



for a greener tomorrow



**MITSUBISHI  
ELECTRIC**

*Changes for the Better*

FACTORY AUTOMATION

# MITSUBISHI CNC C80 Series



# GLOBAL IMPACT OF MITSUBISHI ELECTRIC



Through Mitsubishi Electric's vision, "Changes for the Better" are possible for a brighter future.

## *Changes for the Better*

We bring together the best minds to create the best technologies. At Mitsubishi Electric, we understand that technology is the driving force of change in our lives. By bringing greater comfort to daily life, maximizing the efficiency of businesses and keeping things running across society, we integrate technology and innovation to bring changes for the better.

Mitsubishi Electric is involved in many areas including the following

### **Energy and Electric Systems**

A wide range of power and electrical products from generators to large-scale displays.

### **Electronic Devices**

A wide portfolio of cutting-edge semiconductor devices for systems and products.

### **Home Appliance**

Dependable consumer products like air conditioners and home entertainment systems.

### **Information and Communication Systems**

Commercial and consumer-centric equipment, products and systems.

### **Industrial Automation Systems**

Maximizing productivity and efficiency with cutting-edge automation technology.

# OVERVIEW

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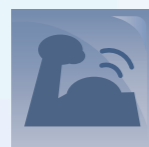
Revolutionary, next-generation CNC opens a new era of production lines through compatibility with MELSEC iQ-R Series

# C80 Series

Advanced technologies delivered by the breakthrough performance of our CNC-dedicated CPU. Reliable MELSEC quality accumulated in various industrial scenes. In addition, the CNC C80 Series can be expanded and updated over time.

Five features ( productivity, expandability, usability, maintenance and safety ) empower manufacturing lines with infinite possibilities and innovative values in terms of advancement, reliability and growth.

## Infinite Possibilities



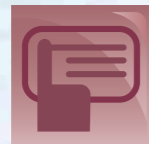
### Productivity

C80 improves productivity through its advanced performance and functionality.



### Expandability

C80 allows flexible system configuration to catch up with the MELSEC evolution.



### Usability

C80 provides unprecedented user-friendliness.



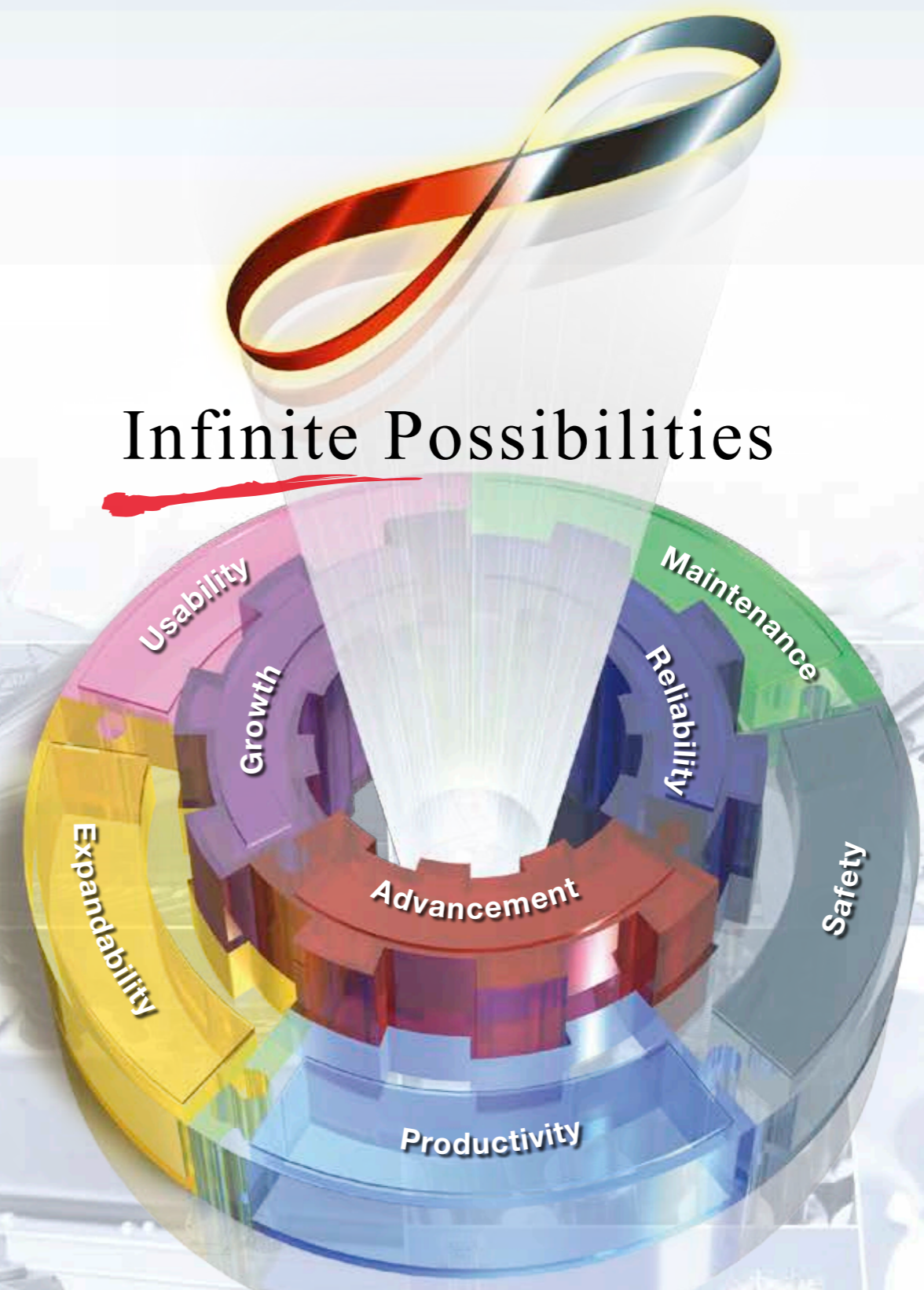
### Maintenance

Low maintenance reduces downtime and maintenance costs.



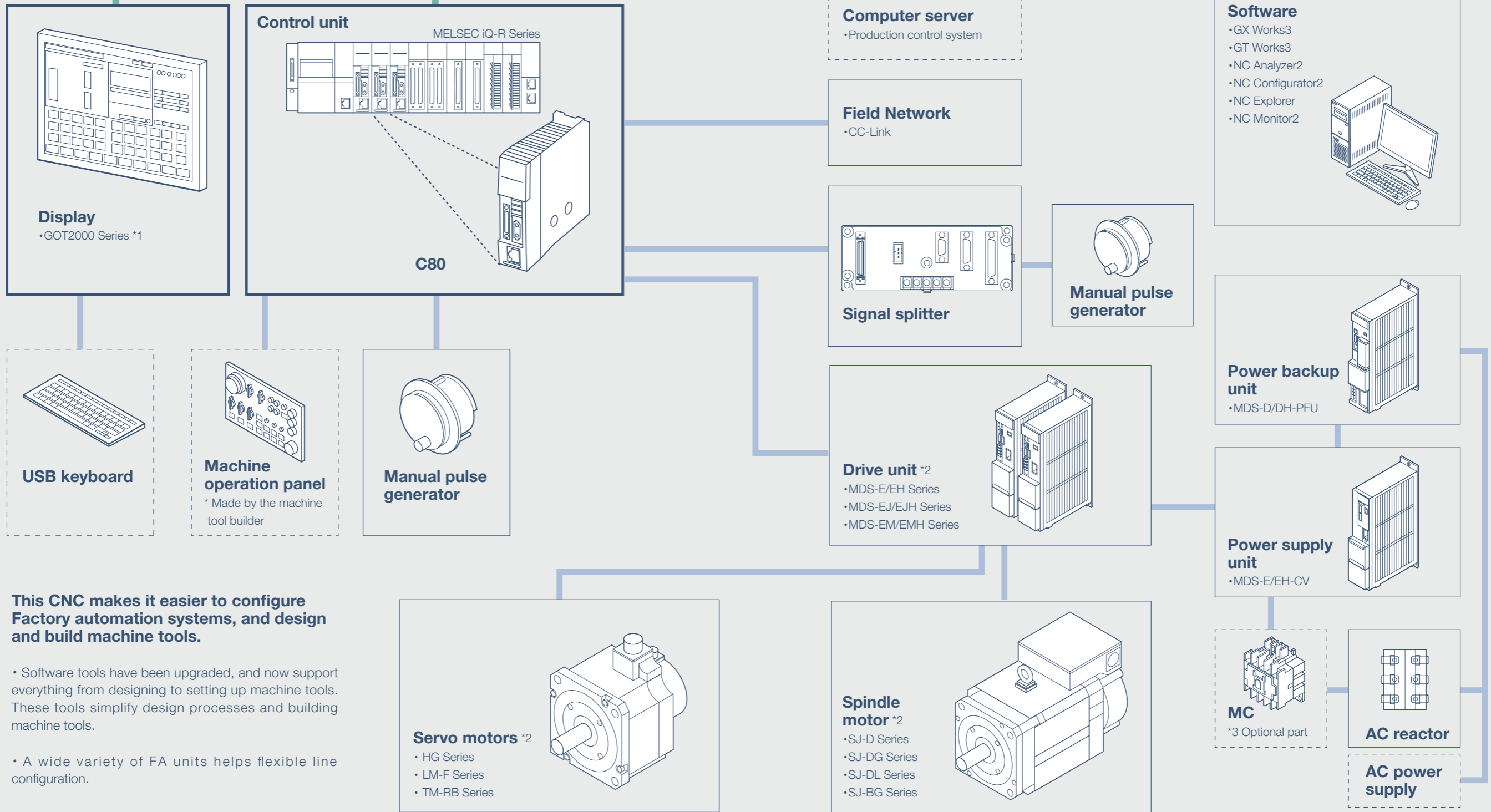
### Safety

Easily implement a plethora of safety measures compliant with global standards.



# CNC SYSTEM CONFIGURATIONS

Ethernet



**This CNC makes it easier to configure Factory automation systems, and design and build machine tools.**

- Software tools have been upgraded, and now support everything from designing to setting up machine tools. These tools simplify design processes and building machine tools.

- A wide variety of FA units helps flexible line configuration.

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User-prepared

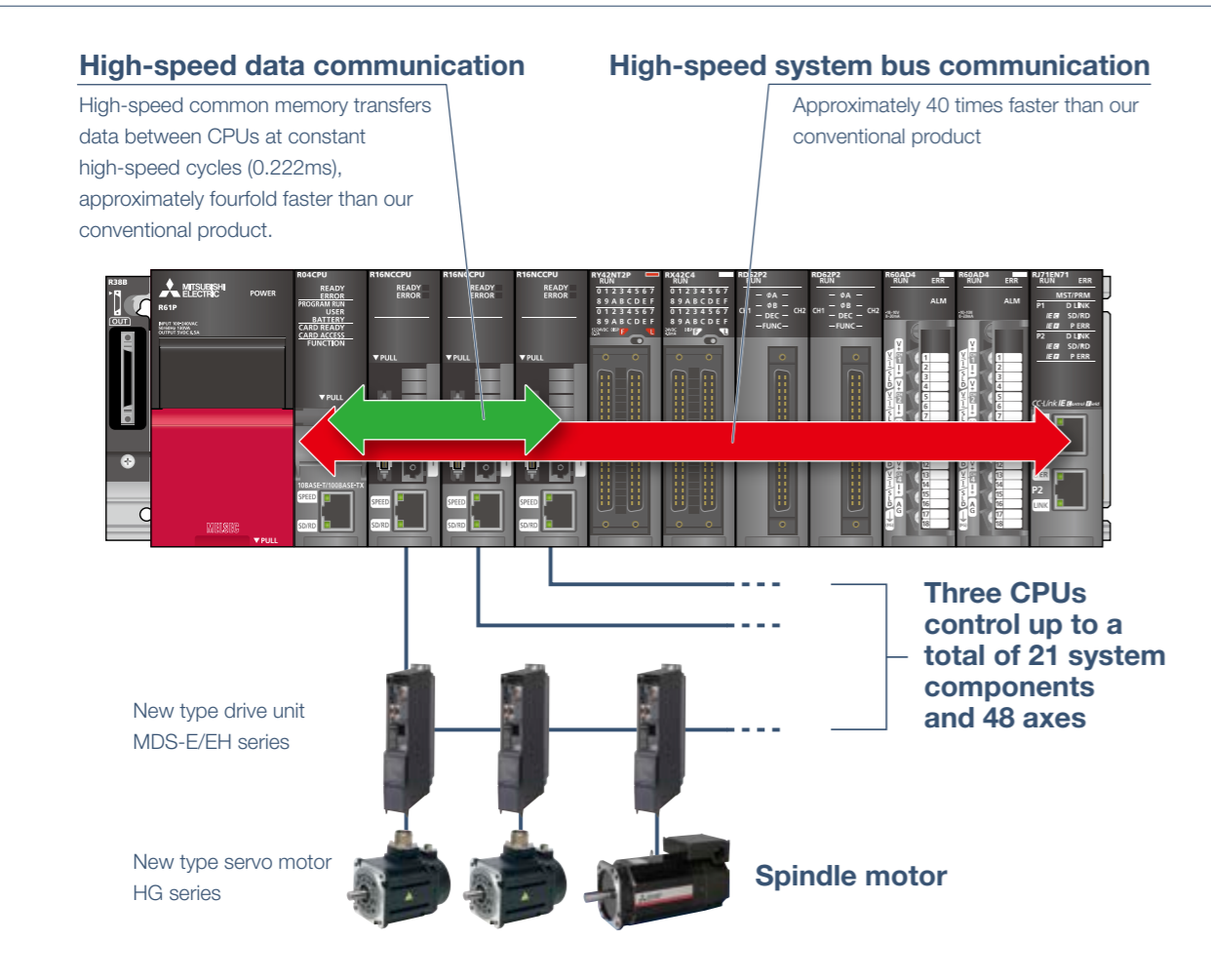
\*1 For target models, refer to "List of Components". \*2 Use Mitsubishi CNC's dedicated drive unit and motor.

\*3 Optional parts are not provided as accessories for NC equipment.

Please purchase desired components from a Mitsubishi Electric dealership, etc.

# PRODUCTIVITY

Mitsubishi Electric's original CNC-dedicated CPU provides a major leap in basic performance. A newly developed high-speed system bus approximately 40 times faster than our conventional product provides high-speed, large-capacity data communication. CNC control functions and drive units have been improved, enabling high-speed, highly accurate machining. The C80 Series contributes to reducing cycle time and increasing productivity.



### PLC processing capability (PCMIx value)



High processing capability of the PLC enables large-scale ladder logic to be processed at high speed in response to the demands in the era of IoT.

### CNC-to-drive communication capability



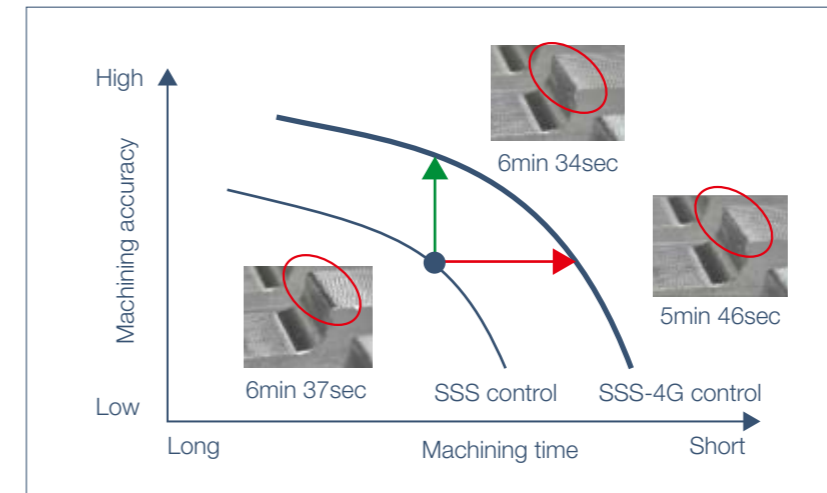
Optical communication speed between CNC and drive has been increased. This improves system responsiveness, leading to more accurate machining.

### MSTB processing capability



Miscellaneous command processing between CNC and PLC became 1.5 times faster than our conventional product. Shorter processing time leads to reduction in cycle time.

### CNC functions ensure high speed and high accuracy



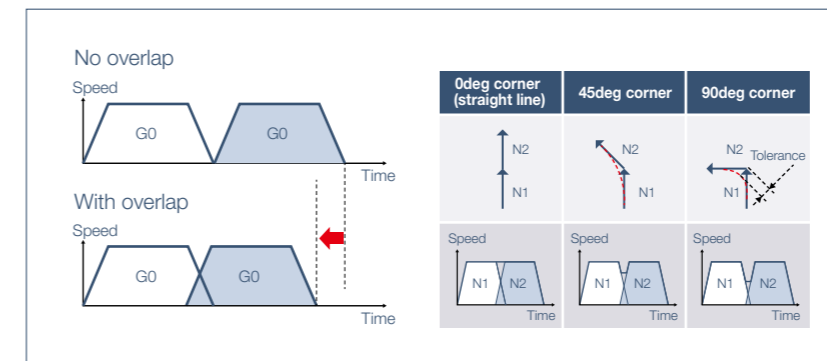
### SSS-4G Control

The M80 Series is equipped with Super Smooth Surface 4th-Generation (SSS-4G) control. This feature effectively reduces tact time, including acceleration and deceleration appropriate for the characteristics of each axis. SSS-4G control simultaneously enhances cutting accuracy, reducing cutting time while maintaining the same degree of accuracy compared to our previous models.



### Tolerance Control

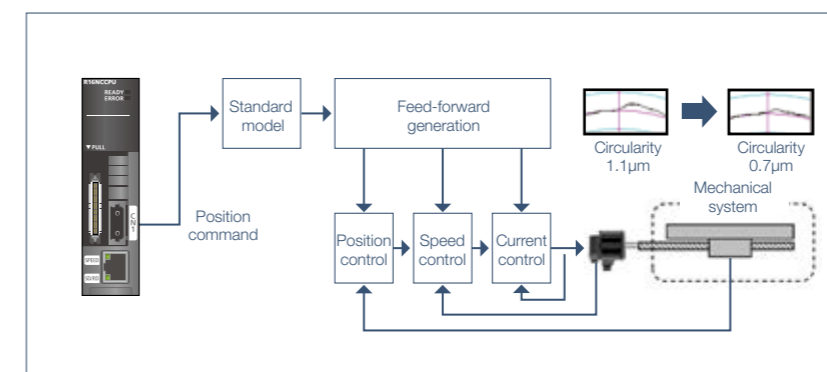
This function enables operators to make high-quality surfaces simply by specifying the desired surface dimensional accuracy and providing a smooth cutting motion within specified error tolerances.



