Warnings, Cautions, and Notes
as Used in this Publication

Warning

Warning notices are used in this publication to emphasize that hazardous voltages, currents, temperatures, or other conditions that could cause personal injury exist in this equipment or may be associated with its use.

In situations where inattention could cause either personal injury or damage to equipment, a Warning notice is used.

Caution

Caution notices are used where equipment might be damaged if care is not taken.

Note

Notes merely call attention to information that is especially significant to understanding and operating the equipment.

This document is based on information available at the time of its publication. While efforts have been made to be accurate, the information contained herein does not purport to cover all details or variations in hardware or software, nor to provide for every possible contingency in connection with installation, operation, or maintenance. Features may be described herein which are not present in all hardware and software systems. GE Fanuc Automation assumes no obligation of notice to holders of this document with respect to changes subsequently made.

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DEFINITION OF WARNING, CAUTION, AND NOTE

This manual includes safety precautions for protecting the user and preventing damage to the machine. Precautions are classified into Warning and Caution according to their bearing on safety. Also, supplementary information is described as a Note. Read the Warning, Caution, and Note thoroughly before attempting to use the machine.

⚠️ **WARNING**
Applied when there is a danger of the user being injured or when there is a damage of both the user being injured and the equipment being damaged if the approved procedure is not observed.

⚠️ **CAUTION**
Applied when there is a danger of the equipment being damaged, if the approved procedure is not observed.

**NOTE**
The Note is used to indicate supplementary information other than Warning and Caution.

- Read this manual carefully, and store it in a safe place.
The models covered by this manual, and their abbreviations are:

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<th>Abbreviation</th>
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<td>0i Mate -TC</td>
</tr>
<tr>
<td>FANUC Series 0i Mate -MC</td>
<td>0i Mate -MC</td>
</tr>
</tbody>
</table>

**NOTE**

1. For ease of explanation, the models may be classified as follows:
   - T series: 0i -TC/0i Mate -TC
   - M series: 0i -MC/0i Mate -MC

2. Some functions described in this manual may not be applied to some products. For details, refer to the DESCRIPTIONS (B-64112EN).

3. The 0i /0i Mate requires setting of parameters to enable part of basic functions. For the parameters to be set, see Section 4.46, "PARAMETERS OF FS0i BASIC FUNCTIONS".
Related manuals of Series 0i/0iMate-MODEL C

The following table lists the manuals related to Series 0i/0iMate-MODEL C. This manual is indicated by an asterisk (*).

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</tr>
</thead>
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<td>B-64113EN</td>
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<tr>
<td>CONNECTION MANUAL (FUNCTION)</td>
<td>B-64113EN-1</td>
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<tr>
<td>Series 0i-TC OPERATOR’S MANUAL</td>
<td>B-64114EN</td>
</tr>
<tr>
<td>Series 0i-MC OPERATOR’S MANUAL</td>
<td>B-64124EN</td>
</tr>
<tr>
<td>Series 0iMate-TC OPERATOR’S MANUAL</td>
<td>B-64134EN</td>
</tr>
<tr>
<td>Series 0iMate-MC OPERATOR’S MANUAL</td>
<td>B-64144EN</td>
</tr>
<tr>
<td>MAINTENANCE MANUAL</td>
<td>B-64115EN</td>
</tr>
<tr>
<td>PARAMETER MANUAL</td>
<td>B-64120EN *</td>
</tr>
</tbody>
</table>

**PMC**

<table>
<thead>
<tr>
<th>Manual name</th>
<th>Specification number</th>
</tr>
</thead>
<tbody>
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<td>PMC Ladder Language PROGRAMMING MANUAL</td>
<td>B-61863E</td>
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<tr>
<td>PMC C Language PROGRAMMING MANUAL</td>
<td>B-61863E-1</td>
</tr>
</tbody>
</table>

**Network**

<table>
<thead>
<tr>
<th>Manual name</th>
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<tbody>
<tr>
<td>Profibus-DP Board OPERATOR’S MANUAL</td>
<td>B-62924EN</td>
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<tr>
<td>FAST Ethernet Board/FAST DATA SERVER OPERATOR’S MANUAL</td>
<td>B-63644EN</td>
</tr>
<tr>
<td>Ethernet Board/DATA SERVER Board OPERATOR’S MANUAL</td>
<td>B-63354EN</td>
</tr>
<tr>
<td>DeviceNet Board OPERATOR’S MANUAL</td>
<td>B-63404EN</td>
</tr>
</tbody>
</table>

**PC function**

<table>
<thead>
<tr>
<th>Manual name</th>
<th>Specification number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen Display Function OPERATOR’S MANUAL</td>
<td>B-63164EN</td>
</tr>
</tbody>
</table>

**Open CNC**

<table>
<thead>
<tr>
<th>Manual name</th>
<th>Specification number</th>
</tr>
</thead>
<tbody>
<tr>
<td>FANUC Open CNC OPERATOR’S MANUAL (Basic Operation Package 1 (For Windows 95/NT))</td>
<td>B-62994EN</td>
</tr>
<tr>
<td>FANUC Open CNC OPERATOR’S MANUAL (DNC Operation Management Package)</td>
<td>B-63214EN</td>
</tr>
</tbody>
</table>
## Related manuals of SERVO MOTOR $\alpha_is/\alpha_i/\beta_is/\beta_i$ series

The following table lists the manuals related to SERVO MOTOR $\alpha_is/\alpha_i/\beta_is/\beta_i$ series:

<table>
<thead>
<tr>
<th>Manual name</th>
<th>Specification number</th>
</tr>
</thead>
<tbody>
<tr>
<td>FANUC AC SERVO MOTOR $\alpha_is$ series</td>
<td>B-65262EN</td>
</tr>
<tr>
<td>FANUC AC SERVO MOTOR $\alpha_i$ series</td>
<td>B-65272EN</td>
</tr>
<tr>
<td>FANUC AC SERVO MOTOR $\beta_is$ series</td>
<td>B-65302EN</td>
</tr>
<tr>
<td>FANUC AC SERVO MOTOR $\beta_i$ series</td>
<td>B-65312EN</td>
</tr>
<tr>
<td>FANUC SERVO AMPLIFIER $\alpha_i$ series</td>
<td>B-65282EN</td>
</tr>
<tr>
<td>FANUC SERVO AMPLIFIER $\beta_i$ series</td>
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</tr>
<tr>
<td>FANUC SERVO MOTOR $\alpha_is$ series</td>
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</tr>
<tr>
<td>FANUC SERVO MOTOR $\alpha_i$ series</td>
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</tr>
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</tr>
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1. DISPLAYING PARAMETERS

Follow the procedure below to display parameters.

(1) Press the function key on the MDI as many times as required, or alternatively, press the function key once, then the PARAM section display soft key. The parameter screen is then selected.

(2) The parameter screen consists of multiple pages. Use step (a) or (b) to display the page that contains the parameter you want to display.

(a) Use the page select key or the cursor move keys to display the desired page.

(b) Enter the data number of the parameter you want to display from the keyboard, then press the [NO.SRH] soft key. The parameter page containing the specified data number appears with the cursor positioned at the data number. (The data is displayed in reverse video.)

NOTE
If key entry is started with the section select soft keys displayed, they are replaced automatically by operation select soft keys including [NO.SRH]. Pressing the [(OPRT)] soft key can also cause the operation select keys to be displayed.
MEM STMN FIN *** 10:02:34
[NO:SRH] [ ON:1 ] [ OFF:0 ] [ *INPUT ] [ INPUT ]

Data entered from the keyboard
Soft key display
(section select)
2. SETTING PARAMETERS FROM MDI

Follow the procedure below to set parameters.

(1) Place the NC in the MDI mode or the emergency stop state.

(2) Follow the substeps below to enable writing of parameters.

1. To display the setting screen, press the function key as many times as required, or alternatively press the function key once, then the [SETTING] section select soft key. The first page of the setting screen appears.

2. Position the cursor on "PARAMETER WRITE" using the cursor move keys.

3. Press the [(OPRT)] soft key to display operation select soft keys.

4. To set "PARAMETER WRITE=" to 1, press the ON:1 soft key, or alternatively enter 1 and press the INPUT soft key. From now on, the parameters can be set. At the same time an alarm condition (P/S100 PARAMETER WRITE ENABLE) occurs in the CNC.

(3) To display the parameter screen, press the function key as many times as required, or alternatively press the function key once, then the PARAM section select soft key. (See "1. Displaying Parameters.")

(4) Display the page containing the parameter you want to set, and position the cursor on the parameter. (See "1. Displaying Parameters.")

(5) Enter data, then press the [INPUT] soft key. The parameter indicated by the cursor is set to the entered data.
Data can be entered continuously for parameters, starting at the selected parameter, by separating each data item with a semicolon (;).

[Example]
Entering 10;20;30;40 and pressing the INPUT key assigns values 10, 20, 30, and 40 to parameters in order starting at the parameter indicated by the cursor.

(6) Repeat steps (4) and (5) as required.
(7) If parameter setting is complete, set "PARAMETER WRITE=" to 0 on the setting screen to disable further parameter setting.
(8) Reset the NC to release the alarm condition (P/S100).
If an alarm condition (P/S000 PLEASE TURN OFF POWER) occurs in the NC, turn it off before continuing operation.
3. INPUTTING AND OUTPUTTING PARAMETERS THROUGH THE READER/PUNCHER INTERFACE

This section explains the parameter input/output procedures for input/output devices connected to the reader/puncher interface. The following description assumes the input/output devices are ready for input/output. It also assumes parameters peculiar to the input/output devices, such as the baud rate and the number of stop bits, have been set in advance. (See 4.2.)
3.1 OUTPUTTING PARAMETERS THROUGH THE READER/PUNCHER INTERFACE

(1) Select the EDIT mode or set to Emergency stop.
(2) To select the parameter screen, press the function key as many times as required, or alternatively press the function key once, then the PARAM section select soft key.
(3) Press the [(OPRT)] soft key to display operation select soft keys, then press the forward menu key located at the right-hand side of the soft keys to display another set of operation select keys including [PUNCH].

(4) Pressing the [PUNCH] soft key changes the soft key display as shown below:

(5) Press the [EXEC] soft key to start parameter output. When parameters are being output, "OUTPUT" blinks in the state display field on the lower part of the screen.

(6) When parameter output terminates, "OUTPUT" stops blinking. Press the key to interrupt parameter output.
3.2 INPUTTING PARAMETERS THROUGH THE READER/PUNCHER INTERFACE

(1) Place the NC in the emergency stop state.
(2) Enable parameter writing.
   1. To display the setting screen, press the [SET] function key as many times as required, or alternatively press the [SET] function key once, then the [SETTING] section select soft key. The first page of the setting screen appears.
   2. Position the cursor on "PARAMETER WRITE" using the cursor move keys.
   3. Press the [(OPRT)] soft key to display operation select soft keys.
   4. To set "PARAMETER WRITE=" to 1, press the ON:1 soft key, or alternatively enter 1, then press the [INPUT] soft key. From now on, parameters can be set. At the same time an alarm condition (P/S100 PARAMETER WRITE ENABLE) occurs in the NC.
(3) To select the parameter screen, press the [SET] function key as many times as required, or alternatively press the [PARAM] key once, then [PARAM] soft key.
(4) Press the [(OPRT)] soft key to display operation select keys, then press the forward menu key located at the right-hand side of the soft keys to display another set of operation select soft keys including [READ].
(5) Pressing the [READ] soft key changes the soft key display as shown below:

   > EDIT STOP [-MG= AAX] 10:37:30
   [ ] [ READ ] [PUNCH] [ ] [ ] ← State display
   [ ] [ ] [ ] [ ] [ ] ← Soft key display

(6) Press the [EXEC] soft key to start inputting parameters from the input/output device. When parameters are being input, "INPUT" blinks in the state display field on the lower part of the screen.

   > EDIT STOP [-MG= AAX] 10:37:30 INPUT
   [ ] [ ] [ ] [CANCEL] [ EXEC ] ← INPUT blinking

(7) When parameter input terminates, "INPUT" stops blinking. Press the [ESC] key to interrupt parameter input.
(8) When parameter read terminates, "INPUT" stops blinking, and an alarm condition (P/S000) occurs in the NC. Turn it off before continuing operation.
Parameters are classified by data type as follows:

<table>
<thead>
<tr>
<th>Data type</th>
<th>Valid data range</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit</td>
<td>0 or 1</td>
<td></td>
</tr>
<tr>
<td>Bit axis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Byte</td>
<td>-128 to 127</td>
<td>In some parameters, signs are ignored.</td>
</tr>
<tr>
<td>Byte axis</td>
<td>0 to 255</td>
<td></td>
</tr>
<tr>
<td>Word</td>
<td>-32768 to 32767</td>
<td>In some parameters, signs are ignored.</td>
</tr>
<tr>
<td>Word axis</td>
<td>0 to 65535</td>
<td></td>
</tr>
<tr>
<td>2-word</td>
<td>-99999999 to 99999999</td>
<td></td>
</tr>
<tr>
<td>2-word axis</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**

1. For the bit type and bit axis type parameters, a single data number is assigned to 8 bits. Each bit has a different meaning.
2. The axis type allows data to be set separately for each control axis.
3. The valid data range for each data type indicates a general range. The range varies according to the parameters. For the valid data range of a specific parameter, see the explanation of the parameter.

(1) Notation of bit type and bit axis type parameters

[Example]

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABC</td>
<td>DEFGH</td>
<td>LJKL</td>
<td>TGFHJK</td>
<td>FGTH</td>
<td>FGTY</td>
<td>HGU</td>
<td></td>
</tr>
</tbody>
</table>

Data No. #0 to #7 are bit positions.

(2) Notation of parameters other than bit type and bit axis type

[Example]

<table>
<thead>
<tr>
<th>0021</th>
<th>Servo axis number of a specific axis</th>
</tr>
</thead>
</table>

Data No.
NOTE
1 The bits left blank in 4. DESCRIPTION OF PARAMETERS and parameter numbers that appear on the display but are not found in the parameter list are reserved for future expansion. They must always be 0.
2 Parameters having different meanings between the T series and M series and parameters that are valid only for the T or M series are indicated in two levels as shown below. Parameters left blank are unavailable.
Example 1
Parameter 5010 has different meanings for the T series and M series.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Tool nose radius compensation</th>
<th>Tool compensation C</th>
</tr>
</thead>
<tbody>
<tr>
<td>5010</td>
<td>T series</td>
<td>M series</td>
</tr>
</tbody>
</table>

Example 2
DPI is a parameter common to the M and T series, but GSB and GSC are parameters valid only for the T series.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>GSC</th>
<th>GSB</th>
<th>DPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>3401</td>
<td>#7</td>
<td>#6</td>
<td>#0</td>
</tr>
</tbody>
</table>

Example 3
The following parameter is provided only for the M series.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>F1 digit feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1450</td>
<td>T series</td>
</tr>
<tr>
<td></td>
<td>M series</td>
</tr>
</tbody>
</table>
4.1  PARAMETERS OF SETTING

<table>
<thead>
<tr>
<th></th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000</td>
<td>SEQ</td>
<td>INI</td>
<td>ISO</td>
<td>TVC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Setting entry is acceptable.

[Data type] Bit

TVC TV check
- 0: Not performed
- 1: Performed

ISO Code used for data output
- 0: EIA code
- 1: ISO code

INI Unit of input
- 0: In mm
- 1: In inches

SEQ Automatic insertion of sequence numbers
- 0: Not performed
- 1: Performed

When a program is prepared by using MDI keys in the part program storage and edit mode, a sequence number can automatically be assigned to each block in set increments. Set the increment to parameter 3216.

<table>
<thead>
<tr>
<th></th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>FCV</td>
</tr>
</tbody>
</table>

Setting entry is acceptable.

[Data type] Bit

FCV Tape format
- 0: Series 0 standard format
  (Series 16/18 compatible format)
- 1: Series 10 / 11 format

**NOTE**

Programs created in the Series 10 / 11 tape format can be used for operation on the following functions:

1. Subprogram call M98
2. Thread cutting with equal leads G32 (T series)
3. Canned cycle G90, G92, G94 (T series)
4. Multiple repetitive canned cycle G71 to G76 (T series)
5. Drilling canned cycle G73, G74, G76, G80 to G89 (M series)
6. Cutter compensation C (M series)

2. When the tape format used in the Series 10/11 is used for this CNC, some limits may add. Refer to the Series 0/0i Mate-MODEL C OPERATOR'S MANUAL.
4.DESCRIPTION OF PARAMETERS

**Parameter 0002**

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>SJZ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RDG</td>
</tr>
</tbody>
</table>

**Settings**

- Setting entry is acceptable.

**[Data type]**

- **Bit**
- **RDG** Remote diagnosis is
  - 0: Not performed.
  - 1: Performed.

  To use an RS-232-C serial port for performing remote diagnosis, connect and setup the modem, cable, and the like, then set 1 in this parameter. When using a modem card, the setting is not necessary.

- **SJZ** Manual reference position is performed as follows:
  - 0: When no reference position has been set, reference position return is performed using deceleration dogs. When a reference position is already set, reference position return is performed using rapid traverse and deceleration dogs are ignored.
  - 1: Reference position return is performed using deceleration dogs at all times.

**NOTE**

SJZ is enabled when bit 3 (HJZ) of parameter No.1005 is set to 1. When a reference position is set without a dog, (i.e. when bit 1 (DLZ) of parameter No.1002 is set to 1 or bit 1 (DLZx) of parameter No.1005 is set to 1) reference position return after reference position setting is performed using rapid traverse at all times, regardless of the setting of SJZ.

**Parameter 0012**

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMVx</td>
<td></td>
<td></td>
<td>AICx</td>
<td></td>
<td></td>
<td></td>
<td>MIRx</td>
</tr>
</tbody>
</table>

**Settings**

- Setting entry is acceptable.

**[Data type]**

- **Bit axis**
- **MIRx** Mirror image for each axis
  - 0: Mirror image is off.
  - 1: Mirror image is on.

- **AICx** The travel distance of an axis command is:
  - 0: Determined by the value specified with the address.
  - 1: Always handled as an incremental value.
Setting entry is acceptable.

**[Data type]** Byte

**[Valid data range]** 0 to 35

**I/O CHANNEL:** Selection of the input/output device to be used

The CNC provides the following interfaces for data transfer to and from the host computer and external input/output devices:
- Input/output device interface (RS-232-C serial port 1, 2)
- DNC2 interface

Data input/output can be performed with a personal computer connected via FOCAS1/Ethernet or FOCAS1/HSSB. Data input/output can be performed with the Power Mate CNC via the FANUC I/O Link.

This parameter selects the interface used to transfer data to and from an input/output device.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0, 1</td>
<td>RS-232-C serial port 1</td>
</tr>
<tr>
<td>2</td>
<td>RS-232-C serial port 2</td>
</tr>
<tr>
<td>4</td>
<td>Memory card interface</td>
</tr>
<tr>
<td>5</td>
<td>Data server interface</td>
</tr>
<tr>
<td>6</td>
<td>The DNC operation is performed or M198 is specified by FOCAS1/ Ethernet.</td>
</tr>
<tr>
<td>10</td>
<td>DNC2 interface, OSI-Ethernet</td>
</tr>
<tr>
<td>15</td>
<td>M198 is specified by FOCAS1/HSSB. (Bit 1 (NWD) of parameter No. 8706) must also be specified.</td>
</tr>
<tr>
<td>20</td>
<td>Group 0</td>
</tr>
<tr>
<td>21</td>
<td>Group 1</td>
</tr>
<tr>
<td>22</td>
<td>Group 2</td>
</tr>
<tr>
<td>23</td>
<td>Group 3</td>
</tr>
<tr>
<td>24</td>
<td>Group 4</td>
</tr>
<tr>
<td>25</td>
<td>Group 5</td>
</tr>
<tr>
<td>26</td>
<td>Group 6</td>
</tr>
<tr>
<td>27</td>
<td>Group 7</td>
</tr>
<tr>
<td>28</td>
<td>Group 8</td>
</tr>
<tr>
<td>29</td>
<td>Group 9</td>
</tr>
<tr>
<td>30</td>
<td>Group 10</td>
</tr>
<tr>
<td>31</td>
<td>Group 11</td>
</tr>
<tr>
<td>32</td>
<td>Group 12</td>
</tr>
<tr>
<td>33</td>
<td>Group 13</td>
</tr>
<tr>
<td>34</td>
<td>Group 14</td>
</tr>
<tr>
<td>35</td>
<td>Group 15</td>
</tr>
</tbody>
</table>

Supplemental remark 1

If the DNC operation is performed with FOCAS1/HSSB, the setting of parameter No. 20 does not matter. The DMMC signal <G042.7> is used.

Supplemental remark 2

If bit 0 (IO4) of parameter No. 110 is set to control the I/O channels separately, the I/O channels can be divided into four types: input and output in the foreground and input and output in the background. If so, parameter No. 20 becomes a parameter for selecting the input device in the foreground.
NOTE

1. An input/output device can also be selected using the setting screen. Usually, the setting screen is used.

2. The specifications (such as the baud rate and the number of stop bits) of the input/output devices to be connected must be set in the corresponding parameters for each interface beforehand. (See Section 4.2.) I/O CHANNEL = 0 and I/O CHANNEL = 1 represent input/output devices connected to RS-232-C serial port 1. Separate parameters for the baud rate, stop bits, and other specifications are provided for each channel.

<table>
<thead>
<tr>
<th>Mother board</th>
<th>Serial communication board</th>
<th>DNC2 board</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS-232-C serial port 1</td>
<td>R232-1 (JD36A)</td>
<td>R232-3 (JD28A)</td>
</tr>
<tr>
<td>R232-2 (JD36B)</td>
<td>I/O CHANNEL=0, 1 (Channel 1)</td>
<td>(when a DNC2 board is used)</td>
</tr>
<tr>
<td></td>
<td>I/O CHANNEL=2 (Channel 2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RS-232-C I/O device</td>
<td>R422-1 (JD6A)</td>
</tr>
</tbody>
</table>

3. The input/output unit interface may be referred to as the reader/punch interface. RS-232-C serial port 1 and RS-232-C serial port 2 are also referred to as channel 1 and channel 2, respectively.

<table>
<thead>
<tr>
<th>0021</th>
<th>Setting of the output device in the foreground</th>
</tr>
</thead>
<tbody>
<tr>
<td>0022</td>
<td>Setting of the input device in the background</td>
</tr>
<tr>
<td>0023</td>
<td>Setting of the output device in the background</td>
</tr>
</tbody>
</table>

Setting entry is acceptable.

[Data type] Byte
[Valid data range] 0 to 2, 5, 10

These parameters are valid only when bit 0 (IO4) of parameter No. 110 is set to control the I/O channels separately. The parameters set individual input/output devices if the I/O channels are divided into these four types: input and output in the foreground and input and output in the background. The input device in the foreground is set in parameter No. 20. For the details of the settings, see the table provided with the description of parameter No. 20.
NOTE
If different input/output devices are simultaneously used in the foreground and background, just a value from 0 to 2 can be specified for the background device.

If an attempt is made to use a busy input/output device, an alarm (P/S233 or BP/S233) will be raised. Note that the settings 0 and 1 indicate the same input/output device.
4.2 PARAMETERS OF READER/PUNCHER INTERFACE, REMOTE BUFFER, DNC1, DNC2, AND M-NET INTERFACE

Before data (programs, parameters, and so on) can be input from and output to an external input/output device via the input/output device interface (RS-232-C serial port), the parameters explained below must be set.

In the I/O CHANNEL setting parameter, the input/output device to be used is selected by specifying one of the two channels (RS-232-C serial port 1 and RS-232-C serial port 2) that is connected to the input/output device.

In addition, the specifications of an input/output device connected to each channel (such as the specification number, baud rate, and number of stop bits of the input/output device) must be set in parameters corresponding to each channel in advance.

For channel 1, two combinations of parameters to specify the input/output device data are provided.

The following shows the interrelation between the input/output device interface parameters for the channels.

![Fig.4.2 I/O Device Interface Settings](image-url)
4.2.1 Parameters Common to all Channels

<table>
<thead>
<tr>
<th>0024</th>
<th>Port for communication with the PMC ladder development tool (FANUC LADDER-III)</th>
</tr>
</thead>
</table>

The following parameter can be set at "Setting screen".

[Data type] Byte

This parameter sets the port to be used for communication with the PMC ladder development tool (FANUC LADDER-III).

- 0 : According to the setting on the PMC online screen
- 1 : RS-232-C serial port 1 (JD36A)
- 2 : RS-232-C serial port 2 (JD36B)
- 10 : High-speed interface (HSSB (COP7) or Ethernet)
- 11 : High-speed interface or RS-232-C serial port 1
- 12 : High-speed interface or RS-232-C serial port 2

<table>
<thead>
<tr>
<th>0100</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ENS</td>
<td>IOP</td>
<td>ND3</td>
<td>NCR</td>
<td>CRF</td>
<td>CTV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

- CTV: Character counting for TV check in the comment section of a program.
  - 0 : Performed
  - 1 : Not performed

- CRF: EOB (end of block) to be output in the ISO code:
  - 0 : Depends on the setting of bit 3 (NCR) of parameter No. 100.
  - 1 : is "CR""LF".

**NOTE**

The EOB output patterns are as shown below:

<table>
<thead>
<tr>
<th>NCR</th>
<th>CRF</th>
<th>EOB output format</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>&quot;LF&quot; &quot;CR&quot; &quot;CR&quot;</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>&quot;CR&quot; &quot;LF&quot;</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>&quot;LF&quot;</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>&quot;CR&quot; &quot;LF&quot;</td>
</tr>
</tbody>
</table>

- NCR: Output of the end of block (EOB) in ISO code
  - 0 : LF, CR, CR are output.
  - 1 : Only LF is output.

- ND3: In DNC operation, a program is:
  - 0 : Read block by block. (A DC3 code is output for each block.)
  - 1 : Read continuously until the buffer becomes full. (A DC3 code is output when the buffer becomes full.)
NOTE
In general, reading is performed more efficiently when ND3 set to 1. This specification reduces the number of buffering interruptions caused by reading of a series of blocks specifying short movements. This in turn reduces the effective cycle time.

IOP  Specifies how to stop program input/output operations.
  0 : An NC reset can stop program input/output operations.
  1 : Only the [STOP] soft key can stop program input/output operations. (An reset cannot stop program input/output operations.)

ENS  Action taken when a NULL code is found during read of EIA code
  0 : An alarm is generated.
  1 : The NULL code is ignored.

[Data type] Bit
IO4  Separate control of I/O channel numbers is:
  0:  Not performed.
  1:  Performed.

If the I/O channels are not separately controlled, set the input/output device in parameter No. 20.
If the I/O channels are separately controlled, set the input device and output device in the foreground and the input device and output device in the background in parameters No. 20 to No. 23 respectively.
Separate control of I/O channels makes it possible to perform background editing, program input/output, and the like during the DNC operation.

4.2.2 Parameters of Channel 1 (I/O CHANNEL=0)

[Data type] Bit
SB2  The number of stop bits
  0 : 1
  1 : 2

HAD  An alarm raised for the internal handy file is:
  0:  Not displayed in detail on the NC screen. (PS alarm 86 is displayed.)
  1:  Displayed in detail on the NC screen.
ASI  Code used at data input
0:  EIA or ISO code (input: determined automatically, output: setting of bit 1 of parameter No. 0000)
1:  ASCII code for both input and output

NOTE
When ASCII code is to be used for inputting and outputting data (when ASI is set to 1), also set bit 1 of parameter No. 0000 to 1.

NFD  Feed before and after the data at data output
0:  Output
1:  Not output

NOTE
When input/output devices other than the FANUC PPR are used, set NFD to 1.

0102  Number specified for the input/output device (when the I/O CHANNEL is set to 0)

[Data type] Byte
Set the number specified for the input/output device used when the I/O CHANNEL is set to 0, with one of the set values listed in Table 4.2.2 (a).

<table>
<thead>
<tr>
<th>Set value</th>
<th>Input/output device</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>RS-232-C (Used control codes DC1 to DC4)</td>
</tr>
<tr>
<td>1</td>
<td>FANUC CASSETTE ADAPTOR 1 (FANUC CASSETTE B1/B2)</td>
</tr>
<tr>
<td>2</td>
<td>FANUC CASSETTE ADAPTOR 3 (FANUC CASSETTE F1)</td>
</tr>
<tr>
<td>3</td>
<td>FANUC PROGRAM FILE Mate, FANUC FA Card Adaptor, FANUC FLOPPY CASSETTE ADAPTOR, FANUC Handy File, FANUC SYSTEM P-MODEL H</td>
</tr>
<tr>
<td>4</td>
<td>RS-232-C (Not used control codes DC1 to DC4)</td>
</tr>
<tr>
<td>5</td>
<td>Portable tape reader</td>
</tr>
<tr>
<td>6</td>
<td>FANUC PPR, FANUC SYSTEM P-MODEL G, FANUC SYSTEM P-MODEL H</td>
</tr>
</tbody>
</table>
4.DESCRIPTION OF PARAMETERS

0103  Baud rate (when the I/O CHANNEL is set to 0)

[Data type]  Byte
Set baud rate of the input/output device used when the I/O CHANNEL is set to 0, with a set value in Table 4.2.2 (b).

<table>
<thead>
<tr>
<th>Set value</th>
<th>Baud rate (bps)</th>
<th>Set value</th>
<th>Baud rate (bps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>7</td>
<td>600</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
<td>8</td>
<td>1200</td>
</tr>
<tr>
<td>3</td>
<td>110</td>
<td>9</td>
<td>2400</td>
</tr>
<tr>
<td>4</td>
<td>150</td>
<td>10</td>
<td>4800</td>
</tr>
<tr>
<td>5</td>
<td>200</td>
<td>11</td>
<td>9600</td>
</tr>
<tr>
<td>6</td>
<td>300</td>
<td>12</td>
<td>19200</td>
</tr>
</tbody>
</table>

4.2.3 Parameters of Channel 1 (I/O CHANNEL=1)

0111  #7  #6  #5  #4  #3  #2  #1  #0
NFD  ASI  SB2

[Data type]  Bit
These parameters are used when I/O CHANNEL is set to 1. The meanings of the bits are the same as for parameter 0101.

0112  Number specified for the input/output device (when I/O CHANNEL is set to 1)

[Data type]  Byte
Set the number specified for the input/output device used when the I/O CHANNEL is set to 1, with one of the set values listed in Table 4.2.2 (a).

0113  Baud rate (when I/O CHANNEL is set to 1)

[Data type]  Byte
Set the baud rate of the input/output device used when I/O CHANNEL is set to 1, with a value in Table 4.2.2 (b).

4.2.4 Parameters of Channel 2 (I/O CHANNEL=2)

0121  #7  #6  #5  #4  #3  #2  #1  #0
NFD  ASI  SB2

[Data type]  Bit
These parameters are used when I/O CHANNEL is set to 2. The meanings of the bits are the same as for parameter 0101.

0122  Number specified for the input/output device (when I/O CHANNEL is set to 2)

[Data type]  Byte
Set the number specified for the input/output device used when I/O CHANNEL is set to 2, with a value in Table 4.2.2 (a).

<table>
<thead>
<tr>
<th>0123</th>
<th>Baud rate (when the I/O CHANNEL is set to 2)</th>
</tr>
</thead>
</table>

[Data type] Byte
Set the baud rate of the input/output device used when I/O CHANNEL is set to 2, with a value in Table 4.2.2 (b).

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCD</td>
<td>SYN</td>
<td>PRY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Bit
PRY Parity bit
0: Not used
1: Used
SYN Reset/alarm in protocol B
0: Not reported to the host
1: Reported to the host with SYN and NAK codes
NCD CD (signal quality detection) of the RS-232-C interface
0:Checked
1: Not checked

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMS</td>
<td>PRA</td>
<td>ETX</td>
<td>ASC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Bit
ASC Communication code except NC data
0: ISO code
1: ASCII code
ETX End code for protocol A or extended protocol A
0: CR code in ASCII/ISO
1: ETX code in ASCII/ISO

**NOTE**
Use of ASCII/ISO is specified by ASC.

PRA Communication protocol
0: Protocol B
1: Protocol A
RMS State of remote/tape operation when protocol A is used
0: Always 0 is returned.
1: Contents of the change request of the remote/tape operation in the SET command from the host is returned.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDN</td>
<td>OWN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

OWM When NC data or an NC program is output to a memory card, a message for file overwrite confirmation is:

0: Displayed.
1: Not displayed.

MDN The DNC operation function by a memory card is:

0: Disabled.
1: Enabled. (A PCMCIA card attachment is required.)

**NOTE**
Use a PCMCIA card attachment suited to the CNC to secure the memory card in the CNC.
### 4.3 PARAMETERS OF DNC2 INTERFACE

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECD</td>
<td>NCE</td>
<td>BCC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### BCC
The BCC value (block check characters) for the DNC2 interface is:
- 0: Checked.
- 1: Not checked.

Even if the BCC value is not checked, the BCC value itself must be specified.

#### NCE
The ER (RS-232-C) and TR (RS-422) signals are:
- 0: Checked.
- 1: Not checked.

This parameter is dedicated to the DNC2 interface.

#### ECD
Error code of negative acknowledgment
- 0: A four-digit hexadecimal error code is added to a negative acknowledgment.
- 1: No error code is added to a negative acknowledgment.

This parameter is dedicated to the DNC2 interface.

#### NOTE
When this parameter is set, the power must be turned off before operation is continued.

#### 0143 Time limit specified for the timer monitoring a response (DNC2 interface)

#### NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Byte
[Unit of data] sec
[Valid data range] 1 to 60 (The standard setting is 3.)

#### 0144 Time limit specified for the EOT signal (DNC2 interface)

#### NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Byte
[Unit of data] sec
[Valid data range] 1 to 60 (The standard setting is 5.)
0145  Time required for switching RECV and SEND (DNC2 interface)

**NOTE**
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Byte
[Unit of data] sec
[Valid data range] 1 to 60 (The standard setting is 1.)

0146  Number of times the system retries holding communication (DNC2 interface)

**NOTE**
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Byte
[Unit of data] sec
[Valid data range] 1 to 10 (The standard setting is 3.)
Set the maximum number of times the system retries holding communication with the remote device if the remote device uses an invalid protocol in the data-link layer or the remote device does not respond to the request.

0147  Number of times the system sends the message in response to the NAK signal (DNC2 interface)

**NOTE**
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Byte
[Unit of data] Number of times
[Valid data range] 1 to 10 (The standard setting is 2.)
Set the maximum number of times the system retries sending the message in response to the NAK signal.

0148  Number of characters in overrun (DNC2 interface)

**NOTE**
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Byte
[Valid data range] 10 to 225 (The standard setting is 10.)
Set the number of characters the system can receive after transmission is stopped (CS off).
### 4. DESCRIPTION OF PARAMETERS

#### 0149

<table>
<thead>
<tr>
<th>Number of characters in the data section of the communication packet (DNC2 interface)</th>
</tr>
</thead>
</table>

**NOTE**

When this parameter is set, the power must be turned off before operation is continued.

**Data type**  
Word

**Valid range**  
80 to 256 (The standard setting is 256.)

The standard setting is 256. If the specified value is out of range, a value of 80 or 256 is used.

This parameter determines the maximum length of the packet used in transmission over the DNC2 interface. Including the two characters at the start of the packet, the four characters used for a command, and the three characters at the end, the maximum number of characters in the packet is nine plus the number specified in parameter No.0149.

<table>
<thead>
<tr>
<th>Length of the packet</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLE</td>
</tr>
<tr>
<td>2 bytes</td>
</tr>
</tbody>
</table>
4.4 PARAMETERS OF REMOTE DIAGNOSIS

**4.DESCRIPTION OF PARAMETERS**

### 4.4.1 PARAMETERS OF REMOTE DIAGNOSIS

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RDG</td>
</tr>
</tbody>
</table>

**Data type**: Bit

**RDG** Remote diagnosis is:

- 0: Not performed.
- 1: Performed.

If an RS-232-C serial port is used to carry out remote diagnosis, connect and set up the modem, cable, and the like, then set 1 in this parameter.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NCR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SB2</td>
</tr>
</tbody>
</table>

**Data type**: Bit

**SB2** The number of stop bits is

- 0: 1.
- 1: 2.

To carry out remote diagnosis, set 0.

**ASC** The code to be used for data output is:

- 0: ISO code.
- 1: ASCII code.

To carry out remote diagnosis, set 1.

**NCR** EOB (end of block) is output as:

- 0: "LF""CR""CR".
- 1: Just as "LF".

To carry out remote diagnosis, set 1.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Baud rate (for remote diagnosis)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Data type**: Byte

Set the baud rate of data input/output by remote diagnosis, with reference to the tables given below.

When using an RS-232-C serial port

<table>
<thead>
<tr>
<th>Set value</th>
<th>Baud rate (bps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>110</td>
</tr>
<tr>
<td>4</td>
<td>150</td>
</tr>
<tr>
<td>5</td>
<td>200</td>
</tr>
<tr>
<td>6</td>
<td>300</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Set value</th>
<th>Baud rate (bps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>600</td>
</tr>
<tr>
<td>8</td>
<td>1200</td>
</tr>
<tr>
<td>9</td>
<td>2400</td>
</tr>
<tr>
<td>10</td>
<td>4800</td>
</tr>
<tr>
<td>11</td>
<td>9600</td>
</tr>
<tr>
<td>12</td>
<td>19200</td>
</tr>
</tbody>
</table>

**NOTE**

The tables above indicate the baud rates of communication between the CNC and modem. The actual communication baud rate may be lowered, depending on the modem and communication line.
0204  Remote diagnosis channel

<table>
<thead>
<tr>
<th>Data type</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Byte</td>
<td>0, 1, 2</td>
</tr>
</tbody>
</table>

The interface to be used for remote diagnosis is:
0, 1 : RS-232-C serial port 1 (channel 1).
2 : RS-232-C serial port 2 (channel 2).

0211  Password 1 for remote diagnosis

0212  Password 2 for remote diagnosis

0213  Password 3 for remote diagnosis

<table>
<thead>
<tr>
<th>Data type</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-word</td>
<td>1 to 99999999</td>
</tr>
</tbody>
</table>

Specify a password for using the remote diagnosis function.
The remote diagnosis function has the following password settings.
Data can be protected by preventing a third party from accessing any
system parameter or machining program without permission.

Password 1:
Set a password for the whole service of the remote diagnosis
function. (The whole remote diagnosis service is available only
when this password is input on the host side (PC, for instance).)

Password 2:
Set a password of a part program. (The input/output, verification,
and the like of a program are possible only when this password is
input on the host side (PC, for instance).)

Password 3:
Set a password of a parameter. (The input/output or the like of a
parameter is possible only when this password is input on the
host side (PC, for instance).)

NOTE
Once any value other than 0 is specified as a password, the password can be changed only
when the same value is specified in the corresponding keyword (parameters No. 221 to No.
223). If any value other than 0 is specified as a password, the password setting is not displayed on
the parameter screen (blank display is provided).
Take great care when setting the password.

0221  Keyword 1 for remote diagnosis

0222  Keyword 2 for remote diagnosis
Keyword 3 for remote diagnosis

<table>
<thead>
<tr>
<th>Data type</th>
<th>2-word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid range</td>
<td>1 to 99999999</td>
</tr>
</tbody>
</table>

Set a keyword corresponding to a password of the remote diagnosis function.

Keyword 1:  Keyword for password 1 (parameter No. 211)
Keyword 2:  Keyword for password 2 (parameter No. 212)
Keyword 3:  Keyword for password 3 (parameter No. 213)

If any value other than 0 is specified as a password (parameters No. 211 to No. 213), the password can be changed only when the same value is specified as the corresponding keyword.

**NOTE**

The keyword value is reset to 0 at power-up. On the parameter screen, the keyword setting is not displayed (blank display is provided).
4.5  PARAMETER OF MEMORY CARD INTERFACE

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PCM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit
PCM If the CNC screen display function is enabled, when a memory card interface is provided on the NC side (HSSB connection),
0 : The memory card interface on the NC side is used.
1 : The memory card interface on the PC side is used.
This parameter is valid when parameter No. 20 is set to 4 (memory card interface). This parameter is valid only while the CNC screen display function is active.
4.6 PARAMETERS OF DATA SERVER

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
</table>
| 0900      | **PARAMETERS OF DATA SERVER**  

<table>
<thead>
<tr>
<th>Bit</th>
<th>ONS</th>
<th>DSV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**DSV**  
The data server function is  
0: Enabled  
1: Disabled

**ONS**  
When the O number of the data server file name and the O number in an NC program do not match:  
0: The O number of the file name takes priority.  
1: The O number in the NC program takes priority.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0921</td>
<td>OS selected for host computer 1 of data server</td>
</tr>
<tr>
<td>0922</td>
<td>OS selected for host computer 2 of data server</td>
</tr>
<tr>
<td>0923</td>
<td>OS selected for host computer 3 of data server</td>
</tr>
</tbody>
</table>

**0924**  
Latency setting for DNC1/Ethernet or FOCAS1/Ethernet

**Data type** | Word  
**Valid data range** | 0 to 1  
0: Windows95/98/NT is selected.  
1: UNIX or VMS is selected.

**Data type** | Word  
**Unit of data** | ms  
**Valid data range** | 0 to 255  
Set service latency of FOCAS1/Ethernet while FOCAS1/Ethernet is used together with the data server function.  
If a value between 0 and 2 is set, 2 ms is assumed.
4.7 PARAMETERS OF ETHERNET

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0931</td>
<td>Special character code corresponding to soft key [CHAR-1]</td>
</tr>
<tr>
<td>0932</td>
<td>Special character code corresponding to soft key [CHAR-2]</td>
</tr>
<tr>
<td>0933</td>
<td>Special character code corresponding to soft key [CHAR-3]</td>
</tr>
<tr>
<td>0934</td>
<td>Special character code corresponding to soft key [CHAR-4]</td>
</tr>
<tr>
<td>0935</td>
<td>Special character code corresponding to soft key [CHAR-5]</td>
</tr>
</tbody>
</table>

[Data type] Byte
[Valid data range] 32 to 95

These parameters are provided to allow a special character that is not provided on the MDI panel but needed in a user name, password, or login DIR to be input by pressing a soft key on the Ethernet parameter screen.

If a value other than 0 is input as a parameter, the special character assigned to the corresponding input soft key [CHAR-1] to [CHAR-5] is displayed.

The special character codes correspond to the ASCII codes.

Sample special character codes

<table>
<thead>
<tr>
<th>Special character</th>
<th>Code</th>
<th>Special character</th>
<th>Code</th>
<th>Special character</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td>32</td>
<td>)</td>
<td>41</td>
<td>&lt;</td>
<td>60</td>
</tr>
<tr>
<td>!</td>
<td>33</td>
<td>*</td>
<td>42</td>
<td>&gt;</td>
<td>62</td>
</tr>
<tr>
<td>&quot;</td>
<td>34</td>
<td>+</td>
<td>43</td>
<td>?</td>
<td>63</td>
</tr>
<tr>
<td>#</td>
<td>35</td>
<td>.</td>
<td>44</td>
<td>@</td>
<td>64</td>
</tr>
<tr>
<td>$</td>
<td>36</td>
<td>-</td>
<td>45</td>
<td>[</td>
<td>91</td>
</tr>
<tr>
<td>%</td>
<td>37</td>
<td>/</td>
<td>46</td>
<td>^</td>
<td>92</td>
</tr>
<tr>
<td>&amp;</td>
<td>38</td>
<td>:</td>
<td>47</td>
<td>#</td>
<td>93</td>
</tr>
<tr>
<td>'</td>
<td>39</td>
<td>;</td>
<td>48</td>
<td>]</td>
<td>94</td>
</tr>
<tr>
<td>(</td>
<td>40</td>
<td>:</td>
<td>49</td>
<td>_</td>
<td>95</td>
</tr>
</tbody>
</table>
### 4.8 PARAMETERS OF POWER MATE CNC MANAGER

<table>
<thead>
<tr>
<th></th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>0960</strong></td>
<td>ASG</td>
<td>SPW</td>
<td>PMN</td>
<td>MD2</td>
<td>MD1</td>
<td>SLV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**[Data type]** Bit

**SLV** When the power mate CNC manager is selected, the screen displays:
- **0**: One slave.
- **1**: Up to four slaves with the screen divided into four.

**MD1,MD2** These parameters set a slave parameter input/output destination.

<table>
<thead>
<tr>
<th>MD2</th>
<th>MD1</th>
<th>Input/output destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>Part program storage</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>Memory card</td>
</tr>
</tbody>
</table>

In either case, slave parameters are output in program format.

**PMN** The power mate CNC manager function is:
- **0**: Enabled.
- **1**: Disabled. (Communication with slaves is not performed.)

**SPW** The power mate CNC manager allows parameters of slaves to be set:
- **0**: Regardless of the PWE settings.
- **1**: According to the PWE settings.

**ASG** Whether the number of bytes allocated to the input/output destination of the β amplifier with the I/O Link is 16 bytes or not is:
- **0**: Not checked.
- **1**: Checked.
### 4.9 PARAMETERS OF AXIS CONTROL/INCREMENT SYSTEM

#### 4.DESCRIPTION OF PARAMETERS B-64120EN/01

#### 4.9 PARAMETERS OF AXIS CONTROL/INCREMENT SYSTEM

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INM</td>
<td>Least command increment on the linear axis</td>
</tr>
<tr>
<td></td>
<td>0: In mm (metric system machine)</td>
</tr>
<tr>
<td></td>
<td>1: In inches (inch system machine)</td>
</tr>
</tbody>
</table>

**NOTE**
When this parameter is set, the power must be turned off before operation is continued.

**[Data type]** Bit

**INM**
Least command increment on the linear axis
- 0: In mm (metric system machine)
- 1: In inches (inch system machine)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>JAX</td>
<td>Number of axes controlled simultaneously in manual continuous feed, manual rapid traverse and manual reference position return</td>
</tr>
<tr>
<td>DLZ</td>
<td>Function setting the reference position without dog</td>
</tr>
<tr>
<td></td>
<td>0: Disabled</td>
</tr>
<tr>
<td></td>
<td>1: Enabled (enabled for all axes)</td>
</tr>
</tbody>
</table>

**NOTE**
1. This function can be specified for each axis by DLZx, bit 1 of parameter No.1005.
2. For a system including an axis of Cs contour control or spindle positioning, avoid using this parameter. Use bit 1 (DLZx) of parameter No. 1005 instead to set just a required axis.

**SFD**
The function for shifting the reference position is
- 0: Not used.
- 1: Used.

**AZR**
When no reference position is set, the G28 command causes:
- 0: Reference position return using deceleration dogs (as during manual reference position return) to be executed.
- 1: P/S alarm No.090 to be issued.
NOTE
When reference position return without dogs is specified, (when bit 1 (DLZ) of parameter No.1002 is set to 1. The G28 command specified before a reference position causes P/S alarm No.090, regardless of the setting of AZR.

XIK When LRP, bit 1 of parameter No.1401, is set to 0, namely, when positioning is performed using non-linear type positioning, if an interlock is applied to the machine along one of axes in positioning,
0: The machine stops moving along the axis for which the interlock is applied and continues to move along the other axes.
1: The machine stops moving along all the axes.

IDG When the reference position is set without dogs, automatic setting of the IDGx parameter (bit 0 of parameter No.1012) to prevent the reference position from being set again is:
0: Not performed.
1: Performed.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPR</td>
<td>IPI</td>
<td>ISC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Bit
ISA, ISC, ISD The least input increment and least command increment are set.

<table>
<thead>
<tr>
<th>ISC</th>
<th>ISA</th>
<th>Least input increment and least command increment</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0.001 mm, 0.001 deg, or 0.0001 inch</td>
<td>IS-B</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0.01 mm, 0.01 deg, or 0.001 inch</td>
<td>IS-A</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0.0001 mm, 0.0001 deg, or 0.00001 inch</td>
<td>IS-C</td>
</tr>
</tbody>
</table>

NOTE
IS-A cannot be used at present.

IPI Bit 7 (IPR) of parameter No. 1004 is:
0: A parameter that requires a power-off operation to make the setting valid, and that becomes invalid for inch input.
1: A parameter that does not require a power-off operation, and that is also valid for inch input.

IPR Whether the least input increment for each axis is set to a value 10 times as large as the least command increment is specified, in increment systems of IS-B or IS-C at setting mm.
0: The least input increment is not set to a value 10 times as large as the least command increment.
1: The least input increment is set to a value 10 times as large as the least command increment.
If IPR is set to 1, the least input increment is set as follows:

<table>
<thead>
<tr>
<th>Input increment</th>
<th>Least input increment</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS-B</td>
<td>0.01 mm, 0.01 deg, or 0.0001 inch</td>
</tr>
<tr>
<td>IS-C</td>
<td>0.001 mm, 0.001 deg, or 0.00001 inch</td>
</tr>
</tbody>
</table>

**NOTE**

For IS-A, the least input increment cannot be set to a value 10 times as large as the least command increment.

The least input increment is not multiplied by 10 also when the calculator-type decimal point input (bit 0 (DPI) of parameter No. 3401) is used.

**NOTE**

1 The state in which the reference position has not been established refers to that state in which reference position return has not been performed after power-on when an absolute position detector is not being used, or that state in which the association of the machine position with the position detected with the absolute position detector has not been completed (see the description of bit 4 (APZx) of parameter No. 1815) when an absolute position detector is being used.

2 To use a function that establishes the reference point and makes a movement with a command other than G28, such as an axis of Cs contour control, set this parameter for the relative axis.

3 When the Cs axis coordinate setup function (bit 2 (CSF) of parameter No. 3712) is used, it is recommended that this parameter be set to 0.

**NOTE**

- An alarm is generated (P/S alarm 224).
- An alarm is not generated.

**NOTE**

1 The state in which the reference position has not been established refers to that state in which reference position return has not been performed after power-on when an absolute position detector is not being used, or that state in which the association of the machine position with the position detected with the absolute position detector has not been completed (see the description of bit 4 (APZx) of parameter No. 1815) when an absolute position detector is being used.

2 To use a function that establishes the reference point and makes a movement with a command other than G28, such as an axis of Cs contour control, set this parameter for the relative axis.

3 When the Cs axis coordinate setup function (bit 2 (CSF) of parameter No. 3712) is used, it is recommended that this parameter be set to 0.

**NOTE**

1 The state in which the reference position has not been established refers to that state in which reference position return has not been performed after power-on when an absolute position detector is not being used, or that state in which the association of the machine position with the position detected with the absolute position detector has not been completed (see the description of bit 4 (APZx) of parameter No. 1815) when an absolute position detector is being used.

2 To use a function that establishes the reference point and makes a movement with a command other than G28, such as an axis of Cs contour control, set this parameter for the relative axis.

3 When the Cs axis coordinate setup function (bit 2 (CSF) of parameter No. 3712) is used, it is recommended that this parameter be set to 0.

**NOTE**

- An alarm is generated (P/S alarm 224).
- An alarm is not generated.

**NOTE**

- An alarm is generated (P/S alarm 224).
- An alarm is not generated.

**NOTE**

- An alarm is generated (P/S alarm 224).
- An alarm is not generated.
NOTE
1 When bit 1 (DLZ) of parameter No. 1002 is 0, DLZx is enabled. When bit 1 (DLZ) of parameter No. 1002 is 1, DLZx is disabled, and the function for setting the reference position without dogs is enabled for all axes.
2 Do not set this parameter for the Cs contour control axis or spindle positioning axis.

HJZx When a reference position is already set:
0: Manual reference position return is performed with deceleration dogs.
1: Manual reference position return is performed using rapid traverse without deceleration dogs, or manual reference position return is performed with deceleration dogs, depending on the setting of bit 7 (SJZ) of parameter No.0002.

NOTE
When the function (see bit 1 (DLZ) of parameter No. 1002) for setting the reference position without dogs is used, positioning to a reference position is always performed using rapid traverse in reference position return after establishment of the reference position, regardless of the setting of HJZ.

EDPx External deceleration signal in the positive direction for each axis
0: Valid only for rapid traverse
1: Valid for rapid traverse and cutting feed

EDMx External deceleration signal in the negative direction for each axis
0: Valid only for rapid traverse
1: Valid for rapid traverse and cutting feed
### 4. DESCRIPTION OF PARAMETERS

#### 1006

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZMIx</td>
<td>DIAx</td>
<td>ROSx</td>
<td>ROTx</td>
<td>ZMIx</td>
<td>ROSx</td>
<td>ROTx</td>
<td></td>
</tr>
</tbody>
</table>

#### NOTE
When this parameter is set, the power must be turned off before operation is continued.

**[Data type]** Bit axis

**ROTx, ROSx** Setting linear or rotation axis.

<table>
<thead>
<tr>
<th>ROSx</th>
<th>ROTx</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| 0    | 0    | Linear axis  
(1) Inch/metric conversion is done.  
(2) All coordinate values are linear axis type.  
(Is not rounded in 0 to 360°)  
(3) Stored pitch error compensation is linear axis type  
(Refer to parameter No.3624) |
| 0    | 1    | Rotation axis (A type)  
(1) Inch/metric conversion is not done.  
(2) Machine coordinate values are rounded in 0 to 360°.  
   Absolute coordinate values are rounded or not rounded by parameter No.1008#0(ROAx) and #2(RRLx).  
(3) Stored pitch error compensation is the rotation type.  
   (Refer to parameter No.3624)  
(4) Automatic reference position return (G28, G30) is done in the reference position return direction and the move amount does not exceed one rotation. |
| 1    | 0    | Setting is invalid (unused) |
| 1    | 1    | Rotation axis (B type)  
(1) Inch/metric conversion, absolute coordinate values and relative coordinate values are not done.  
(2) Machine coordinate values, absolute coordinate values and relative coordinate values are linear axis type. (Is not rounded in 0 to 360°).  
(3) Stored pitch error compensation is linear axis type  
(Refer to parameter No.3624)  
(4) Cannot be used with the rotation axis roll over function and the index table indexing function (M series) |

For the rotation axis used for cylindrical interpolation, set ROTx to 1.

**DIAx** Either a diameter or radius is set to be used for specifying the amount of travel on each axis.  
0 : Radius  
1 : Diameter

**ZMIx** The direction of reference position return.  
0 : Positive direction  
1 : Negative direction

#### NOTE
The direction of the initial backlash, which occurs when power is switched on, is opposite to the direction of a reference position return.
<table>
<thead>
<tr>
<th></th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OKIx</td>
<td>ALZx</td>
<td>RTLx</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit axis

RTLx The reference position return operation for a rotation axis is:

- 0: Of rotation axis type.
- 1: Of linear axis type.

**NOTE**
The rotation axis type reference position return operation and the linear axis type reference position return operation differ in behavior as follows, depending on when the dog (the deceleration signal for reference position return) is pressed:

- **Linear axis type:** When the dog is pressed before the one-rotation signal is seized, P/S alarm No. 090 is issued.
- **Rotation axis type:** When the dog is pressed before the one-rotation signal is seized, the reference position return operation is continued without issuing an alarm.

ALZx An automatic reference position return operation causes:

- 0: A return to the reference position by positioning. When a reference position return has not been performed even once since power-on, a return to the reference position is performed in the same sequence as for the manual reference position return operation.
- 1: A return to the reference position in the same sequence as for the manual reference position return operation.

**NOTE** This parameter has no influence on axes for which a reference position return is performed without dogs.

OKIx In reference position setting by pressing an axis against a stopper, after a reference position return is completed, P/S alarm 000 is:

- 0: Issued. (If this setting is made, an absolute position detector is required when the function of reference position setting by pressing an axis against a stopper is used.)
- 1: Not issued. (If this setting is made, no absolute position detector is required even when the function of reference position setting by pressing an axis against a stopper is used.)
NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Bit axis
ROAx The roll-over function of a rotation axis is
0 : Invalid
1 : Valid

NOTE
ROAx specifies the function only for a rotation axis (for which ROTx, #0 of parameter No.1006, is set to 1)

RABx In the absolute commands, the axis rotates in the direction
0 : In which the distance to the target is shorter.
1 : Specified by the sign of command value.

NOTE
RABx is valid only when ROAx is 1.

RRLx Relative coordinates are
0 : Not rounded by the amount of the shift per one rotation
1 : Rounded by the amount of the shift per one rotation

NOTE
1 RRLx is valid only when ROAx is 1.
2 Assign the amount of the shift per one rotation in parameter No.1260.

RMCx When machine coordinate system selection (G53) or high-speed machine coordinate system selection (G53P1) is specified, for the roll-over function of a rotation axis, the setting of bit 1 (RABx) of parameter No. 1008, which sets the direction of rotation for absolute commands, is:
0 : Invalid.
1 : Valid.

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Byte
[Valid data range] 1, 2, 3, ..., the number of controlled axes
Set the maximum number of axes that can be controlled by the CNC.

Examples
Suppose that the first axis is the X axis, and the second and subsequent axes are the Y, Z, and A axes in that order, and that they are controlled as follows:
X, Y, and Z axes: Controlled by the CNC
A axis: Controlled by the PMC
Then set this parameter to 3 (total 3: 1st to 3rd axes)
With this setting, the fourth axis (A axis) is controlled only by the PMC, and therefore cannot be controlled directly by the CNC.
### 4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Bit axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDGx</td>
<td></td>
</tr>
</tbody>
</table>

The function for setting the reference position again, without dogs, is:

- **0**: Not inhibited.
- **1**: Inhibited.

#### NOTE

1. IDGx is enabled when the IDG parameter (bit 7 of parameter No.1002) is 1.
2. When the function for setting the reference position without dogs is used, and the reference position is lost for some reason, an alarm requesting reference position return (No.300) is generated when the power is next turned on. If the operator performs reference position return, as a result of mistakenly identifying the alarm as that requesting the operator to perform a normal reference position return, an invalid reference position may be set. To prevent such an operator error, the IDGx parameter is provided to prevent the reference position from being set again without dogs.
   - (1) If the IDG parameter (bit 7 of parameter No.1002) is set to 1, the IDGx parameter (bit 0 of parameter No.1012) is automatically set to 1 when the reference position is set using the function for setting the reference position without dogs. This prevents the reference position from being set again without dogs.
   - (2) Once the reference position is prevented from being set for an axis again, without dogs, any attempt to set the reference position for the axis without dogs results in the output of an alarm (No.090).
   - (3) When the reference position must be set again without dogs, set IDGx to 0 before setting the reference position.
[Data type] Bit

RHR After increment system (inch/metric) switching, for the rotation axis, the first G28 command causes reference position return:
0: At a low speed.
1: At a high speed/

ZRL For high-speed reference position return according to G28, second to fourth reference position return according to G30, and G53 command:
0: Non-linear type positioning is performed.
1: Linear type positioning is performed.
This parameter is valid when bit 1 (LRP) of parameter No. 1401 is set to 1.

SVS When the servo along an axis is turned off, simple synchronous control is:
0: Released.
1: Not released.

WIC Direct input of measured values for workpiece origin offsets is:
0: Enabled only in a selected workpiece coordinate system.
1: Enabled in all coordinate systems.

NOTE
If this parameter is set to 0, measured values can be input directly only in the currently selected workpiece coordinate system or external workpiece coordinate system. If a measured value is input directly for a workpiece origin offset in another coordinate system, a warning is issued.

DWT When a dwell time is specified with P, the unit of data is:
0: 1 ms for IS-B, or 0.1 ms for IS-C.
1: 1 ms. (Not depending on the increment system.)

Program axis name for each axis

[Data type] Byte axis
Set the program axis name for each controlled axis, using one of the values listed in the following table:

<table>
<thead>
<tr>
<th>Axis name</th>
<th>Setting</th>
<th>Axis name</th>
<th>Setting</th>
<th>Axis name</th>
<th>Setting</th>
<th>Axis name</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>88</td>
<td>U</td>
<td>85</td>
<td>A</td>
<td>65</td>
<td>E</td>
<td>69</td>
</tr>
<tr>
<td>Y</td>
<td>89</td>
<td>V</td>
<td>86</td>
<td>B</td>
<td>66</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Z</td>
<td>90</td>
<td>W</td>
<td>87</td>
<td>C</td>
<td>67</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
NOTE
1 With the T series, when G code system A is used, neither U, V, nor W can be used as an axis name. Only when G code system B or C is used, U, V, and W can be used as axis names.
2 The same axis name cannot be assigned to more than one axis.
3 When the secondary auxiliary function (option) is provided, the address used by the secondary auxiliary function (address B with the T series or, with the M series, the address specified in parameter No.3460) cannot be used as an axis name.
4 With the T series, when address C or A is used for chamfering, corner rounding, or direct drawing dimension programming (when the CCR parameter (bit 4 of parameter No.3405) is set to 1), addresses C or A cannot be used as an axis name.
5 Only with the T series, address E can be used as an axis name. Address E cannot be used with the M series. When address E is used as an axis name, note the following:
   - When G code system A is used, address E is always assigned to an absolute command.
   - When an equal-lead threading command (G32) is issued in the FS10/11 command format, address E cannot be used to specify the thread lead. Use address F to specify the thread lead.

[Data type] Byte axis
To determine the following planes used for circular interpolation, cutter compensation C (for the M series), tool nose radius compensation (for the T series), etc., each control axis is set to one of the basic three axes X, Y, and Z, or an axis parallel to the X, Y, or Z axis.

G17: Plane Xp-Yp
G18: Plane Zp-Xp
G19: Plane Yp-Zp
Only one axis can be set for each of the three basic axes X, Y, and Z, but two or more parallel axes can be set.

<table>
<thead>
<tr>
<th>Set value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Neither the basic three axes nor a parallel axis</td>
</tr>
<tr>
<td>1</td>
<td>X axis of the basic three axes</td>
</tr>
</tbody>
</table>
### 4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Set value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Y axis of the basic three axes</td>
</tr>
<tr>
<td>3</td>
<td>Z axis of the basic three axes</td>
</tr>
<tr>
<td>5</td>
<td>Axis parallel to the X axis</td>
</tr>
<tr>
<td>6</td>
<td>Axis parallel to the Y axis</td>
</tr>
<tr>
<td>7</td>
<td>Axis parallel to the Z axis</td>
</tr>
</tbody>
</table>

| 1023 | Number of the servo axis for each axis |

#### NOTE

When this parameter is set, power must be turned off before operation is continued.

- **[Data type]** Byte axis
- **[Valid data range]** 1, 2, 3, ..., number of control axes / -1, -2

Set the servo axis for each control axis. Usually set to the same number as the control axis number. The control axis number is the order number that is used for setting the axis-type parameters or axis-type machine signals. To use a controlled axis as a spindle, specify -1.

- Setting parameter CSS (bit 7 of parameter No. 3704) to 1 enables the second serial spindle to be assigned as Cs contour axis.
- To use the second serial spindle as the Cs contour axis, set -2.
- To use a hypothetical Cs axis for Cs contour control, also make a setting for spindle assignment.

Refer to FSSB section of CONNECTION MANUAL (Function) (B-64113EN-1).
### 4.10 PARAMETERS OF COORDINATES

<table>
<thead>
<tr>
<th>#7</th>
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<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>WZR</td>
<td>AWK</td>
<td>ZCL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AWK</td>
<td></td>
<td>ZCL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**WZR** Upon reset, the workpiece coordinate system is:
0: Not returned to that specified with G54
1: Returned to that specified with G54

**AWK** When the workpiece zero point offset value is changed
0: The absolute position display changed when the next buffering block is performed.
1: The absolute position display is changed immediately. (Valid when automatic operation is not being started)
Changed value is valid after buffering the next block.

**ZCL** Local coordinate system when the manual reference position return is performed
0: The local coordinate system is not canceled.
1: The local coordinate system is canceled.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNC</td>
<td>RLC</td>
<td>G50</td>
<td>EWS</td>
<td>EWD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNC</td>
<td>G52</td>
<td>RLC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SNC**

**RLC**

**G50**

**EWS** Shift value of the workpiece coordinate system and external workpiece zero point offset value are
0: Stored in the separate memory areas.
1: Stored in the same memory area, that is, the shift and the offset values are the same.

**EWD**

**EWD=0**

**EWD=1**
G50  If the G50 command for setting a coordinate system (or the G92 command in G command system B or C) is specified,
0:  G50 is executed and no alarm is issued.
1:  G50 is not executed and a P/S alarm (No. 010) is issued.

RLC  Local coordinate system is
0:  Not cancelled by reset
1:  Cancelled by reset

G52  In local coordinate system setting (G52), a cutter compensation vector is:
0:  Not considered.
1:  Considered.

NOTE
Select a local coordinate system setting operation when cutter compensation is applied, and when two or more blocks specifying no movement exist prior to the specification of G52, or when G52 is specified after cutter compensation mode is canceled without eliminating the offset vector.

SNC  After a servo alarm is released, the local coordinate system (G52 or G92 (M series), or G52 or G50 (T series)) is:
0:  Cleared.
1:  Not cleared.

NOTE
Even when this parameter is set to 1, the local coordinate system is cleared if a setting is made to allow the local coordinate system to be canceled by a reset (bit 3 (RLC) of parameter No. 1202 = 1).

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>68A</td>
</tr>
<tr>
<td>MMD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EMC</td>
</tr>
</tbody>
</table>

[Data type]  Bit
EMC  The extended external machine zero point shift function is:
0:  Disabled.
1:  Enabled.

NOTE
When the extended machine zero point shift function is enabled, the conventional external machine zero point shift function is disabled.

68A  In automatic coordinate system setting of an absolute position detector in the mode of mirror image of facing two posts (G68):
0:  Mirror image of facing two posts is not considered.
1:  Mirror image of facing two posts is considered.
MMD  In manual operation, the direction of axis movement for an axis for which the mirror image function is enabled is:
   0 : Not the same direction as in automatic operation.
   1 : The same direction as in automatic operation.

<table>
<thead>
<tr>
<th></th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>R2O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R1O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type]  Bit
R1O  Signal output for the first reference position is:
   0 : Disabled.
   1 : Enabled.
   The reference position signal output function is required. See the description of parameter No.1245.

R2O  Signal output for the second reference position is:
   0 : Disabled.
   1 : Enabled.
   The reference position signal output function is required. See the description of parameter No.1246.

1220  External workpiece zero point offset value

[Data type]  2-word axis
[Unit of data]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear axis (input in mm)</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Linear axis (input in inches)</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>deg</td>
</tr>
</tbody>
</table>

[Valid data range]  -999999999 to 999999999
This is one of the parameters that give the position of the origin of workpiece coordinate system (G54 to G59). It gives an offset of the workpiece origin common to all workpiece coordinate systems.
In general, the offset varies depending on the workpiece coordinate systems. The value can be set from the PMC using the external data input function.
4.DESCRIPTION OF PARAMETERS

- Workpiece zero point offset value in workpiece coordinate system 1 (G54)
- Workpiece zero point offset value in workpiece coordinate system 2 (G55)
- Workpiece zero point offset value in workpiece coordinate system 3 (G56)
- Workpiece zero point offset value in workpiece coordinate system 4 (G57)
- Workpiece zero point offset value in workpiece coordinate system 5 (G58)
- Workpiece zero point offset value in workpiece coordinate system 6 (G59)

[Data type] 2-word axis
[Unit of data]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear axis (input in mm)</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Linear axis (input in inches)</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>deg</td>
</tr>
</tbody>
</table>

[Valid data range] -999999999 to 999999999

The workpiece zero point offset values in workpiece coordinate systems 1 to 6 (G54 to G59) are set.

NOTE
The workpiece origin offset can also be set using the workpiece coordinate system screen.
4.DESCRIPTION OF PARAMETERS

1240 Coordinate value of the first reference position on each axis in the machine coordinate system

1241 Coordinate value of the second reference position on each axis in the machine coordinate system

1242 Coordinate value of the third reference position on each axis in the machine coordinate system

1243 Coordinate value of the fourth reference position on each axis in the machine coordinate system

NOTE
When these parameters are set, power must be turned off before operation is continued.

[Data type] 2-word axis
[Unit of data]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>deg</td>
</tr>
</tbody>
</table>

[Valid data range] -99999999 to 99999999
Set the coordinate values of the first to fourth reference positions in the machine coordinate system.

1260 Amount of a shift per one rotation of a rotation axis

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Data type] 2-word axis
[Unit of data]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Standard value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS-A</td>
<td>0.01 deg</td>
<td>36000</td>
</tr>
<tr>
<td>IS-B</td>
<td>0.001 deg</td>
<td>360000</td>
</tr>
<tr>
<td>IS-C</td>
<td>0.0001 deg</td>
<td>3600000</td>
</tr>
</tbody>
</table>

[Valid data range] 1000 to 99999999
Set the amount of a shift per one rotation of a rotation axis.
For the rotation axis used for cylindrical interpolation, set the standard value.
1280

**First address of the signal group used by the external machine zero point shift extension**

[Data type] Word
[Valid data range] 0 to 65535

Set the first address of the signal group used by the external machine zero point shift extension. If 100 is specified, R0100 to R0115 can be used.

