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TOYODA®

MC1K·AF1K·MA1K

Motion controller K-series



JTEKT

JTEKT CORPORATION

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Motion controller K-series

Compact, excellent cost performance, advanced features, high accuracy, and high maintenance efficiency....These are the features of the motion controllers JTEKT is introducing to the world with pride and confidence.

What is the K-series?

The 1-axis indexing controller [MC1K], 1-axis CNC controller [AF1K], and multi-axis motion controller [MA1K] are generally referred to as "K-series" motion controllers.

You can choose the most appropriate controller for your unique requirements.

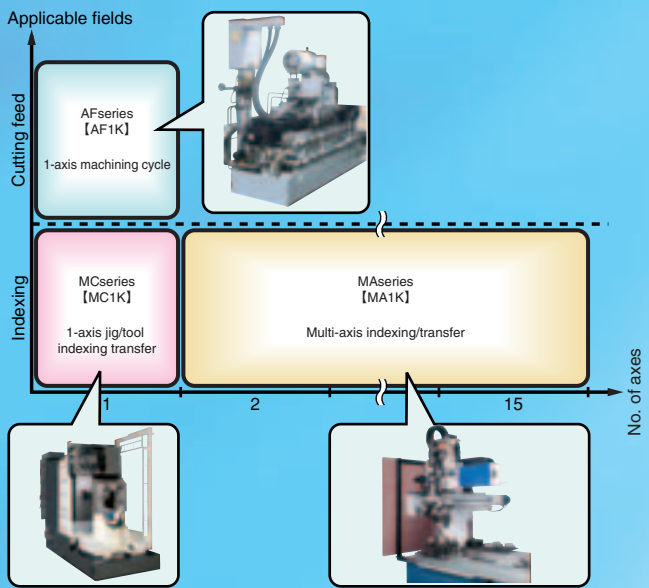
Find your best-suited controller in accordance with the number of axes, applications, and languages (no language, NC language, motion language).

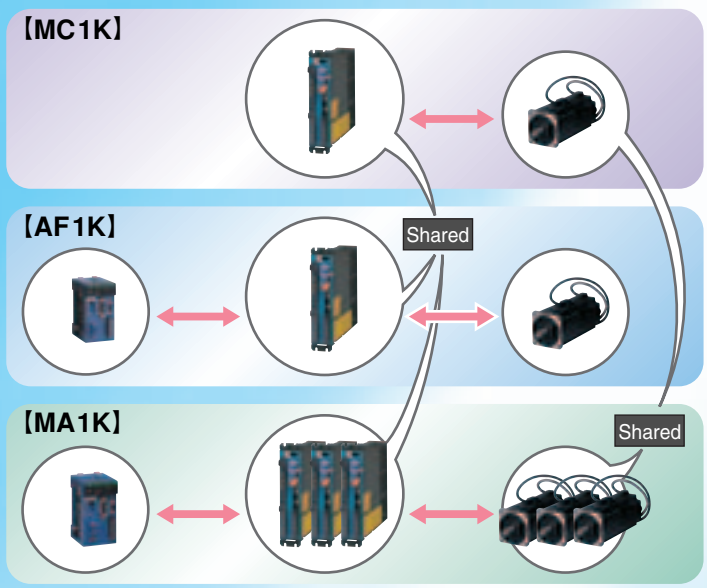
Compact, yet filled with in-depth equipment know-how.

The MC1K with built-in servo-amplifier, palm-size AF1K and MA1K. They are all very small but can do excellent work such as providing reliability with features like absolute position detection and software servo-mechanism, shortening adjustment time with the auto-tuning function, shortening cycle time with the multi-task/multi-unit function, and standardizing the sequence circuit design because they are filled with of an enormous equipment know-how accumulated over years.

Devices are compatible between all K-series controllers.

The controller main unit, servo-amplifier, and servomotor are compatible between all K-series controllers. Therefore, improvement in design efficiency and maintenance efficiency is achieved through the standardization of design and reduction of spare parts.





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K-series and components comprising the series

