dynamically selected by the PMC.

External deceleration can be applied to the rapid traverse rate, cutting feed rate, and manual handle feed rate.

## Benefits

- Addition of controlled deceleration profiles to the CNC
- Simplifies programming
- Improves overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J842 | 30i-A External Deceleration |
| A02B-0306-J842 | 31i-A5 External Deceleration |
| A02B-0307-J842 | 31i-A External Deceleration |
| A02B-0308-J842 | 32i-A External Deceleration |
| A02B-0323-J842 | 30i-B External Deceleration |
| A02B-0326-J842 | 31i-B5 External Deceleration |
| A02B-0327-J842 | 31i-B External Deceleration |
| A02B-0328-J842 | 32i-B External Deceleration |

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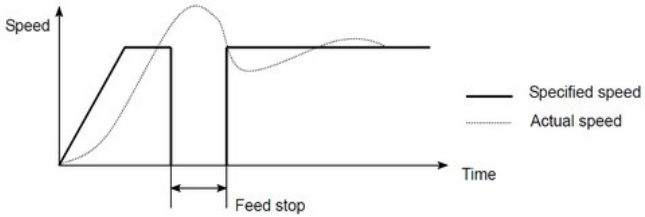


# Feed stop

## Features

The Feed Stop function can avoid shocks to the machine, caused by the overshoot of a large servo motor accelerating in rapid traverse mode.

During axis motion, the feed stop function checks a position deviation amount continuously. When the amount exceeds the "feed stop position deviation amount", the function suspends pulse distribution and acceleration / deceleration control during such a period of time, and terminates the move command for the positioning control circuit.

Thus the function can minimize any overshoot that may occur with a large servo motor in rapid traverse acceleration operation.

## Benefits

- Reduction of the shocks to machine and process
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J847 | 30i-A Feed Stop |
| A02B-0306-J847 | 31i-A5 Feed Stop |
| A02B-0307-J847 | 31i-A Feed Stop |
| A02B-0323-J847 | 30i-B Feed Stop |
| A02B-0326-J847 | 31i-B5 Feed Stop |
| A02B-0327-J847 | 31i-B Feed Stop |

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# 207

## Feed functions

# Feedrate control with acceleration in circular interpolation

## Features

When high-speed cutting is performed in circular, helical or spiral interpolation, the actual tool path has an error with respect to the programmed path.

The feedrate of circular interpolation is automatically clamped by the permissible acceleration specified by the parameter for decreasing the shape error of radius direction.

## Benefits

- Diminution of the tool-path error in circular, helical and spiral interpolation
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J809 | 30i-A Speed Control with Acceleration in Circular Interpolation |
| A02B-0306-J809 | 31i-A5 Speed Control with Acceleration in Circular Interpolation |
| A02B-0307-J809 | 31i-A Speed Control with Acceleration in Circular Interpolation |
| A02B-0308-J809 | 32i-A Speed Control with Acceleration in Circular Interpolation |
| A02B-0323-J809 | 30i-B Speed Control with Acceleration in Circular Interpolation |
| A02B-0326-J809 | 31i-B5 Speed Control with Acceleration in Circular Interpolation |
| A02B-0327-J809 | 31i-B Speed Control with Acceleration in Circular Interpolation |
| A02B-0328-J809 | 32i-B Speed Control with Acceleration in Circular Interpolation |
| A02B-0334-J809 | PM i-A Speed Control with Acceleration in Circular Interpolation |

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# Advanced preview control

## Features

The Advanced Preview Control function is designed for high–speed precise machining. With this function, the delay due to acceleration / deceleration and the delay in the servo system that increases as the feed rate becomes higher can be suppressed.

The tool can then follow specified values accurately and errors in the machining profile can be reduced. In advanced preview control mode, the following functions are available:

- Linear acceleration / deceleration before interpolation
- Automatic corner deceleration function

## Benefits

- Optimization of the machining speed using smooth acceleration / deceleration to minimize axis-overshoot errors.
- Decrease of the part-form tolerances suppressing acceleration / deceleration delays and servo lag
- Elimination of corner-clipping errors that typically increase as the feedrate increases

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-J701 | 0i-TD Advanced Preview Control |

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# AI Contour Control I

## Features

AI Contour Control I (AICC-I) is used to realize high-precision machining at optimal machining speeds. This function suppresses path errors due to acceleration / deceleration delay, servo positioning delay, and mechanical and electro-mechanical machine performance constraints.

Without this function machining profile errors would increase proportionally with the programmed path feedrate.

In practice, this function is useful when cutting on complex part forms involving sudden cutter direction changes such as are found in die/mold machining.

## Benefits

- Optimization of the machining speeds using smooth acceleration / deceleration to minimize axis-overshoot errors.
- Decrease of the part-form tolerances suppressing acceleration / deceleration delays and servo lag
- Elimination of corner-clipping errors that typically increase as the feedrate increases

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S807 | 30i-A AI Contour Control I |
| A02B-0306-S807 | 31i-A5 AI Contour Control I |
| A02B-0307-S807 | 31i-A AI Contour Control I |
| A02B-0308-S807 | 32i-A AI Contour Control I |
| A02B-0319-J665 | 0i-TD AI Contour Control I |
| A02B-0320-J665 | 0i-MD AI Contour Control |
| A02B-0321-J665 | 0i-Mate-TD AI Contour Control I |
| A02B-0322-J665 | 0i-Mate-MD AI Contour Control I |
| A02B-0323-S807 | 30i-B AI Contour Control I - Includes 30 Look-Ahead Blocks |
| A02B-0326-S807 | 31i-B5 AI Contour Control I - Includes 30 Look-Ahead Blocks |
| A02B-0327-S807 | 31i-B AI Contour Control I - Includes 30 Look-Ahead Blocks |
| A02B-0328-S807 | 32i-B AI Contour Control I - Includes 30 Look-Ahead Blocks |

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# 210
## Feed functions

# AI Contour Control II

## Features

AI Contour Control II is used to enable high-precision machining at optimal machining speeds. This function suppresses path errors due to acceleration / deceleration delay, servo positioning delay, and mechanical and electro-mechanical machine performance constraints.

Without this function, machining profile errors would increase proportionally with the programmed path feedrate. In practice, this function is useful when cutting on complex part forms involving sudden cutter direction changes such as are found in die / mold machining.

## Benefits

- Optimization of machining speeds using smooth acceleration / deceleration to minimize axis-overshoot errors
- Decrease of part-form tolerances suppressing acceleration / deceleration delays and servo lag
- Elimination of corner-clipping errors that typically increase as the feedrate increases.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S808 | 30i-A AI Contour Control II |
| A02B-0306-S808 | 31i-A5 AI Contour Control II |
| A02B-0307-S808 | 31i-A AI Contour Control II |
| A02B-0308-S808 | 32i-A AI Contour Control II |
| A02B-0319-S808 | 0i-TD AI Contour Control II |
| A02B-0320-S808 | 0i-MD AI Contour Control II |
| A02B-0323-S808 | 30i-B AI Contour Control II - Includes 200 Look-Ahead Blocks |
| A02B-0326-S808 | 31i-B5 AI Contour Control II - Includes 200 Look-Ahead Blocks |
| A02B-0327-S808 | 31i-B AI Contour Control II - Includes 200 Look-Ahead Blocks |
| A02B-0328-S808 | 32i-B AI Contour Control II - Includes 200 Look-Ahead Blocks |

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# 211
## Feed functions

# High speed processing

## Features

The High-Speed Processing function improves both the CNC Block Processing Time and the NC block look-ahead capability of the option AI Contour Control II.

## Benefits

- Enables higher precision machining of complex free-form surfaces described by minute micro-block moves.
- Optimization of the machining speed of complex free-form surfaces described by minute micro-block moves.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S809 | 30i-A High-Speed Processing |
| A02B-0306-S809 | 31i-A5 High-Speed Processing |
| A02B-0307-S809 | 31i-A High-Speed Processing |
| A02B-0323-S809 | 30i-B High-Speed Processing - Includes 600 Look-Ahead Blocks |
| A02B-0326-S809 | 31i-B5 High-Speed Processing - Includes 600 Look-Ahead Blocks |
| A02B-0327-S809 | 31i-B High-Speed Processing - Includes 600 Look-Ahead Blocks |

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# Look-ahead blocks expansion

## Features

When performing High-Speed Processing with AI Contour Control II, this function expands the CNC look-ahead capability to 1,000 CNC Part Program Blocks.

## Benefits

- Enables a higher-precision machining on cutting complex part-forms that are defined by many, tiny, program blocks such as are found in die/mold machining.
- The more look-ahead blocks the control can preview, the greater the chance it has of predicting a cutter direction change.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S815 | 30i-A Look-Ahead Blocks Expansion - Expands Look-Ahead Blocks to 1000 Blocks |
| A02B-0306-S815 | 31i-A5 Look-Ahead Blocks Expansion - Expands Look-Ahead Blocks to 1000 Blocks |
| A02B-0307-S815 | 31i-A Look-Ahead Blocks Expansion - Expands Look-Ahead Blocks to 1000 Blocks |
| A02B-0323-S815 | 30i-B Look-Ahead Blocks Expansion - Expands Look-Ahead Blocks to 1000 Blocks |
| A02B-0326-S815 | 31i-B5 Look-Ahead Blocks Expansion - Expands Look-Ahead Blocks to 1000 Blocks |
| A02B-0327-S815 | 31i-B Look-Ahead Blocks Expansion - Expands Look-Ahead Blocks to 1000 Blocks |

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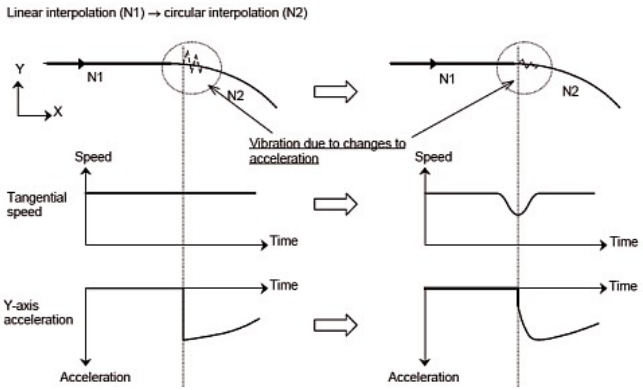
# 213
# Feed functions

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# Jerk control

## Features

Whereas the rate-of-change of velocity is referred to as Acceleration, the rate-of-change of acceleration is technically known as Jerk. Jerk is therefore the third derivative of Position, with Acceleration the second and Velocity the first.

Wherever a part program causes a significant change in cutter-path direction, such as in a transition from a straight line to curve, any axis acceleration that is required to maintain a constant cutter-path vector feedrate through that transition may cause vibration or shock to be induced into the machine structure.

The Jerk Control function can be used to reduce shock and any resultant position error from sudden axis acceleration. Jerk Control temporarily modifies the cutter-path vector feedrate by applying a smoothing effect progressively modifying the rate-of-change of acceleration (Jerk).

Without using Jerk Control, Bell-Shaped Acceleration alone would apply a harsher, constant rate-of-change, acceleration profile. The permissible rate-of-change of acceleration (Jerk) is set by CNC parameters for each machine axis; these limits are usually set in advance by the machine-tool-builder. Any velocity adjustments applied by the Jerk Control function are calculated as true positional commands and hence incur only minimal acceleration or deceleration delays (Acc/Dec Before Interpolation).

## Benefits

- Reduction of machining errors caused by shock and vibration induced into the machine structure that result of sudden changes in axis acceleration

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S678 | 30i-A Jerk Control |
| A02B-0306-S678 | 31i-A5 Jerk Control |
| A02B-0307-S678 | 31i-A Jerk Control |
| A02B-0308-S678 | 32i-A Jerk Control |
| A02B-0320-S678 | 0i-MD Jerk Control |
| A02B-0323-S678 | 30i-B Jerk Control |
| A02B-0326-S678 | 31i-B5 Jerk Control |
| A02B-0327-S678 | 31i-B Jerk Control |
| A02B-0328-S678 | 32i-B Jerk Control |

# 214
## Feed functions

# Rigid tapping with bell-shaped acceleration / deceleration

## Features

Linear acceleration / deceleration and exponential acceleration / deceleration (for milliling / M type only) have conventionally been used to realized to rigid tapping.

Using bell shaped acceleration / deceleration enables a machine-friendly tapping. The use of smaller time constants for the tapping cycle is required by the fact that the time required for acceleration / deceleration is shorter than with linear profile.

Since this bell shaped acceleration / deceleration is a rapid traverse bell shaped type, parameters are used to specify a linear acceleration / deceleration time constant and the time for a bell shaped curved section.

Note: in three-dimensional rigid tapping, bell-shaped acceleration/deceleration is disabled, and linear acceleration / deceleration is applied.

## Benefits

- Smoother movements during tapping operation
- Diminution of the wear of tools and mechanical structure
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S702 | 30i-A Rigid Tapping Bell-Shaped Acceleration/Deceleration |
| A02B-0306-S702 | 31i-A5 Rigid Tapping Bell-Shaped Acceleration/Deceleration |
| A02B-0307-S702 | 31i-A Rigid Tapping Bell-Shaped Acceleration/Deceleration |
| A02B-0308-S702 | 32i-A Rigid Tapping Bell-Shaped Acceleration/Deceleration |
| A02B-0320-S702 | 0i-MD Rigid Tapping Bell-Shaped Acceleration/Deceleration |
| A02B-0323-S702 | 30i-B Rigid Tapping Bell-Shaped Acceleration/Deceleration |
| A02B-0326-S702 | 31i-B5 Rigid Tapping Bell-Shaped Acceleration/Deceleration |
| A02B-0327-S702 | 31i-B Rigid Tapping Bell-Shaped Acceleration/Deceleration |
| A02B-0328-S702 | 32i-B Rigid Tapping Bell-Shaped Acceleration/Deceleration |
| A02B-0333-S702 | 35i-B Rigid Tapping Bell-Shaped Acceleration/Deceleration |

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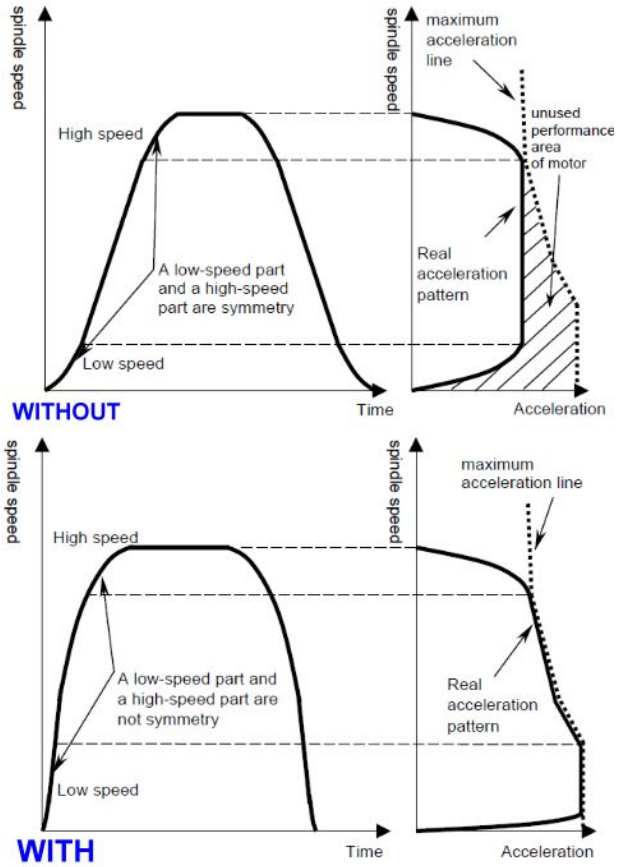
# 215
## Feed functions

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# Optimum torque acceleration / deceleration for rigid tapping

## Features

The Optimum Torque Acceleration / Deceleration for Rigid Tapping function can flexibly set the acceleration and deceleration of the cutting in the rigid tapping according to the torque characteristic of the spindle motor and the machine characteristic such as the friction.

The acceleration and deceleration performance (hereafter the maximum acceleration line) which can be output is usually not symmetric in a low-speed part and a high-speed part because of the torque characteristic of the spindle motor and the machine characteristic.

The conventional acceleration and deceleration (linear / bell-shaped) has a symmetric acceleration and deceleration. The acceleration/deceleration of this function is realized so that the real acceleration pattern may approach the maximum acceleration line as much as possible. The performance of the motor is drawn out to its maximum by this, and the cutting time can be shortened.

However, when the rigid tapping is used in an acceleration constant range of the spindle motor, shortening the cutting time cannot be expected. It is possible to execute the rigid tapping with the acceleration and deceleration along the maximum acceleration line by setting the acceleration line pattern in the parameter of each gear. The acceleration and deceleration of pulling out uses the same acceleration line pattern as them of the cutting.

## Benefits

- Optimization of the rigid tapping processing
- Increase of the tapping and cutting performation of the machine
- Increase of the overall productivity of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R533 | 30i-A Optimum Acceleration/Deceleration for Rigid Tapping |
| A02B-0306-R533 | 31i-A5 Optimum Acceleration/Deceleration for Rigid Tapping |
| A02B-0307-R533 | 31i-A Optimum Acceleration/Deceleration for Rigid Tapping |
| A02B-0308-R533 | 32i-A Optimum Acceleration/Deceleration for Rigid Tapping |
| A02B-0319-R533 | 0i-TD Optimum Acceleration/Deceleration for Rigid Tapping |
| A02B-0320-R533 | 0i-MD Optimum Acceleration/Deceleration for Rigid Tapping |
| A02B-0323-R533 | 30i-B Optimum Acceleration/Deceleration for Rigid Tapping |
| A02B-0326-R533 | 31i-B5 Optimum Acceleration/Deceleration for Rigid Tapping |

| Specification | Description |
|---|---|
| A02B-0327-R533 | 31i-B Optimum Acceleration/Deceleration for Rigid Tapping |
| A02B-0328-R533 | 32i-B Optimum Acceleration/Deceleration for Rigid Tapping |
| A02B-0333-R533 | 35i-B Optimum Acceleration/Deceleration for Rigid Tapping |

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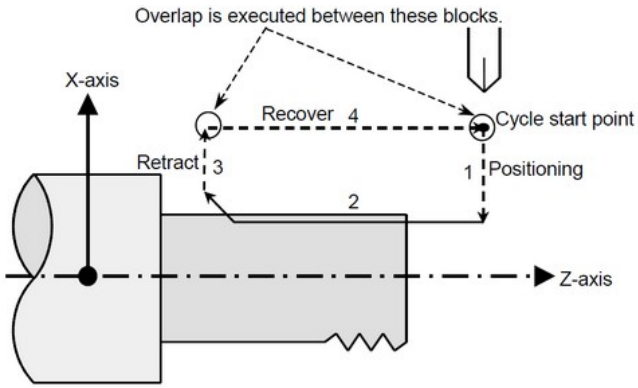
# 217

## Feed functions




# Programmable rapid traverse overlap

## Features

Rapid Traverse Overlap function reduces cycle time by starting the next rapid traverse block before the previous rapid traverse block ends, when continuous blocks with rapid traverse command are given.

Here is an overview to the two added functions of Programmable Rapid Traverse Overlap:

- Programmable rapid traverse overlap: the amount of rapid traverse overlap can be changed by setting the feed rate reduction ratio to a system variable in a part program. This enables an optimal overlapping effect for each rapid traverse path of the machining program.
- Rapid traverse overlap between threading cycle blocks: shortened cycle times become possible by overlapping rapid traverse blocks during the threading cycle. As shown in the right figure, rapid traverse overlap is executed between "3.Retract and 4.Return" and between "4.Return and 1.Positioning".

## Benefits

- Opitimization of the cycle time of high volume production machines
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R502 | 30i-A Programmable Rapid Traverse Overlap |
| A02B-0306-R502 | 31i-A5 Programmable Rapid Traverse Overlap |
| A02B-0307-R502 | 31i-A Programmable Rapid Traverse Overlap |
| A02B-0308-R502 | 32i-A Programmable Rapid Traverse Overlap |
| A02B-0323-R502 | 30i-B Programmable Rapid Traverse Overlap |
| A02B-0326-R502 | 31i-B5 Programmable Rapid Traverse Overlap |
| A02B-0327-R502 | 31i-B Programmable Rapid Traverse Overlap |
| A02B-0328-R502 | 32i-B Programmable Rapid Traverse Overlap |

**Notice**

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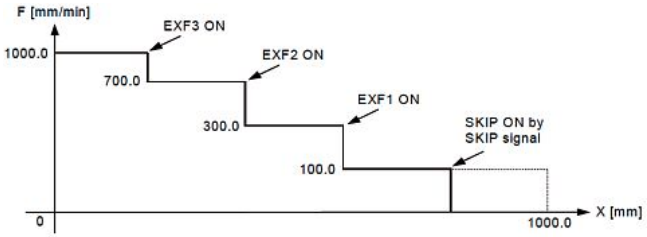
# 218

## Feed functions




# Feed rate change function

## Features

With Feed Rate CHange function, when an external signal is input, the cutting feed rate of G31 and G01 is changed to the value which is set by a parameter.

## Program example (mm input)

G31 X1000.0 F1000.0;

M30;

## Parameters:

- No.1481 = 100.0
- No.1482 = 300.0
- No.1483 = 700.0

When the feed rate change signals EXF3, EXF2, and EXF1 are turned on in this order during executing the above program, feed rate is changed as in the cycle shown in the illustration.

## Benefits

- Possibility to change feedrates without programming
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0333-R716 | 35i-B Feed Rate Change Function |
| A02B-0334-R716 | PM i-A Feed rate Change Function |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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# 219
# Functions

## Program input

This section of the catalogue contains the functions related to the programming and operation of the CNC.

Some of the functions detailed in the catalogue:

- Skip functions
- Coordinate systems
- Custom Macro
- Special cycles
- Tilted Working Plane
- Macro Executor and C-Executor
- FANUC PICTURE
- FANUC Auto HMI
- Etc.

**Notice**

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# 220
## Program input

# Optional block skip

## Features

The Optional Block Skip function allows the operator to select whether a block in the part program that starts with a "/ n", where n=1, is executed or skipped. Setting a bit in the PMC is required to activate this function. The 1st level, n=1, of Optional Block Skip is standard in the 30i/31i/32i and 0i-C controls.

## Example 1:

) /1 N12345 G00 X100.Z200.;

There is also a feature called Additional Optional Block Skip. This adds the levels 2 through 9 to the valid numbers for n, where n is level of the Optional Block Skip, "/n" at the beginning of the block. It requires setting PMC bits to activate these levels of Optional Block Skip.

## Example 2:

) /3 N12345 G00 X100.Z200.;
where n=3 for the 3rd level of Optional Block Skip

## Benefits

- Additionnal levels of Block Skip can be added to the CNC
- Higher flexibility of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J955 | 30i-A Optional Block Skip |
| A02B-0306-J955 | 31i-A5 Optional Block Skip |
| A02B-0307-J955 | 31i-A Optional Block Skip |
| A02B-0308-J955 | 32i-A Optional Block Skip |
| A02B-0323-J955 | 30i-B Optional Block Skip (Total 9) |
| A02B-0326-J955 | 31i-B5 Optional Block Skip (Total 9) |
| A02B-0327-J955 | 31i-B Optional Block Skip (Total 9) |
| A02B-0328-J955 | 32i-B Optional Block Skip (Total 9) |

**Notice**

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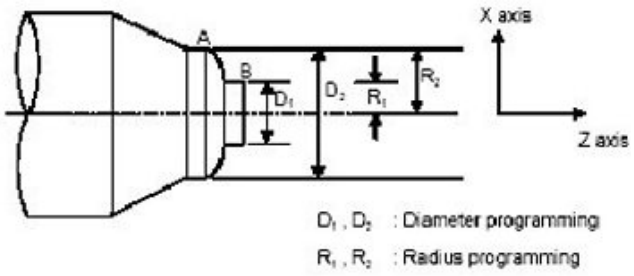
# 221
## Program input




# Dynamic switching of diameter / radius specification

## Features

The Dynamic Switching of Diameter/Radius Specification function enables the user to switch between diameter and radius programming by using a PMC signal or G code.

When turning is performed, the cross section of a workpiece is usually a circle. The size of the circle may be specified by its diameter or radius. When the diameter is specified, it is called diameter programming and when the radius is specified, it is called radius programming. Whether to use radius programming or diameter programming is chosen for each axis by setting a parameter.

There may be cases where some coordinates or program items for an axis in diameter programming mode should preferably be handled in radius programming mode. This function enables the user to switch between diameter programming and radius programming by using a signal or G code command. The user can thus handle coordinates, program items, and other settings for an axis in diameter programming mode as well as in radius programming mode.

## Benefits

- Addition of flexibility to the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S630 | 30i-A Diameter / Radius Dynamic Switching |
| A02B-0306-S630 | 31i-A5 Diameter / Radius Dynamic Switching |
| A02B-0307-S630 | 31i-A Diameter / Radius Dynamic Switching |
| A02B-0323-S630 | 30i-B Diameter / Radius Dynamic Switching |
| A02B-0326-S630 | 31i-B5 Diameter / Radius Dynamic Switching |
| A02B-0327-S630 | 31i-B Diameter / Radius Dynamic Switching |

**Notice**

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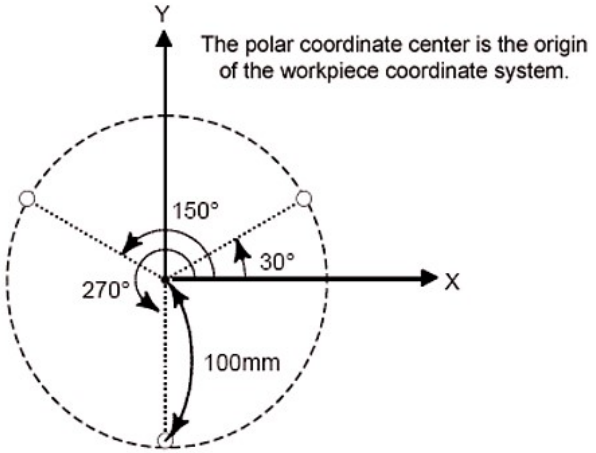
# 222

## Program input




# Polar coordinate command

## Features

When machining using arc based coordinates, it is usually easier to specify a move in terms of an angular displacement and a radius.

By turning on the Polar Coordinate Command function, the programmer can choose to command moves that employ polar coordinates in any segment of his program. He can also cancel polar coordinate commands and revert to the traditional Cartesian command system when those are more appropriate.

## Benefits

- Ease of programming coordinates on arcs and circles.
- Transposition of angles and radii dimensions direct from blueprints.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J818 | 30i-A Polar Coordinate Command |
| A02B-0306-J818 | 31i-A5 Polar Coordinate Command |
| A02B-0307-J818 | 31i-A Polar Coordinate Command |
| A02B-0308-J818 | 32i-A Polar Coordinate Command |
| A02B-0323-J818 | 30i-B Polar Coordinate Command |
| A02B-0326-J818 | 31i-B5 Polar Coordinate Command |
| A02B-0327-J818 | 31i-B Polar Coordinate Command |
| A02B-0328-J818 | 32i-B Polar Coordinate Command |

**Notice**

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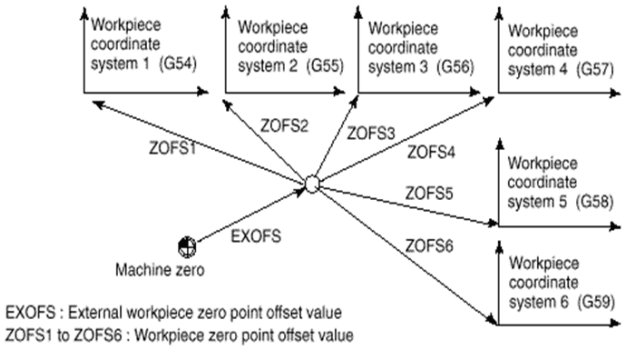
# 223

## Program input




EXOFS : External workpiece zero point offset value
ZOFS1 to ZOFS6 : Workpiece zero point offset value

# Workpiece coordinate system

## Features

Coordinate system used for machining a workpiece is referred to as a workpiece coordinate system.

## Benefits

- Six standard work coordinate systems (G54-G59)
- Part program reflects part print dimensions
- Fixture location inaccuracies compensated
- Additional adjustment using common offset

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J894 | 30i-A Workpiece Coordinate System |
| A02B-0306-J894 | 31i-A5 Workpiece Coordinate System |
| A02B-0307-J894 | 31i-A Workpiece Coordinate System |
| A02B-0308-J894 | 32i-A Workpiece Coordinate System |
| A02B-0323-J894 | 30i-B Workpiece Coordinate System |
| A02B-0326-J894 | 31i-B5 Workpiece Coordinate System |
| A02B-0327-J894 | 31i-B Workpiece Coordinate System |
| A02B-0328-J894 | 32i-B Workpiece Coordinate System |

**Notice**

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# 224

## Program input

# Workpiece coordinate system preset

## Features

The workpiece coordinate system, with its zero point shifted away from the machine coordinate system zero point by the workpiece origin offset value, is set by returning the tool to the reference position by a manual operation.

In addition, when an absolute position detector is provided, the workpiece coordinate system is automatically set by reading the machine coordinate value from the detector when the control is powered on without performing a manual reference position return operation.

The set workpiece coordinate system may shift by any of the following commands or operations:

- Manual intervention performed when the manual absolute signal is off
- Move command executed in the machine lock state
- Movement by handle interruption
- Operation using the mirror image function
- Shifting the workpiece coordinate system by setting the local coordinate system or workpiece coordinate system

By G code specification or MDI operation, a workpiece coordinate system shifted by an operation above can be preset to a workpiece coordinate system offset from the machine zero point by a workpiece origin offset as in the case of manual reference position return.

## Benefits

- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J917 | 30i-A Workpiece Coordinate Preset |
| A02B-0306-J917 | 31i-A5 Workpiece Coordinate Preset |
| A02B-0307-J917 | 31i-A Workpiece Coordinate Preset |
| A02B-0308-J917 | 32i-A Workpiece Coordinate Preset |
| A02B-0323-J917 | 30i-B Workpiece Coordinate Preset |
| A02B-0326-J917 | 31i-B5 Workpiece Coordinate Preset |
| A02B-0327-J917 | 31i-B Workpiece Coordinate Preset |
| A02B-0328-J917 | 32i-B Workpiece Coordinate Preset |

**Notice**

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# 225
## Program input

# Addition of workpiece coordinate system 48 pairs

## Features

Besides the six workpiece coordinate systems based on G54 to G59 (standard workpiece coordinate systems), up to 48 additional workpiece coordinate systems can be used optionally. As with the workpiece coordinate system based on G54 to G59, the following workpiece origin offset setting and modification methods are available:

- MDI-based method.
- Program-based method.
  Setting based on programmable data input (G10L2Pp)
  Setting based on custom macros.

## Benefits

- Increase of the flexibility of the machining
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J895 | 30i-A Workpiece Coordinate, 48 Pairs |
| A02B-0306-J895 | 31i-A5 Workpiece Coordinate, 48 Pairs |
| A02B-0307-J895 | 31i-A Workpiece Coordinate, 48 Pairs |
| A02B-0308-J895 | 32i-A Workpiece Coordinate, 48 Pairs |
| A02B-0323-J895 | 30i-B Workpiece Coordinate, 48 Pairs |
| A02B-0326-J895 | 31i-B5 Workpiece Coordinate, 48 Pairs |
| A02B-0327-J895 | 31i-B Workpiece Coordinate, 48 Pairs |
| A02B-0328-J895 | 32i-B Workpiece Coordinate, 48 Pairs |

**Notice**

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# 226

## Program input

# Addition of workpiece coordinate system 300 pairs

Besides the six workpiece coordinate systems based on G54 to G59 (standard workpiece coordinate systems), up to 300 additional workpiece coordinate systems can be used optionally. As with the workpiece coordinate system based on G54 to G59, the following workpiece origin offset setting and modification methods are available:

- MDI-based method.
- Program-based method.
  Setting based on programmable data input (G10L2Pp)
  Setting based on custom macros.

## Benefits

- Increase of the flexibility of the machine
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J919 | 30i-A Workpiece Coordinate, 300 Pairs |
| A02B-0306-J919 | 31i-A5 Workpiece Coordinate, 300 Pairs |
| A02B-0307-J919 | 31i-A Workpiece Coordinate, 300 Pairs |
| A02B-0323-J919 | 30i-B Workpiece Coordinate, 300 Pairs |
| A02B-0326-J919 | 31i-B5 Workpiece Coordinate, 300 Pairs |
| A02B-0327-J919 | 31i-B Workpiece Coordinate, 300 Pairs |

**Notice**

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# 227

## Program input

# Positioning in machine coordinate systejm with feedrate

## Features

Conventionally machine coordinate system setting (G53) is performed only at a rapid traverse rate.

With this function, the machine coordinate system setting is available at a feed rate.

## Example:

G53.2 G01 IP_ F_;

IP_: Dimension word

F_: Feed rate

## Benefits

- Increase of the setting of coordinate system
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R553 | 30i-A Positioning in Machine Coordinate System with Feed Rate |
| A02B-0306-R553 | 31i-A5 Positioning in Machine Coordinate System with Feed Rate |
| A02B-0307-R553 | 31i-A Positioning in Machine Coordinate System with Feed Rate |
| A02B-0308-R553 | 32i-A Positioning in Machine Coordinate System with Feed Rate |
| A02B-0323-R553 | 30i-B Positioning in Machine Coordinate System with Feed Rate |
| A02B-0326-R553 | 31i-B5 Positioning in Machine Coordinate System with Feed Rate |
| A02B-0327-R553 | 31i-B Positioning in Machine Coordinate System with Feed Rate |
| A02B-0328-R553 | 32i-B Positioning in Machine Coordinate System with Feed Rate |

**Notice**

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# 228

## Program input

# Direct drawing dimension programming

## Features

The Direct Drawing Dimension Programming is a function that simplifies part programming on the shop floor.

Angles of straight lines, chamfering values, corner rounding values, and other dimensional values on machining drawings can be programmed by directly inputting these values.

In addition, chamfering and corner rounding can be inserted between straight lines having an arbitrary angle.

## Benefits

- Addition of programming functions to the CNC
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J870 | 30i-A Direct Drawing Programming |
| A02B-0306-J870 | 31i-A5 Direct Drawing Programming |
| A02B-0307-J870 | 31i-A Direct Drawing Programming |
| A02B-0308-J870 | 32i-A Direct Drawing Programming |
| A02B-0323-J870 | 30i-B Direct Drawing Programming |
| A02B-0326-J870 | 31i-B5 Direct Drawing Programming |
| A02B-0327-J870 | 31i-B Direct Drawing Programming |
| A02B-0328-J870 | 32i-B Direct Drawing Programming |

**Notice**

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# G-Code system B/C

## Features

With the CNC for the lathe system, the G codes listed below are available. Three types of G code systems are usable: A, B, and C. A G code system can be selected by parameter setting.

| G-Code System | | | Group | Function |
|---|---|---|---|---|
| A | B | C | | |
| G00 | G00 | G00 | 01 | Positioning (Rapid traverse) |
| G01 | G01 | G01 | | Linear interppolation (Cutting feed) |
| G02 | G02 | G02 | | Circular interpolation CW or Helical interpolation CW |
| G03 | G03 | G03 | | Circular interpolation CCW or Helical interpolation CCW |
| G02.2 | G02.2 | G02.2 | | Involute interpolation CW |
| G02.3 | G02.3 | G02.3 | | Exponantial interolation CW |
| G02.4 | G02.4 | G02.4 | | Three- dimensional coordinate conversion CW |
| G03.2 | G03.2 | G03.2 | | Involute Interpolation CCW |
| G03.3 | G03.3 | G03.3 | | Exponantial interpolation CCW |
| G03.4 | G03.4 | G03.4 | | Three- dimensional coordinate conversion CCW |
| G04 | G04 | G04 | 00 | Dwell |
| G05 | G05 | G05 | | AI contour control (command compatible with high precision contour control) |
| G05.1 | G05.1 | G05.1 | | AI contour control/ Nano smoothing/ Smooth interpolation |
| G05.4 | G05.4 | G05.4 | | HRV3,4 on/off |
| G06.2 | G06.2 | G06.2 | 01 | NURBS interpolation |
| G07 | G07 | G07 | 00 | Hypothtical axis interpolation |
| G07.1 | G07.1 | G07.1 | | Cylindrical interpolation |
| G08 | G08 | G08 | | Advanced preview control |
| G09 | G09 | G09 | | Exact stop |
| G10 | G10 | G10 | | Programmable data input |
| G10.6 | G10.6 | G10.6 | | Tool retract and recover |
| G10.9 | G10.9 | G10.9 | | Programmable switching of diameter/ radius specification |
| G11 | G11 | G11 | | Programmable data input mode cancel |
| G12.1 | G12.1 | G12.1 | 21 | Polar cooradinate interpolation mode |
| G13.1 | G13.1 | G13.1 | | Polar coordinate interpolation cancel mode |
| G15 | G15 | G15 | 24 | Polar coordinate command cancel |
| G16 | G16 | G16 | | Polar coordinate command |
| G17 | G17 | G17 | 16 | XpYp plane selection |
| G18 | G18 | G18 | | ZpXp plane selection |
| G19 | G19 | G19 | | YpZp plane selection |
| G20 | G20 | G20 | 06 | Input in inch |

**Notice**

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| G-Code System | | | Group | Function |
|---|---|---|---|---|
| A | B | C | | |
| G21 | G21 | G21 | | Input in inch |

## Benefits

- Increase of the programming flexibility of the CNC
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J871 | 30i-A G Code System B and C |
| A02B-0306-J871 | 31i-A5 G Code System B and C |
| A02B-0307-J871 | 31i-A G Code System B and C |
| A02B-0308-J871 | 32i-A G Code System B and C |
| A02B-0323-J871 | 30i-B G Code System B and C |
| A02B-0326-J871 | 31i-B5 G Code System B and C |
| A02B-0327-J871 | 31i-B G Code System B and C |
| A02B-0328-J871 | 32i-B G Code System B and C |

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# 231
## Program input

# Lathe / Machining Center G Code system switching function

## Features

This function switches over G code system of each path for lathe and machining center by certain programming commands (M codes).The optimum program command and function for each processing, the turning processing and the milling processing, is available by switching mode.

Note: tool offset for Milling and Turning function (R595) and Designation of Designation of Machine Control, Type Multiple System (S838/C) is required.

## Benefits

- Increase of the programming flexibility
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R597 | 30i-A Lathe/Machining Center G-Code System Switching Function |
| A02B-0306-R597 | 31i-A5 Lathe/Machining Center G-Code System Switching Function |
| A02B-0307-R597 | 31i-A Lathe/Machining Center G-Code System Switching Function |
| A02B-0308-R597 | 32i-A Lathe/Machining Center G-Code System Switching Function |
| A02B-0323-R597 | 30i-B Lathe/Machining Center G-Code System Switching Function |
| A02B-0326-R597 | 31i-B5 Lathe/Machining Center G-Code System Switching Function |
| A02B-0327-R597 | 31i-B Lathe/Machining Center G-Code System Switching Function |
| A02B-0328-R597 | 32i-B Lathe/Machining Center G-Code System Switching Function |

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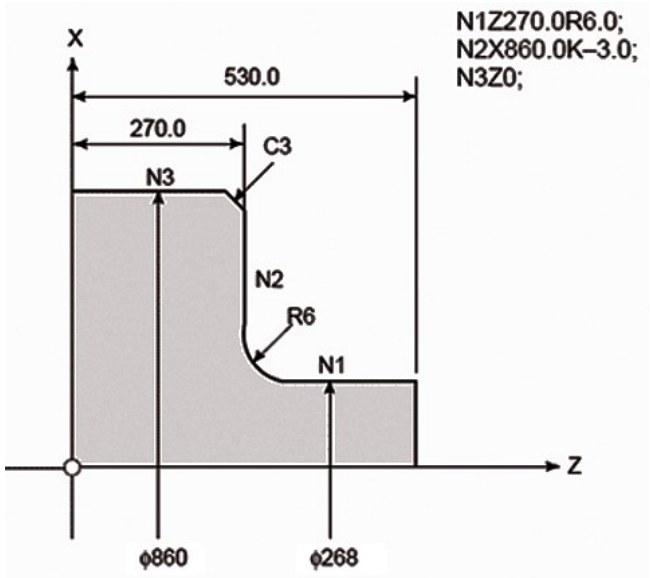
# 232

## Program input




# Chamfering / corner rounding

## Features

The Chamfering / Corner Radius function is used on turning ('T' type) controls to insert a defined 45-degree chamfer or radius between two single-axis linear move program blocks that intersect at right angles.

It allows the programmer to enter the hypothetical corner intersection coordinates without having to calculate the start and end points of the chamfer or radius.

## Benefits

- Simplifies programming of chamfers and radii between right angle linear moves
- Simplifies blueprint programming
- Easy shop-floor changes to add radii and chamfers to existing programs

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J875 | 30i-A Chamfering/Corner R (Turning) |
| A02B-0306-J875 | 31i-A5 Chamfering/Corner R (Turning) |
| A02B-0307-J875 | 31i-A Chamfering/Corner R (Turning) |
| A02B-0308-J875 | 32i-A Chamfering/Corner R (Turning) |
| A02B-0323-J875 | 30i-B Chamfering/Corner R (Turning) |
| A02B-0326-J875 | 31i-B5 Chamfering/Corner R (Turning) |
| A02B-0327-J875 | 31i-B Chamfering/Corner R (Turning) |
| A02B-0328-J875 | 32i-B Chamfering/Corner R (Turning) |

**Notice**

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# 233

## Program input

# Optional chamfering / corner rounding

## Features

The Optional Chamfering / Corner Radius function is used on milling ('M' type) controls to insert a defined chamfer or radius between any two linear or circular program moves.

It allows programming of geometry end-coordinates is if chamfer or corner rounding were not required. Then, chamfers or radii can easily be applied by appending to the first of the program blocks either a (comma),C_ %value% or (comma),R_ %value%.

## Benefits

- Simplifies programming of chamfers and radii
- Simplifies blueprint programming
- Easy shop floor changes to add or change radii and chamfers on existing programs without changing the program block end-coordinates.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S615 | 30i-A Optional Chamfering Corner R (Milling) |
| A02B-0306-S615 | 31i-A5 Optional Chamfering Corner R (Milling) |
| A02B-0307-S615 | 31i-A Optional Chamfering Corner R (Milling) |
| A02B-0308-S615 | 32i-A Optional Chamfering Corner R (Milling) |
| A02B-0323-S615 | 30i-B Optional Chamfering Corner R (Milling) |
| A02B-0326-S615 | 31i-B5 Optional Chamfering Corner R (Milling) |
| A02B-0327-S615 | 31i-B Optional Chamfering Corner R (Milling) |
| A02B-0328-S615 | 32i-B Optional Chamfering Corner R (Milling) |

**Notice**

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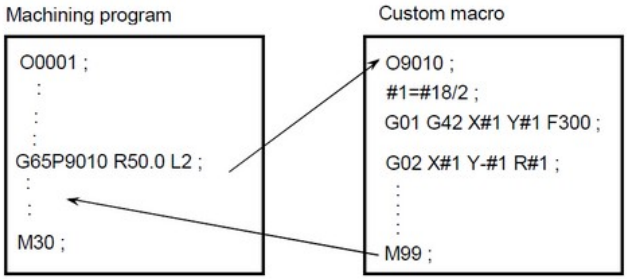


# Custom Macro

## Features

The Custom Macro function (similar to Basic programming) allows programming of G code with variables, logical expressions, conditional loops.

It also allows to read / write machine status to / from the NC program. It is required for Probing applications.

## Benefits

- Receipe management
- Custom Canned cycles
- CNC and operator messages
- Automation of the communication to the Ladder Logic program
- Automation of Probing system
- Update of offsets
- Reduction of Part Program size

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J873 | 30i-A Custom Macro |
| A02B-0303-R583 | 30i-A Custom Macro Variable Names with 31 Characters |
| A02B-0306-J873 | 31i-A5 Custom Macro |
| A02B-0306-R583 | 31i-A5 Custom Macro Variable Names with 31 Characters |
| A02B-0307-J873 | 31i-A Custom Macro |
| A02B-0307-R583 | 31i-A Custom Macro Variable Names with 31 Characters |
| A02B-0308-J873 | 32i-A Custom Macro |
| A02B-0308-R583 | 32i-A Custom Macro Variable Names with 31 Characters |
| A02B-0323-J873 | 30i-B Custom Macro |
| A02B-0323-R583 | 30i-B Custom Macro Variable Names with 31 Characters |
| A02B-0326-J873 | 31i-B5 Custom Macro |
| A02B-0326-R583 | 31i-B5 Custom Macro Variable Names with 31 Characters |
| A02B-0327-J873 | 31i-B Custom Macro |
| A02B-0327-R583 | 31i-B Custom Macro Variable Names with 31 Characters |
| A02B-0328-J873 | 32i-B Custom Macro |
| A02B-0328-R583 | 32i-B Custom Macro Variable Names with 31 Characters |

**Notice**

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# 235

## Program input

# Addition of Custom Macro common variables

## Features

Allows additional data fields for common variables (#100 and #500 series)

## Benefits

- Allows permanent data retention
- No need to re-write data
- Keep calibration data with the job
- No need to use same variable numbers for interim calculations
- Facilitates debugging of Macro B program

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J887 | 30i-A Addition of Custom Macro Common Variables, 500 Variables |
| A02B-0306-J887 | 31i-A5 Addition of Custom Macro Common Variables, 500 Variables |
| A02B-0307-J887 | 31i-A Addition of Custom Macro Common Variables, 500 Variables |
| A02B-0308-J887 | 32i-A Addition of Custom Macro Common Variables, 500 Variables |
| A02B-0323-J887 | 30i-B Addition of Custom Macro Common Variables, 500 Variables |
| A02B-0326-J887 | 31i-B5 Addition of Custom Macro Common Variables, 500 Variables |
| A02B-0327-J887 | 31i-B Addition of Custom Macro Common Variables, 500 Variables |
| A02B-0328-J887 | 32i-B Addition of Custom Macro Common Variables, 500 Variables |

**Notice**

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# 236

## Program input

# Addition of Custom Macro common variables 1000

## Features

The Addition of Custom Macro Common Variables 1000 function provides the possibility to use the custom macro common variables #150-#199, #550-#999, and #98000-#98499 in addition to custom macro common variables #100-#149 and #500-#549.

## Benefits

- Allows permanent data retention
- No need to re-write data
- Keep calibration data with the job
- No need to use same variable numbers for interim calculations
- Facilitates debugging of Macro B program

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R687 | 30i-A Addition of Custom Macro Common Variables, 1000 Variables |
| A02B-0306-R687 | 31i-A5 Addition of Custom Macro Common Variables, 1000 Variables |
| A02B-0307-R687 | 31i-A Addition of Custom Macro Common Variables, 1000 Variables |
| A02B-0308-R687 | 32i-A Addition of Custom Macro Common Variables, 1000 Variables |
| A02B-0323-R687 | 30i-B Addition of Custom Macro Common Variables, 1000 Variables |
| A02B-0326-R687 | 31i-B5 Addition of Custom Macro Common Variables, 1000 Variables |
| A02B-0327-R687 | 31i-B Addition of Custom Macro Common Variables, 1000 Variables |
| A02B-0328-R687 | 32i-B Addition of Custom Macro Common Variables, 1000 Variables |

**Notice**

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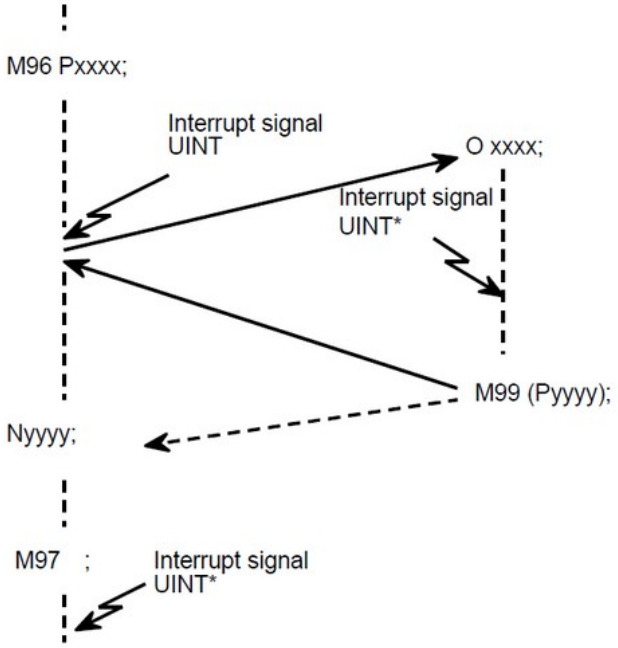
# 237

## Program input




# Interruption type Custom Macro

## Features

When custom macro interruption signal is input during automatic operation, the block currently under execution is interrupted and the specified custom macro is activated.

After execution of this custom macro, it returns to the interrupted block and continues execution of the remaining commands.

## Benefits

- Allows macro program to jump to specific instructions depending on conditions

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J874 | 30i-A Interruption Type Custom Macro |
| A02B-0306-J874 | 31i-A5 Interruption Type Custom Macro |
| A02B-0307-J874 | 31i-A Interruption Type Custom Macro |
| A02B-0308-J874 | 32i-A Interruption Type Custom Macro |
| A02B-0323-J874 | 30i-B Interruption Type Custom Macro |
| A02B-0326-J874 | 31i-B5 Interruption Type Custom Macro |
| A02B-0327-J874 | 31i-B Interruption Type Custom Macro |
| A02B-0328-J874 | 32i-B Interruption Type Custom Macro |

**Notice**

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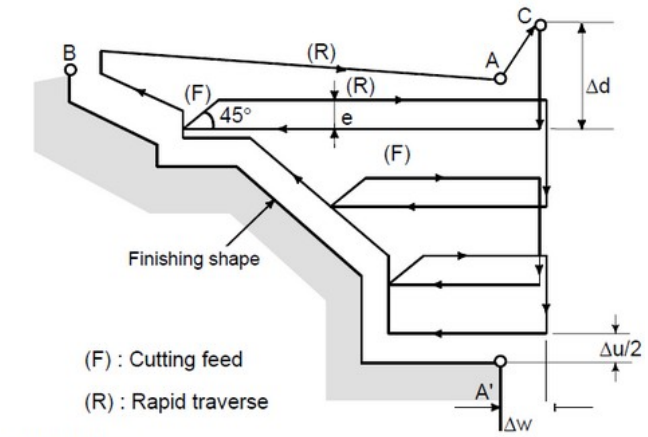
# 238

## Program input




```
G71 U(Δd) R(e);
G71 P(ns) Q(nf) U(Δu) W(Δw) F(f) S(s) T(t);
N(ns). . . .
. . . . . .
    F_
    S_
    T_
N(nf) . . . . ;
```

The move command of a finished shape of A to A' to B is specified in the blocks from sequence number ns to nf.

# Multi repetitive cycles

## Features

Multiple Repetitive Cycles are a series of seven additional Canned Cycles for Turning applications.

G70, G71, G72, G73, G74, G75 and G76 ease the programming of complex machining cycles.

1. G71 - Stock Removal in Turning. Type I figures only, no pockets.
2. G72 - Stock Removal in Facing. Type I figures only, no pockets.
3. G73 - Pattern Repeating.
4. G70 - Finishing
5. G74 - End Face Peck Drilling Cycle.
6. G75 - Outer Diameter / Internal Diameter Drilling Cycle.
7. G76 - Multiple Threading Cycle.

## Benefits

- Simplification of the CNC Programming
- Increase of the productivity of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J877 | 30i-A Multi-Repetitive Cycles |
| A02B-0306-J877 | 31i-A5 Multi-Repetitive Cycles |
| A02B-0307-J877 | 31i-A Multi-Repetitive Cycles |
| A02B-0308-J877 | 32i-A Multi-Repetitive Cycles |
| A02B-0323-J877 | 30i-B Multi-Repetitive Cycles |
| A02B-0326-J877 | 31i-B5 Multi-Repetitive Cycles |
| A02B-0327-J877 | 31i-B Multi-Repetitive Cycles |
| A02B-0328-J877 | 32i-B Multi-Repetitive Cycles |

**Notice**

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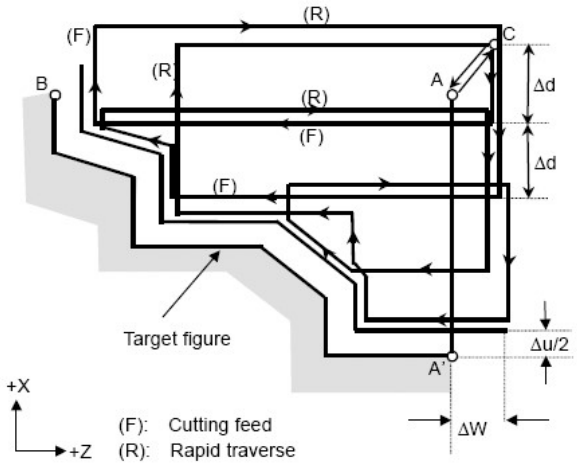
# 239

## Program input




# Multi repetitive cycles II

## Features

Multiple Repetitive Cycles II are an enhanced version of the Multiple Repetitive Cycles I, G71 and G72, that enable the programmer to define pockets on the work piece to be machined.

With Multiple Repetitive Cycles II, the tool cuts the work piece along the target figure (comp. picture).

## Benefits

- Simplification of the Programming of the cycles
- Increase of the productivity of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J889 | 30i-A Multi-Repetitive Cycles II |
| A02B-0306-J889 | 31i-A5 Multi-Repetitive Cycles II |
| A02B-0307-J889 | 31i-A Multi-Repetitive Cycles II |
| A02B-0308-J889 | 32i-A Multi-Repetitive Cycles II |
| A02B-0321-J889 | 0i-Mate-TD Multi-Repetitive Cycles II |
| A02B-0323-J889 | 30i-B Multi-Repetitive Cycles II |
| A02B-0326-J889 | 31i-B5 Multi-Repetitive Cycles II |
| A02B-0327-J889 | 31i-B Multi-Repetitive Cycles II |
| A02B-0328-J889 | 32i-B Multi-Repetitive Cycles II |

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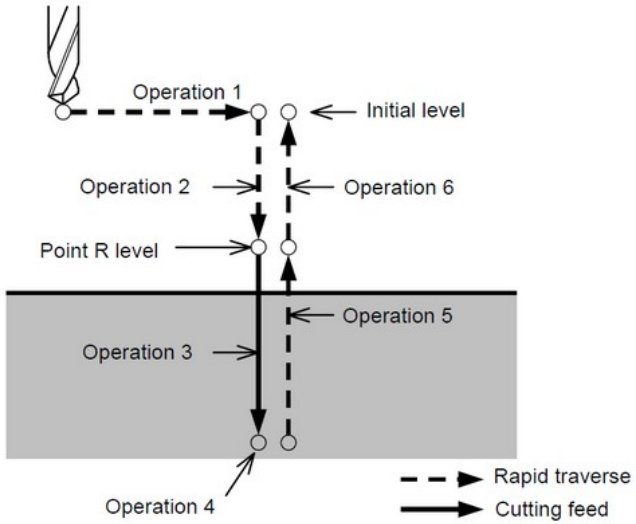
# 240
## Program input




# Canned cycles for drilling

## Features

Canned Cycles for Drilling are programming commands that perform complex drilling operations in a single command block.

## Benefits

- Simplification of the programming of complex cycles
- Increase of the productivity of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J890 | 30i-A Canned Cycles for Drilling |
| A02B-0306-J890 | 31i-A5 Canned Cycles for Drilling |
| A02B-0307-J890 | 31i-A Canned Cycles for Drilling |
| A02B-0308-J890 | 32i-A Canned Cycles for Drilling |
| A02B-0323-J890 | 30i-B Canned Cycles for Drilling |
| A02B-0326-J890 | 31i-B5 Canned Cycles for Drilling |
| A02B-0327-J890 | 31i-B Canned Cycles for Drilling |
| A02B-0328-J890 | 32i-B Canned Cycles for Drilling |

**Notice**

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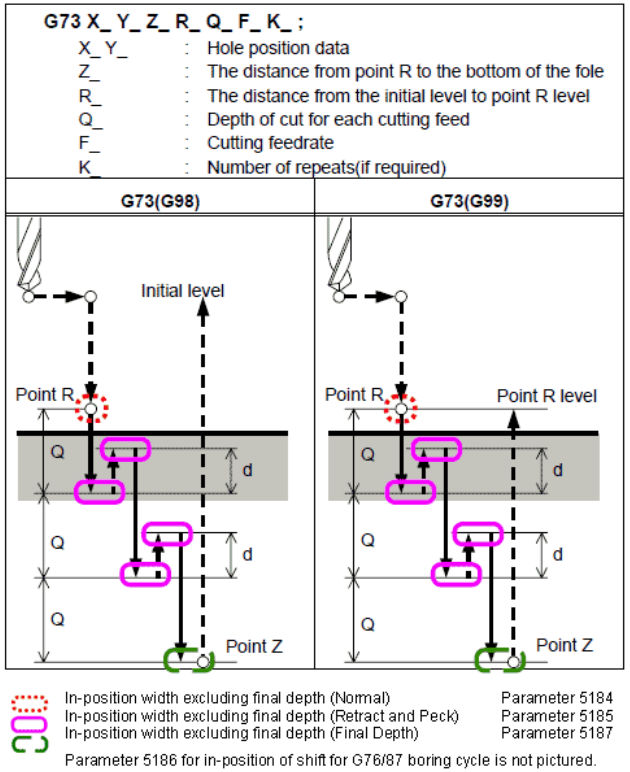
# 241
## Program input

High-Speed peck Drilling Cycle (G73)




# In-position check switching function for drilling canned cycle

## Features

Provides four dedicated in-position zone settings that are defined for use during drilling canned cycles. Three settings may be set to utilize larger in-position zones for moves within drilling canned cycles that do not require fine positioning. Cycle time is reduced by not spending excess time applying higher accuracy positioning when it is not required.

In-position zone setting for final depth of the drilling canned cycle is set separately, facilitating high accuracy positioning to meet part specifications.

## Benefits

- Reduces execution time of Drilling Canned Cycles
- Allows tighter In-Position zone to be used for final depth, without adverse affect on other drilling/positioning moves during the canned cycle
- Tool life during drilling cycles may be improved by more efficient operation

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R648 | 30i-A In-Position Check Switching Function for Canned Cycles for Drilling |
| A02B-0306-R648 | 31i-A5 In-Position Check Switching Function for Canned Cycles for Drilling |
| A02B-0307-R648 | 31i-A In-Position Check Switching Function for Canned Cycles for Drilling |
| A02B-0308-R648 | 32i-A In-Position Check Switching Function for Canned Cycles for Drilling |
| A02B-0323-R648 | 30i-B In-Position Check Switching Function for Canned Cycles for Drilling |
| A02B-0326-R648 | 31i-B5 In-Position Check Switching Function for Canned Cycles for Drilling |
| A02B-0327-R648 | 31i-B In-Position Check Switching Function for Canned Cycles for Drilling |
| A02B-0328-R648 | 32i-B In-Position Check Switching Function for Canned Cycles for Drilling |

**Notice**

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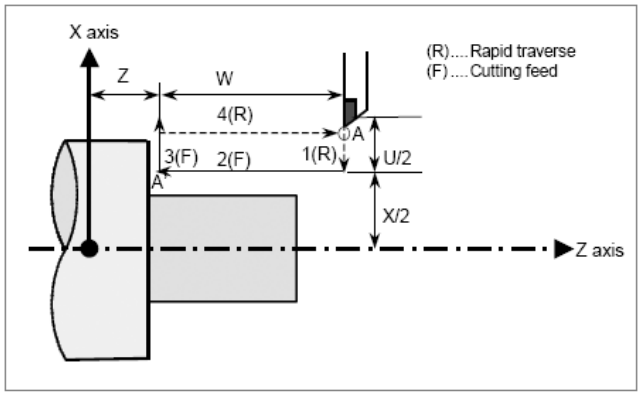
# 242
## Program input




**G77 X(U)_ Z(W)_ F_ ;** (G90 with G code system A)

X_,Z_ : Coordinates of the cutting end point (point A' in the above figure) in the direction of the length

U_,W_ : Travel distance to the cutting end point (point A' in the above figure) in the direction of the length

F_ : Cutting feedrate

# Canned cycles

## Features

Canned Cycles for Turning are modal G code blocks that will command the CNC to perform one of three complex operations and return to the start point.

The three canned cycles are: Outer Diameter/Internal Diameter Cutting canned cycle (G90), Threading canned cycle (G92), and End Face Turning canned cycle (G94).

## Benefits

- Simplification of the programming of complex cycles
- Increase of the productivity of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J890 | 30i-A Canned Cycles for Drilling |
| A02B-0306-J890 | 31i-A5 Canned Cycles for Drilling |
| A02B-0307-J890 | 31i-A Canned Cycles for Drilling |
| A02B-0308-J890 | 32i-A Canned Cycles for Drilling |
| A02B-0323-J890 | 30i-B Canned Cycles for Drilling |
| A02B-0326-J890 | 31i-B5 Canned Cycles for Drilling |
| A02B-0327-J890 | 31i-B Canned Cycles for Drilling |
| A02B-0328-J890 | 32i-B Canned Cycles for Drilling |
| A02B-0333-J890 | 35i-B Canned Cycles for Drilling |

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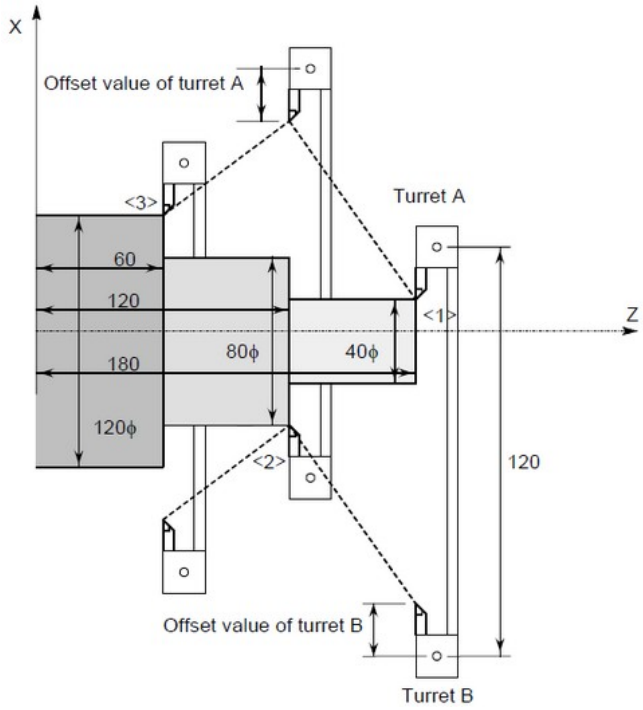
# 243

## Program input

# Mirror image for double turret




## Features

By applying mirror image to the X-axis with a G code, a machining program for the opposite tool post can be created for symmetric cutting as if the program were created in the coordinate system on the same side.

When G68 is designated, the coordinate system is shifted to the double turret side, and the X-axis sign is reversed from the programmed command to perform symmetrical cutting. To use this function, set the distance between the two tool posts to a parameter.

## Programming example

| | |
|---|---|
| X.40.0 Z180.0 T0101 | Position tool post A at '1' |
| G68 | Shift the coordinate system by the distance A to B (120mm), and turn mirror image on |
| X80.0 Z120.0 T0202 | Position tool post B at '2' |
| G69 | Shift the coordinate system by the distance B to A, and cancel mirror image. |
| X120.0 Z60.0 T0101 | Position tool post A at '3' |

## Benefits

- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J881 | 30i-A Mirror Image for Double Turret |
| A02B-0306-J881 | 31i-A5 Mirror Image for Double Turret |
| A02B-0307-J881 | 31i-A Mirror Image for Double Turret |
| A02B-0308-J881 | 32i-A Mirror Image for Double Turret |
| A02B-0323-J881 | 30i-B Mirror Image for Double Turret |
| A02B-0326-J881 | 31i-B5 Mirror Image for Double Turret |
| A02B-0327-J881 | 31i-B Mirror Image for Double Turret |
| A02B-0328-J881 | 32i-B Mirror Image for Double Turret |

**Notice**

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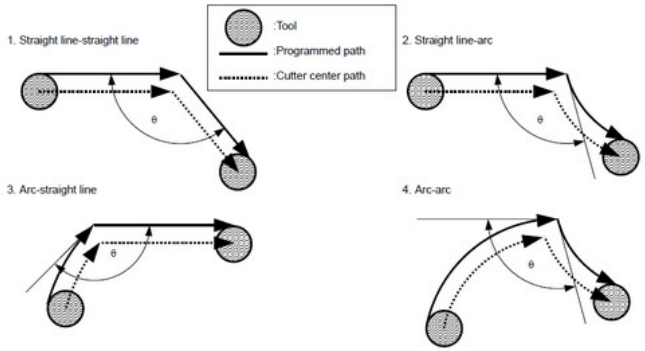
# 244

## Program input




# Automatic corner override

## Features

During cutter compensation, the cutting feed is over-ridden at corners while maintaining material removal rates.

## Benefits

- Improved tool life
- Improved surface finish
- Improved accuracy

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J891 | 30i-A Automatic Corner Override |
| A02B-0306-J891 | 31i-A5 Automatic Corner Override |
| A02B-0307-J891 | 31i-A Automatic Corner Override |
| A02B-0308-J891 | 32i-A Automatic Corner Override |
| A02B-0323-J891 | 30i-B Automatic Corner Override |
| A02B-0326-J891 | 31i-B5 Automatic Corner Override |
| A02B-0327-J891 | 31i-B Automatic Corner Override |
| A02B-0328-J891 | 32i-B Automatic Corner Override |

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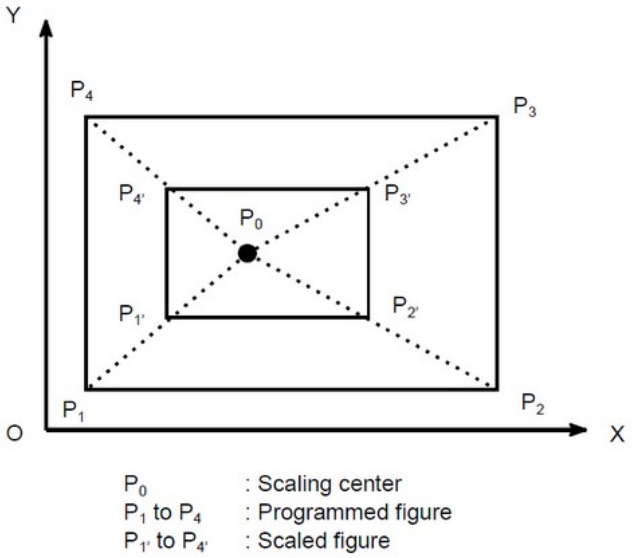
# 245
## Program input




$P_0$ : Scaling center
$P_1$ to $P_4$ : Programmed figure
$P_{1'}$ to $P_{4'}$ : Scaled figure

# Scaling

## Features

Scaling is the function that allows the programmed shape to be magnified or reduced in size.

The dimensions specified with X_, Y_, and Z_ can each be scaled up or down with the same or different rates of magnification. The magnification rate can be specified in the program. Unless specified in the program, the magnification rate specified in the parameter is applied.

## Benefits

- Reduce program size
- Flexibility in programming
- Easy changes on shop floor
- Programming convenience

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J892 | 30i-A Scaling |
| A02B-0306-J892 | 31i-A5 Scaling |
| A02B-0307-J892 | 31i-A Scaling |
| A02B-0308-J892 | 32i-A Scaling |
| A02B-0323-J892 | 30i-B Scaling |
| A02B-0326-J892 | 31i-B5 Scaling |
| A02B-0327-J892 | 31i-B Scaling |
| A02B-0328-J892 | 32i-B Scaling |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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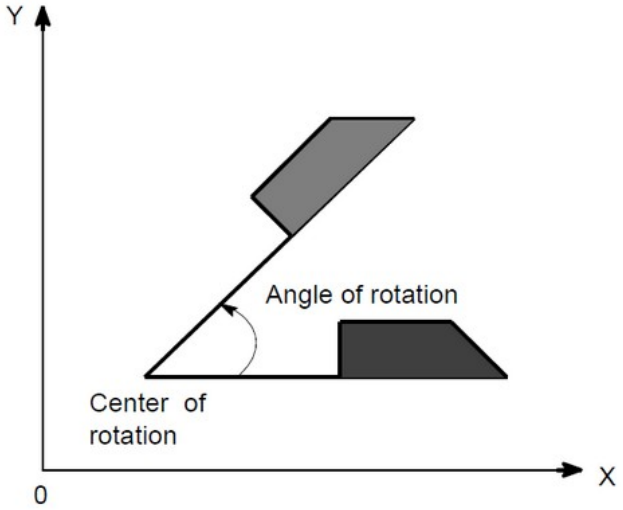
# 246

## Program input




# Coordinate system rotation

## Features

Programmed shape can be rotated by specifying the pivot point and desired angle.

## Benefits

- Minimize set up time
- Reduce program size
- Flexibility in programming
- No need to line up fixtures/Vise jaws perfectly

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J893 | 30i-A Coordinate System Rotation |
| A02B-0306-J893 | 31i-A5 Coordinate System Rotation |
| A02B-0307-J893 | 31i-A Coordinate System Rotation |
| A02B-0308-J893 | 32i-A Coordinate System Rotation |
| A02B-0323-J893 | 30i-B Coordinate System Rotation |
| A02B-0326-J893 | 31i-B5 Coordinate System Rotation |
| A02B-0327-J893 | 31i-B Coordinate System Rotation |
| A02B-0328-J893 | 32i-B Coordinate System Rotation |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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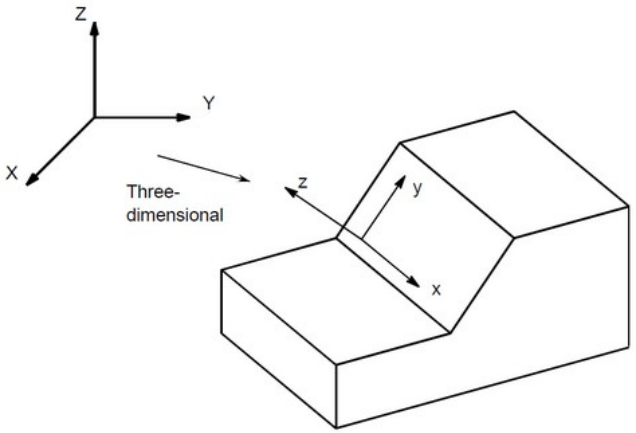
# 247

## Program input




# 3 dimensional coordinate system conversion

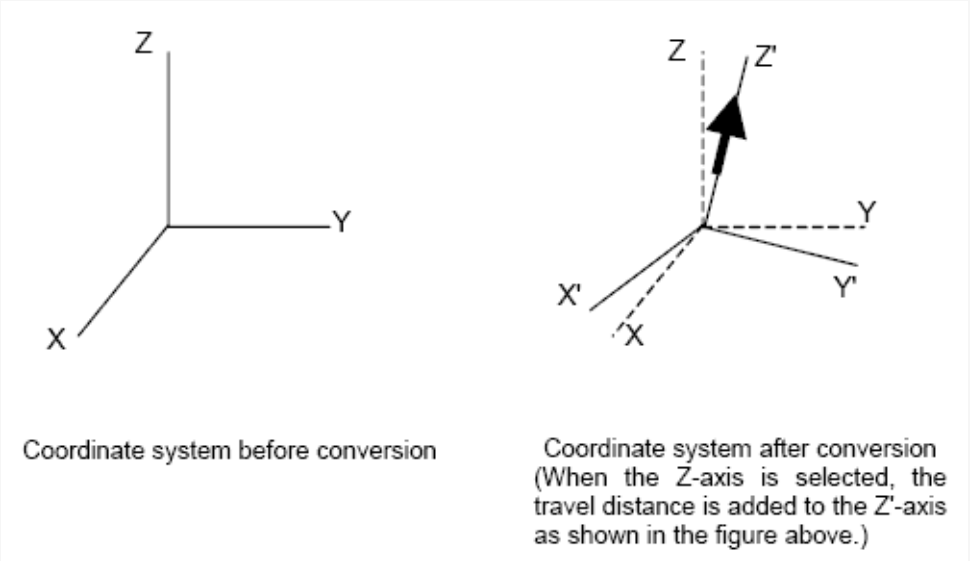
## Features

Coordinate conversion about an axis can be carried out if the center of rotation, direction of the axis of rotation, and angular displacement are specified.

This function is very useful in three-dimensional machining by a die-sinking, or similar, machine. For example, by executing a program created on the XY plane after applying 3 Dimensional Coordinate Conversion, machining can be performed on an arbitrary plane in a three-dimensional space.

By specifying rigid tapping in the 3-dimensional coordinate conversion mode, a tapping operation can be performed in the angle direction specified by the 3-dimensional coordinate conversion command (3-dimensional rigid tapping).

## Manual Interruption function of 3-Dimensional Coordinate Conversion




Coordinate system before conversion

Coordinate system after conversion (When the Z-axis is selected, the travel distance is added to the Z'-axis as shown in the figure above.)

By this function, when the handle of the manual pulse generator is rotated during the 3-dimensional coordinate conversion mode, the travel distance specified by the manual pulse generator is added to the travel distance during automatic operation.

This addition is performed for the new (converted) 3-dimensional coordinate component (programmed coordinate system) in the direction of the axis selected for manual feed using the manual pulse generator.

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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## Benefits

- Addition of 3D Coordinate Conversion to the CNC
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J713 | 30i-A 3-D Coordinate System Conversion |
| A02B-0303-S949 | 30i-A Manual Interruption of 3-D Coordinate System Conversion |
| A02B-0306-J713 | 31i-A5 3-D Coordinate System Conversion |
| A02B-0306-S949 | 31i-A5 Manual Interruption of 3-D Coordinate System Conversion |
| A02B-0307-J713 | 31i-A 3-D Coordinate System Conversion |
| A02B-0307-S949 | 31i-A Manual Interruption of 3-D Coordinate System Conversion |
| A02B-0308-J713 | 32i-A 3-D Coordinate System Conversion |
| A02B-0308-S949 | 32i-A Manual Interruption of 3-D Coordinate System Conversion |
| A02B-0319-J713 | 0i-TD 3-D Coordinate System Conversion |
| A02B-0320-J713 | 0i-MD 3-D Coordinate System Conversion |
| A02B-0323-J713 | 30i-B 3-D Coordinate System Conversion |
| A02B-0323-S949 | 30i-B Manual Interruption of 3-D Coordinate System Conversion |
| A02B-0326-J713 | 31i-B5 3-D Coordinate System Conversion |
| A02B-0326-S949 | 31i-B5 Manual Interruption of 3-D Coordinate System Conversion |
| A02B-0327-J713 | 31i-B 3-D Coordinate System Conversion |
| A02B-0327-S949 | 31i-B Manual Interruption of 3-D Coordinate System Conversion |
| A02B-0328-J713 | 32i-B 3-D Coordinate System Conversion |
| A02B-0328-S949 | 32i-B Manual Interruption of 3-D Coordinate System Conversion |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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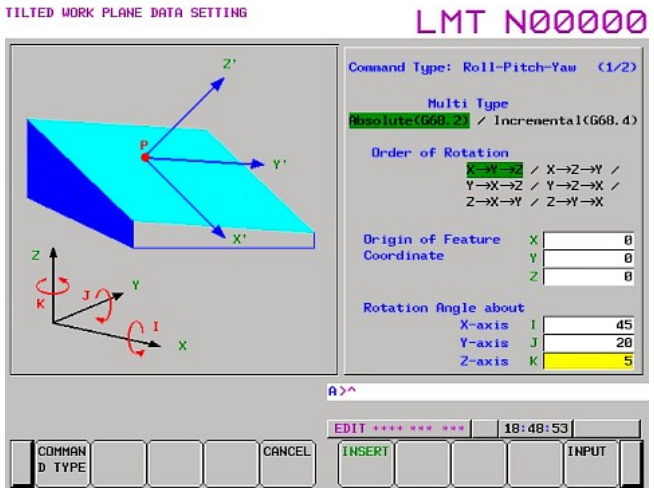
# 249

## Program input




# Tilted Working Plane (TWP)

## Features

Tilted Working Plane is used on 5 axes milling machines to define a plane, tilted relatively to the machine table. When a figure such as a hole or pocket is cut on a plane, tilted relatively to the reference surface of the workpiece, this function defines a coordinate system (referred to a "feature coordinate system") tied to the plane.

When specifying a position in such a coordinate system, a program can be created in a much easier way. A feature coordinate system is defined on a workpiece coordinate system. See the figure below for the relationship between a feature coordinate system and workpiece coordinate system.