- **R0100**: Shift amount of external machine zero point shift extension for the first axis (LOW)
- **R0101**: Shift amount of external machine zero point shift extension for the first axis (HIGH)
- **R0102**: Shift amount of external machine zero point shift extension for the second axis (LOW)
- **R0103**: Shift amount of external machine zero point shift extension for the second axis (HIGH)
- \( \vdots \)
- **R0114**: Shift amount of external machine zero point shift extension for the eighth axis (LOW)
- **R0115**: Shift amount of external machine zero point shift extension for the eighth axis (HIGH)

**NOTE**

1. If the specified number is not present, the external machine zero point shift extension is disabled.
2. A shift amount of the external machine zero point shift extension can be written from the macro executor.
3. This parameter is valid when bit 0 (EMC) of parameter No. 1203 is set to 1.

1290

**Distance between two opposite tool posts in mirror image**

[Data type] 2-word
[Unit of data]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
</tbody>
</table>

[Valid data range] 0 to 99999999

Set the distance between two opposite tool posts in mirror image.
4.11 PARAMETERS OF STROKE CHECK

<table>
<thead>
<tr>
<th></th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>1300</td>
<td>BFA</td>
<td>LZR</td>
<td>RL3</td>
<td>LMS</td>
<td>OUT</td>
<td>BFA</td>
<td>LZR</td>
<td>LMS</td>
</tr>
</tbody>
</table>

[Data type] Bit

OUT The area inside or outside of the stored stroke check 2 is set as an inhibition area (setting by the parameters No.1322 and No.1323).
0: Inside
1: Outside

LMS The EXLM <G007#6> signal for switching stored stroke check
0: Disabled
1: Enabled

NOTE

Stored stroke check 1 supports two pairs of parameters for setting the prohibited area. The stored stroke limit switching signal is used to enable either of the prohibited areas set with these parameter pairs.
(1) Prohibited area I:
Parameters No.1320 and No.1321
(2) Prohibited area II:
Parameters No.1326 and No.1327

RL3 Stored stroke check 3 release signal RLSOT3 <G007#4> is
0: Disabled
1: Enabled

LZR Checking of stored stroke check 1 during the time from power-on to the manual position reference return
0: The stroke check 1 is checked.
1: The stroke check 1 is not checked

NOTE

When an absolute position detector is used and a reference position is already set upon power-up, stored stroke limit check 1 is started immediately after power-up, regardless of the setting.
BFA  When a command that exceeds a stored stroke check is issued
  0: An alarm is generated after the stroke check is exceeded.
  1: An alarm is generated before the stroke check is exceeded.

NOTE
The tool stops at a point up to F/7500 mm short of or ahead of the boundary.
(F: Feedrate when the tool reaches the boundary (mm/min))

DLM  The stored stroke limit switching signals <G104, G105> for each axial direction is:
  0: Disabled.
  1: Enabled.

NPC  As part of the stroke limit check performed before movement, the movement specified in G31 (skip) and G37 (automatic tool length measurement (for M series) or automatic tool compensation (for T series)) blocks is:
  0: Checked
  1: Not checked

OTA  If the tool is already in the prohibited area at power-up, an alarm of stored stroke limit 2 (inside) or stored stroke limit 3 is:
  0: Immediately raised.
  1: Not raised before a movement is made.
Remark) When the alarm is immediately raised, the system enters the state before power-down.
If this parameter is set to 1, no alarm is raised before a movement is made. If the direction of this movement is a direction away from the prohibited area, movements can be made in the opposite direction only. Accordingly, there is danger that the tool enters the prohibited area without an alarm.

OF1  If the tool is moved into the range allowed on the axis after an alarm is raised by stored stroke check 1,
  0: The alarm is not canceled before a reset is made.
  1: The OT alarm is immediately canceled.

NOTE
In the cases below, the automatic release function is disabled. To release an alarm, a reset operation is required.
  1 When a setting is made to issue an alarm before a stored stroke limit is exceeded (bit 7 (BFA) of parameter No. 1300)
  2 When an another overtravel alarm (such as stored stroke check 2 and stored stroke check 3) is already issued
OTF  When an overtravel alarm is issued:
   0 : No signal is output.
   1 : Signals are output to F124 and F126.

PLC  Stroke limit check before movement is:
   0: Not performed
   1: Performed

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
<th>OT3x</th>
<th>OT2x</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>OT2x</td>
<td></td>
</tr>
</tbody>
</table>

[Data type]  Bit axis
OT2x  Whether stored stroke check 2 is checked for each axis is set.
   0: Stored stroke check 2 is not checked.
   1: Stored stroke check 2 is checked.

OT3x  Whether stored stroke check 3 is checked for each axis is set.
   0: Stored stroke check 3 is not checked.
   1: Stored stroke check 3 is checked.
**4. DESCRIPTION OF PARAMETERS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1320</td>
<td>Coordinate value I of stored stroke check 1 in the positive direction on each axis</td>
</tr>
<tr>
<td>1321</td>
<td>Coordinate value I of stored stroke check 1 in the negative direction on each axis</td>
</tr>
</tbody>
</table>

**[Data type]** 2-word axis  

**[Unit of data]**  
- Millimeter machine: 0.01, 0.001, 0.0001 mm  
- Inch machine: 0.001, 0.0001, 0.00001 inch  
- Rotation axis: 0.01, 0.001, 0.0001 deg

**[Valid data range]** -99999999 to 99999999  

The coordinate values of stored stroke check 1 in the positive and negative directions are set for each axis in the machine coordinate system. The outside area of the two checks set in the parameters is inhibited.

![Diagram](image)

**NOTE**  
1. For axes with diameter specification, a diameter value must be set.  
2. When the parameters are set as follows, the stroke becomes infinite:  
   parameter 1320 < parameter 1321  
   For movement along the axis for which infinite stroke is set, only increment commands are available. (The stored stroke limit switching signal also becomes invalid.) If an absolute command is issued for this axis, the absolute register may overflow, and normal movement will not result.  
3. The prohibited area specified with these parameters is invalid if bit 2 (LMS) of parameter No. 1300 is set to 1 and stored stroke limit switching signal EXLM <G007#6> is set to 1. In such a case, the settings of parameters No. 1326 and 1327 are used, instead.
1322  Coordinate value of stored stroke check 2 in the positive direction on each axis

1323  Coordinate value of stored stroke check 2 in the negative direction on each axis

[Data type] 2-word axis
[Unit of data]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>deg</td>
</tr>
</tbody>
</table>

[Valid data range] -999999999 to 999999999
Set the coordinate values of stored stroke check 2 in the positive and negative directions for each axis in the machine coordinate system. OUT, #0 of parameter 1300, sets either the area outside of the area inside specified by two checks are the inhibition area.

(1) When the prohibited area is inside the boundaries (OUT = 0)
(Xp, Yp, Zp)
(Xm, Ym, Zm)

(2) When the prohibited area is outside the boundaries (OUT = 1)
(Xp, Yp, Zp)
(Xm, Ym, Zm)

Set the machine coordinates of the boundaries in the positive direction (Xp, Yp, and Zp) using parameter No. 1322, and those of the boundaries in the negative direction (Xm, Ym, and Zm) using parameter No. 1323. The prohibited area thus becomes the hatched area in the figure on the left.

**NOTE**
For axes with diameter specification, a diameter value must be set.
4. DESCRIPTION OF PARAMETERS

1324
Coordinate value of stored stroke check 3 in the positive direction on each axis

1325
Coordinate value of stored stroke check 3 in the negative direction on each axis

[Data type] 2-word axis
[Unit of data]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>deg</td>
</tr>
</tbody>
</table>

[Valid data range] -999999999 to 999999999
Set the coordinate values of stored stroke check 3 in the positive and negative directions for each axis in the machine coordinate system. The area inside the checks set in the parameter is inhibited.

NOTE
Specify diameters for any axis for which diameter programming is specified.

1326
Coordinate value II of stored stroke check 1 in the positive direction on each axis

1327
Coordinate value II of stored stroke check 1 in the negative direction on each axis

[Data type] 2-word axis
[Unit of data]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>deg</td>
</tr>
</tbody>
</table>

[Valid data range] -999999999 to 999999999
Set the coordinate values of stored stroke check 1 in the positive and negative directions for each axis in the machine coordinate system. The tool cannot enter the area outside the checks set in the parameter. The inhibition area set in the parameter is enabled when bit 2 (LMS) of parameter No. 1300 is 1 and stored stroke limit switching signal EXLM <G007#6> is 1.

NOTE
1 Specify diameter values for any axes for which diameter programming is specified.
2 These parameters are invalid if bit 2 (LMS) of parameter No. 1300 is set to 0, or if stored stroke limit switching signal EXLM <G007#6> is set to 0. In such a case, the settings of parameters No. 1320 and 1321 are used, instead.
### 4.12 PARAMETERS OF THE CHUCK AND TAILSTOCK BARRIER (T SERIES)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1330</td>
<td>Profile of a chuck</td>
</tr>
<tr>
<td>1331</td>
<td>Dimensions of the claw of a chuck (L)</td>
</tr>
<tr>
<td>1332</td>
<td>Dimensions of the claw of a chuck (W)</td>
</tr>
<tr>
<td>1333</td>
<td>Dimensions of the part of a claw at which a workpiece is held (L1)</td>
</tr>
<tr>
<td>1334</td>
<td>Dimensions of the part of a claw at which a workpiece is held (W1)</td>
</tr>
<tr>
<td>1335</td>
<td>X coordinate of a chuck (CX)</td>
</tr>
<tr>
<td>1336</td>
<td>ZX coordinate of a chuck (CZ)</td>
</tr>
</tbody>
</table>

**[Data type]** Byte  
**[Valid data range]** 0 or 1  
0: Chuck which holds a workpiece on the inner surface  
1: Chuck which holds a workpiece on the outer surface

**[Data type]** 2-word  
**[Unit of data]**  
<table>
<thead>
<tr>
<th>Increment system</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
</tbody>
</table>

**[Valid range]**  
No.1331 to No.1334: 0 to 99999999  
No.1335 to No.1336: -99999999 to 99999999  
Specify the profile of a chuck.
4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ty</td>
<td>Profile of a chuck (0: Chuck which holds a workpiece on the inner surface, 1: Chuck which holds a workpiece on the outer surface)</td>
</tr>
<tr>
<td>CX</td>
<td>X coordinate of a chuck</td>
</tr>
<tr>
<td>CZ</td>
<td>Z coordinate of a chuck</td>
</tr>
<tr>
<td>L</td>
<td>Dimensions of the claw of a chuck</td>
</tr>
<tr>
<td>W</td>
<td>Dimensions of the claw of a chuck (radius input)</td>
</tr>
<tr>
<td>L1</td>
<td>Dimensions of the part of a claw at which a workpiece is held</td>
</tr>
<tr>
<td>W1</td>
<td>Dimensions of the part of a claw at which a workpiece is held (radius input)</td>
</tr>
</tbody>
</table>

TY Specifies the profile of a chuck. When TY is set to 0, the chuck holding a workpiece on the inner surface is specified. When TY is set to 1, the chuck holding a workpiece on the outer surface is specified. The profile of the chuck is assumed to be symmetrical with respect to the z-axis.

CX, and CZ Specify the position (point A) of a chuck with the coordinates of the workpiece coordinate system. In this case, do not use the coordinates of the machine coordinate system.

NOTE
Specifying the coordinates with a diameter or radius depends on whether the corresponding axis conforms to diameter or radius specification. When the axis conforms to diameter specification, specify the coordinates with a diameter.
L, L1, W and W1  Define the profile of a chuck.

**NOTE**
Always specify W and W1 with radiuses. Specify L and L1 with radiuses when the Z-axis conforms to radius specification.

<table>
<thead>
<tr>
<th>No. 1341</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length of a tailstock (L)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. 1342</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diameter of a tailstock (D)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. 1343</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length of a tailstock (L1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. 1344</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diameter of a tailstock (D1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. 1345</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length of a tailstock (L2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. 1346</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diameter of a tailstock (D2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. 1347</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diameter of the hole of a tailstock (D3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. 1348</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Z coordinate of a tailstock (TZ)</td>
</tr>
</tbody>
</table>

**[Data type]** 2-words
**[Unit of data]**
- Millimeter machine: 0.001 mm, 0.0001 mm
- Inch machine: 0.0001 inch, 0.00001 inch

**[Valid range]**
- No.1341 to No.1347: 0 to 99999999
- No.1348: -99999999 to 99999999

Specify the profile of a tailstock.
TZ: Specifies the position (point B) of a tailstock with the Z-axis coordinate of the workpiece coordinate system. In this case, do not use the coordinate of the machine coordinate system. The profile of a tailstock is assumed to be symmetrical with respect to the Z-axis.

**NOTE**

Specifying the position of a tailstock with a radius or diameter depends on whether the Z-axis conforms to radius or diameter specification.

L, L1, L2, D, D1, D2, and D3 Define the profile of a tailstock.

**NOTE**

Always specify D, D1, D2, and D3 with diameters. Specify L, L1, and L2 with radiuses if the Z-axis conforms to radius specification.
4.13 PARAMETERS OF FEEDRATE

<table>
<thead>
<tr>
<th>1401</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RDR</td>
<td>TDR</td>
<td>RF0</td>
<td>JZR</td>
<td>LRP</td>
<td>RPD</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RDR</td>
<td>TDR</td>
<td>RF0</td>
<td></td>
<td>LRP</td>
<td>RPD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

RPD  Manual rapid traverse during the period from power-on time to the completion of the reference position return.
0: Disabled (Jog feed is performed.)
1: Enabled

LRP  Positioning (G00)
0: Positioning is performed with non-linear type positioning so that the tool moves along each axis independently at rapid traverse.
1: Positioning is performed with linear interpolation so that the tool moves in a straight line.

JZR  The manual reference position return at JOG feedrate
0: Not performed
1: Performed

RF0  When cutting feedrate override is 0% during rapid traverse,
0: The machine tool does not stop moving.
1: The machine tool stops moving.

TDR  Dry run during threading or tapping (tapping cycle G74 or G84, rigid tapping)
0: Enabled
1: Disabled

RDR  Dry run for rapid traverse command
0: Disabled
1: Enabled

<table>
<thead>
<tr>
<th>1402</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>JRV</td>
<td>JOV</td>
<td></td>
<td>NPC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>JOV</td>
<td></td>
<td>NPC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

NPC  The feed per rotation command is:
0: Ineffective when a position coder is not provided.
1: Effective even when a position coder is not provided (because the CNC converts it to the feed per minute command from F command S command).

NOTE
To use a position coder, set this parameter to 0.
While this parameter is set to 1, threading cannot be performed even if a position coder is provided.

JOV  Job override is:
0: Enabled
1: Disabled (tied to 100%)

JRV  Jog feed or incremental feed is
4.DESCRIPTION OF PARAMETERS

0: Performed at feed per minute.
1: Performed at feed per rotation.

**NOTE**

Specify a feedrate in parameter No.1423.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MIF</td>
</tr>
</tbody>
</table>

**NOTE**

When this parameter is set, the power must be turned off before operation is continued.

[Data type] Bit

MIF Cutting feedrates at feed per minute is specified by F commands
0: In units of 1 mm/min for millimeter machines or 0.01 inches/min for inch machines.
1: In unit of 0.001 mm/min for millimeter machines or 0.00001 inches/min for inch machines.

**NOTE**

M series are not equipped with this parameter. Cutting feedrates are specified by F commands in units of 0.001 mm/min for millimeter machines or 0.00001 inches/min for inch machines.

RTV Override while the tool is retracting in threading
0: Override is effective.
1: Override is not effective.

**NOTE**

The feedrate for helical interpolation is:
0: Clamped so that the feedrates along an arc and linear axis do not exceed the maximum cutting feedrate specified by parameter (No.1422 or 1430).
1: Clamped so that the composite feedrate along an arc and linear axis does not exceed the maximum cutting feedrate specified by parameter (No.1422).

DLF After a reference position is set, manual reference position return performed at:
0: Rapid traverse rate (parameter No.1420)
1: Manual rapid traverse rate (parameter No.1424)
NOTE
This parameter selects a feedrate for reference position return performed without dogs. This parameter also selects a feedrate when manual reference position return is performed according to bit 7 (SJZ) of parameter No.0002 using rapid traverse without deceleration dogs after a reference position is set.

<For T series>

F8A Valid data range for an F command in feed-per-minute mode
0: Range specified with bit 0 (MIF) of parameter No.1403
1:

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Units</th>
<th>IS-A, IS-B</th>
<th>IS-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>mm/min</td>
<td>0.001 to 240000.</td>
<td>0.001 to 100000.</td>
</tr>
<tr>
<td>Inch input</td>
<td>inch/min</td>
<td>0.00001 to 9600.</td>
<td>0.00001 to 4000.</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>deg/min</td>
<td>1 to 240000.</td>
<td>1 to 100000.</td>
</tr>
</tbody>
</table>

<For M series>

F8A Valid data range for an F command with a decimal point in feed-per minute mode
0:
1:

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Units</th>
<th>IS-A, IS-B</th>
<th>IS-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>mm/min</td>
<td>0.001 to 999999.999.</td>
<td></td>
</tr>
<tr>
<td>Inch input</td>
<td>inch/min</td>
<td>0.00001 to 999.99999.</td>
<td></td>
</tr>
<tr>
<td>Rotation axis (mm)</td>
<td>deg/min</td>
<td>1 to 240000.</td>
<td>1 to 100000.</td>
</tr>
<tr>
<td>Rotation axis (inch)</td>
<td>deg/min</td>
<td>1 to 9600.</td>
<td>1 to 4000.</td>
</tr>
</tbody>
</table>

FRV For inch input, the valid range of the feedrate specified for feed per revolution is:
0: Standard range. (F0.000001 to 9.999999 inches per revolution)
1: Extended to F50.0 inches per revolution. (F0.000001 to 50.000000 inches per revolution)

HCF In AI contour control (M series), as the feedrate of helical interpolation:
0: A composite feedrate is specified.
1: A feedrate along the arc is specified.

FC0 Specifies the behavior of the machine tool when a block (G01, G02, G03, etc.) containing a feedrate command (F command) that is 0 is issued during automatic operation, as follows:
0: A P/S alarm (No.011) is displayed, and the block is not executed.
1: No alarm is displayed, and the block is executed.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>1405</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FCI</td>
<td>EDR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 4. DESCRIPTION OF PARAMETERS

#### [Data type] Bit

**FIU**

Specifies the units of the data for the parameters that set the feedrates of the F1-digit feed commands (parameter Nos. 1451 to 1459).

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Units of data When F1U is 0</th>
<th>Units of data When F1U is 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>0.1 mm/min</td>
<td>1 mm/min</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.001 inch/min</td>
<td>0.1 inch/min</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>0.1 deg/min</td>
<td>1 deg/min</td>
</tr>
</tbody>
</table>

**FD3**

The number of significant digits of the fractional part in the feedrate command (F command) for feed per revolution is:

- 0: Up to two decimal positions (three decimal positions for inch input).
- 1: Up to three decimal positions (four decimal positions for inch input).

**EDR**

Selects a parameter for setting the external deceleration applied during interpolation type rapid traverse (bit 1 (LRP) of parameter No. 1401 = 1).

- 0: Parameter No. 1426 is used for setting the external deceleration rate applied during interpolation type rapid traverse.
- 1: The first axis of parameter No. 1427 is used for setting the external deceleration rate applied during interpolation type rapid traverse.

Similarly, for external deceleration 2, 3, 4, and 5, the first axis of the external deceleration rate parameter for rapid traverse is used if EDR is set to 1.

**FCI**

When the inch input and feed per revolution are set, the clamp feedrate for cutting feed is set to:

- 0: 9600 inch/min.
- 1: 144000 inch/min.
4. DESCRIPTION OF PARAMETERS

**1406**

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ED3</td>
<td>ED2</td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

ED2 External deceleration 2 is:
- 0: Disabled.
- 1: Enabled.

ED3 External deceleration 3 is:
- 0: Disabled.
- 1: Enabled.

**1407**

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>ACS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

ACS If the reference position return for a Cs axis is not completed when linear interpolation type positioning including the Cs axis is specified:
- 0: A movement is made by non-linear interpolation type positioning (rapid traverse is performed separately for each axis).
- 1: A P/S alarm (No. 5334) is issued.

ACF In AI advanced preview control or AI contour control mode, the feedrate clamp value is:
- 0: The setting of parameter No. 1432 or the setting of parameter No. 1422, whichever smaller.
  (If one of these settings is 0, a P/S alarm (No. 5157) is issued.)
- 1: The setting of parameter No. 1432 if a non-zero value is set in parameter No. 1432.
  If 0 is set in parameter No. 1432, the setting of parameter No. 1422 is used.
  If 0 is set in parameter No. 1422, a P/S alarm (No. 5157) is issued.
  Parameter No. 1422 = Maximum cutting feedrate
  Parameter No. 1432 = Maximum cutting feedrate for each axis in the advanced preview control mode

**1408**

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RFD</td>
</tr>
</tbody>
</table>

[Data type] Bit axis type

RFD The feedrate about a rotation axis is controlled:
- 0: In the usual method.
- 1: By converting the rotation speed about the rotation axis into the travel speed on the circumference of a virtual circle.
  Set the radius of the virtual circle in parameter No. 1465.

**1410**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Dry run rate</th>
</tr>
</thead>
</table>

[Data type] Word
Set the dry run rate when the manual feedrate is overridden by 100%.

1411

Cutting feedrate in the automatic mode at power-on (initial value)

The following parameter can be set at "Setting screen".

Word

When the machine requires little change in cutting feedrate during cutting, a cutting feedrate can be specified in the parameter. This eliminates the need to specify a cutting feedrate (F command) in the NC program.

The cutting feedrate set by this parameter is valid after the CNC is placed in the clear state by power-up or a reset until a feedrate is specified by a program command (F command). After a feedrate is specified by the F command, the feedrate becomes valid.

1420

Rapid traverse rate for each axis

2-word axis

Set the rapid traverse rate when the rapid traverse override is 100% for each axis.
1421  F0 rate of rapid traverse override for each axis

[Data type]  Word axis

[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>valid data range IS-A, IS-B</th>
<th>IS-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>30 to 15000</td>
<td>30 to 12000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>30 to 6000</td>
<td>30 to 4800</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>30 to 15000</td>
<td>30 to 12000</td>
</tr>
</tbody>
</table>

Set the F0 rate of the rapid traverse override for each axis.

Rapid traverse override signal  Override value
ROV2        ROV1
0           0    100%
0           1    50%
1           0    25%
1           1    F0

F0: Parameter 1421

1422  Maximum cutting feedrate for all axes

[Data type]  2-word

[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>valid data range IS-A, IS-B</th>
<th>IS-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 240000</td>
<td>6 to 100000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 96000</td>
<td>6 to 48000</td>
</tr>
</tbody>
</table>

Specify the maximum cutting feedrate.

A feedrate in the tangential direction is clamped in cutting feed so that it does not exceed the feedrate specified in this parameter.

**NOTE**

1  A maximum cutting feedrate can be specified for each axis only during linear interpolation and circular interpolation by using parameter No. 1430.
2  Even when parameter No. 1430 is used, clamping to a maximum cutting feedrate based on parameter No. 1422 is enabled during polar coordinate interpolation and cylindrical interpolation.
1423  Feedrate in manual continuous feed (jog feed) for each axis

[Data type]  Word axis

(1) In M series, or in T series when JRV, bit 4 of parameter No.1402, is set to 0 (feed per minute), specify a jog feedrate at feed per minute with an override of 100%.

[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>IS-A  6 to 15000, IS-B 6 to 12000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>IS-A  6 to 6000, IS-B 6 to 4800</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>IS-A 6 to 15000, IS-B 6 to 12000</td>
</tr>
</tbody>
</table>

(2) When JRV, bit 4 of parameter No.1402, is set to 1 (feed per revolution) in T series, specify a jog feedrate (feed per revolution) under an override of 100%.

[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>0.01 mm/rev</td>
<td>0 to 32767</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.001 mm/rev</td>
<td>IS-A 0 to 32767, IS-B 0 to 32767</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>0.01 deg/rev</td>
<td>IS-A 0 to 65535, IS-B 0 to 65535</td>
</tr>
</tbody>
</table>

1424  Manual rapid traverse rate for each axis

[Data type]  2-word axis

[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>IS-A 30 to 240000, IS-B 30 to 100000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>IS-A 30 to 96000, IS-B 30 to 48000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>IS-A 30 to 240000, IS-B 30 to 100000</td>
</tr>
</tbody>
</table>

Set the rate of manual rapid traverse when the rapid traverse override is 100% for each axis.

NOTE
If 0 is set, the rate set in parameter 1420 is assumed.

1425  FL rate of the reference position return for each axis

[Data type]  Word axis

[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>IS-A 6 to 15000, IS-B 6 to 12000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>IS-A 6 to 6000, IS-B 6 to 4800</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>IS-A 6 to 15000, IS-B 6 to 12000</td>
</tr>
</tbody>
</table>

Set feedrate (FL rate) after deceleration when the reference position return is performed for each axis.
1426  External deceleration rate 1 of cutting feed

[Data type]   Word

[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 15000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 6000</td>
</tr>
</tbody>
</table>

Set the external deceleration rate of cutting feed.

1427  External deceleration rate 1 of rapid traverse for each axis

[Data type]   Word axis

[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 15000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 6000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>6 to 15000</td>
</tr>
</tbody>
</table>

Set the external deceleration rate of rapid traverse for each axis.
This parameter sets a rapid traverse rate for reference position return operation using deceleration dogs, or for reference position return operation before a reference position is set. This parameter is also used to set a feedrate for the rapid traverse command (G00) in automatic operation before a reference position is set.

**NOTE**

1. This parameter is invalid for an axis using the scale with absolute addressing reference marks.
2. When 0 is set in this parameter, this parameter disables the reference position return feedrate setting function.

### Before a reference position is set

<table>
<thead>
<tr>
<th>No. 1428</th>
<th>After a reference position is set</th>
</tr>
</thead>
<tbody>
<tr>
<td>=0</td>
<td>≠0</td>
</tr>
<tr>
<td>≠0</td>
<td>=0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operation</th>
<th>No. 1424 or No. 1424 (*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference position return by G28</td>
<td>No. 1420 or No. 1424 (**)</td>
</tr>
<tr>
<td>Raped traverse command (G00) in automatic operation</td>
<td>No. 1420 or No. 1424 (**)</td>
</tr>
<tr>
<td>Manual reference position return</td>
<td>No. 1420 or No. 1424 (**)</td>
</tr>
<tr>
<td>Manual raped traverse</td>
<td>No. 1420 or No. 1424 (**)</td>
</tr>
</tbody>
</table>

*1 With/without dogs: Reference position return operation not using/using deceleration dogs

*2 For manual rapid traverse before a reference position is set, a jog feedrate (parameter No.1423) or manual rapid traverse rate (parameter No.1424) is used according to the setting of bit 0 (RPD) of parameter No.1401.

*3 The rapid traverse rate set in parameter No.1424 or No.1420 is used according to the setting of bit 1 (DLF) of parameter No.1404 when reference position return is performed without dogs, or when reference position return operation is performed with bit 7 (SJZ) of parameter No.0002 set to 1 after a reference position is set (when reference position return operation is performed using rapid traverse without deceleration dogs).
4. DESCRIPTION OF PARAMETERS

1430  Maximum cutting feedrate for each axis

[Data type] 2-word axis

[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range IS-A, IS-B</th>
<th>IS-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 240000</td>
<td>6 to 100000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 96000</td>
<td>6 to 48000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>6 to 240000</td>
<td>6 to 100000</td>
</tr>
</tbody>
</table>

Specify the maximum cutting feedrate for each axis. A feedrate for each axis is clamped in cutting feed so that it does not exceed the maximum feedrate specified for each axis.

NOTE

1 This parameter is valid only during linear interpolation and circular interpolation. Even when this parameter is set, clamping to a maximum cutting feedrate based on parameter No. 1422 is enabled during polar coordinate interpolation, cylindrical interpolation, and involute interpolation (M series).

2 When this parameter is set to 0 for all axes, clamping to a maximum cutting feedrate based on parameter No. 1422 is enabled. This means that if a value other than 0 is set for any of the axes with this parameter, clamping to a maximum cutting feedrate is performed for all axes during linear interpolation or circular interpolation according to this parameter.

1431  Maximum cutting feedrate for all axes in the advanced preview control mode

[Data type] 2-words

[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range IS-A, IS-B</th>
<th>IS-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>0 to 240000</td>
<td>0 to 100000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>0 to 96000</td>
<td>0 to 48000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>0 to 240000</td>
<td>0 to 100000</td>
</tr>
</tbody>
</table>

Specify the maximum cutting feedrate for all axes in the advanced preview control mode. A feedrate in the tangential direction is clamped in cutting feed so that it does not exceed the feedrate specified in this parameter.
4. DESCRIPTION OF PARAMETERS

NOTE
1. To specify the maximum cutting feedrate for each axis, use parameter No. 1432 instead.
2. In a mode other than the look-ahead mode, the maximum cutting feedrate specified in parameter No. 1422 or No. 1430 is applied and the feedrate is clamped at the maximum feedrate.

<table>
<thead>
<tr>
<th>Parameter No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1432</td>
<td>Maximum cutting feedrate for each axis in the AI advanced preview control / AI contour control mode or advanced preview control mode</td>
</tr>
</tbody>
</table>

[Data type] 2-word axis

[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>0 to 240000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>0 to 96000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>0 to 240000</td>
</tr>
</tbody>
</table>

Specify the maximum cutting feedrate for each axis in the AI advanced preview control / AI contour control mode or advanced preview control mode.
A feedrate for each axis is clamped during cutting feed so that it does not exceed the maximum cutting feedrate specified for each axis.

NOTE
1. This parameter is effective only in linear and circular interpolation. In polar coordinate and cylindrical interpolation, the maximum feedrate for all axes specified in parameter No. 1431 is effective.
2. If a setting for each axis is 0, the maximum feedrate specified in parameter No. 1431 is applied to all axes and the feedrate is clamped at the maximum feedrate.
3. In a mode other than the AI advanced preview control / AI contour control mode or advanced preview mode, the maximum cutting feedrate specified in parameter No. 1422 or No. 1430 is applied and the feedrate is clamped at the maximum feedrate.
4. DESCRIPTION OF PARAMETERS  

1436  

Maximum speed for each axis for the speed check function  

[Data type] 2-word axis  
[Unit of data, valid data range]  

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>0.30 to 240000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>0.30 to 96000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>0.30 to 240000</td>
</tr>
</tbody>
</table>

If 0 is set, this function is disabled.  
Set the maximum speed for each axis. If the speed set in this parameter is exceeded, a P/S alarm (No. 5323) indicating an excessive speed is issued, and the movement is decelerated then stopped.  
The speed check function checks data obtained by converting this parameter value to the amount of a movement made every 8 ms.  

1440  

External deceleration rate 2 of cutting feed  

[Data type] Word  
[Unit of data, valid data range]  

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 15000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 6000</td>
</tr>
</tbody>
</table>

Set the external deceleration rate of cutting feed.  

1441  

External deceleration rate 2 of rapid traverse for each axis  

[Data type] Word axis  
[Unit of data, valid data range]  

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 15000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 6000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>6 to 15000</td>
</tr>
</tbody>
</table>

Set the external deceleration rate of rapid traverse for each axis.
1442
Maximum feedrate 2 of manual handle feed for each axis

[Data type] Word axis
[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 15000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 6000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>6 to 15000</td>
</tr>
</tbody>
</table>

Set the maximum feedrate of manual handle feed for each axis.

1443
External deceleration rate 3 of cutting feed

[Data type] Word
[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 15000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 6000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>6 to 15000</td>
</tr>
</tbody>
</table>

Set the external deceleration rate of cutting feed.

1444
External deceleration rate 3 of rapid traverse for each axis

[Data type] Word axis
[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 15000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 6000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>6 to 15000</td>
</tr>
</tbody>
</table>

Set the external deceleration rate of rapid traverse for each axis.

1445
Maximum feedrate 3 of manual handle feed for each axis

[Data type] Word axis
[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 15000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 6000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>6 to 15000</td>
</tr>
</tbody>
</table>

Set the maximum feedrate of manual handle feed for each axis.
## 4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Data Type</th>
<th>Valid Data Range</th>
<th>Details</th>
</tr>
</thead>
</table>
| 1450      | Change of feedrate for one graduation on the manual pulse generator during F1 digit feed | Byte      | 1 to 127         | Set the constant that determines the change in feedrate as the manual pulse generator is rotated one graduation during F1-digit feed.  
\[
\Delta F = \frac{F_{\text{max} i}}{100n}
\]  
(\text{where, } i=1 \text{ or } 2)  
In the above equation, set \( n \). That is, the number of revolutions of the manual pulse generator, required to reach feedrate \( F_{\text{max} i} \) is obtained. \( F_{\text{max} i} \) refers to the upper limit of the feedrate for an F1-digit feed command, and set it in parameter 1460 or 1461.  
\( F_{\text{max}1} \): Upper limit of the feedrate for F1 to F4 (parameter 1460)  
\( F_{\text{max}2} \): Upper limit of the feedrate for F5 to F9 (parameter 1461) |
The following parameter can be set at "Setting screen".

**[Data type]** 2-word

**[Unit of data, valid data range]**

1. When the F1U parameter (bit 0 of parameter No.1405) is 0

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>0.1 mm/min</td>
<td>6 to 150000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.01 inch/min</td>
<td>6 to 60000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>0.1 deg/min</td>
<td>6 to 150000</td>
</tr>
</tbody>
</table>

2. When the F1U parameter (bit 0 of parameter No.1405) is 1

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 15000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 6000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>6 to 15000</td>
</tr>
</tbody>
</table>

These parameters set the feedrates for 1-digit feed commands F1 to F9. When an 1-digit feed command is specified, and the feedrate is changed by turning the manual pulse generator, the parameter-set value also changes accordingly.
**4. DESCRIPTION OF PARAMETERS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Data Type</th>
<th>Unit of Data</th>
<th>Valid Data Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1460</td>
<td>Upper limit of feedrate for the one-digit F code command (F1 to F4)</td>
<td>2-word</td>
<td>Millimeter machine 1 mm/min</td>
<td>6 to 15000</td>
</tr>
<tr>
<td>1461</td>
<td>Upper limit of feedrate for the one-digit F code command (F5 to F9)</td>
<td></td>
<td>Inch machine 0.1 inch/min</td>
<td>6 to 6000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Rotation axis 1 deg/min</td>
<td>6 to 15000</td>
</tr>
</tbody>
</table>

Set the upper limit of feedrate for the F1-digit feed command. As the feedrate increases by turning the manual pulse generator, the feedrate is clamped when it reaches the upper limit set. If an F1-digit feed command F1 to F4 is executed, the upper limit is that set in parameter 1460. If an F1-digit command F5 to F9 is executed, the upper limit is that set in parameter 1461.
1465

Virtual radius for feedrate control about rotation axis

[Data type] 2-word axis
[Unit of data] Increment system IS-A IS-B IS-C Unit
Metric input 0.01 0.001 0.0001 mm
Inch input

[Valid data range] 0 to 99999999

Set the radius of a virtual circle when using such a control method that the feedrate of a rotation axis is converted to a travel speed on a circle of a virtual radius.

NOTE
1 Note that the increment system remains unchanged regardless of whether metric input or inch input is used.
2 This function is enabled when bit 0 (ROTx) of parameter No. 1006 and bit 0 (RFDx) of parameter No. 1408 are set to 1.
3 Be careful when setting bit 0 (RFDx) of parameter No. 1408 and parameter No. 1465 (virtual radius). In particular, when this function is used with a small virtual radius value, axis movement speeds up.
4 If a large value is set for the amount of travel and parameter No. 1465 (virtual radius), an alarm (P/S 5307: Internal data exceeded an allowable range.) is issued.
5 This function cannot be used in the following modes:
Rapid traverse, inverse time feed (G93), feed per revolution (G94), threading, AI advanced preview control, AI contour control
4. DESCRIPTION OF PARAMETERS

1466

<table>
<thead>
<tr>
<th>Feedrate of retraction in the threading cycle</th>
</tr>
</thead>
</table>

[Data type] 2-word
[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range IS-A, IS-B</th>
<th>IS-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>30 to 240000</td>
<td>6 to 100000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>30 to 96000</td>
<td>6 to 48000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>30 to 240000</td>
<td>6 to 100000</td>
</tr>
</tbody>
</table>

Set the feedrate of retraction in a threading cycle. If 0 is set in this parameter, a movement is made at the feedrate (rapid traverse rate) set in parameter No. 1420.

[Example] When G92 is specified

In the above figure, R1 denotes the rapid traverse rate, and C denotes the cutting feedrate. Feedrate R2 is set by this parameter. If 0 is set in this parameter, R2 is the same feedrate as R1.
4.14 PARAMETERS OF ACCELERATION/DECELERATION CONTROL

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCI</td>
<td>RTO</td>
<td>ACD</td>
<td>NCI</td>
<td>RTO</td>
<td>OVB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

OV B Block overlap in cutting feed
0: Blocks are not overlapped in cutting feed.
1: Blocks are overlapped in cutting feed.
Block overlap outputs the pulses remaining at the end of pulse distribution in a block together with distribution pulses in the next block. This eliminates changes in feedrates between blocks.
Block overlap is enabled when blocks containing G01, G02, or G03 are consecutively specified in G64 mode. If minute blocks, however, are specified consecutively, overlap may not be performed.
The following pulses in block F2 are added to the pulses remaining at the end of pulse distribution in block F1.

\[
\text{(Number of pulses to be added)} = F_2 \times \frac{\text{(Number of pulses required at the end of block F1)}}{F_1}
\]

When F1 = F2

![Diagram of block overlap in cutting feed](image)

When block overlap is disabled

When block overlap is enabled

RTO Block overlap in rapid traverse
0: Blocks are not overlapped in rapid traverse.
1: Blocks are overlapped in rapid traverse.

NOTE
See the description of parameter No.1722.

NCI In-position check at deceleration
0: Performed
1: Not performed

- 79 -
ACD  Function for automatically reducing the feedrate at corners (automatic corner override function)
0 : The function is not used.
1 : The function is used.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS2</td>
<td>G8S</td>
<td>CSD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>FWB</td>
</tr>
<tr>
<td>LS2</td>
<td>G8S</td>
<td>CSD</td>
<td>BS2</td>
<td>COV</td>
<td></td>
<td></td>
<td>FWB</td>
</tr>
</tbody>
</table>

[Data type]  Bit
FWB  Cutting feed acceleration/deceleration before interpolation
0 : Type A of acceleration/deceleration before interpolation is used.
1 : Type B of acceleration/deceleration before interpolation is used.
Type A:
When a feedrate is to be changed by a command, acceleration/deceleration starts after the program enters the block in which the command is specified.
Type B:
When a feedrate is to be changed by a command, deceleration starts and terminates at the block before the block in which the command is specified.
When a feedrate is to be changed by a command, acceleration starts after the program enters the block in which the command is specified.

<Example of a deceleration process>  <Example of an acceleration process>

COV  The outer arc cutting feedrate change function of the automatic corner override function is:
0 : Not used.
1 : Used.
BS2  The type of acceleration/deceleration after interpolation in cutting feed in advanced preview control mode is:
0 : Specified by bit 6 (LS2) of parameter No. 1602.
1 : Bell-shaped acceleration/deceleration.
### 4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>BS2</th>
<th>LS2</th>
<th>Acceleration/deceleration</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>Exponential acceleration/deceleration after interpolation</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>Linear acceleration/deceleration after interpolation</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>Bell-shaped acceleration/deceleration after interpolation. (The option for bell-shaped acceleration/deceleration after interpolation for cutting feed is required.)</td>
</tr>
</tbody>
</table>

**CSD**  
In the function for automatically reducing a feedrate at corners,  
0: Angles are used for controlling the feedrate.  
1: Differences in feedrates are used for controlling the feedrate.

**G8S**  
Serial spindle advanced preview control is:  
0: Disabled.  
1: Enabled.  
When enabled, advanced preview control can be applied to the following functions:  
- Rigid tapping  
- Cs contour control  
- Spindle positioning (only when bit 3 of parameter No.1800 is 1)

**NOTE**  
For Cs contour control and rigid tapping, advanced preview control is valid only for the first spindle. Cs contour control and rigid tapping with the second spindle does not support advanced preview control.

**LS2**  
Type of acceleration/deceleration after interpolation in cutting feed in advanced preview control, AI advanced preview control, or AI contour control mode  
0: Exponential acceleration/deceleration is applied (advanced preview control), or no acceleration/deceleration is applied (AI advanced preview control and AI contour control).  
1: Linear acceleration/deceleration is applied.

<table>
<thead>
<tr>
<th>1603</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEL</td>
<td>RBL</td>
<td>RPT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PRT**  
The acceleration/deceleration of interpolation-type rapid traverse is performed:  
0: With a constant inclination.  
1: With a constant time.

**NOTE**  
1 The acceleration/deceleration time constant and override for rapid traverse are used.  
2 Rapid traverse block overlap cannot be used.

**RBL**  
In the AI advanced preview control / AI contour control, acceleration/deceleration of rapid traverse is:  
0: Linear acceleration/deceleration.

**NOTE**

Bit 4 (PRT) of parameter No. 1603 is invalid.

**BEL**

In the AI contour control mode:

0: Linear acceleration/deceleration before look-ahead interpolation is used.
1: Bell-shaped acceleration/deceleration before look-ahead interpolation is used.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DS2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**[Data type]** Bit

**DS2**

When an overtravel alarm is issued for stored stroke check 2 during linear acceleration/deceleration before interpolation, the function to perform deceleration in advance so that the feedrate set in parameter No. 12700 can be attained at the issuance of the alarm is:

0: Disabled.
1: Enabled.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>JGLx</td>
<td></td>
<td>JGLx</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CTBx</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**[Data type]** Bit axis

**CTLx**

Acceleration/deceleration in cutting feed including feed in dry run

0: Exponential acceleration/deceleration is applied.
1: Linear acceleration/deceleration after interpolation is applied.

**NOTE**

To use bell-shaped acceleration/deceleration after interpolation, set this parameter to 0 and select the acceleration/deceleration using CTBx, bit 1 of parameter No. 1610.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Acceleration/deceleration</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTBx</td>
<td>CTLx</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

**CTBx**

Acceleration/deceleration in cutting feed including feed in dry run

0: Exponential acceleration/deceleration or linear acceleration/deceleration after interpolation is applied (depending on the setting in CTLx, bit 0 of parameter No. 1610).
B-64120EN/01 4.DESCRIPTION OF PARAMETERS

1: Bell-shaped acceleration/deceleration after interpolation is applied.

**NOTE**
This parameter is effective only when the function of bell-shaped acceleration/deceleration after interpolation in cutting feed is provided. If the function is not provided, the setting in CTLx, bit 0 of parameter No.1610, determines the type of acceleration/deceleration irrespective of the setting in this parameter.

JGLx  Acceleration/deceleration in jog feed
0: Exponential acceleration/deceleration is applied.
1: Linear acceleration/deceleration after interpolation or bell-shaped acceleration/deceleration after interpolation is applied (depending on which is used for cutting feed).

**1620**
<table>
<thead>
<tr>
<th>[Data type]</th>
<th>Word axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Unit of data]</td>
<td>ms</td>
</tr>
<tr>
<td>[Valid data range]</td>
<td>0 to 4000</td>
</tr>
</tbody>
</table>

Specify a time constant used for acceleration/deceleration in rapid traverse for each axis.

(1) When bell-shaped acceleration/deceleration is set
Set time constant $T_1$ for bell-shaped acceleration/deceleration in this parameter, and set time constant $T_2$ in parameter No. 1621.

(2) When linear acceleration/deceleration is set
Set time constant $T$ for linear acceleration/deceleration in this parameter, and set 0 in parameter No. 1621.

**NOTE**
1 When parameter No.1621 (time constant $T_2$ used for bell-shaped acceleration/deceleration in rapid traverse) is set to 0, linear acceleration/deceleration is applied in rapid traverse even if the function is provided. In this case, this parameter stands for a time constant used in linear acceleration/deceleration in rapid traverse.

2 Depending on the set time constant values, a movement may be made at a feedrate a little lower than the rapid traverse rate for a certain time before the rapid traverse rate is attained by acceleration. To prevent this, set the time constants to a multiple of 8.

<Rapid traverse linear acceleration/deceleration>
Set the value when the rapid traverse rate is 100%. If it is under 100%, the total time is reduced. (Constant acceleration method)
The value of $T_1$ is determined from the torque of motor. Usually set the value of $T_2$ to 24 ms or 32 ms.

**Parameter 1621**

<table>
<thead>
<tr>
<th>Data type</th>
<th>Word axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of data</td>
<td>ms</td>
</tr>
<tr>
<td>Valid data range</td>
<td>0 to 512</td>
</tr>
</tbody>
</table>

Specify time constant $T_2$ used for bell-shaped acceleration/deceleration in rapid traverse for each axis.
NOTE
1 Set parameter No.1620 to time constant $T_1$ used for bell-shaped acceleration/deceleration in rapid traverse, and set this parameter to time constant $T_2$.
   For details of time constants $T_1$ and $T_2$, see the description of parameter No.1620.
2 When this parameter is set to 0, linear acceleration/deceleration is applied in rapid traverse. The setting in parameter No.1620 is used as a time constant in linear acceleration/deceleration.

1622

<table>
<thead>
<tr>
<th>Data type</th>
<th>Word axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of data</td>
<td>ms</td>
</tr>
<tr>
<td>Valid data range</td>
<td>0 to 4000 (exponential acceleration/deceleration in cutting feed)</td>
</tr>
<tr>
<td></td>
<td>0 to 512 (linear or bell-shaped acceleration/deceleration after interpolation in cutting feed)</td>
</tr>
</tbody>
</table>

Set the time constant used for exponential acceleration/deceleration in cutting feed, bell-shaped acceleration/deceleration after interpolation or linear acceleration/deceleration after interpolation in cutting feed for each axis. Except for special applications, the same time constant must be set for all axes in this parameter. If the time constants set for the axes differ from each other, proper straight lines and arcs cannot be obtained.

This parameter is valid for threading, irrespective of the acceleration/deceleration type. For threading cycles G76 and G92 (G78 in the G code system B or C), this parameter is valid for operations other than exponential acceleration/deceleration. (T series)
4. DESCRIPTION OF PARAMETERS

1623  FL rate of exponential acceleration/deceleration in cutting feed for each axis

[Data type]  Word axis
[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IS-A, IS-B</td>
<td>IS-C</td>
</tr>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>0, 6 to 15000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>0, 6 to 6000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>0, 6 to 15000</td>
</tr>
</tbody>
</table>

Set the lower limit (FL rate) of exponential acceleration/deceleration in cutting feed for each axis.

NOTE

Except for special applications, this parameter must be set to 0 for all axes. If a value other than 0 is specified, proper straight lines and arcs cannot be obtained.

1624  Time constant of exponential acceleration/deceleration or bell-shaped acceleration/deceleration or linear acceleration/deceleration after interpolation, in jog feed for each axis.

[Data type]  Word axis
[Unit of data]  ms
[Valid data range]

0 to 4000 (exponential acceleration/deceleration in jog feed)
0 to 512 (linear or bell-shaped acceleration/deceleration after interpolation in jog feed)

Set the time constant used for exponential acceleration/deceleration, bell-shaped acceleration/deceleration or linear acceleration/deceleration after interpolation in jog feed for each axis. The type to select depends on the settings of the parameters CTLx, CTBx, and JGLx (Nos. 1610#0, #1, and #4).

1625  FL rate of exponential acceleration/deceleration in jog feed for each axis.

[Data type]  Word axis
[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IS-A, IS-B</td>
<td>IS-C</td>
</tr>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 15000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 6000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>6 to 15000</td>
</tr>
</tbody>
</table>

Set the lower limit (FL rate) of exponential acceleration/deceleration in cutting feed for each axis.

1626  Time constant of exponential acceleration/deceleration in the thread cutting cycle for each axis.
4. DESCRIPTION OF PARAMETERS

Set the time constant used for exponential acceleration/deceleration in the thread cutting cycle (G76, G78 (G92 in G code system A)) for each axis.

If the acceleration type is not exponential acceleration/deceleration, parameter No. 1622 becomes valid.

| 1627 | FL rate of exponential acceleration /deceleration in the thread cutting cycle for each axis |

Set the lower limit (FL rate) of exponential acceleration/deceleration in the thread cutting cycle (G76, G78 (G92 in G code system A)) for each axis.

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 15000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 6000</td>
</tr>
</tbody>
</table>
1710 Minimum deceleration ratio (MDR) of the inner circular cutting rate in automatic corner override

[Data type] Byte  
[Unit of data] %  
[Valid data range] 1 to 100  
This parameter sets the minimum deceleration ratio (MDR) when the inner circular cutting speed is changed by automatic corner override. In circular cutting with an inward offset, the actual feedrate for a specified feedrate (F) is expressed as follows:

\[ F \times \frac{R_c}{R_p} \]

Rc: Radius of the path of the cutter’s center.  
Rp: Programmed radius  
Then, the actual feedrate is controlled so that the feedrate on the programmed path can achieve the specified feedrate F.

If Rc is too small in comparison with Rp, such that Rc/Rp \( \approx 0 \), the cutter will stop. To prevent this, a minimum deceleration ratio (MDR) is set.

1711 Angle (θp) used to recognize an inner corner in inner corner override

[Data type] Byte  
[Unit of data] Degree  
[Valid data range] 1 to 179 (standard value = 91)  
This parameter sets the angle used to recognize an inner corner for inner corner override by automatic corner override.

1712 Amount of override for an inner corner

[Data type] Byte  
[Unit of data] %  
[Valid data range] 1 to 100 (standard value = 50)  
Set the amount of override for an inner corner.
1713

**Distance Le from the starting point in inner corner override**

**[Data type]** 2-word  
**[Unit of data]**

<table>
<thead>
<tr>
<th>Increment system</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>1</td>
<td>0.1</td>
<td>0.01</td>
<td>mm</td>
</tr>
<tr>
<td>Inch input</td>
<td>0.1</td>
<td>0.01</td>
<td>0.001</td>
<td>inch</td>
</tr>
</tbody>
</table>

**[Valid data range]** 0 to 3999  
Set distance Le from the starting point in an inner corner for corner override.

1714

**Distance Ls up to the ending point in inner corner override**

**[Data type]** 2-word  
**[Unit of data]**

<table>
<thead>
<tr>
<th>Increment system</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>1</td>
<td>0.1</td>
<td>0.01</td>
<td>mm</td>
</tr>
<tr>
<td>Inch input</td>
<td>0.1</td>
<td>0.01</td>
<td>0.001</td>
<td>inch</td>
</tr>
</tbody>
</table>

**[Valid data range]** 0 to 3999  
Set distance Ls up to the end point in an inner corner for corner override.

If $\theta \leq \theta_p$, the inside of a corner is recognized. ($\theta_p$ is set in parameter 1711.)

When an inner corner is recognized, the feedrate is overridden in the range of $Le$ in the block immediately before the intersection of the corner and $Ls$ in the next block following the intersection.

$Ls$ and $Le$ are each a straight line connecting the intersection of the corner and a given point on the path of the cutter’s center.

$Ls$ and $Le$ are set in parameters 1713 and 1714.

![Fig.4.17 (b) Distance Le and Ls in the automatic corner override at an inner corner](image-url)
### 1722  Rapid traverse feedrate reduction ratio for overlapping rapid traverse blocks

- **[Data type]** Byte axis
- **[Unit of data]** %
- **[Valid data range]** 1 to 100

This parameter is used when rapid traverse blocks are arranged successively, or when a rapid traverse block is followed by a block that does not cause movement. When the feedrate for each axis of a block is reduced to the ratio set in this parameter, the execution of the next block is started.

#### Examples

```
X-axis feedrate

N1 G00 X- - ;  N2 G00 X- - ;

Fh : Rapid traverse feedrate
\[ \alpha \] : Setting of parameter No.1722 (feedrate reduction ratio)
Fd : Feedrate where deceleration is terminated: \[ Fh \times \frac{\alpha}{100} \]
```

### NOTE

The parameter No.1722 is effective when parameter No.1601 #4 (RT0) is set to 1.

### 1730  Maximum feedrate for arc radius R

- **[Data type]** Word
- **[Unit of data, valid data range]**

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>In IS-A, IS-B: 8 to 15000, IS-C: 8 to 12000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>In IS-A, IS-B: 8 to 6000, IS-C: 8 to 4800</td>
</tr>
</tbody>
</table>

Set a maximum feedrate for the arc radius set in parameter No.1731.
4. DESCRIPTION OF PARAMETERS

**1731**

<table>
<thead>
<tr>
<th>Data type</th>
<th>2-word</th>
</tr>
</thead>
</table>

[Unit of data]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear axis (millimeter machine)</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Linear axis (inch machine)</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
</tbody>
</table>

[Valid data range] 1000 to 99999999

Set the arc radius corresponding to the maximum feedrate set in parameter No.1730.

**1732**

<table>
<thead>
<tr>
<th>Data type</th>
<th>Word</th>
</tr>
</thead>
</table>

[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>0 to 15000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>0 to 6000</td>
</tr>
</tbody>
</table>

The arc radius-based feedrate clamping function reduces the maximum feedrate as the arc radius decreases. When the specified maximum feedrate is not greater than RV min (minimum value for arc radius-based feedrate clamping), RV min is used as the maximum feedrate.

**1740**

<table>
<thead>
<tr>
<th>Data type</th>
<th>2-word</th>
</tr>
</thead>
</table>

[Unit of data] 0.001 deg

[Valid data range] 0 to 180000

Set a critical angle to be subtended by two blocks for corner deceleration when the angle-based automatic corner deceleration function is used.

The angle subtended by two blocks is defined as \( \theta \) in the examples shown below.
## 4. DESCRIPTION OF PARAMETERS

### 1741

**Feedrate for assuming the termination of automatic corner deceleration**

(for acceleration/deceleration after interpolation)

**[Data type]** Word axis

**[Unit of data, valid data range]**

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range IS-A</th>
<th>Valid data range IS-B</th>
<th>Valid data range IS-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 15000</td>
<td>6 to 12000</td>
<td></td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 6000</td>
<td>6 to 4800</td>
<td></td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>6 to 15000</td>
<td>6 to 12000</td>
<td></td>
</tr>
</tbody>
</table>

Set the feedrate for assuming the termination of deceleration in automatic corner deceleration.

### 1762

**Exponential acceleration/deceleration time constant for cutting feed in the advanced preview control mode**

**[Data type]** Word axis

**[Unit of data]** ms

**[Valid data range]** 0 to 4000

Set an exponential acceleration/deceleration time constant for cutting feed in the advanced preview control mode.

### 1763

**Minimum speed in exponential acceleration/deceleration for cutting feed in the advanced preview control mode**

**[Data type]** Word axis

**[Unit of data, valid data range]**

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range IS-A</th>
<th>Valid data range IS-B</th>
<th>Valid data range IS-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 15000</td>
<td>6 to 12000</td>
<td></td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 6000</td>
<td>6 to 4800</td>
<td></td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>6 to 15000</td>
<td>6 to 12000</td>
<td></td>
</tr>
</tbody>
</table>

Set minimum speed (FL) in exponential acceleration/deceleration for cutting feed in the advanced preview control mode.
4. DESCRIPTION OF PARAMETERS

**1768**

<table>
<thead>
<tr>
<th>Data type</th>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of data</td>
<td>msec</td>
</tr>
<tr>
<td>Valid data range</td>
<td></td>
</tr>
<tr>
<td>Advanced preview control, AI advanced preview control</td>
<td>0, 8 to 512</td>
</tr>
<tr>
<td>AI contour control</td>
<td>0, 4 to 256</td>
</tr>
</tbody>
</table>

Set the time constant to be used for linear or bell-shaped acceleration/deceleration after interpolation in cutting feed in advanced preview control, AI advanced preview control, or AI contour control mode.

**NOTE**

For bell-shaped acceleration/deceleration, the function of bell-shaped acceleration/deceleration after cutting feed interpolation is required.

**1769**

<table>
<thead>
<tr>
<th>Data type</th>
<th>Word axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of data</td>
<td>msec</td>
</tr>
<tr>
<td>Valid data range</td>
<td></td>
</tr>
<tr>
<td>Advanced preview control, AI advanced preview control</td>
<td>0, 8 to 512</td>
</tr>
<tr>
<td>AI contour control</td>
<td>0, 4 to 256</td>
</tr>
</tbody>
</table>

Set the time constant to be used for linear or bell-shaped acceleration/deceleration after interpolation in cutting feed for each axis in advanced preview control, AI advanced preview control, or AI contour control mode for each axis. Which acceleration/deceleration type, the linear or bell-shaped type, is to be used is specified by bit 3 (BS2) and bit 6 (LS2) of parameter No. 1602.

**NOTE**

1 If 0 is set in parameter No. 1769 for all axes, the value set in parameter No. 1768 is used. For other than special purposes, set a time constant in parameter No. 1768, which is common to all axes.
2 If a different time constant is set in parameter No. 1769, a correct straight line or arc shape cannot be obtained.

**1770**

Parameter 1 for setting the acceleration rate of linear acceleration/deceleration before interpolation in advanced preview control, Al advanced preview control, or AI contour control mode (maximum machining speed during linear acceleration/deceleration before interpolation)
This parameter is used to set the acceleration rate of linear acceleration/deceleration before interpolation in advanced preview control, AI advanced preview control, or AI contour control mode. In this parameter, set the maximum machining speed during linear acceleration/deceleration before interpolation. Set the time used to reach the maximum machining speed in parameter No.1771.

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS-A, IS-B</td>
<td></td>
<td>IS-C</td>
</tr>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 240000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 96000</td>
</tr>
</tbody>
</table>

NOTE
When 0 is set in parameter No.1770 or parameter No.1771, linear acceleration/deceleration before interpolation is disabled.

Parameter 2 for setting the acceleration rate of linear acceleration/deceleration before interpolation in advanced preview control, AI advanced preview control, or AI contour control mode (time until the maximum machining speed is reached during linear acceleration/deceleration before interpolation)

This parameter is used to set the acceleration rate of linear acceleration/deceleration before interpolation in advanced preview control, AI advanced preview control, or AI contour control mode. In this parameter, set the maximum machining speed during linear acceleration/deceleration before interpolation. In this parameter, set the time (time constant) used to reach the speed set in parameter No.1770.
NOTE
1 When 0 is set in parameter No.1770 or parameter No.1771, linear acceleration/deceleration before interpolation is disabled.
2 In parameter Nos. 1770 and 1771, set values that satisfy the following:
   Parameter No.1770/Parameter No.1771 ≥ 5
3 If 0 is set in parameter No. 1770 or 1771 in AI advanced preview control or AI contour control, P/S alarm 5157 is issued.

**1772**

**Time constant for bell-shaped acceleration/deceleration of acceleration time fixed type before look-ahead interpolation**

[Data type] Byte
[Unit of data] msec
[Valid data range] 0 to 255

This parameter is used to set a time constant when the BEL parameter (bit 7 of parameter No.1603) is set to 1, that is, when bell-shaped acceleration/deceleration before look-ahead interpolation is selected in AI contour control mode. Set the value of tb as shown below. When 0 is set, linear acceleration/deceleration before interpolation is applied.

![Diagram showing bell-shaped acceleration/deceleration](image)

**NOTE**

The option for bell-shaped acceleration/deceleration before look-ahead interpolation is required. This parameter is enabled only in AI contour control mode.
1773

<table>
<thead>
<tr>
<th>[Data type]</th>
<th>Word axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Unit of data]</td>
<td>msec</td>
</tr>
<tr>
<td>[Valid data range]</td>
<td>0 to 4000</td>
</tr>
</tbody>
</table>

Set the time constant of rapid traverse acceleration/deceleration in AI contour control mode.

(1) When bit 6 (RBL) of parameter No. 1603 is set to 1 (when bell-shaped acceleration/deceleration is set)
Set time constant \( T_1 \) of bell-shaped acceleration/deceleration in this parameter, and set time constant \( T_2 \) in parameter No. 1774.

(2) When bit 6 (RBL) of parameter No. 1603 is set to 0 (when linear acceleration/deceleration is set)
Set time constant \( T \) of linear acceleration/deceleration in this parameter, and set 0 in parameter No. 1774.

For an axis for which 0 is set in this parameter, the value set in parameter No. 1620 is used.

**NOTE**

In advanced preview control and AI advanced preview control modes, parameter No. 1773 cannot be used.

1774

<table>
<thead>
<tr>
<th>[Data type]</th>
<th>Word axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Unit of data]</td>
<td>msec</td>
</tr>
<tr>
<td>[Valid data range]</td>
<td>0 to 512</td>
</tr>
</tbody>
</table>

For each axis, set time constant \( T_2 \) of rapid traverse bell-shaped acceleration/deceleration in AI contour control mode. For an axis for which 0 is set in this parameter, the value set in parameter No. 1621 is used.
4. DESCRIPTION OF PARAMETERS

NOTE
1 In advanced preview control and AI advanced preview control modes, parameter No. 1774 cannot be used.
2 To perform bell-shaped acceleration/deceleration, set the following parameter:
   AI advanced preview control and AI contour control: Bit 6 (RBL) of parameter No. 1603 = 1
3 When acceleration/deceleration before interpolation is set for rapid traverse, linear interpolation type positioning is performed. When the following parameters are set, acceleration/deceleration before interpolation is performed:
   AI advanced preview control and AI contour control: Bit 1 (AIR) of parameter No. 7054 = 0
   Alternatively, bit 1 (LRP) of parameter No. 1401 = 1 and bit 1 (AIR) of parameter No. 7054 = 1

1775 (Must not be used) *(Always set 0.)*
1776 (Must not be used) *(Always set 0.)*
1777 Minimum speed for the automatic corner deceleration function (for advanced preview control, AI advanced preview control, or AI contour control)

[Data type] Word
[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 15000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 6000</td>
</tr>
</tbody>
</table>

Set a speed at which the number of buffered pulses in deceleration is assumed to be 0 when linear acceleration/deceleration before interpolation is used.

1779 Critical angle subtended by two blocks for automatic corner deceleration (for advanced preview control, AI advanced preview control, or AI contour control)

[Data type] 2-word
[Unit of data] 0.001 deg
[Valid data range] 0 to 180000

Set a critical angle to be subtended by two blocks for corner deceleration when the angle-based automatic corner deceleration function is used.
The angle subtended by two blocks is defined as $q$ in the examples shown below.
### Allowable speed difference for the speed difference-based corner deceleration function (for linear acceleration/deceleration before interpolation)

**[Data type]** Word  

**[Unit of data, valid data range]**

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>IS-A, IS-B 6 to 15000, IS-C 6 to 12000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>IS-A, IS-B 6 to 6000, IS-C 6 to 4800</td>
</tr>
</tbody>
</table>

Set the speed difference for the speed difference-based automatic corner deceleration function when linear acceleration/deceleration before interpolation is used.

### Allowable speed difference for the speed difference-based corner deceleration function (linear acceleration/deceleration after interpolation)

**[Data type]** Word axis  

**[Unit of data, valid data range]**

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>IS-A, IS-B 6 to 15000, IS-C 6 to 12000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>IS-A, IS-B 6 to 6000, IS-C 6 to 4800</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>IS-A, IS-B 6 to 15000, IS-C 6 to 12000</td>
</tr>
</tbody>
</table>

Set speed difference for the speed difference-based automatic corner deceleration function when linear acceleration/deceleration after interpolation used.
### 4. DESCRIPTION OF PARAMETERS

#### 1783

**Allowable speed difference for the speed difference based corner deceleration function (linear acceleration/deceleration before interpolation)**

**[Data type]** Word axis

**[Unit of data, valid data range]**

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 15000</td>
<td>6 to 12000</td>
<td></td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 6000</td>
<td>6 to 4800</td>
<td></td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>6 to 15000</td>
<td>6 to 12000</td>
<td></td>
</tr>
</tbody>
</table>

A separate allowable feedrate difference can be set for each axis. The allowable feedrate difference is set for each axis with this parameter. Among the axes that exceed the specified allowable feedrate difference, the axis with the greatest ratio of the actual feedrate difference to the allowable feedrate difference is used as the reference to calculate the reduced feedrate at the corner.

#### 1784

**Speed when overtravel alarm has generated during acceleration/deceleration before interpolation**

**[Data type]** Word

**[Unit of data, valid data range]**

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit of data</th>
<th>Valid data range IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 15000</td>
<td>6 to 12000</td>
<td></td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 6000</td>
<td>6 to 4800</td>
<td></td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>6 to 15000</td>
<td>6 to 12000</td>
<td></td>
</tr>
</tbody>
</table>

Deceleration is started beforehand to reach the feedrate set in the parameter when an overtravel alarm is issued (when a limit is reached) during linear acceleration/deceleration before interpolation. By using this parameter, the overrun distance that occurs when an overtravel alarm is output can be reduced.

This setting can be applied also to rapid traverse blocks by setting bit 0 (OTR) of parameter No.7057. (M series)

#### NOTE

1. When 0 is set in this parameter, the control described above is not exercised.
2. Use type-B linear acceleration/deceleration before interpolation (by setting bit 0 (FWB) of parameter No.1602 to 1).
3. The control described above is applicable only to stored stroke check 1.
4. The control described above is performed for the axes specified in the current block and next block. By setting bit 5 (ODA) of parameter No. 7055, the control can be performed just for the axis specified in the current block.
### 1785
**Parameter for determining an allowable acceleration when the feedrate is set by acceleration**

- **[Data type]** Word axis
- **[Unit of data]** ms
- **[Valid data range]** 0 to 32767

This parameter sets the time required to attain the maximum cutting feedrate to determine the allowable acceleration when the feedrate is determined by acceleration in AI advanced preview control mode or AI contour control mode. The maximum cutting feedrate and the data set in this parameter are used to determine the allowable acceleration. As the maximum cutting feedrate parameter, parameter No. 1432 (maximum cutting feedrate in AI advanced preview control mode or AI contour control mode) is used.

![Graph showing the relationship between feedrate and time](image)

### 1786
**Time (time constant) until the maximum machining speed is reached during linear acceleration/deceleration before interpolation in advanced preview control, AI advanced preview control, or AI contour control mode (for rotation axes)**

- **[Data type]** Word
- **[Unit of data]** msec
- **[Valid data range]** 0 to 4000

This parameter is used to set the acceleration rate (for rotation axes) of linear acceleration/deceleration before interpolation in advanced preview control, AI advanced preview control, or AI contour control mode. This parameter sets the time (time constant) required to reach the speed set in parameter No. 1770. The acceleration rate set by this parameter applies to commands containing rotation axes. (The acceleration rate set by parameter No. 1771 applies to commands not containing rotation axes.)

**NOTE**

If 0 is set in this parameter, the acceleration rate set in parameter No. 1771 applies also to commands containing rotation axes.
**4.DESCRIPTION OF PARAMETERS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Time constant of bell-shaped acceleration/deceleration of acceleration time fixed type before look-ahead interpolation in the AI advanced preview control or AI contour control mode (for rotation axes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1787</td>
<td></td>
</tr>
</tbody>
</table>

- **[Data type]** Byte  
- **[Unit of data]** msec  
- **[Valid data range]** 0 to 255

This parameter sets the time constant (for rotation axes) when bell-shaped acceleration/deceleration before look-ahead interpolation is selected as the acceleration/deceleration applied in AI advanced preview control or AI contour control mode.

The time constant set in this parameter applies to commands containing rotation axes. (The time constant set in parameter No. 1772 applies to commands not containing rotation axes.)

**NOTE**

1. The option for bell-shaped acceleration/deceleration before look-ahead interpolation is required.
2. This parameter is valid only when a non-zero value is set in parameter No. 1786.
4.15 PARAMETERS OF SERVO (1 OF 2)

4.DESCRIPTION OF PARAMETERS

B-64120EN/01

---

### PARAMETERS OF SERVO (1 OF 2)

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBK</td>
<td>FFR</td>
<td>OZR</td>
<td>CVR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **RBK** Backlash compensation applied separately for cutting feed and rapid traverse
  - 0: Not performed
  - 1: Performed

- **FFR** Feed-forward control is enabled for
  - 0: Cutting feed only
  - 1: Cutting feed and rapid traverse

- **CVR** When velocity control ready signal VRDY is set ON before position control ready signal PRDY comes ON
  - 0: A servo alarm is generated.
  - 1: A servo alarm is not generated.

- **OZR** When manual reference position return is attempted in the halt state during automatic operation (feed hold stop state) under any of the conditions listed below:
  - 0: Manual reference position return is not performed, with P/S alarm No.091.
  - 1: Manual reference position return is performed without an alarm occurring.

  **<Conditions>**
  1. When there is a remaining distance to travel.
  2. When an auxiliary function (miscellaneous function, spindle-speed function, tool function) is being executed.
  3. When a cycle such as a dwell cycle or canned cycle is being executed.

- **PM1, PM2** Sets a gear ratio between the spindle and motor when the servo motor-based speed control function is used.

