Mitsubishi CNC M700V Series
The best machines for top level manufacturing

Mitsubishi CNC M700V Series is a state-of-the-art model that provides high-speed and high-accuracy machining and advanced control technologies. These Functions are for customers who keep challenging for more production output, with a worldwide recognized machine for today’s globalized industry. M700VS Series is an integrated control unit and display type. M700VW Series also comes with Windows® XP. These two types of Mitsubishi CNC M700V Series support top level manufacturing.

Mitsubishi CNC M700V Series
The best machines for top level manufacturing

M700VS and M700VW Series, advanced Mitsubishi CNCs for next-generation machining
From drive units to servo/spindle motors

Advanced CNC components for higher performance
Mitsubishi Electric Factory Automation technologies are condensed into a 64 bit RISC processor and an exclusively developed high speed LSI. The basic CNC functions, built-in PLC and graphic performance are all improved. The M700VS has been downsized with power consumption reduced by 66% compared to our conventional Windows-based control models while maintaining the same performance. Windows®XPe-based M700VW was designed with expandability and stability to enable a higher level of custom functions.

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**Basic Performance and Functions**

For higher speed and higher accuracy

Bringing the complete nano world closer to you

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### Machining Program Processing Speed

<table>
<thead>
<tr>
<th></th>
<th>M700 Series</th>
<th>M700V Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPM</td>
<td>135k</td>
<td>168k</td>
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</tbody>
</table>

(Note 1: BPM is the number of machining program blocks processed per minute. Note 2: M700V’s machining program processing speed is 62.14MBPM)

### User Macro Processing Performance

<table>
<thead>
<tr>
<th></th>
<th>M700 Series</th>
<th>M700V Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macro</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

### Built-in PLC Basic Instruction Processing Performance

<table>
<thead>
<tr>
<th></th>
<th>M700 Series</th>
<th>M700V Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steps/µs</td>
<td>10</td>
<td>100</td>
</tr>
</tbody>
</table>

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**Complete Nano Control**

All operations from program values to servo commands are done in nanometer units. Interpolation is at the nano-unit level even when program commands are in micrometer units.

**Speed command fluctuation reduced**

Even with one-micron-unit commands in the machining program, interpolation is in nanometer units. As the calculation accuracy of a block intersection is improved, lines on the surface is finer.

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**PLC Axis**

**Indexing function with magazine axis**

If setting the number of stations required for the application, the drive automatically sets up equal intervals between each station. Positioning of the axis is only possible by commanding the station number.

**PLC axis mixed control**

Even if a pallet is changed, the axis can always be controlled as an NC axis in the machining area, and as a PLC axis in the setup area, which enables setup of a rotary axis without stopping machining.

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**Index Modification Function of PLC Instructions**

The index modification function is available, which is one of MELSEC’s wide variety of instructions.

Repetitive programs can be written easily.

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When several similar programs exist...

"n" number of same programs can be written in one line.
Supporting Machine Tool Accuracy Improvement

OMR-DD Control (High-speed synchronous tapping)

A high-speed error-compensation function is used for controlling the spindle and servo, enabling accurate tapping.

Adaptive Notch Filter

This function is used to estimate the resonance frequency of the machine and automatically adjust notch filter parameters. This enables the system to monitor the machine fluctuations and prevents repeated fluctuations caused by aged deterioration.

Lost Motion Compensation Control Type 3

This control can compensate for not only the machine friction but also the spring and viscosity elements. Thus quadrant protrusions, which are generated in circular cutting, can be compensated for within a wide range from low-speed to high-speed cutting.

Machine-end Compensation Control

This control can compensate for not only the machine friction but also the spring and viscosity elements. Thus quadrant protrusions, which are generated in circular cutting, can be compensated for within a wide range from low-speed to high-speed cutting.

Position-dependent Gradually Increasing-type Backlash Compensation

Friction is reduced by gradually changing the backlash compensation amount according to the reversal of axis travel direction, which enables higher-accuracy machining.

Position Loop of Spindle Control

High traceability to command (High-gain control), which has been developed in servo axis control, is now available on spindles, contributes to shorter machining time and higher accuracy.

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Orientation time is reduced

Deceleration is performed with the maximum torque to minimize the spindle orientation time.

Heavy cutting performance improved

Heavy cutting performance has been improved with the addition of position loop control on the spindle. By lowering the impact load fluctuation, the speed fluctuation rate has been reduced to less than 1/2 of our conventional system.