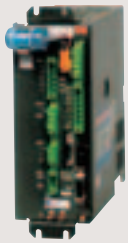
【MC1K-V】



→P3

1-axis indexing
motion controller

【MC1K-J】



Miniaturized,
lower-priced and
limited-to-small capacity

→P9

【MC1K-D】



Compatible
with DeviceNet

→P9

Feed unit integrated control system

【MC10】



Integrated,
power supply
regenerative &
two-axis built-in type

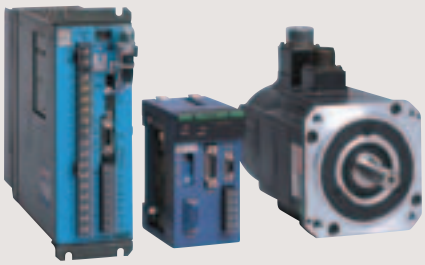
【AF10】



Integrated,
2 channel
independent control

→P11・12

【AF1K】



→P5

1-axis CNC
motion
controller

【MA1K】



→P7

Multi-positioning
motion controller

【MA1K-Ls】

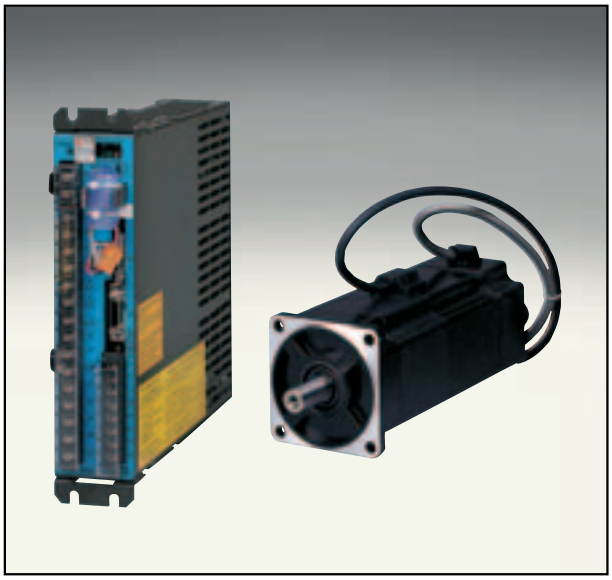


Multi-axis controller
specialized in
transfer/loading

→P10

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MC1K-V *Simple, flexible and low cost*



Compact controller/servo amplifier integrated type

The MC1K-V incorporates a power source, a controller and a servo amplifier in one piece - a space-saving and mountable unit

PLC(programmable controller)-led, flexible control

Such commands as indexing point are led by PLC thereby allowing flexible control. The MC1K-V can be connected to a PLC with one serial cable (PLC link or HPC link).

Most suitable motor selectable

A high-speed rotation type motor is used for the servomotor. The most suitable motor for your needs can be selected as the servomotor is available in models ranging from 50W for light-load application, up to 15.0kW

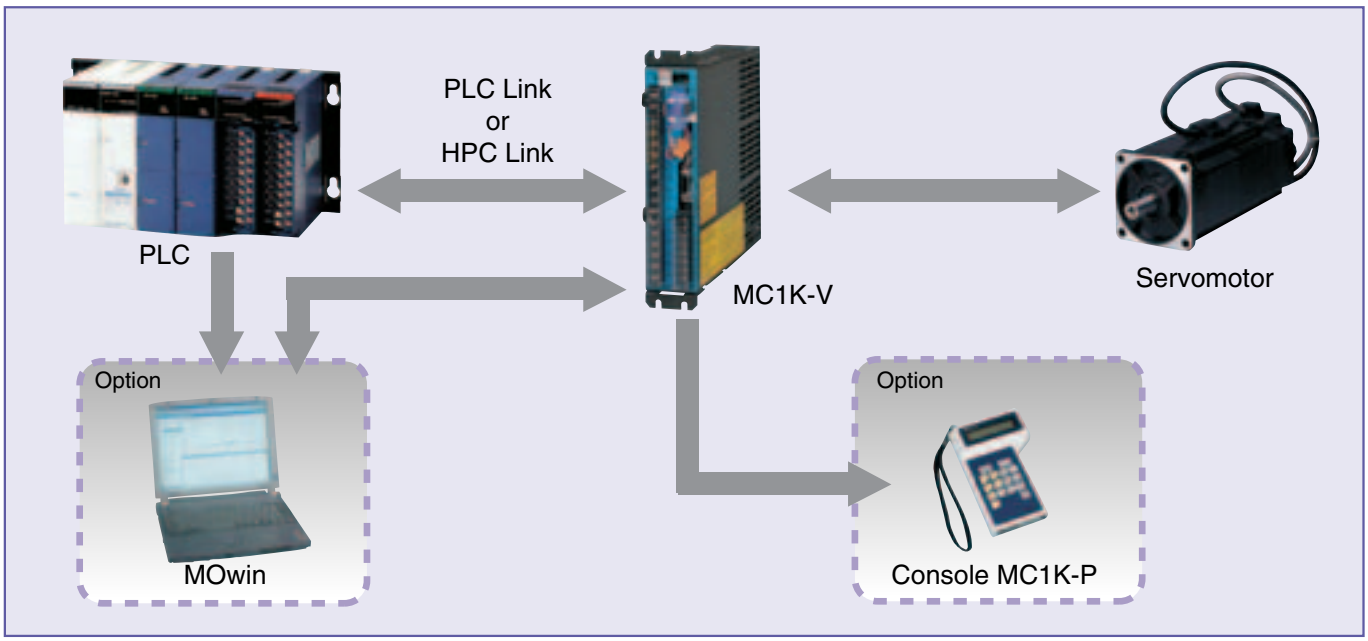
One unit plays three roles

This unit works not only as a controller for one-axis indexing operation but also as a servo-amplifier for the 1-axis CNC controller AF1K and for the multi-axis positioning motion controller MA1K. It also can be run by direct commands from an upper-ranking controller, such as CNC.