This function is applicable to the "table type" machine configuration of the Robodrill.

## Tilted Working Plane Command with Guidance

With this enhancement of the "Tilted Working Plane" command, the following commands can be programmed using a specific graphical screen:

- Euler's Angle
- Roll-Pitch-Yaw
- Three points
- Two vectors
- Projection angles

The guidance screen for tilted working plane command creates a tilted working plane command block after the machine operator has entered tilted working plane data on an interactive screen. With this function, a complicated tilted working plane command block can be easily created.

## Benefits

- Addition of TWP command to the CNC
- Simplification of the programming for 5 axis machines
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R522 | 30i-A Tilted Working Plane Command with Guidance (Conventional Tilted Working Plane Command (-S676) Not Required) |
| A02B-0303-S676 | 30i-A Tilted Working Plane Command - Conventional |

**Notice**

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| Specification | Description |
|---|---|
| A02B-0306-R522 | 31i-A5 Tilted Working Plane Command with Guidance (Conventional Tilted Working Plane Command (-S676) Not Required) |
| A02B-0306-S676 | 31i-A5 Tilted Working Plane Command - Conventional |
| A02B-0307-R522 | 31i-A Tilted Working Plane Command with Guidance (Conventional Tilted Working Plane Command (-S676) Not Required) |
| A02B-0307-S676 | 31i-A Tilted Working Plane Command - Conventional |
| A02B-0320-R522 | 0i-MD Tilted Working Plane Indexing |
| A02B-0323-R522 | 30i-B Tilted Working Plane Indexing Command |
| A02B-0326-R522 | 31i-B5 Tilted Working Plane Indexing Command |
| A02B-0327-R522 | 31i-B Tilted Working Plane Indexing Command |

**Notice**

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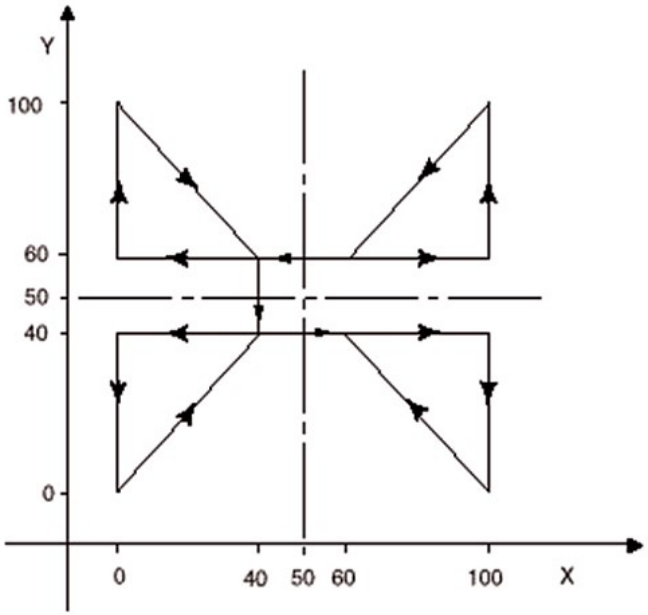
# 251
## Program input




# Programmable mirror image

## Features

Programmed shape can be mirror imaged about the axis of symmetry.

## Benefits

- Reduce Program size
- Flexibility in Programming
- Minimize math for creating programs
- Easy changes
- Real part programming convenience

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J880 | 30i-A Programmable Mirror Image |
| A02B-0306-J880 | 31i-A5 Programmable Mirror Image |
| A02B-0307-J880 | 31i-A Programmable Mirror Image |
| A02B-0308-J880 | 32i-A Programmable Mirror Image |
| A02B-0323-J880 | 30i-B Programmable Mirror Image |
| A02B-0326-J880 | 31i-B5 Programmable Mirror Image |
| A02B-0327-J880 | 31i-B Programmable Mirror Image |
| A02B-0328-J880 | 32i-B Programmable Mirror Image |

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# 252
## Program input

# Figure copying

## Features

Figure Copying is a function that allows machining to be repeated after moving or rotating the figure using a subprogram.

This can save part program storage space as multiple parts can be defined in one part program

## Benefits

- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J897 | 30i-A Figure Copying |
| A02B-0306-J897 | 31i-A5 Figure Copying |
| A02B-0307-J897 | 31i-A Figure Copying |
| A02B-0323-J897 | 30i-B Figure Copying |
| A02B-0326-J897 | 31i-B5 Figure Copying |
| A02B-0327-J897 | 31i-B Figure Copying |

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# 253

## Program input

# Tape format for Series 15 CNC

## Features

Tape Format for FS15 allows a control to execute part programs written for the Series 15 control (certain limitations apply).

## Benefits

- Use existing programs created for Series 15 CNC

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J882 | 30i-A Tape Format of CNC Series 15 |
| A02B-0306-J882 | 31i-A5 Tape Format of CNC Series 15 |
| A02B-0307-J882 | 31i-A Tape Format of CNC Series 15 |
| A02B-0308-J882 | 32i-A Tape Format of CNC Series 15 |
| A02B-0323-J882 | 30i-B Tape Format of CNC Series 15 |
| A02B-0326-J882 | 31i-B5 Tape Format of CNC Series 15 |
| A02B-0327-J882 | 31i-B Tape Format of CNC Series 15 |
| A02B-0328-J882 | 32i-B Tape Format of CNC Series 15 |

**Notice**

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# 254

## Program input

# Macro Executor

## Features

Fixed program sequences, machining technology cycles, advanced machining sequences or frequently repeated patterns can be written as sub-programs. These sub-programs are called Macro Programs.

Macros Programs are written using an advanced extended language and structure; they also feature parameters and variables.

The Macro Programs (also called P-CODE Macro) are compiled in executable code using the Macro Compiler (refer to the software section of this catalogue for further details about the compiler).

The Macro Executor function provides to the CNC the capability to run the Macro Programs. Macro Programs are divided in 3 categories:

- Execution Macro functions
- Conversational Macro functions
- Auxiliary Macro functions

## Execution Macro function

The Execution Macro function calls and executes the Macro Programs (P-CODE macro) from the Parts Program of the CNC using different methods (G, M, T or specific code as well as a program call).

## Conversational Macro function

When the Conversational Macro function key is pressed on the MDI, the conversational macro function calls and executes a special macro program which is specialized in processing screens (conversational macro). The screen displayed by the program is called the conventional macro screen or user screen.

## Auxiliary Macro function

At power-on, the Auxiliary Macro function calls and executes a macro program for performing auxiliary processing (auxiliary macro).

## Benefits

- High speed execution: a macro program run as compiled executable and is fast, so that machining time can be reduced and machining precision can be improved.
- The P-CODE is stored in the CNC Flash ROM (F-ROM); it provides additional safety and reliability.

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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- A program compiled to the execution format cannot be displayed on the CNC program screen, so that the know-how related to the cycles can be protected.
- The user can call the execution Macro program with an easy call procedure
- An original screen can be created using graphic display. Screens can be selected by the use of soft keys.
- Possibility to create advanced machining cycles, interfactive screens for operators, communication management, etc.
- Improvement of the machine efficiency and productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J888 | 30i-A Macro Executor |
| A02B-0306-J888 | 31i-A5 Macro Executor |
| A02B-0307-J888 | 31i-A Macro Executor |
| A02B-0308-J888 | 32i-A Macro Executor |
| A02B-0319-J888 | 0i-TD Macro Executor |
| A02B-0320-J888 | 0i-MD Macro Executor |
| A02B-0321-J888 | 0i-Mate-TD Macro Executor |
| A02B-0322-J888 | 0i-Mate-MD Macro Executor |
| A02B-0323-J888 | 30i-B Macro Executor |
| A02B-0326-J888 | 31i-B5 Macro Executor |
| A02B-0327-J888 | 31i-B Macro Executor |
| A02B-0328-J888 | 32i-B Macro Executor |
| A02B-0329-J888 | 30i-LB Macro Executor |
| A02B-0330-J888 | 31i-LB Macro Executor |
| A02B-0331-J888 | 30i-PB Macro Executor |
| A02B-0332-J888 | 31i-PB Macro Executor |

**Notice**

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# 256
## Program input

# Extended conversational macro function

## Features

With the Extended Conversational Macro function, a set of macro instructions are available to improve the flexibility of the screen display / management.

## Overview of the functions

- Window display
- Display of external characters at any position
- Display of 2-by-2 characters
- Shift and scale in the graphical coordinate system

## Benefits

- Simplifies the programming of complex Human Machine Interfaces

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0323-S798 | 30i-B Extended Conversational Macro Function |
| A02B-0326-S798 | 31i-B5 Extended Conversational Macro Function |
| A02B-0327-S798 | 31i-B Extended Conversational Macro Function |
| A02B-0328-S798 | 32i-B Extended Conversational Macro Function |

**Notice**

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# 257

## Program input

# Macro Executor + C Language Executor

## Features

## Macro Executor

Fixed program sequences, machining technology cycles, advanced machining sequences or frequently repeated patterns can be written as sub-programs. These sub-programs are called Macro Programs.

Macros Programs are written using an advanced extended language and structure; they also feature parameters and variable.

The Macro programs (also called P-CODE Macro) are compiled in executable code using the Macro Compiler (refer to the software section of this catalogue for further details about the compiler).

The Macro Executor function provides to the CNC the capability to run the Macro Programs. Macro Programs are divided in 3 categories:

- Execution Macro functions
- Conversational Macro functions
- Auxiliary Macro functions

Execution Macro function

The Execution Macro function calls and executes the Macro Programs (P-CODE macro) from the Parts Program of the CNC using different methods (G, M, T or specific code as well as a program call).

Conversational Macro function

When the Conversational Macro function key is pressed on the MDI, the conversational macro function calls and executes a special macro program which is specialized in processing screens (conversational macro). The screen displayed by the program is called the conventional macro screen or user screen.

Auxiliary Macro function

At power-on, the Auxiliary Macro function calls and executes a macro program for performing auxiliary processing (auxiliary macro).

## C-language Executor

The C-language executor function is used to customize screen display and implement a mechanism for user-specific operation as with the macro executor function. Instead of macro statements, application programs for display and operation can be created using the general C programming language. It also has all the benefits of the Macro executor.

**Notice**

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C-Language executor requires the selection of an amount of Custom Software Size storage space between 256kB and 12MB in the Flash Rom (F-ROM). The size of the memory depends on the CNC type and the options selected.

## Benefits

- High speed execution: a macro program run as compiled executable and is fast, so that machining time can be reduced and machining precision can be improved.
- The P-CODE is stored in the CNC Flash ROM (F-ROM); it provides additional safety and reliability.
- A program compiled to the execution format cannot be displayed on the CNC program screen, so that the know-how related to the cycles can be protected.
- The user can call the execution Macro program with an easy call procedure
- An original screen can be created using graphic display. Screens can be selected by the use of soft keys.
- Possibility to create advanced machining cycles, interfactive screens for operators, communication management, etc.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J734 | 30i-A Macro Executor and C-Language Executor |
| A02B-0306-J734 | 31i-A5 Macro Executor and C-Language Executor |
| A02B-0307-J734 | 31i-A Macro Executor and C-Language Executor |
| A02B-0308-J734 | 32i-A Macro Executor and C-Language Executor |
| A02B-0319-J734 | 0i-TD Macro Executor and C-Language Executor |
| A02B-0320-J734 | 0i-MD Macro Executor and C-Language Executor |
| A02B-0321-J734 | 0i-Mate-TD Macro Executor and C-Language Executor |
| A02B-0322-J734 | 0i-Mate-MD Macro Executor and C-Language Executor |
| A02B-0323-J734 | 30i-B Macro Executor and C-Language Executor |
| A02B-0326-J734 | 31i-B5 Macro Executor and C-Language Executor |
| A02B-0327-J734 | 31i-B Macro Executor and C-Language Executor |
| A02B-0328-J734 | 32i-B Macro Executor and C-Language Executor |
| A02B-0329-J734 | 30i-LB Macro Executor and C-Language Executor |
| A02B-0330-J734 | 31i-LB Macro Executor and C-Language Executor |
| A02B-0331-J734 | 30i-PB Macro Executor and C-Language Executor |
| A02B-0332-J734 | 31i-PB Macro Executor and C-Language Executor |

**Notice**

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# 259
## Program input

# C Language Executor additional SRAM

## Features

If the Static Random Access Memory (SRAM) area required for applications created with the C-language executor exceeds the standard size, which is 63K bytes, the SRAM area can optionally be expanded to up to 255K bytes.

The memory of the Series 0i-D CNC can be extended to a maximum of 192K bytes.

## Benefits

- Addition of additional processing memory for C-Language
- Increase of the processing capabilities
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J736 | 30i-A C-Language Executor, Additional SRAM |
| A02B-0306-J736 | 31i-A5 C-Language Executor, Additional SRAM |
| A02B-0307-J736 | 31i-A C-Language Executor, Additional SRAM |
| A02B-0308-J736 | 32i-A C-Language Executor, Additional SRAM |
| A02B-0319-J736 | 0i-TD C-Language Executor, Additional SRAM |
| A02B-0320-J736 | 0i-MD C-Language Executor, Additional SRAM |
| A02B-0323-J736 | 30i-B C-Language Executor, Additional SRAM |
| A02B-0326-J736 | 31i-B5 C-Language Executor, Additional SRAM |
| A02B-0327-J736 | 31i-B C-Language Executor, Additional SRAM |
| A02B-0328-J736 | 32i-B C-Language Executor, Additional SRAM |

**Notice**

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# 260
## Program input

# Middle level task for C Language Executor

## Features

Middle-Level Task is the independent task of C Language Executor ordinary tasks (Main Task, Auxiliary Tasks and Window Task), and is a task executed at a constant start interval.

The processing time of Middle-Level Task is divided from the processing time allocated in High-Level Task according to the parameter, and Middle-Level Task can be executed as a task in addition to High-Level Task.

Start interval of Middle-Level Task can be selected by the parameter while the start interval of a High-Level Task is constant.

## Benefits

- Addition of additional task management capabilities for the C-Language Executor
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R550 | 30i-A Middle-Level Task of C-Language Executor |
| A02B-0306-R550 | 31i-A5 Middle-Level Task of C-Language Executor |
| A02B-0307-R550 | 31i-A Middle-Level Task of C-Language Executor |
| A02B-0308-R550 | 32i-A Middle-Level Task of C-Language Executor |
| A02B-0323-R550 | 30i-B Middle-Level Task of C-Language Executor |
| A02B-0326-R550 | 31i-B5 Middle-Level Task of C-Language Executor |
| A02B-0327-R550 | 31i-B Middle-Level Task of C-Language Executor |
| A02B-0328-R550 | 32i-B Middle-Level Task of C-Language Executor |

**Notice**

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# 261
## Program input

# Custom software size

## Features

Custom Software Size is the size of custom software that can be used from the Macro Executor and C-Language Executor programs.

When a multi-path system is used, the total size required for all paths needs to be selected. This amount of space is reserved in the systems Flash-ROM (FROM) memory.

## Benefits

- Addition of additional storage memory for C-Language
- Increase of the processing capabilities
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J738#12M | 30i-A Custom Software Size for Main CPU, 12 MB |
| A02B-0303-J738#1M | 30i-A Custom Software Size for Main CPU, 1 MB |
| A02B-0303-J738#256K | 30i-A Custom Software Size for Main CPU, 256 kB |
| A02B-0303-J738#2M | 30i-A Custom Software Size for Main CPU, 2 MB |
| A02B-0303-J738#3M | 30i-A Custom Software Size for Main CPU, 3 MB |
| A02B-0303-J738#4M | 30i-A Custom Software Size for Main CPU, 4 MB |
| A02B-0303-J738#512K | 30i-A Custom Software Size for Main CPU, 512 kB |
| A02B-0303-J738#5M | 30i-A Custom Software Size for Main CPU, 5 MB |
| A02B-0303-J738#6M | 30i-A Custom Software Size for Main CPU, 6 MB |
| A02B-0303-J738#8M | 30i-A Custom Software Size for Main CPU, 8 MB |
| A02B-0306-J738#12M | 31i-A5 Custom Software Size for Main CPU, 12 MB |
| A02B-0306-J738#1M | 31i-A5 Custom Software Size for Main CPU, 1 MB |
| A02B-0306-J738#256K | 31i-A5 Custom Software Size for Main CPU, 256 kB |
| A02B-0306-J738#2M | 31i-A5 Custom Software Size for Main CPU, 2 MB |
| A02B-0306-J738#3M | 31i-A5 Custom Software Size for Main CPU, 3 MB |
| A02B-0306-J738#4M | 31i-A5 Custom Software Size for Main CPU, 4 MB |
| A02B-0306-J738#512K | 31i-A5 Custom Software Size for Main CPU, 512 kB |
| A02B-0306-J738#5M | 31i-A5 Custom Software Size for Main CPU, 5 MB |
| A02B-0306-J738#6M | 31i-A5 Custom Software Size for Main CPU, 6 MB |
| A02B-0306-J738#8M | 31i-A5 Custom Software Size for Main CPU, 8 MB |

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| Specification | Description |
|---|---|
| A02B-0307-J738#12M | 31i-A Custom Software Size for Main CPU, 12 MB |
| A02B-0307-J738#1M | 31i-A Custom Software Size for Main CPU, 1 MB |
| A02B-0307-J738#256K | 31i-A Custom Software Size for Main CPU, 256 kB |
| A02B-0307-J738#2M | 31i-A Custom Software Size for Main CPU, 2 MB |
| A02B-0307-J738#3M | 31i-A Custom Software Size for Main CPU, 3 MB |
| A02B-0307-J738#4M | 31i-A Custom Software Size for Main CPU, 4 MB |
| A02B-0307-J738#512K | 31i-A Custom Software Size for Main CPU, 512 kB |
| A02B-0307-J738#5M | 31i-A Custom Software Size for Main CPU, 5 MB |
| A02B-0307-J738#6M | 31i-A Custom Software Size for Main CPU, 6 MB |
| A02B-0307-J738#8M | 31i-A Custom Software Size for Main CPU, 8 MB |
| A02B-0308-J738#1M | 32i-A Custom Software Size for Main CPU, 1 MB |
| A02B-0308-J738#256K | 32i-A Custom Software Size for Main CPU, 256 kB |
| A02B-0308-J738#2M | 32i-A Custom Software Size for Main CPU, 2 MB |
| A02B-0308-J738#3M | 32i-A Custom Software Size for Main CPU, 3 MB |
| A02B-0308-J738#4M | 32i-A Custom Software Size for Main CPU, 4 MB |
| A02B-0308-J738#512K | 32i-A Custom Software Size for Main CPU, 512 kB |
| A02B-0308-J738#5M | 32i-A Custom Software Size for Main CPU, 5 MB |
| A02B-0308-J738#6M | 32i-A Custom Software Size for Main CPU, 6 MB |
| A02B-0308-J738#8M | 32i-A Custom Software Size for Main CPU, 8 MB |
| A02B-0319-J738#12M | 0i-TD Custom Software Size, 12 MB |
| A02B-0319-J738#1M | 0i-TD Custom Software Size, 1 MB |
| A02B-0319-J738#2M | 0i-TD Custom Software Size, 2 MB |
| A02B-0319-J738#3M | 0i-TD Custom Software Size, 3 MB |
| A02B-0319-J738#4M | 0i-TD Custom Software Size, 4 MB |
| A02B-0319-J738#512K | 0i-TD Custom Software Size, 512 kB |
| A02B-0319-J738#5M | 0i-TD Custom Software Size, 5 MB |
| A02B-0319-J738#6M | 0i-TD Custom Software Size, 6 MB |
| A02B-0319-J738#8M | 0i-TD Custom Software Size, 8 MB |
| A02B-0320-J738#12M | 0i-MD Custom Software Size, 12 MB |
| A02B-0320-J738#2M | 0i-MD Custom Software Size, 2 MB |
| A02B-0320-J738#4M | 0i-MD Custom Software Size, 4 MB |
| A02B-0320-J738#512K | 0i-MD Custom Software Size, 512 kB |
| A02B-0320-J738#6M | 0i-MD Custom Software Size, 6 MB |
| A02B-0321-J738#4M | 0i-Mate-TD Custom Software Size, 4 MB |
| A02B-0321-J738#512K | 0i-Mate-TD Custom Software Size, 512 kB |
| A02B-0322-J738#4M | 0i-Mate-MD Custom Software Size, 4 MB |
| A02B-0322-J738#512K | 0i-Mate-MD Custom Software Size, 512 kB |
| A02B-0323-J738#12M | 30i-B Custom Software Size Main CPU, 12 MB |
| A02B-0323-J738#2M | 30i-B Custom Software Size Main CPU, 2 MB |
| A02B-0323-J738#4M | 30i-B Custom Software Size Main CPU, 4 MB |

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| Specification | Description |
|---|---|
| A02B-0323-J738#512K | 30i-B Custom Software Size Main CPU, 512 kB |
| A02B-0323-J738#6M | 30i-B Custom Software Size Main CPU, 6 MB |
| A02B-0323-J738#8M | 30i-B Custom Software Size Main CPU, 8 MB |
| A02B-0326-J738#12M | 31i-B5 Custom Software Size Main CPU, 12 MB |
| A02B-0326-J738#2M | 31i-B5 Custom Software Size Main CPU, 2 MB |
| A02B-0326-J738#4M | 31i-B5 Custom Software Size Main CPU, 4 MB |
| A02B-0326-J738#512K | 31i-B5 Custom Software Size Main CPU, 512 kB |
| A02B-0326-J738#6M | 31i-B5 Custom Software Size Main CPU, 6 MB |
| A02B-0326-J738#8M | 31i-B5 Custom Software Size Main CPU, 8 MB |
| A02B-0327-J738#12M | 31i-B Custom Software Size Main CPU, 12 MB |
| A02B-0327-J738#2M | 31i-B Custom Software Size Main CPU, 2 MB |
| A02B-0327-J738#4M | 31i-B Custom Software Size Main CPU, 4 MB |
| A02B-0327-J738#512K | 31i-B Custom Software Size Main CPU, 512 kB |
| A02B-0327-J738#6M | 31i-B Custom Software Size Main CPU, 6 MB |
| A02B-0327-J738#8M | 31i-B Custom Software Size Main CPU, 8 MB |
| A02B-0328-J738#12M | 32i-B Custom Software Size Main CPU, 12 MB |
| A02B-0328-J738#2M | 32i-B Custom Software Size Main CPU, 2 MB |
| A02B-0328-J738#4M | 32i-B Custom Software Size Main CPU, 4 MB |
| A02B-0328-J738#512K | 32i-B Custom Software Size Main CPU, 512 kB |
| A02B-0328-J738#6M | 32i-B Custom Software Size Main CPU, 6 MB |
| A02B-0328-J738#8M | 32i-B Custom Software Size Main CPU, 8 MB |
| A02B-0333-J738#12M | 35i-B Custom Software Size Main CPU, 12 MB |
| A02B-0333-J738#2M | 35i-B Custom Software Size Main CPU, 2 MB |
| A02B-0333-J738#4M | 35i-B Custom Software Size Main CPU, 4 MB |
| A02B-0333-J738#6M | 35i-B Custom Software Size Main CPU, 6 MB |
| A02B-0333-J738#8M | 35i-B Custom Software Size Main CPU, 8 MB |

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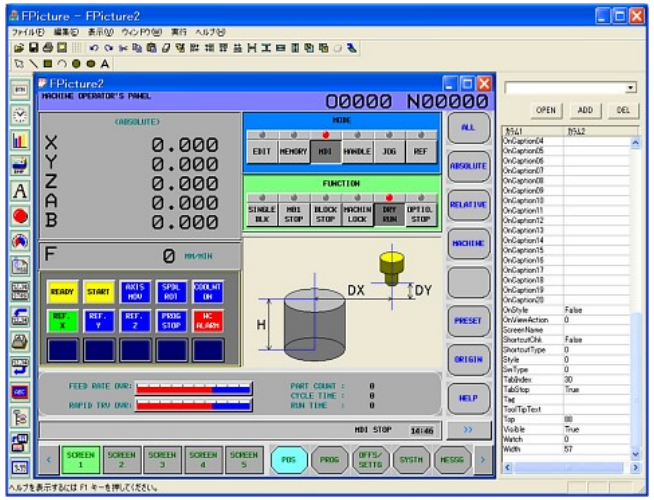
# 264

## Program input




# FANUC PICTURE Executor

## Features

FANUC PICTURE Executor is a function in the CNC allowing the execution of HMI projects created by the FANUC PICTURE for Windows® software.

FANUC PICTURE provides an easy way to create custom operator and HMI screens to drive a complex process.

The screens are created using a development software called FANUC PICTURE for Windows®. The software has all the functions and features of modern HMI software tools, supports objects, animations, data, multi-language and also feature a macro language to run routines to perform tasks.

The screens are compiled and stored in the CNC Flash-ROM (FROM) memory and are rendered directly by the CNC without requiring any Windows operating system or runtime.

FANUC PICTURE supports multi-language projects; on multi-language projects, the language of the HMI application can be switched on the fly by the operator.

## Benefits

- Easy screen customization capabilities
- Simplification of the operator work on production machine
- Reduction of operation error on production machines
- Simplification of the machine and process control
- Improvement of the overall machine or production line productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S879 | 30i-A FANUC PICTURE Function - Touch Panel Display |
| A02B-0303-S944 | 30i-A FANUC PICTURE Function - Non-Touch Panel Display |
| A02B-0306-S879 | 31i-A5 FANUC PICTURE Function - Touch Panel Display |
| A02B-0306-S944 | 31i-A5 FANUC PICTURE Function - Non-Touch Panel Display |
| A02B-0307-S879 | 31i-A FANUC PICTURE Function - Touch Panel Display |
| A02B-0307-S944 | 31i-A FANUC PICTURE Function - Non-Touch Panel Display |
| A02B-0308-S879 | 32i-A FANUC PICTURE Function - Touch Panel Display |
| A02B-0308-S944 | 32i-A FANUC PICTURE Function - Non-Touch Panel Display |
| A02B-0319-R644 | 0i-TD FANUC PICTURE Executor |
| A02B-0319-S881 | 0i-TD FANUC PICTURE Function - Touch Panel Control C (Includes Custom Software Size 6 MB) |

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| Specification | Description |
|---|---|
| A02B-0320-R644 | 0i-MD FANUC PICTURE Executor |
| A02B-0320-S881 | 0i-MD FANUC PICTURE Function - Touch Panel Control C (Includes Custom Software Size 6 MB) |
| A02B-0321-R644 | 0i-Mate-TD FANUC PICTURE Executor |
| A02B-0322-R644 | 0i-Mate-MD FANUC PICTURE Executor |
| A02B-0323-R644 | 30i-B FANUC PICTURE Executor |
| A02B-0323-S879 | 30i-B FANUC PICTURE Function - Touch Panel Display |
| A02B-0323-S944 | 30i-B FANUC PICTURE Function - Non-Touch Panel Display |
| A02B-0326-R644 | 31i-B5 FANUC PICTURE Executor |
| A02B-0326-S879 | 31i-B5 FANUC PICTURE Function - Touch Panel Display |
| A02B-0326-S944 | 31i-B5 FANUC PICTURE Function - Non-Touch Panel Display |
| A02B-0327-R644 | 31i-B FANUC PICTURE Executor |
| A02B-0327-S879 | 31i-B FANUC PICTURE Function - Touch Panel Display |
| A02B-0327-S944 | 31i-B FANUC PICTURE Function - Non-Touch Panel Display |
| A02B-0328-R644 | 32i-B FANUC PICTURE Executor |
| A02B-0328-S879 | 32i-B FANUC PICTURE Function - Touch Panel Display |
| A02B-0328-S944 | 32i-B FANUC PICTURE Function - Non-Touch Panel Display |
| A02B-0333-R644 | 35i-B FANUC PICTURE Executor |
| A02B-0333-R708 | 35i-B FANUC PICTURE Function - Touch Panel Display |
| A02B-0334-R644 | PM i-A FANUC PICTURE Executor |
| A02B-0334-R708 | PM i-A FANUC PICTURE Function - Touch Panel Display |

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# 266

## Program input

# Embedded macro

## Features

This function protects a program created by a machine tool builder, by storing the program in an exclusive folder to embedded macros (hereinafter referred to as an MTB1 folder) and assigning an attribute to the folder.

At the same time, the following functions are available:

- An exclusive program memory capacity of 100K bytes (corresponding to about 260 m) is provided in addition the ordinary program memory capacity. The number of registerable programs remains unchanged from the ordinary number of registerable programs.
- Attributes such as edit lock and edit/display lock can be assigned to the MTB1 folder. In addition, a set values can be locked using an exclusive password.
- A program stored in the MTB1 folder can be called based on a M/T codes or G code; subprogram can be called using M code.
- Custom macro common variables (#200 to #499) are added.

## Benefits

- Protection of programs

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S652#128K | 30i-A Embedded Macro, 128 kB |
| A02B-0306-S652#128K | 31i-A5 Embedded Macro, 128 kB |
| A02B-0307-S652#128K | 31i-A Embedded Macro, 128 kB |
| A02B-0308-S652#128K | 32i-A Embedded Macro, 128 kB |
| A02B-0323-S652#128K | 30i-B Embedded Macro, 128 kB |
| A02B-0326-S652#128K | 31i-B5 Embedded Macro, 128 kB |
| A02B-0327-S652#128K | 31i-B Embedded Macro, 128 kB |
| A02B-0328-S652#128K | 32i-B Embedded Macro, 128 kB |

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# 267

## Program input

# Small-hole peck drilling cycle

## Features

The Small-Hole Peck Drilling Cycle performs a drilling operation that periodically retracts the tool above the parts surface (to a clearance position) to clear chips or flood the hole with coolant until the desired hole depth is reached.

## Benefits

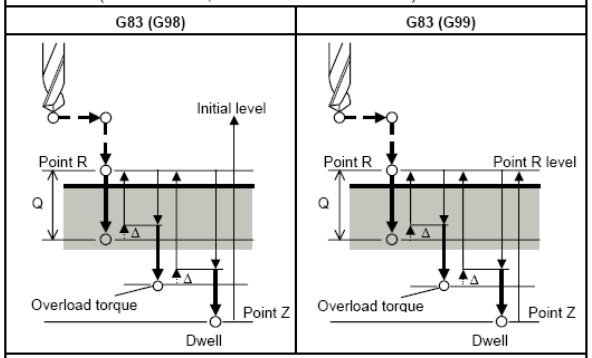
- Simplified Programming

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J896 | 30i-A Small-Hole Peck Drilling Cycle |
| A02B-0306-J896 | 31i-A5 Small Hole Peck Drilling Cycle |
| A02B-0307-J896 | 31i-A Small Hole Peck Drilling Cycle |
| A02B-0308-J896 | 32i-A Small Hole Peck Drilling Cycle |
| A02B-0323-J896 | 30i-B Small-Hole Peck Drilling Cycle |
| A02B-0326-J896 | 31i-B5 Small Hole Peck Drilling Cycle |
| A02B-0327-J896 | 31i-B Small Hole Peck Drilling Cycle |
| A02B-0328-J896 | 32i-B Small Hole Peck Drilling Cycle |

G83 X_ Y_ Z_ R_ Q_ F_I_ K_P ;

X_ Y_ : Hole position data
Z_ : Distance from point R to the bottom of the hole
R_ : Distance from the initial level to point R
Q_ : Depth of each cut
F_ : Cutting feedrate
I_ : Forward or backward traveling speed (same format as F above)
(If this is omitted, the values in parameters No.5172 and No.5173 are assumed as defaults.)
K_ : Number of times the operation is repeated (if required)
P_ : Dwell time at the bottom of the hole
(If this is omitted, P0 is assumed as the default.)




Δ: Initial clearance when the tool is retracted to point R and the clearance from the bottom of the hole in the second or subsequent drilling (parameter 5174)
Q: Depth of each cut
Path along which the tool travels at the rapid traverse rate
Path along which the tool travels at the programmed cutting feedrate
Path along which the tool travels at the forward or backward rate during the cycle specified with parameters

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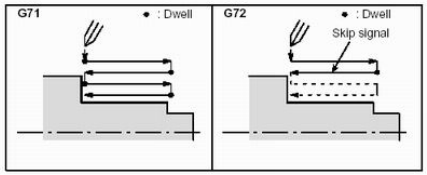
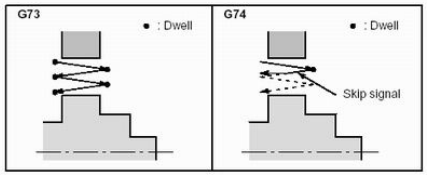
# 268

## Program input

Traverse grinding cycle (G71, G72)




Oscillating grinding cycle (73, G74)




# Canned cycle for grinding

## Features

Canned Cycles for Grinding provides an easier way for the programmer to create programs for grinding.

With a canned grinding cycle, repetitive operations peculiar to grinding can be specified in a single block with a G function. The repetitive machining specific to grinding can be specified by one block. Since four types of canned cycles are provided for grinding, programming is simplified.

## Benefits

- Simplified Programming

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S974 | 30i-A Canned Cycle for Grinding |
| A02B-0306-S974 | 31i-A5 Canned Cycle for Grinding |
| A02B-0307-S974 | 31i-A Canned Cycle for Grinding |
| A02B-0308-S974 | 32i-A Canned Cycle for Grinding |
| A02B-0319-S682 | 0i-TD Grinding Function A (for Machines without Angular Axis) - Incl. Multi-Step Skip, Canned Cycles for Grinding |
| A02B-0319-S683 | 0i-TD Grinding Function B (for Machines with Angular Axis) - Incl. Grinding Function A, Angular Axis Control |
| A02B-0320-S682 | 0i-MD Grinding Function A (for Machines without Angular Axis) - Incl. Multi-Step Skip, Canned Cycles for Grinding, Continuous Dressing, Infeed Control |
| A02B-0320-S683 | 0i-MD Grinding Function B (for Machines with Angular Axis) - Incl. Grinding Function A, Angular Axis Control |
| A02B-0323-S974 | 30i-B Canned Cycle for Grinding |
| A02B-0326-S974 | 31i-B5 Canned Cycle for Grinding |
| A02B-0327-S974 | 31i-B Canned Cycle for Grinding |
| A02B-0328-S974 | 32i-B Canned Cycle for Grinding |

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# 269

## Program input

# Real time custom macro

## Features

Used with an NC program, the real time custom macro function controls peripheral axes and signals.

If a macro statement is used together with an NC statement, a program using the conventional custom macro function executes the macro statement immediately when the macro statement is read. So, the macro statement cannot be executed independently of the NC statement.

On the other hand, the real time custom macro function enables the following control operations when a real time macro command (RTM command) is coded in an NC program.

## Key functions

- A real time macro command starts operation in synchronism with the NC statement and is executed independently During NC program execution, a real time macro command can be executed at the same time.
- PMC interface signals can be read and written (with a restriction). In an NC program, a motion using a signal as a trigger can be coded
- Variables dedicated to a real time macro command can be read and written
- A real time macro command can exercise axis control
- Multiple real time macro commands can be executed at the same time. Multiple real time custom macro statements can be coded in an NC program and can be controlled independently of each other

## Benefits

- Simplified Programming

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S842 | 30i-A Real Time Custom Macro |
| A02B-0306-S842 | 31i-A5 Real Time Custom Macro |
| A02B-0307-S842 | 31i-A Real Time Custom Macro |
| A02B-0308-S842 | 32i-A Real Time Custom Macro |
| A02B-0323-S842 | 30i-B Real Time Custom Macro |
| A02B-0326-S842 | 31i-B5 Real Time Custom Macro |
| A02B-0327-S842 | 31i-B Real Time Custom Macro |
| A02B-0328-S842 | 32i-B Real Time Custom Macro |

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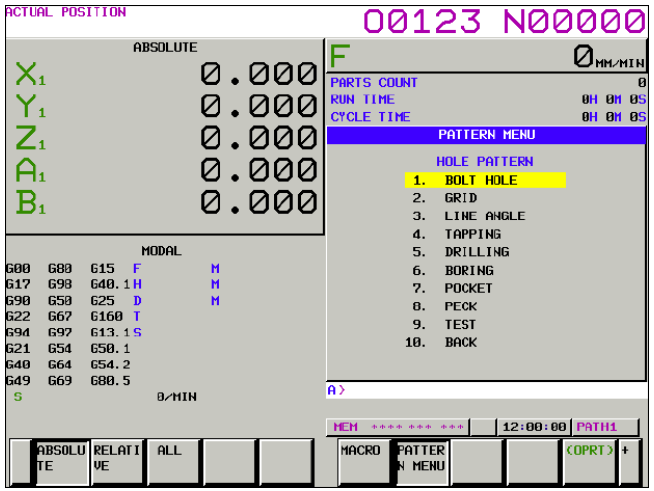
# 270

## Program input




# Pattern data input

## Features

With the Pattern Data Input function, a part program can be created from a selected menu with the possibility to enter data on conversational screens.

## Benefits

- No need for extensive G code knowledge
- Conversational screens for standard cycles
- Simplifies part programming

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J884 | 30i-A Pattern Data Input |
| A02B-0306-J884 | 31i-A5 Pattern Data Input |
| A02B-0307-J884 | 31i-A Pattern Data Input |
| A02B-0308-J884 | 32i-A Pattern Data Input |
| A02B-0323-J884 | 30i-B Pattern Data Input |
| A02B-0326-J884 | 31i-B5 Pattern Data Input |
| A02B-0327-J884 | 31i-B Pattern Data Input |
| A02B-0328-J884 | 32i-B Pattern Data Input |

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# 271

## Program input

# M code protect function

## Features

Execution of some specific M-codes (miscellaneous function) is permitted only when commanded in the macro program which is called as macro.

With this function, specific M-codes, which are used in the macro program for machine control, can be protected from the illegal use in user machining program.

## Benefits

- Simplified Programming

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R594 | 30i-A M-Code Protect Function |
| A02B-0306-R594 | 31i-A5 M-Code Protect Function |
| A02B-0307-R594 | 31i-A M-Code Protect Function |
| A02B-0308-R594 | 32i-A M-Code Protect Function |
| A02B-0323-R594 | 30i-B M-Code Protect Function |
| A02B-0326-R594 | 31i-B5 M-Code Protect Function |
| A02B-0327-R594 | 31i-B M-Code Protect Function |
| A02B-0328-R594 | 32i-B M-Code Protect Function |

**Notice**

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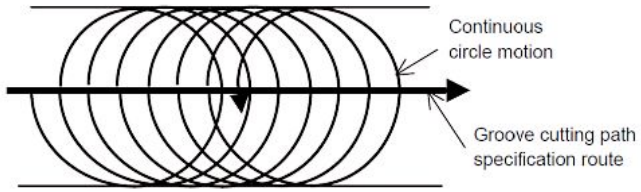
## Program input




# Groove cutting function by continuous circle movement

## Features

Groove cutting with a width greater than the tool diameter can be performed by causing the tool to make continuous circle motion independently of axis movement by the groove cutting path program and superposing the continuous circle motion on the axis movement by the groove cutting path program.

## Benefits

- Simplification of the programming

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0306-S854 | 31i-A5 Groove Cutting Function by Continuous Circle Movement |
| A02B-0307-S854 | 31i-A Groove Cutting Function by Continuous Circle Movement |
| A02B-0323-S854 | 30i-B Groove Cutting Function by Continuous Circle Movement |
| A02B-0326-S854 | 31i-B5 Groove Cutting Function by Continuous Circle Movement |
| A02B-0327-S854 | 31i-B Groove Cutting Function by Continuous Circle Movement |

**Notice**

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## Functions

# Integrated operation & programming guidance function

FANUC products and solutions reflect over 50 years of experience in machine tools, conversational / interactive programming and part programming on the shop floor. The straightforward design of the operation screens allows fast, simple and user friendly operation.

Without particular knowledge of G-code programming, it is possible to generate part programs, just by answering simple questions.

Enhanced simulation capabilities are also provided to verify the part programs without moving the axes.

Interactive programming solutions detailed in this catalogue:

- MANUAL GUIDE i for Series 30i and Series 0i CNC
- MANUAL GUIDE 0i for Series 0i CNC
- TURN MATE i for Series 0i CNC

**Notice**

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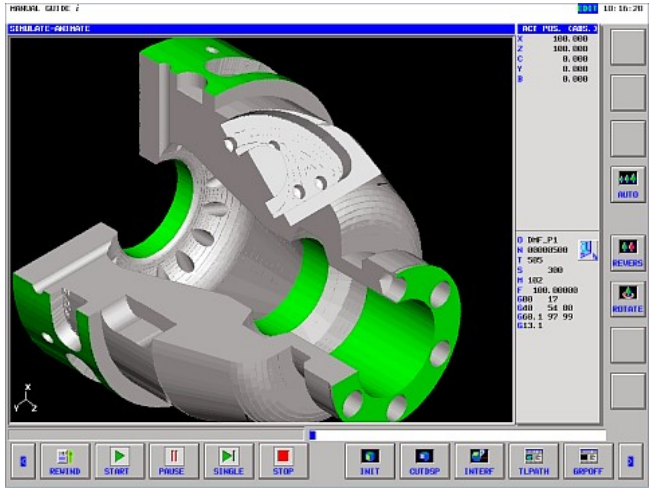
## Integrated operation & programming guidance function




# MANUAL GUIDE i basic software

## Features

MANUAL GUIDE i is a powerful software for shop floor programming; it provides machine operators with user friendly and powerfull capabilities to operate a machine. The innovative programming system enables the development of programs from a drawing to a production part in a very short time.

MANUAL GUIDE i supports turning, milling and compound machining applications and can be used on simple machine as well as on very advanced machining processes.

The MANUAL GUIDE i software is built around the standard CNC ISO code format of the CNC and adds an ergonomic user interface to program the cycles. It uses a Graphical User Interface (GUI) with user-friendly icons which allows the user to interactively create part programs in just a few steps. All of the relevant information is displayed on a single CNC screen. Having to constantly change between screens is thus avoided as is the risk of getting lost in the numerous pop-up screens.

Key features of MANUAL GUIDE i:

- Operator friendly programming environment
- Advanced cycle machining (Turning and Milling)
- Measurement cycles for workpieces and tools
- Detailed part program 3D simulation
- CNC ISO conversion of machining cycles
- Powerful editor and profile calculation
- Seamless environment switching
- Support for multi path Lathes and Milling machines
- Residual cutting
- Background machining simulation
- File management
- Customizable to add guidance windows for customer machining cycles

Several additional functions are available for MANUAL GUIDE i, such as Multi Path support, Tilted Working Plane support for 5-axis machining, etc. These functions are described further in the catalogue.

MANUAL GUIDE i can also be simulated on a Personal Computer with NCGuide or NCGuidePro. Refer to the software section of the catalogue for further information on this subject.

## Benefits

- Assisted and conversational programming of machining cycles
- Simplification of the programming of parts
- Reduction of the total time required from drawing to cutting
- Simulation of the part program before cutting metal and machining

**Notice**

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- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S790 | 30i-A MANUAL GUIDE i |
| A02B-0306-S790 | 31i-A5 MANUAL GUIDE i |
| A02B-0307-S790 | 31i-A MANUAL GUIDE i |
| A02B-0308-S790 | 32i-A MANUAL GUIDE i |
| A02B-0319-S790 | 0i-TD MANUAL GUIDE i |
| A02B-0320-S790 | 0i-MD MANUAL GUIDE i |
| A02B-0323-S790 | 30i-B MANUAL GUIDE i |
| A02B-0326-S790 | 31i-B5 MANUAL GUIDE i |
| A02B-0327-S790 | 31i-B MANUAL GUIDE i |
| A02B-0328-S790 | 32i-B MANUAL GUIDE i |

**Notice**

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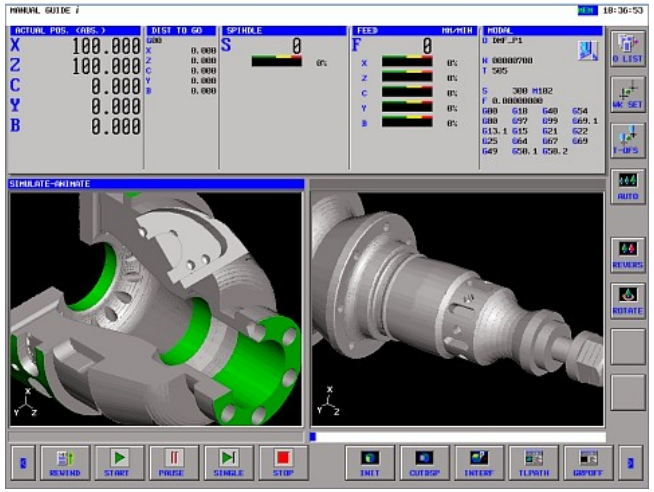
## Integrated operation & programming guidance function



# MANUAL GUIDE i multi-path support

## Features

The Multi-Path Support function extends the MANUAL GUIDE i functionalities to multi paths machines. It provides the capability to program machining cycles and execute them in several paths.

Supported machine configurations:

- Lathes machines: 2, 3 and 4 paths
- Milling machines: 2 paths

## Benefits

- Increase of the capability of MANUAL GUIDE i to support multi-path configurations
- Increase of the productivity of multi path lathes and multi path milling machines

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S786 | 30i-A MANUAL GUIDE i - Multi-Path Lathe - 4-Path-Lathe ONLY Possible if Paths #1 - #3 are Machining Paths and Path #4 is Loader Path |
| A02B-0306-S786 | 31i-A5 MANUAL GUIDE i - Multi-Path Lathe - 4-Path-Lathe ONLY Possible if Paths #1 - #3 are Machining Paths and Path #4 is Loader Path |
| A02B-0307-S786 | 31i-A MANUAL GUIDE i - Multi-Path Lathe - 4-Path-Lathe ONLY Possible if Paths #1 - #3 are Machining Paths and Path #4 is Loader Path |
| A02B-0308-S786 | 32i-A MANUAL GUIDE i - Multi-Path Lathe |
| A02B-0319-S786 | 0i-TD MANUAL GUIDE i - Multi-Path Lathe |
| A02B-0323-S786 | 30i-B MANUAL GUIDE i - Multi-Path Lathe |
| A02B-0326-S786 | 31i-B5 MANUAL GUIDE i - Multi-Path Lathe |
| A02B-0327-S786 | 31i-B MANUAL GUIDE i - Multi-Path Lathe |
| A02B-0328-S786 | 32i-B MANUAL GUIDE i - Multi-Path Lathe |

**Notice**

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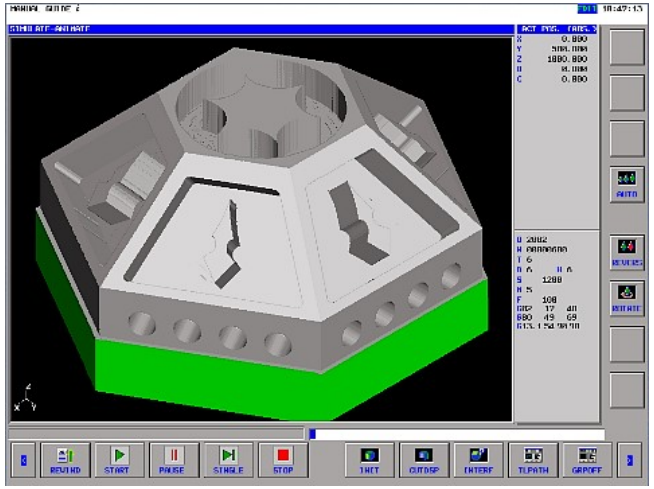
## Integrated operation & programming guidance function



# MANUAL GUIDE i Tilted Working Plane (TWP) machining function

## Features

The Tilted Working Plane (TWP) Machining function for MANUAL GUIDE i provides a set of guidance windows to program Tilted Working Plane machining comfortably.

The following Tilted Working Plane machining cycles are available in MANUAL GUIDE i:

- Euler's angle
- Roll-Pitch-Yaw angle
- 3 points specification
- 2 vectors specification
- Projection angle
- Tool axis direction
- Tilted Working Plane cancel

Limitation in machining simulation:

- The machining simulation is only provided for mechanical unit or mechanical configurations which are of "table rotation type", that the "A" is the rotary master axis and the "C" is the rotary slave axis. In all other rotary axis configurations machining simulation cannot be performed.
- In case of incremental Tilted Working Plane command or simulation of Tilted Working Plane with simultaneous rotation of two axes, the machining simulation cannot be performed.
- Machining simulation by single block soft key cannot be simulated.

## Benefits

- Guidance windows to program Tilted Planes commands in different formats
- The operator can choose which cycle is best suited depending from how the tilted plane is specified in the part drawing

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S788 | 30i-A MANUAL GUIDE i - Tilted Working Plane Machining Function |
| A02B-0306-S788 | 31i-A5 MANUAL GUIDE i - Tilted Working Plane Machining Function |
| A02B-0307-S788 | 31i-A MANUAL GUIDE i - Tilted Working Plane Machining Function |
| A02B-0320-S788 | 0i-MD MANUAL GUIDE i - Tilted Working Plane Machining Function |

**Notice**

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| Specification | Description |
|---|---|
| A02B-0323-S788 | 30i-B MANUAL GUIDE i - Tilted Working Plane Machining Function |
| A02B-0326-S788 | 31i-B5 MANUAL GUIDE i - Tilted Working Plane Machining Function |
| A02B-0327-S788 | 31i-B MANUAL GUIDE i - Tilted Working Plane Machining Function |
| A02B-0328-S788 | 32i-B MANUAL GUIDE i - Tilted Working Plane Machining Function |

**Notice**

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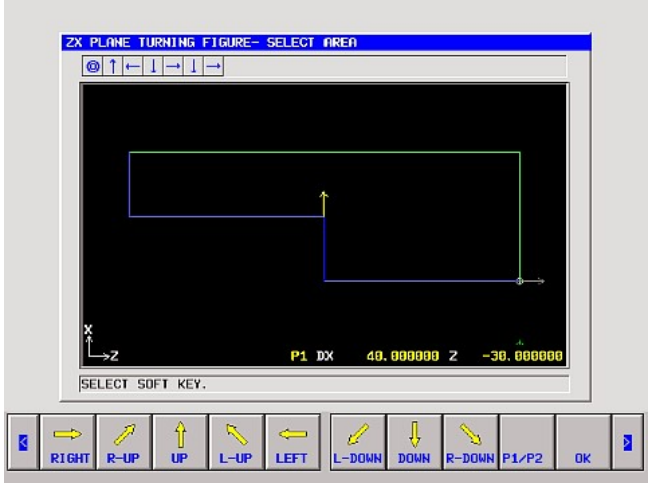
## Integrated operation & programming guidance function




# MANUAL GUIDE i windows call function

## Features

The Windows Call function provides the capability to call and display MANUAL GUIDE i windows within a C Language Executor application :

- Blank figure selection window
- Blank figure data input window (fixed form and arbitrary free figure)
- Free figure input window (free figure creation window and range selection window)
- Machining simulation window
- NC program conversion window

## Benefits

- Possibility to customize and enhance MANUAL GUIDE i with screens and features.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0323-S779 | 30i-B MANUAL GUIDE i - Windows Call Function |
| A02B-0326-S779 | 31i-B5 MANUAL GUIDE i - Windows Call Function |
| A02B-0327-S779 | 31i-B MANUAL GUIDE i - Windows Call Function |
| A02B-0328-S779 | 32i-B MANUAL GUIDE i - Windows Call Function |

**Notice**

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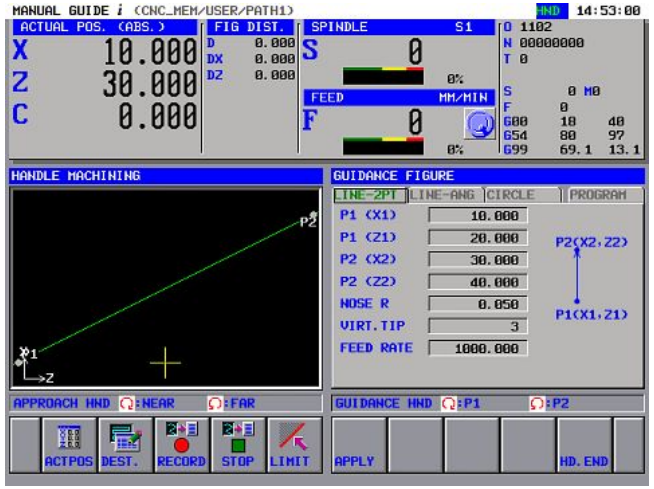
# 280

## Integrated operation & programming guidance function




# MANUAL GUIDE i handle machining function

## Features

The Handle Machining function provides the following two features to MANUAL GUIDE i:

- Machining by handle: this feature enables the operators to machine a slanted line or an arc with simultaneous two axes motion using a single handle.
- Programming by handle: the handle operation can be memorized as a program and the tool motion can be played back.

## Benefits

- Simplification of the approach and programming process
- Decrease of the time required to setup the work
- Overall increase of the productivity of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0323-S797 | 30i-B Handle Machining Function |
| A02B-0326-S797 | 31i-B5 Handle Machining Function |
| A02B-0327-S797 | 31i-B Handle Machining Function |
| A02B-0328-S797 | 32i-B Handle Machining Function |

**Notice**

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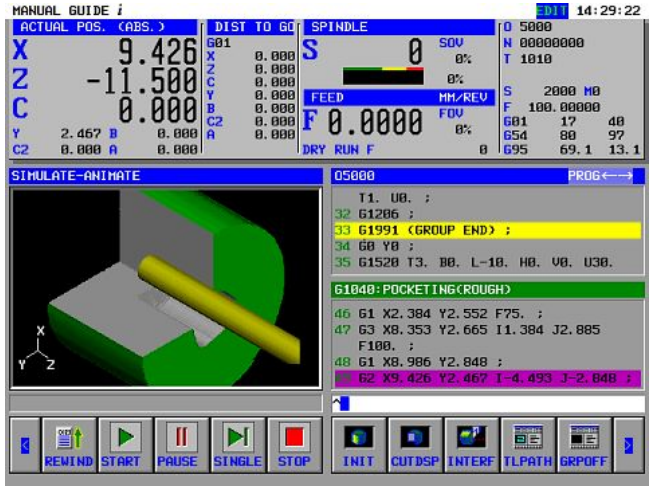
## Integrated operation & programming guidance function




# MANUAL GUIDE i advanced guidance function

## Features

The MANUAL GUIDE i Advanced Guidance Option provides the following features:

- Decomposed cycle display: this function can display the part program blocks being generated by the MANUAL GUIDE i cycles during machining simulation on the machining simulation screen.
- Input data check by simulation: the operation of a cycle that is being edited can be checked by the machining simulation function (animation / tool pathdrawing ) at the same time.
- Help window for each screen (PANEL i required): a context sensitive help of the MANUAL GUIDE i cycle currently being edited is displayed by pushing the HELP key on the MDI keyboard.
- Integration of animation software that is running on PANEL i: MANUAL GUIDE i can be interfaced to 3rd party simulation software running on PC; these packages can be used when high performance simulations are required. The 3rd party animation software can access the storage memory of the CNC and can acquire the machining program (MANUAL GUIDE i does not output the machining program to 3rd party animation software directly).

## Benefits

- Extension of the function set of MANUAL GUIDE i
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0323-S774 | 30i-B MANUAL GUIDE i - Advanced Guidance Function |
| A02B-0326-S774 | 31i-B5 MANUAL GUIDE i - Advanced Guidance Function |
| A02B-0327-S774 | 31i-B MANUAL GUIDE i - Advanced Guidance Function |
| A02B-0328-S774 | 32i-B MANUAL GUIDE i - Advanced Guidance Function |

**Notice**

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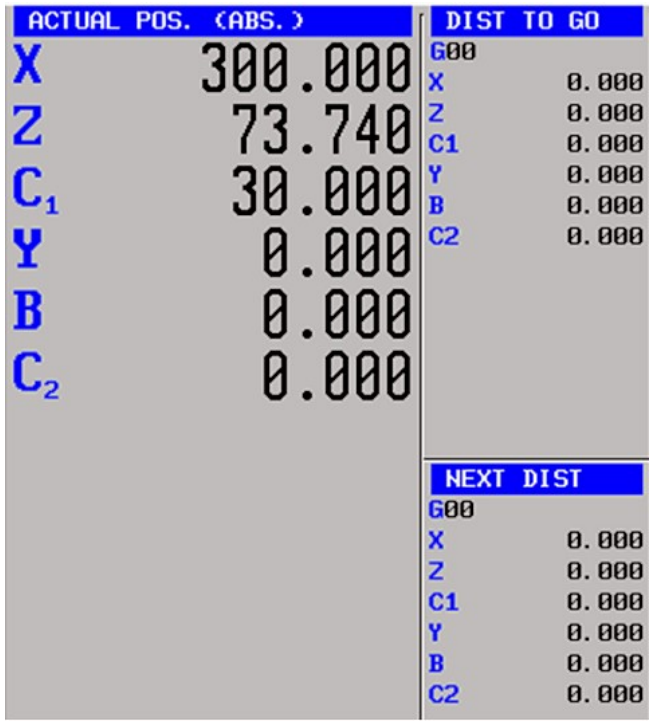
## Integrated operation & programming guidance function




# MANUAL GUIDE i extended axis name function

## Features

With the Extended Axis Name function, it is possible to add extended axis names to MANUAL GUIDE i machining cycles .

Extended axis name can be used with linear axis other than the basic three axis or rotary axis of workpiece rotation and are composed of 2 characters that are a letter and a number; for example B2, C2, etc.

Extended axis name can also be displayed on the following screens:

- Base screen
- Relative coordinates presetting screen
- Workpiece coordinate data screen
- Machining simulation screen

This function can be used on following screens / resolutions:

- 19" and 15" LCD screens on the Series 30i / 31i / 32i - MODEL A and MODEL B CNC
- 8.4" and 10.4" LCD screens on the Series 30i / 31i / 32i MODEL B CNC

## Benefits

- The advantage of the MANUAL GUIDE i machining cycles can also used on machines tools using extended axis names

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S789 | 30i-A MANUAL GUIDE i - Extended Axis Name Function - 2 Characters for Axis Name on MANUAL GUIDE i Screen, for 1-Path Lathe with 1 Turret and 2 Spindles |
| A02B-0306-S789 | 31i-A5 MANUAL GUIDE i - Extended Axis Name Function - 2 Characters for Axis Name on MANUAL GUIDE i Screen, for 1-Path Lathe with 1 Turret and 2 Spindles |
| A02B-0307-S789 | 31i-A MANUAL GUIDE i - Extended Axis Name Function - 2 Characters for Axis Name on MANUAL GUIDE i Screen, for 1-Path Lathe with 1 Turret and 2 Spindles |
| A02B-0308-S789 | 32i-A MANUAL GUIDE i - Extended Axis Name Function - 2 Characters for Axis Name on MANUAL GUIDE i Screen, for 1-Path Lathe with 1 Turret and 2 Spindles |
| A02B-0323-S789 | 31i-B MANUAL GUIDE i - Extended Axis Name Function - 2 Characters for Axis Name on MANUAL GUIDE i Screen |
| A02B-0326-S789 | 31i-B5 MANUAL GUIDE i - Extended Axis Name Function - 2 Characters for Axis Name on MANUAL GUIDE i Screen |
| A02B-0327-S789 | 31i-B MANUAL GUIDE i - Extended Axis Name Function - 2 Characters for Axis Name on MANUAL GUIDE i Screen |

**Notice**

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| Specification | Description |
| --- | --- |
| A02B-0328-S789 | 32i-B MANUAL GUIDE i - Extended Axis Name Function - 2 Characters for Axis Name on MANUAL GUIDE i Screen |


## Notice

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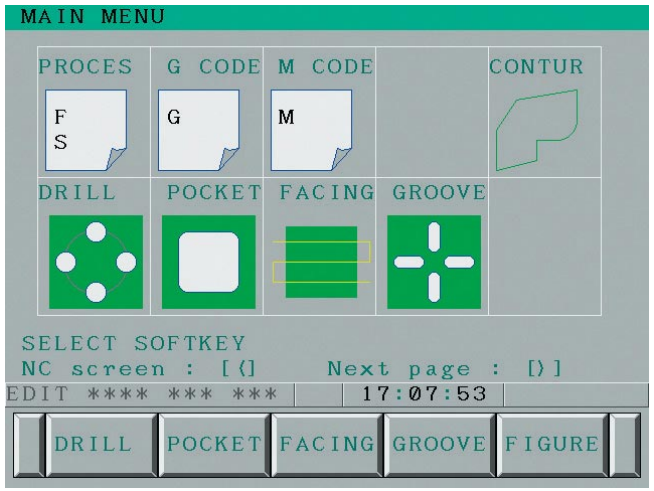
## Integrated operation & programming guidance function




# MANUAL GUIDE 0i

## Features

MANUAL GUIDE 0i is a simplified operation guidance software to assist an operator in creating complex part program, and actual machining.

MANUAL GUIDE 0i provides the following features:

- ISO code part programming: ISO can be used to directly input a simple operation such as linear or arc machining with G codes or easily input complicated operations such as pocketing or turning within an existing machining cycle
- Easy specification of a tool, spindle, coolant and feedrate: these conditions can easily be specified on a screen before machining
- Easy programming of G codes and M codes: G codes and M codes can easily be input with reference to the screen for G code description and illustration and the screen for M code description and illustration.
- Preparation of machining cycles for machining centers:
  - Hole machining (pattern figure)
  - Pocketing (pattern figure)
  - Facing (pattern figure)
  - Grooving (pattern figure)
- Preparation of machining cycles for lathe systems:
  - Drilling (workpiece center)
  - Turning (arbitrary figure)
  - Grooving (normal groove, trapezoidal groove)
  - Threading (general-purpose thread, metric thread, unified thread, PT/PF thread)
- Easy input of contour figure: a contour figure consisting of lines and arcs can be easily input and converted into a NC command block (G01/G02/G03). In addition, advance figure calculation functions can be performed with the help of 11 auxiliary functions.

Available language packages for MANUAL GUIDE 0i:

- English, Chinese, Japanese
- English, German, French
- English, Italian, Spanish
- English, Swedish, Portuguese
- English, Czech, Polish

## Benefits

- Assisted and conversational programming of machining cycles
- Simplification of the programming of parts
- Reduction of the total time required from parts drawing to parts cutting
- Improvement of the overall machining productivity

**Notice**

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# Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-S772 | 0i-TD MANUAL GUIDE 0i |
| A02B-0320-S772 | 0i-MD MANUAL GUIDE 0i |
| A02B-0321-S772 | 0i-Mate-TD MANUAL GUIDE 0i |
| A02B-0322-S772 | 0i-Mate-MD MANUAL GUIDE 0i |

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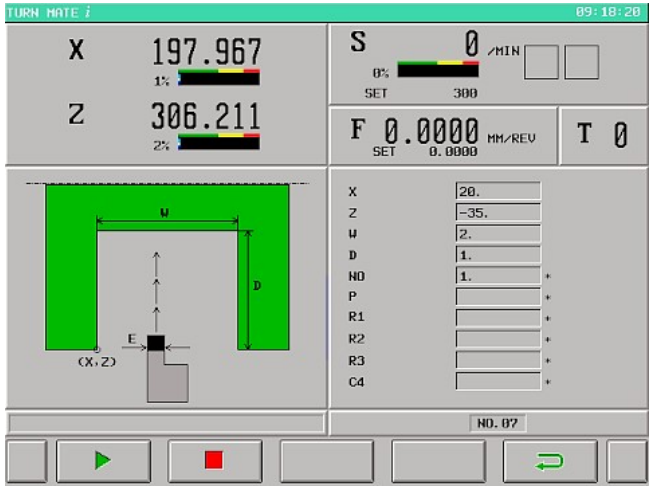
## Integrated operation & programming guidance function




# TURN MATE i basic software

## Features

TURN MATE i is a conversational software function which can assist the operation of entry-level turning machines. The productivity and the flexibility of turning machines can be greatly increased through the operator assistance functions provided by TURN MATE i, which can substitute to the know-how in CNC machining.

No knowledge of G code ISO language is required to program workpieces with TURN MATE i.

TURN MATE i is easy to operate with clearly laid out screens; it is available for monochrome or color displays, for touch screens or traditional keyboard / MDI operation.

Various semi-automatic cycles and linked cycles are provided and with the NC conversion function it is possible to convert machining cycles in standard NC ISO language (Optional Function).

Overview of the product features:

- Manual operation with programmable traversing limits
- Tool geometry compensation for up to 16 tools
- Constant surface speed
- Program execution in accordance with DIN/ ISO
- Imperial (inches) or metric display
- Choice of language
- Calculator function
- Cutting cycles
  - Outer roughing
  - Inner roughing (including dressing)
  - Rear face maching
  - Taper turning
  - Thread cutting
  - Tapping
  - Cutting of tapered threads
  - Thread repair
  - Recess Cutting
  - Ball turning
  - Grooving
  - Contour turning based on individual points (free figures)
  - Non-monotonous free figures
- Linked cutting cycles
- Memory Card interface
- NC ISO conversion

- Assisted and conversational programming of machining cycles

**Notice**

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- Simplification of the programming of parts
- Reduction of the total time required from parts drawing to parts cutting
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-S792 | 0i-TD TURN MATE i - with Touch Panel Control |
| A02B-0319-S793 | 0i-TD TURN MATE i - without Touch Panel Control |
| A02B-0321-S792 | 0i-Mate-TD TURN MATE i - with Touch Panel Control |
| A02B-0321-S793 | 0i-Mate-TD TURN MATE i - without Touch Panel Control |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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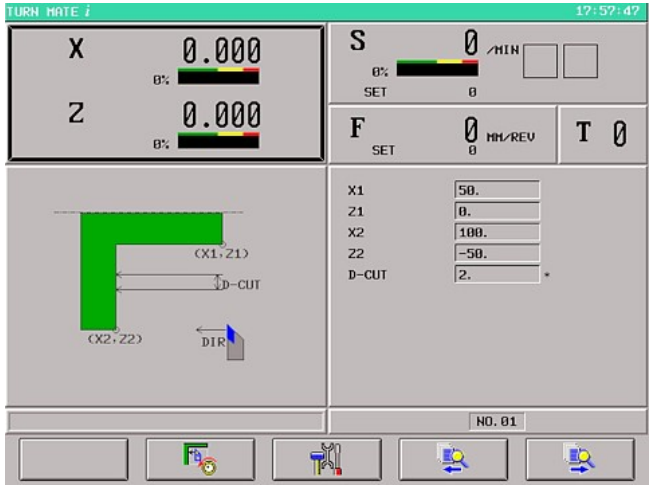
# 288

## Integrated operation & programming guidance function




# TURN MATE i MDI key operation function

## Features

TURN MATE i has been originally designed to work on CNC equipped with touch panel displays. With this function, it is also possible to operate TURN MATE i on non-touch panel displays equipped with a MDI keyboard.

A cursor on the screen will indicate the object being focused on. The cursor can be moved on the screen using the cursor keys of the MDI keyboard.

## Benefits

- Possibility to use TURN MATE i on machine not equipped with touch panel displays

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-S794 | 0i-TD TURN MATE i - MDI Key Operation Function |
| A02B-0321-S794 | 0i-Mate-TD TURN MATE i - MDI Key Operation Function |

**Notice**

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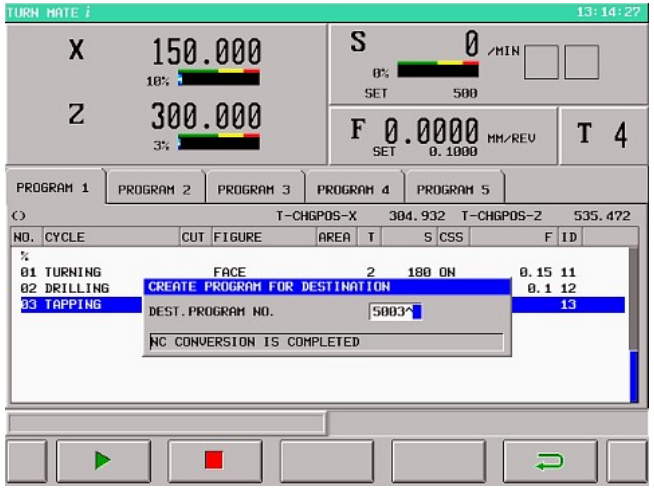
# 289

## Integrated operation & programming guidance function




# TURN MATE i NC program conversion function

## Features

TURN MATE i machining cycles can be converted into standard ISO G code blocks with the NC Program Conversion function.

The part program generated by this function can be used on other machines which do not feature TURN MATE i. In addition, the operator can perform a detailed analysis of the movements generated by the machining cycles.

## Benefits

- The same workpiece machined with TURN MATE i can also be machined on CNC machines where TURN MATE i is not available.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-S795 | 0i-TD TURN MATE i - NC Program Conversion Function |
| A02B-0321-S795 | 0i-Mate-TD TURN MATE i - NC Program Conversion Function |

**Notice**

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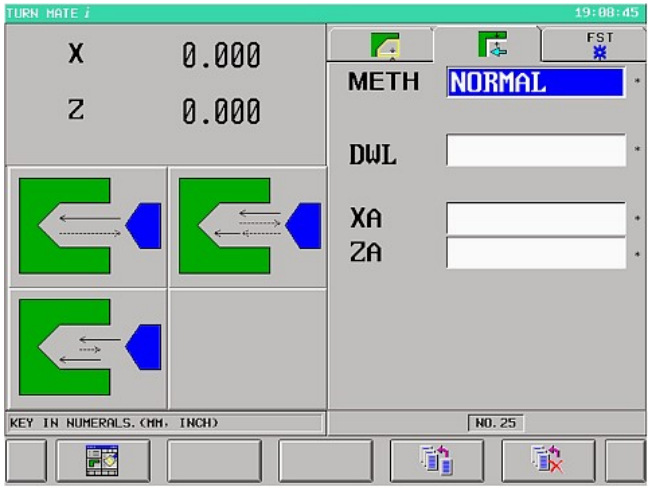
# 290

## Integrated operation & programming guidance function




# TURN MATE i expansion of machining cycles

## Features

The TURN MATE i Expansion of Machining Cycle function features the following key items:

- Detailed information such as cutting method, etc. is displayed on the base screen
- The 3 types of drilling cycles (Normal / Peck / High-speed Peck) can be selected on the input data screen
- Possibility to input the negative X values in facing cycles

## Benefits

- Extension of the function set of TURN MATE i
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-S796 | 0i-TD TURN MATE i - Expansion of Machining Cycle |
| A02B-0321-S796 | 0i-Mate-TD TURN MATE i - Expansion of Machining Cycle |

**Notice**

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# 291
# Functions

## Auxiliary / spindle speed function

This section of the catalogue contains the functions related to auxiliary and spindle functions in the CNC.

Some of the functions detailed in the catalogue:

- Analogue spindle control
- Spindle orientation
- Spindle synchronous control
- Multi-spindlecontrol
- Spindle CS contour control
- High precision learning control
- Etc.

**Notice**

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# 292

## Auxiliary / spindle speed function

# 2nd auxilliary function

## Features

The 2nd Auxiliary Function provides a second part programming code called "code B" to activate Auxiliary functions.

Up to eight digits, selectable by a parameter setting and a strobe signal are sent to the PMC. Only one B code is allowed per block.

## Benefits

- Allows programming of B code to do M code functions
- Sometime B codes provide ease of use for operation and programming
- Typical application Turn on coolant command
  Pallet 1=M08, Pallet 2=B08
- No change in cycle time

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J920 | 30i-A 2nd Auxiliary Function |
| A02B-0306-J920 | 31i-A5 2nd Auxiliary Function |
| A02B-0307-J920 | 31i-A 2nd Auxiliary Function |
| A02B-0308-J920 | 32i-A 2nd Auxiliary Function |
| A02B-0323-J920 | 30i-B 2nd Auxiliary Function |
| A02B-0326-J920 | 31i-B5 2nd Auxiliary Function |
| A02B-0327-J920 | 31i-B 2nd Auxiliary Function |
| A02B-0328-J920 | 32i-B 2nd Auxiliary Function |
| A02B-0333-J920 | 35i-B 2nd Auxiliary Function |

**Notice**

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# 293

## Auxiliary / spindle speed function

# Auxiliary function output in moving axis

## Features

The Auxiliary Function Output in Moving Axis provides a way when specifying absolute coordinate values and auxiliary function (M, B) at the G50.9 block, that auxiliary functions are output to PMC when the absolute coordinate enters the specified area in movement block. G50.9 can be specified in 2 blocks continuously.

In other words, the auxiliary function output point in the movement block can be specified in two. Code signals and strobe signals are output to the same signal address as usual auxiliary function.

## Benefits

- Simplification of the programming

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-S889 | 0i-TD Auxilliary Function Output in Moving Axis |
| A02B-0320-S889 | 0i-MD Auxilliary Function Output in Moving Axis |
| A02B-0323-S889 | 30i-B Auxilliary Function Output in Moving Axis |
| A02B-0326-S889 | 31i-B5 Auxilliary Function Output in Moving Axis |
| A02B-0327-S889 | 31i-B Auxilliary Function Output in Moving Axis |
| A02B-0328-S889 | 32i-B Auxilliary Function Output in Moving Axis |

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# 294

## Auxiliary / spindle speed function

# Waiting function by specifying start point

## Features

Control based on M codes is normally used to make one path to wait on the other during machining. When a M code for waiting is specified in a block of a path during automatic operation, the other path waits for the same M code to be specified before staring the execution of the next block.

With the Waiting Function by Specifying Start Point function, by specifying a start point with a waiting M code, the absolute coordinate value of that path or the other path can be used as the condition for waiting.

## Benefits

- Simplification of the programming

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-S888 | 0i-TD Waiting Function by Specifying Start Point |
| A02B-0323-S888 | 30i-B Waiting Function by Specifying Start Point |
| A02B-0326-S888 | 31i-B5 Waiting Function by Specifying Start Point |
| A02B-0327-S888 | 31i-B Waiting Function by Specifying Start Point |
| A02B-0328-S888 | 32i-B Waiting Function by Specifying Start Point |

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# 295

## Auxiliary / spindle speed function

# Spindle serial output

## Features

A speed command is output to the spindle motor according to the specified spindle speed.

## Benefits

- Permits Contouring C axis capability
- Single point threads capability
- Allows for spindle orientation
- Better interface as compared to Analog
- Can have 2 serial spindles per path

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J850 | 30i-A Spindle Serial Output |
| A02B-0306-J850 | 31i-A5 Spindle Serial Output |
| A02B-0307-J850 | 31i-A Spindle Serial Output |
| A02B-0308-J850 | 32i-A Spindle Serial Output |
| A02B-0323-J850 | 30i-B Spindle Serial Output |
| A02B-0326-J850 | 31i-B5 Spindle Serial Output |
| A02B-0327-J850 | 31i-B Spindle Serial Output |
| A02B-0328-J850 | 32i-B Spindle Serial Output |
| A02B-0333-J850 | 35i-B Spindle Serial Output |

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# 296

## Auxiliary / spindle speed function

# Spindle serial / analog output

## Features

An analog spindle can be used with serial spindles at the same time. An analog spindle can be used for one of the controlled spindle axes of the system.

In this function, the spindle output control and the spindle output control by the PMC can be used for an analog spindle.

## Benefits

- Possibility to mix analog and digital spindle control
- Improvement of the machine flexibility

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R584 | 30i-A Serial / Analog Spindle Control |
| A02B-0306-R584 | 31i-A5 Serial / Analog Spindle Control |
| A02B-0307-R584 | 31i-A Serial / Analog Spindle Control |
| A02B-0308-R584 | 32i-A Serial / Analog Spindle Control |
| A02B-0323-R584 | 30i-B Serial / Analog Spindle Control |
| A02B-0326-R584 | 31i-B5 Serial / Analog Spindle Control |
| A02B-0327-R584 | 31i-B Serial / Analog Spindle Control |
| A02B-0328-R584 | 32i-B Serial / Analog Spindle Control |

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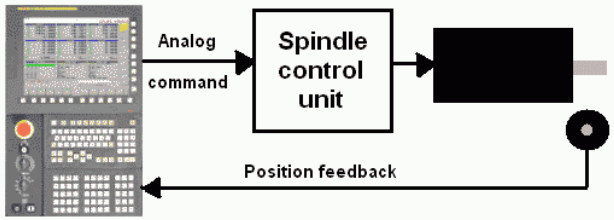
# 297

## Auxiliary / spindle speed function




# Spindle analog output

## Features

Allows speed proportional to analog output voltage command on S code.

