Multi-axis high response CNC for Industrial Machine

FANUC
Power Motion *i*-MODEL A

Multi-axis high response motion controller for industrial
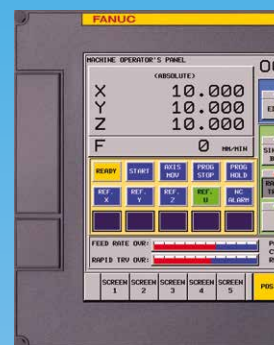
FANUC Power Motion i-MODEL A

Max. number of paths : 4 paths
Max. total number of controlled axes : 32 axes
Max. number of simultaneous controlled axes : 4 axes

Multi-axis high response motion control

- Up to 24 programs can be executed at the same time
- Shortened cycle time by quick axis start/stop
- Improved accuracy for machines that require high speed operation by quick response to an external signal
- Shortened cycle time by high speed ladder execution cycle

FANUC Power Motion

Functions for industrial machines

- Supports up to 32 axes by PMC axis control function that can be executed independently for each axis
- Flexible motion control of axes by position, speed, torque, or pressure
- Synchronous operation up to 32 axes
- Shortened cycle time by PMC axis control acceleration/deceleration specification feed
- Used for a wide range of industrial machines and motion applications with multi-axis and multi-process functions
  Examples:
  ・Press machines   ・Die cushions   ・Loaders
  ・Wire saws   ・Winding machines   ・Filling machines
  ・Packing/wrapping machines   ・Stamping machines
  ・Replace hydraulic cylinders with servo motor, etc.
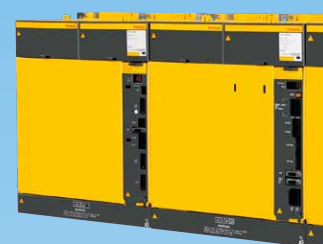
Servo Amplifier
Achieving Energy

Functions for press machines

- Easily control the link type servo press
- Improved forming quality by high accuracy pressure control
- Coordinated motion of transfer system with press machine can be performed easily by electric CAM function
- Easily replace hydraulic drive to servo drive with press related functions

Servo motors and servo amplifiers

- Servo motors, DD motors, and linear motors line-up from small to large models can support to various industrial macines
- Servo amplifiers achieve significant energy savings with power source regeneration and the latest low–loss power devices

Servo motors
wide range line-up

machines

i-MODEL A

Savings

State-of-the-Art Hardware

- Leading-edge hardware has enhanced the basic performance of the motion controller, servos and the PMC
  - Ultra high-speed digital servo processors
  - High-speed internal bus
  - Optical fiber cables for high-speed data transfer

Variety of customized functions

- Simplified custom screen development with FANUC PICTURE further compact operator's panel with touch panel
- Advanced functionality with C language executor

Various types of field networks

- Various types of architectures can be constructed easily by using field networks with PLC and peripherals
- Communication with PC and robot can be performed easily via embedded Ethernet
- Various information of machines can be collected and managed by using FANUC MT-LINK*i*

High reliability and easy maintainability

- Hardware built for high reliability allows robust operation in harsh industrial environments
- Enhanced diagnostics improve maintainability so the cause of trouble can be identified quickly reducing MTTR
- USB port can be used to transfer files or upload/download data in the controller using easily obtainable USB flash drives