  **Magnification** = spindle speed / motor speed

<table>
<thead>
<tr>
<th>Magnification</th>
<th>PM2</th>
<th>PM1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1/2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1/4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1/8</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

- **CCI** The in-position area for cutting feed is:
  - 0: Set in parameter No.1826 (same as for rapid traverse).
  - 1: Set in bit 5 (CIN) of parameter No.1801.
CIN  When bit 4 (CCI) of parameter No.1801 = 1, the in-position area for
cutting feed is:
0 : Use value in parameter No.1827 if the next block is also for
cutting feed, or use value in parameter No.1826 if the next block
is not for cutting feed.
1 : Use value in parameter No.1827, regardless of the next block.
(The setting of parameter No.1826 is used for rapid traverse, and
the setting of parameter No.1827 is used for cutting feed.)

<table>
<thead>
<tr>
<th></th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>1802</td>
<td>DPS</td>
<td>B15</td>
<td>DC2</td>
<td>DC4</td>
<td>CTS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FWC</td>
<td></td>
<td>B15</td>
<td>DC2</td>
<td>DC4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE
After this parameter is set, the power needs to be
turned off.

[Data type] Bit
CTS  The servo motor-based speed control function is:
0 : Not used
1 : Used
DC4  The reference position on an encoder (linear scale or rotary encoder)
with absolute address reference marks is established as follows:
0 : An absolute position is established by detecting three reference
marks.
1 : An absolute position is established by detecting four reference
marks.

NOTE
With an encoder with the absolute address zero point (linear scale or rotary encoder) (detection
circuit C), the setting of this parameter is invalid.

DC2  The reference position on the linear scale with absolute address
reference mark is established:
0:  As determined by bit 1 (DC4) of parameter No. 1802.
1:  By establishing the absolute position through detection of two
reference marks.
### NOTE

1. When this parameter is set to 1, set the direction of the zero point of the encoder with bit 4 (SCPx) of parameter No. 1817.
2. When a rotary encoder with absolute address reference marks is used (bit 3 (DCRx) of parameter No. 1815 = 1), this parameter becomes invalid. Even if this parameter is set to 1, the setting of the DC4 parameter is followed.
3. With an encoder with the absolute address zero point (linear scale or rotary encoder) (detection circuit C), the setting of this parameter is invalid.

#### B15
In backlash compensation, the travel direction is determined:
- 0: Without consideration of the compensation amount (pitch error, external machine coordinate shift, etc.).
- 1: In consideration of the compensation amount. (FS15 format)

#### DPS
When servo motor-based speed control is applied, a position coder is:
- 0: Used
- 1: Not used

#### FWC
The processing of command multiplication (CMR) is performed:
- 0: After acceleration/deceleration after interpolation.
- 1: Before acceleration/deceleration after interpolation.

#### 1803

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
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<th>#1</th>
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</tr>
</thead>
<tbody>
<tr>
<td>TQF</td>
<td>TQA</td>
<td>TQI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

- **TQI** While torque restriction is applied, in-position check is:
  - 0: Performed.
  - 1: Not performed.

- **TQA** While torque restriction is applied, checking for an excessive error in the stopped state/during movement is:
  - 0: Performed.
  - 1: Not performed.

- **TQF** When torque control is performed by an axis control command of the PMC axis control function, follow-up operation is:
  - 0: Not performed.
  - 1: Performed.

#### 1804

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
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</tr>
</thead>
<tbody>
<tr>
<td>SAK</td>
<td>ANA</td>
<td>IVO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit axis

- **IVO** When an attempt is made to release an emergency stop while the VRDY OFF alarm ignore signal is 1:
  - 0: The emergency stop state is not released until the VRDY OFF alarm ignore signal is set to 0.
  - 1: The emergency stop state is released.
NOTE
When a reset is issued while the VRDY OFF alarm ignore signal is set to 1 and the motor activating current is low, the reset state can also be released, provided this parameter is set to 1.

ANA When an abnormal load is detected for an axis:
0 : Movement along all axes is stopped, and a servo alarm is output.
1 : No servo alarm is output, and movement along only the axes of the group containing the axis with the abnormal load is stopped in interlock mode. (The group number of each axis is set in parameter No.1881.)

SAK When the VRDY OFF alarm ignore signal IGNVRY is 1, or when the VRDY OFF alarm ignore signals IGVRY1 to IGVRY8 are 1:
0 : Servo ready signal SA is set to 0.
1 : Servo ready signal SA remains set to 1.

1805

[Data type] Bit
TQU If follow-up is not performed by the torque control command of PMC axis control, the servo error counter is:
0: Updated.
1: Not updated.

NOTE
1 This parameter is valid if follow-up is not performed (bit 4 (TQF) of parameter No. 1803 is set to 0).
2 When torque control is switched to position control, a reference position return must be made.

1807

[Data type] Bit
SWP When the αi servo amplifier is placed in the warning state (for a cause such as a stopped fan):
0 : An alarm is issued.
   Automatic operation enters the feed hold state, and the servo axis decelerates and stops.
1 : No alarm is issued.
   Automatic operation continues. When the amplifier state changes from the warning state to alarm state, servo activation stops.
4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>1815</th>
<th>#7</th>
<th>#6</th>
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<th>#4</th>
<th>#3</th>
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<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NRTx</td>
<td>APCx</td>
<td>APZx</td>
<td>DCRx</td>
<td>DCLx</td>
<td>OPTx</td>
<td>NRTx</td>
<td>APCx</td>
</tr>
</tbody>
</table>

**NOTE**
When this parameter has been set, the power must be turned off before operation is continued.

[Data type] Bit axis

**RVSx** When rotation axis B type is set for an axis for which a scale not having speed data is used:
0 : The NC does not maintain speed data.
1 : The NC maintains speed data.

**NOTE**
1 For axes that are of rotation axis B type and have a movable range of one turn or more, use of a scale having speed data is recommended.
2 This parameter is valid only for axes of rotation axis B type.
3 The NC maintains speed data observed immediately before power-off and uses the data to obtain coordinates at the next power-on. Therefore, if an axis turns 180 degrees or more while the power is off, the coordinate value may be displaced by one turn or more.
4 When you have changed this parameter, establish the reference position again.

**OPTx** Position detector
0 : A separate Pulsecoder is not used.
1 : A separate Pulsecoder is used.
For an absolute-position system using Inductosyn, set this parameter to 1.

**DCLx** As a separate position detector:
0 : Neither an encoder with absolute address reference marks (linear scale or rotary encoder) nor encoder with the absolute address zero point (linear scale or rotary encoder) (detection circuit C) is used.
1 : An encoder with absolute address reference marks (linear scale or rotary encoder) or encoder with the absolute address zero point (linear scale or rotary encoder) (detection circuit C) is used.
NOTE
When an encoder with absolute address reference marks (linear scale or rotary encoder) or encoder with the absolute address zero point (linear scale or rotary encoder) (detection circuit C) (closed loop system) is used, set bit 1 (OPTx) of parameter No. 1815 to 1. When a linear scale with the absolute address zero point (detection circuit C) (linear motor system) is used, however, set OPTx to 0.

DCRx  As an encoder with absolute address reference marks:
0 : A linear scale with absolute address reference marks is used.
1 : A rotary encoder with absolute address reference marks is used.

NOTE
1 Set bit 2 (DCLx) of parameter No. 1815 to 1.
2 When a rotary encoder with the absolute address zero point (detection circuit C) is used, set this parameter to 0.

APZx  Machine position and position on absolute position detector when the absolute position detector is used
0 : Not corresponding
1 : Corresponding

NOTE
When an absolute position detector is used, after primary adjustment is performed or after the absolute position detector is replaced, this parameter must be set to 0, power must be turned off and on, then manual reference position return must be performed. This completes the positional correspondence between the machine position and the position on the absolute position detector, and sets this parameter to 1 automatically.

APCx  Position detector
0 : Other than absolute position detector
1 : Absolute position detector (absolute Pulsecoder)
For an absolute-position system using Inductosyn, set this parameter to 1.

NRTx  When the machine coordinate value on a rotation axis passes the 0-degree point or a point at which the machine coordinate value is rounded off (360 degrees or the setting of parameter No. 1260):
0 : The zero point (parameter Nos. 1860 and 1861) is updated.
1 : The zero point (parameter Nos. 1860 and 1861) is not updated.
When a scale not maintaining speed data is used, set this parameter to 1.
NOTE

1. This parameter is valid only for axes of rotation axis A type.
2. For axes of rotation axis A type that use a scale having no speed data, be sure to set this parameter.
3. When you have changed this parameter, establish the reference position again.

NOTE

When this parameter has been set, the power must be turned off before operation is continued.

[Data type] Bit axis
SCRx When rotation axis B type is set for an axis for which a scale not having speed data is used, scale data conversion is:
0: Not performed.
1: Performed.

NOTE

1. This parameter is valid only for axes of rotation axis B type.
2. When there is no discontinuous point in scale data within the movable range of a rotation axis, do not set this parameter for the axis even if the axis is of rotation axis B type.
3. When you have changed this parameter, establish the reference position again.

SCPx When bit 2 (DC2) of parameter No. 1802 is set to 1, the zero point of an encoder with absolute address reference marks (linear scale or rotary encoder) is located:
0: On the negative side.
1: On the positive side.
(The reference position is located on the positive side when viewed from the encoder zero point.)

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NOTE

1. If an incorrect value is set in this parameter, the coordinate system cannot be established properly. In this case, reverse the setting, and establish the reference position again.

2. For an encoder with the absolute address zero point (linear scale or rotary encoder) (detection circuit C), the setting of this parameter is invalid.

TANx  Tandem control
0 : Not used
1 : Used

NOTE
Set this parameter to both master axis and slave axis.

**[Data type] Bit axis type**

RFSx  When the reference position has not yet been established on an axis for which an encoder with absolute address reference marks (linear scale or rotary encoder) or encoder with the absolute address zero point (linear scale or rotary encoder) (detection circuit C) is used, an automatic reference position return (G28) causes the following behavior after the reference position is established:
0:  A movement to the reference position is made.
1:  A movement to the reference position is not made, but the operation is completed.

RF2x  When the reference position has already been established on an axis for which an encoder with absolute address reference marks (linear scale or rotary encoder) or encoder with the absolute address zero point (linear scale or rotary encoder) (detection circuit C) is used, an automatic reference position return (G28) causes the following behavior:
0:  A movement to the reference position is made.
1:  A movement to the reference position is not made, but the operation is completed.

DG0x  For an axis for which an encoder with absolute address reference marks (linear scale or rotary encoder) is used, a reference position return operation by a rapid traverse command or jog feed is:
0:  Disabled.
1:  Enabled.

SDCx  An encoder with the absolute address zero point (linear scale or rotary encoder) (detection circuit C) is:
0 : Not used.
1 : Used.
NOTE
After setting this parameter, be sure to turn off the power. Note that P/S 0 (power-off request alarm) is not issued.

<table>
<thead>
<tr>
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<th>#3</th>
<th>#2</th>
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<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DATx</td>
<td>CRFx</td>
<td>FUPx</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DATx</td>
<td>CRFx</td>
<td>FUPx</td>
</tr>
</tbody>
</table>

[Data type] Bit axis
FUPx To perform follow-up when the servo is off is set for each axis.
0: The follow-up signal, *FLWU, determines whether follow-up is performed or not.
   When *FLWU is 0, follow-up is performed.
   When *FLWU is 1, follow-up is not performed.
1: Follow-up is not performed.

NOTE
When the index table indexing function (M series) is used, be sure to set FUPx of the 4th axis to 1.

CRFx When servo alarm No.445 (software disconnection), No.446 (hardware disconnection), No.447 (hardware disconnection (separate type)), or No.421 (excessive dual position feedback error) is issued:
0: The reference position setting remains as is.
1: The system enters the reference position undefined state.

DATx With an encoder with absolute address reference marks (linear scale or rotary encoder) or encoder with the absolute address zero point (linear scale or rotary encode), automatic setting of parameter Nos. 1883 and 1884 at the time of a manual reference position return operation is:
0: Not performed.
1: Performed.
The automatic setting is performed according to the following steps:
<1> Set appropriate values in parameter Nos. 1815, 1821, and 1882.
   * For an encoder with the absolute address zero point (linear scale or rotary encoder) (detection circuit C), parameter No. 1882 need not be set.
<2> By manual operation, position the machine at the reference position.
<3> Set this parameter to 1.
<4> Perform a manual reference position return operation. Upon completion of the manual reference position return operation, parameter Nos.1883 and 1884 are set, and this parameter is automatically set to 0.

NAHx In the advanced preview control mode, advanced feed-forward is:
0: Used
1: Not used

NOTE
Set 1 for a PMC-based control axis.
Command multiplier for each axis (CMR)

**NOTE**
When this parameter has been set, the power must be turned off before operation is continued.

[Data type] Byte axis

Set a command multiplier indicating the ratio of the least command increment to the detection unit for each axis.

Least command increment = detection unit × command multiplier

Relationship between the increment system and the least command increment

(1) T series

<table>
<thead>
<tr>
<th>IS-B</th>
<th>Millimeter input</th>
<th>Least command increment</th>
<th>Inch input</th>
<th>Least command increment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.001 mm (diameter specification)</td>
<td>0.0005 mm</td>
<td>0.0001 inch (diameter specification)</td>
<td>0.0005 inch</td>
</tr>
<tr>
<td></td>
<td>0.001 mm (radius specification)</td>
<td>0.001 mm</td>
<td>0.0001 inch (radius specification)</td>
<td>0.001 mm</td>
</tr>
<tr>
<td>Inch</td>
<td>0.0001 mm (diameter specification)</td>
<td>0.0005 mm</td>
<td>0.0001 inch (diameter specification)</td>
<td>0.0005 inch</td>
</tr>
<tr>
<td></td>
<td>0.0001 mm (radius specification)</td>
<td>0.001 mm</td>
<td>0.0001 inch (radius specification)</td>
<td>0.001 mm</td>
</tr>
<tr>
<td>Inch</td>
<td>0.0001 inch (diameter specification)</td>
<td>0.0005 inch</td>
<td>0.0001 inch (diameter specification)</td>
<td>0.0005 inch</td>
</tr>
<tr>
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<td>0.0001 inch (radius specification)</td>
<td>0.001 inch</td>
<td>0.0001 inch (radius specification)</td>
<td>0.001 inch</td>
</tr>
</tbody>
</table>

Rotation axis
- IS-B: 0.001 deg
- IS-C: 0.0001 deg

(2) M series

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Least input increment</th>
<th>Least command increment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>IS-A</td>
<td>IS-B</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.0001</td>
<td>0.0001</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.00001</td>
<td>0.00001</td>
</tr>
</tbody>
</table>

Setting command multiply (CMR), detection multiply (DMR), and the capacity of the reference counter

---
Set the magnification ratios of CMR and DMR so that the weight of positive inputs to the error counter equals that of negative inputs.

\[
\begin{align*}
\text{Least command increment} \quad \frac{\text{CMR}}{} &= \text{Detection unit} = \frac{\text{Feedback pulse unit}}{\text{DMR}} \\
\text{The feedback pulse unit varies according to the type of detector.}
\end{align*}
\]

The amount of travel per rotation of the Pulsecoder

\[
\text{Feedback pulse unit} = \frac{\text{The number of pulses per rotation of the Pulsecoder}}{2000, 2500, \text{or 3000}}
\]

As the size of the reference counter, specify the grid interval for the reference position return in the grid method.

\[
\text{Size of the reference counter} = \frac{\text{Grid interval}}{\text{Detection unit}}
\]

Grid interval = The amount of travel per rotation of the Pulsecoder

The value set in the parameter is obtained as follows:

(1) When command multiplier is 1/2 to 1/27

\[
\text{Set value} = \frac{1}{\text{Command multiplier}} + 100
\]

Valid data range: 102 to 127

(2) When command multiply is 1 to 48

\[
\text{Set value} = 2 \times \text{command multiplier}
\]

Valid data range: 2 to 96

**NOTE**

When command multiplier is 1 to 48, the set value must be determined so that an integer can be set for command multiplier.
1821  Reference counter size for each axis

**NOTE**
When this parameter has been set, the power must be turned off before operation is continued.

- **Data type**: 2-word axis
- **Valid data range**: 0 to 99999999

Set the size of the reference counter.
When an encoder with absolute address reference marks (linear scale or rotary encoder) is to be used, set the interval of mark 1 on the encoder with absolute address reference marks (linear scale or rotary encoder).

**NOTE**
With a scale with the absolute address zero point (detection circuit C), this parameter is used for the normal purpose (for setting the reference counter size for each axis).

1825  Servo loop gain for each axis

- **Data type**: Word axis
- **Unit of data**: 0.01 s\(^{-1}\)
- **Valid data range**: 1 to 9999

Set the loop gain for position control for each axis.
When the machine performs linear and circular interpolation (cutting), the same value must be set for all axes. When the machine requires positioning only, the values set for the axes may differ from one another. As the loop gain increases, the response by position control is improved. A too large loop gain, however, makes the servo system unstable.

The relationship between the positioning deviation (the number of pulses counted by the error counter) and the feedrate is expressed as follows:

\[
\text{Positioning deviation} = \frac{\text{Feedrate}}{60 \times (\text{loop gain})}
\]

**Unit**:
- Positioning deviation: mm, inches, or deg
- Feedrate: mm/min, inches/min, or deg/min
- Loop gain: s\(^{-1}\)
4. DESCRIPTION OF PARAMETERS

**1826 In-position width for each axis**

- **Data type**: Word axis
- **Unit of data**: Detection unit
- **Valid data range**: 0 to 32767

The in-position width is set for each axis. When the deviation of the machine position from the specified position (the absolute value of the positioning deviation) is smaller than the in-position width, the machine is assumed to have reached the specified position. (The machine is in the in-position state.)

**1827 In-position width in cutting feed for each axis**

- **Data type**: Word axis
- **Unit of data**: Detection unit
- **Valid data range**: 0 to 32767

Set an in-position width for each axis in cutting feed. This parameter is valid when bit 4 (CCI) of parameter No.1801=1.

**1828 Positioning deviation limit for each axis in movement**

- **Data type**: 2-word axis
- **Unit of data**: Detection unit
- **Valid data range**: 0 to 99999999

Set the positioning deviation limit in movement for each axis. If the positioning deviation exceeds the positioning deviation limit during movement, a servo alarm is generated, and operation is stopped immediately (as in emergency stop). Generally, set the positioning deviation for rapid traverse plus some margin in this parameter.

**1829 Positioning deviation limit for each axis in the stopped state**

- **Data type**: Word axis
- **Unit of data**: Detection unit
- **Valid data range**: 0 to 32767

Set the positioning deviation limit in the stopped state for each axis. If, in the stopped state, the positioning deviation exceeds the positioning deviation limit set for stopped state, a servo alarm is generated, and operation is stopped immediately (as in emergency stop).
1830  Axis-by-axis positional deviation limit at servo-off time

[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

This parameter is used to set a positional deviation limit at servo-off time, on an axis-by-axis basis. If the value specified with this parameter is exceeded at servo-off time, a servo alarm (No.410) is issued to cause an immediate stop (same as an emergency stop). Usually, set the same value as a positional deviation at stop time (parameter No.1829).

NOTE
When this parameter is set to 0, no positional deviation limit check is made at servo-off time.

1836  Servo error amount where reference position return is possible

[Data type] Byte axis
[Unit of data] Detection unit
[Valid data range] 0 to 127

This parameter sets a servo error used to enable reference position return in manual reference position return. In general, set this parameter to 0. (When 0 is set, 128 is assumed as the default.)

NOTE
When bit 0 (PLC01) of parameter No.2000 is set to 1, a value ten times greater than the value set in this parameter is used to make the check. Example
When the value 10 is set in this parameter, and bit 0 (PLC01) of parameter No.2000 is set to 1, reference

1850  Grid shift and reference position shift for each axis

[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] (1) 0 to 99999999 (for reference shift position)
(2) Reference counter size or less (for grid shift)

To shift the reference position, set the amount of grid shift or reference position shift for each axis. Up to the maximum value counted by the reference counter can be specified as the grid shift. In case of parameter SFD (No.1002#2) is 0: Grid shift
In case of parameter SFD (No.1002#2) is 1: Reference shift position

NOTE
When this parameter has been set, the power must be turned off before operation is continued.
1851  Backlash compensating value for each axis

[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] -9999 to +9999

Set the backlash compensating value for each axis.
When the machine moves in a direction opposite to the reference position return direction after the power is turned on, the first backlash compensation is performed.

1852  Backlash compensating value used for rapid traverse for each axis

[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] -9999 to +9999

Set the backlash compensating value used in rapid traverse for each axis.
This parameter is valid when RBK, #4 of parameter 1800, is set to 1.
More precise machining can be performed by changing the backlash compensating value depending on the feedrate, the rapid traverse or the cutting feed.
Let the measured backlash at cutting feed be \( A \) and the measured backlash at rapid traverse be \( B \). The backlash compensating value is shown below depending on the change of feedrate (cutting feed or rapid traverse) and the change of the direction of movement.

\[
\alpha = \frac{(A - B)}{2}
\]

The positive or negative direction for compensating values is the direction of movement.

<table>
<thead>
<tr>
<th>Change of direction of movement</th>
<th>Change of feedrate</th>
<th>Cutting feed to cutting feed</th>
<th>Rapid traverse to rapid traverse</th>
<th>Rapid traverse to cutting feed</th>
<th>Cutting feed to rapid traverse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same direction</td>
<td></td>
<td>0</td>
<td>0</td>
<td>( \pm \alpha )</td>
<td>( \pm (-\alpha) )</td>
</tr>
<tr>
<td>Opposite direction</td>
<td></td>
<td>( \pm A )</td>
<td>( \pm B )</td>
<td>( \pm (B + \alpha) )</td>
<td>( \pm B (B + \alpha) )</td>
</tr>
</tbody>
</table>

Assign the measured backlash at cutting feed (\( A \)) in parameter No.1851 and that at rapid traverse (\( B \)) in parameter No.1852.
NOTE
1 Jog feed is regarded as cutting feed.
2 The backlash compensation depending on a rapid traverse and a cutting feed is not performed until the first reference position return is completed after the power is turned on. The normal backlash compensation is performed according to the value specified in parameter No.1851 irrespective of a rapid traverse and a cutting feed.
3 The backlash compensation depending on a rapid traverse and a cutting feed is performed only when RBK, bit 4 of parameter No.1800, is set to 1. When RBK is set to 0, the normal backlash is performed.

Threshold for scale data conversion (common to all axes)

<table>
<thead>
<tr>
<th>Increment system</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotation axis</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>deg</td>
</tr>
</tbody>
</table>

1 When this parameter has been set, the power must be turned off before operation is continued.
2 This parameter is valid only for axes for which bit 3 (SCR) of parameter No. 1817 is set to 1.
3 When you have changed this parameter, establish the reference position again.
1868

Threshold for scale data conversion (for each axis)

[Data type] 2-word axis
[Unit of data]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotation axis</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>deg</td>
</tr>
</tbody>
</table>

[Valid data range] 0 to 99999999

If scale data is greater than the setting of this parameter, data for one turn is subtracted from the scale data so that continuous scale data is obtained within the movable range. The threshold to be set must be the scale data of a position outside the movable range (an angle from a discontinuous point). For axes for which this parameter is set to 0, the parameter common to all axes (parameter No. 1867) becomes valid.

**NOTE**

1. When this parameter has been set, the power must be turned off before operation is continued.
2. This parameter is valid only for axes for which bit 3 (SCR) of parameter No. 1817 is set to 1.
3. When you have changed this parameter, establish the reference position again.

1874

Number of the conversion coefficient for inductosyn position detection

1875

Denominator of the conversion coefficient for inductosyn position detection

**NOTE**

When this parameter has been set, the power must be turned off before operation is continued.

[Data type] Word axis
[Valid data range] 1 to 32767

Set a conversion coefficient for inductosyn position detection for each axis. The value set is determined as follows:

\[
\text{No. 1874} = \frac{\text{No. 1875} \times 1,000,000}{\text{Number of position feedback pulses per motor revolution}}
\]

1876

One-pitch interval of the inductosyn

**NOTE**

When this parameter has been set, the power must be turned off before operation is continued.

[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 1 to 32767

Set a one-pitch interval of the inductosyn for each axis.
SUPPLEMENTAL REMARK
To use an absolute-position detector using Inductosyn, set the following digital servo parameters as well:

Bit 4 (INDx) of parameter No. 2015
The absolute-position detect function by Inductosyn is:
0 : Disabled.
1 : Enabled.

Parameter No. 2141 Inductosyn data acquisition time
Set a time requirement for acquiring the Inductosyn data. If the setting is 0, 20 ms is assumed. (For the setting, contact the scale manufacturer.)

1880 Unexpected disturbance torque detection alarm timer
[Data type] Word
[Unit of data] ms
[Valid data range] 0 to 32767 (200 msec is assumed when 0 is set)
This parameter sets the time from the detection of an unexpected disturbance torque until a servo alarm is issued. The specified value is rounded up to the nearest integral multiple of 8 msec.
[Example]
When 30 is specified, the value is rounded up to 32 (msec).

1881 Group number when an unexpected disturbance torque is detected
[Data type] Byte axis
[Valid data range] 0 to 4
This parameter sets the group number of each axis, used when an unexpected disturbance torque is detected.
If an unexpected disturbance torque is detected for an axis, only the movement along the axes of the group containing the axis with the unexpected disturbance torque is stopped. If 0 is set for an axis, movement along that axis is stopped whenever an unexpected disturbance torque is detected for any axis.
[Example]
Assume that the following settings have been made. If an unexpected disturbance torque is detected for the first axis, movement along the first, third, and fourth axes is stopped. If an unexpected disturbance torque is detected for the second axis, movement along the second and fourth axes is stopped.

<table>
<thead>
<tr>
<th>Parameter No. 1881</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>(First axis)</td>
<td>1</td>
</tr>
<tr>
<td>(Second axis)</td>
<td>2</td>
</tr>
<tr>
<td>(Third axis)</td>
<td>1</td>
</tr>
<tr>
<td>(Fourth axis)</td>
<td>0</td>
</tr>
</tbody>
</table>

NOTE
This parameter is enabled when the ANA parameter (bit 5 of parameter No. 1804) is 1.
4. DESCRIPTION OF PARAMETERS

1882
Interval of mark 2 on encoder with absolute address reference marks

[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

This parameter sets the interval of mark 2 on the encoder with absolute address reference marks (linear scale or rotary encoder).

**NOTE**
For an encoder with the absolute address zero point (linear scale or rotary encoder) (detection circuit C), the setting of this parameter is invalid.

1883
Distance 1 from the mark zero point of an encoder with absolute address reference marks or encoder with the absolute address zero point (detection circuit C) to the reference position

[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] -99999999 to 99999999

**NOTE**
When this parameter has been set, the power must be turned off before operation is continued.

1884
Distance 2 from the mark zero point of an encoder with absolute address reference marks or encoder with the absolute address zero point (detection circuit C) to the reference position

[Data type] Word axis
[Unit of data] Detection unit × 100,000,000
[Valid data range] -20 to 20

This parameter is used when the distance from the zero point of an encoder to the reference position exceeds the setting range of parameter No. 1883.

**NOTE**
1. When this parameter has been set, the power must be turned off before operation is continued.
2. When an encoder with the absolute address zero point (linear scale or rotary encoder) (detection circuit C) is used, specifying a value beyond the valid data range in this parameter can cause P/S 5325 to be issued during the establishment of the reference position.

With parameter Nos. 1883 and 1884, set the distance from the zero point of the encoder with absolute address reference marks (linear scale or rotary encoder) or encoder with the absolute address zero point (linear scale or rotary encoder) (detection circuit C) to the
reference position. The distance from the zero point of the encoder to the reference position is obtained from the following equation:

\[
\text{Distance from the zero point of the encoder to the reference position} = \text{No.}\text{.1884} \times 100,000,000 + \text{No.}\text{.1883}
\]

The zero point of the encoder refers to the point at which mark 1 and mark 2 match. Normally, this point is a hypothetical point that does not physically exist on the encoder. (See the figure below.) If the reference position is located on the positive side when viewed from the zero point of the encoder, set a positive value. If the reference position is located on the negative side when viewed from the zero point of the encoder, set a negative value.

[Example of parameter settings] When an encoder as shown below is used with an IS-B, millimeter machine:

\[
-\frac{9960}{(20020-20000)} \times 20000 + 5000 = -9965000
\]

Parameters

- No.1821 (interval of mark 1) = 20000
- No.1882 (interval of mark 2) = 20020
- No.1883 (reference position) = position of point A + 5.000
  = distance between A and B/(mark 2 – mark 1) \times mark 1 + 5000
  = 9960/(20020-20000) \times 20000 + 5000
  = 9965000

- 121 -
4. DESCRIPTION OF PARAMETERS

-9965000 (the reference position is on the negative side)

[Setting parameter No. 1883] (For an encoder with absolute address reference marks (linear scale or rotary encoder))

If it is difficult to measure the distance from the zero point of the encoder to the reference position (parameter No. 1883), the distance can be obtained by following the steps below:

1. Set the following parameters to use the encoder with absolute address reference marks (linear scale or rotary encoder): OPTx(No.1815#1)=1, DCLx(No.1815#2)=1, DCRx(No.1815#3)=0/1
2. Set appropriate values in parameter Nos. 1821 and 1882.
3. Set parameter No. 1240 to 0.
4. Set parameter Nos. 1883 and 1884 to 0.
5. Establish the reference position at an appropriate position.
   (As a result of this, the machine coordinate value shows the distance from the zero point of the encoder to the current position.)
6. Perform a jog feed or handle feed to position the machine at the accurate reference position.
7. In parameter No. 1883, set the result of the conversion of the machine coordinate value observed at this point of time (diagnosis screen No. 301) into the detection unit (by multiplying the value on diagnosis screen No. 301 by CMR).
8. If necessary, set parameter No. 1240.

NOTE
This method does not apply if the distance from the zero point of the encoder to the reference position exceeds 99,999,999.

[Setting parameter No. 1883] (For an encoder with the absolute address zero point (linear scale or rotary encoder) (detection circuit C))

The value to be set can be obtained by following the steps below.

1. Set bit 1 (OPTx) of parameter No. 1815 to 0 or 1, and bit 2 (DCLx) of parameter No. 1815 to 1 to use the encoder with the absolute address zero point (linear scale or rotary encoder) (detection circuit C).
2. Set parameter No. 1240 to 0.
3. Set parameter Nos. 1883 and 1884 to 0.
4. Establish the reference position at an appropriate position.
   (As a result of this, the machine coordinate value shows the distance from the zero point of the encoder to the current position.)
5. Perform a jog feed or handle feed to position the machine at the accurate reference position.
6. In parameter No. 1883, set the result of the conversion of the machine coordinate value observed at this point of time (diagnostic screen No. 301) into the detection unit (multilication of the value on diagnostic screen No. 301 by CMR).
7. If necessary, set parameter No. 1240.
NOTE
This method does not apply if the distance from the zero point of the encoder to the reference position exceeds 99,999,999.

1885  Maximum allowable value for total travel during torque control
[Data type]  Word axis
[Unit of data]  Detection unit
[Valid data range]  0 to 32767
This parameter sets the maximum allowable value for the total travel (error counter value) for an axis placed under torque control, as specified by the axis control command of the PMC axis control function. If the total travel exceeds the parameter-set value while torque control is applied, a servo alarm (No.423) is generated.

NOTE
This parameter is enabled when the TQF parameter (bit 4 of parameter No.1803) is 0 (follow-up is not performed during torque control).

1886  Positional deviation when torque control is canceled
[Data type]  Word axis
[Unit of data]  Detection unit
[Valid data range]  0 to 32767
This parameter sets the positional deviation used when torque control, performed for an axis according to the axis control command of the PMC axis control function, is canceled and position control is resumed. After the positional deviation has fallen to the parameter-set value, switching to position control is performed.

NOTE
This parameter is enabled when the TQF parameter (bit 4 of parameter No.1803) is 0 (follow-up is not performed during torque control).
### 1895 Servo motor axis number used for a milling tool

- **Data type**: Byte
- **Valid data range**: 1, 2, 3, ..., number of controlled axes

This parameter sets the servo motor axis number used for displaying the speed of a milling tool that incorporates a servo motor.

### 1896 Number of gear teeth on the servo motor axis side

- **Data type**: Word
- **Valid data range**: 1 to 9999

This parameter sets the number of servo motor axis gear teeth used for displaying the speed of a milling tool that incorporates a servo motor.

### 1897 Number of gear teeth on the milling axis side

- **Data type**: Word
- **Valid data range**: 1 to 9999

This parameter sets the number of milling axis gear teeth used for displaying the speed of a milling tool that incorporates a servo motor.

### 1901 RFD

- **Data type**: Bit

  - **RFD**: In jog feed mode, the fine acceleration/deceleration function and feed-forward function are:
    - 0: Disabled.
    - 1: Enabled.

### NOTE

1. The axis operating under PMC axis control are not affected by this parameter. For such an axis, the settings for PMC axis control are followed. To enable the fine acceleration/deceleration function and feed-forward function in PMC axis control, advanced preview control for the PMC-controlled axis must be enabled. (See the descriptions of bit 3 (G8C) of parameter No. 8004 and bit 4 (G8R) of parameter No. 8004.)

2. Note that when the abnormal load detection function for cutting and rapid traverse is used, setting this parameter changes the threshold value:
   - 0: Threshold value for rapid traverse,
   - 1: Threshold value for cutting feed.)
NOTE
When this parameter has been set, the power must be turned off before operation is continued.

WARNING
Be sure to set bits 5 and 7 of parameter No. 1902 to 0. If 1 is set, the safety function may not work properly.

[Data type] Bit
FMD The FSSB setting mode is:
0: Automatic setting mode.
   (When information including an axis-amplifier relationship is set on the FSSB setting screen, parameter Nos. 1023, 1905, 1910 through 1919, 1936, and 1937 are set automatically.)
1: Manual setting 2 mode.
   (Set parameter Nos. 1023, 1905, 1910 through 1919, 1936, and 1937 manually.)

ASE When automatic setting mode is selected for FSSB setting (when the FMD parameter (bit 0 of parameter No.1902) is set to 0), automatic setting is:
0: Not completed.
1: Completed.
   (This bit is automatically set to 1 upon the completion of automatic setting.)

NOTE
When this parameter has been set, the power must be turned off before operation is continued.

[Data type] Bit axis
DSPx
0: Two axes use one DSP. (Ordinary axes)
1: One axis uses one DSP exclusively.

NOTE
Parameter No.1904 is set on the FSSB setting screen. So, parameter No.1904 should not have to be specified directly. This parameter need not be set in FSSB manual setting 2 mode.
NOTE
When this parameter has been set, the power must be turned off before operation is continued.

[Data type] Bit axis
FSLx The type of interface used between the servo amplifier and servo software is:
0: Fast type.
1: Slow type.
The user can choose between two interface types for servo data transfer: fast type or slow type. Set this parameter so that the following conditions are satisfied:

- When a one-axis amplifier is used, either the fast type or slow type interface can be used.
- When a two-axis amplifier is used, the use of the fast type for both axes is not allowed. The slow type can be used for both axes.
- When a three-axis amplifier is used, the requirement for a two-axes amplifier described above applies to the first and second axes, and the requirement for a one-axis amplifier, again described above, applies to the third axis.
- When an odd number is specified for parameter No.1023, the fast type interface must be used. However, the slow type may be used for high-speed current loop axis and high-speed interface axis.
- When an even number is specified for parameter No.1023, only the slow type interface can be used. (The FSL bit must always be set to 1.)

PM1x The first separate detector interface unit is:
0: Not used.
1: Used.
PM2x The second separate detector interface unit is:
0: Not used.
1: Used.
NOTE
When automatic setting mode is selected for FSSB setting (when the FMD parameter (bit 0 of parameter No.1902) is set to 0), parameter No.1905 is automatically set when input is performed with the FSSB setting screen. When manual setting 2 mode is selected for FSSB setting (when the FMD parameter (bit 0 of parameter No.1902) is set to 1), parameter No.1905 must be set directly. When a separate detector interface unit is used, a connector number must be set in the corresponding parameter (No.1936 or No.1937).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1910</td>
<td>Address conversion table value for slave 1 (ATR)</td>
</tr>
<tr>
<td>1911</td>
<td>Address conversion table value for slave 2 (ATR)</td>
</tr>
<tr>
<td>1912</td>
<td>Address conversion table value for slave 3 (ATR)</td>
</tr>
<tr>
<td>1913</td>
<td>Address conversion table value for slave 4 (ATR)</td>
</tr>
<tr>
<td>1914</td>
<td>Address conversion table value for slave 5 (ATR)</td>
</tr>
<tr>
<td>1915</td>
<td>Address conversion table value for slave 6 (ATR)</td>
</tr>
<tr>
<td>1916</td>
<td>Address conversion table value for slave 7 (ATR)</td>
</tr>
<tr>
<td>1917</td>
<td>Address conversion table value for slave 8 (ATR)</td>
</tr>
<tr>
<td>1918</td>
<td>Address conversion table value for slave 9 (ATR)</td>
</tr>
<tr>
<td>1919</td>
<td>Address conversion table value for slave 10 (ATR)</td>
</tr>
</tbody>
</table>

NOTE
After these parameters have been set, the power must be turned off then back on for the settings to become effective.

[Data type] Byte
[Valid data range] 0 to 3, 16, 40, 48
These parameters set address conversion table values for slaves 1 to 10. A slave is the generic name given to a device such as a servo amplifier or separate detector interface unit, connected to the CNC via an FSSB optical cable. Smaller numbers, starting from 1 are assigned to slaves closer to the CNC; the maximum number that can be assigned is 10. A two-axis amplifier has two slaves, while a three-axis amplifier has three slaves. Set each parameter as described below,
depending on whether the slave is an amplifier or separate detector interface unit, or when no slave exists.

- When the slave is an amplifier:
  Set the value obtained by subtracting 1 from the setting of parameter No.1023 for the axis to which the amplifier is assigned.

- When the slave is a separate detector interface unit:
  Set 16 for the first separate detector interface unit (closest to the CNC).
  Set 48 for the second separate detector interface unit (furthest from the CNC).

- When no slave exists
  Set 40.

**NOTE**

When automatic setting mode is selected for FSSB setting (when the FMD parameter (bit 0 of parameter No.1902) is set to 0), parameters No.1910 to No.1919 are automatically set when input is performed with the FSSB setting screen.

When manual setting 2 mode is selected for FSSB setting (when the FMD parameter (bit 0 of parameter No.1902) is set to 1), parameter No.1910 to No.1919 must be directly set.
### Examples of axis configurations and parameter settings

<table>
<thead>
<tr>
<th>Controlled axis number</th>
<th>Program axis name No.1020</th>
<th>Servo axis number No.1023</th>
<th>Slave number</th>
<th>ATR No.1910 to 1919</th>
<th>Axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td>Y</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>A</td>
</tr>
<tr>
<td>3</td>
<td>Z</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>Y</td>
</tr>
<tr>
<td>4</td>
<td>A</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>(M1)</td>
</tr>
</tbody>
</table>

**M1/M2**: First separate detector interface unit/second separate detector interface unit

<table>
<thead>
<tr>
<th>Controlled axis number</th>
<th>Program axis name</th>
<th>Servo axis number No.1023</th>
<th>Slave number</th>
<th>ATR No.1910 to 1919</th>
<th>Axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td>Y</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>Y</td>
</tr>
<tr>
<td>3</td>
<td>Z</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>Z</td>
</tr>
<tr>
<td>4</td>
<td>A</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Controlled axis number</th>
<th>Program axis name</th>
<th>Servo axis number No.1023</th>
<th>Slave number</th>
<th>ATR No.1910 to 1919</th>
<th>Axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>5</td>
<td>16</td>
<td>(M1)</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>6</td>
<td>48</td>
<td>(M2)</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>7</td>
<td>40</td>
<td>(None)</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td>8</td>
<td>40</td>
<td>(None)</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td>9</td>
<td>40</td>
<td>(None)</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>10</td>
<td>40</td>
<td>(None)</td>
</tr>
</tbody>
</table>

- **1920** Controlled axis number for slave 1 (dedicated to the FSSB setting screen)
- **1921** Controlled axis number for slave 2 (dedicated to the FSSB setting screen)
- **1922** Controlled axis number for slave 3 (dedicated to the FSSB setting screen)
- **1923** Controlled axis number for slave 4 (dedicated to the FSSB setting screen)
- **1924** Controlled axis number for slave 5 (dedicated to the FSSB setting screen)
### 4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1925</td>
<td>Controlled axis number for slave 6 (dedicated to the FSSB setting screen)</td>
</tr>
<tr>
<td>1926</td>
<td>Controlled axis number for slave 7 (dedicated to the FSSB setting screen)</td>
</tr>
<tr>
<td>1927</td>
<td>Controlled axis number for slave 8 (dedicated to the FSSB setting screen)</td>
</tr>
<tr>
<td>1928</td>
<td>Controlled axis number for slave 9 (dedicated to the FSSB setting screen)</td>
</tr>
<tr>
<td>1929</td>
<td>Controlled axis number for slave 10 (dedicated to the FSSB setting screen)</td>
</tr>
</tbody>
</table>

**NOTE**

After these parameters have been set, the power must be turned off then back on for the settings to become effective.

**Data type** Byte

**Valid data range** 0 to 3

These parameters are used to set the controlled axis numbers for slaves 1 to 10.

**NOTE**

These parameters are set using the FSSB setting screen. So, these parameters should not normally have to be specified directly. These parameters need not be set in FSSB manual setting mode.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1931</td>
<td>Connector number for the first separate detector interface unit (dedicated to the FSSB setting screen)</td>
</tr>
<tr>
<td>1932</td>
<td>Connector number for the second separate detector interface unit (dedicated to the FSSB setting screen)</td>
</tr>
</tbody>
</table>

**NOTE**

After these parameters have been set, the power must be turned off then back on for the settings to become effective.

**Data type** Byte

**Valid data range** 0 to number of connectors provided on each separate detector interface unit

When a separate detector interface unit is used, these parameters set a separate detector interface unit connector number for each axis.

**NOTE**

These parameters are set using the FSSB setting screen. So, these parameters should not normally have to be specified directly. These parameters need not be set in FSSB manual setting 2 mode.
1933  Cs contour control axis (dedicated to the FSSB setting screen)

**NOTE**
When this parameter has been set, the power must be turned off before operation is continued.

- **[Data type]** Byte axis
- **[Valid data range]** 0, 1

When Cs contour control is to be applied for an axis, this parameter must be set to 1 for that axis.

**NOTE**
This parameter is set using the FSSB setting screen. So, this parameter should not normally have to be specified directly. This parameter need not be set in FSSB manual setting 2 mode.

1934  Master and slave axis numbers subject to tandem control (dedicated to the FSSB setting screen)

**NOTE**
When this parameter has been set, the power must be turned off before operation is continued.

- **[Data type]** Byte axis
- **[Valid data range]** 0 to 3

This parameter is used to set an odd number, and the subsequent even number, for a master axis and slave axis subject to tandem control, respectively.

**NOTE**
This parameter is set using the FSSB setting screen. So, this parameter should not normally have to be specified directly. This parameter need not be set in FSSB manual setting 2 mode.
4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1936</td>
<td>Connector number of the first separate detector interface unit</td>
</tr>
<tr>
<td>1937</td>
<td>Connector number of the second separate detector interface unit</td>
</tr>
</tbody>
</table>

**NOTE**

After these parameters have been set, the power must be turned off then back on for the settings to become effective.

**NOTE**

- **Data type**: Byte axis
- **Valid data range**: 0 to 7

When a separate detector interface unit is used, each of these parameters sets the value obtained by subtracting 1 from a separate detector interface unit connector number for each axis. That is, values of 0 through 7 are set for connector numbers 1 through 8. In addition, bits 6 and 7 of parameter No.1905 must be set. For an axis that does not use a separate detector interface unit, 0 must be set.

Any connector can be used for any axis, however the connectors in a single separate detector interface unit should be used in ascending order of connector number. For instance, connector 4 of a separate detector interface unit cannot be used without using connector 3 of the same separate detector interface unit.

**Example**

<table>
<thead>
<tr>
<th>Controlled axis</th>
<th>Connector number for the first separate detector interface unit</th>
<th>Connector number for the second separate detector interface unit</th>
<th>No.1936</th>
<th>No.1937</th>
<th>No.1905 (#7, #6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>1</td>
<td>Not used</td>
<td>0</td>
<td>0</td>
<td>0, 1</td>
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<tr>
<td>Y</td>
<td>Not used</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1, 0</td>
</tr>
<tr>
<td>Z</td>
<td>Not used</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1, 0</td>
</tr>
<tr>
<td>A</td>
<td>Not used</td>
<td>Not used</td>
<td>0</td>
<td>0</td>
<td>0, 0</td>
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</table>

**NOTE**

- When automatic setting mode is selected for FSSB setting (when bit 0 of parameter No.1902 is set to 0), these parameters are automatically set when input is performed with the FSSB setting screen.
- When manual setting 2 mode is selected for FSSB setting (when bit 0 of parameter No.1902 is set to 1), these parameters must be set directly.
Parameters No.2000 to 2999 are for digital servo, The following parameters are not explained in this manual. Refer to FANUC AC SERVO MOTOR αi series PARAMETER MANUAL (B-65270EN)

<table>
<thead>
<tr>
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<td>2003</td>
<td>Bit axis</td>
<td>V0FS OVSC BLEN NSP PIEN OBEN TGAL</td>
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<tr>
<td>2004</td>
<td>Bit axis</td>
<td>TRW1 TRW0 TIB0 TIA0</td>
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<td>Bit axis</td>
<td>SFCM BRKC FEED</td>
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<td>ACCF PKVE FCBL</td>
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<td>FRCA FAD IGVRO ESP2AX</td>
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<td>LAXD PFBS VCTM SPPC SPPR VFBA TNDM</td>
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<td>Bit axis</td>
<td>BLST BLCU ADBL SERD</td>
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<td>RCCL FFALWY SYNMOD</td>
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<td>2012</td>
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<tr>
<td>2013</td>
<td>Bit axis</td>
<td>APTG HRV3</td>
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<tr>
<td>2014</td>
<td>Bit axis</td>
<td>(Reserve)</td>
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<tr>
<td>2015</td>
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<td>BZNG BLAT TDOU SSG1 PGTW</td>
</tr>
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<td>2016</td>
<td>Bit axis</td>
<td>K2VC ABNT</td>
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<td>2017</td>
<td>Bit axis</td>
<td>PK25 OVR RISC HTNG</td>
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<tr>
<td>2018</td>
<td>Bit axis</td>
<td>PFBC OVR8 MOVO REVTS</td>
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<td>Word axis</td>
<td>Number of velocity pulses</td>
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<td>Word axis</td>
<td>Number of position pulses</td>
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<tr>
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<td>Word axis</td>
<td>Effective speed for integral deceleration at low speed</td>
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<tr>
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<td>2050</td>
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<td>Word axis</td>
<td>D phase current at high-speed operation (PVPA)</td>
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### 4. DESCRIPTION OF PARAMETERS

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<td>Overload protection coefficient (OVC2)</td>
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<td>Backlash acceleration effective duration, time during which the static friction compensation function is enabled</td>
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</tr>
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<td>Conversion coefficient for dual position feedback (denominator)</td>
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</tr>
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</tr>
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<td>Word axis</td>
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<td>Word axis</td>
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<tr>
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<td>Word axis</td>
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<td>Word axis</td>
<td>Velocity loop gain override</td>
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<tr>
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<td>Word axis</td>
<td>Fine acceleration/deceleration time constant (for cutting when switch function is used)</td>
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<tr>
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<td>Word axis</td>
<td>Magnetic saturation compensation (base/coefficient)</td>
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<td>Word axis</td>
<td>Deceleration torque limit (base/coefficient)</td>
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<td>Word axis</td>
<td>AMR conversion coefficient 1</td>
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<td>Word axis</td>
<td>Attenuation center frequency (Hz) of vibration-damping filter 1</td>
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<td>Stage 2 acceleration amount override for two-stage backlash acceleration</td>
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<td>2116</td>
<td>Word axis</td>
<td>Abnormal load detection, dynamic friction compensation value</td>
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<td>Word axis</td>
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<td>2119</td>
<td>Word axis</td>
<td>Stop level with variable proportional gain</td>
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</table>
### 4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>No.</th>
<th>Data type</th>
<th>Contents</th>
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<tbody>
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<td>Word axis</td>
<td>Two smooth compensation operations per magnetic pole pair</td>
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<td>Word axis</td>
<td>Four smooth compensation operations per magnetic pole pair</td>
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<td>Six smooth compensation operations per magnetic pole pair</td>
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<td>800PLS</td>
</tr>
<tr>
<td>2221</td>
<td>Bit axis</td>
<td>Disturbance filter gain</td>
</tr>
<tr>
<td>No.</td>
<td>Data type</td>
<td>Contents</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>2319</td>
<td>Word axis</td>
<td>Inertial ratio of disturbance filter</td>
</tr>
<tr>
<td>2320</td>
<td>Word axis</td>
<td>Inverse function gain of disturbance filter</td>
</tr>
<tr>
<td>2321</td>
<td>Word axis</td>
<td>Filter time constant of disturbance filter</td>
</tr>
<tr>
<td>2322</td>
<td>Word axis</td>
<td>Acceleration feedback limit of disturbance filter</td>
</tr>
<tr>
<td>2323</td>
<td>Word axis</td>
<td>Variable current PI ratio</td>
</tr>
<tr>
<td>2324</td>
<td>Word axis</td>
<td>Proportional gain change function at stop Any magnification at stop (for cutting only)</td>
</tr>
<tr>
<td>2325</td>
<td>Word axis</td>
<td>Tandem vibration-damping control/integral gain (main axis) Phase coefficient (sub-axis)</td>
</tr>
<tr>
<td>2326</td>
<td>Word axis</td>
<td>Disturbance input gain</td>
</tr>
<tr>
<td>2327</td>
<td>Word axis</td>
<td>Starting frequency of disturbance input</td>
</tr>
<tr>
<td>2328</td>
<td>Word axis</td>
<td>Ending frequency of disturbance input</td>
</tr>
<tr>
<td>2329</td>
<td>Word axis</td>
<td>Number of disturbance input measurement points</td>
</tr>
<tr>
<td>2333</td>
<td>Word axis</td>
<td>Tandem vibration-damping control/incomplete integral time constant (main axis)</td>
</tr>
<tr>
<td>2334</td>
<td>Word axis</td>
<td>Current loop gain magnification (valid only during high-speed HRV current control)</td>
</tr>
<tr>
<td>2335</td>
<td>Word axis</td>
<td>Velocity loop gain magnification (valid only during high-speed HV current control)</td>
</tr>
<tr>
<td>2337</td>
<td>Word axis</td>
<td>Stage 2 acceleration limit amount for two-stage backlash acceleration</td>
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<tr>
<td>2338</td>
<td>Word axis</td>
<td>Stage 2 acceleration amount for two-stage backlash acceleration (negative direction)</td>
</tr>
<tr>
<td>2339</td>
<td>Word axis</td>
<td>Stage 2 acceleration amount override for two-stage backlash acceleration (negative direction)</td>
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<tr>
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<td>Word axis</td>
<td>Stage 2 acceleration limit amount for two-stage backlash acceleration (negative direction)</td>
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<td>Stage 2 acceleration limit amount for two-stage backlash acceleration (negative direction)</td>
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<td>2345</td>
<td>Word axis</td>
<td>Dynamic friction compensation amount at stop in abnormal load detection</td>
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<tr>
<td>2346</td>
<td>Word axis</td>
<td>Dynamic friction compensation limit in abnormal load detection</td>
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<tr>
<td>2352</td>
<td>Word axis</td>
<td>Detection level of active vibration-damping filter</td>
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<tr>
<td>2359</td>
<td>Word axis</td>
<td>Damping of vibration-damping filter 1</td>
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<td>2360</td>
<td>Word axis</td>
<td>Attenuation center frequency of vibration-damping filter 2</td>
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<td>2361</td>
<td>Word axis</td>
<td>Attenuation band width of vibration-damping filter 2</td>
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<td>2362</td>
<td>Word axis</td>
<td>Damping of vibration-damping filter 2</td>
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<td>Word axis</td>
<td>Attenuation center frequency of vibration-damping filter 3</td>
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<td>Attenuation band width of vibration-damping filter 3</td>
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<td>Damping of vibration-damping filter 3</td>
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<td>Word axis</td>
<td>Attenuation center frequency of vibration-damping filter 4</td>
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<td>Word axis</td>
<td>Attenuation band width of vibration-damping filter 4</td>
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<td>2368</td>
<td>Word axis</td>
<td>Damping of vibration-damping filter 4</td>
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<td>2369</td>
<td>Word axis</td>
<td>Two smooth compensation operations per magnetic pole pair (negative direction)</td>
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<td>2370</td>
<td>Word axis</td>
<td>Four smooth compensation operations per magnetic pole pair (negative direction)</td>
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<td>Word axis</td>
<td>Six smooth compensation operations per magnetic pole pair (negative direction)</td>
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<td>2373</td>
<td>Word axis</td>
<td>Pull-up amount of vertical axis pull-up function at emergency stop</td>
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<td>2374</td>
<td>Word axis</td>
<td>Pull-up time of vertical axis pull-up function at emergency stop</td>
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<td>2395</td>
<td>Word axis</td>
<td>Feed-forward timing adjustment function (when FAD is enabled)</td>
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4.16 Parameters of DI/DO

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<th>Parameters</th>
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<td>MHI</td>
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<td></td>
</tr>
<tr>
<td>ZPO</td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>RWM</td>
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<td></td>
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</table>

[Data type] Bit

<table>
<thead>
<tr>
<th>Description</th>
<th>Bit</th>
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<tbody>
<tr>
<td>RWM</td>
<td>RWD signal indicating that rewinding is in progress</td>
</tr>
<tr>
<td></td>
<td>0: Output only when the tape reader is being rewound by the reset and rewind signal RRW</td>
</tr>
<tr>
<td></td>
<td>1: Output when the tape reader is being rewound or a program in memory is being rewound by the reset and rewind signal RRW</td>
</tr>
<tr>
<td>ZPO</td>
<td>The reference position return completion signal for G28 and G30 is:</td>
</tr>
<tr>
<td></td>
<td>0: Output upon completion of the reference position return operation.</td>
</tr>
<tr>
<td></td>
<td>1: Output when the machine is positioned at the reference position after the completion of the reference position return operation.</td>
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</tbody>
</table>

NOTE
If this parameter is set to 0, executing G28 or G30 outputs the reference position return completion signal even when the reference position return operation is performed in the machine lock state.

<table>
<thead>
<tr>
<th>MHI</th>
<th>Exchange of strobe and completion signals for the M, S, T, and B codes</th>
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<tbody>
<tr>
<td>0</td>
<td>Normal</td>
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<tr>
<td>1</td>
<td>High-speed</td>
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</table>

<table>
<thead>
<tr>
<th>IOV</th>
<th>For the feedrate override signal and rapid traverse override signal:</th>
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<tr>
<td>0</td>
<td>Negative logic is used.</td>
</tr>
<tr>
<td>1</td>
<td>Positive logic is used.</td>
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</table>

<table>
<thead>
<tr>
<th>ITL</th>
<th>Interlock signal</th>
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</thead>
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<tr>
<td>0</td>
<td>Enabled</td>
</tr>
<tr>
<td>1</td>
<td>Disabled</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>ITX</th>
<th>Interlock signals for each axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Enabled</td>
</tr>
<tr>
<td>1</td>
<td>Disabled</td>
</tr>
</tbody>
</table>
4. DESCRIPTION OF PARAMETERS

DIT  Interlock for each axis direction
0 : Enabled
1 : Disabled

DAU  If bit 3 (DIT) of parameter No. 3003 is set to 0, the interlock signal of each axial direction is:
0 : Enabled only in manual operation and disabled in automatic operation.
1 : Enabled in both manual operation and automatic operation.

DEC  Deceleration signal (*DEC1 to *DEC4) for reference position return
0 : Deceleration is applied when the signal is 0.
1 : Deceleration is applied when the signal is 1.

MVX  The axis-in-movement signal is set to 0 when:
0 : Distribution for the axis is completed. (The signal is set to 0 in deceleration.)
1 : Deceleration of the axis is terminated, and the current position is in the in-position.
If, however, a parameter specifies not to make in-position during deceleration, the signal turns to "0" at the end of deceleration.

MVG  While drawing using the dynamic graphics function (with no machine movement), the axis-in-movement signal is:
0 : Output
1 : Not output

NOTE
In case of M series the signal is not output.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OTH</td>
<td>BSL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type]  Bit
BSL  The block start interlock signal *BSL and cutting block start interlock signal *CSL are:
0 : Disabled.
1 : Enabled.

BCY  When more than one operation is performed by one block command such as a canned cycle, the block start interlock signal *BSL is:
0 : Checked only at the beginning of the first cycle.
1 : Checked at the beginning of every cycle.

NOTE
This is enabled when the BSL parameter (bit 0 of parameter No.3004) is set to 1.

OTH  The overtravel limit signal is:
0 : Checked
1 : Not checked

⚠️ WARNING
For safety, usually set 0 to check the overtravel limit signal.
4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>#7 #6 #5 #4 #3 #2 #1 #0</td>
<td></td>
</tr>
<tr>
<td>3006</td>
<td>EPS EPN GDC</td>
</tr>
</tbody>
</table>
| GDC       | As the deceleration signal for reference position return:  
0: X009 is used.  
1: G196 is used. (X009 is disabled.)  
EPN Workpiece number search signals are assigned to:  
0: PN1, PN2, PN4, PN8, and PN16 <G009>.  
1: EPN0 to EPN13 <G024, G025>.  
EPS When a program is searched using the workpiece number search function, it is started by:  
0: Automatic operation start signal ST (when automatic operation (memory operation) is started).  
1: Workpiece number search start signal EPNS <G025#7>. (Search is not started by ST.)  
| 3008      | XSG |
| NOTE      | When this parameter is set, the power must be turned off before operation is continued.  
[Data type] Bit  
XSG The signals assigned to X addresses are:  
0: Fixed to these addresses.  
1: Able to be re-assigned to any addresses. (Emergency stop signal *ESP <X008#4>, however, cannot be changed.)  
When assignment to any addresses is selected, set parameter Nos. 3012 to 3014.  
| 3010      | Time lag in strobe signals MF, SF, TF, and BF  
[Data type] Word  
[Unit of data] 1 ms  
[Valid data range] 16 to 32767  
The time required to send strobe signals MF, SF, TF, and BF after the M, S, T, and B codes are sent, respectively.  

Fig.4.19 (a) Delay Time of the strobe signal
NOTE
The time is counted in units of 8 ms. If the set value is not a multiple of eight, it is raised to the next multiple of eight.
Example
When 30 is set, 32 ms is assumed.
When 32 is set, 32 ms is assumed.
When 100 is set, 104 ms is assumed.

3011 Acceptable width of M, S, T, and B function completion signal (FIN)

[Data type] Word
[Unit of data] 1 ms
[Valid data range] 16 to 32767
Set the minimum signal width of the valid M, S, T, and B function completion signal (FIN).

![Diagram showing M, S, T, B code, MF, SF, TF, BF signal, and FIN signal with valid and ignored signal widths]

Fig.4.19 (b) Valid width of the FIN (M, S, T, and B function completion) signal

NOTE
The time is counted in units of 8 ms. If the set value is not a multiple of eight, it is raised to the next multiple of eight.
Example
When 30 is set, 32 ms is assumed.
3012  Address to be assigned to skip signals

**NOTE**
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Word
[Valid data range] 0 to 127
Set the address to which the skip signals (SKIPn), measurement position arrival signals (XAE, YAE (for the M series only), and ZAE), and manual feed interlock signal for each axis direction and tool compensation amount write signal (±MIT1 (for the T series only) and ±MIT2 (for the T series only)) are assigned.
This parameter is valid when bit 2 (XSG) of parameter No. 3008 is set to 1.

3013  Address to be assigned to reference position return deceleration signals

**NOTE**
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Word axis
[Valid data range] 0 to 127
Set the address to which the reference position return deceleration signal for each axis (*DECn) is assigned.
This parameter is valid when bit 2 (XSG) of parameter No. 3008 is set to 1.

3014  Bit position to be assigned to reference position return deceleration signals

**NOTE**
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Byte axis
[Valid data range] 0 to 7
Set the bit position to which the reference position return deceleration signal for each axis (*DECn) is assigned. Set the address in parameter No. 3013.
This parameter is valid when bit 2 (XSG) of parameter No. 3008 is set to 1.
### 3017  Output time of reset signal RST

- **[Data type]**: Word
- **[Unit of data]**: 16 ms
- **[Valid data range]**: 0 to 255

To extend the output time of reset signal RST, the time to be added is specified in this parameter.

\[
\text{RST signal output time} = \text{time required for reset} + \text{parameter} \times 16 \text{ ms}
\]

### 3030  Allowable number of digits for the M code

- **[Data type]**: Byte
- **[Valid data range]**: 1 to 8

Set the allowable numbers of digits for the M, S, T, and B codes.

### 3031  Allowable number of digits for the S code

### 3032  Allowable number of digits for the T code

### 3033  Allowable number of digits for the B code

**NOTE**

Up to 5 digits can be specified in the S code.
4.17 PARAMETERS OF DISPLAY AND EDIT (1 OF 2)

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>COR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CEM</td>
</tr>
</tbody>
</table>

[Data type] Bit

CEM On screens such as the operation history screen and help screen, keys on the MDI panel are indicated:
0: In English.
1: With graphics qualifying for CE marking. (A character generator supporting graphics qualifying for CE marking is required.)

COR Display
0: Monochrome display
1: Color display

NOTE
When using the 8.4" LCD, set this bit to 1.

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<thead>
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<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
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<tbody>
<tr>
<td>BGD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>KBF</td>
</tr>
</tbody>
</table>

[Data type] Bit

KBF When the screen or mode is changed, the contents of the key-in buffer are:
0: Cleared.
1: Not cleared.

NOTE
When KBF = 1, the contents of the key-in buffer can all be cleared at one time by pressing the key followed by the key.

BGD In background editing, a program currently selected in the foreground:
0: Cannot be selected. (BP/S alarm No.140 is issued disabling selection.)
1: Can be selected. (However, the program cannot be edited, only displayed.)
4. DESCRIPTION OF PARAMETERS

NOTE
When this parameter has been set, the power must be turned off before operation is continued.

[Data type] Bit
Select the language to be used for the display.

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<thead>
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<th>SWE</th>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Czech</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Chinese (simplified characters)</td>
</tr>
</tbody>
</table>

[Data type] Bit
NMH The system alarm history screen is:
0 : Not displayed.
1 : Displayed.
### 4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAC</td>
<td>DAL</td>
<td>DRC</td>
<td>DRL</td>
<td>PPD</td>
<td></td>
<td></td>
<td>MCN</td>
</tr>
</tbody>
</table>

**[Data type]** Bit

**MCN** Machine position

- **0**: Displayed according to the unit of output.
  (The machine position is displayed regardless of whether metric input or inch input is used; for a machine with metric output, the machine position is displayed in mm, and for a machine with inch output, the machine position is displayed in inches.)

- **1**: Displayed according to the unit of input.
  (When input is made in mm, the machine position is displayed in mm, and when input is made in inches, the machine position is displayed in inches accordingly.)

**PPD** Relative position display when a coordinate system is set

- **0**: Not preset
- **1**: Preset

**NOTE**

When PPD is set to 1 and the absolute position display is preset by one of the following, the relative position display is also preset to the same value as the absolute position display:

1) The manual reference position return
2) Setting of a coordinate system by G92 (G50 for T series G code system A)

**DRL** Relative position

- **0**: The actual position displayed takes into account tool length offset (M series) or tool offset (T series).
- **1**: The programmed position displayed does not take into account tool length offset (M series) or tool offset (T series).

**NOTE**

When tool geometry compensation of the T system is to be performed by shifting the coordinate system (with bit 4 (LGT) of parameter No.5002 set to 0), the programmed position, ignoring tool offset, is displayed (with this parameter set to 1), but the programmed position, ignoring tool geometry compensation, cannot be displayed.

**DRC** Relative position

- **0**: The actual position displayed takes into account cutter compensation (M series) or tool nose radius compensation (T series).
- **1**: The programmed position displayed does not take into account cutter compensation (M series) or tool nose radius compensation (T series).
4. DESCRIPTION OF PARAMETERS

DAL  Absolute position
0: The actual position displayed takes into account tool length
   offset (M series) or tool offset (T series).
1: The programmed position displayed does not take into account
   tool length offset (M series) or tool offset (T series).

**NOTE**
When tool geometry compensation of the T system is to be performed by shifting the coordinate
system (with bit 4 (LGT) of parameter No. 5002 set to 0), the programmed position, ignoring tool offset,
is displayed (with this parameter set to 1), but the programmed position, ignoring tool geometry
compensation, cannot be displayed.

DAC  Absolute position
0: The actual position displayed takes into account cutter
   compensation (M series) or tool nose radius compensation (T series).
1: The programmed position displayed does not take into account
   cutter compensation (M series) or tool nose radius compensation
   (T series).

<table>
<thead>
<tr>
<th>#7</th>
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<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DPS</td>
<td>PCF</td>
<td>DPF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DPS</td>
<td>PCF</td>
<td>DPF</td>
</tr>
</tbody>
</table>

[Data type]  Bit
DPF  Display of the actual speed on the current position display screen, program check screen and program screen (MDI mode)
0: Not displayed
1: Displayed
PCF  Addition of the movement of the PMC-controlled axes to the actual speed display
0: Added
1: Not added

**NOTE**
For each setting, movement along any axis other than those controlled by the CNC (see the
description of parameter No. 1010) is not reflected in the actual speed display.

DPS  Actual spindle speed and T code
0: Not always displayed
1: Always displayed
SMF During simplified synchronous control, movement along a slave axis is: (see the parameter No.8311)
0: Included in the actual speed display
1: Not included in the actual speed display

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
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<th>#3</th>
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<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>OHS</td>
<td>SOV</td>
<td>OPH</td>
<td>SPD</td>
<td>GPL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OHS</td>
<td>SOV</td>
<td>OPH</td>
<td>GPL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

GPL On the program list screen, the list-by-group function is:
0: Disabled
1: Enabled

SPD Names for actual spindle speed values are displayed:
0: Regardless of the selected spindle position coder (in second position coder selection signal (PC2SLC))
1: Depending of the selected spindle position coder (in second position coder selection signal (PC2SLC))

<table>
<thead>
<tr>
<th>SPD=0</th>
<th>SPD=1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spindles 1 and 2</td>
<td>Spindles 1</td>
</tr>
<tr>
<td>S</td>
<td>S1</td>
</tr>
<tr>
<td>SACT</td>
<td>SACT1</td>
</tr>
<tr>
<td>ACT, S</td>
<td>ACT, S</td>
</tr>
</tbody>
</table>

OPH The operation history screen is:
0: Not displayed.
1: Displayed.

SOV The spindle override value is:
0: Not displayed.
1: Displayed.

NOTE This parameter is enabled only when bit 2 (DPS) of parameter No.3105 is set to 1.

OHS Operation history sampling is:
0: Performed.
1: Not performed.

NOTE Normally, set 0 (sampling is performed).

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
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<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDL</td>
<td>SOR</td>
<td>REV</td>
<td>DNC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

DNC Upon reset, the program display for DNC operation is:
0: Not cleared
1: Cleared
REV The actual speed in feed per revolution mode is displayed in:
0: MM/MIN or INCH/MIN.
1: MM/REV or INCH/REV.

SOR Display of the program directory
0: Programs are listed in the order of registration.
1: Programs are listed in the order of program number.

MDL Display of the modal state on the program display screen
0: Not displayed
1: Displayed (only in the MDI mode)

<table>
<thead>
<tr>
<th></th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
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<th>#3</th>
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</thead>
<tbody>
<tr>
<td>JSP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SLM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WCI</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>PCT</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

PCT On the program check screen, T code displayed
0: is a T code specified in a program (T).
1: is a T code specified by the PMC (HD. T/NX. T)

WCI On the workpiece coordinate system screen, a counter input is:
0: Disabled.
1: Enabled.

SLM The spindle load meter is:
0: Not displayed.
1: Displayed.

NOTE
1 This parameter is enabled only when the DPS parameter (bit 2 of parameter No.3105) is set to 1.
2 This is valid only for serial spindles.

JSP On the current position display screen and program check screen, jog feed is:
0: Not displayed.
1: Displayed.

NOTE
In manual operation mode, the jog feedrate is displayed. In automatic operation mode, the dry run feedrate is displayed. In each case, the feedrate to which a manual feedrate override has been applied is displayed.
4. DESCRIPTION OF PARAMETERS

3109

<table>
<thead>
<tr>
<th>#7</th>
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<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

DWT Characters G and W in the display of tool wear/geometry compensation amount
0: The characters are displayed at the left of each number.
1: The characters are not displayed.