### Rapid Traverse Block Overlap

This function enables cutting of the next block to start before positioning deceleration (G00) or reference position return (G28/G30) has been completed, resulting in shorter intervals between cutting processes.

### Drive function increases speed



### OMR-FF Control

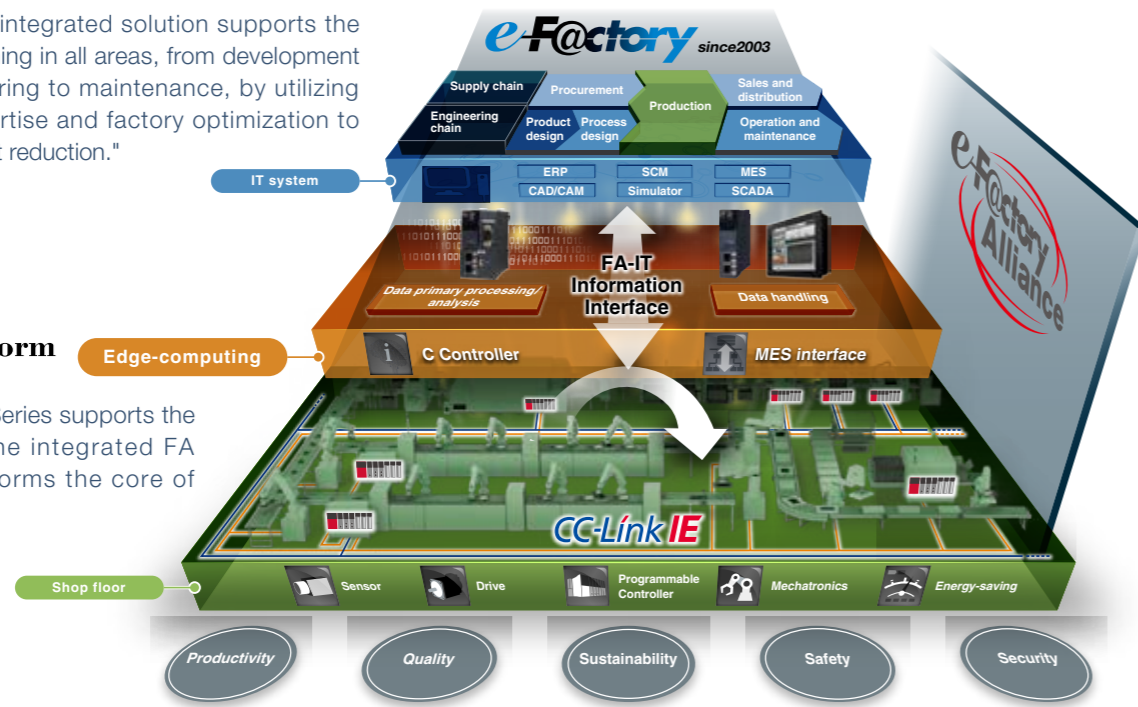
This function optimizes the position loop gain for each axis, leading to smoother and more accurate cutting, and drawing out the full potential of the machine tools.

# EXPANDABILITY e-F@ctory®

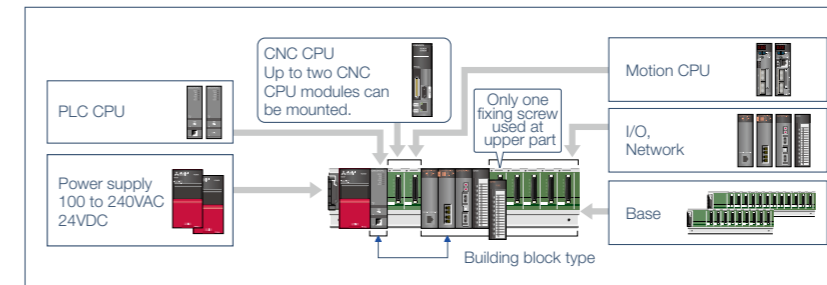
The e-F@ctory integrated solution supports the future of machining in all areas, from development and manufacturing to maintenance, by utilizing advanced expertise and factory optimization to realize "total cost reduction."

## iQ Platform

The CNC C80 Series supports the iQ Platform, the integrated FA platform that forms the core of e-F@ctory.



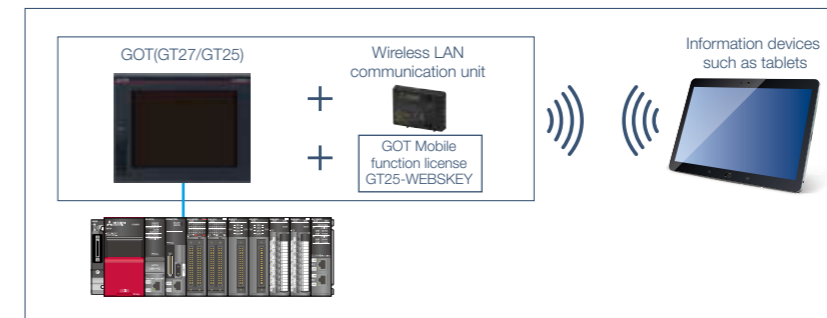
## Flexible system configurations



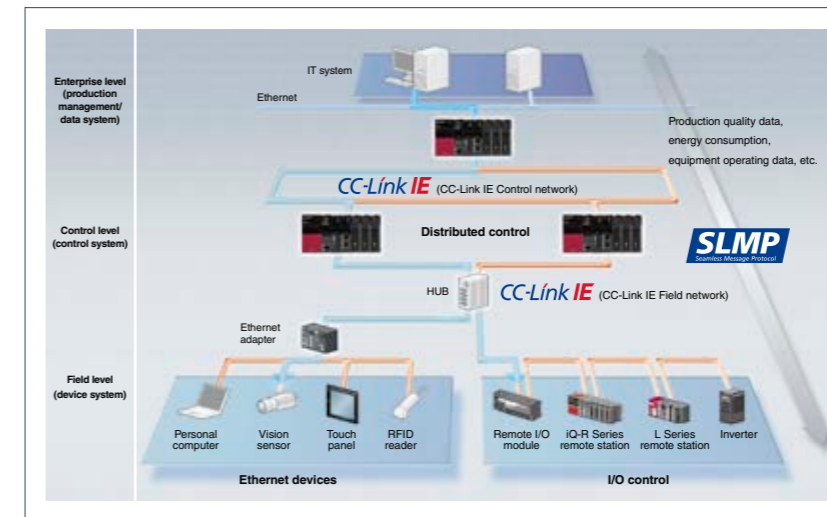
## C language controller mounted with edge computing support function



## Support for "visualization" of shop floor

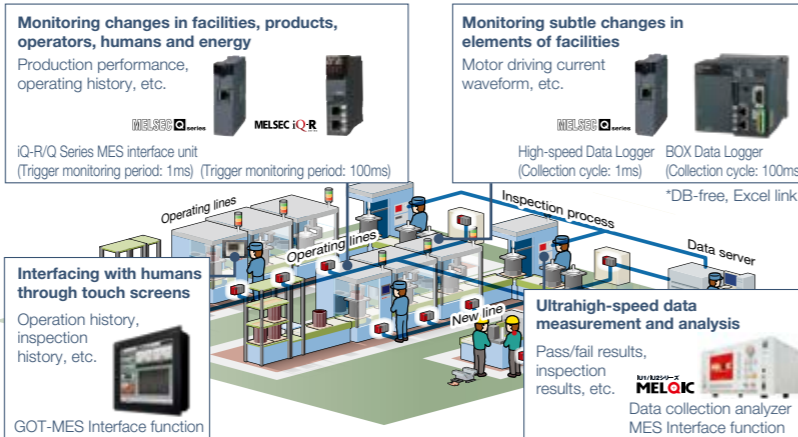


## Seamless connectivity between shop floor and host information system



## This solution enables visualization and analysis that lead to improvements and increase availability at production sites.

The Manufacturing Execution System (MES) Interface is the link for data passing from production equipment to controlling devices. The High-speed Data Logger collects data from each measuring device directly without requiring dedicated logging equipment. The Box Data Logger can be connected to a network while existing equipment is running, and collect data thereafter. The C Language Controller provides control, information processing and higher-level communication using C/C++ programming. These products, which enable information sharing between FA and IT, implement factory-wide optimization, from higher-level information systems to facility management systems.



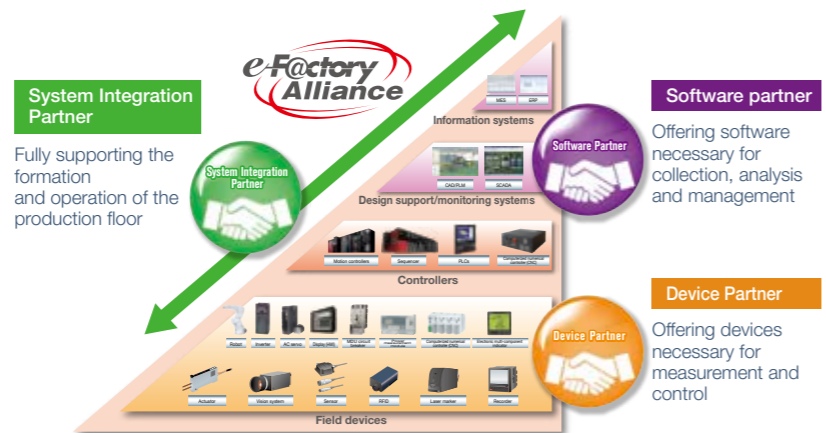
Data on shop floor have different characteristics according to their purposes

## e-F@ctory Alliance

e-Factory Alliance offers our customers the optimal solution across entire supply and engineering chains through strong alliances with partners who provide software and devices highly compatible with Mitsubishi FA products, and system integration partners who build systems using those products.

## Participating companies: Approx. 320

(In total domestic and overseas, as of Apr. 2016)



The PLC CPU is independent in the C80 Series, enabling selection according to production scale and application, and best-fit configuration of hardware.

## Automatic data collection software

This software supports optimization of the entire production process, analyzing manufacturing data in real time and feeding back results to the shop floor. This enables the detection of equipment fatigue and potential production stoppage early on.

## SECS/GEM communication (\*) software

The software eliminates the need for a gateway computer between shop floor and IT system, leading to shorter production line setup time. It can also reduce engineering workload, including design and development, installation and maintenance.

\*Communication protocols used in the semiconductor manufacturing

## GOT Mobile

Via GOT at the worksite, connected devices can be monitored from computers and tablets in a remote location.

\*A separate license (GT25-WEBSKEY) is required.

## Field network CC-Link IE Field

Single network covers high-speed controller distributed control, I/O control and safety control. The network allows a high degree of freedom in wiring for flexible equipment layouts.

## Controller network CC-Link IE Control

The controller network builds a highly reliable high-speed, large-capacity system and dual optical loop.

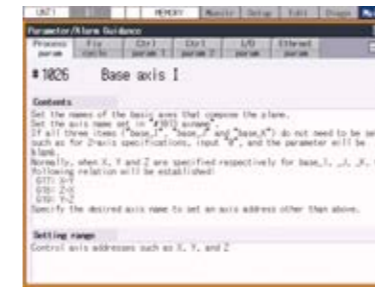
# USABILITY

CNC monitor2 newly developed to simplify use through the introduction of touch-screen operation displays the equivalent screen to the M800/M80 Series standard screens available in 8.4, 10.4 and 12.1-type models.

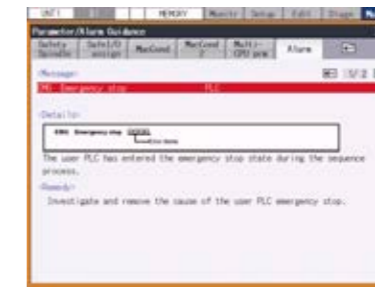


## More convenient guidance function

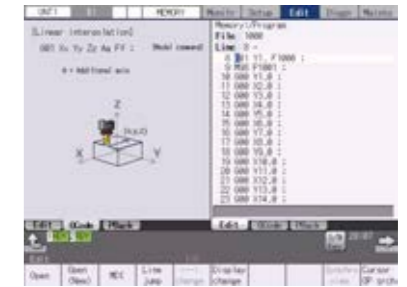
Pressing Help opens a guidance of the currently displayed screen (parameter, alarm or G-code format). This frees the operator from looking information up in a printed manual.



Parameter guidance



Alarm guidance



G code guidance

## Simple screen with enhanced visibility from a long distance



Simple monitor screen

The simple monitor screen has been designed to make it easy to see and read only data required from a distance.

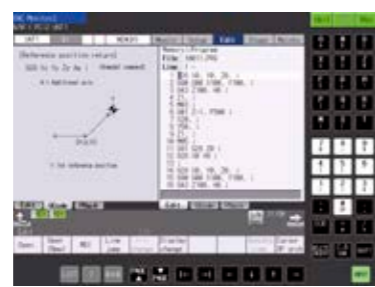
Switching between Normal screen and Simple screen is done from the screen menu.

\*The simple display can be used only when the parameter #11019 (2-system display) is invalid.

## CNC monitor2 screen designed with pursuit of ease-of-use



Monitor screen



Program editor screen

Program edit screen enables direct-touch data entry, eliminating the use of cursor keys and realizing more intuitive operation.

## Direct transition to CNC monitor2 screen



Example screen created by a machine tool builder. Press the [Setup] key.



Screen switches to NC monitor2 setup.

NC monitor2 allows a short-cut key to be designated for taking the operator directly to a specific CNC monitor2 screen from a machine builder-prepared screen. The key enables the operator to, for example, call up a parameter screen with a single touch instead of the conventional three-step operation. Additionally, machine builders can use CNC monitor2 screens as is, reducing the workload related to designing screens.

## CNC monitor2 supports 17 languages



Display languages can be switched with a single parameter operation.

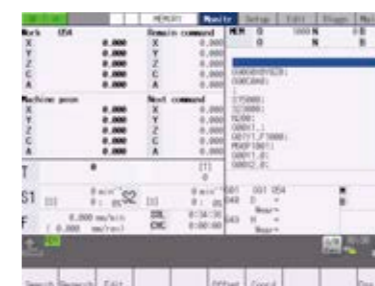
This provides great ease of use for users worldwide.

Languages supported		
Japanese	Chinese (traditional)	Swedish
English	Chinese (simplified)	Turkish
German	Korean	Polish
Italian	Portuguese	Russian
French	Hungarian	Czech
Spanish	Dutch	

## VGA added to product line



SVGA



VGA

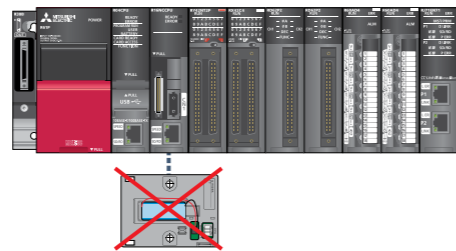
CNC monitor2 supports VGA in addition to the conventional SVGA resolution, which expands the availability of GOT2000 Series.

# MAINTENANCE

The C80 Series has greatly improved maintenance features compared to our conventional product, including the ability to acquire three times the alarm and warning history data. The program number and PLC number of the machining program executed can also be acquired, leading to early problem solving and less downtime.

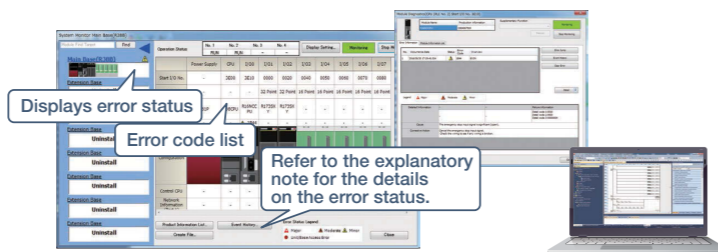
## CNC CPU requires no batteries

The CNC CPU backs up NC data (e.g., parameters, machining programs and alarm history) without the use of batteries. Troubleshooting battery management and battery exchange are no longer required, leading to a reduction in maintenance costs.



## Easy-to-use diagnostics function

Easily run a diagnostics check of the CNC CPU using the system diagnostics function of GX Works3. Troubleshooting is as simple as connecting a personal computer to the PLC CPU via USB port.



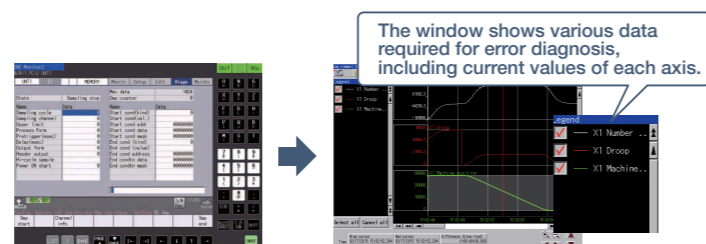
## Multiple language comments supported

With GX Works3, ladder comments can be created in multiple languages. Users can select their preferred display language when applying projects created in Japan overseas.



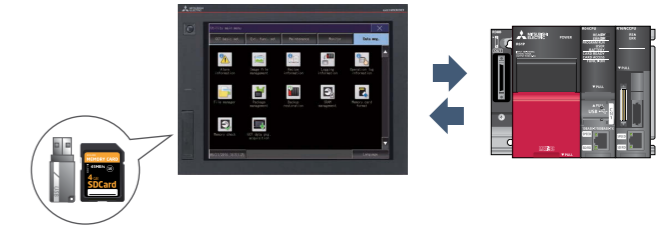
## Log viewer function

GOT log viewer function displays the NC sampling data. This enables waveforms to be diagnosed on the spot for early troubleshooting.



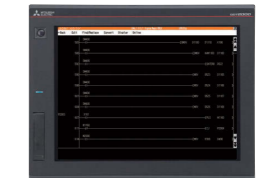
## GOT backup/restoration

The C80 Series supports data storage (backup) and writing (restore) of not only C80 parameters and programs, but also PLC CPU data into SD memory card or the USB memory of the GOT. The system can be restored using GOT only, enabling parts to be exchanged for quick system restoration.



## On-board ladder edit of GOT

Use the GOT "Sequence program monitor (ladder) function" to edit sequence ladder programs without requiring GX Works on a computer. Ladder program operation status can be confirmed as well.