Superior safety functions

- Integrated safety functions facilitate safety of machine by Dual Check Safety (DCS)
- Integration of motion control and safety
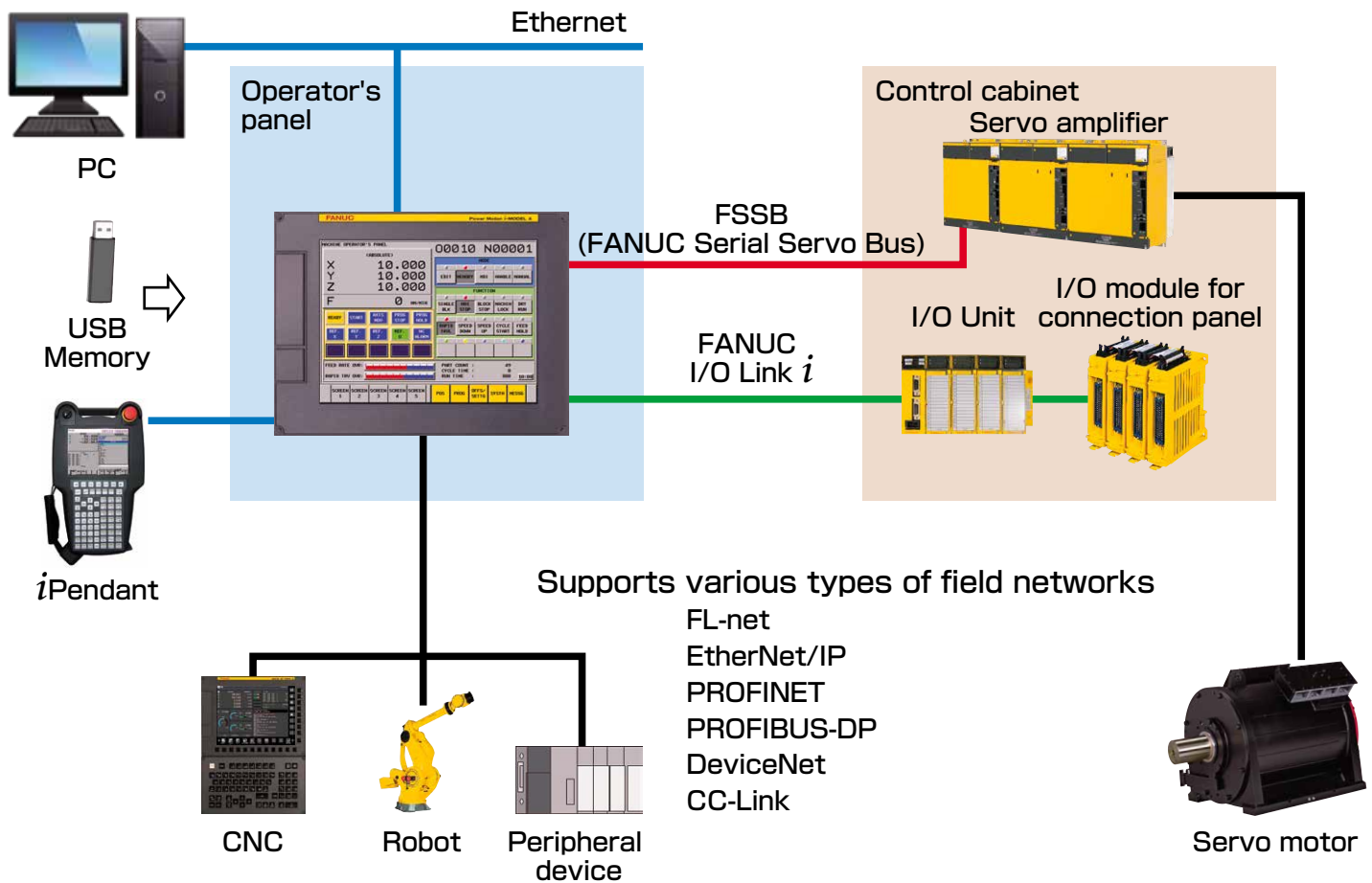- Conformity with International Safety Standard "Functional Safety" ISO13849-1

State-of-the-Art High-Speed, High-Reliability Hardware
Ultra-Compact, Reduced wiring, High-Reliability

Ethernet

PC

USB Memory

*i*Pendant

Operator's panel

FSSB
(FANUC Serial Servo Bus)

FANUC I/O Link *i*

Control cabinet
Servo amplifier

I/O Unit

I/O module for connection panel

Servo motor

CNC Robot Peripheral device

Supports various types of field networks
FL-net
EtherNet/IP
PROFINET
PROFIBUS-DP
DeviceNet
CC-Link

Enhanced basic performance

Leading-edge hardware has enhanced the basic performance of the control, servos and the PMC to support advanced control functionality such as multi-axis multi-path control.