IKY On the tool offset screen and workpiece shift screen (T series), soft key [INPUT] is:
0: Displayed.
1: Not displayed.

RHD When a manual handle interrupt is generated, the relative position display is:
0: Not updated.
1: Updated.

NOTE

This parameter is enabled when the INH parameter (bit 2 of parameter No.7100) is 1.

3110

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
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<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

OFA The axis names on the offset screen, Y-axis offset screen, and 4th axis offset screen are:
0: Always X, Z, and Y.
1: As specified by parameter No. 1020.

AHC With a soft key, the alarm history:
0: Can be cleared.
1: Cannot be cleared.

3111

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
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<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPA</td>
<td>OPS</td>
<td>OPM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

SVS Servo tuning screen
0: Not displayed
1: Displayed

SPS Spindle tuning screen
0: Not displayed
1: Displayed

SVP Synchronization errors displayed on the spindle tuning screen
0: Instantaneous values are displayed.
1: Peak-hold values are displayed.

OPM Operating monitor
0: Not displayed
1: Displayed

OPS The speedometer on the operating monitor screen indicates:
0:  Spindle motor speed
1:  Spindle speed

NPA  Action taken when an alarm is generated or when an operator message is entered
0:  The display shifts to the alarm or message screen.
1:  The display does not shift to the alarm or message screen.

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Data type]  Bit
SGD  Servo waveform
0:  Not displayed
1:  Displayed

NOTE
If SGD is set to 1, no graphic display other than servo waveform display is done.

OMH  The external operator message history screen is:
0:  Not displayed.
1:  Displayed.

EAH  Messages of the external alarm/macro alarm in alarm history:
0:  Not recorded
1:  Recorded

OPH  The operation history log function is:
0:  Displayed.
1:  Enable.

[Data type]  Bit
MHC  External operator message history data:
0:  Cannot be cleared.
1:  Can be cleared.
(Such data can be cleared using the [CLEAR] soft key.)

MS0, MS1  A combination of the number of characters preserved as external operator message history data and the number of history data items is set according to the table below.

<table>
<thead>
<tr>
<th>MS1</th>
<th>MS0</th>
<th>Number of history data characters</th>
<th>Number of history data items</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>255</td>
<td>8</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>200</td>
<td>10</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>100</td>
<td>18</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>50</td>
<td>32</td>
</tr>
</tbody>
</table>
NOTE
When the values of MS0 and MS1 are changed, all preserved external operator message history data is cleared.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>3114</td>
<td>ICS</td>
<td>IUS</td>
<td>IMS</td>
<td>ISY</td>
<td>IOF</td>
<td>IPR</td>
<td>IPO</td>
</tr>
</tbody>
</table>

[Data type] Bit
IPO When the function key is pressed while the position display screen is being displayed:
0 : The screen is changed.
1 : The screen is not changed.

IPR When the function key is pressed while the program screen is being displayed:
0 : The screen is changed.
1 : The screen is not changed.

IOF When the function key is pressed while the offset/setting screen is being displayed:
0 : The screen is changed.
1 : The screen is not changed.

ISY When the function key is pressed while the system screen is being displayed:
0 : The screen is changed.
1 : The screen is not changed.

IMS When the function key is pressed while the message screen is being displayed:
0 : The screen is changed.
1 : The screen is not changed.

IUS When the (using small MDI unit) or (using standard MDI unit) function key is pressed while the custom or graphic screen is being displayed:
0 : The screen is changed.
1 : The screen is not changed.

ICS When the function key is pressed while the custom screen is being displayed:
0 : The screen is changed.
1 : The screen is not changed.

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>3115</td>
<td></td>
<td></td>
<td>NDFx</td>
<td>SFMx</td>
<td>NDAx</td>
<td>NDPx</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>D10x</td>
<td>NDFx</td>
<td>NDAx</td>
<td>NDPx</td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit axis
NDPx Display of the current position for each axis
0 : The current position is displayed.
1 : The current position is not displayed.
NDAx  Position display using absolute coordinates and relative coordinates is:
   0 :  Performed.
   1 :  Not performed. (Machine coordinates are displayed.)

SFMx  In current position display, subscripts are:
   0 :  Added to the absolute, relative, and machine coordinate axis names.
   1 :  Assed only to the machine coordinate axis names.

NDFx  To the actual speed display, axis movement data is:
   0 :  Added.
   1 :  Not added.

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Even if the PCF parameter (bit 1 of parameter No.3105) is set to 0, so as to add PMC controlled axis movement data to the actual speed display, the movement data for a PMC controlled axis for which NDFx is set to 1 is not added to the actual speed display.</td>
</tr>
</tbody>
</table>

D10x  The current positions (absolute position, relative position, machine position, remaining travel, and travel by manual handle interrupt), and workpiece zero-point offset are:
   0 :  Displayed as usual. (Not multiplied by ten.)
   1 :  Multiplied by ten, and displayed.

Example:
   The current position on the Y-axis is multiplied by ten and displayed.
   X 1.2345  →  X 1.2345
   Y 1.2345  →  Y 12.345
   Z 1.2345  →  Z 1.2345
4.DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th></th>
<th>#7</th>
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<th>#3</th>
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<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>3116</td>
<td>MDC</td>
<td>T8D</td>
<td>COA</td>
<td>FOV</td>
<td>PWR</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

PWR Alarm No.100 (parameter enable):
- 0: Clear by \( \text{CNR} + \text{REJ} \) key
- 1: Clear by \( \text{REJ} \) key

FOV In the field of specified feedrate \( F \) on the program check screen,
- 0: The specified feedrate is displayed.
- 1: (Specified feedrate) \( \times \) (override) is displayed.

COA While an external alarm state is present or while an external message is being displayed, automatic screen erasure is:
- 0: Performed.
- 1: Not performed.

T8D T codes that are always displayed are displayed with:
- 0: Four digits.
- 1: Eight digits.

This parameter expands the T code display to eight digits for the continuous S or T display (bit 2 (DPS) of parameter No. 3105 is set to 1).

MDC Maintenance information by operating soft key:
- 0: All clear disable.
- 1: All clear enable.

<table>
<thead>
<tr>
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<th>#6</th>
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<th>#3</th>
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<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>3117</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Bit

SMS On the program check screen, the soft key to enable or disable the graph of spindle speed and load is:
- 0: Not displayed.
- 1: Displayed.

SPP On the diagnostic screen, spindle position data (the number of pulses from the position coder, detected after the detection of the one-revolution signal) is:
- 0: Not displayed.
- 1: Displayed. (Diagnostic Nos. 445 to 447)

ANS The subscript of each axis name set in parameter No. 3131 is displayed:
- 0: Only when the current position is displayed.
- 1: On the parameter screen, diagnosis screen, alarm screen, and alarm history screen as well as when the current position is displayed.
3118  3119

[Data type] Bit
AS1 to AS2
When the actual spindle speeds (SACT) of the first spindle and second spindle are displayed, each value is:
0: The value calculated based on the feedback pulses from the position coder.
1: The value calculated from the spindle motor speed (the same as the spindle speed displayed on the operating monitor screen).

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Bit
POR
Display in Portuguese is:
0: Disabled.
1: Enabled.

TAP
When the external touch panel interface option is available, the external touch panel is:
0: Enabled.
1: Disabled.

NVG
When a color display device is used, VGA mode is:
0: Used.
1: Not used.

3120

Time from the output of an alarm to the termination of sampling (waveform diagnosis function)

[Data type] Word
[Unit of data] ms
[Valid data range] 1 to 32760
When the waveform diagnosis function is used, this parameter sets the time from the output of a servo alarm until data collection. Storage operation is stopped because of the alarm. (This means that the termination of data collection can be delayed by a specified time.)

3121

Store-type waveform diagnosis data select (waveform diagnosis function)

[Data type] Byte
[Valid data range] 0 to 1
The six types of sampling data in store-type waveform diagnosis are:
0: Thermal simulation data.
1: Spindle load meter.
### 3122

**Time interval used to record time data in operation history**

- **Data type**: Word
- **Unit of data**: min
- **Valid data range**: 0 to 1439

Time data is recorded in operation history at set intervals. When 0 is specified in this parameter, 10 minutes is assumed as the default. However, note that time data is not recorded if there is no data to be recorded at the specified time.

### 3123

**Time until automatic screen clear function is applied**

- **Data type**: Byte
- **Unit of data**: min
- **Valid data range**: 1 to 255

This parameter specifies the period that must elapse before the automatic screen clear function is applied. This parameter is valid when bit 1 (COK) of parameter No. 3208 is 0. However, the automatic screen clear function is disabled if 0 is set in this parameter.

**NOTE**

When the automatic screen clear function is enabled, manual screen clearing with CAN+FUNCTION is disabled.

### 3124

<table>
<thead>
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<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
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</tr>
</thead>
<tbody>
<tr>
<td>D08</td>
<td>D07</td>
<td>D06</td>
<td>D05</td>
<td>D04</td>
<td>D03</td>
<td>D02</td>
<td>D01</td>
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### 3125

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<th>#2</th>
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</tr>
</thead>
<tbody>
<tr>
<td>D16</td>
<td>D15</td>
<td>D14</td>
<td>D13</td>
<td>D12</td>
<td>D11</td>
<td>D10</td>
<td>D09</td>
</tr>
</tbody>
</table>

### 3126

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<th>#7</th>
<th>#6</th>
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</tr>
</thead>
<tbody>
<tr>
<td>D24</td>
<td>D23</td>
<td>D22</td>
<td>D21</td>
<td>D20</td>
<td>D19</td>
<td>D18</td>
<td>D17</td>
</tr>
</tbody>
</table>

### 3127

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>D25</td>
</tr>
</tbody>
</table>

- **Data type**: Bit
- **Dxx (xx: 01 to 25)**: When modal G code is displayed on the program check screen, the xx group G code is:
  - 0: Displayed.
  - 1: Not displayed.
3131  **Subscript of each axis name**

**[Data type]** Byte axis

This parameter specifies a subscript (one character) of each axis name with a code.

The subscript (one character) specified in this parameter is displayed following the axis name.

**NOTE**

For characters and codes, see the correspondence table in Appendix A.

**[Example]**

When the axes include X, Z, C, and Y, and the following settings are made, the axis names are displayed as XA, Z1, CS, and Y1:

- Parameter 3131x 65 (A)
- Parameter 3131z 49 (1)
- Parameter 3131c 83 (S)
- Parameter 3131y 49 (1)

3132 **Axis name (absolute coordinate) for current position display**

3133 **Axis name (relative coordinate) for current position display**

**[Data type]** Byte axis

**[Valid data range]** 0 to 255

These parameters set the axis name for current position display.

When G code system B or C is used, the axis name set in parameter No.3132 is used for both absolute and relative coordinate axes.

The values set in these parameters are used only for display.

For a command address, the axis name set in parameter No.1020 is used.

When 0 is specified in these parameters, the value set in parameter No.1020 is used.

3134  **Axis display order on workpiece coordinate system screen and workpiece shift screen**

**[Data type]** Byte axis

**[Valid data range]** 0, 1 to the number of controlled axes

This parameter specifies the order in which axes are displayed on the workpiece coordinate system screen and workpiece shift screen (for T series).

When the parameters of all axes are set to 0, all axes are displayed.

When the parameters of some axes are set, the axes for which a value of 0 is specified do not appear. The displayed axes are consecutive without spaces being left for non-displayed axes.
3151  Number of the axis for which the 1st load meter for the servo motor is used

3152  Number of the axis for which the 2nd load meter for the servo motor is used

3153  Number of the axis for which the 3rd load meter for the servo motor is used

3154  Number of the axis for which the 4th load meter for servo motor is used

[Data type]  Byte
[Valid data range]  0, 1, ..., the number of control axes

Set the numbers of the axes for which measurement values on the load meters for the four servo motors are displayed. Set the parameters to 0 for those axes for which a load meter need not be displayed.

3163  Time required to smooth the spindle load meter readings

[Data type]  Byte
[Unit of data]  32 ms
[Valid data range]  0 to 32

When the spindle load meter reading is displayed (see the description of the SLM parameter (bit 6 of parameter No.3108)), smoothing can be applied to the spindle load meter reading to prevent flickering. This parameter sets the time width for smoothing.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Time for smoothing (msec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>256</td>
</tr>
<tr>
<td>1</td>
<td>32</td>
</tr>
<tr>
<td>2</td>
<td>64</td>
</tr>
<tr>
<td>3</td>
<td>96</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>32</td>
<td>1024</td>
</tr>
</tbody>
</table>

Each smoothing operation is performed for a time width of between 32 ms and 1024 ms.

3190  

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH2</td>
<td>CZE</td>
<td>SWE</td>
<td>HUN</td>
<td>POL</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Data type]  Bit
POL  Display in Polish is:
0 : Not performed.
1 : Performed.

HUN  Display in Hungarian is:
0 : Not performed.
1 : Performed.

SWE  Display in Swedish is:
0 : Not performed.
1 : Performed.

CZE  Display in Czech is:
0 : Not performed.
1 : Performed.

CH2 Display in Chinese (simplified Chinese characters)
0 : Not performed.
1 : Performed.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAP</td>
<td>FSS</td>
<td>STS</td>
<td>FPS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3191

[Data type] Bit

FPS The unit of values in the display of actual speeds in feed per revolution mode is:
0 : Feedrate per minute.
1 : Feedrate per spindle rotation.
This parameter is valid when bit 3 (REV) of parameter No. 3107 is set to 1.

WKI On the workpiece coordinate system setting screen, the soft key [INPUT] is:
0 : Displayed.
1 : Not displayed.

STS When data is input on the setting screen, a confirmation message is:
0 : Not displayed.
1 : Displayed.

FSS The feedrate display is switched:
0 : In accordance with the operation state.
1 : By a DI signal.

CAP The position of soft key [ALL] that appears by pressing soft key [ERASE] for clearing offset values on the offset screen is:
0 : Not changed.
1 : Changed.

NOTE
Soft key [ALL] is displayed in the same position as soft key [ERASE]. Therefore, when soft key [ERASE] is pressed twice by mistake, offset data may be all cleared.
Since the position of soft key [ALL] is changed when this parameter is set to 1, it is possible to prevent offset data from being all cleared even when soft key [ERASE] is pressed twice by mistake.
### 4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>3192</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RDM</td>
</tr>
</tbody>
</table>

**Data type** Bit

**RDM**
The machine remote diagnostic message notification function is:

- 0: Enabled.
- 1: Disabled.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>3195</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CPR</td>
</tr>
</tbody>
</table>

**Data type** Bit

**CPR**
Pressing the [SYSTEM] function key:

- 0: Displays the parameter setting assistance screen.
- 1: Does not display the parameter setting assistance screen.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>3201</td>
<td>MIP</td>
<td>NPE</td>
<td>N99</td>
<td>PUO</td>
<td>REP</td>
<td>RAL</td>
<td>RDL</td>
</tr>
</tbody>
</table>

**Data type** Bit

**RDL**
When a program is registered by input/output device external control

- 0: The new program is registered following the programs already registered.
- 1: All registered programs are deleted, then the new program is registered. Note that programs which are protected from being edited are not deleted.

**RAL**
When programs are registered through the reader/puncher interface

- 0: All programs are registered.
- 1: Only one program is registered.

**REP**
Action in response to an attempt to register a program whose number is the same as that of an existing program

- 0: An alarm is generated.
- 1: The existing program is deleted, then the new program is registered. Note that if the existing program is protected from being edited, it is not deleted, and an alarm is generated.

**PUO**
When address O of a program number is output in ISO code:

- 0: ":,,:" is output.
- 1: ":O:" is output.

**N99**
With an M99 block, when bit 6 (NPE) of parameter No.3201 = 0, program registration is assumed to be:

- 0: Completed
- 1: Not completed

**NPE**
With an M02, M30, or M99 block, program registration is assumed to be:

- 0: Completed
- 1: Not completed

**MIP**
Program registration by external start signal (MINP):

- 0: Not performed.
- 1: Performed.
3202

<table>
<thead>
<tr>
<th>[Data type]</th>
<th>Bit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NE8</strong></td>
<td>Editing of subprograms with program numbers 8000 to 8999</td>
</tr>
<tr>
<td>0</td>
<td>Not inhibited</td>
</tr>
<tr>
<td>1</td>
<td>Inhibited</td>
</tr>
</tbody>
</table>

The following edit operations are disabled:
1. Program deletion (Even when deletion of all programs is specified, programs with program numbers 8000 to 8999 are not deleted.)
2. Program output (Even when outputting all programs is specified, programs with program numbers 8000 to 8999 are not output.)
3. Program number search
4. Program editing of registered programs
5. Program registration
6. Program collation
7. Displaying programs

**OLV**

When a program other than the selected program is deleted or output:
0: The display of the selected program is not held.
1: The display of the selected program is held.

**CND**

By using the [CONDENSE] soft key on the program directory screen, the program condensing operation is:
0: Not performed. (The [CONDENSE] soft key is not displayed.)
1: Performed.

**OSR**

In programming number search, when pressing soft key [O-SEARCH] without inputting program number by key:
0: Search the following program number
1: Operation is invalid

**NE9**

Editing of subprograms with program numbers 9000 to 9999
0: Not inhibited
1: Inhibited

The following program editing during operation is invalid.
1. Program deletion (Even when deletion of all programs is specified, programs with program numbers 9000 to 9999 are not deleted.)
2. Program punching (Even when punching of all programs is specified, programs with program numbers 9000 to 9999 are not punched.)
3. Program number search
4. Program editing after registration
5. Program registration
6. Program collation
7. Displaying programs

**CPD**

When an NC program is deleted, a confirmation message and confirmation soft key are:
0: Not output.
1: Output.

**PSR**

Search for the program number of a protected program
0: Disabled
1: Enabled
NOTE
If this parameter is set, a protected program is also displayed.

3203  

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCL</td>
<td>MER</td>
<td>MIE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit
MIE  After MDI operation is started, program editing during operation is:
0 : Enabled
1 : Disabled
MER  When the last block of a program has been executed at single block operation in the MDI mode, the executed block is:
0 : Not deleted
1 : Deleted

NOTE
When MER is set to 0, the program is deleted if the end-of-record mark (%) is read and executed. (The mark % is automatically inserted at the end of a program.)

MCL  Whether a program prepared in the MDI mode is cleared by reset
0 : Not deleted
1 : deleted

3204  

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>MKP</td>
<td></td>
<td></td>
<td></td>
<td>EXK</td>
<td></td>
<td></td>
<td>PAR</td>
</tr>
</tbody>
</table>

[Data type] Bit
PAR  When a small keyboard is used, characters "]" and "]" are:
0 : Used as "[" and "]".
1 : Used as "(" and ")".
EXK  The input character extension function is:
0 : Not used. ([C-EXT] soft key is displayed.)
1 : Used.

NOTE
The [C-EXT] soft key is used to select an operation on the program screen. This soft key enables the entry of "(" , ")", and "@" using soft keys. This soft key is useful when using the small MDI keyboard, which does not have the "(" , ")", and "@" keys.

MKP  When M02, M30, or EOR(%) is executed during MDI operation, the created MDI program is:
0 : Erased automatically.
1 : Not erased automatically.
NOTE
If the MER parameter (bit 6 of parameter No.3203) is 1, executing the last block provides a choice of whether to automatically erase a created program.

<table>
<thead>
<tr>
<th>Parameter No.</th>
<th>MCK</th>
<th>BGC</th>
<th>OSC</th>
<th>PNS</th>
<th>CMO</th>
<th>CHG</th>
<th>COL</th>
</tr>
</thead>
<tbody>
<tr>
<td>3205</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[Data type]</td>
<td>Bit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When a program is displayed or output, any colons (:) in the comments of the program are:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 : Converted to letter O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 : Displayed or output as is</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When the change function of the extended edit function is used:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 : Once the user has decided whether to make a change, the cursor is moved to the target position.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 : The cursor is moved to the change source, after which the user can choose whether to make a change.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In extended tape editing, the copy or move operation:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 : Is performed in the usual way.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 : Can also copy or move data from a program to a key-in buffer in units of words.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PNS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On the program screen, a search by a cursor key is:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 : Performed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 : Not performed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OSC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On the offset screen, offset value erasure by a soft key is:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 : Enabled.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 : Disabled.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BGC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When background editing starts:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 : The edit program is initialized (no program is selected).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 : The previous edit program is edited continuously. (Continuous editing is allowed only when neither editing nor operation is being performed in the foreground (that is, when continuation is possible).)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The system tape memory check function is:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 : Not used.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 : Used. (This setting is inhibited.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter No.</th>
<th>NS2</th>
<th>PHS</th>
<th>MIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>3206</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[Data type]</td>
<td>Bit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Editing of the maintenance information screen is:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 : Not prohibited.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 : Prohibited.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The selection of an operation history signal and parameters (No. 12801 to No. 128900) are:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 : Not linked.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 : Linked.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NS2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The CNC screen display function dual display is:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 : Not used.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1 : Used.

### 3207

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>OM4</td>
</tr>
</tbody>
</table>

**NOTE**

When this parameter has been set, the power must be turned off before operation is continued.

**[Data type]** Bit

**OM4** A message displayed on the external operator message screen can have:

- 0 : Up to 256 characters, and just a single message can be displayed.
- 1 : Up to 64 characters, and up to four messages can be displayed.

### 3208

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>COK</td>
</tr>
</tbody>
</table>

**[Data type]** Bit

**SKY** The function key [SYSTEM] on the MDI panel is:

- 0 : Enabled.
- 1 : Disabled.

**COK** The automatic screen erase function is:

- 0 : Enabled.
- 1 : Disabled.

**NOTE**

If this parameter is set to 1, manual screen erase by the CAN + FUNCTION key is enabled, irrespective of the setting of parameter No. 3123.

### 3209

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MPD</td>
</tr>
</tbody>
</table>

**[Data type]** Bit

**MPD** When a subprogram is executed, the main program number is:

- 0 : Not displayed.
- 1 : Displayed.

**NFU** In the screen erase function/automatic screen erase function, when the function key is pressed to erase or display a screen, switching of screen with the function key is:

- 0 : Performed.
- 1 : Not performed.

**UPP** The FOCAS1/ETHERNET cnc_upload3( ) function:

- 0 : Does not upload the protected programs.
- 1 : Uploads the protected programs if a search is possible.

### 3210

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Password</td>
</tr>
</tbody>
</table>

**[Data type]** 2-word axis
This parameter sets a password for protecting program Nos. 9000 to 9999. When a value other than zero is set in this parameter and this value differs from the keyword set in parameter No.3211, bit 4 (NE9) of parameter No.3202 for protecting program Nos. 9000 to 9999 is automatically set to 1. This disables the editing of program Nos. 9000 to 9999. Until the value set as the password is set as a keyword, NE9 cannot be set to 0 and the password cannot be modified.

### NOTE

1. The state where password ≠ 0 and password ≠ keyword is referred to as the locked state. When an attempt is made to modify the password by MDI input operation in this state, the warning message "WRITE PROTECTED" is displayed to indicate that the password cannot be modified. When an attempt is made to modify the password with G10 (programmable parameter input), P/S alarm No.231 is issued.

2. When the value of the password is not 0, the parameter screen does not display the password. Care must be taken in setting a password.

#### 3211 Keyword

- **[Data type]** 2-word
- When the value set as the password (set in parameter No.3210) is set in this parameter, the locked state is released and the user can now modify the password and the value set in bit 4 (NE9) of parameter No.3202.

### NOTE

The value set in this parameter is not displayed. When the power is turned off, this parameter is set to 0.

#### 3216 Increment in sequence numbers inserted automatically

- **[Data type]** Word
- **[Valid data range]** 0 to 9999
- Set the increment for sequence numbers for automatic sequence number insertion (when SEQ, #5 of parameter 0000, is set to 1.)
#7 #6 #5 #4 #3 #2 #1 #0

3232

[Data type] Bit

ND8 While program No. 8000 to 8999 is being executed as a subprogram or macro program, display on the program screen is:
0 : Not disabled.
1 : Disabled.

ND9 While program No. 9000 to 9999 is being executed as a subprogram or macro program, display on the program screen is:
0 : Not disabled.
1 : Disabled.

3241

Character blinking in the AI advanced preview control mode or AI contour control mode (first character)

3242

Character blinking in the AI advanced preview control mode or AI contour control mode (second character)

3243

Character blinking in the AI advanced preview control mode or AI contour control mode (third character)

3244

Character blinking in the AI advanced preview control mode or AI contour control mode (fourth character)

3245

Character blinking in the AI advanced preview control mode or AI contour control mode (fifth character)

3246

Character blinking in the AI advanced preview control mode or AI contour control mode (sixth character)

3247

Character blinking in the AI advanced preview control mode or AI contour control mode (seventh character)

[Data type] Byte

[Valid data range] 0 to 255

Set the character codes of characters blinking in the AI advanced preview control mode or AI contour control mode.

NOTE
1 Set character codes according to the character code list in Appendix A.
2 If 0 is set, "AICC" blinks when the AI contour control option is provided, and when the option is not provided, "AIAPC" blinks.
**4.DESCRIPTION OF PARAMETERS**

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>3290</td>
<td>KEY</td>
<td>MCM</td>
<td>IWZ</td>
<td>WZO</td>
<td>MCV</td>
<td>GOF</td>
<td>WOF</td>
</tr>
</tbody>
</table>

[Data type] Bit

**WOF** Setting the tool offset value by MDI key input is:
- 0: Not disabled
- 1: Disabled (With parameter No.3294 and No.3295, set the offset number range in which updating the setting is to be disabled.)

**GOF** Setting the tool offset value by MDI key input is:
- 0: Not disabled
- 1: Disabled (With parameter No.3294 and No.3295, set the offset number range in which updating the setting is to be disabled.)

**MCV** Macro variable setting by MDI key input is:
- 0: Not disabled
- 1: Disabled

**NOTE**

If this parameter is set to 1, input of tool life management data by MDI is also disabled.

**WZO** Setting a workpiece zero point offset value by MDI key input is:
- 0: Not disabled
- 1: Disabled

**IWZ** Setting a workpiece zero point offset value or workpiece shift value (T-series) by MDI key input in the automatic operation activation or halt state is:
- 0: Not disabled
- 1: Disabled

**MCM** The setting of custom macros by MDI key operation is:
- 0: Enabled regardless of the mode.
- 1: Enabled only in the MDI mode.

**KEY** For memory protection keys:
- 0: The KEY1, KEY2, KEY3, and KEY4 signals are used.
- 1: Only the KEY1 signal is used.
NOTE

The functions of the signals depend on whether KEY=0 or KEY=1.
When KEY = 0:
- KEY1: Enables a tool offset value and a workpiece zero point offset value to be input.
- KEY2: Enables setting data and macro variables to be input.
- KEY3: Enables program registration and editing.
- KEY4: Enables PMC data (counter and data table) to be input.
When KEY = 1:
- KEY1: Enables program registration and editing, and enables PMC parameter input.
- KEY2 to KEY4: Not used

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>WPT</td>
</tr>
</tbody>
</table>

[Data type] Bit

WPT

The input of the tool wear compensation amount is:
0 : Enabled according to memory protection key signal KEY1.
1 : Always enabled.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PK5</td>
</tr>
</tbody>
</table>

[Data type] Bit

PK5

The KEYPRM signal (memory protection signal, parameter write setting) is:
0 : Disabled.
1 : Enabled.

If this parameter is set to 1, PWE on the setting screen becomes invalid, and the KEYPRM signal <G046#0> is used to make memory protection and parameter write settings.
### 4. DESCRIPTION OF PARAMETERS

**3294**

Start number of tool offset values whose input by MDI is disabled

**3295**

Number of tool offset values (from the start number) whose input by MDI is disabled

[Data type] Word

To prevent tool offset values from being changed by MDI key input operation using bit 0 (WOF) of parameter No. 3290 and bit 1 (GOF) of parameter No. 3290, set the inhibited range in this parameter.

Set the start offset number of the tool offset values to be protected in parameter No. 3294 and the number of tool offset values from the start in parameter No. 3295.

When 0 or a negative value is set in parameter No.3294 or parameter No.3295, no modification of the tool offset values is allowed.

When the value set with parameter No.3294 is greater than the maximum tool offset count, no modification is allowed.

[Example]

The following setting disables the modification of both the tool geometry compensation values and tool wear compensation values corresponding to offset numbers 51 to 60:

- Bit 1 (GOF) of parameter No.3290=1 (Disables tool offset value modification.)
- Bit 0 (WOF) of parameter No.3290=1 (Disables tool wear compensation value modification.)
- Parameter No.3294 = 51
- Parameter No.3295 = 10

If bit 0 (WOF) of parameter No.3290 is set to 0, the modification of the tool offset values alone is disabled. The tool wear compensation values may be modified.

---

**3301**

HDC  HCG  HCA  HCC

[Data type] Bit

HCC In the VGA-compatible mode display,

- 0: A 256-color bit map data of the screen hard copy is created.
- 1: A 16-color bit map data of the screen hard copy is created.

HCA An alarm message related to hard copy is:

- 0: Not displayed.
- 1: Displayed.

HCG In a monochrome bit map,

- 0: Black and white are not inverted. (same as the screen image)
- 1: Black and white are inverted.

HDC A screen hard copy is:

- 0: Not provided.
- 1: Provided.
4.18 PARAMETERS OF PROGRAMS

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSC</td>
<td>GSB</td>
<td></td>
<td></td>
<td></td>
<td>FCD</td>
<td>DPI</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DPI</td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

DPI When a decimal point is omitted in an address that can include a decimal point
0: The least input increment is assumed.
1: The unit of mm, inches, or second is assumed. (Pocket calculator type decimal point input)

FCD When an F command and a G command (G98, G99) for feed per minute or feed per rotation are specified in the same block, and the G command (G98, G99) is specified after the F command, the F command is:
0: Assumed to be specified in the mode (G98 or G99) when the F command is specified
1: Assumed to be specified in the mode of the G command (G98 or G99) of the same block

NOTE
1 When FCD = 1:
   If the block containing a G command (G98, G99) does not include an F command, the last F command specified is assumed to be specified in the G command mode of the block.
   Example
   N1 G99 ;
   N2 Faaaa G98 ; - Faaaa is assumed to be specified in the G98 mode.
   N3 Fbbbb ; - Fbbbb is assumed to be specified in the G98 mode.
   N4 G99 ; - Fbbbb is assumed to be specified in G99 mode.
2 In G code system B or C, G98 and G99 function are specified in G94 and G95.

MAB Switching between the absolute and incremental commands in MDI operation
0: Performed by G90 or G91
1: Depending on the setting of ABS, #5 of parameter No.3401

ABS Program command in MDI operation
0: Assumed as an incremental command
1: Assumed as an absolute command

NOTE
ABS is valid when MAB, #4 of parameter No.3401, is set to 1.
GSB, GSC

The G code system is set.

<table>
<thead>
<tr>
<th>GSC</th>
<th>GSB</th>
<th>G code</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>G code system A</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>G code system B</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>G code system C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>G23</td>
<td>CLR</td>
<td>FPM</td>
<td>G91</td>
<td>G19</td>
<td>G18</td>
<td>G17</td>
<td>G01</td>
</tr>
</tbody>
</table>

[Data type] Bit

G01 Mode entered when the power is turned on or when the control is cleared
0 : G00 mode (positioning)
1 : G01 mode (linear interpolation)

G18 and G19 Plane selected when power is turned on or when the control is cleared

<table>
<thead>
<tr>
<th>G19</th>
<th>G18</th>
<th>G17, G18 or G19 mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>G17 mode (plane XY)</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>G18 mode (plane ZK)</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>G19 mode (plane YZ)</td>
</tr>
</tbody>
</table>

G91 When the power is turned on or when the control is cleared
0 : G90 mode (absolute command)
1 : G91 mode (incremental command)

FPM When the power is turned on
0 : Feed per revolution on
1 : Feed per minute mode

CLR Reset button on the MDI panel, external reset signal, reset and rewind signal, and emergency stop signal
0 : Cause reset state.
1 : Cause clear state.
For the reset and clear states, refer to Appendix in the Operator's Manual.

G23 When the power is turned on
0 : G22 mode (stored stroke check on)
1 : G23 mode (stored stroke check off)

[Data type] Bit

CIR When neither the distance (I, J, K) from a start point to the center nor an arc radius (R) is specified in circular interpolation (G02, G03):
0 : The tool moves to an end point by linear interpolation.
1 : P/S alarm No.022 is issued.

AD2 Specification of the same address two or more times in a block is:
0 : Enabled (Next specification is enabled.)
1 : Disabled (P/S alarm No.5074)
**NOTE**

1. When 1 is set, specifying two or more G codes of the same group in a block will also result in an alarm being issued.
2. Up to three M codes can be specified in a single block, when bit 7 (M3B) of parameter No.3404 is set to 1.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>M3B</td>
<td>EOR</td>
<td>M02</td>
<td>M30</td>
<td>SBP</td>
<td>POL</td>
<td>NOP</td>
<td></td>
</tr>
</tbody>
</table>

**[Data type]** Bit

**NOP** When a program is executed, a block consisting of an O number, EOB, or N number is:
- 0: Not ignored, but regarded as being one block.
- 1: Ignored.

**POL** For a command address allowing a decimal point, omission of the decimal point is:
- 0: Enabled
- 1: Disabled (P/S alarm No.5073)

**SBP** Address P of the block including M198 in the subprogram call function
- 0: Indicating a file number
- 1: Indicating a program number

**M30** When M30 is specified in a memory operation:
- 0: M30 is sent to the machine, and the head of the program is automatically searched for. So, when the ready signal FIN is returned and a reset or reset and rewind operation is not performed, the program is executed, starting from the beginning.
- 1: M30 is sent to the machine, but the head of the program is not searched for. (The head of the program is searched for by the reset and rewind signal.)

**M02** When M02 is specified in memory operation
- 0: M02 is sent to the machine, and the head of the program is automatically searched for. So, when the end signal FIN is returned and a reset or reset and rewind operation is not performed, the program is executed, starting from the beginning.
- 1: M02 is sent to the machine, but the head of the program is not searched for.

**EOR** When the end-of-record mark (%) is read during program execution:
- 0: P/S alarm No.5010 occurs. (Automatic operation is stopped, and the system enters the alarm state.)
- 1: No alarm occurs. (Automatic operation is stopped, and the system is reset.)

**M3B** The number of M codes that can be specified in one block
- 0: One
- 1: Up to three
### Description of Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AUX</strong></td>
<td>The least increment of the command of the second miscellaneous function specified with a decimal point</td>
</tr>
<tr>
<td>0</td>
<td>Assumed to be 0.001</td>
</tr>
<tr>
<td>1</td>
<td>Depending on the input increment. (For input in mm, 0.001 is assumed, or for input in inches, 0.0001 is assumed.)</td>
</tr>
<tr>
<td><strong>DWL</strong></td>
<td>The dwell time (G04) is:</td>
</tr>
<tr>
<td>0</td>
<td>Always dwell per second</td>
</tr>
<tr>
<td>1</td>
<td>Dwell per second in the feed per minute mode, or dwell per rotation in the feed per rotation mode</td>
</tr>
<tr>
<td><strong>PPS</strong></td>
<td>The passing-point signal output function is:</td>
</tr>
<tr>
<td>0</td>
<td>Not used</td>
</tr>
<tr>
<td>1</td>
<td>Used</td>
</tr>
<tr>
<td><strong>CCR</strong></td>
<td>Addresses used for chamfering and corner rounding</td>
</tr>
<tr>
<td>0</td>
<td>Address used for chamfering and corner rounding is &quot;I&quot; or &quot;K&quot;, not &quot;C&quot;. In direct drawing dimension programming, addresses &quot;,C&quot;, &quot;,R&quot;, and &quot;,A&quot; (with comma) are used in stead of &quot;C&quot;, &quot;R&quot;, and &quot;A&quot;.</td>
</tr>
<tr>
<td>1</td>
<td>Addresses used for chamfering, corner rounding, and direct drawing dimension programming are &quot;C&quot;, &quot;R&quot;, and &quot;A&quot; without comma. Thus, addresses A and C cannot be used as the names of axes.</td>
</tr>
<tr>
<td><strong>DDP</strong></td>
<td>Angle commands by direct drawing dimension programming</td>
</tr>
<tr>
<td>0</td>
<td>Normal specification</td>
</tr>
<tr>
<td>1</td>
<td>A supplementary angle is given</td>
</tr>
<tr>
<td><strong>QLG</strong></td>
<td>When the passing-point signal output function is used, the remaining distance to be traveled specified in address &quot;,Q&quot; is:</td>
</tr>
<tr>
<td>0</td>
<td>The combined distance of all axes</td>
</tr>
<tr>
<td>1</td>
<td>The distance of the longest axis</td>
</tr>
</tbody>
</table>

**NOTE**

This parameter is valid when bit 7 (QAB) of parameter No.3405 = 0.

**QAB**

When the passing-point signal output function is used, address ",Q" specifies:

| 0 | Remaining distance to be traveled |
| 1 | Coordinate value of the longest axis |
### Parameters Description

#### 3406

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>C07</td>
<td>C05</td>
<td>C04</td>
<td>C03</td>
<td>C02</td>
<td>C01</td>
<td>C07</td>
<td>C05</td>
</tr>
</tbody>
</table>

#### 3407

<table>
<thead>
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<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>C14</td>
<td>C14</td>
<td>C13</td>
<td>C11</td>
<td>C10</td>
<td>C09</td>
<td>C08</td>
<td>C14</td>
</tr>
</tbody>
</table>

#### 3408

<table>
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<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C20</td>
<td>C19</td>
</tr>
</tbody>
</table>

#### 3409

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
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<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFH</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**[Data type]** Bit

**Cxx (xx: 01 to 20)**

When bit 6 (CLR) of parameter No.3402 is 1, the reset button on the MDI panel, the external reset signal, the reset and rewind signal, or emergency stop will:

- **0**: Clear the G code with group number xx.
- **1**: Not clear the G code with group number xx.

**CFH**

When bit 6 (CLR) of parameter No.3402 is 1, the reset button on the MDI panel, the external reset signal, the reset and rewind signal, or emergency stop will:

- **0**: Clear F codes, H codes (for the M series), D codes (for the M series), and T codes (for the T series).
- **1**: Not clear F codes, H codes (for the M series), D codes (for the M series), and T codes (for the T series).

#### 3410

**Tolerance of arc radius**

**[Data type]** 2-word

**[Unit of data]**

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch input</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
</tbody>
</table>

**[Valid data range]** 1 to 99999999

When a circular interpolation command (G02, G03) is executed, the tolerance for the radius between the start point and the end point is set. If the difference of radii between the start point and the end point exceeds the tolerance set here, a P/S alarm No.20 is informed.

**NOTE**

When the set value is 0, the difference of radii is not checked.
### 4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3411</td>
<td>M code preventing buffering 1</td>
</tr>
<tr>
<td>3412</td>
<td>M code preventing buffering 2</td>
</tr>
<tr>
<td>3413</td>
<td>M code preventing buffering 3</td>
</tr>
<tr>
<td></td>
<td>...</td>
</tr>
<tr>
<td>3420</td>
<td>M code preventing buffering 10</td>
</tr>
</tbody>
</table>

**[Data type]**  | Byte                        
**[Valid data range]**  | 0 to 255

Set M codes that prevent buffering the following blocks. If processing directed by an M code must be performed by the machine without buffering the following block, specify the M code. M00, M01, M02, and M30 always prevent buffering even when they are not specified in these parameters.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3421</td>
<td>Minimum value 1 of M code preventing buffering</td>
</tr>
<tr>
<td>3422</td>
<td>Maximum value 1 of M code preventing buffering</td>
</tr>
<tr>
<td>3423</td>
<td>Minimum value 2 of M code preventing buffering</td>
</tr>
<tr>
<td>3424</td>
<td>Maximum value 2 of M code preventing buffering</td>
</tr>
<tr>
<td>3425</td>
<td>Minimum value 3 of M code preventing buffering</td>
</tr>
<tr>
<td>3426</td>
<td>Maximum value 3 of M code preventing buffering</td>
</tr>
<tr>
<td>3427</td>
<td>Minimum value 4 of M code preventing buffering</td>
</tr>
<tr>
<td>3428</td>
<td>Maximum value 4 of M code preventing buffering</td>
</tr>
<tr>
<td>3429</td>
<td>Minimum value 5 of M code preventing buffering</td>
</tr>
<tr>
<td>3430</td>
<td>Maximum value 5 of M code preventing buffering</td>
</tr>
<tr>
<td>3431</td>
<td>Minimum value 6 of M code preventing buffering</td>
</tr>
<tr>
<td>3432</td>
<td>Maximum value 6 of M code preventing buffering</td>
</tr>
</tbody>
</table>

**[Data type]**  | Word                        
**[Valid data range]**  | 0 to 65535

When a specified M code is within the range specified with parameter Nos. 3421 and 3422, 3423 and 3424, 3425 and 3426, 3427 and 3428, 3429 and 3430, or 3431 and 3432, buffering for the next block is not performed until the execution of the block is completed.

**NOTE**

1. The specification of a minimum value that exceeds the specified maximum value is invalid.
2. When there is only one data item, set the following: minimum value = maximum value.
3435

Central angle limit of circular with R specification

[Data type] Byte
[Unit of data] 1°
[Valid data range] 0 to 180

Set a central angle limit that can be permitted in commands for circular interpolation with R specification (G02 and G03). If circular interpolation of which central angle exceeds the limit is specified, P/S alarm No.23 is issued.

If this parameter is set to 0, the radius R specification alarm function is disabled.

3450

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDX</td>
<td>NPS</td>
<td>CQD</td>
<td>CQD</td>
<td>AUP</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit
AUP When a command for the second miscellaneous function contains a decimal point or negative sign:
0 : The command is invalid.
1 : The command is valid.

NOTE
For the T series, a decimal point and negative sign are supported for commands for the second miscellaneous function, regardless of the setting made with this parameter.

CQD The method used for determining the amount of travel in circular interpolation is:
0 : Series 16 type.
1 : Series 15 type.

NPS A block that contains M98 Pxxx or M99, and which contains no addresses other than O and N functions:
0 : As a one-block NC statement involving no movement.
   (A single-block stop is caused.)
1 : As a macro statement.
   (A single-block stop is not caused. Moreover, the block is not regarded as a block involving no movement in tool-tip radius compensation mode.)

BDX A decimal point specified with address B is handled:
0 : In the conventional way.
1 : In the same way as in a system equipped with the second auxiliary function.

In a system without second auxiliary function, the decimal point specified with address B can be handled as in a system equipped with the second auxiliary function. The following parameters can be used:
- Bit 0 (AUP) of parameter No. 3450
- Bit 0 (AUX) of parameter No. 3405
4. DESCRIPTION OF PARAMETERS

**3451**

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NBN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CCK</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SDP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GQS</td>
</tr>
</tbody>
</table>

**[Data type] Bit**

**GQS** When G33 is specified, the threading start angle shift function (Q) is:
0: Disabled.
1: Enabled.

**SDP** The function to specify an S command with decimal point is:
0: Not used.
1: Used.
An S command with one decimal place can be specified. However, the S command value is rounded off to the nearest whole number.

Example:
Relationships between specified value and S code output/alarm
S200.5 -> S code output value = 201
S200.2 -> S code output value = 200
S200.12 -> P/S007 alarm is raised.

**CCK** If chamfering or corner R is enabled and if the end point specified in an arc command is not complete,
0: No alarm is raised.
1: An alarm (P/S058 alarm) is raised.
This parameter specifies whether an alarm is raised if chamfering or corner R is enabled, if the end point specified in an arc command is not complete, and if an address is omitted.
If the end point is omitted in an arc command, chamfering or corner R may affect the omitted point, and the operation may not be performed as intended by the programmer. If this parameter is specified, an alarm can be raised for that type of program execution.

**NBN** If bit 0 (NOP) of parameter No. 3404 is set to 1, a block including just N (sequence number) is:
0: Ignored.
1: Not ignored but handled as a single block.

**3453**

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CRD</td>
</tr>
</tbody>
</table>

**[Data type] Bit**

**CRD** If the functions of chamfering or corner R and direct drawing dimension programming are both enabled,
0: Chamfering or corner R is enabled.
1: Direct drawing dimension programming is enabled.
If the functions of chamfering or corner R and direct drawing dimension programming are both specified, this parameter specifies which function is used.
This parameter is displayed also on the setting screen. ("CHAMFERING/DIRECT DRAWING DIMENSION PROGRAMMING") The function to be enabled can be changed from the setting screen or parameter screen.
4.DESCRIPTION OF PARAMETERS

3454

[Data type]      Bit
    RF2  Reference position return commands G28.2 and G30.2, which
          suppress in-position checks during reference position return, are:
          0 : Invalid.
          1 : Valid.

3455

[Data type]      Bit axis
    AXDx  If a decimal point is omitted for an address with which a decimal point
          can be used, the value is determined:
          0 : In accordance with the least input increment.
          1 : In millimeters, inches, or seconds. (calculator-type decimal point
              input)

NOTE
1  This parameter is valid if bit 0 (DPI) of parameter
   No. 3401 is set to 0.
2  Because some addresses (such as R and K) are
   not related to an axis, setting this parameter for all
   axes is not equivalent to setting bit 0 (DPI) of
   parameter No. 3401 to 1.
3  This parameter cannot be used together with:
   - Macro executor
   - Basic operation package
   - Macro call argument

3460

[Data type]      Byte
    This parameter specifies the address used for the second
    miscellaneous function, as follows:

<table>
<thead>
<tr>
<th>Address</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>U</th>
<th>V</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set value</td>
<td>65</td>
<td>66</td>
<td>67</td>
<td>85</td>
<td>86</td>
<td>87</td>
</tr>
</tbody>
</table>

Address B is assumed when a value other than the above is set.
Axes names cannot be used to specify the address.
4.19  PARAMETERS OF PITCH ERROR COMPENSATION

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>3605</td>
<td>ROPx</td>
<td>BDPx</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE
When this parameter has been set, the power must be turned off before operation is continued.

[Data type] Bit
BDPx Both-direction pitch error compensation is:
0 : Not used.
1 : Used.

NOTE
The function of both-direction pitch error compensation is required.

ROPx The interval of pitch error compensation for a rotation axis (type A) is:
0 : Restricted by the following equation:
   Minimum value = maximum feedrate (rapid traverse rate)/7500.
1 : Not restricted by the following equation:
   Minimum value = maximum feedrate (rapid traverse rate)/7500.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>3620</td>
<td>Number of the pitch error compensation position for the reference position for each axis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Word axis
[Unit of data] Number
[Valid data range] 0 to 1023
Set the number of the pitch error compensation position for the reference position for each axis.

Pitch error compensation value (absolute value)

<table>
<thead>
<tr>
<th>Compensation position number</th>
<th>31</th>
<th>32</th>
<th>33</th>
<th>34</th>
<th>35</th>
<th>36</th>
<th>37</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set compensating value</td>
<td>-3</td>
<td>+1</td>
<td>+1</td>
<td>+1</td>
<td>+2</td>
<td>-1</td>
<td>-3</td>
</tr>
</tbody>
</table>
Fig.4.19 Pitch error compensation position number and value (example)

In the above example, set 33 as the number of the pitch error compensation position for the reference position.

3621 Number of the pitch error compensation position at extremely negative position for each axis

**NOTE**
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Word axis
[Unit of data] Number
[Valid data range] 0 to 1023
Set the number of the pitch error compensation position at the extremely negative position for each axis.

3622 Number of the pitch error compensation position at extremely positive position for each axis

**NOTE**
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Word axis
[Unit of data] Number
[Valid data range] 0 to 1023
Set the number of the pitch error compensation position at the extremely positive position for each axis.
This value must be larger than set value of parameter (No.3620).
3623  Magnification for pitch error compensation for each axis

**NOTE**
When this parameter is set, the power must be turned off before operation is continued.

<table>
<thead>
<tr>
<th>Data type</th>
<th>Byte axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of data</td>
<td>1</td>
</tr>
<tr>
<td>Valid data range</td>
<td>0 to 100</td>
</tr>
</tbody>
</table>

Set the magnification for pitch error compensation for each axis.
If the magnification is set to 1, the same unit as the detection unit is used for the compensation data. If 0 is set, the same magnification selected by setting 1 is selected.

3624  Interval between pitch error compensation positions for each axis

**NOTE**
When this parameter is set, the power must be turned off before operation is continued.

<table>
<thead>
<tr>
<th>Data type</th>
<th>2-word axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of data</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>deg</td>
</tr>
</tbody>
</table>

Valid data range: 0 to 99999999

The pitch error compensation positions are arranged with equal spacing. The space between two adjacent positions is set for each axis.

The minimum interval between pitch error compensation positions is limited and obtained from the following equation:

Minimum interval between pitch error compensation positions = maximum feedrate (rapid traverse rate) / 7500

Units:
- Minimum interval between pitch error compensation positions: mm, inch, deg
- Maximum feedrate: mm/min, inch/min, deg/min

Example:
When the maximum feedrate is 15000 mm/min, the minimum interval between pitch error compensation positions is 2 mm.

If setting a magnification causes the absolute value of the compensation amount at a compensation position to exceed 100, enlarge the interval between the compensation positions by using a multiple calculated as follows:

Multiple = maximum compensation amount (absolute value) / 128
(Round the remainder up to the nearest integer.)

Minimum interval between pitch error compensation positions = Value obtained from the above maximum feedrate × multiple

[Example 1]  For linear axis
- Machine stroke: -400 mm to + 800 mm
4. DESCRIPTION OF PARAMETERS

- Interval between the pitch error compensation positions: 50 mm
- No. of the compensation position of the reference position: 40

If the above is specified, the No. of the farthest compensation point in the negative direction is as follows:

\[
\text{No. of the farthest compensation position in the negative direction} = \text{No. of the compensation position of the reference position} - \left( \frac{\text{Machine stroke length in the negative direction}}{\text{Interval between the compensation points}} \right) + 1
\]

\[
= 40 - \frac{400}{50} + 1
= 33
\]

No. of the farthest compensation position in the positive direction is as follows:

\[
\text{No. of the farthest compensation position in the positive direction} = \text{No. of the compensation position of the reference position} + \left( \frac{\text{Machine stroke length in the positive direction}}{\text{Interval between the compensation positions}} \right)
\]

\[
= 40 + \frac{800}{50}
= 56
\]

The correspondence between the machine coordinate and the compensation position No. is as follows:

<table>
<thead>
<tr>
<th>Machine coordinate (mm)</th>
<th>Compensation point No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>-400</td>
<td>33</td>
</tr>
<tr>
<td>-350</td>
<td>39</td>
</tr>
<tr>
<td>-100</td>
<td>40</td>
</tr>
<tr>
<td>-50</td>
<td>41</td>
</tr>
<tr>
<td>0</td>
<td>42</td>
</tr>
<tr>
<td>50</td>
<td>43</td>
</tr>
<tr>
<td>100</td>
<td>44</td>
</tr>
<tr>
<td>750</td>
<td>45</td>
</tr>
<tr>
<td>800</td>
<td>46</td>
</tr>
</tbody>
</table>

Compensation values are output at the positions indicated by f.

Therefore, set the parameters as follows:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 3620: Compensation point number for reference position</td>
<td>40</td>
</tr>
<tr>
<td>No. 3621: Compensation point number for farthest point in the negative direction</td>
<td>33</td>
</tr>
<tr>
<td>No. 3622: Compensation point number for farthest point in the positive direction</td>
<td>56</td>
</tr>
<tr>
<td>No. 3623: Compensation magnification</td>
<td>1</td>
</tr>
<tr>
<td>No. 3624: Compensation point interval</td>
<td>50000</td>
</tr>
</tbody>
</table>

The compensation value is output at the compensation position No. corresponding to each section between the coordinates.

The following is an example of the compensation values:

<table>
<thead>
<tr>
<th>No.</th>
<th>Compensation values</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>+2</td>
</tr>
<tr>
<td>34</td>
<td>+1</td>
</tr>
<tr>
<td>35</td>
<td>+1</td>
</tr>
<tr>
<td>36</td>
<td>-2</td>
</tr>
<tr>
<td>37</td>
<td>0</td>
</tr>
<tr>
<td>38</td>
<td>-1</td>
</tr>
<tr>
<td>39</td>
<td>0</td>
</tr>
<tr>
<td>40</td>
<td>-1</td>
</tr>
<tr>
<td>41</td>
<td>+2</td>
</tr>
<tr>
<td>42</td>
<td>+1</td>
</tr>
<tr>
<td>43</td>
<td>0</td>
</tr>
<tr>
<td>44</td>
<td>-1</td>
</tr>
<tr>
<td>45</td>
<td>-2</td>
</tr>
<tr>
<td>46</td>
<td>0</td>
</tr>
<tr>
<td>47</td>
<td>+1</td>
</tr>
<tr>
<td>48</td>
<td>+2</td>
</tr>
<tr>
<td>49</td>
<td>+2</td>
</tr>
</tbody>
</table>
4. DESCRIPTION OF PARAMETERS

[Example 2] For the rotation axis

- Amount of movement per rotation: 360°
- Interval between pitch error compensation position: 45°
- No. of the compensation position of the reference position: 60

If the above is specified, the No. of the farthest compensation position in the negative direction for the rotation axis is always equal to the compensation position No. of the reference position.

The No. of the farthest compensation position in the positive direction is as follows:

No. of the compensation position of the reference position + 
(Move amount per rotation/Interval between the compensation position)
= 60 + 360/45
= 68

The correspondence between the machine coordinate and the compensation position No. is as follows:

The compensation value is output at the circled position.

If the sum of the compensation value from 61 to 68 is not zero, the pitch error per rotation accumulates, resulting in a positional shift. For compensation position 60, set the same compensation value as for 68.
Set the parameters as follows:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 3620: Compensation point number for reference position</td>
<td>60</td>
</tr>
<tr>
<td>No. 3621: Compensation point number for farthest point in the negative direction</td>
<td>60</td>
</tr>
<tr>
<td>No. 3622: Compensation point number for farthest point in the positive direction</td>
<td>68</td>
</tr>
<tr>
<td>No. 3623: Compensation magnification</td>
<td>1</td>
</tr>
<tr>
<td>No. 3624: Compensation point interval</td>
<td>45000</td>
</tr>
</tbody>
</table>

The following is an example of compensation values.

<table>
<thead>
<tr>
<th>No. of the compensation position</th>
<th>60</th>
<th>61</th>
<th>62</th>
<th>63</th>
<th>64</th>
<th>65</th>
<th>66</th>
<th>67</th>
<th>68</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compensation value</td>
<td>+1</td>
<td>-2</td>
<td>+1</td>
<td>+3</td>
<td>-1</td>
<td>-1</td>
<td>-3</td>
<td>+2</td>
<td>+1</td>
</tr>
</tbody>
</table>
### 4.DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3625</td>
<td><strong>Travel distance per revolution in pitch error compensation of rotation axis type</strong></td>
</tr>
</tbody>
</table>

**NOTE**

When this parameter has been set, the power must be turned off before operation is continued.

- **Data type:** 2-word axis
- **Valid data range:** 0 to 99999999

If the pitch error compensation of rotation axis type is performed (bit 1 (ROSx) of parameter No. 1006 is set to 0 and bit 0 (ROTx) of parameter No. 1006 is set to 1), set the travel distance per revolution. The travel distance per revolution does not have to be 360 degrees, and a cycle of pitch error compensation of rotation axis type can be set. However, the travel distance per revolution, compensation interval, and number of compensation points must satisfy the following condition:

\[(\text{Travel distance per revolution}) = (\text{Compensation interval}) \times (\text{Number of compensation points})\]

The compensation at each compensation point must be set so that the total compensation per revolution equals 0.

**NOTE**

1. If 0 is set, the travel distance per revolution becomes 360 degrees.
2. When setting a value other than 360 (and 0) degrees, set the same value as the value set in parameter No. 1260.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3626</td>
<td><strong>Number of pitch error compensation point at the farthest end in the negative direction (for movement in the negative direction)</strong></td>
</tr>
</tbody>
</table>

**NOTE**

When this parameter has been set, the power must be turned off before operation is continued.

- **Data type:** Word axis
- **Unit of data:** Number
- **Valid data range:** 0 to 1023, 3000 to 4023

When using both-direction pitch error compensation, set the number of pitch error compensation point at the farthest end in the negative direction for a movement in the negative direction.

**NOTE**

1. For a movement in the positive direction, set the compensation point number at the farthest end in the negative direction in parameter No. 3621.
2. A set of compensation data items for a single axis should not be set to lie astride 1023 and 3000.
3627

**Pitch error compensation (absolute value) at reference position when a movement to the reference position is made from the direction opposite to the direction of reference position return**

**NOTE**

When this parameter has been set, the power must be turned off before operation is continued.

[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] -32768 to 32767

Set the absolute value of pitch error compensation at reference position when a movement to the reference position is made from the negative direction if the direction of reference position return (bit 5 (ZMI) of parameter No. 1006) is positive or from the positive direction if the direction of reference position return is negative.
### 4.20 PARAMETERS OF SPINDLE CONTROL

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESP</td>
<td>ESV</td>
<td>MSE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data type</th>
<th>Bit</th>
</tr>
</thead>
</table>

NRF  The first move command (such as G00 and G01) after the serial spindle is switched to Cs axis contouring control performs:
0: Positioning after returning to the reference position.
1: Normal positioning.

**NOTE**
When using the Cs axis establishment function, this parameter is recommended to be set to 1.

MSE  Rigid tapping synchronization error data output when bit 5 (ESV) of parameter No. 3700 is set to 1 or when bit 7 (ESP) of parameter No. 3700 is set to 1 is:
0: A synchronization error in the positional deviation. (equivalent to DGN No. 456)
1: A synchronization error in the machine position. (equivalent to DGN No. 459)

**NOTE**
Set this parameter as necessary when making servo and spindle adjustments by using a servo guide and so forth. After completing adjustments, reset this parameter to 0.

ESV  When bit 7 (ESP) of parameter No. 3700 is set to 1, rigid tapping synchronization error data is:
0: Not output to the servo system.
1: Output to the servo system.

**NOTE**
Set this parameter as necessary when making servo and spindle adjustments by using a servo guide and so forth. After completing adjustments, reset this parameter to 0.

ESP  Rigid tapping synchronization error data is:
0: Not output to the spindle.
1: Output to the spindle.

**NOTE**
Set this parameter as necessary when making servo and spindle adjustments by using a servo guide and so forth. After completing adjustments, reset this parameter to 0.
NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Data type]  Bit
ISI  The serial interface for the first and second spindles are:
    0 : Used.
    1 : Not used.

NOTE
1  This parameter is valid when the spindle serial output option is provided.
2  It is used when the CNC is started with serial interface control for the first and second serial spindles disabled temporarily (for example, for CNC startup adjustment).
3  Usually, it should be set to 0.
4  If this parameter is set to 1 when using the serial spindle and analog spindle at the same time, the analog spindle is set the first axis.

SS2  In serial spindle control, the second spindle is:
    0 : Not used.
    1 : Used.

NOTE
1  This parameter is valid, when the spindle serial output option is provided and parameter ISI(bit 1 of parameter No.3701)is 0.
2  (a) Confirmation of connection of the second serial spindle amplifier, and communication with it
    (b) Control of the second spindle during asynchronous control (SIND2)
When this parameter is set, it is also necessary to set the serial spindle parameter for the second spindle.
### Parameter Description

**Parameter 3702**

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR2</td>
<td>OR1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**
When this parameter is set, the power must be turned off before operation is continued.

**[Data type]** Bit

**OR1** Whether the stop-position external-setting type orientation function is used by the first spindle motor
- 0: Not used
- 1: Used

**OR2** Whether the stop-position external-setting type orientation function is used by the second spindle motor
- 0: Not used
- 1: Used

**Parameter 3703**

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**
When this parameter is set, the power must be turned off before operation is continued.

**[Data type]** Bit

**MPP** Under multi-spindle control, the spindle is not selected by a spindle signal (SWS1 to SWS3 <G027 bits 0 to 2>), and a programmed command (address P) is:
- 0: Not used.
- 1: Used.

**NOTE**
If this parameter is set to 1, set parameters No. 3781 to No. 3783 as well.
4.DESCRIPTION OF PARAMETERS

**NOTE**
When this parameter has been set, the power must be turned off before operation is continued.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSS</td>
<td>SSS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

**SSS** Synchronous spindle control by each spindle is:

0: Not performed.
1: Performed.

The master axis and slave axis of synchronous spindle control can be selected from the first to second spindles.

The target spindle of synchronous spindle control is specified in parameters No. 4831 to 4832.

In addition, the following signals affect the control.

- Synchronous spindle signal of each spindle
  - SPSYC1 to SPSYC2 <G288 bits 0 to 1>
- Signal of synchronous control of the spindle phase for each spindle
  - SPPHS1 to SPPHS2 <G289 bits 0 to 1>

**CSS** On the second spindle, Cs contour control is:

0: Not performed.
1: Performed.

If Cs contour control is performed on each spindle as specified by this parameter, set parameter No. 1023 as indicated below.

**Setting**

-1 = Axis of Cs contour control by the first spindle
-2 = Axis of Cs contour control by the second spindle

**NOTE**

1. A single spindle cannot be specified as multiple axes of Cs contour control.
2. This parameter cannot be used with the spindle positioning function. When using the spindle positioning function, set bit 7 (CSS) of parameter No. 3704 to 0.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SFA</td>
<td>NSF</td>
<td>SGT</td>
<td>SGB</td>
</tr>
<tr>
<td>EVS</td>
<td></td>
<td></td>
<td></td>
<td>GST</td>
<td>ESF</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

**ESF** When the spindle control function (Spindle analog output or Spindle serial output) is used, and the constant surface speed control function is used or bit 4 (GTT) of parameter No. 3705 is set to 1:

0: S codes and SF are output for all S commands.
1: S codes and SF are not output for an S command in constant surface speed control mode (G96 mode) or for an S command used to specify maximum spindle speed clamping (G50S---;
NOTE
For the T series, this parameter is enabled when bit 4 (EVS) of parameter No.3705 is set to 1.
For the M series, SF is not output:
(1) For an S command used to specify maximum spindle speed clamping (G92S---;) in constant surface speed control mode
(2) When bit 5 (NSF) of parameter No.3705 is set to 1

GST
The SOR signal is used for:
0 : Spindle orientation
1 : Gear shift

NOTE
If the function of constant surface speed control or bit 4 (GTT) of parameter No. 3706 is specified, this parameter is invalid.

SGB
Gear switching method
0 : Method A (Parameters 3741 to 3743 for the maximum spindle speed at each gear are used for gear selection.)
1 : Method B (Parameters 3751 and 3752 for the spindle speed at the gear switching point are used for gear selection.)

SGT
Gear switching method during tapping cycle (G84 and G74)
0 : Method A (Same as the normal gear switching method)
1 : Method B (Gears are switched during tapping cycle according to the spindle speed set in parameters 3761 and 3762).

EVS
When the spindle control function (Spindle analog output or Spindle serial output) is used, S codes and SF are:
0 : Not output for an S command.
1 : Output for an S command.

NOTE
The output of S codes and SF for an S command in constant surface speed control mode (G96), or for an S command used to specify maximum spindle speed clamping (G50S---;) depends on the setting of bit 0 (ESF) of parameter No.3705.

NSF
If the function of constant surface speed control is specified or if bit 4 (GTT) of parameter No. 3706 is set to 1 and when an S code is specified,
0 : SF is output.
1 : SF is not output.

SFA
The SF signal is output:
0 : When gears are switched.
1 : Irrespective of whether gears are switched.
4. DESCRIPTION OF PARAMETERS

#7 #6 #5 #4 #3 #2 #1 #0
TCW CWM ORM PG2 PG1

TCW CWM ORM GTT PG2 PG1

[Data type] Bit

PG2 and PG1 Gear ratio of spindle to position coder

<table>
<thead>
<tr>
<th>Magnification</th>
<th>PG2</th>
<th>PG1</th>
</tr>
</thead>
<tbody>
<tr>
<td>×1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>×2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>×4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>×8</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Magnification = Number of spindle revolutions
Number of position coder revolutions

GTT Selection of a spindle gear selection method
0: Type M.
1: Type T.

NOTE
1 The gear selection method differs as described below. For details, refer to the description of spindle control in the connection manual (function part).
Type M:
The CNC determines a proper gear from the parameter setting and S command value, and requests the PMC to specify the gear and its switching.
In addition, spindle control is exercised according to a gear selected by the CNC.
Type T:
The CNC exercises spindle control according to a gear selected by the PMC.
2 When the constant surface speed control option is selected, type T is selected, regardless of whether this parameter is specified.
3 When type T spindle gear switching is selected, the following parameters have no effect:
No.3705#2 SGB, No.3751, No.3752, No.3705#3 SGT,
No.3761, No.3762, No.3705#6 SFA, No.3735,
No.3736
On the other hand, parameter No. 3744 becomes usable for ordinary spindle control.

ORM Voltage polarity during spindle orientation
0: Positive
1: Negative

TCW, CWM Voltage polarity when the spindle speed voltage is output

<table>
<thead>
<tr>
<th>TCW</th>
<th>CWM</th>
<th>Voltage polarity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>Both M03 and M04 positive</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>Both M03 and M04 negative</td>
</tr>
</tbody>
</table>
4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 M03 positive, M04 negative</td>
<td>[Data type] Bit</td>
</tr>
<tr>
<td>11 M03 negative, M04 positive</td>
<td>Gear ratio of spindle to second position coder</td>
</tr>
</tbody>
</table>

P22 and P21: Gear ratio of spindle to second position coder

<table>
<thead>
<tr>
<th>Magnification</th>
<th>P22</th>
<th>P21</th>
</tr>
</thead>
<tbody>
<tr>
<td>×1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>×2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>×4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>×8</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

NOTE
This parameter is valid when the multi-spindle control option is selected.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3707</td>
<td>[Data type] Bit</td>
</tr>
<tr>
<td>TSO SOC SVD SAT SAR</td>
<td>Number of spindle revolutions</td>
</tr>
</tbody>
</table>

SAR: The spindle speed arrival signal is:
0: Not checked
1: Checked

SAT: Check of the spindle speed arrival signal at the start of executing the thread cutting block
0: The signal is checked only when SAR, #0 of parameter 3708, is set.
1: The signal is always checked irrespective of whether SAR is set.

NOTE
When thread cutting blocks are consecutive, the spindle speed arrival signal is not checked for the second and subsequent thread cutting blocks.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3708</td>
<td>[Data type] Bit</td>
</tr>
<tr>
<td>TSO SOC SVD SAT SAR</td>
<td>Number of position coder revolutions</td>
</tr>
</tbody>
</table>

SVD: When the SIND signal is on, the detection of spindle speed fluctuation is:
0: Disabled
1: Enabled

SOC: During constant surface speed control (G96 mode), the speed clamp by the maximum spindle speed clamp command (M series: G92 S_; T series: G50 S_;) is carried out:
0: Before spindle speed override.
1: After spindle speed override.

If this parameter is set to 0, the spindle speed may exceed the maximum spindle speed (numeric value following S in G92 S_; (M series) or G50 S_; (T series)).
If this parameter is set to 1, the spindle speed is limited to the maximum spindle speed.
4. DESCRIPTION OF PARAMETERS

The spindle speed is limited to the upper limit of spindle speed specified in parameter No. 3772, irrespective of the setting of this parameter.

TSO During a threading or tapping cycle, the spindle override is:
0: Disabled (tied to 100%).
1: Enabled.

NOTE
During rigid tapping, the override is tied to 100%, irrespective of the setting of this parameter.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>THB</td>
<td>MRS</td>
<td>MSI</td>
<td>RSC</td>
<td>SAM</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SMC   RSC

[Data type] Bit

SAM The sampling frequency to obtain the average spindle speed
0: 4 (Normally, set to 0.)
1: 1

RSC In the constant surface speed control mode, the surface speed of a rapid traverse block is calculated:
0: In accordance with the coordinates of the end point.
1: In accordance with the current value, as in cutting feed.

MSI In multi-spindle control, the SIND signal is valid
0: Only when the first spindle is valid (SIND signal for the 2nd, 3rd spindle becomes ineffective)
1: For each spindle irrespective of whether the spindle is selected (Each spindle has its own SIND signal).

MRS When the S 12-bit code signals and actual spindle speed signals are output in multi-spindle control:
0: Signals common to the first through second spindles are used.
   In this case, information about a spindle selected by the spindle selection signal (SWS1-SWS2<G027#0-#1>) is output.
1: Information about each of the first through third spindles is output on individual signals.

<table>
<thead>
<tr>
<th>Signal</th>
<th>When MRS is set to 0</th>
<th>When MRS is set to 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>S 12-bit code signals R010-R12O&lt;F036,F037&gt; Actual spindle speed signals AR0-AR15&lt;F040,F041&gt;</td>
<td>First spindle (SWS1 = 1) Second spindle (SWS1 = 0, SWS2 = 1)</td>
<td>First spindle</td>
</tr>
<tr>
<td>S 12-bit code signals 2 R01O3-R12O2&lt;F200,F201&gt; Actual spindle speed signals 2 AR200-AR215&lt;F202,F203&gt;</td>
<td>-</td>
<td>Second spindle</td>
</tr>
</tbody>
</table>

NOTE
To use this parameter, the multi-spindle control option and spindle serial output are required.