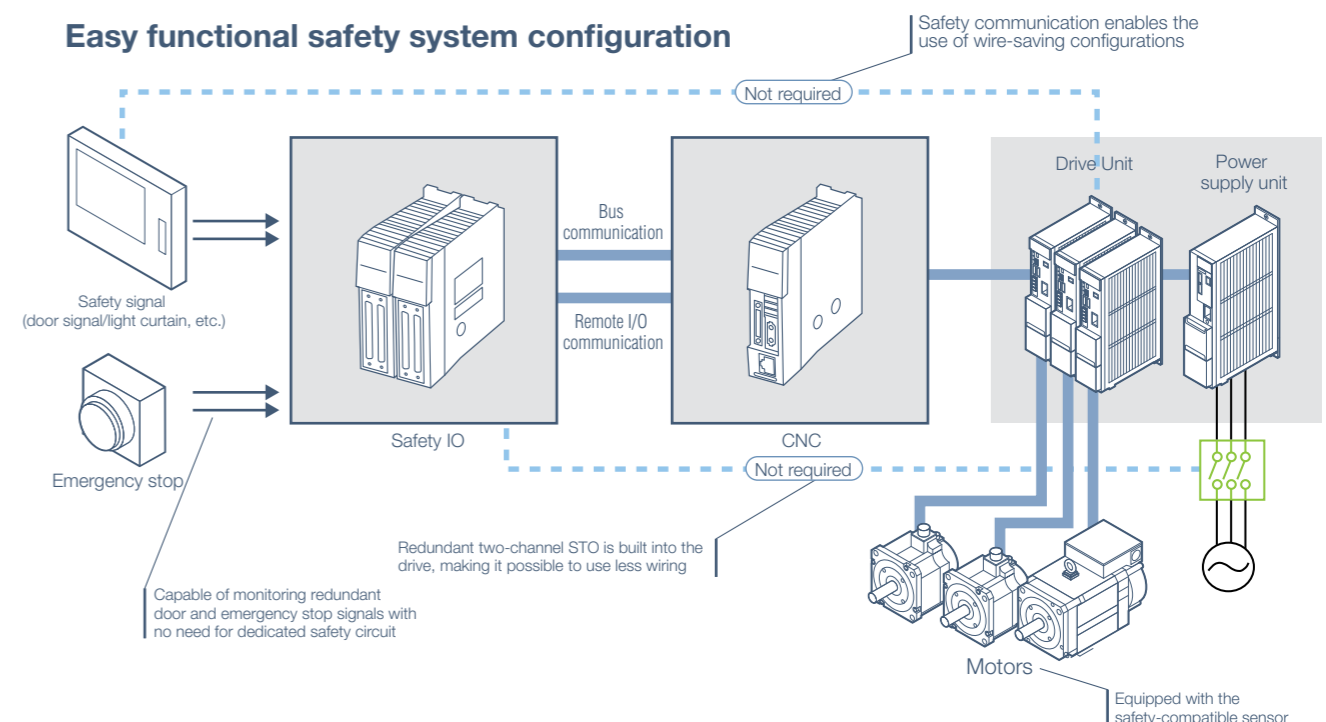
# SAFETY

The C80 Series provides a range of safety features collectively called the "Smart Safety Observation Function". This function has achieved full conformity with the safety standards that cover the entire system including CNC, drive, I/O, sensors and communication.

## Smart Safety Observation Function

- Safety-related I/O observation
- Safely-Limited Speed (SLS)
- Safe Operating Stop (SOS)
- Safe Brake Control/Safe Brake Test (SBC/SBT)
- Safe Stop (SS1/SS2)
- Emergency stop observation
- Safely-Limited Position (SLP)
- Safe Speed Monitor (SSM)
- Safe Cam (SCA)
- Safe Torque Off (STO)

## Easy functional safety system configuration





# SOFTWARE TOOLS

## Flow from machine design and development to operation and maintenance



### •NC-related processes

Servo selection	PLC development	Parameter creation	Operation
NC Servo Selection	GX Works3	NC Configurator2	Maintenance
	Display screen creation	Servo/spindle adjustment	NC Explorer
	GT Works3	Machine adjustment	NC Monitor2
		NC Analyzer2	

### •Machine design

Use the following instructions to set machining parameters

Calculation results of the spindle acceleration/deceleration times

[NC Servo Selection] Input machining parameters to determine the optimum servo motor. This function automatically calculates spindle acceleration/deceleration time and selects the optimum power supply module.

The spindle acceleration/deceleration times are shown in a graph.

### •Electrical circuitry design

[GX Works3] GX Works3 is the programming and maintenance software designed for the MELSEC iQ-R Series control system. Graphic-based system configuration helps to reduce engineering time to 60% over our conventional product<sup>\*1</sup>

Simple motion setting tool: Easily configure the simple motion module with this convenient integrated tool.

Tab view multiple editors: Conveniently work on multiple editors without having to switch between software screens.

Navigation window: Easily access project components. Organize program file list.

Module label/FB: Automatically generate module function blocks simply by selecting one and placing it directly into the ladder editor.

Module configuration: Easily parameterize each module directly from the configuration editor.

Module list: Simply drag & drop modules directly into the module configuration.

[Global operation realized with multi-language support] To meet today's global production needs, the GX Works3 supports multi-language features at various levels, such as a multi-language software menu system and language-switching for device comment functions.

\*1: Based on new project test benchmarks between GX Works2 and GX Works3.

[GT Works3] This integrated software is used to create professional screen designs for GOTs. Developed based on the concepts of simplicity, streamline and user-friendly, this powerful tool pushes operational boundaries to deliver infinite design possibilities.

Work Tree Upgrade: View projects, and easily add or delete screens!

Property Sheet: Setting details are shown as a tree view, and can be changed in a batch!

Data Browser: Settings are listed allowing settings to be confirmed and revised easily!

Dialog Box: The easy-to-use display makes it simple to complete your settings!

Data Check List: Identify errors quickly!

Data Transfer Upgrade: Transfer data with a single click!

Simulator: Check operations with a single click!

Library Upgrade: Easily create beautiful screens!

Utilize Data Function: Search through existing screen assets with keywords and effectively use data!

Sample Projects: A variety of samples are available for use!

### •Machine assembly and adjustment

Check and setup the parameters list using a computer.

Check the contents of the parameters in the help section.

NC Configurator2

Adjusting with simple parameter settings

Servo parameters are adjusted automatically

Results displayed in bode diagram

[NC Configurator2] NC parameters required for NC control or machine operation can be edited on a computer. It is also possible to create initial parameters simply by inputting the machine configuration.

[NC Analyzer2] Servo parameters can be adjusted automatically by measuring and analyzing machine characteristics. Measurement and analysis can be done by running a servo motor using the machining program for adjustment, or using the vibration signal. This function can sample various types of data.

### •Operation and maintenance

Machining data file

Drag and drop to transfer machining data files

NC Explorer

Ethernet

Machining data file

Monitor the status of multiple CNCs on one computer

NC Monitor2

Ethernet

[NC Explorer] CNC machining data can be managed using Windows® Explorer on a computer when the computer is connected to multiple CNCs via Ethernet.

[NC Monitor2] Taking advantage of connection with a factory network, CNC operation status can be monitored from remote locations. Several CNCs can be connected and monitored simultaneously.

For details on GX Works3, please refer to the GX Works3 catalog (L(NA)08334).  
 For details on GT Works3, please refer to the GT Works3 catalog (L(NA)08170).  
 For details on each software tool, please refer to the Mitsubishi CNC software tools catalog (BNP-A1224).

# DRIVE SYSTEM

## Drive unit



### High-performance Servo/ Spindle Drive Units MDS-E/EH Series

- The servo control-dedicated core processor realizes improved control speed, leading to enhanced basic performance. When combined with a higher resolution motor sensor and advanced high-speed optical communication, this drive contributes to high-speed, high-accuracy control.
- The motor power connector is equipped with an anti-misinsertion mechanism. This helps to eliminate connection errors.
- Improved diagnostic and preventive-maintenance features.
- Safe Torque Off (STO) and Safe Brake Control (SBC) are also incorporated as additional safety features.

### Multi-hybrid Drive Units MDS-EM/EMH Series

- The multi-hybrid drive units are capable of driving a maximum of three servo axes and one spindle. This contributes to the downsizing of machines and offers technical advantages.
- The motor power connector is equipped with an anti-misinsertion mechanism. This helps to eliminate connection errors.
- Safe Torque Off (STO) and Safe Brake Control (SBC) are also incorporated as additional safety features.
- Fan unit contributes to easier fan exchange.
- MDS-EMH 400V system drive unit is available.

### All-in-one Compact Drive Units MDS-EJ/EJH Series

- Ultra-compact drive units with built-in power supplies contribute to smaller control panel size.
- The 2-axis type is added for further downsizing.
- The servo control-dedicated core processor realizes an increase in control speed, leading to improved basic performance. When combined with a higher resolution motor sensor and enhanced high-speed optical communication, this drive contributes to high-speed, high-accuracy control.
- Safe Torque Off (STO) and Safe Brake Control (SBC) also incorporated as additional safety features.
- MDS-EJH 400V system drive unit is available (Note 1).

## Servo motors



### Medium-inertia, High-accuracy, High-speed Motors HG Series

- Sensor resolution has been significantly improved. The servo motors, which boast smooth rotation and outstanding acceleration capabilities, are well-suited to serve as feed axes of machine tools.
- Range: 0.2 to 9 [kW]
- Maximum speed: 4,000 or 5,000 [r/min]
- Safety support sensors are included as standard specification. Sensor connectors are screw-locked and have enhanced vibration resistance. Three sensor resolutions (i.e., 1, 4 and 67 million pulses/rev) are available.
- Small-sized connector allows horizontal cable connection, which helps to save space in machines. (Note 2)

### Linear Servo Motors LM-F Series

- Use in clean environments is possible since no ball screws are used, eliminating possible contamination from grease.
- Elimination of transmission mechanisms, including backlash, enables smooth, quiet operation even at high speeds.
- Dimensions: Length: 170 to 1,010 [mm] Width: 120 to 240 [mm]

### Direct-drive Servo Motors TM-RB Series

- High-torque, direct-drive motors combined with high-gain control provide quick acceleration and positioning, which makes rotation smoother.
- Suitable for rotary axes that drive tables or spindle heads.
- Range: Maximum torque: 36 to 1,280 [N·m]

## Spindle motors



### High-performance Spindle Motors SJ-D Series

- Motor energy loss has been significantly reduced by optimizing the magnetic circuit.
- High-speed bearings are incorporated as a standard feature, helping to achieve higher speed, lower vibration and improved durability.
- Range: Normal SJ-D Series 3.7 to 11 [kW] Compact & light SJ-DJ Series 5.5 to 15 [kW]
- Maximum speed 10,000 or 12,000 [r/min]

### High-output, High-torque Spindle Motors SJ-DG Series

- Addition of S3 rating (%ED rating) has improved output and torque acceleration/deceleration characteristics.
- Balance adjustment ring added to the counter-load side for fine tuning.
- Range S3 rating: 5.5 to 15 [kW]
- Maximum speed 10,000 or 12,000 [r/min]

### Low-inertia, High-speed Spindle Motors SJ-DL Series

- This series of spindle motors is dedicated to use in tapping machines that require faster drilling and tapping.
- The latest design technologies have made it possible to attain lower vibration and greater rigidity even with the lighter weight.
- Range 0.75-7.5[kW]



### Built-in Spindle Motors SJ-BG Series

- The electrical design has been optimized to increase the continuous rated torque per unit volume, contributing to the downsizing of spindle units.
- A mold with cooling jacket is available as an optional feature.

### Tool Spindle Motors HG/HG-JR Series

- Compact tool spindle motors are designed to have the small, high-output characteristics of servo motors yet offer high-speed rotation (8,000rpm). These motors contribute to downsizing spindle size, like rotary tool spindles.
- Product line: Small-capacity HG Series 0.4 to 0.9 [kW] Medium-capacity HG-JR Series 0.75 to 1.5 [kW]
- Small-sized connector allows horizontal cable connection, which helps to save space in machines. (Note 2)

(Note 1) For servo motors only  
 (Note 2) Options supported. (Flange size 90SQ only)  
 \*Prepare drive units and motors which are for use with CNCs only.

# LIST OF COMPONENTS

## CNC-related modules

### CNC CPU module

Product name	Model name	Remarks
CNC CPU module	R16NCCPU	mitsubishi CNC C80

### Dual-signal modules

Product name	Model name	Remarks
Dual-signal modules	R173SXY	IO redundant monitoring (up to 3)
Terminal block	FA-TBS40P	Terminal block conversion (separately prepared: Mitsubishi Electric Engineering) UL supported
Terminal block	FA-LTB40P	Terminal block conversion (separately prepared: Mitsubishi Electric Engineering)
Cable	FA-CBL□□FMV-M	Terminal block conversion connection cable (length □□= 05: 0.5m, 10: 1m, 20: 2m, 30: 3m, 50: 5m) (separately prepared: Mitsubishi Electric Engineering)

### Drive units

Series name	Remarks
MDS-E/EH Series	Power regeneration
MDS-EM/EMH Series	Multi-axis integrated, power regeneration
MDS-EJ/EJH Series	Resistor regeneration

Product name	Model name	Remarks
Battery box	MDSBTBOX-LR2060	size-D alkaline batteries LR20

### Peripheral units

Product name	Model name	Remarks
Signal splitter	FCU7-HN387	Options (necessary for 2 or 3-axis manual pulse generator)
Manual pulse generator	UFO-01-2Z9	5V specification
Manual pulse generator	HD60C	12V specification, for connecting to signal splitter, need to prepare 12V power supply.

### Cable for CNC CPU

Cable model name	Purpose	Max. length	Standard length (m)	Remarks
F020	Manual pulse generator : 1ch	45m	0.5, 1, 2, 3, 5, 7, 10, 15, 20	12V power supply is available. For connection with signal splitter.
F021	Manual pulse generator : 2ch	45m	0.5, 1, 2, 3, 5, 7, 10, 15, 20	
F022	Manual pulse generator : 3ch	45m	0.5, 1, 2, 3, 5, 7, 10, 15, 20	
G020	Manual pulse generator : 1ch	15m	0.5, 1, 2, 3, 5, 7, 10, 15	5V power supply is available. For connection with signal splitter.
G021	Manual pulse generator : 2ch	15m	0.5, 1, 2, 3, 5, 7, 10, 15	
G022	Manual pulse generator : 3ch	15m	0.5, 1, 2, 3, 5, 7, 10, 15	
H010	For connection with signal splitter	5m	0.5, 1, 2, 3, 5	
H101	Emergency stop	20m	0.5, 1, 2, 3, 5, 7, 10, 15, 20	
H300	SKIP/MPG input	20m	0.5, 1, 2, 3, 5, 7, 10, 15, 20	For connection with signal splitter.
H310	SKIP signal connection	15m	0.5, 1, 2, 3, 5, 7, 10, 15	
H401	1ch manual pulse generator 5V	20m	0.5, 1, 2, 3, 5, 7, 10, 15, 20	
H501	Dual signal module connection	0.5m	0.1, 0.2, 0.3, 0.5	
J303	Connection with display (straight)	20m	1, 2, 3, 5, 7, 10, 15, 20	

Use Mitsubishi CNC dedicated drive system (drive unit, servo motor and spindle motor).

For Mitsubishi CNC dedicated drive systems, please refer to MITSUBISHI CNC DRIVE SYSTEM GENERAL CATALOG.

For other related units, please contact us.

## MELSEC-related modules

### Main base unit

Product name	Model name	Remarks
Main base	R35B	5 slots: for mounting MELSEC iQ-R series module
	R38B	8 slots: for mounting MELSEC iQ-R series module
	R312B	12 slots: for mounting MELSEC iQ-R series module

### PLC CPU module

Product name	Model name	Remarks
PLC CPU	R04CPU	Program capacity: 40k steps, Elementary operation processing speed (LD command): 0.98ns
	R08CPU	Program capacity: 80k steps, Elementary operation processing speed (LD command): 0.98ns
	R16CPU	Program capacity: 160k steps, Elementary operation processing speed (LD command): 0.98ns
	R32CPU	Program capacity: 320k steps, Elementary operation processing speed (LD command): 0.98ns
	R120CPU	Program capacity: 1200k steps, Elementary operation processing speed (LD command): 0.98ns

### Power supply module

Product name	Model name	Remarks
Power supply	R61P	AC power-supply module input: 100-240VAC, output 5VDC/6.5A
	R62P	AC power-supply module input: 100-240VAC, output 5VDC/3.5A, 24VDC/0.6A
	R63P	DC power-supply module input: 24VDC, output 5VDC/6.5A
	R64P	AC power-supply module input: 100-240VAC, output 5VDC/9A

For other related units, please contact us.

### GOT related unit

Product name	Product name	Screen size	Resolution	Display device Display color	Multimedia and video/ RGB compatible	Multi-touch compatible	Power supply voltage	User memory Memory for storage (ROM)/ Memory for operation (RAM)
GT27	GT2712-STBA	12.1"	SVGA	TFT color LCD, 65,536 colors	○	○	100-240VAC	57MB/128MB
	GT2712-STBD						24VDC	
	GT2710-STBA	10.4"	VGA				100-240VAC	
	GT2710-STBD						24VDC	
	GT2710-VTBA						100-240VAC	
	GT2710-VTBD						24VDC	
	GT2708-STBA	8.4"	SVGA				100-240VAC	
	GT2708-STBD						24VDC	
	GT2708-VTBA						100-240VAC	
	GT2708-VTBD	VGA	24VDC					
GT2705-VTBD	5.7"		24VDC	32MB/80MB				
GT25	GT2512-STBA	12.1"	SVGA	TFT color LCD, 65,536 colors	-	-	100-240VAC	32MB/80MB
	GT2512-STBD						24VDC	
	GT2510-VTBA	10.4"	VGA				100-240VAC	
	GT2510-VTBD						24VDC	
	GT2508-VTBA						100-240VAC	
	GT2508-VTBD						24VDC	
GT2508-VTBD	8.4"		24VDC					

(Note 1) For SVGA, GT Designer3 Version1 (GOT2000) 1.155M or later is needed.

For VGA, GT Designer3 Version1 (GOT2000) 1.165X or later is needed.

(Note 2) Resolution for SVGA: 800x600 pixels, resolution for VGA: 640x480 pixels.

For other related units, please contact us.

