

FACTORY AUTOMATION

NUMERICAL CONTROL (CNC) M800V/M80V 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

"Changes for the Better" represents the Mitsubishi Electric Group's attitude to "always strive to achieve something better", as we continue to change and grow. Each one of us shares a strong will and passion to continuously aim for change, reinforcing our commitment to creating "an even better tomorrow".

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.

Our advances in AI and IoT are adding new value to society in diverse areas from automation to information systems. The creation of game-changing solutions is helping to transform the world, which is why we are honored to be recognized in the 2019 "Forbes Digital 100" as one of world's most influential digital corporations.

INITIATIVES THAT CONTRIBUTE TO ADDRESSING SOCIAL ISSUES

Mitsubishi Electric Group will pursue value creation for addressing social challenges, and contribute to achieving the 17 goals of the SDGs*1, through all corporate activities.

Environmental initiatives

The Mitsubishi Electric Group has set forth its Environmental Sustainability Vision 2050 to clarify the company's stance on addressing long-term environmental issues and creating new value for a sustainable future toward 2050.

The company's new Environmental Sustainability Vision 2050 positions environmental protection as a great corporate priority and stipulates increased initiatives toward this end. The vision establishes Mitsubishi Electric's future course for implementing key initiatives based on its Environmental Declaration and Three Environmental Action Guidelines toward 2050.

Environmental Sustainability Vision 2050

Environmental Declaration Protect the air, land, and water with our hearts and technologies to sustain a better future for all. To solve various factors that lead to environment issues, the Mitsubishi Electric Group shall unite the wishes of each and every person, and strive to create new value for a sustainable future.



	Key Activities	
Climate Change Measures Resource Circulation Live in Harmony with Nature	Long-term Activities Innovation Nurturing Human Resources	Understanding Needs Co-create and Disseminate New Values Live in Harmony with the Region

The Mitsubishi Electric Group's Materiality



*1. Sustainable Development Goals adopted by the United Nations as goals to achieve towards 2030.

CONCEPT OF M800V/M80V SERIES CONCEPT OF M800V/M80V SERIES



The Evolution in Smart Manufacturing

Seven years on, M800/M80 Series ushers in a new dimension.

A variety of innovative control functions help you to machine various 'things' with high speed and accuracy.

Industry-first*1 built-in wireless LAN, which allows an operator to manage machining at a distance, high-definition 3D machining simulation, which minimizes trial cutting, and advanced user-friendly and intuitive operation will streamline overall manufacturing processes and unlock 'time' that has been unnoticed so far.

Our new CNC, keeping abreast of manufacturers' needs and the advancement of the times, will optimize manufacturing in a smarter way from the perspective of 'things' and 'time'.

The all new M800V/M80V Series.

*1. As of August 2021. According to research by Mitsubishi Electric Corporation.

Functions that contribute to sustainability

Connectivity and usability that further support streamlining on the shop floor

High-speed
high-accuracy function
that helps to further
improve productivity
on the shop floor



OVERVIEW

INITIATIVES THAT CONTRIBUTE TO ADDRESSING SOCIAL ISSUES P.2
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FEATURES OF M800V/M80V SERIES FEATURES OF M800V/M80V SERIES

FEATURES OF M800V/M80V SERIES

M800V/M80V Series smartly makes all the difference in each phase of the engineering chair



BASIC PERFORMANCE IMPROVEMENTS

Increased fine segment processing capability further reduces cycle time



Increased number of control axes

■ Machining center system (M system)

	M800VS M800VW	M80V (TypeA)	M80V (TypeB)
Max. num of axes	32	11	9
Num of spindles	4 ▶ 6	2 ▶ 4	2

■Lathe system (L system)

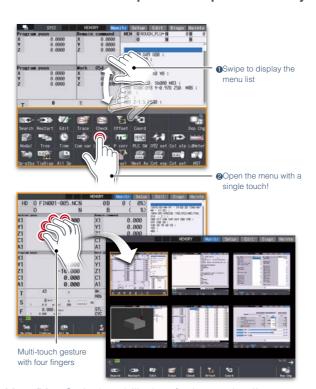
	M800VS M800VW	M80V (TypeA)	M80V (TypeB)
Max. num of axes	32	12 ▶ 13	9
Num of spindles	8	5 ▶ 6	4

With improved hardware optimized for CNC, the dedicated CPU significantly improves the fine segment processing capability.

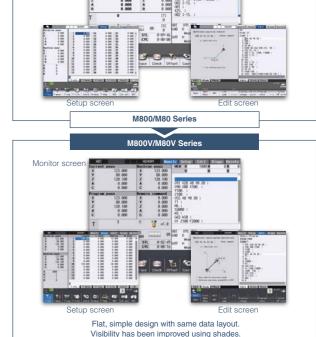
High machining program processing capability translates to a shorter cycle time.

The number of some control axes is greater than M800/M80 Series, allowing control of more complex mechanisms.

Multi-touch function provides superior usability



Screen design focused on visibility



The screen design and colors are optimized for readability considering information content. Better visibility aids in increasing work efficiency.

M800/M80 Series' usability has further evolved!

Multi-touch gestures enables smarter operations such as

- Pinch-in/pinch-out in program display area to change text size
- Drag/flick the menu upward to open the menu list
- Use grab operation with four or more points to open the list of recently selected screens.

Watch the introduction video here. ▶

FEATURES OF M800V/M80V SERIES FEATURES OF M800V/M80V SERIES

EVOLUTION OF CONTROL UNIT AND DISPLAY UNIT

tablet drive work efficiency Coming soon

Built-in wireless LAN and screen mirroring to a The gateway unit functionality for remote service is built into the NC Coming soon



Our industry-first*1 NC control unit with built-in wireless LAN frees operation from the constraints of time and space. A tablet can be used as a sub monitor, allowing operators to work at a distance from the operation panel. *1. As of August 2021. According to research by Mitsubishi Electric

Watch the introduction video here.