SMC The function to check a large S command is:
0 : Not used.
1 : Used.

If a spindle gear of M type is selected, this function compares the specified S value and the settings of parameters No. 3741 to No. 3743 and raises an alarm if the S value is greater.

If this function is used, specifying an S value larger than the settings of parameters No. 3741 to No. 3743 causes P/S alarm 5310 to be raised.

NOTE
This function cannot be used together with any of bit 4 (GTT) of parameter No. 3706, constant surface speed control, or multi-spindle control.

THB The threading start type is:
0 : Type A.
1 : Type B.

NOTE
When using PMC axis control, set this parameter to 1.

<table>
<thead>
<tr>
<th>3710</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SGR</td>
</tr>
</tbody>
</table>

[Data type] Bit
SGR When method B is selected as the spindle gear switching method for a tapping cycle (G84 or G74) (bit 3 (SGT) of parameter No. 3705 = 1), gear switching method B is used for:
0 : Both tapping and rigid tapping.
1 : Rigid tapping only.

CSL In Cs contour control mode, fine acceleration/deceleration is disabled for:
0 : An axis selected by the signal (CDFn <G0127>) issued from the PMC. (n = 1 to 4)
1 : An axis for which interpolation is performed with the Cs contour controlled axis (parameter No. 39n0). (n = 0 to 2)

<table>
<thead>
<tr>
<th>3712</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

[Data type] Bit
CSF The Cs axis coordinate setup function is:
0 : Disabled.
1 : Enabled.

NOTE
When setting this parameter to 1, also set bit 5 of parameter No. 4353 to 1.
4.DESCRIPTION OF PARAMETERS

When this parameter has been set, the power must be turned off before operation is continued.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE

In multi-spindle control, when address P is used for spindle selection (bit 3 of parameter No. 3703 = 1), and an axis move command and S command are specified in the same block:

0: The S command becomes valid after an axis movement is completed.

1: The S command becomes valid at the same time when an axis movement is made.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSAx</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This parameter specifies an axis for which confirmation of the spindle speed reached signal (SAR) is unnecessary when a move command is executed for the axis. When a move command is issued only for an axis for which 1 is set in this parameter, the spindle speed reached signal (SAR) is not checked.

0: Confirmation of SAR is necessary.

1: Confirmation of SAR is unnecessary.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data used for adjusting the gain of the analog output of spindle speed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Word

0.1 %

700 to 1250

Set data used for adjusting the gain of the analog output of spindle speed.

(1) Assign standard value 1000 to the parameter.

(2) Specify the spindle speed so that the analog output of the spindle speed is the maximum voltage (10 V).

(3) Measure the output voltage.

(4) Assign the value obtained by the following equation to parameter No.3730.

\[
\text{Set value} = \frac{10 \text{ (V)}}{\text{Measured data (V)}} \times 1000
\]

(5) After setting the parameter, specify the spindle speed so that the analog output of the spindle speed is the maximum voltage. Confirm that the output voltage is 10V.
3731 Compensation value for the offset voltage of the analog output of the spindle speed

[Data type] Word
[Unit of data] Velo
[Valid data range] -1024 to +1024

Set compensation value for the offset voltage of the analog output of the spindle speed.

\[
\text{Set value} = \frac{-8191 \times \text{Offset voltage (V)}}{12.5}
\]

[Adjustment method]

1. Assign standard value 0 to the parameter.
2. Specify the spindle speed so that the analog output of the spindle speed is 0.
3. Measure the output voltage.
4. Assign the value obtained by the following equation to parameter No.3731.

\[
\text{Set value} = \frac{-8191 \times \text{Offset voltage (V)}}{12.5}
\]

5. After setting the parameter, specify the spindle speed so that the analog output of the spindle speed is 0. Confirm that the output voltage is 0V.

NOTE
This parameter usually need not to be set for serial spindles (Set to 0).
3732

**The spindle speed during spindle orientation or the spindle motor speed during spindle gear shift**

**[Data type]** Word  
**[Valid data range]** 0 to 20000  
Set the spindle speed during spindle orientation or the spindle motor speed during gear shift.  
When GST, #1 of parameter 3705, is set to 0, set the spindle speed during spindle orientation in rpm.  
When GST, #1 of parameter 3705, is set to 1, set the spindle motor speed during spindle gear shift calculated from the following formula.

- **For a serial spindle**
  
  \[
  \text{Set value} = \frac{\text{Spindle motor speed during spindle gear shift}}{\text{Maximum spindle motor speed}} \times 16383
  \]

- **For an analog spindle**
  
  \[
  \text{Set value} = \frac{\text{Spindle motor speed during spindle gear shift}}{\text{Maximum spindle motor speed}} \times 4095
  \]

3735

**Minimum clamp speed of the spindle motor**

**[Data type]** Word  
**[Valid data range]** 0 to 4095  
Set the minimum clamp speed of the spindle motor.

\[
\text{Set value} = \frac{\text{Minimum clamp speed of the spindle motor}}{\text{Maximum spindle motor speed}} \times 4095
\]

**NOTE**

If the function of constant surface speed control or bit 4 (GTT) of parameter No. 3706 is specified, this parameter is invalid.
### 3736

**Maximum clamp speed of the spindle motor**

- **Data type:** Word
- **Valid data range:** 0 to 4095

Set the maximum clamp speed of the spindle motor.

Set value = \[
\frac{\text{Maximum clamp speed of the spindle motor}}{\text{Maximum spindle motor speed}} \times 4095
\]

**NOTE**

If the function of constant surface speed control or bit 4 (GTT) of parameter No. 3706 is specified, this parameter is invalid. In this case, the maximum clamp speed of spindle motor cannot be specified. However, the maximum spindle speed can be specified by the following parameters:

- Parameter No.3772 (for the first axis)
- Parameter No.3802 (for the second axis)
- Parameter No.3882 (for the third axis)

---

### 3740

**Time elapsed prior to checking the spindle speed arrival signal**

- **Data type:** Byte
- **Unit of data:** msec
- **Valid data range:** 0 to 225

Set the time elapsed from the execution of the S function up to the checking of the spindle speed arrival signal.
### Description of Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3741</td>
<td>Maximum spindle speed for gear 1</td>
</tr>
<tr>
<td>3742</td>
<td>Maximum spindle speed for gear 2</td>
</tr>
<tr>
<td>3743</td>
<td>Maximum spindle speed for gear 3</td>
</tr>
<tr>
<td>3744</td>
<td>Maximum spindle speed for gear 4</td>
</tr>
</tbody>
</table>

**Note**

- **Data type:** Two-word
- **Unit of data:** min⁻¹
- **Valid data range:** 0 to 32767

Set the maximum spindle speed corresponding to each gear.

#### Diagram

![Diagram showing spindle motor speed and gear max speed](image)

**Fig. 4.20 (b) Maximum Spindle Speed Corresponding to Gear 1/2/3**

**NOTE**

If a type-T gear shift scheme is selected for the M series (with the constant surface speed control option installed or parameter GTT (bit 4 of parameter No. 3706) = 1), parameter No. 3744 is usable also in the M series. Note, however, that, even in this case, only up to three main gear stages are usable for rigid tapping.
3751

Spindle motor speed when switching from gear 1 to gear 2

3752

Spindle motor speed when switching from gear 2 to gear 3

[Data type] Word
[Valid data range] 0 to 4095

For gear switching method B, set the spindle motor speed when the gears are switched.

Set value = \[
\frac{\text{Spindle motor speed when the gears are switched}}{\text{Maximum spindle motor speed}} \times 4095
\]

Fig.4.20 (c) Spindle Motor Speed at Gear 1-2/2-3 Change Point
3761

| Spindle speed when switching from gear 1 to gear 2 during tapping |

3762

| Spindle speed when switching from gear 2 to gear 3 during tapping |

[Data type] 2-word
[Unit of data] min\(^{-1}\)
[Valid data range] 0 to 32767

When method B is selected (SGT,#3 of parameter 3705, is set to 1) for the tapping cycle gear switching method, set the spindle speed when the gears are switched.

![Spindle Motor Speed Diagram](attachment:image.png)

**Fig.4.20 (d) Spindle Motor Speed at Gear 1-2/2-3 Change Point during Tapping**
### 4. DESCRIPTION OF PARAMETERS

#### 3770  
**Axis as the calculation reference in constant surface speed control**

- **Data type**: Byte
- **Valid data range**: 0, 1, ..., number of control axes

Set the axis as the calculation reference in constant surface speed control.

**NOTE**

When 0 is set, constant surface speed control is always applied to the X-axis. In this case, specifying P in a G96 block has no effect on the constant surface speed control.

#### 3771

**Minimum spindle speed in constant surface speed control mode (G96)**

- **Data type**: 2-word
- **Unit of data**: min⁻¹
- **Valid data range**: 0 to 32767

Set the minimum spindle speed in the constant surface speed control mode (G96). The spindle speed in constant surface speed control is clamped to the speed given by parameter 3771.
This parameter sets the maximum spindle speed. When a command specifying a speed exceeding the maximum speed of the spindle is specified, or the speed of the spindle exceeds the maximum speed because of the spindle speed override function, the spindle speed is clamped at the maximum speed set in the parameter.

**NOTE**

1. For M series, this parameter is valid if the function of constant surface speed control is provided or parameter GTT (bit 4 of No. 3706) is set to 1.
2. When the constant surface speed control is selected, the spindle speed is clamped at the maximum speed, regardless of whether the G96 mode or G97 mode is specified.
3. When 0 is set in this parameter, the speed of the spindle is not clamped.
4. When spindle speed command control is applied using the PMC, this parameter has no effect, and the spindle speed is not clamped.
5. When the multi-spindle control is selected (T series), set the maximum speed for each spindle in the following parameters:
   - Parameter No.3772: Sets the maximum speed for the first spindle.
   - Parameter No.3802: Sets the maximum speed for the second spindle.
   - Parameter No.3822: Sets the maximum speed for the third spindle.
### 4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>P code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>3781</td>
<td>P code for selecting the first spindle in multi-spindle control</td>
</tr>
<tr>
<td>3782</td>
<td>P code for selecting the second spindle in multi-spindle control</td>
</tr>
<tr>
<td>3783</td>
<td>P code for selecting the third spindle in multi-spindle control</td>
</tr>
</tbody>
</table>

**NOTE**

When this parameter has been set, the power must be turned off before operation is continued.

- **[Data type]** Word
- **[Valid data range]** 0, 1 to 32767

If bit 3 (MPP) of parameter No. 3703 is set to 1, set the P code to select each spindle under multi-spindle control. Specify the P code in a block containing the S command.

Example)

If the P code value for selecting the second spindle is set to 3,
S1000 P3;
causes the second spindle to rotate at S1000.

**NOTE**

1. This parameter is valid if bit 3 (MPP) of parameter No. 3703 is set to 1.
2. If this parameter is set to 0, the corresponding spindle cannot be selected by a P code.
3. Identical P code values cannot be used for different spindles.
4. If this parameter is used (bit 3 (MPP) of parameter No. 3703 is set to 1), signals SWS1 to SWS3 <G027 bits 0 to 2> become invalid.
5. To use this parameter, the multi-spindle control function is needed.
3802  Maximum speed of the second spindle

- 2-word
- Unit of data: min⁻¹
- Valid data range: 0 to 32767

Parameter sets the maximum speed for the second spindle. When a command specifying a speed exceeding the maximum speed of the spindle is specified, or the speed of the spindle exceeds the maximum speed because of the spindle speed override function, the spindle speed is clamped at the maximum speed set in the parameter.

NOTE
1. This parameter is valid when the multi-spindle control is selected.
2. When the constant surface speed control is selected, the spindle speed is clamped to a maximum speed, regardless of whether the G96 mode or G87 mode is set.
3. When this parameter is set to 0, parameter No. 3772 (maximum speed of the first spindle) is valid. The spindle speed is not clamped when parameter No. 3772 is set to 0.
4. When spindle speed command control is applied using the PMC, this parameter has no effect, and the spindle speed is not clamped.

3811  Maximum spindle speed for gear 1 of the second spindle

3812  Maximum spindle speed for gear 2 of the second spindle

- 2-word
- Unit of data: min⁻¹
- Valid data range: 0 to 32767

Set the maximum spindle speed for each gear of the second spindle.

NOTE
These parameters are used for the multi-spindle control.
3820  Data for adjusting the gain of the analog output of the third-spindle speed

[Data type]  Word
[Unit of data]  0.1%
[Valid data range]  700 to 1250
Set the data used for adjusting the gain of the analog output
of the third spindle speed.

NOTE
This parameter is used for controlling the
multi-spindles.

3821  Offset-voltage compensation value of the analog output of the third-spindle speed

[Data type]  Word
[Unit of data]  Velo
[Valid data range]  -1024 to 1024
Set the offset-voltage compensation value of the analog output of the
third-spindle speed.
(See the description of parameter No. 3731.)

NOTE
This parameter is used for controlling the
multi-spindles.

3822  Maximum speed of the third spindle

[Data type]  Word
[Unit of data]  min\(^{-1}\)
[Valid data range]  0 to 32767
This parameter sets the maximum speed for the third spindle.
When a command specifying a speed exceeding the maximum spindle speed is specified, or the spindle speed exceeds the maximum speed because of the spindle speed override function, the spindle speed is clamped at the maximum speed set in the parameter.
4. DESCRIPTION OF PARAMETERS

NOTE
1. This parameter is valid when the multi-spindle control is selected.
2. When the constant surface speed control option is selected, the spindle speed is clamped to a maximum speed, regardless of whether the G96 mode or G97 mode is set.
3. When this parameter is set to 0, parameter No. 3772 (maximum speed of the first spindle) is valid. The spindle speed is not clamped when parameter No. 3772 is set to 0.
4. When spindle speed command control is applied using the PMC, this parameter has no effect, and the speed of the spindle is not clamped.

<table>
<thead>
<tr>
<th>No.</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3831</td>
<td>Word</td>
<td>Maximum spindle speed for gear 1 of the third spindle</td>
</tr>
<tr>
<td>3832</td>
<td>Word</td>
<td>Maximum spindle speed for gear 2 of the third spindle</td>
</tr>
</tbody>
</table>

[Data type] Word
[Unit of data] min⁻¹
[Valid data range] 0 to 32767
Set the maximum spindle speed for each gear of the third spindle.

NOTE
These parameters are used for the multi-spindle control.

List of parameters for control of serial interface spindle Cs contouring control axis

<table>
<thead>
<tr>
<th>No.</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3900</td>
<td>Byte</td>
<td>First group Number of the servo axis whose loop gain is to be changed according to the set values of parameters 3901 to 3904 when the Cs contouring axis is controlled (set values 0 to 8)</td>
</tr>
<tr>
<td>3901</td>
<td>Word</td>
<td>Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 1 selection</td>
</tr>
<tr>
<td>3902</td>
<td>Word</td>
<td>Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 2 selection</td>
</tr>
<tr>
<td>3903</td>
<td>Word</td>
<td>Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 3 selection</td>
</tr>
<tr>
<td>3904</td>
<td>Word</td>
<td>Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 4 selection</td>
</tr>
<tr>
<td>3910</td>
<td>Byte</td>
<td>Second group Number of the servo axis whose loop gain is to be changed according to the set values of parameters 3911 to 3914 when the Cs contouring axis is controlled (set values 0 to 8)</td>
</tr>
<tr>
<td>3911</td>
<td>Word</td>
<td>Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 1 selection</td>
</tr>
<tr>
<td>3912</td>
<td>Word</td>
<td>Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 2 selection</td>
</tr>
<tr>
<td>3913</td>
<td>Word</td>
<td>Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 3 selection</td>
</tr>
<tr>
<td>3914</td>
<td>Word</td>
<td>Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 4 selection</td>
</tr>
</tbody>
</table>
List of parameters for control of serial interface spindle Cs contouring control axis

<table>
<thead>
<tr>
<th>No.</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3920</td>
<td>Byte</td>
<td>Third group Number of the servo axis whose loop gain is to be changed according to the set values of parameters 3921 to 3924 when the Cs contouring axis is controlled (set values 0 to 8)</td>
</tr>
<tr>
<td>3921</td>
<td>Word</td>
<td>Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 1 selection</td>
</tr>
<tr>
<td>3922</td>
<td>Word</td>
<td>Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 2 selection</td>
</tr>
<tr>
<td>3923</td>
<td>Word</td>
<td>Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 3 selection</td>
</tr>
<tr>
<td>3924</td>
<td>Word</td>
<td>Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 4 selection</td>
</tr>
</tbody>
</table>

<Setting method>
First, select servo axes which perform interpolation with the Cs contouring axis. (Up to three axes can be selected.)

When there is no servo axis for interpolation with the Cs contouring axis, set the parameters 3900, 3910, and 3920 to 0 to terminate parameter setting.

When there are servo axes for interpolation with the Cs contouring axis, the parameters must be set according to the procedure below for each axis.

1. Set the number of a servo axis (1 to 4) for interpolation with the Cs contouring axis in parameters 39n0 (n = 0, 1, and 2).
2. Set loop gain values of the servo axis specified in (1) above which is used when the Cs contouring axis is controlled in parameters 39n1, 39n2, 39n3, and 39n4. (There are four stages for main gears used.)
3. When the number of specified servo axes is less than 3, set the remaining parameters (39n0) to 0 to terminate parameter setting.

When the number of a Cs contouring axis is set to parameter 39n0, the parameter is assumed to be set to 0.

**NOTE**

1. In general, it is difficult to set a high loop gain for a spindle motor axis when compared with a servo axis. These parameters are provided so that, by changing the loop gain of a servo axis that requires interpolation with the Cs contour axis, interpolation control can be exercised correctly between the Cs axis and servo axis while the spindle exercises Cs contour control.
2. The loop gain of the servo axis is changed using the parameter settings made for a spindle gear selected at the time of conversion from the spindle mode to the Cs contour control mode.
   In normal use, it is unlikely that the gear of the spindle is switched during Cs contour control. However, note that if the gear of the spindle is changed during Cs contour control, the loop gain of the servo axis is not changed.
3. Even when multiple Cs axes are used (bit 7 (CSS) of parameter No. 3704 = 1), these parameters are shared.
Parameters for Serial interface spindle or spindle

Parameters Nos. 4000 to 4539 below are basically used with the serial spindle amplifier (SPM). For details of these parameters, refer to either of the following manuals and other related documents, depending on the spindle that is actually connected.

- FANUC AC SPINDLE MOTOR αi series Parameter Manual (B-65280EN)
- FANUC AC SPINDLE MOTOR α series Parameter Manual (B-65160E)

### Parameters for Serial Interface Spindle or Spindle

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
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<tr>
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</table>

4015 (No user setting allowed = Note 1)

<table>
<thead>
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<tbody>
<tr>
<td>4019</td>
<td>(Note 2)</td>
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</table>

**[Data type]** Bit axis (spindle)

<table>
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<tr>
<td>4020</td>
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4133

**[Data type]** Word axis (spindle)

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<tr>
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4135

**[Data type]** 2-word axis (spindle)

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<tr>
<td>4136</td>
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4175

**[Data type]** Word axis (spindle)

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4191 (No user setting allowed = Note 1)

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<tbody>
<tr>
<td>4195</td>
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</table>

**[Data type]** Bit axis (spindle)
4. DESCRIPTION OF PARAMETERS

- 210 -
## 4. Description of Parameters

### Bit axis (spindle)

<table>
<thead>
<tr>
<th>#7</th>
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### Word axis (spindle)

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</tbody>
</table>

### Notes on parameters of the spindle amplifier with the serial interface

- Data type
- Bit axis (spindle)
- Word axis (spindle)
NOTE
1 Among the parameters of the spindle amplifier with the serial interface, parameters Nos. 4015 and 4191 cannot be changed by the users. These parameters require to assign optional software to the CNC and are automatically set depending on the type of the software.
2 To set the parameters of the spindle amplifier with the serial interface automatically, set #7 of parameter No.4019 (if the sub spindle is set in the CNC with the spindle switching function, use parameter No.4195) to 1, assign the model code of the motor to be used to parameter No.4133 (if the sub spindle is set in the CNC with the spindle switching function, use parameter No.4309), turn off the power of the CNC and spindle amplifier, and restart the CNC and spindle amplifier.
3 Parameters No.4000 to No.4539 are used in the processing on the spindle amplifier. For details of these parameters, refer to either of the following manuals, depending on the serial spindle that is actually used.
   - FANUC AC SPINDLE MOTOR αi series Parameter Manual B-65280EN)
   - FANUC AC SPINDLE MOTOR α series Parameter Manual B-65160E)
4 The CNC can control up to two spindle amplifiers with the serial interface. When the spindle amplifier provides the spindle switching function, one spindle amplifier can control two spindle motors using the switching function. The output switching function can be used in spindle motors to be connected. Up to four spindles, or eight types, can be used by switching the spindle motors. (The number of spindles that can controlled simultaneously is the same as the number of spindle amplifiers, that is two spindles.) Parameters of the spindle amplifier with the serial interface correspond to the above functions as follows:
   (1) Parameter No.4000 to No.4539 "S1": First spindle amplifier
       Parameter No.4000 to No.4539 "S2": Second spindle amplifier
   (2) Parameter No.4000 to No.4175 "S1"/"S2": When the spindle switching function is not provided, or for the main spindle in the spindle amplifier when the function is provided.
       Parameter No.4176 to No.4351 "S1"/"S2": For the sub spindle in the spindle amplifier when the spindle switching function is provided.
   (3) Parameters at low speed when the output switching function is provided. Parameters No.4136 to No.4175 "S1"/"S2": When the spindle switching function is not provided, or for the main spindle when the function is provided. Parameters No.4284 to No.4351 "S1"/"S2": For the sub spindle when the spindle switching function is provided.
5 The CNC stores the parameters of the spindle amplifier with the serial interface. The CNC sends them to the spindle amplifier at the system power on and they are used in the unit.

These parameters are sent from the CNC to the spindle amplifier in a batch when:
- The CNC is switched on.
- The serial spindle is restarted by a reset that is carried out after spindle communication alarm 749 occurs (because the spindle control unit is switched off or because of noise).

If these parameters are rewritten, they are sent from the CNC to the spindle amplifier sequentially when:
- The parameters have been entered from the MDI.
- The parameters have been entered as programmable (G10).
- The parameters have been entered via the reader/punch interface.

If bit 4 (WSP) of parameter No. 8703 is set to 0, the CNC does not immediately perform data transfer to the spindle amplifier even when data has been written to a parameter by using the PMC window function. So, the new parameter value set by rewriting does not become valid automatically. To perform data transfer immediately, set bit 4 (WSP) of parameter No. 8703 to 1.

If you want to change such parameter settings during automatic operation, use programmable parameter input (G10).

To set parameters automatically, upload parameters corresponding to the motor model from the spindle amplifier to the CNC prior to the procedure specified above. The parameters of the spindle amplifier with serial interface can be changed after the system starts. Changing the parameters (No.4000 to No.4539 "S1", "S2") in the CNC sends them to the spindle amplifier at an appropriate time and the parameters in the unit are updated. Be careful not to change parameters incorrectly.
### 4.DESCRIPTION OF PARAMETERS

#### 4800

<table>
<thead>
<tr>
<th>#7</th>
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<td>ND2</td>
<td>ND1</td>
<td></td>
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</tbody>
</table>

#### NOTE
When this parameter is set, the power must be turned off before operation is continued.

- **ND1**
  - In controlling the spindle synchronization, the direction of the first spindle motor rotation is:
    - 0: The direction indicated by the command sign
    - 1: The opposite direction to that indicated by the command sign

- **ND2**
  - In controlling the spindle synchronization, the direction of the 2nd spindle motor rotation is:
    - 0: The direction indicated by the command sign
    - 1: The opposite direction to that indicated by the command sign

- **SYM**
  - As the maximum spindle speed in spindle synchronization control:
    - 0: The maximum spindle speed of the master spindle is used.
    - 1: The maximum spindle speed of the master spindle or slave spindle, whichever lower, is used.

#### 4810
**Error pulse between two spindles when synchronizing phases in the serial spindle synchronization control mode**

- **Data type**: Byte
- **Unit of data**: Pulse
- **Valid data range**: 0 to 255

Set the difference in error pulses between two spindles when synchronizing phases in the serial spindle synchronization control mode. When the difference in error pulse between two spindles is within the value set in this parameter, the spindle phase synchronization completion signal FSPPH becomes "1". This parameter is used to check the difference in phase in synchronization control and to confirm the completion of synchronization in the serial spindle synchronization control mode. For spindle synchronization, serial spindle parameters such as parameter No. 4032 must be set.

#### 4811
**Allowable error count for the error pulses between two spindles in the serial spindle synchronization control mode or simple synchronous control mode**

- **Data type**: Word
- **Unit of data**: Pulse
- **Valid data range**: 0 to 32767

Set the allowable error count for the error pulses between two spindles in the serial spindle synchronization control mode or simple synchronous control mode.
NOTE
This parameter is used to output the inter-spindle phase error detection signal SYCAL in the serial spindle synchronization control mode. The SYCAL <F044#4> signal becomes "1" when a phase error exceeding the value set in this parameter is found.

| 4812 | Master spindle under synchronous spindle control |
| 4813 | Slave spindle under synchronous spindle control |

[Data type] Byte
[Valid data range] 0, 1, 2
Set the master spindle and slave spindle in spindle synchronization control.
Setting value : 1 to 2, First to second spindles

NOTE
These parameters are valid only in spindle synchronization control specified by programming. If 0 is set, turning on spindle synchronization control by programming (G51.8) results in an alarm.

| 4831 | Master axis of first spindle under synchronous spindle control |
| 4832 | Master axis of second spindle under synchronous spindle control |

NOTE
When these parameters have been set, the power must be turned off before operation is continued.

[Data type] Byte
[Valid data range] 1 to Number of spindles
Set the slave axis and master axis of synchronous spindle control by spindles. Set the axis number of the master axis for the axis to be handled as the slave axis.

NOTE
This parameter is valid if bit 4 (SSS) of parameter No. 3704 is set to 1.
When the spindle speed fluctuation detection function is used, the rates of allowance (q) and fluctuation (r) those are set in parameter No.4911 and No.4912, respectively are set in steps of:

0 : 1%
1 : 0.1%

Set the ratio (q) of the spindle speed which is assumed to be the specified spindle speed in the spindle speed fluctuation detection function.

Let the commanded speed be Sc. When the actual spindle speed reaches between (Sc-Sq) and (Sc + Sq), it is assumed to be the commanded speed.

The spindle speed fluctuation detection starts.

where,

$$Sq = Sc \times \frac{q}{100}$$

Set the spindle speed fluctuation ratio (r) for which no alarm is activated in the spindle speed fluctuation detection function.

Set the spindle speed fluctuation ratio (r) for which no alarm is activated in the spindle speed fluctuation detection function (see Fig.4.20 (e)).
4.DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spindle speed fluctuation value (d) for which no alarm is activated in the spindle speed fluctuation detection function</th>
</tr>
</thead>
<tbody>
<tr>
<td>4913</td>
<td>Word</td>
</tr>
<tr>
<td></td>
<td><strong>Unit of data</strong>: min(^{-1})</td>
</tr>
<tr>
<td></td>
<td><strong>Valid data range</strong>: 0 to 32767</td>
</tr>
</tbody>
</table>

Set the allowable fluctuation speed (Sd) for which no alarm is activated in the spindle speed fluctuation detection function.

The function for detecting spindle speed fluctuation checks whether the actual speed varies for the specified speed or not. Sd or Sr, whichever is greater, is taken as the allowable fluctuation speed (Sm).

An alarm is activated when the actual spindle speed varies for the commanded speed (Sc) under the condition that the variation width exceeds the allowable variation width (Sm).

- **Sd**: The allowable constant variation width which is independent of the specified spindle speed (Sd is set with parameter 4913.)
- **Sr**: The allowable variation width which is obtained by multiplying Sc (commanded spindle speed) by r (constant ratio). (r is set with parameter 4912.)
- **Sm**: Sd or Sr, whichever is greater

![Fig.4.20 (e)  Sd and Sm](image)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Time (p) elapsed from when the commanded spindle speed is changed to the start of spindle speed fluctuation detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>4914</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Data type</strong>: 2-word</td>
</tr>
<tr>
<td></td>
<td><strong>Unit of data</strong>: ms</td>
</tr>
<tr>
<td></td>
<td><strong>Valid data range</strong>: 0 to 999999</td>
</tr>
</tbody>
</table>

Set the time elapsed from when the specified spindle speed is changed to the start of spindle speed fluctuation detection in the spindle speed fluctuation detection function. That is, the fluctuation in the spindle speed is not detected until the specified time elapses from when the specified spindle speed is changed.
4. DESCRIPTION OF PARAMETERS

**Fig. 4.20 (f) Sd and Sm**

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMB</td>
<td>ESI</td>
<td>TRV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISZ</td>
<td>IDM</td>
<td>IOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 4950 |

[Data type] Bit

**IOR** Resetting the system in the spindle positioning mode

0 : Does not releases the mode.
1 : Releases the mode

**IDM** The positioning direction for the spindle using a M code is

0 : The positive direction
1 : The negative direction

**ISZ** When an M code for spindle orientation is specified in spindle positioning:

0 : The spindle rotation mode is cleared and the mode is switched to the spindle positioning mode, and spindle orientation operation is performed.
1 : The spindle rotation mode is cleared and the mode is switched to the spindle positioning mode but spindle orientation operation is not performed.

**TRV** Rotation direction of spindle positioning is set to:

0 : The positive direction
1 : The reverse direction

**ESI** Selection of a spindle positioning specification

0 : The conventional specification is used.
1 : The extended specification is used.
The extended specification includes the following two extensions:

(1) With the conventional specification, the number of M codes for specifying a spindle positioning angle is always 6. With the extended specification, an arbitrary number of such M codes from 1 to 255 can be selected by parameter setting (See parameter No.4964.)

(2) The maximum feedrate for spindle positioning (setting of parameter No.1420) can be extended from 240000 to 269000 (in increments of 10 deg/min).

When the spindle positioning function is used, half-fixed angle positioning based on M codes uses:

0: Specification A
1: Specification B

In the case of half-fixed angle positioning based on M codes, three types of spindle positioning operations can occur:

(1) The spindle rotation mode is cleared, then the mode is switched to the spindle positioning mode.

(2) Spindle positioning is performed in the spindle positioning mode.

(3) The spindle positioning mode is cleared, then the mode is switched to the spindle rotation mode.

In the case of specification A:
Operations (1) to (3) are specified using separate M codes.

(1) Specified using M codes for performing spindle orientation. (See parameter No.4960)

(2) Specified using M codes for specifying a spindle positioning angle. (See parameter No.4962)

(3) Specified using M codes for clearing spindle positioning operation. (See parameter No.4961.)

In the case of specification B:
When M codes for specifying a spindle positioning angle are specified, operations (1) to (3) are performed successively. (See parameter No.4962.)
### 4.DESCRIPTION OF PARAMETERS

#### 4960 M code specifying the spindle orientation

**[Data type]** Word  
**[Unit of data]** Integer  
**[Valid data range]** 6 to 97  

Set an M code to change the spindle rotating mode to the spindle positioning mode. Setting the M code performs the spindle orientation. Spindle positioning can be specified from the next block.

#### 4961 M code releasing the spindle positioning mode

**[Data type]** Word  
**[Unit of data]** Integer  
**[Valid data range]** 6 to 97  

Set the M code to release the spindle positioning mode and to change the mode to the spindle rotating mode.

#### 4962 M code for specifying a spindle positioning angle

**[Data type]** Word  
**[Unit of data]** Integer  
**[Valid data range]** 6 to 92  

Two methods are available for specifying spindle positioning. One method uses address C for arbitrary-angle positioning. The other uses an M code for half-fixed angle positioning. This parameter sets an M code for the latter method.

- **When bit 6 (ESI) of parameter No.4950=0**  
  Six M code from Mα to M(α+5) are used for half-fixed angle positioning, when α is the value of this parameter.

- **When bit 6(ESI) of parameter No.4950=1**  
  Set the start M code in this parameter, and set the number of M codes in parameter No.4964. Suppose that the setting of parameter No. 4962 is α and the setting of parameter No. 4964 is β. Then β M codes from Mα to M (α+β-1) are used for half fixed angle positioning.

The table below indicates the relationship between the M codes and positioning angles.

<table>
<thead>
<tr>
<th>M code</th>
<th>Positioning angle</th>
<th>Example: Positioning angle when θ = 30°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mα</td>
<td>θ</td>
<td>30°</td>
</tr>
<tr>
<td>M(α+1)</td>
<td>2θ</td>
<td>60°</td>
</tr>
<tr>
<td>M(α+2)</td>
<td>3θ</td>
<td>90°</td>
</tr>
<tr>
<td>M(α+3)</td>
<td>4θ</td>
<td>120°</td>
</tr>
<tr>
<td>M(α+4)</td>
<td>5θ</td>
<td>150°</td>
</tr>
<tr>
<td>M(α+5)</td>
<td>6θ</td>
<td>180°</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>M(α+n)</td>
<td>(n+1)θ</td>
<td></td>
</tr>
</tbody>
</table>
NOTE

θ represents the basic angular displacement set in parameter No.4963.

4963

<table>
<thead>
<tr>
<th>Data type</th>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of data</td>
<td>deg</td>
</tr>
<tr>
<td>Valid data range</td>
<td>1 to 60</td>
</tr>
</tbody>
</table>

This parameter sets a basic angular displacement used for half-fixed angle positioning using M codes.

4964

<table>
<thead>
<tr>
<th>Data type</th>
<th>Byte</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of data</td>
<td>Integer</td>
</tr>
<tr>
<td>Valid data range</td>
<td>0, 1 to 255</td>
</tr>
</tbody>
</table>

This parameter sets the number of M codes used for Half-fixed angle positioning using M codes. As many M codes as the number specified in this parameter, starting with the M code specified in parameter No.4962, are used to specify half-fixed angle positioning. Let α be the value of parameter No.4962, and let β be the value of parameter No.4964. That is, M codes from Mα to M (α+β-1) are used for half-fixed angle positioning.

NOTE

1 This parameter is valid when bit 6 (ESI) of parameter No.4950=1.
2 Make sure that M codes from Mα to M (α+β-1) do not duplicate other M codes.
3 Setting this parameter to 0 has the same effect as setting 6. That is, M code from Mα to M (α+5) are used for half-fixed angle positioning.

4970

<table>
<thead>
<tr>
<th>Data type</th>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of data</td>
<td>0.01 s⁻¹</td>
</tr>
<tr>
<td>Valid data range</td>
<td>1 to 9999</td>
</tr>
</tbody>
</table>

Set the servo loop gain of the spindle in the spindle positioning mode.
4.DESCRIPTION OF PARAMETERS

4971

Servo loop gain multiplier of the spindle for gear 1

4972

Servo loop gain multiplier of the spindle for gear 2

4973

Servo loop gain multiplier of the spindle for gear 3

4974

Servo loop gain multiplier of the spindle for gear 4

[Data type]  Word

Set the servo loop gain multipliers of the spindle for gears 1 to 4. The multipliers are used to convert the amount of the position deviation to the voltage used in the velocity command. Assign the data obtained from the following equation to the parameters.

\[
\text{Loop gain multiplier} = 2048000 \times E \times \frac{A}{L}
\]

where;

\( E \) : Voltage required to rotate the spindle motor at 1000 min\(^{-1}\) in the velocity command

\( L \) : Rotation angle of the spindle per one motor rotation (normally 360)

\( A \) : Unit used for the detection (degree)

[Example]

Let \( E \) be 2.2 V, \( L \) be 360 degrees, and \( A \) be 0.088 degrees/pulse.

\[
\text{Loop gain multiplier} = 2048000 \times 2.2 \times \frac{0.088}{360} = 1101
\]

* When the voltage specified for the spindle motor is 10 V at a spindle speed of 4500 min\(^{-1}\), \( E \) is regarded as 2.2 V.

**NOTE**

The above parameters No.4971 to No.4974 are for analog spindles.
4.21 PARAMETERS OF TOOL COMPENSATION

<table>
<thead>
<tr>
<th>5001</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EVO</td>
<td>EVR</td>
<td>TAL</td>
<td>TLB</td>
<td>TLC</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>EVO</td>
<td>TPH</td>
<td>EVR</td>
<td>TAL</td>
<td>OFH</td>
<td>TLB</td>
<td>TLC</td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

TLC Tool length compensation
0 : Tool length compensation A or B (Conforms to TLB in parameter No.5001)
1 : Tool length compensation C

TLB Tool length compensation axis
0 : Always Z axis irrespective of plane specification (Tool length compensation A)
1 : Axis perpendicular to plane specification (G17, G18, and G19) (Tool length compensation B)

OFH Offset number of tool length compensation, cutter compensation and tool offset
0 : Specifies the tool length compensation using an H code, and cutter compensation C using a D code
  Tool offset conforms to TPH in parameter No.5001#5.
1 : Specifies the tool length compensation, cutter compensation and tool offset using H codes

TAL Tool length compensation C
0 : Generates an alarm when two or more axes are offset
1 : Not generate an alarm even if two or more axes are offset

EVR When a tool compensation value is changed in cutter compensation C mode:
0 : Enables the change, starting from that block where the next D or H code is specified.
1 : Enables the change, starting from that block where buffering is next performed.

TPH Specifies whether address D or H is used as the address of tool offset number (G45 to G48).
0 : D code
1 : H code
TPH is valid when OFH in parameter No.5001#2 is 0.

EVO When in tool length compensation A or tool length compensation B, the tool compensation amount is changed in offset mode (G43 or G44) (for the M series) or when in tool position compensation, the compensation amount is changed (for the T series):
0 : A block specifying the next G43, G44, or an H code and subsequent blocks become valid. (M series)
  A block specifying the next T code and subsequent blocks become valid. (T series)
1 : A block to be buffered next and subsequent blocks become valid.
4. DESCRIPTION OF PARAMETERS

5002

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
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<th>#2</th>
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<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>WNP</td>
<td>LWM</td>
<td>LGC</td>
<td>LGT</td>
<td>LWT</td>
<td>LGN</td>
<td>LD1</td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

LD1 Offset number of tool offset
0 : Specified using the lower two digits of a T code
1 : Specified using the lower one digit of a T code

LGN Geometry offset number of tool offset
0 : Is the same as wear offset number
1 : Specifies the geometry offset number by the tool selection number

LWT Tool wear compensation is performed by:
0 : Moving the tool.
1 : Shifting the coordinate system.
(Only when the LGT parameter (bit 4 of No.5002) is set to 0)

LGT Tool geometry compensation
0 : Compensated by the shift of the coordinate system
   (Compensation is made in the block of T code regardless of LWM at this time.)
1 : Compensated by the tool movement

LGC Tool geometry compensation (It is effective when LGT = 0. When LGT is 1, it is always canceled.)
0 : Not canceled by offset number 0
1 : Canceled by offset number 0

LWM Tool offset (Geometry and wear compensation when LGT = 1.)
0 : Is done in the T code block
1 : Is done together with the axis movement

NOTE
When LGT = 0, the offset is done in a T code block regardless of this parameter.

WNP Imaginary tool tip direction used for tool nose radius compensation, is the direction specified by:
0 : Geometry offset number
1 : Wear offset number

5003

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
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<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>TGC</td>
<td>LVC</td>
<td>CCN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LVK</td>
<td>CCN</td>
<td>SUV</td>
<td>SUP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

SUP Start up or cancel in cutter compensation C or cutter compensation for 5-axis machining
0 : Type A
1 : Type B

SUV Startup or cancellation of cutter compensation C is:
0 : Type A or type B. (The setting of bit 0 (SUP) of parameter No. 5003 is followed.)
1 : Perpendicular to the next movement.
CCN  When automatic reference position return (G28) is specified in the cutter compensation C mode (M series) or in tool nose radius compensation (T series):
0 : The cutter compensation or tool nose radius compensation vector is cancelled in movement to an intermediate position.
1 : The cutter compensation or tool nose radius compensation vector is not cancelled in movement to an intermediate position, but is cancelled in movement to the reference position.

LVC  Offset value of tool offset
0 : Not cleared, but held by reset
1 : Cleared by reset

LVK  Tool length offset value
0 : Cleared by reset
1 : Not cleared, but held by reset

TGC  Tool geometry compensation value
0 : Not canceled by reset
1 : Canceled by reset
(Valid when LVC, #6 of parameter No.5003, is "1")

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
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</thead>
<tbody>
<tr>
<td>Y03</td>
<td></td>
<td></td>
<td></td>
<td>TS1</td>
<td></td>
<td>ORC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ODI</td>
</tr>
</tbody>
</table>

**NOTE**
When this parameter is set, the power must be turned off before operation is continued.

- Data type - Bit

ORC  Tool offset value
0 : Set by the diameter specification
   (Can be set in only the axis under diameter programming)
1 : Set by the radius specification

ODI  A cutter compensation amount is set using:
0 : A radius.
1 : A diameter.

TS1  When the tool offset measurement value direct input B function is used, touch sensor contact detection is based on:
0 : Four-contact input.
1 : One-contact input.

Y03  Y axis offset is:
0 : Used for 4th axis.
1 : Used for 3rd axis.
4. DESCRIPTION OF PARAMETERS

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---

### 5005

<table>
<thead>
<tr>
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<th>#6</th>
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</tr>
</thead>
<tbody>
<tr>
<td>TLE</td>
<td>QNI</td>
<td>PRC</td>
<td>CNI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**[Data type]** Bit

**CNI**
- On the offset screen, Y-axis offset screen, and macro screen, the [INP.C] soft key is:
  - 0: Used.
  - 1: Not used. (The [INP.C] soft key is not displayed.)

**PRC**
- Direct input of tool offset value and workpiece coordinate-system shift value
  - 0: Not use a PRC signal
  - 1: Uses a PRC signal

**QNI**
- In the function of input of offset value measured B
  - 0: Not automatically select the tool offset number
  - 1: Automatically selects a tool offset number

**TLE**
- When the tool offset measurement value direct input B function is used, a tool offset value, set by the offset write signal, is:
  - 0: Always received in offset write mode.
  - 1: Received only in offset write mode and during movement along an axis (where "during movement along an axis" means that the positional deviation value is other than 0).

---

### 5006

<table>
<thead>
<tr>
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<th>#6</th>
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<th>#4</th>
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<th>#0</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>TCE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TGC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TGC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>OIM</td>
</tr>
</tbody>
</table>

**[Data type]** Bit

**OIM**
- When the unit is switched between the inch and metric systems, automatic tool offset value conversion is:
  - 0: Not performed
  - 1: Performed

---

**NOTE**

If this parameter setting is changed, reset the tool offset data.

---

**TGC**
- When a T code is specified in a block containing G50, G04, or G10:
  - 0: No alarm occurs.
  - 1: P/S alarm No.245 occurs.

**TCE**
- When a tool length offset is specified in a rigid tapping or drilling canned cycle, the axis to which the tool length offset applies is:
  - 0: Determined according to the specifications of tool length offset C.
  - 1: The drilling axis.

---

**NOTE**

This parameter is valid when tool length offset C is selected (bit 0 (TLC) of parameter No. 5001 = 1).
The operation of tool length compensation is set as follows:
0 : Tool length compensation is performed by axis movement.
1 : Tool length compensation is performed by shifting the coordinate system.

<table>
<thead>
<tr>
<th>5008</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GCS</td>
<td>QCR</td>
<td>MCR</td>
<td>CNV</td>
<td>CNC</td>
<td>CNI</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

Interference check for cutter compensation C (M series) or tool nose radius compensation (T series) is:
0 : Performed
1 : Not performed

During interference check for cutter compensation C (M series) or tool nose radius compensation (T series), when the direction of movement after application of the offset differs from the programmed direction by between 90° and 270°:
0 : An alarm is issued.
1 : No alarm is issued.

The corner rounding function (G39) in cutter compensation C mode is:
0 : Disabled.
1 : Enabled.

The interference check and vector erasure of cutter compensation C (M series) or tool nose radius compensation (T series) are:
0 : Performed.
1 : Not performed.

If G41/G42 (cutter compensation C (M series) or tool nose radius compensation (T series)) is specified in the MDI mode, an alarm is:
0 : Not raised.
1 : Raised. (P/S5257)

**NOTE**

In the MDI mode, cutter compensation C (M series) or tool nose radius compensation (T series) is not performed, irrespective of the setting of this parameter.

The travel distance of circular interpolation in cutter compensation C (M series) or tool nose radius compensation (T series) is judged:
0 : In the FS0(FS16) format.
1 : In the FS15 format.

FS0(FS16) and FS15 determine the travel distance in different ways if the radius of arc at the start point of circular interpolation is different from that at the end point (if the end point is not on the arc). By this parameter, the method of determining the travel distance of circular interpolation can be selected.
If the end point viewed from the start point is in the A region, the movement is made along the shortcut. If the end point is in the B, C, or D region, almost a single turn is made.

[FS15 format]

If the end point is in the A region separated by the line L drawn between the start point and the center, the movement is made along the shortcut. If the end point is in the B region, almost a single turn is made.

**NOTE**

The setting of this parameter determines the travel distance determination method for circular interpolation not during cutter compensation C (M series) or tool nose radius compensation (T series) as well. Accordingly, if this parameter is set, the setting of bit 3 (CQD) of parameter No. 3450 is invalid.

GCS If G49 (G code for canceling tool length compensation) and G40 (G code for canceling cutter compensation) are specified in a single block, the tool length compensation is cancelled:
- 0 : In the next block.
- 1 : In the specified block.
NOTE
When this parameter has been set, the power must be turned off before operation is continued.

[Data type] Bit
GSG In the mode of tool compensation direct input B, the offset write input signal is input:
  0 : From the machine side. <G004 bits 2 to 5>
  1 : From the PMC side. <G132 bits 0 and 1, G134 bits 0 and 1>
QSA The angular axis control function is:
  0 : Not supported by the tool compensation direct input B function.
  1 : Supported by the tool compensation direct input B function.
TSD In the tool compensation direct input B function, the error prevention function is:
  0 : Disabled.
  1 : Enabled.
NTT When a shift type tool offset is applied during simplified synchronization control, and the master spindle and slave spindle are not related to the tool offset:
  0 : An alarm is issued. (P/S alarm 214)
  1 : No alarm is issued.

Limit value that ignores the vector when a tool moves on the outside of a corner during tool nose radius compensation

| Limit value that ignores the vector when a tool moves on the outside of a corner during cutter compensation C |

[Data type] Word
[Unit of data]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch input</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
</tbody>
</table>

[Valid data range] 0 to 16383
This parameter sets the limit value that ignores a slight movement occurring when a tool moves on the outside of the corner during tool nose radius compensation (T series) or cutter compensation C (M series).
4. DESCRIPTION OF PARAMETERS

5013

Maximum value of tool wear compensation

[Data type] 2-word
[Unit of data]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch input</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
</tbody>
</table>

[Valid data range]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>0 to 99999</td>
<td>0 to 999999</td>
<td>0 to 9999999</td>
</tr>
<tr>
<td>Inch input</td>
<td>0 to 99999</td>
<td>0 to 999999</td>
<td>0 to 9999999</td>
</tr>
</tbody>
</table>

This parameter sets the maximum allowable tool wear compensation value. If an attempt is made to set a tool wear compensation value, the absolute value of which exceeds the value set in this parameter, the following alarm or warning is output:
Input from MDI
Warning: Too many digits
Input by G10
P/S alarm No.032: Offset value is out of range by G10.

5014

Maximum value of incremental input for tool wear compensation

[Data type] 2-word
[Unit of data]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch input</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
</tbody>
</table>

[Valid data range]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>0 to 99999</td>
<td>0 to 999999</td>
<td>0 to 9999999</td>
</tr>
<tr>
<td>Inch input</td>
<td>0 to 99999</td>
<td>0 to 999999</td>
<td>0 to 9999999</td>
</tr>
</tbody>
</table>
4. DESCRIPTION OF PARAMETERS

Set the maximum allowable value for the tool wear compensation value, input as an incremental value. If the incremental input value (absolute value) exceeds the set value, the following alarm or warning message is output:
Input from MDI
Warning: Setting value out of range.
Input using G10
P/S alarm No.032: Offset value is out of range by G10.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5015</td>
<td>Distance (XP) between reference position and X axis + contact surface Distance (X1P) between reference position and X axis + contact surface of touch sensor 1</td>
</tr>
<tr>
<td>5016</td>
<td>Distance (XM) between reference position and X axis - contact surface Distance (X1M) between reference position and X axis - contact surface of touch sensor 1</td>
</tr>
<tr>
<td>5017</td>
<td>Distance (ZP) between reference position and Z axis + contact surface Distance (Z1P) between reference position and Z axis + contact surface of touch sensor 1</td>
</tr>
<tr>
<td>5018</td>
<td>Distance (ZM) between reference position and Z axis - contact surface Distance (Z1M) between reference position and Z axis - contact surface of touch sensor 1</td>
</tr>
</tbody>
</table>

[Data type] 2-word
[Unit of data]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch input</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
</tbody>
</table>

[Valid data range] -99999999 to 99999999

These parameters are related to the function of input of tool offset value measured B. They set the distance (with sign) between the measurement reference position and sensor contact surface. For an axis under diameter programming, set it by a diameter value.
5020 Tool offset number used for the input of tool offset value measured

- [Data type] Byte
- [Valid data range] 1 to the maximum number of tool compensation sets

Set a tool offset number to be used for setting the amount by which the workpiece coordinate system is shifted by the tool compensation direct input B function. This parameter is valid when the tool offset number is not selected automatically (QNI, #5 of parameter 5005, is zero).

5021 Number of pulse interpolation cycles memorized prior to contacting the touch sensor

- [Data type] Byte
- [Unit of data] Interpolation cycle
- [Valid data range] 0 to 8

When the error prevention function in the tool compensation direct input B function is used, or when a touch sensor with single-contact signal input is used, this parameter sets the number of interpolation cycles of pulses stored immediately before the tool is brought into contact with the touch sensor by manual operation. If 0 is set for this parameter, the specification of 8 (maximum allowable value) is assumed.

**NOTE**
This parameter is enabled when the TS1 parameter (bit 3 of parameter No.5004) is set to 1.
4. DESCRIPTION OF PARAMETERS

5030

Minimum grinding wheel diameter in minimum grinding wheel diameter check

[Data type] 2-word
[Unit of data]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch input</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
</tbody>
</table>

[Valid data range]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>-999999 to 999999</td>
<td>-9999999 to 9999999</td>
<td></td>
</tr>
<tr>
<td>Inch input</td>
<td>-999999 to 999999</td>
<td>-9999999 to 9999999</td>
<td></td>
</tr>
</tbody>
</table>

If the compensation value corresponding to an offset number specified by an H code is smaller than the minimum grinding wheel diameter specified in this parameter during compensation with G43 or G44, the signal F0065#3 GWLF is output to the PMC.

NOTE
This is a parameter for cylindrical grinding machines.

5040

[Data type] Bit
[Unit of data] OWD

In radius programming (bit 1 (ORC) of parameter No. 5004 is set to 1),
0 : Tool offset values of both geometry compensation and wear compensation are specified by radius.
1 : Tool offset value of geometry compensation is specified by radius and tool offset value of wear compensation is specified by diameter, for an axis of diameter programming.

NOTE
When this parameter has been set, the power must be turned off before operation is continued.

5041

[Data type] Bit
[Unit of data] UMD

If a program contains no D command in cutter compensation C:
0 : Compensation data is not updated.
1 : If G41 or G42 command is present, the value of modal D is used as a compensation number to update compensation data.
CRS If a startup with a travel distance of 0 is performed after a reference position return operation when a T code specifying a virtual tool tip number other than 0 and 9 is specified, the startup block operation is as follows:
0: The block does not make any movement.
1: The block makes a movement so that the tool tip center is placed at the current coordinates.

**NOTE**
If the virtual tool tip number is 0 or 9, a movement is made so that the tool tip center is placed at the current coordinates, regardless of the setting of this parameter.

NM2 When two or more blocks that specify no movement are specified successively, or when an M code not buffered is specified in one block:
0: No alarm is issued.
1: An alarm is issued. (P/S 041 alarm)
4.22 PARAMETERS OF CANNED CYCLES

4.22.1 Parameter of canned Cycle for Drilling

<table>
<thead>
<tr>
<th></th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>M5T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M5B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ILV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RTR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FXY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

**FXY**
The drilling axis in the drilling canned cycle is:
- 0: Always the Z-axis
- 1: The axis selected by the program

**NOTE**
In the case of the T series, this parameter is valid only for the drilling canned cycle in the FS10/11 format.

**EXC**
- G81
  - 0: Specifies a drilling canned cycle
  - 1: Specifies an external operation command

**RTR**
- G83 and G87
  - 0: Specify a high-speed peck drilling cycle
  - 1: Specify a peck drilling cycle

**ILV**
Initial point position in drilling canned cycle
- 0: Not updated by reset
- 1: Updated by reset

**RD2, RD1**
Set the axis and direction in which the tool in drilling canned cycle G76 or G87 is got free. RD2 and RD1 are set as shown below by plane selection.

<table>
<thead>
<tr>
<th>RD2</th>
<th>RD1</th>
<th>G17</th>
<th>G18</th>
<th>G19</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>+X</td>
<td>+Z</td>
<td>+Y</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>-X</td>
<td>-Z</td>
<td>-Y</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>+Y</td>
<td>+X</td>
<td>+Z</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>-Y</td>
<td>-X</td>
<td>-Z</td>
</tr>
</tbody>
</table>

**M5T**
When a spindle rotates from the forward to the reverse direction and vice versa in tapping cycles G84 and G74 for M series (G84 and G88 for T series), before M04 or M03 is output:
- For T series
  - 0: Not output M05
  - 1: Outputs M05
- For M series
  - 0: Outputs M05
  - 1: Not output M05

**M5B**
In drilling canned cycles G76 and G87:
- 0: Outputs M05 before an oriented spindle stops
- 1: Not output M05 before an oriented spindle stops
MRC When a target figure other than a monotonically increasing or monotonically decreasing figure is specified in a multiple repetitive turning canned cycle (G71, G72):
0 : No alarm occurs.
1 : P/S alarm No.064 is occurs.

NOTE
This parameter is valid for multiple repetitive turning canned cycle type I.

QSR Before a multiple repetitive canned cycle (G70 to G73) is started, a check to see if the program contains a block that has the sequence number specified in address Q is:
0 : Not made.
1 : Made. (If the sequence number specified in address Q cannot be found, an alarm occurs and the canned cycle is not executed.)

F16 When the FS10/11 format is used (with bit 1 (FCV) of parameter No.0001 set to 1), a canned drilling cycle is specified using:
0 : FS10/11 format
1 : FS0 format. (However, the number of repetitions is specified using address L.)

RFC For the semifinish figure of G71 or G72 and for a cutting pattern of G73, tool-nose radius compensation is:
0 : Not performed.
1 : Performed.

K0E When K0 is specified in a hole machining canned cycle (G80 to G89):
0 : Hole machining is performed once.
1 : Hole machining is not performed. Instead, the hole machining data is merely memorized.

RAB The R command for the drilling canned cycle in the Series 15 format is:
0 : Regarded as an incremental command
1 : Regarded as:
   An absolute command in the case of G code system A
   An absolute command in the case of G code system B or C when the G90 mode is specified.
   An incremental command in the case of G code system B or C when the G91 mode is specified.

RDI The R command for the drilling canned cycle in the FS10/11 format:
0 : Is regarded as the specification of a radius
1 : Follows the specification of a diameter/radius for the drilling axis
[Data type] Bit

SIJ When the FS10/11 command format is used, a tool shift value for the drilling canned cycle G76 or G87 is specified by:
0: Address Q
1: Address I, J, or K

TFD During a threading cycle, feed forward is:
0: Enabled.
1: Disabled.

QZA When the specification of the depth of cut (Q) for each time is omitted, or if Q0 is specified in a high-speed peck drilling canned cycle (G73) or peck drilling canned cycle (G83):
0: No alarm is issued.
1: An alarm (No.045) is issued.

P15 When the FS10/11 command format is used, the machining sequence for pocketing using multiple repetitive canned cycle G71 or G72 follows:
0: FS0(FS16) specification
1: FS10/11 specification

DCP When an axis perpendicular to or an axis parallel to a specified plane is specified in a canned cycle for drilling:
0: The specified axis is regarded as the drilling axis.
1: The specified axis is regarded as the positioning axis.

PNA If the FS10/11 tape format is used and if a plane without an axis is specified in the canned cycle mode of drilling, an alarm is:
0: Raised. (P/S 028)
1: Not raised.

COD In pocketing, the sequence of axis movements made to return the tool to the start point at the end of machining is as follows:
0: X-axis to Z-axis
1: Z-axis to X-axis

NOTE
If this parameter is set to 1, specifying G71 causes the tool to return to the start point in the sequence from Z-axis to X-axis. Therefore, when the tool returns to the start point after end facing, interference between the tool and workpiece surface can be prevented.

CID When the FS10/11 command format is used, application of the setting of bit 7 (IPR) of parameter No. 1004 to the depth of cut in a multiple repetitive turning canned cycle is:
0: Disabled.
1: Enabled.

TCZ In a tapping cycle (excluding rigid tapping), an accumulated zero check in the tapping step (forward, backward) is:
0: Not performed.
1: Performed.
Execute a tapping cycle (excluding rigid tapping) with the servo feed forward (bit 1 of parameter No. 2005). If an impact is detected, set this parameter to 1.
A canned cycle for high-speed positioning and drilling is:
0: Disabled.
1: Enabled.

In a boring cycle, retraction is made:
0: At a cutting feedrate.
1: At a rapid traverse rate.

In a multiple repetitive canned cycle (G71/G72), the machining profile is:
0: Not checked.
1: Checked.

If this parameter is specified, the machining profile specified in the multiple repetitive canned cycle for lathe (G71/G72) and the machining start point are checked. If the relationship is incorrect, the P/S 062 alarm is raised.

An incorrect relationship between the machining profile and machining start point indicates either of the following cases.
- Although the finishing allowance is specified with a positive sign, the start point of the canned cycle is smaller than the maximum value of the machining profile.
- Although the finishing allowance is specified with a negative sign, the start point of the canned cycle is larger than the minimum value of the machining profile.

[Data type] Bit

**NOTE**
1. The machining profile is checked before the operation of the canned cycle (not during machining).
2. The machining profile to be checked is a programmed profile. The path of retraction or return is not checked.
3. This parameter is not valid for G71 or G72 of the canned cycle for grinder.

In a multiple repetitive threading cycle in the FS10/11 tape format, single-edge thread cutting and both-edge zigzag thread cutting with the depth of cut kept constant:
0: Cannot be specified.
1: Can be specified.

In a multiple repetitive turning canned cycle (G71 or G72), whether an illegal arc is specified or not is:
0: Not checked immediately before the start of a movement.
1: Checked immediately before the start of a movement.
NOTE
1 This parameter is valid when bit 1 (MRC) of parameter No. 5102 is set to 1.
2 Regardless of the setting of this parameter, the shape is checked during a movement made by an arc command.

PCT A Q command in a tapping cycle (G84 or G88) is:
0 : Invalid.
1 : Valid. (A peck tapping cycle is performed.)
When this parameter is set, and the depth of cut for each time is specified with address Q in G84 or G88, a peck tapping cycle is performed.
As a peck tapping cycle operation, high-speed peck tapping or peck tapping can be selected by bit 5 (PCP) of parameter No. 5200. This function can be used for both tapping and rigid tapping. Even when this parameter is set, ordinary tapping or rigid tapping is performed if Q is not specified or if Q0 is specified.

<table>
<thead>
<tr>
<th>5110</th>
<th>C-axis clamp M code in drilling canned cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Invalid</td>
</tr>
<tr>
<td>1</td>
<td>Valid. (A peck tapping cycle is performed.)</td>
</tr>
</tbody>
</table>

This parameter sets the C-axis clamp M code in a drilling canned cycle.

<table>
<thead>
<tr>
<th>5111</th>
<th>Dwell time when C-axis unclamping is specified in drilling canned cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dwell time when C-axis unclamping is specified in drilling canned cycle</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data type</th>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of data</td>
<td>ms</td>
</tr>
<tr>
<td>Valid data range</td>
<td>0 to 32767</td>
</tr>
</tbody>
</table>

This parameter sets the dwell time when C-axis unclamping is specified in a drilling canned cycle.
5112

Spindle forward-rotation M code in drilling canned cycle

[Data type] 2-word
[Valid data range] 0 to 255

This parameter sets the spindle forward-rotation M code in a drilling canned cycle.

NOTE

M03 is output when "0" is set.

5113

Spindle reverse-rotation M code in drilling canned cycle

[Data type] 2-word
[Valid data range] 0 to 255

This parameter sets the spindle reverse-rotation M code in a drilling canned cycle.

NOTE

M04 is output when "0" is set.

5114

Return or clearance value of drilling canned cycle G83

Return value of high-speed peck drilling cycle G73

[Data type] Word
[Unit of data]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>0.01</td>
<td>0.001</td>
<td>0.001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch input</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.0001</td>
<td>inch</td>
</tr>
</tbody>
</table>

[Valid data range] 0 to 32767

For M series this parameter sets the return value in high-speed peck drilling cycle G73 (G83 for T series).

Fig. 4.22.1 (a)  High-speed Peck Drilling Cycle G73
For T series this parameter sets the return or clearance value in drilling canned cycle G83.

<table>
<thead>
<tr>
<th>G83 for T series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter No.5101 #2 RTR=1 (Peck drilling cycle)</td>
</tr>
<tr>
<td>q : Depth of cut</td>
</tr>
<tr>
<td>d : Return value</td>
</tr>
</tbody>
</table>

![Fig.4.22.1 (b) Drilling Canned Cycle G83](image)

<table>
<thead>
<tr>
<th>5115</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearance of canned cycle G83</td>
</tr>
</tbody>
</table>

[Data type] Word
[Unit of data]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>0.01</td>
<td>0.001</td>
<td>0.001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch input</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.0001</td>
<td>inch</td>
</tr>
</tbody>
</table>

[Valid data range] 0 to 32767
This parameter sets the clearance of peck drilling cycle G83.

![Fig.4.22.1 (c) Peck drilling cycle G83](image)
### Override value for retraction in boring cycle (G85, G89)

**5121**  
[Data type] Byte  
[Unit of data] 100%  
[Valid data range] 0.1 to 20

Set the override value of retraction in a boring cycle. If 20 or a greater value is specified in this parameter, the override is set to 2000%. If 0 is specified, this parameter becomes invalid, and the retraction speed becomes two times the cutting speed.

### Parameter of Thread Cutting Cycle

**5130**  
[Data type] Byte  
[Unit of data] 0.1 pitch  
[Valid data range] 0 to 127

This parameter sets the chamfering in the thread cutting cycles G76 and G92.

**5131**  
[Data type] Byte  
[Unit of data] 1 deg  
[Valid data range] 1 to 89

Set a chamfering angle in a threading cycle.

### Parameter of Multiple Repetitive Canned Cycle

**5132**  
[Data type] 2-word  
[Unit of data]  

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>0.001</td>
<td>0.001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch input</td>
<td>0.0001</td>
<td>0.0001</td>
<td>inch</td>
</tr>
</tbody>
</table>

[Valid data range] 0 to 99999999

This parameter sets the depth of cut in multiple repetitive canned cycles G71 and G72.
4.DESCRIPTION OF PARAMETERS

5133

<table>
<thead>
<tr>
<th>[Data type]</th>
<th>2-word</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Unit of data]</td>
<td></td>
</tr>
<tr>
<td>[Valid data range]</td>
<td>0 to 99999999</td>
</tr>
<tr>
<td>This parameter sets the escape in multiple repetitive canned cycle G71 and G72.</td>
<td></td>
</tr>
</tbody>
</table>

5135

| Escape in multiple repetitive canned cycle G73 in X-axis direction |

5136

| Escape in multiple repetitive canned cycle G73 in Z-axis direction |

<table>
<thead>
<tr>
<th>[Data type]</th>
<th>2-word</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Unit of data]</td>
<td></td>
</tr>
<tr>
<td>[Valid data range]</td>
<td>-99999999 to 99999999</td>
</tr>
<tr>
<td>This parameter sets the escape in multiple repetitive canned cycle G73 of an X, then Z axis.</td>
<td></td>
</tr>
</tbody>
</table>

5137

| Division count in multiple repetitive canned cycle G73 |

<table>
<thead>
<tr>
<th>[Data type]</th>
<th>2-word</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Unit of data]</td>
<td>Cycle</td>
</tr>
<tr>
<td>[Valid data range]</td>
<td>1 to 99999999</td>
</tr>
<tr>
<td>This parameter sets the division count in multiple repetitive canned cycle G73.</td>
<td></td>
</tr>
</tbody>
</table>

5139

| Return in multiple canned cycles G74 and G75 |

<table>
<thead>
<tr>
<th>[Data type]</th>
<th>2-word</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Unit of data]</td>
<td></td>
</tr>
<tr>
<td>[Valid data range]</td>
<td>0 to 99999999</td>
</tr>
<tr>
<td>This parameter sets the return in multiple repetitive canned cycles G74 and G75.</td>
<td></td>
</tr>
</tbody>
</table>
4. DESCRIPTION OF PARAMETERS

5140

Minimum depth of cut in the multiple repetitive canned cycle G76

[Data type] 2-word
[Unit of data]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch input</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
</tbody>
</table>

[Valid data range] 0 to 99999999
This parameter sets the minimum depth of cut in the multiple repetitive canned cycle G76.

5141

Finishing allowance in the multiple repetitive canned cycle G76

[Data type] 2-word
[Unit of data]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch input</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
</tbody>
</table>

[Valid data range] 1 to 99999999
This parameter sets the finishing allowance in multiple repetitive canned cycle G76.

5142

Repetition count of final finishing in multiple repetitive canned cycle G76

[Data type] 2-word
[Unit of data] Cycle
[Valid data range] 1 to 99999999
This parameter sets the repetition count in multiple repetitive canned cycle G76.

5143

Tool nose angle in multiple repetitive canned cycle G76

[Data type] 2-word
[Unit of data] Degree
[Valid data range] When FS10/11 format is used: 0 to 120
When FS10/11 format is not used: 0, 29, 30, 55, 60, 80
This parameter sets the tool nose angle in multiple repetitive canned cycle G76.
The amount of retraction from the crest of a pocket of type II in roughing cycle (G71, G72)

<table>
<thead>
<tr>
<th>[Data type]</th>
<th>2-word</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Unit of data]</td>
<td></td>
</tr>
</tbody>
</table>

Inertial running distance in a canned cycle for high-speed positioning and drilling

<table>
<thead>
<tr>
<th>[Data type]</th>
<th>2-word</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Unit of data]</td>
<td></td>
</tr>
</tbody>
</table>

Rapid traverse deceleration ratio for overlap between rapid traverse blocks in a canned cycle for high-speed positioning and drilling

<table>
<thead>
<tr>
<th>[Data type]</th>
<th>Byte</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Unit of data]</td>
<td>%</td>
</tr>
<tr>
<td>[Valid data range]</td>
<td>0 to 100</td>
</tr>
</tbody>
</table>

This parameter sets the rapid traverse deceleration ratio for an overlap between rapid traverse blocks in a canned cycle for high-speed positioning and drilling. In the cycle, the setting of this parameter is valid for all axes.

**NOTE**

In a canned cycle for high-speed positioning and drilling, a rapid traverse overlap is applied even when bit 4 (RTO) of parameter No. 1601 is set to 0. To disable the rapid traverse overlap, set this parameter to 0.
4.22.4 Parameters of Peck Drilling Cycle of a Small Diameter

<table>
<thead>
<tr>
<th>5160</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CYM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CYM</td>
<td>NOL</td>
<td>OLS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

OLS When an overload torque signal is received in a peck drilling cycle of a small diameter, the feed and spindle speed are:
- 0: Not changed.
- 1: Changed.

NOL When the depth of cut per action is satisfied although no overload torque signal is received in a peck drilling cycle of a small diameter, the feed and spindle speed are:
- 0: Not changed.
- 1: Changed.

CYM When a subprogram call (M98) and another NC command are specified in the same block in a canned cycle mode:
- 0: No alarm is issued.
- 1: AN alarm is issued. (P/S alarm 5329)

<table>
<thead>
<tr>
<th>5161</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RLV</td>
<td></td>
<td>PKG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

PKG Method for specifying a high-speed peck drilling cycle and a peck drilling cycle
- 0: G83 or G87 is used, and a high-speed peck drilling or peck drilling cycle is selected by bit 2 (RTR) of parameter No. 5101.
- 1: A specification is added to the G83 or G87 command so that a high-speed peck drilling cycle can be specified using G83.5 or G87.5 and that a peck drilling cycle can be specified using G83.6 or G87.6.