# INSTALLATION ENVIRONMENT CONDITIONS

## CNC CPU module

Item	Specification				
Ambient operating temperature	0 to 55°C				
Ambient storage temperature	-25 to 75°C				
Ambient operating humidity	5 to 95%RH, non-condensing				
Ambient storage humidity	5 to 95%RH, non-condensing				
Vibration resistance	Under intermittent vibration	Frequency	Constant acceleration	Half amplitude	10 times each in X, Y and Z directions (80 min.)
		5 to 8.4Hz	-	3.5mm	
	8.4 to 150Hz	9.8m/s <sup>2</sup>	-		
	Under continuous vibration	Frequency	Constant acceleration	Half amplitude	
5 to 8.4Hz	-	1.75mm	-		
8.4 to 150Hz	4.9m/s <sup>2</sup>	-	-		
Shock resistance	147m/s <sup>2</sup> , 3 times in each of 3 directions X, Y and Z				
Operating ambience	No corrosive gases or inflammable gases				
Operating altitude	2000m (6561.68ft.) or lower (Note 3)				
Installation location	Inside control panel				
Overvoltage category (Note 1)	II or less				
Pollution level (Note 2)	2 or less				

C80, which is open equipment, must be installed within a sealed metal control panel (IP54 or higher). C80 must also be used and stored under the conditions listed in the specifications table above. The following environmental conditions are also required for the layout design.

- No large amount of accumulated dust, iron filings, oil mist, salt, or organic solvents
- No direct sunlight
- No strong electrical or magnetic fields
- No direct vibrations or shocks

(Note 1) Assumes that module is connected between a public power distribution network and local machinery.

Category II applies to equipment for which electrical power is supplied from fixed facilities. The surge voltage withstand level for the rated voltage of up to 300V is 2,500V.

(Note 2) Indicates the degree to which material accumulates in terms of the environment where the equipment is used.

Pollution level 2 means that only non-conductive pollution can occur. However, temporary conductivity may be caused by accidental condensation.

(Note 3) Do not use or store C80 Series modules under pressure higher than the atmospheric pressure of altitude 0m. Doing so may cause operation failure.

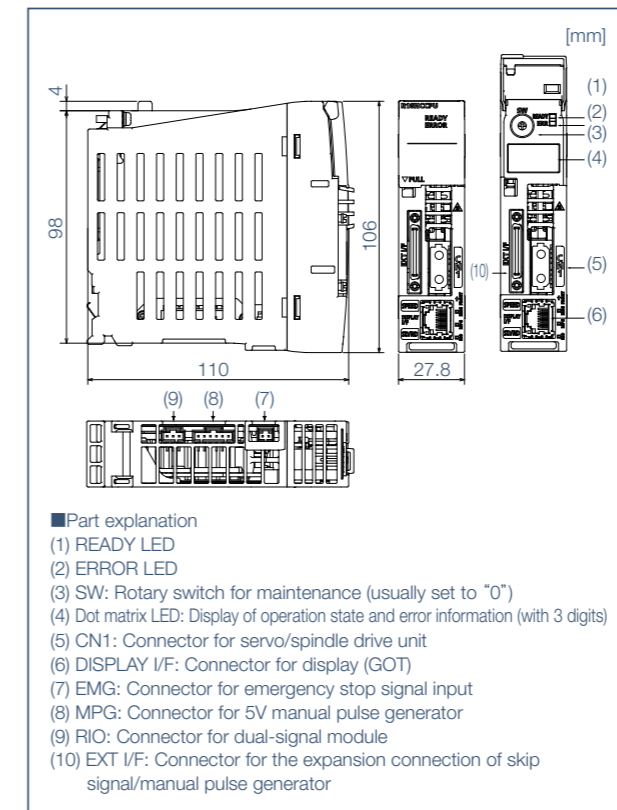
# LIST OF MANUALS

Manuals relating to the C80 are listed below. For the latest versions, please contact us.

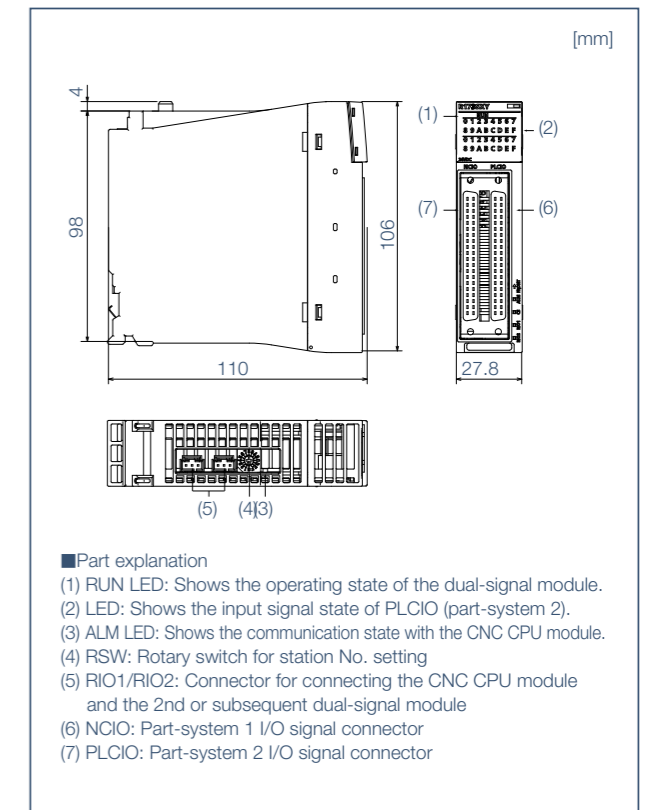
Classification	Manual title	Manual No.	Intended purpose/contents
C80	M800/M80/C80 Series Specifications Manual	IB-1501267	•Model selection •Specifications of hardware •Outline of various functions
	M800/M80/C80 Series PLC Interface Manual	IB-1501272	•Electrical circuitry design •Interface signals between NC and PLC
	M800/M80/C80 Series Programming Manual (Lathe System) (1/2)	IB-1501275	•G code programming for lathe system •Basic functions, etc.
	M800/M80/C80 Series Programming Manual (Lathe System) (2/2)	IB-1501276	•G code programming for lathe system •Functions for multi-part system, high-accuracy function, etc.
	M800/M80/C80 Series Programming Manual (Machining Center System) (1/2)	IB-1501277	•G code programming for machining center system •Basic functions, etc.
	M800/M80/C80 Series Programming Manual (Machining Center System) (2/2)	IB-1501278	•G code programming for machining center system •Functions for multi-part system, high-accuracy function, etc.
	M800/M80/C80 Series Alarm/Parameter Manual	IB-1501279	•Alarms •Parameters
Drive system (servo/spindle)	C80 Series Connection and Setup Manual	IB-1501452	•Detailed specifications of hardware •Installation, connection, wiring, setup (startup/adjustment)
	C80 Series Instruction Manual	IB-1501453	•Operation guide for NC •Explanation for screen operation, etc.
	C80 Series Maintenance Manual	IB-1501454	•Cleaning and replacement for each unit •Other items related to maintenance
	MDS-E/EH Series Specifications Manual	IB-1501226	•Specifications of regenerative power modules
	MDS-E/EH Series Instruction Manual	IB-1501229	•Handling of regenerative power modules
	MDS-EJ/EJH Series Specifications Manual	IB-1501232	•Specifications of resistor regeneration type units
	MDS-EJ/EJH Series Instruction Manual	IB-1501235	•Handling of resistor regeneration type units
iQ-R	MDS-EM/EMH Series Specifications Manual	IB-1501238	•Specifications of multi-axis integrated, regenerative power modules
	MDS-EM/EMH Series Instruction Manual	IB-1501241	•Handling of multi-axis integrated, regenerative power modules
	DATA BOOK	IB-1501252	•Specifications of servo drive unit, spindle drive unit, motor, etc.
	MELSEC iQ-R Module Configuration Manual	SH-081262	Outline of system configuration, specifications, installation, wiring, maintenance, etc.
	MELSEC iQ-R CPU Module User's Manual (Startup)	SH-081263	Outline of specifications, procedures before operation, troubleshooting, etc. for CPU module
	MELSEC iQ-R CPU Module User's Manual (Application)	SH-081264	Outline of memory, functions, devices, parameters, etc. for CPU module
	QCPU User's Manual (Hardware Design, Maintenance and Inspection)	SH-080483	Outline of specifications, necessary knowledge to configure the system and maintenance-related descriptions for Q series CPU module, etc.
GOT	GX Works3 Operating Manual	SH-081215	Outline of functions, programming, etc.
	GOT2000 Series User's Manual (Hardware)	SH-081194	Outline of hardware such as part names, external dimensions, installation, wiring, maintenance, etc. of GOTs
	GOT2000 Series User's Manual (Utility)	SH-081195	Outline of utilities such as screen display setting, operation method, etc. of GOTs
	GOT2000 Series User's Manual (Monitor)	SH-081196	Outline of each monitor function of GOTs
	GOT2000 Series Connection Manual (Mitsubishi Electric Products)	SH-081197	Outline of connection types and connection method between GOT and Mitsubishi Electric connection devices
GT Designer3 (GOT2000) Screen Design Manual	SH-081220	Outline of screen design method using screen creation software GT Designer3	

# OUTLINE DRAWINGS

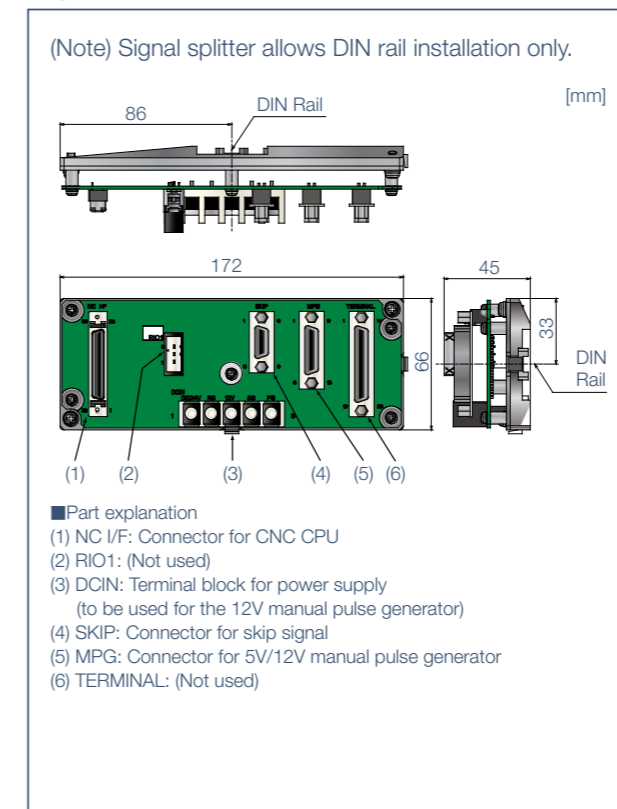
## CNC CPU module (R16NCCPU)



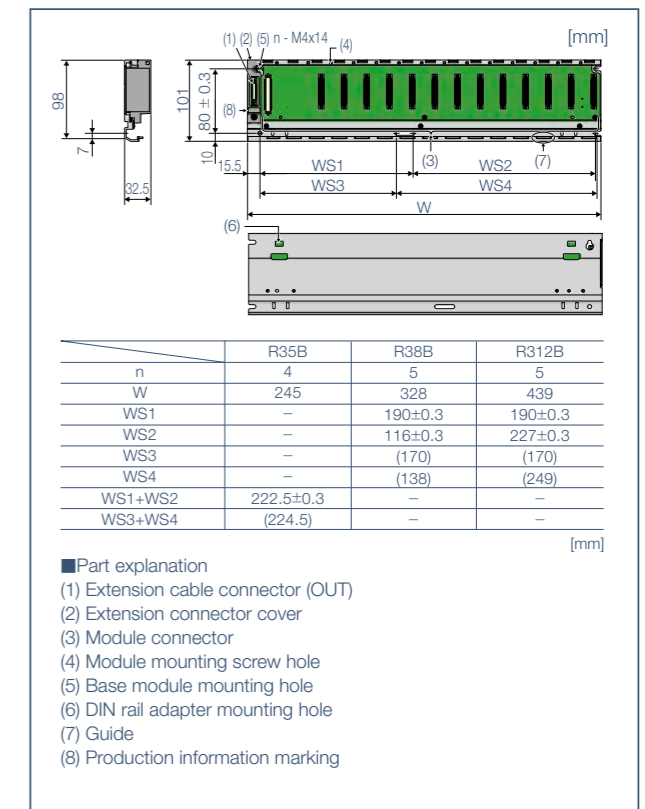
## Dual-signal module (R173SXY)



## Signal splitter (FCU7-HN387)



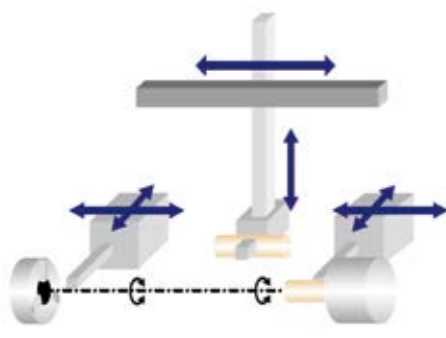
## Main base unit (R35B/R38B/R312B)



# CASE STUDY

One CNC CPU controls up to seven part systems and 16 axes. Up to three CNC CPUs can be mounted on a single base. The C80 Series modules can control not only the machines in automobile parts production lines, but also various other machines.

## Lathe system (two spindles and two turrets, equipped with workpiece loading robot)



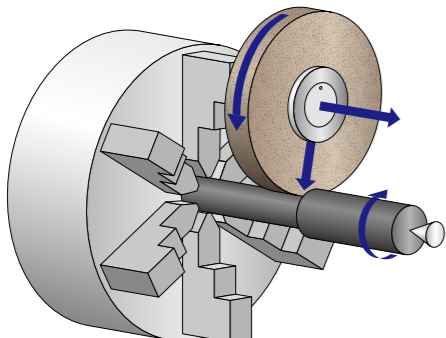
**[Point to adopt C80 Series]**

- Multi-part system control (up to 7 systems) enables independent control of lathe machining and work loading.
- iQ Platform-based robot control is supported.
- The system enables concurrent use of networks (field network, between controllers) are required in manufacturing lines.

**[Main functions]**

- Multi-part system control (start point designation timing synchronization, etc.)
- Machine group-based alarm stop
- Rapid traverse block overlap
- Connection to various networks

## Grinder



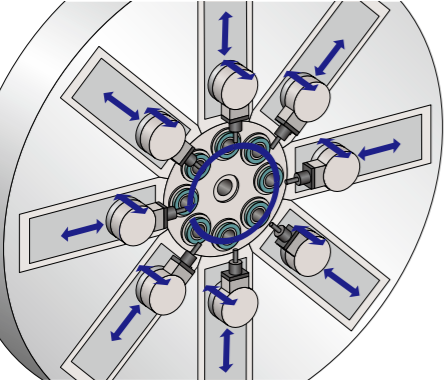
**[Point to adopt C80 Series]**

- GT Works3 helps design a variety of customized screens.
- Tool offset and tool life management functions support automation.
- Subprogram control allows modular part programming.

**[Main functions]**

- Tool offset and tool radius compensation
- Tool life management
- Subprogram control (up to eight nesting levels)

## Multi-station machine



**[Point to adopt C80 Series]**

- C80 modules support up to three CPUs mounted, which enables multi-axis multi-part system control (up to 21 part-systems and 48 axes).
- A great number of tools can be managed through tool offset and tool life management functions.

**[Main functions]**

- Timing synchronization between part systems<sup>(\*)</sup>
- Start point designation timing synchronization<sup>(\*)</sup>
- Multi-part system program management<sup>(\*)</sup>
- Multi-part system simultaneous high-accuracy control<sup>(\*)</sup>
- Number of tool offset sets [machining center system: up to 400 sets, lathe system: up to 256 sets]
- Number of tool life management sets [machining center system: up to 400 sets, lathe system: up to 256 sets]

(\*) Specifications for each CNC CPU.

