MITSUBISHI CNC
M70V Series

The Best Partner for Your Success
Further progress to the new MITSUBISHI standard CNC

Higher cost-performance for realizing higher-grade machines

### High-speed
Cycle time reduced with higher machining-control performance

### Multi-axis control
Multi-axis control and two-part systems for compatibility with various machines

### Nano interpolation
Smoother cutting surface is achieved with one-nanometer position interpolation

### High-accuracy
High-accuracy tapping with high-speed compensation control of spindle and servo

### Easy operation
Simple programming system for machining center and lathe

### Customize
Development tools for providing a CNC with customized solutions

#### M70v TypeA
- Max. number of part systems: 2
- Max. number of axes: 11
- Max. number of NC axes (in total for all the part systems): 8
- Machining center system: 8
- Lathe system: 9
- Number of simultaneous contouring control axes: 4
- Least command increment: 0.1 micrometer
- Least control increment: 1 nanometer
- Max. PLC program capacity: 32,000 steps

#### M70v TypeB
- Max. number of part systems: 1
- Max. number of axes: 9
- Max. number of NC axes (in total for all the part systems): 5
- Machining center system: 5
- Lathe system: 5
- Number of simultaneous contouring control axes: 5
- Least command increment: 0.1 micrometer
- Least control increment: 1 nanometer
- Max. PLC program capacity: 20,000 steps

The Best Partner for Your Success
MITSUBISHI CNC
Versatile lines boasting compact size and less wiring

**Drive units**
- Multi-hybrid drive unit | MDS-DM2 Series
- High-performance drive unit | MDS-D2/DH2 Series
- Ultra-compact drive unit with built-in power supply | MDS-D3 Series

**Servo motors**
- Medium-inertia motor | HF Series
- Low-inertia motor | HF-KP Series
- Direct drive motor | TM-RB Series
- Rotary detector | MBA Series

**Spindle motors**
- High-performance spindle motor | SJ-D Series
- Low-inertia and high-speed spindle motor | SJ-DL Series
- Tool spindle motor | HF-KP Series
- Detector for C axis | MBE Series

**Operation panel I/O unit** (Max.: 96 inputs/96 outputs)

**Ethernet**
- Manual pulse generator
- RIO 1 (Max.: 256 inputs/256 outputs)
- RIO 2 (Max.: 96 inputs/96 outputs)

**Personal computer**

**High-speed optical communication**

<Display front side> USB memory interface

CF card interface
**Basic Performance**

- **Machining program**
  - **Capacity**: Machining program capacity is greatly enhanced to the standard of 500kB (1,280m).
  - **Processing speed**
    - TypeA: 33.7k blocks/minute
    - TypeB: 16.8k blocks/minute
- **Built-in PLC function**
  - Multi-program
    - Up to 20 PLC program files can be registered, which are executed according to priority. A PLC program can be split into each process and developed.
  - High-speed PLC engine installed (TypeA)

**Nano Control**

- The least control increment is one nanometer, the command increment is ±9999.9999, and the rapid traverse rate is 1000m/min. All processing from the analysis of machining programs to servo commands is performed in nanometers.
- **Speed command fluctuation reduced**
  - In nano control, the position command calculation fraction of the interpolation calculation is small, so fluctuations in speed command due to the fractions is reduced. This reduces acceleration fluctuations, resulting in finer lines at the time of repeated acceleration/deceleration.
- **Interpolation calculation accuracy improved**
  - Even with one-micron-unit commands in the machining program, interpolation is in nanometer units. As the calculation increment of a block intersection is improved, lines on the surface is finer.

**Multi-part Systems Multi-axis**

A maximum of two part systems and 11 axes can be controlled for both the machining center and lathe.

**Increased Production Efficiency**

**Remarkable reduction in cycle time**

- **OMR-DD control (high-speed synchronous tapping)**
  - A high-speed error-compensation function is used for controlling the spindle and servo, enabling accurate tapping.
- **Position Loop of Spindle Control**
  - The spindle’s constant position loop control has eliminated the zero point return time when switching from the spindle to C-axis.
- **Orientation time is reduced**
  - Deceleration is performed with the maximum torque to minimize the spindle orientation time.

**SSS Control**

- **Machining Center System**
  - By judging shapes in large from commanded paths, unnecessary deceleration is reduced even when fine steps exist; thereby, realizing smooth and deviation free die-mold machining. Machining time can be shorter by 5 to 30% relative to our conventional system, especially more effective at a higher feed rate.
  - (Note) Additional hardware is required. In order to use this function also in the 2nd part system, the option “High-accuracy control in 2 part systems” is required.

**Rapid Traverse Constant Inclination Multi-step Acceleration/Deceleration Function**

- Rapid traverse acceleration/deceleration is performed according to the motor’s torque characteristics.
- As the motor’s characteristics can be utilized optimally, positioning time is reduced, and cycle time is improved.