Thin and compact

The LCD-mounted type control with all the functionality implemented behind the display greatly reduces control mounting space required on the machine. This contributes to downsizing. Intelligent communication functions are also embedded in the ultra-thin control unit of 60mm in depth, which helps design a compact operator's panel.
A standalone type for panel mount is also available - making operation with or without a display possible. This allows selection of a controller suitable for your machine.

Leading-edge servo control with fast FSSB and high-speed DSP

Controls and amplifiers are connected with FSSB (FANUC Serial Servo Bus) using an optical fiber cable. Leading-edge DSPs and newly-designed FSSB offer advanced servo control such as multi-axis control and fast current control.

FANUC I/O Link *i*

FANUC I/O Link *i* is a serial I/O interface between the PMC and various I/O units. In addition to general-purpose I/O units, the machine operator's panel or handy machine operator's panel can also be connected.
FANUC I/O Link *i* helps with quick recovery from trouble by making it easy to pinpoint the faulty part using various error detection capabilities such as bitwise DO ground fault detection and I/O power supply failure detection, etc.

High reliability achieved by ECC

By applying the ECC (Error correcting code), it can automatically correct the error from electrical noise inside of the CNC. As a result, a highly reliable CNC is realized.

*i*Pendant

*i*Pendant is a portable operating unit. It is possible to watch the CNC screen and operate the machines at a distant point from the main operator's panel. Moreover, touch panel and the manual pulse generator can be selected as an option.

Intelligent Servo System with High-Speed, Precision and Efficiency
## Promoting High-Speed, Precision, Compact Size and High Efficiency of Industrial Machines

FANUC AC SERVO MOTOR αi-B series , βi-B series

AC SERVO MOTOR Achieving Servo Drive for Industrial Machines

- **Wide range of sizes**

  Motor ranges with continuous torque from 0.16Nm to 18000Nm

  Large servo motors with high torque and high power are suited to large industrial machines.
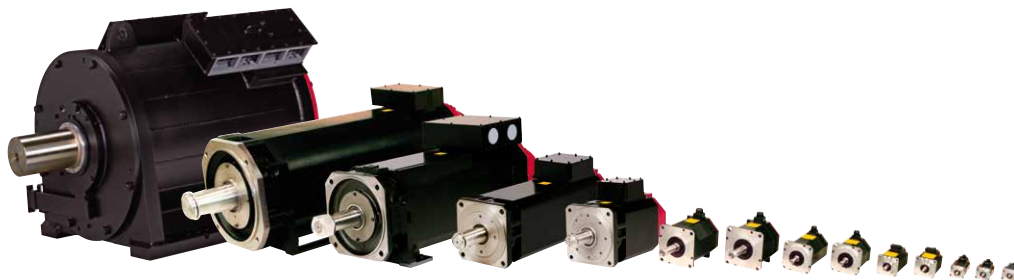
FANUC DD MOTOR DiS-B series
FANUC LINEAR MOTOR LiS-B series

DD Motor and Linear Motor Achieving High-Speed and High Precision Feed for Industrial Machines

- **Wide range of sizes**

  DD Motor : Motor range with continuous torque from 15Nm to 4500Nm
  Linear Motor : Motor range with peak force from 300N to 21000N

- **High-speed and high acceleration with direct drive**

  Achieving high-speed and high precision feed for industrial machines due to high response and backlasheless with direct drive

FANUC SERVO AMPLIFIER αi-B series , βi-B series

Compact and Energy Saving Servo Amplifier

- **Compact size**

  Downsizing of amplifier is achieved by optimum cooling design, also contributing to control cabinet downsizing.

- **Energy saving**

  Power consumption is largely reduced by full line regeneration back to power source.
  Reduction in power loss is achieved by using the latest high efficiency power devices.

- **Technology for larger output**

  Large servo motors can be driven by multiple standard large servo amplifiers.
  Supporting larger output application by multiple motor drive.