# FUNCTIONAL SPECIFICATIONS

○Standard △Optional □Selection

Class	C80		General explanation	
	Lathe system	Machining center system		
<b>1 Control axes</b>				
1 Control axes				
1	Number of basic control axes (NC axes)	○ 2	○ 3	The NC axis, spindle, and PLC axis are generically called the control axis. The NC axis can be manually or automatically operated using a machining program. The PLC axis can be controlled using a sequence program. The number of axes that is within the max. number of control axes, and that does not exceed the max. number given for the NC axis, spindle and PLC axis, can be used.
2	Max. number of axes (NC axes + Spindles + PLC axes)	16	16	
	Max. number of NC axes (in total for all the part systems)	16	16	
	Max. number of spindles	4	7	
	Max. number of PLC axes	8	8	
4	Max. number of PLC indexing axes	8	8	
5	Number of simultaneous contouring control axes	4	4	Number of axes with which simultaneous interpolation control is possible.
6	Max. number of NC axes in a part system	8	8	Max. number of NC axes possible to control in the same part system.
<b>2 Control part system</b>				
1	Standard number of part systems	1	1	One part system is the standard.
2	Max. number of part systems	△3	△7	Up to three part systems for a lathe system, and up to seven part systems for a machining center system.
	Max. number of main part systems	△3	△7	
	Max. number of sub part systems	△2	—	
<b>3 Control axes and operation modes</b>				
2	Memory mode	○	○	Machining programs stored in the memory of the CNC module are run.
3	MDI mode	○	○	MDI data stored in the memory of the CNC unit are executed.
<b>2 Input command</b>				
<b>1 Data increment</b>				
1	Least command increment	—	—	The data increment handled in the controller includes the input setting increment and command increment. Each type is set with parameters.
	Least command increment 1μm	○	○	Possible to command in increments of 0.001mm (linear axis) and 0.001° (rotary axis).
	Least command increment 0.1μm	○	○	Possible to command in increments of 0.0001mm (linear axis) and 0.0001° (rotary axis).
2	Least control increment	○	○	The least control increment determines the CNC's internal operation accuracy.
	Least control increment 0.01μm (10nm)	○	○	Possible to control in increments of 0.00001mm (linear axis) and 0.00001° (rotary axis).
	Least control increment 0.001μm (1nm)	○	○	Possible to control in increments of 0.000001mm (linear axis) and 0.000001° (rotary axis).
3	Indexing increment	○	○	This function limits the command value for the rotary axis.
<b>2 Unit system</b>				
1	Inch / Metric changeover	○	○	The unit systems of the data handled in the controller include the metric system and inch system. The type can be designated with a parameter and a machining program.
2	Input command increment tenfold	○	○	The program's command increment can be multiplied by an arbitrary scale with the parameter designation. This function is valid when a decimal point is not used for the command increment.
<b>3 Program format</b>				
1	Program format			G code (program) format
1	Format 1 for Lathe (G Code List 2, 3)	○	—	G code list for the lathe system. The G-code list is selected by parameter.
2	Format 2 for Lathe (G Code List 4, 5)	○	—	
3	Special format for lathe (G Code List 6, 7)	○	—	
4	Format 1 for Machining center	—	○	G code list for the machining center system. The G-code list is selected by parameter.
5	Format 2 for Machining center (M2 format)	—	○	
6	MITSUBISHI CNC special format	○	—	The formats of the fixed cycle for turning machining (G77 to G79), compound type fixed cycle for turning machining (G71 to G76) and fixed cycle for drilling (G80 to G89) can be switched to the MITSUBISHI CNC special formats.
<b>4 Command value</b>				
1	Decimal point input I, II	○	○	For the decimal point input type 1, the unit of the last digit of a command without a decimal point is the same as that of the least command increment. For decimal point input type 2, the last digit of a command without a decimal point is interpreted in millimeters during the metric mode, in inches in the inch mode, or in seconds for a time-based command.
2	Absolute / Incremental command	○	○	When axis coordinate data are issued in a machining program command, either the incremental command method, which commands a relative distance from the current position, or the absolute command method, which commands a movement to a designated position in a predetermined coordinate system, can be selected.
3	Diameter / Radius designation	○	—	The designation method of an axis command value can be changed over with parameters between the radius designation or diameter designation. When the diameter designation is selected, the scale of the length of the selected axis is doubled. (moves only half (1/2) the commanded amount)
<b>3 Positioning / Interpolation</b>				
<b>1 Positioning</b>				
1	Positioning	○	○	This function carries out positioning at high speed using a rapid traverse rate with the travel command value given in the program.
2	Unidirectional positioning	—	△	The G code command always moves the tool to the final position in the direction determined by parameters.
<b>2 Linear / Circular interpolation</b>				
1	Linear interpolation	○	○	Linear interpolation is a function that moves a tool linearly by the travel command value supplied in the program at the cutting feedrate designated by the F code.
2	Circular interpolation (Center / Radius designation)	○	○	This function moves a tool along a circular arc on the plane selected by the travel command value supplied in the program.
3	Helical interpolation	○	○	With this function, any two of three axes intersecting orthogonally are made to perform circular interpolation while the third axis performs linear interpolation in synchronization with the arc rotation. This control can be exercised to machine large-diameter screws or 3-dimensional cams.
4	Spiral / Conical interpolation	—	△	This function interpolates arcs where the start point and end point are not on the circumference of the same circle into spiral shapes.
5	Cylindrical interpolation	△	△	This function transfers the shape that is on the cylinder's side surface (shape yielded by the cylindrical coordinate system) onto a plane, and when the transferred shape is designated in the program in the form of plane coordinates, the shape is converted into a movement along the linear and rotary axes of the original cylinder coordinates, and the contours are controlled by means of the CNC unit during machining.
6	Polar coordinate interpolation	△	△	This function converts the commands programmed by the orthogonal coordinate axes into linear axis movements (tool movements) and rotary axis movements (workpiece rotation) to control the contours. It is useful for cutting linear cutouts on the outside diameter of the workpiece, grinding cam shafts, etc.
7	Milling interpolation	△	—	When a lathe with linear axes (X, Z axes) and rotary axis (C axis) serving as the control axes is to perform milling at a workpiece end face or in the longitudinal direction of the workpiece, this function uses the hypothetical axis Y, which is at right angles to both the X and Z axes, to enable the milling shape to be programmed as the X, Y and Z orthogonal coordinate system commands.
<b>3 Curve interpolation</b>				
3	Spline interpolation (G05.1Q2 / G61.2)	—	△	This function automatically generates spline curves that smoothly pass through rows of dots designated by a fine-segment machining program, and performs interpolation for the paths along the curves. This enables high-speed and high-accuracy machining.

○Standard △Optional □Selection

Class	C80		General explanation
	Lathe system	Machining center system	
6 Spline interpolation2 (G61.4)	—	△	This function automatically generates curves that smoothly pass in the tolerance error range, and moves on the paths along the curves. This enables smooth machining.
<b>4 Feed</b>			
<b>1 Feedrate</b>			
1 Rapid traverse rate (m/min)	1000	1000	The rapid traverse rate can be set independently for each axis using parameters.
2 Cutting feedrate (m/min)	1000	1000	This function specifies the feedrate of the cutting commands, and gives a command for a feed amount per spindle rotation or feed amount per minute.
3 Manual feedrate (m/min)	1000	1000	The manual feedrates are designated as the feedrate in jog mode or incremental feed mode for manual operation and the feedrate during dry run ON for automatic operation. The manual feedrates are set using external signals.
4 Rotary axis command speed tenfold	○	○	This function multiplies the rotary axis' command speed by ten during initial inching.
<b>2 Feedrate input methods</b>			
1 Feed per minute (Asynchronous feed)	○	○	By issuing a G command, the command from the block is issued directly with a numerical value following F as the feedrate per minute (mm / min or inch / min).
2 Feed per revolution (Synchronous feed)	○	△	By issuing a G command, the command from the block is issued directly with a numerical value following F as the feedrate per spindle revolution (mm / rev or inch / rev).
3 Inverse time feed	—	△	This function can issue one block of machining time (inverse) commands in F commands, in place of normal feed commands. This enables the machining speed on the cutting surface to be constantly controlled and prevents the loss of accuracy, even if radius compensation is applied to the machining program that expresses the free curve surface with fine segment lines.
4 F 1-digit feed	○	○	The feedrate registered by parameter in advance can be assigned by designating a single digit, following address F.
5 Manual speed command	△	△	By enabling a manual speed command and selecting either hand feed or jog (manual) feed in the memory or MDI mode, automatic operation can be carried out at this feedrate.
7 G00 feedrate designation (F command)	△	△	Feedrates can be specified for G00 (positioning command). The speed of tool exchange, axis movement of gantry, etc. can be specified with the machining program so that the mechanical vibration can be suppressed.
<b>3 Override</b>			
1 Rapid traverse override	○	○	Override can be applied to manual or automatic rapid traverse using the external input signal.
2 Cutting feed override	○	○	Override can be applied to the feedrate command designated in the machining program using the external input signal.
3 2nd cutting feed override	○	○	Override can be further applied as a second-stage override to the feedrate after the cutting feed override has been applied.
4 Override cancel	○	○	By turning on the override cancel external signal, the override is automatically set to 100% for the cutting feed during the automatic operation mode (tape, memory and MDI).
<b>4 Acceleration / Deceleration</b>			
1 Automatic acceleration / deceleration after interpolation	○	○	Acceleration / deceleration is automatically applied to all commands. The acceleration / deceleration patterns can be selected using a parameter from the following types: linear acceleration/deceleration, soft acceleration / deceleration, exponent function acceleration / deceleration and exponent function acceleration / linear deceleration.
2 Rapid traverse constant inclination acceleration / deceleration	○	○	This function performs acceleration / deceleration at a constant inclination during linear acceleration / deceleration in the rapid traverse mode. Compared to the method of acceleration / deceleration after interpolation, the constant inclination acceleration / deceleration method enables improved cycle time.
3 Rapid traverse constant inclination multi-step acceleration / deceleration	—	△	This function carries out the acceleration / deceleration according to the torque characteristic of the motor in the rapid traverse mode during automatic operation. (This function is not available in manual operation.) The rapid traverse constant inclination multi-step acceleration / deceleration method makes for improved cycle time because the positioning time is shortened by using the motor ability to the maximum.
<b>5 Thread cutting</b>			
1 Thread cutting (Lead / Thread number designation)	○	△	Thread cutting with a designated lead can be performed. Inch threads are cut by designating the number of threads per inch with the E address.
2 Variable lead thread cutting	○	—	By commanding the lead increment/decrement amount per thread rotation, variable lead thread cutting can be performed.
<b>3 Synchronous tapping</b>			
1 Synchronous tapping cycle	○	○	This function performs tapping through synchronized control of the spindle and servo axis. This eliminates the need for floating taps and enables tapping to be conducted at a highly accurate tapping depth.
2 Pecking tapping cycle	△	△	The load applied to the tool can be reduced by designating the depth of cut per pass and cutting the workpiece to the hole bottom with a multiple number of passes.
3 Deep-hole tapping cycle	△	△	In the deep-hole tapping, the load applied to the tool can be reduced by designating the depth of cut per pass and cutting the workpiece to the hole bottom with a multiple number of passes.
102 Multiple spindle synchronous tapping	△	△	This function enables two or more spindles to perform synchronous tapping at a time, thereby improving the tapping efficiency.
4 Chamfering	○	—	Chamfering can be enabled during the thread cutting cycle by using external signals.
8 High-speed synchronous tapping (OMR-DD)	○	○	The servo axis directly detects and compensates the spindle's delay in tracking by using the communication between drive units over the high-speed optical servo network. By minimizing the synchronization error, the accuracy of the synchronous tapping is increased.
11 Thread cutting override	△	—	The thread cutting feedrate can be changed by changing the spindle override depending on rough cutting, finish machining, etc.
12 Variable feed thread cutting	△	—	This function changes the cutting feedrate by the spindle override at the time of the thread cutting. The machining condition during thread cutting can be changed.
<b>6 Manual feed</b>			
1 Manual rapid traverse	○	○	The tool can be moved at the rapid traverse rate for each axis separately. Override can also be applied to the rapid traverse rate by means of the rapid traverse override function.
2 Jog feed	○	○	The tool can be moved in the axis direction (+ or -) in which the machine is to be moved at the per-minute feedrate.
3 Incremental feed	○	○	The tool can be moved for the designated amount (incremental value) in the axis direction each time the jog switch is pressed.
4 Handle feed	○	○	The machine can be moved in very small amounts by rotating the manual pulse generator.
5 Manual feedrate B	○	○	Manual feedrate B is a function that sets an arbitrary axis feedrate from the user PLC separately from the manual feedrate.
8 Manual speed clamp	○	○	The maximum speed for manual feed can be switched to the rapid traverse rate or the manual feed clamp speed.
<b>7 Dwell</b>			
1 Dwell (Time-based designation)	○	○	The G code command temporarily stops machine movements and sets the machine in the stand-by status for the time designated in the program.
2 Dwell (Revolution-based designation)	○	—	When G04 is commanded in the synchronous feed mode (G95), the machine waits for the spindle to rotate for the number of the revolutions designated.
<b>5 Program memory / editing</b>			
<b>1 Memory capacity</b>			
1 Memory capacity (number of programs stored)			Machining programs are stored in the NC memory, data server or external memory devices (front SD card, built-in disk of display unit, etc.). (Note) For a multi-part system, the specifications shown here is the total for all part systems.
500kB [1280m] (1000 programs)	○	○	

○Standard △Optional □Selection

Class	C80		General explanation
	Lathe system	Machining center system	
<b>2 Editing</b>			
1 Program editing	○	○	This function enables program editing such as correction, deletion and addition.
2 Background editing	○	○	This function enables one machining program to be created or edited while another program is running.
3 Buffer correction	○	○	During automatic operation (including memory, tape, SD card or Data Server (DS) operation) or MDI operation, this function initiates single block stop and enables the next command to be corrected or changed.
5 Multi-part system simultaneous program editing	△	—	When an operation to open a machining program in the NC memory is performed on the edit screen, machining programs are opened in the right and left areas at the same time; the specified machining program of the displayed part system in the edit area being selected and the machining program of another part system with the same name in the unselected edit area.
6 Special program editing display for synchronization between part systems	△	—	When the left and right edit areas are displaying the same named programs of different part systems stored on the NC memory, the display is switched to the synchronized display of the left- and right- side programs aligned using the timing synchronization symbols.
<b>6 Operation and display</b>			
<b>1 Structure of operation / display panel</b>			
102 GOT(GOT2000 series GT27/GT25 12.1/10.4/8.4/5.7)	○	○	Select a GOT in its lineup. For details, refer to catalogs : "GOT2000 series".
<b>2 Operation methods and functions</b>			
1 Operation input	○	○	In addition to the method of directly inputting numeric data, a method to input the operation results using four basic arithmetic operators and function symbols can be used for specific data settings.
2 Absolute value / Incremental value setting	○	○	When setting the data, the absolute/incremental setting can be selected from the menu.
3 Multiple display connection	○(GOT)	○(GOT)	Using an Ethernet hub, one CNC module can be connected to and switched between up to eight displays. (Note that the max. number of connectable displays is limited depending on the machine operation panel specifications.)
4 Common display to multiple NCs	○(GOT)	○(GOT)	Using an Ethernet hub, one display can be connected to and switched between up to 64 CNC modules. (Note that the max. number of connectable displays is limited depending on the machine operation panel specifications.)
5 Displayed part system switch	○	○	The part system displayed on the screen can be changed.
6 Menu list	○	○	The menu list function displays the menu configuration of each screen as a list, making it possible to directly select the menu for other screens.
7 Display switch by operation mode	○	○	The screen display changes when the screen mode selection switch is changed.
8 External signal display switch	○	○	The screen display changes with the signal from PLC.
9 Screen saver	○(GOT)	○(GOT)	The screen saver function protects the display unit by turning the backlight OFF after the length of time specified in a parameter.
10 Parameter guidance	○	○	This function displays the details of the parameters or the operation methods according to the state of the screen currently displayed.
11 Alarm guidance	○	○	Guidance is displayed for the alarm currently issued.
14 Screenshot capture	○(GOT)	○(GOT)	This function allows to output a bitmap file of a screen displayed on the setting and display unit.
15 User selectable menu configuration	○	○	This function allows to change the display order of the main menu in the "Monitor", "Setup" and "Edit" screens, and to change display / non-display selection.
19 MTB selectable menu configuration	○	○	Menu items on the "Monitor", "Setup" and "Edit" screens (of MITSUBISHI standard format) can be moved within a screen or hidden as desired. The custom screen menu items added by machine tool builders, on the contrary, cannot be moved or hidden.
<b>3 Display methods and contents</b>			
1 Status display	○	○	The status of the program currently being executed is indicated.
2 Clock display	○	○	The clock is built in, and the date (year, month, date) and time (hour, minute, second) are displayed.
3 Monitor screen display	○	○	Various information related to operation, such as the axis counter, speed display and MSTB command are displayed.
4 Setup screen display	○	○	Tool/workpiece related settings, user parameter settings, MDI editing, counter setting, manual numeric command issuing and pallet program registration (option) can be carried out.
5 Edit screen display	○	○	Machining program editing (addition, deletion, change) and checking, simple program creation, and machining program input / output can be carried out.
6 Diagnosis screen display	○	○	The following operations related to the CNC diagnosis can be carried out. (1) Display the hardware and software configuration. (2) Display the CNC options. (3) Diagnose the PLC interface. (4) Display the drive unit information. (5) Display the alarm message / alarm history list etc.
7 Maintenance screen display	○	○	Parameter setting and display, and NC data input/output, etc., can be carried out.
<b>10 Additional languages</b>			
1 Japanese	□	□	Available display languages.
2 English	○	○	
3 German	□	□	
4 Italian	□	□	
5 French	□	□	
6 Spanish	□	□	
7 Chinese			
Traditional Chinese characters	□	□	
Simplified Chinese characters	□	□	
8 Korean	□	□	
9 Portuguese	□	□	
10 Hungarian	□	□	
11 Dutch	□	□	
12 Swedish	□	□	
13 Turkish	□	□	
14 Polish	□	□	
15 Russian	□	□	
16 Czech	□	□	
<b>7 Input / Output functions and devices</b>			
<b>1 Input / Output data</b>			
1 Machining program input / output	○	○	Certain kinds of data handled by the NC system can be input and output between the NC system's memory and external devices.
2 Tool offset data input / output	○	○	
3 Common variable input / output	○	○	
4 Parameter input / output	○	○	
5 History data output	○	○	
6	○	○	
7 System configuration data output	○	○	