Two-way Pitch Error Compensation

The pitch error compensation function has been improved. By setting the compensation amounts separately for the positive and negative directions, different compensation can be applied to each direction.

Lowering Heat Generation of Spindle Motors

Reduced harmonic current mitigates heat generation in the spindle motor.

Automatic Temperature Compensation of Spindle Motor

A built-in thermistor detects the spindle motor's temperature to compensate for the acceleration/deceleration time when the motor is at a low temperature. It is also possible to monitor the spindle motor's temperature on the NC screen.
Technologies

Human Machine Interface provides for better visibility and operator ease of use

Easy-to-use interface with useful functions

HMI for Easier and More Visible Use

Screen structure linking to the operation processes
Operation processes are divided into three steps, “Monitor”, “Setup” and “Edit”, and necessary information is aggregated into three screens. These screens can be displayed by touching a single button on the keyboard.

Pop-up screens
Tabs allow the user to select necessary operations from the operation menu, and pop-up screens allow the user to access desired information while the original screen remains displayed. For displays with a touch panel, a keyboard can be displayed on the screen.

2-part system display
The Monitor screen of the 2nd part system can be displayed together with the 1st part system. Switching screens is not necessary.

Menu customization function
Menu keys on the bottom of the screen can be freely arranged. Frequently used menu keys can be put together on the first page.

Operation Support

Manual/Automatic backup function
- Batch-backup of the NC data into memory inserted in the front interface of the display is possible. For the built-in hard disk type M700VW Series, backup in the hard disk is also possible.
- Data is automatically backed-up at a certain interval set by the parameter.

Operability of operation search improved
Using the program edit screen, it is possible to execute a program from the line specified by the cursor. The operation search immediately detects the edited part to check the content of operation.

Guidance function
By pressing the help button, guidance (operation procedure /parameter descriptions/alarm descriptions/G code format) regarding the currently displayed screen will be shown.

Program input error warning function
The added 3D solid model check function allows more realistic cutting check.

Operability of program restart function improved
Even if a machining program is stopped for reasons such as tool breakage, the program can be restarted when it has been stopped using only the INPUT operation.

Menu list
Menu list buttons are newly introduced. With these buttons, the screen desired for display can be called up directly. The selected screen’s function outline is also displayed.

Program Operation

Programs are automatically created for each process when an operator selects machining process and inputs data on screen. A tool path can be graphically drawn for the program check.

This function also supports in-clined surface machining.

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Menu keys on the bottom of the screen can be freely arranged. Frequently used menu keys can be put together on the first page.

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- This function helps an operator to input and check programs. Errors are indicated when a decimal point is omitted.

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Program Operation

- Machining programs in the memory card or in the hard disk (for M700VW Series) can be directly searched and run. Direct edit is also available.
- Sub-program call is available from machining programs stored in the memory card or hard disk.
- The program format is unlimited.

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Technologies

For High Quality machining with smoother finish and faster performance

Five-Axis Machining functions such as Tool Center Point and SSS control have been enhanced.

With the enhancement of these functions, five-axis control will provide high-end performance.

The advanced five-axis control provides great potentials.

SSS Control (Machining Center System)
Super Smooth Surface

- By judging part program paths, unnecessary deceleration is reduced, even when fine steps in the program exist. This provides a smooth finish without deviation for die-mold machining.
- This function suppresses the vibrations of the tool by moving the rotary axis smoothly. Even when this function is active, the Tool Center Point path moves according to the command program path.
- SSS control can be used during simultaneous five-axis machining.

R-Navi (Machining Center System)

- Provides easy setup of index machining (multiple/inclined surface machining) using a rotary axis.
- Enables secure, easy and smooth setup and index machining.

Tool Center Point Control (Machining Center System)

High-accuracy machining is realized by controlling each axis so that the tool center point moves linearly at a commanded feed rate even if the rotary axis moves in linear interpolation.

Inclined Surface Machining (Machining Center System)

You can rotate or move the origin of the original coordinate system parallel to define a feature coordinate system. To start machining, issue normal program commands to the arbitrary plane (inclined surface) in space. The feature coordinate system is set again according to the tool axis’s direction. The machining program can be created without paying attention to the direction of the coordinate system or tool axis rotational direction.

OMR-FF Control
Optimum Feed Forward

Unlike conventional control, which simply matches the motor path to the commands, OMR control calculates the machine’s status based on a model and applies correction to motor control in order to match not the motor position, but the machine tool position to the commands.

3D Machine Interference Check

This function prevents interference on a machine model (in both manual and automatic operations) before it actually happens in the machine.