**NOTE**
When the FS10/11 format is used (when bit 1 (FCV) of parameter No. 0001 is set to 1), this parameter is invalid.

RLV For G code system A, the return operation in a drilling canned cycle performs:
- 0: A return to the initial level.
- 1: A return to the level of the R point.

**NOTE**
For G code systems B and C, a selection is made using G codes.
- G98: Return to the initial level
- G99: Return to the level of the R point
5163

[Data type] 2-word
[Valid data range] 1 to 99999999

This parameter sets an M code that specifies the peck drilling cycle mode of a small diameter.

5164

[Data type] Byte
[Unit of data] %
[Valid data range] 1 to 255

This parameter sets the percentage of the spindle speed to be changed when the tool is retracted because the overload torque signal is received in a peck drilling cycle of a small diameter.

\[ S_2 = S_1 \times d_1 \div 100 \]

- \( S_1 \): Spindle speed to be changed
- \( S_2 \): Spindle speed changed
- \( d_1 \) is set as a percentage.

5165

[Data type] Byte
[Unit of data] %
[Valid data range] 1 to 255

This parameter sets the percentage of the spindle speed to be changed when the tool is retracted without the overload torque signal received in a peck drilling cycle of a small diameter.

\[ S_2 = S_1 \times d_2 \div 100 \]

- \( S_1 \): Spindle speed to be changed
- \( S_2 \): Spindle speed changed
- \( d_2 \) is set as a percentage.
5166

**Parameter: Percentage of cutting feedrate to be changed when the tool is retracted after an overload torque signal is received**

- **Data type:** Byte
- **Unit of data:** %
- **Valid data range:** 1 to 255

This parameter sets the percentage of the cutting feedrate to be changed when the tool is retracted because the overload torque signal is received in a peck drilling cycle of a small diameter.

\[ F_2 = F_1 \times b_1 \div 100 \]

- **F1:** Cutting feedrate to be changed
- **F2:** Changed cutting feedrate

*b1* is set as a percentage.

5167

**Parameter: Percentage of the cutting feedrate to be changed when the tool is retracted without an overload torque signal received**

- **Data type:** Byte
- **Unit of data:** %
- **Valid data range:** 1 to 255

This parameter sets the percentage of the cutting feedrate to be changed when the tool is retracted without the overload torque signal received in a peck drilling cycle of a small diameter.

\[ F_2 = F_1 \times b_2 \div 100 \]

- **F1:** Cutting feedrate to be changed
- **F2:** Changed cutting feedrate

*b2* is set as a percentage.

5168

**Parameter: Lower limit of the percentage of the cutting feedrate in a peck drilling cycle of a small diameter**

- **Data type:** Byte
- **Unit of data:** %
- **Valid data range:** 0 to 255

This parameter sets the lower limit of the percentage of the cutting feedrate changed repeatedly in a peck drilling cycle of a small diameter to the specified cutting feedrate.

\[ F_{L} = F \times b_3 \div 100 \]

- **F:** Specified cutting feedrate
- **F_{L}:** Changed cutting feedrate

Set *b3* as a percentage.
5170

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of the macro variable to which the total number of retractions during cutting is output</td>
<td></td>
</tr>
</tbody>
</table>

**[Data type]** Word  
**[Valid data range]** 100 to 149  
This parameter sets the number of the macro variable to which the total number of times the tool is retracted during cutting in a peck drilling cycle mode of a small diameter is output.

**NOTE**  
The total number cannot be output to common variables 500 to 531.

5171

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of the macro variable to which the total number of retractions because of an overload signal is output</td>
<td></td>
</tr>
</tbody>
</table>

**[Data type]** Word  
**[Valid data range]** 100 to 149  
This parameter sets the common variable number of the custom macro to which the number of times the tool is retracted after the overload signal is received during cutting in a peck drilling cycle mode of a small diameter is output.

**NOTE**  
The total number cannot be output to common variables 500 to 531.

5172

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed of retraction to point R when no address I is issued</td>
<td></td>
</tr>
</tbody>
</table>

**[Data type]** Word  
**[Unit of data]** mm/min  
**[Valid data range]** 0 to 400  
This parameter sets the speed of retraction to point R when no address I is issued in a peck drilling cycle of a small diameter.

5173

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed of advancing to the position just before the bottom of a hole when no address I is issued</td>
<td></td>
</tr>
</tbody>
</table>

**[Data type]** Word  
**[Unit of data]** mm/min  
**[Valid data range]** 0 to 400  
This parameter sets the speed of advancing to the position just before the bottom of a previously machined hole when no address I is issued in a peck drilling cycle of a small diameter.
5174

<table>
<thead>
<tr>
<th></th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear axis (input in mm)</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Linear axis (input in inches)</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
</tbody>
</table>

This parameter sets the clearance in a peck drilling cycle of a small diameter.
### 4.23 PARAMETERS OF RIGID TAPPING

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRS</td>
<td>FHD</td>
<td>DOV</td>
<td>SIG</td>
<td>CRG</td>
<td>VGR</td>
<td>G84</td>
<td></td>
</tr>
<tr>
<td>FHD</td>
<td>PCP</td>
<td>DOV</td>
<td>SIG</td>
<td>CRG</td>
<td>VGR</td>
<td>G84</td>
<td></td>
</tr>
</tbody>
</table>

#### [Data type] Bit

**G84** Method for specifying rigid tapping

- **0**: An M code specifying the rigid tapping mode is specified prior to the issue of the G84 (or G74) command. (See parameter No.5210).
- **1**: An M code specifying the rigid tapping mode is not used. (G84 cannot be used as a G code for the tapping cycle; G74 cannot be used for the reverse tapping cycle.)

**VGR** Any gear ratio between spindle and position coder in rigid tapping

- **0**: Not used (The gear ratio is set in parameter No.3706.)
- **1**: Used (The gear ratio is set by parameters Nos. 5221 through 5224 and 5231 through 5234.)

#### NOTE

For serial spindles, set this parameter to 0 when using the DMR function for position coder signals on the spindle side.

**CRG** Rigid mode when a rigid mode cancel command is specified (G80, G01 group G code, reset, etc.)

- **0**: Canceled after rigid tapping signal RGTAP <G061#0> is set to "0".
- **1**: Canceled before rigid tapping signal RGTAP <G061#0> is set to "0".

**SIG** When gears are changed for rigid tapping, the use of SIND <G032 and G033> is

- **0**: Not permitted.
- **1**: Permitted.

**DOV** Override during extraction in rigid tapping

- **0**: Invalidated
- **1**: Validated (The override value is set in parameter No.5211 (M/T) or No.5381(M).)

**PCP** Tapping or rigid tapping

- **0**: Used as a high-speed peck tapping cycle
- **1**: Not used as a high-speed peck tapping cycle

For the T series, this parameter is valid when bit 6 (PCT) of parameter No. 5104 is set to 1.

According to the setting of this parameter, also set parameter No. 5213.

**FHD** Feed hold and single block in rigid tapping

- **0**: Invalidated
- **1**: Validated

**SRS** To select a spindle used for rigid tapping in multi-spindle control:
0: The spindle selection signals SWS1 and SWS2 (bits 0 and 1 of G027) are used. (These signals are used also for multi-spindle control.)
1: The rigid tapping spindle selection signals RGTSP1 and RGTSP2 (bits 4 and 5 of G061) are used. (These signals are provided expressly for rigid tapping.)

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>OV3</td>
<td>OVU</td>
<td>TDR</td>
<td></td>
<td>NIZ</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>OV3</td>
<td>OVU</td>
<td>TDR</td>
<td></td>
<td>NIZ</td>
</tr>
</tbody>
</table>

[Data type] Bit
NIZ Smoothing in rigid tapping is:
0: Not performed.
1: Performed.
TDR Cutting time constant in rigid tapping
0: Uses a same parameter during cutting and extraction (Parameter Nos. 5261 through 5264)
1: Not use a same parameter during cutting and extraction
Parameter Nos. 5261 to 5264: Time constant during cutting
Parameter Nos. 5271 to 5274: Time constant during extraction

OVU The increment unit of the override parameter (No.5211 (M/T) or No.5381 (M)) for tool rigid tapping extraction is:
0: 1%
1: 10%

OV3 The spindle speed for tool extraction is specified by program. The tool extraction function based on this spindle speed is:
0: Disabled.
1: Enabled.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ORI</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RG3</td>
</tr>
</tbody>
</table>

**NOTE**
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Bit
ORI When rigid tapping is started:
0: Spindle orientation is not performed.
1: Spindle orientation is performed.

**NOTE**
This parameter can be used only for a serial spindle.

RG3 A rigid tapping return operation is specified:
0: With input signal RTNT <G062#6>.
1: With one-shot G code G30.
Feed forward during movement from the initial point to point R in rigid tapping is:
0 : Disabled.
1 : Enabled.

When this parameter is set, the following function is also enabled:
• When rigid tapping is specified in advanced preview control mode, the system automatically exits from advanced preview control mode and executes rigid tapping. After termination of rigid tapping, the system automatically returns to look-ahead control mode.

When bit 0 (MIF) of parameter No. 1403 is set to 1 and rigid tapping is specified in feed-per-minute mode, the spindle speed becomes:
0 : 1/1000 of the specified speed.
1 : 1/1 of the specified speed.

In rigid tapping, override by the feedrate override signal and invalidation of override by the override cancel signal is:
0 : Disabled.
1 : Enabled.

Setting this parameter enables override by the feedrate override signal <G012> to be applied for rigid tapping operation (cutting and extraction) in rigid tapping.
The spindle speed override is fixed to 100%, but override is also applied to the spindle speed in synchronization with the feedrate along the tapping axis by feedrate override.
The override cancel signal OVC <bit 4 of G006> also becomes available.

**NOTE**

1 When this parameter is set to override the feedrate, override by parameters (see parameters Nos. 5211 (T/M) and 5381 (M)) is disabled.

2 Regardless of whether this parameter is set, when feedrate override is disabled by the override cancel signal OVC <bit 4 of G006>, override by parameters (see parameters Nos. 5211 (T/M) and 5381 (M)) is enabled.

As acceleration/deceleration for rigid tapping cutting feed:
0 : Linear acceleration/deceleration is used.
1 : Bell-shaped acceleration/deceleration is used.

**NOTE**
The bell-shaped acceleration/deceleration option for rigid tapping is required.
NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Bit
DGN On the diagnosis screen:
0 : A rigid tapping synchronization error is displayed. (Nos. 455 to 457)
1 : An error difference between the spindle and tapping axis is displayed. (Nos. 452 and 453)

SPR In rigid tapping, the parameters are:
0 : Not changed on a spindle-by-spindle basis.
1 : Changed on a spindle-by-spindle basis.

NOTE
1 When switching between the rigid tapping parameters on a spindle-by-spindle basis in rigid tapping using the second serial spindle, set this parameter to 1. The following parameters are supported for each spindle:

<table>
<thead>
<tr>
<th>First spindle</th>
<th>Second spindle (2-stage gear)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.5214</td>
<td>No.5215</td>
</tr>
<tr>
<td>No.5221 to No.5224</td>
<td>No.5225, No.5226</td>
</tr>
<tr>
<td>No.5231 to No.5234</td>
<td>No.5235, No.5236</td>
</tr>
<tr>
<td>No.5241 to No.5244</td>
<td>No.5245, No.5246</td>
</tr>
<tr>
<td>No.5261 to No.5264</td>
<td>No.5265, No.5266</td>
</tr>
<tr>
<td>No.5271 to No.5274</td>
<td>No.5335, No.5336</td>
</tr>
<tr>
<td>No.5280</td>
<td>No.5341</td>
</tr>
<tr>
<td>No.5281 to No.5284</td>
<td>No.5342, No.5343</td>
</tr>
<tr>
<td>No.5300, No.5301</td>
<td>No.5302, No.5303</td>
</tr>
<tr>
<td>No.5310 to No.5314</td>
<td>No.5350 to No.5353</td>
</tr>
<tr>
<td>No.5321 to No.5324</td>
<td>No.5325, No.5326</td>
</tr>
</tbody>
</table>

2 For rigid tapping using the second serial spindle, the multispindle control option is required.
## 5205

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>REF</td>
<td>PKD</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REF</td>
<td></td>
<td>NRV</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RCK</td>
</tr>
</tbody>
</table>

### [Data type] Bit

**RCK**
In rigid tapping, an excessive error during movement/at stop is:
- 0: Checked regardless of whether mode is cutting (tapping) or rapid traverse.
- 1: Checked only in cutting (tapping) mode.

**NRV**
For the rigid tapping function, the spindle returns back from the bottom of a hole with:
- 0: Rotating opposite to the drilling direction
- 1: Rotating in the drilling direction (special purpose)

### CAUTION
This parameter is intended for special uses only. When rigid tapping is performed, therefore, this parameter must not be set. If rigid tapping is performed with this parameter set, a tapping tool, workpiece, or machine may be damaged.

**PKD**
For rigid peck tapping, diagnostic number 457 (maximum rigid tapping synchronization error) indicates:
- 0: A value per tap operation.
- 1: A total value until the hole bottom is reached.

**REF**
Fine acceleration/deceleration during rigid tapping is:
- 0: Disabled.
- 1: Enabled.
To use the spindle fine acceleration/deceleration (FAD) function, set 1.

### NOTE
When fine acceleration/deceleration is used, fine acceleration/deceleration settings for the spindle and servo system must be made in addition to the setting of this parameter.

## 5210

<table>
<thead>
<tr>
<th>Rigid tapping mode specification M code</th>
</tr>
</thead>
</table>

### [Data type] Byte
### [Valid data range] 0 to 255

This parameter sets an M code that specifies the rigid tapping mode.

### NOTE
1. A setting value of 0 is assumed to be 29 (M29).
2. To use an M code whose number is greater than 256, Specify the code number with parameter No.5212.
5211  Override value during rigid tapping extraction

[Data type] Byte
[Unit of data] 1 % or 10 %
[Valid data range] 0 to 200

The parameter sets the override value during rigid tapping extraction.

NOTE
The override value is valid when DOV in parameter No.5200 #4 is "1".
When OVU (bit 3 of parameter No.5201) is 1, the unit of set data is 10%. An override of up to 200% can be applied to extraction.

5212  M code that specifies a rigid tapping mode

[Data type] 2-word
[Unit of data] Integer
[Valid data range] 0 to 65535

This parameter sets the M code that specifies the rigid tapping mode. The M code that specifies the rigid tapping mode is usually set by parameter 5210. To use an M code whose number is greater than 256, specify the code number with parameter 5212.

NOTE
If the setting of this parameter is 0, the M code specifying the rigid tapping mode is determined by the setting of parameter 5210. Otherwise, it is determined by the setting of parameter 5212. The setting of parameter 5212 must always be within the above valid range.

5213  Return or clearance in peck tapping cycle

[Data type] Word
[Unit of data]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>0.01</td>
<td>0.001</td>
<td>0.001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch input</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.0001</td>
<td>inch</td>
</tr>
</tbody>
</table>

[Valid data range] 0 to 32767

This parameter sets the return or clearance in the peck tapping cycle.
5214 Setting of an allowable rigid tapping synchronization error range

5215 Setting of an allowable rigid tapping synchronization error range for the second spindle

[Data type] Word
[Unit of data] Detection unit (1/4096rev)
[Valid data range] 0 to 32767

Each of these parameters is used to set an allowable synchronization error range between a spindle used for rigid tapping and the tapping axis. If the value set with each parameter is exceeded, rigid tapping alarm No.741 (excessive error during movement) is issued. When 0 is set, a synchronization error check is not made.

**NOTE**

When rigid tapping is performed using the second spindle
- When the SPR parameter (bit 1 of parameter No.5204) is set to 0, the setting of parameter No.5214 is applied to the second spindle, as well as to the first spindle.
- When the SPR parameter (bit 1 of parameter No.5204) is set to 1, the settings of parameter No.5215 is applied to the second spindle.
### Description of Parameters B-64120EN/01

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5221</td>
<td>Number of spindle gear teeth (first-stage gear)</td>
</tr>
<tr>
<td>5222</td>
<td>Number of spindle gear teeth (second-stage gear)</td>
</tr>
<tr>
<td>5223</td>
<td>Number of spindle gear teeth (third-stage gear)</td>
</tr>
<tr>
<td>5224</td>
<td>Number of spindle gear teeth (fourth-stage gear)</td>
</tr>
<tr>
<td>5225</td>
<td>Number of second spindle gear teeth (first-stage gear)</td>
</tr>
<tr>
<td>5226</td>
<td>Number of second spindle gear teeth (second-stage gear)</td>
</tr>
</tbody>
</table>

**Data type:** Word  
**Valid data range:** 1 to 32767

When an arbitrary gear ratio is used in rigid tapping, each of these parameters sets the number of teeth of each spindle gear.

**NOTE**

1. These parameters are enabled when the VGR parameter (bit 1 of parameter No.5200) is set to 1.
2. When a position coder is attached to the spindle, set the same value for all of parameters No.5221 through No.5224.
3. When the DMR function of the position coder signal is used with a serial spindle, set the VGR parameter (bit 1 of parameter No.5200) to 0, and set these parameters to 0.
4. When rigid tapping is performed using the second spindle
   - When the SPR parameter (bit 1 of parameter No.5204) is set to 0, the settings of parameters No.5221 and No.5222 are applied to the second spindle, as well as to the first spindle.
   - When the SPR parameter (bit 1 of parameter No.5204) is set to 1, the settings of parameters No.5225 and No.5226 are applied to the second spindle.
When an arbitrary gear ratio is used in rigid tapping, each of these parameters sets the number of teeth of each position coder gear.

**NOTE**

1. These parameters are enabled when the VGR parameter (bit 1 of parameter No.5200) is set to 1. When a position coder is attached to the spindle, set the same value for all of parameters No.5231 through No.5234.

   When a spindle motor with a built-in position coder is used, a position coder with a resolution of 2048 pulses/rev may be used. In such a case, set the actual number of teeth, multiplied by 2 (for conversion to 4096 pulses/rev).

2. When the DMR function of the position coder signal is used with a serial spindle, set the VGR parameter (bit 1 of parameter No.5200) to 0, and set these parameters to 0.

3. When rigid tapping is performed using the second spindle
   - When the SPR parameter (bit 1 of parameter No.5204) is set to 0, the settings of parameters No.5231 and No.5232 are applied to the second spindle, as well as to the first spindle.
   - When the SPR parameter (bit 1 of parameter No.5204) is set to 1, the settings of parameters No.5235 and No.5236 are applied to the second spindle.
### Description of Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5241</td>
<td>Maximum spindle speed in rigid tapping (first-stage gear)</td>
</tr>
<tr>
<td>5242</td>
<td>Maximum spindle speed in rigid tapping (second-stage gear)</td>
</tr>
<tr>
<td>5243</td>
<td>Maximum spindle speed in rigid tapping (third-stage gear)</td>
</tr>
<tr>
<td>5244</td>
<td>Maximum spindle speed in rigid tapping (fourth-stage gear)</td>
</tr>
<tr>
<td>5245</td>
<td>Maximum spindle speed in rigid tapping using the second spindle (first-stage gear)</td>
</tr>
<tr>
<td>5246</td>
<td>Maximum spindle speed in rigid tapping using the second spindle (second-stage gear)</td>
</tr>
</tbody>
</table>

**[Data type]** 2-word  
**[Unit of data]** min⁻¹  
**[Valid data range]** The setting range is determined according to the spindle to position coder gear ratio as follows:

<table>
<thead>
<tr>
<th>Spindle : Position coder</th>
<th>Setting range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 : 1</td>
<td>0 to 7400</td>
</tr>
<tr>
<td>1 : 2</td>
<td>0 to 9999</td>
</tr>
<tr>
<td>1 : 4</td>
<td>0 to 9999</td>
</tr>
<tr>
<td>1 : 8</td>
<td>0 to 9999</td>
</tr>
</tbody>
</table>

Each of these parameters is used to set a maximum spindle speed for each gear in rigid tapping.

### Note

1. For the M series, set the same value for both parameter No.5241 and parameter No.5243 for a one-stage gear system. For a two-stage gear system, set the value specified for parameter No. 5241 or 5242, whichever is greater, for parameter No. 5243. Otherwise, P/S alarm No.200 will be issued.

2. When rigid tapping is performed using the second spindle
   - When the SPR parameter (bit 1 of parameter No.5204) is set to 0, the settings of parameters No.5241 and No.5242 are applied to the second spindle, as well as to the first spindle.
   - When the SPR parameter (bit 1 of parameter No.5204) is set to 1, the settings of parameters No.5245 and No.5246 are applied to the second spindle.
### 4.DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5261</td>
<td>Linear acceleration/deceleration time constant for the spindle and tapping axis (first-stage gear)</td>
</tr>
<tr>
<td>5262</td>
<td>Linear acceleration/deceleration time constant for the spindle and tapping axis (second-stage gear)</td>
</tr>
<tr>
<td>5263</td>
<td>Linear acceleration/deceleration time constant for the spindle and tapping axis (third-stage gear)</td>
</tr>
<tr>
<td>5264</td>
<td>Linear acceleration/deceleration time constant for the spindle and tapping axis (fourth-stage gear)</td>
</tr>
<tr>
<td>5265</td>
<td>Linear acceleration/deceleration time constant for the second spindle and tapping axis (first-stage gear)</td>
</tr>
<tr>
<td>5266</td>
<td>Linear acceleration/deceleration time constant for the second spindle and tapping axis (second-stage gear)</td>
</tr>
</tbody>
</table>

- **Data type**: Word
- **Unit of data**: ms
- **Valid data range**: 0 to 4000

Each of these parameters is used to set a linear acceleration/deceleration time constant for the spindle of each gear and the tapping axis in rigid tapping. Set the period required to reach each maximum spindle speed (parameters No.5241 through No.5248). The set time constant, multiplied by the ratio of a specified S value to a maximum spindle speed, is actually used as a time constant.

### NOTE

When rigid tapping is performed using the second spindle:
- When the SPR parameter (bit 1 of parameter No.5204) is set to 0, the settings of parameters No.5261 and No.5262 are applied to the second spindle, as well as to the first spindle.
- When the SPR parameter (bit 1 of parameter No.5204) is set to 1, the settings of parameters No.5265 and No.5266 are applied to the second spindle.
4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5271</td>
<td>Time constant for the spindle and tapping axis in extraction operation (first-stage gear)</td>
</tr>
<tr>
<td>5272</td>
<td>Time constant for the spindle and tapping axis in extraction operation (second-stage gear)</td>
</tr>
<tr>
<td>5273</td>
<td>Time constant for the spindle and tapping axis in extraction operation (third-stage gear)</td>
</tr>
<tr>
<td>5274</td>
<td>Time constant for the spindle and tapping axis in extraction operation (fourth-stage gear)</td>
</tr>
</tbody>
</table>

- **Data type:** Word
- **Unit of data:** ms
- **Valid data range:** 0 to 4000

Each of these parameters is used to set a linear acceleration/deceleration time constant for the spindle of each gear and tapping axis in extraction operation during rigid tapping.

**NOTE**

1. These parameters are enabled when the TDR parameter (bit 2 of parameter No.5201) is set to 1.
2. When rigid tapping is performed using the second spindle
   - When the SPR parameter (bit 1 of parameter No.5204) is set to 0, the settings of parameters No.5271 and No.5272 are applied to the second spindle, as well as to the first spindle.
   - When the SPR parameter (bit 1 of parameter No.5204) is set to 1, the settings of parameters No.5335 and No.5336 are applied to the second spindle.
4.DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5280</td>
<td>Position control loop gain for the spindle and tapping axis in rigid tapping (common to all gears)</td>
</tr>
<tr>
<td>5281</td>
<td>Position control loop gain for the spindle and tapping axis in rigid tapping (first-stage gear)</td>
</tr>
<tr>
<td>5282</td>
<td>Position control loop gain for the spindle and tapping axis in rigid tapping (second-stage gear)</td>
</tr>
<tr>
<td>5283</td>
<td>Position control loop gain for the spindle and tapping axis in rigid tapping (third-stage gear)</td>
</tr>
<tr>
<td>5284</td>
<td>Position control loop gain for the spindle and tapping axis in rigid tapping (fourth-stage gear)</td>
</tr>
</tbody>
</table>

NOTE

Once these parameters have been set, the power must be turned off then back on for the settings to become effective.

[Data type] Word
[Unit of data] 0.01 s\(^{-1}\)
[Valid data range] 1 to 9999

Each of these parameters is used to set a position control loop gain for the spindle and tapping axis in rigid tapping. These parameters significantly affect the precision of threading. Conduct cutting tests, and make adjustments to obtain an optimum value.

When performing threading with an analog spindle, also adjust the loop gain multipliers (parameter Nos. 5291 to 5294).

NOTE

1. To use a varied loop gain on a gear-by-gear basis, set parameter No.5280 to 0, and set a loop gain for each gear in parameters No.5281 through No.5284. The specification of a loop gain on a gear-by-gear basis is disabled if parameter No.5280 is set to a value other than 0. In such a case, the value set in parameter No.5280 is used as a loop gain that is common to all the gears.

2. When rigid tapping is performed using the second spindle
   - When the SPR parameter (bit 1 of parameter No.5204) is set to 0, the setting of parameter No.5280 or the settings of parameters No.5281 and No.5282 are applied to the second spindle, as well as to the first spindle.
   - When the SPR parameter (bit 1 of parameter No.5204) is set to 1, the settings of parameters No.5341 through No.5343 are applied to the second spindle.
Spindle loop gain multiplier in the rigid tapping mode (for gear 1)
Spindle loop gain multiplier in the rigid tapping mode (for gear 2)
Spindle loop gain multiplier in the rigid tapping mode (for gear 3)
Spindle loop gain multiplier in the rigid tapping mode (for gear 4)

[Data type] Word type
[Valid data range] 0 to 32767

Set the spindle loop gain multipliers for gears 1 to 4 in the rigid tapping mode. The thread precision depends on the multipliers. Conduct cutting tests, and make fine adjustments to obtain an optimum value.

**NOTE**
These parameters are used for analog spindles.

Loop gain multiplier = 2048 \times E/L \times \alpha \times 1000

where;
E : Voltage in the velocity command at 1000 min\(^{-1}\)
L : Rotation angle of the spindle per one rotation of the spindle motor
\alpha : Unit used for the detection

Examples

When the spindle motor, spindle, and position coder are connected as shown left, let the variables be as follows:

E = 1.667 (V) (A motor speed of 6000 min\(^{-1}\) corresponds to 10 V.)
L = 360\(^\circ\) (One rotation of the spindle corresponds to one rotation of the spindle motor.)
\alpha = \frac{La}{4096} = \frac{720\(^\circ\)}{4096} = 0.17578
La = 720\(^\circ\) (= 360\(^\circ\) \times 2. One rotation of the position coder corresponds to two rotations of the spindle.)

4096 = The number of detected pulses per rotation of the position coder

Gear ratio between the spindle and the position coder
1:1 0.08789 degrees
1:2 0.17578 degrees
1:4 0.35156 degrees
1:8 0.70313 degrees

According to above ratio the loop gain multiplier is calculated as
2048 \times 1.667/360 \times 0.17578 \times 1000 = 1667

\* When the position coder which is built in a spindle motor sends 512 pulses per rotation, the unit used for the detection, \alpha, is \frac{La}{2048}.

Fig.4.23 (b) Connection among the spindle motor, spindle, and position coder
### 4.DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Data Type</th>
<th>Unit of Data</th>
<th>Valid Data Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>5300</td>
<td>Tapping axis in-position width in rigid tapping</td>
<td>Word</td>
<td>Detection unit</td>
<td>0 to 32767</td>
</tr>
<tr>
<td>5301</td>
<td>Spindle in-position width in rigid tapping</td>
<td>Word</td>
<td>Detection unit</td>
<td>0 to 32767</td>
</tr>
</tbody>
</table>

These parameters are used to set tapping axis and spindle in-position widths in rigid tapping.

**NOTE**

1. If an excessively large value is specified, the threading precision will deteriorate.
2. When rigid tapping is performed using the second spindle
   - When the SPR parameter (bit 1 of parameter No.5204) is set to 0, the settings of parameter No.5300 and No.5301 are applied to the second spindle, as well as to the first spindle.
   - When the SPR parameter (bit 1 of parameter No.5204) is set to 1, the settings of parameters No.5302 and No.5303 are applied to the second spindle.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Data Type</th>
<th>Unit of Data</th>
<th>Valid Data Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>5302</td>
<td>Tapping axis in-position width in rigid tapping using the second spindle</td>
<td>Word</td>
<td>Detection unit</td>
<td>0 to 32767</td>
</tr>
<tr>
<td>5303</td>
<td>Spindle in-position width in rigid tapping using the second spindle</td>
<td>Word</td>
<td>Detection unit</td>
<td>0 to 32767</td>
</tr>
</tbody>
</table>

These parameters are used to set spindle and tapping axis in-position widths in rigid tapping using the second spindle.

**NOTE**

These parameters are enabled when the SPR parameter (bit 1 of parameter No.5204) is set to 1.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Data Type</th>
<th>Unit of Data</th>
<th>Valid Data Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>5308</td>
<td>In-position width at point R in rigid tapping (tapping axis)</td>
<td>Word</td>
<td>Detection unit</td>
<td>0 to 32767</td>
</tr>
</tbody>
</table>

This parameter is used to set the tapping axis in-position width at point R in rigid tapping.
5310 Positional deviation limit imposed during tapping axis movement in rigid tapping

<table>
<thead>
<tr>
<th>Data type</th>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of data</td>
<td>Detection unit</td>
</tr>
<tr>
<td>Valid data range</td>
<td>1 to 32767</td>
</tr>
</tbody>
</table>

This parameter is used to set a positional deviation limit during tapping axis movement in rigid tapping. A value that falls outside the valid data range, described above, can be specified in parameter No.5314.

**NOTE**
1. When a high-resolution detector is used, the unit must be multiplied by 10.
2. When rigid tapping is performed using the second spindle
   - When the SPR parameter (bit 1 of parameter No.5204) is set to 0, the setting of parameter No.5310 (or No.5314) is applied to the second spindle, as well as to the first spindle.
   - When the SPR parameter (bit 1 of parameter No.5204) is set to 1, the setting of parameter No.5350 is applied to the second spindle, respectively.

5311 Limit value of spindle positioning deviation during movement in rigid tapping.

<table>
<thead>
<tr>
<th>Data type</th>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of data</td>
<td>Detection unit</td>
</tr>
<tr>
<td>Valid data range</td>
<td>1 to 32767</td>
</tr>
</tbody>
</table>

This parameter sets the limit value of a spindle positioning deviation during movement in rigid tapping.

\[
\text{Limit value} = \frac{S \times 360 \times 100 \times 1.5}{60 \times G \times \alpha}
\]

where
- \( S \) : Maximum spindle speed in rigid tapping
  (Setting value of parameter Nos. 5241 and greater)
- \( G \) : Loop gain of rigid tapping axis
  (Setting value of parameter Nos. 5280 and greater)
- \( \alpha \) : Detection unit
Calculation example

\[
\begin{align*}
S &= 3600 \\
G &= 3000 \\
L &= 360 \text{ degrees (One spindle rotation per spindle motor rotation)} \\
a &= \frac{L}{4096} \\
&= 720 \text{ degrees}/4096 \\
&= 0.17578 \text{ degrees} \\
\La &= 720 \text{ degrees} \\
&= \text{Detection pulse per position coder rotation} \\
&= \frac{360 \times 360 \times 100 \times 1.5}{60 \times 3000 \times 0.17578} \\
&= 6144
\end{align*}
\]

Fig.4.23 (c) Connection Among Spindle Motor, Spindle and Position Coder

**NOTE**

1. The detection unit is \( a = \frac{\La}{2048} \) when the position coder built-in spindle motor uses a position coder of 512 pulses per revolution.

2. When rigid tapping is performed using the second spindle
   - When the SPR parameter (bit 1 of parameter No.5204) is set to 0, the setting of parameter No.5311 is applied to the second spindle, as well as to the first spindle.
   - When the SPR parameter (bit 1 of parameter No.5204) is set to 1, the setting of parameter No.5351 is applied to the second spindle, respectively.

5312 Positional deviation limit imposed while the tapping axis is stopped in rigid tapping

- [Data type] Word
- [Unit of data] Detection unit
- [Valid data range] 1 to 32767

This parameter is used to set a positional deviation limit imposed while the tapping axis is stopped in rigid tapping.
NOTE
When rigid tapping is performed using the second spindle

- When the SPR parameter (bit 1 of parameter No.5204) is set to 0, the setting of parameter No.5312 is applied to the second spindle, as well as to the first spindle.
- When the SPR parameter (bit 1 of parameter No.5204) is set to 1, the setting of parameter No.5352 is applied to the second spindle, respectively.

5313
Positional deviation limit imposed while the spindle is stopped in rigid tapping

[Data type] Word
[Unit of data] Detection unit
[Valid data range] 1 to 32767

This parameter is used to set a positional deviation limit imposed while the spindle is stopped in rigid tapping.

NOTE
When rigid tapping is performed using the second spindle

- When the SPR parameter (bit 1 of parameter No.5204) is set to 0, the setting of parameter No.5313 is applied to the second spindle, as well as to the first spindle.
- When the SPR parameter (bit 1 of parameter No.5204) is set to 1, the setting of parameter No.5353 is applied to the second spindle, respectively.

5314
Positional deviation limit imposed during tapping axis movement in rigid tapping

[Data type] 2-word
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

Usually, parameter No.5310 is used to set a positional deviation limit imposed during tapping axis movement in rigid tapping. However, parameter No.5314 can be used to set a value greater than the valid data range of parameter No.5310 because of the resolution of the detector being used.
NOTE
1 When parameter No.5314 is set to 0, the setting of parameter No.5310 is used. When parameter No.5314 is set to a value other than 0, parameter No.5310 is disabled; in this case, the setting of parameter No.5314 is used.
2 When rigid tapping is performed using the second spindle
   - When the SPR parameter (bit 1 of parameter No.5204) is set to 0, the setting of parameter No.5314 (or No.5310) is applied to the second spindle, as well as to the first spindle.
   - When the SPR parameter (bit 1 of parameter No.5204) is set to 1, the setting of parameter No.5350 is applied to the second spindle, respectively.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5321</td>
<td>Spindle backlash in rigid tapping (first-stage gear)</td>
</tr>
<tr>
<td></td>
<td>Spindle backlash in rigid tapping</td>
</tr>
<tr>
<td>5322</td>
<td>Spindle backlash in rigid tapping (second-stage gear)</td>
</tr>
<tr>
<td>5323</td>
<td>Spindle backlash in rigid tapping (third-stage gear)</td>
</tr>
<tr>
<td>5324</td>
<td>Spindle backlash in rigid tapping (fourth-stage gear)</td>
</tr>
<tr>
<td>5325</td>
<td>Spindle backlash in rigid tapping using the second spindle (first-stage gear)</td>
</tr>
<tr>
<td>5326</td>
<td>Spindle backlash in rigid tapping using the second spindle (second-stage gear)</td>
</tr>
</tbody>
</table>

[Data type] Byte
[Unit of data] Detection unit
[Valid data range] 0 to 127

Each of these parameters is used to set a spindle backlash.
When rigid tapping is performed using the second spindle:

- When the SPR parameter (bit 1 of parameter No.5204) is set to 1, the settings of parameters No.5325 and No.5326 are applied to the second spindle.
- When the SPR parameter (bit 1 of parameter No.5204) is set to 0, the settings of parameters No.5321 and No.5322 are applied to the second spindle, as well as to the first spindle.

| 5335 | Time constant for the spindle and tapping axis in second spindle extraction operation (first-stage gear) |
| 5336 | Time constant for the spindle and tapping axis in second spindle extraction operation (second-stage gear) |

[Data type] Word  
[Unit of data] ms  
[Valid data range] 0 to 4000

Each of these parameters is used to set a linear acceleration/deceleration time constant for the spindle and tapping axis in extraction operation during rigid tapping on a gear-by-gear basis.

NOTE
This parameter is enabled when both the TDR parameter (bit 2 of parameter No.5201) and the SPR parameter (bit 1 of parameter No.5204) are set to 1.
Position control loop gain for the spindle and tapping axis in rigid tapping using the second spindle (common to all the gears)

Position control loop gain for the spindle and tapping axis in rigid tapping using the second spindle (first-stage gear)

Position control loop gain for the spindle and tapping axis in rigid tapping using the second spindle (second-stage gear)

NOTE
After these parameters have been set, the power must be turned off then back on for the settings to become effective.

[Data type] Word
[Unit of data] 0.01 s⁻¹
[Valid data range] 1 to 9999

Each of these parameters is used to set a position control loop gain for the spindle and tapping axis in rigid tapping using the second spindle.

NOTE
1. To use a varied loop gain on a gear-by-gear basis, set parameter No.5341 to 0, and set a loop gain for each gear in parameters No.5342 and No.5343.
2. This parameter is enabled when the SPR parameter (bit 1 of parameter No.5204) is set to 1.

Positional deviation limit imposed during tapping axis movement in rigid tapping using the second spindle

[Data type] 2-word
[Unit of data] Detection unit
[Valid data range] 1 to 99999999

This parameter sets a positional deviation limit imposed during tapping axis movement in rigid tapping using the second spindle.

NOTE
This parameter is enabled when the SPR parameter (bit 1 of parameter No.5204) is set to 1.
### Positional deviation limit imposed during spindle movement in rigid tapping using the second spindle

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Data Type</th>
<th>Unit of Data</th>
<th>Valid Data Range</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>5351</td>
<td>Positional deviation limit imposed during spindle movement in rigid tapping using the second spindle</td>
<td>Word</td>
<td>Detection unit</td>
<td>1 to 32767</td>
<td>This parameter is used to set a positional deviation limit imposed during spindle movement in rigid tapping using the second spindle.</td>
</tr>
</tbody>
</table>

**NOTE**
This parameter is enabled when the SPR parameter (bit 1 of parameter No.5204) is set to 1.

### Positional deviation limit imposed while the tapping axis is stopped in rigid tapping using the second spindle

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Data Type</th>
<th>Unit of Data</th>
<th>Valid Data Range</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>5352</td>
<td>Positional deviation limit imposed while the tapping axis is stopped in rigid tapping using the second spindle</td>
<td>Word</td>
<td>Detection unit</td>
<td>1 to 32767</td>
<td>This parameter is used to set a positional deviation limit imposed while the tapping axis is stopped in rigid tapping using the second spindle.</td>
</tr>
</tbody>
</table>

**NOTE**
This parameter is enabled when the SPR parameter (bit 1 of parameter No.5204) is set to 1.

### Positional deviation limit imposed while the spindle is stopped in rigid tapping using the second spindle

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Data Type</th>
<th>Unit of Data</th>
<th>Valid Data Range</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>5353</td>
<td>Positional deviation limit imposed while the spindle is stopped in rigid tapping using the second spindle</td>
<td>Word</td>
<td>Detection unit</td>
<td>1 to 32767</td>
<td>This parameter is used to set a positional deviation limit imposed while the spindle is stopped in rigid tapping using the second spindle.</td>
</tr>
</tbody>
</table>

**NOTE**
This parameter is enabled when the SPR parameter (bit 1 of parameter No.5204) is set to 1.
### 4.DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Data Type</th>
<th>Unit</th>
<th>Valid Data Range</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>5365</td>
<td>Bell-shaped acceleration/deceleration time constant for the first spindle in rigid tapping (first-stage gear)</td>
<td>Word</td>
<td>msec</td>
<td>0 to 512</td>
<td>These parameters are used to set bell-shaped acceleration/deceleration time constants for the first spindle in rigid tapping.</td>
</tr>
<tr>
<td>5366</td>
<td>Bell-shaped acceleration/deceleration time constant for the first spindle in rigid tapping (second-stage gear)</td>
<td>Word</td>
<td>msec</td>
<td>0 to 512</td>
<td></td>
</tr>
<tr>
<td>5367</td>
<td>Bell-shaped acceleration/deceleration time constant for the first spindle in rigid tapping (third-stage gear)</td>
<td>Word</td>
<td>msec</td>
<td>0 to 512</td>
<td></td>
</tr>
<tr>
<td>5369</td>
<td>Bell-shaped acceleration/deceleration time constant for the second spindle in rigid tapping (first-stage gear)</td>
<td>Word</td>
<td>msec</td>
<td>0 to 512</td>
<td>These parameters are used to set bell-shaped acceleration/deceleration time constants for the second spindle in rigid tapping.</td>
</tr>
<tr>
<td>5370</td>
<td>Bell-shaped acceleration/deceleration time constant for the second spindle in rigid tapping (second-stage gear)</td>
<td>Word</td>
<td>msec</td>
<td>0 to 512</td>
<td></td>
</tr>
<tr>
<td>5381</td>
<td>Override value during rigid tapping return</td>
<td>Byte</td>
<td>1% or 10%</td>
<td>0 to 200</td>
<td>This parameter is used to set the override value during rigid tapping return. If the setting is 0, no override is applied.</td>
</tr>
</tbody>
</table>

**NOTE**

This parameter is valid when bit 4 (DOV) of parameter No. 5200 is set to 1. If bit 3 (OVU) of parameter No. 5201 is set to 1, 10% is set as the units of data. Thus, an override of up to 2000% can be applied during extraction.
### Amount of return for rigid tapping return

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5382</td>
<td>Amount of return for rigid tapping return</td>
</tr>
</tbody>
</table>

**[Data type]** 2-word  
**[Unit of data]** Input increments  
**[Valid data range]** 0 to 99999999

During rigid tapping return, the tool can be pulled out, along the tapping axis, going beyond the stored rigid tapping start position by the amount specified with this parameter.  
If the tool has already been retracted from rigid tapping, it will be retracted further only by the distance specified in this parameter.
### 4.24 PARAMETERS OF SCALING/COORDINATE ROTATION

<table>
<thead>
<tr>
<th>5400</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SCR</td>
<td>XSC</td>
<td>RCW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RIN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**[Data type]** Bit  
**RIN** Coordinate rotation angle command (R)  
0: Specified by an absolute method  
1: Specified by G90 or G91

**NOTE**  
For the G code system A (T series), this parameter is invalid.

**RCW** When a workpiece or local coordinate system command is issued in coordinate system rotation mode:  
0: No alarm is issued.  
1: An alarm (P/S alarm No. 5302) is issued.

**XSC** Scaling mirror image for each axis in scaling is:  
0: Disabled. (The scaling magnification common to all axes is specified with P.)  
1: Enabled. (The scaling magnification for each axis is specified with I, J, and K.)

**SCR** Scaling magnification unit  
0: 0.00001 times (1/100,000)  
1: 0.001 times

<table>
<thead>
<tr>
<th>5401</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SCLx</td>
</tr>
</tbody>
</table>

**[Data type]** Bit axis  
**SCLx** Scaling  
0: Invalidated  
1: Validated

<table>
<thead>
<tr>
<th>5402</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S8D</td>
<td></td>
</tr>
</tbody>
</table>

**[Data type]** Bit axis  
**S8D** The unit of scaling magnification is:  
0: Dependent on the setting of bit 7 (SCR) of parameter No. 5400.  
1: 0.0000001 (1/10,000,000).
**5410**

Angular displacement used when no angular displacement is specified for coordinate system rotation

The following parameter can be set at "Setting screen".

[Data type] 2-word
[Unit of data] 0.001 degrees
[Valid data range] -360000 to 360000

This parameter sets the angular displacement for coordinate system rotation. When the angular displacement for coordinate system rotation is not specified with address R in the block where G68 is specified, the setting of this parameter is used as the angular displacement for coordinate system rotation.

**5411**

Magnification used when scaling magnification is not specified

The following parameter can be set at "Setting screen".

[Data type] 2-word
[Unit of data] 0.001, 0.00001, or 0.0000001 times (selected by bit 7 (SCR) of parameter No. 5400) or bit 0 (S8D) of parameter No. 5402 (M series))
[Valid data range] 1 to 999999 (when 0.001 or 0.00001 times is selected)
1 to 99999999 (when 0.0000001 times is selected) (M series)

This parameter sets the scaling magnification. This setting value is used when a scaling magnification (P) is not specified in the program.

**NOTE**

Parameter No.5421 becomes valid when scaling for every axis is valid. (XSC, #6 of parameter No.5400 is "1").

**5421**

Scaling magnification for every axis

The following parameter can be set at "Setting screen".

[Data type] 2-word axis
[Unit of data] 0.001, 0.00001, or 0.0000001 times (selected by bit 7 (SCR) of parameter No. 5400) or bit 0 (S8D) of parameter No. 5402 (M series))
[Valid data range] -999999 to -1, 1 to 999999 (when 0.001 or 0.000001 times is selected)
-99999999 to -1, 1 to 99999999 (when 0.0000001 times is selected) (M series)

This parameter sets the scaling magnification for every axis.
4. DESCRIPTION OF PARAMETERS

4.25  PARAMETERS OF UNI-DIRECTIONAL POSITIONING

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MDL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PDI</td>
<td></td>
</tr>
</tbody>
</table>

[Data type]  Bit

**MDL** Specifies whether the G code for single direction positioning (G60) is included in one-shot G codes (00 group) or modal G codes (01 group)
- 0: One-shot G codes (00 group)
- 1: Modal G codes (01 group)

**PDI** When the tool is stopped before or after a specified end point with the unidirectional positioning function:
- 0: No in-position check is performed.
- 1: An in-position check is performed.

![Diagram](attachment:image)

- **Overrun distance**
- **Start point**
- **End point**
- **Stop after overrun**

<table>
<thead>
<tr>
<th>5440</th>
<th>Positioning direction and overrun distance in uni-directional positioning for each axis</th>
</tr>
</thead>
</table>

[Data type]  Word axis

[Unit of data]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>deg</td>
</tr>
</tbody>
</table>

[Valid data range]  -16383 to +16383

This parameter sets the positioning direction and overrun distance in uni-directional positioning (G60) for each axis. The positioning direction is specified using a setting data sign, and the overrun distance using a value set here.

- Overrun distance > 0: The positioning direction is positive (+).
- Overrun distance < 0: The positioning direction is negative (-).
- Overrun distance = 0: Uni-directional positioning is not performed.
Fig. 4.25 Positioning Direction and Overrun distance

Positioning direction (plus)

Overrun distance
4.26 PARAMETERS OF POLAR COORDINATE INTERPOLATION

**PARAMETERS OF POLAR COORDINATE INTERPOLATION**

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AFC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**[Data type]** Bit

**AFC** In polar coordinate interpolation mode, automatic override operation and automatic feedrate clamp operation are:

0 : Not performed.
1 : Performed.

**NOTE**

In polar coordinate interpolation mode, the feedrate component for a rotational axis increases as the tool moves closer to the center of a workpiece. Near the center of a workpiece, the maximum cutting feedrate (parameter No.5462) may be exceeded, causing servo alarm No.411 to be issued. The automatic feedrate override function and automatic feedrate clamp function automatically control the feedrate to prevent the feedrate component on a rotation axis from exceeding a specified maximum cutting feedrate.

<table>
<thead>
<tr>
<th>5460</th>
<th>Axis (linear axis) specification for polar coordinate interpolation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5461</th>
<th>Axis (rotary axis) specification for polar coordinate interpolation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**[Data type]** Byte

**[Valid data range]** 1, 2, 3, ... control axes count

These parameters set control axis numbers of linear and rotary axes to execute polar interpolation.

<table>
<thead>
<tr>
<th>5462</th>
<th>Maximum cutting feedrate during polar coordinate interpolation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**[Data type]** 2-word

**[Unit of data, valid data range]**

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Units of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>IS-A, IS-B</td>
</tr>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>0, 6 to 240000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>0, 6 to 96000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>0, 6 to 240000</td>
</tr>
</tbody>
</table>
This parameter sets the upper limit of the cutting feedrate that is effective during polar coordinate interpolation. If a feedrate greater than the maximum feedrate is specified during polar coordinate interpolation, it is clamped to the feedrate specified by the parameter. When the setting is 0, the feedrate during polar coordinate interpolation is clamped to the maximum cutting feedrate usually specified with parameter 1422.

<table>
<thead>
<tr>
<th>5463</th>
<th>Allowable automatic override percentage in polar coordinate interpolation</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Data type]</td>
<td>Byte</td>
</tr>
<tr>
<td>[Unit of data]</td>
<td>%</td>
</tr>
<tr>
<td>[Valid data range]</td>
<td>0 to 100</td>
</tr>
</tbody>
</table>

This parameter sets an allowable percentage to find an allowable feedrate on a rotation axis in polar coordinate interpolation mode. A maximum cutting feedrate (parameter No.5462), multiplied by the allowable percentage set with this parameter represents an allowable feedrate.

\[
\text{Allowable feedrate on rotation axis} = \frac{\text{maximum cutting feedrate}}{\text{ allowable percentage}}
\]

In polar coordinate interpolation mode, the feedrate component on a rotation axis increases as the tool moves closer to the center of a workpiece. Near the center of a workpiece, the maximum allowable feedrate (parameter No.5462) may be exceeded. To prevent the feedrate component on a rotation axis from exceeding the maximum allowable feedrate in polar coordinate interpolation mode, the following override is automatically applied to the feedrate (automatic override):

\[
\text{Override} = \frac{\text{Allowable feedrate on rotation axis}}{\text{Feedrate component on rotation axis}} \times 100 \text{ (%)}
\]

If the overridden feedrate component for a rotation axis still exceeds the allowable feedrate, the feedrate is clamped to prevent the feedrate component on a rotation axis from exceeding a maximum cutting feedrate (automatic feedrate clamp).

**NOTE**

When 0 is set in this parameter, a specification of 90% is assumed. When a value of 100 or greater is set with this parameter, a specification of 100% is assumed. Before the automatic override function and automatic feedrate clamp function can be used, bit 1 (AFC) of parameter No.5450 must be set to
4.27 PARAMETERS OF NORMAL DIRECTION CONTROL

<table>
<thead>
<tr>
<th><strong>5480</strong></th>
<th>Number of the axis for controlling the normal direction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data type</strong></td>
<td>Byte</td>
</tr>
<tr>
<td><strong>Valid data range</strong></td>
<td>1 to the maximum control axis number</td>
</tr>
<tr>
<td></td>
<td>This parameter sets the control axis number of the axis for controlling the normal direction.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>5481</strong></th>
<th>Rotation feedrate of normal direction control axis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data type</strong></td>
<td>Word</td>
</tr>
<tr>
<td><strong>Unit of data</strong></td>
<td>deg/min</td>
</tr>
<tr>
<td><strong>Valid data range</strong></td>
<td>1 to 15000</td>
</tr>
<tr>
<td></td>
<td>This parameter sets the feedrate of a normal direction control axis that is inserted at the start point of a block during normal direction control.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>5482</strong></th>
<th>Limit value that ignores the rotation insertion of normal direction control axis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data type</strong></td>
<td>2-word</td>
</tr>
<tr>
<td><strong>Unit of data</strong></td>
<td>0.01 0.001 0.0001 deg</td>
</tr>
<tr>
<td><strong>Valid data range</strong></td>
<td>1 to 99999999</td>
</tr>
<tr>
<td></td>
<td>The rotation block of a normal direction control axis is not inserted when the rotation insertion angle calculated during normal direction control does not exceed this setting value. The ignored rotation angle is added to the next rotation insertion angle. The block insertion is then judged.</td>
</tr>
</tbody>
</table>

**NOTE**

1. No rotation block is inserted when 360 or more degrees are set.
2. If 180 or more degrees are set, a rotation block is inserted only when the circular interpolation is 180 or more degrees.
4. DESCRIPTION OF PARAMETERS

5483

Limit value of movement that is executed at the normal direction angle of a preceding block

[Data type] 2-word
[Unit of data]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch input</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
</tbody>
</table>

[Valid data range] 1 to 99999999

This parameter sets the limit value of movement at the normal direction angle of a preceding block.

N1

Programmed path

Tool center path

N2

N3

Movement

For straight line

Block N2 is machined with the tool being normal to block N1 when the movement of N2 in the figure on the left does not exceed the set value.

Fig. 4.27 (a) When the Block Moves Along a Straight Line

N1

N2

Tool center path

N3

Programmed path

Diameter

For arc

Arc N2 is machined with the tool being normal to block N1 when the arc diameter of N2 in the figure on the left does not exceed the setting value. A normal direction axis is not controlled to move in the normal direction according to the arc movement.

Fig. 4.27 (b) When the Block Moves Along on Arc
### 4. DESCRIPTION OF PARAMETERS

#### 5484

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ANM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CTI</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SDC</td>
</tr>
</tbody>
</table>

[Data type] Bit

**SDC**

In normal direction control:

0: A C-axis movement is automatically inserted between blocks so that the C-axis is directed at right angles to the direction of motion at the start point of each block. (After movement on the C-axis, movement (along the X-axis and Y-axis) specified by the block is performed.)

1: If the amount of C-axis movement is smaller than the value set in parameter No.5485, a C-axis movement is not inserted before a block. Instead, it is performed together with movement along the X-axis and Y-axis.

**CTI**

If such an arc that the vector from the center of the arc to a start point rotates in the reverse direction after cutter compensation is specified during normal direction control in the cutter compensation C mode:

0: P/S 041 alarm is issued.

1: The command is executed.

If this parameter is set to 1, and such an arc that the vector from the center of the arc to a start point rotates in the reverse direction after cutter compensation is specified during normal direction control in the cutter compensation C mode (see the tool path from (4) to (5) in the figure below), the tool is controlled so that the tool faces in the direction at right angles to the move direction (programmed path) before cutter compensation (see the tool path from (2) to (3) in the figure below).

Thus, as shown by the programmed path from (4) to (5) in the figure below, the inside of an arc where the radius of the workpiece is smaller than the compensation value of the tool can be cut.
NOTE
When this parameter is set to 1, no interference check is made in cutter compensation C.

ANM
In AI contour control mode, the normal direction control function is:
0: Disabled.
1: Enabled.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Limit imposed on the insertion of a single block for rotation about the normal direction control axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Data type]</td>
<td>2-word</td>
</tr>
<tr>
<td>[Unit of data]</td>
<td></td>
</tr>
<tr>
<td>Input increment</td>
<td>IS-A</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>0.01</td>
</tr>
</tbody>
</table>

[Valid data range] 1 to 99999999
When normal direction control is applied, the amount of movement (rotation angle) on the normal direction control axis (C-axis), calculated so that the C-axis is directed at right angles to the direction of motion at the start point of a block, may be smaller than the value specified in this parameter. In such a case, the C-axis movement is not inserted before the movement (along the X-axis and Y-axis) specified by the block. Instead, the C-axis movement is performed together with the movement specified by the block. If the amount of movement (rotation angle) on the C-axis is greater than or equal to the value specified with this parameter, the C-axis movement is inserted, and the movement specified by the block is made after the completion of the C-axis movement.

NOTE
This parameter is enabled when the SDC parameter (bit 0 of parameter No. 5484) is set to 1. If a value equal to or greater than 180 degrees is specified, a C-axis movement is inserted only when circular interpolation involving a C-axis rotation of 180 degrees or more is performed.
4.28 PARAMETERS OF INDEXING INDEX TABLE

<table>
<thead>
<tr>
<th></th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IDX</td>
<td>SIM</td>
<td>G90</td>
<td>INC</td>
<td>ABS</td>
<td>REL</td>
<td>DDP</td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

**DDP** Selection of decimal-point input method of index table indexing axis
0 : Conventional method (Example IS-B: B1; = 0.001 deg)
1 : Pocket calculator method (Example IS-B: B1; = 1.000 deg)

**REL** Relative position display of index table indexing axis
0 : Not rounded by 360 degrees
1 : Rounded by 360 degrees

**ABS** Displaying absolute coordinate value of index table indexing axis
0 : Not rounded by 360 degrees
The index table indexing axis rotates 720 degrees (two rotations) when G90 B720.0; is specified from the 0-degree position. It rotates in reverse direction 720 degrees (two rotations) when G90 B0.; is specified. The absolute coordinate value then becomes 0 degree.
1 : Rounded by 360 degrees
The index table indexing axis is positioned in 40 degrees when G90 B400.0; is specified from the 0-degree position. The index table indexing axis does not rotate by two or more turns when this parameter is set to 1. It also does not move when G90 B720.0; is specified from the 0-degree position.

**INC** Rotation in the G90 mode when negative-direction rotation command M code (parameter No.5511) is not set
0 : Not set to the shorter way around the circumference
1 : Set to the shorter way around the circumference (Set ABS, #2 of parameter No.5500, to 1.)

**G90** Index table indexing command
0 : Judged to be an absolute/increment command according to the G90/G91 mode
1 : Judged to be an absolute command

**SIM** When the same block includes a command for an index table indexing axis and a command for another controlled axis:
0 : A P/S alarm (No.136) is issued.
1 : The commands are executed. (In a block other than G00, G28, and G30, however, a P/S alarm (No.136) is issued.)

**IDX** Index table indexing sequence
0 : Type A
1 : Type B
The index table index function is:
0 : Enabled.
1 : Disabled.

ISP For the index table axis, an automatic servo-off operation when clamping is completed and an automatic servo-on operation when unclamping is completed are:
0 : Performed.
1 : Not performed.

NOTE
Set ABS, #2 of parameter No.5500, to 1.

This parameter sets the unit of index table indexing angle. A P/S alarm (No.135) generated when movement other than integer multiple of the setting value is specified.

NOTE
If zero is specified as the setting value, any command can be specified irrespective of the unit of angle.
4.29 PARAMETERS OF CUSTOM MACROS

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBV</td>
<td>SBM</td>
<td>HGO</td>
<td>HMC</td>
<td>G67</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBV</td>
<td>SBM</td>
<td>HGO</td>
<td>V15</td>
<td>HMC</td>
<td>G67</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

G67 If the macro continuous-state call cancel command (G67) is specified when the macro continuous-state call mode (G66) is not set:
0 : P/S alarm No.122 is issued.
1 : The specification of G67 is ignored.

HMC A custom macro is executed:
0 : At a normal speed.
1 : At a high speed.

**NOTE**
When this parameter is set, the CNC executes a custom macro first. For this reason, when this parameter is set, performance of the following functions may be degraded:
- Screen display of CNC
- Macro executor (excluding execution macros)
- Embedded Ethernet

V15 As system variable numbers for tool offset:
0 : The standard system variable numbers for the Series 16 are used.
1 : The same system variable numbers as those used for the Series 15 are used.
The tables below indicate the system variables for tool offset numbers 1 to 999. The values for tool offset numbers 1 to 200 can be read from or assigned to the system variables in parentheses.

<table>
<thead>
<tr>
<th>H-Code Geometry offset value</th>
<th>System parameter number</th>
</tr>
</thead>
<tbody>
<tr>
<td>#11001 to #11999 (#2201 to #2400)</td>
<td>V15 = 0</td>
</tr>
<tr>
<td>#10001 to #10999 (#2001 to #2200)</td>
<td>V15 = 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>H-Code Wear offset value</th>
<th>System parameter number</th>
</tr>
</thead>
<tbody>
<tr>
<td>#10001 to #10999 (#2001 to #2200)</td>
<td>V15 = 0</td>
</tr>
<tr>
<td>#11001 to #11999 (#2201 to #2400)</td>
<td>V15 = 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D-Code Geometry offset value</th>
<th>System parameter number</th>
</tr>
</thead>
<tbody>
<tr>
<td>#13001 to #13999</td>
<td>V15 = 0</td>
</tr>
<tr>
<td>#12001 to #12999</td>
<td>V15 = 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D-Code Wear offset value</th>
<th>System parameter number</th>
</tr>
</thead>
<tbody>
<tr>
<td>#12001 to #12999</td>
<td>V15 = 0</td>
</tr>
<tr>
<td>#13001 to #13999</td>
<td>V15 = 1</td>
</tr>
</tbody>
</table>

HGO When a GOTO statement for specifying custom macro control is executed:
0 : A high-speed branch is not caused to 30 sequence numbers, immediately following the point of execution.
1 : A high-speed branch is caused to 30 sequence numbers, immediately before the point of execution.
SBM Custom macro statement
0: Not stop the single block
1: Stops the single block
If you want to disable the single blocks in custom macro statements using system variable #3003, set this parameter to 0. If this parameter is set to 1, the single blocks in custom macro statements cannot be disabled using system variable #3003. To control single blocks in custom macro statements using system variable #3003, use bit 7 (SBV) of parameter No. 6000.

NOTE
1 This bit is invalid when bit 0 (NOP) of parameter No. 3404 is set to 1. (M series)
2 When the block look-ahead operation is enabled, a block look-ahead operation is performed also in single block operation, so macro statements are executed when they are read by the look-ahead operation.
3 In cutter offset C mode, an intersection on the path resulting from offsetting is calculated. So, a block look-ahead operation is performed also in single block operation. To stop a macro statement in single block mode, cancel cutter offset C mode in advance.

SBV Custom macro statement
0: Not stop the single block
1: Stops the single block
To control single blocks in custom macro statements using system variable #3003, use this parameter to enable or disable single blocks in custom macro statements.
This bit is valid when bit 5 (SBM) of parameter No. 6000 is set to 0.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6001</td>
<td>Custom macro interface signals:</td>
</tr>
<tr>
<td>#7</td>
<td>CLV</td>
</tr>
<tr>
<td>#6</td>
<td>CCV</td>
</tr>
<tr>
<td>#5</td>
<td>TCS</td>
</tr>
<tr>
<td>#4</td>
<td>CRO</td>
</tr>
<tr>
<td>#3</td>
<td>PV5</td>
</tr>
<tr>
<td>#2</td>
<td>PRT</td>
</tr>
<tr>
<td>#1</td>
<td>MIF</td>
</tr>
</tbody>
</table>

[Data type] Bit
MIF The system variable numbers of custom macro interface signals are:
0: Not expanded.
1: Expanded.
PRT Reading zero when data is output using a DPRINT command
0: Outputs a space
1: Outputs no data
PV5 Custom macro common variables:
0: Nos. 500 to 599 are output.
1: Nos. 100 to 199 and Nos. 500 to 599 are output.
CRO ISO code in BPRWT or DPRNT command
0: Outputs only LF after data is output
1: Outputs LF and CR after data is output
TCS Subprogram
0: Not called using a T code
1: Called using a T code

CCV  Custom macro's common variables Nos. 100 to 199
0: Cleared to "vacant" by reset
1: Not cleared by reset

CLV  Custom macro's local variables Nos. 1 to 33
0: Cleared to "vacant" by reset
1: Not cleared by reset

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MUS</td>
<td>MCY</td>
<td>MSB</td>
<td>MPR</td>
<td>TSE</td>
<td>MIN</td>
<td>MSK</td>
</tr>
</tbody>
</table>

**NOTE**

When this parameter is set, the power must be turned off before operation is continued.

[Data type] Bit

MSK  Absolute coordinates at that time during custom macro interrupt
0: Not set to the skip coordinates (system variables #5061 and later)
1: Set to the skip coordinates (system variables #5061 and later)

MIN  Custom macro interrupt
0: Performed by interrupting an in-execution block (Custom macro interrupt type I)
1: Performed after an in-execution block is completed (Custom macro interrupt type II)

TSE  Custom macro interrupt signal UINT <G053#3>
0: Edge trigger method (Rising edge)
1: Status trigger method

MPR  Custom macro interrupt valid/invalid M code
0: M96/M97
1: M code set using parameters (Nos. 6033 and 6034)

MSB  Interrupt program
0: Uses a dedicated local variable (Macro-type interrupt)
1: Uses the same local variable as in the main program (Subprogram-type interrupt)

MCY  Custom macro interrupt
0: Not performed during cycle operation
1: Performed during cycle operation

MUS  Interrupt-type custom macro
0: Not used
1: Used
**4. DESCRIPTION OF PARAMETERS**

<table>
<thead>
<tr>
<th></th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>6004</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>D15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MFZ</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NAT</td>
</tr>
</tbody>
</table>

[Data type] Bit

NAT Specification of the results of custom macro functions ATAN
0: The result of ATAN is 0 to 360.0.
1: The result of ATAN is -180 to 0 to 180.0.

MFZ If the angle of a custom macro operation command SIN, COS, or TAN is $1.0 \times 10^{-8}$ or below or if the result of operation is not accurately 0, the operation result is:
0: Handled as underflow.
1: Normalized to 0.

VHD With system variables #5121 through #5128
0: Tool position offset values (geometry offset values) are read.
1: The amount of interrupt shift caused by a manual handle interrupt is read.

D15 When tool compensation memory C is used, for reading or writing tool offset values (for up to offset number 200) for D code (tool radius), the same system variables, #2401 through #2800, as Series 15 are:
0: Not used.
1: Used.

<table>
<thead>
<tr>
<th>Offset number</th>
<th>Geometry offset value</th>
<th>Tool wear compensation value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>#2401</td>
<td>#2601</td>
</tr>
<tr>
<td>2</td>
<td>#2402</td>
<td>#2602</td>
</tr>
<tr>
<td>:</td>
<td>:</td>
<td>:</td>
</tr>
<tr>
<td>200</td>
<td>#2600</td>
<td>#2800</td>
</tr>
</tbody>
</table>

**NOTE**

When the D15 parameter is set to 1, system variables #2500 through #2806, for workpiece reference point offset values, cannot be used. Instead, use system variables #5201 through #5324.
## 4. DESCRIPTION OF PARAMETERS

### 6005

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SQC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ADR</td>
<td>SQC</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**
When this parameter has been set, the power must be turned off before operation is continued.

- **SQC**
  - Calling a subprogram with its sequence number by the subprogram call function is:
    - 0: Disabled.
    - 1: Enabled.

- **ADR**
  - Calling a subprogram with address E by the subprogram call function using a custom macro and macro executor special code is:
    - 0: Disabled.
    - 1: Enabled.
  - Address E can be set for parameters Nos. 6090 and 6091.

### 6006

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MMG</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MMG</td>
<td>MMG</td>
</tr>
</tbody>
</table>

- **MLG**
  - In conditional decision statements in custom macros, logical operations:
    - 0: Cannot be used.
    - 1: Can be used.

- **MMG**
  - With system variables (#4001 to #4022) for reading modal information:
    - 0: Modal information specified in the previous blocks up to the immediately preceding one can be read.
    - 1: Modal information of the currently executed block can be read.
4. DESCRIPTION OF PARAMETERS

**[Data type]** Bit

These parameters are used for input/output with EIA codes. The numeral of a suffix indicates the bit position in a code.

*0 to *7 : Set the hole pattern of an EIA code indicating *.
=0 to =7 : Set the hole pattern of an EIA code indicating =.
#0 to #7 : Set the hole pattern of an EIA code indicating #.
[ 0 to ] 7 : Set the hole pattern of an EIA code indicating [.
] 0 to ] 7 : Set the hole pattern of an EIA code indicating ].
0 : Corresponding bit is 0
1 : Corresponding bit is 1.

**M code that calls the program entered in file**

**[Data type]** 2-word

**[Valid data range]** 0, and 1 to 255

This parameter sets an M code that calls the program entered in a file.

**NOTE**

The M code is judged to be M198 when zero is specified as the setting value.
### 4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6033</td>
<td>M code that validates a custom macro interrupt</td>
</tr>
<tr>
<td>6034</td>
<td>M code that invalidates a custom macro interrupt</td>
</tr>
</tbody>
</table>

**[Data type]** 2-word  
**[Valid data range]** 0 to 255  
These parameters set the custom macro interrupt valid/invalid M codes.

**NOTE**  
These parameters can be used when MPR, #4 of parameter No.6003, is 1. M96 is used as a valid M code and M97 is used as an invalid M code when MPR is 0, irrespective of the state of this parameter.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6050</td>
<td>G code that calls the custom macro of program number 9010</td>
</tr>
<tr>
<td>6051</td>
<td>G code that calls the custom macro of program number 9011</td>
</tr>
<tr>
<td>6052</td>
<td>G code that calls the custom macro of program number 9012</td>
</tr>
<tr>
<td>6053</td>
<td>G code that calls the custom macro of program number 9013</td>
</tr>
<tr>
<td>6054</td>
<td>G code that calls the custom macro of program number 9014</td>
</tr>
<tr>
<td>6055</td>
<td>G code that calls the custom macro of program number 9015</td>
</tr>
<tr>
<td>6056</td>
<td>G code that calls the custom macro of program number 9016</td>
</tr>
<tr>
<td>6057</td>
<td>G code that calls the custom macro of program number 9017</td>
</tr>
<tr>
<td>6058</td>
<td>G code that calls the custom macro of program number 9018</td>
</tr>
<tr>
<td>6059</td>
<td>G code that calls the custom macro of program number 9019</td>
</tr>
</tbody>
</table>

**[Data type]** Word  
**[Valid data range]** 1 to 9999  
These parameters set the G codes that call the custom macros of program numbers 9010 through 9019.

**NOTE**  
Setting value 0 is invalid. No custom macro can be called by G00.
These parameters set the M codes that call the subprograms of program numbers 9001 through 9009.