○Standard △Optional □Selection

Class	C80		General explanation
	Lathe system	Machining center system	
2 Input / Output I/F			
3 Ethernet I/F	○(GOT)	○(GOT)	Ethernet interface card can be attached onto the NC unit.
101 USB I/F (GOT front side USB I/F)	○	○	Interface card to use USB memory can be attached inside the GOT.
102 SD I/F (GOT back side SDcard I/F)	○	○	Interface card to use SD card can be attached inside the GOT.
<b>8 Spindle, Tool and Miscellaneous functions</b>			
<b>1 Spindle functions (S)</b>			
1 Spindle control functions			The spindle rotation speed is determined in consideration of the override and gear ratio for the S command given in automatic operation or with manual numerical commands, and the spindle is rotated.
1 Spindle digital I/F	○	○	This interface is used to connect the digital spindle (AC spindle motor and spindle drive unit).
2 Spindle analog I/F	△(MELSEC)	△(MELSEC)	Spindle control can be executed using an analog spindle instead of the digital spindle.
3 Coil switch	○	○	Constant output characteristics can be achieved across a broad spectrums down to the low-speed ranges by switching the spindle motor connections. This is a system under which commands are assigned from the PLC.
4 Automatic coil switch	○	○	Constant output characteristics can be achieved across a broad spectrums down to the low-speed ranges by switching the spindle motor connections. This is a system under which the CNC module switches the coils automatically in accordance with the motor speed.
6 Spindle-mode servo motor control	△	△	This function controls a spindle using the combination of servo motor and servo drive unit (MDS-E Series) which controls NC axis.
2 S code output	○	○	When an 8-digit number following address S (S0 to S9999999) is commanded, signed 32-bit binary data and start signal, or non-signed 32-bit binary data and start signal will be output to the PLC.
3 Constant surface speed control	○	○	With radial direction cutting, this function enables the spindle speed to be changed in accordance with changes in the radial direction coordinates and the workpiece to be cut with the cutting point always kept at a constant speed (constant surface speed).
4 Spindle override	○	○	This function applies override to the rotation speed of a spindle or milling spindle assigned by the machining program command during automatic operation or by manual operation.
5 Multiple-spindle control			Multiple-spindle control is a function that controls all the spindles except the first spindle (main spindle) in a machine tool equipped with the second, third and fourth spindles (sub-spindles) in addition to the first spindle.
1 Multiple-spindle control I	○	—	This function controls the spindles in a machine tool equipped with several spindles.
2 Multiple-spindle control II	○	○	With this function, commands to the spindle are performed with one S command, and a signal from the PLC determines which spindle is selected.
6 Spindle orientation	○	○	This function stops the spindle rotation at a certain position.
7 Spindle position control (Spindle / C axis control)	○	○	
1 Spindle position control (Spindle / C axis control)	○	○	This function enables one spindle drive unit to be also used as the C axis (rotary axis) using an external signal.
8 Spindle synchronization			
1 Spindle synchronization I	○	—	In a machine with two or more spindles, this function controls the rotation speed and phase of one selected spindle (synchronized spindle) in synchronization with the rotation of the other selected spindle (basic spindle). There are two methods for giving commands: G code and PLC.
2 Spindle synchronization II	○	—	
9 Tool spindle synchronization I (Polygon)			
1 Tool spindle synchronization I A (Spindle-Spindle, Polygon)	△	—	With a machine equipped with two or more spindles under serial connection control, this function enables spindle-spindle polygon machining (A) by controlling the workpiece spindle rotation in synchronization with the rotary tool spindle rotation. The rotary tool spindle and workpiece spindle are designated from the spindles subject to serial connection control.
2 Tool spindle synchronization I B (Spindle-Spindle, Polygon)	△	—	With a machine equipped with two or more spindles under serial connection control, this function enables spindle-spindle polygon machining (B) by controlling the rotary tool spindle rotation in synchronization with the workpiece spindle rotation. The rotary tool spindle and workpiece spindle are designated from the spindles subject to serial connection control.
3 Tool spindle synchronization I C (Spindle-NC axis, Polygon)	△	—	This function controls the workpiece (spindle) and tool (NC axis) so that they synchronously rotate at the commanded ratio, allowing polygon machining.
10 Tool spindle synchronization II (Hobbing)	△	—	This function is to cut the gear with a hob (hob cutter).
11 Spindle speed clamp	○	○	The spindle rotation speed is clamped between max. rotation speed and min. rotation speed.
14 Spindle superimposition control	△	—	Spindles are controlled by superimposing the rotation speed of one spindle on the rotary speed of other spindle. Use this function when the tool spindle needs to be rotated with the superimposed speed on the spindle rotation speed.
<b>2 Tool functions (T)</b>			
1 Tool functions (T command)	○	○	The tool function is commanded with an 8-digit number following the address T (T0 to T9999999) to specify the tool No. In the controller for a lathe, the tool compensation (tool length compensation, tool nose wear compensation) Nos. are also indicated.
<b>3 Miscellaneous functions (M)</b>			
1 Miscellaneous functions	○	○	Miscellaneous function, or M function, is used to command auxiliary functions for NC, such as rotating the spindle forward / backward or stopping it, as well as turning the cooling oil ON/OFF.
2 Multiple M codes in 1 block	○	○	Up to four sets of M commands can be issued in a block.
3 M code independent output	○	○	When the M00, M01, M02 or M30 command is issued during an automatic operation (tape, memory, MDI) or by a manual numerical command, the signal of this function is output. It is turned OFF after the miscellaneous function finishes or by the reset & rewind signal.
4 Miscellaneous function finish	○	○	These signals inform the CNC system that a miscellaneous function (M), spindle function (S), tool function (T) or 2nd miscellaneous function (A, B, C) has been issued, and that the PLC that has received it has completed the required operation. They include miscellaneous function finish signal 1 (FIN1) and miscellaneous function finish signal 2 (FIN2).
5 M code output during axis traveling	○	—	This function controls the timing at which miscellaneous functions are output, and it outputs a miscellaneous function when the axis reaches the designated position movement.
6 Miscellaneous function command high-speed output	○	○	This function shortens a processing time per miscellaneous function.
<b>4 2nd miscellaneous functions (B)</b>			
1 2nd miscellaneous functions	○	○	The code data and start signals are output when an 8-digit number is assigned following the address code A, B or C, whichever does not duplicate the axis name being used.
2 2nd miscellaneous function name extension	○	○	The 2nd miscellaneous function name same as the additional axes (A, B, C) can be used by specifying the command address of the 2nd miscellaneous function with two characters.
<b>9 Tool compensation</b>			
<b>1 Tool length / Tool position</b>			
1 Tool length offset	○	○	These commands make it possible to control the axis movement by offsetting the position of the end point of the travel command by the amount set in the tool compensation screen.
2 Tool position offset	—	○	This function uses commands to control the movement by changing the end point positions of the movement commands to positions which have been extended or reduced for a tool compensation amount.
3 Tool compensation for additional axes	○	—	The tool compensation for a lathe is valid for the X and Z axes. If an additional axis (Y axis) is added, the tool compensation will be validated for the additional axis.
<b>2 Tool radius</b>			
1 Tool radius compensation	—	○	This function provides tool radius compensation. Through a combination of the G command and D address assignment, the actual tool center path is compensated either inside or outside the programmed path by an amount equivalent to the tool radius.

○Standard △Optional □Selection

Class	C80		General explanation
	Lathe system	Machining center system	
3 Tool nose radius compensation (G40 / 41 / 42)	○	—	The tool nose of the specified tool No. is assumed to be a half circle of the radius R, and compensation is applied so that the half circle touches the programmed path.
4 Automatic decision of nose radius compensation direction (G46 / 40)	○	—	The nose radius compensation direction is automatically determined from the tool tip and the specified movement vector.
5 Tool radius compensation diameter designation	—	○	Tool diameter designation handles the compensation amount as diameter value and compensates the amount set in the tool compensation amount screen when tool radius compensation (G41/G42) is commanded.
<b>3 Tool offset amount</b>			
1 Number of tool offset sets			
2 128 sets	○	—	The number of configurable sets of tool data such as tool length compensation and tool radius compensation.
3 200 sets	—	○	
4 256 sets	△	—	
5 400 sets	—	△	
2 Offset memory			
1 Tool shape / wear offset amount	○	○	This function registers the tool shape compensation and wear compensation amounts.
<b>10 Coordinate system</b>			
<b>1 Coordinate system type and setting</b>			
1 Machine coordinate system	○	○	This shows the coordinate systems handled by the NC. The points that can be commanded with the movement command are points in the local coordinate system or machine coordinate system. The machine coordinate system is used to express the prescribed positions (such as the tool change position and stroke end position) that are specific to each machine, and it is automatically set immediately upon completion of the first dog-type reference position return after power ON, or immediately after power ON if the absolute position specifications apply.
2 Coordinate system setting	○	○	By issuing a G code, the program coordinate system (zero point of program) can be changed in the workpiece coordinate system.
3 Automatic coordinate system setting	○	○	After turning the power ON, even without executing the reference position return, the basic machine coordinate system and the workpiece coordinate system are set automatically.
4 Workpiece coordinate system selection			
1 Workpiece coordinate system selection (6 sets)	○	○	When multiple workpieces with the same shape are to be machined, these commands enable the same shape to be machined by executing a single machining program in the coordinate system of each workpiece.
2 Extended workpiece coordinate system selection (48 sets) G54.1P1 to P48	△	△	In addition to the six workpiece coordinate systems G54 to G59, 48/96 sets of workpiece coordinate systems can be used by assigning G54.1Pn command.
5 External workpiece coordinate offset	○	○	An external workpiece coordinate offset that serves as a reference for all the workpiece coordinate systems is available outside the workpiece coordinates. By setting the external workpiece coordinate offset, the external workpiece coordinate system can be shifted, and all the workpiece coordinate systems can be simultaneously shifted by an amount equivalent to the offset.
6 Workpiece coordinate system preset (G92.1)	○	—	This function presets the workpiece coordinate system, which has been shifted by the programmed command or the manual operation, as the workpiece coordinate system which has been offset by the programmed command (G92.1) from the machine zero point by an amount equivalent to the workpiece coordinate offset amount.
7 Local coordinate system	○	○	This function is for assigning another coordinate system in the workpiece coordinate system currently selected. This enables the workpiece coordinate system to be changed temporarily.
8 Coordinate system for rotary axis	○	○	The rotary axis includes the rotating type (short-cut valid/invalid) or the linear type (workpiece coordinate position linear type, all coordinate position linear type). The workpiece coordinate position range is 0 to 359.999° for the rotating type, and 0 to 99999.999° for the linear type.
9 Plane selection	○	○	By issuing a G code, it is possible to specify the planes for the arc, tool radius compensation, coordinate rotation and other commands.
10 Origin set / Origin cancel	○	○	Origin set is a function that shifts the coordinate system so that the current position is set as the zero point in the workpiece coordinate system containing the workpiece coordinate system's offset value. Origin cancel is a function that manually cancels all deviated amounts, and shifts to the designated zero point with the workpiece offset.
11 Counter set	○	○	The relative position counter can be set to an arbitrary value from the setting and display unit screen.
13 Workpiece coordinate system shift	○	—	When a workpiece coordinate system which is considered at programming is misaligned with an actual set workpiece coordinate or a workpiece coordinate set by automatic coordinate system setting, the measured workpiece coordinate system can be shifted to the workpiece coordinate system at the program creation so that the machining can be performed without modification of the machining program.
<b>2 Return</b>			
1 Manual reference position return	○	○	This function enables the tool to be returned manually to a position specific to the machine (reference position).
2 Automatic 1st reference position return	○	○	By commanding the G code during an automatic operation, the 1st reference position return is executed. If an intermediate point is commanded, a positioning is made to the point at rapid traverse rate, then each axis returns to its 1st reference position.
3 2nd, 3rd, 4th reference position return	○	○	As in the automatic 1st reference position return, by commanding the G code during an automatic operation, an axis returns to a certain position specific to the machine (2nd/3rd/4th reference position).
4 Reference position check	○	○	By issuing a G code, a machining program where the tool is programmed to start off from the reference position and return to the reference position can be checked if the tool will return successfully to the reference position.
5 Absolute position detection	○	○	With this function, a battery stores the relation of the actual machine position and the machine coordinate kept in the CNC even during the power OFF, and an automatic operation is enabled without executing a reference position return.
6 Tool exchange position return	○	○	By specifying the tool change position in a parameter and also assigning a tool change position return command in a machining program, the tool can be changed at the most appropriate position.
<b>11 Operation support functions</b>			
<b>1 Program control</b>			
1 Optional block skip	○	○	When "/" (slash code) is programmed at the head of a block, and the optional block skip input signal from the external source is turned ON for automatic operation, the block with the "/" code is skipped.
2 Optional block skip addition	○	○	When "/n (n: 1 to 9)" is programmed at the head of a block, and the optional block skip input n signal from the external source is turned ON for automatic operation, the block with the "/n" code is skipped.
3 Single block	○	○	The commands for automatic operation can be executed one block at a time (block stop) by turning ON the single block input signal.
<b>2 Program test</b>			
1 Dry run	○	○	F code feed commands for automatic operation can be switched to the manual feedrate data of the machine operation board by turning ON the dry run input signal.
2 Machine lock	○	○	When the machine lock input signal is set to ON, the CNC operations can be executed without actually moving the NC axis.
3 Miscellaneous function lock	○	○	When the "External input" signal or "Miscellaneous function lock" signal is turned ON, the output signals of M, S, T, and B (2nd miscellaneous function) will not be output to the PLC. This is useful when checking only travel commands in a program check.
7 Manual arbitrary reverse run (Program check operation)	△	△	The manual arbitrary reverse run can be performed by controlling the feedrate being in the automatic operation in the memory or MDI mode in proportion to the manual feedrate by jog or the rotation speed by manual handle.
8 High-speed simple program check	○	○	This function checks whether a program error occurs by operating the machining program without the axes movements. The estimated machining time can be checked in time shorter than the actual execution time of the machining program.

○Standard △Optional □Selection

Class	C80		General explanation
	Lathe system	Machining center system	
<b>3 Program search / start / stop</b>			
1 Program search	○	○	This function specifies the program No. of the program to run automatically and calls the program.
2 Sequence number search	○	○	Blocks can be indexed by setting the program No., sequence No. and block No. of the program to run automatically.
3 Verification stop	○	○	This function enables the single block stop status to be established at any block without having to turn the SINGLE BLOCK switch ON.
4 Program restart	○	○	When a machining program is to be resumed after suspended midway due to tool damage or for some other reason, this function searches the program and the block to resume and enables machining to be resumed from the block.
5 Automatic operation start	○	○	With the input of the automatic operation start signal (change from ON to OFF), automatic operation of the program that was found by an operation search is started by the controller (or the halted program is restarted).
6 NC reset	○	○	This function enables the controller to be reset.
7 Feed hold	○	○	When the feed hold signal is set to ON during automatic operation, the machine feed is immediately decelerated and stopped.
8 Search & Start	○	○	If the "Search & Start" signal is input when the memory mode is selected, the designated machining program is searched and executed from the beginning.
10 Auto-restart	○	○	A machining program is restarted automatically at the completion of the machining program execution.
<b>4 Interrupt operation</b>			
1 Manual interruption	○	○	Manual interrupt is a function that enables manual operations to be performed during automatic operation.
2 Automatic operation handle interruption	○	○	The handle command can interrupt and be superimposed onto a command without suspending automatic operation to move the machine by rotating the manual pulse generator during automatic operation.
3 Manual absolute switch	○	○	The program absolute positions are updated by an amount equivalent to the distance by which the tool is moved manually when the manual absolute switch signal is turned ON.
4 Thread cutting cycle retract	○	—	This function suspends the thread cutting cycle if a feed hold signal has been input during thread cutting cycle.
5 Tapping retract	○	○	If tapping is interrupted by a reset or emergency stop signal that is input during tapping and the tap is left engaged inside the workpiece, the tap tool engaged inside the workpiece can be rotated in the reverse direction so that it will be disengaged by inputting the tap retract signal.
6 Manual numerical value command	○	○	On the screen of the setting and display unit, the M, S and T (and B when 2nd miscellaneous function is valid) commands can be executed by setting numerical values and pressing [INPUT].
8 MDI interruption	○	○	This function enables MDI programs to be executed during automatic operation in the single block stop status. When the modal status is changed in a MDI program, the modal status in the automatic operation mode is also changed.
9 Simultaneous operation of manual and automatic modes	○	○	This function enables manual operations to be performed during automatic operation by selecting an automatic operation mode (tape, MDI or memory) and manual mode (handle, step, jog or manual reference position return) simultaneously. (Arbitrary feed based on the PLC is also possible.)
10 Simultaneous operation of JOG and handle modes	○	○	When executing the jog feed and handle feed, both these feeds are available without changing the mode each time by inputting the jog mode signal and simultaneous operation of jog and handle modes signal to the control unit.
11 Reference position retract	○	○	When the retract signal is turned ON during the automatic and manual operation, this function can retract the tool immediately to a set reference position.
13 Skip retract	—	○	This function is used to return in the direction opposite the travel direction when the skip signal is input during G31 command.
14 PLC interruption	○	○	The interrupt program set with the R register is executed with the signals from the PLC during single block stop in program operation or during the manual mode.
<b>12 Program support functions</b>			
<b>1 Machining method support functions</b>			
<b>1 Program</b>			
1 Subprogram control	○8 layers	○8 layers	When the same pattern is repeated during machining, the machining pattern is registered as one subprogram, which can be called from the main program as required, thereby realizing the same machining easily. This enables the efficient use of programs.
3 Scaling	—	△	The shape commanded by a program can be extended or reduced to the desired size by applying a scale factor to the movement axis command position.
4 Axis name switch	○	—	The axis name switch function switches the name of a command axis and a control axis.
<b>2 Macro program</b>			
1 User macro	○4 layers	○4 layers	In order to execute one integrated function, a group of control and arithmetic instructions can be used and registered as a macro program.
2 Machine tool builder macro	○	○	This function enables macro programs exclusively designed for use by a specific machine tool builder to be registered in addition to the regular user macro programs.
3 Macro interruption	○	○	By inputting a user macro interrupt signal from the PLC, the program being currently executed is interrupted and other programs can be called instead.
<b>4 Variable command</b>			
3 700 sets	○	○	Programming can be made flexible and versatile by designating variables instead of directly assigning numbers to addresses in programs and by supplying the values of those variables as required when running the programs. Arithmetic operations (adding, subtracting, multiplying and dividing) can also be conducted for the variables.
6 (600+100×number of part systems) sets	○	○	
<b>3 Fixed cycle</b>			
1 Fixed cycle for drilling	○	○	These functions enable drilling, tapping and other hole machining cycles to be assigned in a simple 1-block program. Special fixed cycles must always be used in combination with fixed cycles.
2 Fixed cycle for drilling (Type II)	○	—	
3 Special fixed cycle	—	△	
4 Fixed cycle for turning machining	○	—	
5 Compound type fixed cycle for turning machining	○	—	
6 Compound type fixed cycle for turning machining (Type II)	△	—	
<b>4 Mirror image</b>			
1 Mirror image by parameter setting	○	○	A parameter is used to designate the axis for which the mirror image function is to be executed before the machining program is run.
2 Mirror image by external input	○	○	Signals from an external device (PLC) request the mirror image operation either during or before the execution of a machining program.
3 Mirror image by G code	—	○	Using a program for the left or right side of an image, this function can machine the other side of the image when a left/right symmetrical shape is to be cut.
4 Mirror image for facing tool posts	○	—	With machines in which the base tool post and the facing tool post are integrated in one post, this function enables the programs prepared for cutting at the base side to be executed by the tools on the facing side as well.
5 T code mirror image for facing tool posts	○	—	When tools that correspond to tool Nos. 1 to 64 are selected (T commands) but these are the tool Nos. for which the facing tool post mirror image function has already been designated with a parameter, the status equivalent to G68 (facing tool post mirror image ON) is established.
<b>5 Coordinate system operation</b>			