The functionality of the remote service gateway unit required for remote service iQ Care Remote4U is built into the NC control unit, leading to less wiring and easier remote diagnostics



Addition of 19-inch display to the lineup of display-integrated control unit (M800VS/M80V Series)











A 19-type display is added to the lineup in addition to the current 8.4, 10.4 and 15 types.

M800VW M800VS M80VW M80V

A large screen improves visibility and provides greater flexibility in designing an operation panel.

M800VW M800VS M80VW M80V

Evolution of control unit and display unit (M800VW/M80VW Series)



■ Evolved Windows display

Advanced design inherited from M800/M80 Series with doubled storage

A new PC unit supporting Windows 10.



■New control unit with enhanced field network support

The added LAN connector on the control unit offers connectivity with a wider variety of networks.

The expandability through the expansion slots is maintained while ensuring the installation compatibility with M800VW/M80W Series.

EXPANSION AND EVOLUTION OF CONTROL FUNCTIONS

Sheet metal laser cutting machines can also be controlled Coming soon

The introduction of laser processing functionality expands the areas of control.



Laser processing control Manny					
Laser processing co	11 1	101	M800VW M800VS M80VW M80V		
	No	Laser processing functionality	Description		
introduction of laser processing tionality expands the areas of		Laser oscillator power control	The NC outputs to the laser oscillator the processing conditions (laser power value, etc.) it created for each interpolation cycle when the M code for laser ON is enabled		
lionality expands the aleas of	2	Laser oscillator digital I/O control	The NC device controls the digital I/O of the laser oscillator		
RIO2.0 communication		Selection of laser processing conditions	The laser processing conditions are set on a dedicated screen (each condition can be selected using an M code.) (selection of conditions fit for the processing situation leads to high-quality processing)		
	4	DR (dross reduction) control	Laser processing conditions are automatically adjusted according to the processing speed (The effect of heating at an acute corner is reduced, minimizing dross and increasing the processing accuracy)		
	5	F-CUT (flycutting) control	The timing of turning on/off the beam is controlled by checking the feedback position obtained from the motor-side encoder against the programmed position		
		Height control	The height from the workpiece surface is held constant based on the height sensor (Copying the workpiece, leading to high-quality processing)		
10V/M80 Laser interface unit Laser oscillator* leries	7	Power calibration control	Laser power is adjusted based on the measured laser power from the laser head(Actual laser power is made consistent with the programmed value, contributing to oscillator protection)		

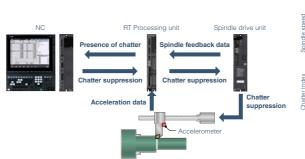
* The laser oscillator must be prepared by the customer

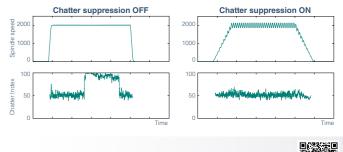
Chatter suppression increases lathe machining accuracy Coming soon

Chatter suppression

M800VW M800VS M80VW M80V

Chatter is automatically detected during machining by connecting an accelerometer to the RT processing unit. Chatter is suppressed by adjusting the spindle speed, achieving high-accuracy high-quality machining.

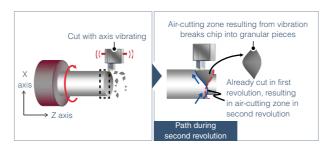




Vibration cutting shortens the time required to remove chip, improving machine utilization

Vibration cutting

Vibration cutting, in which machining is performed with the feed axis vibrating to break up chip, reduces the time it takes to remove chip and increases machine utilization.

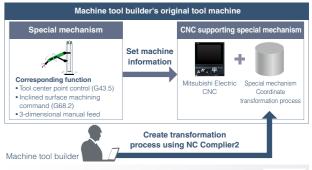


Motion control release enables control of special mechanisms Coming soon

Watch the introduction video here.

Motion control release (coordinate transformation)

Motion control release allows transformation of coordinates different from the NC's rectangular coordinate system, making it possible to control special mechanisms such as parallel link.



Watch the introduction video here. I

CNC LINEUP

High Performance

M800VW

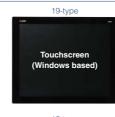




- Separated type, a control unit separated from display
- Windows-based display is included in the lineup, which provides excellent expandability
- Four expansion slots are provided as standard specications, allowing for expansion using option card slot

Display unit size

19-type





Main Specifications

	Lathe system	Machining center system
Max. number of axes (NC axes + Spindles + PLC axes)	Standard:16	Optional:32
Max. number of spindles	8	6
Max. number of part systems (main+sub)	Standard:4 Optional:8	2
Fine segment processing capability [kilo-blocks/min]	168	540

M800VS



High-grade CNC well suited to high-speed high-accuracy machining and multi-axis multipart system control

- Panel-in type, a control unit with integrated display
- Multi-CPU architecture allows for high performance and high functional graphics
- · Windows-less display provides easy operability

19-type Coming soon Touchscreen





	Lathe system Machining cer system	
Max. number of axes (NC axes + Spindles + PLC axes)	Standard:16 Optional:32	
Max. number of spindles	8	6
Max. number of part systems (main+sub)	Standard:4 Optional:8	2
Fine segment processing capability [kilo- blocks/min]	168	540

M80VW



Standard CNC with expandability and flexibility

- Separated type, a control unit separated from display
- Windows-based display is included in the lineup, which provides excellent expandability
- Packaged type for selecting a machine type
 easily
- Two expansion slots are provided as standard specications, allowing for expansion using option cards slot

10.1



15-type



19-type

	Lathe system	Machining center system
Max. number of axes (NC axes + Spindles + PLC axes)	13	11
Max. number of spindles	6	4
Max. number of part systems (main+sub)	4	2
Fine segment processing capability [kilo-blocks/min]	101	202

M80V



Standard CNC provides high productivity and easy operability

- Panel-in type, a control unit with integrated display.
- Provided in package (TypeA/TypeB) for easier selection
- Windows-less display provides easy operability