The part to interfere can be checked by moving, rotating or enlarging the models.

OMR-FF Control

Example of detecting a tool interference while a tilt type tool is rotating.

When a possibility of interference is detected on a machine model, the motor decelerates to a stop before interfering. The part to interfere changes in color.
Various Functions for Compound Machining

Supports various compound machining applications, from multi-part system program paths for multi-axis machining centers to multi-axis milling and hobbing.

Multi-part Systems Multi-axis

A maximum of two part systems and 16 axes can be controlled for the machining center. A maximum of four part systems and 16 axes can be controlled for the lathe. (A maximum of two part systems and 12 axes for M720VS, M720VW)

- Separate programs, used in each part system, can be managed under a common name in the multi-part system. This function facilitates management of the process programs that are simultaneously executed in the multi-part systems.

- This function enables machining using a certain part system simultaneously with that of another part system by superimposing their movements. This is effective when machining in multiple part systems is executed simultaneously. It allows for an axis to shift its coordinate system relative to the system using the axis.

Multi-part System Program Management

Control Axis Superimposition (Lathe System)

This function converts the commands programmed for the orthogonal coordinate axes into linear axis movements (tool movements) and rotary axis movements (workpiece rotation) to control the contours. This enables milling operations using a lathe without a Y axis.

Balance Cut (Lathe System)

G code format is available for hobbing. A spur gear can be machined by synchronously rotating the hob axis and the workpiece axis in a constant ratio. A helical gear can be machined by compensating the workpiece axis according to the gear torsion angle for the Z axis movement.

Guide Bushing Spindle Synchronization Control (Lathe System)

The control axes of each part system can be exchanged using a program command. This enables the axis defined as the axis of the 1st part system to be operated as the axis of the 2nd part system.

Guide Bushing Spindle Synchronization Control (Lathe System)

This function is for a machine with a spindle motor to rotate a guide bushing. This function allows the guide bushing spindle motor to rotate a reference spindle (Reference spindle).

Mixed Control (cross axis control) (Lathe System)

2-part System Synchronous Thread Cutting (Lathe System)

2-part system synchronous thread cutting allows the 1st part system and the 2nd part system to perform thread cutting simultaneously for the same spindles. 2-part system synchronous thread cutting has two commands; command (G76.1) for cutting threads in two places simultaneously, which is known as “2-part system synchronous thread cutting cycle I”; and command (G76.2) for cutting a thread using the two part systems simultaneously, which is known as “2-part system synchronous thread cutting cycle II”.

Milling Interpolation (Lathe System)

This function converts the commands programmed for the orthogonal coordinate axes into linear axis movements (tool movements) and rotary axis movements (workpiece rotation) to control the contours. This enables milling operations using a lathe without a Y axis.

Balance Cut (Lathe System)

Thread cutting cycle II (reference spindle)
**Solution**

**Customization/Support Tool**

NC Designer and other Software Applications tools are available to support the customization of the machine. Some software applications support a C Language Library to support a higher level of customization.

**NC Designer (Screen Design Tool)**
- By laying out ready-made standard parts, you can easily create original screens without programming.
- When using touch panel display, a machine operation panel can be built on the NC display.
- Events of the standard parts can be described using macros.
- Using the C language source generation function of NC Designer, customized functions can be added by programming in C language (dedicated development environment necessary).

**Develop screen configuration**
- Simply by locating parts of various functions on the screen, it is possible to create custom screens easily.
- It is possible to check the performance of custom screens on a personal computer.

**GX Developer (Sequence Programming Tool)**

The MELSEC programming tool, offering a wide array of functions and easy use, allows for convenient program design and debugging. Linking with a simulator or other utility allows for the efficient creation of desired programs.

**NC Maintainer**

A software tool for a personal computer to carry out maintenance (such as parameter setting, NC diagnosis and PLC program diagnosis) of MITSUBISHI CNC on customer’s display.

**NC Trainer / NC Trainer plus (MITSUBISHI CNC Training Tool)**
- NC Trainer is an application for operating the screens of MITSUBISHI CNC M700V Series and machining programs. This application can be used for learning operating CNC and checking the operations of the machining programs.
- NC Trainer plus can also be used for checking the PLC program and custom screens.

**NC Analyzer (Servo Adjustment Support Tool)**

Servo parameters can be automatically adjusted by activating the motor using machining programs for adjustment or vibration signals, and measuring/analyzing the machine characteristics.