A variety of compensation functions

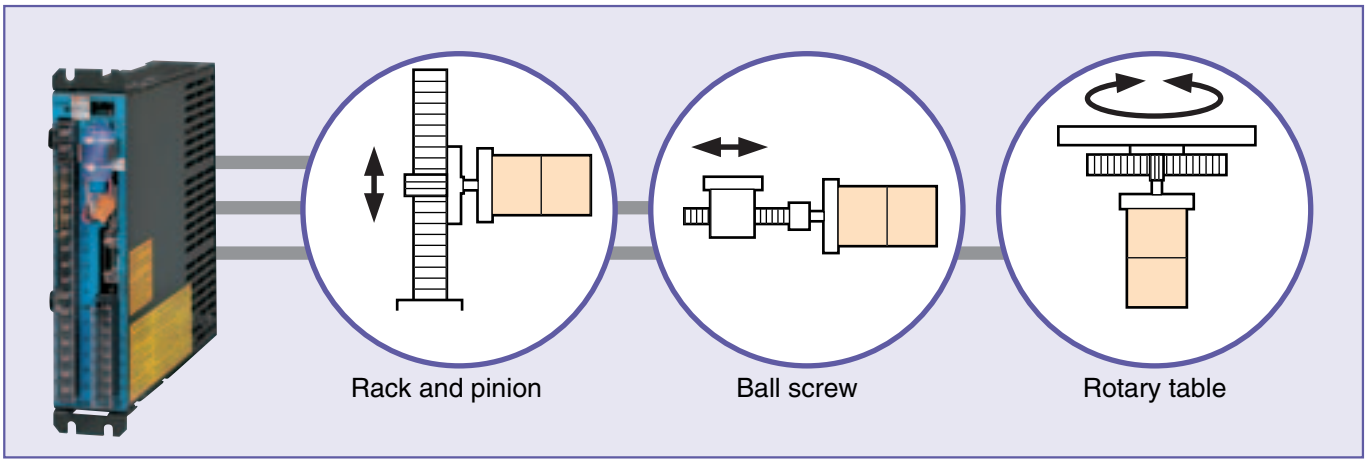
The "compensation amount input function" allows you to write the compensation amount for the indexing position from a PLC, and this compensation amount can be increased or decreased by a fixed amount as well. The "one-way indexing direction compensation function" (backlash compensation function) can minimize the fluctuations in the stopping position caused by the backlash mechanism. Furthermore, the unit can be forcibly stopped by an external signal during the indexing operation. (External positioning function) The difference between this stopping position and the programmed indexing position is that this stopping position can be used as the compensation amount for another indexing position. (Indexing position compensation function)

■ Configuration



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■ Applications



■ Specifications

■General specifications

Item		1-axis indexing motion controller
Type		MC1K-U015V MC1K-U030V MC1K-U050V MC1K-U100V MC1K-U150V MC1K-U300V
Hardware		
	Main circuit power source voltage	3 Phase AC200V～230V＋10, －15% 50/60Hz±3%
	Control power source voltage	Single phase AC200V～230V＋10, －15% 50/60Hz±3%
	Ambient temperature/humidity	0-55℃/90% RH under (No dew condensation)
	Structure	Tray type power source built-in
	Detector	Absolute encoder (Resolution 8,192 pulses/rotation)
	Maximum detection range	Amount of shift per motor rotation ×1,024 rotations
	Built-in function	DB resistance, Regenerative resistance

■Controller function mode

Connection		
	Communication method	PLC Link or HPC Link
	No. of I/O points	32/40 points 56/72 points 64/72 points selection
	Transfer speed	PLC Link: 19.2/57.6kbps HPC Link: 625kbps
	Communication cable	Twist pair cable (shielded)
	Total cable length	PLC Link: Maximum 1 km HPC Link: Maximum 500m
Functional specifications		
	Control axis	Linear axis/rotating axis
	Unit of setting	0.01mm(Linear axis)/0.01˚ (Rotating axis) Note) In the case of non-integral speed reduction, these numbers change depending upon the speed reduction range.
	No. of indexing points	16 points (in single command) 60 points (in matrix command) 700 points (in BCD command)
	No. of in-position and position output signals	In-position output: 700 points Programmable position output(Position output): 16 points
	Feed rate	Feed rate is set for each indexing point.
	Acceleration/deceleration	Linear acceleration/deceleration, S-slope acceleration/deceleration
	Compensation functions	External positioning function, indexing position compensation function, one-way indexing function
	Monitor functions using MC1K-P	Monitoring of speed command, motor speed, motor current, and positional deviation using check terminals
	Other functions	Jog, current limit, Motor power off, (1/n) Endless operation, Stored stroke limit function
	Peripheral equipment	Console MC1K-P Windows Software "MOwin"

■Amplifier function mode

Connection		
	Communication method	SV Link
	No. of connection axes	AF1K: Maximum 1 axis MA1K: Maximum 15 axes
	Communication cable	Twist pair cable (shielded) RG-22B/U or 0VCTF-SS2C×0.75²
	Total cable length	Maximum 400m (when using RG-22B/U) Maximum 100m (when using RG-22B/U or 0VCTF-SS2C×0.75²)
Functional specifications		Refer to AF1K and MA1K