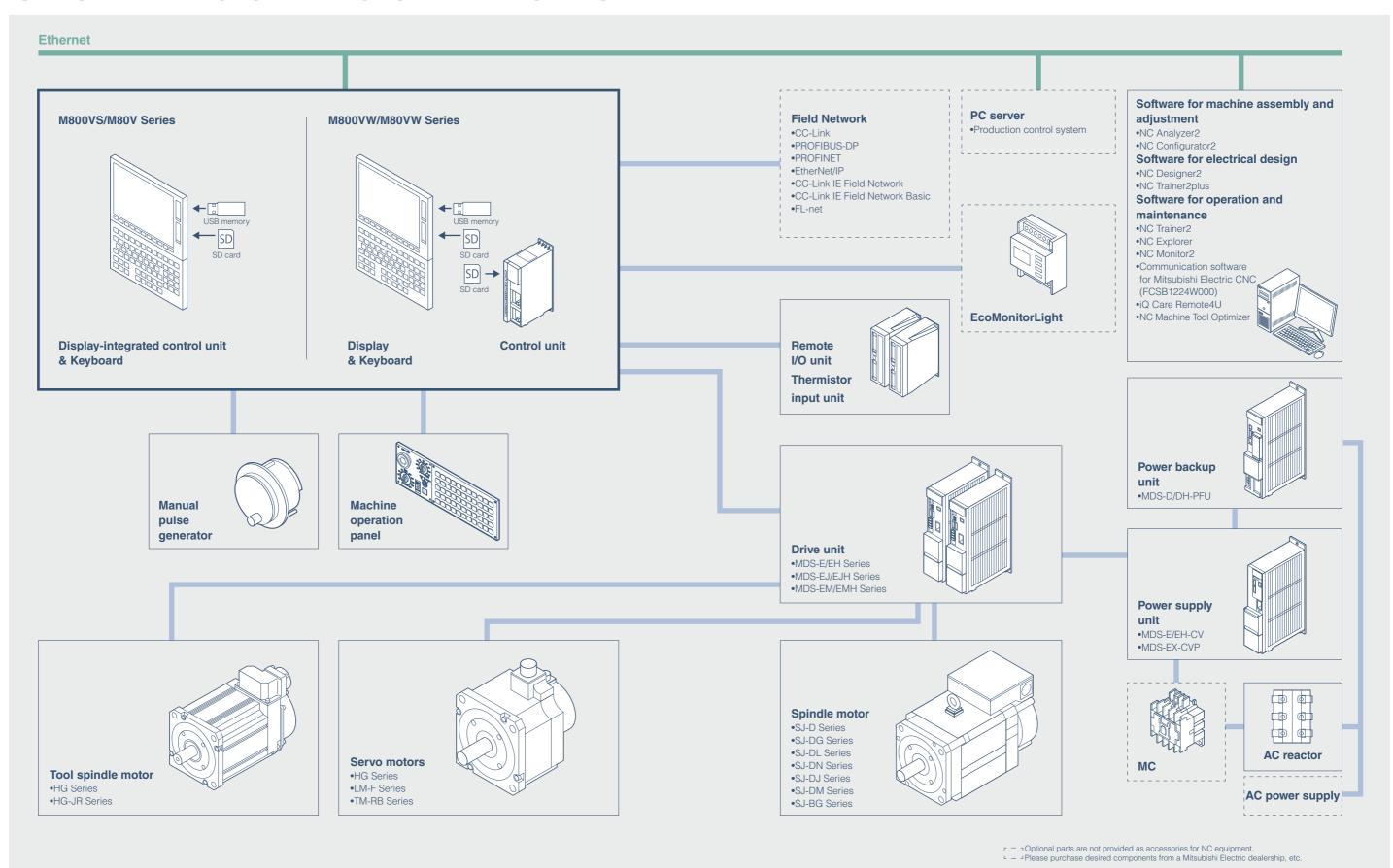


	Lathe system	system	
Max. number of axes (NC axes + Spindles + PLC axes)	TypeA:13 TypeB:9	TypeA:11 TypeB:9	
Max. number of spindles	TypeA:6 TypeB:4	TypeA:4 TypeB:2	
Max. number of part systems (main+sub)	TypeA:4 TypeB:2	TypeA:2 TypeB:1	
Fine segment processing capability [kilo-blocks/min]	TypeA:101 TypeB:-	TypeA:202 TypeB:67.5	

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SYSTEM CONFIGURATIONS SYSTEM CONFIGURATIONS

SYSTEM CONFIGURATIONS



INTRODUCTION TO FUNCTIONS INTRODUCTION TO FUNCTIONS

INTRODUCTION TO FUNCTIONS

Mechanical and electrical design

Setup

Machining

Production maintenance

"Image input interface" enables flexible customization of NC screens and applications to differentiate machine tools, creating added value.



The NC screen that can display the applications on the industrial PC or images from the camera inside the machine provides added value to machine tools. The applications on the industrial PC can be operated from the NC screen.



Watch the introduction video here. ▶

"Direct robot control" enables the NC to directly control a robot, allowing more flexible machine design including workpiece transportation.

Direct robot control M800VW | M800VS | M80VW | M80V

Guidance on the dedicated screen and special G codes allow easy programming and operation without requiring knowledge about robot language. The teaching and operation of a robot can be done using the NC screen on the tablet when screen mirroring to tablet (See P.7) is used together.



ST language is supported in addition to the ladder language. This allows PLC programs to be created and edited efficiently using the syntax resembling that of conventional programming languages.

MELSEC development tool (GX Works2) Coming soon | M800VW | M800VS | M80VW | M80V

Unlike the ladder language, ST language allows flexible text-based programming and compact operation processing. The use of function blocks (FB) also makes PLC programming more flexible.

The monitoring of function blocks using PLC on-board makes development smarter and more efficient.



"Menu key customization" function allows the screen menu to be moved or hidden to meet the machine specifications and the needs of machine tool users.

Menu key customization M800VW | M800VS | M80VW | M80V

It also allows the optional functions of the machine tool to be hidden from the menu key.

Gathering frequently used menu keys streamlines setup work.



Mechanical and electrical design

Setup Machining

Production maintenance

"Interactive programming" allows the user to set values by simply following guidance, streamlining the creation of machining programs.