## Benefits

- Allows speed proportional to analog output voltage command on S code
- Constant surface speed control possible
- Third party spindles can be interfaced

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J860 | 30i-A Spindle Analog Output Function |
| A02B-0306-J860 | 31i-A5 Spindle Analog Output Function |
| A02B-0307-J860 | 31i-A Spindle Analog Output Function |
| A02B-0308-J860 | 32i-A Spindle Analog Output Function |
| A02B-0323-J860 | 30i-B Spindle Analog Output Function |
| A02B-0326-J860 | 31i-B5 Spindle Analog Output Function |
| A02B-0327-J860 | 31i-B Spindle Analog Output Function |
| A02B-0328-J860 | 32i-B Spindle Analog Output Function |
| A02B-0333-J860 | 35i-B Spindle Analog Output Function |

**Notice**

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# 298

## Auxiliary / spindle speed function

# Constant surface speed control

## Features

When a surface speed (in m/min or feet/min) is specified with an S code (a numeric value following S), the spindle speed is controlled so that the surface speed is kept constant with respect to the change in tool position.

## Benefits

- Spindle speed adjusted automatically to maintain constant amount of material
- Typical example are surface grinders: as diameter increases speed reduces thereby improving surface finish, reducing tool wear while maintaining constant material removal rate

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J855 | 30i-A Constant Surface Speed Control |
| A02B-0306-J855 | 31i-A5 Constant Surface Speed Control |
| A02B-0307-J855 | 31i-A Constant Surface Speed Control |
| A02B-0308-J855 | 32i-A Constant Surface Speed Control |
| A02B-0323-J855 | 30i-B Constant Surface Speed Control |
| A02B-0326-J855 | 31i-B5 Constant Surface Speed Control |
| A02B-0327-J855 | 31i-B Constant Surface Speed Control |
| A02B-0328-J855 | 32i-B Constant Surface Speed Control |
| A02B-0333-J855 | 35i-B Constant Surface Speed Control |

**Notice**

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# 299

## Auxiliary / spindle speed function

# Actual spindle speed output

## Features

The actual spindle speed calculated from the spindle motor position coder feedback signal is output in 16-bit binary code.

## Benefits

- Simplification of the programming

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J856 | 30i-A Actual Spindle Speed Output |
| A02B-0306-J856 | 31i-A5 Actual Spindle Speed Output |
| A02B-0307-J856 | 31i-A Actual Spindle Speed Output |
| A02B-0308-J856 | 32i-A Actual Spindle Speed Output |
| A02B-0323-J856 | 30i-B Actual Spindle Speed Output |
| A02B-0326-J856 | 31i-B5 Actual Spindle Speed Output |
| A02B-0327-J856 | 31i-B Actual Spindle Speed Output |
| A02B-0328-J856 | 32i-B Actual Spindle Speed Output |
| A02B-0333-J856 | 35i-B Actual Spindle Speed Output |

**Notice**

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# 300

## Auxiliary / spindle speed function

# Spindle orientation

## Features

Spindle orientation can be performed by simply mounting a position coder on the spindle thereby stopping the spindle at fixed point.

## Benefits

- No need to mount stoppers or pins to physically stop the spindle at same location every time
- Minimizes mechanical parts and improves accuracy and machine life
- Accuracy of orientation even at high speeds reduces cycle time
- Permits precise tool changes
- Orientation can be done either from machine operator panel or by simple M command

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J853 | 30i-A Spindle Orientation for One Spindle |
| A02B-0306-J853 | 31i-A5 Spindle Orientation for One Spindle |
| A02B-0307-J853 | 31i-A Spindle Orientation for One Spindle |
| A02B-0308-J853 | 32i-A Spindle Orientation for One Spindle |
| A02B-0323-J853 | 30i-B Spindle Orientation for One Spindle |
| A02B-0326-J853 | 31i-B5 Spindle Orientation for One Spindle |
| A02B-0327-J853 | 31i-B Spindle Orientation for One Spindle |
| A02B-0328-J853 | 32i-B Spindle Orientation for One Spindle |
| A02B-0333-J853 | 35i-B Spindle Orientation for One Spindle |

**Notice**

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# 301

## Auxiliary / spindle speed function

# Extended spindle orientation

## Features

This function extends the spindle orientation function so that up to 8 spindle motors can be positioned simultaneously.

## Benefits

- Simplification of the programming

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J861 | 30i-A Extended Spindle Orientation, Max. 8 Spindles |
| A02B-0306-J861 | 31i-A5 Extended Spindle Orientation, Max. 6 Spindles |
| A02B-0307-J861 | 31i-A Extended Spindle Orientation, Max. 6 Spindles |
| A02B-0308-J861 | 32i-A Extended Spindle Orientation, Max. 2 Spindles |
| A02B-0323-J861 | 30i-B Extended Spindle Orientation, Max. 8 Spindles |
| A02B-0326-J861 | 31i-B5 Extended Spindle Orientation, Max. 6 Spindles |
| A02B-0327-J861 | 31i-B Extended Spindle Orientation, Max. 6 Spindles |
| A02B-0328-J861 | 32i-B Extended Spindle Orientation, Max. 6 Spindles |
| A02B-0333-J861 | 35i-B Extended Spindle Orientation, Max. 4 Spindles |

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# 302

## Auxiliary / spindle speed function

# Spindle output switching function

## Features

The Spindle Output Switching functions allows to switch seamlessly between the two windings of the spindle motor. One winding is used for low speed and the other winding for high speed. This provides a stable output for the spindle motor over a large speed range.

## Benefits

- Constant characteristic over a wide speed range of the spindle
- Increases the quality output of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J854 | 30i-A Spindle Output Switching for One Spindle (Speed-Range Switching) |
| A02B-0306-J854 | 31i-A5 Spindle Output Switching for One Spindle (Speed-Range Switching) |
| A02B-0307-J854 | 31i-A Spindle Output Switching for One Spindle (Speed-Range Switching) |
| A02B-0308-J854 | 32i-A Spindle Output Switching for One Spindle (Speed-Range Switching) |
| A02B-0323-J854 | 30i-B Spindle Output Switching for One Spindle (Speed-Range Switching) |
| A02B-0326-J854 | 31i-B5 Spindle Output Switching for One Spindle (Speed-Range Switching) |
| A02B-0327-J854 | 31i-B Spindle Output Switching for One Spindle (Speed-Range Switching) |
| A02B-0328-J854 | 32i-B Spindle Output Switching for One Spindle (Speed-Range Switching) |
| A02B-0333-J854 | 35i-B Spindle Output Switching for One Spindle (Speed-Range Switching) |

**Notice**

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# 303

## Auxiliary / spindle speed function

# Extended spindle output switching function

## Features

This function extends the Spindle Output Switching function so that winding swiching can be performed for up to 8 spindle motors.

## Benefits

- Constant characteristic over a wide speed range of the spindle
- Increases the quality output of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J862 | 30i-A Extended Spindle Output Switching Function, Max. 8 Spindles |
| A02B-0306-J862 | 31i-A5 Extended Spindle Output Switching Function, Max. 6 Spindles |
| A02B-0307-J862 | 31i-A Extended Spindle Output Switching Function, Max. 6 Spindles |
| A02B-0308-J862 | 32i-A Extended Spindle Output Switching Function, Max. 4 Spindles |
| A02B-0323-J862 | 30i-B Extended Spindle Output Switching Function, Max. 8 Spindles |
| A02B-0326-J862 | 31i-B5 Extended Spindle Output Switching Function, Max.6 Spindles |
| A02B-0327-J862 | 31i-B Extended Spindle Output Switching Function, Max. 4 Spindles |
| A02B-0328-J862 | 32i-B Extended Spindle Output Switching Function, Max. 4 Spindles |
| A02B-0333-J862 | 35i-B Extended Spindle Output Switching Function, Max. 4 Spindles |

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# 304

## Auxiliary / spindle speed function

# Spindle synchronous control

## Features

In a machine having two or more spindles (such as a multi-path lathe), this function provides a way to synchronize the spindles together.

When a workpiece is switched between two spindles during spindle rotation, or when the spindle speeds of two spindles are accelerated or decelerated while the spindles are holding a workpiece, the spindles can be rotated at the same speed. This is pindle speed synchronization.

When a workpiece is transfered from one spindle to the other, the rotations of the two spindles can be made in phase to each other, matching the angular displacement. This is called phase synchronization.

## Benefits

- Simplification of the handling of the spindle in multi-spindle lathes

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J858 | 30i-A Spindle Synchronous Control |
| A02B-0306-J858 | 31i-A5 Spindle Synchronous Control |
| A02B-0307-J858 | 31i-A Spindle Synchronous Control |
| A02B-0308-J858 | 32i-A Spindle Synchronous Control |
| A02B-0319-J858 | 0i-TD Spindle Synchronous Control - Incl. Spindle Tandem Control |
| A02B-0320-J858 | 0i-MD Spindle Synchronous Control - Incl. Spindle Tandem Control |
| A02B-0323-J858 | 30i-B Spindle Synchronous Control - Incl. Spindle Tandem Control |
| A02B-0326-J858 | 31i-B5 Spindle Synchronous Control - Incl. Spindle Tandem Control |
| A02B-0327-J858 | 31i-B Spindle Synchronous Control - Incl. Spindle Tandem Control |
| A02B-0328-J858 | 32i-B Spindle Synchronous Control - Incl. Spindle Tandem Control |
| A02B-0333-J858 | 35i-B Spindle Synchronous Control - Incl. Spindle Tandem Control |

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# 305

## Auxiliary / spindle speed function

# Simple spindle synchronous control

## Features

Allows second spindle to be controlled as slave to the first one.

## Benefits

- Multiple identical parts can be cut
- Double the output using two spindles
- No need to create two part programs

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J748 | 30i-A Simple Spindle Synchronous Control |
| A02B-0306-J748 | 31i-A5 Simple Spindle Synchronous Control |
| A02B-0307-J748 | 31i-A Simple Spindle Synchronous Control |
| A02B-0308-J748 | 32i-A Simple Spindle Synchronous Control |
| A02B-0320-J748 | 0i-MD Simple Spindle Synchronous Control |

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# 306

## Auxiliary / spindle speed function

# Multi spindle control

## Features

In addition to the first spindle, the second to fourth, sixth or eighth spindle, can be controlled using an S command from the CNC. The maximum number of spindle is dependant on the CNC capabilities / type.

Spindle commands are specified using a single S command as conventionally done. A spindle is selected depending on the signal from the PMC or the address P command.

Gear change between two stages can be made for additional spindles in the same manner as for the first spindle. Parameter setting provides the possiblity to set a maximum spindle speed for each spindle and clamp the speed of each spindle at the corresponding maximum spindle speed.

The position coder interfaces for the second to fourth spindles can be selected and added. The additional position coders are selected by signals from the PMC.

## Benefits

- Simplification of the programming
- Increase of the throughput of the machine
- Overall increase of the productivity of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J859 | 30i-A Multi-Spindle Control |
| A02B-0306-J859 | 31i-A5 Multi-Spindle Control |
| A02B-0307-J859 | 31i-A Multi-Spindle Control |
| A02B-0308-J859 | 32i-A Multi-Spindle Control |
| A02B-0320-J859 | 0i-MD Multi-Spindle Control |
| A02B-0323-J859 | 30i-B Multi-Spindle Control |
| A02B-0326-J859 | 31i-B5 Multi-Spindle Control |
| A02B-0327-J859 | 31i-B Multi-Spindle Control |
| A02B-0328-J859 | 32i-B Multi-Spindle Control |
| A02B-0333-J859 | 35i-B Multi-Spindle Control (Max. 4 Spindles) |

**Notice**

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# 307

## Auxiliary / spindle speed function

# Spindle positioning

## Features

The workpiece mounted on the spindle can be positioned at a certain angle by moving the spindle attached to the spindle motor by a certain angle. This function is called the Spindle Positioning function.

During turning, use of this function allows for instance to perform a drilling operation at any position on the circumference of the workpiece.

The spindle position is detected by the position coder attached to the spindle.

Whether to use the spindle for spindle positioning (spindle positioning mode) or to use the spindle for spindle rotation (spindle rotation mode) is command by special M code (set by parameters).

## Benefits

- Addition of machining capabilities at the cirumference of a turned part
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J851 | 30i-A Spindle Positioning |
| A02B-0306-J851 | 31i-A5 Spindle Positioning |
| A02B-0307-J851 | 31i-A Spindle Positioning |
| A02B-0308-J851 | 32i-A Spindle Positioning |
| A02B-0323-J851 | 30i-B Spindle Positioning |
| A02B-0326-J851 | 31i-B5 Spindle Positioning |
| A02B-0327-J851 | 31i-B Spindle Positioning |
| A02B-0328-J851 | 32i-B Spindle Positioning |

**Notice**

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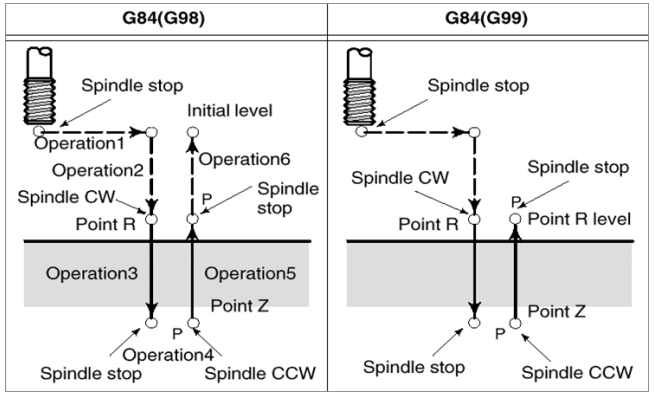
# 308

## Auxiliary / spindle speed function




# Rigid tapping

## Features

Rigid tapping is a function for performing high-precision tapping by exercising position control so that the spindle rotation is synchronized with tapping axis feed at all times.

In a tapping cycle (M series: G84/G74, T series: G84/G88), synchronous control is applied to the tapping operation of a tapping axis and the operation of the spindle.

## Benefits

- Tools such as a float tapper are not needed
- Improvement of the tapped hole quality
- Reduction of tap breakage
- Reduction of tool holders cost by 50%
- Controll of the depth for blind holes
- Better tap life
- Higher speed, higher precision tapping

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J828 | 30i-A Rigid Tapping |
| A02B-0306-J828 | 31i-A5 Rigid Tapping |
| A02B-0307-J828 | 31i-A Rigid Tapping |
| A02B-0308-J828 | 32i-A Rigid Tapping |
| A02B-0323-J828 | 30i-B Rigid Tapping |
| A02B-0326-J828 | 31i-B5 Rigid Tapping |
| A02B-0327-J828 | 31i-B Rigid Tapping |
| A02B-0328-J828 | 32i-B Rigid Tapping |
| A02B-0333-R707 | 35i-B Rigid Tapping - Incl. Rigid Tapping Retract |

**Notice**

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# 309

## Auxiliary / spindle speed function

# Rigid tapping by manual handle

## Features

This function allows switching from a programmed command for rigid tapping to the handle mode. The tapping itself can than be performed while moving the tapping axis by manual handle.

## Benefits

- Allows operator feedback by using handle for rigid tapping to overcome hard spots in material, hole misalignment
- Ideal for repair/rework, generally for large parts
- Tapping is possible without separate set up
- Other than Z axis tapping possible
- Minimizes handling for low volume parts

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J651 | 30i-A Rigid Tapping by Manual Handle |
| A02B-0306-J651 | 31i-A5 Rigid Tapping by Manual Handle |
| A02B-0307-J651 | 31i-A Rigid Tapping by Manual Handle |
| A02B-0319-J651 | 0i-TD Rigid Tapping by Manual Handle |
| A02B-0320-J651 | 0i-MD Rigid Tapping by Manual Handle |
| A02B-0321-J651 | 0i-Mate-TD Rigid Tapping by Manual Handle |
| A02B-0322-J651 | 0i-Mate-MD Rigid Tapping by Manual Handle |
| A02B-0323-J651 | 30i-B Rigid Tapping by Manual Handle |
| A02B-0326-J651 | 31i-B5 Rigid Tapping by Manual Handle |
| A02B-0327-J651 | 31i-B Rigid Tapping by Manual Handle |
| A02B-0328-J651 | 32i-B Rigid Tapping by Manual Handle |

**Notice**

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# 310

## Auxiliary / spindle speed function

# Arbitrary position reference setting for CS axis

## Features

When a reference position return command (G28 or a manual reference position return) is executed for the first time since a serial spindle is placed in the Cs contour control mode, an arbitrary position can be set as the reference position by parameter setting.

In this case, the system performs reference position return, assuming that the current position is the reference position, so the system does not move the spindle to position it to the reference position.

Because the reference position return operation does not involve positioning to the spindle position specific to the spindle, this function can reduce the cycle time.

## Benefits

- Reduction of the cycle time
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S664 | 30i-A Arbitrary position reference setting for CS Axis |
| A02B-0306-S664 | 31i-A5 Arbitrary Position Reference Setting for CS Axis |
| A02B-0307-S664 | 31i-A Arbitrary Position Reference Setting for CS Axis |
| A02B-0323-S664 | 30i-B Arbitrary position reference setting for CS Axis |
| A02B-0326-S664 | 31i-B5 Arbitrary Position Reference Setting for CS Axis |
| A02B-0327-S664 | 31i-B Arbitrary Position Reference Setting for CS Axis |

**Notice**

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# 311

## Auxiliary / spindle speed function

# M Code group check function

## Features

The M code group check function checks if a combination of multiple M codes (up to three M codes) contained in a block is correct.

This function has two purposes:

- To detect if any of the multiple M codes specified in a block include an M code that must be specified alone
- To detect if any of the multiple M codes specified in a block include M codes that belong to the same group.

In either of these cases, alarm is issued.

## Benefits

- Addition of check function to avoid programming mistakes
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J922 | 30i-A M Code Group Check |
| A02B-0306-J922 | 31i-A5 M Code Group Check |
| A02B-0307-J922 | 31i-A M Code Group Check |
| A02B-0308-J922 | 32i-A M Code Group Check |
| A02B-0323-J922 | 30i-B M Code Group Check |
| A02B-0326-J922 | 31i-B5 M Code Group Check |
| A02B-0327-J922 | 31i-B M Code Group Check |
| A02B-0328-J922 | 32i-B M Code Group Check |

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# 312

## Auxiliary / spindle speed function

# Spindle speed fluctuation detection

## Features

With the Spindle Speed Fluctuation Detection function, an overheat alarm OH0704 ("OVERHEAT") is raised and the spindle speed fluctuation detection alarm signal SPAL is issued when the spindle speed deviates from the specified speed due to machine conditions.

This function is useful to prevent preventing the seizure of the guide bushing.

G26 enables spindle speed fluctuation detection. G25 disables spindle speed fluctuation detection.

## Benefits

- Protection of machine and spindle parts
- Reduction of maintenance cases
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J857 | 30i-A Spindle Speed Fluctuation Detection |
| A02B-0306-J857 | 31i-A5 Spindle Speed Fluctuation Detection |
| A02B-0307-J857 | 31i-A Spindle Speed Fluctuation Detection |
| A02B-0308-J857 | 32i-A Spindle Speed Fluctuation Detection |
| A02B-0323-J857 | 30i-B Spindle Speed Fluctuation Detection |
| A02B-0326-J857 | 31i-B5 Spindle Speed Fluctuation Detection |
| A02B-0327-J857 | 31i-B Spindle Speed Fluctuation Detection |
| A02B-0328-J857 | 32i-B Spindle Speed Fluctuation Detection |

**Notice**

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# 313

## Auxiliary / spindle speed function

# Spindle control with servo motor

## Features

This function allows to execute spindle rotation commands and spindle-speed functions such as rigid tapping, with a servo motor. It handles the servo motor used as a live tool axis as a single spindle. The option for spindle serial output and multi-spindle control function is necessary to use this function.

## Spindle speed control with servo motor

Allows to perform speed control with rotation commands (S commands), using a servo motor as a live tool. At the switching between rotation commands and positioning commands, no reference position return is necessary.

## Live tool indexing function

There are two types of live tool indexing functions:

- Execution of the commands in the next block without waiting for the completion of live tool indexing
- Execution of the next block after waiting for the completion of live tool indexing.

The type that does not wait for completion allows the user to specify commands for other axes before issuing the next command for the live tool indexing command axis. It also allows the user to check to see if live tool indexing has completed before issuing the next command for the live tool indexing command axis.

## Rigid tapping with servo motor

Allows to perform rigid tapping with a servo motor as a rotation axis. The option for rigid tapping and canned cycle is necessary to use rigid tapping with servo motor.

## Benefits

- Simplification of the machine structure
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J978 | 30i-A Spindle Control with Servo Motor (Live Tool Control) |

**Notice**

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| Specification | Description |
|---|---|
| A02B-0306-J978 | 31i-A5 Spindle Control with Servo Motor (Live Tool Control) |
| A02B-0307-J978 | 31i-A Spindle Control with Servo Motor (Live Tool Control) |
| A02B-0308-J978 | 32i-A Spindle Control with Servo Motor (Live Tool Control) |
| A02B-0319-J978 | 0i-TD Spindle Control with Servo Motor (Live Tool Control) |
| A02B-0320-J978 | 0i-MD Spindle Control with Servo Motor (Live Tool Control) |
| A02B-0321-J978 | 0i-Mate-TD Spindle Control with Servo Motor (Live Tool Control) |
| A02B-0322-J978 | 0i-Mate-MD Spindle Control with Servo Motor (Live Tool Control) |
| A02B-0323-J978 | 30i-B Spindle Control with Servo Motor (Live Tool Control) |
| A02B-0326-J978 | 31i-B5 Spindle Control with Servo Motor (Live Tool Control) |
| A02B-0327-J978 | 31i-B Spindle Control with Servo Motor (Live Tool Control) |
| A02B-0328-J978 | 32i-B Spindle Control with Servo Motor (Live Tool Control) |
| A02B-0333-J978 | 35i-B Spindle Control with Servo Motor (Live Tool Control) |

**Notice**

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# 315

## Auxiliary / spindle speed function

# Spindle control with CS contour control

## Features

This function allows the execution of spindle rotation commands and spindle-speed functions such as rigid tapping, with a Cs contour control axis.

A speed control with rotation commands (S commands) is possible, using a Cs contour control axis. At the switching between rotation commands and positioning commands, no reference position return is necessary.

## Benefits

- Increase of the flexibility of the spindle control
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J985 | 30i-A Spindle Control with CS Contour Control |
| A02B-0306-J985 | 31i-A5 Spindle Control with CS Contour Control |
| A02B-0307-J985 | 31i-A Spindle Control with CS Contour Control |
| A02B-0308-J985 | 32i-A Spindle Control with CS Contour Control |
| A02B-0323-J985 | 30i-B Spindle Control with CS Contour Control |
| A02B-0326-J985 | 31i-B5 Spindle Control with CS Contour Control |
| A02B-0327-J985 | 31i-B Spindle Control with CS Contour Control |
| A02B-0328-J985 | 32i-B Spindle Control with CS Contour Control |

**Notice**

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# 316

## Auxiliary / spindle speed function

# Spindle switching function

## Features

The Spindle Switching function can realize the spindle control in arbitrary combination of spindle motors and commands to a spindle.

The combination of spindle motors and commands can be switched by the signals of the spindle switching function.

## Benefits

- Increase of the flexibility of the machine
- Simplification of programming
- Overall increase of the machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R515 | 30i-A Spindle Switching Function |
| A02B-0306-R515 | 31i-A5 Spindle Switching Function |
| A02B-0307-R515 | 31i-A Spindle Switching Function |
| A02B-0323-R515 | 30i-B Spindle Switching Function |
| A02B-0326-R515 | 31i-B5 Spindle Switching Function |
| A02B-0327-R515 | 31i-B Spindle Switching Function |

**Notice**

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# 317

## Auxiliary / spindle speed function

# Spindle control switching function for high-speed machining

## Features

Generally, motion command must be given after the spindle deceleration stop and the reference position return in the case of machining after switching from spindle speed control to Cs contour control.

When the Spindle Control Switching function for High-Speed cycle machining is used with high-speed cycle machining function, it is possible to start the machining on the Cs contour control mode without stopping the spindle rotation by establishing the reference position of the Cs contour control axis while the spindle is rotating.

In addition, the control mode of the spindle can be switched from Cs contour control to spindle speed control without stopping the spindle rotation by utilizing the signal, which is outputted during high-speed cycle machining.

As the acceleration/deceleration is not performed at changing control mode, the cycle time can be reduced.

## Benefits

- Reduction of cycle time
- Increase of the machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R608 | 30i-A High-Speed Cycle Machining - Spindle Control Switching Function |
| A02B-0306-R608 | 31i-A5 High-Speed Cycle Machining - Spindle Control Switching Function |
| A02B-0307-R608 | 31i-A High-Speed Cycle Machining - Spindle Control Switching Function |
| A02B-0323-R608 | 30i-B High-Speed Cycle Machining - Spindle Control Switching Function |
| A02B-0326-R608 | 31i-B5 High-Speed Cycle Machining - Spindle Control Switching Function |
| A02B-0327-R608 | 31i-B High-Speed Cycle Machining - Spindle Control Switching Function |

**Notice**

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# 318

## Auxiliary / spindle speed function

# Spindle tandem control

## Features

If a single spindle motor is not capable of producing sufficient torque to drive a spindle axis, spindle tandem control allows more than one spindle motor to produce the torque required.

## Benefits

- Coupling of standard spindle motors to produce high torque for a spindle axis becomes possible

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S648 | 30i-A Spindle Tandem Control |
| A02B-0306-S648 | 31i-A5 Spindle Tandem Control |
| A02B-0307-S648 | 31i-A Spindle Tandem Control |
| A02B-0319-J858 | 0i-TD Spindle Synchronous Control - Incl. Spindle Tandem Control |
| A02B-0320-J858 | 0i-MD Spindle Synchronous Control - Incl. Spindle Tandem Control |
| A02B-0323-J858 | 30i-B Spindle Synchronous Control - Incl. Spindle Tandem Control |
| A02B-0326-J858 | 31i-B5 Spindle Synchronous Control - Incl. Spindle Tandem Control |
| A02B-0327-J858 | 31i-B Spindle Synchronous Control - Incl. Spindle Tandem Control |
| A02B-0328-J858 | 32i-B Spindle Synchronous Control - Incl. Spindle Tandem Control |
| A02B-0333-J858 | 35i-B Spindle Synchronous Control - Incl. Spindle Tandem Control |

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# 319

## Auxiliary / spindle speed function

# Thread start position compensation for changing spindle speed

## Features

The thread cutting is correctly performed by this function even if the spindle override is changed in the interval of the thread cutting performing.

The spindle override can be changed only while the thread cutting is not performed.

## Benefits

- Reduction of the cycle time
- Increase of the machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S946 | 30i-A Thread Start Position Compensation in Changing Spindle Speed function |
| A02B-0306-S946 | 31i-A5 Thread Start Position Compensation in Changing Spindle Speed Function |
| A02B-0307-S946 | 31i-A Thread Start Position Compensation in Changing Spindle Speed Function |
| A02B-0308-S946 | 32i-A Thread Start Position Compensation in Changing Spindle Speed Function |
| A02B-0323-S946 | 30i-B Thread Start Position Compensation in Changing Spindle Speed function |
| A02B-0326-S946 | 31i-B5 Thread Start Position Compensation in Changing Spindle Speed Function |
| A02B-0327-S946 | 31i-B Thread Start Position Compensation in Changing Spindle Speed Function |
| A02B-0328-S946 | 32i-B Thread Start Position Compensation in Changing Spindle Speed Function |

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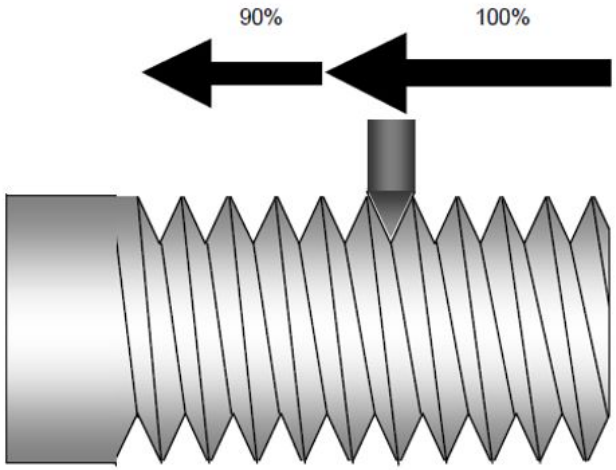
# 320

## Auxiliary / spindle speed function




# Arbitrary speed threading

## Features

Spindle speed cannot be changed normally during threading because the tool movement could not synchronize with the spindle rotation. This function allows threading to change the spindle speed without losing the precision.

This function is available for constant lead threading, threading cycle, and multiple threading cycle.

Changing the spindle speed can prevent the vibration that occurs during threading at the specific spindle speed for large size machine. Besides, for repetitive machining, the same thread shape can be machined even if the indle speed is changed between rough machining and finishing machining.

## Benefits

- Reduction of vibrations
- Improvement of the threading quality on large parts
- Increase of the machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R672 | 30i-A Arbitrary Speed Threading |
| A02B-0306-R672 | 31i-A5 Arbitrary Speed Threading |
| A02B-0307-R672 | 31i-A Arbitrary Speed Threading |
| A02B-0308-R672 | 32i-A Arbitrary Speed Threading |
| A02B-0323-R672 | 30i-B Arbitrary Speed Threading |
| A02B-0326-R672 | 31i-B5 Arbitrary Speed Threading |
| A02B-0327-R672 | 31i-B Arbitrary Speed Threading |
| A02B-0328-R672 | 32i-B Arbitrary Speed Threading |

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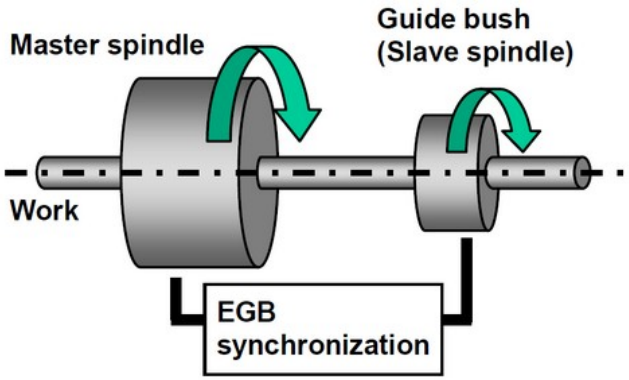
# 321

## Auxiliary / spindle speed function




# Spindle synchronous control for guide bush

## Features

In order to control an axis (slave spindle axis) to follow an axis (master spindle axis) synchronously between two spindle axes, the function “Spindle Electronic Gear Box” called “Spindle EGB” or “Simple spindle EGB” can be used. Both functions require Cs contour control to the slave axis.

With the “Spindle Synchronous Control for Guide Bush”, a similar functionality as for the Simple Spindle EGB can be realized WITHOUT using Cs contour control for the slave axis.

When this function is used, the additional control axis is not necessary because there is no Cs contour control axis.

## Benefits

- Simplification of the implementation of spindle synchronization for a rotary guide bush

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-R420 | 0i-TD Spindle Synchronous Control for Guide Bush |
| A02B-0320-R420 | 0i-MD Spindle Synchronous Control for Guide Bush |

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# 322
# Functions

# Tool functions / tool compensation

This section of the catalogue contains the functions related to Tool Management and Tool compensation.

Some of the functions detailed in the catalogue:

- Tool offset
- Tool Center Point control (TCP
- Smooth TCP
- Automatic compensation
- Geometry compensation
- Tool wear compensation
- Advanced Tool Management
- Wheel wear compensation
- Etc.

**Notice**

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# 323

## Tool functions / tool compensation

# Tool offset pairs

## Features

This function enhances the maximum number of tool offset to a higher maximum value. The tool offset number is specified with the last three digits in T-code value. The tool offset number is specified with the remaining digits after excluding the three digits used to specify the tool offset number.

The maximum size of the tool offset depends on the type of CNC. Refer to the ordering information table for further details.

## Benefits

- Increase of the tool capability of the CNC
- Increase of the flexibility of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J721 | 30i-A Tool Offset, 999 Pairs |
| A02B-0303-J925 | 30i-A Tool Offset, 64 Pairs |
| A02B-0303-J926 | 30i-A Tool Offset, 99 Pairs |
| A02B-0303-J927 | 30i-A Tool Offset, 200 Pairs |
| A02B-0303-J928 | 30i-A Tool Offset, 400 Pairs |
| A02B-0303-S614 | 30i-A Tool Offset, 499 Pairs |
| A02B-0303-S622 | 30i-A Tool Offset, 2000 Pairs |
| A02B-0306-J721 | 31i-A5 Tool Offset, 999 Pairs |
| A02B-0306-J925 | 31i-A5 Tool Offset, 64 Pairs |
| A02B-0306-J926 | 31i-A5 Tool Offset, 99 Pairs |
| A02B-0306-J927 | 31i-A5 Tool Offset, 200 Pairs |
| A02B-0306-J928 | 31i-A5 Tool Offset, 400 Pairs |
| A02B-0306-S614 | 31i-A5 Tool Offset, 499 Pairs |
| A02B-0306-S622 | 31i-A5 Tool Offset, 2000 Pairs |
| A02B-0307-J721 | 31i-A Tool Offset, 999 Pairs |
| A02B-0307-J925 | 31i-A Tool Offset, 64 Pairs |
| A02B-0307-J926 | 31i-A Tool Offset, 99 Pairs |
| A02B-0307-J927 | 31i-A Tool Offset, 200 Pairs |
| A02B-0307-J928 | 31i-A Tool Offset, 400 Pairs |
| A02B-0307-S614 | 31i-A Tool Offset, 499 Pairs |

**Notice**

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| Specification | Description |
|---|---|
| A02B-0307-S622 | 31i-A Tool Offset, 2000 Pairs |
| A02B-0308-J925 | 32i-A Tool Offset, 64 Pairs |
| A02B-0308-J926 | 32i-A Tool Offset, 99 Pairs |
| A02B-0308-J927 | 32i-A Tool Offset, 200 Pairs |
| A02B-0308-J928 | 32i-A Tool Offset, 400 Pairs |
| A02B-0319-J926 | 0i-TD Tool Offset, 99 Pairs |
| A02B-0319-J927 | 0i-TD Tool Offset, 200 Pairs |
| A02B-0321-J926 | 0i-Mate-TD Tool Offset, 99 Pairs |
| A02B-0323-J721 | 30i-B Tool Offset, 999 Pairs |
| A02B-0323-J925 | 30i-B Tool Offset, 64 Pairs |
| A02B-0323-J926 | 30i-B Tool Offset, 99 Pairs |
| A02B-0323-J927 | 30i-B Tool Offset, 200 Pairs |
| A02B-0323-J928 | 30i-B Tool Offset, 400 Pairs |
| A02B-0323-S614 | 30i-B Tool Offset, 499 Pairs |
| A02B-0323-S622 | 30i-B Tool Offset, 2000 Pairs (up to 999 Pairs Available in Each Path) |
| A02B-0326-J721 | 31i-B5 Tool Offset, 999 Pairs |
| A02B-0326-J925 | 31i-B5 Tool Offset, 64 Pairs |
| A02B-0326-J926 | 31i-B5 Tool Offset, 99 Pairs |
| A02B-0326-J927 | 31i-B5 Tool Offset, 200 Pairs |
| A02B-0326-J928 | 31i-B5 Tool Offset, 400 Pairs |
| A02B-0326-S614 | 31i-B5 Tool Offset, 499 Pairs |
| A02B-0326-S622 | 31i-B5 Tool Offset, 2000 Pairs (up to 999 Pairs Available in Each Path) |
| A02B-0327-J721 | 31i-B Tool Offset, 999 Pairs |
| A02B-0327-J925 | 31i-B Tool Offset, 64 Pairs |
| A02B-0327-J926 | 31i-B Tool Offset, 99 Pairs |
| A02B-0327-J927 | 31i-B Tool Offset, 200 Pairs |
| A02B-0327-J928 | 31i-B Tool Offset, 400 Pairs |
| A02B-0327-S614 | 31i-B Tool Offset, 499 Pairs |
| A02B-0327-S622 | 31i-B Tool Offset, 2000 Pairs (up to 999 Pairs Available in Each Path) |
| A02B-0328-J925 | 32i-B Tool Offset, 64 Pairs |
| A02B-0328-J926 | 32i-B Tool Offset, 99 Pairs |
| A02B-0328-J927 | 32i-B Tool Offset, 200 Pairs |
| A02B-0328-J928 | 32i-B Tool Offset, 400 Pairs |
| A02B-0333-J927 | 35i-B Tool Offset, 200 Pairs |
| A02B-0334-J927 | PM i-A Tool Offset, 200 Pairs |

**Notice**

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# 325

## Tool functions / tool compensation

# Tool offset memory B

## Features

Tool Offset Memory B provides separate offsets for geometry compensation and wear compensation. There is no difference between cutter compensation (D code) and tool length compensation (H code).

## Setting Example for Tool Compensation Memory B

| Offset Number | Compensation Value (Geometry) | Compensation Value (Wear) | Common to D and H Codes |
|---|---|---|---|
| 001 | 10100 | 0,100 | for D code |
| 002 | 20200 | 0,200 | for D code |
| 003 | 100000 | 0,100 | for H code |
| ... | ... | ... | ... |

## Benefits

- Addition of the Tool Offset Memory B to the CNC
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S616 | 30i-A Tool Offset Memory B |
| A02B-0306-S616 | 31i-A5 Tool Offset Memory B |
| A02B-0307-S616 | 31i-A Tool Offset Memory B |
| A02B-0308-S616 | 32i-A Tool Offset Memory B |
| A02B-0323-S616 | 30i-B Tool Offset Memory B |
| A02B-0326-S616 | 31i-B5 Tool Offset Memory B |
| A02B-0327-S616 | 31i-B Tool Offset Memory B |
| A02B-0328-S616 | 32i-B Tool Offset Memory B |

**Notice**

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# Tool offset memory C

## Features

Tool Offset Memory C provides for geometry compensation and wear compensation in separate tool compensation memory. Geometry compensation and wear compensation can thus be set separately. Separate memories are prepared for cutter compensation (for D code) and for tool length compensation (for H code).

## Setting Example for Tool Compensation Memory C

| Offset Number | D Code | | H Code | |
|---|---|---|---|---|
| | Compensation Value (Geometry) | Compensation Value (Wear) | Compensation Value (Geometry) | Compensation Value (Wear) |
| 001 | 10000 | 0,100 | 100000 | 0,100 |
| 002 | 20000 | 0,200 | 200000 | 0,300 |
| ... | ... | ... | ... | ... |

## Benefits

- Addition of the Tool Offset Memory C to the CNC
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J937 | 30i-A Tool Offset Memory C |
| A02B-0306-J937 | 31i-A5 Tool Offset Memory C |
| A02B-0307-J937 | 31i-A Tool Offset Memory C |
| A02B-0308-J937 | 32i-A Tool Offset Memory C |
| A02B-0323-J937 | 30i-B Tool Offset Memory C |
| A02B-0326-J937 | 31i-B5 Tool Offset Memory C |
| A02B-0327-J937 | 31i-B Tool Offset Memory C |
| A02B-0328-J937 | 32i-B Tool Offset Memory C |

**Notice**

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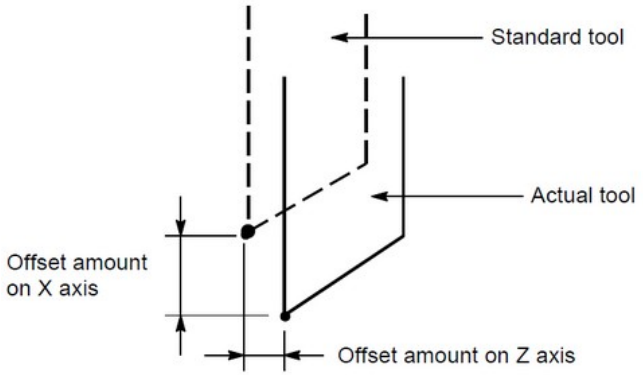
# 327

## Tool functions / tool compensation




# Tool offset

## Features

The Tool Offset function is an option on the milling software of the Series 30i CNC. The programmed travel distance of the tool can be increased or decreased by a specified tool offset value or by twice the offset value. The Tool Offset function can also be applied to an additional axis.

The Tool Offset function is standard in the turning software of the Series 30i CNC. It is used to compensate for the difference when the tool actually used differs from the imagined tool used in programming (usually standard tool).

## Benefits

- Simplifies the operation of the machine
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S617 | 30i-A Tool Offset |
| A02B-0306-S617 | 31i-A5 Tool Offset |
| A02B-0307-S617 | 31i-A Tool Offset |
| A02B-0308-S617 | 32i-A Tool Offset |
| A02B-0323-S617 | 30i-B Tool Offset |
| A02B-0326-S617 | 31i-B5 Tool Offset |
| A02B-0327-S617 | 31i-B Tool Offset |
| A02B-0328-S617 | 32i-B Tool Offset |

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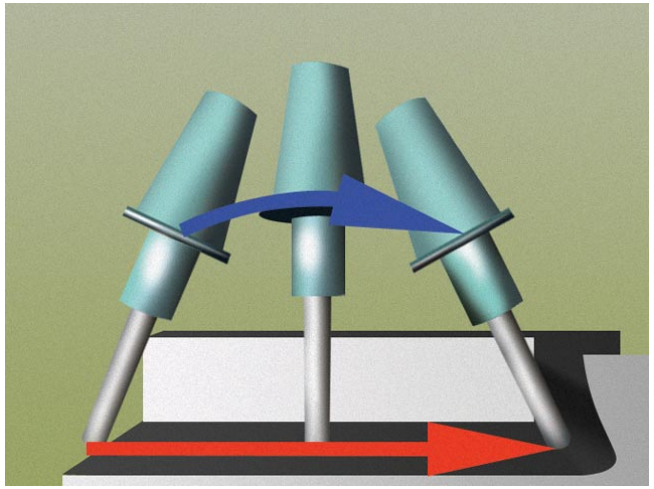
# 328

## Tool functions / tool compensation



# Tool Center Point control

## Features

On a 5-axis machine having two rotary axes that turn a tool or table, this function performs tool length compensation constantly, even in the middle of a block, and exerts control so that the tool center point moves along the specified path.

## Benefits

- The tool center point will move along the specified path even if the direction of the tool changes with respect to the workpiece.
- May be used with all classes of 5-axes machine tools
- Uniform parameters with other 5-axes functions.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0281-S677 | 16i-TB Tool Center Point Control |
| A02B-0282-S677 | 16i-MB Tool Center Point Control |
| A02B-0284-S677 | 18i-MB Tool Center Point Control |
| A02B-0303-S677 | 30i-A Tool Center Point Control |
| A02B-0306-S677 | 31i-A5 Tool Center Point Control |
| A02B-0307-S677 | 31i-A Tool Center Point Control |
| A02B-0323-S677 | 30i-B Tool Center Point Control |
| A02B-0326-S677 | 31i-B5 Tool Center Point Control |
| A02B-0327-S677 | 31i-B Tool Center Point Control |

**Notice**

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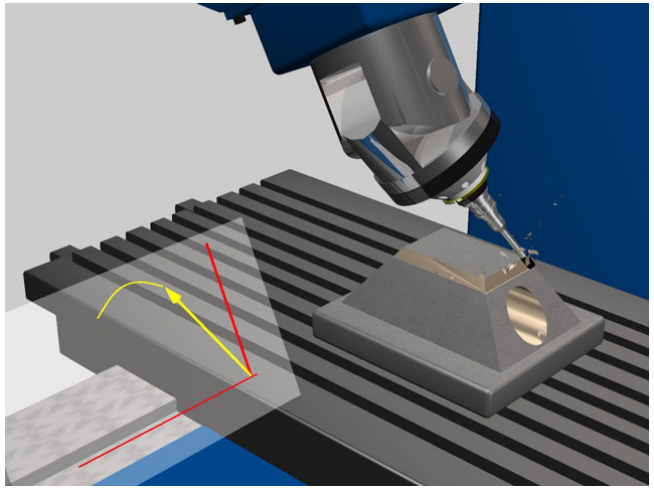
# 329

## Tool functions / tool compensation



# Tool Posture control

## Features

The function of Tool Posture Control, former Tool Posture Control of Tool Center Point Control for 5-Axis Machining, is in a way an extension of Tool Center Point Control, which controls the path of the tool centre point on a straight line.

Additionally the control of the tool is linked to the vector between the start and end point such that unintentional stock removal by the side of the cutting tool is avoided. Tool Posture Control is mainly used in side cutting, if pockets or forms with varying angles are being milled.

## Benefits

- Usage of different tool cutter radius for side cutting in 5-axis machining
- Higher machining flexibility
- Machining of complex 5-axis parts (e.g. pyramids and cons)

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S994 | 30i-A Tool Posture Control of Tool Center Point Control (TCP) for 5-Axes Machining |
| A02B-0306-S994 | 31i-A5 Tool Posture Control of Tool Center Point Control (TCP) for 5-Axes Machining |
| A02B-0323-S994 | 30i-B Tool Posture Control of Tool Center Point Control (TCP) for 5-Axes Machining |
| A02B-0326-S994 | 31i-B5 Tool Posture Control of Tool Center Point Control (TCP) for 5-Axes Machining |

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# 330

## Tool functions / tool compensation

# Cutting point command

## Features

Whether when using end, ball or bull-nose milling tools, the Cutting Point Command function enables the definition of the orientation of the tool relative to the programmed path – information that previously would have had to be input to the CAM system. Now an operator may determine the optimum cutting conditions at the machine and the FANUC CNC will internally re-calculate the required tool path.

## Benefits

- Reduced Setup/Machining Time
- Cutting conditions can be easily adjusted/optimized by the operator
- Same part program can be used with various tools such as end, ball or bull-nose milling tools

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S996 | 30i-A Cutting Point Command |
| A02B-0306-S996 | 31i-A5 Cutting Point Command |
| A02B-0323-S996 | 30i-B Cutting Point Command |
| A02B-0326-S996 | 31i-B5 Cutting Point Command |

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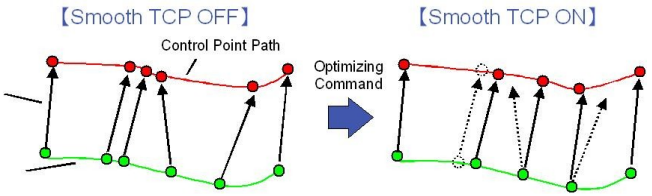
# 331

## Tool functions / tool compensation




# Smooth TCP

## Features

The function Smooth TCP is based on the Tool Center Point Control function and compensates deviations in the tool orientation.

In addition Smooth TCP also ignores redundant commands with regard to the tool centre-point position.

## Benefits

- Shorter cycle times (in extreme cases, time savings of up to 44%)
- Smoother surfaces
- Minimisation of machine or tool wear due to avoidance of jerk in the motion profile

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R639 | 30i-A Smooth Tool Center Point Control (TCP) |
| A02B-0306-R639 | 31i-A5 Smooth Tool Center Point Control (TCP) |
| A02B-0307-R639 | 31i-A Smooth Tool Center Point Control (TCP) |
| A02B-0323-R639 | 30i-B Smooth Tool Center Point Control (TCP) |
| A02B-0326-R639 | 31i-B5 Smooth Tool Center Point Control (TCP) |
| A02B-0327-R639 | 31i-B Smooth Tool Center Point Control (TCP) |

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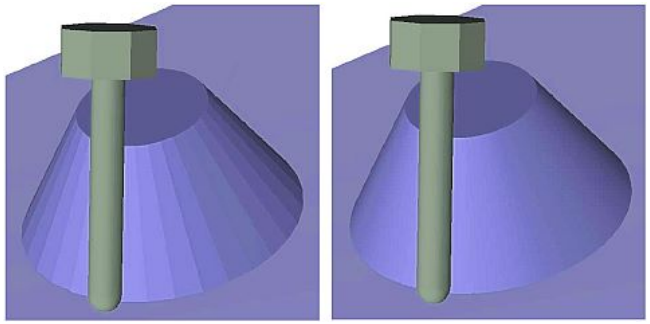
# 332

## Tool functions / tool compensation



# High-speed smooth TCP

## Features

Under Tool Posture Control, the tool posture is controlled every moment for operation on the plane formed by the tool postures (tool length compensation vectors) at the start point and the and point of a block.

This control method is suitable for machining a plane with the side of a tool using the tool center point control.

Adding to the Tool Posture Control, the High-Speed Smooth TCP fuunction generates and interpolates smooth surfaces from commanded tool center points and tool postures.

Traditionally, when a free surface is machined by Tool Posture Control, the free surface is approximated by polyhedrons (left illustration). When using the Smooth TCP, the free surface can be machined with smooth surfaces and the machining quality can be improved (right illustration).

This feature is suitable for machining free surfaces with tool side using Tool Center Point control. This feature has two modes, one is Speed priority mode in which speed has higher priority and the other is Surface quality priority mode in which quality of machining surface has higher priority. One of those modes can be selected by a command.

## Benefits

- Shorter cycle times (in extreme cases, time savings of up to 44%)
- Smoother surfaces
- Minimisation of machine or tool wear due to avoidance of jerk in the motion profile

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R677 | 30i-A High-Speed Smooth TCP (Tool Center Point Control) |
| A02B-0306-R677 | 31i-A5 High-Speed Smooth TCP (Tool Center Point Control) |
| A02B-0323-R677 | 30i-B High-Speed Smooth TCP (Tool Center Point Control) - Incl. Smooth TCP, Tool Posture Control, Cutting Point Command Expansion of Axis Command in TCP Control |
| A02B-0326-R677 | 31i-B5 High-Speed Smooth TCP (Tool Center Point Control) - Incl. Smooth TCP, Tool Posture Control, Cutting Point Command Expansion of Axis Command in TCP Control |

**Notice**

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# 333

## Tool functions / tool compensation

# Y-axis offset

## Features

Y-Axis Offset function is used in turning controls equipped with a third linear axis. When the Y axis, one of the basic three axes, is used with a lathe system, this function performs Y axis offset.

If the tool geometry / wear offset options are provided, both tool geometry offset and tool wear offset are effective to Y axis offset.

## Benefits

- Addition of an additional offset capability for the Y axis
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J934 | 30i-A Y-Axis Offset |
| A02B-0306-J934 | 31i-A5 Y-Axis Offset |
| A02B-0307-J934 | 31i-A Y-Axis Offset |
| A02B-0308-J934 | 32i-A Y-Axis Offset |
| A02B-0323-J934 | 30i-B Y-Axis Offset |
| A02B-0326-J934 | 31i-B5 Y-Axis Offset |
| A02B-0327-J934 | 31i-B Y-Axis Offset |
| A02B-0328-J934 | 32i-B Y-Axis Offset |

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# 334

## Tool functions / tool compensation

# 4th/5th axis offset

## Features

This function performs the tool offset for the 4th and the 5th axis following the basic three axes X, Z, Y. The number of tool offset pairs are 32 pairs, the same as for the X, Z, Y axis.

It is possible to divide into a tool wear offset and a tool geometry offset by specifying a option. The number of 32 pairs can be optionally extended to 64, 99, 400, 999, 2000 pairs. The number of maximum pairs depends on the CNC type.

## Benefits

- Addition of tool offsef for the 4th and 5th axis
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R517 | 30i-A 4th / 5th Axis Offset (Lathe) |
| A02B-0306-R517 | 31i-A5 4th / 5th Axis Offset (Lathe) |
| A02B-0307-R517 | 31i-A 4th / 5th Axis Offset (Lathe) |
| A02B-0308-R517 | 32i-A 4th / 5th Axis Offset (Lathe) |
| A02B-0323-R517 | 30i-B 4th / 5th Axis Offset (Lathe System) |
| A02B-0326-R517 | 31i-B5 4th / 5th Axis Offset (Lathe System) |
| A02B-0327-R517 | 31i-B 4th / 5th Axis Offset (Lathe System) |
| A02B-0328-R517 | 32i-B 4th / 5th Axis Offset (Lathe System) |

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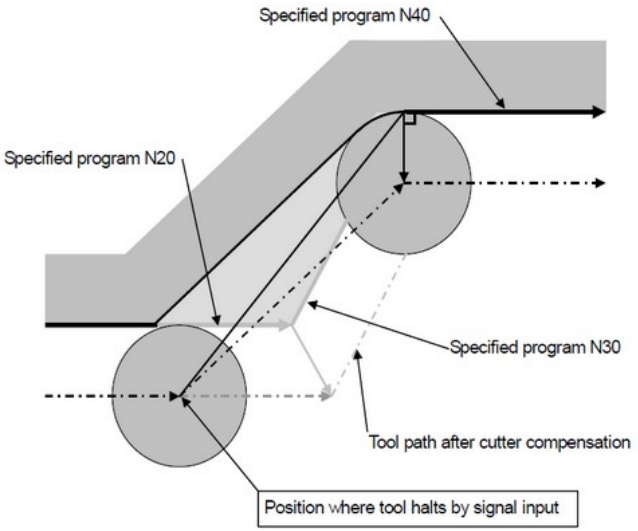
# 335

## Tool functions / tool compensation




# Tool radius - Tool nose radius compensation

## Features

The Tool Radius Compensation function can offset a programmed tool path by the tool radius set in the CNC when machining is performed.

When the radius of the tool to be used for machining is measured and set as the offset value in the CNC, the tool moves along the offset path to cut a programmed profile. As a consequence, when the tool diameter changes, only the offset value needs to be changed and it is not necessary to modify the program.

To obtain the actual offset tool path, the CNC internally calculates intersections of a straight line and a straight line, an arc and an arc, and a straight line and an arc automatically. The programmer only has to program a machining profile, therefore the programming can be done very easily

## Benefits

- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J930 | 30i-A Tool Radius (Cutter) Compensation and Tool Nose Radius Compensation |
| A02B-0306-J930 | 31i-A5 Tool Radius (Cutter) Compensation and Tool Nose Radius Compensation |
| A02B-0307-J930 | 31i-A Tool Radius (Cutter) Compensation and Tool Nose Radius Compensation |
| A02B-0308-J930 | 32i-A Tool Radius (Cutter) Compensation and Tool Nose Radius Compensation |
| A02B-0323-J930 | 30i-B Tool Radius (Cutter) Compensation and Tool Nose Radius Compensation |
| A02B-0326-J930 | 31i-B5 Tool Radius (Cutter) Compensation and Tool Nose Radius Compensation |
| A02B-0327-J930 | 31i-B Tool Radius (Cutter) Compensation and Tool Nose Radius Compensation |
| A02B-0328-J930 | 32i-B Tool Radius (Cutter) Compensation and Tool Nose Radius Compensation |
| A02B-0333-J930 | 35i-B Tool Radius (Cutter) Compensation |

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# 336

## Tool functions / tool compensation

# Automatic tool nose radius compensation

## Features

When using the Tool Nose Radius Compensation function, it is necessary to command the direction offset by G41 / G42 depending on the cutting direction.

With the Automatic Tool Nose Radius Compensation function, it is possible to determinand set the direction offset automatically according to the current cutting direction.

## Benefits

- Easy Programming

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S942 | 30i-A Automatic Tool Nose Radius Compensation |
| A02B-0306-S942 | 31i-A5 Automatic Tool Nose Radius Compensation |
| A02B-0307-S942 | 31i-A Automatic Tool Nose Radius Compensation |
| A02B-0308-S942 | 32i-A Automatic Tool Nose Radius Compensation |
| A02B-0323-S942 | 30i-B Automatic Tool Nose Radius Compensation |
| A02B-0326-S942 | 31i-B5 Automatic Tool Nose Radius Compensation |
| A02B-0327-S942 | 31i-B Automatic Tool Nose Radius Compensation |
| A02B-0328-S942 | 32i-B Automatic Tool Nose Radius Compensation |

**Notice**

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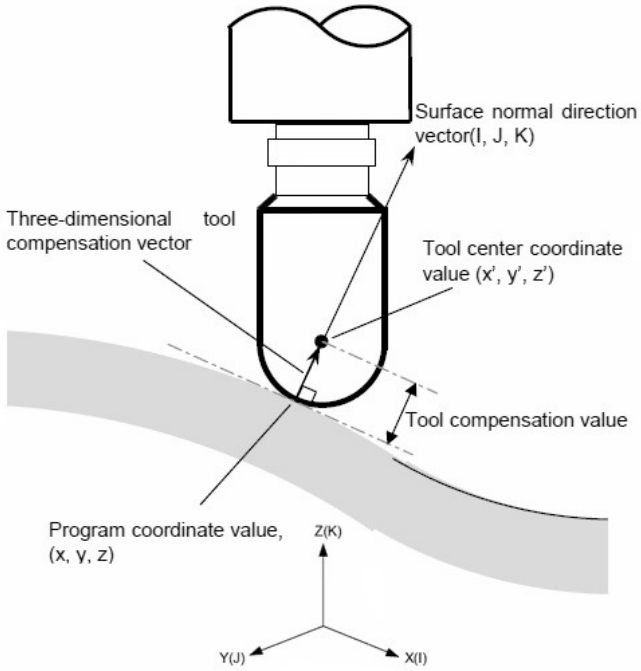
# 337

## Tool functions / tool compensation




# 3 dimensional tool compensation

## Features

The 3-Dimensional Tool Compensation function, used on machines having three basic orthogonal axes, calculates a compensation vector perpendicular to the machining surface as a three-dimensional compensation vector.

Typically, this function is used for ball-nosed cutters on 3-axis machines.

This function is different from the similar 5-axis compensation functions.

## Benefits

- Programming uncompensated surface coordinates of free-form 3D sculptured surfaces typically in Die and Mold applications
- 3–dimensional compensation for ball-nosed cutters
- Can easily change to a different sized ball-nosed cutter without re-calculating the part surface coordinates

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J727 | 30i-A 3-Dimensional Tool Compensation |
| A02B-0306-J727 | 31i-A5 3-Dimensional Tool Compensation |
| A02B-0307-J727 | 31i-A 3-Dimensional Tool Compensation |
| A02B-0323-J727 | 30i-B 3-Dimensional Tool Compensation |
| A02B-0326-J727 | 31i-B5 3-Dimensional Tool Compensation |
| A02B-0327-J727 | 31i-B 3-Dimensional Tool Compensation |

**Notice**

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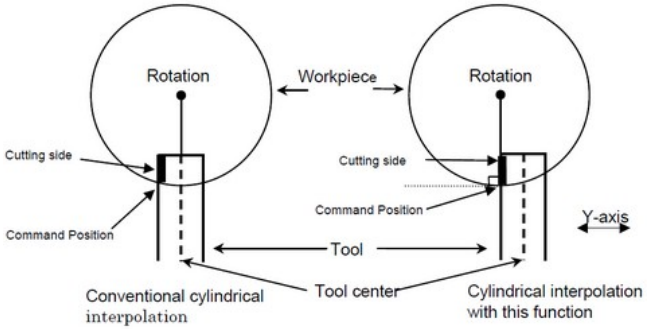
# 338

## Tool functions / tool compensation




# Cutting point interpolation for cylindrical interpolation

## Features

The Cutting Point Interpolation function for Cylindrical Interpolation provides an easy use of the cutter compensation when performing cylindrical interpolation.

The conventional cylindrical interpolation function controls the tool center so that the tool axis always moves along a specified path on the cylindrical surface, towards the rotary axis (cylindrical axis) of the workpiece. The Cutting Point Interpolation for Cylindrical Interpolation function controls the tool so that the tangent of the tool and the cutting surface of a contour always passes the rotation center of the workpiece.This means that the cutting surface of the contour is always perpendicular to the cylinder.

With this function, the figure on the cutting surface can always be kept constant regardless of the cutter compensation value of the tool used.

As shown on the picture the tool is controlled in the offset axis (Y- axis) direction that is perpendicular to the tool centre.

## Benefits

- Addition of cutting capabilities for cylindrical shapes
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S674 | 30i-A Cutting Point Interpolation for Cylindrical Interpolation |
| A02B-0306-S674 | 31i-A5 Cutting Point Interpolation for Cylindrical Interpolation |
| A02B-0307-S674 | 31i-A Cutting Point Interpolation for Cylindrical Interpolation |
| A02B-0323-S674 | 30i-B Cutting Point Interpolation for Cylindrical Interpolation |
| A02B-0326-S674 | 31i-B5 Cutting Point Interpolation for Cylindrical Interpolation |
| A02B-0327-S674 | 31i-B Cutting Point Interpolation for Cylindrical Interpolation |

**Notice**

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# 339

## Tool functions / tool compensation

# 2nd geometry tool offset

## Features

The 2nd Geometry Tool Offset function provides compensation for the difference in tool mounting position or in selected position; the second geometry tool offset can be provided in addition to tool offset.

Data that can be set for second geometry tool offset is the compensation values for the X-, Z-, and Y-axes.

## Benefits

- Addition of offset compensation
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J980 | 30i-A 2nd Geometry Tool Offset |
| A02B-0306-J980 | 31i-A5 2nd Geometry Tool Offset |
| A02B-0307-J980 | 31i-A 2nd Geometry Tool Offset |
| A02B-0308-J980 | 32i-A 2nd Geometry Tool Offset |
| A02B-0323-J980 | 30i-B 2nd Geometry Tool Offset |
| A02B-0326-J980 | 31i-B5 2nd Geometry Tool Offset |
| A02B-0327-J980 | 31i-B 2nd Geometry Tool Offset |
| A02B-0328-J980 | 32i-B 2nd Geometry Tool Offset |

**Notice**

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# 340

## Tool functions / tool compensation

# Tool geometry / wear compensation

## Features

The Tool Geometry / Wear Compensation function changes the tool compensation memory configuration depending on whether the tool geometry and wear compensation functions are provided or not.

The following data items in tool compensation memory are affected:

- X- and Z-axis compensation values in tool offset
- Compensation value R when tool nose radius compensation is provided
- Y-axis compensation value when Y-axis offset is provided

When the tool geometry and wear compensation functions are not provided, there is no distinction between geometry compensation memory and wear compensation memory.

Therefore, a sum of the geometry compensation value and wear compensation value is set in compensation memory. When the tool geometry and wear compensation functions are provided, geometry compensation memory and wear compensation memory are prepared separately. In this case, geometry compensation values and wear compensation values can be set separately.

## Benefits

- Addition of copmpensation capabilities to the CNC
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J931 | 30i-A Tool Geometry/Wear Compensation |
| A02B-0306-J931 | 31i-A5 Tool Geometry/Wear Compensation |
| A02B-0307-J931 | 31i-A Tool Geometry/Wear Compensation |
| A02B-0308-J931 | 32i-A Tool Geometry/Wear Compensation |
| A02B-0323-J931 | 30i-B Tool Geometry/Wear Compensation |
| A02B-0326-J931 | 31i-B5 Tool Geometry/Wear Compensation |
| A02B-0327-J931 | 31i-B Tool Geometry/Wear Compensation |
| A02B-0328-J931 | 32i-B Tool Geometry/Wear Compensation |

**Notice**

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# 341

## Tool functions / tool compensation

# Tool pair for tool management function

## Features

This function provides a framework and tables to manage machine tooling data. The tooling data table can be accessed through the PMC Window functions, C-Language Executor or via FOCAS / HSSB to a Panel i. When using this function, it is not necessary to develop an own machine-specific tool management HMI screens using C-Language Executor, Macro Executor, or PC-based high-level languages.

Data in the Tool Management table can be accessed by machine-specific tool change macros, read / write access through the main part program (G10 commands) and via manual data entry by the machine operator.

The Tool Management function is available in 3 different sizes:

- Tool Management Function - 64 pairs
- Tool Management Function - 240 pairs
- Tool Management Function - 1000 pairs.

## Benefits

- Custom tooling data HMI without using high level programming languages
- Management of tool life
- Sister tooling management (tool-type groups)
- Random or fixed tool-storage location.
- Customizable tool data management for Balluff ID, adaptive control, etc.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S830 | 30i-A Tool Management Function - 64 Tool Pairs |
| A02B-0303-S831 | 30i-A Tool Management Function - 240 Tool Pairs |
| A02B-0303-S833 | 30i-A Tool Management Function - 1000 Tool Pairs |
| A02B-0306-S830 | 31i-A5 Tool Management Function - 64 Tool Pairs |
| A02B-0306-S831 | 31i-A5 Tool Management Function - 240 Tool Pairs |
| A02B-0306-S833 | 31i-A5 Tool Management Function - 1000 Tool Pairs |
| A02B-0307-S830 | 31i-A Tool Management Function - 64 Tool Pairs |
| A02B-0307-S831 | 31i-A Tool Management Function - 240 Tool Pairs |
| A02B-0307-S833 | 31i-A Tool Management Function - 1000 Tool Pairs |
| A02B-0308-S830 | 32i-A Tool Management Function - 64 Tool Pairs |
| A02B-0308-S831 | 32i-A Tool Management Function - 240 Tool Pairs |
| A02B-0308-S833 | 32i-A Tool Management Function - 1000 Tool Pairs |

**Notice**

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| Specification | Description |
|---|---|
| A02B-0319-S830 | 0i-TD Tool Management Function - 64 Tool Pairs |
| A02B-0319-S831 | 0i-TD Tool Management Function - 240 Tool Pairs |
| A02B-0319-S833 | 0i-TD Tool Management Function - 1000 Tool Pairs |
| A02B-0320-S830 | 0i-MD Tool Management Function - 64 Tool Pairs |
| A02B-0320-S831 | 0i-MD Tool Management Function - 240 Tool Pairs |
| A02B-0320-S833 | 0i-MD Tool Management Function - 1000 Tool Pairs |
| A02B-0323-S830 | 30i-B Tool Management Function - 64 Tool Pairs |
| A02B-0323-S831 | 30i-B Tool Management Function - 240 Tool Pairs |
| A02B-0323-S833 | 30i-B Tool Management Function - 1000 Tool Pairs |
| A02B-0326-S830 | 31i-B5 Tool Management Function - 64 Tools Pairs |
| A02B-0326-S831 | 31i-B5 Tool Management Function - 240 Tool Pairs |
| A02B-0326-S833 | 31i-B5 Tool Management Function - 1000 Tool Pairs |
| A02B-0327-S830 | 31i-B Tool Management Function - 64 Tool Pairs |
| A02B-0327-S831 | 31i-B Tool Management Function - 240 Tool Pairs |
| A02B-0327-S833 | 31i-B Tool Management Function - 1000 Tool Pairs |
| A02B-0328-S830 | 32i-B Tool Management Function - 64 Tool Pairs |
| A02B-0328-S831 | 32i-B Tool Management Function - 240 Tool Pairs |
| A02B-0328-S833 | 32i-B Tool Management Function - 1000 Tool Pairs |

**Notice**

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# 343

## Tool functions / tool compensation

# Customized data expansion

## Features

This function provides 16 (or 36) additional customizable data columns for the Tool Management option. The data is located in columns 5 through 20 (or 5 through 40).

## Benefits

- Custom tooling data HMI without using high level programming languages
- Customizable tool data management for Balluff ID, adaptive control, etc
- Greater flexibility for machine-specific 'Tool Management' customization
- Enhanced tool data presentation.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S834 | 30i-A Tool Management Function - Customized Data Expansion (5 - 20) |
| A02B-0303-S835 | 30i-A Tool Management Function - Customized Data Expansion (5 - 40) |
| A02B-0306-S834 | 31i-A5 Tool Management Function - Customized Data Expansion (5 - 20) |
| A02B-0306-S835 | 31i-A5 Tool Management Function - Customized Data Expansion (5 - 40) |
| A02B-0307-S834 | 31i-A Tool Management Function - Customized Data Expansion (5 - 20) |
| A02B-0307-S835 | 31i-A Tool Management Function - Customized Data Expansion (5 - 40) |
| A02B-0308-S834 | 32i-A Tool Management Function - Customized Data Expansion (5 - 20) |
| A02B-0308-S835 | 32i-A Tool Management Function - Customized Data Expansion (5 - 40) |
| A02B-0319-S834 | 0i-TD Tool Management Function - Customized Data Expansion (5 - 20) |
| A02B-0319-S835 | 0i-TD Tool Management Function - Customized Data Expansion (5 - 40) |
| A02B-0320-S834 | 0i-MD Tool Management Function - Customized Data Expansion (5 - 20) |
| A02B-0320-S835 | 0i-MD Tool Management Function - Customized Data Expansion (5 - 40) |
| A02B-0323-S834 | 30i-B Tool Management Function - Customized Data Expansion (5 - 20) |
| A02B-0323-S835 | 30i-B Tool Management Function - Customized Data Expansion (5 - 40) |
| A02B-0326-S834 | 31i-B5 Tool Management Function - Customized Data Expansion (5 - 20) |
| A02B-0326-S835 | 31i-B5 Tool Management Function - Customized Data Expansion (5 - 40) |
| A02B-0327-S834 | 31i-B Tool Management Function - Customized Data Expansion (5 - 20) |
| A02B-0327-S835 | 31i-B Tool Management Function - Customized Data Expansion (5 - 40) |
| A02B-0328-S834 | 32i-B Tool Management Function - Customized Data Expansion (5 - 20) |
| A02B-0328-S835 | 32i-B Tool Management Function - Customized Data Expansion (5 - 40) |

**Notice**

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# 344

## Tool functions / tool compensation

# Tool management expansion

## Features

The Tool Management Expansion function provides the following enhancements to the Tool Management Function:

- Customization of a tool management data item display
- Setting of the name of the spindle position and the wait position
- Setting of the customizing data with a decimal point
- Protection of a various tool management data by the key signal
- Selecting of the life counting cycle of tool life value
- Individual / each tool data screen
- Total life time display for tools of the same type[1)]
- Output to external device[2)]

1) Series 30i, 31i, 32i CNC only
2) Standard on Series 30i/31i/32i CNC

## Benefits

- Greater flexibility for machine-specific Tool Management customization
- Enhanced tool data presentation

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S852 | 30i-A Tool Management Function - Tool Management Expansion |
| A02B-0306-S852 | 31i-A5 Tool Management Function - Tool Management Expansion |
| A02B-0307-S852 | 31i-A Tool Management Function - Tool Management Expansion |
| A02B-0308-S852 | 32i-A Tool Management Function - Tool Management Expansion |
| A02B-0323-S852 | 30i-B Tool Management Function - Tool Management Expansion |
| A02B-0326-S852 | 31i-B5 Tool Management Function - Tool Management Expansion |
| A02B-0327-S852 | 31i-B Tool Management Function - Tool Management Expansion |
| A02B-0328-S852 | 32i-B Tool Management Function - Tool Management Expansion |

**Notice**

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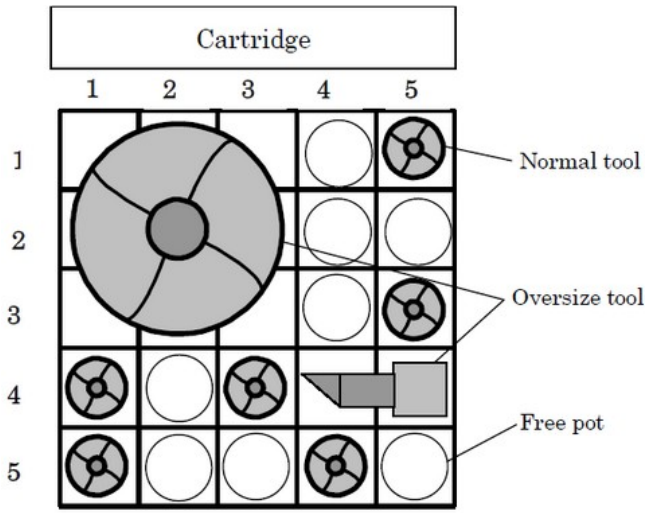
# 345

## Tool functions / tool compensation




# Tool management function for oversize tools

## Features

The Tool Management function for Oversize Tools can be used when oversize tools are used in a tool magazine. When a tool extends over more than one standard tool pocket, this function will try to locate an open pocket that can handle the large tool.

Both chain-type and matrix-type tool changers can be used.

## Benefits

- Open pocket can be automatically determined to handle a large or oversized
- Increase of the flexibility of the tool changer
- Simplification of the programming of the tool changer handling

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S602 | 30i-A Tool Management Function - Oversize Tools |
| A02B-0306-S602 | 31i-A5 Tool Management Function - Oversize Tools |
| A02B-0307-S602 | 31i-A Tool Management Function - Oversize Tools |
| A02B-0308-S602 | 32i-A Tool Management Function - Oversize Tools |

**Notice**

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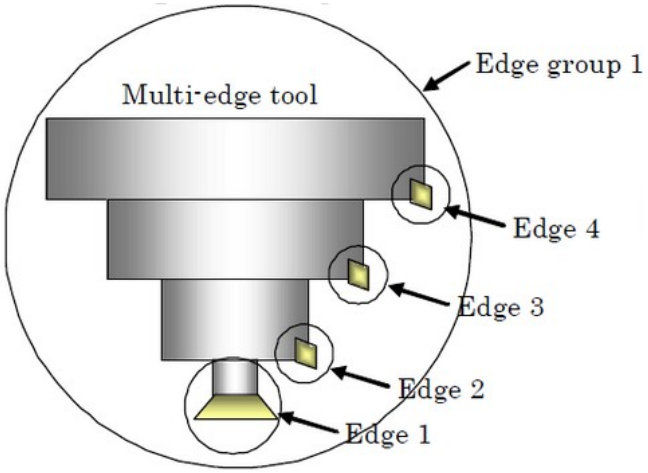
# 346

## Tool functions / tool compensation




# Tool management function for multi-edge tools

## Features

When using the Tool Management Function for Multi-Edge Tools to machine parts with a multi-edge tools (tools which has more than one edge), the tool life management is carried out for individual edges separately.

Unlike the conventional tool management function, which assigns an individual tool management data item to each tool, the multi-edge tool management function assigns an individual tool management data item to each edge.

## Benefits

- Simplifies the management of multi-edge tools on complex machining centers
- Increase of the flexibility of the tool changer
- Simplification of the programming of the tool changer handling

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R681 | 30i-A Tool Management Function - Multi-Edge Tools |
| A02B-0306-R681 | 31i-A5 Tool Management Function - Multi-Edge Tools |
| A02B-0307-R681 | 31i-A Tool Management Function - Multi-Edge Tools |
| A02B-0308-R681 | 32i-A Tool Management Function - Multi-Edge Tools |
| A02B-0323-R681 | 30i-B Tool Management Function - Multi-Edge Tools |
| A02B-0326-R681 | 31i-B5 Tool Management Function - Multi-Edge Tools |
| A02B-0327-R681 | 31i-B Tool Management Function - Multi-Edge Tools |
| A02B-0328-R681 | 32i-B Tool Management Function - Multi-Edge Tools |

**Notice**

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# 347

## Tool functions / tool compensation

# Tool attachment / detachment management function

## Features

The Tool Attachment / Detachment Management function enables the machine operator to load a tool and enter tool management data, all in one operation.

The tool will be registered to the empty magazine pocket selected, and the keyed-in Tool Data will be automatically entered into the Tool Management Data Table. Tool Attachment / Detachment is used in conjunction with the basic Tool Management Function and one of the optional Tool Management Function Pair features must also be activated.

Basic operation of the Tool Management Function requires that the Tool Type and Tool Data be defined in the Tool Management Table first before the tool can be assigned to the machine's spindle or tool magazine pocket. This is not always convenient for tool loading operations. Tool Attachment / Detachment allows the Machine Tool Builder / System Integrator to develop improved Tool Loading and Unloading procedures for enhanced end-user operation.