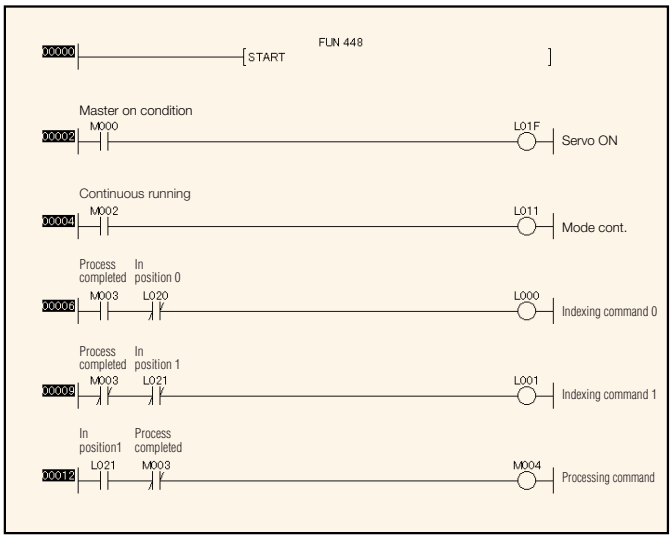
■Applicable servomotor

Amplifier	Motor	Applicable servo amplifier: MC1K-U
AP-1M	075	030V
	100	
AP-2M	005	015V
	010	
	020	
	030	
	040	030V
	050	
	075	050V(S)
	100	

Amplifier	Motor	Applicable servo amplifier: MC1K-U
AP-3M	048	015V
	066	030V
	120	050V(S)
	160	
	250	100V(S)
	360	
	450	150V(S)

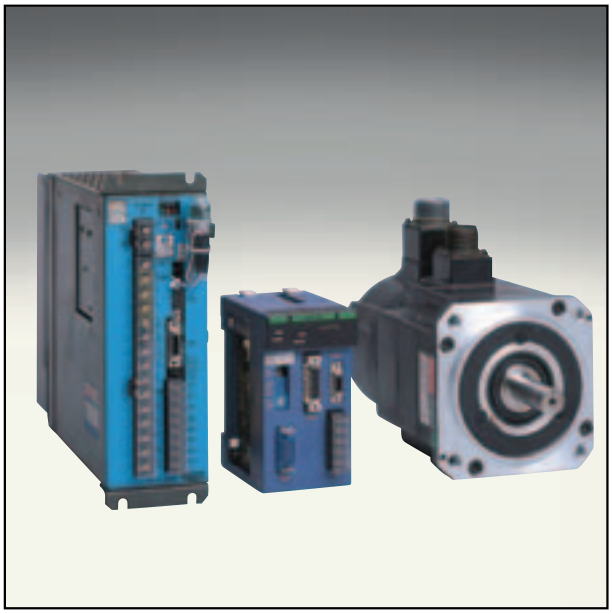
Amplifier	Motor	Applicable servo amplifier: MC1K-U
AP-5M	150	050V(S)
	200	100V(S)
	350	150V(S)
	450	
	550	
	700	
	750	300VS
	11K	
	15K	

■ Ladder circuit (Example)



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AF1K *Indispensable unit for compact machine tools*



Controller integrated with PLC (Programmable Logic Controller)

The controller was inserted as a module for TOYOPUC-PC3J/2J, which resulted in a reduction of wiring and mounting space.

User-friendly programming language

Commands (NC language) incorporating G Code (JIS) used by the JTEKT CNC unit are used for programming.

A variety of compensation functions

The fields of application are expanded because of the various compensation functions including the external signal positioning function (skip function), incremental/decremental compensation function, and indexing position compensation function.