**NOTE**

Setting value 0 is invalid. No subprogram can be called by M00.
### 4.DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6080</td>
<td>M code that calls the custom macro of program number 9020</td>
</tr>
<tr>
<td>6081</td>
<td>M code that calls the custom macro of program number 9021</td>
</tr>
<tr>
<td>6082</td>
<td>M code that calls the custom macro of program number 9022</td>
</tr>
<tr>
<td>6083</td>
<td>M code that calls the custom macro of program number 9023</td>
</tr>
<tr>
<td>6084</td>
<td>M code that calls the custom macro of program number 9024</td>
</tr>
<tr>
<td>6085</td>
<td>M code that calls the custom macro of program number 9025</td>
</tr>
<tr>
<td>6086</td>
<td>M code that calls the custom macro of program number 9026</td>
</tr>
<tr>
<td>6087</td>
<td>M code that calls the custom macro of program number 9027</td>
</tr>
<tr>
<td>6088</td>
<td>M code that calls the custom macro of program number 9028</td>
</tr>
<tr>
<td>6089</td>
<td>M code that calls the custom macro of program number 9029</td>
</tr>
</tbody>
</table>

**Data type**: 2-word  
**Valid data range**: 1 to 99999999  
These parameters set the M codes that call the custom macros of program numbers 9020 through 9029.

**NOTE**  
Setting value 0 is invalid. No custom macro can be called by M00.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6090</td>
<td>ASCII code that calls the subprogram of program number 9004</td>
</tr>
<tr>
<td>6091</td>
<td>ASCII code that calls the subprogram of program number 9005</td>
</tr>
</tbody>
</table>

**NOTE**  
When this parameter is set, the power must be turned off before operation is continued.

**Data type**: Byte  
**Valid data range**: 65 (A:41H) to 90 (Z:5AH)  
These parameters set the ASCII codes that call subprograms in decimal.  
Addresses that can be used are as follows:  

**NOTE**  
Set 0 when no subprogram is called
### 4.30  PARAMETERS OF PATTERN DATA INPUT

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6101</td>
<td>First variable number displayed on pattern data screen 1</td>
</tr>
<tr>
<td>6102</td>
<td>First variable number displayed on pattern data screen 2</td>
</tr>
<tr>
<td>6103</td>
<td>First variable number displayed on pattern data screen 3</td>
</tr>
<tr>
<td>6104</td>
<td>First variable number displayed on pattern data screen 4</td>
</tr>
<tr>
<td>6105</td>
<td>First variable number displayed on pattern data screen 5</td>
</tr>
<tr>
<td>6106</td>
<td>First variable number displayed on pattern data screen 6</td>
</tr>
<tr>
<td>6107</td>
<td>First variable number displayed on pattern data screen 7</td>
</tr>
<tr>
<td>6108</td>
<td>First variable number displayed on pattern data screen 8</td>
</tr>
<tr>
<td>6109</td>
<td>First variable number displayed on pattern data screen 9</td>
</tr>
<tr>
<td>6110</td>
<td>First variable number displayed on pattern data screen 10</td>
</tr>
</tbody>
</table>

**[Data type]**  Word  

**[Valid data range]**  0, 100 to 199, 500 to 999  

These parameters specify the first variable number displayed on the pattern data screen selected from the pattern menu screen. When 0 is set, 500 is assumed.
### 4.31 PARAMETERS OF SKIP FUNCTION

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKF</td>
<td>SRE</td>
<td>SLS</td>
<td>HSS</td>
<td>MIT</td>
<td>SK0</td>
<td>GSK</td>
<td></td>
</tr>
</tbody>
</table>

#### 6200

<table>
<thead>
<tr>
<th>[Data type]</th>
<th>Bit</th>
</tr>
</thead>
</table>

**GSK** In skip cutting (G31), the skip signal SKIPP <G006#6> is:
- 0: Not used as a skip signal.
- 1: Used as a skip signal.

**SK0** This parameter specifies whether the skip signal is made valid under the state of the skip signal SKIP <X004#7> and the multistage skip signals <X004#0-7> (for the T series only).
- 0: Skip signal is valid when these signals are 1.
- 1: Skip signal is valid when these signals are 0.

**MIT** In skip cutting (G31), the tool compensation measurement value direct input B signals +MIT1, -MIT1, +MIT2, and -MIT2 <X004#2-5> are:
- 0: Not used as skip signals.
- 1: Used as skip signals.

**HSS** 0: The skip function does not use high-speed skip signals.
- 1: The skip function uses high-speed skip signals.

**SLS** 0: The multi-step skip function does not use high-speed skip signals while skip signals are input.
- 1: The multi-step skip function uses high-speed skip signals while skip signals are input.

**SRE** When a high-speed skip signal is used:
- 0: The signal is considered to be input at the rising edge (0#1).
- 1: The signal is considered to be input at the falling edge (1#0).

**SKF** Dry run, override, and automatic acceleration/deceleration for G31 skip command
- 0: Disabled
- 1: Enabled

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPE</td>
<td>IGX</td>
<td>TSA</td>
<td>TSE</td>
<td>SEB</td>
<td>SEA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>[Data type]</th>
<th>Bit</th>
</tr>
</thead>
</table>

**SEA** When a high-speed skip signal goes on while the skip function is used, acceleration/deceleration and servo delay are:
- 0: Ignored.
- 1: Considered and compensated (type A).

**SEB** When a high-speed skip signal goes on while the skip function is used, acceleration/deceleration and servo delay are:
- 0: Ignored.
- 1: Considered and compensated (type B).
NOTE

There are two types of compensation: Types A and B. With the skip function, the current position is stored in the CNC according to the skip signal. However, the current position stored in the CNC contains servo delay. The machine position is therefore deviated by the servo delay. The deviation can be obtained from the position deviation of the servo and the error generated due to feedrate acceleration/deceleration performed by the CNC. If the deviation can be compensated, it is not necessary to include the servo delay in measurement errors. The deviation can be compensated with the following two types by the parameter as follows:

1) Type A: The deviation is the value calculated from the cutting time constant and servo time constant (loop gain).
2) Type B: The deviation is the error due to acceleration/deceleration and the position deviation when the skip signal goes on.

TSE When the torque limit skip function (G31 P99/98) is used, the skip position held in a system variable is:
0: Position that is offset considering the delay (positional deviation) incurred by the servo system.
1: Position that does not reflect the delay incurred by the servo system.

NOTE

The torque limit skip function stores the current position in the CNC when the torque limit arrival signal is turned on. However, the current position in the CNC includes a servo system delay, so that the position is shifted from the machine position by an amount corresponding to the servo system delay. The value of this shift can be determined from the servo system positional deviation. When TSE is set to 0, a skip position is determined by subtracting the positional deviation from the current position. When TSE is set to 1, the current position (including the servo system delay) is used as the skip position, without considering any shift or position deviation.
TSA When the torque limit skip function (G31 P99/98) is used, torque limit arrival monitoring is performed for:
0 : All axes.
1 : Only those axes that are specified in the block containing the G31 command.

IGX When the high-speed skip function is used, SKIPP <G006#6>, SKIP <X004#7>, and +MIT1 to -MIT2 <X004#2-5> are:
0 : Enabled as skip signals.
1 : Disabled as skip signals.

NOTE
1 SKIPP <G006#6> and +MIT1 to -MIT2 <X004#2-5> are enabled only when bit 0 (GSK) of parameter No.6200 is set to 1 and bit 3 (MIT) of parameter No.6200 is set to 1. Note also that these signals are enabled only for the T series.
2 The skip signals for the multistage skip function (SKIP, SKIP2 to SKIP8) can also be disabled.

SPE For the skip function (G31), the skip signal <X004#7> is:
0 : Disabled.
1 : Enabled.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1S1</td>
<td>HDI0</td>
</tr>
<tr>
<td>1S2</td>
<td>HDI1</td>
</tr>
<tr>
<td>1S3</td>
<td>HDI2</td>
</tr>
<tr>
<td>1S4</td>
<td>HDI3</td>
</tr>
<tr>
<td>1S5</td>
<td></td>
</tr>
<tr>
<td>1S6</td>
<td></td>
</tr>
<tr>
<td>1S7</td>
<td></td>
</tr>
<tr>
<td>1S8</td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit
1S1 to 1S8 Specify which high-speed skip signal is enabled when the G31 skip command is issued. The bits correspond to the following signals:
1S1 HDI0
1S2 HDI1
1S3 HDI2
1S4 HDI3
1S5          
1S6          
1S7          
1S8          

1S1 to 1S8, 2S1 to 2S8, 3S1 to 3S8, 4S1 to 4S8, DS1 to DS8 Specify which skip signal is enabled when the skip command (G31, or G31P1 to G31P4) and the dwell command (G04, G04Q1 to G04Q4) are issued with the multi-step skip function.
The following table shows the correspondence between the bits, input signals, and commands.
The setting of the bits have the following meaning:
0: The skip signal corresponding to the bit is disabled.
1: The skip signal corresponding to the bit is enabled.

### High-speed skip function

<table>
<thead>
<tr>
<th>Input signal</th>
<th>Command</th>
<th>G31</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDI0</td>
<td></td>
<td>1S1</td>
</tr>
<tr>
<td>HDI1</td>
<td></td>
<td>1S2</td>
</tr>
<tr>
<td>HDI2</td>
<td></td>
<td>1S3</td>
</tr>
<tr>
<td>HDI3</td>
<td></td>
<td>1S4</td>
</tr>
</tbody>
</table>

### Multi-step skip function

<table>
<thead>
<tr>
<th>Input signal</th>
<th>Command</th>
<th>G31</th>
<th>G31P1</th>
<th>G31P2</th>
<th>G31P4</th>
<th>G04Q1</th>
<th>G04Q2</th>
<th>G04Q4</th>
<th>G04</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKIP/HDI0</td>
<td></td>
<td>1S1</td>
<td>2S1</td>
<td>3S1</td>
<td>4S1</td>
<td>DS1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SKIP2/HDI1</td>
<td></td>
<td>1S2</td>
<td>2S2</td>
<td>3S2</td>
<td>4S2</td>
<td>DS2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SKIP3/HDI2</td>
<td></td>
<td>1S3</td>
<td>2S3</td>
<td>3S3</td>
<td>4S3</td>
<td>DS3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SKIP4/HDI3</td>
<td></td>
<td>1S4</td>
<td>2S4</td>
<td>3S4</td>
<td>4S4</td>
<td>DS4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SKIP5</td>
<td></td>
<td>1S5</td>
<td>2S5</td>
<td>3S5</td>
<td>4S5</td>
<td>DS5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SKIP6</td>
<td></td>
<td>1S6</td>
<td>2S6</td>
<td>3S6</td>
<td>4S6</td>
<td>DS6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SKIP7</td>
<td></td>
<td>1S7</td>
<td>2S7</td>
<td>3S7</td>
<td>4S7</td>
<td>DS7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SKIP8</td>
<td></td>
<td>1S8</td>
<td>2S8</td>
<td>3S8</td>
<td>4S8</td>
<td>DS8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**

HDI0 to HDI3 are high-speed skip signals.

### Data type Bit

ROS When the skip position goes beyond the roll-over range, the values of system variables #5061 through #5068 indicating the skip signal position:
0: Are not rolled over.
1: Are rolled over similar to the absolute coordinates.

ASB, ASL Set the type and time constant of acceleration/deceleration after interpolation for the skip function in advanced preview control, AI advanced preview control, or AI contour control mode as listed below.

<table>
<thead>
<tr>
<th>ASB</th>
<th>ASL</th>
<th>Acceleration/ deceleration type</th>
<th>Parameter No. of time constant</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>Linear</td>
<td>Parameter No. 6280 (If 0 is set, the value in parameter No. 1769 (1768) is used.)</td>
</tr>
<tr>
<td>1</td>
<td>-</td>
<td>Bell-shaped</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>This function is disabled. (See NOTE.)</td>
<td></td>
</tr>
</tbody>
</table>
When bell-shaped acceleration/deceleration is specified, the following equations hold as with ordinary bell-shaped acceleration/deceleration after cutting feed interpolation, where $T$ denotes the time constant: $T_1 = T/2$, $T_2 = T/2$. Therefore, an acceleration/deceleration type containing no linear part is set.

**NOTE**

If ASB is set to 0, and ASL is set to 0, the acceleration/deceleration type is set by bit 3 (BS2) of parameter No.1602 and bit 6 (LS2) of parameter No. 1602, and the time constant set in parameter No. 1762, 768, or 1769 is used.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>6215</td>
<td>CSTx</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit axis

CSTx For the Cs contour controlled axis, the torque limit skip function is:
0 : Disabled.
1 : Enabled.

Torque limit skip operation is performed for the Cs counter controlled axis by using the serial spindle torque limit command signal TLMH<G070,G074> and the load detection signal LDT1<F045,F049>.

**NOTE**

When this parameter is set to perform torque limit skip operation for a Cs counter controlled axis, note the following:

1. For the Cs contour controlled axis (spindle) that uses the torque limit skip function, set bit 4 of serial spindle parameter No. 4009 to 1 so that load detection signals are output even during acceleration/deceleration.
2. If the load detection state (LDT1 = 1) is set when the torque limit command is specified (TLMH1 = 1) in the Cs mode, no excessive error check at stop is performed for the axis.
3. If the load detection state (LDT1 = 1) is set in the Cs mode, no in-position check is made for the axis.
6221

<table>
<thead>
<tr>
<th>Data type</th>
<th>Unit of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word</td>
<td>ms</td>
<td>0 to 65535</td>
</tr>
</tbody>
</table>

**Time from the specification of a torque limit skip until the skip operation is enabled**

Set a time from the specification of a torque limit skip until the skip operation is enabled. Within the set time, the skip operation is not performed.
4.32 PARAMETERS OF AUTOMATIC TOOL COMPENSATION (T SERIES) AND AUTOMATIC TOOL LENGTH COMPENSATION (M SERIES)

<table>
<thead>
<tr>
<th></th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>6240</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AE0</td>
</tr>
</tbody>
</table>

**[Data type]** Bit

AE0 Measurement position arrival is assumed when the automatic tool compensation signals XAE and ZAE <X004#0,1> (T series) or the automatic tool length measurement signals XAE, YAE, and ZAE <X004#0-2> (M series) are:

0: 1
1: 0

**6241**

**[Data type]** Word

<table>
<thead>
<tr>
<th>Unit of data, valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increment system</td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Millimeter machine</td>
</tr>
<tr>
<td>Inch machine</td>
</tr>
</tbody>
</table>

This parameter sets the feedrate during measurement of automatic tool compensation (T series) and automatic tool length compensation (M series).

**6251**

**γ value on X axis during automatic tool compensation**

**6252**

**γ value on Z axis during automatic tool compensation**

**[Data type]** 2-word

**[Unit of data]**

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch input</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
</tbody>
</table>

**[Valid data range]** 1 to 999999999

These parameters set the γ value during automatic tool compensation (T series) or tool length automatic compensation (M series).
NOTE
Set a radius value irrespective of whether the diameter programming or the radius programming is specified.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6254</td>
<td>( \varepsilon \text{ value on X axis during automatic tool compensation} )</td>
</tr>
<tr>
<td>6255</td>
<td>( \varepsilon \text{ value on Z axis during automatic tool compensation} )</td>
</tr>
</tbody>
</table>

[Data type] 2-word
[Unit of data]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch input</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
</tbody>
</table>

[Valid data range] 1 to 99999999
These parameters set the \( \varepsilon \) value during automatic tool compensation (T series) or automatic tool length offset (M series).

NOTE
Set a radius value irrespective of whether the diameter programming or the radius programming is specified.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6280</td>
<td>( \text{Time constant of acceleration/deceleration after interpolation in the skip function in advanced preview control, AI advanced preview control, or AI contour control mode for each axis} )</td>
</tr>
</tbody>
</table>

[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 512
This parameter sets the time constant of acceleration/deceleration after interpolation in the skip function in advanced preview control, AI advanced preview control, or AI contour control mode for each axis. This parameter is valid when bit 3 (ASL) of parameter No. 6210 is set to 1. (See the description of bit 3 (ASL) of parameter No. 6210.) If this parameter is set to 0, the value set in parameter No. 1769 is used. If parameter No. 1769 is set also to 0, the value in parameter No. 1768 is used.
4.33  PARAMETERS OF EXTERNAL DATA INPUT/OUTPUT

<table>
<thead>
<tr>
<th>6300</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EEX</td>
<td></td>
<td>ESR</td>
<td>ESC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type]  Bit

ESC  When a reset is input between input of the external data input read signal ESTB <G002#7> and execution of a search, the external program number search function:
0 : Performs a search.
1 : Does not perform a search.

ESR  External program number search
0 : Disabled
1 : Enabled

EEX  PMC EXIN function
0 : Conventional specifications
1 : Extended specifications
If you want to handle data unavailable with the PMC/EXIN command according to the conventional specifications, such as an 8-digit program number, in an external program number search, set this bit to 1.
To use this function for multipath control, the setting for the first path (main) is used. The EXIN specifications cannot be changed for each path. For details of EXIN and how to change ladder software, refer to the PMC specifications and other manuals.

<table>
<thead>
<tr>
<th>6310</th>
<th>Number of added message numbers of external operator messages</th>
</tr>
</thead>
</table>

[Data type]  Word
[Valid data range]  0, 1 to 1000
For external operator messages within the range set in this parameter, message numbers each obtained by adding 2000 to the relevant message number are indicated.

NOTE
When this parameter is set, the power must be turned off before operation is continued.

NOTE
If 0 or a value beyond the valid data range is set in this parameter, this parameter becomes invalid.
### Parameters of Graphic Display/Dynamic Graphic Display

<table>
<thead>
<tr>
<th></th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>NZM</td>
<td>DPA</td>
<td>DPO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DPA</td>
<td>Current position display on the graphic display screen</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0: Displays the actual position to ensure tool nose radius compensation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: Displays the programmed position</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DPO</td>
<td>Current position on the solid drawing (machining profile drawing) or tool path drawing screen</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0: Not appear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: Appears</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NZM</td>
<td>0: The screen image is not enlarged by specifying the center of the screen and magnification. (Screen image enlargement by a conventional method is enabled.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: The screen image is enlarged by specifying the center of the screen and magnification.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSR</td>
<td>FIM</td>
<td>RID</td>
<td>3PL</td>
<td>TLC</td>
<td>ORG</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSR</td>
<td>Movement when coordinate system is altered during drawing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0: Draws in the same coordinate system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: Draws in the new coordinate system (only for the tool path drawing)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TLC</td>
<td>In solid drawing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0: Not compensate the tool length</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: Compensates the tool length</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3PL</td>
<td>Tri-plane drawing in solid drawing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0: Drawn by the third angle projection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: Drawn by the first angle projection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RID</td>
<td>In solid drawing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0: Draws a plane without edges.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: Draws a plane with edges.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIM</td>
<td>Machining profile drawing in solid drawing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0: Displayed in the coarse mode</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: Displayed in the fine mode</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSR</td>
<td>While the screen image is enlarged, the shape of the graphic cursor is:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0: A square. (■)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: An X. (X)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.DESCRIPTION OF PARAMETERS

**6503**

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>MST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Data type** Bit

**MST**

In check drawing (animated simulation) using the dynamic graphic display function, the M, S, and T code commands in the program are:

0 : Ignored.

1 : Output to the machine in the same way as in normal operation.

**6510**

**Drawing coordinate system**

**Data type** Byte

**Valid data range** 0 to 7

This parameter specifies the drawing coordinate system for the graphic function. The following show the relationship between the set values and the drawing coordinate systems.

- Setting value = 0
- Setting value = 1
- Setting value = 2
- Setting value = 3
- Setting value = 4
- Setting value = 5
- Setting value = 6
- Setting value = 7

**6511**

**Right margin in solid drawing**

**6512**

**Left margin in solid drawing**

**6513**

**Upper margin in solid drawing**

**6514**

**Lower margin in solid drawing**

**Data type** Word

**Unit of data** Dot
These parameters set the machining profile drawing position in margins. The unit is a dot.

<table>
<thead>
<tr>
<th>Parameter No.</th>
<th>Margin area</th>
<th>Standard set value</th>
</tr>
</thead>
<tbody>
<tr>
<td>6511</td>
<td>Right</td>
<td>DPO = 0: 0, DPO = 1: 200</td>
</tr>
<tr>
<td>6512</td>
<td>Left</td>
<td>DPO = 0: 0, DPO = 1: 0</td>
</tr>
<tr>
<td>6513</td>
<td>Upper</td>
<td>DPO = 0: 25, DPO = 1: 25</td>
</tr>
<tr>
<td>6514</td>
<td>Lower</td>
<td>DPO = 0: 0, DPO = 1: 0</td>
</tr>
</tbody>
</table>

DPO is set in bit 5 (DPO) of parameter No. 6500.

**6515**

Change in cross-section position in tri-plane drawing

- **Data type:** Byte
- **Unit of data:** Dot
- **Valid data range:** 0 to 10

This parameter sets the change in the cross-section position when a soft key is continuously pressed in tri-plane drawing. When zero is specified, it is set to 1.

**6520**

C-axis number for dynamic graphic display

- **Data type:** Byte
- **Valid data range:** 0, 1 to number of controlled axes

This parameter sets a C-axis number for dynamic graphic display. When 0 or a value greater than the number of controlled axes is specified with this parameter, the third axis is assumed.

### 4.34.2 Parameters of Graphic Color

- **6561** Standard color data for graphic color number 1
- **6562** Standard color data for graphic color number 2
- **6563** Standard color data for graphic color number 3
- **6564** Standard color data for graphic color number 4
- **6565** Standard color data for graphic color number 5
- **6566** Standard color data for graphic color number 6
- **6567** Standard color data for graphic color number 7
- **6568** Standard color data for graphic color number 8
- **6569** Standard color data for graphic color number 9
### 4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6570</td>
<td>Standard color data for graphic color number 10</td>
</tr>
<tr>
<td>6571</td>
<td>Standard color data for graphic color number 11</td>
</tr>
<tr>
<td>6572</td>
<td>Standard color data for graphic color number 12</td>
</tr>
<tr>
<td>6573</td>
<td>Standard color data for graphic color number 13</td>
</tr>
<tr>
<td>6574</td>
<td>Standard color data for graphic color number 14</td>
</tr>
<tr>
<td>6575</td>
<td>Standard color data for graphic color number 15</td>
</tr>
<tr>
<td>6581</td>
<td>Standard color data for character color number 1</td>
</tr>
<tr>
<td>6582</td>
<td>Standard color data for character color number 2</td>
</tr>
<tr>
<td>6583</td>
<td>Standard color data for character color number 3</td>
</tr>
<tr>
<td>6584</td>
<td>Standard color data for character color number 4</td>
</tr>
<tr>
<td>6585</td>
<td>Standard color data for character color number 5</td>
</tr>
<tr>
<td>6586</td>
<td>Standard color data for character color number 6</td>
</tr>
<tr>
<td>6587</td>
<td>Standard color data for character color number 7</td>
</tr>
<tr>
<td>6588</td>
<td>Standard color data for character color number 8</td>
</tr>
<tr>
<td>6589</td>
<td>Standard color data for character color number 9</td>
</tr>
<tr>
<td>6590</td>
<td>Standard color data for character color number 10</td>
</tr>
<tr>
<td>6591</td>
<td>Standard color data for character color number 11</td>
</tr>
<tr>
<td>6592</td>
<td>Standard color data for character color number 12</td>
</tr>
<tr>
<td>6593</td>
<td>Standard color data for character color number 13</td>
</tr>
<tr>
<td>6594</td>
<td>Standard color data for character color number 14</td>
</tr>
<tr>
<td>6595</td>
<td>Standard color data for character color number 15</td>
</tr>
</tbody>
</table>

**[Data type]** 2-word  
**[Unit of data]** rr gg bb: 6-digit number (rr: Red  gg: Green  bb: Blue)  
When a number of less than six digits is set, the system assumes that 0 has been specified for the unspecified higher digit(s).
[Valid data range] Data of each color: 00 to 15 (same value as the tone level data on the color setting screen)
When a value of more than 16 is set, the system assumes that 15 has been specified.

Example:
Set 10203 in this parameter when the color tone levels are as follows:
Red: 1  Green: 2  Blue: 3

NOTE
To set the color of the VGA display, use the color setting screen. Note that the color changes when the settings of parameters No.6561 through No.6595 are modified.
4.35 PARAMETERS OF DISPLAYING OPERATION TIME AND NUMBER OF PARTS

6700

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRT</td>
<td>PCM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

PCM M code that counts the total number of machined parts and the number of machined parts
0: M02, or M30, or an M code specified by parameter No.6710
1: Only M code specified by parameter No.6710

PRT Upon reset, signal PRTSF <F062#7>, which indicates that a required number of parts has been reached, is:
0: Turned off.
1: Not turned off.

6710

M code that counts the total number of machined parts and the number of machined parts

[Data type] 2-word
[Valid data range] 0 to 255 except 98 and 99

The total number of machined parts and the number of machined parts are counted (+1) when the M code set is executed.

**NOTE**

Set value 0 is invalid (the number of parts is not counted for M00). Data 98 and 99 cannot be set.

6711

Number of machined parts

[Data type] 2-word
[Unit of data] One piece
[Valid data range] 0 to 99999999

The number of machined parts is counted (+1) together with the total number of machined parts when the M02, M30, or a M code specified by parameter No.6710 is executed.

**NOTE**

The number of parts is not counted for M02, M03, when bit 0 (PCM) of parameter No. 6700 is set to 1.
The following parameter can be set at "Setting screen".

[Data type] 2-word
[Unit of data] One piece
[Valid data range] 0 to 99999999

This parameter sets the total number of machined parts. The total number of machined parts is counted (+1) when M02, M30, or an M code specified by parameter No.6710 is executed.

**NOTE**
The number of parts is not counted for M02, M03, when bit 0 (PCM) of parameter No. 6700 is set to 1.

The following parameter can be set at "Setting screen".

[Data type] Word
[Unit of data] One piece
[Valid data range] 0 to 9999

This parameter sets the number of required machined parts. Required parts finish signal PRTSF <F062#7> is output to PMC when the number of machined parts reaches the number of required parts. The number of parts is regarded as infinity when the number of required parts is zero. The PRTSF <F062#7> signal is then not output.

The following parameter can be set at "Setting screen".

[Data type] 2-word
[Unit of data] min
[Valid data range] 0 to 99999999

This parameter displays the integrated value of power-on period.

The following parameter can be set at "Setting screen".

[Data type] 2-word
[Unit of data] msec
[Valid data range] 0 to 60000
6752  Operation time (integrated value of time during automatic operation) II

- The following parameter can be set at "Setting screen".
- [Data type]: 2-word
- [Unit of data]: min
- [Valid data range]: 0 to 99999999
- This parameter displays the integrated value of time during automatic operation (neither stop nor hold time included).
- The actual time accumulated during operation is the sum of this parameter No. 6751 and parameter No. 6752.

6753  Integrated value of cutting time I

- The following parameter can be set at "Setting screen".
- [Data type]: 2-word
- [Unit of data]: msec
- [Valid data range]: 1 to 60000

6754  Integrated value of cutting time II

- The following parameter can be set at "Setting screen".
- [Data type]: 2-word
- [Unit of data]: min
- [Valid data range]: 0 to 99999999
- This parameter displays the integrated value of a cutting time that is performed in cutting feed such as linear interpolation (G01) and circular interpolation (G02 or G03).
- The actual time accumulated during cutting is the sum of this parameter No. 6753 and parameter No. 6754.

6755  Integrated value of general-purpose integrating meter drive signal (TMRON) ON time I

- The following parameter can be set at "Setting screen".
- [Data type]: 2-word
- [Unit of data]: msec
- [Valid data range]: 0 to 60000

6756  Integrated value of general-purpose integrating meter drive signal (TMRON) ON time II

- The following parameter can be set at "Setting screen".
- [Data type]: 2-word
- [Unit of data]: min
- [Valid data range]: 0 to 99999999
- This parameter displays the integrated value of a time while input signal TMRON <G053#0> from PMC is on.
- The actual integrated time is the sum of this parameter No. 6755 and parameter No. 6756.

6757  Operation time (integrated value of one automatic operation time) I
The following parameter can be set at "Setting screen".

**Data type**: 2-word  
**Unit of data**: msec  
**Valid data range**: 0 to 60000

**6758 Operation time (integrated value of one automatic operation time)**

The following parameter can be set at "Setting screen".

**Data type**: 2-word  
**Unit of data**: min  
**Valid data range**: 0 to 99999999

This parameter displays the one automatic operation drive time (neither stop nor hold state included). The actual time accumulated during operating is the sum of this parameter No. 6757 and parameter No. 6758. The operation time is automatically preset to 0 during the power-on sequence and the cycle start from the reset state.
## 4.36 Parameters of Tool Life Management

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNG</td>
<td>GRS</td>
<td>SIG</td>
<td>LTM</td>
<td>GS2</td>
<td>GS1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### GS1, GS2

This parameter sets the combination of the number of tool life groups which can be entered, and the number of tools which can be entered per group as shown in the table below.

<table>
<thead>
<tr>
<th>GS2</th>
<th>GS1</th>
<th>M series</th>
<th>T series</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Group count</td>
<td>Tool count</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1 to 16</td>
<td>1 to 16</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1 to 32</td>
<td>1 to 8</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1 to 64</td>
<td>1 to 4</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1 to 128</td>
<td>1 to 2</td>
</tr>
</tbody>
</table>

### LTM

- **0**: Specified by the number of times
- **1**: Specified by time

### SIG

- **0**: Not input using the tool group signal during tool skip (The current group is specified.)
- **1**: Input using the tool group signal during tool skip

### GRS

- **0**: Clears only the execution data of a specified group
- **1**: Clears the execution data of all entered groups

### SNG

Input of the tool skip signal TLSKP <G048#5> when a tool that is not considered tool life management is selected.

- **0**: Skips the tool of the group used last or of the specified group (using SIG, #3 of parameter No.6800).
- **1**: Ignores a tool skip signal

### IGI

- **0**: Not ignored
- **1**: Ignored

### M6T

- **0**: Judged as a back number
- **1**: Judged as a next tool group command

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXG</td>
<td>E1S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TSM</td>
</tr>
<tr>
<td>M6E</td>
<td>E1S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EMD</td>
</tr>
</tbody>
</table>

### TSM

When a tool takes several tool numbers, life is counted in tool life management:

- **0**: For each of the same tool numbers.
- **1**: For each tool.
LFV  The life count override in the extended tool life management function is:
  0 : Disabled.
  1 : Enabled.

EMD  An asterisk (*) indicating that a tool has been expired is displayed,
  0 : When the next tool is selected
  1 : When the tool life is expired

E1S  When the life of a tool is measured in time-based units:
  0 : The life is counted every four seconds.
  1 : The life is counted every second. (The maximum life is 1075 (minutes).)

NOTE
  This parameter is valid when bit 2 (LTM) of parameter No.6800 is set to 1.

EXT  Specifies whether the extended tool life management function (M series) is used.
  0 : Not used
  1 : Used

EXG  Tool life management data registration by G10 (T series) is:
  0 : Performed after the data for all tool groups has been cleared.
  1 : Performed by adding/changing or deleting the data for a specified group.

NOTE
  When EXG = 1, address P in the block including G10 can be used to specify whether data is to be added/changed or deleted (P1: add/change, P2: delete). When P is not specified, the data for all tool groups is cleared before the tool life management data is registered.

M6E  When a T code is specified in the same block as M06
  0 : The T code is processed as a return number or as a group number selected next. Either is set by parameter M6T (No.6800#7).
  1 : The tool group life is counted immediately.

<table>
<thead>
<tr>
<th>6802</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RMT</td>
<td>TSK</td>
<td></td>
<td>E17</td>
<td>TCO</td>
<td>T99</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

T99  If a tool group whose life has expired is found to exist when M99 is executed in the main program:
  0 : The tool change signal is not output.
  1 : The tool change signal is output.

TCO  When function code 171 or 172 (tool life management data write) of the PMC window function is specified, tool data of a tool in the currently selected group that is currently not in use:
0: Cannot be cleared.
1: Can be cleared.

**E17** When function code 171 or 172 (tool life management data write) of the PMC window function is specified to clear tool life management data of the tool currently in use in the currently selected group:
- 0: The tool data is not cleared and operation terminates normally.
- 1: The tool data is not cleared and completion code 13 is output.

**TSK** When the life is specified by time and the last tool in a group is skipped in tool life management:
- 0: The count for the last tool indicates the life value.
- 1: The count for the last tool is not changed.

**RMT** Specifies when to turn off the tool life arrival signal TLCHB, as follows:
- 0: The actual remaining life is longer than that specified in a parameter ("less than" type).
- 1: The actual remaining life is not equal to that specified in a parameter ("equal" type).

---

### 6803 Parameter Table

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>LFE</td>
<td></td>
<td></td>
<td>LGR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LFE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**
After this parameter has been set, the power must be turned off then on again for the setting to become effective.

---

**[Data type]** Bit

**LGR** When the tool life management function is used, a tool life type is:
- 0: Chosen based on the LTM parameter (bit 2 of parameter No.6800) for all groups.
- 1: Set to either count or duration on a group-by-group basis.

When LGR is set to 1, the specification of address Q is added to the G10 (tool life management data setting) command format. As shown in the example below, specify the tool life of each group as either a count (Q1) or a duration (Q2). If address Q is omitted for a group, the specification of the LTM parameter (bit 2 of parameter No.6800) applies to the group.

**Example:**
- When the LTM parameter (bit 2 of parameter No.6800) is set to 0
  - G10 L3;
  - P1 L10 Q1; (Q1: The life of group 1 is specified as a count.)
  - ;
  - P2 L20 Q2; (Q2: The life of group 2 is specified as a duration.)
  - ;
  - P3 L20;
  - (Omission of Q: The life of group 3 is specified as a count.)
  - ;
  - G11;
  - M30;
LFE When a tool life is specified by count:
- 0: A count value from 0 to 9999 can be specified.
- 1: A count value from 0 to 65535 can be specified.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

# Data type: Bit

E10 When the tool life is specified by time:
- 0: The tool life is counted at intervals of 4 seconds.
- 1: The tool life is counted at intervals of 10 seconds.

**NOTE**

This parameter is valid when bit 2 (LTM) of parameter No. 6800 is set to 1.

TC1 During automatic operation, preset of the tool life counter is:
- 0: Disabled.
- 1: Enabled.

ETE In extended tool life management, as the mark indicating that the life of the last tool in a group has expired:
- 0: "@" is also used.
- 1: "*" is used.

<table>
<thead>
<tr>
<th>#7</th>
<th>TC1</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

# Data type: Word

[Valid data range] 0 to 9999

This parameter sets the tool life management ignored number. When the set value is subtracted from a T code, a remainder is used as the tool group number of tool life management when a value exceeding the set value is specified in the T code.
4.DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6811</td>
<td>Tool life count restart M code</td>
</tr>
<tr>
<td>[Data type]</td>
<td>2-word</td>
</tr>
<tr>
<td>[Valid data range]</td>
<td>0 to 255 (not including 01, 02, 30, 98, and 99)</td>
</tr>
<tr>
<td>When zero is specified, it is ignored. When the life is specified by the number of times, the tool exchange signal is output when a tool life count restart M code is specified if tool life of at least one tool group is expired. A tool in life is selected in the specified group when a T code command (tool group command) is specified after the tool life count restart M code is specified. A tool life counter is then incremented by one. When the life is specified by time, a tool in life is selected in the specified group when a T code command (tool group command) is specified after the tool life count restart M code is specified.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6844</td>
<td>Remaining tool life (use count)</td>
</tr>
<tr>
<td>[Data type]</td>
<td>Word</td>
</tr>
<tr>
<td>[Unit of data]</td>
<td>Count</td>
</tr>
<tr>
<td>[Valid data range]</td>
<td>0 to 9999</td>
</tr>
<tr>
<td>This parameter sets a remaining tool life (use count) used to output the tool life arrival notice signal TLCHB &lt;F064#3&gt; when the tool life is specified as a use count.</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**

1. When the remaining life (use count) of a selected tool reaches the value specified with this parameter, tool life arrival notice signal TLCHB is output to the PMC.
2. If a value greater than the life of a tool is specified with this parameter, the tool life arrival notice signal TLCHB is not output.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6845</td>
<td>Remaining tool life (use duration)</td>
</tr>
<tr>
<td>[Data type]</td>
<td>2-word</td>
</tr>
<tr>
<td>[Unit of data]</td>
<td>min</td>
</tr>
<tr>
<td>[Valid data range]</td>
<td>0 to 4300</td>
</tr>
<tr>
<td>This parameter sets the remaining tool life (use duration), used to output the tool life arrival notice signal TLCHB &lt;F064#3&gt; when the tool life is specified as a use duration.</td>
<td></td>
</tr>
</tbody>
</table>
NOTE
1 When the remaining life (use duration) of a selected tool reaches the value specified in this parameter, tool life arrival notice signal TLCHB is output to the PMC. The tool life management function allows the user to specify a tool life either as a use duration or use count for each tool group. For a group whose life is specified as a use count, parameter No.6844 is used. For a group whose life is specified as a use time, this parameter is used.
2 If a value greater than the life of a tool is specified with parameter No.6845, the tool life arrival notice signal TLCHB is not output.

6846 Number of remaining tools in a group

[Data type] Byte
[Valid data range] 0 to 127
This parameter sets the number of remaining tools in a group. If the number of remaining tools in the currently used group is equal to or smaller than the number set in this parameter, signal TLAL <F154#0> is output. If this parameter is set to 0, the signal is not output.
4.37 PARAMETERS OF POSITION SWITCH FUNCTIONS

<table>
<thead>
<tr>
<th></th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PCM</td>
<td>EPS</td>
<td>IGP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6901</td>
<td></td>
<td>PSF</td>
<td>PCM</td>
<td>EPS</td>
<td>IGP</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

IGP During follow-up for the absolute position detector, position switch signals are:
- 0: Output
- 1: Not output

EPS The number of position switches is:
- 0: Up to 10.
- 1: Up to 16.

PCM Position switch signals are output:
- 0: Without considering acceleration/deceleration and servo delay.
- 1: With considering acceleration/deceleration and servo delay.

PSF In advanced preview control mode, AI advanced preview control mode, or AI contour control mode, position switches are:
- 0: Not used.
- 1: Used.

NOTE

The position switch signals are output considering acceleration/deceleration after interpolation and servo delay. Acceleration/deceleration after interpolation and servo delay are considered even for position switch signal output in a mode other than advanced preview control mode, AI advanced preview control mode, and AI contour control mode. When this parameter is set to 1, however, signals are output from the position switches at different times from the specified ones.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6910</td>
<td>Axis corresponding to the first position switch</td>
</tr>
<tr>
<td>6911</td>
<td>Axis corresponding to the second position switch</td>
</tr>
<tr>
<td>6912</td>
<td>Axis corresponding to the third position switch</td>
</tr>
<tr>
<td>6913</td>
<td>Axis corresponding to the fourth position switch</td>
</tr>
<tr>
<td>6914</td>
<td>Axis corresponding to the fifth position switch</td>
</tr>
<tr>
<td>6915</td>
<td>Axis corresponding to the sixth position switch</td>
</tr>
<tr>
<td>6916</td>
<td>Axis corresponding to the seventh position switch</td>
</tr>
<tr>
<td>6917</td>
<td>Axis corresponding to the eighth position switch</td>
</tr>
<tr>
<td>6918</td>
<td>Axis corresponding to the ninth position switch</td>
</tr>
<tr>
<td>6919</td>
<td>Axis corresponding to the tenth position switch</td>
</tr>
<tr>
<td>6920</td>
<td>Axis corresponding to the eleventh position switch</td>
</tr>
<tr>
<td>6921</td>
<td>Axis corresponding to the twelfth position switch</td>
</tr>
<tr>
<td>6922</td>
<td>Axis corresponding to the thirteenth position switch</td>
</tr>
<tr>
<td>6923</td>
<td>Axis corresponding to the fourteenth position switch</td>
</tr>
<tr>
<td>6924</td>
<td>Axis corresponding to the fifteenth position switch</td>
</tr>
<tr>
<td>6925</td>
<td>Axis corresponding to the sixteenth position switch</td>
</tr>
</tbody>
</table>

**[Data type]**  Byte  
**[Valid data range]**  0 to Number of controlled axes

These parameters sequentially specify the numbers of the controlled axes corresponding to the 1st through 16th position switch functions. The corresponding position switch signal is output to the PMC when the machine coordinate of the corresponding axis is within the range set in parameters.

**NOTE**  
Set 0 for the number corresponding to a position switch which is not to be used.
6930  Maximum operation range of the first position switch
6931  Maximum operation range of the second position switch
6932  Maximum operation range of the third position switch
6933  Maximum operation range of the fourth position switch
6934  Maximum operation range of the fifth position switch
6935  Maximum operation range of the sixth position switch
6936  Maximum operation range of the seventh position switch
6937  Maximum operation range of the eighth position switch
6938  Maximum operation range of the ninth position switch
6939  Maximum operation range of the tenth position switch
6940  Maximum operation range of the eleventh position switch
6941  Maximum operation range of the twelveth position switch
6942  Maximum operation range of the thirteenth position switch
6943  Maximum operation range of the fourteenth position switch
6944  Maximum operation range of the fifteenth position switch
6945  Maximum operation range of the sixteenth position switch

[Data type]  2-word
[Unit of data]  

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metric machine</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>deg</td>
</tr>
</tbody>
</table>

[Valid data range]  -99999999 to 99999999

These parameters sequentially set the maximum operation ranges of the 1st through 16th position switches.
4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6950</td>
<td>Minimum operation range of the first position switch</td>
</tr>
<tr>
<td>6951</td>
<td>Minimum operation range of the second position switch</td>
</tr>
<tr>
<td>6952</td>
<td>Minimum operation range of the third position switch</td>
</tr>
<tr>
<td>6953</td>
<td>Minimum operation range of the fourth position switch</td>
</tr>
<tr>
<td>6954</td>
<td>Minimum operation range of the fifth position switch</td>
</tr>
<tr>
<td>6955</td>
<td>Minimum operation range of the sixth position switch</td>
</tr>
<tr>
<td>6956</td>
<td>Minimum operation range of the seventh position switch</td>
</tr>
<tr>
<td>6957</td>
<td>Minimum operation range of the eighth position switch</td>
</tr>
<tr>
<td>6958</td>
<td>Minimum operation range of the ninth position switch</td>
</tr>
<tr>
<td>6959</td>
<td>Minimum operation range of the tenth position switch</td>
</tr>
<tr>
<td>6960</td>
<td>Minimum operation range of the eleventh position switch</td>
</tr>
<tr>
<td>6961</td>
<td>Minimum operation range of the twelfth position switch</td>
</tr>
<tr>
<td>6962</td>
<td>Minimum operation range of the thirteenth position switch</td>
</tr>
<tr>
<td>6963</td>
<td>Minimum operation range of the fourteenth position switch</td>
</tr>
<tr>
<td>6964</td>
<td>Minimum operation range of the fifteenth position switch</td>
</tr>
<tr>
<td>6965</td>
<td>Minimum operation range of the sixteenth position switch</td>
</tr>
</tbody>
</table>

[Data type] 2-word
[Unit of data]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metric machine</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>deg</td>
</tr>
</tbody>
</table>

[Valid data range] -999999999 to 999999999

These parameters sequentially set the minimum operation ranges of the 1st through 16th position switches.
4.38 PARAMETERS OF MANUAL OPERATION AND AUTOMATIC OPERATION

### 7001

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
<th>MIN</th>
</tr>
</thead>
</table>

**[Data type]** Bit

**MIN** The manual intervention and return function is:
- 0: Disabled.
- 1: Enabled.

### 7015

**Least command increment setting for jog feed**

**[Data type]** Word

**[Unit of data]**

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metric machine</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>deg</td>
</tr>
</tbody>
</table>

**[Valid data range]** 0 to 10000

This parameter sets the least command increment for jog feed when PMC signal JGUNIT <G0023#0> is set to 1. If the setting of this parameter is 0, a value of 1 is recognized.

### 7050

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MI1</td>
<td>MI0</td>
</tr>
</tbody>
</table>

**NOTE**

After setting this parameter, turn off the power. Then, turn the power back on to enable the setting.

**[Data type]** Bit

**MI0, MI1** Set this parameter as indicated below.

<table>
<thead>
<tr>
<th>MI1</th>
<th>MI0</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

When the servo FAD function is not used in AI advanced preview control or AI contour control

When the servo FAD function is used in AI advanced preview control or AI contour control
ACR When rigid tapping is specified in AI advanced preview control mode or AI contour control mode, the mode is:

0 : Not turned off.
1 : Turned off.

When the serial spindle does not support advanced preview control of rigid tapping, AI advanced preview control mode or AI contour control mode must be turned off in rigid tapping.

Setting this parameter and satisfying the following conditions can automatically turn AI advanced preview control mode or AI contour control mode off only during execution of rigid tapping when rigid tapping is specified in AI advanced preview control mode or AI contour control mode.

**Conditions**

- To specify rigid mode, use "the method for specifying M29 S**** prior to the tapping command."
  
  If a method other than the above is used, P/S alarm No. 5110 is issued.
- The interval between M29 (rigid mode specification M code) and the completion signal (FIN) must be at least 32 msec.
- The rigid mode cancel command and cutting feed move command cannot be specified simultaneously. If they are specified simultaneously, P/S alarm No. 5110 is issued.
  
  (Additional information: The rigid mode cancel command and rapid traverse move command can be specified in the same block.)
- Set bit 2 (CRG) of parameter No. 5200 to 0.
  
  (This setting specifies that rigid tapping mode is canceled when the rigid tapping signal RGTAP is set to "0").

**NOTE**

After this parameter has been set, the power must be turned off.

**NMI**

Set this parameter as indicated below.

<table>
<thead>
<tr>
<th>Axes used for the function below when the servo FAD function is not used:</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMC axis</td>
</tr>
<tr>
<td>Cs axis</td>
</tr>
<tr>
<td>Index table indexing axis set for follow-up (fourth axis)</td>
</tr>
</tbody>
</table>

When the servo FAD function is used

<table>
<thead>
<tr>
<th>NMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>
### 4. DESCRIPTION OF PARAMETERS

#### 7053

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AIP</td>
</tr>
</tbody>
</table>

**NOTE**

When this parameter has been set, the power must be turned off before operation is continued.

[Data type] Bit  
AIP In AI contour control, a stroke limit check before movement is:
- 0: Disabled.
- 1: Enabled.

**NOTE**

The stroke limit check before movement must be enabled (by setting bit 7 (PLC) of parameter No. 1301 to 1).

#### 7054

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AIL AZR FNS AIR</td>
</tr>
</tbody>
</table>

[Data type] Bit  
AIR In AI advanced preview control mode or AI contour control mode, the rapid traverse type is:
- 0: Linear interpolation type positioning (acceleration/deceleration before interpolation is performed).
- 1: According to the setting of bit 1 (LRP) of parameter No. 1401.

FNS When an S code is specified in AI advanced preview control or AI contour control mode, execution of a move command in the same block as the block specifying the S code is:
- 0: Decelerated to stop once.
- 1: Not decelerated to stop.

AZR In AI advanced preview control mode or AI contour control mode, the G27, G28, G30, G30.1, and G53 commands are executed:
- 0: In normal mode. (advanced preview feed forward is valid.)
- 1: In AI contour control mode.

AIL When non-linear type positioning is specified in AI advanced preview control mode or AI contour control mode and an axis-by-axis interlock signal is input:
- 0: The tool stops along all axes.
- 1: The setting of bit 4 (XIK) of parameter No. 1002 is used.
4.DESCRIPTION OF PARAMETERS

[Data type] Bit

ACO In AI advanced preview control mode or AI contour control mode:
0: Automatic corner override and changing both internal and external circular feedrates are disabled.
1: Automatic corner override and changing the internal circular feedrate are enabled, and whether to enable changing the external circular feedrate depends on the setting of bit 2 (COV) of parameter No. 1602.

AF1 During one-digit F code feed in AI advanced preview control mode or AI contour control mode, changing the feedrate by the manual handle is:
0: Disabled.
1: Enabled.

ALZ If no reference position has been established and G28 is specified in AI contour control mode:
0: P/S alarm No. 090 is issued.
1: AI advanced preview control mode or AI contour control mode is turned off and the command is executed.

BCG The bell-shaped acceleration/deceleration time constant change function in AI contour control mode is:
0: Disabled.
1: Enabled.
See also the description of parameter No. 7066.

ADP In AI advanced preview control or AI contour control mode, positioning in a single direction is:
0: Performed in normal mode.
1: Performed in AI contour control or AI nano contour control mode.

ODA In advanced preview control, AI advanced preview control, or AI contour control mode, the distance to a stored stroke limit is determined for:
0: The axes specified by the current block and next block.
1: The axes specified by the current block.
7066

Acceleration/deceleration reference speed for the bell-shaped acceleration/deceleration time constant change function in AI contour control mode

[Data type] 2 word

[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Units of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>1 mm/min</td>
<td>IS-B: 0 - 600000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>IS-B: 0 - 600000</td>
</tr>
</tbody>
</table>

Set the acceleration/deceleration reference speed for the function for changing the time constant of bell-shaped acceleration/deceleration before interpolation (bit 3 (BCG) of parameter No. 7055 = 1) in AI contour control.
Since this parameter is set in the input unit, when the input unit has been changed, the setting of the parameter must be changed.
4.39 PARAMETERS OF MANUAL HANDLE FEED, MANUAL HANDLE INTERRUPTION AND TOOL DIRECTION
HANDLE FEED

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>7100</td>
<td></td>
<td></td>
<td>HPF</td>
<td>HCL</td>
<td>IHD</td>
<td>THD</td>
<td>JHD</td>
</tr>
</tbody>
</table>

[Data type] Bit

JHD Manual handle feed in JOG feed mode or incremental feed in the manual handle feed
0 : Invalid
1 : Valid

<table>
<thead>
<tr>
<th>When JHD:=0</th>
<th>When JHD:=1</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOG feed mode</td>
<td>Manual handle feed mode</td>
</tr>
<tr>
<td>JOG feed</td>
<td>O</td>
</tr>
<tr>
<td>Manual handle feed</td>
<td>X</td>
</tr>
<tr>
<td>Incremental feed</td>
<td>X</td>
</tr>
</tbody>
</table>

THD Manual pulse generator in TEACH IN JOG mode
0 : Invalid
1 : Valid

IHD The travel increment for manual handle interrupt is:
0 : Output unit, and acceleration/deceleration after interpolation is disabled.
1 : Input unit, and acceleration/deceleration after interpolation is enabled.

HCL The clearing of handle interruption amount display by soft key [CAN] operation is:
0 : Disabled.
1 : Enabled.

HPF When a manual handle feed exceeding the rapid traverse rate is issued,
0 : The rate is clamped at the rapid traverse rate, and the handle pulses corresponding to the excess are ignored. (The graduations of the manual pulse generator may not agree with the distance the machine has traveled.)
1 : The rate is clamped at the rapid traverse rate, and the handle pulses corresponding to the excess are not ignored, but stored in the CNC. (If the rotation of the manual pulse generator is stopped, the machine moves by the distance corresponding to the pulses preserved in the CNC, then stops.)
4.DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7102</td>
<td>Bit</td>
<td>HNGx Axis movement direction for rotation direction of manual pulse generator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 : Same in direction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 : Reverse in direction</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7103</td>
<td>Bit</td>
<td>RHD By a reset, the amount of manual handle interruption is:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 : Not canceled.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 : Canceled.</td>
</tr>
</tbody>
</table>

**NOTE**

This parameter is valid when bit 2 (IHD) of parameter No. 7100 is set to 1.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HNT</td>
<td>The manual handle feed/incremental feed magnification is:</td>
</tr>
<tr>
<td></td>
<td>0 : Multiplied by 1.</td>
</tr>
<tr>
<td></td>
<td>1 : Multiplied by 10.</td>
</tr>
<tr>
<td>HIT</td>
<td>The manual handle interruption magnification is:</td>
</tr>
<tr>
<td></td>
<td>0 : Multiplied by 1.</td>
</tr>
<tr>
<td></td>
<td>1 : Multiplied by 10.</td>
</tr>
<tr>
<td>IBH</td>
<td>Manual handle feed for the β servo unit using an I/O link manual pulse generator is:</td>
</tr>
<tr>
<td></td>
<td>0 : Disabled.</td>
</tr>
<tr>
<td></td>
<td>1 : Enabled.</td>
</tr>
<tr>
<td>HIE</td>
<td>As the acceleration/deceleration type and time constant for manual handle interruption:</td>
</tr>
<tr>
<td></td>
<td>0 : Those used in automatic operation are used.</td>
</tr>
<tr>
<td></td>
<td>1 : Those used in manual feed are used.</td>
</tr>
<tr>
<td></td>
<td>(The acceleration/deceleration type is determined by bit 0 (CTL) and bit 4 (JGL) of parameter No. 1610. As the time constant, the value set in parameter No. 1624 is used, and as the FL feedrate, the value set in parameter No. 1625 is used.)</td>
</tr>
</tbody>
</table>

**NOTE**

This parameter is valid when bit 2 (IHD) of parameter No. 7100 is set to 1.
4. DESCRIPTION OF PARAMETERS

7105

[Data type]  Bit

HDX  I/O Link manual handles are:

0  :  Assigned automatically in the order of connection to the I/O Link.
1  :  Assigned to the addresses of the X signals set in parameter Nos. 12305 to 12307.

7106

[Data type]  Bit

CLH  When a high-speed type manual reference position return, reference position setting without dogs after the establishment of the reference position, reference position setting by pressing an axis against the stopper, or workpiece coordinate system presetting is performed, the indication of the manual handle interruption amount is:

0  :  Not cleared.
1  :  Cleared.

7110

Number of manual pulse generators used

[Data type]  Byte
[Valid data range]  1 or 2 (T series), 3 (M series)

This parameter sets the number of manual pulse generators.

7113

Manual handle feed magnification m

[Data type]  Word
[Unit of data]  One time
[Valid data range]  1 to 127

This parameter sets the magnification when manual handle feed movement selection signals MP1 and MP2 are set to 0 and 1.

7114

Manual handle feed magnification n

[Data type]  Word
[Unit of data]  One time
[Valid data range]  1 to 1000

This parameter sets the magnification when manual handle feed movement selection signals MP1 and MP2 are set to 1.

<table>
<thead>
<tr>
<th>Movement selection signal</th>
<th>Movement (Manual handle feed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP2</td>
<td>MP1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Allowable number of pulses that can be accumulated during manual handle feed

[Data type] 2-Word  
[Unit of data] Pulses  
[Valid data range] 0 to 99999999

If manual handle feed is specified such that the rapid traverse rate will be exceeded momentarily, those pulses received from the manual pulse generator that exceed the rapid traverse rate are accumulated rather than canceled. This parameter sets the maximum number of pulses which can be accumulated in such a case.

NOTE
If the specification of manual handle feed is such that the rapid traverse rate will be exceeded, for example, when the manual pulse generator is rotated at high speed with a large magnification such as 100, the axial feedrate is clamped at the rapid traverse rate and those pulses received from the manual pulse generator that exceed the rapid traverse rate are ignored. In such a case, therefore, the scale on the manual pulse generator may differ from the actual amount of travel. If such a difference is not acceptable, this parameter can be set to temporarily accumulate the excess pulses in the CNC, rather than ignoring them, up to the specified maximum (pulses in excess of the set maximum are ignored). The accumulated pulses are output and converted to a move command once the feedrate falls below the rapid traverse rate by reducing the rotational speed of the manual pulse generator or stopping its rotation altogether. Note, however, that if the maximum number of pulses to be accumulated is too large, stopping the rotation of the manual pulse generator does not stop feeding until the tool moves by an amount corresponding to the pulses accumulated in the CNC.
4.40 PARAMETERS OF BUTT-TYPE REFERENCE POSITION SETTING

7181  First withdrawal distance in butt-type reference position setting

[Data type]  2-word axis
[Unit of data]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch input</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
</tbody>
</table>

[Valid data range]  -999999999 to 999999999

When the butt-type reference position setting is used, this parameter sets a distance an axis, along which withdrawal is performed after the mechanical stopper is hit (distance from the mechanical stopper to the withdrawal point).

**NOTE**
Set the same direction as that set in bit 5 (ZMlx) of parameter No. 1006. Cycle operation cannot be started if the opposite direction is set.

7182  Second withdrawal distance in butt-type reference position setting

[Data type]  2-word axis
[Unit of data]

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter input</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch input</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
</tbody>
</table>

[Valid data range]  -999999999 to 999999999

When the butt-type reference position setting is used, this parameter sets a distance an axis, along which withdrawal is performed after the mechanical stopper is hit (distance from the mechanical stopper to the withdrawal point).

**NOTE**
Set the same direction as that set in bit 5 (ZMlx) of parameter No. 1006. Cycle operation cannot be started if the opposite direction is set.
4.DESCRIPTION OF PARAMETERS

7183 First butting feedrate in butt-type reference position setting

[Data type] Word axis

[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Units of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>30 to 15000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>30 to 6000</td>
</tr>
</tbody>
</table>

When the butt-type reference position setting is used, this parameter sets the feedrate first used to hit the stopper on an axis.

7184 Second butting feedrate in butt-type reference position setting

[Data type] Word axis

[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Units of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>30 to 15000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>30 to 6000</td>
</tr>
</tbody>
</table>

When the butt-type reference position setting is used, this parameter sets the feedrate used to hit the stopper on an axis for a second time.

7185 Withdrawal feedrate (common to the first and second butting operations) in butt-type reference position setting

[Data type] Word axis

[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Units of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>30 to 15000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>30 to 6000</td>
</tr>
</tbody>
</table>

When the butt-type reference position setting is used, this parameter sets the feedrate used for withdrawal along an axis after the mechanical stopper has been hit.

7186 Torque limit value in butt-type reference position setting

[Data type] Byte axes

[Unit of data] %

[Valid data range] 0 to 100

This parameter sets a torque limit value in butt-type reference position setting.

**NOTE**

When 0 is set in this parameter, 100% is assumed.
4.41 PARAMETERS OF SOFTWARE OPERATOR'S PANEL

<table>
<thead>
<tr>
<th></th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>7200</td>
<td>OP7</td>
<td>OP6</td>
<td>OP5</td>
<td>OP4</td>
<td>OP3</td>
<td>OP2</td>
<td>OP1</td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

OP1 Mode selection on software operator's panel
0 : Not performed
1 : Performed

OP2 JOG feed axis select and JOG rapid traverse buttons on software operator's panel
0 : Not performed
1 : Performed

OP3 Manual pulse generator's axis select and manual pulse generator's magnification switches on software operator's panel
0 : Not performed
1 : Performed

OP4 JOG speed override and rapid traverse override switches on software operator's panel
0 : Not performed
1 : Performed

OP5 Optional block skip, single block, machine lock, and dry run switches on software operator's panel
0 : Not performed
1 : Performed

OP6 Protect key on software operator's panel
0 : Not performed
1 : Performed

OP7 Feed hold on software operator's panel
0 : Not performed
1 : Performed

<table>
<thead>
<tr>
<th></th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>JPC</th>
</tr>
</thead>
<tbody>
<tr>
<td>7201</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

JPC For the name of a general-purpose switch function on the software operator's panel, the use of full-size characters is:
0 : Not allowed.
1 : Allowed.
On software operator's panel, set a feed axis corresponding to an arrow key on the MDI panel when jog feed is performed.

<table>
<thead>
<tr>
<th>Set value</th>
<th>Feed axis and direction</th>
<th>Arrow keys on the MDI panel</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Not moved</td>
<td>7</td>
</tr>
<tr>
<td>1</td>
<td>First axis, positive direction</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>First axis, negative direction</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>Second axis, positive direction</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Second axis, negative direction</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Third axis, positive direction</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>Third axis, negative direction</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Fourth axis, positive direction</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Fourth axis, negative direction</td>
<td>3</td>
</tr>
</tbody>
</table>

Under X, Y, and Z axis configuration, to set arrow keys to feed the axes in the direction specified as follows, set the parameters to the values given below. [8 ↑] to the positive direction of the Z axis, [2 ↓] to the negative direction of the Z axis, [6 →] to the positive direction of the X axis [4 ←] to the negative direction of the X axis, [1 ↗] to the positive direction of the Y axis, [9 ↘] to the negative direction of the Y axis

Parameter No. 7210 = 5 (Z axis, positive direction)
Parameter No. 7211 = 6 (Z axis, negative direction)
Parameter No. 7212 = 1 (X axis, positive direction)
Parameter No. 7213 = 2 (X axis, negative direction)
Parameter No. 7214 = 3 (Y axis, positive direction)
Parameter No. 7215 = 4 (Y axis, negative direction)
Parameter No. 7216 = 0 (Not used)
Parameter No. 7217 = 0 (Not used)
4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7220</td>
<td>Name of general-purpose switch on software operator's panel</td>
</tr>
<tr>
<td>7283</td>
<td>Name of general-purpose switch on software operator's panel</td>
</tr>
</tbody>
</table>

[Data type] Byte

These parameters set the names of the general-purpose switches (SIGNAL 1 through SIGNAL 8) on the software operator's panel as described below.

These names are set using character codes that are displayed in parameter Nos. 7220 to 7283.

Parameter No. 7220:
Sets the character code (083) corresponding to S of SIGNAL 1.

Parameter No. 7221:
Sets the character code (073) corresponding to I of SIGNAL 1.

Parameter No. 7222:
Sets the character code (071) corresponding to G of SIGNAL 1.

Parameter No. 7223:
Sets the character code (078) corresponding to N of SIGNAL 1.

Parameter No. 7224:
Sets the character code (065) corresponding to A of SIGNAL 1.

Parameter No. 7225:
Sets the character code (076) corresponding to L of SIGNAL 1.

Parameter No. 7226:
Sets the character code (032) corresponding to (space) of SIGNAL 1.

Parameter No. 7227:
Sets the character code (049) corresponding to 1 of SIGNAL 1.

Parameter Nos. 7228 to 7235:
Set the character codes of SIGNAL 2 shown in the figure above.

Parameter Nos. 7236 to 7243:
Set the character codes of SIGNAL 3 shown in the figure above.

Parameter Nos. 7244 to 7251:
Set the character codes of SIGNAL 4 shown in the figure above.

Parameter Nos. 7252 to 7259:
Set the character codes of SIGNAL 5 shown in the figure above.

Parameter Nos. 7260 to 7267:
Set the character codes of SIGNAL 6 shown in the figure above.

Parameter Nos. 7268 to 7275:
Set the character codes of SIGNAL 7 shown in the figure above.

Parameter Nos. 7276 to 7283:
Set the character codes of SIGNAL 8 shown in the figure above.

The character codes are shown in Appendix A CHARACTER CODE LIST.
4.42 PARAMETERS OF PROGRAM RESTART

<table>
<thead>
<tr>
<th>7300</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOU</td>
<td>MOA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOU</td>
<td>MOA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SJG</td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

SJG Return feedrate in program restart operation
- 0 : Dry run feedrate
- 1 : Jog feedrate

MOA In program restart operation, before movement to a machining restart point after restart block search:
- 0 : The last M, S, T, and B codes are output.
- 1 : All M codes and the last S, T, and B codes are output.

NOTE
This parameter is enabled when the MOU parameter is set to 1.

MOU In program restart operation, before movement to a machining restart point after restart block search:
- 0 : The M, S, T, and B codes are not output.
- 1 : The last M, S, T, and B codes are output.

| 7310 | Movement sequence to program restart position |

The following parameter can be set at "Setting screen".

[Data type] Byte axis

[Valid data range] 1 to No. of controlled axes
This parameter sets the axis sequence when the machine moves to the restart point by dry run after a program is restarted.

[Example]
The machine moves to the restart point in the order of the fourth, first, second, and third axes one at a time when the first axis = 2, the second axis = 3, the third axis = 4, and the fourth axis = 1 are set.
4.43  PARAMETERS OF POLYGON TURNING

### 7600

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLZ</td>
<td>PQE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**[Data type]** Bit

**PQE** The specification range of the rotation ratio for polygon turning
- 0: P=1 to 9, Q=-9 to -1, 1 to 9
- 1: P=1 to 999, Q=-999 to -1, 1 to 999

**PLZ** Synchronous axis using G28 command
- 0: Returns to the reference position in the same sequence as the manual reference position return.
- 1: Returns to the reference position by positioning at a rapid traverse.

The synchronous axis returns to the reference position in the same sequence as the manual reference position return when no return-to-reference position is performed after the power is turned on.

### 7603

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLR</td>
<td>SBR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**[Data type]** Bit

**SBR** For spindle synchronization, speed ratio control is:
- 0: Disabled.
- 1: Enabled.

**NOTE**
1. This parameter is used to set the slave spindle speed to a multiple of the master spindle speed when the spindle synchronization function is used.
2. This parameter is not related to the polygon turning function.
3. The spindle synchronization option is needed.
4. Parameter Nos. 7635 and 7636 also need be set up.

**PLR** The machine coordinates of a tool axis for polygon turning are:
- 0: Rounded by the setting in parameter 7620.
- 1: Rounded by 360° (or the setting in parameter No. 1260 when bit 0 (ROA) of parameter No. 1008 is set to 1).
4.DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7610</td>
<td>Control axis number of tool rotation axis for polygon turning</td>
</tr>
<tr>
<td>[Data type]</td>
<td>Byte</td>
</tr>
<tr>
<td>[Valid data range]</td>
<td>1, 2, 3, . . . number of control axes</td>
</tr>
<tr>
<td></td>
<td>This parameter sets the control axis number of a rotation tool axis used for polygon turning.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7620</td>
<td>Movement of tool rotation axis per revolution</td>
</tr>
<tr>
<td>[Data type]</td>
<td>2-word</td>
</tr>
<tr>
<td></td>
<td>Input increment IS-A IS-B IS-C Unit</td>
</tr>
<tr>
<td></td>
<td>Rotation axis 0.01 0.001 0.0001 deg</td>
</tr>
<tr>
<td>[Valid data range]</td>
<td>1 to 9999999</td>
</tr>
<tr>
<td></td>
<td>This parameter sets the movement of a tool rotation axis per revolution.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7621</td>
<td>Maximum allowable speed for the tool rotation axis (polygon synchronization axis)</td>
</tr>
<tr>
<td>[Data type]</td>
<td>Word</td>
</tr>
<tr>
<td>[Unit of data]</td>
<td>min⁻¹</td>
</tr>
<tr>
<td>[Valid data range]</td>
<td>0 to $1.2 \times 10^9$ / Set value of the parameter No.7620</td>
</tr>
<tr>
<td></td>
<td>This parameter sets the maximum allowable speed of the tool rotation axis (polygon synchronization axis).</td>
</tr>
<tr>
<td></td>
<td>If the speed of the tool rotation axis (polygon synchronization axis) exceeds the specified maximum allowable speed during polygon turning, the speed is clamped at the maximum allowable speed. When the speed is clamped at a maximum allowable speed, however, synchronization between the spindle and tool rotation axis (polygon synchronization axis) is lost. And, when the speed is clamped, P/S alarm No.5018 is issued.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7635</td>
<td>Multiplier influencing the slave spindle speed</td>
</tr>
<tr>
<td>[Data type]</td>
<td>Byte</td>
</tr>
<tr>
<td>[Unit of data]</td>
<td>Slave spindle (min⁻¹)/master spindle (min⁻¹)</td>
</tr>
<tr>
<td>[Valid data range]</td>
<td>1 to 9</td>
</tr>
<tr>
<td></td>
<td>Set up a multiplier that will act on the distance through which the slave spindle is to move.</td>
</tr>
<tr>
<td></td>
<td>In speed ratio control, the relationship between the speeds of the spindles is:</td>
</tr>
<tr>
<td></td>
<td>Slave spindle speed = master spindle speed × setting of parameter No. 7635</td>
</tr>
</tbody>
</table>
NOTE
1 This parameter is used to set the slave spindle speed to a multiple of the master spindle speed when the spindle synchronization function is used.
2 This parameter is not related to the polygon turning function.
3 The spindle synchronization control is needed.
4 Bit 2 (SBR) of parameter No. 7603 and parameter No. 7636 must be set as well.

### 7636

<table>
<thead>
<tr>
<th>Upper limit of the slave spindle speed</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>[Data type]</th>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Unit of data]</td>
<td>min⁻¹</td>
</tr>
<tr>
<td>[Valid data range]</td>
<td>1 to 19999</td>
</tr>
</tbody>
</table>

Specify a clamp speed for the slave spindle. If the slave spindle speed calculated from the master spindle speed exceeds the specified slave spindle clamp speed, the actual slave spindle speed is clamped at this clamp speed. At the same time, the master spindle speed is decreased to maintain a constant spindle rotation ratio.

NOTE
1 This parameter is used to set the slave spindle speed to a multiple of the master spindle speed when the spindle synchronization function is used.
2 This parameter is not related to the polygon turning function.
3 The spindle synchronization control is needed.
4 Bit 2 (SBR) of parameter No. 7603 and parameter No. 7635 must be set as well.
4.44 PARAMETERS OF GENERAL-PURPOSE RETRACTION

**7704**

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit  
ACR In advanced preview control, AI advanced preview control, or AI contour control mode, the general-purpose retraction function is:  
0 : Not used.  
1 : Used.  
(See the description of parameter No. 7745.)