## Benefits

- Register / Delete a tool to / from the Magazine Management and Tool Management Tables simultaneously in one operation
- Automatic Attachment / Detachment operation enables the creation of Load / Unload cycles for automatic handling of tool to and from the magazine pocket

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S997 | 30i-A Tool Management Function - Tool Attach / Detach Function |
| A02B-0306-S997 | 31i-A5 Tool Management Function - Tool Attach / Detach Function |
| A02B-0307-S997 | 31i-A Tool Management Function - Tool Attach / Detach Function |
| A02B-0308-S997 | 32i-A Tool Management Function - Tool Attach / Detach Function |
| A02B-0323-S997 | 30i-B Tool Management Function - Tool Attach / Detach Function |
| A02B-0326-S997 | 31i-B5 Tool Management Function - Tool Attach / Detach Function |
| A02B-0327-S997 | 31i-B Tool Management Function - Tool Attach / Detach Function |
| A02B-0328-S997 | 32i-B Tool Management Function - Tool Attach / Detach Function |

**Notice**

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# 348

## Tool functions / tool compensation

# Tool management expansion B

## Features

The Tool Management Expansion B function provides the following enhancements to the Tool Management Function:

- Cartridge management data protection function
- Tool management data extraction function
- Tool management function magazine property / pot property
- Tool return function

## Benefits

- Increase of the flexibility to manage custom Tool Management systems

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R616 | 30i-A Tool Management Function - Tool Management Expansion B |
| A02B-0306-R616 | 31i-A5 Tool Management Function - Tool Management Expansion B |
| A02B-0307-R616 | 31i-A Tool Management Function - Tool Management Expansion B |
| A02B-0308-R616 | 32i-A Tool Management Function - Tool Management Expansion B |
| A02B-0319-R616 | 0i-TD Tool Management Function - Tool Management Expansion B |
| A02B-0320-R616 | 0i-MD Tool Management Function - Tool Management Expansion B |
| A02B-0323-R616 | 30i-B Tool Management Function - Tool Management Expansion B - Incl. Tool Mgmt. Expansion, Tool Mgmt. Function for Oversize Tools, Tool Mgmt. Function for Multi-Edge Tools |
| A02B-0326-R616 | 31i-B5 Tool Management Function - Tool Management Expansion B - Incl. Tool Mgmt. Expansion, Tool Mgmt. Function for Oversize Tools, Tool Mgmt. Function for Multi-Edge Tools |
| A02B-0327-R616 | 31i-B Tool Management Function - Tool Management Expansion B - Incl. Tool Mgmt. Expansion, Tool Mgmt. Function for Oversize Tools, Tool Mgmt. Function for Multi-Edge Tools |
| A02B-0328-R616 | 32i-B Tool Management Function - Tool Management Expansion B - Incl. Tool Mgmt. Expansion, Tool Mgmt. Function for Oversize Tools, Tool Mgmt. Function for Multi-Edge Tools |

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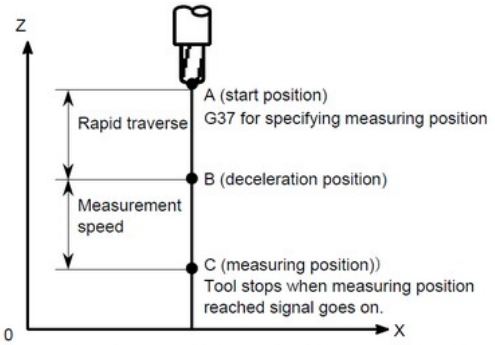
# 349

## Tool functions / tool compensation




Compensation = (Current compensation) + [(Coordinate at tool stop) - (Coordinate at specification of measuring position)]

# Automatic tool length measurement

## Features

The Automatic Tool Length Measurement function provides the capability to automatically measure tools. The difference between the coordinate value of tool when the tool end has reached the measuring position and coordinate value of the measuring position is automatically measured, calculated and added to the currently set tool offset amount by CNC system.

The machine must be equipped with measuring devices, for example touch probe, so that a signal is sent when the tool end has reached the measuring position.

The image shows an example of how the measuring position coordinate value is controlled.

When G37 is specified, the tool moves from the start point to the deceleration position by rapid traverse. Then, from the deceleration position, the tool decelerates to a parameter-set measurement federate and moves until the approach end signal is issued from the measuring device. The tool movement stops when the tool tip has reached the measurement position.

## Benefits

- Automation of the tool length measurement
- Simplification of the machine operation
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S618 | 30i-A Automatic Tool Length Measurement (CNC for Milling) / Automatic Tool Offset (CNC for Turning) |
| A02B-0306-S618 | 31i-A5 Automatic Tool Length Measurement (CNC for Milling) / Automatic Tool Offset (CNC for Turning) |
| A02B-0307-S618 | 31i-A Automatic Tool Length Measurement (CNC for Milling) / Automatic Tool Offset (CNC for Turning) |
| A02B-0308-S618 | 32i-A Automatic Tool Length Measurement (CNC for Milling) / Automatic Tool Offset (CNC for Turning) |
| A02B-0323-S618 | 30i-B Automatic Tool Length Measurement (CNC for Milling) / Automatic Tool Offset (CNC for Turning) |
| A02B-0326-S618 | 31i-B5 Automatic Tool Length Measurement (CNC for Milling) / Automatic Tool Offset (CNC for Turning) |
| A02B-0327-S618 | 31i-B Automatic Tool Length Measurement (CNC for Milling) / Automatic Tool Offset (CNC for Turning) |

**Notice**

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| Specification | Description |
|---|---|
| A02B-0328-S618 | 32i-B Automatic Tool Length Measurement (CNC for Milling) / Automatic Tool Offset (CNC for Turning) |

**Notice**

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# 351

## Tool functions / tool compensation

# High-speed measuring position reach signal input

## Features

Measurement can be made using the high-speed measuring position reached signals HAE1 to HAE8 (connected directly to the CNC). This procedure is provided instead of the standard measuring position reached signals. Up to eight signal inputs can be used with the high-speed measuring position reached signals.

When using the standard function through the PMC, the delay and variation in detecting the input of a measuring position reached signal is 0 to 2 ms on the CNC side, excluding the PMC side.

A delay and variation in detecting the input of a high-speed measuring position reached signal can be reduced to 0.1 ms or lower, so that high-precision measurement can be made.

## Benefits

- Automation of the tool length measurement
- Simplification of the machine operation
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S998 | 30i-A High-Speed Measuring Position Reach Signal Input |
| A02B-0323-S998 | 30i-B High-Speed Measuring Position Reach Signal Input |
| A02B-0326-S998 | 31i-B5 High-Speed Measuring Position Reach Signal Input |
| A02B-0327-S998 | 31i-B High-Speed Measuring Position Reach Signal Input |

**Notice**

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# 352

## Tool functions / tool compensation

# Tool length / work zero point measurement

## Features

Tool Length /Work Zero Point Measurement function has been designed to simplify the procedure of tool length measurement.

This function facilitates the machining setup, resulting in a reduced machining setup time. The function eases the measurement of the workpiece origin offset. With this function, the operator can program a T / M code or a reference position return by specifying a manual numerical command on the tool length offset measurement screen.

## Benefits

- Automation of the tool length measurement
- Simplification of the machine operation
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J668 | 30i-A Tool Length / Work Zero Point Measurement |
| A02B-0306-J668 | 31i-A5 Tool Length / Work Zero Point Measurement |
| A02B-0307-J668 | 31i-A Tool Length / Work Zero Point Measurement |
| A02B-0323-J668 | 30i-B Tool Length / Work Zero Point Measurement |
| A02B-0326-J668 | 31i-B5 Tool Length / Work Zero Point Measurement |
| A02B-0327-J668 | 31i-B Tool Length / Work Zero Point Measurement |

**Notice**

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# 353

## Tool functions / tool compensation

# Direct input of offset value measured B

## Features

The Direct Input of Offset Value Measured B function provides the capability to input offset values using a touch probe. Using the touch probe and by manually making the tool contact the touch probe, it is possible to set the offset amount of that tool automatically in the tool offset amount memory.

It is also possible to set the workpiece coordinate system shift amount automatically. The tool setter function for single-turret / two-spindle lathes is also available, which allows to use the direct input of the tool offset value measured B for each spindle in a single-turret / two-spindle lathe.

## Benefits

- Automation of the tool offset
- Simplification of the machine operation
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J933 | 30i-A Direct Input Value Measured B |
| A02B-0306-J933 | 31i-A5 Direct Input Value Measured B |
| A02B-0307-J933 | 31i-A Direct Input Value Measured B |
| A02B-0308-J933 | 32i-A Direct Input Value Measured B |
| A02B-0323-J933 | 30i-B Direct Input Value Measured B |
| A02B-0326-J933 | 31i-B5 Direct Input Value Measured B |
| A02B-0327-J933 | 31i-B Direct Input Value Measured B |
| A02B-0328-J933 | 32i-B Direct Input Value Measured B |

**Notice**

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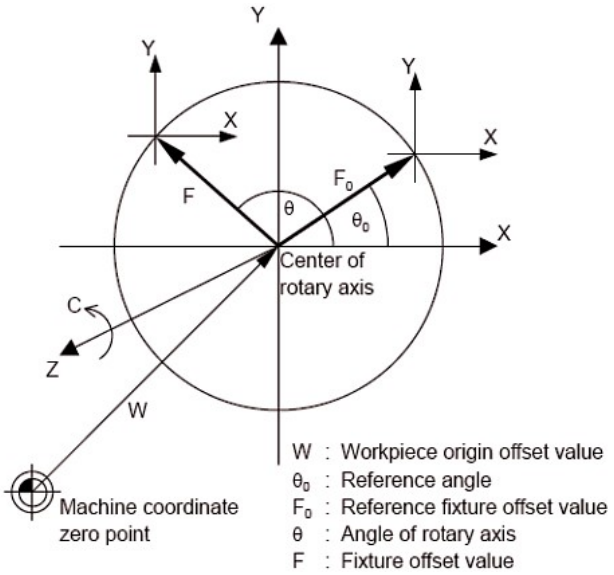
# 354

## Tool functions / tool compensation




# Rotary table dynamic fixture offset

## Features

The Rotary Table Dynamic Fixture Offset function avoids for the operator to re-set the workpiece coordinate system whenever the rotary table rotates before cutting is started.

## Benefits

- Ability to adjust part location at the control level
- No need to repost programs if rotary axis is misaligned
- Ease of operation
- Reduce Setups

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S728 | 30i-A Rotary Table Dynamic Fixture Offset |
| A02B-0306-S728 | 31i-A5 Rotary Table Dynamic Fixture Offset |
| A02B-0307-S728 | 31i-A Rotary Table Dynamic Fixture Offset |
| A02B-0308-S728 | 32i-A Rotary Table Dynamic Fixture Offset |
| A02B-0323-S728 | 30i-B Rotary Table Dynamic Fixture Offset |
| A02B-0326-S728 | 31i-B5 Rotary Table Dynamic Fixture Offset |
| A02B-0327-S728 | 31i-B Rotary Table Dynamic Fixture Offset |
| A02B-0328-S728 | 32i-B Rotary Table Dynamic Fixture Offset |

**Notice**

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# 355

## Tool functions / tool compensation

# Changing active offset value with manual move

## Features

When rough machining or semi-finishing need to be performed using a single tool, it is possilble to make a fine adjustment of a tool length compensation value or cutter compensation value.

During setup, it is also desirable to make a fine adjustment of a workpiece origin offset once set.

With this function, a travel distance moved on an axis by manual feed is automatically added to the workpiece coordinate system or the currently valid offset number among the specified offset values (tool length compensation value / cutter compensation value / workpiece origin offset) to make a offset value change.

## Benefits

- On the fly adjustment of offset during rough machining or semi-finishing
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S825 | 30i-A Changing Active Offset Value with Manual Move |
| A02B-0306-S825 | 31i-A5 Changing Active Offset Value with Manual Move |
| A02B-0307-S825 | 31i-A Changing Active Offset Value with Manual Move |
| A02B-0308-S825 | 32i-A Changing Active Offset Value with Manual Move |
| A02B-0323-S825 | 30i-B Changing Active Offset Value with Manual Move |
| A02B-0326-S825 | 31i-B5 Changing Active Offset Value with Manual Move |
| A02B-0327-S825 | 31i-B Changing Active Offset Value with Manual Move |
| A02B-0328-S825 | 32i-B Changing Active Offset Value with Manual Move |

**Notice**

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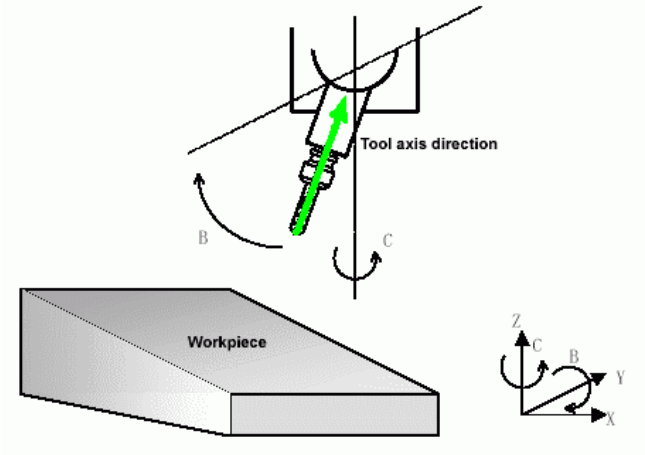
# 356

## Tool functions / tool compensation




# Tool length compensation in tool axis direction

## Features

On a five-axis machine, when two axes are used to rotate the tool, the tool length compensation can be performed in a specified tool axis direction on a rotation axis.

When a rotation axis is specified in tool axis direction tool length compensation mode, the tool length compensation is applied in a specified tool axis direction on the rotation axis by the compensation value specified in the H code.

As a consequence, the movement is made along the three linear axes (Xp, Yp, Zp).

## Benefits

- Addition of tool compensation function on a 5-axis machine
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S670 | 30i-A Tool Length Compensation in Tool Axis Direction |
| A02B-0306-S670 | 31i-A5 Tool Length Compensation in Tool Axis Direction |
| A02B-0323-S670 | 30i-B Tool Length Compensation in Tool Axis Direction |
| A02B-0326-S670 | 31i-B5 Tool Length Compensation in Tool Axis Direction |

**Notice**

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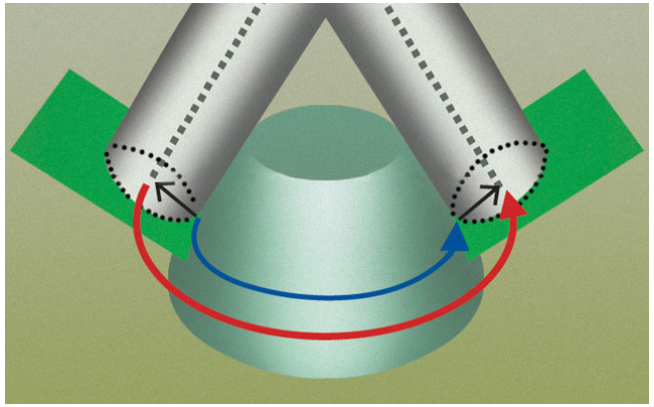
# 357

## Tool functions / tool compensation



# 3 dimensional cutter compensation

## Features

The 3-Dimensional Cutter Compensation function, formerly called Tool Radius Compensation for 5 Axis Machining, supports part programming of surface coordinates of full 5-Axes complex contours.

It allows the definition of the diameter of the tool at the control level rather than compensating for the tool radius in the part-program.

For machines having multiple rotary axes to freely control the orientation of a tool axis, this function calculates a tool vector from the positions of these rotary axes. This function then calculates a compensation vector in a plane perpendicular to the tool vector and applies three-dimensional cutter offset. This allows for full 5-Axes surface coordinate contouring of complex parts and for any adjustment of the tooling diameter to be maintained at the control level.

## Benefits

- Usage of different tool cutter radius for side cutting in 5-axis machining
- Higher machining flexibility
- Machining of complex 5-axis parts (e.g. pyramids and cons)
- Ability to adjust the tool diameter at the control
- Ability to offset part using machine work piece offsets
- Part Programming verses machine programming
- Program is easily transferable to similar machines
- No need to repost programs when tool diameter changes
- Saves on tooling costs. Easily use reground tooling

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S667 | 30i-A 3-Dimensional Cutter Compensation |
| A02B-0306-S667 | 31i-A5 3-Dimensional Cutter Compensation |
| A02B-0307-S667 | 31i-A 3-Dimensional Cutter Compensation |
| A02B-0323-S667 | 30i-B 3-Dimensional Cutter Compensation |
| A02B-0326-S667 | 31i-B5 3-Dimensional Cutter Compensation |
| A02B-0327-S667 | 31i-B 3-Dimensional Cutter Compensation |

**Notice**

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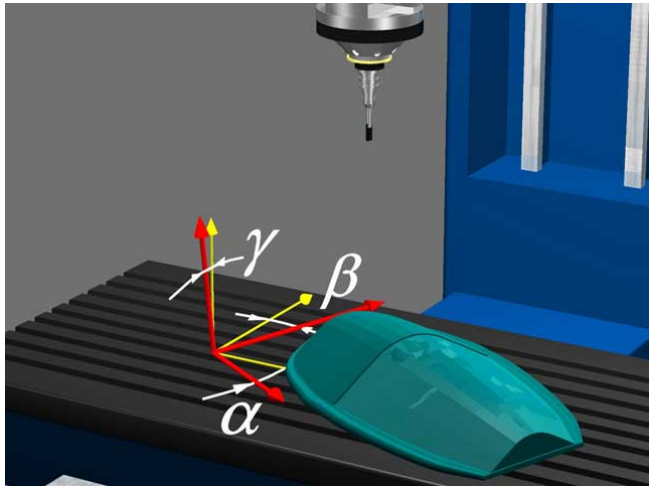
# 358

## Tool functions / tool compensation




# Work setting error compensation

## Features

With large workpieces, it is often the case that a workpiece is clamped for the first or second machining stage and is then, perhaps, removed for measurement.

It must then be re-clamped before machining is continued and position errors are unavoidable. The Workpiece Setting Error Compensation feature detects this through measuring cycles that determine the error and automatically corrects prior to initiating the standard part program.

## Benefits

- Shortens set-up time
- More efficient production process
- Better quality
- Avoiding potential operators errors

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S993 | 30i-A Workpiece Setting Error Compensation |
| A02B-0306-S993 | 31i-A5 Workpiece Setting Error Compensation |
| A02B-0307-S993 | 31i-A Workpiece Setting Error Compensation |
| A02B-0323-S993 | 30i-B Workpiece Setting Error Compensation |
| A02B-0326-S993 | 31i-B5 Workpiece Setting Error Compensation |
| A02B-0327-S993 | 31i-B Workpiece Setting Error Compensation |

**Notice**

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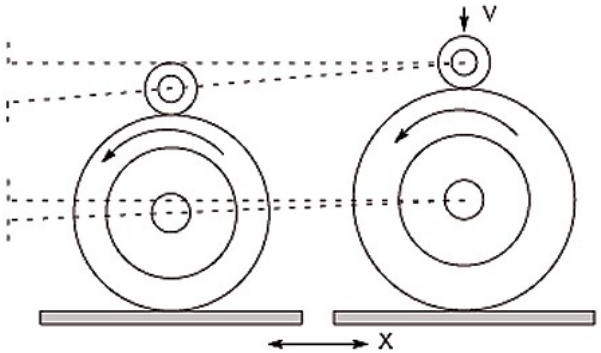
# 359

## Tool functions / tool compensation




# Wheel wear compensation

## Features

The Wheel Wear Compensation function is used on grinding machines to compensate for wear of the wheel and dresser. The grinding-wheel and dresser are compensated continuously during grinding in the canned cycles for surface grinding (G75, and G77 to G79). They are compensated according to the amount of continuous dressing.

## Benefits

- Addition of compensation for grinding wheel
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J633 | 30i-A Wheel Wear Compensation |
| A02B-0306-J633 | 31i-A5 Wheel Wear Compensation |
| A02B-0307-J633 | 31i-A Wheel Wear Compensation |
| A02B-0323-J633 | 30i-B Wheel Wear Compensation |
| A02B-0326-J633 | 31i-B5 Wheel Wear Compensation |
| A02B-0327-J633 | 31i-B Wheel Wear Compensation |

**Notice**

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# 360

## Tool functions / tool compensation

# Direct input of offset value measured B for 2 spindle lathe

## Features

In lathe with two touch sensors, each tool offset and workpiece origin offset for two workpiece coordinate systems can be automatically calculated. The lathe, which has a back spindle, has a different workpiece coordinate system for each spindle.

## Benefits

- For 2 workpiece coordinate system, each tool offset and workpiece origin offset can be automatically calculated

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J686 | 30i-A Direct Input of Offset Value Measured B for 2 Spindle Lathe |
| A02B-0306-J686 | 31i-A5 Direct Input of Offset Value Measured B for 2 Spindle Lathe |
| A02B-0307-J686 | 31i-A Direct Input of Offset Value Measured B for 2 Spindle Lathe |
| A02B-0308-J686 | 32i-A Direct Input of Offset Value Measured B for 2 Spindle Lathe |
| A02B-0323-J686 | 30i-B Direct Input of Offset Value Measured B for 2 Spindle Lathe |
| A02B-0326-J686 | 31i-B5 Direct Input of Offset Value Measured B for 2 Spindle Lathe |
| A02B-0327-J686 | 31i-B Direct Input of Offset Value Measured B for 2 Spindle Lathe |
| A02B-0328-J686 | 32i-B Direct Input of Offset Value Measured B for 2 Spindle Lathe |

**Notice**

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# 361

## Tool functions / tool compensation

# Tool life management

## Features

When the usage of a tool exceeds the preset hours or times of use, another tool in the same group which has not yet exceeded the preset lifetime is selected.

## Benefits

- Improvement of the tool group management
- Optimization of the machine and tool usage
- Automatic alarm generated
- Automation for mass production

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J935 | 30i-A Tool Life Management |
| A02B-0303-J936 | 30i-A Tool Life Management - Addition of Tool Pairs |
| A02B-0306-J935 | 31i-A5 Tool Life Management |
| A02B-0306-J936 | 31i-A5 Tool Life Management - Addition of Tool Pairs |
| A02B-0307-J935 | 31i-A Tool Life Management |
| A02B-0307-J936 | 31i-A Tool Life Management - Addition of Tool Pairs |
| A02B-0308-J935 | 32i-A Tool Life Management |
| A02B-0308-J936 | 32i-A Tool Life Management - Addition of Tool Pairs |
| A02B-0323-J935 | 30i-B Tool Life Management |
| A02B-0323-J936 | 30i-B Tool Life Management - Addition of Tool Pairs |
| A02B-0326-J935 | 31i-B5 Tool Life Management |
| A02B-0326-J936 | 31i-B5 Tool Life Management - Addition of Tool Pairs |
| A02B-0327-J935 | 31i-B Tool Life Management |
| A02B-0327-J936 | 31i-B Tool Life Management - Addition of Tool Pairs |
| A02B-0328-J935 | 32i-B Tool Life Management |
| A02B-0328-J936 | 32i-B Tool Life Management - Addition of Tool Pairs |

**Notice**

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# 362

## Tool functions / tool compensation

# Automatic alteration of tool position compensation

## Features

The Automatic Alteration of Tool Position Compensation function is used to select a new tool number by an external signal from the PMC in manual operation mode.

When a tool is changed manually, the tool offset value (Tool geometry/wear compensation) can be adjusted to the selected tool by specifying the new tool number with an external signal through the PMC.

## Benefits

- Increase of the manual tool management capabilities
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J690 | 30i-A Automatic Alteration of Tool Position Compensation |
| A02B-0306-J690 | 31i-A5 Automatic Alteration of Tool Position Compensation |
| A02B-0307-J690 | 31i-A Automatic Alteration of Tool Position Compensation |
| A02B-0308-J690 | 32i-A Automatic Alteration of Tool Position Compensation |
| A02B-0319-J690 | 0i-TD Automatic Alteration of Tool Position Compensation |
| A02B-0323-J690 | 30i-B Automatic Alteration of Tool Position Compensation |
| A02B-0326-J690 | 31i-B5 Automatic Alteration of Tool Position Compensation |
| A02B-0327-J690 | 31i-B Automatic Alteration of Tool Position Compensation |
| A02B-0328-J690 | 32i-B Automatic Alteration of Tool Position Compensation |

**Notice**

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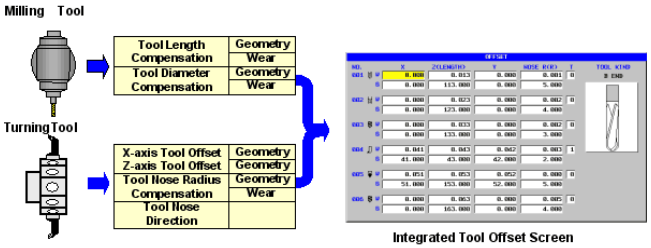
# 363

## Tool functions / tool compensation




# Tool offset for Milling and Turning function

## Features

The Tool Offset Screen for Compound Machine function has been designed to meet the requirements of compound machine tools to manage both offset data of milling and turning tools on one offset screen, which simplifies the tool offset data management of compound machines.

Features:

- Manages and displays offset data of both milling and turning tools on an Integrated Tool Offset Screen
- Manages and displays geometry and wear compensation data on an Integrated Tool Offset Screen
- Displays tool shape in graphic for easy operation. Designates tool shape on the dedicated screen

Limitation

The following functions cannot be used with this function:

- Tool position offset (G45~G48)
- Tool position offset B
- Changing Active Offset Value with Manual Move
- Basic operation package 2
- Manual Guide i
- Tool offset data cannot be protected by '8-level data protection function'

## Benefits

- Addition of tool management capabilities for compound machines
- Simplification of the setup and tool management
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R595 | 30i-A Tool Offset for Milling and Turning Function |
| A02B-0306-R595 | 31i-A5 Tool Offset for Milling and Turning Function |
| A02B-0307-R595 | 31i-A Tool Offset for Milling and Turning Function |
| A02B-0308-R595 | 32i-A Tool Offset for Milling and Turning Function |
| A02B-0323-R595 | 30i-B Tool Offset for Milling and Turning Function |
| A02B-0326-R595 | 31i-B5 Tool Offset for Milling and Turning Function |
| A02B-0327-R595 | 31i-B Tool Offset for Milling and Turning Function |

**Notice**

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# 364

| Specification | Description |
|---|---|
| A02B-0328-R595 | 32i-B Tool Offset for Milling and Turning Function |


## Notice

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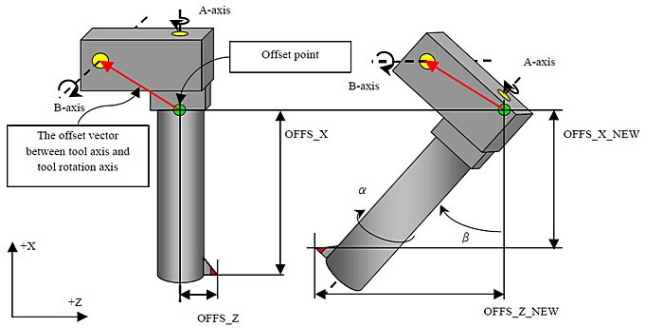
# 365

## Tool functions / tool compensation




# Tool offset conversion function

## Features

On a complicated machine composition that has rotation axes (see illustration), the tool offset of each axis and the direction of imaginary tool nose are changed by angle of rotation degree of the tool nose rotation axis and the swivel head axis.

It is assumed that the direction of the tool nose rotation axis is X(A-axis) and the direction of the swivel head axis is Y(B-axis) in X-Z plane.

In this function, the tool offset and the direction of imaginary tool nose (which are measured and are set to the tool offset screen when A and B are set to 0 degree) are converted into appropriate value which depends on the angle of the rotation axis (A and B) by the G44.1 command. The commanded angle of A-axis must be selected from 0 or 180 degree.

## Benefits

- Benefit list not available

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R691 | 30i-A Tool Offset Conversion Function |
| A02B-0306-R691 | 31i-A5 Tool Offset Conversion Function |
| A02B-0307-R691 | 31i-A Tool Offset Conversion Function |
| A02B-0308-R691 | 32i-A Tool Offset Conversion Function |
| A02B-0323-R691 | 30i-B Tool Offset Conversion Function |
| A02B-0326-R691 | 31i-B5 Tool Offset Conversion Function |
| A02B-0327-R691 | 31i-B Tool Offset Conversion Function |
| A02B-0328-R691 | 32i-B Tool Offset Conversion Function |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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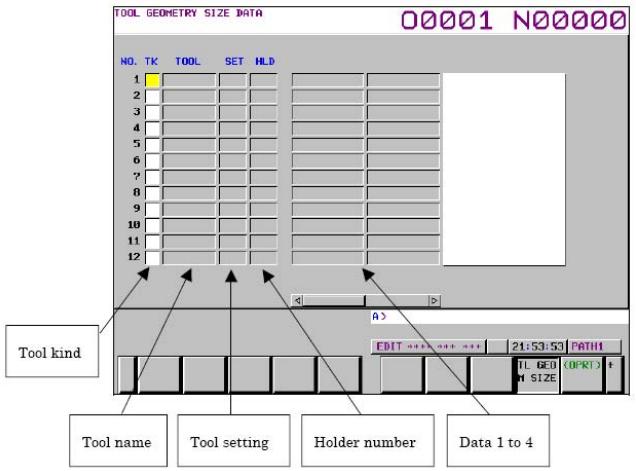
# 366

## Tool functions / tool compensation




# Tool geometry size data

## Features

The tool geometry size data can be set through a special input screen (Tool geometry size data setting screen) under the tool management screen.

The tool geometry size data stores tool data like shape and size etc. to be used in the 3D interference check function and dynamic graphic display function. It also applies to the simulation functionality of MANUAL GUIDE i.

## Benefits

- Addition of capabilities for the Tool Management function
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R589 | 30i-A Tool Geometry Size Data, 100 Pairs |
| A02B-0303-R590 | 30i-A Tool Geometry Size Data, 300 Pairs |
| A02B-0306-R589 | 31i-A5 Tool Geometry Size Data, 100 Pairs |
| A02B-0306-R590 | 31i-A5 Tool Geometry Size Data, 300 Pairs |
| A02B-0307-R589 | 31i-A Tool Geometry Size Data, 100 Pairs |
| A02B-0307-R590 | 31i-A Tool Geometry Size Data, 300 Pairs |
| A02B-0308-R589 | 32i-A Tool Geometry Size Data, 100 Pairs |
| A02B-0308-R590 | 32i-A Tool Geometry Size Data, 300 Pairs |
| A02B-0323-R589 | 30i-B Tool Geometry Size Data, 100 Pairs |
| A02B-0323-R590 | 30i-B Tool Geometry Size Data, 300 Pairs |
| A02B-0326-R589 | 31i-B5 Tool Geometry Size Data, 100 Pairs |
| A02B-0326-R590 | 31i-B5 Tool Geometry Size Data, 300 Pairs |
| A02B-0327-R589 | 31i-B Tool Geometry Size Data, 100 Pairs |
| A02B-0327-R590 | 31i-B Tool Geometry Size Data, 300 Pairs |
| A02B-0328-R589 | 32i-B Tool Geometry Size Data, 100 Pairs |
| A02B-0328-R590 | 32i-B Tool Geometry Size Data, 300 Pairs |

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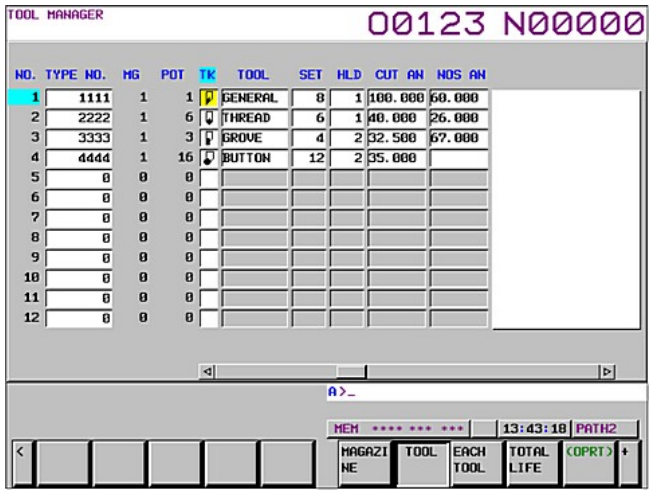
# 367

## Tool functions / tool compensation




# Tool geometry size data - Additional tool type

## Features

This function supports to use the tool kind for the lathe system even if it is used in the machining center type path.

As a result, when the compound machining is executed in the machining center type path, the tool geometry size data can be used for it.

## Benefits

- Simplifies the management of tools for compound machines

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R685 | 30i-A Addition of Tool Kind in Tool Geometry Size Data |
| A02B-0306-R685 | 31i-A5 Addition of Tool Kind in Tool Geometry Size Data |
| A02B-0307-R685 | 31i-A Addition of Tool Kind in Tool Geometry Size Data |
| A02B-0308-R685 | 32i-A Addition of Tool Kind in Tool Geometry Size Data |
| A02B-0323-R685 | 30i-B Addition of Tool Kind in Tool Geometry Size Data |
| A02B-0326-R685 | 31i-B5 Addition of Tool Kind in Tool Geometry Size Data |
| A02B-0327-R685 | 31i-B Addition of Tool Kind in Tool Geometry Size Data |
| A02B-0328-R685 | 32i-B Addition of Tool Kind in Tool Geometry Size Data |

**Notice**

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# 368
## Functions

# Accuracy compensation functions

Machine Compensation Functions are options that allow the CNC to compensate for mechanical inaccuracies in the machine.

Some of the functions detailed in the catalogue:

- Backlash compensation
- Pitch error compensation
- Inclination compensation
- Straightness compensation
- 3 dimensional error compensation
- 3 dimensional machine compensation
- Etc.

**Notice**

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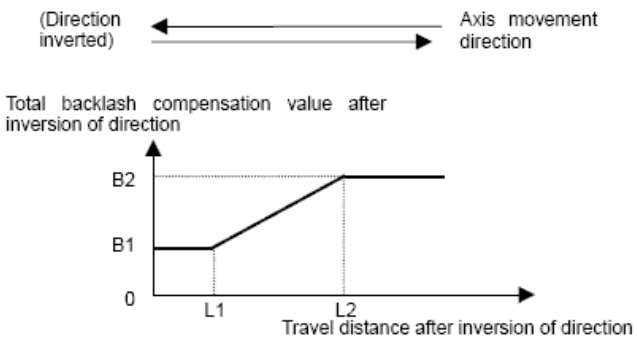
## Accuracy compensation functions




B2 : Backlash compensation value

B1 : Compensation value in the 1st smooth backlash compensation stage

L1 : Distance for starting the 2nd smooth backlash compensation stage

L2 : Distance for ending the 2nd smooth backlash compensation stage

# Smooth backlash compensation

## Features

Backlash compensation functions compensate the lost of motion on the machine (e.g. due to the slop in any toothed gears or threaded screws in the drive system).

## Example

- When a lead screw changes its direction of rotation, the slideway it drives should begin to move immediately. This is the ideal situation. In reality this does not happen. There is a small amount of slack in the bearings, the lead screw and other components which has to be taken up first.
- Backlash compensation functions such as Smooth Backlash Compensation can help to compensate this. Compensation values can be set in detection units from 0 to ±9999 pulses for each axis.
- With normal backlash compensation, all backlash compensation pulses are output at the location where the direction of axis moving reverses.
- With smooth backlash compensation, backlash compensation pulses are output in accordance with the distance from the location where the direction of axis moving reverses, so that fine backlash compensation corresponding to the characteristics of the machine is possible.

## Benefits

- Improvement of machine precision
- Increase of production quality and overall machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-S638 | 0i-TD Smooth Backlash Compensation |
| A02B-0320-S638 | 0i-MD Smooth Backlash Compensation |

**Notice**

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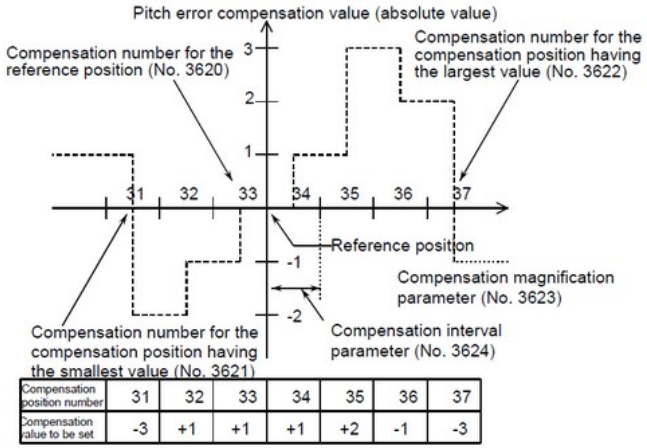
## Accuracy compensation functions




| Compensation position number | 31 | 32 | 33 | 34 | 35 | 36 | 37 |
|---|---|---|---|---|---|---|---|
| Compensation value to be set | -3 | +1 | +1 | +1 | +2 | -1 | -3 |

# Stored pitch error compensation

## Features

The Pitch Error Compensation function is used to compensate for error in the ball screw. A total number of compensation points for the system are arbitrarily divided among the axes. The compensation amount, in detection units, is subject to a multiplier.

The pitch error compensation pulse at each pitch error compensation point is output in the interval between that point and the next compensation point, as shown in the figure.

## Benefits

- Improvement of machine precision
- Increase of production quality and overall machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J841 | 30i-A Pitch Error Compensation |
| A02B-0306-J841 | 31i-A5 Pitch Error Compensation |
| A02B-0307-J841 | 31i-A Pitch Error Compensation |
| A02B-0308-J841 | 32i-A Pitch Error Compensation |
| A02B-0323-J841 | 30i-B Pitch Error Compensation |
| A02B-0326-J841 | 31i-B5 Pitch Error Compensation |
| A02B-0327-J841 | 31i-B Pitch Error Compensation |
| A02B-0328-J841 | 32i-B Pitch Error Compensation |

**Notice**

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## Accuracy compensation functions

PITCH ERROR COMPENSATION

| NO. | DATA | NO. | DATA |
|---|---|---|---|
| (+X1) 00000 | 100 | (+Y1) 00011 | -100 |
| 00001 | 101 | 00012 | -101 |
| 00002 | 102 | 00013 | -102 |
| 00003 | 103 | 00014 | -103 |
| 00004 | 104 | 00015 | -104 |
| 00005 | 105 | 00016 | -105 |
| 00006 | 106 | 00017 | -106 |
| 00007 | 107 | 00018 | -107 |
| 00008 | 108 | 00019 | -108 |
| 00009 | 109 | 00020 | -109 |
| 00010 | 110 | 00021 | -110 |

Input screen by incremental value

PITCH ERROR COMPENSATION

| NO. | DATA | NO. | DATA |
|---|---|---|---|
| (+X1) 00000 | 10000 | (+Y1) 00011 | -10000 |
| 00001 | 10001 | 00012 | -10001 |
| 00002 | 10002 | 00013 | -10002 |
| 00003 | 10003 | 00014 | -10003 |
| 00004 | 10004 | 00015 | -10004 |
| 00005 | 10005 | 00016 | -10005 |
| 00006 | 10006 | 00017 | -10006 |
| 00007 | 10007 | 00018 | -10007 |
| 00008 | 10008 | 00019 | -10008 |
| 00009 | 10009 | 00020 | -10009 |
| 00010 | 10010 | 00021 | -10010 |

Input screen by total value

**Notice**

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# Stored pitch error compensation total value input

## Features

In a normal case, the data of Stored Pitch Error Compensation, Bi-directional Pitch Error Compensation, Interpolation Type Pitch Error Compensation, Periodical secondary pitch error compensation, Interpolation Type Straightness Compensation, Simple Spindle Synchronous Control Independent Pitch Error Compensation can only be input using an incremental value.

When the function is activated, the Stored Pitch Error Compensation data can be input using a total value. With the conventional Pitch Error Compensation, it is necessary to calculate the difference between two consecutive compensation data. With this function, the measured value that is a total value from the base point can be input directly.

## Benefits

- Simplification of the input process for the operator
- Improvement of machine precision
- Increase of production quality and overall machine productivity

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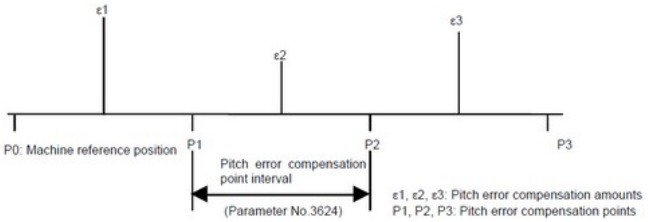
## Accuracy compensation functions




# Interpolation type pitch error compensation

## Features

The Interpolation Type Pitch Error Compensation function outputs divided compensation pulses between compensation points in such a way that a smoother pitch error compensation can be realized.

The compensation amount at each error compensation point is divided into pulses in the interval between that point and the next point on the travel axis and output, as shown in the figure.

The Stored Pitch Error Compensation function is required to be able to use this function, and can be used with Bi-Directional Pitch Error Compensation.

## Benefits

- Increase of the precision of the compensation
- Improvement of machine precision
- Increase of production quality and overall machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S644 | 30i-A Interpolation Type Pitch Error Compensation |
| A02B-0306-S644 | 31i-A5 Interpolation Type Pitch Error Compensation |
| A02B-0307-S644 | 31i-A Interpolation Type Pitch Error Compensation |
| A02B-0308-S644 | 32i-A Interpolation Type Pitch Error Compensation |
| A02B-0323-S644 | 30i-B Interpolation Type Pitch Error Compensation |
| A02B-0326-S644 | 31i-B5 Interpolation Type Pitch Error Compensation |
| A02B-0327-S644 | 31i-B Interpolation Type Pitch Error Compensation |
| A02B-0328-S644 | 32i-B Interpolation Type Pitch Error Compensation |

**Notice**

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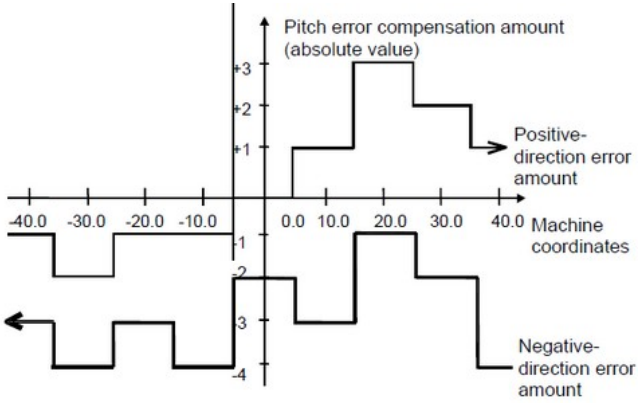
## Accuracy compensation functions




# Bi-directional pitch error compensation

## Features

The Bi-Directional Pitch Error Compensation function allows different pitch error compensation amounts to be set for travel in the positive direction and in the negative direction, so that pitch error compensation can be performed differently in the two directions.

The Stored Pitch Error Compensation function, as a comparison, does not distinguish between the directions of travel.

In addition, when the direction of travel is reversed, the compensation amount is automatically calculated from the pitch error compensation data to perform compensation in the same way as in backlash compensation. This reduces the difference between the paths in the positive and negative directions.

The total number of compensation points is 2048. It requires the option Stored Pitch Error Compensation.

## Benefits

- Compensation of the errors in 2 different directions
- Improvement of machine precision
- Increase of production quality and overall machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S656 | 30i-A Bi-Directional Pitch Error Compensation |
| A02B-0306-S656 | 31i-A5 Bi-Directional Pitch Error Compensation |
| A02B-0307-S656 | 31i-A Bi-Directional Pitch Error Compensation |
| A02B-0308-S656 | 32i-A Bi-Directional Pitch Error Compensation |
| A02B-0319-S656 | 0i-TD Bi-Directional Pitch Error Compensation |
| A02B-0320-S656 | 0i-MD Bi-Directional Pitch Error Compensation |
| A02B-0323-S656 | 30i-B Bi-Directional Pitch Error Compensation |
| A02B-0326-S656 | 31i-B5 Bi-Directional Pitch Error Compensation |
| A02B-0327-S656 | 31i-B Bi-Directional Pitch Error Compensation |
| A02B-0328-S656 | 32i-B Bi-Directional Pitch Error Compensation |

**Notice**

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## Accuracy compensation functions

# Extended bi-directional pitch error compensation

## Features

The Extended Bi-Directional Pitch Error Compensation function provides the same functionality as the Bi-Directional Pitch Error Compensation function, but increases the number of compensation points from 2048 to 5120.

It requires both Stored Pitch Error Compensation and Bi-Directional Pitch Error Compensation function activated in the CNC.

## Benefits

- Increase the precision of the compensation in 2 different directions
- Improvement of machine precision
- Increase of production quality and overall machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S657 | 30i-A Extended Bi-Directional Pitch Error Compensation |
| A02B-0306-S657 | 31i-A5 Extended Bi-Directional Pitch Error Compensation |
| A02B-0307-S657 | 31i-A Extended Bi-Directional Pitch Error Compensation |
| A02B-0308-S657 | 32i-A Extended Bi-Directional Pitch Error Compensation |
| A02B-0323-S657 | 30i-B Extended Bi-Directional Pitch Error Compensation |
| A02B-0326-S657 | 31i-B5 Extended Bi-Directional Pitch Error Compensation |
| A02B-0327-S657 | 31i-B Extended Bi-Directional Pitch Error Compensation |
| A02B-0328-S657 | 32i-B Extended Bi-Directional Pitch Error Compensation |

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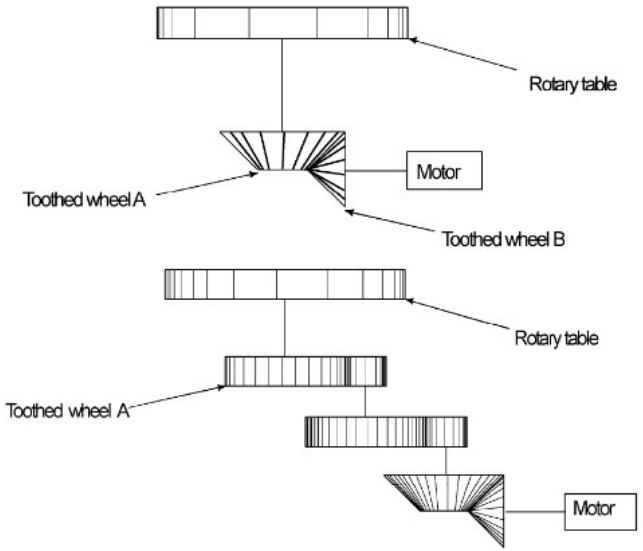
## Accuracy compensation functions




# Periodical secondary pitch error compensation

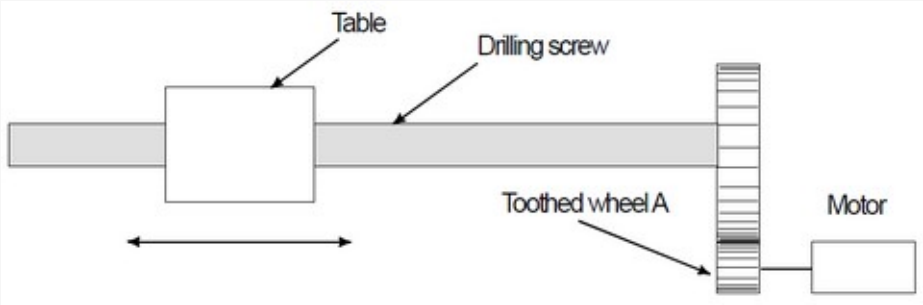
## Features

The Periodical Secondary Pitch Error Compensation is used when there is a gear between the motor and shaft of the axis of travel.

To compensate for pitch errors, the compensation for the pitch error due to the rotation of the gear is superimposed on the compensation for the pitch error per rotation of the rotary table. If the gear between the rotary table and the servo motor is of a single stage, as shown below, the stored pitch error compensation is used for the compensation for the pitch error of the toothed wheel A and Periodical Secondary Pitch Error compensation is used for the pitch error of the toothed wheel B.

If there is a multiple-stage gear, as shown below, the stored pitch error compensation is used for toothed wheel A and Periodical Secondary Pitch Error compensation is used for the cyclic pitch error that occurs in each pitch error compensation interval of toothed wheel A.

Although a rotary table is used as an example here, Periodical Secondary Pitch Error compensation can be used in the same way when the machine is moved along a linear axis using a gear. For example, in a configuration such as that shown below, stored pitch error compensation is used for the compensation for the pitch error of the drilling hole and Periodical Secondary Pitch Error compensation is used for the compensation for the pitch error of toothed wheel A.




## Benefits

- Increase of the precision is geared systems such as rotation tables
- Improvement of machine precision
- Increase of production quality and overall machine productivity

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# Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S634 | 30i-A Periodical Secondary Pitch Error Compensation |
| A02B-0306-S634 | 31i-A5 Periodical secondary pitch error compensation |
| A02B-0307-S634 | 31i-A Periodical Secondary Pitch Error Compensation |
| A02B-0323-S634 | 30i-B Periodical Secondary Pitch Error Compensation |
| A02B-0326-S634 | 31i-B5 Periodical Secondary Pitch Error Compensation |
| A02B-0327-S634 | 31i-B Periodical Secondary Pitch Error Compensation |

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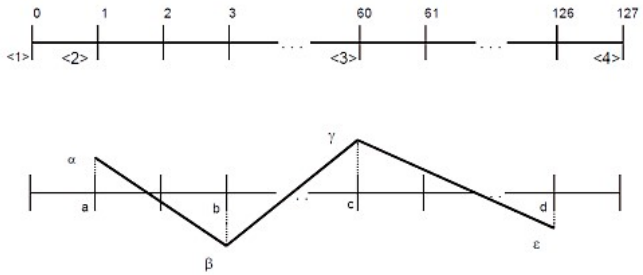
## Accuracy compensation functions




# Inclination compensation

## Features

The Inclination Compensation function, also called "Gradient Compensation", may be super-imposed on the stored pitch error compensation to reduce the number of points that must be entered for stored pitch error compensation.

Three approximate straight lines are formed with four parameter specified compensation points and compensation amounts related to the respective compensation points.

Inclination compensation is carried out along these approximate straight lines at pitch error compensation intervals. The inclination compensation amount is added to the pitch error compensation amount.

To perform inclination compensation, the Stored Pitch Error Compensation must be set for the axis subject to compensation. Unlike the Stored Pitch Error Compensation function, whose amount is set up for an individual compensation point, an amount of inclination compensation is calculated for individual compensation points by setting up four typical points and compensation amounts for them.

This function can be used to reduce the number of stored pitch error compensation points that must be entered for long ball screws.

## Benefits

- Increase of the precision of systems with long ball screws and large machiens
- Improvement of machine precision
- Increase of production quality and overall machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J981 | 30i-A Inclination Compensation |
| A02B-0306-J981 | 31i-A5 Inclination Compensation |
| A02B-0307-J981 | 31i-A Inclination Compensation |
| A02B-0308-J981 | 32i-A Inclination Compensation |
| A02B-0319-J981 | 0i-TD Inclination Compensation |
| A02B-0320-J981 | 0i-MD Inclination Compensation |
| A02B-0323-J981 | 30i-B Inclination Compensation |
| A02B-0326-J981 | 31i-B5 Inclination Compensation |
| A02B-0327-J981 | 31i-B Inclination Compensation |
| A02B-0328-J981 | 32i-B Inclination Compensation |

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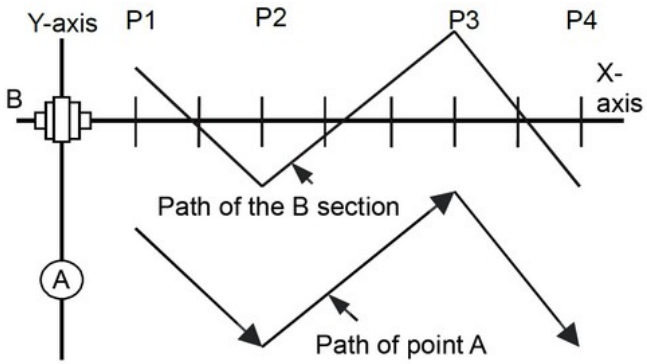
## Accuracy compensation functions




# Straightness compensation

## Features

The Straightness Compensation function is used to compensate the alignment of two perpendicular axes.

In straightness compensation, similarly to Inclination compensation, four typical pitch error compensation points (a, b, c, and d) are selected from pitch error compensation points and specified as straightness compensation points, and compensation amounts are set up only for these four points.

For pitch error compensation points between straightness compensation points, the CNC calculates and outputs amounts that match straightness compensation. Straightness compensation largely differs from Inclination compensation in that the moving axis is not a compensation axis; Inclination compensation is applied directly to the moving axis.

This relationship is specified by a parameter (for example, to apply compensation to the Y-axis as movement occurs along the X-axis).

## Benefits

- Improvement of the precision for perpendicular axes
- Improvement of machine precision
- Increase of production quality and overall machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J747 | 30i-A Straightness Compensation |
| A02B-0306-J747 | 31i-A5 Straightness Compensation |
| A02B-0307-J747 | 31i-A Straightness Compensation |
| A02B-0308-J747 | 32i-A Straightness Compensation |
| A02B-0319-J799 | 0i-TD Simple Straightness Compensation (1 Axis Pair) |
| A02B-0320-J799 | 0i-MD Simple Straightness Compensation |
| A02B-0323-J747 | 30i-B Straightness Compensation |
| A02B-0326-J747 | 31i-B5 Straightness Compensation |
| A02B-0327-J747 | 31i-B Straightness Compensation |
| A02B-0328-J747 | 32i-B Straightness Compensation |
| A02B-0333-J747 | 35i-B Straightness Compensation |

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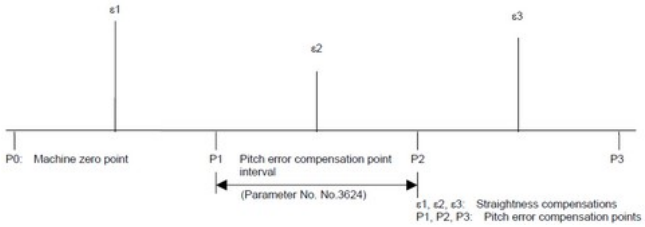
## Accuracy compensation functions




# Interpolation type straightness compensation

## Features

The Interpolation Straightness Compensation function outputs divided compensation pulses between compensation points so that smoother straightness compensation can be realized.

In conventional straightness compensation, for each interval between pitch error compensation points set by parameters, the amount of all straightness compensation at the compensation point is output and compensation is performed. This function equally divides the amount of compensation for each interval between pitch error compensation points for compensation data set using 128 straightness compensation points and outputs it as a compensation pulse.

## Benefits

- Increase of the precision of the compensation for parallel axes
- Improvement of machine precision
- Increase of production quality and overall machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S639 | 30i-A Interpolation Type Straightness Compensation |
| A02B-0306-S639 | 31i-A5 Interpolation Type Straightness Compensation |
| A02B-0307-S639 | 31i-A Interpolation Type Straightness Compensation |
| A02B-0308-S639 | 32i-A Interpolated Type Straightness Compensation |
| A02B-0323-S639 | 30i-B Interpolation Type Straightness Compensation |
| A02B-0326-S639 | 31i-B5 Interpolation Type Straightness Compensation |
| A02B-0327-S639 | 31i-B Interpolation Type Straightness Compensation |
| A02B-0328-S639 | 32i-B Interpolated Type Straightness Compensation |

**Notice**

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# 380

## Accuracy compensation functions

# Interpolated straightness compensation 3072 points

## Features

The Interpolated Strightness Compensation 3072 Points function increases the number of compensation points to 3072.

The number of points which can be used for one pair of Interpolated straightness compensation is expanded to 1536.

As a result, a more accurate machining can be realized than with the standard compensations performed by the Interpolated Straightness Compensation function.

## Benefits

- Increases significantly the correction accuracy
- Improvement of machine precision
- Increase of production quality and overall machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R638 | 30i-A Interpolation Type Straightness Compensation 3072 Points |
| A02B-0306-R638 | 31i-A5 Interpolation Straightness Compensation 3072 Points |
| A02B-0307-R638 | 31i-A Interpolation Straightness Compensation 3072 Points |
| A02B-0323-R638 | 30i-B Interpolation Type Straightness Compensation 3072 Points |
| A02B-0326-R638 | 31i-B5 Interpolation Straightness Compensation 3072 Points |
| A02B-0327-R638 | 31i-B Interpolation Straightness Compensation 3072 Points |

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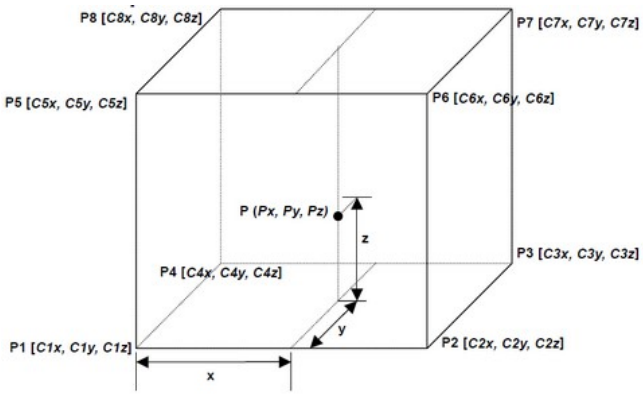
# 381

## Accuracy compensation functions




# 3 dimensional error compensation

## Features

In ordinary pitch error compensation, the compensation is applied to a specified compensation axis according to the positional information of that axis. For example, pitch error compensation for the X-axis is performed based on the X-axis positional information.

With the 3-Dimensional Error Compensation function, the compensation is performed for the current position for up to three compensation axes by calculating the compensation data (for three axes) from the compensation amounts at eight periphery compensation points based on the internal ratio in a compensation area (rectangular parallelepiped) including the current position.

## Benefits

- Increase of the correction and compensation efficiency
- Improvement of machine precision
- Increase of production quality and overall machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S666 | 30i-A 3-D Error Compensation |
| A02B-0306-S666 | 31i-A5 3-D Error Compensation |
| A02B-0307-S666 | 31i-A 3-D Error Compensation |
| A02B-0323-S666 | 30i-B 3-D Error Compensation |
| A02B-0326-S666 | 31i-B5 3-D Error Compensation |
| A02B-0327-S666 | 31i-B 3-D Error Compensation |

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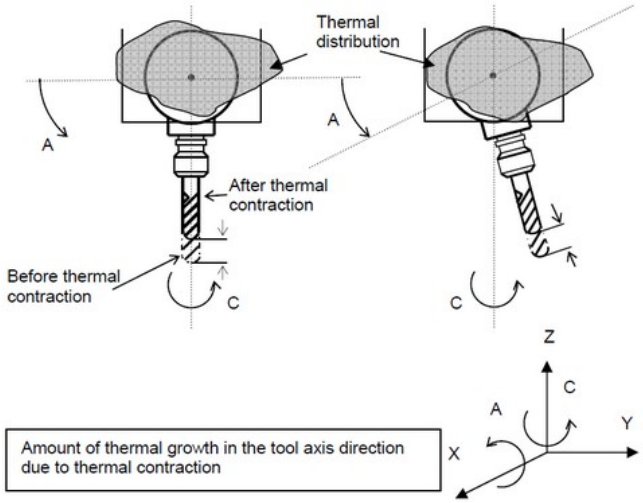
# 382

## Accuracy compensation functions




# Thermal growth compensation along tool vector

## Features

The Thermal Growth Compensation Along Tool Vector function is used in five-axis machine applications where the tool is controlled by two rotary axes.

The compensation for thermal expansion or shrinkage of the tool can be applied along the tool vector specified with the rotation axes.

This function compensates for the thermal tool displacement set along the tool vector by setting the displacement as the input signal from the PMC or another unit.

## Benefits

- Compensation of thermal effects on 5-axis machines
- Improvement of machine precision
- Increase of production quality and overall machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S860 | 30i-A Thermal Growth Compensation |
| A02B-0306-S860 | 31i-A5 Thermal Growth Compensation |
| A02B-0307-S860 | 31i-A Thermal Growth Compensation |
| A02B-0323-S860 | 30i-B Thermal Growth Compensation |
| A02B-0326-S860 | 31i-B5 Thermal Growth Compensation |
| A02B-0327-S860 | 31i-B Thermal Growth Compensation |

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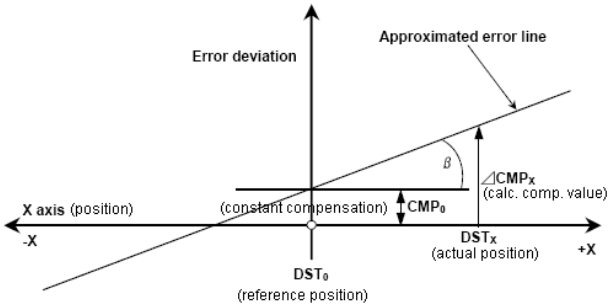
# 383

## Accuracy compensation functions




# Linear inclination compensation function

## Features

The Linear Inclination Compensation function compensates the change of state of the machine by the approximated error line by the parameter of straight line slope and slice.

In Inclination Compensation, up to 3 approximated error lines are compensated. This function compensate it by one approximated error line. Moreover, this function can work independently of other compensation functions such as pitch error compensation, etc.

## Benefits

- Improvement of machine precision
- Increase of production quality and overall machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R520 | 30i-A Linear Inclination Compensation Function |
| A02B-0306-R520 | 31i-A5 Linear Inclination Compensation Function |
| A02B-0307-R520 | 31i-A Linear Inclination Compensation Function |
| A02B-0323-R520 | 30i-B Linear Inclination Compensation Function |
| A02B-0326-R520 | 31i-B5 Linear Inclination Compensation Function |
| A02B-0327-R520 | 31i-B Linear Inclination Compensation Function |

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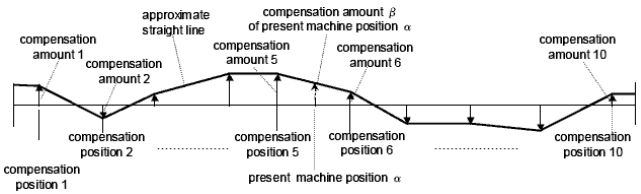
# 384

## Accuracy compensation functions




# 3 dimensional machine position compensation

## Features

The 3-Dimensional Machine Position Compensation function compensate machine position errors that occur during processing along an approximate straight line formed with specified compensation point in a machine coordinate and a compensation amount related to it.

Compensation of this function is carried out along nine approximate straight lines formed with ten compensation points and compensation amounts related to the respective compensation points.

Compensation amounts can be rewritten by the PMC window function or programmable parameter input (G10 L52), in addition, the rewritten value immediately becomes effective. Therefore, this function can be applied to compensation for those machine position errors that occurs during processing.

## Benefits

- Compensation of large machine tools
- Improvement of machine precision
- Increase of production quality and overall machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R581 | 30i-A 3-Dimensional Machine Position Compensation |
| A02B-0306-R581 | 31i-A5 3-Dimensional Machine Position Compensation |
| A02B-0307-R581 | 31i-A 3-Dimensional Machine Position Compensation |
| A02B-0308-R581 | 32i-A 3-Dimensional Machine Position Compensation |
| A02B-0323-R581 | 30i-B 3-Dimensional Machine Position Compensation |
| A02B-0326-R581 | 31i-B5 3-Dimensional Machine Position Compensation |
| A02B-0327-R581 | 31i-B 3-Dimensional Machine Position Compensation |
| A02B-0328-R581 | 32i-B 3-Dimensional Machine Position Compensation |

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# 385

## Accuracy compensation functions

# 3 dimensional rotary error compensation

## Features

The 3D Rotary Error Compensation improves the correction of geometric machine errors by including not only linear axes but also any rotary axes that are used in the machining envelope.

In contrast to most compensation options, this function is able to process three-dimensional measurement data for the overall machine volume and makes it ideal for five-axis machines.

## Benefits

- Greater Cutting Accuracy and Precision

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R649 | 30i-A 3-D Rotary Error Compensation |
| A02B-0306-R649 | 31i-A5 3-D Rotary Error Compensation |
| A02B-0307-R649 | 31i-A 3-D Rotary Error Compensation |
| A02B-0323-R649 | 30i-B 3-D Rotary Error Compensation |
| A02B-0326-R649 | 31i-B5 3-D Rotary Error Compensation |
| A02B-0327-R649 | 31i-B 3-D Rotary Error Compensation |

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# 386
# Functions

## Hobbing/Electronic gear box

This section of the catalogue contains the functions related to hobbing functions and Electronic Gear Box (EGB) functions for gear cutting and gear grinding machines.

Some of the functions detailed in the catalogue:

- Electronic Gear Box
- Skip function for Electronic Gear Box
- Spindle Electronic Gear Box
- Phase synchronization
- Etc.

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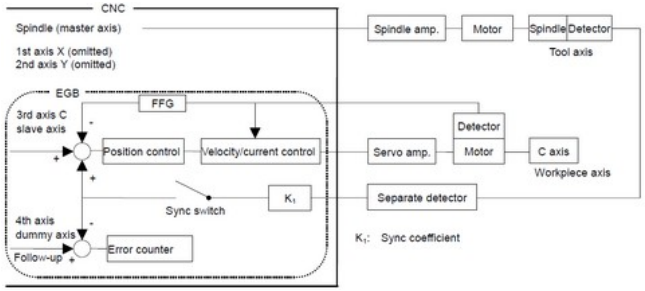
# 387

## Hobbing/Electronic gear box




# Electronic Gear Box (EGB)

## Features

This function enables fabrication of high-precision gears, screws, and other components by rotating the workpiece in synchronization with a rotating tool or by moving the tool in synchronization with a rotating workpiece.

The rate of synchronization can be specified with a program. The synchronization of tool and workpiece axes with this function adopts a system in which the synchronization is directly controlled by digital servo, so that the workpiece axis can follow up the speed fluctuations on the tool axis with no error, thereby allowing fabrication of high-precision cogwheels.

## Benefits

- Addition of the Electronic Gear Box (EGB) function to the CNC
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J779 | 30i-A Electronic Gear Box |
| A02B-0306-J779 | 31i-A5 Electronic Gear Box |
| A02B-0307-J779 | 31i-A Electronic Gear Box |
| A02B-0308-J779 | 32i-A Electronic Gear Box |
| A02B-0320-J779 | 0i-MD Electronic Gear Box |
| A02B-0323-J779 | 30i-B Electronic Gear Box |
| A02B-0326-J779 | 31i-B5 Electronic Gear Box |
| A02B-0327-J779 | 31i-B Electronic Gear Box |
| A02B-0328-J779 | 32i-B Electronic Gear Box |

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# 388

## Hobbing/Electronic gear box

# Skip function for Electronic Gear Box (EGB) axis

## Features

The Skip function for EGB axis enables the skip or high-speed skip signal for the EBG slave axis in synchronization mode with the EGB (electronic gear box).

This function has following features:

1. If a skip signal is input while an EGB axis skip command block is being executed, this block does not terminate until the specified number of skip signals have been input.
2. If a skip signal is input while an EGB axis skip command block is being executed, the tool remains in synchronous mode and moves, not stopping on the EGB slave axis.
3. The machine coordinates assumed when skip signals are input and the number of input skip signals are stored in specified custom macro variables.

## Benefits

- Addition of interaction between external signals and the EBG function
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J696 | 30i-A Skip Function for EGB Axis |
| A02B-0306-J696 | 31i-A5 Skip Function for EGB Axis |
| A02B-0307-J696 | 31i-A Skip Function for EGB Axis |
| A02B-0320-J696 | 0i-MD Skip Function for EGB Axis |
| A02B-0323-J696 | 30i-B Skip Function for EGB Axis |
| A02B-0326-J696 | 31i-B5 Skip Function for EGB Axis |
| A02B-0327-J696 | 31i-B Skip Function for EGB Axis |
| A02B-0328-J696 | 32i-B Skip Function for EGB Axis |

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# 389

## Hobbing/Electronic gear box

# Electronic Gear Box (EGB) 2 pairs

## Features

The Electronic Gear Box (EGB) function is a function for rotating a workpiece in sync with a rotating tool, or to move a tool in sync with a rotating workpiece. With this function, the high-precision machining of gears, threads, and other similar machining processes can be implemented.

A desired synchronization ratio can be programmed. Up to 2 sets of axes can be synchronized. A gear grinding machine can be controlled, for instance, by using one axis for rotating the workpiece in sync with the tool and another axis for performing dressing in sync with the tool.

## Benefits

- Addition of 2 sets of axis in the synchronization
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S710 | 30i-A Electronic Gear Box, 2 Pairs |
| A02B-0306-S710 | 31i-A5 Electronic Gear Box, 2 Pairs |
| A02B-0323-S710 | 30i-B Electronic Gear Box, 2 Pairs |
| A02B-0326-S710 | 31i-B5 Electronic Gear Box, 2 Pairs |
| A02B-0327-S710 | 31i-B Electronic Gear Box, 2 Pairs |

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# 390

## Hobbing/Electronic gear box

# Electronic Gear Box (EGB) automatic phase synchronization

## Features

With the Electronic Gear Box (EGB) function active and when synchronization start or cancellation is specified, the synchronization is not started or canceled immediately. Instead, acceleration / deceleration is executed first. In this case, synchronization can be started or canceled while the spindle is rotating; the synchronization ratio can also be changed while the spindle is rotating.

At synchronization start, automatic phase synchronization is performed such that the workpiece axis position matches the position corresponding to the spindle one-rotation signal. With this synchronization, the same operation is performed as synchronization start caused by a one-rotation signal in hobbing synchronization when using the functions of a hobbing machine.

The spindle corresponds to the EGB master axis and the workpiece axis corresponds to an EGB slave axis.

## Benefits

- Addition of automatic synchronization to the EGB function
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S711 | 30i-A Electronic Gear Box Automatic Phase Synchronisation |
| A02B-0306-S711 | 31i-A5 Electronic Gear Box Automatic Phase Synchronisation |
| A02B-0307-S711 | 31i-A Electronic Gear Box Automatic Phase Synchronisation |
| A02B-0320-S711 | 0i-MD Electronic Gear Box Automatic Phase Synchronisation |
| A02B-0323-S711 | 30i-B Electronic Gear Box Automatic Phase Synchronisation |
| A02B-0326-S711 | 31i-B5 Electronic Gear Box Automatic Phase Synchronisation |
| A02B-0327-S711 | 31i-B Electronic Gear Box Automatic Phase Synchronisation |
| A02B-0328-S711 | 32i-B Electronic Gear Box Automatic Phase Synchronisation |

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# 391

## Hobbing/Electronic gear box

# Spindle Electronic Gear Box (EGB)

## Features

A gear can be shaped (grind/cut) by the synchronization of the workpiece axis rotation to the tool axis (grinding axis / hob) rotation using two spindles as a tool axis and a workpiece axis. To synchronize these two axes, the Electronic gear box (EGB) is used.

In the Spindle EGB, the synchronous pulse is produced from the feedback pulse of the position detector attached to the tool axis (master axis) in the motor control, and the workpiece axis (slave axis) rotates with the pulse. Feedback pulse from Master side to Slave side is forwarded by the communication between spindle amplifiers.

The specifications of the Spindle EGB control are as follows:

1. The Spindle EGB synchronization is started by specifying T command (number of teeth) and L command (number of hob threads), which determine the synchronous ratio, in G81 block. The Spindle EGB synchronization is canceled by specifying G80.
2. The synchronous ratio is calculated from T and L command in G81 block and the number of position detector pulses per rotation about the tool and the workpiece axis (parameter setting).
3. This function has the retract function like the hobbing function.
4. The cutting helical gear is performed by specifying Q command (module or diametral pitch) and P command (gear helix angle) in G81 block.
5. The Spindle EGB synchronization is maintained regardless of whether the operation is automatic or manual.

## Benefits

- Addition of the Electronic Gear Box function to Spindle
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S720 | 30i-A Spindle Electronic Gear Box |
| A02B-0306-S720 | 31i-A5 Spindle Electronic Gear Box |
| A02B-0323-S720 | 30i-B Spindle Electronic Gear Box |
| A02B-0326-S720 | 31i-B5 Spindle Electronic Gear Box |
| A02B-0327-S720 | 31i-B Spindle Electronic Gear Box |
| A02B-0328-S720 | 32i-B Spindle Electronic Gear Box |

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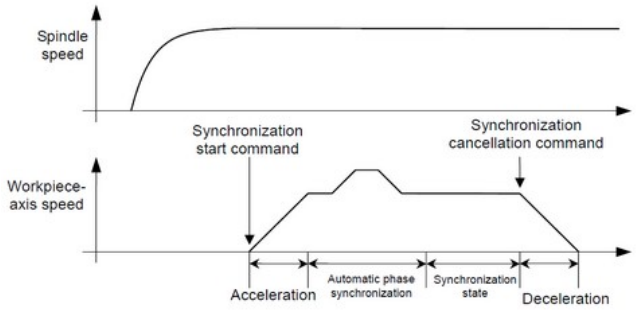
# 392

## Hobbing/Electronic gear box




# Automatic phase synchronization for flexible synchronous control

## Features

## Flexible Synchronous Control

The Flexible Synchronization Control function applies to hobbing machines and other machines that require synchronization of multiple sets of axes with various gear ratios.

This function allows up to four individual sets to be synchronized independently. This can implement features specific to the hobbing machine such as synchronization between hobbing axis and a workpiece axis, Z–C synchronization in helical gear cutting, and Y–C synchronization in hobbing axis shift.

The specifications of flexible synchronization control are as follows:

1. The master axis number, slave axis number, and gear ratio are set in parameters.
2. There are four groups of these parameters. Synchronization of four groups can be performed at the same time.
3. For multiple master axes, one slave axis can also be specified.
4. Synchronization is started and canceled by DI signals from the PMC. When DI signal switching is to be made during automatic operation, a parameter–set M code must be used.
5. The two Cs axes can also be used as a master axis and slave axis.
6. The two Cs axes can also be used as a master axis and slave axis.
7. Feedback pulses of the spindle operating as the Cs axis can be used for feed per revolution. The command format is G95P_;, where P_ is the axis number of Cs axis.

## Automatic Phase Synchronization for Flexible Synchronous Control

In the flexible synchronous control, when synchronization start or cancellation is specified, acceleration/deceleration is executed.

By this acceleration/deceleration, synchronization can be started or canceled while the master axis is moving.

Also, automatic phase synchronization can be performed such that the machine coordinate zero position of the master axis matches the slave axis machine coordinate position at the synchronization start.

## Benefits

- Addition of automatic synchronization to the Electronic Gear Box function
- Simplification of the programming

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- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S611 | 30i-A Automatic Phase Synchronization for Flexible Synchronous Control |
| A02B-0303-S709 | 30i-A Flexible Synchronous Control |
| A02B-0306-S611 | 31i-A5 Automatic Phase Synchronization for Flexible Synchronous Control |
| A02B-0306-S709 | 31i-A5 Flexible Synchronous Control |
| A02B-0307-S611 | 31i-A Automatic Phase Synchronization for Flexible Synchronous Control |
| A02B-0307-S709 | 31i-A Flexible Synchronous Control |
| A02B-0308-S709 | 32i-A Flexible Synchronous Control |
| A02B-0319-S611 | 0i-TD Automatic Phase Synchronisation for Flexible Synchronisation Control |
| A02B-0319-S709 | 0i-TD Flexible Synchronisation Control |
| A02B-0320-S611 | 0i-MD Automatic Phase Synchronisation for Flexible Synchronisation Control |
| A02B-0320-S709 | 0i-MD Flexible Synchronisation Control |
| A02B-0323-S611 | 30i-B Automatic Phase Synchronization for Flexible Synchronous Control |
| A02B-0323-S709 | 30i-B Flexible Synchronous Control |
| A02B-0326-S611 | 31i-B5 Automatic Phase Synchronization for Flexible Synchronous Control |
| A02B-0326-S709 | 31i-B5 Flexible Synchronous Control |
| A02B-0327-S611 | 31i-B Automatic Phase Synchronization for Flexible Synchronous Control |
| A02B-0327-S709 | 31i-B Flexible Synchronous Control |
| A02B-0328-S709 | 32i-B Flexible Synchronous Control |

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# 394

## Hobbing/Electronic gear box

# Inter-path flexible synchronous control

## Features

The Inter-Path Flexible Synchronous Control function enables flexible synchronous control between axes in different paths in multi paths system.

Up to 4 slave axes can be specified in one path. An axis in other path can be specified as master axis of each slave axes. All synchronization pairs in all paths can be performed simultaneously.

## Benefits

- Increase of machine design flexibility
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S610 | 30i-A Inter-Path Flexible Synchronous Control |
| A02B-0306-S610 | 31i-A5 Inter-Path Flexible Synchronous Control |
| A02B-0307-S610 | 31i-A Inter-Path Flexible Synchronous Control |
| A02B-0319-S610 | 0i-TD Inter-Path Flexible Synchronisation Control |
| A02B-0323-S610 | 30i-B Inter-Path Flexible Synchronous Control |
| A02B-0326-S610 | 31i-B5 Inter-Path Flexible Synchronous Control |
| A02B-0327-S610 | 31i-B Inter-Path Flexible Synchronous Control |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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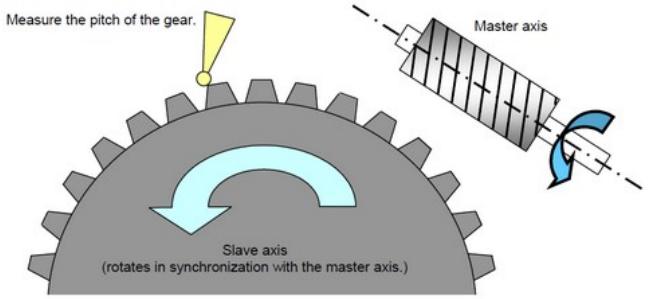
# 395

## Hobbing/Electronic gear box




# Skip function for flexible synchronous control

## Features

This function provides the capability that skip function or high speed skip function can be commanded for the slave axis in the flexible synchronous control mode.

Features:

- The program block to enable the function is not interrupted until the total number of skip signal inputs reaches a value specified in the same block
- The machine coordinate position of the slave axis at each time of the signal inputs is stored in one of consecutive custom macro variables. The top number of the variables is specified in the block.
- The total number of the inputs is stored in another specified variable.