○Standard △Optional □Selection

Class	C80		General explanation	
	Lathe system	Machining center system		
1 Coordinate rotation by program	△	△	When it is necessary to machine a complicated shape at a position that has been rotated with respect to the coordinate system, you can machine a rotated shape by programming the shape prior to rotation on the local coordinate system, and then specifying the parallel shift amount and rotation angle by means of this coordinate rotation command.	
3 3-dimensional coordinate conversion	—	△	With the 3-dimensional coordinate conversion function, a new coordinate system can be defined by rotating and moving in parallel the zero point in respect to the X, Y and Z axes of the currently set workpiece coordinate system.	
<b>6 Dimension input</b>				
1 Corner chamfering / Corner R	△	△	This function executes corner processing by automatically inserting a straight line or arc in the commanded amount between two consecutive travel blocks.	
2 Linear angle command	△	△	The end point coordinates are automatically calculated by assigning one element (one component of the selected plane) of the end point coordinates and the linear angle.	
3 Geometric command	○	—	When it is difficult to find the intersection point of two straight lines with a continuous linear interpolation command, this point can be calculated automatically by programming the command for the angle of the straight lines.	
4 Polar coordinate command	—	△	With this function, the end point position is commanded with the radius and angle.	
<b>7 Axis control</b>				
<b>1 Chopping</b>				
1 Chopping	△	△	This function continuously raises and lowers the chopping axis independently of program operation. During the grinding operation, chopping can produce a better surface accuracy than using abrasive grain.	
2 Normal line control	—	○	This function controls the swiveling of the C axis (rotary axis) so that the tool is always pointing in the normal line direction for the X and Y axis movement commands during program operation.	
3 Circular cutting	—	○	In circular cutting, a system of cutting steps are performed; first, the tool departs from the center of the circle, and by cutting along the inside circumference of the circle, it draws a complete circle, then it returns to the center of the circle.	
<b>8 Multi-part system control</b>				
<b>1 Timing synchronization between part systems</b>				
1 Timing synchronization between part systems	○	○	The multi-axis, multi-part system compound control CNC system can simultaneously run multiple machining programs independently. This function is used in cases when, at some particular point during operation, the operations of different part systems are to be synchronized or in cases when the operation of only one part system is required.	
<b>2 Start point designation timing synchronization</b>				
2 Start point designation timing synchronization	○	○	The synchronizing point can be placed in the middle of a block by designating the start point.	
<b>3 Mixed control</b>				
<b>1 Mixed control (cross axis control)</b>				
1 Mixed control (cross axis control)	△	—	This function enables any axis to be replaced with another axis between part systems. There are two methods for giving commands: G code and PLC.	
<b>2 Arbitrary axis exchange control</b>				
2 Arbitrary axis exchange control	△	—	An arbitrary axis can be exchanged freely across part systems in the multiple part systems. The machining can be freed by exchanging an axis which can be commanded for machining programs in each part system.	
<b>5 Control axis synchronization between part systems</b>				
5 Control axis synchronization between part systems	△	—	Synchronization control enables an arbitrary control axis in another part system to move in synchronization with the movement command assigned to an arbitrary control axis. There are two methods for giving commands: G code and PLC.	
<b>6 Balance cut</b>				
6 Balance cut	○	—	The deflection can be minimized by holding tools simultaneously from both sides of the workpiece and using them in synchronization to machine the workpiece (balance cutting). In addition, since the workpiece is machined by two tools, the machining time is reduced.	
<b>7 Common memory for part systems</b>				
7 Common memory for part systems	○	—	For a machine with multiple part systems, the common variables and tool compensation memory which exist for each part system can be made common to all part systems by setting the parameters.	
<b>8 Multi-part system simultaneous thread cutting</b>				
<b>1 Two-part system simultaneous thread cutting</b>				
1 Two-part system simultaneous thread cutting	○	—	This function performs synchronous thread cutting for the same spindle using the 1st and 2nd part systems.	
<b>9 Multi-part system program management</b>				
9 Multi-part system program management	○	○	Separate programs, used in each part system, can be managed under a common name in a multi-part system.	
<b>10 Synchronization between part systems</b>				
<b>1 Single block between part systems</b>				
1 Single block between part systems	△	—	Single block operation with part systems synchronized is the function for executing single block operation while maintaining the synchronization among the part systems when two or more part systems are operated in the multi-part system. When one part system has been stopped by single block stop, the other part systems pause in the cycle operation.	
<b>2 Dwell / Miscellaneous function time override</b>				
2 Dwell / Miscellaneous function time override	△	—	Override can be applied to dwell time and miscellaneous function finish wait time of all part systems. The synchronization among part systems can be maintained when the multiple machining programs are operated with override.	
<b>3 Synchronization between part systems OFF</b>				
3 Synchronization between part systems OFF	△	—	Synchronization among part systems and feedrate change are turned OFF in a part of a machining program to eliminate a synchronization relation among part systems by single block operation with part systems synchronized or variation of a machining program feedrate by dry run. This function is effective mainly in blocking the cycle operation pause or feedrate variation in only some of part systems when the sub part system control II function is being used.	
<b>11 Sub part system control I</b>				
11 Sub part system control I	△	—	This function activates and operates any non-operating part system (sub part system) in the multi-part system. An auxiliary axis machining program can be controlled in the sub part system by commanding Sub part system control I (G122) from the main part system.	
<b>12 Sub part system control II</b>				
12 Sub part system control II	△	—	This function activates and operates any non-operating part system (sub part system) in the multi-part system. Using sub part system enables parallel operation between an operating program in main part system and a program called with Sub part system control II (G144).	
<b>9 Data input / output by program</b>				
<b>1 Parameter input by program</b>				
1 Parameter input by program	○	○	The parameters set from the display can be changed using machining programs.	
<b>2 Compensation data input by program</b>				
2 Compensation data input by program	○	○	The value of the workpiece coordinate systems selected can be set or changed using program commands. The tool compensation amounts, that are set from the display can be input using program commands.	
<b>3 Tool / Material shape input by program</b>				
3 Tool / Material shape input by program	○	○	Tool shape data on the tool management screen and workpiece shape data of the 3D solid program check can be set with the machining program.	
<b>5 API section and sub-section Nos. input / output by program</b>				
5 API section and sub-section Nos. input / output by program	○	○	NC internal data can be read/written by specifying the section number, sub-section number, part system number and axis number using system variables.	
<b>10 Machining modal</b>				
<b>1 Tapping mode</b>				
1 Tapping mode	○	○	When tapping mode commands are issued, the CNC system is set to the internal control modes required for tapping.	
<b>2 Cutting mode</b>				
2 Cutting mode	○	○	When a cutting mode command is issued, the CNC system is set to the cutting mode that enables a smoothly cut surface.	
<b>11 High-speed parts machining</b>				
<b>1 Rapid traverse block overlap</b>				
1 Rapid traverse block overlap	△	△	This function enables the next block to start (overlap) without waiting for positioning (G00) or reference position return (G28/G30). Consequently, cycle time of machining can be reduced.	
<b>2 Machining accuracy support functions</b>				
<b>1 Automatic corner override</b>				
1 Automatic corner override	○	○	To prevent machining surface distortion due to increase in the cutting load when cutting corners, this function automatically applies an override on the cutting feedrate so that the cutting amount is not increased for a set time at the corner.	
<b>2 Deceleration check</b>				
<b>1 Exact stop check mode</b>				
1 Exact stop check mode	○	○	This function decelerates and stops a motor before executing the next block, which reduces the impact on the machine caused by a rapid change of feedrate, and prevents a corner from being machined round.	
<b>2 Exact stop check</b>				
2 Exact stop check	○	○		
<b>3 Error detection</b>				
3 Error detection	○	○		
<b>4 Programmable in-position check</b>				
4 Programmable in-position check	○	○		



○Standard △Optional □Selection

Class	C80		General explanation
	Lathe system	Machining center system	
3 High-speed and high-accuracy functions [kBPM: k Block per Minute]			
1 High-speed machining mode			
1 High-speed machining mode I (G05P1) maximum [kBPM]	△	△	This function runs a machining program that approximates a free curve with fine segments at a high speed.
2 High-speed machining mode II (G05P2) maximum [kBPM]	△	△	
2 High-accuracy control			
1 High-accuracy control (G61.1 / G08)	△	△	Machining errors caused by delays in control systems can be inhibited. This function is useful for machining which needs to make an edge at a corner or reduce an error from an inner route of curved shape.
2 Multi-part system simultaneous high-accuracy control *Up to two part systems for high-speed high-accuracy control	—	△	High-accuracy control and high-speed machining mode are available respectively in all part systems. The simultaneous usage of high-accuracy control and high-speed machining mode (including High-speed high-accuracy control I / II / III) are available only in part systems which are limited by the parameter.
3 SSS control	—	△	With SSS (Super Smooth Surface) control, the large area path information is used instead of just the angle between the blocks. Thus, optimum speed control that is not adversely affected by minute steps or waviness is possible. This enables machining with a fewer scratches and streaks on the cutting surface compared to the normal high-accuracy control function. Multiple part systems simultaneous high-accuracy function is required to conduct the SSS control in the second or following part systems.
4 Tolerance control	—	△	This function enables the smooth operation within the tolerance error range. The desired machining result can be obtained with simple parameter adjustment.
3 High-speed high-accuracy control			
1 High-speed high-accuracy control I (G05.1Q1) maximum [kBPM]	△	△	A machining program that approximates a free curve with fine segments can be run at a high speed and with a high accuracy. This function is effective in decreasing the cycle time of machining dies with free curves. This function is also useful in machining which needs to make an edge at a corner or reduce a path error from inner route of curved shape because the high-accuracy control mode is turned ON automatically.
2 High-speed high-accuracy control II (G05P10000) maximum [kBPM]	△	△	
3 High-speed high-accuracy control III (G05P20000) maximum [kBPM]	—	△	
4 Smooth fairing	—	△	
4 Machining condition selection I	○	○	The machining condition parameter set which consists of parameters related to the high-accuracy control can be configured in advance for each machining application (such as part machining or die machining) or machining process (such as rough or finishing), and it can be switched according to the purpose.
4 Programming support functions			
1 Playback	—	○	This function enables creation of a program while proceeding with sample machining by manual (handle or job) feed or mechanical handle feed.
5 G code guidance	○	○	G code guidance is a function to display illustration of the contents or movements of the commanded format for the G code currently under editing. This is used when creating or editing a machining program.
13 Machine accuracy compensation			
1 Static accuracy compensation			
1 Backlash compensation	○	○	This function compensates the error (backlash) produced when the direction of the machine system is reversed.
2 Memory-type pitch error compensation	○10 sets	○10 sets	Machining accuracy can be improved by compensating the errors in the screw pitch intervals among the mechanical errors (production errors, wear, etc.) of the feed screws.
3 Memory-type relative position error compensation	○	○	Machining accuracy can be improved by compensating the relative error between machine axes, such as a production error or aging.
4 External machine coordinate system compensation	△	△	The coordinate system can be shifted by inputting a compensation amount from the PLC. This compensation amount will not appear on the counters (all counters including machine position).
5 Circular error radius compensation	△	△	With commands designated during arc cutting, this function compensates movement toward the inside of the arcs caused by a factor such as servo delay.
6 Ball screw thermal expansion compensation	△	△	This compensates the axis feed error caused by a ball screw's thermal expansion, etc. using the values set by the PLC.
8 Position-dependent gradually increasing-type backlash compensation	△	△	With this function, the gradually increasing-type lost motion which depends on the distance from the point where the machine movement direction is reversed can be compensated by controlling the variation of backlash compensation amount according to the distance from the direction reversal point.
9 Two-way pitch error compensation	△	△	Two-way pitch error compensation function is used to compensate the pitch error in each direction by setting the pitch error compensation amount when moving in the positive and negative direction.
2 Dynamic accuracy compensation			
1 Smooth high-gain (SHG) control	○	○	This is a high-response and stable position control method using the servo system. SHG control realizes an approximately three-fold position loop gain compared to the conventional control method.
2 Dual feedback	○	○	Use position feedback with a motor-side detector in ranges with high acceleration to enable stable control. In ranges with low acceleration, use position feedback with the machine-side detector (scale). This will make it possible to increase the position loop gain. A machine-side detector (scale) is separately required.
3 Lost motion compensation	○	○	This function compensates the error in protrusion shapes caused by lost motion at the arc quadrant changeover section during circular cutting.
4 OMR II (Backlash with filter)	△	△	The OMR (Optimal Machine Response) control function estimates the machine or motor model (moment of inertia, clone friction, viscosity coefficient, etc.) that can cause a path error (deviation of the actual tool path from the programmed path). High-accuracy machining is achieved by carrying out feed forward control based on that model. This allows error caused by quadrant protrusions during circular interpolation or quadrants on the inner side of the path to be greatly reduced. OMR-II is a function that focuses on the quadrant protrusions, and improves the path error with this. Quadrant path compensation is included in OMR-II.
6 OMR-FF	△	△	OMR-FF control enables fine control by generating feed forward inside the drive unit and can realize the strict feedback control to the program command than the conventional high-speed accuracy control.
14 Automation support functions			
1 Measurement			
1 Skip			
1 Skip	○	○	When the external skip signal is input during linear interpolation using the G31 command, machine feeding is stopped immediately and the remaining distance is discarded to execute the commands in the next block.
2 Multiple-step skip	○	○	This function realizes skipping by designating a combination of skip signals for each skip command.
4 PLC skip	△	△	This function enables skip operations to be performed by signals which are input from the user PLC.
6 Torque limitation skip	△	—	Axis movement is performed in the torque limited status, and the axis movement command is suspended to proceed to the next block when the current command value reaches the designated torque skip value and the torque skip turns ON.
2 Automatic tool length measurement	○	○	This function moves the tool in the direction of the tool measurement position by the commanded value between the measurement start position and measurement position. It stops the tool as soon as it reaches the sensor and calculates the difference between the coordinates where the tool has stopped and the command coordinates. It registers this difference as the tool length compensation amount for that tool.
3 Manual tool length measurement 1	○	○	Simple measurement of the tool length is done without a sensor.

○Standard △Optional □Selection

Class	C80		General explanation
	Lathe system	Machining center system	
4 Manual tool length measurement 2	○	○	[M system] When the tool is positioned at the reference position, this function measures the distance from the reference position to the tool tip and registered it as the tool length compensation amount. [L system] A device with a built-in touch sensor is used. Simply by causing the tool nose to touch the touch sensor in manual feed, the tool compensation amount can be calculated and stored in tool compensation amount memory.
5 Workpiece coordinate offset measurement	○	—	The external workpiece coordinate offset data for the Z axis can be set by cutting the workpiece face by means of manual operations and inputting the workpiece measurement signal.
6 Workpiece position measurement	—	○	The workpiece position measurement function is used to measure each axis' coordinate by installing a sensor on the spindle and the sensor contacting the workpiece with the manual feed or handle feed. The surface, hole center and width center coordinates are calculated from the measured coordinates, and those calculated results are set in the workpiece coordinate offset.
7 Rotation measurement	—	○	The offset of the rotary coordinate system (rotation center and rotation angle) is measured, and the results are set to the workpiece coordinate system offset (rotation center) and the parameters.
2 Tool life management			
1 Tool life management			
1 Tool life management I	○	○	The tool usage is monitored by accumulating each tool's usage time or the frequency of use.
2 Tool life management II	○	○	[M system] A spare tool change function is added to the tool life management I. [L system] The life of each tool (time and frequency) is controlled, and when the life is reached, a spare tool of the same type is selected from the same group.
3 Tool life management III	—	○	The tool usage is monitored by accumulating each tool's usage time and the frequency of use. This function is not controlled by the group No.
2 Number of tool life management sets			
128 sets	○	—	The max. sets of tools available for tool life management
200 sets	—	○	
256 sets	△	—	
400 sets	—	△	
3 Tool life management set allocation to part systems (Variable number of per-part-system life management tools)	○	—	The number of tool life management tools can be set per part system. There are two types of the allocation: "Arbitrary allocation" which allocates the number of tool life management tools to each part system arbitrarily and "Fixed allocation" which automatically allocates the number of tool life management tools to each part system equally, and the type can be selected using the parameter.
3 Others			
1 Programmable current limitation	○	○	This function allows the current limit value of the NC axis to be changed to a desired value in the program, and is used for the workpiece stopper, etc.
101 PLC axis current limit	○	○	A current limit is available for the PLC axis as well as for the NC axis. This function can be used for actions such as stopper operation.
15 Safety and maintenance			
1 Safety switches			
1 Emergency stop	○	○	All operations are stopped by the emergency stop signal input and, at the same time, the drive section is stopped and the movement of the machine is stopped.
2 Data protection key	○	○	With the input from the user PLC, it is possible to prohibit the parameter setting or deletion, and the program edit from the setting and display unit.
2 Display for ensuring safety			
1 NC warning	○	○	Warnings are output by the CNC system. When one of these warnings occurs, a warning number is output to the PLC and a description of the warning appears on the screen. Operation can be continued without taking further action.
2 NC alarm	○	○	The alarms are output by the CNC system. When one of these alarms occurs, an alarm number is output to the PLC, and a description of the alarm appears on the screen. Operation cannot be continued without taking remedial action.
3 Operation stop cause	○	○	The stop cause of automatic operation is shown on the display.
4 Emergency stop cause	○	○	When the "EMG" (emergency stop) message is displayed in the operation status area of the display, the cause of the emergency stop can be confirmed.
5 Thermal detection	○	○	When overheating is detected in the control unit, an overheat signal is output at the same time as the alarm is displayed.
6 Battery alarm / warning	○	○	When it is time to change the batteries, an alarm and warning are displayed.
3 Protection			
1 Stroke end (Over travel)	○	○	Limit switches and dogs are attached to the machine, and when a limit switch has kicked a dog, the movement of the machine is stopped by the signal input from the limit switch.
2 Stored stroke limit			
1 Stored stroke limit I / II	○	○	This function sets the areas prohibited for the tool to enter. There are multiple types of prohibitions according to the prohibited range and method.
2 Stored stroke limit IB	△	△	
3 Stored stroke limit IIB	△	△	
4 Stored stroke limit IC	△	△	
3 Stroke check before travel	—	△	By commanding, from the program, the boundary for prohibiting machine entry as a coordinate position in the machine coordinate system, entry into the inner side of that boundary can be prohibited.
4 Chuck / Tailstock barrier check	○	—	By limiting the tool nose point movement range, this function prevents the tool from colliding with the chuck or tail stock because of a programming error.
5 Interlock	○	○	The machine movement will decelerate and stop as soon as the interlock signal, serving as the external input, is turned ON. When the interlock signal is turned OFF, the machine starts moving again.
6 External deceleration	○	○	This function reduces the feedrate to the deceleration speed set by the parameter when the external deceleration input signal has been set to ON.
9 Door interlock			
1 Door interlock I	○	○	Under the CE marking scheme of the European safety standards (machine directive), the opening of any protection doors while a machine is moving is prohibited. When the door open signal is input from the PLC, this function first decelerates, stops all the control axes, establishes the ready OFF status, and then shuts off the drive power inside the servo drive units so that the motors are no longer driven.
2 Door interlock II	○	○	
10 Parameter lock	○	○	This function is used to prohibit the changing of machine parameters.
11 Program protection (Edit lock B, C)	○	○	The edit lock function B or C inhibits machining program B or C (group by machining program numbers) from being edited or erased when these programs require protection.
12 Program display lock	○	○	This function allows the display of only a target program (label address 9000) to be disabled for the program display in the monitor screen, etc.
13 Data protection by user's level	△	△	Up to 8 levels of access permission helps to prevent you from dispatching defective works.
15 Vertical axis pull-up	○	○	This function prevents the tool from breakage, through pulling up the cutting tool during emergency stop or instantaneous power interruption at low cutting speed.
16 Machine group-based alarm stop	△	△	When an alarm occurs for an axis, this function performs an alarm stop only for the axes in a machine group to which the axis belongs.
4 Maintenance and troubleshooting			