A machining program can be developed easily by selecting menus and entering numerical values and other data for the items displayed on the screen. The programmed shape can be checked each time data is entered, and the created machining program can be directly run without converting into a G code program.



Parameter setting guidance on the dedicated screen makes it easy for anyone to improve machining quality.



The parameters for high-accuracy control can be adjusted through intuitive operation using three machining indexes (cycle time, accuracy, quality) displayed in the guidance. This makes it unnecessary for an operator to be a highly skilled expert to make adjustments for optimal machining.



Machining program management linked with images makes it possible to find a machining program smartly.



The photo of the workpiece registered in association with a machining program visually helps to find a program. It is also possible to download the images on the tablet to the NC using the application on the tablet and use them as preview.



"Rotation center error measurement" can be used to instantly set the error compensation amount for rotation center error of the machine.



This function allows the rotation center error to be measured using the reference sphere and touch probe and the compensation value to be applied effortlessly from the screen. The measurement result can be reflected in the rotary axis configuration parameters.

The machine configurations that support the function now includes not only table-tilt type but also combined type in M800V/M80V Series.



INTRODUCTION TO FUNCTIONS INTRODUCTION TO FUNCTIONS

Setup

OMR-CC (Optimum machine response-contour control) smartly reduces cycle time while maintaining the current machining accuracy.

OMR-CC (Optimum machine response-contour control) M800VW M800VS M80VW M80V

Cycle time is reduced without compromising on accuracy by outputting movement commands considering position error resulting from servo response delay.



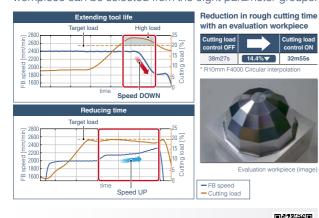
R10mm F4000 arc command

Watch the introduction video here.

Cutting load control function automatically controls cutting load, leading to a longer tool life and shorter cycle time.

Cutting load control M800VW M800VS M80VW M80V

The feedrate is automatically adjusted so that the actual load rate matches the predefined target load rate during machining. The parameters appropriate for the tool and workpiece can be selected from the eight parameter groups.



Watch the introduction video here

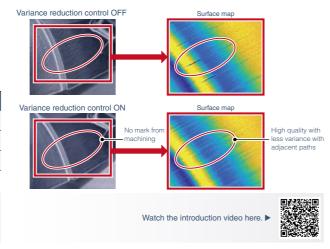
Machining

Spline interpolation 2 function achieves high-quality fine surface by making adjacent machining paths globally smooth.

Spline interpolation 2

M800VW M800VS M80VW M80V

The function solves the problem of uneven (marked) surface resulting from the variance of programmed points that occur when a machining program is generated by a CAM tool, improving machining quality.

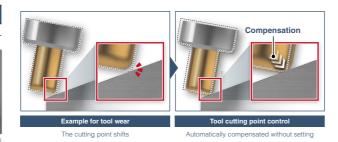


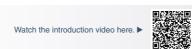
Tool cutting point control enables optimum machining without modifying the machining program even when the tool shape changes.

Tool cutting point control

M800VW M800VS M80VW M80V

In five-axis machining, it was necessary to modify the machining program as tool wear occurs to keep the cutting point constant. Now tool wear is automatically compensated for by simply setting the tool length and tool shape (tool radius, corner radius).





Setup

Production maintenance

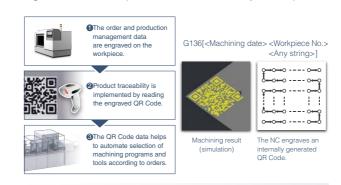
The QR Code engraved directly on the workpiece allows automatic selection of programs and tools and helps to implement traceability easily.

Two-dimensional barcode (QR code) engraving cycle

M800VW M800VS M80VW M80V

A program for engraving a QR code can be created easily using a fixed cycle.

The QR Code engraved on the workpiece helps automation of high-mix low-volume production and traceability of workpieces.



Remote service iQ Care Remote4U has evolved. Remote diagnostics through a cloud server help

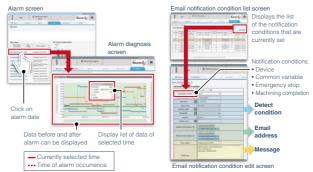
Watch the introduction video here.

iQ Care Remote4U

Machine downtime is reduced by automatic email notifications sent upon occurrence of an alarm and alarm diagnostics, in addition to the built-in remote service gateway unit functionality in the NC control unit (See P.7).

ishi Electric CNC M700(V)/M70(

to reduce machine downtime.



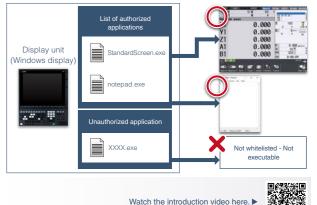
Watch the introduction video here.

Machining

Security feature for Windows display smartly protects the NC from virus and other threats using whitelist technique.

Security feature for Windows display M800VW M800VS M80VW M80V

Virus attacks can be prevented by prohibiting software not whitelisted (unauthorized) for the NC from being run. It addresses the security needs posed by the growth of



Operation monitoring software NC Machine Tool Optimizer visualizes the status of various equipment in multiple factories.

NC Machine Tool Optimizer

Besides being able to be connected with a variety of controllers (made, model) on the shop floor, it can monitor and analyze the operation of multiple factories together, helping to increase productivity.

* Connection with Mitsubishi Electric CNC (old models) and third-party controllers is supported ■Visualize operational status



Aggregations by plant, by group, or by machine



NC Machine Tool Optimizer oftware product that collects operation at a from NC machine tools and peripherals CONTRIBUTION TO SUSTAINABILITY HARDWARE

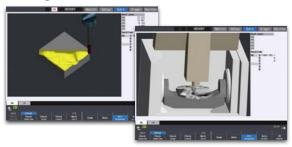
Contribute to sustainability through the reduction of scrap and visualization of power consumption

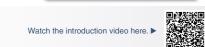


3D machining simulation

M800VW M800VS M80VW M80V

Machine interference and machining quality can be checked before machining, which reduces workpieces discarded because of trial cutting and defective machining.