## Benefits

- Addition of event driven control capabilities to the flexible synchronous control mode
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S612 | 30i-A Skip Function for Flexible Synchronous Control |
| A02B-0306-S612 | 31i-A5 Skip Function for Flexible Synchronous Control |
| A02B-0307-S612 | 31i-A Skip Function for Flexible Synchronous Control |
| A02B-0319-S612 | 0i-TD Skip Function for Flexible Synchronisation Control |
| A02B-0320-S612 | 0i-MD Skip Function for Flexible Synchronisation Control |
| A02B-0323-S612 | 30i-B Skip Function for Flexible Synchronous Control |
| A02B-0326-S612 | 31i-B5 Skip Function for Flexible Synchronous Control |
| A02B-0327-S612 | 31i-B Skip Function for Flexible Synchronous Control |

**Notice**

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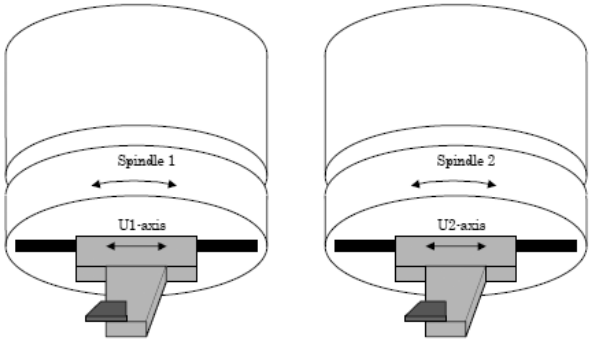
# 396

## Hobbing/Electronic gear box




# U-Axis Control 2 pairs

## Features

The U-axis control function enables two synchronous U-axis pairs to remain in a fixed position or to move at a programmed speed without using a mechanism such as a planetary gear box.

## Benefits

- Change of diameter being machined during multitasking machining operations

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R659 | 30i-A U-Axis Control 2 Pairs |
| A02B-0306-R659 | 31i-A5 U-Axis Control 2 Pairs |
| A02B-0307-R659 | 31i-A U-Axis Control 2 Pairs |
| A02B-0323-R659 | 30i-B U-Axis Control 2 Pairs |
| A02B-0326-R659 | 31i-B5 U-Axis Control 2 Pairs |
| A02B-0327-R659 | 31i-B U-Axis Control 2 Pairs |

**Notice**

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# Grinding functions

## Features

The "Grinding Function A" package contains the following items:

- Multi-step skip
- Canned cycles for grinding
- Continuous dressing
- Infeed control

The "Grinding Function B" package contains the same functions as "Grinding Function A" and also the Angular Axis Control function.

Note: for more information about the functions included in the packages, refer to their respective descriptions in this catalogue.

## Benefits

- Simplification of the selection of the control functions required for popular grinding machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-S682 | 0i-TD Grinding Function A (for Machines without Angular Axis) - Incl. Multi-Step Skip, Canned Cycles for Grinding |
| A02B-0319-S683 | 0i-TD Grinding Function B (for Machines with Angular Axis) - Incl. Grinding Function A, Angular Axis Control |
| A02B-0320-S682 | 0i-MD Grinding Function A (for Machines without Angular Axis) - Incl. Multi-Step Skip, Canned Cycles for Grinding, Continuous Dressing, Infeed Control |
| A02B-0320-S683 | 0i-MD Grinding Function B (for Machines with Angular Axis) - Incl. Grinding Function A, Angular Axis Control |
| A02B-0321-S682 | 0i-Mate-TD Grinding Function A (for Machines without Angular Axis) - Incl. Multi-Step Skip, Canned Cycles for Grinding |
| A02B-0321-S683 | 0i-Mate-TD Grinding Function B (for Machines with Angular Axis) - Incl. Grinding Function A, Angular Axis Control |
| A02B-0322-S682 | 0i-Mate-MD Grinding Function A (for Machines without Angular Axis) - Incl. Multi-Step Skip, Canned Cycles for Grinding, Continuous Dressing, Infeed Control |
| A02B-0322-S683 | 0i-Mate-MD Grinding Function B (for Machines with Angular Axis) - Incl. Grinding Function A, Angular Axis Control |

**Notice**

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# 398
# Functions

## Punch press functions

This section of the catalogue contains the functions related to Punch Press machines.

**Notice**

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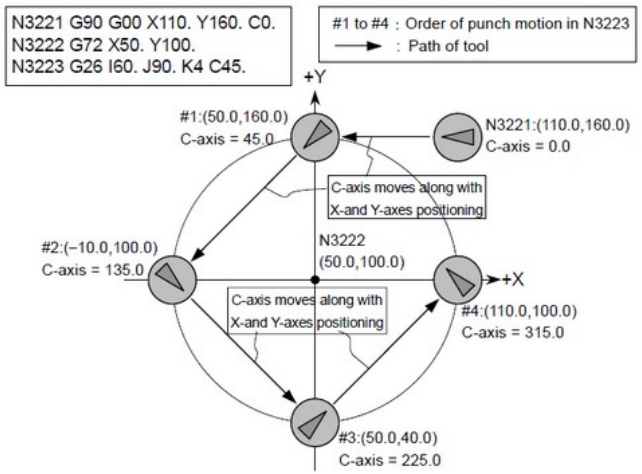
# 399

# Punch press functions




# C axis control

## Features

The C-Axis Control function consist of the following functions:

- C-axis control (die angle indexing)
- C-axis synchronization control
- C-axis offset function

## C-axis control (die-angle indexing)

For predetermined dies (tools) on a turret, the angular position of the die can be changed with a command from a tape, a memory or MDI.

In the past, it was necessary to use many dies when the die shape is the same but the die arrangement is different. Even in such a case, this new function makes it possible to conduct the operations only with one die since the function can freely change the angular position of the die. Further, since chamfering of four corners of a workpiece can be performed only with one die, the time required for die change is reduced, resulting in shorter machining time.

Further, in pattern function for a circular geometry bolt hole circle, arc pattern, and arc nibbling function, the C axis is automatically controlled so that one side of the die always faces the center of arc at each punching position.

## C-axis synchronization control

The C–axis synchronization control function enables operation of the punch section of the die in sync with the die section of the die by using a separate servo motor for each section.

C–axis synchronization control simultaneously issues the same command to both servo motors. So, synchronization error correction, normally required to detect and reduce deviation between the two servo motors during synchronous operation, is not applied. In C–axis synchronization control, the master axis is referred to as the C1–axis, and the slave axis as the C2–axis.

## C-axis offset function

For the punch press, a tool is used which allows the angle to be changed according to the machine. This type of rotary tool is subject to CNC C–axis control. A C command is used to change the angular position of a tool. When a machine controlling multiple tools of this type is used, mechanical adjustment of each tool is necessary to ensure correct punching.

**Notice**

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# 400

This function simplifies mechanical adjustment by performing automatic C–axis offset when indexing up to 20 tools that allow angle changes. A machine that uses C–axis synchronization control enables offset to be performed separately for each of the C1–axis and C2–axis.

## Benefits

- Reduction of the number of dies
- Simplification of the mechanical adjustments
- Increase of the productivity of the punch press

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0331-J601 | 30i-PB C-Axis Control |
| A02B-0332-J601 | 31i-PB C-Axis Control |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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# 401

## Punch press functions

# T and C axes simultaneous control

## Features

The conventional turret punch press cannot make a T–axis movement and C–axis movement simultaneously because of mechanical constraints. If the T and C commands are simultaneously specified, the CNC executes the commands successively.

Recently, machines without these mechanical constraints have been developed. The T–axis / C–axis simultaneous control function enables simultaneous control of the T–axis and C–axis on those new machines, consequently reducing the cycle time.

## Benefits

- Reduction of the cycle time of the punch press
- Increase of the machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0331-S907 | 30i-PB T- and C-Axes Simultaneous Control |
| A02B-0332-S907 | 31i-PB T- and C-Axes Simultaneous Control |

**Notice**

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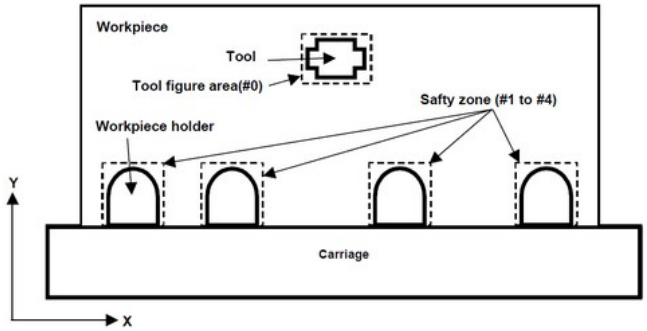
# 402

## Punch press functions




# Safety zone check

## Features

This is the safety function to set the safety zone for protecting the workpiece holder that holds the workpiece set on the carriage, and disable punching in that area or forbid the tool to approach thereinto.

This function permits to set tool figure area (#0) and up to four safety zones (#1 - #4), as shown above. Two types of safety zone check methods are available.

## Benefits

- Reduce risks on the machine and breakdowns
- Increase the overall machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0331-J605 | 30i-PB Safety Zone Check |
| A02B-0332-J605 | 31i-PB Safety Zone Check |

**Notice**

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# 403

## Punch press functions

# Safety zone area expansion

## Features

This function extends the safety zone check function as follows:

- Extends the safety zone check areas: Up to 8
- Extends the safety zone tool areas: Up to 16
- Adds interference safety zone area signals (DO signals): Fn228, Fn238
- Inproves the automatic safety–zone setting

## Benefits

- Support of large punch press machines with multiple settings
- Reduce risks on the machine and breakdowns
- Increase the overall machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0331-S908 | 30i-PB Safety Zone Area Expansion |
| A02B-0332-S908 | 31i-PB Safety Zone Area Expansion |

**Notice**

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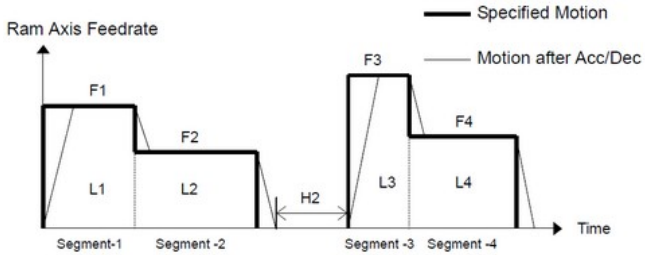
# 404

## Punch press functions




# Ram axis control

## Features

The CNC cannot move RAM-axis by program command.

With this function, the RAM-axis moves automatically at the end of the block executing 1-cycle press by setting RAM-axis and the RAM-axis motion patterns.

## Benefits

- Simplification of the RAM axis command
- Increase of the punching quality

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0331-S919 | 30i-PB RAM Axis Control |
| A02B-0332-S919 | 31i-PB RAM Axis Control |
| A02B-0335-S919 | 0i-PD RAM Axis Control |

**Notice**

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# 405

## Punch press functions

# Y-axis crack cancel

## Features

With this function, when the M–codes which are set by parameters are commanded, the crack between work coordinate system and machine coordinate system of Y–axis repositioning motion is canceled.

## Example 1

Y1525M30
Y–axis moves including the crack of repositioning.

## Example 2

Y1525 ;
M30 ;
The work coordinate system is preset to the machine coordinate systemto cancel the crack of repositioning by M30. (Y–axis does not move.)

## Benefits

- Simplification of the programming

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0331-J616 | 30i-PB Y-Axis Crack Cancel |
| A02B-0332-J616 | 31i-PB Y-Axis Crack Cancel |
| A02B-0335-J616 | 0i-D Y-Axis Crack Cancel |

**Notice**

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# Tool data setting function

## Features

This function makes the area used for registering tool numbers, tool position compensation, punch count and other tool data available to the user.

This enables the user to customize the registered tool data. This allows the conventional tool data setting method to be changed and the number of tools that can be registered to be increased considerably.

## Benefits

- Increase of the flexibility of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0331-J621 | 30i-PB Tool Data Setting Function |
| A02B-0332-J621 | 31i-PB Tool data Setting Function |

**Notice**

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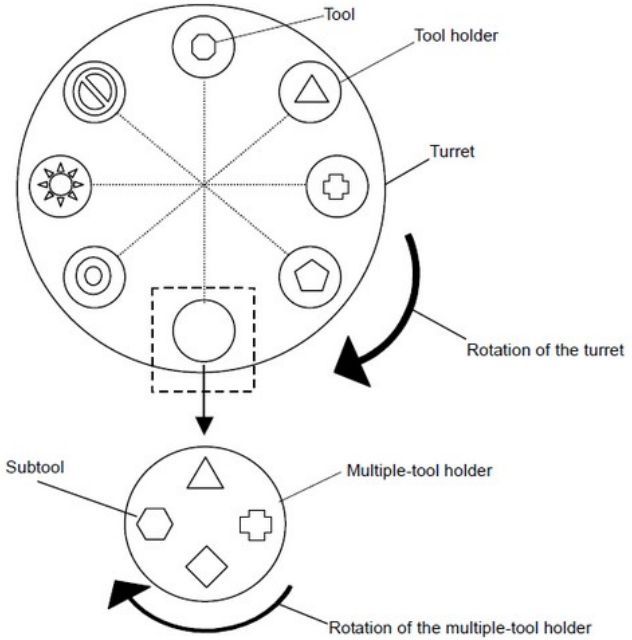
# 407

## Punch press functions




# Multiple tool control

## Features

A common way of handling the tools, i.e., the metal dies, for punch presses is to store each die in the tool holder. To select a tool, it is necessary to index the magazine containing the required tool holder to the position at which the tool is changed with a T command and to set the tool holder on the punch holder at that position.

In the multiple–tool system, however, one tool holder contains different types of metal dies. This makes it possible to change tools by simply moving the relevant tool holder. The multiple–tool system, therefore, reduces the time taken to change tools and enables a larger variety of tools to be used, enhancing the range of machining that can be performed.

## Benefits

- Increase of the flexibility and efficiency of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0331-J604 | 30i-PB Multiple Tool Control |
| A02B-0332-J604 | 31i-PB Multiple Tool Control |

**Notice**

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# 408

## Punch press functions

# Tool life management

## Features

The function sets the maximum punch count for each tool on the screen. If the actual punch count for a selected tool exceeds the predetermined maximum punch count, tool expired signal PTLCH is output.

Upon detecting this signal, the PMC outputs an alarm or instructs the operator to change the tool.

## Benefits

- Increase of the quality of the machining

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0331-J614 | 30i-PB Tool Life Management |
| A02B-0332-J614 | 31i-PB Tool Life Management |

**Notice**

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# 409

## Punch press functions

# Program auto restart

## Features

When a laser cutting process is interrupted (by a reset operation or a power failure) the Program Auto Restart function provides the possibility to restart the cutting from the interruption point.

## Benefits

- Fast restart of the production after an interruption
- Simplification of the programming of the restart process
- Overall increase of the machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0331-S904 | 30i-PB Automatic Program Restart |
| A02B-0332-S904 | 31i-PB Automatic Program Restart |

**Notice**

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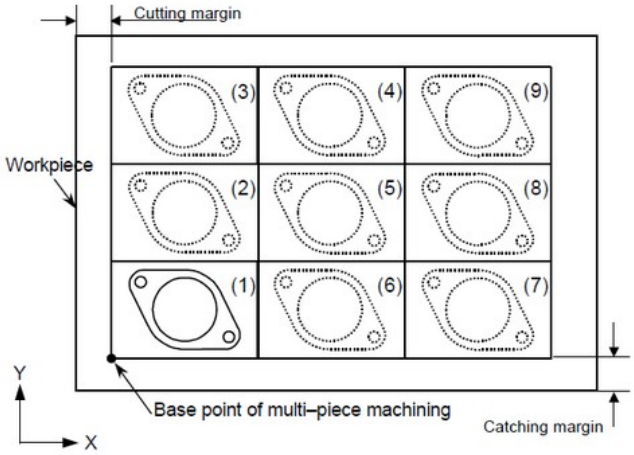
# 410

## Punch press functions




# Multi-piece machining

## Features

The multi–piece machining function enables several sheets of product with the same punching shape to be produced from a single sheet of material at a time by simple commands.

This function allows so called “trial machining” that performs punching only on a sheet of product from the machining program for “multi–piece machining” by a simple setup method, therefore the machining program can be easily checked before full machining.

## Benefits

- Simplification of the programming
- Overall increase of the machine efficiency and productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0331-J603 | 30i-PB Multi-Piece Machining |
| A02B-0332-J603 | 31i-PB Multi-Piece Machining |

**Notice**

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# 411
# Functions

## Laser functions

This section of the catalogue contains the functions related to the CO2 Laser systems of FANUC.

Some of the functions detailed in the catalogue:

- Standard functions
- Gap control
- Cutting settings
- Laser high-speed control
- Etc.

**Notice**

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# 412

## Laser functions

# Standard laser functions

## Features

The Series 30i-LB or Series 31i-LB CNC are specialized CNC that can be connected to a FANUC CO2 laser oscillator via a dedicated interface and can be used to control a high-performance laser machine easily.

Beside the standard CNC function set, the Series 30i-LB or Series 31i-LB CNC feature a rich set of specialized functions for laser control and laser machine control.

## Key functions:

- Connection via a serial interface: the FANUC I/O LINK interface is used to connect the Series 30i-LB and Series 31i-LB CNC to a FANUC laser oscillator
- Laser Oscillator control: the following functions are provided in the LB CNC:
  - Oscillator start/stop sequence control
  - Automatic laser output compensation
  - Laser output feedback
  - Laser gas pressure control
  - Leakage check
  - Electric shutter control
  - Return light detection
  - Parameter management for uniform oscillator output
- Output control in synchronization with interpolation calculation:
  - Change an output command in each block separately
  - Control the output quickly without wasting time
  - Change the output without causing discontinuance between move commands
  - Control the output control according to the command type
- Automation of functions such as:
  - Assist gas control
  - Saving and restoring machining condition data
  - High-speed piercing control
  - Cutting restart function based on the retrace function

## Benefits

- Fast and performant integration of a laser machine

**Notice**

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# 413

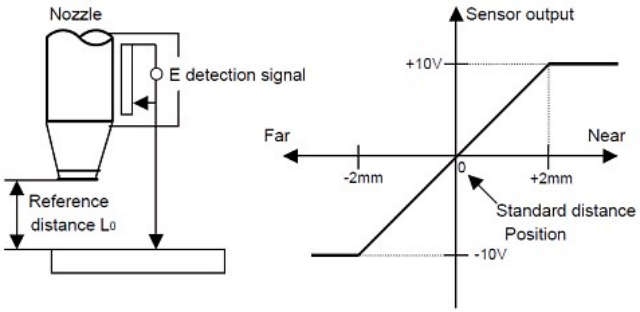
## Laser functions

# Gap control for laser

## Features

When the laser cutting machine is equipped with a detector to measure the distance to the surface of the workpiece, it is possible with the Gap Control function to use an analog signal generated by this detector and send it to the CNC through a specified interface.

This signal is processed by the CNC and enables a precise gap control using the Z-axis of the CNC / machine.




## Benefits

- Control of the gap between nozzle and workpiece
- Improvement of the cutting quality

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0329-J817 | 30i-LB Gap Control |
| A02B-0330-J817 | 31i-LB Gap Control |

**Notice**

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# 414

## Laser functions

# Automatic gap control axis retract / approaching function

## Features

The Automatic Gap Control Axis Retraction and Approaching function enables an automatic retraction along the gap control axis under gap control during a positioning operation from the end point of the current cutting to the next cutting point along the X-/Y-axis.

It also enables to approach the workpiece along the gap control axis while approaching the next cutting point along the X-/Y-axis, without canceling the gap control mode, so the next cutting phase can be started.

## Benefits

- Increase the ease of use of the machine in nozzle approaching and retract cycles

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0329-S914 | 30i-LB Automatic Gap Control Axis Retraction and Approaching |
| A02B-0330-S914 | 31i-LB Automatic Gap Control Axis Retraction and Approaching |

**Notice**

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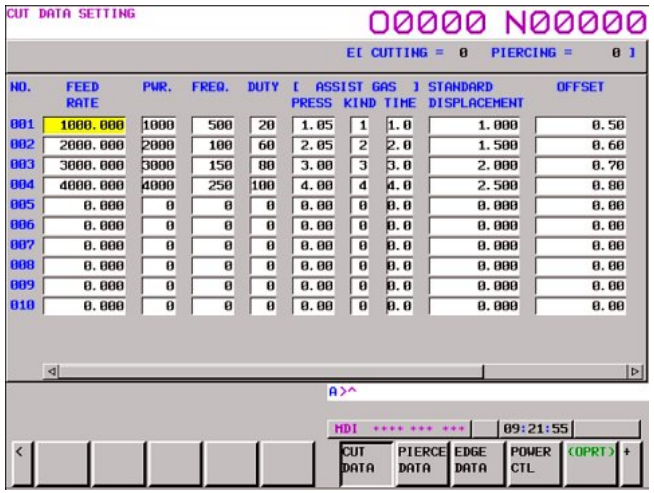
# 415

## Laser functions




# Cutting condition setting function

## Features

The Cutting Condition Setting function saves the laser machining data (otherwise specified using the S, P, and Q addresses separately) all together in the memory and enables to process machining according to the saved data.

This function is provided for controlling the C laser oscillators. It requires the display unit with 10.4-inch color LCD.

## Benefits

- Simplification of the operation of the machine when repetitive parts are produced
- Reduction of the setup time
- Overall improvement of the machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0329-J886 | 30i-LB Cutting Condition Setting Function |
| A02B-0330-J886 | 31i-LB Cutting Condition Setting Function |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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# 416

## Laser functions

# Edge machine function

## Features

The edge cutting function detects edges, controls deceleration-to-stop, performs piercing, and controls the feed rate and power during a shift from piercing to cutting.

It is capable of producing sharper edges. Using this function requires the cutting condition setting function.

## Benefits

- Improvement of the cutting quality in edges
- Increase the quality of the cut and the performance of the machine
- Overall increase of the machinr productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0329-J833 | 30i-LB Edge Cutting Function |
| A02B-0330-J833 | 31i-LB Edge Cutting Function |

**Notice**

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# 417

## Laser functions

# Laser high speed control function 2

## Features

This function allows to transfer 4 sets of laser output conditions every 8msec in AI-NANO contour control mode to the laser oscillator via FSSB I/O. The Laser output can be controlled every 125msec by commanding the laser output conditions to the laser oscillator via FSSB I/O.

4 sets of laser output conditions such as laser power or block overlap position are transferred to DSP software for laser control in AI-NANO contour control mode. The DSP software controls 1 laser output conditions every 125 u sec and commands to laser oscillator via FSSB I/O.

## Benefits

- High-precision and high-speed laser processing can be realized
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0329-S922 | 30i-LB Laser High-Speed Control 2 |
| A02B-0330-S922 | 31i-LB Laser High-Speed Control 2 |

**Notice**

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# Program auto restart

## Features

When a laser cutting process is interrupted (by a reset operation or a power failure) the Program Auto Restart function provides the possibility to restart the cutting from the interruption point.

## Benefits

- Fast restart of the production after an interruption
- Simplification of the programming of the restart process
- Overall increase of the machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0329-S904 | 30i-LB Automatic Program Restart |
| A02B-0330-S904 | 31i-LB Automatic Program Restart |

**Notice**

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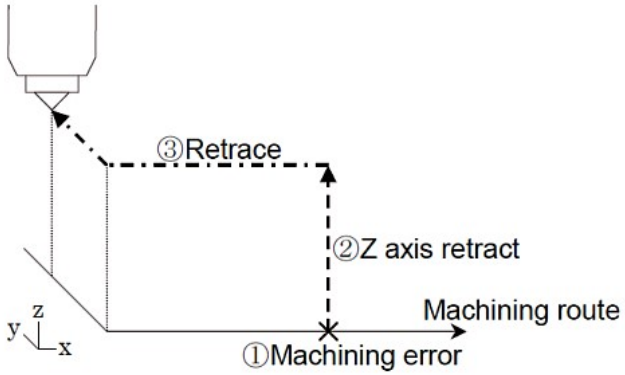
# 419

## Laser functions




# Cutting restart

## Features

The burning is generated in the laser cutting, and the cutting might not be able to be continued. In such a case, machining may be resumed by putting the machine back in the state in which it was before burning. This is done by a Processing Restart function.

If a machining error is detected, the cutting restart function moves the machine back to a specified position through the same path it had taken before the error occurred, while the laser beam is kept turned off.

When the machine gets back to the specified position, the cutting restart function again places the machine in an operable state and causes it to move forward to the position where it started going back.

## Benefits

- Simplification of the restart procedure of the machine in case of issue
- Simplification of the programming of the retstart cycle
- Overall increase of the machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0329-J887 | 30i-LB Cutting Restart |
| A02B-0330-J887 | 31i-LB Cutting Restart |

**Notice**

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# 420

## Laser functions

# Multi-piece machining

## Features

The Multi–piece Machining function enables several sheets of product with the same cut shape to be produced from a single sheet of material at a time by simple commands.

This function allows so called “trial cutting” that performs cutting only on a sheet of product from the cutting program for “multi–piece machining” by a simple setup method, therefore the cutting program can be easily checked before full machining.

## Benefits

- Reduction of the time from try out to production

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0329-J603 | 30i-LB Multi-Piece Machining |
| A02B-0330-J603 | 31i-LB Multi-Piece Machining |

**Notice**

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# 421
# Laser functions

# Enhanced buffer

## Features

This function enhances the number of reading blocks at cutter compensation (parameter No.19625). To find correct actual path, the intersecting point at the movement blocks is calculated with cutter compensation.

When the block that has no movement is commanded, eight blocks or less are read until the block which has the movement is found in this intersection calculation.

In the laser cutting, the piercing command, the cutting condition command, the assist gas command and the command with no movement might be consecutive. Even if the block which has no movement is continued 30 blocks or less, this function enables to maintain the offset vector and the beam route in cutter compensation mode and start-up mode as usual.

## Benefits

- Simplification of the programming
- Increase of the overall machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0329-J611 | 30i-LB Buffer Expansion |
| A02B-0330-J611 | 31i-LB Buffer Expansion |

**Notice**

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# 422

## Laser functions

# Attitude control

## Features

When at least five controlled axes are specified and attitude control is also specified, control can be applied to the attitude of the nozzle with the fourth and fifth axes used as rotational axes.

When using this function, the laser machine tool can be use as a three-dimensional machine tool.

## Benefits

- Simplification of the programming
- Overall improvement of the machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0329-J827 | 30i-LB Attitude Control |

**Notice**

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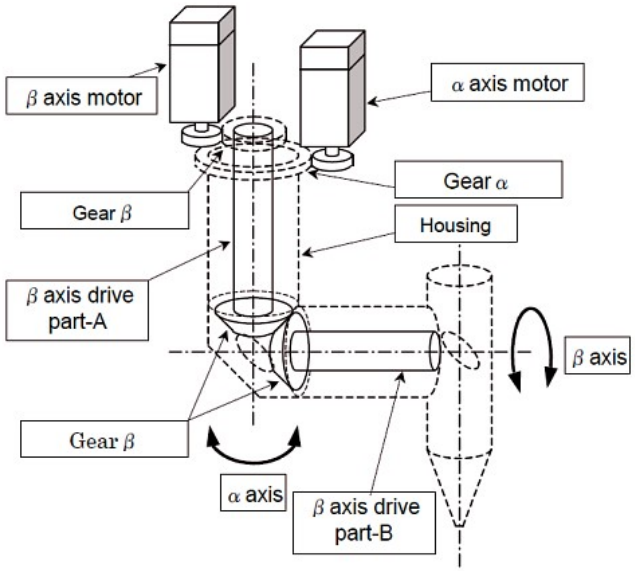
# 423

## Laser functions




# Interaction control

## Features

In nozzle attitude control, as shown in the diagram of the axis configuration of the nozzle head, the ß axis motor is arranged around the Z axis. In the case of a structure which transmits by gear, if the α axis is commanded, the housing rotates and the nozzle rotates around the Z axis.

However, simultaneously at this time gear ß must rotate around gear α. This movement results in the nozzle being rotated by the ß axis.

Namely, if the α axis rotates by an α axis command, a rotational operation simultaneously occurs at the ß axis.

Interaction control is the function to automatically generate commands in the ß axis of the same amount as the α axis commands in order to cancel the rotational operation of the ß axis for a nozzle head of axis configuration such that the ß axis rotates by the α axis commands. The command polarity can be selected by parameter.

## Benefits

- Simplification of the programming
- Overall increase of the machine productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0329-J864 | 30i-LB Interaction Control |

**Notice**

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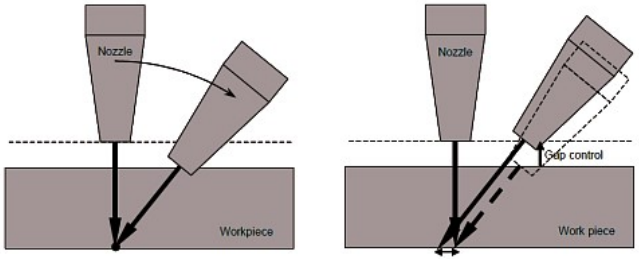
# 424

## Laser functions




# Bevel cutting compensation function

## Features

In the bevel cutting that uses the inclination to the work cutting side, the laser beam irradiation point specified by the program might become a work bottom.

Therefore, the laser beam irradiation point as a nozzle tip point in the nozzle length compensation function, operate the nozzle tip fixing mode, bevel angle changes, the nozzle might collide with the workpiece surface (left figure).

To avoid this collision, the gap control is used, the nozzle is done gap control in the vertical direction, the tracks error margin in the work bottom occurs (right figure).

By compensating the nozzle length automatically according to the bevel angle in the nozzle tip fixing mode, the bevel cutting compensation function loses the tracks error margin without the nozzle colliding with the workpiece surface.

## Benefits

- Increase of the cutting capabilities of the machine
- Avoidance of the collision between the nozzle and the working table

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0329-S909 | 30i-LB Bevel Cutting Compensation Function |

**Notice**

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# 425

## Laser functions

# Punch press function for compound cutting

## Features

When the function for Punch Press is activated and parameter ALA (No.16242#0) is 1, the punch press function becomes effective. As a result, the function of Series 30i/31i-PB CNC can be used also with Series 30i/31i-LB CNC.

When the punch press function is effective, the punch mode that does the punch press processing and the laser mode that does laser processing become possible. Each mode is switched by specified M code.

In the program, the punch press processing and the laser processing can be alternately done by one program when specified M code of each mode in the first block of the punch press processing and the laser processing.

## Benefits

- Increase of the capabilities of the laser CNC to punch press

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0329-R815 | 30i-LB Punch Press Function |
| A02B-0330-R815 | 31i-LB Punch Press Function |

**Notice**

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# 426

# Functions

## Gas cutting machine functions

This section of the catalogue contains the functions related to Gas Cutting machines.

Some of the functions detailed in the catalogue:

- Torch swing
- In- acceleration / deceleration
- Corner control
- Tool offset B
- Etc.

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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# 427

## Gas cutting machine functions

# Automatic exact stop check

## Features

The Automatic Exact Stop Check function checks the corner inner angle between successive blocks specifying linear interpolation (G01) or circular interpolation (G02, G03) and perform an exact stop automatically between the blocks if the angle is equal to or less than a set critical angle.

## Benefits

- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R505 | 30i-A Automatic Exact Stop Check |
| A02B-0306-R505 | 31i-A5 Automatic Exact Stop Check |
| A02B-0307-R505 | 31i-A Automatic Exact Stop Check |
| A02B-0323-R505 | 30i-B Automatic Exact Stop Check |
| A02B-0326-R505 | 31i-B5 Automatic Exact Stop Check |
| A02B-0327-R505 | 31i-B Automatic Exact Stop Check |

**Notice**

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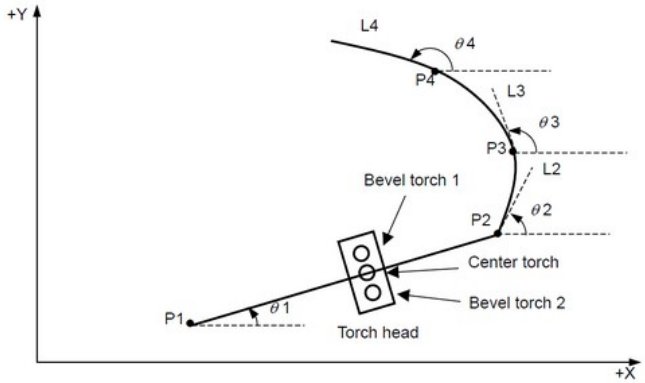
# 428

## Gas cutting machine functions




# Torch swing for gas cutting machine

## Features

For beveling using a torch head with a bevel torch (hereinafter simply referred to as a torch head), the torch head generally needs to be positioned in the normal direction to a specified straight line or arc at all times. This function automatically controls the torch head swing control axis (hereinafter referred to as the torch swing axis) to position the torch head in the normal direction to a specified straight line or arc.

For positioning in the normal direction to a straight line, the torch control axis is fed at a constant speed in the normal direction to the straight line according to linear interpolation execution. For positioning in the normal direction to an arc, the torch control axis is positioned in the momentarily changing normal direction to the arc according to circular interpolation execution.

## Benefits

- Addition of Torch Swing control for gas cutting process
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R506 | 30i-A Torch Swing for Gas Cutting Machine |
| A02B-0306-R506 | 31i-A5 Torch Swing for Gas Cutting Machine |
| A02B-0307-R506 | 31i-A Torch Swing for Gas Cutting Machine |
| A02B-0323-R506 | 30i-B Torch Swing for Gas Cutting Machine |
| A02B-0326-R506 | 31i-B5 Torch Swing for Gas Cutting Machine |
| A02B-0327-R506 | 31i-B Torch Swing for Gas Cutting Machine |

**Notice**

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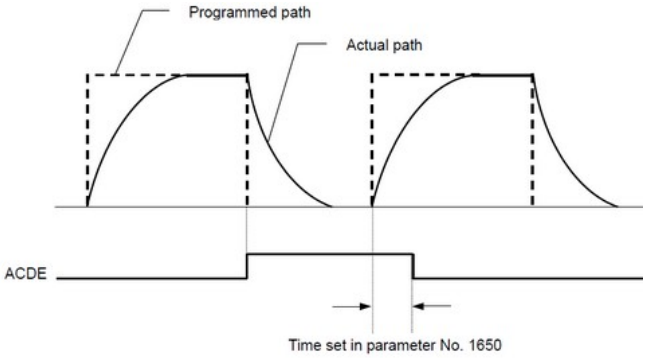
# 429

## Gas cutting machine functions




# In- acceleration / deceleration signal

## Features

The In- Acceleration / Deceleration Signal function During deceleration in a block for cutting feed, the in-acceleration/ deceleration signal is output to the machine.

## Benefits

- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R519 | 30i-A In-Acceleration / Deceleration Signal |
| A02B-0306-R519 | 31i-A5 In-Acceleration / Deceleration Signal |
| A02B-0307-R519 | 31i-A In-Acceleration / Deceleration Signal |
| A02B-0323-R519 | 30i-B In-Acceleration / Deceleration Signal |
| A02B-0326-R519 | 31i-B5 In-Acceleration / Deceleration Signal |
| A02B-0327-R519 | 31i-B In-Acceleration / Deceleration Signal |

**Notice**

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# 430

## Gas cutting machine functions

# Gentle curve cutting

## Features

With the Gentle Curve Cutting function, if the V-axis is added as an axis parallel to the Y-axis, the V-axis in the gentle curve cutting cancel mode (G13) and a command for the Y-axis alone is assumed to be specified for the V-axis as well and enables movement also on the V-axis.

In the gentle curve cutting mode (G12), a command for the Y-axis is valid for the Y-axis alone and a command for the V-axis is valid for the V-axis alone.

## Benefits

- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R504 | 30i-A Gentle Curve Cutting |
| A02B-0306-R504 | 31i-A5 Gentle Curve Cutting |
| A02B-0307-R504 | 31i-A Gentle Curve Cutting |
| A02B-0323-R504 | 30i-B Gentle Curve Cutting |
| A02B-0326-R504 | 31i-B5 Gentle Curve Cutting |
| A02B-0327-R504 | 31i-B Gentle Curve Cutting |

**Notice**

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# 431

## Gas cutting machine functions

# Corner control by feedrate

## Features

If a block for cutting feed is followed by another block for cutting feed, the number of accumulated pulses in the automatic acceleration / deceleration circuit of each axis in the block being executed is assumed to be 0 and machining proceeds to the next block when the feedrate being decelerated on each axis with the automatic acceleration / deceleration circuit has decreased to or below the feedrate set in parameter.

## Benefits

- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R508 | 30i-A Corner Control by Feedrate |
| A02B-0306-R508 | 31i-A5 Corner Control by Feedrate |
| A02B-0307-R508 | 31i-A Corner Control by Feedrate |
| A02B-0323-R508 | 30i-B Corner Control by Feedrate |
| A02B-0326-R508 | 31i-B5 Corner Control by Feedrate |
| A02B-0327-R508 | 31i-B Corner Control by Feedrate |

**Notice**

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# 432

## Gas cutting machine functions

# Tool offset B

## Features

With the Tool Offset B function G43H_ or G44H_ command, the tool offset not affected by mirror image can be applied.

With the G49 command, the tool offset can be canceled without being affected by the mirror image. The offset axes are the first axis and second axis for the plane selection.

## Benefits

- Benefit list not available

## Benefits

- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S616 | 30i-A Tool Offset Memory B |
| A02B-0306-S616 | 31i-A5 Tool Offset Memory B |
| A02B-0307-S616 | 31i-A Tool Offset Memory B |
| A02B-0308-S616 | 32i-A Tool Offset Memory B |
| A02B-0323-S616 | 30i-B Tool Offset Memory B |
| A02B-0326-S616 | 31i-B5 Tool Offset Memory B |
| A02B-0327-S616 | 31i-B Tool Offset Memory B |
| A02B-0328-S616 | 32i-B Tool Offset Memory B |
| A02B-0333-S616 | 35i-B Tool Offset Memory B |

**Notice**

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# 433

# Functions

## Editing operation

This section of the catalogue contains the functions related to the Editing Operations on the CNC.

Some of the functions detailed in the catalogue:

- Size of parts program
- Number of programs
- Encryption
- Background editing
- Etc.

**Notice**

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# Part program storage size

## Features

The Part Program Storage is the amount of space available for the operator or user of the CNC to store CNC Part Programs.

The size of the program memory can be incremented to up to 8MB, depending on the CNC model.

Refer to the ordering information table for the sizes available.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J944 | 30i-A Part Program Memory, 128 kB |
| A02B-0303-J945 | 30i-A Part Program Memory, 256 kB |
| A02B-0303-J946 | 30i-A Part Program Memory, 512 kB |
| A02B-0303-J947 | 30i-A Part Program Memory, 1 MB |
| A02B-0303-J948 | 30i-A Part Program Memory, 2 MB |
| A02B-0303-J949 | 30i-A Part Program Memory, 4 MB |
| A02B-0303-J959 | 30i-A Part Program Memory, 8 MB |
| A02B-0306-J944 | 31i-A5 Part Program Memory, 128 kB |
| A02B-0306-J945 | 31i-A5 Part Program Memory, 256 kB |
| A02B-0306-J946 | 31i-A5 Part Program Memory, 512 kB |
| A02B-0306-J947 | 31i-A5 Part Program Memory, 1 MB |
| A02B-0306-J948 | 31i-A5 Part Program Memory, 2 MB |
| A02B-0306-J949 | 31i-A5 Part Program Memory, 4 MB |
| A02B-0306-J959 | 31i-A5 Part Program Memory, 8 MB |
| A02B-0307-J944 | 31i-A Part Program Memory, 128 kB |
| A02B-0307-J945 | 31i-A Part Program Memory, 256 kB |
| A02B-0307-J946 | 31i-A Part Program Memory, 512 kB |
| A02B-0307-J947 | 31i-A Part Program Memory, 1 MB |
| A02B-0307-J948 | 31i-A Part Program Memory, 2 MB |
| A02B-0307-J949 | 31i-A Part Program Memory, 4 MB |
| A02B-0307-J959 | 31i-A Part Program Memory, 8 MB |
| A02B-0308-J943 | 32i-A Part Program Memory, 64 kB |
| A02B-0308-J944 | 32i-A Part Program Memory, 128 kB |
| A02B-0308-J945 | 32i-A Part Program Memory, 256 kB |
| A02B-0308-J946 | 32i-A Part Program Memory, 512 kB |
| A02B-0308-J947 | 32i-A Part Program Memory, 1 MB |

**Notice**

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| Specification | Description |
|---|---|
| A02B-0308-J948 | 32i-A Part Program Memory, 2 MB |
| A02B-0319-J948 | 0i-TD Part Program Memory, 2 MB |
| A02B-0320-J948 | 0i-MD Part Program Memory, 2 MB |
| A02B-0323-J944 | 30i-B Part Program Memory, 128 kB |
| A02B-0323-J945 | 30i-B Part Program Memory, 256 kB |
| A02B-0323-J946 | 30i-B Part Program Memory, 512 kB |
| A02B-0323-J947 | 30i-B Part Program Memory, 1 MB |
| A02B-0323-J948 | 30i-B Part Program Memory, 2 MB |
| A02B-0323-J949 | 30i-B Part Program Memory, 4 MB |
| A02B-0323-J959 | 30i-B Part Program Memory, 8 MB |
| A02B-0326-J944 | 31i-B5 Part Program Memory, 128 kB |
| A02B-0326-J945 | 31i-B5 Part Program Memory, 256 kB |
| A02B-0326-J946 | 31i-B5 Part Program Memory, 512 kB |
| A02B-0326-J947 | 31i-B5 Part Program Memory, 1 MB |
| A02B-0326-J948 | 31i-B5 Part Program Memory, 2 MB |
| A02B-0326-J949 | 31i-B5 Part Program Memory, 4 MB |
| A02B-0326-J959 | 31i-B5 Part Program Memory, 8 MB |
| A02B-0327-J944 | 31i-B Part Program Memory, 128 kB |
| A02B-0327-J945 | 31i-B Part Program Memory, 256 kB |
| A02B-0327-J946 | 31i-B Part Program Memory, 512 kB |
| A02B-0327-J947 | 31i-B Part Program Memory, 1 MB |
| A02B-0327-J948 | 31i-B Part Program Memory, 2 MB |
| A02B-0327-J949 | 31i-B Part Program Memory, 4 MB |
| A02B-0327-J959 | 31i-B Part Program Memory, 8 MB |
| A02B-0328-J943 | 32i-B Part Program Memory, 64 kB |
| A02B-0328-J944 | 32i-B Part Program Memory, 128 kB |
| A02B-0328-J945 | 32i-B Part Program Memory, 256 kB |
| A02B-0328-J946 | 32i-B Part Program Memory, 512 kB |
| A02B-0328-J947 | 32i-B Part Program Memory, 1 MB |
| A02B-0328-J948 | 32i-B Part Program Memory, 2 MB |
| A02B-0333-J943 | 35i-B Part Program Memory, 64 kB |
| A02B-0333-J944 | 35i-B Part Program Memory, 128 kB |
| A02B-0333-J945 | 35i-B Part Program Memory, 256 kB |
| A02B-0333-J946 | 35i-B Part Program Memory, 512 kB |
| A02B-0333-J947 | 35i-B Part Program Memory, 1 MB |
| A02B-0334-J943 | PM i-A Part Program Memory, 64 kB |
| A02B-0334-J944 | PM i-A Part Program Memory, 128 kB |
| A02B-0334-J945 | PM i-A Part Program Memory, 256 kB |
| A02B-0334-J946 | PM i-A Part Program Memory, 512 kB |
| A02B-0334-J947 | PM i-A Part Program Memory, 1 MB |

**Notice**

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# Number of registered programs

## Features

The number of registered programs is the total number of programs, subject to the availability of memory space, which can be stored in the CNC. The number varies with the total size of part program storage. The Registered Program Expansion option increases the number of programs according to the table below:

| Part Program Storage Length | Expansion 1 | Expansion 2 |
|---|---|---|
| 64 KByte | 120 | -- |
| 128 KByte | 250 | -- |
| 256 KByte | 500 | -- |
| 512 KByte | 1000 | -- |
| 1MByte | 1000 | 2000 |
| 2MByte | 1000 | 4000 |
| 4MByte | 1000 | 4000 |
| 8MByte | 1000 | 4000 |

## Benefits

- Allows bether organisation of complex part programs into subroutines
- Quick access to a large number of different programs for shop floor programming

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J953 | 30i-A Registered Program Expansion 1 |
| A02B-0303-J954 | 30i-A Registered Program Expansion 2 |
| A02B-0306-J953 | 31i-A5 Registered Program Expansion 1 |
| A02B-0306-J954 | 31i-A5 Registered Program Expansion 2 |
| A02B-0307-J953 | 31i-A Registered Program Expansion 1 |
| A02B-0307-J954 | 31i-A Registered Program Expansion 2 |
| A02B-0308-J953 | 32i-A Registered Program Expansion 1 |
| A02B-0323-J953 | 30i-B Registered Program Expansion 1, Max. 1000 Programs |
| A02B-0323-J954 | 30i-B Registered Program Expansion 2, Max. 4000 Programs |
| A02B-0326-J953 | 31i-B5 Registered Program Expansion 1, Max. 1000 Programs |
| A02B-0326-J954 | 31i-B5 Registered Program Expansion 2, Max. 4000 Programs |
| A02B-0327-J953 | 31i-B Registered Program Expansion 1, Max. 1000 Programs |
| A02B-0327-J954 | 31i-B Registered Program Expansion 2, Max. 4000 Programs |

**Notice**

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# 437

| Specification | Description |
|---|---|
| A02B-0328-J953 | 32i-B Registered Program Expansion 1, Max. 1000 Programs |

## Notice

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# Key and program encryption

## Features

The Key and Program Encryption function protects part programs from unauthorized use. Program contents can be protected by setting parameters for encryption and for the program security range.

- When the password and security range parameters are specified, the display, editing, and input/output operations are disabled for the programs within the security range.
- The programs in the security range can be encrypted before being output. Once encrypted, the programs cannot be decrypted. In addition, encrypted programs can be input directly.

## Benefits

- Increase of the safety and security of the machine operation

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J778 | 30i-A Key and Program Encryption |
| A02B-0306-J778 | 31i-A5 Key and Program Encryption |
| A02B-0307-J778 | 31i-A Key and Program Encryption |
| A02B-0323-J778 | 30i-B Key and Program Encryption |
| A02B-0326-J778 | 31i-B5 Key and Program Encryption |
| A02B-0327-J778 | 31i-B Key and Program Encryption |

**Notice**

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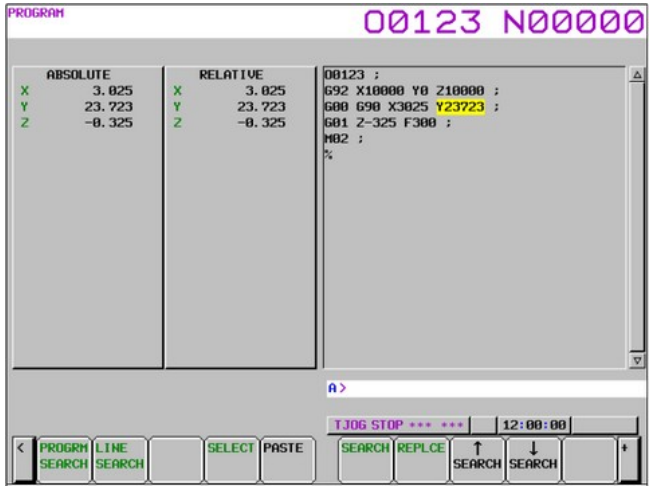
# 439

## Editing operation




# Playback

## Features

Playback is a function that allows the operator to teach the CNC a part program in JOG or HANDLE mode.

In these modes, a machine position along the X, Y and Z axes, obtained by manual operation, is stored in memory as a program position to create a program. The words other than X, Y and Z, which include O, N, G, R, F, C, M, S, T, P, Q, and EOB, can be stored in memory in the same way as in EDIT mode.

## Benefits

- Reduce set up time
- Save repeated motions in memory by capturing machine position of manual motions,G,M,S,T can also be added
- Great tool for fixture preparation such as facing a fixture/jaws

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J879 | 30i-A Playback |
| A02B-0306-J879 | 31i-A5 Playback |
| A02B-0307-J879 | 31i-A Playback |
| A02B-0308-J879 | 32i-A Playback |
| A02B-0323-J879 | 30i-B Playback |
| A02B-0326-J879 | 31i-B5 Playback |
| A02B-0327-J879 | 31i-B Playback |
| A02B-0328-J879 | 32i-B Playback |

**Notice**

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# 440

## Editing operation

# Machining time stamp

## Features

The execution times of the most recently executed ten programs can be displayed in hours, minutes, and seconds.

The calculated machining time can be inserted as a comment of the program to check the machining time on the program directory screen.

Run Hour and Parts Count Display Function is required.

## Benefits

- Simplification of production efficiency tracking

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J964 | 30i-A Machine Time Stamp |
| A02B-0306-J964 | 31i-A5 Machine Time Stamp |
| A02B-0307-J964 | 31i-A Machine Time Stamp |
| A02B-0323-J964 | 30i-B Machine Time Stamp |
| A02B-0326-J964 | 31i-B5 Machine Time Stamp |
| A02B-0327-J964 | 31i-B Machine Time Stamp |
| A02B-0328-J964 | 32i-B Machining Time Stamp |

**Notice**

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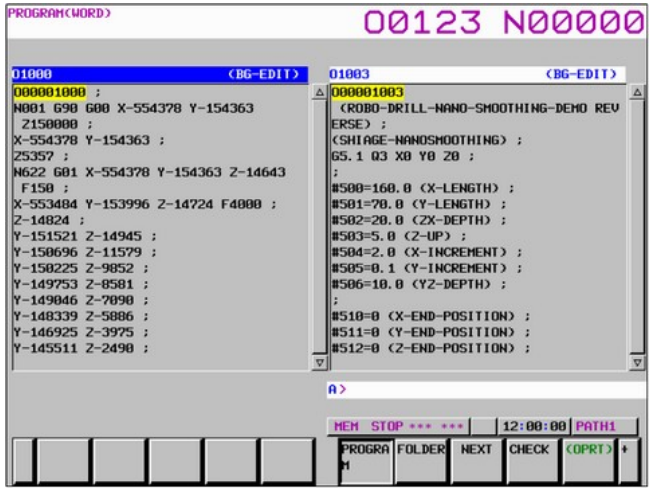
# 441

## Editing operation




# Background editing

## Features

While a program is being executed, another program may be edited. Such an edit operation is called Background Editing (BG editing). Background Editing can be performed in exactly the same way as ordinary editing (foreground editing).

## Benefits

- Edit part programs, other than the currently active program, while the machine tool is operating
- Non-active part programs for future jobs may be safely edited in background on the CNC while the machine tool is running the production program in foreground

## Benefits

- Simplifies the operation of the machine
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J956 | 30i-A Multi-Part Program Editing (Background Editing) |
| A02B-0306-J956 | 31i-A5 Multi-Part Program Editing (Background Editing) |
| A02B-0307-J956 | 31i-A Multi-Part Program Editing (Background Editing) |
| A02B-0308-J956 | 32i-A Multi-Part Program Editing (Background Editing) |
| A02B-0323-J956 | 30i-B Multi-Part Program Editing (Background Editing) |
| A02B-0326-J956 | 31i-B5 Multi-Part Program Editing (Background Editing) |
| A02B-0327-J956 | 31i-B Multi-Part Program Editing (Background Editing) |
| A02B-0328-J956 | 32i-B Multi-Part Program Editing (Background Editing) |

**Notice**

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# 442

## Editing operation

# Memory card program entry count extension

## Features

This function extends the number of part programs and folders that may be formatted onto a memory card for direct operation and/or editing. The standard allowance of 63 programs and folders may be extended up to a maximum of 1000.

This feature is only used when the PC Tool for Memory Card Program Operation/ Editing software is used to format part program text files to a memory card, for use via the PCMCIA card slot. This feature is not applicable when using the memory card for basic READ, PUNCH or DNC operations with part programs or input/output of maintenance files.

## Benefits

- Allows up to 1000 folders and programs to be used.
- Use of folders can greatly assist organization of files on memory card

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S995 | 30i-A Memory Card Program, Entry Count Extension |
| A02B-0306-S995 | 31i-A5 Memory Card Program, Entry Count Extension |
| A02B-0307-S995 | 31i-A Memory Card Program, Entry Count Extension |
| A02B-0308-S995 | 32i-A Memory Card Program, Entry Count Extension |
| A02B-0323-S995 | 30i-B Memory Card Program, Entry Count Extension, Max. 1000 Programs |
| A02B-0326-S995 | 31i-B5 Memory Card Program, Entry Count Extension, Max. 1000 Programs |
| A02B-0327-S995 | 31i-B Memory Card Program, Entry Count Extension, Max. 1000 Programs |
| A02B-0328-S995 | 32i-B Memory Card Program, Entry Count Extension, Max. 1000 Programs |

**Notice**

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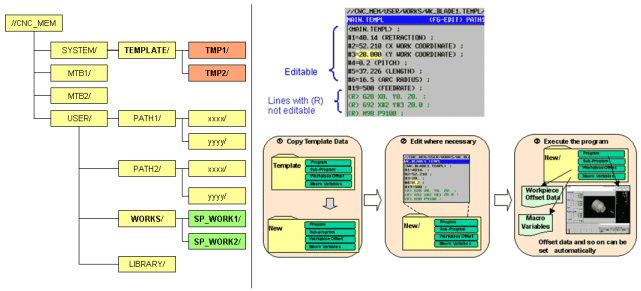
# 443

## Editing operation




# Template program function

## Features

The Machining Data Management Function management function provides the following features:

- Easy and Fast Creation of Complex Part Programs
- Combination of Machining Data and Part Programs

Manages program data such as

- Offsets
- Parameter
- Macro Variables
- Program Template

Folder based program structure

- Template Folder
- Machining Folder

Adjustable Data

- Parameter (G10 L52; ...)
- Pitch Error Compensation data (G10 L50;...)
- Workpiece Origin Offsets (G10 L20 P...)
  - External workpiece offset (G10 L2 P...)
  - Additional workpiece coordinate system (G10 P0 ...)
- Tool Management Data
  - Modifying, Deleting (G10 L75 P...)
  - Register, Modify, Delete Cartridge Management Table (G10 L76 P...)
  - Offset data for Lathe and Machining
  - ...
- Custom Macro Variables (#xxx = yyy;)

Remarks

To use this function, the 8-level data protection function is also necessary.

## Benefits

- Simplifies the operation of the machine
- Improves machining productivity

**Notice**

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# Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R561 | 30i-A Template Program Function (Machining Data Management Function) |
| A02B-0306-R561 | 31i-A5 Template Program Function (Machining Data Management Function) |
| A02B-0307-R561 | 31i-A Template Program Function (Machining Data Management Function) |
| A02B-0308-R561 | 32i-A Template Program Function (Machining Data Management Function) |
| A02B-0323-R561 | 30i-B Template Program Function (Machining Data Management Function) |
| A02B-0326-R561 | 31i-B5 Template Program Function (Machining Data Management Function) |
| A02B-0327-R561 | 31i-B Template Program Function (Machining Data Management Function) |
| A02B-0328-R561 | 32i-B Template Program Function (Machining Data Management Function) |

**Notice**

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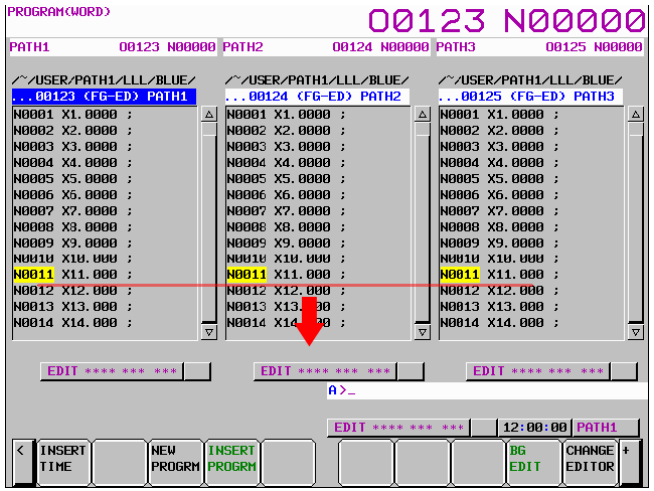
# 445

## Editing operation




# Multi-path editing function

## Features

In the simultaneous multi-path editing function, when the program of selected path is scrolled, other path programs that are displayed on the same screen can be scrolled simultaneously.

In this function, there are the synchronous scroll mode which scrolls all programs simultaneously displayed on the one screen and the single scroll mode which scrolls one program of the selected path. It is possible to switch between the synchronous scroll mode and the single scroll mode by the soft key operation easily.

In a synchronous scroll mode, when the cursor moves to the waiting M-code, the scroll of its path stops automatically until the cursor of the other path move to the same waiting M-code. So it is possible to edit the program confirming the waiting of each path program.
Moreover, the cursor of all paths in simultaneous editing can be moved to specified waiting M-code at a time by synchronous search.

## Benefits

- Simplifies the operation of the machine
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R615 | 30i-A Multi-Path Editing Function |
| A02B-0306-R615 | 31i-A5 Multi-Path Editing Function |
| A02B-0307-R615 | 31i-A Multi-Path Editing Function |
| A02B-0308-R615 | 32i-A Multi-Path Editing Function |
| A02B-0319-R615 | 0i-TD Multi-Path Editing Function |
| A02B-0323-R615 | 30i-B Multi-Path Editing Function |
| A02B-0326-R615 | 31i-B5 Multi-Path Editing Function |
| A02B-0327-R615 | 31i-B Multi-Path Editing Function |
| A02B-0328-R615 | 32i-B Multi-Path Editing Function |

**Notice**

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# High-speed program management

## Features

The High-Speed Program Management function can be used to ease the work when the operator is working on many machining programs at the same time.

The function allows to save all programs at once as it also allows to erase all the programs.

## Benefits

- Addition of the "All" function to the save or erase function
- Simplification of the programming
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R647 | 30i-A High-Speed Program Management |
| A02B-0306-R647 | 31i-A5 High-Speed Program Management |
| A02B-0307-R647 | 31i-A High-Speed Program Management |
| A02B-0308-R647 | 32i-A High-Speed Program Management |
| A02B-0323-R647 | 30i-B High-Speed Program Management |
| A02B-0326-R647 | 31i-B5 High-Speed Program Management |
| A02B-0327-R647 | 31i-B High-Speed Program Management |
| A02B-0328-R647 | 32i-B High-Speed Program Management |

**Notice**

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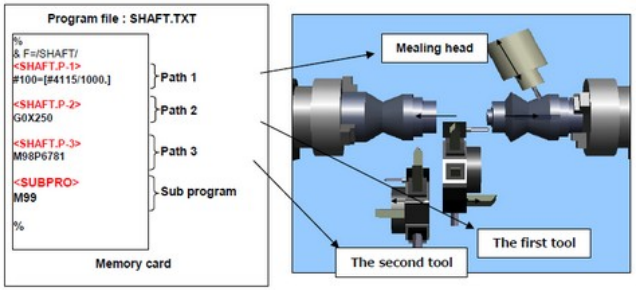
# 447

## Editing operation




Example of complex machining center (One milling head and two tool posts)

# Multi-path program management function

## Features

The multi-path lathe and the complex machine that have several turrets or heads machine workpieces using two or more machining programs. With this function, multi-path programs, offset data, and parameters, etc. for one part machining are managed together by a folder.

In addition, batch creation, batch selection, simultaneous editing and batch Input / Output of the programs are enabled. As a result, this function makes it easy to handle such multi-path programs.

## Benefits

- Simplifies the operation of the machine
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R684 | 30i-A Multi-Path Program Management Function |
| A02B-0306-R684 | 31i-A5 Multi-Path Program Management Function |
| A02B-0307-R684 | 31i-A Multi-Path Program Management Function |
| A02B-0308-R684 | 32i-A Multi-Path Program Management Function |
| A02B-0323-R684 | 30i-B Multi-Path Program Management Function |
| A02B-0326-R684 | 31i-B5 Multi-Path Program Management Function |
| A02B-0327-R684 | 31i-B Multi-Path Program Management Function |
| A02B-0328-R684 | 32i-B Multi-Path Program Management Function |

**Notice**

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# 448

# Functions

## Setting and Display

This section of the catalogue contains the functions related to Display Functions which the CNC to display more than just the basic machine information.

Some of the functions detailed in the catalogue:

- Languages
- Machine operation menus
- Protection of data
- Graphic functions
- Etc.

**Notice**

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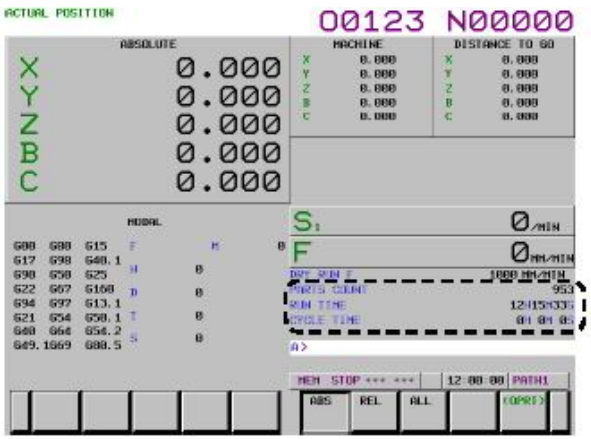
# 449

## Setting and Display




# Run hour and parts count display

## Features

With the Run Hour and Parts Count Display function, various run times, the total number of machined parts, number of parts required, and number of machined parts can be displayed.

## Benefits

- Easy shop floor data management

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J971 | 30i-A Run Hour & Parts Count Display |
| A02B-0306-J971 | 31i-A5 Run Hour & Parts Count Display |
| A02B-0307-J971 | 31i-A Run Hour & Parts Count Display |
| A02B-0308-J971 | 32i-A Run Hour & Parts Count Display |
| A02B-0323-J971 | 30i-B Run Hour & Parts Count Display |
| A02B-0326-J971 | 31i-B5 Run Hour & Parts Count Display |
| A02B-0327-J971 | 31i-B Run Hour & Parts Count Display |
| A02B-0328-J971 | 32i-B Run Hour & Parts Count Display |

**Notice**

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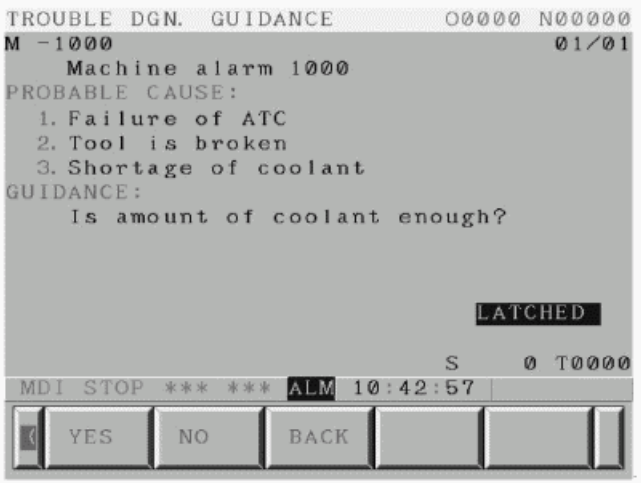
# 450

## Setting and Display




# Machine alarm diagnosis

## Features

Machine alarms (External alarm messages and Macro alarms) can be diagnosed on the a specific trouble diagnosis guidance screen in addition to the CNC alarms.

The following alarms can be diagnosed:

- External alarm message (Alarm No.1000–1999)
- Macro alarm (#3000) (Alarm No.3000–3200)

Guidance tables for diagnosis of machine alarms are made with Mircrosoft Excel sheet which is provided by FANUC.

Alarm No., Classified code, Alarm message, Probable cause and etc. are registered into a guidance table (1).

[Guidance Table (1)]

CHECK OK | 10 | Add lines | Convert

| No. | Alarm No. | Classified code | | Alarm message | Probable cause | | | Message ID | (Reserved) |
|---|---|---|---|---|---|---|---|---|---|
| | | Code 1 | Code 2 | | Line 1 | Line 2 | Line 3 | | |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |

"Guidance message" is registered into a guidance table (2).
"Guidance message" is a question and an instruction to an operator.

[Guidance Table (2)]

← | CHECK OK | 10 | Add lines

| No. | Message ID | Guidance message | Next message ID | | Comment |
|---|---|---|---|---|---|
| | | | YES | NO | |
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |

## Benefits

- Possibility to create a performant and assisted alarm diagnostic system for the CNC
- Reduction of the time required to diagnose the problem
- Improves machining productivity

**Notice**

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# Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-S813 | 0i-TD Machine Alarm Diagnosis |
| A02B-0320-S813 | 0i-MD Machine Alarm Diagnosis |
| A02B-0321-S813 | 0i-Mate-TD Machine Alarm Diagnosis |
| A02B-0322-S813 | 0i-Mate-MD Machine Alarm Diagnosis |
| A02B-0323-S813 | 30i-B Machine Alarm Diagnosis |
| A02B-0326-S813 | 31i-B5 Machine Alarm Diagnosis |
| A02B-0327-S813 | 31i-B Machine Alarm Diagnosis |
| A02B-0328-S813 | 32i-B Machine Alarm Diagnosis |
| A02B-0333-S813 | 35i-B Machine Alarm Diagnosis |
| A02B-0334-S813 | PM i-A Machine Alarm Diagnosis |

**Notice**

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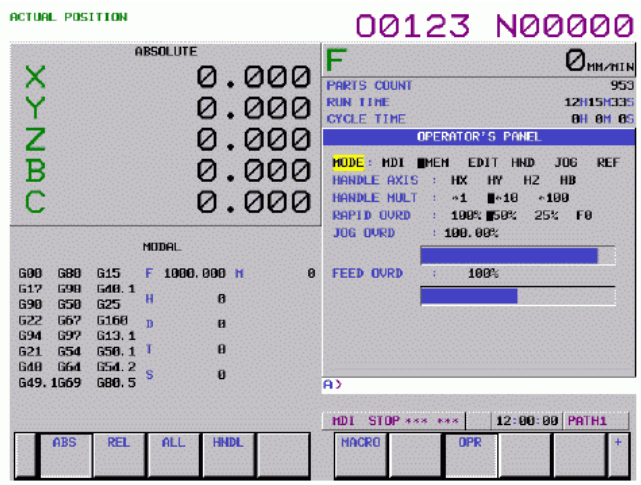
# 452

## Setting and Display




# Software operator's panel

## Features

The functions of switches on the machine operator's panel are made available by using the MDI panel. This means that functions such as a mode selection and selection of jog feedrate override can be made by operating the MDI panel, so corresponding switches on the machine operator's panel need not be used.

This function is enabled only when the software operator's panel screen is displayed. The user can make selection operations by moving the cursor by using the cursor keys while checking the screen.

The following functions can be performed:

- A : Mode selection
- B : Selection of jog feed axis, manual rapid traverse
- C : Selection of manual pulse generator feed axis, selection of manual pulse magnification
- D : Jog federate, federate override, rapid traverse override
- E : Optional block skip, single block, machine lock, dry run
- F : Protect key
- G : Feed hold
- H : General purpose switch

A parameter that enables and disables MDI operations is provided for each of operation groups A to G indicated above.

## Benefits

- Simplifies the operation of the machine
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J960 | 30i-A Software Operator's Panel |
| A02B-0306-J960 | 31i-A5 Software Operator's Panel |
| A02B-0307-J960 | 31i-A Software Operator's Panel |
| A02B-0308-J960 | 32i-A Software Operator's Panel |
| A02B-0323-J960 | 30i-B Software Operator's Panel |
| A02B-0326-J960 | 31i-B5 Software Operator's Panel |
| A02B-0327-J960 | 31i-B Software Operator's Panel |
| A02B-0328-J960 | 32i-B Software Operator's Panel |

**Notice**

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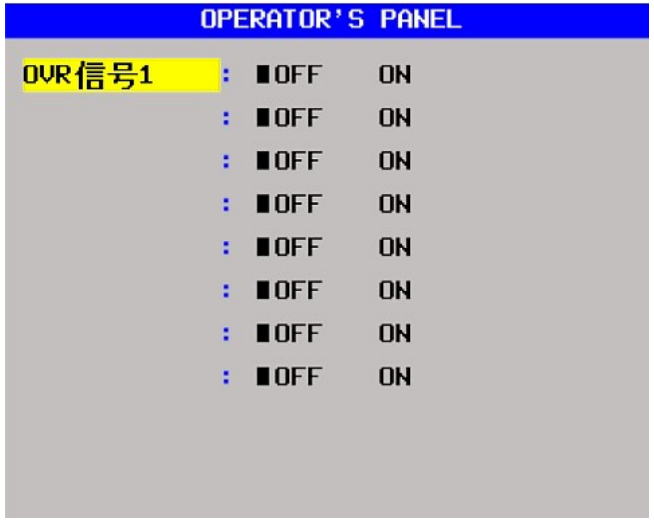
# 453

## Setting and Display




# Software operator's panel general purpose switch

## Features

This function allows the user to assign arbitrary signals to general purpose switches 1 to 16 on the software operator's panel.

## Benefits

- Simplifies the operation of the machine
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J961 | 30i-A Software Operator's Panel General Purpose Switch |
| A02B-0306-J961 | 31i-A5 Software Operator's Panel General Purpose Switch |
| A02B-0307-J961 | 31i-A Software Operator's Panel General Purpose Switch |
| A02B-0308-J961 | 32i-A Software Operator's Panel General Purpose Switch |
| A02B-0323-J961 | 30i-B Software Operator's Panel General Purpose Switch |
| A02B-0326-J961 | 31i-B5 Software Operator's Panel General Purpose Switch |
| A02B-0327-J961 | 31i-B Software Operator's Panel General Purpose Switch |
| A02B-0328-J961 | 32i-B Software Operator's Panel General Purpose Switch |

**Notice**

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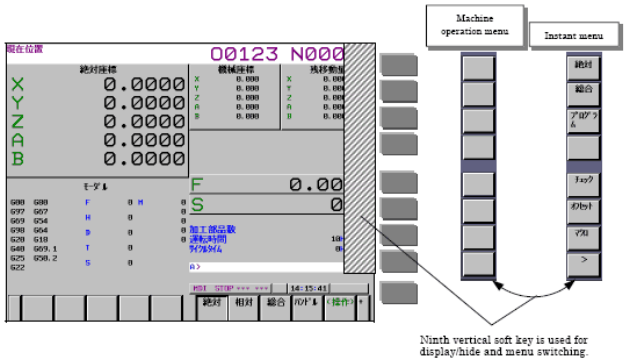
# 454

## Setting and Display




# Machine operation menu

## Features

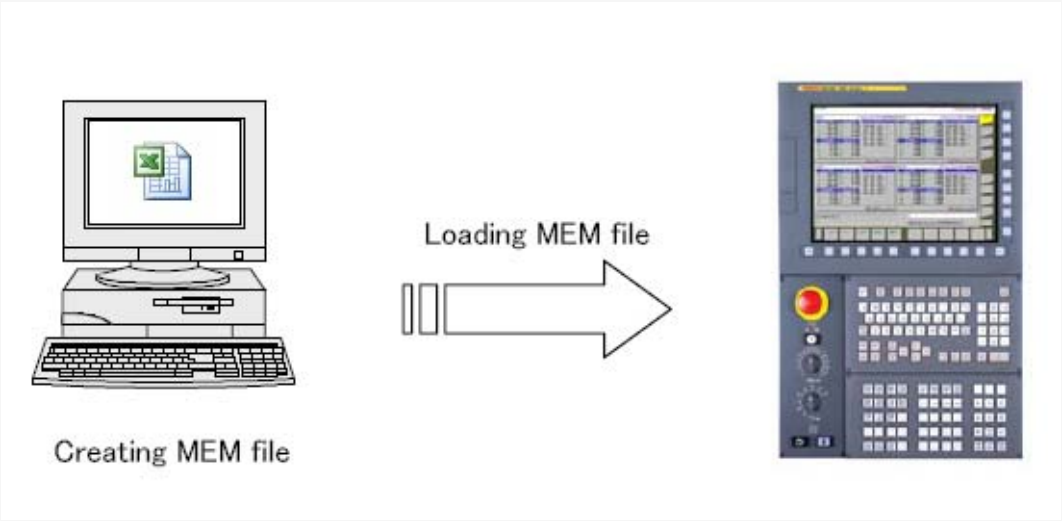
### Machine Operation Menu Function

The soft keys displayed on the standard CNC screen can be used as menu keys for the machine operation.

The soft keys can be customized easily by the machine tool builder. A menu can have a hierarchy, and the indication of each soft key can be specified.

Customization data is created as a machine operation menu definition file and is stored in the CNC.

### Machine Operation Menu Tool




When using the "Machine Operation Menu" making tool it is possible to define the machine operation menu and output the defined contents as MEM file.

## Benefits

- Simplifies the operation of the machine
- Improves machining productivity

**Notice**

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# Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S844 | 30i-A Machine Operation Menu |
| A02B-0306-S844 | 31i-A5 Machine Operation Menu |
| A02B-0307-S844 | 31i-A Machine Operation Menu |
| A02B-0308-S844 | 32i-A Machine Operation Menu |
| A02B-0319-S844 | 0i-TD Machine Operation Menu |
| A02B-0320-S844 | 0i-MD Machine Operation Menu |
| A02B-0323-S844 | 30i-B Machine Operation Menu |
| A02B-0326-S844 | 31i-B5 Machine Operation Menu |
| A02B-0327-S844 | 31i-B Machine Operation Menu |
| A02B-0328-S844 | 32i-B Machine Operation Menu |

**Notice**

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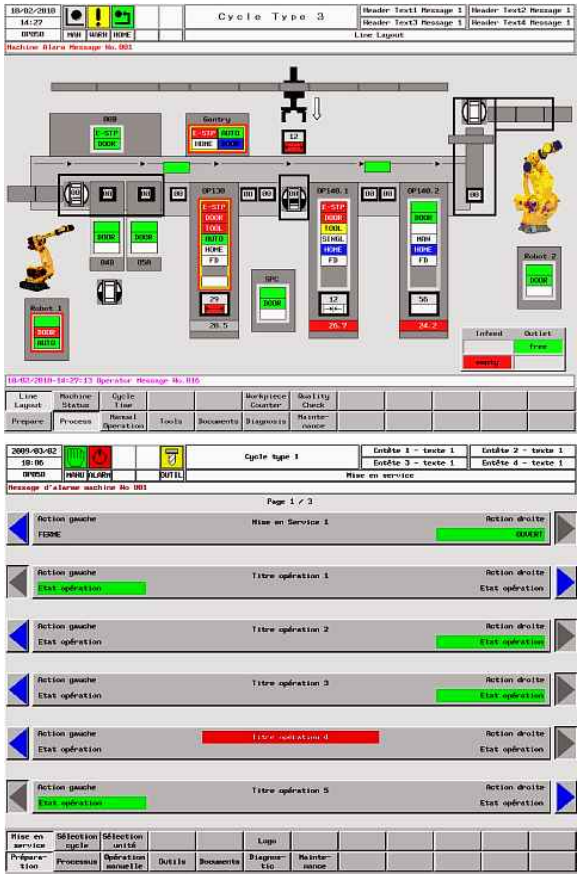
# 456

## Setting and Display



# FANUC Auto HMI-NC

## Features

FANUC Auto HMI-NC is an application composed of a set of HMI templates, objects, tables and scripts to create standardized user interfaces in automotive applications or machining applications producing large batches of products.

Typical screens are provided such as workpiece counters; tool life overview; manual operations etc. are available. The screens are multilingual and can be easily customized and supplemented by the machine manufacturer.

FANUC Auto HMI-NC is based on FANUC PICTURE. The main target of this application is to visualize the detailed status of a single machine, but also to provide on each machine a view and general information about the production line. It supports the 15 inch Display Station for Automotive as well as the 15" and 10" Touch Panel LCD displays.

The FANUC Auto HMI-NC application runs directly in the CNC, and is designed for 'passive' LCD displays (10.4 inch and 15 inch). The whole HMI system is cost effective and extremely reliable.

FANUC Auto HMI-NC has been developed to meet the requirements of standardization of operation of automotive machining plants and high volume production lines. This application contains a basic set of standardized HMI screens as well as libraries of objects based on "FANUC PICTURE".

Typical screens available:

- Power-On Conditions
- Line Layout
- Shift Counter
- Tool Lifetime
- Maintenance Menu
- Cycle Type Selection
- Machine Status
- Manual Operations
- Diagnosis Menu

'FANUC Auto HMI-NC' supports multi-language, with immediate switching between the languages. It can also be switched automatically with the language selected in the CNC. English is always available for maintenance reasons, one language for the end-user and one language for the machine builder / integrator. Language tables are easy to update and provide to external translation companies through the export-impoirt functions.