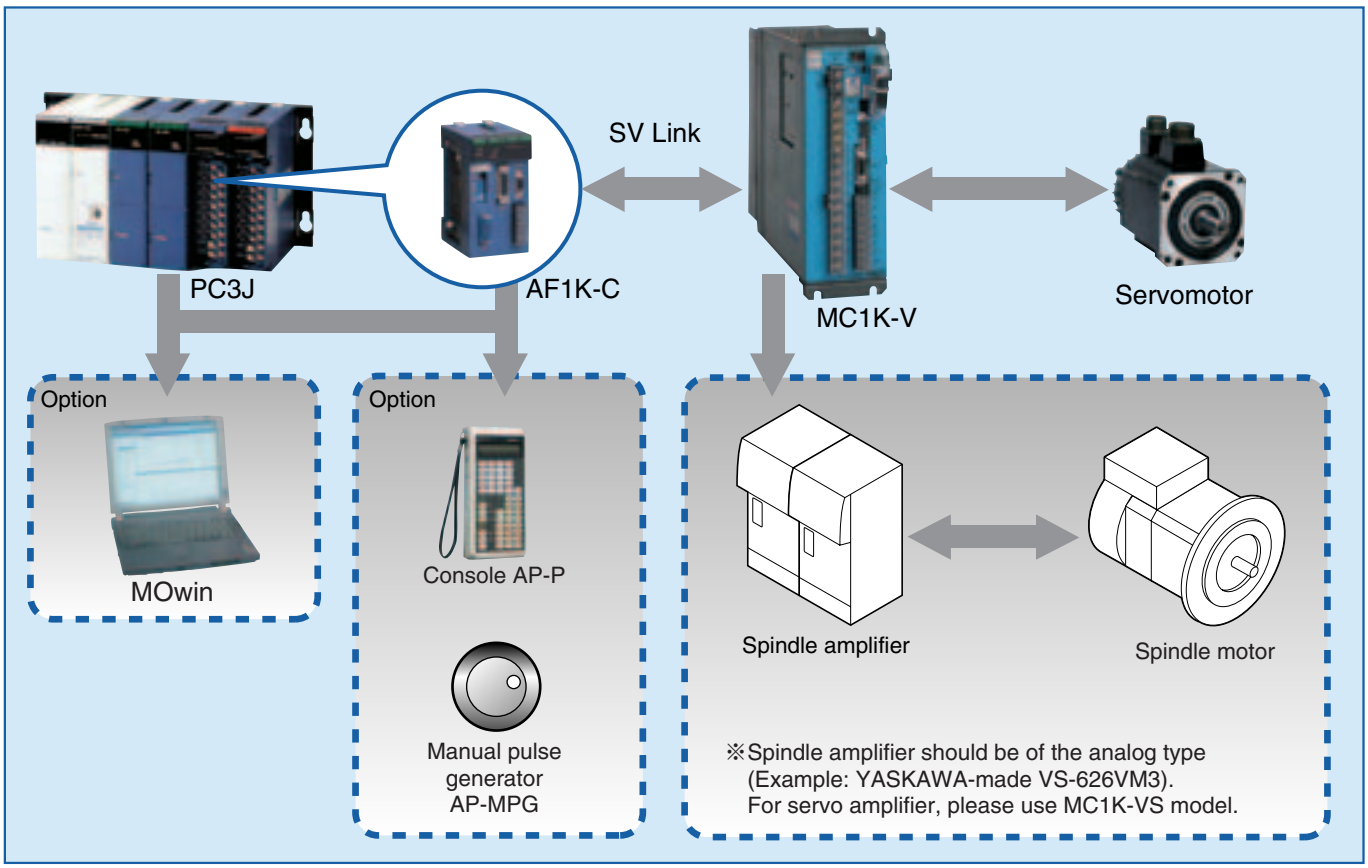
High accuracy synchronous tapping function

The synchronous error compensating function allows you to process the tap operation of JIS 1 degree in error pulse levels. (Using JTEKT machines)

High resolution/high speed servomotor

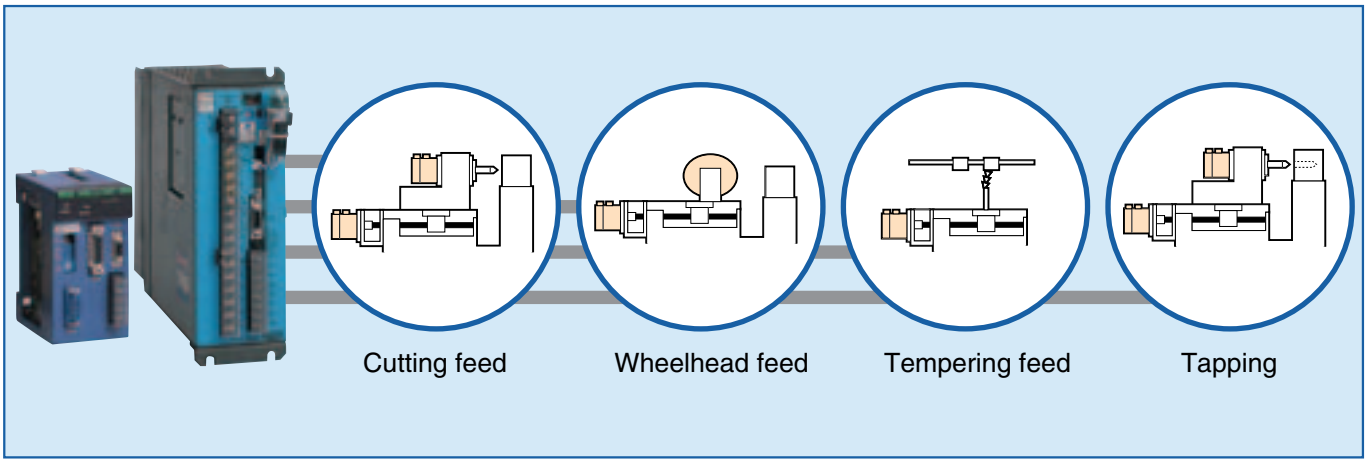
The resolution of the absolute encoder is 32768 pulses/revolution and the motor speed is 8192 revolutions, capable of controlling long strokes.

■ Configuration



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■ Applications



■ Specifications

■Controller specifications

Item	1-axis CNC motion controller
Type	AF1K-C
Basic specifications	
Power source	5V dc ±5% (supplied from C3J)
Current consumption	At and under 1.0A , controller alone
Ambient temperature/humidity	0-55℃/35-85% RH (No dew condensation)
Control axis	1 Linear axis
Unit of setting	0.001mm
Detector	Absolute encoder (Resolution 32,768 pulses/revolution)
Maximum detecting range	Traveling distance per motor revolution × 8,192 revolutions
P[S1]C interface	PC3J module (2 slots)
Input/output signal	Standard 80/80 points (expansion 48/48 points)
No. of programs	32 programs
No. of blocks	1,600 blocks (50 blocks × 32)
Functional specifications	
No. of positioning outputs	20 (compensation register can be added)
No. of M outputs	16 programs
Flag output	8 programs
Skip signal	8 (General-purpose inputs are defined by program)
Compensation functions	Register: 16 Level output: 1(Compensation amount limit: 5-level output possible) Compensation amount addition/subtraction : 8 (Operation via PLC possible)
Coordinate system	Machine coordinate · Workpiece coordinate
Feed rate	mm/min G000, G001 μm/min G215 (Low cutting feed)
Mode	Program operation, Single block operation, Jogging operation, Step operation, Manual handwheel operation, Editing
Spindle control	Rigid tapping, Multi-orientation
Peripheral equipment (optional)	Windows Software "MOwin" AP-MPG (Manual pulse generator) AP-P (Console)