Reduce capacity of power source by Energy Charge Unit

- **Cutting peak power of power source**

  Large servo motor needs high power to accelerate.
  This function provides power from buffering motor to driving motor, and can cut peak power from power source.
  By using FANUC AC SERVO MOTOR with high efficiency as buffering motor, the whole system is high efficiency.
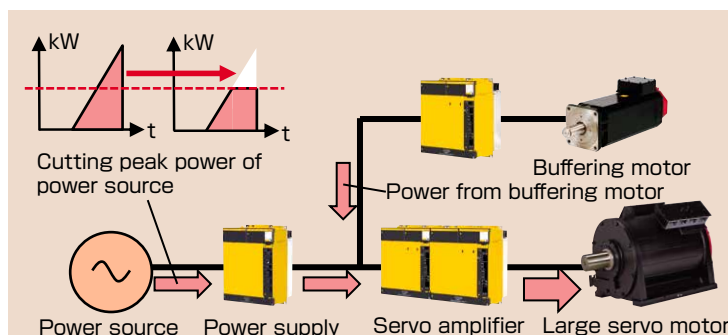
Multi-axis high response motion control

Multi-axis high response function for quick axis start/stop

Simultaneous execution of multiple programs.
- Independent motion for each axis can be achieved by ISO G-code program as max. 24 programs can be executed at the same time.

Quick response is achieved for an external signal.
- Examples of machines where the accuracy can be improved are: notching machines, stamping machines, cutting machines, packaging/wrapping machines.
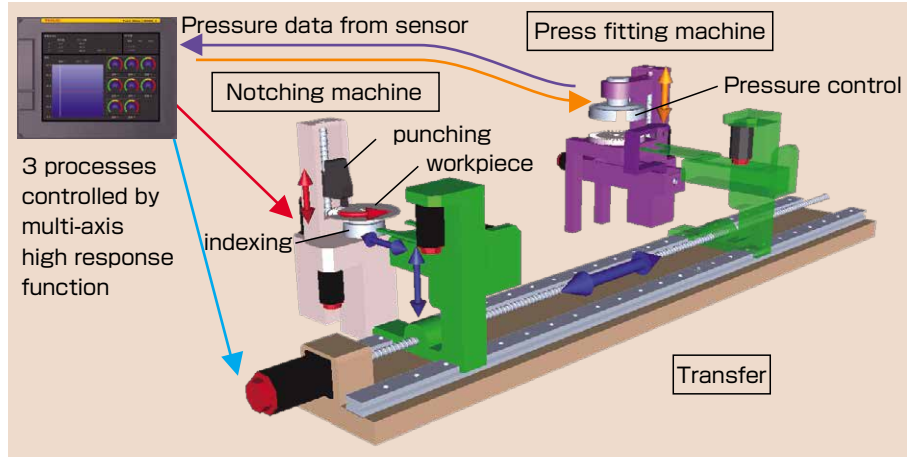- High response and reduction of cycle time can be achieved by high-speed ladder execution cycle.
- The pressure control can be achieved with high accuracy by the pressure and position control.

Pressure data from sensor

Press fitting machine

Notching machine

Pressure control

3 processes controlled by multi-axis high response function

punching workpiece

indexing

Transfer

Applicable functions for industrial machines

Flexible support for various machine configurations by multi-axis and multi-path functions

One control can support up to 4 paths and 32 axes – this includes multi-axis machines.
- Up to 4 ISO G-code programs can be executed at the same time. Independent operation such as press operation and loader operation, etc. can be easily achieved. Synchronization between two or more executing programs can be easily achieved by the waiting M-codes function.
- Simple motion profiles can be achieved by using the ISO G-code programs and/or PMC axis control functions.

Integrated functions for press machine

Control function for link type press
- Link type servo press where deceleration ratio in slider part changes according to the main gear position angle can be controlled easily.