The Machine Builder or Integrator can develop its own screens to match his application requirements, based on templates and library of objects provided. In this case, FANUC PICTURE package is required. Animated objects, alarms or any data used in the FANUC Auto HMI-NC are mapped in PMC data tables for easy integration with the CNC.

**Notice**

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## Benefits

- No PC hardware used, no Hard-Disk, No Windows® operating system, absolute virus immunity
- Screens and HMI located in the CNC - No operating system to maintain in the display
- Customizable through FANUC PICTURE
- Plug and Play display - easy to maintain
- No particular boot and shutdown procedure of the CNC, HMI and display

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R572 | 30i-A FANUC Auto HMI-NC |
| A02B-0303-R653 | 30i-A FANUC Auto HMI-NC, Screen Enhancement 1 |
| A02B-0306-R572 | 31i-A5 FANUC Auto HMI-NC |
| A02B-0306-R653 | 31i-A5 FANUC Auto HMI-NC, Screen Enhancement 1 |
| A02B-0307-R572 | 31i-A FANUC Auto HMI-NC |
| A02B-0307-R653 | 31i-A FANUC Auto HMI-NC, Screen Enhancement 1 |
| A02B-0308-R572 | 32i-A FANUC Auto HMI-NC |
| A02B-0308-R653 | 32i-A FANUC Auto HMI-NC, Screen Enhancement 1 |
| A02B-0319-R572 | 0i-TD FANUC Auto HMI-NC |
| A02B-0319-R653 | 0i-TD FANUC Auto HMI-NC, Screen Enhancement 1 |
| A02B-0320-R572 | 0i-MD FANUC Auto HMI-NC |
| A02B-0320-R653 | 0i-MD FANUC Auto HMI-NC, Screen Enhancement 1 |
| A02B-0323-R572 | 30i-B FANUC Auto HMI-NC |
| A02B-0323-R653 | 30i-B FANUC Auto HMI-NC, Screen Enhancement 1 |
| A02B-0326-R572 | 31i-B5 FANUC Auto HMI-NC |
| A02B-0326-R653 | 31i-B5 FANUC Auto HMI-NC, Screen Enhancement 1 |
| A02B-0327-R572 | 31i-B FANUC Auto HMI-NC |
| A02B-0327-R653 | 31i-B FANUC Auto HMI-NC, Screen Enhancement 1 |
| A02B-0328-R572 | 32i-B FANUC Auto HMI-NC |
| A02B-0328-R653 | 32i-B FANUC Auto HMI-NC, Screen Enhancement 1 |

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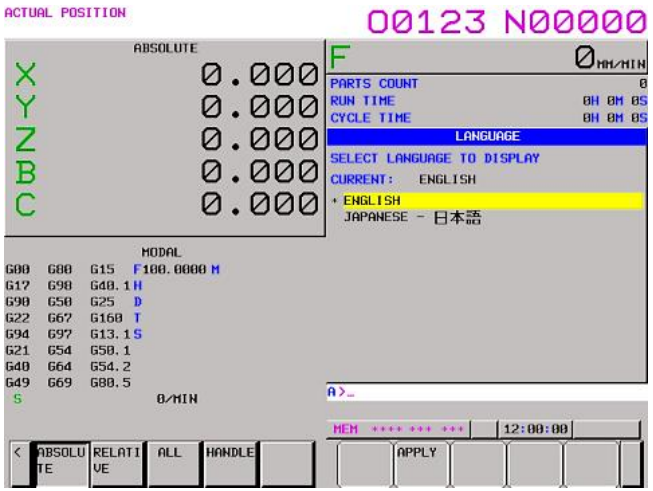


# Multi-language display

## Features

The Multi Language Display is the language that is used for user guidance on the CNC.

The user can switch the operator language without restart of the control on the 30i, 31i and 32i controls whereas a restart is necessary on 0i controls.

## Selection of Five Optional Languages

CNC system provides many optional languages for the display screens. This function allows the selection of up to five languages according to the parameter among the optional language stored in CNC system. These selected languages and English can be displayed.

Refer to the ordering information table for the available languages.

## Benefits

- Simplifies the operation of the machine in languages other than English
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R587 | 30i-A Turkish Language Display |
| A02B-0303-S849 | 30i-A Russian Language Display |
| A02B-0306-R587 | 31i-A5 Turkish Language Display |
| A02B-0306-S849 | 31i-A5 Russian Language Display |
| A02B-0307-R587 | 31i-A Turkish Language Display |
| A02B-0307-S849 | 31i-A Russian Language Display |
| A02B-0308-R587 | 32i-A Turkish Language Display |
| A02B-0308-S849 | 32i-A Russian Language Display |
| A02B-0323-R587 | 30i-B Turkish Language Display |
| A02B-0323-R686 | 30i-B Bulgarian Language Display |
| A02B-0323-R693 | 30i-B Slovakian Language Display |
| A02B-0323-R694 | 30i-B Romanian Language Display |
| A02B-0323-R726 | 30i-B Finnish Language Display |
| A02B-0323-S849 | 30i-B Russian Language Display |

**Notice**

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| Specification | Description |
|---|---|
| A02B-0326-R587 | 31i-B5 Turkish Language Display |
| A02B-0326-R686 | 31i-B5 Bulgarian Language Display |
| A02B-0326-R693 | 31i-B5 Slovakian Language Display |
| A02B-0326-R694 | 31i-B5 Romanian Language Display |
| A02B-0326-R726 | 31i-B5 Finnish Language Display |
| A02B-0326-S849 | 31i-B5 Russian Language Display |
| A02B-0327-R587 | 31i-B Turkish Language Display |
| A02B-0327-R686 | 31i-B Bulgarian Language Display |
| A02B-0327-R693 | 31i-B Slovakian Language Display |
| A02B-0327-R694 | 31i-B Romanian Language Display |
| A02B-0327-R726 | 31i-B Finnish Language Display |
| A02B-0327-S849 | 31i-B Russian Language Display |
| A02B-0328-R587 | 32i-B Turkish Language Display |
| A02B-0328-R686 | 32i-B Bulgarian Language Display |
| A02B-0328-R693 | 32i-B Slovakian Language Display |
| A02B-0328-R694 | 32i-B Romanian Language Display |
| A02B-0328-R726 | 32i-B Finnish Language Display |
| A02B-0328-S849 | 32i-B Russian Language Display |
| A02B-0333-R587 | 35i-B Turkish Language Display |
| A02B-0333-S849 | 35i-B Russian Language Display |
| A02B-0334-J650 | PM i-A Danish Language Display |
| A02B-0334-J678 | PM i-A Portuguese Language Display |
| A02B-0334-J962 | PM i-A Dutch Language Display |
| A02B-0334-J967 | PM i-A Chinese Language Display |
| A02B-0334-J968 | PM i-A Italian Language Display |
| A02B-0334-J969 | PM i-A Korean Language Display |
| A02B-0334-J970 | PM i-A Spanish Language Display |
| A02B-0334-R587 | PM i-A Turkish Language Display |
| A02B-0334-S689 | PM i-A Czech Language Display |
| A02B-0334-S690 | PM i-A Hungarian Language Display |
| A02B-0334-S691 | PM i-A Swedish Language Display |
| A02B-0334-S739 | PM i-A Polish Language Display |
| A02B-0334-S829 | PM i-A Chinese Language Display, Simplified Chinese Characters |
| A02B-0334-S839 | PM i-A German Language Display |
| A02B-0334-S841 | PM i-A French Language Display |
| A02B-0334-S849 | PM i-A Russian Language Display |

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# 460

## Setting and Display

# Selection of five optional languages

## Features

This function allows to activate 5 different languages at once in the CNC. The 5 languages then are activated and the user can switch between the languages on the fly.

## Benefits

- Increase the flexibility of the CNC usage in multi-language environment

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R521 | 30i-A Selection of Five Optional Languages - Select Option Assemblies According Desired 5 Languages - Do Not Specify Any Single Language Option |
| A02B-0306-R521 | 31i-A5 Selection of Five Optional Languages - Select Option Assemblies According Desired 5 Languages - Do Not Specify Any Single Language Option |
| A02B-0307-R521 | 31i-A Selection of Five Optional Languages - Select Option Assemblies According Desired 5 Languages - Do Not Specify Any Single Language Option |
| A02B-0308-R521 | 32i-A Selection of Five Optional Languages - Select Option Assemblies According Desired 5 Languages - Do Not Specify Any Single Language Option |
| A02B-0323-R521 | 30i-B Selection of Five Optional Languages - Select Option Assemblies According Desired 5 Languages - Do Not Specify Any Single Language Option |
| A02B-0326-R521 | 31i-B5 Selection of Five Optional Languages - Select Option Assemblies According Desired 5 Languages - Do Not Specify Any Single Language Option |
| A02B-0327-R521 | 31i-B Selection of Five Optional Languages - Select Option Assemblies According Desired 5 Languages - Do Not Specify Any Single Language Option |
| A02B-0328-R521 | 32i-B Selection of Five Optional Languages - Select Option Assemblies According Desired 5 Languages - Do Not Specify Any Single Language Option |
| A02B-0333-R521 | 35i-B Selection of Five Optional Languages - Select Option Assemblies According Desired 5 Languages - Do Not Specify Any Single Language Option |
| A02B-0334-R521 | PM i-A Selection of Five Optional Languages |

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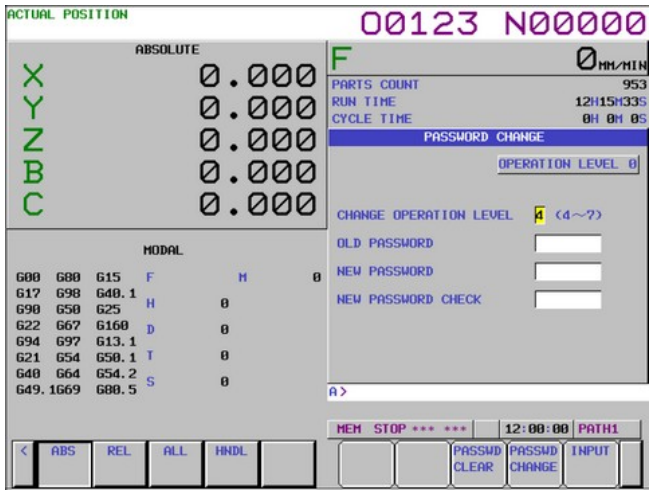
# 461

## Setting and Display




# Protection of data at 8 levels

## Features

The Protection of Data at Eight Levels function provides the ability to define multiple levels of access for the operators of the machine. Eight operation levels can be set for the CNC and PMC operations, and eight protection levels can be set for various types of CNC and PMC data.

When the CNC and PMC data is modified or output externally, the operation level and protect level are compared to determine whether to allow the modification or external output.

## Benefits

- Inprovement of the safety of operation of the machine
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S828 | 30i-A Protection of Data at Eight Levels |
| A02B-0306-S828 | 31i-A5 Protection of Data at Eight Levels |
| A02B-0307-S828 | 31i-A Protection of Data at Eight Levels |
| A02B-0308-S828 | 32i-A Protection of Data at Eight Levels |
| A02B-0319-S828 | 0i-TD Protection of Data at Eight Levels |
| A02B-0320-S828 | 0i-MD Protection of Data at Eight Levels |
| A02B-0321-S828 | 0i-Mate-TD Protection of Data at Eight Levels |
| A02B-0322-S828 | 0i-Mate-MD Protection of Data at Eight Levels |
| A02B-0323-S828 | 30i-B Protection of Data at Eight Levels |
| A02B-0326-S828 | 31i-B5 Protection of Data at Eight Levels |
| A02B-0327-S828 | 31i-B Protection of Data at Eight Levels |
| A02B-0328-S828 | 32i-B Protection of Data at Eight Levels |

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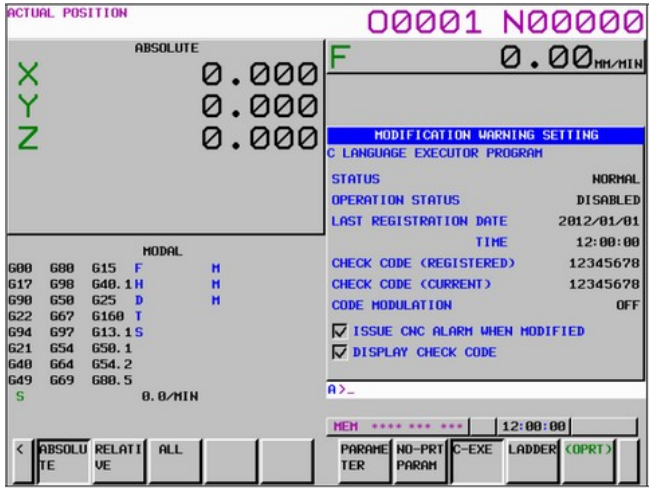
## Setting and Display




# Warning function against modification of setting

## Features

This function is to protect important setting of parameters, C Language Executor programs, or ladder programs on CNC and to detect unauthorized modifications on them.

The following parameters and programs can be protected:

- CNC Parameters (which are selected to be protected)
- C Language Executor program
- Ladder program (each of multi-path PMC programs)
- Dual Check Safety PMC Ladder program

After the registration of above parameters, C Language Executor programs, or ladder programs to this function, those are verified by the CNC, when the power of CNC is turned on.

If any modification is applied to registered parameters, C Language Executor programs, or ladder programs the signal that means some modification is applied is output. And in this case, it is also possible to generate the alarm.

## Benefits

- Protection of CNC programs against harful changes
- Increase of the security

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-R670 | 0i-TD Warning Function Against Modification of Setting |
| A02B-0320-R670 | 0i-MD Warning Function Against Modification of Setting |
| A02B-0321-R670 | 0i-Mate-TD Warning Function Against Modification of Setting |
| A02B-0322-R670 | 0i-Mate-MD Warning Function Against Modification of Setting |
| A02B-0323-R670 | 30i-B Warning Function Against Modification of Setting |
| A02B-0326-R670 | 31i-B5 Warning Function Against Modification of Setting |
| A02B-0327-R670 | 31i-B Warning Function Against Modification of Setting |
| A02B-0328-R670 | 32i-B Warning Function Against Modification of Setting |

**Notice**

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# 463

## Setting and Display

# Machining condition selecting function

## Features

Machining Condition Selection Function (MCSF) is a programmable way for the operator to set a level of machine accuracy whilst also optimising productivity.

With 10 defined steps, speed can be prioritised during roughing and then precision for the final finishing cuts.

## Benefits

- Optimize the machining cycles
- Better quality
- Reduced machining time

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S637 | 30i-A Machining Condition Selection Function |
| A02B-0306-S637 | 31i-A5 Machining Condition Selection Function |
| A02B-0307-S637 | 31i-A Machining Condition Selection Function |
| A02B-0308-S637 | 32i-A Machining Condition Selection Function |
| A02B-0319-S637 | 0i-TD Machining Condition Selection Function |
| A02B-0320-S637 | 0i-MD Machining Condition Selection Function |
| A02B-0321-S637 | 0i-Mate-TD Machining Condition Selection Function |
| A02B-0322-S637 | 0i-Mate-MD Machining Condition Selection |
| A02B-0323-S637 | 30i-B Machining Condition Selection Function |
| A02B-0326-S637 | 31i-B5 Machining Condition Selection Function |
| A02B-0327-S637 | 31i-B Machining Condition Selection Function |
| A02B-0328-S637 | 32i-B Machining Condition Selection Function |

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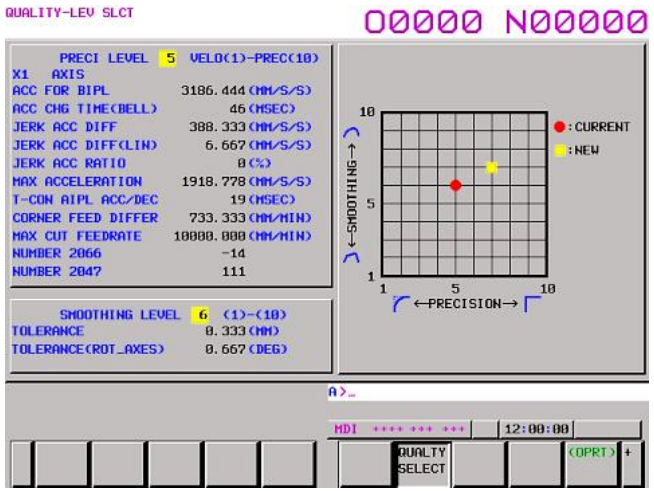
# 464

## Setting and Display




# Machining quality level adjustment

## Features

Smoothing and precision level of the Nano smoothing function can be adjusted from an adjustment screen to set machining quality level.

The following options are necessary:

- AI contour control 1 or AI contour control 2
- Nano smoothing
- The machining condition selection function

## Benefits

- Simplifies the operation of the machine
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R593 | 30i-A Machining Quality Level Adjustment |
| A02B-0306-R593 | 31i-A5 Machining Quality Level Adjustment |
| A02B-0307-R593 | 31i-A Machining Quality Level Adjustment |
| A02B-0320-R593 | 0i-MD Machining Quality Level Adjustment |
| A02B-0323-R593 | 30i-B Machining Quality Level Adjustment |
| A02B-0326-R593 | 31i-B5 Machining Quality Level Adjustment |
| A02B-0327-R593 | 31i-B Machining Quality Level Adjustment |
| A02B-0328-R593 | 32i-B Machining Quality Level Adjustment |

**Notice**

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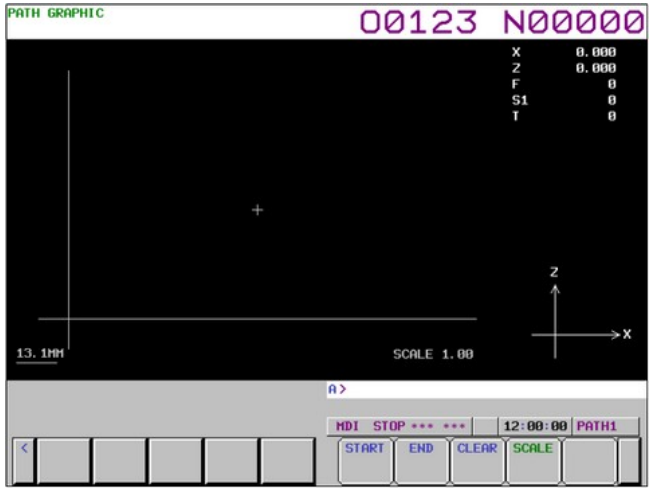
# 465

## Setting and Display




# Graphic function

## Features

Graphic Display option allows the tool path of a program to be drawn during machining.

## Benefits

- Easy to prove out tool paths
- Minimized crashes and scrap parts
- Reduced Set up/prove out time
- Increased operator confidence for running part program
- Easy to verify all 3 planes XY, YZ, ZX including isometric views
- Zooming for easy verification of dense cuts

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J972 | 30i-A Graphic Display |
| A02B-0306-J972 | 31i-A5 Graphic Display |
| A02B-0307-J972 | 31i-A Graphic Display |
| A02B-0308-J972 | 32i-A Graphic Display |
| A02B-0323-J972 | 30i-B Graphic Display |
| A02B-0326-J972 | 31i-B5 Graphic Display |
| A02B-0327-J972 | 31i-B Graphic Display |
| A02B-0328-J972 | 32i-B Graphic Display |
| A02B-0331-J972 | 30i-PB Graphic Display |
| A02B-0332-J972 | 31i-PB Graphic Display |

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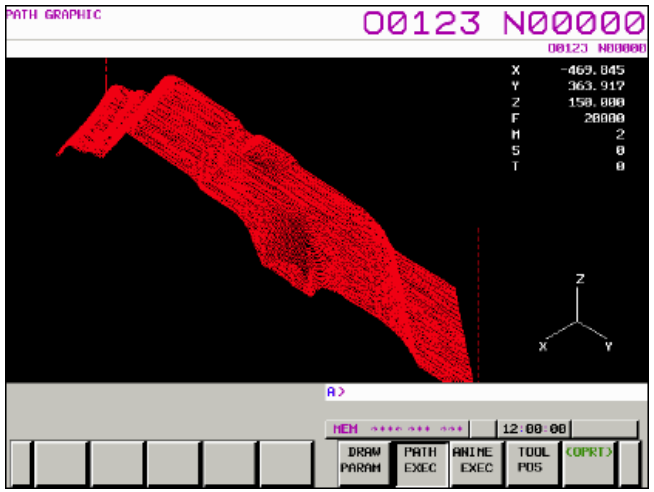
# 466

## Setting and Display




# Dynamic graphic display function

## Features

Created programs can be checked visually by displaying them using graphic data. Graphic data can be displayed in the following two drawing modes:

- Tool path drawing mode:Tool paths are drawn with lines.
- Animation drawing mode: The profile of a workpiece that changes as the tool moves can be simulated and drawn three-dimensionally.

## Benefits

- Much faster drawing capabilities compared to Graphic Display function
- Easy to prove out tool paths
- Minimized crashes and scrap parts
- Reduced Set up/prove out time
- Increased operator confidence for running part program
- Easy to verify all 3 planes XY, YZ, ZX including isometric views
- Zooming for easy verification of dense cuts

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J760 | 30i-A Dynamic Graphic Display Function |
| A02B-0306-J760 | 31i-A5 Dynamic Graphic Display Function |
| A02B-0307-J760 | 31i-A Dynamic Graphic Display Function |
| A02B-0308-J760 | 32i-A Dynamic Graphic Display Function |
| A02B-0319-J973 | 0i-TD Dynamic Graphic Display |
| A02B-0320-J973 | 0i-MD Dynamic Graphic Display |
| A02B-0321-J973 | 0i-Mate-TD Dynamic Graphic Display |
| A02B-0322-J973 | 0i-Mate-MD Dynamic Graphic Display |
| A02B-0323-J760 | 30i-B Dynamic Graphic Display Function |
| A02B-0326-J760 | 31i-B5 Dynamic Graphic Display Function |
| A02B-0327-J760 | 31i-B Dynamic Graphic Display Function |
| A02B-0328-J760 | 32i-B Dynamic Graphic Display Function |

**Notice**

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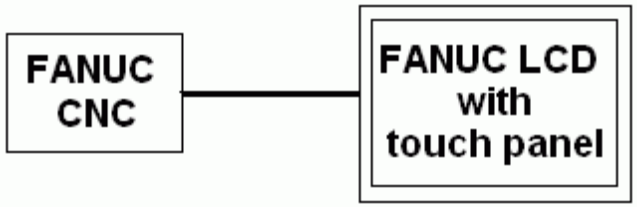
# 467

## Setting and Display




# Touch panel control

## Features

The Touch Panel Control function is required to support the Touch Panel display of the CNC. The physical Touch Panel display is also required.

A display unit with a touch panel enables the operator to perform control of the menus touching the screen.

## Benefits

- Simplifies the operation of the machine
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J682 | 30i-A Touch Panel Control |
| A02B-0306-J682 | 31i-A5 Touch Panel Control |
| A02B-0307-J682 | 31i-A Touch Panel Control |
| A02B-0308-J682 | 32i-A Touch Panel Control |
| A02B-0319-J682 | 0i-TD Touch Panel Control |
| A02B-0320-J682 | 0i-MD Touch Panel Control |
| A02B-0321-J682 | 0i-Mate-TD Touch Panel Control |
| A02B-0322-J682 | 0i-Mate-MD Touch Panel Control |
| A02B-0323-J682 | 30i-B Touch Panel Control |
| A02B-0326-J682 | 31i-B5 Touch Panel Control |
| A02B-0327-J682 | 31i-B Touch Panel Control |
| A02B-0328-J682 | 32i-B Touch Panel Control |

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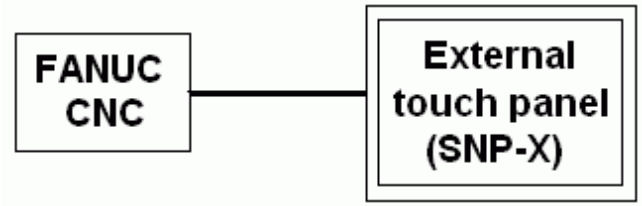
## Setting and Display




# External touch panel interface

## Features

The External Touch Panel Interface allows an External Touch Panel using the SNP-X protocol to be connected with the CNC.

The External Touch Panel Interface has functions that can read / write in from / to the PMC such control signals as input signal(X), output signal(Y), internal relay(R), keep relay(K), data table(D), timer(T), counter(C) and the function is almost the same as operating panel of machine.

## Benefits

- Simplifies the connection of 3rd party screens using the SNP-X protocol of GE
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J685 | 30i-A External Touch Panel Interface |
| A02B-0306-J685 | 31i-A5 External Touch Panel Interface |
| A02B-0307-J685 | 31i-A External Touch Panel Interface |
| A02B-0308-J685 | 32i-A External Touch Panel Interface |
| A02B-0319-J685 | 0i-TD External Touch Panel Interface |
| A02B-0320-J685 | 0i-MD External Touch Panel Interface |
| A02B-0321-J685 | 0i-Mate-TD External Touch Panel Interface |
| A02B-0322-J685 | 0i-Mate-MD External Touch Panel Interface |
| A02B-0323-J685 | 30i-B External Touch Panel Interface |
| A02B-0326-J685 | 31i-B5 External Touch Panel Interface |
| A02B-0327-J685 | 31i-B External Touch Panel Interface |
| A02B-0328-J685 | 32i-B External Touch Panel Interface |

**Notice**

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# 469

## Setting and Display

# Two touch panels control for stand-alone type CNC

## Features

An external touch panel can be used together with the Stand-Alone Type CNC display's touch panel.

## Benefits

- Operation improvement of large machines

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R658 | 30i-A Two Touch Panel Control for Stand-Alone Type CNC |
| A02B-0306-R658 | 31i-A5 Two Touch Panel Control for Stand-Alone Type CNC |
| A02B-0307-R658 | 31i-A Two Touch Panel Control for Stand-Alone Type CNC |
| A02B-0308-R658 | 32i-A Two Touch Panel Control for Stand-Alone Type CNC |
| A02B-0323-R658 | 30i-B Two Touch Panel Control for Stand-Alone Type CNC |
| A02B-0326-R658 | 31i-B5 Two Touch Panel Control for Stand-Alone Type CNC |
| A02B-0327-R658 | 31i-B Two Touch Panel Control for Stand-Alone Type CNC |
| A02B-0328-R658 | 32i-B Two Touch Panel Control for Stand-Alone Type CNC |

**Notice**

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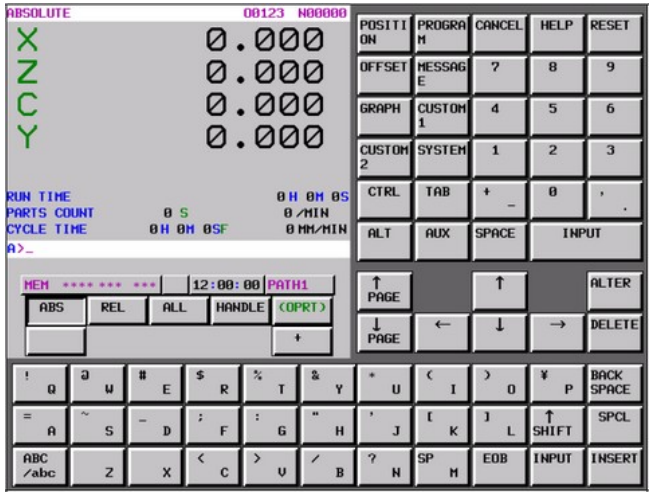
# 470

## Setting and Display




# Virtual MDI key

## Features

The Virtual MDI Key function provides a replacement for the physical MDI unit; in this case, the MDI keys are displayed on the Touch Screen.

Since the MDI key hardware is not required any more, a more compact operator panel can be deisgned.

## Benefits

- Simplifies the design of compact operator panels

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S883 | 30i-A Virtual MDI Key Function |
| A02B-0306-S883 | 31i-A5 Virtual MDI Key Function |
| A02B-0307-S883 | 31i-A Virtual MDI Key Function |
| A02B-0308-S883 | 32i-A Virtual MDI Key Function |
| A02B-0319-S883 | 0i-TD Virtual MDI Key |
| A02B-0320-S883 | 0i-MD Virtual MDI Key |
| A02B-0323-S883 | 30i-B Virtual MDI Key Function |
| A02B-0326-S883 | 31i-B5 Virtual MDI Key Function |
| A02B-0327-S883 | 31i-B Virtual MDI Key Function |
| A02B-0328-S883 | 32i-B Virtual MDI Key Function |

**Notice**

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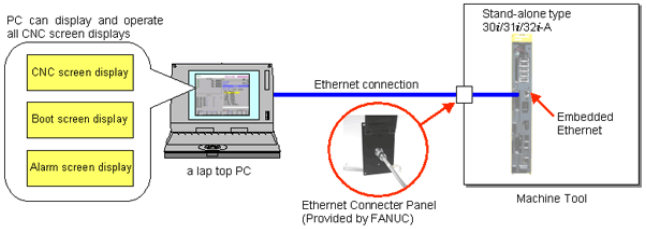
# 471

## Setting and Display




# Ethernet Display function

## Features

The Ethernet Display Function provides CNC screen display on PC screen via Embedded Ethernet.

Its capability to show maintenance screen display, boot and alarm, in addition to CNC screen display for usual operation, enables linking to PC for maintenance, instead of the CNC display unit.

## Benefits

- Provide Ethernet connectivity and remote control function for the CNC
- Improves machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R950 | 30i-A Ethernet Display Function |
| A02B-0306-R950 | 31i-A5 Ethernet Display Function |
| A02B-0307-R950 | 31i-A Ethernet Display Function |
| A02B-0308-R950 | 32i-A Ethernet Display Function |
| A02B-0323-R950 | 30i-B Ethernet Display Function |
| A02B-0326-R950 | 31i-B5 Ethernet Display Function |
| A02B-0327-R950 | 31i-B Ethernet Display Function |
| A02B-0328-R950 | 32i-B Ethernet Display Function |
| A02B-0333-R950 | 35i-B Ethernet Display Function |
| A02B-0334-R950 | PM i-A Ethernet Display Function |

**Notice**

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# 472

## Setting and Display

# Ethernet display sharing function

## Features

The Ethernet Display Sharing function provides the possibility to allocate one display screen to several standalone CNC. Up to 8 CNC can be connected to one display (One Master CNC and 7 Slave CNC).

It can display CNC maintenance screens (including the BOOT, IPL, and alarm screens) as well as the standard CNC operation screens

## Benefits

- Cost reduction on large machines featuring several CNC

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0323-R722 | 30i-B Ethernet Display Sharing Function - Specify in Each CNC Connected via Ethernet to Shared LCD Unit |
| A02B-0326-R722 | 31i-B5 Ethernet Display Sharing Function - Specify in Each CNC Connected via Ethernet to Shared LCD Unit |
| A02B-0327-R722 | 31i-B Ethernet Display Sharing Function - Specify in Each CNC Connected via Ethernet to Shared LCD Unit |
| A02B-0328-R722 | 32i-B Ethernet Display Sharing Function - Specify in Each CNC Connected via Ethernet to Shared LCD Unit |
| A02B-0333-R722 | 35i-B Ethernet Display Sharing Function - Specify in Each CNC Connected via Ethernet to Shared LCD Unit |
| A02B-0334-R722 | PM i-A Ethernet Display Sharing Function - Specify in Each CNC Connected via Ethernet to Shared LCD Unit |

**Notice**

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# 473

## Setting and Display

# CNC Screen dual display function

## Features

With the Dual CNC Screen Display Function, it is possible to display the content of the CNC screen on both the original CNC screen as well as on a PC or Panel i connected to the CNC via Ethernet or HSSB.

## Benefits

- Machine operation on large machining centers requiring 2 operator stations

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S884 | 30i-A Dual Screen Display Function (Dual SDF) |
| A02B-0306-S884 | 31i-A5 Dual Screen Display Function (Dual SDF) |
| A02B-0307-S884 | 31i-A Dual Screen Display Function (Dual SDF) |
| A02B-0308-S884 | 32i-A Dual Screen Display Function (Dual SDF) |
| A02B-0319-S884 | 0i-TD Dual Screen Display Function (Dual SDF) |
| A02B-0320-S884 | 0i-MD Dual Screen Display Function (Dual SDF) |
| A02B-0323-S884 | 30i-B Dual Screen Display Function (Dual SDF) |
| A02B-0326-S884 | 31i-B5 Dual Screen Display Function (Dual SDF) |
| A02B-0327-S884 | 31i-B Dual Screen Display Function (Dual SDF) |
| A02B-0328-S884 | 32i-B Dual Screen Display Function (Dual SDF) |

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# 474

## Setting and Display

# CNC screen display for 19" LCD

## Features

This function provides the capability to control the 19" Panel i display on the CNC.

## Benefits

- Improvement of the operation using larger screen

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R624 | 30i-A CNC Screen Display Function for 19.0" LCD Unit |
| A02B-0306-R624 | 31i-A5 CNC Screen Display Function for 19.0" LCD Unit |
| A02B-0307-R624 | 31i-A CNC Screen Display Function for 19.0" LCD Unit |
| A02B-0308-R624 | 32i-A CNC Screen Display Function for 19.0" LCD Unit |
| A02B-0323-R624 | 30i-B CNC Screen Display Function for 19.0" LCD Unit |
| A02B-0326-R624 | 31i-B5 CNC Screen Display Function for 19.0" LCD Unit |
| A02B-0327-R624 | 31i-B CNC Screen Display Function for 19.0" LCD Unit |
| A02B-0328-R624 | 32i-B CNC Screen Display Function for 19.0" LCD Unit |

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# 475

## Setting and Display

# Enlarged CNC screen display for 19" LCD

## Features

This function enlarges and displays the design for 15" LCD on 19" PANELi. It is possible with this feature to magnify the size of he screen so that it is possible to better read the screen and use the full surface of the 19" screen.

## Benefits

- Improvement of the operation using large fonts sizes

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R673 | 30i-A Enlarged CNC Screen Display Function for 19.0" LCD Unit (Enlarges 15.0" Screen Display to 19.0" Screen Display) |
| A02B-0306-R673 | 31i-A5 Enlarged CNC Screen Display Function for 19.0" LCD Unit (Enlarges 15.0" Screen Display to 19.0" Screen Display) |
| A02B-0307-R673 | 31i-A Enlarged CNC Screen Display Function for 19.0" LCD Unit (Enlarges 15.0" Screen Display to 19.0" Screen Display) |
| A02B-0308-R673 | 32i-A Enlarged CNC Screen Display Function for 19.0" LCD Unit (Enlarges 15.0" Screen Display to 19.0" Screen Display) |
| A02B-0323-R673 | 30i-B Enlarged CNC Screen Display Function for 19.0" LCD Unit |
| A02B-0326-R673 | 31i-B5 Enlarged CNC Screen Display Function for 19.0" LCD Unit |
| A02B-0327-R673 | 31i-B Enlarged CNC Screen Display Function for 19.0" LCD Unit |
| A02B-0328-R673 | 32i-B Enlarged CNC Screen Display Function for 19.0" LCD Unit |

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# 476

## Setting and Display

# CNC screen web server function

## Features

This function enables screen display and screen switch of CNC on a Web browser of a Tablet-type device that connects with CNC through Ethernet.

The screen which is displayed on a Web browser is the same as the screen displayed on a standard CNC Display unit.

The screen switch operation at a Web browser is reflected in a standard CNC Display unit.

## Benefits

- Provide a full screen duplication of the CNC on Web-Browser or Tablet devices

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0323-R728 | 30i-B CNC Screen Web Server Function |
| A02B-0326-R728 | 31i-B5 CNC Screen Web Server Function |
| A02B-0327-R728 | 31i-B CNC Screen Web Server Function |
| A02B-0328-R728 | 32i-B CNC Screen Web Server Function |

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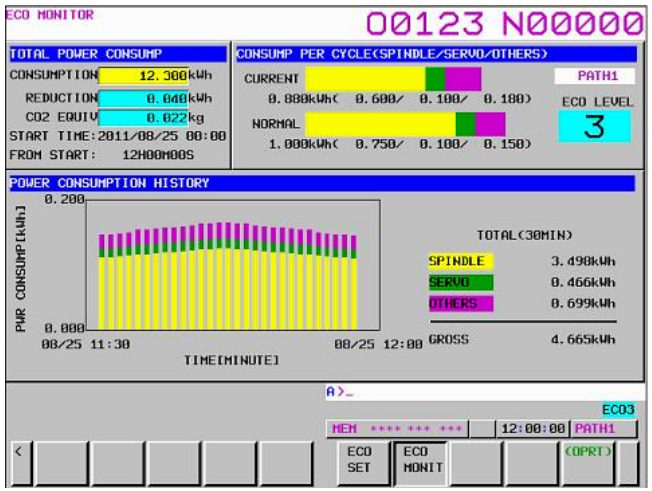
# 477

## Setting and Display




# Energy saving level selection function

## Features

The total power consumption of a machine is the sum of:

- Power consumption of the spindle motors
- Power consumption of the servo motors
- Power consumption in peripheral devices (coolant pump, etc.)

Suppressing torque at acceleration / deceleration in spindles, where a large power consumption is generated, can reduce whole power consumption of a machine. The drawback is that it has an influence on the machining time.

When using the Energy Level Selection Function, it is possible to switch between machining with shorter time and that with less power consumption.

In addition, the function provides screens to monitor the energy consumption of the spindles, servo motors and peripherals in real time.

## Benefits

- Monitoring of the consumption of the machine and identification of the source
- Adjustment of the ratio between productivity and energy consumption to optimize costs

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-R719 | 0i-TD Energy Saving Level Selection Function (Not for Analogue Spindle) |
| A02B-0320-R719 | 0i-MD Energy Saving Level Selection Function (Not for Analogue Spindle) |
| A02B-0323-R719 | 30i-B Energy Saving Level Selection Function - Usable with 30i/31i/32i/35i-B Spindle Amplifiers A06B-6220-Hxxx#H600 or A06B-6230-Hxxx#H600 or A06B-6270-Hxxx#H600 |
| A02B-0326-R719 | 31i-B5 Energy Saving Level Selection Function - Usable with 30i/31i/32i/35i-B Spindle Amplifiers A06B-6220-Hxxx#H600 or A06B-6230-Hxxx#H600 or A06B-6270-Hxxx#H600 |
| A02B-0327-R719 | 31i-B Energy Saving Level Selection Function - Usable with 30i/31i/32i/35i-B Spindle Amplifiers A06B-6220-Hxxx#H600 or A06B-6230-Hxxx#H600 or A06B-6270-Hxxx#H600 |
| A02B-0328-R719 | 32i-B Energy Saving Level Selection Function - Usable with 30i/31i/32i/35i-B Spindle Amplifiers A06B-6220-Hxxx#H600 or A06B-6230-Hxxx#H600 or A06B-6270-Hxxx#H600 |

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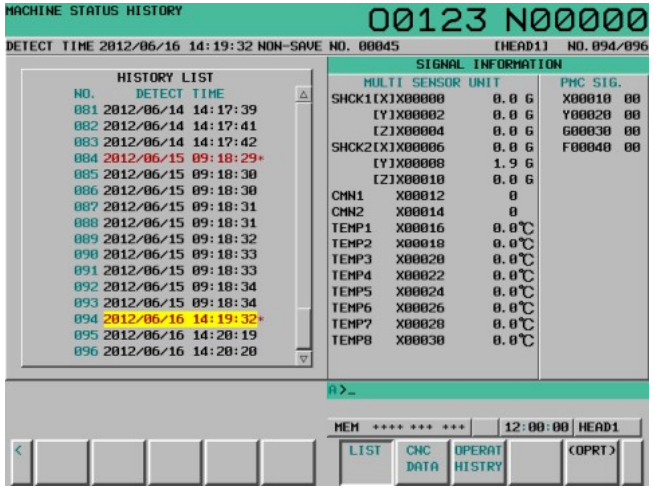
# 478

## Setting and Display




# Machine state monitoring function

## Features

This function monitors the state of the machine and when problems occur on the machine, it is possible to retrieve information such as the operation history, the position and the feedrate at the time of the problem and other useful information from the CNC memory.

The retrieved information can be used to investigate the cause of machine breakdown.

It is also possible to customize the function to monitor additional information such as shock value, abnormal load torque, the Multi-Sensor Unit (MSU) and unexpected disturbance torque detection.

When a problem occurs on the machine, such as a spindle collision, the ladder program notifies the CNC; when the CNC is notified it saves the information related to the event in the CNC memory for later retrieval.

The CNC can save a maximum of 100 events in its memory.

## Benefits

- Collection of key data to help the investigation of problems on machine
- Reduction of the breakdown time and better support of the maintenance teams
- Overall increase of the productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-R717 | 0i-TD Machine State Monitoring Function |
| A02B-0320-R717 | 0i-MD Machine State Monitoring Function |
| A02B-0321-R717 | 0i-Mate-TD Machine State Monitoring Function |
| A02B-0322-R717 | 0i-Mate-MD Machine State Monitoring Function |
| A02B-0323-R717 | 30i-B Machine State Monitoring Function |
| A02B-0326-R717 | 31i-B5 Machine State Monitoring Function |
| A02B-0327-R717 | 31i-B Machine State Monitoring Function |
| A02B-0328-R717 | 32i-B Machine State Monitoring Function |

**Notice**

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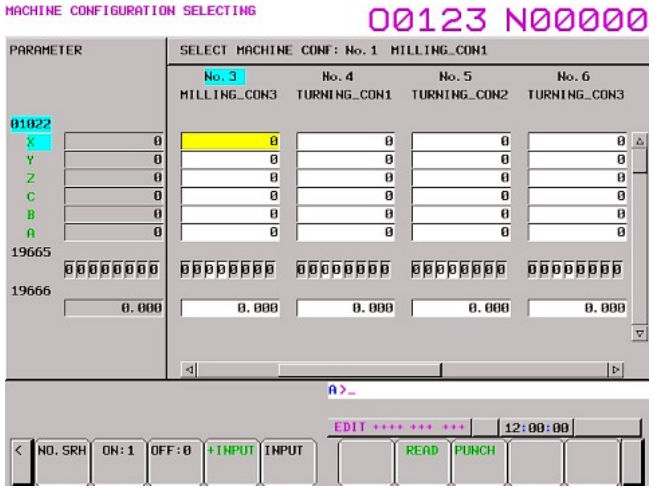
# 479

## Setting and Display




# Machine configuration selecting function

## Features

The Machine Configuration Selecting function allows an easy switching of machine configuration when the machine needs to adapt to different production environments or batch.

Ten sets of parameters for these machine configurations can be set on machine configuration selecting screen.

## Benefits

- Decreases the time required to switch between different production batchs and setups
- Increases the efficiency and the productivity of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R700 | 30i-A Machine Configuration Selection Function |
| A02B-0306-R700 | 31i-A5 Machine Configuration Selection Function |
| A02B-0323-R700 | 30i-B Machine Configuration Selection Function |
| A02B-0326-R700 | 31i-B5 Machine Configuration Selection Function |

**Notice**

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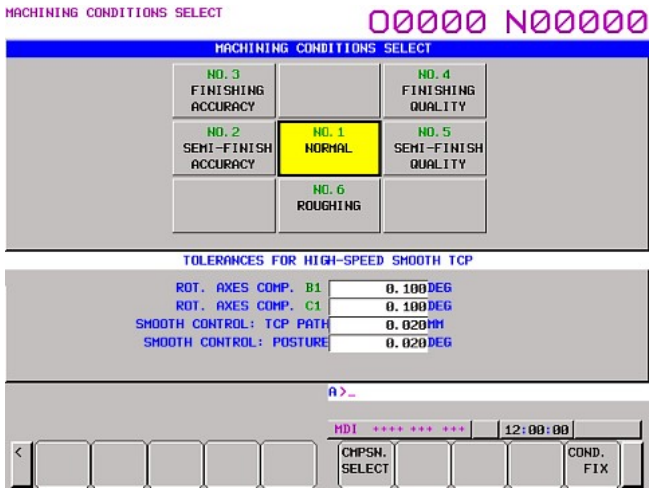
# 480

## Setting and Display




# 5-axis machining condition setting function

## Features

The 5-axis Machining Condition Setting provides the capability to change the parameters of machining conditions according to the machining situation when an operator selects one among six machining conditions.

This function provides a selection screen and a setting screen. The selecting screen is a screen for the operator, and the setting screen is a screen for the machine builder.

## Note

This function cannot be used together with the following functions:

- Machining condition selecting function
- Machining quality level adjustment

## Benefits

- Decreases the time required to switch between different production batchs and setups of 5-axis machines
- Increases the efficiency and the productivity of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0323-R721 | 30i-B 5-Axis Machinng Condition Setting Function |
| A02B-0326-R721 | 31i-B5 5-Axis Machinng Condition Setting Function |

**Notice**

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# 481
# Functions

## Data input / output

This section of the catalogue contains the functions related to Data Input / Output.

Some of the functions detailed in the catalogue:

- RS232 interface
- Data Server
- Messaging
- Automatic Backup
- Etc.

**Notice**

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# 482

## Data input / output

# RS232C interface

## Features

The Reader / Puncher Interface option enables the on board RS-232 port to be able to input / output files to / from the CNC.

## Benefits

- Download / Upload programs in background edit mode
- Output data to external PC for SPC charts
- Drip feed large programs
- Output data to serial printer
- No need to un-hook peripheral devices
- User selectable ports

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J900 | 30i-A Reader/Puncher Interface for 1 Channel |
| A02B-0303-J901 | 30i-A Reader/Puncher Interface for 2 Channels |
| A02B-0306-J900 | 31i-A5 Reader/Puncher Interface for 1 Channel |
| A02B-0306-J901 | 31i-A5 Reader/Puncher Interface for 2 Channels |
| A02B-0307-J900 | 31i-A Reader/Puncher Interface for 1 Channel |
| A02B-0307-J901 | 31i-A Reader/Puncher Interface for 2 Channels |
| A02B-0308-J900 | 32i-A Reader/Puncher Interface for 1 Channel |
| A02B-0308-J901 | 32i-A Reader/Puncher Interface for 2 Channels |
| A02B-0323-J900 | 30i-B Reader/Puncher Interface for 1 Channel |
| A02B-0323-J901 | 30i-B Reader/Puncher Interface for 2 Channels |
| A02B-0326-J900 | 31i-B5 Reader/Puncher Interface for 1 Channel |
| A02B-0326-J901 | 31i-B5 Reader/Puncher Interface for 2 Channels |
| A02B-0327-J900 | 31i-B Reader/Puncher Interface for 1 Channel |
| A02B-0327-J901 | 31i-B Reader/Puncher Interface for 2 Channels |
| A02B-0328-J900 | 32i-B Reader/Puncher Interface for 1 Channel |
| A02B-0328-J901 | 32i-B Reader/Puncher Interface for 2 Channels |

**Notice**

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# 483

## Data input / output

# RS232C interface expansion of receiving buffer

## Features

Expands the receiving buffer of the RS-232 Reader/Puncher interface from the default size of 0.5K bytes, to 2K bytes. Expanded buffer size enables more stable automatic operation by drip feed, in moderately demanding machining applications.

## Benefits

- Expanded buffer capacity prevents intermittent delays or loss of RS-232 serial data during operation or storage

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R511 | 30i-A Reader / Puncher Interface Expansion of Receiving Buffer |
| A02B-0306-R511 | 31i-A5 Reader / Puncher Interface Expansion of Receiving Buffer |
| A02B-0307-R511 | 31i-A Reader / Puncher Interface Expansion of Receiving Buffer |
| A02B-0308-R511 | 32i-A Reader / Puncher Interface Expansion of Receiving Buffer |
| A02B-0323-R511 | 30i-B Reader / Puncher Interface Expansion of Receiving Buffer |
| A02B-0326-R511 | 31i-B5 Reader / Puncher Interface Expansion of Receiving Buffer |
| A02B-0327-R511 | 31i-B Reader / Puncher Interface Expansion of Receiving Buffer |
| A02B-0328-R511 | 32i-B Reader / Puncher Interface Expansion of Receiving Buffer |

**Notice**

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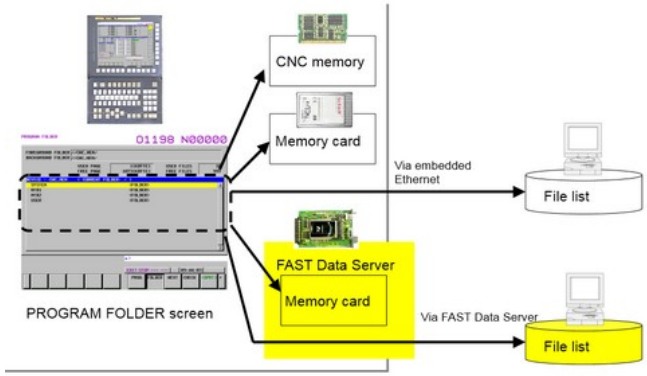


# Fast data server

## Features

The Data Server / Fast Data Server consists of an embedded memory card and an Ethernet connection on the CNC. The Data Server allows files to be transferred from a host computer to the CNC memory, or to the memory card on the Data server. Part programs may also be executed directly either from the network or the Compact Flash card on the Data Server.

## Benefits

- Manage part programs for multiple machines at a central location.
- Store and reliably execute large part programs without taking up part program storage on the CNC.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S737 | 30i-A Data Server Function |
| A02B-0306-S737 | 31i-A5 Data Server Function |
| A02B-0307-S737 | 31i-A Data Server Function |
| A02B-0308-S737 | 32i-A Data Server Function |
| A02B-0319-S737 | 0i-TD Data Server Function |
| A02B-0320-S737 | 0i-MD Data Server Function |
| A02B-0323-S737 | 30i-B Data Server Function - Incl. Data Server Buffer Mode |
| A02B-0326-S737 | 31i-B5 Data Server Function - Incl. Data Server Buffer Mode |
| A02B-0327-S737 | 31i-B Data Server Function - Incl. Data Server Buffer Mode |
| A02B-0328-S737 | 32i-B Data Server Function - Incl. Data Server Buffer Mode |

**Notice**

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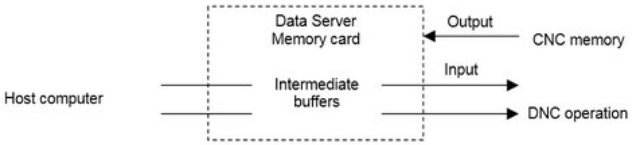
# 485

## Data input / output




# Data server buffer mode

## Features

The buffer mode is designed to handle NC programs larger than the capacity of the data server board built-in hard disk. In this mode, the data server board built-in hard disk is used as a temporary, intermediate buffer.

In the buffer mode, two areas (A and B) are previously prepared on the hard disk. While an NC program is being supplied from one (A) of the areas to the CNC, the rest of the NC program is read from the host computer into the other area (B), using the FTP

When the data transfer from area A ends, a data transfer from area B to the CNC is started, and the NC program transfer from the host computer to the emptied area (A) is resumed, using the FTP

## Benefits

- Increase of the capacity of the CNC to handle large programs
- Improvement of machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J728 | 30i-A Data Server Buffer Mode |
| A02B-0306-J728 | 31i-A5 Data Server Buffer Mode |
| A02B-0307-J728 | 31i-A Data Server Buffer Mode |

**Notice**

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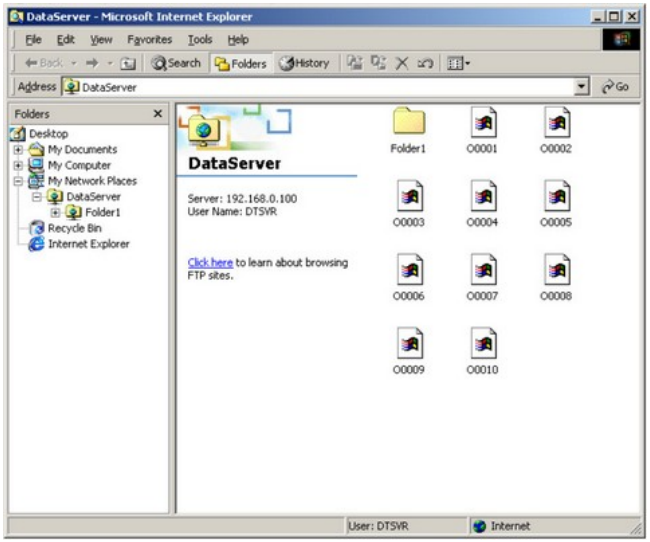
# 486

## Data input / output




# Data server explorer connection

## Features

The following functions are added to FTP Server function of Data Server.

- Increase of FTP Server connections.
- Connection with Windows Explorer
- Addition of maintenance screen for FTP server

## Benefits

- Simplification of the handling of large program over FTP
- Improvement of the machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R953 | 30i-A Data Server Explorer Connection |
| A02B-0306-R953 | 31i-A5 Data Server Explorer Connection |
| A02B-0307-R953 | 31i-A Data Server Explorer Connection |
| A02B-0308-R953 | 32i-A Data Server Explorer Connection |
| A02B-0323-R953 | 30i-B Data Server Explorer Connection |
| A02B-0326-R953 | 31i-B5 Data Server Explorer Connection |
| A02B-0327-R953 | 31i-B Data Server Explorer Connection |
| A02B-0328-R953 | 32i-B Data Server Explorer Connection |

**Notice**

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# Data server editing / operation

## Features

A large program such as a program for molding can be stored on the built-in ATA flash card of the Fast Data Server to allow highspeed machining. While the data server is operating, another Ethernet function can be used at the same time.

Following function are supported:

- High-speed transfer: machining programs can be transferred between a Personal Computer and the data server at a high speed. CNC parameters and tool information files can also be sent and received.
- Memory operation: memory operation that calls macro statements and subprograms from the ATA flash card can be performed.
- DNC operation: the DNC operation of an NC program stored on the ATA flash card can be performed. In addition, the DNC operation can also be performed while NC programs are being FTP-transferred from the Personal Computer.
- Program editing: NC programs stored on the ATA flash card can be edited.

## Benefits

- Manage part programs for multiple machines at a central location.
- Store and reliably execute large part programs without taking up part program storage on the CNC.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0319-R643 | 0i-TD Data Server Editing / Operation |
| A02B-0320-R643 | 0i-MD Data Server Editing / Operation |

**Notice**

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# External tool offset

## Features

The External Tool Offset function provides signals for changing the tool compensation value via the PMC. When the offset number is specified by a part program, data input from the PMC is added to the offset value. The offset value can also be used as input data itself by specifying the input signal.

If the tool compensation value is externally input when offset number 0 specified in a part program (an offset cancel) in the lathe turning machine, the workpiece coordinate system shifts by the entered quantity.

## Benefits

- Simplification of the machine operation
- Improvement of the machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J910 | 30i-A External Tool Offset |
| A02B-0306-J910 | 31i-A5 External Tool Offset |
| A02B-0307-J910 | 31i-A External Tool Offset |
| A02B-0308-J910 | 32i-A External Tool Offset |
| A02B-0323-J910 | 30i-B External Tool Offset |
| A02B-0326-J910 | 31i-B5 External Tool Offset |
| A02B-0327-J910 | 31i-B External Tool Offset |
| A02B-0328-J910 | 32i-B External Tool Offset |

**Notice**

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# 489

## Data input / output

# External machine zero point shift

## Features

The machine coordinate system can be externally shifted by inputting a shift value.

When the shift value is input, compensation is immediately applied to the corresponding axis and the axis moves. The position accuracy can be improved by combining this function with sensors.

The specification to shift the axis is the same as the external workpiece coordinate system shift. The compensation value is specified in signals ED0 to ED15 using a binary code ranging from 0 to ±9999. This compensation value must be specified in absolute value. The value that the machine actually moves at input is the difference from the previously stored value.

## Benefits

- Simplification of the machine operation
- Improvement of the machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J912 | 30i-A External Machine Zero Point Shift |
| A02B-0306-J912 | 31i-A5 External Machine Zero Point Shift |
| A02B-0307-J912 | 31i-A External Machine Zero Point Shift |
| A02B-0308-J912 | 32i-A External Machine Zero Point Shift |
| A02B-0323-J912 | 30i-B External Machine Zero Point Shift |
| A02B-0326-J912 | 31i-B5 External Machine Zero Point Shift |
| A02B-0327-J912 | 31i-B External Machine Zero Point Shift |
| A02B-0328-J912 | 32i-B External Machine Zero Point Shift |

**Notice**

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# 490

## Data input / output

# External message

## Features

The external operator message function allows the transfer of messages for the operator from the PMC to the CNC display screen. The operator messages can be cleared by the PMC. Up to 256 characters can be sent in a single operator message, or up to 4 messages of 63 characters can be displayed at the same time. A parameter setting controls the range of the message numbers and their display form.

- When the parameter is set to 0
  The message numbers 0 to 999 can be sent. The message numbers 0 to 99 are displayed along with the message. To distinguish these alarms from other alarms, the CNC displays them by adding 2000 to an alarm number. When a message from 100 to 999 is displayed, the message number is not displayed; only its text is displayed.
- When the parameter is set to 1
  The message numbers 0 to 4095 can be sent. The message numbers 0 to 99 are displayed along with the message. The CNC displays them with prefix characters 'EX' to an alarm for display. When a message number from 100 to 4095 is displayed, the message number is not displayed; only its text is displayed.

## Benefits

- Simplification of the machine operation
- Improvement of the communication with the operator
- Improvement of the machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J911 | 30i-A External Message |
| A02B-0306-J911 | 31i-A5 External Message |
| A02B-0307-J911 | 31i-A External Message |
| A02B-0308-J911 | 32i-A External Message |
| A02B-0323-J911 | 30i-B External Message |
| A02B-0326-J911 | 31i-B5 External Message |
| A02B-0327-J911 | 31i-B External Message |
| A02B-0328-J911 | 32i-B External Message |

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# 491

## Data input / output

# External data input

## Features

The External Data Input function is a collection of options that enables the PMC to send data to the CNC to perform a desired operation. The external data input function includes the following capabilities:

- External tool offset - Changing the tool offset value from the PMC.
- External program number search - Selecting the part program number to activate by the PMC.
- External workpiece coordinate system shift - Modifying the shift value by the PMC.
- External machine zero point shift -Shifting the machine zero point on an axis by the PMC.
- Extended external machine zero point shift - Shifting the machine zero point on all axes by PMC.
- External alarm message -The PMC can send an ALARM message to the CNC.
- External operator message -The PMC can send an Operator message to the CNC
- Assignment of machined parts count and required parts count data -The PMC can preset the required parts count and machined parts count to a value in the range 0 to 9999.

## Benefits

- Simplification of the machine operation
- Improvement of the machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J913 | 30i-A External Data Input - Incl. External Message, External Tool Offset, External Machine Zero Point Shift |
| A02B-0306-J913 | 31i-A5 External Data Input - Incl. External Message, External Tool Offset, External Machine Zero Point Shift |
| A02B-0307-J913 | 31i-A External Data Input - Incl. External Message, External Tool Offset, External Machine Zero Point Shift |
| A02B-0308-J913 | 32i-A External Data Input - Incl. External Message, External Tool Offset, External Machine Zero Point Shift |
| A02B-0323-J913 | 30i-B External Data Input - Incl. External Message, External Tool Offset, External Machine Zero Point Shift, External Program Number Search |
| A02B-0326-J913 | 31i-B5 External Data Input - Incl. External Message, External Tool Offset, External Machine Zero Point Shift, External Program Number Search |
| A02B-0327-J913 | 31i-B External Data Input - Incl. External Message, External Tool Offset, External Machine Zero Point Shift, External Program Number Search |
| A02B-0328-J913 | 32i-B External Data Input - Incl. External Message, External Tool Offset, External Machine Zero Point Shift, External Program Number Search |

**Notice**

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# Power Mate CNC manager

## Features

When the servo amplifier unit is used as an additional (slave) axis of the CNC, the power mate CNC manager enables the display and setting of data from the CNC. Up to eight slave units can be connected.

The Power Mate CNC manager supports the following functions:

- Current position display (absolute/machine coordinate)
- Parameter display and setting
- Diagnosis
- System configuration screen
- Alarm

## Benefits

- Cost effective way to configure/drive auxilliary axis

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J674 | 30i-A Power Mate CNC Manager |
| A02B-0306-J674 | 31i-A5 Power Mate CNC Manager |
| A02B-0307-J674 | 31i-A Power Mate CNC Manager |
| A02B-0308-J674 | 32i-A Power Mate CNC Manager |
| A02B-0323-J674 | 30i-B Power Mate CNC Manager |
| A02B-0326-J674 | 31i-B5 Power Mate CNC Manager |
| A02B-0327-J674 | 31i-B Power Mate CNC Manager |
| A02B-0328-J674 | 32i-B Power Mate CNC Manager |

**Notice**

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# 493

## Data input / output

# External I/O device control

## Features

Part program registration and punch can be commanded externally.

## Benefits

- Operator can conveniently upload/download part programs from host device
- No need to push read/punch button on CNC
- Read/Punch can be activated by external device such as from enter button on laptop
- Permits better part program control from CAM room
- Easy to maintain one master part program

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J902 | 30i-A External I/O Device Control |
| A02B-0306-J902 | 31i-A5 External I/O Device Control |
| A02B-0307-J902 | 31i-A External I/O Device Control |
| A02B-0308-J902 | 32i-A External I/O Device Control |
| A02B-0323-J902 | 30i-B External I/O Device Control |
| A02B-0326-J902 | 31i-B5 External I/O Device Control |
| A02B-0327-J902 | 31i-B External I/O Device Control |
| A02B-0328-J902 | 32i-B External I/O Device Control |

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# 494

## Data input / output

# One touch macro call

## Features

This function enables the CNC to perform a complex macro operation at the push of a button.

By pressing a switch on the machine, the following three operations can be performed with minimum ladder modifications:

- Switching to the MEM mode.
- Execution of macro programs stored in memory.
- Return to the mode before execution. The program selected before execution is automatically selected.

This function is enabled only in the reset state. This means that this function cannot be used during automatic operation (during automatic operation halt and automatic operation stop periods as well).

## Benefits

- Simplification of the machine operation
- Improvement of the machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S655 | 30i-A One Touch Macro Call Function |
| A02B-0306-S655 | 31i-A5 One Touch Macro Call Function |
| A02B-0307-S655 | 31i-A One Touch Macro Call Function |
| A02B-0308-S655 | 32i-A One Touch Macro Call Function |
| A02B-0319-S655 | 0i-TD One Touch Macro Call Function |
| A02B-0320-S655 | 0i-MD One Touch Macro Call Function |
| A02B-0323-S655 | 30i-B One Touch Macro Call Function |
| A02B-0326-S655 | 31i-B5 One Touch Macro Call Function |
| A02B-0327-S655 | 31i-B One Touch Macro Call Function |
| A02B-0328-S655 | 32i-B One Touch Macro Call Function |

**Notice**

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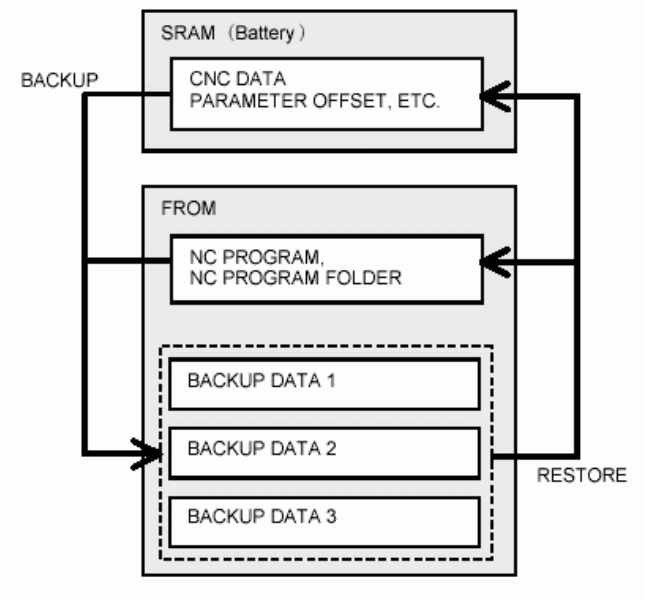
## Data input / output




# Automatic data backup

## Features

Enables automatic backup of battery-backed SRAM memory contents to the control's Flash ROM memory. In the event of SRAM memory loss, maintenance personnel can immediately recover data from a saved backup.

## Benefits

- Up to three backup copies can be made/maintained.
- Backup may be performed at set interval and/or when E-Stop occurs.
- One backup copy may be protected for saving of original data/settings.
- Backup of CNC part programs in FROM memory may be included.

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-H510#B10 | 30i-A Automatic Data Back-up, 1 Set of Back-up Data, SRAM |
| A02B-0303-H510#B11 | 30i-A Automatic Data Back-up, 1 Set of Back-up Data, SRAM + Part Programs |
| A02B-0303-H510#B20 | 30i-A Automatic Data Back-up, 2 Sets of Back-up Data, SRAM |
| A02B-0303-H510#B21 | 30i-A Automatic Data Back-up, 2 Sets of Back-up Data, SRAM + Part Programs |
| A02B-0303-H510#B30 | 30i-A Automatic Data Back-up, 3 Sets of Back-up Data, SRAM |
| A02B-0303-H510#B31 | 30i-A Automatic Data Back-up, 3 Sets of Back-up Data, SRAM + Part Programs |
| A02B-0306-H510#B10 | 31i-A5 Automatic Data Back-up, 1 Set of Back-up Data, SRAM |
| A02B-0306-H510#B11 | 31i-A5 Automatic Data Back-up, 1 Set of Back-up Data, SRAM + Part Programs |
| A02B-0306-H510#B20 | 31i-A5 Automatic Data Back-up, 2 Sets of Back-up Data, SRAM |
| A02B-0306-H510#B21 | 31i-A5 Automatic Data Back-up, 2 Sets of Back-up Data, SRAM + Part Programs |
| A02B-0306-H510#B30 | 31i-A5 Automatic Data Back-up, 3 Sets of Back-up Data, SRAM |
| A02B-0306-H510#B31 | 31i-A5 Automatic Data Back-up, 3 Sets of Back-up Data, SRAM + Part Programs |
| A02B-0307-H510#B10 | 31i-A Automatic Data Back-up, 1 Set of Back-up Data, SRAM |
| A02B-0307-H510#B11 | 31i-A Automatic Data Back-up, 1 Set of Back-up Data, SRAM + Part Programs |
| A02B-0307-H510#B20 | 31i-A Automatic Data Back-up, 2 Sets of Back-up Data, SRAM |
| A02B-0307-H510#B21 | 31i-A Automatic Data Back-up, 2 Sets of Back-up Data, SRAM + Part Programs |
| A02B-0307-H510#B30 | 31i-A Automatic Data Back-up, 3 Sets of Back-up Data, SRAM |
| A02B-0307-H510#B31 | 31i-A Automatic Data Back-up, 3 Sets of Back-up Data, SRAM + Part Programs |
| A02B-0308-H510#B10 | 32i-A Automatic Data Back-up, 1 Set of Back-up Data, SRAM |
| A02B-0308-H510#B11 | 32i-A Automatic Data Back-up, 1 Set of Back-up Data, SRAM + Part Programs |
| A02B-0308-H510#B20 | 32i-A Automatic Data Back-up, 2 Sets of Back-up Data, SRAM |
| A02B-0308-H510#B21 | 32i-A Automatic Data Back-up, 2 Sets of Back-up Data, SRAM + Part Programs |

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| Specification | Description |
|---|---|
| A02B-0308-H510#B30 | 32i-A Automatic Data Back-up, 3 Sets of Back-up Data, SRAM |
| A02B-0308-H510#B31 | 32i-A Automatic Data Back-up, 3 Sets of Back-up Data, SRAM + Part Programs |
| A02B-0319-R641 | 0i-TD Automatic Data Back-up |
| A02B-0320-R641 | 0i-MD Automatic Data Back-up |
| A02B-0321-R641 | 0i-Mate-TD Automatic Data Back-up |
| A02B-0322-R641 | 0i-Mate-MD Automatic Data Back-up |
| A02B-0323-H510#B10 | 30i-B Automatic Data Back-up, 1 Set of Back-up Data, SRAM |
| A02B-0323-H510#B11 | 30i-B Automatic Data Back-up, 1 Set of Back-up Data, SRAM + Part Programs |
| A02B-0323-H510#B20 | 30i-B Automatic Data Back-up, 2 Sets of Back-up Data, SRAM |
| A02B-0323-H510#B21 | 30i-B Automatic Data Back-up, 2 Sets of Back-up Data, SRAM + Part Programs |
| A02B-0323-H510#B30 | 30i-B Automatic Data Back-up, 3 Sets of Back-up Data, SRAM |
| A02B-0323-H510#B31 | 30i-B Automatic Data Back-up, 3 Sets of Back-up Data, SRAM + Part Programs |
| A02B-0326-H510#B10 | 31i-B5 Automatic Data Back-up, 1 Set of Back-up Data, SRAM |
| A02B-0326-H510#B11 | 31i-B5 Automatic Data Back-up, 1 Set of Back-up Data, SRAM + Part Programs |
| A02B-0326-H510#B20 | 31i-B5 Automatic Data Back-up, 2 Sets of Back-up Data, SRAM |
| A02B-0326-H510#B21 | 31i-B5 Automatic Data Back-up, 2 Sets of Back-up Data, SRAM + Part Programs |
| A02B-0326-H510#B30 | 31i-B5 Automatic Data Back-up, 3 Sets of Back-up Data, SRAM |
| A02B-0326-H510#B31 | 31i-B5 Automatic Data Back-up, 3 Sets of Back-up Data, SRAM + Part Programs |
| A02B-0327-H510#B10 | 31i-B Automatic Data Back-up, 1 Set of Back-up Data, SRAM |
| A02B-0327-H510#B11 | 31i-B Automatic Data Back-up, 1 Set of Back-up Data, SRAM + Part Programs |
| A02B-0327-H510#B20 | 31i-B Automatic Data Back-up, 2 Sets of Back-up Data, SRAM |
| A02B-0327-H510#B21 | 31i-B Automatic Data Back-up, 2 Sets of Back-up Data, SRAM + Part Programs |
| A02B-0327-H510#B30 | 31i-B Automatic Data Back-up, 3 Sets of Back-up Data, SRAM |
| A02B-0327-H510#B31 | 31i-B Automatic Data Back-up, 3 Sets of Back-up Data, SRAM + Part Programs |
| A02B-0328-H510#B10 | 32i-B Automatic Data Back-up, 1 Set of Back-up Data, SRAM |
| A02B-0328-H510#B11 | 32i-B Automatic Data Back-up, 1 Set of Back-up Data, SRAM + Part Programs |
| A02B-0328-H510#B20 | 32i-B Automatic Data Back-up, 2 Sets of Back-up Data, SRAM |
| A02B-0328-H510#B21 | 32i-B Automatic Data Back-up, 2 Sets of Back-up Data, SRAM + Part Programs |
| A02B-0328-H510#B30 | 32i-B Automatic Data Back-up, 3 Sets of Back-up Data, SRAM |
| A02B-0328-H510#B31 | 32i-B Automatic Data Back-up, 3 Sets of Back-up Data, SRAM + Part Programs |
| A02B-0333-H510#B10 | 35i-B Automatic Data Back-up, 1 Set of Back-up Data, SRAM |
| A02B-0333-H510#B11 | 35i-B Automatic Data Back-up, 1 Set of Back-up Data, SRAM + Part Programs |
| A02B-0333-H510#B20 | 35i-B Automatic Data Back-up, 2 Sets of Back-up Data, SRAM |
| A02B-0333-H510#B21 | 35i-B Automatic Data Back-up, 2 Sets of Back-up Data, SRAM + Part Programs |
| A02B-0333-H510#B30 | 35i-B Automatic Data Back-up, 3 Sets of Back-up Data, SRAM |
| A02B-0333-H510#B31 | 35i-B Automatic Data Back-up, 3 Sets of Back-up Data, SRAM + Part Programs |
| A02B-0334-H510#B10 | PM i-A Automatic Data Back-up, 1 Set of Back-up Data, SRAM |
| A02B-0334-H510#B11 | PM i-A Automatic Data Back-up, 1 Set of Back-up Data, SRAM + Part Programs |
| A02B-0334-H510#B20 | PM i-A Automatic Data Back-up, 2 Sets of Back-up Data, SRAM |
| A02B-0334-H510#B21 | PM i-A Automatic Data Back-up, 2 Sets of Back-up Data, SRAM + Part Programs |

**Notice**

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| Specification | Description |
|---|---|
| A02B-0334-H510#B30 | PM i-A Automatic Data Back-up, 3 Sets of Back-up Data, SRAM |
| A02B-0334-H510#B31 | PM i-A Automatic Data Back-up, 3 Sets of Back-up Data, SRAM + Part Programs |

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# Functions

## PMC System

This section of the catalogue contains the functions related to the Programmable Machine Controller (PMC) which is a Programmable Logic Controller integrated in the CNC.

Some of the functions detailed in the catalogue:

- General overview
- Multi-path PMC
- Symbols and messaging
- Step sequence
- Function Blocks
- Etc.

**Notice**

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# PMC ladder function

## Features

The Programmable Machine Controller (PMC) which is integrated in the CNC is sizable to match the requirement of the machine.

PMC program sizes of up to 300,000 steps (depending on the CNC model) can be defined. Please refer to the ordering information to identify the sizes available per CNC model.