Power consumption calculation

M800VW M800VS M80VW M80V

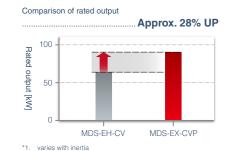
Visualization of machine power consumption enables users to see which process has higher power consumption, contributing to power savings in factories.

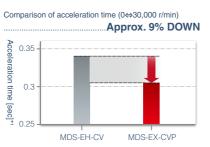


PWM converter MDS-EX-CVP Series

M800VW M800VS M80VW M80V

PWM converter MDS-EX-CP Series controls the boost and stabilization of DC link voltage, achieving both increased output and shorter acceleration and deceleration time for the below combination. Reduced supply current harmonics and improved power factor help to lower the power supply equipment capacity.







HARDWARE

Control unit

M800VW/M80VW Series
(Separated-type)

Control unit

Separated from display

M800VS/M80VS Series
(Integrated type)

Integrated on back of display

Control unit

M800VW: 90×180×380(WxDxH)

M800VW: 90×180×380(WxDxH)

		[mm]				
Machine operation panel						
FCU8-KB921 FCU8-KB923 Standard specification A	Key switch: 55 points, LED: 55 points	KB921/922/925:260 KB923/924/926:290				
FCU8-KB925 FCU8-KB926 Standard specification B	Mitsubishi Electric standard key layout	140				
FCU8-KB922 FCU8-KB924	Key switch: 55 points, LED: 55 points Custom specication key layout					
FCU8-KB931 Standard specification A	Rotary switch (Spindle override, cutting override)	140				
FCU8-KB941 Standard specification B	Selective switch (memory protection) Emergency stop button	140				

	90×180×380(W×D×H) 60×180×380(W×D×H)		Standard specificat	tion B Emergency stop button	() 8 m
Display	Keyboard	M800VW Series	M800VS Series	M80VW Series	M80V Series
19-type Touchscreen	_	365 Windows based	_	365 Windows based	_
19-type, horizontal Touchscreen	_	440 Windows based	_	440 Windows based	-
19-type Touchscreen Coming soon	FCU8-KB091 Clear key Full keyboard Coming soon	_	475	_	475 400
15-type Touchscreen	FCU8-KB083 Clear key Full keyboard	400 Windows based display can be selected	320	400 Windows based display can be selected	320
10.4-type Touchscreen	FCU8-KB047 Clear key Full keyboard	-	290	_	290
10.4-type Touchscreen	FCU8-KB041 Clear key ONG(XZF) layout for L system FCU8-KB046 Clear key ONG(XYZ) layout	-	290 140	_	290 140
10.4-type Touchscreen	FCU8-KB048 Clear key ABC layout	_	290 230	_	290 230
8.4-type	FCU8-KB026 Clear key ONG(XYZ) layout FCU8-KB028 Clear key ONG(XYZ) layout for L system	_	_	_	260 140
8.4-type	FCU8-KB029 Clear key ONG layout	_	_	_	260

SPECIFICATION SPECIFICATION

SPECIFICATION

Max. number of vacues (N/L zozes - Spindles a PCC zozes)	001/	840			01/0	1400		N. /3 A /	Mana		01/14/	MOO		
Max. number of axes (NC axes - Spindus + PC axes) Cite	L L		N		I		N				UVW	VI	1	Class
Max. number of size see fixed for all for all the pert systems 10	TypeA Ty	ТуреВ	ТуреА	M830	M850	M830	M850			M830	M850	M830	M850	
Max. number of Max Date for oat the part systems Color C	13	9	11					13	11					Max. number of axes (NC axes + Spindles + PLC axes)
Max. number of PLC Deces	10	5	9	O16	O16			10	9	○16	○16			Max. number of NC axes (in total for all the part systems)
Max. number of shall private proper control grows control years of the control	6	2	4	-	-	6	6	6	4	-	-	6	6	Max. number of spindles
Number of simultaneous contrologic control axees	6													
Max. number of NC assa in a part systam	4			_										
Max. number of part payment													_	
Max. number of part systems (max. number of part systems)	8			△12	△12	△12	△12			△12	△12	△12	△12	
Max. number of main part systems	04 (O1	02			02	02	04	02			O2	02	Max. number of part systems (main + sub)
Max. number of sub part systems	O2 (O4	O4					O4	O4			
Control and sales High-speed program server mode	O2 (_	_	04	04	02	02	02	_	O4	O4	02	02	Max. number of sub part systems
Least command increment	-	-	-	_		-	-	0	0			Δ	Δ	Control unit-side High-speed program server mode
Least command increment	0	0	0	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	
Least control increment				0.04	O 0 4	○ 0 d	0.04			O 0 4	O 0 4	O 0 4	O 0 4	Data increment
Linear Interpolation Center/Radius designation Cente	n ○ 0.1μm ○ (○ 0.1µm	○ 0.1µm					○ 0.1µm	○ 0.1µm					Least command increment
Circular interpolation (Center/Radius designation)	O1nm O													
Helical Interpolation	0			_										
SpiralConical Interpolation	0													
Solution Continue interpolation	-													
Milling Interpolation	0	0	0						0					Cylindrical interpolation
	0												Δ	· · · · · · · · · · · · · · · · · · ·
Involute interpolation	0												_	
Spine interpolation (605.120/Sel21)	-													
NUMBs Interpolation	-	-	-	Δ	Δ	Δ	Δ	-	-	Δ	Δ	Δ	Δ	
Solice Interpolation A	-													
Spilne interpolation 2 (G61-4)	-													
Memory capacity (number of programs stored)	-													<u> </u>
1000KB [256m] (1000 programs)			- U						Ů,					
Z000KB [\$120m] (1000 programs)	0	0	0	0	0	0	0	0	0	0	0	0	0	
Extended Memory (NC memory 2)	-			_										
2000KB (§120m) (1000 programs)	-	_	-	Δ	Δ	Δ	Δ	-	-	Δ	Δ	Δ		
Multi-part system simultaneous program editing Special program editing display for synchronization between part systems		0	0	0	0	0	0	0	0	0	0	0	0	
Finish shape view programming	0	-	-	0	0	0	0	0	-	0	0	0	0	
Remote desktop connection	0													
VNC server	0													
Spindle-mode servo motor control	0													
Spindle-mode rotary axis control	□*13	□* ¹³	□*13	□* ¹³	□* ¹³	□* ¹³	□* ¹³	-	-	-	-	-	-	Image input interface*2
Turret gear change control	0			_										
Spindle position control (Spindle/C axis control)	- 0													
C axis control during Spindle synchronization △ ○<	0			_										
Spindle synchronization	0		-	Δ		Δ	Δ			Δ	Δ		Δ	
Guide bushing spindle synchronization	0													
Spindle superimposition control	0													
Multiple spindle synchronization set control	0												-	
Additional Control	0													
Carphic check	O 256	O 400	O 400					○ 256	O 400					Number of tool offset sets
3D solid program check	0	0		_										
3D machining simulation	0													· · · · · · · · · · · · · · · · · · ·
Variable command 600 sets -	0			Δ										
600 sets		-	-	-	-	-	-		-	-	-	Δ	Δ	
700 sets	Τ - Τ		_	_	_	_	_	_				_	_	
(600 + 100 x number of part systems) sets	0													
(7900 + 100 × number of part systems) sets	0			_										
Two-dimensional barcode engraving cycle	0													
Vibration cutting control*3	0			_										1 1 1
Rapid traverse block overlap														
High-speed machining mode II (G05P2) maximum [kBPM]	0													
High-accuracy control (G61.1/G08)	○33.7			_										
	O67.5													
Multi-part system simultaneous high-accuracy control*4 \(\Delta \ \Delta \Delta \ \Delta \Delta \ \D	-													
SSS control	0	0						0						
Tolerance control A A A A O O A A A O O	0													
	O33.7			_										
High-speed high-accuracy control II (G05P10000) maximum [kBPM] △168 △168 △168 △168 △168 ○101 ○101 △168 △168 △168 △168 ○101 ○101 ○101 ○101 ○101 ○101 ○101 ○10	○67.5 -			△ 168						△168				
Smooth fairing	-			-						-				