○Standard △Optional □Selection

Class	C80		General explanation
	Lathe system	Machining center system	
1 Operation history	○	○	This is a maintenance function which is useful for tracing down the history and NC operation information and analyzing problems, etc. This information is saved in the history data file, and can be displayed on the screen and output to a file.
2 Data sampling	○	○	The NC data sampling function samples the NC internal data (speed output from NC to drive unit, and feedback data from the drive unit, etc.). This data can be output as text data.
3 NC data backup	○	○	The NC data back up function backs up the NC parameters, etc., on a built-in disk of display unit or SD card. The data can also be restored.
4 Servo tuning support			
1 NC Analyzer2 (Note 1)	○	○	With this function, the servo parameters can be automatically adjusted by connecting the CNC and NC Analyzer2, which is an application that runs on a regular personal computer.
5 Automatic backup	○(GOT)	○(GOT)	With this function, system data, ladder program and custom software can be automatically backed up in case of system failure.
10 NC Configurator2 (Note 2)	○	○	NC Configurator2 runs on a personal computer to edit the NC data files required for NC control and machine operations such as parameters, tool data and common variables.
102 Backup	○	○	This function saves (backs up) the screen data and each controller (PLC, CNC) data to a GOT's memory card or USB memory. It also reloads (restores) that data to each device.
<b>5 Safety Function</b>			
2 Smart Safety observation			
1 Safety-related I/O observation	△	△	Using the dual circuits for processing signals input/output to / from the machine (safety signal compare sequence) and dual execution of safety signal process logic made by users (safety PLC), if one circuit has broken down, the other circuit can detect errors, which improves the safety of signal process.
2 Emergency stop observation	△	△	Emergency stop signal is doubled and observed to see whether there is any error. When one emergency stop signal is in open state, the whole system can be set in emergency stop condition.
3 Drive safety function			
1 SLS (Safely-Limited Speed)	△	△	Axis speed (command speed, FB speed) is observed doubly to see whether the speed exceeds the safe speed.
2 SLP (Safely-Limited Position)	△	△	Axis absolute position (command position, FB position) is observed doubly to see whether the position exceeds the safe position range.
3 SOS (Safe Operating Stop)	△	△	Axis stop speed (command speed, FB speed) is observed doubly whether the speed exceeds the safe stop speed. Axis stop position (command position, FB position) is observed doubly whether the position exceeds the safe stop position range. Observe axis stop position deviation (difference between command position and FB position) doubly to see whether the deviation exceeds the safe stop position deviation.
4 SSM (Safe Speed Monitor)	△	△	This function uses the safety signals to inform that the axis speed (command speed, FB speed) is equal to or below the safe speed.
5 SBC / SBT (Safe Brake Control / Safe Brake Test)	△	△	The brakes connected to motors are activated by this function. Because there are two circuits for activating the brakes, one circuit can activate the brakes even when the other circuit is broken down. Furthermore, Safe Brake Test (SBT) can diagnose the circuits for activating the breaks and the effectiveness of the brakes (deterioration due to abrasion, etc.).
6 SCA (Safe Cam)	△	△	This function uses the safety signals to inform that the axis absolute position (command position, FB position) is within the range of safe position.
7 SS1 / SS2 (Safe Stop)	△	△	[Safe stop 1 (SS1)] STO function is activated after an axis is decelerated and the speed (command speed, FB speed) becomes equal to or below the safe stop speed. [Safe stop 2 (SS2)] SOS function is activated after an axis is decelerated and the speed (command speed, FB speed) becomes equal to or below the safe stop speed.
8 STO (Safe Torque Off)	△	△	This function shuts OFF power supply to axes. Because there are two power shutoff circuits, one circuit can shut OFF the power supply even when the other circuit is broken down.
<b>16 Drive system</b>			
1 Servo / Spindle			
1 Feed axis			
1 MDS-E-Vx	□	□	
2 MDS-EH-Vx	□	□	
3 MDS-EJ-Vx	□	□	
4 MDS-EJH-Vx	□	□	
5 MDS-EM-SPVx	□	□	
2 Spindle			CNC-dedicated drive units, spindle motors, and servo motors are used.
1 MDS-E-SPx	□	□	
2 MDS-EH-SPx	□	□	
3 MDS-EJ-SPx	□	□	
5 MDS-EM-SPVx	□	□	
4 Power supply			
1 MDS-E-CV	□	□	
2 MDS-EH-CV	□	□	
<b>17 Machine support functions</b>			
1 PLC			
2 PLC functions			
1 Built-in PLC basic function	△(MELSEC)	△(MELSEC)	
1 Index modification	△(MELSEC)	△(MELSEC)	
2 Multi-program [number of programs]	△(MELSEC)	△(MELSEC)	
4 Function block (FB)	△(MELSEC)	△(MELSEC)	
5 Label programming	△(MELSEC)	△(MELSEC)	
2 PLC exclusive instruction	△(MELSEC)	△(MELSEC)	PLC-dedicated instruction is provided for some limited applications, enabling a complex machining process, which is difficult to carry out only by the basic instructions and function instructions.
3 PLC support functions			
2 Operator message display	○(*)	○(*)	When some conditions occur where you wish to inform a messages to the operator, an operator message can be displayed separately from the alarm message. (*) Only the macro alarm message can be displayed.
4 Load meter display	○	○	A load meter can be displayed on the setting and display unit.
5 User PLC version display	○	○	The user PLC version can be displayed in the software list on the Software Configuration screen.
6 Ladder program writing during RUN	△(MELSEC)	△(MELSEC)	Ladder program can be edited while PLC is running. This function is available, either by GX Developer or PLC onboard edit.

(Note 1) Please contact us to purchase this tool.

(Note 2) Please contact us to purchase a full function version. A limited function version is also available free of charge.

○Standard △Optional □Selection

Class	C80		General explanation
	Lathe system	Machining center system	
7 PLC program protection	△(MELSEC)	△(MELSEC)	For PLC data protection, the file password can be set to each file of PLC data.
4 Built-in PLC capacity			
1 Standard PLC capacity [number of steps]	△(MELSEC)	△(MELSEC)	For the details, refer to the manual of MITSUBISHI IQ Platform-compatible PAC "MELSEC IQ-R series".
5 Machine contact input / output I/F	△(MELSEC)	△(MELSEC)	The device is selected from the I/O modules of the MITSUBISHI Programmable Controller MELSEC IQ-R Series.
6 Ladder monitor	○(GOT)	○(GOT)	This function enables on GOT displays the operating status of the sequence circuit to be checked "Sequence program monitor" (GOT2000) is applied.
7 PLC development			
3 MELSEC development tool (GX Works3) (Note 1)	○	○	Using GX Works3, the sequence programs of the MELSEC CPU can be developed and debugged.
8 PLC parameter			
1 PLC constant (150 points)	○	○	The PLC constants set with the data type, and the bit selection parameters set with the bit types can be specified on the screen as the parameters to use in the built-in PLC.
9 GOT connection			
1 CPU direct connection (RS-422 / RS-232C)	△(MELSEC)	△(MELSEC)	
2 CC-Link connection (Remote device)	△(MELSEC)	△(MELSEC)	For connecting a MITSUBISHI Graphic Operation Terminal (GOT), refer to the GOT Catalogs.
3 CC-Link connection (Intelligent terminal)	△(MELSEC)	△(MELSEC)	
101 Built-in PLC processing mode	○	○	This function is used when executing safety observation of significant signals using a dual signal module. For details, refer to the manual related to the safety observation function.
<b>2 Machine construction</b>			
1 Servo OFF	○	○	When the servo OFF signal (per axis) is input, the corresponding axis is set in the servo OFF state. When the moving axis is mechanically clamped, this function is designed to prevent the servo motor from being overloaded by the clamping force.
2 Axis detachment	○	○	This function enables the control axis to be released from control.
3 Synchronous control	△	△	The synchronous control is a control method whereby both master and slave axes are controlled with the same travel command by designating the travel command for the master axis also to the slave axis. This function is assumed to be used in such equipment as large machine tools, which drive one axis with two servo motors.
4 Inclined axis control	△	—	Even when the control axes in a machine are mounted at an angle other than 90 degrees, this function enables it to be programmed and controlled in the same way as with an orthogonal axis.
5 Position switch	○(*)	○(*)	Instead of a dog switch on a machine's axis, a hypothetical dog switch is established using a parameter to set a coordinate position to show the axis name and the hypothetical dog position. When the machine reaches the position, a signal is output to the PLC interface. (*) 24 points for each part system and 32 points for the whole PLC axes.
7 Index table indexing	○	○	The indexing of the index table can be performed by setting the index axes.
12 Inclined surface machining command	—	△	An arbitrary spatial plane defined with this function can be machined using normal program commands.
16 3-dimensional manual feed	—	△	By selecting the hypothetical coordinate system to be machined, axis can be moved with manual feed (JOG, HANDLE or INCREMENTAL) in the coordinate system with this function. It can be easy to setup because multiple axes is moved by NC according to the tool angle or the inclination of the table.
<b>3 PLC operation</b>			
1 Arbitrary feed in manual mode	○	○	This function enables the feed directions and feed rates of the control axes to be controlled using commands from the user PLC.
3 PLC axis control	○	○	This function allows independent axes to be controlled with PLC-based commands, separately from the NC control axes.
5 PLC axis indexing	○	○	By setting positioning points (stations) in advance, positioning control can be performed simply by designating a positioning point No. (station No.).
101 NC axis / PLC axis switchover	△	△	This function enables one control axis to be dynamically switched to be used as NC axis or PLC axis. If the PLC axis is set as indexing axis, changeover is available between the NC axis and indexing axis.
<b>4 PLC interface</b>			
1 CNC control signal	○	○	Control commands to the CNC system are assigned from the PLC. Input signals with skip inputs that respond at high speed can also be used.
2 CNC status signal	○	○	The status signals are output from the CNC system. They can be utilized by referencing them from the PLC.
3 PLC window	○	○	This function uses the "read window" or "write window" assigned to the R register's user area to read and write the CNC operation status, axis information, parameters and tool data, etc.
4 External search	○	○	This function enables searching of the program to automatically start from the PLC. The program No., block No. and sequence No. can be designated. In addition, the details of the search in progress can be read.
5 Direct Screen Selection	○	○	This signal allows an automatic transition to the alarm display screen when an alarm occurs.
<b>6 External PLC link</b>			
1 CC-Link (Master / Slave)	△(MELSEC)	△(MELSEC)	Refer to manuals of MITSUBISHI Programmable Controller "MELSEC IQ-R series" for information on the function and the performance.
3 CC-Link IE Field (Master / Slave)	△(MELSEC)	△(MELSEC)	
<b>7 Installing S/W for machine tools</b>			
3 EZSocket I/F (Note 1)	△	△	This middleware makes it easy to develop applications having the Windows interface.
4 APLC release (Note 1)	△	△	APLC (Advanced Programmable Logic Controller) release is a function that allows the user-generated C language module to be called from the NC. Control operations that are difficult to express in a sequence program can be created with the C language.
102 GOT2000 Screen design tool GT Works3(Note 1)	○	○	This integrated software is used to create professional screen designs for GOTs.
<b>8 Others</b>			
2 CNC remote operation tool			
1 NC Monitor2 (Note 1)	○	○	NC Monitor2 is a PC software tool that monitors information in the NC unit connected with the Ethernet.
2 NC Explorer (Note 3)	○	○	NC Explorer is a software tool to operate the machining data files of each NC unit connected with a host personal computer by Ethernet connection from the Explorer on the host personal computer.
3 Automatic operation lock	○	○	Automatic operation lock function prevents the falsification of APLC (C language module) by a third party.
4 Power consumption computation	○	○	Present power consumption and accumulated power consumption can be acquired with this function. The present power consumption notifies the instantaneous power consumption and the accumulated power consumption notifies the integrated value of the present power consumption.
102 GOT window	○	○	This is the interface to display the variety of NC data on GOT connected to the CNC CPU. This reads out the running machining program No., the running machining program and the coordinate values, etc. by the device read command.
103 Log viewer	○	○	This function enables the recorded data by the data sampling function of the NC to display with a graph on the GOT, and to store the data as a file.

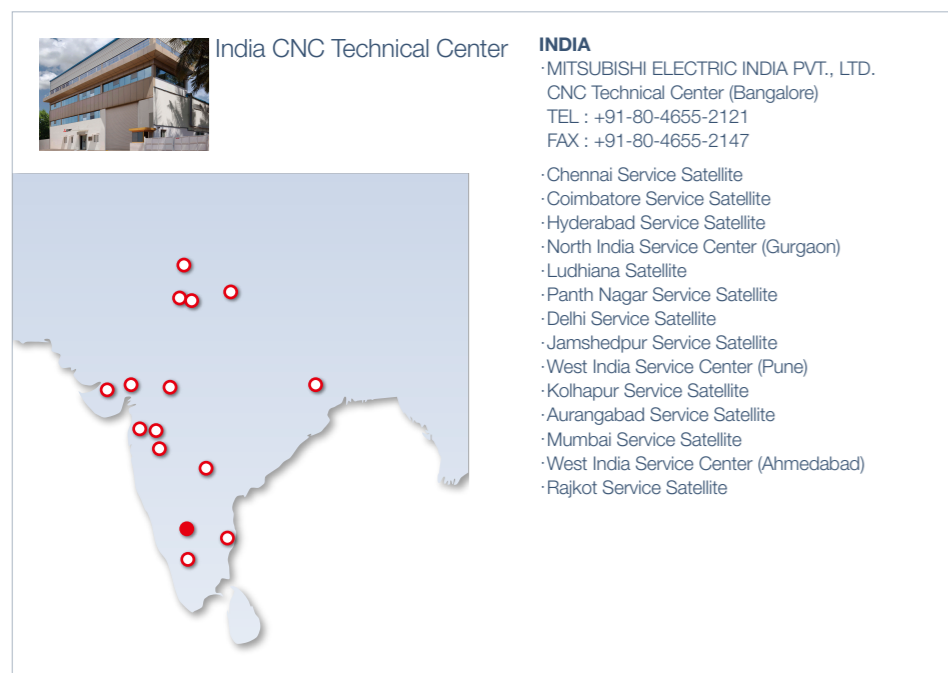
(Note 1) Please contact us to purchase this tool.

(Note 3) This tool is free of charge. Please contact us.

# GLOBAL SALES & SERVICE NETWORK

■: Production site ●: FA Center ○: Service Center/Service Satellite

Providing reliable services in regions around the world  
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# WARRANTY

Please confirm the following product warranty details before using MITSUBISHI CNC.

## 1. Warranty Period and Coverage

Should any fault or defect (hereafter called "failure") for which we are liable occur in this product during the warranty period, we shall provide repair services at no cost through the distributor from which the product was purchased or through a Mitsubishi Electric service provider. Note, however that this shall not apply if the customer was informed prior to purchase of the product that the product is not covered under warranty. Also note that we are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit is replaced.

### [Warranty Term]

The term of warranty for this product shall be twenty-four (24) months from the date of delivery of product to the end user, provided the product purchased from us in Japan is installed in Japan (but in no event longer than thirty (30) months, including the distribution time after shipment from Mitsubishi Electric or its distributor).

Note that, for the case where the product purchased from us in or outside Japan is exported and installed in any country other than where it was purchased; please refer to "2. Service in overseas countries" as will be explained.

### [Limitations]

(1) The machine tool builder is requested to conduct an initial failure diagnosis, as a general rule. It can also be carried out by us or our service provider upon the machine tool builder's request and the actual cost will be charged.

(2) This warranty applies only when the conditions, method, environment, etc., of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual, user's manual, and the caution label affixed to the product, etc.

(3) Even during the term of warranty, repair costs shall be charged to the customer in the following cases:

(a) a failure caused by improper storage or handling, carelessness or negligence, etc., or a failure caused by the customer's hardware or software problem

(b) a failure caused by any alteration, etc., to the product made by the customer without

Mitsubishi Electric's approval

(c) a failure which may be regarded as avoidable, if the customer's equipment in which this product is incorporated is equipped with a safety device required by applicable laws or has any function or structure considered to be indispensable in the light of common sense in the industry

(d) a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced

(e) any replacement of consumable parts (including a battery, relay and fuse)

(f) a failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning, and natural disasters

(g) a failure which is unforeseeable under technologies available at the time of shipment of this product from our company

(h) any other failures which we are not responsible for or which the customer acknowledges we are not responsible for

## 2. Service in Overseas Countries

If the customer installs the product purchased from us in his/her machine or equipment, and export it to any country other than where he/she bought it, the customer may sign a paid warranty contract with our local FA center.

This falls under the case where the product purchased from us in or outside Japan is exported and installed in any country other than where it was purchased.

For details please contact the distributor from which the customer purchased the product.

## 3. Exclusion of Responsibility for Compensation against Loss of Opportunity, Secondary Loss, etc.

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to:

(1) Damages caused by any cause found not to be the responsibility of Mitsubishi.

(2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.

(3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.

(4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

## 4. Changes in Product Specifications

Specifications shown in our catalogs, manuals or technical documents are subject to change without notice.

## 5. Product Application

(1) For the use of this product, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in the product, and a backup or fail-safe function should operate on an external system to the product when any failure or malfunction occurs.

(2) Mitsubishi CNC is designed and manufactured solely for applications to machine tools to be used for industrial purposes.

Do not use this product in any applications other than those specified above, especially those which are substantially influential on the public interest or which are expected to have significant influence on human lives or properties.

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# YOUR SOLUTION PARTNER



Mitsubishi Electric offers a wide range of automation equipment from PLCs and HMIs to CNC and EDM machines.

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The Mitsubishi brand name is recognized around the world as a symbol of premium quality.

Mitsubishi Electric Corporation is active in space development, transportation, semi-conductors, energy systems, communications and information processing, audio visual equipment and home electronics, building and energy management and automation systems, and has 237 factories and laboratories worldwide in over 121 countries.

This is why you can rely on Mitsubishi Electric automation solution - because we know first hand about the need for reliable, efficient, easy-to-use automation and control in our own factories.

As one of the world's leading companies with a global turnover of over 4 trillion Yen (over \$40 billion), employing over 100,000 people, Mitsubishi Electric has the resource and the commitment to deliver the ultimate in service and support as well as the best products.



Low voltage: MCCB, MCB, ACB



Medium voltage: VCB, VCC



Power monitoring, energy management



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Visualisation: HMIs



Numerical Control (NC)



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Transformers, Air conditioning, Photovoltaic systems

\* Not all products are available in all countries.

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**⚠ Safety Warning**

To ensure proper use of the products listed in this catalog, please be sure to read the instruction manual prior to use.

Mitsubishi Electric Corporation Nagoya Works is a factory certified for ISO14001 (standards for environmental management systems) and ISO9001(standards for quality assurance management systems)



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