## Benefits

- Customization of the PMC program size
- Adaptation to the machine and process requirements

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-H990#100K | 30i-A 1st-Path PMC Ladder Function, 100000 Steps |
| A02B-0303-H990#100KA | 30i-A 1st-Path PMC Ladder Function, 100000 Steps, up to 2 MB of Total PMC Program Memory, with Symbol Capacity Expansion |
| A02B-0303-H990#12K | 30i-A 1st-Path PMC Ladder Function, 12000 Steps, up to 128 kB of Total PMC Program Memory |
| A02B-0303-H990#16K | 30i-A 1st-Path PMC Ladder Function, 16000 Steps, up to 128 kB of Total PMC Program Memory |
| A02B-0303-H990#24K | 30i-A 1st-Path PMC Ladder Function, 24000 Steps, up to 256 kB of Total PMC Program Memory |
| A02B-0303-H990#32K | 30i-A 1st-Path PMC Ladder Function, 32000 Steps, up to 384 kB of Total PMC Program Memory |
| A02B-0303-H990#32KA | 30i-A 1st-Path PMC Ladder Function, 32000 Steps, up to 768 kB of Total PMC Program Memory, with Symbol Capacity Expansion |
| A02B-0303-H990#3K | 30i-A 1st-Path PMC Ladder Function, 3000 Steps, up to 128 kB of Total PMC Program Memory |
| A02B-0303-H990#40K | 30i-A 1st-Path PMC Ladder Function, 40000 Steps, up to 384 kB of Total PMC Program Memory |
| A02B-0303-H990#48K | 30i-A 1st-Path PMC Ladder Function, 48000 Steps, up to 512 kB of Total PMC Program Memory |
| A02B-0303-H990#48KA | 30i-A 1st-Path PMC Ladder Function, 48000 Steps, up to 1 MB of Total PMC Program Memory, with Symbol Capacity Expansion |
| A02B-0303-H990#5K | 30i-A 1st-Path PMC Ladder Function, 5000 Steps, up to 128 kB of Total PMC Program Memory |
| A02B-0303-H990#64K | 30i-A 1st-Path PMC Ladder Function, 64000 Steps, up to 768 kB of Total PMC Program Memory |

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| Specification | Description |
|---|---|
| A02B-0303-H990#64KA | 30i-A 1st-Path PMC Ladder Function, 64000 Steps, up to 1.5 MB of Total PMC Program Memory, with Symbol Capacity Expansion |
| A02B-0303-H990#8K | 30i-A 1st-Path PMC Ladder Function, 8000 Steps, up to 128 kB of Total PMC Program Memory |
| A02B-0306-H990#100K | 31i-A5 1st-Path PMC Ladder Function, 100000 Steps |
| A02B-0306-H990#100KA | 31i-A5 1st-Path PMC Ladder Function, 100000 Steps, up to 2 MB of Total PMC Program Memory, with Symbol Capacity Expansion |
| A02B-0306-H990#12K | 31i-A5 1st Path PMC Ladder Function, 12000 Steps, up to 128 kB of total PMC Program Memory |
| A02B-0306-H990#16K | 31i-A5 1st Path PMC Ladder Function, 16000 Steps, up to 128 kB of total PMC Program Memory |
| A02B-0306-H990#24K | 31i-A5 1st Path PMC Ladder Function, 24000 Steps, up to 256 kB of Total PMC Program Memory |
| A02B-0306-H990#32K | 31i-A5 1st Path PMC Ladder Function, 32000 Steps, up to 384 kB of total PMC Program Memory |
| A02B-0306-H990#32KA | 31i-A5 1st Path PMC Ladder Function, 32000 Steps, up to 768 kB of total PMC Program Memory, with Symbol Capacity Expansion |
| A02B-0306-H990#3K | 31i-A5 1st Path PMC Ladder Function, 3000 Steps, up to 128 kB of total PMC Program Memory |
| A02B-0306-H990#40K | 31i-A5 1st Path PMC Ladder Function, 40000 Steps, up to 384 kB of total PMC Program Memory |
| A02B-0306-H990#48K | 31i-A5 1st Path PMC Ladder Function, 48000 Steps, up to 512 kB of total PMC Program Memory |
| A02B-0306-H990#48KA | 31i-A5 1st Path PMC Ladder Function, 48000 Steps, up to 1 MB of total PMC Program Memory, with Symbol Capacity Expansion |
| A02B-0306-H990#5K | 31i-A5 1st Path PMC Ladder Function, 5000 Steps, up to 128 kB of total PMC Program Memory |
| A02B-0306-H990#64K | 31i-A5 1st Path PMC Ladder Function, 64000 Steps, up to 768 kB of total PMC Program Memory |
| A02B-0306-H990#64KA | 31i-A5 1st Path PMC Ladder Function, 64000 Steps, up to 1.5 MB of total PMC Program Memory, with Symbol Capacity Expansion |
| A02B-0306-H990#8K | 31i-A5 1st Path PMC Ladder Function, 8000 Steps, up to 128 kB of total PMC Program Memory |
| A02B-0307-H990#100K | 31i-A 1st-Path PMC Ladder Function, 100000 Steps |
| A02B-0307-H990#100KA | 31i-A 1st-Path PMC Ladder Function, 100000 Steps, up to 2 MB of Total PMC Program Memory, with Symbol Capacity Expansion |
| A02B-0307-H990#12K | 31i-A 1st Path PMC Ladder Function, 12000 Steps, up to 128 kB of total PMC Program Memory |
| A02B-0307-H990#16K | 31i-A 1st Path PMC Ladder Function, 16000 Steps, up to 128 kB of total PMC Program Memory |
| A02B-0307-H990#24K | 31i-A 1st Path PMC Ladder Function, 24000 Steps, up to 256 kB of total PMC Program Memory |
| A02B-0307-H990#32K | 31i-A 1st-Path PMC Ladder Function, 32000 Steps, up to 384 kB of total PMC Program Memory |

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| Specification | Description |
|---|---|
| A02B-0307-H990#32KA | 31i-A 1st-Path PMC Ladder Function, 32000 Steps, up to 768 kB of total PMC Program Memory, with Symbol Capacity Expansion |
| A02B-0307-H990#3K | 31i-A 1st Path PMC Ladder Function, 3000 Steps, up to 128 kB of total PMC Program Memory |
| A02B-0307-H990#40K | 31i-A 1st Path PMC Ladder Function, 40000 Steps, up to 384 kB of total PMC Program Memory |
| A02B-0307-H990#48K | 31i-A 1st Path PMC Ladder Function, 48000 Steps, up to 512 kB of total PMC Program Memory |
| A02B-0307-H990#48KA | 31i-A 1st Path PMC Ladder Function, 48000 Steps, up to 1 MB of total PMC Program Memory, with Symbol Capacity Expansion |
| A02B-0307-H990#5K | 31i-A 1st Path PMC Ladder Function, 5000 Steps, up to 128 kB of total PMC Program Memory |
| A02B-0307-H990#64K | 31i-A 1st Path PMC Ladder Function, 64000 Steps, up to 768 kB of total PMC Program Memory |
| A02B-0307-H990#64KA | 31i-A 1st Path PMC Ladder Function, 64000 Steps, up to 1.5 MB of total PMC Program Memory, with Symbol Capacity Expansion |
| A02B-0307-H990#8K | 31i-A 1st Path PMC Ladder Function, 8000 Steps, up to 128 kB of total PMC Program Memory |
| A02B-0308-H990#100K | 32i-A 1st-Path PMC Ladder Function, 100000 Steps |
| A02B-0308-H990#100KA | 32i-A 1st-Path PMC Ladder Function, 100000 Steps, up to 2 MB of Total PMC Program Memory, with Symbol Capacity Expansion |
| A02B-0308-H990#12K | 32i-A 1st-Path PMC Ladder Function, 12000 Steps, up to 128 kB of total PMC Program Memory |
| A02B-0308-H990#16K | 32i-A 1st-Path PMC Ladder Function, 16000 Steps, up to 128 kB of total PMC Program Memory |
| A02B-0308-H990#24K | 32i-A 1st-Path PMC Ladder Function, 24000 Steps, up to 256 kB of total PMC Program Memory |
| A02B-0308-H990#32K | 32i-A 1st-Path PMC Ladder Function, 32000 Steps, up to 384 kB of total PMC Program Memory |
| A02B-0308-H990#32KA | 32i-A 1st-Path PMC Ladder Function, 32000 Steps, up to 768 kB of total PMC Program Memory, with Symbol Capacity Expansion |
| A02B-0308-H990#3K | 32i-A 1st-Path PMC Ladder Function, 3000 Steps, up to 128 kB of total PMC Program Memory |
| A02B-0308-H990#40K | 32i-A 1st-Path PMC Ladder Function, 40000 Steps, up to 384 kB of total PMC Program Memory |
| A02B-0308-H990#48K | 32i-A 1st-Path PMC Ladder Function, 48000 Steps, up to 512 kB of total PMC Program Memory |
| A02B-0308-H990#48KA | 32i-A 1st-Path PMC Ladder Function, 48000 Steps, up to 1 MB of total PMC Program Memory, with Symbol Capacity Expansion |
| A02B-0308-H990#5K | 32i-A 1st-Path PMC Ladder Function, 5000 Steps, up to 128 kB of total PMC Program Memory |
| A02B-0308-H990#64K | 32i-A 1st-Path PMC Ladder Function, 64000 Steps, up to 768 kB of total PMC Program Memory |
| A02B-0308-H990#64KA | 32i-A 1st-Path PMC Ladder Function, 64000 Steps, up to 1.5 MB of total PMC Program Memory, with Symbol Capacity Expansion |
| A02B-0308-H990#8K | 32i-A 1st-Path PMC Ladder Function, 8000 Steps, up to 128 kB of total PMC Program Memory |
| A02B-0319-R002#24K | 0i-TD PMC Ladder Function, 24000 Steps |
| A02B-0319-R002#8K | 0i-TD PMC Ladder Function, 8000 Steps |

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| Specification | Description |
|---|---|
| A02B-0319-R006#32K | 0i-TD PMC Ladder Function, 32000 Steps |
| A02B-0319-R006#64K | 0i-TD PMC Ladder Function, 64000 Steps |
| A02B-0320-R002#24K | 0i-MD PMC Ladder Function, 24000 Steps |
| A02B-0320-R002#8K | 0i-MD PMC Ladder Function, 8000 Steps |
| A02B-0320-R006#32K | 0i-MD PMC Ladder Function, 32000 Steps |
| A02B-0320-R006#64K | 0i-MD PMC Ladder Function, 64000 Steps |
| A02B-0321-R002#24K | 0i-Mate-TD PMC Ladder Function, 24000 Steps |
| A02B-0321-R002#8K | 0i-Mate-TD PMC Ladder Function, 8000 Steps |
| A02B-0322-R002#24K | 0i-Mate-MD PMC Ladder Function, 24000 Steps |
| A02B-0322-R002#8K | 0i-Mate-MD PMC Ladder Function, 8000 Steps |
| A02B-0323-H990#100K | 30i-B 1st-Path PMC Ladder Function, 100000 Steps |
| A02B-0323-H990#300K | 30i-B 1st Path PMC Ladder Function 300000 Steps |
| A02B-0323-H990#32K | 30i-B 1st-Path PMC Ladder Function, 32000 Steps, up to 384 kB of Total PMC Program Memory |
| A02B-0323-H990#64K | 30i-B 1st-Path PMC Ladder Function, 64000 Steps, up to 768 kB of Total PMC Program Memory |
| A02B-0326-H990#100K | 31i-B5 1st-Path PMC Ladder Function, 100000 Steps |
| A02B-0326-H990#300K | 31i-B5 1st Path PMC Ladder Function 300000 Steps |
| A02B-0326-H990#32K | 31i-B5 1st Path PMC Ladder Function, 32000 Steps, up to 384 kB of total PMC Program Memory |
| A02B-0326-H990#64K | 31i-B5 1st Path PMC Ladder Function, 64000 Steps, up to 768 kB of total PMC Program Memory |
| A02B-0327-H990#100K | 31i-B 1st-Path PMC Ladder Function, 100000 Steps |
| A02B-0327-H990#300K | 31i-B 1st Path PMC Ladder Function, 300000 Steps |
| A02B-0327-H990#32K | 31i-B 1st-Path PMC Ladder Function, 32000 Steps, up to 384 kB of total PMC Program Memory |
| A02B-0327-H990#64K | 31i-B 1st Path PMC Ladder Function, 64000 Steps, up to 768 kB of total PMC Program Memory |
| A02B-0328-H990#100K | 32i-B 1st-Path PMC Ladder Function, 100000 Steps |
| A02B-0328-H990#300K | 32i-B 1st Path PMC Ladder Function, 300000 steps |
| A02B-0328-H990#32K | 32i-B 1st-Path PMC Ladder Function, 32000 Steps, up to 384 kB of total PMC Program Memory |
| A02B-0328-H990#64K | 32i-B 1st-Path PMC Ladder Function, 64000 Steps, up to 768 kB of total PMC Program Memory |
| A02B-0333-H990#100K | 35i-B 1st-Path PMC Ladder Function, 100000 Steps |
| A02B-0333-H990#300K | 35i-B 1st Path PMC Ladder Function, 300000 steps |
| A02B-0333-H990#32K | 35i-B 1st-Path PMC Ladder Function, 32000 Steps, up to 384 kB of Total PMC Program Memory |
| A02B-0333-H990#64K | 35i-B 1st-Path PMC Ladder Function, 64000 Steps, up to 768 kB of Total PMC Program Memory |
| A02B-0334-H990#100K | PM i-A PMC Ladder Function, 100000 Steps, 1 MB Program Memory |

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| Specification | Description |
|---|---|
| A02B-0334-H990#300K | PM i-A PMC Ladder Function, 300000 Steps, 3 MB PMC Program Memory |
| A02B-0334-H990#32K | PM i-A PMC Ladder Function, 32000 Steps, 384 kB PMC Program Memory |
| A02B-0334-H990#64K | PM i-A PMC Ladder Function, 64000 Steps, 768 kB PMC Program Memory |

**Notice**

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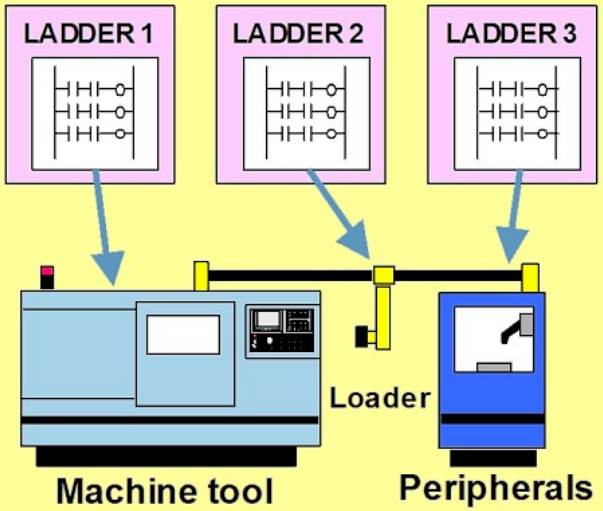
# 504

## PMC System




# Multi-path PMC function

## Features

The Programmable Machine Controller (PMC) usually runs one single program. In order to extend the processing capabilities of the PMC, it is possible to increase the number of concurrent PMC programs running at the same time to 3 or 5.

Each of the program or path can exchange data with the other paths using shared data and can control specific parts of the process. For instance, one path can be allocated to the machine itself, one to the auxiliary functions and the 3rd one to the loading / unloading system.

## Benefits

- Increase of the processing and structuring capacity of the PMC
- Possibility to associate separate PMC paths with process sub-systems
- Simplification of the maintenance of the machine
- Possiibility to design the PMC programs with different developpers teams

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0323-R855#3 | 30i-B Multi-Path PMC Function (3 Paths) |
| A02B-0323-R855#5 | 30i-B Multi-Path PMC Function (5 Paths) |
| A02B-0326-R855#3 | 31i-B5 Multi-Path PMC Function (3 Paths) |
| A02B-0326-R855#5 | 31i-B5 Multi-Path PMC Function (5 Paths) |
| A02B-0327-R855#3 | 31i-B Multi-Path PMC Function (3 Paths) |
| A02B-0327-R855#5 | 31i-B Multi-Path PMC Function (5 Paths) |
| A02B-0328-R855#3 | 32i-B Multi-Path PMC Function (3 Paths) |
| A02B-0328-R855#5 | 32i-B Multi-Path PMC Function (5 Paths) |
| A02B-0333-R855#3 | 35i-B Multi-Path PMC Function (3 Paths) |
| A02B-0333-R855#5 | 35i-B Multi-Path PMC Function (5 Paths) |
| A02B-0334-R855#3 | PM i-A Multi-Path PMC Function (3 Paths) |
| A02B-0334-R855#5 | PM i-A Multi-Path PMC Function (5 Paths) |

**Notice**

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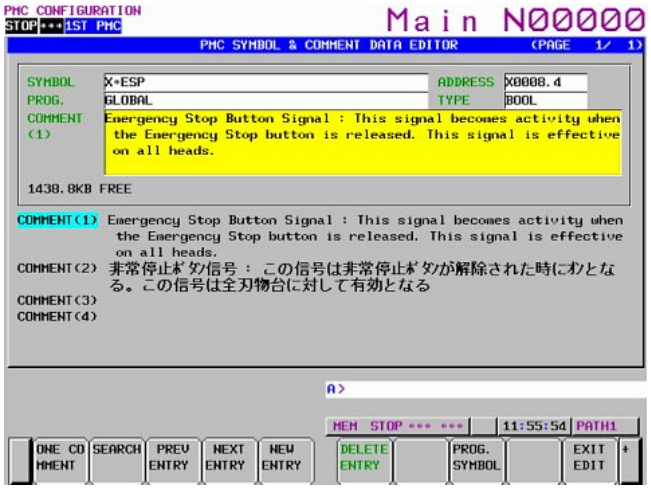
# 505

## PMC System




# PMC symbol, comment and message area expansion

## Features

When the Extension of Symbols, Comments and Messages area is used, it is possible to:

- Use local symbols in sub programs: local symbols are then only effective in a sub program. In this case the same string does not conflict with other same strings in other sub-programs
- Extend the maximum character length of symbols (40 instead of 16) and comments (4 sets of 255 characters instead of 1 set of 30)
- Support multi-language: one symbol entry can have up to four comment sets in maximum and the switch of the comment language is synchronized to the general switch of language of the CNC.
- Multi-definition of symbol and comment to one signal
- Data type definition (BOOL, BYTE, WORD, LABEL, PROG, etc.) can be associated to the symbol and comment
- Extension of the character set used in the symbols and comment

## Benefits

- Increase of the capacity to handle messages and symbols
- Simplification of the maintenance tasks with the multi-language comments

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0323-R856#1M | 30i-B PMC Symbol, Comment and Message Capacity Expansion (1 MB) |
| A02B-0323-R856#2M | 30i-B PMC Symbol, Comment and Message Capacity Expansion (2 MB) |
| A02B-0323-R856#512K | 30i-B PMC Symbol, Comment and Message Capacity Expansion (512 kB) |
| A02B-0326-R856#1M | 31i-B5 PMC Symbol, Comment and Message Capacity Expansion (1 MB) |
| A02B-0326-R856#2M | 31i-B5 PMC Symbol, Comment and Message Capacity Expansion (2 MB) |
| A02B-0326-R856#512K | 31i-B5 PMC Symbol, Comment and Message Capacity Expansion (512 kB) |
| A02B-0327-R856#1M | 31i-B PMC Symbol, Comment and Message Capacity Expansion (1 MB) |
| A02B-0327-R856#2M | 31i-B PMC Symbol, Comment and Message Capacity Expansion (2 MB) |
| A02B-0327-R856#512K | 31i-B PMC Symbol, Comment and Message Capacity Expansion (512 kB) |
| A02B-0328-R856#1M | 32i-B PMC Symbol, Comment and Message Capacity Expansion (1 MB) |
| A02B-0328-R856#2M | 32i-B PMC Symbol, Comment and Message Capacity Expansion (2 MB) |
| A02B-0328-R856#512K | 32i-B PMC Symbol, Comment and Message Capacity Expansion (512 kB) |
| A02B-0333-R856#1M | 35i-B PMC Symbol, Comment and Message Capacity Expansion (1 MB) |
| A02B-0333-R856#2M | 35i-B PMC Symbol, Comment and Message Capacity Expansion (2 MB) |

**Notice**

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| Specification | Description |
|---|---|
| A02B-0333-R856#512K | 35i-B PMC Symbol, Comment and Message Capacity Expansion (512 kB) |
| A02B-0334-R856#1M | PM i-A PMC Symbol, Comment and Message Capacity Expansion (1 MB) |
| A02B-0334-R856#2M | PM i-A PMC Symbol, Comment and Message Capacity Expansion (2 MB) |
| A02B-0334-R856#512K | PM i-A PMC Symbol, Comment and Message Capacity Expansion (512 kB) |

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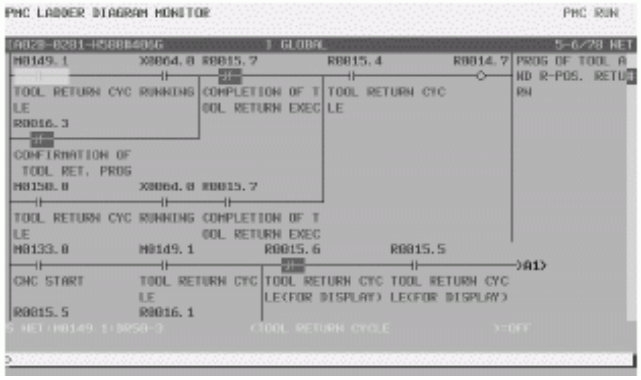
# 507

## PMC System




# Step sequence function

## Features

The standard PMC programming style on FANUC CNC is the Ladder Programming. This ladder language has been available since many years, and always improved to match the growing demand in complexity.

The ladder method is most often used for programming the sequence control governed by a programmable controller. This method was derived from relay-panel control circuits. Since it has been in use for years, many sequence control engineers are already familiar with it. This method is also used in PMC sequence programming.

A large-scale system requires a large program and a greater number of processes, to control the overall process. In addition optional step sequence method is available for some PMC models, to describe the order/flow of the overall process (see image).

## Step sequence

Step sequence method has been created to describe programs structurally. It is well-suited to the control of entire processes and provides an easy-to-understand visualized flow of the process. The step sequence programming features the direct representation of the control flow on a flow chart. Each block of processing is described as a subprogram, using the ladder method. The entire program is then created by combining these subprograms.

In step sequence programming, a sequence control program is divided into two types of subprograms, steps and transitions. Steps describe processes. Transitions connect steps and determine whether the transition conditions from one step to another evaluate true.

Step Sequence is also called Structure Function Charts (SFC) or Gracet.

**Notice**

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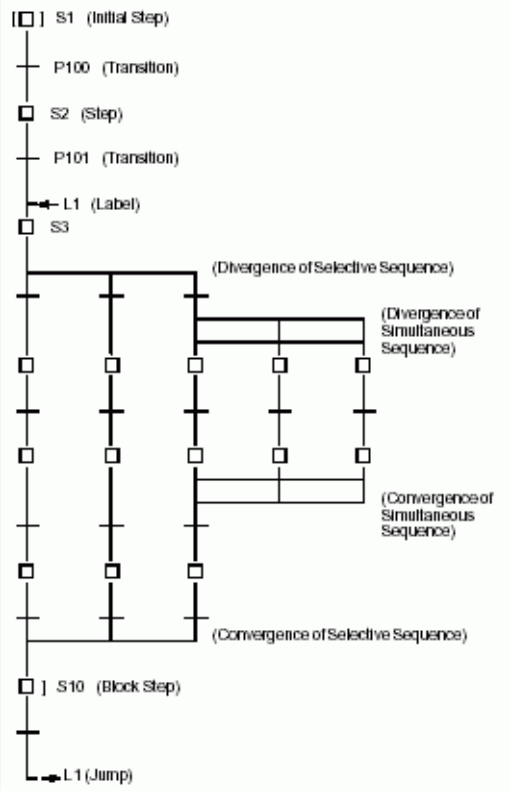


## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S982 | 30i-A Step Sequence Function |
| A02B-0306-S982 | 31i-A5 Step Sequence Function |
| A02B-0307-S982 | 31i-A Step Sequence Function |
| A02B-0308-S982 | 32i-A PMC Step Sequence Function |
| A02B-0323-S982 | 30i-B Step Sequence Function |
| A02B-0326-S982 | 31i-B5 Step Sequence Function |
| A02B-0327-S982 | 31i-B Step Sequence Function |
| A02B-0328-S982 | 32i-B PMC Step Sequence Function |
| A02B-0333-S982 | 35i-B PMC Step Sequence Function |
| A02B-0334-S982 | PM i-A Step Sequence Function |

**Notice**

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# 509

## PMC System

# Non-volatile PMC extra relay function

## Features

This function increases the number of non-volatile relays available in the PMC to 10 kB

## Benefits

- Increase of the capabilities to handle data to accomodate larger machines

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S984 | 30i-A PMC Nonvolatile Extra Relay Function |
| A02B-0306-S984 | 31i-A5 PMC Nonvolatile Extra Relay Function |
| A02B-0307-S984 | 31i-A PMC Nonvolatile Extra Relay Function |
| A02B-0308-S984 | 32i-A PMC Nonvolatile Extra Relay Function |
| A02B-0323-S984#10K | 30i-B PMC Nonvolatile Extra Relay Function, 10 kB |
| A02B-0326-S984#10K | 31i-B5 PMC Nonvolatile Extra Relay Function, 10 kB |
| A02B-0327-S984#10K | 31i-B PMC Nonvolatile Extra Relay Function, 10 kB |
| A02B-0328-S984#10K | 32i-B PMC Nonvolatile Extra Relay Function, 10 kB |
| A02B-0333-S984#10K | 35i-B PMC Nonvolatile Extra Relay Function, 10 kB |
| A02B-0334-S984#10K | PM i-A PMC Nonvolatile Extra Relay Function, 10 kB |

**Notice**

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# 510
## PMC System

# Non-volatile PMC data table area expansion (40kB)

## Features

This function increases the number of non-volatile data table available in the PMC to 40 kB

## Benefits

- Increase of the capabilities to handle data to accomodate larger machines

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0323-S967#40K | 30i-B PMC Nonvolatile Data Table Expansion, 40 kB |
| A02B-0326-S967#40K | 31i-B5 PMC Nonvolatile Data Table Expansion, 40 kB |
| A02B-0327-S967#40K | 31i-B PMC Nonvolatile Data Table Area Expansion, 40 kB |
| A02B-0328-S967#40K | 32i-B PMC Nonvolatile Data Table Expansion, 40 kB |
| A02B-0333-S967#40K | 35i-B PMC Nonvolatile Data Table Expansion, 40 kB |
| A02B-0334-S967#40K | PM i-A PMC Nonvolatile Data Table Area Expansion, 40 kB |

**Notice**

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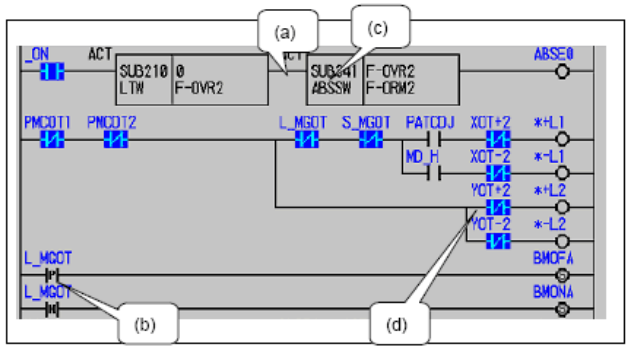
# 511

## PMC System




(a) Continuous operetion by cascading functional instructions within a net.
(b) Positive and Negative transition contact.
(c) New functional instructions.
(d) Logical operations after branch of circuit.

# Extended PMC ladder instruction function

## Features

Ladder programs can become quite complex for high sophisticated and complex machines. To overcome this increasing complexity, FANUC has developed several new specialized functions which have been added to the basic set of instructions and functions of the PMC.

The following ladder instructions have been added / extended:

- Total 125 of new functional instructions have been added
- Positive and Negative transition contact have been added
- Two or more functional instructions can be used for one net
- A relay or other functional instructions are connectable with the output of a functional instruction
- In the output section, not only a coil (coil, negative coil, set coil, reset coil) but also a relay and the functional instruction can be located

Ladder programming is upwards compatible between PMC generation: it is simple to take an old PMC program from an older CNC generation and use it on a new one. If the program has used the extended function set, then it is not possible to reuse the code on the previous generation systems which do not support this feature.

## Benefits

- Increase the capability of the PMC to solve complex tasks
- Adaptation of the Ladder Language to the modern function sets
- Increase of the processing capability of the PMC
- Decrease of the cycle time of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R851 | 30i-A Extended PMC Ladder Instruction Function |
| A02B-0306-R851 | 31i-A5 Extended PMC Ladder Instruction Function |
| A02B-0307-R851 | 31i-A Extended PMC Ladder Instruction Function |
| A02B-0308-R851 | 32i-A Extended PMC Ladder Instruction Function |
| A02B-0319-R851 | 0i-TD Extended PMC Ladder Instruction Function |
| A02B-0320-R851 | 0i-MD Extended PMC Ladder Instruction Function |
| A02B-0321-R851 | 0i-Mate-TD Extended PMC Ladder Instruction Function |
| A02B-0322-R851 | 0i-Mate-MD Extended PMC Ladder Instruction Function |

**Notice**

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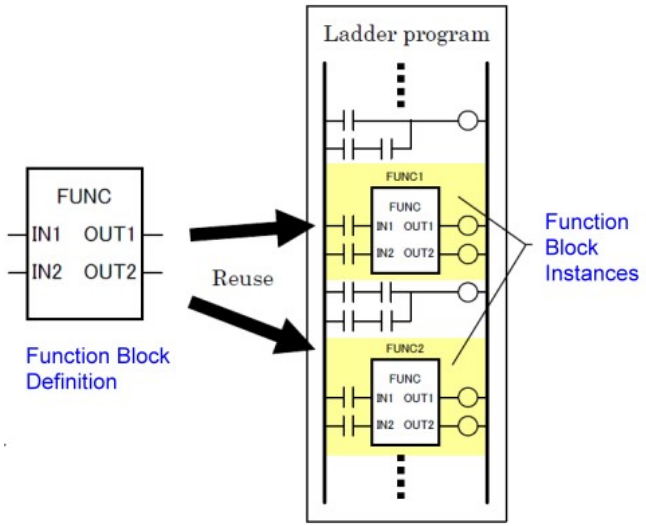
# 512
## PMC System




# PMC Function Block function

## Features

A Function Block (also called FB) is a block of a Ladder Program defined in advance in a library that contains a particular process ( or function).

It is possible to place a defined Function Block in other ladder program and set the required input / output parameters to execute the function.

By defining a frequently used function as a Function Block, it is possible to reuse the function easily thus reducing the time required for programming and increasing the development efficiency.

In addition to the above, program diagnosis can be performed without displaying the detailed program in the function block, which is very efficient to decreases the amount time required to maintain the machine.

## Benefits

- Reduction of the PMC program development time
- Reduction of the time required to maintain the machine
- Overall improvement of the efficiency and productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R852 | 30i-A Extended PMC Ladder Instruction Function - PMC Function Blocks |
| A02B-0306-R852 | 31i-A5 Extended PMC Ladder Instruction Function - PMC Function Blocks |
| A02B-0307-R852 | 31i-A Extended PMC Ladder Instruction Function - PMC Function Blocks |
| A02B-0308-R852 | 32i-A Extended PMC Ladder Instruction Function - PMC Function Blocks |
| A02B-0319-R852 | 0i-TD PMC Function Blocks |
| A02B-0320-R852 | 0i-MD PMC Function Blocks |
| A02B-0321-R852 | 0i-Mate-TD PMC Function Blocks |
| A02B-0322-R852 | 0i-Mate-MD Function Block |
| A02B-0323-R852 | 30i-B Extended PMC Ladder Instruction Function - PMC Function Blocks |
| A02B-0326-R852 | 31i-B5 Extended PMC Ladder Instruction Function - PMC Function Blocks |
| A02B-0327-R852 | 31i-B Extended PMC Ladder Instruction Function - PMC Function Blocks |
| A02B-0328-R852 | 32i-B Extended PMC Ladder Instruction Function - PMC Function Blocks |
| A02B-0333-R852 | 35i-B Extended PMC Ladder Instruction Function - PMC Function Blocks |
| A02B-0334-R852 | PM i-A Extended PMC Ladder Instruction Function - PMC Function Blocks |

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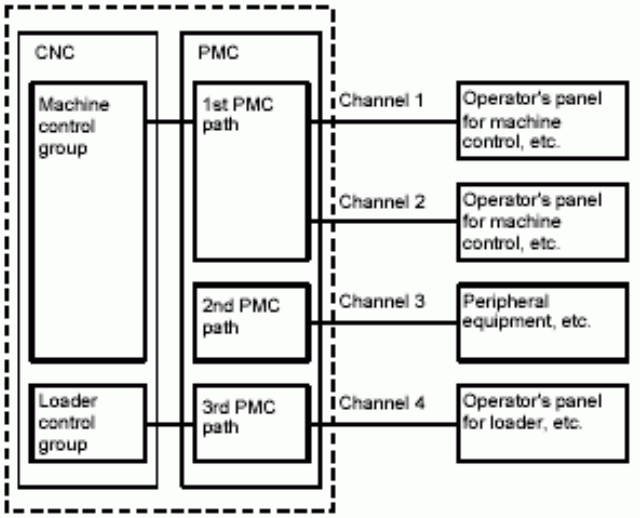
# 513
## PMC System




# FANUC I/O Link expansion

## Features

The number of 1,024 DI/DO signal points that can be used as input / output on the FANUC I/O LINK Network can be extended by adding further FANUC I/O LINK channels to the CNC.

With each channel added, the number of DI/DO signals can be extended by 1,024 respectively. The CNC Series 0i-MODEL D, Series 31i-MODEL A and Series 32i-MODEL A can have up to three channels (3,072 DI/DO). The Series 30i-MODEL A can have up to four channels (4,096 DI/DO).

## Benefits

- Addition of I/O control capability to the PMC of the CNC
- Adaptation of the CNC to larger systems
- Improvement of the overall machining productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-S981 | 30i-A I/O LINK Expansion, 2nd Channel |
| A02B-0303-S985 | 30i-A I/O LINK Expansion, 3rd Channel |
| A02B-0303-S986 | 30i-A I/O LINK Expansion, 4th Channel |
| A02B-0306-S981 | 31i-A5 I/O LINK Expansion, 2nd Channel |
| A02B-0306-S985 | 31i-A5 I/O LINK Expansion, 3rd Channel |
| A02B-0307-S981 | 31i-A I/O LINK Expansion, 2nd Channel |
| A02B-0307-S985 | 31i-A I/O LINK Expansion, 3rd Channel |
| A02B-0308-S981 | 32i-A I/O LINK Expansion, 2nd Channel |
| A02B-0308-S985 | 32i-A I/O LINK Expansion, 3rd Channel |
| A02B-0319-S985 | 0i-TD I/O LINK Expansion, 3rd Channel |
| A02B-0320-S985 | 0i-MD I/O LINK Expansion, 3rd Channel |

**Notice**

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# 514
## CNC

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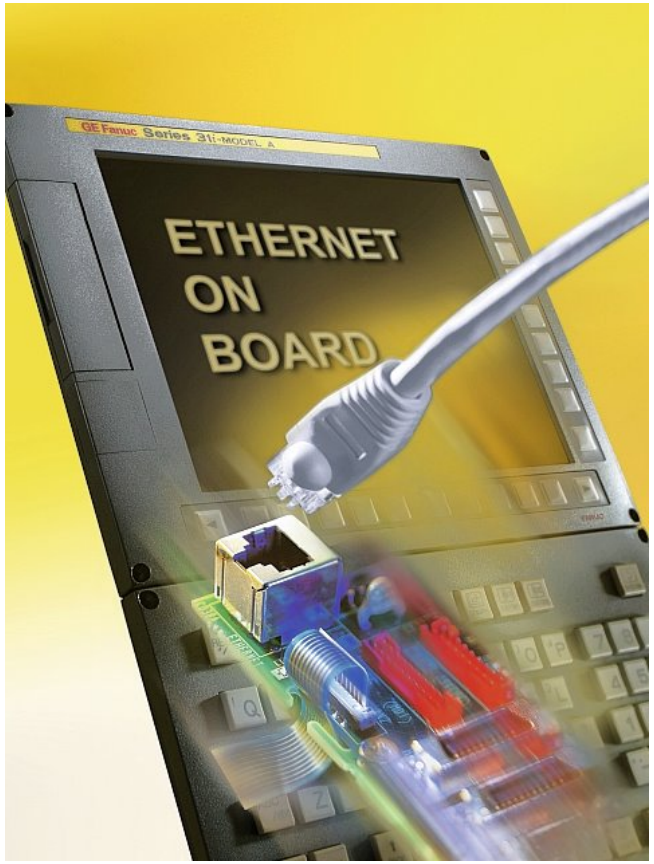
# Communication

This section of the catalogue contains an overview of the most popular communication function available on the FANUC CNC.

The communication functions described include:

- FANUC Ethernet protocols
- EtherNet/IP
- PROFIBUS-DP
- PROFINET
- Etc.




# Embedded Ethernet

## Features

The Series 30i CNC family as well as the Power Motion i CNC are equipped with an embedded Ethernet port (Ethernet connection on the mother board). This port can support several connection types and protocols to simplify the connection of the CNC to the outside world and greatly improve its efficiency.

The following functions and protocols are supported by the embedded Ethernet port:

- DHCP
- DNS
- DNC1 over Ethernet
- FTP client
- FOCAS / FOCAS 2
- Basic Operation Package 2
- FANUC Ladder
- Modbus/TCP Server*

Note: *Modbus/TCP function required. See further in the communication section of the catalogue for more information about the Modbus/TCP function.

In addition to the embedded Ethernet port, it is possible to increase the number of Ethernet ports of the CNC by adding separate Ethernet boards in the option slots of the CNC (Standalone or LCD-Mounted types) or using a Multi-Function Ethernet module (LCD-Mounted type CNC only). The additional Ethernet boards and modules have their own processors and provide more processing power for complex protocols or multiple and concurrent Ethernet connections.

## Benefits

- Addition of Ethernet connectivity to the CNC
- Increase of the maintenance and remote access efficiency
- Provides data collection capabilities to the CNC
- Improvement of machine flexibility and increase of the system efficiency / productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J571#656E | 30i/31i/32i-A Embedded Ethernet - Control Software |
| A02B-0323-J571#658M | 30i/31i/32i-B Embedded Ethernet - Control Software |
| A02B-0333-J571#658M | 35i-B Embedded Ethernet - Control Software |
| A02B-0334-J571#658M | PM i-A Embedded Ethernet - Control Software |

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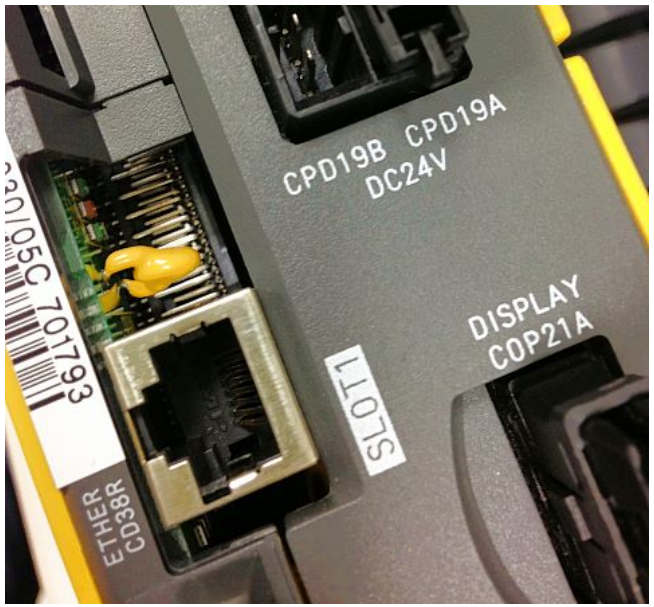
# 516
## Communication




# Fast Ethernet

## Features

The Fast Ethernet board and functions bring the possibility to install additional Ethernet connections to the CNC. The Fast Ethernet board features its own processors so that more processing power is available to manage the communication and protocols.

Up to 3 Fast Ethernet boards can be installed in a Series 30i/31i/32i 4-slots standalone controllers. Up to 2 Fast Ethernet boards can be installed in a LCD-mounted CNC or in a Series 35i and Power Motion i-A standalone controllers.

Together with the embedded Ethernet port, the Fast Ethernet boards and/or the Multi-Function Ethernet Module, up to 4 separate Ethernet connections can be realized.

The Fast Ethernet board can run concurrent protocols and services such as:

- DHCP
- DNS
- DNC1 over Ethernet
- FTP client
- Screen Display Function
- Data Server and Fast Data Server
- FOCAS / FOCAS 2
- Basic Operation Package 2
- Remote Diagnostics
- FANUC Ladder
- FANUC SERVO GUIDE

It can support popular networking protocols such as:

- EtherNet/IP Scanner
- EtherNet/IP Scanner Adapter
- PROFINET I/O Device
- FL-net
- Modbus/TCP

Note:

- Refer to the connection manual for additional information on the protocols, settings and eventual limitations related to the concurrent use of different protocols in the Fast Ethernet board.

## Benefits

- Addition of Ethernet connectivity to the CNC

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- Improvement of the Ethernet connectivity of the CNC with many popular protocols
- Increase of the maintenance and remote access efficiency
- Provides data collection capabilities to the CNC
- Improvement of machine flexibility and increase of the system efficiency / productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J146 | 30i/31i/32i-A Fast Ethernet / Fast Data Server Board |
| A02B-0303-J599#6569 | 30i/31i/32i-A Fast Ethernet - Control Software |
| A02B-0303-S707 | 30i-A Ethernet Function |
| A02B-0306-S707 | 31i-A5 Ethernet Function |
| A02B-0307-S707 | 31i-A Ethernet Function |
| A02B-0308-S707 | 32i-A Ethernet Function |
| A02B-0319-J146 | 0i-D Fast Ethernet / Fast Data Server Board |
| A02B-0319-J561#658W | 0i-D Fast Ethernet - Control Software |
| A02B-0319-S707 | 0i-TD Ethernet Function |
| A02B-0320-S707 | 0i-MD Ethernet Function |
| A02B-0323-J147 | 30i/31i/32i/35i-B, PM i-A Fast Ethernet Board |
| A02B-0323-J561#658K | 30i/31i/32i-B Fast Ethernet - Control Software |
| A02B-0323-S707 | 30i-B Ethernet Function |
| A02B-0326-S707 | 31i-B5 Ethernet Function |
| A02B-0327-S707 | 31i-B Ethernet Function |
| A02B-0328-S707 | 32i-B Ethernet Function |
| A02B-0333-J561#658K | 35i-B Fast Ethernet - Control Software |
| A02B-0333-S707 | 35i-B Ethernet Function |
| A02B-0334-J561#658K | PM i-A Fast Ethernet - Control Software |
| A02B-0334-S707 | PM i-A Ethernet Function |

**Notice**

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# 518
## Communication

EtherNet/IP™

Scanner

# EtherNet/IP scanner

## Features

EtherNet/IP is an industrial network based on Ethernet. The specification of EtherNet/IP is managed by ODVA (Open DeviceNet Vendor Association) and its globalization and standardization are promoted. Therefore, EtherNet/IP has been adopted by many vendors, and it is possible to connect to various types of industrial devices. Moreover, EtherNet/IP devices can be used together with general-purpose Ethernet devices because a standard Ethernet technology is used.

The EtherNet/IP Scanner function provides the CNC with the capability to act as an EtherNet/IP Scanner (Master) to connect the CNC to an EtherNet/IP device environment. This function provides an easy way to setup the system installation and the connection to popular PLCs and I/O devices using EtherNet/IP.

When using multicast between up to 32 CNC, it is possible to realize simple shared memory, which greatly simplifies network management and allows, for instance, an overview of the status of each machine of a line on each CNC.

The EtherNet/IP Scanner function can be used with the following Ethernet hardware:

- The "Fast Ethernet board" of the Series 30i/31i/32i/35i-B CNC and the Power Motion i-A
- The "Multi-Function Ethernet module" of the Series 30i/31i/32i/35i-B and Power Motion i-A LCD-Mounted type

Notes:

- Refer to the connection manual for additional information about the EtherNet/IP data type supported, the size of the data tables, programming, EDS file as well as the function specifications.
- The Ethernet hardware of the CNC supports several concurrent protocols and connections. Refer to the connection manuals for details and limitations that may exist.
- It is possible to run the EtherNet/IP Scanner and Adapter function on the same Ethernet hardware module or on different modules. Refer to the connection manuals for details and limitations that may exist.
- If the EtherNet/IP Scanner function and the EtherNet/IP PORT2 function are specified, the EtherNet/IP Scanner function can be operated on different hardware boards at the same time.

## Benefits

- Connection to PLCs and equipment by EtherNet/IP network
- Acceleration of the system installation and commissionning
- Improvement of machine flexibility and increase of the system efficiency / productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0323-J147 | 30i/31i/32i/35i-B, PM i-A Fast Ethernet Board |
| A02B-0323-J561#658K | 30i/31i/32i-B Fast Ethernet - Control Software |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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| Specification | Description |
|---|---|
| A02B-0323-R966 | 30i-B Ethernet/IP Scanner Function |
| A02B-0323-R973 | 30i-B Ethernet/IP Scanner Port 2 Function |
| A02B-0323-S707 | 30i-B Ethernet Function |
| A02B-0326-R966 | 31i-B5 Etherne/IP Scanner Function |
| A02B-0326-R973 | 31i-B5 Etherne /IP Scanner Port 2 Function |
| A02B-0326-S707 | 31i-B5 Ethernet Function |
| A02B-0327-R966 | 31i-B Ethernet/IP Scanner Function |
| A02B-0327-R973 | 31i-B Ethernet/IP Scanner Port 2 Function |
| A02B-0327-S707 | 31i-B Ethernet Function |
| A02B-0328-R966 | 32i-B Ethernet/IP Scanner Function |
| A02B-0328-R973 | 32i-B Ethernet/IP Scanner Port 2 Function |
| A02B-0328-S707 | 32i-B Ethernet Function |
| A02B-0333-J561#658K | 35i-B Fast Ethernet - Control Software |
| A02B-0333-R966 | 35i-B Ethernet/IP Scanner Function |
| A02B-0333-R973 | 35i-B Ethernet/IP Scanner Port 2 Function |
| A02B-0333-S707 | 35i-B Ethernet Function |
| A02B-0334-J561#658K | PM i-A Fast Ethernet - Control Software |
| A02B-0334-R966 | PM i-A Ethernet/IP Scanner Function |
| A02B-0334-R973 | PM i-A Ethernet/IP Scanner Port 2 Function |
| A02B-0334-S707 | PM i-A Ethernet Function |

**Notice**

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# 520
## Communication

EtherNet/IP™
Adaptor

# EtherNet/IP adapter

## Features

EtherNet/IP is an industrial network based on Ethernet. The specification of EtherNet/IP is managed by ODVA (Open DeviceNet Vendor Association) and its globalization and standardization are promoted. Therefore, EtherNet/IP has been adopted by many vendors, and it is possible to connect to various types of industrial devices. Moreover, EtherNet/IP devices can be used together with general-purpose Ethernet devices because a standard Ethernet technology is used.

The EtherNet/IP Adapter function provides the CNC with the capability to act as an EtherNet/IP Adapter (Slave) to connect the CNC to an EtherNet/IP environment. This function provides an easy way to setup the system installation and the connection to popular PLCs and equipment using EtherNet/IP.

When using multicast between up to 32 CNC, it is possible to realize simple shared memory, which greatly simplifies network management and allows, for instance, an overview of the status of each machine of a line on each CNC.

The EtherNet/IP Adapter function can be used with the following Ethernet hardware:

- The "Fast Ethernet board" of the Series 30i/31i/32i/35i-B CNC and the Power Motion i-A
- The "Multi-Function Ethernet module" of the Series 30i/31i/32i/35i-B and Power Motion i-A LCD-Mounted type

Notes:

- Refer to the connection manual for additional information on the EtherNet/IP data type supported, the size of the data tables, settings, EDS files as well as the function specifications.
- The Ethernet hardware of the CNC supports several concurrent protocols and connections. Refer to the connection manuals for details and limitations that may exist.
- It is possible to run the EtherNet/IP Scanner and Adapter function on the same Ethernet hardware module or on different modules. Refer to the connection manuals for details and limitations that may exist.
- If the EtherNet/IP Adapter function and the EtherNet/IP PORT2 function are specified, the EtherNet/IP Adpater function can be operated on different hardware boards at the same time.

## Benefits

- Connection to PLCs and machines by EtherNet/IP network
- Acceleration of the system installation and commissionning
- Improvement of the system uptime and efficiency

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0323-J147 | 30i/31i/32i/35i-B, PM i-A Fast Ethernet Board |
| A02B-0323-J561#658K | 30i/31i/32i-B Fast Ethernet - Control Software |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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| Specification | Description |
|---|---|
| A02B-0323-R967 | 30i-B Ethernet/IP Adapter Function |
| A02B-0323-R974 | 30i-B Ethernet/IP Adapter Port 2 Function |
| A02B-0323-S707 | 30i-B Ethernet Function |
| A02B-0326-R967 | 31i-B5 Ethernet/IP Adapter Function |
| A02B-0326-R974 | 31i-B5 Ethernet/IP Adapter Port 2 Function |
| A02B-0326-S707 | 31i-B5 Ethernet Function |
| A02B-0327-R967 | 31i-B Ethernet/IP Adapter Function |
| A02B-0327-R974 | 31i-B Ethernet/IP Adapter Port 2 Function |
| A02B-0327-S707 | 31i-B Ethernet Function |
| A02B-0328-R967 | 32i-B Ethernet/IP Adapter Function |
| A02B-0328-R974 | 32i-B Ethernet/IP Adapter Port 2 Function |
| A02B-0328-S707 | 32i-B Ethernet Function |
| A02B-0333-J561#658K | 35i-B Fast Ethernet - Control Software |
| A02B-0333-R967 | 35i-B Ethernet/IP Adapter Function |
| A02B-0333-R974 | 35i-B Ethernet/IP Adapter Port 2 Function |
| A02B-0333-S707 | 35i-B Ethernet Function |
| A02B-0334-J561#658K | PM i-A Fast Ethernet - Control Software |
| A02B-0334-R967 | PM i-A Ethernet/IP Adapter Function |
| A02B-0334-R974 | PM i-A Ethernet/IP Adapter Port 2 Function |
| A02B-0334-S707 | PM i-A Ethernet Function |

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# 522
## Communication

# PROFIBUS-DP master

## Features

The PROFIBUS-DP Master function and the PROFIBUS-DP Master board for the CNC provide an easy way to setup the CNC system to connect to popular PLCs and I/O devices equipment using PROFIBUS-DP.

Up to 48 PROFIBUS-DP Slave stations can be connected to the Master with a total of 244 bytes per Slave station.

PROFIBUS-DP is available for the Series 30i/31i/32i-A CNC, the Series 30i/31i/32i/35i-B CNC, the Power Motion i-A and the Series 0i-D CNC. It is also available on numerous FANUC legacy CNC systems.

Notes:

- The PROFIBUS-DP functions cannot be used simultaneously with the DeviceNet functions or CC-Link functions
- Refer to the connection manual for additional information on the PROFIBUS-DP functions supported, the size of the data tables, settings, diagnostics and GSD files

## Benefits

- Connection to PLCs and equipment by PROFIBUS-DP network
- Acceleration of the system installation and commissionning
- Improvement of machine flexibility and increase of the system efficiency / productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J311 | 30i/31i/32i-A PROFIBUS DP Master Board |
| A02B-0303-J535#655B | 30i/31i/32i-A PROFIBUS DP - Application Software |
| A02B-0303-J562#6552 | 30i/31i/32i-A PROFIBUS DP Master - Control Software |
| A02B-0303-S731 | 30i-A PROFIBUS DP Master Function |
| A02B-0306-S731 | 31i-A5 PROFIBUS DP Master Function |
| A02B-0307-S731 | 31i-A PROFIBUS DP Master Function |
| A02B-0308-S731 | 32i-A PROFIBUS DP Master Function |
| A02B-0319-J315 | 0i-D PROFIBUS DP Master Board |
| A02B-0319-S731 | 0i-TD PROFIBUS DP Master Function |
| A02B-0320-S731 | 0i-MD PROFIBUS DP Master Function |
| A02B-0323-J311 | 30i/31i/32i/35i-B, PM i-A PROFIBUS DP Master Board |
| A02B-0323-J535#655B | 30i/31i/32i-B PROFIBUS DP - Application Software |
| A02B-0323-J562#6552 | 30i/31i/32i-B PROFIBUS DP Master - Control Software |
| A02B-0323-S731 | 30i-B PROFIBUS DP Master Function |

**Notice**

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| Specification | Description |
|---|---|
| A02B-0326-S731 | 31i-B5 PROFIBUS DP Master Function |
| A02B-0327-S731 | 31i-B PROFIBUS DP Master Function |
| A02B-0328-S731 | 32i-B PROFIBUS DP Master Function |
| A02B-0333-J535#655B | 35i-B PROFIBUS DP - Application Software |
| A02B-0333-J562#6552 | 35i-B PROFIBUS DP Master - Control Software |
| A02B-0333-S731 | 35i-B PROFIBUS DP Master Function |
| A02B-0334-J535#655B | PM i-A PROFIBUS DP - Application Software |
| A02B-0334-J562#6552 | PM i-A PROFIBUS DP Master - Control Software |
| A02B-0334-S731 | PM i-A PROFIBUS DP Master Function |

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# 524
## Communication

# PROFIBUS-DP slave

## Features

The PROFIBUS-DP Slave function and the PROFIBUS-DP Slave board for the CNC provide an easy way to setup the CNC system to connect to popular PLCs and I/O devices equipment using PROFIBUS-DP.

The PROFIBUS-DP Slave function provides up to 244 bytes of data to the PROFIBUS-DP Master device.

PROFIBUS-DP is available for the Series 30i/31i/32i-A CNC, the Series 30i/31i/32i/35i-B CNC, the Power Motion i-A and the Series 0i-D CNC. It is also available on numerous FANUC legacy CNC systems.

Notes:

- The PROFIBUS-DP functions cannot be used simultaneously with the DeviceNet functions or CC-Link functions
- Refer to the connection manual for additional information on the PROFIBUS-DP functions supported, the size of the data tables, settings, diagnostics and GSD files

## Benefits

- Connection to PLCs and equipment by PROFIBUS-DP network
- Acceleration of the system installation and commissionning
- Improvement of machine flexibility and increase of the system efficiency / productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J313 | 30i/31i/32i-A PROFIBUS DP Slave Board |
| A02B-0303-J535#655B | 30i/31i/32i-A PROFIBUS DP - Application Software |
| A02B-0303-J563#655C | 30i/31i/32i-A PROFIBUS DP Slave - Control Software |
| A02B-0303-S732 | 30i-A PROFIBUS DP Slave Function |
| A02B-0306-S732 | 31i-A5 PROFIBUS DP Slave Function |
| A02B-0307-S732 | 31i-A PROFIBUS DP Slave Function |
| A02B-0308-S732 | 32i-A PROFIBUS DP Slave Function |
| A02B-0319-J316 | 0i-D PROFIBUS DP Slave Board |
| A02B-0319-S732 | 0i-TD PROFIBUS DP Slave Function |
| A02B-0320-S732 | 0i-MD PROFIBUS DP Slave Function |
| A02B-0323-J313 | 30i/31i/32i/35i-B, PM i-A PROFIBUS DP Slave Board |
| A02B-0323-J535#655B | 30i/31i/32i-B PROFIBUS DP - Application Software |
| A02B-0323-J563#655C | 30i/31i/32i-B PROFIBUS DP Slave - Control Software |
| A02B-0323-S732 | 30i-B PROFIBUS DP Slave Function |

**Notice**

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| Specification | Description |
|---|---|
| A02B-0326-S732 | 31i-B5 PROFIBUS DP Slave Function |
| A02B-0327-S732 | 31i-B PROFIBUS DP Slave Function |
| A02B-0328-S732 | 32i-B PROFIBUS DP Slave Function |
| A02B-0333-J535#655B | 35i-B PROFIBUS DP - Application Software |
| A02B-0333-J563#655C | 35i-B PROFIBUS DP Slave - Control Software |
| A02B-0333-S732 | 35i-B PROFIBUS DP Slave Function |
| A02B-0334-J535#655B | PM i-A PROFIBUS DP - Application Software |
| A02B-0334-J563#655C | PM i-A PROFIBUS DP Slave - Control Software |
| A02B-0334-S732 | PM i-A PROFIBUS DP Slave Function |

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# 526
## Communication

# PROFINET I/O device

## Features

PROFINET is an industrial network using Ethernet. It enables I/O communication between I/O Controller and I/O Devices. The communication standard is managed by PI (PROFIBUS and PROFINET International).

The PROFINET-IO Device (Slave) function for the Fast Ethernet board or the Multi-Function Ethernet module provides an easy way to setup the system installation and the connection of the CNC system to popular PLCs and equipment using PROFINET-IO.

It provides up to 256 bytes of input and 256 bytes of output data to a PROFINET I/O Controller.

PROFINET is available for the Series 30i/31i/32i/35i-B CNC and the Power Motion i-A.

Notes:

- Refer to the connection manual for additional information on the PROFINET-IO Device data type supported, the size of the data, settings and GSDML files.
- The Ethernet hardware of the CNC supports several concurrent protocols and connections. Refer to the connection manuals for details and limitations that may exist.

## Benefits

- Connection to PLCs and equipment by PROFINET-IO network
- Acceleration of the system installation and commissionning
- Improvement of machine flexibility and increase of the system efficiency / productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0323-J147 | 30i/31i/32i/35i-B, PM i-A Fast Ethernet Board |
| A02B-0323-J561#658K | 30i/31i/32i-B Fast Ethernet - Control Software |
| A02B-0323-R972 | 30i-B PROFINET I/O Device Function |
| A02B-0326-R972 | 31i-B5 PROFINET I/O Device Function |
| A02B-0327-R972 | 31i-B PROFINET I/O Device Function |
| A02B-0328-R972 | 32i-B PROFINET I/O Device Function |
| A02B-0333-J561#658K | 35i-B Fast Ethernet - Control Software |
| A02B-0333-R972 | 35i-B PROFINET I/O Device Function |
| A02B-0334-J561#658K | PM i-A Fast Ethernet - Control Software |
| A02B-0334-R972 | PM i-A PROFINET I/O Device Function |

**Notice**

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# 527
## Communication

# FL-net

## Features

The FL-net network on Ethernet is also known as JEMA Open PLC network - 2 (OPCN-2). The FL-net interface board and function provide an easy way to setup the system installation and the connection to popular PLCs and equipment using FL-net.

FL-net can interconnect various types of controllers such as programmable controllers (PLC), robots, CNC and personal computers of many different manufacturers to control and monitor them.

Function highlights:

- Multi-vendor environment using an open network: FL-net conforms to open standards so that communication devices manufactured by different vendors /manufacturers can communicate with each other.
- Large-scale network: up to 249 communication devices (nodes) can be connected to share data.
- Two communication functions are available: FL-net supports both the common memory and message communication. The common memory communication uses cyclic data transmission to allow the nodes to always share the same data. The message communication allows the nodes to exchange only required information on demand.
- Large-capacity common memory: 8K bits + 8K words (a total of 17K bytes) of large-capacity common memory can be shared among all nodes.
- Fast response: FL-net provides a fast response of 50 ms/32 nodes (at 2K bits + 2K words/32 nodes).
- High reliability: each node can participate in or be disconnected from the FL-net at any time. In this case, the power to each node can be turned on or off without problem and can provide high maintainability. The masterless token method allows communication to be continued without stopping the network by the token management, if a failure occurs in a communication device.
- Low cost: the use of cables for Ethernet can reduce the cost of communication devices such as transceivers and hubs as well as on cabling.
- High maintainability: various types of management tables are available. The management tables can be referenced to identify a faulty node quickly.
- Additional FANUC enhancements to FL-net: increase of the transmission speed from 10Mbps to 100Mbps, simultaneous FL-net and Ethernet communication on the same network (CNC Screen Display, File Transfer, FANUC LADDER-III, etc.)

Notes:

- The Ethernet hardware of the CNC supports several concurrent protocols and connections. Refer to the connection manuals for details and limitations that may exist.
- The PORT 2 function provides the capability to operate the same function on different hardware boards at the same time. Example: if the FL-net function and the FL-net PORT 2 functions are specified, the FL-net function can be operated on different hardware boards at the same time.
- FL-net supports safety functions. Refer to the "FL-net safety" section further in this catalogue for more information.

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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## Benefits

- Easy connection to Robots, PLCs and equipment using FL-net network
- Acceleration of the system installation and commissionning
- Improvement of machine flexibility and increase of the system efficiency / productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J272 | 30i/31i/32i-A FL-Net Board |
| A02B-0303-J566#656K | 30i/31i/32i-A FL-Net - Control Software |
| A02B-0303-J568#656M | 30i/31i/32i-A FL-Net - Application Software |
| A02B-0303-J692 | 30i-A FL-Net Function |
| A02B-0306-J692 | 31i-A5 FL-Net Function |
| A02B-0307-J692 | 31i-A FL-Net Function |
| A02B-0308-J692 | 32i-A FL-Net Function |
| A02B-0319-J272 | 0i-D FL-Net Board |
| A02B-0319-J566#6584 | 0i-D FL-Net - Control Software |
| A02B-0319-J568#6585 | 0i-D FL-Net - Application Software |
| A02B-0319-J692 | 0i-TD FL-Net Function |
| A02B-0320-J692 | 0i-MD FL-Net Function |
| A02B-0323-J147 | 30i/31i/32i/35i-B, PM i-A Fast Ethernet Board |
| A02B-0323-J561#658K | 30i/31i/32i-B Fast Ethernet - Control Software |
| A02B-0323-J692 | 30i-B FL-Net Function |
| A02B-0323-R964 | 30i-B FL-Net PORT 2 function |
| A02B-0326-J692 | 31i-B5 FL-Net Function |
| A02B-0326-R964 | 31i-B5 FL-Net PORT 2 function |
| A02B-0327-J692 | 31i-B FL-Net Function |
| A02B-0327-R964 | 31i-B FL-Net PORT 2 Function |
| A02B-0328-J692 | 32i-B FL-Net Function |
| A02B-0328-R964 | 32i-B FL-Net PORT 2 Function |
| A02B-0333-J561#658K | 35i-B Fast Ethernet - Control Software |
| A02B-0333-J692 | 35i-B FL-Net Function |
| A02B-0333-R964 | 35i-B FL-Net PORT 2 Function |
| A02B-0334-J561#658K | PM i-A Fast Ethernet - Control Software |
| A02B-0334-J692 | PM i-A FL-Net Function |
| A02B-0334-R964 | PM i-A FL-Net Port 2 Function |

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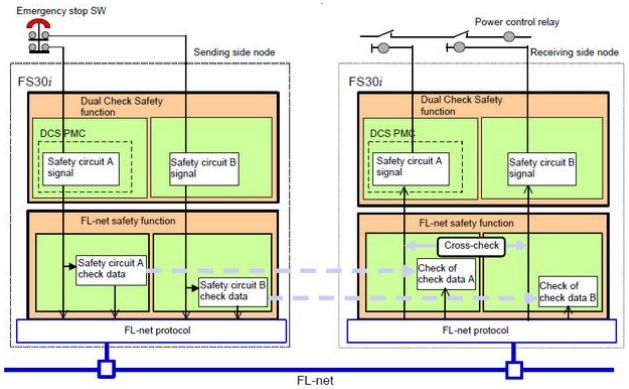


# FL-net safety

## Features

In a machining system such as a transfer machine or a networked manufacturing cells, stations are each equipped with an operator's panel having an emergency stop button or other safety rellated signals.

Traditionally, it is necessary to implement a separate hardwired safety circuit for the entire system so that, when the emergency stop button at any station is pressed, the emergency stop signal can be transferred to all CNCs.

When using the Safety function on FL-net, the transmission of safety-related signals connected to safety circuits to multiple CNCs connected via FL-net is provided on a single network. In this case, the system cabling is simplified, the setup and commissioning is accelerated and the total cost of the system is reduced.

The Safety function of FL-net is an additional function of the Dual Check Safety function of the CNC. It operates on two CPUs as the Dual Check Safety function does. Refer to "Dual Check Safety" section of the catalogue for further details on the safety functions of the CNC.

Basic elements of the Safety function by FL-net are redundant nodes on the sending side and the receiving side. A safe circuit for the line is implemented by the combination of these nodes. The sending node adds proofing data to each of the redundant signals of the safety circuit and sends these signals safely. The receiving node checks the proofing data and cross-checks the received signal data to ensure that there is no error in the FL-net communication.

## Benefits

- Simplified connection of Robots, CNC and PLCs with Safety Function transmitted over the FL-net network
- Simplification of the architectures
- Acceleration of the system installation and commissionning
- Improvement of machine flexibility and increase of the system efficiency / productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0323-J147 | 30i/31i/32i/35i-B, PM i-A Fast Ethernet Board |
| A02B-0323-J561#658K | 30i/31i/32i-B Fast Ethernet - Control Software |
| A02B-0323-J692 | 30i-B FL-Net Function |
| A02B-0323-S851 | 30i-B Safety Function by FL-Net |
| A02B-0326-J692 | 31i-B5 FL-Net Function |
| A02B-0326-S851 | 31i-B5 Safety Function by FL-Net |
| A02B-0327-J692 | 31i-B FL-Net Function |
| A02B-0327-S851 | 31i-B Safety Function by FL-Net |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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| Specification | Description |
|---|---|
| A02B-0328-J692 | 32i-B FL-Net Function |
| A02B-0328-S851 | 32i-B Safety Function by FL-Net |
| A02B-0333-J561#658K | 35i-B Fast Ethernet - Control Software |
| A02B-0333-J692 | 35i-B FL-Net Function |
| A02B-0333-S851 | 35i-B Safety Function by FL-Net |
| A02B-0334-J561#658K | PM i-A Fast Ethernet - Control Software |
| A02B-0334-J692 | PM i-A FL-Net Function |
| A02B-0334-S851 | PM i-A Safety Function by FL-Net |

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# 531
## Communication

# Modbus/TCP Server

## Features

Modbus/TCP Server function enables the connection to PLCs and equipment via the Modbus protocol over Ethernet. Modbus is a very popular protocol which is available on many automation devices. The Modbus/TCP function provides an easy way to setup the system installation and the connection to many PLCs, supervision systems and equipment using Modbus/TCP.

The Modbus/TCP Server function can be used on the following Ethernet hardware:

- The "embedded Ethernet port" of the Series 30i/31i/32i/35i-B CNC and Power Motion i-A
- The "Fast Ethernet board" of the Series 30i/31i/32i-A CNC, the Series 30i/31i/32i/35i-B CNC, the Power Motion i-A and the Series 0i-D CNC
- The "Multi-Function Ethernet module" of the Series 30i/31i/32i/35i-B and Power Motion i-A LCD-Mounted type

Notes:

- When Modbus/TCP is used on the "embedded Ethernet port" of the CNC, the number of clients connected at the same time to the CNC is limited to 3 instead of 10 for the "Fast Ethernet board" or the "Multi-Function Ethernet Module".
- Refer to the connection manual for additional information on the Modbus/TCP data type supported, the size of the data tables as well as the function specifications.
- The Ethernet hardware of the CNC supports several concurrent protocols and connections. Refer to the connection manuals for details and limitations that may exist.

## Benefits

- Connect to PLCs and equipment by ModBus/TCP network over Ethernet
- Acceleration of the system installation and commissionning
- Improvement of machine flexibility and increase of the system efficiency / productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J146 | 30i/31i/32i-A Fast Ethernet / Fast Data Server Board |
| A02B-0303-J599#6569 | 30i/31i/32i-A Fast Ethernet - Control Software |
| A02B-0303-R968 | 30i-A MODBUS/TCP Server Function |
| A02B-0303-S707 | 30i-A Ethernet Function |
| A02B-0306-R968 | 31i-A5 MODBUS/TCP Server Function |
| A02B-0306-S707 | 31i-A5 Ethernet Function |
| A02B-0307-R968 | 31i-A MODBUS/TCP Server Function |

**Notice**

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| Specification | Description |
|---|---|
| A02B-0307-S707 | 31i-A Ethernet Function |
| A02B-0308-R968 | 32i-A MODBUS/TCP Server Function |
| A02B-0308-S707 | 32i-A Ethernet Function |
| A02B-0319-J146 | 0i-D Fast Ethernet / Fast Data Server Board |
| A02B-0319-J561#658W | 0i-D Fast Ethernet - Control Software |
| A02B-0319-R968 | 0i-TD MODBUS/TCP-Server-Funktion |
| A02B-0319-S707 | 0i-TD Ethernet Function |
| A02B-0320-R968 | 0i-MD MODBUS/TCP-Server-Funktion |
| A02B-0320-S707 | 0i-MD Ethernet Function |
| A02B-0323-J147 | 30i/31i/32i/35i-B, PM i-A Fast Ethernet Board |
| A02B-0323-J561#658K | 30i/31i/32i-B Fast Ethernet - Control Software |
| A02B-0323-R968 | 30i-B MODBUS/TCP Server Function |
| A02B-0323-S707 | 30i-B Ethernet Function |
| A02B-0326-R968 | 31i-B5 MODBUS/TCP Server Function |
| A02B-0326-S707 | 31i-B5 Ethernet Function |
| A02B-0327-R968 | 31i-B MODBUS/TCP Server Function |
| A02B-0327-S707 | 31i-B Ethernet Function |
| A02B-0328-R968 | 32i-B MODBUS/TCP Server Function |
| A02B-0328-S707 | 32i-B Ethernet Function |
| A02B-0333-J561#658K | 35i-B Fast Ethernet - Control Software |
| A02B-0333-R968 | 35i-B MODBUS/TCP Server Function |
| A02B-0333-S707 | 35i-B Ethernet Function |
| A02B-0334-J561#658K | PM i-A Fast Ethernet - Control Software |
| A02B-0334-R968 | PM i-A MODBUS/TCP Server Function |
| A02B-0334-S707 | PM i-A Ethernet Function |

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# 533
## Communication

DeviceNet™
Scanner

# DeviceNet Scanner (Master)

## Features

DeviceNet is one of the world's leading device-level networks for industrial automation. DeviceNet offers robust, efficient data handling because it is based on Producer/Consumer technology. This modern communications model offers key capabilities that allow the user to determine effectively what information is needed and when.

The specification of DeviceNet is managed by ODVA (Open DeviceNet Vendor Association).

The DeviceNet Scanner (Master) function and the DeviceNet Scanner board provide an easy way to setup the installation and the connection of the CNC to popular PLCs and I/O devices using DeviceNet.

Specifications:

- Up to 63 slaves can be addressed
- Up to 128 byte of digital inputs and 128 bytes of digital output per slave (maximum 320 bytes of digital inputs and 320 bytes of digital outputs for the whole network)
- Supports poll I/O connection and bit strobe I/O connection
- MAC ID can be selected between 0 to 63

## Benefits

- Connect to PLCs and machines by DeviceNet network
- Acceleration of the system installation and commissionning
- Improvement of machine flexibility and increase of the system efficiency / productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J301 | 30i/31i/32i-A DeviceNet Master Board |
| A02B-0303-J565#6577 | 30i/31i/32i-A DeviceNet - Control Software |
| A02B-0303-S723 | 30i-A DeviceNet Master Function |
| A02B-0306-S723 | 31i-A5 DeviceNet Master Function |
| A02B-0307-S723 | 31i-A DeviceNet Master Function |
| A02B-0308-S723 | 32i-A DeviceNet Master Function |
| A02B-0319-J301 | 0i-D DeviceNet Master Board |
| A02B-0319-J565#6578 | 0i-D DeviceNet - Control Software |
| A02B-0319-S723 | 0i-TD DeviceNet Master Function |
| A02B-0320-S723 | 0i-MD DeviceNet Master Function |
| A02B-0323-J301 | 30i/31i/32i/35i-B, PM i-A DeviceNet Master Board |

**Notice**

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| Specification | Description |
|---|---|
| A02B-0323-J303 | 30i/31i/32i-B DeviceNet Master Board (Card Slot on Main Board A2 or A5) |
| A02B-0323-J565#6579 | 30i/31i/32i-B DeviceNet - Control Software |
| A02B-0323-S723 | 30i-B DeviceNet Master Function |
| A02B-0326-S723 | 31i-B5 DeviceNet Master Function |
| A02B-0327-S723 | 31i-B DeviceNet Master Function |
| A02B-0328-S723 | 32i-B DeviceNet Master Function |
| A02B-0333-J565#6579 | 35i-B DeviceNet - Control Software |
| A02B-0333-S723 | 35i-B DeviceNet Master Function |
| A02B-0334-J565#6579 | PM i-A DeviceNet - Control Software |
| A02B-0334-S723 | PM i-A DeviceNet Master Function |

**Notice**

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# 535
## Communication

# DeviceNet Adapter (Slave)

## Features

DeviceNet is one of the world's leading device-level networks for industrial automation. DeviceNet offers robust, efficient data handling because it is based on Producer/Consumer technology. This modern communications model offers key capabilities that allow the user to determine effectively what information is needed and when.

The specification of DeviceNet is managed by ODVA (Open DeviceNet Vendor Association).

The DeviceNet Adapter (Slave) function and the DeviceNet Adapter board provide an easy way to setup the installation and the connection of the CNC to popular PLCs and I/O devices using DeviceNet.

Specifications:

- Up to 128 byte of digital inputs and 128 bytes of digital output per slave
- Supports poll I/O connection and bit strobe I/O connection
- MAC ID can be selected between 0 to 63

## Benefits

- Connect to PLCs and machines by DeviceNet network
- Acceleration of the system installation and commissionning
- Improvement of machine flexibility and increase of the system efficiency / productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J302 | 30i/31i/32i-A DeviceNet Slave Board |
| A02B-0303-J565#6577 | 30i/31i/32i-A DeviceNet - Control Software |
| A02B-0303-S724 | 30i-A DeviceNet Slave Function |
| A02B-0306-S724 | 31i-A5 DeviceNet Slave Function |
| A02B-0307-S724 | 31i-A DeviceNet Slave Function |
| A02B-0308-S724 | 32i-A DeviceNet Slave Function |
| A02B-0319-J302 | 0i-D DeviceNet Slave Board |
| A02B-0319-J565#6578 | 0i-D DeviceNet - Control Software |
| A02B-0319-S724 | 0i-TD DeviceNet Slave Function |
| A02B-0320-S724 | 0i-MD DeviceNet Slave Function |
| A02B-0323-J302 | 30i/31i/32i/35i-B, PM i-A DeviceNet Slave Board |
| A02B-0323-J565#6579 | 30i/31i/32i-B DeviceNet - Control Software |
| A02B-0323-S724 | 30i-B DeviceNet Slave Function |

**Notice**

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| Specification | Description |
|---|---|
| A02B-0326-S724 | 31i-B5 DeviceNet Slave Function |
| A02B-0327-S724 | 31i-B DeviceNet Slave Function |
| A02B-0328-S724 | 32i-B DeviceNet Slave Function |
| A02B-0333-J565#6579 | 35i-B DeviceNet - Control Software |
| A02B-0333-S724 | 35i-B DeviceNet Slave Function |
| A02B-0334-J565#6579 | PM i-A DeviceNet - Control Software |
| A02B-0334-S724 | PM i-A DeviceNet Slave Function |

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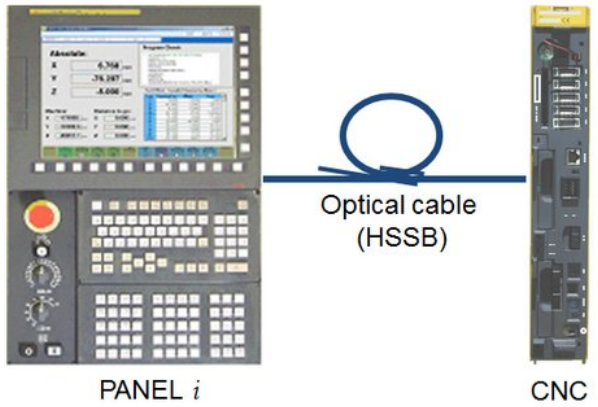
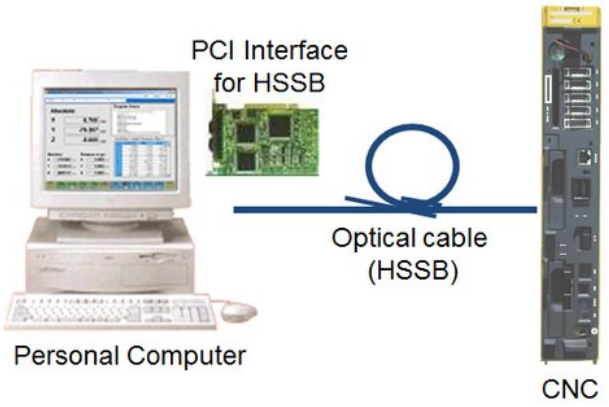
# 537
## Communication




**Notice**

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# High Speed Serial Bus (HSSB)

## Features

The FANUC HSSB (High Speed Serial Bus) is a FANUC proprietary communication protocol and hardware designed for point to point communication. It can be used to communicate between a CNC and a Panel i or between a CNC and a Personal Computer. The bus is mainly used within the "Open CNC" concept of FANUC.

The HSSB communication uses Fiber Optics cables as transmission media; it is therefore very robust and noise immune.

FANUC provides optional boards for certain CNC models and PCI cards for Personal Computers. The Panel i PC display units and recent FANUC CNC feature on-board HSSB ports.

Note:

- The PORT 2 function provides the capability to operate the same function on different hardware boards at the same time. Example: if the HSSB function and the HSSB PORT 2 function are specified, the HSSB function can be operated on different hardware boards at the same time.