M: Machining center system L: Lathe system / ○ Standard △ Optional □ Selection

		M80	0VW		M80	VW		M80	0VS			M8	V0V	
Class		Л			М			VI				VI		L
	M850	M830	M850	M830	_		M850	M830	M850	M830	TypeA	TypeB	TypeA	Туре
Internative evels insenting					_									_
Interactive cycle insertion	Δ.	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	0	0	0	0
Simple programming (NAVI MILL/LATHE)	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	0	0	0	0
G code guidance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DXF data input	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	0	-	0	_
Interactive programming (JOB LATHE)		_	Δ	Δ	_	0	_	_	Δ	Δ	_	_	0	0
						0								_
OMR II (Backlash with filter)	Δ	Δ	Δ	Δ	0		Δ	Δ	Δ	Δ	0	0	0	0
OMR III (Continuous variable backlash)	-	-	-	-	-	-	-	-	-	-	-	-	-	_
OMR-FF	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	0	0	0	0
OMR-CC	1 .				_									
(Optimum Machine Response-Contour Control)		Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	0	0	0	0
Rotation center error measurement	Δ	Δ	_	_	0	_	Δ	Δ	_	_	0	_	_	_
notation center error measurement	_				0							_		_
Number of tool life management sets	0 200	O 200	0 128	O 128	○ 200	○ 256	O 200	O 200	O 128	0 128	○ 200	○ 200	○ 256	09
	△400/999	△400/999	△400/999	△400/999			△400/999	△400/999	△400/999	△400/999				
Direct robot control														
Cutting load control	Δ	Δ	-	-	0	-	Δ	Δ	-	-	0	-	-	-
Chatter suppression*5	_	_	□*13	□*13	_	T*13	_	_	_	_	_	_	_	_
	_			_									_	
Data protection by user's level	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	0	0	0	0
Machine group-based alarm stop	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	0	0	0	0
Email notification to operator	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	0	0	0	0
Security feature for Windows display	Δ	Δ	Δ	Δ	-	-	-	-	-	-	-	-	-	_
Safety observation	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	0	0	0	0
	H													
Smart Safety observation													_	
Safety-related I/O observation	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	□*6	□*6	□*6	
Emergency stop observation	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	□*6	□*6	□*6	
SLS (Safely-Limited Speed)	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	□*6	□*6	*6	
	-			_		0					□*6	□*6	□*6	
SLP (Safely-Limited Position)	Δ	Δ	Δ	Δ	0		Δ	Δ	Δ	Δ				_
SOS (Safe Operating Stop)	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	□*6	□*6	□*6	
SSM (Safe Speed Monitor)		Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	□*6	□*6	□*6	
SBC/SBT (Safe Brake Control/Safe Brake Test)	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	□*6	□*6	□*6	
SCA (Safe Cam)	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	*6	□*6	□*6	
														_
SS1/SS2 (Safe Stop)	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	□*6	□*6	□*6	
STO (Safe Torque Off)	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	□*6	□*6	□*6	
Function block (FB)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Label programming	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u> </u>	0	0				0		0					0	
ST language			0	0	0		0		0	0	0	0		_
MELSEC development tool (GX Developer)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MELSEC development tool (GX Works2)	O*13	O*13	O*13	O*13	O*13	O*13	O*13	O*13	O*13	O*13	O*13	O*13	O*13	0
GOT connection														
GOT connection (Ethernet connection)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
														_
GOT connection (CC-Link connection)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tool handle feed & interruption	Δ	Δ	-	-	-	-	Δ	Δ	-	-	-	-	-	-
Tool center point control (G43.4/G43.5)	Δ	△*7	-	-	O*7	-	Δ	△*7	-	-	O*7	-	-	-
Tool cutting point control (G43.8/G43.9)	Δ	_	_	_	_	_	Δ	-	-	_		_	_	_
		^	^	^	0	_		^	^	^		_		_
Inclined surface machining command	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	0		0	
Simple inclined surface machining command*8		-	Δ	Δ	-	0	-	-	Δ	Δ	-	-	0	0
3-dimensional tool radius compensation	Δ	Δ	△*9	△*9		_	Δ	Δ	△*9	△*9		_		
(Tool's vertical-direction compensation)		Δ		Δ			Δ	Δ		Δ				
Workpiece installation error compensation	Δ	-	△*9	-	-	-	Δ	-	△*9	-	-	-	-	-
3-dimensional manual feed	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	0	_	0	_
	-			_										
Real-time tuning 1 (speed gain)	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	0	-	0	_
Real-time tuning 2 (rapid traverse time constant)	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	0	-	0	-
Constant torque control	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	0	0	0	0
CC-Link (Master/Local)														
PROFIBUS-DP (Master)														
				_							_	_		_
CC-Link IE Field (Master/Local)														
PROFINET	□*13	□*13	□*13	□*13	□*13	□*13	□*13	□*13	□*13	□*13	□*13	□*13	□*13	
EtherNet/IP														
FL-net														
CC-Link IE field network Basic			0			0						0		_
	0	0		0	0		0	0	0	0	0		0	0
Customization (NC Designer2)*10	0	0	0	0	0	0	0	0	0	0	0	0	0	С
APLC release*10	Δ	Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	0	0	0	0
Custom API library	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MES interface library		Δ	Δ	Δ	0	0	Δ	Δ	Δ	Δ	0	0	0	
				_							_			_
SLMP Server	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Numerical Control (CNC) communication software		0	0	0	0	0	0	0	0	0	0	0	0	
FCSB1224W000*10					0	0								
Motion control release Coordinate transformation	△*13	-	-	-	-	-	△*13	-	-	_	-	-	-	-
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Power consumption computation	-			_									_	_
			0	0	0	0	0	0	0	0	0	0	0	0
EcoMonitorLight connection	0													
EcoMonitorLight connection Laser processing control*11	□*13	□*13 ○*12*13	-	-	□*13 ○*12*13	− ○*12*13	□*13	□*13	-	-	□*13	□*13	-	-