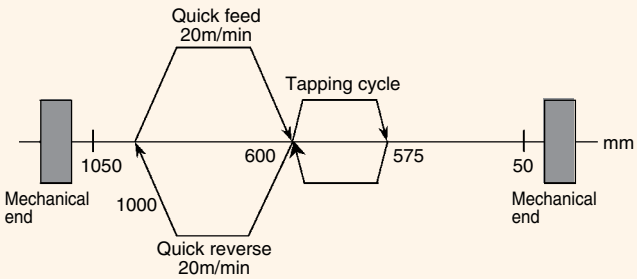
■Applicable servoamplier

Amplifier \ Motor		Applicable servo amplifier: MC1K-U
AP-4M	050	050V(S)
	100	
	150	
	200	
	350	100V(S)
	450	
	550	150V(S)

Amplifier \ Motor		Applicable servo amplifier: MC1K-U
AP-6M	050	050V(S)
	100	
	150	
	200	100V(S)
	350	150V(S)
	450	

Amplifier \ Motor		Applicable servo amplifier: MC1K-U
AP-7M	050	050V(S)
	100	
	150	
	200	150V(S)
	350	
	450	
	550	
	750	300VS
	11K	
	15K	

■ Programming (Example)



Maximum feed rate	20	m/min
Zero position	1000	mm
Quick feed target position	600	mm
Allowable deviation when start tapping	100	pulses
Tapping bottom value	575	mm
Tapping bottom dowel time	0.6	sec
Tapping pitch	1	mm/r
Tapping feed rotation speed	1000	min^{-1}
Process completion signal allocation	M1	

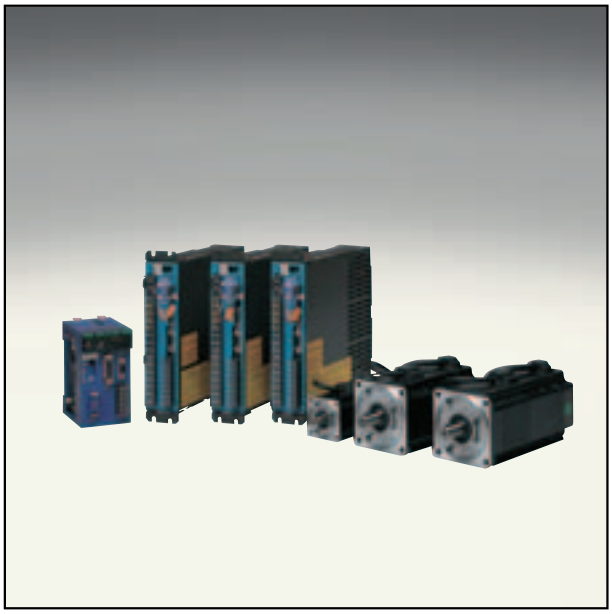
```
;PROGRAM01
(* Tapping cycle *)
M18                          (* Current limit off *)
G000X600000G011Q100          (* Quick feed, "IN POSI. WAITING"
                                within 100 pulses *)
G084X575000Q6F1000S1000      (* Tapping cycle *)
M1                           (* Process completion *)
G000X1000000                 (* Quick reverse *)
M30                          (* Program end *)

;PROGRAM08
(* Tapping return cycle *)
M18                          (* Current limit off *)
G085                         (* Tapping return cycle *)
G000X1000000                 (* Quick reverse *)
M30                          (* Program end *)
```

Notice) No inputting IN POSI. WAITING" (G11) may cause erroneous pulses to be excessive when you start tapping.

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MA1K *Applicable to any machine with excellent cost performance*



Controller integrated with PLC (Programmable Logic Controller)

The controller is inserted as a module for TOYOPUC-PC3J, which results in a reduction of wiring and mounting space.

User-friendly programming language

The motion language TL1 is used for the programming language. The TL1 is compatible with the programming language of JTEKT's FRIEND robot, leading to excellence in design efficiency and expansion.