Related functions:

- FOCAS / FOCAS 2
- Basic Operation Package 2
- Ladder Editing Package
- DNC Management Package
- CNC Screen Display Function

## Benefits

- Simple, robust and noise immune connection betwen CNC and Personnal Computers or Panel i
- Simplification of the integration of an "Open CNC" concept
- Improvement of machine flexibility and increase of the system efficiency / productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0207-J800 | 16i/18i/21i-A/B, PM i-D/H, 0i-C/D Extended Drivers and Libraries |
| A02B-0207-J900 | 30i/31i/32i-A, 30i/31i/32i/35i-B, PM i-A Extended Drivers and Libraries |
| A02B-0236-J202 | 16i/16i/21i-A/B LCD-Mounted Type - CNC Side HSSB Interface Board |
| A02B-0261-J101 | 15i-B - CNC Side HSSB Interface Board |
| A02B-0265-J200 | 16i/18i/21i-A/B Stand Alone Type - CNC Side HSSB Interface Board |
| A02B-0303-J202 | 30i/31i/32i-A - CNC Side HSSB Interface Board A |

| Specification | Description |
|---|---|
| A02B-0303-S749 | 30i-A FOCAS2 / HSSB PORT2 Function |
| A02B-0306-S749 | 31i-A5 FOCAS2 / HSSB PORT2 Function |
| A02B-0307-S749 | 31i-A FOCAS2 / HSSB PORT2 Function |
| A02B-0308-S749 | 32i-A FOCAS2 / HSSB PORT2 Function |
| A02B-0323-J202 | 30i/31i/32i-B - CNC Side HSSB Interface Board A |
| A02B-0323-S749 | 30i-B FOCAS2 / HSSB PORT2 Function |
| A02B-0326-S749 | 31i-B5 FOCAS2 / HSSB PORT2 Function |
| A02B-0327-S749 | 31i-B FOCAS2 / HSSB PORT2 Function |
| A02B-0328-S749 | 32i-B FOCAS2 / HSSB PORT2 Function |
| A08B-0088-J050 | 15i/16i/18i/21i-A/B - PC Side HSSB Interface Board, 1 Channel, PCI Bus |
| A20B-8001-0960 | 16i/18i/21i-B / 0i-C / PM-iD/iH - PC Side HSSB Interface Board Type 2, 2 Channels, PCI Bus |
| A20B-8001-0961 | 16i/18i/21i-B / 0i-C / PM-iD/iH - PC Side HSSB Interface Board Type 2, 1 Channel, PCI Bus |
| A20B-8101-0162 | 30i/31i/32i / 0i-D - PC Side HSSB Interface Board, 2 Channels, PCI Bus |
| A20B-8101-0163 | 30i/31i/32i / 0i-D - PC Side HSSB Interface Board, 1 Channel, PCI Bus |

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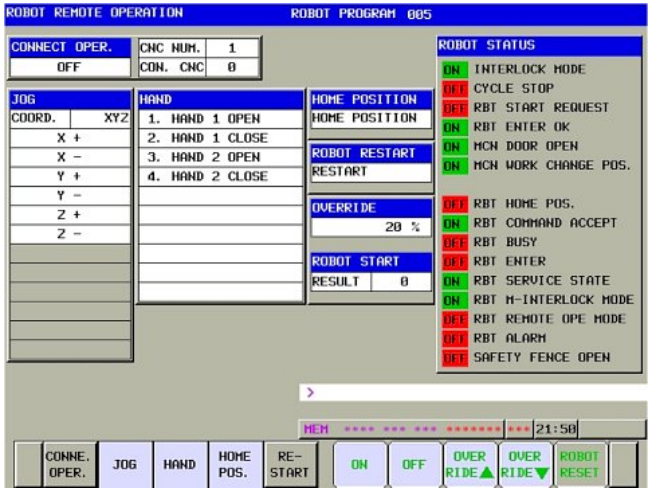
# 539

## Communication




# Robot Connection Function

## Features

A standard interface between a FANUC robot and any machine tool equipped with a FANUC CNC significantly reduces the integration time and cost. Simple customizable wizards built into the robot pendant step the integrator through the settings for the I/O interface, grippers, programs and positions.

FANUC robots and up to four FANUC CNCs can be easily connected into a system using Ethernet or I/O Link. Robot operation and monitoring can be performed through one of integrated FANUC CNC screens in a cell without entering the safety zone of the robot. Custom CNC screens can be quickly created by the integrator using FANUC Picture to simplify the cell operation. Similarly, screens on the robot pendant can also be used for complete CNC and robot system operation and monitoring.

NCGuidePro and ROBOGUIDE simulators can be used on a PC to test, debug and program the integrated system. The integrated simulation systems can be used to teach the robot accurate workpiece exchange positions. CNC part programs can be executed and the total system operation can be visualized.

The Robot Connection Function provides the following functionalities:

- Connection of CNC and Robot
- Display of the robot status and operation (jog robot axes in "joint" or "cartesian" modes, issue macro programs for gripper control, etc.) on the CNC screen
- Display of CNC status and operation (jog of the feed axes, adjustment of tool offsets) on the iPendant of the Robot

To speed up the setup of this function on both Robot and CNC, robot connection sample programs are provided; it includes FANUC PICTURE sample screens for robot remote operation for the CNC as well as ladder programs for the CNC and the Robot. All programs can be customised if required.

## Benefits

- Easy connection of FANUC CNC and robots
- Time saving during development and setup
- Improvement of the system efficiency
- Decrease of the Total Cost of Ownership (TCO)

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-R683 | 30i-A Robot Connection Function - Machine Tool Connection Function (A05B-2500-J984) Required on Robot Control |

**Notice**

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| Specification | Description |
|---|---|
| A02B-0306-R683 | 31i-A5 Robot Connection Function - Machine Tool Connection Function (A05B-2500-J984) Required on Robot Control |
| A02B-0307-R683 | 31i-A Robot Connection Function - Machine Tool Connection Function (A05B-2500-J984) Required on Robot Control |
| A02B-0308-R683 | 32i-A Robot Connection Function - Machine Tool Connection Function (A05B-2500-J984) Required on Robot Control |
| A02B-0319-R683 | 0i-TD Robot Connection Function - Machine Tool Connection Function (A05B-2500-J984) Required on Robot Control |
| A02B-0320-R683 | 0i-MD Robot Connection Function - Machine Tool Connection Function (A05B-2500-J984) Required on Robot Control |
| A02B-0323-R683 | 30i-B Robot Connection Function - Machine Tool Connection Function (A05B-2500-J984) Required on Robot Control |
| A02B-0326-R683 | 31i-B5 Robot Connection Function - Machine Tool Connection Function (A05B-2500-J984) Required on Robot Control |
| A02B-0327-R683 | 31i-B Robot Connection Function - Machine Tool Connection Function (A05B-2500-J984) Required on Robot Control |
| A02B-0328-R683 | 32i-B Robot Connection Function - Machine Tool Connection Function (A05B-2500-J984) Required on Robot Control |
| A02B-0333-R683 | 35i-B Robot Connection Function - Machine Tool Connection Function (A05B-2500-J984) Required on Robot Control |
| A02B-0334-R683 | PM i-A Robot Connection Function - Machine Tool Connection Function (A05B-2500-J984) Required on Robot Control |
| A08B-9510-J550 | 30i/31i/32i-A, 30i/31i/32i/35i-B, PM i-A, 0i-D Robot Connection Function Sample Programs |

**Notice**

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# 541
## Communication

# CC-Link Remote Device

## Features

The CC-Link Remote Device function and CC-Link board can be used to connect to the CNC to the CC-Link fieldbus of Mitsubishi Electric.

The CC-Link functions of the Series 30i/31i/32i–A/B can be operated as remote device stations (slave stations) and can communicate with control units compliant with CC-Link master stations.

Specification:

- Transfer rate (Baud rate): 156K/625K/2.5M/5M/10M bps.
- Station number: 1 to 64
- Number of occupied stations: 1 to 4
- Maximum transfer data size (when 4 stations are occupied):
    - Remote output RY: 16 bytes (128 bits), user area 14 bytes, system 2 bytes
    - Remote input RY: 16 bytes (128 bits), user area 14 bytes, system 2 bytes
    - Remote register RWw: 16 words (32 bytes)
    - Remote register RWr: 16 words (32 bytes)

Note:

- The CC-Link functions cannot be used simultaneously as the DeviceNet functions or the PROFIBUS-DP functions

## Benefits

- Connect to PLCs and equipment using CC-Link network
- Decrease of the time required to design and setup the system
- Improvement of machine flexibility and increase of the system efficiency / productivity

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0303-J320 | 30i/31i/32i-A CC-Link Remote Device Station Board |
| A02B-0303-J574#6590 | 30i/31i/32i-A CC-Link Remote Device - Control Software |
| A02B-0303-R954 | 30i-A CC-Link Remote Device Function |
| A02B-0306-R954 | 31i-A5 CC-Link Remote Device Function |
| A02B-0307-R954 | 31i-A CC-Link Remote Device Function |
| A02B-0308-R954 | 32i-A CC-Link Remote Device Function |
| A02B-0323-J320 | 30i/31i/32i/35i-B, PM i-A CC-Link Remote Device Station Board |
| A02B-0323-J574#6591 | 30i/31i/32i-B CC-Link Remote Device - Control Software |

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| Specification | Description |
|---|---|
| A02B-0323-R954 | 30i-B CC-Link Remote Device Function |
| A02B-0326-R954 | 31i-B5 CC-Link Remote Device Function |
| A02B-0327-R954 | 31i-B CC-Link Remote Device Function |
| A02B-0328-R954 | 32i-B CC-Link Remote Device Function |
| A02B-0333-J574#6591 | 35i-B CC-Link Remote Device - Control Software |
| A02B-0333-R954 | 35i-B CC-Link Remote Device Function |
| A02B-0334-J574#6591 | PM i-A CC-Link Remote Device - Control Software |
| A02B-0334-R954 | PM i-A CC-Link Remote Device Function |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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# 543
## CNC

# Software

This section groups all the different software products that are used when dealing with CNC systems such as

- Software for Operator Control (e.g. Manual Guide)
- Development Software (e.g. FANUC Ladder, C-Executor, ...)
- PC Opterating Software (e.g. Windows)
- HMI Software (e.g. FANUC Picture)

**Notice**

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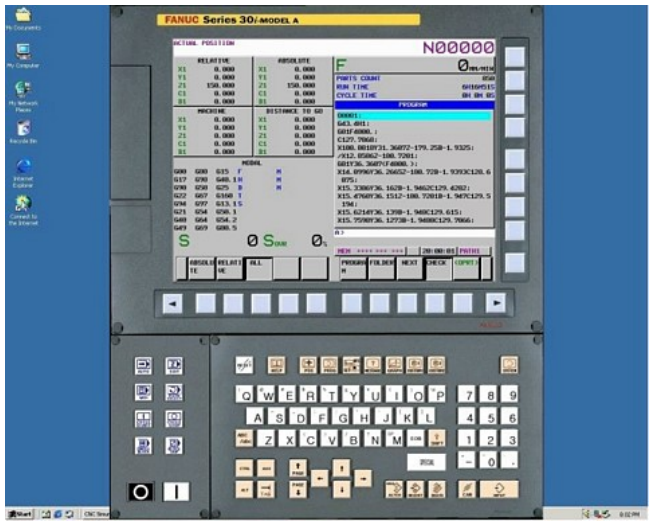


# NCGuide

## Features

NCGuide, NCGuide Academic Packages and NCGuidePro are FANUC's CNC software running on a PC. They are available with single or multiseat licences. This is the ideal solution for a dedicated training room or development team.

## NCGuide and NCGuide Academic Packages

NCGuide and NCGuide Academic Packages provide a realistic operation and part programming environment at a fraction of the cost of using a production machine tool. This translates into lower training costs. They support both conventional G-code programming, including canned cycles and custom macros, and FANUC's conversational programming, MANUAL GUIDE i.

Comprehension and retention is enhanced as students perform repetitive hands-on exercises in an ergonomically friendly environment - away from the noise of the factory floor. Operators, programmers, and maintenance engineers can all practice common procedures and develop optimized processes without risks to people, tooling or machines.

- The simulation emulates the CNC exactly, which means programs can be written, tested and optimized on the PC bringing productivity gains by working offline and keeping the machine in production.
- Simulators fit to a classroom situation and so both educational and industrial training is easily implemented resulting in better educated and highly motivated staff.

## NCGuidePro

NCGuidePro provides a superior software development environment for FANUC CNCs, by adding the PMC ladder and machine signal simulation capabilities, and support for the standard FANUC operator panel. When combined with other FANUC software development tools (FANUC LADDER III, FANUC PICTURE, C- and MACRO EXECUTER), NCGuidePro provides a more efficient development environment that an actual CNC.

## Version comparison

| Functionality | NCGuidePro | NCGuide | NCGuide Academic Packages |
|---|---|---|---|
| CNCs supported | Series 0i MODEL D<br>Series 30i-MODEL B<br>Series 31i-MODEL A/B<br>Series 31iL-MODEL B<br>Series 31iP-MODEL B<br>Series 35i-MODEL B | | |

**Notice**

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| Functionality | NCGuidePro | NCGuide | NCGuide Academic Packages |
|---|---|---|---|
| Support milling and turning | | Yes | |
| CNC operation | | Yes | |
| CNC part programming | | Yes | |
| MANUAL GUIDE i | | Yes | |
| Custom Macro | | Yes | |
| Axes/Paths | Per CNC specifications | | Lathes: 2-axes, 1 path<br>Mills: 3-axes, 1 path |
| Part program storage | Per CNC specifications | | 32kB |
| Operator panel | FANUC / Custom / Mini | Mini operator panel | |
| Software execution and development<br>• C-Executor | Yes | No | No |
| Software execution and development<br>• Macro Executor | Yes | Yes (without PMC) | No |
| PMC and related software execution and development<br>• PMC ladder<br>• FOCAS2<br>• FANUC PICTURE | Yes | No | No |

## Ordering Information

| Specification | Description |
|---|---|
| A08B-9010-J730#ZZ12 | FANUC NCGuide (CNC Model 30i-B, 31i-A/B, 32i-A/B, 35i-B, 31i-LB, 31i-PB, 0i/0i-Mate-D) - Simulation of CNC / MANUAL GUIDE i - 1 User (DVD) |
| A08B-9010-J731#ZZ12 | FANUC NCGuide (CNC Model 30i-B, 31i-A/B, 32i-A/B, 35i-B, 31i-LB, 31i-PB, 0i/0i-Mate-D) - Simulation of CNC / MANUAL GUIDE i - 10 Users (DVD) |
| A08B-9010-J732#ZZ12 | FANUC NCGuide (CNC Model 30i-B, 31i-A/B, 32i-A/B, 35i-B, 31i-LB, 31i-PB, 0i/0i-Mate-D) - Simulation of CNC / MANUAL GUIDE i - 20 Users (DVD) |
| A08B-9010-J733#ZZ12 | FANUC NCGuide (CNC Model 30i-B, 31i-A/B, 32i-A/B, 35i-B, 31i-LB, 31i-PB, 0i/0i-Mate-D) - Simulation of CNC / MANUAL GUIDE i - 30 Users (DVD) |
| A08B-9010-J740#ZZ12 | FANUC NCGuide (CNC Model 30i-B, 31i-A/B, 32i-A/B, 35i-B, 31i-LB, 31i-PB, 0i/0i-Mate-D) - Simulation of CNC / MANUAL GUIDE i - Upgrade - 1 User (DVD) |
| A08B-9010-J741#ZZ12 | FANUC NCGuide (CNC Model 30i-B, 31i-A/B, 32i-A/B, 35i-B, 31i-LB, 31i-PB, 0i/0i-Mate-D) - Simulation of CNC / MANUAL GUIDE i - Upgrade - 10 Users (DVD) |
| A08B-9010-J742#ZZ12 | FANUC NCGuide (CNC Model 30i-B, 31i-A/B, 32i-A/B, 35i-B, 31i-LB, 31i-PB, 0i/0i-Mate-D) - Simulation of CNC / MANUAL GUIDE i - Upgrade - 20 Users (DVD) |

**Notice**

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| Specification | Description |
|---|---|
| A08B-9010-J743#ZZ12 | FANUC NCGuide CNC Model 30i-B, 31i-A/B, 32i-A/B, 35i-B, 31i-LB, 31i-PB, 0i/0i-Mate-D) - Simulation of CNC / MANUAL GUIDE i - Upgrade - 30 Users (DVD) |
| A08B-9010-J750#ZZ12 | FANUC NCGuide / FANUC NCGuidePro (CNC Model 30i-B, 31i-A/B, 32i-A/B, 35i-B, 31i-LB, 31i-PB, 0i/0i-Mate-D) - Software Upgrade only (DVD without License Key) |

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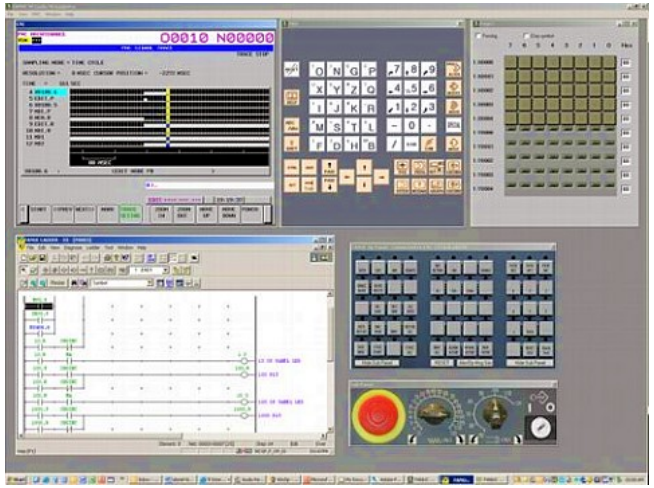

# NCGuidePro

## Features

NCGuide, NCGuide Academic Packages and NCGuidePro are FANUC's CNC software running on a PC. They are available with single or multiseat licences. This is the ideal solution for a dedicated training room or development team.

## NCGuide and NCGuide Academic Packages

NCGuide and NCGuide Academic Packages provide a realistic operation and part programming environment at a fraction of the cost of using a production machine tool. This translates into lower training costs. They support both conventional G-code programming, including canned cycles and custom macros, and FANUC's conversational programming, MANUAL GUIDE i.

Comprehension and retention is enhanced as students perform repetitive hands-on exercises in an ergonomically friendly environment - away from the noise of the factory floor. Operators, programmers, and maintenance engineers can all practice common procedures and develop optimized processes without risks to people, tooling or machines.

- The simulation emulates the CNC exactly, which means programs can be written, tested and optimized on the PC bringing productivity gains by working offline and keeping the machine in production.
- Simulators fit to a classroom situation and so both educational and industrial training is easily implemented resulting in better educated and highly motivated staff.

## NCGuidePro

NCGuidePro provides a superior software development environment for FANUC CNCs, by adding the PMC ladder and machine signal simulation capabilities, and support for the standard FANUC operator panel. When combined with other FANUC software development tools (FANUC LADDER III, FANUC PICTURE, C- and MACRO EXECUTER), NCGuidePro provides a more efficient development environment that an actual CNC.

## Version comparison

| Functionality | NCGuidePro | NCGuide | NCGuide Academic Packages |
|---|---|---|---|
| CNCs supported | Series 0i MODEL D<br>Series 30i-MODEL B<br>Series 31i-MODEL A/B<br>Series 31iL-MODEL B<br>Series 31iP-MODEL B<br>Series 35i-MODEL B | | |

**Notice**

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| Functionality | NCGuidePro | NCGuide | NCGuide Academic Packages |
|---|---|---|---|
| Support milling and turning | | Yes | |
| CNC operation | | Yes | |
| CNC part programming | | Yes | |
| MANUAL GUIDE i | | Yes | |
| Custom Macro | | Yes | |
| Axes/Paths | Per CNC specifications | | Lathes: 2-axes, 1 path<br>Mills: 3-axes, 1 path |
| Part program storage | Per CNC specifications | | 32kB |
| Operator panel | FANUC / Custom / Mini | Mini operator panel | |
| Software execution and development<br>• C-Executor | Yes | No | No |
| Software execution and development<br>• Macro Executor | Yes | Yes (without PMC) | No |
| PMC and related software execution and development<br>• PMC ladder<br>• FOCAS2<br>• FANUC PICTURE | Yes | No | No |

## Ordering Information

| Specification | Description |
|---|---|
| A08B-9010-J735#ZZ12 | FANUC NCGuidePro (CNC Model 30i-B, 31i-A/B, 32i-A/B, 35i-B, 31i-LB, 31i-PB, 0i/0i-Mate-D) - Simulation of CNC / MANUAL GUIDE i / PMC - 1 User (DVD) |
| A08B-9010-J736#ZZ12 | FANUC NCGuidePro (CNC Model 30i-B, 31i-A/B, 32i-A/B, 35i-B, 31i-LB, 31i-PB, 0i/0i-Mate-D) - Simulation of CNC / MANUAL GUIDE i / PMC - 10 Users (DVD) |
| A08B-9010-J737#ZZ12 | FANUC NCGuidePro (CNC Model 30i-B, 31i-A/B, 32i-A/B, 35i-B, 31i-LB, 31i-PB, 0i/0i-Mate-D) - Simulation of CNC / MANUAL GUIDE i / PMC - 20 Users (DVD) |
| A08B-9010-J738#ZZ12 | FANUC NCGuidePro (CNC Model 30i-B, 31i-A/B, 32i-A/B, 35i-B, 31i-LB, 31i-PB, 0i/0i-Mate-D - Simulation of CNC / MANUAL GUIDE i / PMC - 30 User (DVD) |
| A08B-9010-J745#ZZ12 | FANUC NCGuidePro (CNC Model 30i-B, 31i-A/B, 32i-A/B, 35i-B, 31i-LB, 31i-PB, 0i/0i-Mate-D) - Simulation of CNC / MANUAL GUIDE i / PMC - Upgrade - 1 User (DVD) |
| A08B-9010-J746#ZZ12 | FANUC NCGuidePro (CNC Model 30i-B, 31i-A/B, 32i-A/B, 35i-B, 31i-LB, 31i-PB, 0i/0i-Mate-D) - Simulation of CNC / MANUAL GUIDE i / PMC - Upgrade - 10 Users (DVD) |
| A08B-9010-J747#ZZ12 | FANUC NCGuidePro (CNC Model 30i-B, 31i-A/B, 32i-A/B, 35i-B, 31i-LB, 31i-PB, 0i/0i-Mate-D) - Simulation of CNC / MANUAL GUIDE i / PMC - Upgrade - 20 Users (DVD) |

**Notice**

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| Specification | Description |
|---|---|
| A08B-9010-J748#ZZ12 | FANUC NCGuidePro (CNC Model 30i-B, 31i-A/B, 32i-A/B, 35i-B, 31i-LB, 31i-PB, 0i/0i-Mate-D) - Simulation of CNC / MANUAL GUIDE i / PMC - Upgrade - 30 Users (DVD) |
| A08B-9010-J750#ZZ12 | FANUC NCGuide / FANUC NCGuidePro (CNC Model 30i-B, 31i-A/B, 32i-A/B, 35i-B, 31i-LB, 31i-PB, 0i/0i-Mate-D) - Software Upgrade only (DVD without License Key) |

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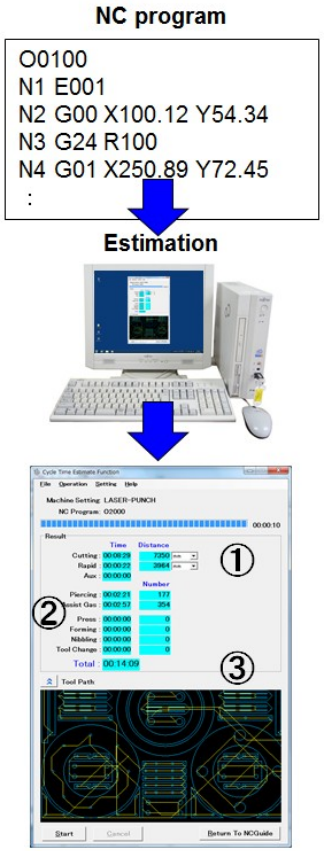
# 550
## Software




# Cycle time estimation function for NCGuide / NCGuidePro

## Features

The Cycle Time Estimation Function is a Personal Computer tool that can quickly estimate the machining cycle time of NC program. With this function, the following estimations are delivered by the software (refer to illustration):

- Travel distance (1)
- Cycle time (2)
- Path drawing (3)

## Key highlights

- The accuracy of the estimation made is higher than estimations made with 3rd party software; the reason of this higher accuracy is that the cycle time is calculated including the acceleration / deceleration
- The target program can be selected and the NC parameter can be set as on a real machine and CNC using NCGuide / NCGuidePro
- The machining time of a complex program can be estimated, for example from a 5-axis machining cycle

## Details of the estimated data

Because not only the entire cycle time of specified NC program but also time of rapid traverse and cutting, as well as distance are calculated, the tool provides a very efficient method to optimize machining cycles, decrease the processing time and extend the tool life.

The Estimation Function is available for the program of machining center and one path and provides the following details:

- Entire processing time
- Rapid traverse time
- Cutting feed time (calculated with the time of acceleration / deceleration but without taking in consideration the lag provided by the servo motors, the spindle and the machine time)
- Processing time of miscellaneous functions (the total of the time of each M/S/T/B code set beforehand is multiplied at the entire processing time
- Macro processing time (Custom Macro and Execution Macro can be executed except that the macro processing time is not included in the entire processing time)
- Rapid traverse distance
- Cutting feed distance (traveled distance of the tool center point is calculated)

**Notice**

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# 551

## Supported CNC

Series 30i/31i/32i-MODEL B

## Accuracy

The accuracy of the estimation time depends on many factors, but essentialy is linked to the type of machining process. The estimation reaches a higher accuracy under the following conditions:

- When the processing time of the estimated machining duration is longer
- When the ratio of cutting and rapid traverse is higher
- When the ratio of miscellaneous function is lower

## Benefits

- Optimization of machining cycles (reduction of time, increase of accuracy and reduction of tool wear)
- Increase of the machine productivity
- Reduction of trials with real cutting, especially for expensive materials

## Ordering Information

| Specification | Description |
|---|---|
| A08B-9010-J753#ZZ12 | Cycle Time Estimate Function (DVD) |

**Notice**

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# NCGuide Academic

## Features

NCGuide, NCGuide Academic Packages and NCGuidePro are FANUC's CNC software running on a PC. They are available with single or multiseat licences. This is the ideal solution for a dedicated training room or development team.

## NCGuide and NCGuide Academic Packages

NCGuide and NCGuide Academic Packages provide a realistic operation and part programming environment at a fraction of the cost of using a production machine tool. This translates into lower training costs. They support both conventional G-code programming, including canned cycles and custom macros, and FANUC's conversational programming, MANUAL GUIDE i.

Comprehension and retention is enhanced as students perform repetitive hands-on exercises in an ergonomically friendly environment - away from the noise of the factory floor. Operators, programmers, and maintenance engineers can all practice common procedures and develop optimized processes without risks to people, tooling or machines.

- The simulation emulates the CNC exactly, which means programs can be written, tested and optimized on the PC bringing productivity gains by working offline and keeping the machine in production.
- Simulators fit to a classroom situation and so both educational and industrial training is easily implemented resulting in better educated and highly motivated staff.

## NCGuidePro

NCGuidePro provides a superior software development environment for FANUC CNCs, by adding the PMC ladder and machine signal simulation capabilities, and support for the standard FANUC operator panel. When combined with other FANUC software development tools (FANUC LADDER III, FANUC PICTURE, C- and MACRO EXECUTER), NCGuidePro provides a more efficient development environment that an actual CNC.

## Version comparison

| Functionality | NCGuidePro | NCGuide | NCGuide Academic Packages |
|---|---|---|---|
| CNCs supported | Series 0i MODEL D<br>Series 30i-MODEL B<br>Series 31i-MODEL A/B<br>Series 31iL-MODEL B<br>Series 31iP-MODEL B<br>Series 35i-MODEL B | | |

**Notice**

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| Functionality | NCGuidePro | NCGuide | NCGuide Academic Packages |
|---|---|---|---|
| Support milling and turning | | Yes | |
| CNC operation | | Yes | |
| CNC part programming | | Yes | |
| MANUAL GUIDE i | | Yes | |
| Custom Macro | | Yes | |
| Axes/Paths | Per CNC specifications | | Lathes: 2-axes, 1 path<br>Mills: 3-axes, 1 path |
| Part program storage | Per CNC specifications | | 32kB |
| Operator panel | FANUC / Custom / Mini | Mini operator panel | |
| Software execution and development<br>• C-Executor | Yes | No | No |
| Software execution and development<br>• Macro Executor | Yes | Yes<br>(without PMC) | No |
| PMC and related software execution and development<br>• PMC ladder<br>• FOCAS2<br>• FANUC PICTURE | Yes | No | No |

## Ordering Information

| Specification | Description |
|---|---|
| A08B-9010-J751#ZZ12 | FANUC NCGuide Academic Package (Classroom) - License for 16 PCs Connected to Network (DVD) |
| A08B-9010-J752#ZZ12 | FANUC NCGuide Academic Package (Student) - License for 1 PC Not Connected to Network, Valid for 1 Year (DVD) |

**Notice**

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# FANUC Ladder-III

## Features

FANUC LADDER-III is the standard programming system for developing, diagnosing and maintaining sequence programs for CNC PMC ladder, FANUC's integrated PLC.

## Key functions

- Creating, displaying, editing and printing ladder sequence programs
- Monitoring and debugging ladder sequence programs
- Support of the creation, debugging and management of Function Blocks
- Program monitoring
- PMC signal status display
- PMC signal trace
- Writing to flash ROM
- Connection to the CNC via Ethernet
- Works with NCGuidePro on one or multiple PCs

## Supported PMC Types

- CNC Series 30i/31i/32i/35i-MODEL Band Power Motion i-MODEL A (refer to the PMC Programming Manual B-64513EN)
- CNC Series 30i/31i/32i-MODEL A (refer to the PMC Programming Manual B-63983EN)
- CNC Series 0i-MODEL D, and Series 0i Mate-MODEL D (refer to PMC Programming Manual B-64393EN)
- Legacy PMC systems MODEL PA1 / PA3 / SA1 / SA2 / SA3 / SA5 / SB / SB2 / SB3 / SB4 / SB5 / SB6 / SB7 / SC / SC3 / SC4 / NB / NB2 / NB6 (refer to the Ladder Language Programming Manual B-61863E)

## Benefits

- Creation of the machine PMC program, startup and debug
- Modification of the PMC program to follow machine and production evolution
- Rich maintenance and diagnostics capabilities of the PMC and machine control

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0200-K814 | RS232C Cable for Programm Transmission and Online Monitor: PC (SUB-D 9 Pins) <--> Punch Panel (SUB-D 25 Pins), Length 7 m |

**Notice**

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| Specification | Description |
|---|---|
| A08B-9210-J505 | FANUC LADDER III - for Windows 95 / 98 / NT 4.0 / 2000 / XP / Vista / 7 (32-Bit), Release 6.3 or later |
| A08B-9210-J506 | FANUC LADDER III - Upgrade of FANUC LADDER III A08B-9210-J505 - for Windows 95 / 98 / NT 4.0 / 2000 / XP / Vista / 7 (32-Bit) |
| A08B-9210-J507 | FANUC LADDER III - for Windows 95 / 98 / NT 4.0 / 2000 / XP / Vista / 7 (32-Bit) - 5 User Licences |
| A08B-9210-J508 | FANUC LADDER III - Upgrade of FANUC LADDER III A08B-9210-J507 - for Windows 95 / 98 / NT 4.0 / 2000 / XP / Vista / 7 (32-Bit) - 5 User Licences |

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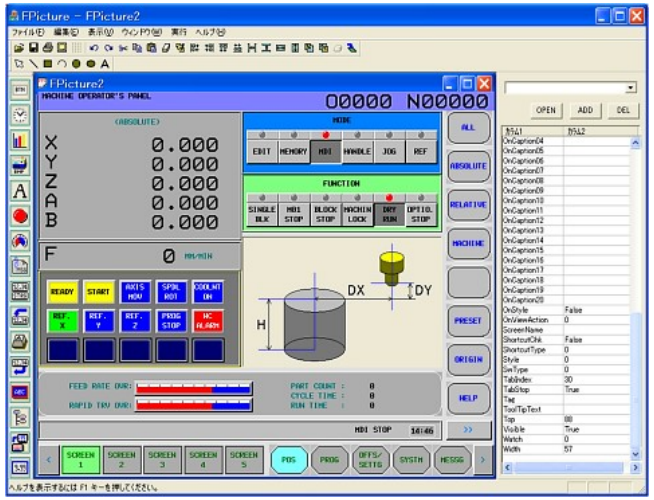
# 556
## Software




# FANUC PICTURE

## Features

The FANUC PICTURE software provides a rich set of functions and tools to design and implement customized Human Machine Interfaces (HMI) on the FANUC CNC.

The projects created by FANUC PICTURE are compiled to a format that can be executed directly by the CNC and displayed on the standard LCD screen without requiring additional Personnal Computer display.

Key functions

- Support of many screen sizes and resolutions
- Support of touch screens, including virtual keypads
- WYSIWYG editor
- Rich set of controls such as keys, switches, push buttons, touch buttons, lamps, scales, etc.
- Many parameters can be adjusted for each of the objects
- No need to program, just draw and parameter
- Support of multi-language HMI application
- Easy import-export of projects, variables, descriptions and translations
- Script language (scheduled or event driven) to execute complex tasks

Supported CNC

- Series 30i/31i/32i-MODEL A/B and Series 35i-MODEL B CNC
- Power Motion i-MODEL A
- Series 0i-MODEL C and Series 0i-MODEL D CNC
- Series 16i/18i/21i-MODEL A/B CNC
- Power Mate i-MODEL D and Power Mate i-MODEL H CNC

## Benefits

- Creation of customized HMI on the FANUC CNC
- Powerful HMI without the requirement of PC hardware
- Simple modification of the HMI to follow machine and production evolution

## Ordering Information

| Specification | Description |
|---|---|
| A08B-9010-J514#ZZ11 | FANUC PICTURE for Windows, Japanese / English, CD-ROM |
| A08B-9010-J518#ZZ11 | FANUC PICTURE for Windows, CD-ROM - Development of Machine Operation Screens |

**Notice**

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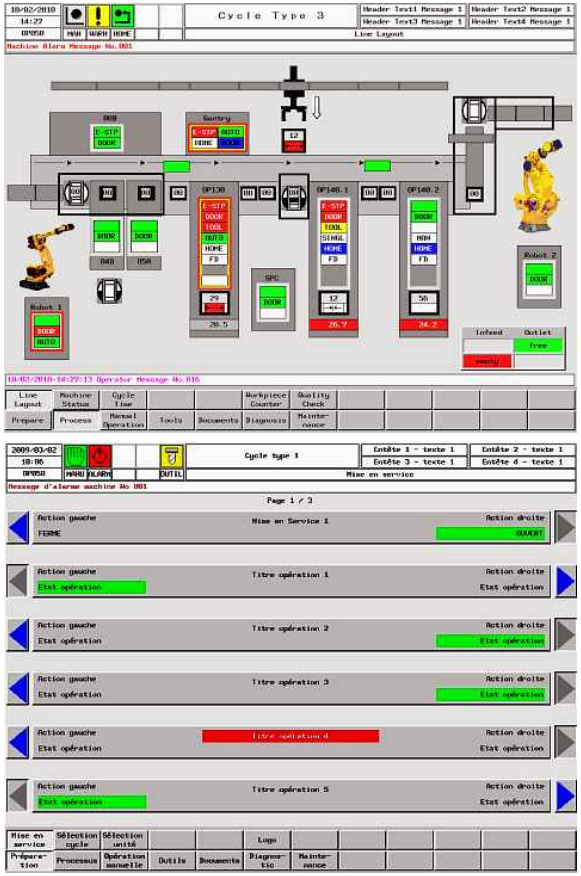
# 557
## Software



**Notice**

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# FANUC Auto HMI-NC disk

## Features

FANUC Auto HMI-NC is an application composed of a set of HMI templates, objects, tables and scripts to create standardized user interfaces in automotive applications or machining applications producing large batches of products.

Refer to the "FANUC Auto HMI-NC" section of this catalogue for further information about this application.

The disk contains the template files for various configurations and screen sizes, variable maps as well as documentation.

## Benefits

- Powerfull ready-made application templates and variable tables
- Customizable through FANUC PICTURE

## Ordering Information

| Specification | Description |
|---|---|
| A08B-9010-J519#ZZ11 | FANUC Auto HMI-NC, CD-ROM - Development of Machine Operation Screens |
| A08B-9010-J524#ZZ11 | FANUC Auto HMI/T, CD-ROM - Development of Machine Operation Panel Screens |
| A08B-9510-J931 | FANUC Auto HMI PC Application for Proficy Machine Edition - Standard |
| A08B-9510-J932 | FANUC Auto HMI PC Application for Proficy Machine Edition - GM/Mexico |

# MACRO compiler and library

## Features

Some NC programs such as technology functions or programs created using custom macros do not need to be modified once created. Other NC programs, such as machining programs, evolve during machining.

The Macro Executor function can convert a Custom Macro program created by the machine tool builder to an executable macro program, load the executable macro program (P-CODE macro) into F-ROM (CNC Flash Memory), and execute it.

The function which converts a Custom Macro program to an Executable Macro program is called the Macro Compiler. The function which reads and executes a P-CODE macro is called the Macro Executor.

## Key functions

- High execution speed of the code, since a custom macro program is loaded after conversion and compilation to an executable so that the machining time can be reduced and the machining precision can be improved.
- Custom Macro used in Technology Modules cannot be destroyed because they are loaded into the FROM (CNC Flash Memory)
- A program converted to execution format is not displayed on the program screen, so that the know-how and the technology can be protected
- An execution format macro program is registered in the F-ROM, so that the program storage space can be efficiently used
- The user can call the execution format macro program with an easy call procedure without being conscious of the complexity of the program itself
- Custom screens can be created using the graphic display functions
- Extension of the CNC control function set (machining functions, interactive screens, RS232 (reader/puncher) interface control, PMC data read/write , etc.)

## Benefits

- Creation of customized functions and programs
- Modification of Macro Programs to follow machine and production evolution
- Powerful programming language for machining or machine management purpose

## Ordering Information

| Specification | Description |
|---|---|
| A08B-9001-J809#ZZ07 | MANUAL GUIDE - Macro Library, Object Format |
| A08B-9001-J843#ZZ07 | MANUAL GUIDE 0i - Macro Library, Operation Improved Version, CNC Series 0i-M/0i-Mate-M |
| A08B-9001-J844#ZZ07 | MANUAL GUIDE 0i - Macro Library, Operation Improved Version, CNC Series 0i-T/0i-Mate-T |

**Notice**

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| Specification | Description |
|---|---|
| A08B-9010-J601#ZZ11 | Macro Library - CNC Series 30i/31i/32i (CD-ROM) |
| A08B-9010-J603#ZZ11 | Macro Library - CNC Series 0i-D / 0i-Mate-D |
| A08B-9010-J604#EN11 | Macro Compiler, CNC Series 30i/31i/32i, 0i-D/0i-Mate-D |
| A08B-9010-J607#ZZ11 | Macro Library - CNC Series Power Motion i-A (DVD) |

**Notice**

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# 560
## Software

# C-language Library for C-language Executor

## Features

FANUC CNC provides a powerful set of tools to allow custom software developed in C (using special libraries) to access the CNC functions.

Using the C-Language Executor functionality it is possible to develop customized CNC screens and powerful Human Machine Interfaces (HMI).

It is also possible to add new functionality to the CNC, as well as machine control functions written in C.

## Benefits

- Creation of customized functions and programs using C-Language
- Modification of Macro Programs to follow machine and production evolution
- Powerful programming language for machining or machine management purpose

## Ordering Information

| Specification | Description |
|---|---|
| A08B-9001-J702#ZZ11 | C-Language Library for C-Language Executor - CD-ROM - Replaces A08B-9001-J700/EN07 |
| A08B-9010-J610#ZZ11 | C-Language Library for C-Language Executor - CNC Series 30i/31i/32i |
| A08B-9010-J611#ZZ11 | C-Language Library for C-Language Executor - CNC Series 0i-D / 0i-Mate-D |
| A08B-9010-J613#ZZ11 | C-Language Library for C-Language Executor - CNC Series Power Motion i-A |
| A08B-9210-J719#ZZ11 | C-Language Executor Library ( for Conversion from PMC C-Language ) |

**Notice**

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# 561
## Software

# FANUC Customize assist

## Features

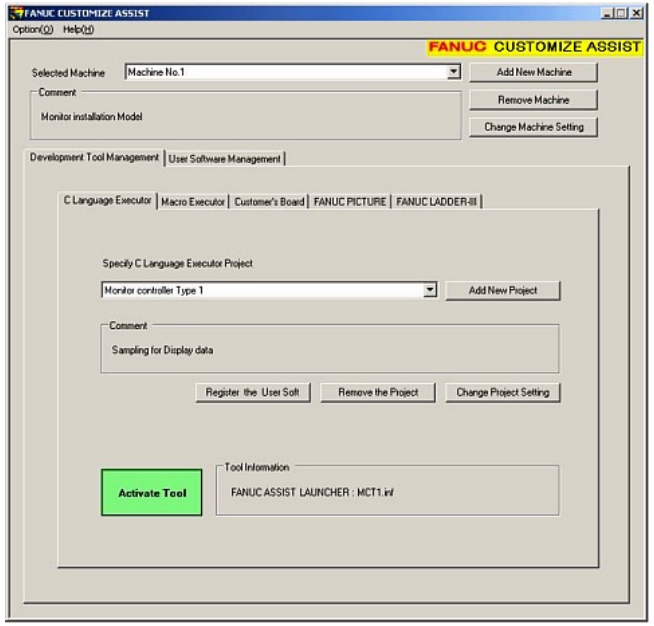
The FANUC Customize Assist tool simplifies the management of software development for a given machine or project. It provides a launcher for the different customization tools provided by FANUC and also a management capabilities for the different files and programming ressources.

## Benefits

- Simplification of the management of complex projects
- All tools required are easily accessible from a launcher
- Ease of the files, data and ressources management

## Ordering Information

| Specification | Description |
|---|---|
| A08B-9010-J550#ZZ11 | FANUC Customize Assist - CNC Series 30i/31i/32i-A |

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# 562

## Software

# FOCAS 1/2 Library disk

## Features

FOCAS (FANUC Open CNC API Specification) is the protocol used to be able to interact with the FANUC CNC from an external Personal Computer (PC).

The FOCAS library provides all required functions to be able to develop Windows® applications which can communicate with a FANUC CNC via either Ethernet or HSSB (fiber optics).

## Key functions

- Reading/writing data related to controlled axes/spindle
- Operations related to CNC program
- Reading/writing CNC file data
- Reading/writing tool life management data
- Reading history data
- Reading servo/spindle data
- Reading/writing data related to Data Server, DNC1, DNC2, OSI-Ethernet (HSSB version only)
- Reading/writing waveform diagnosis data
- Reading/writing data related to PUNCH PRESS CNC
- Reading/writing data related to LASER CNC
- Reading/writing data related to servo learning data (HSSB version only)
- Reading/writing of other data (diagnostic data, alarm information, operator messages,etc.)
- Reading/writing data related to PMC
- Reading/writing data related to PROFIBUS-DP

## Benefits

- Creation of customized functions and applications under Windows®
- Modification of Macro Programs to follow machine and production evolution
- Easy access to many ressources of the FANUC CNC to create advanced applications

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0207-K737 | FOCAS 1/2 Library Disk, CD-ROM |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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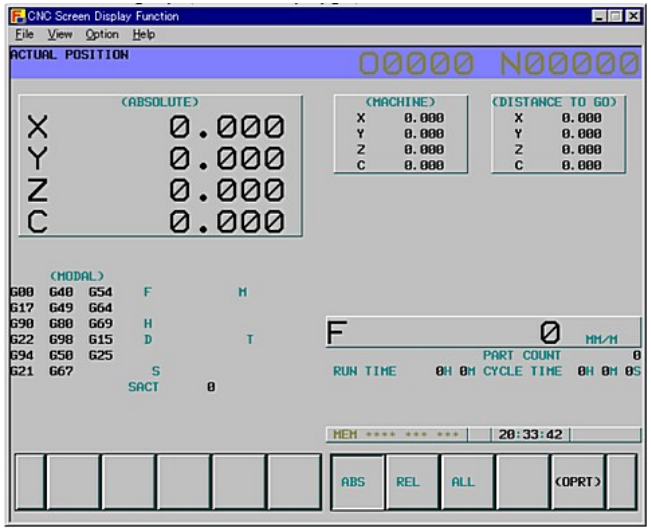
# 563
## Software




# CNC Screen Display Function (SDF)

## Features

The CNC Screen Display Function (SDF) Windows® application provides a straight-forward emulation of the CNC screen. The CNC can be connected to the PC running the SDF application via Ethernet or HSSB.

Because of the special structure of the SDF application, it is not necessary to update SDF if some new functions are added to the CNC. This makes SDF the best tool for CNC maintenance and setup on Open CNC systems.

## Benefits

- Simplified access to the CNC screen from a Personal Computer
- Simple and efficient remote maintenance tool

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0207-J857 | Windows CE.NET 4.1 / 4.2 - CNC Screen Display Function (SDF) |
| A02B-0207-J858 | CNC Screen Display Function - Specify "Extended Drivers and Libraries" for HSSB Connection, or Specify "Ethernet Function" for Fast Ethernet Connection |
| A02B-0207-J859 | Windows CE 4.2 / Windows CE 6.0 Embedded - CNC Screen Display Function, Enhanced GUI Function |
| A02B-0207-K775 | CNC Screen Display Function Disk, CD-ROM (HSSB) - Specify for Each PANEL i when Using SDF via HSSB |
| A02B-0207-K776 | CNC Screen Display Function Disk, CD-ROM (Ethernet) - Specify for Each PANEL i or PC when Using SDF via Ethernet |

**Notice**

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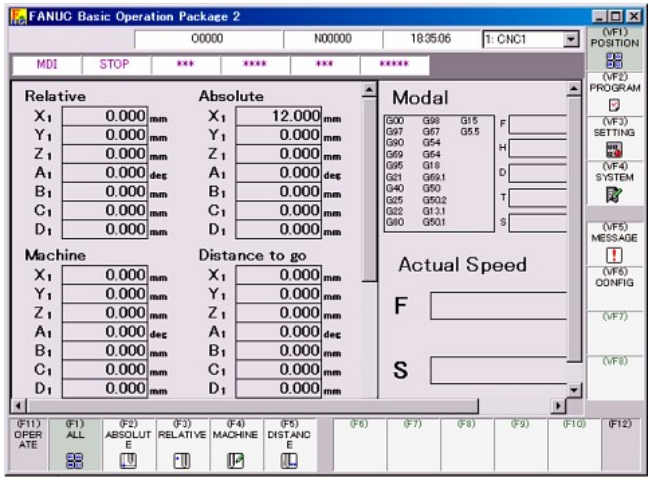
# Basic Operation Package (BOP)




## Features

The Basic Operation Package (BOP) is a native Windows® software which allows the CNC operations on a PC.

It offers the same comfort and operability in order that users of FANUC CNC can quickly become familiar with the system. BOP can be customized to even increase the operability and efficiency and match the machine requirement. Screens can be added, modified or removed.

BOP is designed to be used with a Personal Computer display connected via HSSB or Ethernet to a FANUC CNC.

## Note

- BOP 1 is based on ActiveX® technology and is available for the legacy CNC systems of the Series 16-MODEL C or the Series 16i-MODEL A/B family.
- BOP 2 is based on Microsoft® .NET Framework®. BOP 2 screens can be created / modified using simple XML configuration. It is available for the Series 30i-MODEL A/B CNC Family and the Series 0i-MODEL D CNC Family. It is also usable on the legacy CNC Series 16-MODEL C and Series 16i-MODEL A/B family.

## Benefits

- Simplified implementation of the CNC operation for a Personal Computer
- Simple and efficient customization

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0207-K755 | Basic Operation Package 2 - HSSB / Ethernet, CD-ROM - BOP 2 (Enhanced Step 2) |
| A02B-0207-K757 | Basic Operation Package 1 - FOCAS 1 / Ethernet, CD-ROM |

**Notice**

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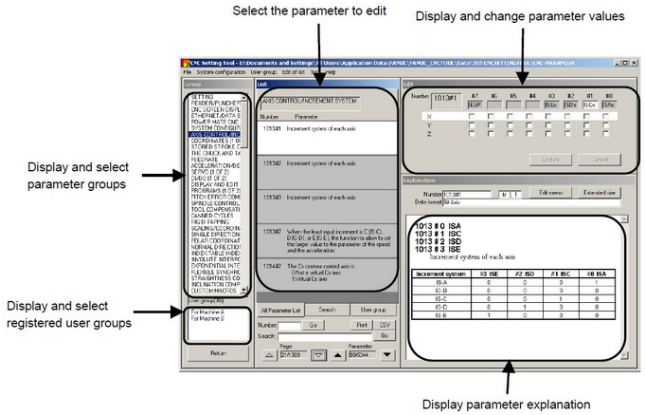
# 565
## Software




# CNC setting tool

## Features

CNC Setting tool is a Windows® application that can be used to display and edit CNC parameter files on Personal Computer.

Parameter files are managed by the included File Management function.

## Key functions

- Display and edit of a parameter file
- All parameters can be displayed in order
- Parameters can be displayed in the order of function
- Explanation of selected parameters
- Range check when changing limited parameters
- Comparison of master file and edited file
- Management of parameter files operated by CNC setting tool (Copy, Delete)
- Transfer of parameter files between CNC and PC (Ethernet or Memory card)
- Extract parameters and save them to the file
- Combine parameter files to create new parameter file

## Benefits

- Simplified management of the CNC parameter setting
- Increase of the efficiency in managing multiple machine seetings

## Ordering Information

| Specification | Description |
|---|---|
| A08B-9510-J531 | CNC Setting Tool - for CNC Parameter Setting via PC, Loading Data via Memory Card or via PC with Ethernet Link to CNC |
| A08B-9510-J532 | CNC Setting Tool - Upgrade of CNC Setting Tool A08B-9510-J531 |
| A08B-9510-J535 | CNC Setting Tool - Parameter Module Management Function - CNC Setting Tool A08B-9510-J531 or CNC Setting Tool Upgrade A08B-9510-J532 is Required |

**Notice**

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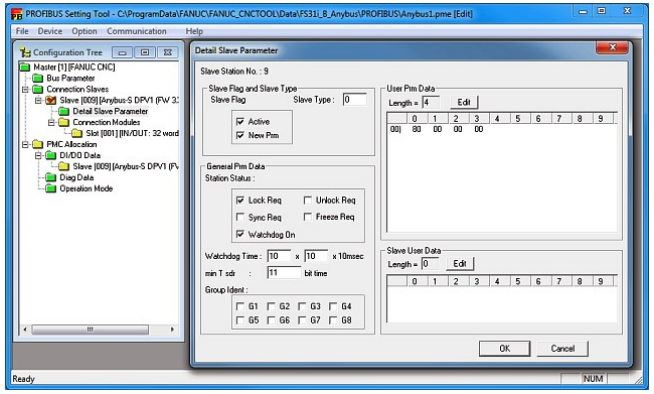


# PROFIBUS setting tool

## Features

The PROFIBUS Setting Tool is a Windows® application used to efficiently set PROFIBUS parameters in the CNC from a Personal Computer. The tool simplifies the management of large PROFIBUS network sets.

This software tool can generate PROFIBUS parameters for the CNC using the definition-data file of a slave devices (GSD files supplied by the device vendor). The generated parameters are transferred to the CNC via Ethernet.

## Benefits

- Simplified management of PROFIBUS network settings
- Increase of the efficiency in managing multiple machine seetings and large networking projects

## Ordering Information

| Specification | Description |
|---|---|
| A08B-9510-J530 | PROFIBUS DP Setting Tool |
| A08B-9510-J538 | PROFIBUS DP Setting Tool - Upgrade of PROFIBUS DP Setting Tool A08B-9510-J530 |

**Notice**

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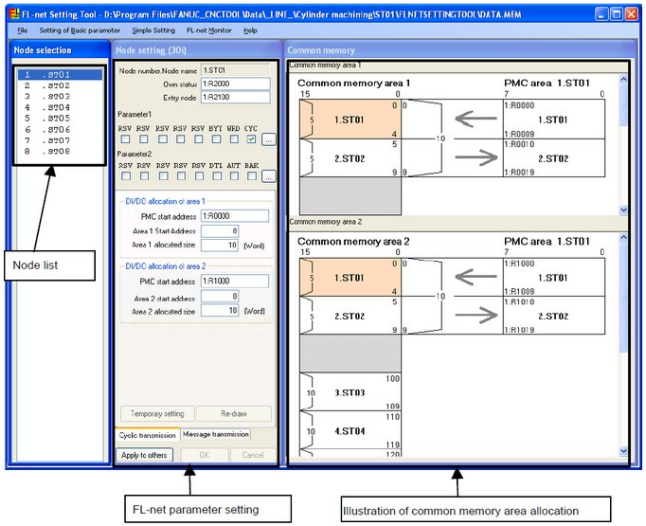
# 567
## Software




# FL-net setting tool

## Features

The FL-net Setting Tool is a Windows® application used to efficiently set FL-net parameters in the CNC from a Personal Computer. The tool simplifies the management of large FL-net network sets.

This software tool can generate FL-net parameters for the CNC using configuration screens, especially focused on providing a clear definition of the shared memory across the different devices. The generated parameters are transferred to the CNC via Ethernet.

## Benefits

- Simplified management of FL-net network settings
- Increase of the efficiency in managing multiple machine seetings and large networking projects

## Ordering Information

| Specification | Description |
|---|---|
| A08B-9510-J536 | FL-Net Setting Tool |
| A08B-9510-J537 | FL-Net Setting Tool - Upgrade of FL-Net Setting Tool A08B-9510-J536 |

**Notice**

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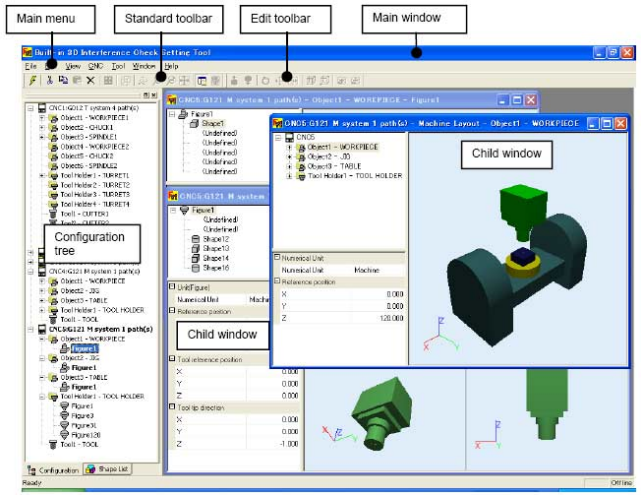
# Built-in 3D Interference Check Setting Tool




## Features

The Build-in 3D Interference Check Setting Tool is a Windows® application that allows the setting of the Series 30i/31i Built-In 3D Interference Check functions through a Personal Computer

Key functions

- Creation, setting and display of the 3D objects and figures representing the work piece, the fixtures and the tools
- Object moving and axis settings
- Real-time 3D interference check monitoring
- Setting of the NC parameters 10931 to 10958 related to the Built-In 3D Interference Check Function

## Benefits

- Simplified management of the 3D Interference Check Project
- Import of 3D shapes to accelerate the setup
- Increase of the efficiency in managing multiple machine seetings and large projects
- Simplified startup through online functions

## Ordering Information

| Specification | Description |
|---|---|
| A08B-9010-J726#ZZ11 | Built-in 3-D Interference Check Setting Tool |

**Notice**

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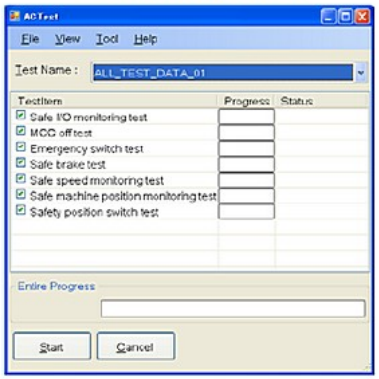
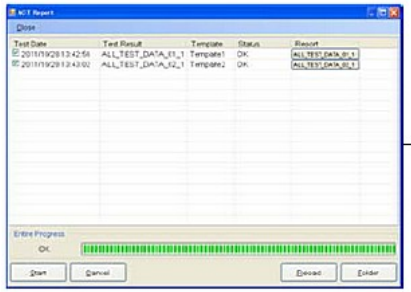
# 569
## Software

Test running screen




Report making screen



Report

# Acceptance test assist tool

## Features

The Acceptance Test Assit Tool is a Windows® application running on a Personal Computer which can assist the machine builder during the acceptance test procedure of Dual Check Safety through automated tests and report generation. This application provides the following two functions:

- Execution of the acceptance tests connected to the CNC
- Generation of test reports for the test result to create the final test certificate

The application provides a set of templates to enter the required data and generates a report which can be then further enhanced with Microsoft® Word (.docx format).

## Note

- To use this tool, the “Dual Check Safety” and “Test Mode of Acceptance Test” functions are required in the CNC (refer to the "Function" section of this catalogue for additional information)
- This application supports a connection to the CNC with either HSSB or Ethernet
- In order to control certain signals, a PMC sequence program must be created

## Benefits

- Decrease of the time required to proceed the Dual Check Safety acceptance test
- Automated generation of key report data to save time on the redaction of the final acceptance test documents

## Ordering Information

| Specification | Description |
|---|---|
| A08B-9010-J702#ZZ12 | Dual Check Safety - Acceptance Test Assist Tool |

**Notice**

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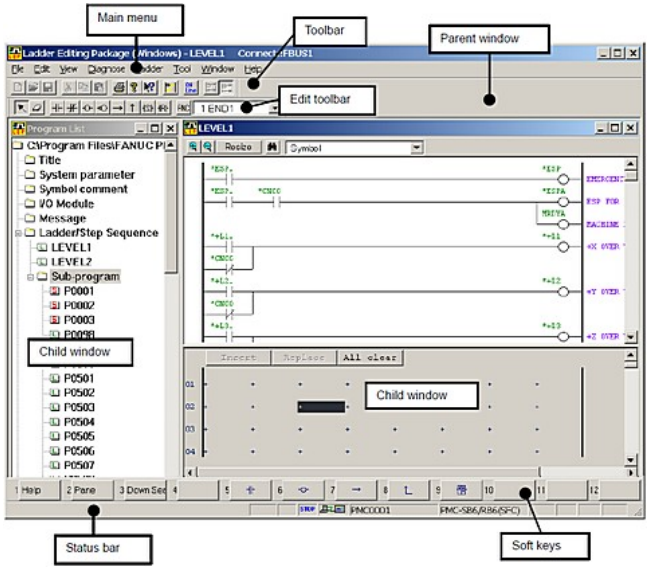
# 570

## Software




# Ladder Editing Package execute files

## Features

LADDER EDITING PACKAGE is a programming system for developing, diagnosing and maintaining sequence programs for CNC PMC ladder, FANUC's integrated PLC.

The LADDER EDITING PACKAGE has been designed as a Windows® application which can reside on the Personal Computer display unit connected to a FANUC CNC (Open CNC).

## Key functions

- Creating, displaying, editing and printing ladder sequence programs
- Monitoring and debugging ladder sequence programs
- Program monitoring
- PMC signal status display
- PMC signal trace
- Writing to flash ROM
- Connection to the CNC via Ethernet
- Works with NCGuidePro on one or multiple PCs

## Supported PMC Types

- CNC Series 30i/31i/32i/35i-MODEL Band Power Motion i-MODEL A (refer to the PMC Programming Manual B-64513EN)
- CNC Series 30i/31i/32i-MODEL A (refer to the PMC Programming Manual B-63983EN)
- CNC Series 0i-MODEL D, and Series 0i Mate-MODEL D (refer to PMC Programming Manual B-64393EN)
- Legacy PMC systems MODEL PA1 / PA3 / SA1 / SA2 / SA3 / SA5 / SB / SB2 / SB3 / SB4 / SB5 / SB6 / SB7 / SC / SC3 / SC4 / NB / NB2 / NB6 (refer to the Ladder Language Programming Manual B-61863E)

## Benefits

- Creation of the machine PMC program, startup and debug
- Modification of the PMC program to follow machine and production evolution
- Rich maintenance and diagnostics capabilities of the PMC and machine control

**Notice**

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# Ordering Information

| Specification | Description |
|---|---|
| A08B-9210-J511 | FANUC LADDER Editing Package - CD-ROM Containing Executable Files for Windows 95 / 98 / NT 4.0 / 2000 / XP / 7 (32-Bit) |

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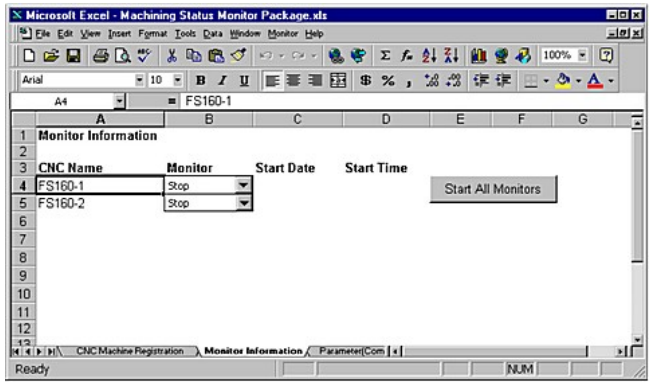
Software




# Machining status monitor package disk

## Features

The Machining Status Monitor Package provides a simple connection capability between the CNC and Microsoft® Excel.

## Key functions

- The machining status monitor package outputs the logging data in the form of Microsoft Excel. All the functions of Excel can be used (spreadsheet functions or charts).
- The running results of the program and the number of processed parts can be monitored and output as the logging data.
- The data acquired from the CNC machine and the logging data output can be customized
- Maximum number of CNC machines that canb be monitored: up to 8 machines (HSSB) or 32 machines (Ethernet)

## Benefits

- Realisation of simple data logging and monitoring application
- Increase of the efficiency (Machine Tool Efficiency)

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0207-J870 | Machine Status Monitor Package Function |

**Notice**

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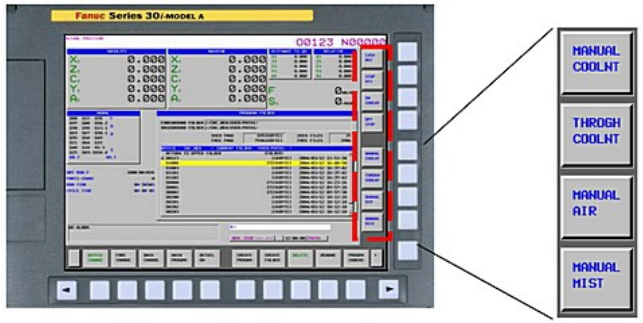
# 573

## Software




# Machine operation menu making tool

## Features

The softkey displayed on the CNC screen can be also used as keys for the operation of the machine. The machine operation such as turning on or off the coolant, that is usually done with the machine operator's panel, can be done with a softkey on the CNC screen instead.

Using this function, it is not required to add additional hardware to add additional operation function to the CNC; it is realized with sofware.

The hierarchy of the menus, the operation and the displayed text strings can be easily set with the "Machine Operation Meny Tool" on the Personal Computer.

## Benefits

- Simple customization of the CNC softkeys
- Realization of simple machine control menus

## Ordering Information

| Specification | Description |
|---|---|
| A08B-9010-J701#ZZ11 | Machine Operation Menu Making Tool - for Microsoft EXCEL 2000 / XP / 2003 |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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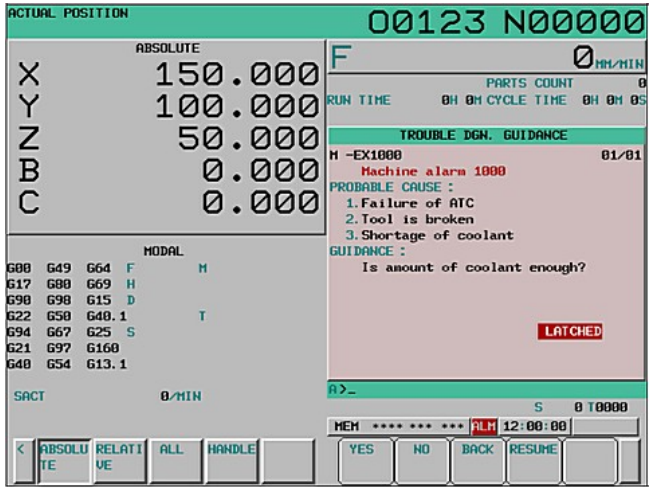
# 574

## Software




# Guidance table for machine alarm diagnosis

## Features

The machine alarms (external alarm messages, external operator messages and macro alarms) can be diagnosed on the "trouble diagnosis guidance screen" in addition to standard CNC alarms.

In addition to the alarm, the CNC will propose a list of possible causes of the problem and propose a guidance. The guidance can be answered with YES / NO, and depending on the answers, other hints and guidance will appear.

The Guidance Table for Machine Diagnosis is a Windows® application for the Personal Computer that provides a set of tool to create the guidance parts and the structure of the questions / answers that will guide the operator. Once this data has been created, it can be transferred to the CNC with the tool.

## Benefits

- Creation of a powerful guidance system to diagnose the machine
- The diagnosis Q and A / guidance application in directly integrated in the CNC and does required any additional hardware
- Decrease of the time required to diagnose problems at the operator level
- General increase of the productivity of the machine

## Ordering Information

| Specification | Description |
|---|---|
| A08B-9010-J515#ZZ07 | Guidance Table for Machine Alarm Diagnosis |
| A08B-9010-J523#ZZ11 | 0i-D Guidance Table for Machine Alarm Diagnosis |

**Notice**

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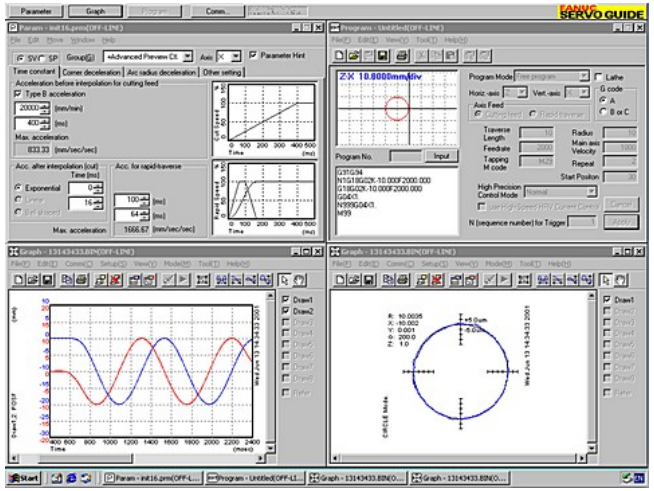
# 575

## Software



# FANUC SERVO GUIDE

## Features

FANUC SERVO GUIDE is a Windows® application that allows a quick and easy optimization of servos and spindles axes.

This software provides the integrated environment to test programs, set parameters and data measurement, needed for servo and spindle tuning.

Direct connection is possible between the Personal Computer and CNC through Ethernet.

## Key functions

- Easy connection to the CNC
- Integrated working environment for tuning machine servo and spindles
- Integrated and optimized environment for creating, tuning and optimizing programs, measuring data and changing parameters
- Measurement of servo and spindle data as well as external triggering events from the PMCat once
- many automatic adjustment functions

## 3-D View function

With this function, it is possible to view the result X, Y and Z coordinate data of the 3-D graph captured by SERVO GUIDE. 3-D graph and time-based waveform are displayed in the same window, and a point on 3-D graph easily corresponds to the point on time axis.

For example, it is possible to display tool path of machining center by capturing position data of X, Y and Z axis. By selecting points on the tool path, you can check waveforms of each servo axis, which corresponds to the selected area. 5-axis machining is also supported. Position of 5 axes are converted to tool center point, and 3-D path of tool is visualized. In addition, axis configuration including Cs axis(spindle axis) is also supported.

## Benefits

- Optimization of the
- Modification of the PMC program to follow machine and production evolution
- Rich maintenance and diagnostics capabilities of the PMC and machine control

**Notice**

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# Ordering Information

| Specification | Description |
|---|---|
| A08B-9010-J522#ZZ11 | FANUC SERVO GUIDE MATE Display |
| A08B-9010-J900 | FANUC SERVO GUIDE Servo Tuning Tool - CD-ROM and Single User License Key |
| A08B-9010-J901 | FANUC SERVO GUIDE Servo Tuning Tool, Upgrade - CD-ROM and Single User License Key |
| A08B-9010-J902 | FANUC SERVO GUIDE Servo Tuning Tool, Graph Edition (Wave Form Measurement) - CD-ROM and Single User License Key |
| A08B-9010-J904 | FANUC SERVO GUIDE Servo Tuning Tool, 3-D View Function - CD-ROM and Single User License Key (Also Contains Upgrade for FANUC SERVO GUIDE Servo Tuning Tool A08B-9010-J900) |

**Notice**

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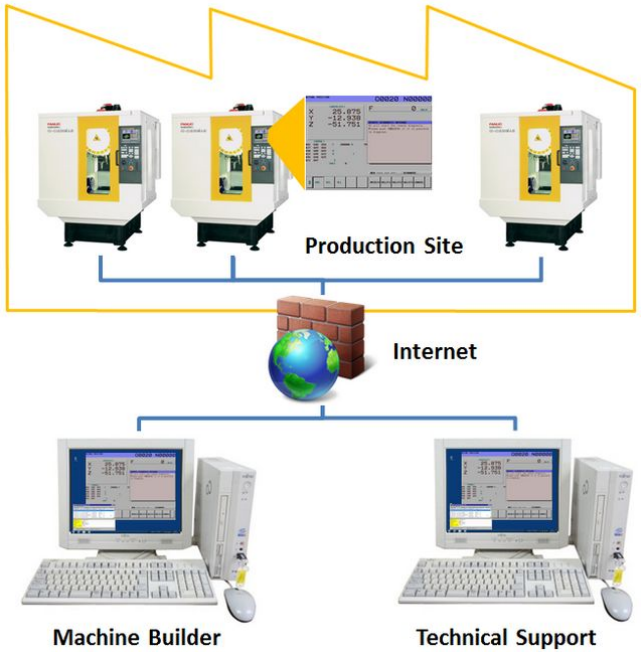
# 577
## Software



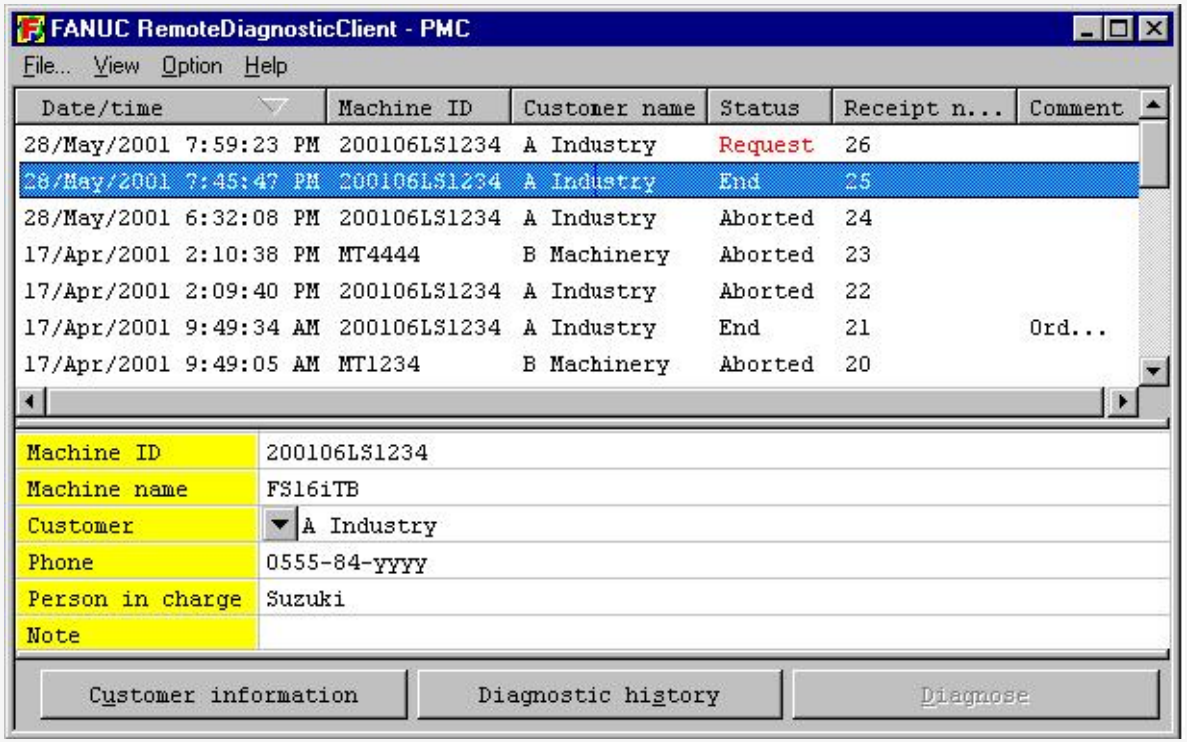

# Machine Remote Diagnosis Package

## Features

The Machine Remote Diagnosis Package application is a tool designed for the machine tool builder to provide remote support of machines easily.This software is designed to use Internet technology to investigate the internal states of remote CNCs and PMCs.

## Key functions

- Communication with a CNC machine tool of an end user over the Internet (or a LAN) to investigate the internal state of the CNC
- Elimination of the need to travel to the machine installation site to check problems; increasing service efficiency
- Server functions to enable quick reception and processing
- Enhanced CNC/PMC operation functions to diagnose problems remotely (sequence program, NC program, and NC parameter corrections can be made for recovery)

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# 578

## Benefits

- Direct connection between the machine and machine builder through remote operation
- Improvement of the efficiency of the machine service
- Decrease of the ownership costs

## Ordering Information

| Specification | Description |
|---|---|
| A02B-0207-J854 | CNC Screen Display Function for Machine Remote Diagnosis Package (Fast Ethernet Required) |
| A08B-9210-J515 | Machine Remote Diagnostics Package (CD-ROM) |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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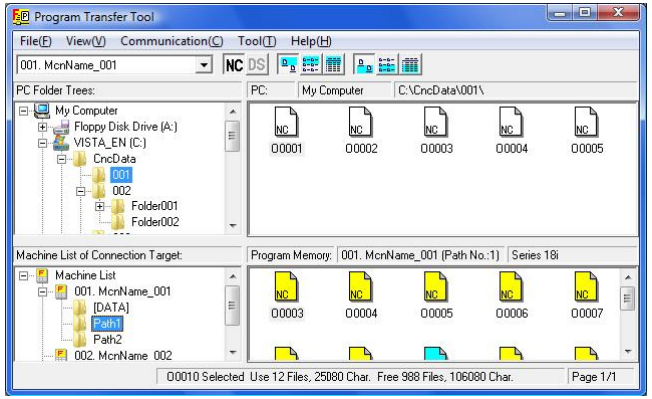
# 579

## Software




# Program Transfer Tool

## Features

The Program Transfer Tool is a Windows® application to manage part programs, tool offsets, custom Macro value, workpiece origin offset and tool management data. The data can easiely transfered by Ethernet between the CNC memory or data server and a PC. The software allows the operator to delete and rename files/folders or create folders in the CNC or the PC.

## Benefits

- Effcient administration
- Easy and faster managing of programs
- Store and organize backups of CNC data

## Ordering Information

| Specification | Description |
|---|---|
| A08B-9510-J513 | Program Transfer Tool |
| A08B-9510-J514 | Program Transfer Tool - Upgrade of Program Transfer Tool A08B-9510-J513 - Can be installed on Windows Vista |

**Notice**

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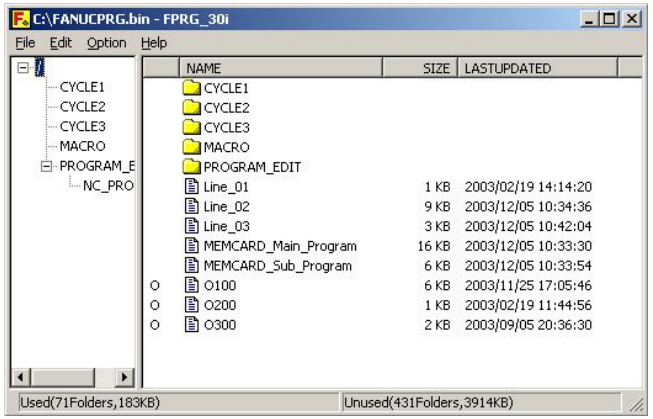
# 580
## Software




# PC tool for memory card program operation/editing

## Features

The "Memory Card Program Operation/Editing" function of Series 30i/31i/32i Model A requires a memory card program file on a FAT formatted memory card. This PC tool is used to prepare the memory card program file for this function. The maximum size of the memory card program file is 2048 Mbytes (2 Gbytes).

## Key functions

- Browsing the folders of the memory card program file
- Adding a program to the memory card program file
- Extracting a program in the memory card program file as a text file
- Renaming a program in the memory card program file
- Deleting a program in the memory card program file
- Creating a new folder into the memory card program file
- Renaming a folder in the memory card program file
- Deleting a folder in the memory card program file
- Display of free space on the memory card program file
- Sorting list view of the memory card program file

## Benefits

- Simplified management of parts programs

## Ordering Information

| Specification | Description |
|---|---|
| A08B-9010-J700#ZZ11 | PC Tool for Memory Card Program Editing / Operation |

**Notice**

Certain functions may require additional hardware, different CPU type or additional memory capacity or may cause compatibility issue with other functions. In case of doubt, contact your FANUC sales representative for additional information and support.

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# Parameter conversion tool

## Features

The Parameter Conversion Tool provides the possibility to convert parameter files created for legacy systems to actual / new CNC systems automatically.

The tool converts for instance parameter files of the Series 16i CNC to the Series 30i CNC, or from Series 0i-MODEL C to Series 0i-MODEL D.

## Benefits

- Simplifies the migration of machines from legacy CNC systems to current CNC systems

## Ordering Information

| Specification | Description |
|---|---|
| A08B-9010-J709#ZZ11 | Parameter Conversion Assist Tool for FS 0i-D / 0i-Mate-D - PC-Software for Conversion of FS 0i-C / 0i-Mate-C Parameters to FS 0i-D / 0i-Mate-D Parameters, Specify for each PC |

**Notice**

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