Electric CAM function
- Synchronized motion between transfer machine and press machine can be performed by electric CAM function.

position data from press machine

Press machine

cooperate with press machine

Transfer

workpiece
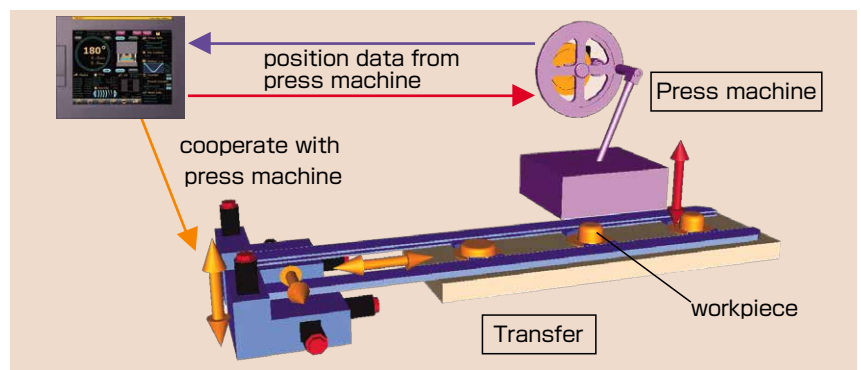
Contribution to introduction of IoT on the machine

FANUC MT-LINK*i* (Operation Management software)

MT-LINK*i* is a PC software product that can collect and manage various information of machines in the factory connected via Ethernet. You can collect not only information of machine with FANUC CNCs, but also information of other devices such as a PLC supporting OPC communication with MT-LINK*i*.
MT-LINK*i* can manage the operation results and perform other processing based on the collected information.
It also has a function for transferring machining programs, which contributes to the centralized management of machine in the factory and improvement of minimizing downtime by checking the operating status.
The collected data including operation results can be read from a third-party upper host system such as MES（Manufacturing Execution System）and user applications.

Upper Host System (MES etc.)

FANUC MT-LINK*i*
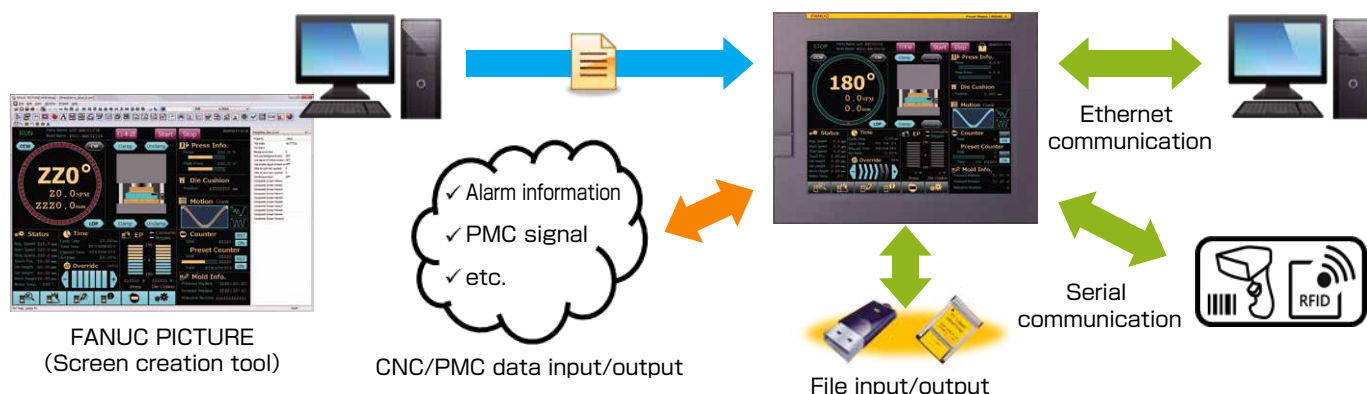(Operation management software)

Ethernet

PLC
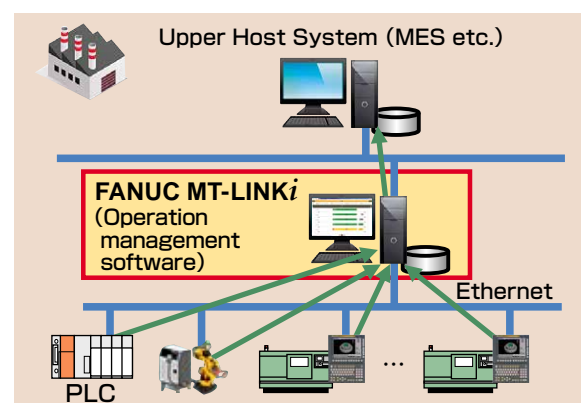
Many Customizable Functions

FANUC PICTURE

This tool enables you to create a machine operation screen simply by pasting screen components such as buttons and lamps on the PC.