**Higher-grade CNC performance attained**

- **OMR DD Control**
  - Optimum Machine Response Direct Drive

- **SSS Control**
  - Super Smooth Surface

- **Position Loop of Spindle Control**
  - High traceability to command (High-gain control II), which has been developed in servo axis control, is now available for the spindle, contributing to shorter machining time and higher accuracy.

- **Rapid Traverse Constant Inclination Multi-step Acceleration/Deceleration Function**
  - Reduced by 20%
M70v series

Full of useful functions for combined machining

**Inclined Axis Control**
- Even when the control axes configuring 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.
- The inclination angle is set using a parameter, and axes are controlled using the movement amounts of the axes which are obtained through conversion and compensation using this angle.

**Hobbing (TypeA)**
- 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.

**Mixed Control (cross axis control) (TypeA)**
- 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.
- Two-part system synchronous thread cutting allows the 1st part system and the 2nd part system to perform thread cutting simultaneously for the same spindle.

**Balance Cut (TypeA)**
- X1 Z1 (Base axis) X2 Z2 (Synchronized axis)

**Polar Coordinate Interpolation**
- 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.
- It is useful for tasks such as cutting linear cutouts on the outside diameter of the workpiece and grinding camshafts.

**Milling Interpolation (TypeA)**
- 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.
Machining Center System

Compact Milling Machine

The compact operation board, in which the control unit is integrated, and the ultra-compact drive units achieve downsizing of the control board and machine.

Tapping Machine

The multi-hybrid drive unit optimally controls the spindle motor for tapping to bring out the function of high-speed tapping OMR-DD. An NC five-axis control (simultaneous four-axis) enables control of the tilt table.

Multi-axis Machining Center (TypeA compatible)

A system with a maximum of 11 axes and two part systems achieves optimal control even for a compound axis configuration that includes a synchronization axis and a peripheral axis, such as in a large machine or a line dedicated machine.

Lathe System

Compact Lathe

The compact operation board, in which the control unit is integrated, and the ultra-compact drive units achieve downsizing of the control board and machine.

Milling-enabled Lathe (TypeA compatible)

Even without a Y axis, the milling function enables contour control machining on the side or face of a workpiece. Furthermore, the tool spindle motor contributes to downsizing of the turret.

Compound Multi-axis Lathe (TypeA compatible)

Up to four spindles can be controlled by a system with a maximum of 11 axes and two part systems. Owing to the drive units that drive three servo axes/two spindles, we offer an optimal system construction for machines of various axis configurations.
Enhanced operability with greater ease of use

**HMI for Easier and More Visible Use**

- **Screen structure linked to 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.

- **Auto-scale adjustment of the graphic check function**
  
  When the automatic graphic check function is enabled, by selecting a file, the scale is automatically adjusted to draw the whole machining path. (In single-plane display mode)

- **3D solid program check**
  
  The added 3D solid model check function allows more realistic cutting check.*

**Operation Support**

- **Manual/Automatic backup function**
  
  - Batch backup of the NC data into the CF card/USB memory inserted in the front interface of the display is possible.
  - Data is automatically backed-up at a certain interval set by the parameter.

- **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.

- **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.

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*Available with M70V TypeA (M System) only.
### Easy to import external data

**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).

**Ethernet Communication**

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

**Front IC Card Mode**

- It is possible to directly search and run the machining programs from the CF card. 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.
- Easy to change languages of the guidance function using a CF card. (English + Two more languages are selectable)
- Support for 17 languages, securing reliable use worldwide.

**Languages supported**

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

**Downtime Reduction**

**Various support functions minimize downtime**

**Data Backup Function**

It is possible to backup NC data collectively and periodically to a CF card/USB memory on the front of the display. This backup data is helpful for restoring the system in the case of an accident.

**Program Restart Function**

It is possible to restart a program even when a machining program is interrupted due to tool breakage or power outages by automatically searching the block that was last executed before the interruption.

**Tapping Retract**

Even when tapping is interrupted due to emergency stops or power outages, retraction of the tool out of a workpiece can be automatically carried out upon restarting operation.

**Vertical Axis Drop Prevention Function at Power Failure**

The drive system instantly detects a power failure, and the gravity axis is retracted so as to prevent a crash with a workpiece.

**Ground Fault Detection for Each Motor Drive Unit with Higher Oil-proof**

Ground fault detection, which was formerly centrally performed by a power supply unit, has changed so that the fault can be detected per motor. As detecting a faulty axis is possible, the restore time is shorter.

**Drive Unit with Higher Oil-proof**

A cooling fan for the radiator fin outside the panel is molded so as to further prevent the oil from entering. The absence of a fan inside the drive unit contributes to the avoidance of electric circuit failures caused by inhaled dust and oil-mist.

**Application example** Remote monitor via tablet PC

When combined with Ethernet, NC Monitor enables remote monitoring via a tablet device. Within reach of wireless LAN, NC Monitor can display on a tablet PC an NC screen that is running on a shop floor. This allows an operator who is distant from work to remote-monitor program running state and presence of alarms, etc. This application also serves as a sub monitor of large-size or difficult-to-approach machines.

*For details of NC Monitor, refer to Page 18.

*Remote networking software (application) is required.