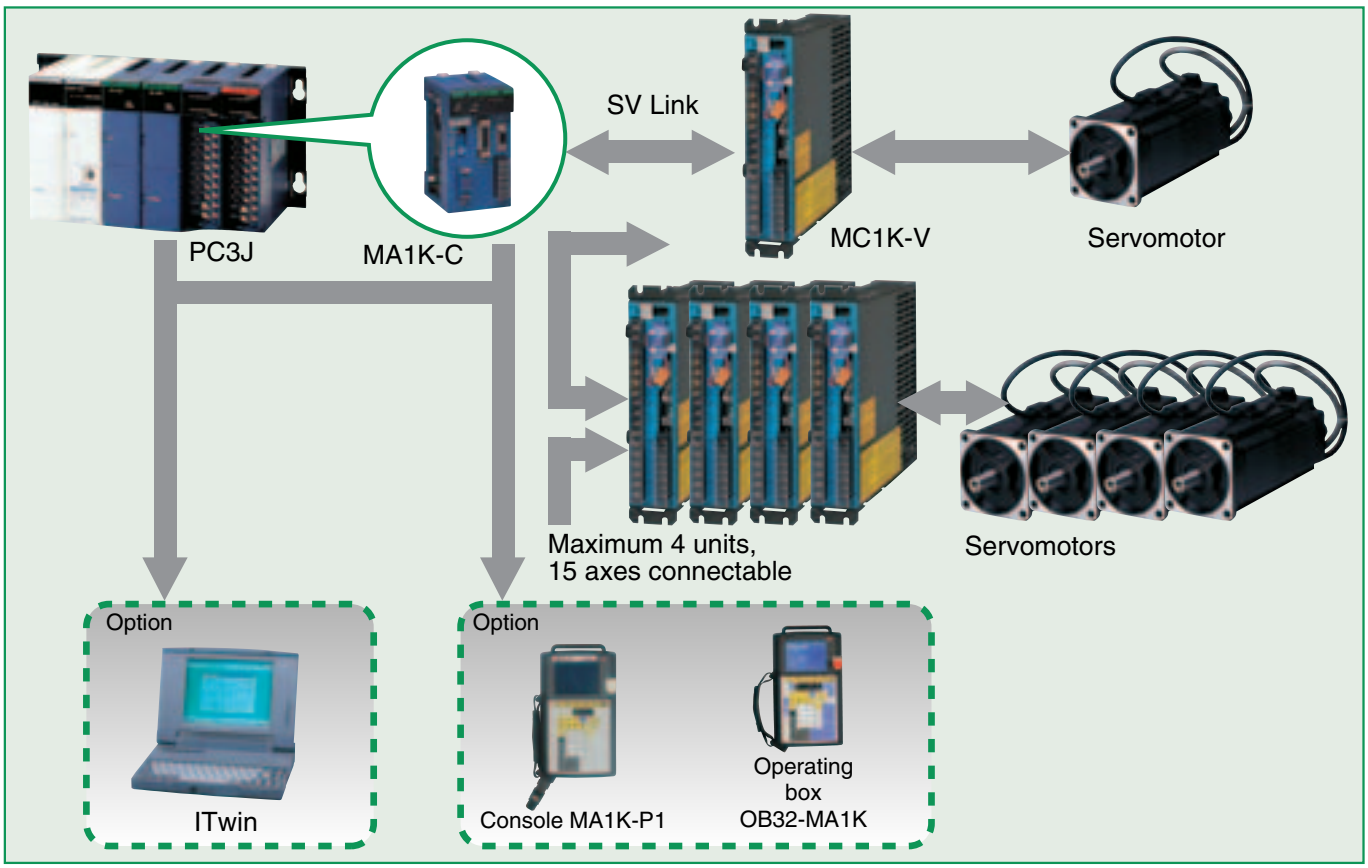
Multi-task/multi-unit function

Up to 15 axes can be controlled.
The multi-unit function allows you to define up to 4 units, and this function also let you control up to 5 tasks independently at one time.

Easy-to-use OB and operation without OB is also possible.

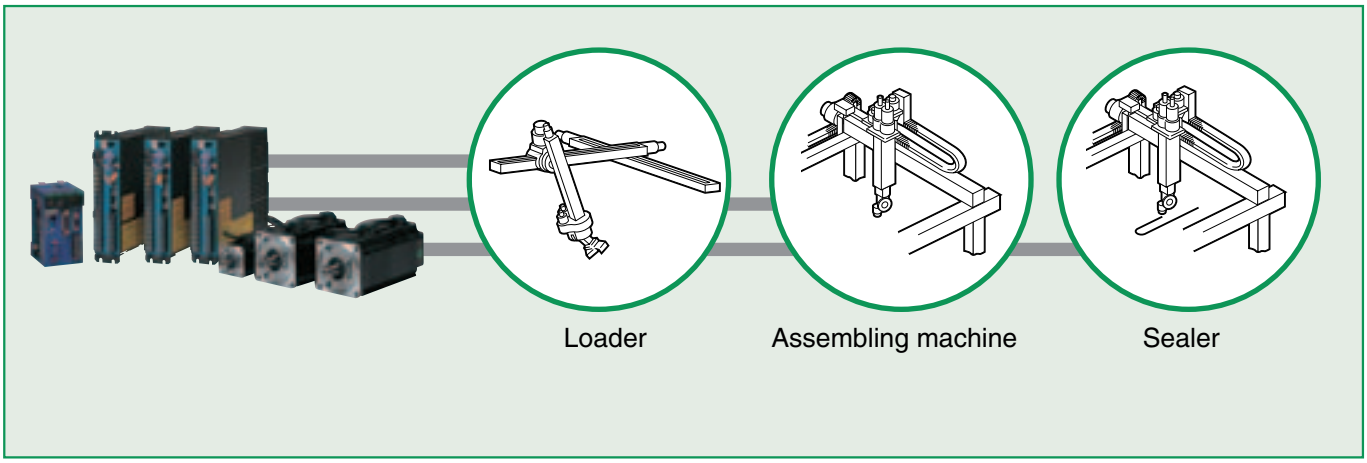
The teaching box is the OB32-MA1K, based on the OB32, which is full of advanced features that are used for the TC32 robot controller.
A variety of monitors, such as one to monitor the current position, for point teaching can be performed on the general-purpose operation panel so that operation without the teaching box is also possible.