- The screen creation tool is FANUC's proprietary easy-to-use user interface that is optimized for creating screens for CNCs.
- Screens that are created can be displayed and operated on various CNC models.
- A screen usable on a display unit with or without a touch Complicated controls such as network communication and file control can be easily implemented by using general-purpose scripts.

In addition, in the PANEL *i*H series display device, it is possible to create screens that leverage the performance of display devices.

- You can display the font for each language of any desired size.
- You can display buttons, lamps, and high precision images in full color.

FANUC PICTURE
(Screen creation tool)

✓ Alarm information
✓ PMC signal
✓ etc.

CNC/PMC data input/output

File input/output

Ethernet communication

Serial communication

C Language Executor

Machine tool builders can create their own operation screens, which enables unique control display and operation.

- In addition to standard ANSI functions, many functions are available for controls and PMCs.
- High-level tasks to which high execution priority is assigned can monitor signal and position information.

Easy maintenance

Maintenance parts

Fans for cooling and the backup battery in snap-in cartridges can be replaced quite easily enhancing maintainability.
(LCD-mounted type control)

On the amplifier, fan motors are detachable from the front side for easy access.
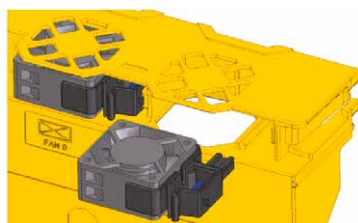
Preventive maintenance

Unexpected system downtime can be prevented by predictive trouble detection and warning indication.

Trouble Diagnosis Function

The cause of an alarm can be diagnosed by answering questions displayed on Trouble Diagnosis Guidance Screen when an alarm occurs on the control. As a result, downtime can be shortened.

Safety Functions

Integration of motion control and safety

Dual Check Safety Function

This is a safety function integrated into the CNC that conforms to ISO 13849-1 PL d. Multiple processors perform dual monitoring of the actual positions, speed, and safety-related I/O of servo motors, securing a high level of safety by providing duplicated paths for cutting off power.

Network safety function

By combining this function with the Dual Check Safety function, safety functionality of the machining line is achieved.

- Safety function by FL-net
- EtherNet/IP Adapter Safety function
- PROFINET IO Device Safety function

Safe Torque Off (STO) function

This is a safety function integrated in servo amplifiers that conforms to IEC 61800-5-2.
Motor power can be safely cut off by the duplicated cut-off path within the amplifier.

Dual Check Safety Function
· The machine can be operated safely while the protective door is open

Optimization of set-up tasks

Network safety function
· Achieves the safety functionality of the machining line

Safety I/O signal
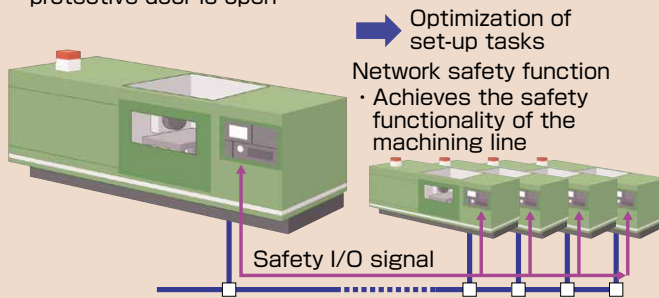
Service & Support

Excellent Maintenance Services

FANUC service team delivers customer trust and confidence based on direction of service "Maximizing Uptime", "Global Service" and "Lifetime maintenance".

Service First

Conforming to the spirit of "Service First", FANUC provides lifetime maintenance to its products for as long as they are used by customers, through more than 260 service locations supporting more than 100 countries and regions throughout the world.

Maximizing Uptime

Global Service

Lifetime Maintenance

FANUC ACADEMY

FANUC ACADEMY operates versatile training courses to develop skilled engineers effectively in several days.

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