**7730**

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit axis  
RTRx Retraction function is:  
0 : Disabled for each axis.  
1 : Enabled for each axis.

**7740**

|    |    |    |    |    |    |    |    |    |
|---|---|---|---|---|---|---|---|

[Data type] 2-word axis  
[Unit of data, valid data range]  
<table>
<thead>
<tr>
<th>Increment system</th>
<th>Units of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>30 to 240000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>30 to 96000</td>
</tr>
</tbody>
</table>

This parameter sets the feedrate during retraction for each axis.

**7741**

|    |    |    |    |    |    |    |    |    |
|---|---|---|---|---|---|---|---|

[Data type] 2-word axis  
[Valid range] -99999999 to 99999999  
This parameter sets the retracted distance for each axis.
4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>7745</th>
<th>Time constant of linear acceleration/deceleration during retraction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[Data type] Word axis</td>
</tr>
<tr>
<td></td>
<td>[Unit of data] msec</td>
</tr>
<tr>
<td></td>
<td>[Valid range] 0 to 4000</td>
</tr>
</tbody>
</table>

This parameter is used to set the acceleration rate of linear acceleration/deceleration performed during retraction by the general-purpose retraction function. For each axis, set a time (time constant) required to achieve the feedrate set in parameter No. 7740.

**NOTE**
This parameter is valid when bit 0 (ACR) of parameter No. 7704 is set to 1.
### 4.45 PARAMETERS OF AXIS CONTROL BY PMC

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>#7</td>
<td>#6</td>
<td>#5</td>
<td>#4</td>
<td>#3</td>
<td>#2</td>
<td>#1</td>
</tr>
<tr>
<td></td>
<td>SKE</td>
<td>AUX</td>
<td>NCC</td>
<td>RDE</td>
<td>OVE</td>
<td>MLE</td>
</tr>
</tbody>
</table>

#### MLE
- Whether all axis machine lock signal MLK <G044#1> is valid for PMC-controlled axes
- 0: Valid
- 1: Invalid

#### NOTE
Each-axis machine lock signals MLK1 to MLK8 <G108#0 to #7> are always valid, regardless of the setting of this parameter.

#### OVE
- Signals related to dry run and override used in PMC axis control
- 0: Same signals as those used for the CNC
  - (1) Feedrate override signals *FV0 to *FV7 <G012#0 to #7>
  - (2) Override cancellation signal OVC <G006#4>
  - (3) Rapid traverse override signals ROV1 and ROV2 <G014#0,#1>
  - (4) Dry run signal DRN <G046#7>
  - (5) Rapid traverse selection signal RT <G019#7>
- 1: Signals specific to the PMC
  - (1) Feedrate override signals *FV0E to *FV7E <G151#0 to #7>
  - (2) Override cancellation signal OVCE <G150#5>
  - (3) Rapid traverse override signals ROV1E and ROV2E <G150#0,#1>
  - (4) Dry run signal DRNE <G150#7>
  - (5) Rapid traverse selection signal RTE <G150#6>

#### RDE
- Whether dry run is valid for rapid traverse in PMC axis control
- 0: Invalid
- 1: Valid

#### NCC
- When a travel command is issued for a PMC-controlled axis (selected by a controlled-axis selection signal) according to the program:
- 0: P/S alarm 139 is issued while the PMC controls the axis with an axis control command. While the PMC does not control the axis, a CNC command is enabled.
- 1: P/S alarm 139 is issued unconditionally.

#### AUX
- The number of bytes for the code of an auxiliary function (12H) command to be output is
- 0: 1 (0 to 255)
- 1: 2 (0 to 65535)

#### SKE
- Skip signal during axis control by the PMC
- 0: Uses the same signal SKIP <X004#7> as CNC.
- 1: Uses dedicated axis control signal ESKIP <X004#6> used by the PMC.
4. DESCRIPTION OF PARAMETERS

[Data type] Bit

RPD Rapid traverse rate for PMC-controlled axes
- 0: Feedrate specified with parameter No.1420
- 1: Feedrate specified with the feedrate data in an axis control command

DWE Minimum time which can be specified in a dwell command in PMC axis control when the increment system is IS-C
- 0: 1 ms
- 1: 0.1 ms

SUE Whether acceleration/deceleration is performed for an axis that is synchronized with external pulses, for external pulse synchronization commands in PMC axis control
- 0: Performed (exponential acceleration/deceleration)
- 1: Not performed

F10 Least increment for the feedrate for cutting feed (per minute) in PMC axis control

<table>
<thead>
<tr>
<th>F10</th>
<th>Millimeter input</th>
<th>Inch input</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1 mm/min</td>
<td>0.01 inch/min</td>
</tr>
<tr>
<td>1</td>
<td>10 mm/min</td>
<td>0.1 inch/min</td>
</tr>
</tbody>
</table>

PF1, PF2 Set the feedrate unit of feed per minute in PMC axis control

<table>
<thead>
<tr>
<th>PF2</th>
<th>PF1</th>
<th>Feedrate unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>1/1</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1/10</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1/100</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1/1000</td>
</tr>
</tbody>
</table>

FR1, FR2 Set the feedrate unit for feed per rotation for an axis controlled by the PMC.

<table>
<thead>
<tr>
<th>FR2</th>
<th>FR1</th>
<th>Millimeter input</th>
<th>Inch input</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0.0001 mm/rev</td>
<td>0.000001 inch/rev</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0.001 mm/rev</td>
<td>0.00001 inch/rev</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0.01 mm/rev</td>
<td>0.0001 inch/rev</td>
</tr>
</tbody>
</table>

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Bit

PIM Specifies whether to cause an inch/metric input to affect the linear axis that is subjected only to PMC axis control (see the parameter No.1010), as follows:
- 0: To affect.
- 1: Not to affect.
PAX  When the number of CNC-controlled axes (parameter No. 1010) is set to 0:
    0 : All axes are assumed to be CNC axes.
    1 : All axes are assumed to be PMC axes.

<table>
<thead>
<tr>
<th>8004</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>NDI</td>
<td>NCI</td>
<td>DSL</td>
<td></td>
<td></td>
<td></td>
<td>NMT</td>
<td>CMV</td>
<td></td>
</tr>
<tr>
<td>NDI</td>
<td>NCI</td>
<td>DSL</td>
<td>G8R</td>
<td>G8C</td>
<td></td>
<td>NMT</td>
<td>CMV</td>
<td></td>
</tr>
</tbody>
</table>

[Data type]  Bit
CMV  When a move command and auxiliary function are specified from the CNC, and the system is awaiting the auxiliary function completion signal after completion of the specified axis movement:
    0 : An alarm (No.130) is issued when an axis control command is issued from the PMC for the same axis.
    1 : An axis control command, when issued from the PMC for the same axis, is executed.
NMT  When a command is specified from the CNC for the axis on which the tool is moving according to axis control specification from the PMC:
    0 : P/S alarm No.130 is issued.
    1 : The command is executed without issuing an alarm, provided the command does not involve a movement on the axis.
G8C  Advanced preview control for the axes controlled by the PMC is:
    0 : Disabled.
    1 : Enabled.

**NOTE**
This parameter is valid for an axis for which bit 7 (NAHx) of parameter No.1819 is set to 0.

G8R  Advanced preview control over axes controlled by the PMC is:
    0 : Enabled for cutting feed (disabled for rapid traverse).
    1 : Enabled for both cutting feed and rapid traverse.

**NOTE**
This parameter is valid for an axis for which bit 7 (NAHx) of parameter No.1819 is set to 0.

DSL  If the selection of an axis is changed when PMC axis selection is disabled:
    0 : P/S alarm No.139 is issued.
    1 : The change is valid, and no alarm is issued for an unspecified system.
NCl  In axis control by the PMC, a position check at the time of deceleration is:
    0 : Performed.
    1 : Not performed.
NDI  For PMC axis control, when diameter programming is specified for a PMC-controlled axis:
    0 : The amount of travel and feedrate are each specified with a radius.

- 347 -
1: The amount of travel and feedrate are each specified with a diameter.

**NOTE**

NDI is valid for an axis for which diameter programming is specified (bit 3 (DIAx) of parameter No. 1006 is set to 1) when bit 1 (CDI) of parameter No. 8005 is set to 0.

---

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFD</td>
<td>IFV</td>
<td>PVP</td>
<td>DRR</td>
<td>R10</td>
<td>CDI</td>
<td>EDC</td>
<td></td>
</tr>
</tbody>
</table>

**[Data type] Bit**

EDC In PMC-based axis control, an external deceleration signal is:
- 0: Disabled.
- 1: Enabled.

CDI For PMC axis control, when diameter programming is specified for a PMC-controlled axis:
- 0: The amount of travel and feedrate are each specified with a radius.
- 1: The amount of travel is specified with a diameter while the feedrate is specified with a radius.

**NOTE**

1. This parameter is valid when bit 3 (DIA) of parameter No.1006 is set to 1.
2. When CDI is set to 1, bit 7 (NDI) of parameter No.8004 is disabled.

R10 When the RPD parameter (bit 0 of parameter No.8002) is set to 1, the unit for specifying a rapid traverse rate for the PMC axis is:
- 0: 1 mm/min.
- 1: 10 mm/min.

DRR For cutting feed per rotation in PMC axis control, the dry run function is:
- 0: Disabled.
- 1: Enabled.

PVP For velocity command in PMC axis control, position control is:
- 0: Not performed.
- 1: Performed.

IFV Override for each group in PMC axis control is:
- 0: Disabled.
- 1: Enabled.

MFD Output by each auxiliary function of the PMC axis control function is:
- 0: Disabled.
- 1: Enabled.

---

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAL</td>
<td>EZR</td>
<td>ESI</td>
<td></td>
<td>IPA</td>
<td></td>
<td>EML</td>
<td></td>
</tr>
</tbody>
</table>
4. DESCRIPTION OF PARAMETERS

[Data type] Bit

EML When bit 0 (MLE) of parameter No. 8001 is set to 1, for PMC axes:

0: The all axis machine lock signal and axis-by-axis machine lock signals are disabled.
1: The all axis machine lock signal is disabled and the axis-by-axis machine lock signals are enabled.

IPA For controlled axis at PMC axis control only (see the parameter No. 1010):

0: The in-position check is performed when no move command is issued for the PMC axis.
1: No in-position check is always performed.

EZR For PMC axes, the setting of bit 0 (ZRN) of parameter No. 1005 is:

0: Not followed. (Constant checking of the reference position return status is not made.)
1: Followed. (The reference position return status is checked according to the setting of bit 0 (ZRN) of parameter No. 1005.)

EAL In axis control by the PMC, the function that allows the alarm signal (EIALg) to be reset by a CNC reset operation is:

0: Disabled.
1: Enabled.

---

NIS In the in-position check of PMC axes, in-position check disable signal NOINPS <G023#5> and in-position check disable signals for individual axes NOINP1 to NOINP8 <G359> are:

0: Invalid.
1: Valid.

NOTE

Although in-position checks of ordinary blocks can be disabled by using in-position check disable signal NOINPS <G023#5> and in-position check disable signals for individual axes NOINP1 to NOINP8 <G359>, the in-position check at the reference position obtained by a reference position return operation (G28 or G30) is always performed. The in-position check at an intermediate point, however, can be disabled. To disable the in-position check at the reference position as well, set bit 0 (RF2) of parameter No. 3454 to 1, and specify a reference position return by using G28.2 or G30.2.
MIRx When a PMC axis control command is issued in mirror image mode, the mirror image is:
0 : Not considered.
1 : Considered.
This parameter is valid when PMC signals MI1 to MI4 <G106#0-3> are set to "1" or bit 0 (MIRx) of parameter No. 0012 is set to "1".

8010 Selection of the DI/DO group for each axis controlled by the PMC

<table>
<thead>
<tr>
<th>Data type</th>
<th>Byte axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid data range</td>
<td>1 to 4</td>
</tr>
</tbody>
</table>

Specify the DI/DO group to be used to specify a command for each PMC-controlled axis.

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DI/DO group A (G142 to G153) is used.</td>
</tr>
<tr>
<td>2</td>
<td>DI/DO group B (G154 to G165) is used.</td>
</tr>
<tr>
<td>3</td>
<td>DI/DO group C (G166 to G177) is used.</td>
</tr>
<tr>
<td>4</td>
<td>DI/DO group D (G178 to G189) is used.</td>
</tr>
</tbody>
</table>

8020 Low-speed feedrate at reference position return in axis control by PMC (FL)

<table>
<thead>
<tr>
<th>Data type</th>
<th>Word axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of data, valid data range</td>
<td></td>
</tr>
</tbody>
</table>

This parameter specifies the low-speed feedrate at a reference position return on a PMC-controlled axis (FL).

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Units of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IS-B</td>
<td>IS-C</td>
</tr>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 15000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 6000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>6 to 15000</td>
</tr>
</tbody>
</table>

NOTE
If 0 is specified, the value of parameter No. 1425 is used.
8021  Minimum speed of rapid traverse override in axis control by PMC (F0)

[Data type] Word axis

[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Units of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>IS-B</td>
</tr>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 15000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 6000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>6 to 15000</td>
</tr>
</tbody>
</table>

This parameter specifies the minimum speed of rapid traverse override on a PMC-controlled axis (F0).

8022  Upper-limit rate of feed per revolution during PMC axis control

[Data type] Word

[Unit of data, valid data range]

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Units of data</th>
<th>Valid data range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>IS-B</td>
</tr>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 15000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 6000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>6 to 15000</td>
</tr>
</tbody>
</table>

This parameter sets the upper limit rate of feed per revolution during PMC axis control.

NOTE
The upper limit specified for the first axis is valid for all axes. The specifications for the second and subsequent axes are ignored.

8028  Linear acceleration/deceleration time constant for speed commands for PMC axis control

[Data type] Word axis

[Unit of data] ms/1000 min⁻¹

[Valid data range] 0 to 32767

This parameter sets the time required for the servo motor rotation speed to increase or decrease by 1000 min⁻¹, for each axis, as a linear acceleration/deceleration time constant for speed commands for PMC axis control. (See also the description of bit 6 (JVB) of parameter No. 8003.)

NOTE
If this parameter is set to 0, acceleration/deceleration control is not applied.
4.46  PARAMETERS OF FS0i BASIC FUNCTIONS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8130</td>
<td><strong>Total number of controlled axes</strong></td>
</tr>
</tbody>
</table>

**NOTE**
When this parameter has been set, the power must be turned off before operation is continued.

- **[Data type]** Byte
- **[Valid data range]** 2 to 4

This parameter sets the total number of axes controlled by the CNC.

<table>
<thead>
<tr>
<th></th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8131</td>
<td><strong>AOV EDC F1D HPG</strong></td>
</tr>
</tbody>
</table>

**NOTE**
When this parameter has been set, the power must be turned off before operation is continued.

- **[Data type]** Bit

<table>
<thead>
<tr>
<th>HPG</th>
<th>Manual handle feed is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Not Used.</td>
</tr>
<tr>
<td>1</td>
<td>Used.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>F1D</th>
<th>One-digit F code feed is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Not Used.</td>
</tr>
<tr>
<td>1</td>
<td>Used.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EDC</th>
<th>External deceleration is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Not Used.</td>
</tr>
<tr>
<td>1</td>
<td>Used.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AOV</th>
<th>Automatic corner override is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Not Used.</td>
</tr>
<tr>
<td>1</td>
<td>Used.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YOF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TLF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>SCL</th>
<th>SPK</th>
<th>IXC</th>
<th>BCD</th>
<th>TLF</th>
</tr>
</thead>
</table>

**NOTE**
When this parameter has been set, the power must be turned off before operation is continued.

- **[Data type]** Bit

<table>
<thead>
<tr>
<th>TFL</th>
<th>Tool life management is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Not Used.</td>
</tr>
<tr>
<td>1</td>
<td>Used.</td>
</tr>
</tbody>
</table>
NOTE
When TLF is changed, the data listed below is erased.
Therefore, before changing TLF, save the following data:
- Additional custom macro common variable data
- Tool offset data
- Tool life management data
- Additional workpiece coordinate system data
  (0i-MC / 0i Mate-MC only)

YOF Y-axis offset is:
0 : Not Used.
1 : Used.

BCD Second auxiliary function is:
0 : Not Used.
1 : Used.

IXC Index table indexing is:
0 : Not Used.
1 : Used.

SPK Small diameter peck drilling cycle is:
0 : Not Used.
1 : Used.

SCL Scaling is:
0 : Not Used.
1 : Used.

NOTE
1 When this parameter has been set, the power must be turned off before operation is continued.
2 A small diameter peck drilling cycle and scaling cannot be used at the same time.

[Data type] Bit
SSC Constant surface speed control is:
0 : Not Used.
1 : Used.

AXC Spindle positioning is:
0 : Not Used.
1 : Used.

SCS Cs contour control is:
0 : Not Used.
1 : Used.

MSP Multi-spindle is:
0 : Not Used.
1 : Used.
SYC  Spindle synchronization is:
   0 : Not Used.
   1 : Used.

SSN  Serial spindle function is:
   0 : Used. (The analog spindle function is not used.)
   1 : Not Used. (The analog spindle function is used.)

**NOTE**

Spindle positioning and Cs contour control by the serial spindle cannot be used at the same time.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**

When this parameter has been set, the power must be turned off before operation is continued.

**[Data type]**  Bit

**IAP**  Conversational programming with graphic function is:
   0 : Not Used.
   1 : Used.

**BAR**  Chuck and tail stock barrier function is:
   0 : Not Used.
   1 : Used.

**CCR**  Chamfering / corner R is:
   0 : Not Used.
   1 : Used.

**NOTE**

When the chuck and tail stock barrier function is selected, stored stroke limits 2 and 3 cannot be used.
4.47 PARAMETERS OF ANGULAR AXIS CONTROL

<table>
<thead>
<tr>
<th>8200</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
</table>

**NOTE**

When this parameter is set, the power must be turned off before operation is continued.

[Data type] Bit

**AAC**

0: Does not perform angular axis control.
1: Performs inclined axis control.

**AZR**

0: The machine tool is moved along the Cartesian axis during manual reference position return along the slanted axis under angular axis control.
1: The machine tool is not moved along the Cartesian axis during manual reference position return along the slanted axis under angular axis control.

**AZP**

When an angular axis moves, the reference position return completion signal for the Cartesian axis, ZPx <F094, F096, F098, or F100>, is:

0: Not cleared.
1: Cleared.

<table>
<thead>
<tr>
<th>8201</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
</table>

[Data type] Bit

**AOT**

When angular axis control is enabled, the values indicating the area for stored stroke check 1 (parameters Nos. 1320, 1321, 1326, and 1327) are treated as:

0: Coordinates in the angular coordinate system.
1: Coordinates in the Cartesian coordinate system.

**AO2**

When angular axis control is enabled, the values indicating the area for stored stroke check 2 (parameters Nos. 1322 and 1323) are treated as:

0: Coordinates in the angular coordinate system.
1: Coordinates in the Cartesian coordinate system.

**AO3**

When angular axis control is enabled, the values indicating the area for stored stroke check 3 (parameters Nos. 1324 and 1325) are treated as:

0: Coordinates in the angular coordinate system.
1: Coordinates in the Cartesian coordinate system.
ALN  When manual rapid traverse or reference position return without dogs is performed for an angular axis during angular axis control:
0 : The acceleration/deceleration time for a Cartesian axis is not controlled.
1 : The acceleration/deceleration time for a Cartesian axis is controlled so that it matches the acceleration/deceleration time for the angular axis. (A linear path is formed by the angular axis and Cartesian axis.)

ACL  In linear interpolation type rapid traverse, the feedrate clamp function for angular axis control is:
0 : Enabled.
1 : Disabled.

**NOTE**
This parameter is valid when bit 1 (LRP) of parameter No. 1401 is set to 1.

A53  During angular axis control, when a machine coordinate system command (G53) specifies an angular axis alone:
0 : A movement along a Cartesian axis is also made.
1 : A movement is made along the angular axis only.

ADG  The contents of diagnostic data Nos. 306 and 307 are:
0 : Not swapped. The angular axis and Cartesian axis are displayed in this order.
1 : Swapped. The Cartesian axis and angular axis are displayed in this order.

**8210**
Inclination angle for angular axis control

[Data type] 2-word
[Unit of data] 0.001 degree
[Valid data range] 20000 to 60000

![Diagram of inclination angle for angular axis control](image-url)
4.DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8211</td>
<td>Axis number of a slanted axis subject to angular axis control</td>
</tr>
<tr>
<td>8212</td>
<td>Axis number of a Cartesian axis subject to slanted axis control</td>
</tr>
</tbody>
</table>

[Data type]  Byte
[Unit of data] Axis number
[Valid data range] 1 to number of controlled axes

When angular axis control is to be applied to an arbitrary axis, these parameters set the axis numbers of a slanted axis and Cartesian axis.
4.48 PARAMETERS OF SIMPLE SYNCHRONOUS CONTROL

4.48.1 Parameters of Simple Synchronous Control

<table>
<thead>
<tr>
<th>Parameter</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>8301</td>
<td>SOF</td>
<td>SYE</td>
<td>SYA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**[Data type]** Bit

**SYA** In the servo-off state in simple synchronous control, the limit of the difference between the positioning deviation of the master axis and that of the slave axis is:

- 0: Checked.
- 1: Not checked.

**SYE** During execution of synchronization, the limit of the difference between positioning deviations (parameter No. 8313 or 8323) is:

- 0: Checked.
- 1: Not checked.

**SOF** The synchronization function in simple synchronous control (one pair) is:

- 0: Not used.
- 1: Used.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>8302</td>
<td>SMA</td>
<td></td>
<td>SSE</td>
<td></td>
<td>ATS</td>
<td></td>
<td>ATE</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**

When this parameter is set, the power must be turned off before operation is continued.

**[Data type]** Bit

**ATE** Automatic setting of grid positioning for simplified synchronous control one pair is:

- 0: Disabled
- 1: Enabled

**ATS** Automatic setting of grid positioning for simplified synchronous control one pair is:

- 0: Not started
- 1: Started

**NOTE**

1. When the bits are set to 1, parameter No.8316 and bit 4 (APZx) of parameter No.1815 for the master and slave axes are set to 0.
2. These bits are automatically set to 0 once grid positioning has been completed.

**SSE** In simple synchronization control, the external machine coordinate system shift function for the slave axis is:

- 0: Not used.
1: Used.
For axes under simple synchronization control, when the external machine coordinate system shift is performed for the master axis, it can also performed for the slave axis simultaneously.

NOTE
The simple synchronous signal must be manipulated.
Carefully turn the simple synchronous signal on and off because the machine may move at that time.

SMA When bit 4x (APZx) of parameter No. 1815 is turned off for one axis under simple synchronous control, APZx for the other axis under simple synchronous control is:
0: Not turned off.
1: Turned off.
When an axis for which the simple synchronous axis parameter is set is under simple synchronous control, the simple synchronous signal is turned on for the axis.

<table>
<thead>
<tr>
<th></th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOFx</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ATSx</td>
<td>ATEx</td>
</tr>
</tbody>
</table>

NOTE
After this parameter has been set, the power must be turned off then on again for the setting to become effective.

[Data type] Bit axis
ATEx In simple synchronous control, automatic setting for grid positioning is:
0: Disabled.
1: Enabled.
ATSx In simple synchronous control, automatic setting for grid positioning is:
0: Not started.
1: Started.

NOTE
When starting automatic setting for grid positioning, set ATSx to 1. Upon the completion of setting, ATSx is automatically set to 0.

SOFx In simple synchronous control, the synchronization function is:
0: Not used.
1: Used.
NOTE
Set this parameter on the master axis side.

8304

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
<th>USD</th>
</tr>
</thead>
</table>

[Data type] Bit axis

USD In simple synchronous control, the uni-directional synchronization function uses:

0: Axis of which machine coordinate is larger as the reference.
1: Axis of which machine coordinate is smaller as the reference.

NOTE
Set this parameter (USD) to the same value for both the master and slave axes.

8305

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
<th>USE</th>
<th>USC</th>
</tr>
</thead>
</table>

[Data type] Bit

USC In simple synchronous control, the uni-directional synchronization function is:

0: Not used.
1: Used.

NOTE
This parameter is valid only when bit 7 (SOF) of parameter No. 8301 or bit 7 (SOFx) of parameter No. 8303 is set to 1.

USE In simple synchronous control, after emergency stop, the uni-directional synchronization function is:

0: Used.
1: Not used.

NOTE
This parameter is valid only when bit 7 (SOF) of parameter No. 8301 or bit 7 (SOFx) of parameter No. 8303 is set to 1.
8311  
Axis number of master axis in synchronous control

**NOTE**

When this parameter is set, the power must be turned off before operation is continued.

[Data type]  Byte axis

**<For the T series>**

[Valid data range]  0 to (Number of controlled axes - 1)

Select a master axis and slave axis in simple synchronous control. Set a master axis number with a slave axis. For the parameters for the first axis through the fourth axis of parameter No.8311, set the following:

- Units digit of the parameter for the first axis → Set the axis number of the master axis when the first axis is used as the slave axis.
- Tens digit of the parameter for the first axis → Set the axis number of the master axis when the second axis is used as the slave axis.
- Units digit of the parameter for the second axis → Set the axis number of the master axis when the third axis is used as the slave axis.
- Tens digit of the parameter for the second axis → Set the axis number of the master axis when the fourth axis is used as the slave axis.

- Units digit of the parameter for the third axis → Always set to 0.
- Tens digit of the parameter for the third axis → Always set to 0.
- Units digit of the parameter for the fourth axis → Always set to 0.
- Tens digit of the parameter for the fourth axis → Always set to 0.

<table>
<thead>
<tr>
<th>Number</th>
<th>Tens digit</th>
<th>Units digit</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.8311 : First axis</td>
<td>Second axis</td>
<td>First axis</td>
</tr>
<tr>
<td>No.8311 : Second axis</td>
<td>Fourth axis</td>
<td>Third axis</td>
</tr>
</tbody>
</table>

Note that the axis number settings are as follows:

0 -> First axis, 1 -> Second axis, 2 -> Third axis, 3 -> Fourth axis

**Example:**

To use the third axis as the master axis and the fourth axis as the slave axis, set the axis number (setting of 2) of the third axis (master axis) in the tens digit for the second axis in the fourth axis (slave axis) parameter, that is, parameter No. 8311.

No. 8311
- First: 00
- Second: 20
- Third: 00
- Fourth: 00
NOTE

For an axis for which 0 is set, the first axis serves as the master axis. So, when the control signal for the axis is set to 1, the first axis serves as a master axis, and synchronous control is exercised.

<For the M series>

[Valid data range] 0, 1 to Number of controlled axes
Select a master axis and slave axis in simple synchronous control. Set a master axis number with the slave axis side. The axis number settings are: 1 → First axis, 2 → Second axis, 3 → Third axis, 4 → Fourth axis. Up to four pairs can be specified.

Example1:
Simple synchronous control is exercised with one pair.
When using the first axis (X-axis) as the master axis, and the third axis (Z-axis) as the slave axis, set parameter No.8311 as follows:
Parameter No. 8311 X (first axis) = 0
Y (second axis) = 0
Z (third axis) = 1
A (fourth axis) = 0

Example2:
Simple synchronous control is exercised with two pairs.
Assume that the following two pairs are to be used:
The master axis is the first axis, while a slave axis is the fourth axis.
The master axis is the second axis, while a slave axis is the third axis.
For this specification, set this parameter as follows:
Parameter No.8311 X (First axis) = 0
Y (Second axis) = 0
Z (Third axis) = 2
(Fourth axis) = 1

NOTE

The axis number of a master axis must always be smaller than the corresponding slave axis number. Multiple slave axes cannot be assigned to a master axis.

Enabling/disabling mirror image in synchronous control

[Data type] Byte axis
[Valid data range] -127 to +128
This parameter sets the mirror image function. When 100 or a greater value is set with this parameter, the mirror image function is applied to synchronous control. Set this parameter to the slave axis.
[Example]
To establish reversed synchronization when using the third axis as the master axis and the fourth axis as the slave axis, set parameter No.8311 and parameter No.8312 as follows:
- Parameter No.8311 (first axis) = 0
- Parameter No.8311 (second axis) = 20
- Parameter No.8311 (third axis) = 0
- Parameter No.8311 (fourth axis) = 0
- Parameter No.8312 (first axis) = 0
- Parameter No.8312 (second axis) = 0
- Parameter No.8312 (third axis) = 0
- Parameter No.8312 (fourth axis) = 100

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>8311</td>
<td>0</td>
</tr>
<tr>
<td>8312</td>
<td>100</td>
</tr>
</tbody>
</table>

8313
Limit of the difference between the amount of positioning deviation of the master and slave axes (Synchronous control one pair)

[Data type] Word
[Unit of data] Detection unit
[Valid data range] 0 to 32767

Set the limit of the difference between the amount of positioning deviation of the master and slave axes. If the difference between them exceeds the limit assigned to the parameter, the P/S alarm (No.213) is activated.

8314
Maximum error in synchronization error check

[Data type] Word axis
[Unit of data] Input increment

<table>
<thead>
<tr>
<th>Input increment</th>
<th>IS-A</th>
<th>IS-B</th>
<th>IS-C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>mm</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>inch</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>deg</td>
</tr>
</tbody>
</table>

[Valid data range] 0 to 32767
The machine coordinates on a master axis and slave axis are monitored. If a difference (synchronization error) which is greater than the value specified in this parameter is detected, a servo alarm (No.407) is generated, and the machine is stopped.
Set this parameter with a master axis. When 0 is set in this parameter, no synchronization error check is made.
## 4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Data Type</th>
<th>Unit</th>
<th>Valid Data Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8315</strong></td>
<td>Maximum compensation value for synchronization (Synchronous control one pair)</td>
<td>Word axis</td>
<td>Unit used for the detection</td>
<td>0 to 32767</td>
</tr>
<tr>
<td></td>
<td>This parameter sets the maximum compensation value for synchronization. When a compensation value greater than the value set in this parameter is used, servo alarm No.410 of slave axis is issued.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>8316</strong></td>
<td>Difference between reference counters for master and slave axes (Synchronous control one pair)</td>
<td>2-word</td>
<td>Detection unit</td>
<td>-99999999 to 99999999</td>
</tr>
<tr>
<td></td>
<td>This parameter indicates the difference between the values in the reference counter for the master axis and that for the slave axis.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>8317</strong></td>
<td>Torque difference alarm detection time (Synchronous control one pair)</td>
<td>Word</td>
<td>ms</td>
<td>0 to 4000 (When 0 is set, 512 ms is assumed.)</td>
</tr>
<tr>
<td></td>
<td>This parameter specifies the period between the servo preparation completion signal (SA &lt;F000 bit 6&gt;) being set to 1 and the check of the torque difference alarm being started, for the torque difference alarm detection function. The set value is rounded up to the nearest a multiple of 16 ms.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**
When this parameter is set, the power must be turned off before operation is continued.

**NOTE**
Once grid positioning has been completed, the difference between the reference counters is automatically set in this parameter. At this time, bit 1 (ATS) of parameter No.8302 is set to 0.
## 4. DESCRIPTION OF PARAMETERS

### 8318

**Detection timer for the limit of the difference between the positioning deviation of the master axis and that of the slave axis**

<table>
<thead>
<tr>
<th>Data type</th>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of data</td>
<td>8m</td>
</tr>
<tr>
<td>Valid data range</td>
<td>0 to 1000</td>
</tr>
</tbody>
</table>

This parameter sets the time from the output of a compensation pulse to the slave axis to the start of the check of the limit of the difference between the positioning deviation of the master axis and that of the slave axis by the synchronization function. The setting is also used for the check of an excessive error at stop.

**NOTE**

If a value greater than 1000 is set, a value of 1000 is assumed.

### 8323

**Maximum allowable difference between master axis and slave axis positional deviations**

<table>
<thead>
<tr>
<th>Data type</th>
<th>Word axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of data</td>
<td>Detection unit</td>
</tr>
<tr>
<td>Valid data range</td>
<td>0 to 32767</td>
</tr>
</tbody>
</table>

This parameter sets the maximum allowable difference between the master axis and slave axis position deviations. If a positional deviation difference exceeds the value specified in this parameter, an alarm (No.213) is issued.

Set this parameter with a master axis. If 0 is specified in this parameter, no position deviation difference check is made.

### 8325

**Maximum compensation value for synchronization**

<table>
<thead>
<tr>
<th>Data type</th>
<th>Word axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of data</td>
<td>Detection unit</td>
</tr>
<tr>
<td>Valid data range</td>
<td>0 to 32767</td>
</tr>
</tbody>
</table>

This parameter sets the maximum compensation value for synchronization. If a compensation value exceeds the value specified with this parameter, a servo alarm (No.407) is issued.

Specify a master axis for this parameter. To enable this parameter, set the SOFx parameter (bit 7 of parameter No.8303) to 1.
### 8326

#### Difference between master axis and slave axis reference counters

<table>
<thead>
<tr>
<th>Data type</th>
<th>2-word axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of data</td>
<td>Detection unit</td>
</tr>
<tr>
<td>Valid data range</td>
<td>-999999999 to 999999999</td>
</tr>
</tbody>
</table>

The difference between the master axis reference counter and slave axis reference counter (master axis and slave axis grid shift) is automatically set when automatic setting for grid positioning is performed. Then, the difference is transferred together with an ordinary grid shift value to the servo system when the power is turned on.

This parameter is set with a master axis.

### 8327

#### Torque difference alarm detection timer

<table>
<thead>
<tr>
<th>Data type</th>
<th>Word axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of data</td>
<td>ms</td>
</tr>
<tr>
<td>Valid data range</td>
<td>0 to 4000</td>
</tr>
</tbody>
</table>

This parameter sets a time from the servo preparation completion signal, SA (F000#6), being set to 1 until torque difference alarm detection is started in simple synchronous control. A fraction of less than 16 msec is rounded up.

**Example:**
- Setting = 100: The specification of 112 msec is assumed.
- Set this parameter with a master axis. If 0 is set in this parameter, the specification of 512 msec is assumed.
## 4.49 PARAMETERS OF SEQUENCE NUMBER COMPARISON AND STOP

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8341</strong></td>
<td>Program number subject to comparison and stop</td>
</tr>
<tr>
<td>[Data type]</td>
<td>Word</td>
</tr>
<tr>
<td>[Valid data range]</td>
<td>0 to 9999</td>
</tr>
<tr>
<td><strong>8342</strong></td>
<td>Sequence number subject to comparison and stop</td>
</tr>
<tr>
<td>[Data type]</td>
<td>2-word</td>
</tr>
<tr>
<td>[Valid data range]</td>
<td>0 to 9999</td>
</tr>
</tbody>
</table>

This parameter sets the program number, including a sequence number, subject to sequence number comparison and stop. Parameter No.8342 is used to set a sequence number subject to check termination.

**NOTE**
A program number can also be set on the setting screen. If a program number is set on the setting screen, the value of the parameter is changed accordingly.

This parameter sets the sequence number subject to sequence number comparison and stop.
If the block containing the sequence number set with this parameter is executed while the program set with parameter No.8341 is being executed, a single block stop occurs after the block is executed. At this time, the setting is automatically set to -1. Upon power-up, the setting is automatically set to 0.

**NOTE**
A sequence number can also be set by using the setting screen. If a sequence number is set on the setting screen, the value of the parameter is changed accordingly.
# 4.50 OTHER PARAMETERS

### 4.50 OTHER PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>8700</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### DMM

- **Data type**: Bit
- **Description**: In DNC operation from the PMC, OPEN CNC, or C-EXE, pre-reading is:
  - 0: Not performed.
  - 1: Performed.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>8701</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### WPR

- **Data type**: Bit
- **Description**: The function that allows parameters that are rewritten using the PMC window to be enabled during automatic operation is:
  - 0: Disabled.
  - 1: Enabled.

**NOTE**

If this parameter is set, a move command based on manual operation is disabled (interlock state) while parameter rewriting using the PMC window is being executed.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>8702</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### SME

- **Data type**: Bit
- **Description**: During DNC operation or M198 call, parameter No. 8790 (timing for executing an auxiliary macro) is:
  - 0: Invalid.
  - 1: Valid.

- **Description**: At the beginning of program uploading in response to a request using the data window library:
  - 0: "LF+%" is not output.
  - 1: "LF+%" is output.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>8703</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### WSP

- **Data type**: Bit
- **Description**: When serial spindle parameter Nos. 4000 to 4799 are rewritten with function code 18 (parameter write) of the PMC window function, the new data is:
  - 0: Not transferred to the spindle amplifier immediately.
  - 1: Transferred to the spindle amplifier immediately.
1 When a parameter write operation with all axes specified (axis specification: -1) is performed with function code 18 of the PMC window function, this function cannot be used. (Even if the function is specified, data for all axes is not transferred to the spindle amplifier.)

2 When a spindle startup operation is being performed at the time of power-up and so on, or when serial spindle parameter data (parameter Nos. 4000 to 4799) is being rewritten through MDI keys, RS-232C, or programmable data input (G10), the serial spindle parameter data (parameter Nos. 4000 to 4799) must not be rewritten with the PMC window function at the same time.

3 When spindle orientation with the stop position set externally or incremental command type spindle orientation (both set by bit 2 (OR1) and bit 3 (OR2) of parameter No. 3702) is used, the same condition as described in NOTE 2 above applies if the status of the spindle orientation external stop position command signals (below) changes. When a change to the spindle orientation external stop position command signals and rewriting of spindle parameters (parameter Nos. 4000 to 4799) by the PMC window function are performed successively, insert a wait time of at least 50 ms between these operations.

Spindle orientation external stop position command signals
- First spindle SHA00 to SHA11 <G078, G079>
- Second spindle SHB00 to SHB11 <G080, G081>

4 When a parameter has been changed using this function, it requires 1000 ms for the new parameter data to become valid on the spindle amplifier side. To use a parameter as soon as changing it, wait for at least 1000 ms after the PMC window completion code is returned.
**NOTE**
When this parameter has been set, the power must be turned off before operation is continued.

- **Data type:** Bit
- **HSD**
  - Main machining during DNC operation with FOCAS1/HSSB is:
    - 0: Normal operation.
    - 1: High-speed operation.
  - Set this parameter according to machining during DNC operation.
  - Usually, when binary operation and programs containing contiguous small blocks are performed during DNC operation with FOCAS1/HSSB, high-speed operation is selected.

**NOTE**
For details of this parameter, also refer to "FANUC Open CNC DNC Operation Management Package" and other manuals.

- **NWD**
  - During DNC operation with FOCAS1/HSSB, new DNC functions are:
    - 0: Not executed.
    - 1: Executed.
  - When this parameter is set, the M198 command (subprogram call) can also be executed with FOCAS1/HSSB.

**NOTE**
To execute the M198 command with FOCAS1/HSSB, parameter No. 20 must be set to "15".
For details of this parameter, also refer to "FANUC Open CNC DNC Operation Management Package" and other manuals.

- **Program number for data registration (data input/output function using the I/O link)**

  - **Data type:** Word
  - **Valid data range:** 0 to 9999
  - When the data input/output function using the I/O link is used, this parameter sets the program numbers of the programs to be used for registering data (parameters, macro variables, and diagnostic data) from Power Mates.
  - For a Power Mate in group n, the following program numbers are used:
    - For parameters: Setting $+ n \times 10 + 0$
    - For macro variables: Setting $+ n \times 10 + 1$
    - For diagnostic data: Setting $+ n \times 10 + 2$
Example: When 8000 is set
- 8000: Parameters of group 0 (I/O channel = 20)
- 8001: Macro variables of group 0 (I/O channel = 20)
- 8002: Diagnostic data of group 0 (I/O channel = 20)
- 8010: Parameters of group 1 (I/O channel = 21)
- 8011: Macro variables of group 1 (I/O channel = 21)
- 8012: Diagnostic data of group 1 (I/O channel = 21)
- 8020: Parameters of group 2 (I/O channel = 22)
- 8021: Macro variables of group 2 (I/O channel = 22)
- 8022: Diagnostic data of group 2 (I/O channel = 22)

Note
1. When 0 is set, the input/output of parameters, macro variables, and diagnostic data cannot be performed, but program input/output processing is performed.
2. When data is input from or output to the Power Mate, setting data of I/O CHANNEL must also be set.

8790 Timing for executing an auxiliary macro

[Data type] Word
[Unit of data] This parameter sets the timing for executing a macro executor auxiliary macro while NC programs, offset data, and so forth are being read or punched out.

When as many characters as the number specified with this parameter are read or punched out, an auxiliary macro is executed once. When 0 is set in this parameter, no auxiliary macro is executed during read or punch processing.

8801

[Data type] Bit
[Bit parameter 1 for machine tool builder]
### 4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Data Type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>8802</td>
<td>Bit parameter 2 for machine tool builder</td>
<td>Bit</td>
<td>These parameters are used only by the machine tool builder. Refer to the relevant manual supplied by the machine tool builder for details.</td>
</tr>
<tr>
<td>8811</td>
<td>2-word parameter 1 for machine tool builder</td>
<td>2-word</td>
<td>-99999999 to 99999999</td>
</tr>
<tr>
<td>8812</td>
<td>2-word parameter 2 for machine tool builder</td>
<td>2-word</td>
<td>-99999999 to 99999999</td>
</tr>
<tr>
<td>8813</td>
<td>2-word parameter 3 for machine tool builder</td>
<td>2-word</td>
<td>-99999999 to 99999999</td>
</tr>
</tbody>
</table>
### Parameters of Failure Diagnosis

#### 4.51 Parameters of Failure Diagnosis

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
</table>
| 8850 MDG | Bit       | The failure diagnosis function is:  
0: Enabled.  
1: Disabled. |
| 8853 TS8 to TS1 | Bit | For the thermal simulation data for each servo axis:  
0: Failure prediction is not performed.  
1: Failure prediction is performed. (Set a prediction level in parameter No. 8860.) |
| 8854 TR8 to TR1 | Bit | For the disturbance load torque value for each servo axis:  
0: Failure prediction is not performed.  
1: Failure prediction is performed. (Set a prediction level in parameter No. 8861.) |

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8860</td>
<td>Word axis</td>
<td>Failure prediction level of thermal simulation data</td>
</tr>
<tr>
<td>8861</td>
<td>Word axis</td>
<td>Failure prediction level of disturbance load torque</td>
</tr>
</tbody>
</table>

Data Type: Bit

Unit of Data: %

Valid Data Range: 0 to 100

Valid Data Range: 0 to 100
4.52 PARAMETERS OF MAINTENANCE

8901  
<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit  
FAN  
A fan motor error is:  
0 : Detected. (When the fan motor error is detected, an overheating alarm occurs.)  
1 : Not detected. (Use inhibited)

8903  
<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit  
PRM  
A periodic maintenance expiration message is:  
0 : Not displayed.  
1 : Displayed.

8911  

Ratio of the items on the periodic maintenance screen to the respective lives  

[Data type] Byte  
[Unit of data] 1%  
[Valid data range] 0 to 100  
On the periodic maintenance screen, if the remaining time of an item falls to a value less than the percentage of the life specified in this parameter, the remaining time is displayed in red as a warming.

8940  

Title character code 1

8941  

Title character code 2

8949  

Title character code 10

[Data type] Byte  
[Valid data range] See below.  
When the CNC is turned on, up to ten characters specified in these parameters are displayed on the screen showing the series and edition of the CNC.  
- The following characters can be used.  
  0 to 9, A to Z, - (minus sign), . (period), and space  
- The character codes to be specified are listed in the character code list in Appendix A.  
- If any code other than those character codes that can be specified is specified, a space is displayed.
### 4.53 PARAMETERS OF SERVO SPEED CHECK

<table>
<thead>
<tr>
<th>Parameter</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>12290</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SSA</td>
<td>SSC</td>
</tr>
</tbody>
</table>

- **[Data type]** Bit
- **SSC** The servo speed check is:
  - 0: Disabled.
  - 1: Enabled.
- **SSA** When the actual speed is lower than the setting of the reference speed parameter (No. 12291) of the servo speed check:
  - 0: No alarm is issued.
  - 1: An alarm is issued. (Servo alarm 616)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Reference speed for servo speed check</th>
</tr>
</thead>
<tbody>
<tr>
<td>12291</td>
<td></td>
</tr>
</tbody>
</table>

- **[Data type]** Word axis
- **[Unit of data]** min\(^{-1}\)
- **[Valid data range]** 0 to 8000

This parameter sets the reference speed used for the servo speed check, which is conducted when bit 0 (SSC) of parameter No. 12290 is set to 1.
4. DESCRIPTION OF PARAMETERS

4.54 PARAMETERS OF MANUAL HANDLE FUNCTION

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>12305</td>
<td>Address of the X signal for first manual handle</td>
</tr>
<tr>
<td>12306</td>
<td>Address of the X signal for second manual handle</td>
</tr>
<tr>
<td>12307</td>
<td>Address of the X signal for third manual handle</td>
</tr>
</tbody>
</table>

**[Data type]** Word  
**[Valid data range]** 0 to 127, 200 to 327  
These parameters set the address of the X signal used for each manual handle.  
These parameters are valid when bit 1 (HDX) of parameter No.7105 is set to 1.  
If the address assigned to a manual handle of an I/O module connected to the I/O Link is not set correctly, the manual handle does not function.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#7 #6 #5 #4 #3 #2 #1 #0</td>
<td>GR7 GR6 GR5 GR4 GR3 GR2 GR1 GR0</td>
</tr>
<tr>
<td>12330</td>
<td>GRF GRE GRD GRC GRB GRA GR9 GR8</td>
</tr>
</tbody>
</table>

**[Data type]** Bit  
**GR0** When group 0 (channel 1) of the PMC is a Power Mate or I/O Link β, pulses of a manual pulse generator connected via the I/O Link are:  
0 : Transferred to the target group.  
1 : Not transferred to the target group.  
**GR1 to GRD** When group 1 (channel 1) of the PMC is a Power Mate or I/O Link β, pulses of a manual pulse generator connected via the I/O Link are:  
0 : Transferred to the target group.  
1 : Not transferred to the target group.  
**GRE** When group 14 (channel 1) of the PMC is a Power Mate or I/O Link β, pulses of a manual pulse generator connected via the I/O Link are:  
0 : Transferred to the target group.  
1 : Not transferred to the target group.  
**GRF** When group 15 (channel 1) of the PMC is a Power Mate or I/O Link β, pulses of a manual pulse generator connected via the I/O Link are:  
0 : Transferred to the target group.  
1 : Not transferred to the target group.

**NOTE**  
When a Power Mate is connected to the I/O Link, set this parameter to 1.
4. DESCRIPTION OF PARAMETERS

**12350**

<table>
<thead>
<tr>
<th>Manual handle feed magnification m</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>[Data type]</strong></td>
</tr>
<tr>
<td><strong>[Unit of data]</strong></td>
</tr>
<tr>
<td><strong>[Valid data range]</strong></td>
</tr>
</tbody>
</table>

This parameter sets the magnification to be used for each axis when manual handle feed movement amount select signal MP1 <G019#4> is set to 0, and MP2 <G019#5> is set to 1.

If this parameter is set to 0 for a target axis for movement, the setting of parameter No. 7113 applies.

**12351**

<table>
<thead>
<tr>
<th>Manual handle feed magnification n</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>[Data type]</strong></td>
</tr>
<tr>
<td><strong>[Unit of data]</strong></td>
</tr>
<tr>
<td><strong>[Valid data range]</strong></td>
</tr>
</tbody>
</table>

This parameter sets the magnification to be used for each axis when manual handle feed movement amount select signal MP1 <G019#4> is set to 1, and MP2 <G019#5> is set to 1.

If this parameter is set to 0 for a target axis for movement, the setting of parameter No. 7114 applies.

<table>
<thead>
<tr>
<th>Movement amount select signal</th>
<th>Movement amount (manual handle feed or manual handle interrupt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP2</td>
<td>MP1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
4.55 PARAMETERS OF ACCELERATION CONTROL

12700

**Feedrate when overtravel occurs during linear acceleration/deceleration before interpolation (for stored stroke check 2)**

- **Data type**: Word
- **Unit of data, valid data range**

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Units of data</th>
<th>IS-A, IS-B</th>
<th>IS-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>6 to 15000</td>
<td>6 to 12000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>6 to 6000</td>
<td>6 to 4800</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>6 to 15000</td>
<td>6 to 12000</td>
</tr>
</tbody>
</table>

When an overtravel alarm is issued during linear acceleration/deceleration before interpolation, deceleration is performed in advance so that the feedrate set in this parameter can be attained at the time of issuance of the alarm (when the limit is reached). Use of this parameter reduces the amount of overrun that occurs when the overtravel alarm is issued.

If bit 2 (DS2) of parameter No. 1604 is set to 1, set in parameter No. 12700 the feedrate to be attained when the overtravel alarm for stored stroke check 2 is issued.

**NOTE**

When bit 2 (DS2) of parameter No. 1604 is set to 1, and parameter No. 12700 is set to 0, parameter No. 1784 is used.

12710

**Maximum cutting feedrate for each axis in HRV3 mode**

- **Data type**: 2-word axis
- **Unit of data, valid data range**

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Units of data</th>
<th>IS-A, IS-B</th>
<th>IS-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
<td>0 to 240000</td>
<td>0 to 100000</td>
</tr>
<tr>
<td>Inch machine</td>
<td>0.1 inch/min</td>
<td>0 to 96000</td>
<td>0 to 48000</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
<td>0 to 240000</td>
<td>0 to 100000</td>
</tr>
</tbody>
</table>

This parameter sets the maximum cutting feedrate applied in HRV3 mode for each axis. For a specified axis, the cutting feedrate is clamped at a maximum feedrate that does not allow the result of interpolation to exceed the maximum cutting feedrate for that axis.
NOTE
1 The maximum cutting feedrate for each axis is valid for linear interpolation and circular interpolation only. During polar coordinate interpolation or cylindrical interpolation, the value in parameter No. 1431, which is common to all axes, is used.
2 If the settings in this parameter are all 0, the maximum cutting feedrate set in parameter No. 1432 is used.
### 4.56 PARAMETERS OF OPERATION HISTORY

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>12801</td>
<td>Number of a signal symbol table for selecting an operation history signal (01)</td>
</tr>
<tr>
<td>12802</td>
<td>Number of a signal symbol table for selecting an operation history signal (02)</td>
</tr>
<tr>
<td>12803</td>
<td>Number of a signal symbol table for selecting an operation history signal (03)</td>
</tr>
<tr>
<td>12804</td>
<td>Number of a signal symbol table for selecting an operation history signal (04)</td>
</tr>
<tr>
<td>12805</td>
<td>Number of a signal symbol table for selecting an operation history signal (05)</td>
</tr>
<tr>
<td>12806</td>
<td>Number of a signal symbol table for selecting an operation history signal (06)</td>
</tr>
<tr>
<td>12807</td>
<td>Number of a signal symbol table for selecting an operation history signal (07)</td>
</tr>
<tr>
<td>12808</td>
<td>Number of a signal symbol table for selecting an operation history signal (08)</td>
</tr>
<tr>
<td>12809</td>
<td>Number of a signal symbol table for selecting an operation history signal (09)</td>
</tr>
<tr>
<td>12810</td>
<td>Number of a signal symbol table for selecting an operation history signal (10)</td>
</tr>
<tr>
<td>12811</td>
<td>Number of a signal symbol table for selecting an operation history signal (11)</td>
</tr>
<tr>
<td>12812</td>
<td>Number of a signal symbol table for selecting an operation history signal (12)</td>
</tr>
<tr>
<td>12813</td>
<td>Number of a signal symbol table for selecting an operation history signal (13)</td>
</tr>
<tr>
<td>12814</td>
<td>Number of a signal symbol table for selecting an operation history signal (14)</td>
</tr>
<tr>
<td>12815</td>
<td>Number of a signal symbol table for selecting an operation history signal (15)</td>
</tr>
<tr>
<td>12816</td>
<td>Number of a signal symbol table for selecting an operation history signal (16)</td>
</tr>
<tr>
<td>12817</td>
<td>Number of a signal symbol table for selecting an operation history signal (17)</td>
</tr>
<tr>
<td>12818</td>
<td>Number of a signal symbol table for selecting an operation history signal (18)</td>
</tr>
</tbody>
</table>
### Number of a signal symbol table for selecting an operation history signal

**Number of a signal symbol table for selecting an operation history signal**

- **12819**
  - **Number of a signal symbol table for selecting an operation history signal (19)**
  - **[Data type]** Byte
  - **[Valid data range]** 1 to 12
  - Set the number of a symbol table including a signal of which operation history is to be recorded for operation history channel (01) to (20) as follows:
    - 1 : G0 to G511
    - 3 : F0 to F511
    - 5 : Y0 to Y127
    - 6 : X0 to X127
    - 10 : Y200 to Y327
    - 10 : X200 to X327

- **12820**
  - **Number of a signal symbol table for selecting an operation history signal (20)**

### Number of a signal selected as an operation history signal

- **12841**
  - **Number of a signal selected as an operation history signal (01)**

- **12842**
  - **Number of a signal selected as an operation history signal (02)**

- **12843**
  - **Number of a signal selected as an operation history signal (03)**

- **12844**
  - **Number of a signal selected as an operation history signal (04)**

- **12845**
  - **Number of a signal selected as an operation history signal (05)**

- **12846**
  - **Number of a signal selected as an operation history signal (06)**

- **12847**
  - **Number of a signal selected as an operation history signal (07)**

- **12848**
  - **Number of a signal selected as an operation history signal (08)**

- **12849**
  - **Number of a signal selected as an operation history signal (09)**

- **12850**
  - **Number of a signal selected as an operation history signal (10)**

- **12851**
  - **Number of a signal selected as an operation history signal (11)**

- **12852**
  - **Number of a signal selected as an operation history signal (12)**

- **12853**
  - **Number of a signal selected as an operation history signal (13)**

- **12854**
  - **Number of a signal selected as an operation history signal (14)**

- **12855**
  - **Number of a signal selected as an operation history signal (15)**

- **12856**
  - **Number of a signal selected as an operation history signal (16)**
4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>12857</td>
<td>Number of a signal selected as an operation history signal (17)</td>
</tr>
<tr>
<td>12858</td>
<td>Number of a signal selected as an operation history signal (18)</td>
</tr>
<tr>
<td>12859</td>
<td>Number of a signal selected as an operation history signal (19)</td>
</tr>
<tr>
<td>12860</td>
<td>Number of a signal selected as an operation history signal (20)</td>
</tr>
</tbody>
</table>

**[Data type]** Word

**[Valid data range]** 0 to 511

Set the number of a signal of which operation history is to be recorded for operation history channel (01) to (20) with a value between 0 and 511.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>History record bit settings for an operation history signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>12881</td>
<td>RB7 RB6 RB5 RB4 RB3 RB2 RB1 RB0 (01)</td>
</tr>
<tr>
<td>12882</td>
<td>RB7 RB6 RB5 RB4 RB3 RB2 RB1 RB0 (02)</td>
</tr>
<tr>
<td>12883</td>
<td>RB7 RB6 RB5 RB4 RB3 RB2 RB1 RB0 (03)</td>
</tr>
<tr>
<td>12884</td>
<td>RB7 RB6 RB5 RB4 RB3 RB2 RB1 RB0 (04)</td>
</tr>
<tr>
<td>12885</td>
<td>RB7 RB6 RB5 RB4 RB3 RB2 RB1 RB0 (05)</td>
</tr>
<tr>
<td>12886</td>
<td>RB7 RB6 RB5 RB4 RB3 RB2 RB1 RB0 (06)</td>
</tr>
</tbody>
</table>
### Description of Parameters

#### History record bit settings for an operation history signal (07)

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB7</td>
<td>RB6</td>
<td>RB5</td>
<td>RB4</td>
<td>RB3</td>
<td>RB2</td>
<td>RB1</td>
<td>RB0</td>
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</tbody>
</table>

#### History record bit settings for an operation history signal (08)

<table>
<thead>
<tr>
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<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB7</td>
<td>RB6</td>
<td>RB5</td>
<td>RB4</td>
<td>RB3</td>
<td>RB2</td>
<td>RB1</td>
<td>RB0</td>
</tr>
</tbody>
</table>

#### History record bit settings for an operation history signal (09)

<table>
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<tr>
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<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB7</td>
<td>RB6</td>
<td>RB5</td>
<td>RB4</td>
<td>RB3</td>
<td>RB2</td>
<td>RB1</td>
<td>RB0</td>
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</tbody>
</table>

#### History record bit settings for an operation history signal (10)

<table>
<thead>
<tr>
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<th>#4</th>
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<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB7</td>
<td>RB6</td>
<td>RB5</td>
<td>RB4</td>
<td>RB3</td>
<td>RB2</td>
<td>RB1</td>
<td>RB0</td>
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</table>

#### History record bit settings for an operation history signal (11)

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB7</td>
<td>RB6</td>
<td>RB5</td>
<td>RB4</td>
<td>RB3</td>
<td>RB2</td>
<td>RB1</td>
<td>RB0</td>
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</table>

#### History record bit settings for an operation history signal (12)

<table>
<thead>
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<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB7</td>
<td>RB6</td>
<td>RB5</td>
<td>RB4</td>
<td>RB3</td>
<td>RB2</td>
<td>RB1</td>
<td>RB0</td>
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</tbody>
</table>

#### History record bit settings for an operation history signal (13)

<table>
<thead>
<tr>
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<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB7</td>
<td>RB6</td>
<td>RB5</td>
<td>RB4</td>
<td>RB3</td>
<td>RB2</td>
<td>RB1</td>
<td>RB0</td>
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</table>

#### History record bit settings for an operation history signal (14)

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<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB7</td>
<td>RB6</td>
<td>RB5</td>
<td>RB4</td>
<td>RB3</td>
<td>RB2</td>
<td>RB1</td>
<td>RB0</td>
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</table>

#### History record bit settings for an operation history signal (15)

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<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB7</td>
<td>RB6</td>
<td>RB5</td>
<td>RB4</td>
<td>RB3</td>
<td>RB2</td>
<td>RB1</td>
<td>RB0</td>
</tr>
</tbody>
</table>

#### History record bit settings for an operation history signal (16)

<table>
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<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB7</td>
<td>RB6</td>
<td>RB5</td>
<td>RB4</td>
<td>RB3</td>
<td>RB2</td>
<td>RB1</td>
<td>RB0</td>
</tr>
</tbody>
</table>
4.DESCRIPTION OF PARAMETERS

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<th>#6</th>
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<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB7</td>
<td>RB6</td>
<td>RB5</td>
<td>RB4</td>
<td>RB3</td>
<td>RB2</td>
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<td>RB0</td>
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</tbody>
</table>

History record bit settings for an operation history signal (17)

<table>
<thead>
<tr>
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<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB7</td>
<td>RB6</td>
<td>RB5</td>
<td>RB4</td>
<td>RB3</td>
<td>RB2</td>
<td>RB1</td>
<td>RB0</td>
</tr>
</tbody>
</table>

History record bit settings for an operation history signal (18)

<table>
<thead>
<tr>
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<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB7</td>
<td>RB6</td>
<td>RB5</td>
<td>RB4</td>
<td>RB3</td>
<td>RB2</td>
<td>RB1</td>
<td>RB0</td>
</tr>
</tbody>
</table>

History record bit settings for an operation history signal (19)

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB7</td>
<td>RB6</td>
<td>RB5</td>
<td>RB4</td>
<td>RB3</td>
<td>RB2</td>
<td>RB1</td>
<td>RB0</td>
</tr>
</tbody>
</table>

History record bit settings for an operation history signal (20)

[Data type] Bit
RB7 to RB0
In the signals set for channels (01) to (20) (parameter Nos. 12801 to 12860), of which operation history is to be recorded, the history of each bit is:

- **0**: Not recorded. (The history of this bit is not recorded.)
- **1**: Recorded. (The history of this bit is recorded.)
### 4.57 PARAMETERS OF DISPLAY AND EDIT (2/2)

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>ODC</td>
<td>NDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

**NDC**
The color scheme (color palette value) of VGA-compatible screens on a color LCD is:
- 0: Not changed.
- 1: Changed to FANUC standard colors 1 (new FANUC standard colors).

**ODC**
The color scheme (color palette value) of VGA-compatible screens on a color LCD is:
- 0: Not changed.
- 1: Changed to FANUC standard colors 2 (old FANUC standard colors).

**NOTE**
1. After bit 6 (NDC) of parameter No. 13101 is set to 1, turning the power off then back on resets the bit to 0 automatically.
2. After bit 7 (ODC) of parameter No. 13101 is set to 1, turning the power off then back on resets the bit to 0 automatically.
3. If the standard color data parameters of color scheme 1 (parameter Nos. 6561 to 6595) are all set to 0, the color scheme settings can be changed by setting parameter NDC or ODC to 1.

<table>
<thead>
<tr>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>JPN</td>
</tr>
</tbody>
</table>

[Data type] Bit

**JPN**
As the display language used for failure diagnosis and machine alarm diagnosis:
- 0: English has precedence.
  - For machine alarm diagnosis, the GUIE_USR.MEM file has precedence.
- 1: Japanese has precedence.
  - For machine alarm diagnosis, the GUIJ_USR.MEM file has precedence.

**NOTE**
When this parameter is set, the power must be turned off before operation is continued.
4. DESCRIPTION OF PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>#7</th>
<th>#6</th>
<th>#5</th>
<th>#4</th>
<th>#3</th>
<th>#2</th>
<th>#1</th>
<th>#0</th>
</tr>
</thead>
<tbody>
<tr>
<td>13112</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Bit

- **IDW**  Editing on the servo information screen or spindle information screen is
  - 0: Prohibited.
  - 1: Not prohibited.

- **SVI**  Servo information screen is
  - 0: Displayed.
  - 1: Not displayed.

- **SPI**  Spindle information screen is
  - 0: Displayed.
  - 1: Not displayed.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Number of sets of offset data displayed on the offset screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>13150</td>
<td></td>
</tr>
</tbody>
</table>

[Data type] Word

[Valid data range] 0, 1 to the maximum sets of tool offset data

This parameter sets the number of sets of offset data to be displayed on the offset screen.

**NOTE**

1. When this parameter is set, the power must be turned off before operation is continued.
2. If 0 or a value beyond the data range is set in this parameter, the setting of this parameter becomes invalid, and all offset data is displayed.
4.58 PARAMETERS OF MACHINING CONDITION SELECTION

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCR</td>
<td>Bit</td>
<td>When the permissible acceleration is adjusted with the machining condition selection function (machining parameter adjustment screen or precision level selection screen), parameter Nos. No. 1730 and 1731, which are related to feedrate clamping by arc radius, are: 0: Changed. 1: Not changed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPR</td>
<td>Bit</td>
<td>The machining parameter adjustment screen is: 0: Displayed. 1: Not displayed.</td>
</tr>
</tbody>
</table>

**NOTE**

1. When this parameter has been set, the power must be turned off before operation is continued.
2. Even when this parameter is set to 1, the precision level selection screen is displayed.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#13610</td>
<td>2-word</td>
<td>Acceleration rate of acceleration/deceleration before interpolation when advanced preview control, AI advanced preview control, or AI contour control is used (precision level 1)</td>
</tr>
<tr>
<td>#13611</td>
<td>2-word</td>
<td>Acceleration rate of acceleration/deceleration before interpolation when advanced preview control, AI advanced preview control, or AI contour control is used (precision level 10)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Increment system</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeter machine</td>
<td>0.001mm/sec²</td>
</tr>
</tbody>
</table>

These parameters set the acceleration rate of acceleration/deceleration before interpolation in advanced preview control, AI advanced preview control, or AI contour control. Two levels including precision level 1, which places emphasis on speed, and precision level 10, which places emphasis on precision, can be set.
13612  Acceleration change time when AI contour control is used (bell-shaped) (precision level 1)

13613  Acceleration change time when AI contour control is used (bell-shaped) (precision level 10)

[Data type] Byte
[Unit of data] msec
[Valid data range] 1 to 100

These parameters set an acceleration change time (bell-shaped) with emphasis placed on speed (precision level 1) and an acceleration change time (bell-shaped) with emphasis placed on precision (precision level 10) in AI contour control.

13620  Permissible acceleration when advanced preview control, AI advanced preview control, or AI contour control is used (precision level 1)

13621  Permissible acceleration when advanced preview control, AI advanced preview control, or AI contour control is used (precision level 10)

[Data type] 2-word axis
[Unit of data]
[Valid data range] 0 to 99999999

These parameters set a permissible acceleration with emphasis placed on speed (precision level 1) and a permissible acceleration with emphasis placed on precision (precision level 10) in advanced preview control, AI advanced preview control, or AI contour control.

13622  Time constant of acceleration/deceleration after interpolation (precision level 1)

13623  Time constant of acceleration/deceleration after interpolation (precision level 10)

[Data type] Word axis
[Unit of data] msec
[Valid data range] See the description of parameter No. 1768.

These parameters set a time constant of linear acceleration/deceleration after interpolation with emphasis placed on speed (precision level 1) and a time constant of linear acceleration/deceleration after interpolation with emphasis placed on precision (precision level 10).

The linear or bell-shaped type is selected by bit 3 (BS2) and bit 6 (LS2) of parameter No. 1602.

<table>
<thead>
<tr>
<th>Parameter No.1602</th>
<th>Acceleration/deceleration</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS2(#6) BS2(#3)</td>
<td></td>
</tr>
<tr>
<td>1 0</td>
<td>Selects linear acceleration/deceleration after cutting feed interpolation.</td>
</tr>
<tr>
<td>0 1</td>
<td>Selects bell-shaped acceleration/deceleration after cutting feed interpolation.</td>
</tr>
</tbody>
</table>
4.DESCRIPTION OF PARAMETERS

NOTE
1. For bell-shaped acceleration/deceleration, the function for bell-shaped acceleration/deceleration after cutting feed interpolation is required.
2. The same parameters are used in advanced preview control, AI advanced preview control, and AI contour control.

<table>
<thead>
<tr>
<th>[Data type]</th>
<th>Word axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Unit of data, valid data range]</td>
<td>Increment system</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
</tr>
</tbody>
</table>

These parameters set a permissible speed difference with emphasis placed on speed (precision level 1) and a permissible speed difference with emphasis placed on precision (precision level 10) when the speed is determined by a corner speed difference in advanced preview control, AI advanced preview control, or AI contour control.

<table>
<thead>
<tr>
<th>[Data type]</th>
<th>2-word axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Unit of data, valid data range]</td>
<td>Increment system</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Millimeter machine</td>
<td>1 mm/min</td>
</tr>
<tr>
<td>Rotation axis</td>
<td>1 deg/min</td>
</tr>
</tbody>
</table>

These parameters set the maximum machining speed for each axis.
These parameters specify parameter numbers corresponding to arbitrary items 1 and 2.

**NOTE**

1. You cannot specify the numbers of the following parameters:
   - Bit parameters
   - Spindle parameters (Nos. 4000 to 4799)
   - Parameters requiring power disconnection (P/S 0 alarm is issued for these parameters.)
   - Nonexistent parameters
2. When such a parameter is set, the power must be turned off before operation is continued.

**[Data type]** Word
**[Valid data range]** 1 to 65535

The currently selected level is set.
4. DESCRIPTION OF PARAMETERS

4.59 PARAMETERS OF SERVO (2)

<table>
<thead>
<tr>
<th>14010</th>
<th>Maximum permissible movement amount at FL feedrate when the reference position is established with an encoder with the absolute address zero point (detection circuit C)</th>
</tr>
</thead>
</table>
|       | **[Data type]** 2-word axis  
|       | **[Unit of data]** Detection unit  
|       | **[Valid data range]** 0 to 99999999 |

This parameter sets the amount of a movement made at the FL feedrate when the reference position is established with an encoder with the absolute address zero point (linear scale or rotary encoder) (detection circuit C). If the reference position is not established even when a movement is made by the amount set in this parameter or more, P/S alarm 5326 (Scale with the zero point: Failure in reference position establishment) is issued. When this parameter is set to 0, the maximum permissible movement amount at the FL feedrate at the time of reference position establishment becomes invalid.

**NOTE**

1. When the reference position is established under simplified synchronization control of the M series, if this parameter is set for one of the master and slave axes, the setting automatically applies also to the other axis.

2. In angular axis control, the setting of this parameter is invalid for a Cartesian axis with which angular axis reference position is being established.
APPENDIX
## CHARACTER CODE LIST

<table>
<thead>
<tr>
<th>Character</th>
<th>Code</th>
<th>Comment</th>
<th>Character</th>
<th>Code</th>
<th>Comment</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>065</td>
<td></td>
<td>6</td>
<td>054</td>
<td></td>
</tr>
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<td>066</td>
<td></td>
<td>7</td>
<td>055</td>
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<td>C</td>
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<td></td>
<td>041</td>
<td>Right parenthesis</td>
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<tr>
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<td>079</td>
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