^{1.} Two alphabet letters.
2. Image input expansion unit is required.
3. Vibration cutting expansion unit is required.
4. Up to two part systems.
5. The RT Processing unit and the RTU expansion unit are required.
6. Functional safety expansion unit is required for M80V.
7. Restrained to 4-axis simultaneous contouring for M830VW, M830VS, M80VW, M80V(TypeA).
8. This includes Simple tool center point control.
9. For L system, this function is available only during program format switch.
10. Separately sold software is required.
11. Laser interface unit is required.
12. Only for the 19-type display unit of M800VW/M80VW Series, the side memory interface unit is required.
13. Coming soon.

DRIVE SYSTEM

DRIVE SYSTEM

DRIVE SYSTEM

Drive units



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



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
- •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) are also incorporated as additional safety features.
- •MDS-EJH 400V system drive unit is available (Note 1).



PWM Converter MDS-EX-CVP Series

- •Product of the PWM converter series which has a stabilizing DC voltage function and boost function. MDS-EX-CVP series reduces the output deceleration of the spindle motor and improves output in the high-speed range.
- Only 400V system power supply unit is available.

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: 3.7 to 26 lkWl
- •Maximum speed: 8,000 to 12,000 [r/min]

High-output, High-speed 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 to 12,000 [r/min]

High-torque Spindle Motors SJ-DN Series

- •Higher torque characteristics than those of SJ-D series with the same output. This series has made it possible to drive with the small-capacity multi-hybrid drive unit.
- Suitable for heavy cutting. This helps to improve productivity.
- •Range: 7.5 to 18.5 [kW]
 •Maximum speed: 8,000 [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 to 7.5 [kW]
- •Maximum speed: 10,000 to 24,000 [r/min]

Compact, Lightweight Spindle Motors SJ-DJ Series

- Spindle motors that are smaller and lighter than those of SJ-D series with the same output. This helps to further downsize machines.
- •Range: 5.5 to 15 [kW]
- •Maximum speed: 8,000 to 12,000 [r/min]

High-output high-torque IPM spindle motor SJ-DM Series

- •The use of magnets allows for a higher output and torque, leading to a reduced cycle time.
- •SJ-DM Series can provide torque characteristics comparable to the former SJ-D Series of the next frame number.
- •Maximum rotation speed: 12,000 [r/min]

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 11 [kW]
- •Maximum rotation speed:
- 2.000 to 6.000 [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 or 67 million pulses/rev) are available.
- •This can also be used as a tool spindle motor.
- •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.
- •Range:
- Maximum thrust: 900 to 18,000 [N·m]



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
- Suitable for rotary axes that of heads
- •Range: Maximum torque: 36 to 1,280 [N·m]



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.
- •Options for mold specification and cooling jacket specification are prepared.



Tool Spindle Motors HG-JR Series

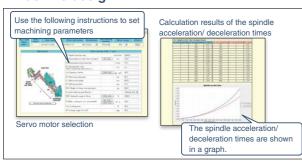
- •Compact tool spindle motors are designed to have the small, high-output characteristics of servo motors yet offer high-speed rotation (8,000r/min). These motors contribute to downsizing spindle size, like rotary tool spindles. •Range: 0.75 to 1.5 [kW]
- •Maximum rotation speed: 8,000 [r/min]
- •Small-sized 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) * Use Mitsubishi Electric CNC's dedicated drive unit and motor. **SOFTWARE TOOLS SOFTWARE TOOLS**

SOFTWARE TOOLS

Operation and Electrical circuitry design Machine design NC-related processes Servo selection Custom screen creation Parameter creation Training NC Designer2 NC Trainer2 NC Servo Selection NC Configurator2 NC Compiler2 Servo/spindle adjustment Operation and maintenance Debug Machine adjustment NC Explorer NC Trainer2 plus NC Analyzer2 NC Monitor2 Operation monitoring and remote diagnostic NC Machine Tool Optimizer*

■Machine design



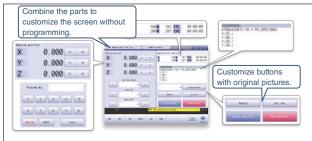
[NC Servo Selection]

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

iQ Care Remote 4U*

* For more information, see P.16

■Electrical circuitry design



[NC Designer2]

We provide a developmental environment where the MTB can customize screens easily. Two types of screen development methods are available; the interpreter method (programming without C++) for simple screen development, and the compilation method with a complex controller (programming with C++).