(Note) Wireless LAN system and security environment must be set up by the user.
Simple Programming Functions

Create machining programs on a personal computer

User Support Tools

**Interface Design with Overall View**

Intuitively view system configuration and machining programs.

**LIST VIEW**

LIST VIEW displays objects such as programs, processes, file data, and parameters.

**OPERATION VIEW**

OPERATION VIEW displays the items corresponding to the object selected in LIST VIEW. Data can be input easily referring to the guidance drawing for input items.

**Automatic Setting of Cutting Conditions**

Simply input the tool number. The cutting conditions for each process are automatically set based on previously registered tool files and cutting condition files.

**Checker and Guidance Functions**

Detects input errors for troubleshooting.

**Message guidance**

Troubleshooting options for input errors are displayed.

**Parameter guidance**

Displays parameter details and setting range.

**Tool guidance**

Displays primary data of the tool data previously registered in the tool file.

**Customize Machining Programs**

Machining programs using macro programs enable commands to be added between processes via the editing screen. Machine tool builders can customize the macro program of each process according to machine specifications and machining know-how.

**Menu**

**NAVI MILL**

- Turning
- Facing cutting
- Boring
- Milling
- Tray milling
- Keyway

**NAVI LATHE**

- Hole drilling
- Face cutting
- Contour cutting
- Pocket machining
- EIA

**NC Explorer** (Data Transfer Tool)

By connecting the NC and host personal computer via Ethernet, data such as machining programs can easily be shared. This tool is free of charge. Please contact us.

**NC Trainer / NC Trainer plus** (MITSUBISHI CNC Training Tool)

- NC Trainer is an application for operating the screens of MITSUBISHI CNC M70V 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.
Development Tools

More comfortable development environment

<Custom screen development>
Make your CNC more user-friendly by developing original screens

NC Designer (Screen Design Tool)
- By laying out ready-made standard parts, you can easily create original screens without programming.
- When using a 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.)

цион настроить экраны пользователя.

<Sequence program development> Editable on both personal computers and HMI screens

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.

Onboard Ladder Editor
Operability of ladder editing/monitoring on the NC display is widely improved. Various functions are enhanced, such as divided screens, the search function and the monitoring screen.

Setup Installer
Register the desired display language.

NC Configurator2 (Parameter Setup Support Tool)
The NC data file necessary for NC control and machine operation (such as parameters, tool data and common variables) can be edited on a personal computer. Please contact us to purchase a full function version. (A limited function version is also available free of charge.)

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.

Main functions
- Block diagram measurement display, speed loop gain adjustment, position loop gain adjustment, notch filter setting, acceleration/deceleration time calculation, power supply capacity selection, power supply facility capacity calculation, etc.

<Easy setup>
Offering a wide range of support tools, from machine design to setup

Servo Selection Tool
By selecting the machine configuration model and inputting the machine specification parameters, the optimal servo motor meeting specifications can be selected. Other selection functions which fully support drive system selection are also available. This tool is free of charge. Please contact us.

<Main functions>
- Servo motor capacity selection, regenerative resistor capacity selection, spindle acceleration/deceleration time calculation, power supply capacity selection, power supply facility capacity calculation, etc.

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.

<Device batch display>
17 18

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A wide range of support features according to various machine configurations

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.

Hardware

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. The term of warranty coverage from the date of shipment from Mitsubishi Electric or its distributor.

2. Service in Overseas Countries

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

3. Exclusion of Responsibility for Compensation against Loss of Opportunities, Securities, 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 damages arising under specific circumstances that either foresee or unforesee 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 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 application 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.

(seriesM 70 V)
Specifications

**Direct Drive Servo Motor TM-RB Series**

*The control unit is integrated into the back side of the display.*

- **Specifications**

  - **Max. number of PLC axes**
  - **Max. number of linear axes**
  - **Max. number of rotary axes**
  - **Max. number of linear axes + rotary axes**

  - **Max. PLC program capacity**
  - **Max. program capacity**
  - **Least control increment**

  - Additional hardware is required.

**Displays & Keyboards**

- **FCU7-KB029**
- **FCU7-KB024**
- **Lathe system sheet keys**
- **8.4-type & 10.4-type touch panel**

**Servo Motors**

- **High-performance Servo/Spindle Drive Units MDS-D2/DH2 Series**
- **High-performance New Type Spindle Motor SJ-D Series**
- **Low-inertia, High-speed Spindle Motor SJ-DL Series**
- **Low-inertia, High-speed Spindle Motor SJ-VL Series**

- **Spindle Motors**
  - **High-performance Spindle Motor SJ-V Series**
  - **Tool Spindle Motor HF-KP/HF-SP Series**

**Drive System**

- **High-performance Servo/Spindle Drive Units MDS-D2/DH2 Series**
- **All-in-one compact drive units MDS-DJ Series**
- **Linear Servo Motor LM-F Series**
- **Direct Drive Servo Motor TM-RB Series**

**Drive Units**

- **Multi-hybrid Drive Units MDS-DM2 Series**

(Refer to the specifications manuals.)