**NC Monitor (Remote Monitoring Tool)**

An identical NC display screen can be displayed on a personal computer. By connecting a personal computer to the NC unit when necessary, various data can be checked and set using the same HMI as the standard NC screen.

**NC Explorer (Data Transfer Tool)**

A software tool for a personal computer to carry out maintenance (such as parameter setting, NC diagnosis and PLC program diagnosis) of MITSUBISHI CNC on customer’s display.

**Note**

An operation check is required in combination with software installed on the display.
A wide range of support features according to various machine configurations

Easy to import external data via USB and memory card interfaces.
A wide array of network functions offers good compatibility with various machine configurations.

Memory Card/USB Memory Interface
A compact flash memory card (CF card) or USB memory interface is located on the front of the display. In using CF card, the card slot can be completely covered by a lid so as to prevent foreign materials from entering (IP67).
(Note) M700VW Series is equipped with PCMCIA Interface

Front IC Card Mode
• It is possible to directly search and run the machining programs from the CF card (or PCMCIA card for M700VW Series). Subprogram calls are also available.
• The machining programs in the CF card can be edited directly.

Easy to Change Languages
• Display languages can be switched with a single parameter operation.
• For guidance display, two other languages aside from English are selectable for M700VS Series, or all the desired languages for M700VW Series by option setting.
• Support for 17 languages, securing reliable use worldwide.

Ethernet Communication
By connecting a personal computer and an CNC via Ethernet, the machining programs and parameters can be input and output.

Example of M700V Series

Memory Card/USB Memory Interface

Ethernet Communication

Front IC Card Mode

Easy to Change Languages

Optical Communication Repeater Unit
The optical cable can be extended to a maximum of 90m by connecting up to two optical servo communication repeater units between the CNC unit and a servo drive unit.

Mitsubishi Factory Automation Solutions
• Our cultivated Factory Automation technologies and experience contribute to offer the best suited systems for users.
• Our FA solutions support high and low hierarchy components, a network and even applications that control the components and network required for a manufacturing floor.

CC-Link
The NC unit can be connected to a network to serve as the master/local station of the MELSEC CC-Link.
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 the warranty unit is replaced.

2. Service in Overseas Countries

If the customer installs the product purchased from us in his/her own country, the warranty applies only when the conditions, method, etc., of use in compliance with the terms and conditions as will be explained.

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

Whether during or after the term of warranty, we assume no responsibility for any damages arising from causes for which we are not responsible, any losses of opportunity and/or profit incurred by the customer due to a failure of this product, any damages, secondary damages or compensation for accidents arising under specific circumstances that either foreseen or unforeseen by Mitsubishi Electric, any damages to products other than this product, or compensation for any replacement work, readjustment and startup test run of on-site machines or any other operations conducted by the customer.

4. Changes in Product Specifications

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

5. Product Application

(1) 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 application 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.

(3) Even during the term of warranty, repair costs shall be charged to the owner of the product purchased from us.

(4) This warranty applies only when the conditions, method, etc., of use are subject to change without notice.

(5) A failure caused by improper storage or handling, carelessness or negligence, etc., or a failure caused by the customer’s hardware or software problem is excluded from the warranty.

(6) A failure caused by any alteration, etc., to the product made by the customer without Mitsubishi Electric’s approval is excluded from the warranty.

(7) 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.

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

(9) 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.

2 Trademarks

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Microsoft® and Windows® are either trademarks or registered trademarks of Microsoft Corporation in the United States and/or other countries.

Other company and product names that appear in this manual are trademarks or registered trademarks of the respective companies.

The internal components of the machine operation panel are protected against water and oil (IP65F).

Refer to the product brochure for details.
Servo Motors

Medium-inertia Motor HF Series
- Medium-inertia, high accuracy and high-speed motors.
- High-inertia machine accuracy is ensured. Suitable for machines requiring quick acceleration.
- Range: 0.5 to 9 kW
- Maximum speed: 4,000 or 5,000 [r/min]
- Range: 0.5 to 9 kW

Low-inertia Motor HF-KP Series
- Suitable for an auxiliary unit that requires high-speed positioning.
- Range: 0.1 to 0.75 kW
- Maximum speed: 6,000 [r/min]

Linear Servo Motor LM-F Series
- Medium-inertia, high-accuracy and high-speed spindle motor.
- Range: 0.5 to 9 kW
- Maximum speed: 6,000 [r/min]