[NC Compiler2]

NC Compiler2 is required when the compilation method is applied.

Edit PLC program with PLC development tool NC Designer2 and check its operation using NC Trainer2 plus of NC Trainer2 plus.

[NC Trainer2 Plus]

NC Trainer2 plus supports customization development; it helps to program the ladder programming of the user PLC to be developed by machine tool builders and debug it and check the operations of customized screens.

Machine assembly and adjustment



[NC Configurator2]

NC parameters required for NC control or machine operation can be edited on a

It is also possible to create initial parameters simply by inputting the machine configuration.

For details on each software tool, refer to the software tools catalog (BNP-A1224).

Machine assembly and adjustment



[NC Analyzer2]

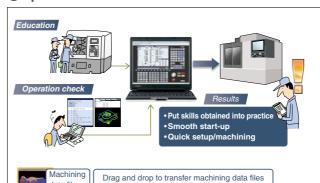
Servo parameters can be adjusted automatically by measuring and analyzing machine characteristics. Measurement and analysis can be done by running a servo motor using the machining program for adjustment, or using the vibration signal. This function can sample various types of data.

Operation and maintenance

CE CE

Monitor the status

of multiple CNCs



[NC Trainer2]



NC Trainer2 plus supports customization development; it helps to program the ladder programming of the user PLC to be developed by machine tool builders and debug it and check the operations of customized screens.

[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]

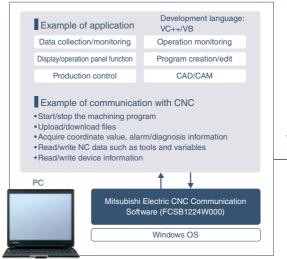


Taking advantage of connection with a

factory network, CNC operation status can be monitored from remote locations. Several CNCs can be connected and monitored simultaneously.

Application development support

NC Monitor2



[Mitsubishi Electric CNC Communication Software (FCSB1224W000)]

This software provides a bunch of API functions. They facilitate development of an Windows application which requires connection and communication with Mitsubishi Electric CNC*. You can use the common interfaces for any

Mitsubishi Electric CNC model, which leads to high efficiency in development.

* The compatible model is Mitsubishi Electric CNCs after M700/M70.



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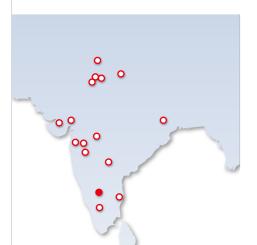
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· Edmonton, AB Service Satellite · Montreal, QC Service Satellite · Mexico Region Service Center (Queretaro)

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GLOBAL SALES & SERVICE NETWORK

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Detroit, MI Service Satellite

Grand Rapids, MI Service Satellite

Milwaukee, WI Service Satellite

Cleveland, OH Service Satellite

Indianapolis, IN Service Satellite St. Louis, MO Service Satellite

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Charlotte, NC Service Satellite

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Houston, TX Service Satellite Hartford, CT Service Satellite

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Western Region Service Center (California)

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San Jose, CA Service Satellite Seattle, WA Service Satellite

Denver, CO Service Satellite

Canada Region Service Center (Tronto)

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Parque Tecnológico Innovación Querétaro, Lateral Carretera Estatal 431,

Km 2+200, Lote 91 Modulos 1 y 2

Hacienda la Machorra, CP 76246, El Marqués, Querétaro, México

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Monterrey, NL Service Satellite

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France Service Satellite (Lyon)

120, ALLEE JACQUES MONOD 69800 SAINT PRIEST FRANCE

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Tianjin Service Center Xian Service Center

Dalian Service Center Chengdu Service Center

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Oceania Service Center 348 VICTORIA ROAD, RYDALMERE, N.S.W. 2116 AUSTRALIA

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 (1)Damages caused by any cause found not
- (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 be the responsibility of Mitsubishi.
- (2)Loss in opportunity, lost prots 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
- (4)Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

4. Changes in Product **Specifications**

Specications 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 inuential on the public interest or which are expected to have significant influence on human lives or properties.

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Fransformers, Med-voltage Distribution Products



Power Monitoring and Energy Saving Products



Power (UPS) and Environmental Product















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Electric automation solution - because

we know first hand about the need for

reliable, efficient, easy-to-use automation

As one of the world's leading compan-

ies with a global turnover of over 4 trillion

Yen (over \$40 billion), employing over

146,000 people, Mitsubishi Electric has

the resource and the commitment to

deliver the ultimate in service and support

as well as the best products.

and control in our own factories.

A NAME TO TRUST

commerce and industry.

premium quality.

Since its beginnings in 1870, some 45

companies use the Mitsubishi name,

covering a spectrum of finance,

The Mitsubishi brand name is recognized

around the world as a symbol of

Mitsubishi Electric Corporation, estab-

lished in 1921, is active in space

development, transportation, semi-con-

ductors, energy systems, communica-

tions and information processing,

audio visual equipment and home

electronics, building and energy

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User support videos will be available, including how to backup/restore data and replace batteries as well as introduction to our products and technologies.









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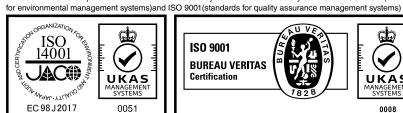
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Mitsubishi Electric Corporation Industrial Mechatronics Systems Works is a factory certified for ISO 14001(standards



🕂 Safety Warning

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







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