Direct Drive Servo Motor TM-RB Series
- High-torque direct-drive combined motor with a high-gain control system provides quick acceleration and positioning, which makes rotation smoother.
- Suitable for a rotary axis that drives a table or spindle head.
- Compared with a conventional rotary axis with a deceleration gear, this motor has higher accuracy and a maintenance-free, having no wear or backlash.
- Range: Maximum torque: 36 to 12,600 [N·m]

Spindle Motors

High-performance New Type Spindle Motor SJ-D Series
- Motor energy loss has been significantly reduced by optimizing the magnetic circuit.
- High-speed spindles: bearings are equipped as standard, achieving higher speed, lower vibration and improved durability.
- Product line: Normal SJ-D Series: 0.7 to 11 [kW]
- Compact & light SJ-DU Series: 0.5 to 15 [kW]

Low-inertia, High-speed New Type Spindle Motor SJ-DL Series
- Spindles dedicated to tapping machines requiring faster drilling and tapping.
- Our cutting-edge design technologies have brought forth higher rigidity and lower vibration of motor and spindle unit weight.
- The low-inertia reduces acceleration/deceleration energy savings.
- Product line: Low-inertia SJ-DL Series: 0.7 to 7.5 [kW]

Built-in Spindle Motor SJ-BG Series
- The optimized electrical design increases the continuous rated torque per unit volume compared to our conventional model, contributing to downsizing of the spindle unit.
- The most cost-effective solution is available as an optional feature.

Medium-inertia Motor HF Series
- Medium-inertia, high accuracy and high-speed motors.
- High-inertia machine accuracy is ensured. Suitable for machines requiring quick acceleration.
- Range: 0.5 to 9 kW
- Maximum speed: 4,000 or 5,000 [r/min]
- Supports three types of detection with a resolution of 500,000, 1 million or 18 million ppm.

Low-inertia Motor HF-KP Series
- Suitable for an auxiliary unit that requires high-speed positioning.
- Range: 0.1 to 0.75 kW
- Maximum speed: 6,000 [r/min]

Tool Spindle Motor HF-K/P/SP Series
- Taking advantage of the characteristics of a servo motor such as smoothness and high-output, the motor serves as a compact and high-output spindle motor which is capable of high-speed rotation (60,000rpm). This motor contributes to downsizing of spindles, such as the rotary tool spindle.
- Product line:
  - Small capacity: HF-KP Series: 0.4 to 0.9 [kW]
  - Medium capacity: HF-SP Series: 2.2 to 9 [kW]

Drive Units

High-performance Servo/Spindle Drive Units
- With the fastest current control cycle, basic performance is drastically enhanced (high-gain control). A combination of a high-speed servo motor and high-performance control helps enhance overall drive performance.
- High-speed optical communication enables a shorter position interpolation cycle and direct communication between drives, promoting further high-speed and high-accuracy machining.
- High-efficiency, sin and low-loss power mode have been established. A line of drive units driving a maximum of two spindles is available, contributing to a reduction in control panel size.
- STD: Gable torque off is now available.

Multi-hybrid Drive Units
- A line of high-performance multi-hybrid drive units are available. The multi-hybrid drive unit takes a maximum of three servo axes and one spindle, supporting the superimposing of units and offering technical advantages.
- A power regeneration system that efficiently uses energy during deceleration as power contributes to highly frequent acceleration/deceleration and energy savings.
- STD: Gable torque off is now available.

Main Specifications

Product line:
- MDS-2I/DH2 Series
- MDS-DM2 Series

Specifications
- Specifications: Specifications (Note 1) Please contact us for availability of STO as a whole system.
- Available:
- Available:
- Available:

Number of control axes
- Max. number of NC axes in a part system
- Max. number of PLC indexing axes
- Max. number of auxiliary axes
- Max. number of spindles

Main Specifications
- Specifications: Specifications (Note 1) Please contact us for availability of STO as a whole system.
- Available:
- Available:
- Available:

Multiline interpolation
- High-speed synchronous tapping (MRS CK)
- Spindle feed rate synchronization
- Tool spindle synchronization (3 holding)
- MDS-DM2 Series
- Machine control (Gable 1)
- Multi-axial synchronization
- Tool handle feed & interruption
- Tool center point coordination
- Inclined surface machining command
- Available:

Note: In order to use this function also in the 2nd part system, the option “high-accuracy control in 2 part systems” is required.
Safety Warning

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

Eco Changes is the Mitsubishi Electric Group’s environmental statement, and expresses the Group’s stance on environmental management. Through a wide range of businesses, we are helping contribute to the realization of a sustainable society.