■ Configuration



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■ Applications



■ Specifications

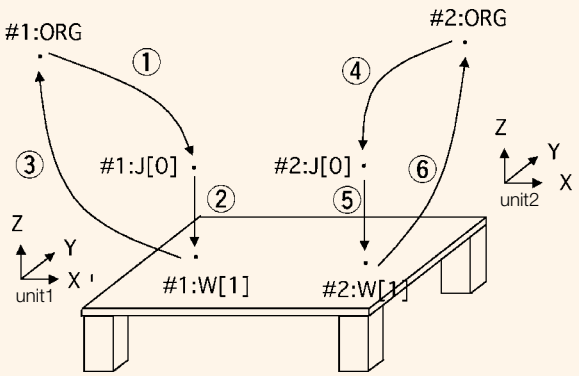
■Controller specifications

Item		Multi-axis motion controller
Type		MA1K-C
General specifications		
	Power source	5V dc ±5% (supplied from C3J)
	Current consumption	At and under 1.0A, controller alone
	Ambient temperature/humidity	0-55℃/35-85% RH (No dew condensation)
	No. of control axes	1-15 axes
	Multi-unit	Maximum 4 units (maximum 4 axes per unit)
	Multi-task	Maximum 5 tasks
	Controlled mechanical construction	Any combination of rectangular type coordinates (X,Y,Z, θ) or special
	Teaching method	Operating box (OB32), general-purpose panel
	Memory capacity	192KB
	Positioning points	Maximum 5,000 points
	Axial interpolation	Axial interpolation / Linear interpolation / Circle interpolation (3 dimensional)
	Position detector	Absolute encoder (Resolution 8,192 pulses/revolution)
	Maximum detecting range	Traveling distance per motor revolution × 8,192 revolutions
	Position setting increment	0. 001mm (Linear axis) 0.001° (rotating axis)
Functional specifications		
	Language	Motion language "TL1" (compatible with FRIED robot)
	Coordinate system	Axis, rectangular, tooling and workpiece coordinate system
	OB operation mode	【Teach】 JOB, point editing, JOG operation, teaching confirmation operation 【MDI】 1-line execution, I/O output 【Monitor】 Status indication 【Auxiliary】 Parameter setting, zeroing 【OB inactive】 Automatic operation, manual operation
	Monitor function	Error/alarm display, current status display, current position/servo data monitor, input/output status monitor, directory display
	Maintenance function	Program change date, power source servo ON time, error log, servo history monitor, unlinking function
	Safety function	Interlook functions applicable for TMS (teaching speed limit, deadman switch, power OFF function)
	Other	Self-diagnotic functions, PSW

■Applicable servoamplier

Amplifier \ Motor		Applicable servo amplifier: MC1K-U	Amplifier \ Motor		Applicable servo amplifier: MC1K-U	Amplifier \ Motor		Applicable servo amplifier: MC1K-U
AP-1M	075	030V	AP-3M	048	015V	AP-5M	150	050V(S)
	100			066	030V		200	100V(S)
AP-2M	005	015V		120	050V(S)		350	150V(S)
	010			160			450	
	020			250	100V(S)		550	
	030			360			700	
	040	030V		450	150V(S)		750	300VS
	050						11K	
	075	050V(S)					15K	
	100							

■ Programming (Example)




```
JOB1                ·····Parent program
000 01 USE     0    ·····No unit
    02 RUN     #1: JOB101, #2: JOB201···Child program start
    03 JWAIT   JOB101, JOB102 ·····Child program completion waiting
    04 STOP     ·····Stop

JOB101              ·····Child program 1
000 01 USE     #1   ·····unit 1
    02 DSPEED  #1: 100 ·····Maximum speed · acceleration
001 01 MOVE    #1: J[0] ·····①Travel to Position J[0]
002 01 MOVES   #1: W[1] ·····②Linear travel to Position W[1]
003 01 ORG     #1   ·····③Travel to working zero point
    02 STOP     ·····Stop

JOB201              ·····Child program 2
000 01 USE     #2   ·····unit 2
    02 DSPEED  #2: 100 ·····Maximum speed · acceleration
001 01 MOVE    #2: J[0] ·····④Travel to Position J[0]
002 01 MOVES   #2: W[1] ·····⑤Linear travel to Position W[1]
003 01 ORG     #2   ·····⑥Travel to working zero point
    02 STOP     ·····Stop
```


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MC1KJ/MC1K-D

■Miniature MC1K of limited-to-smallcapacity (Motor output: Below IKW) type



Wiring is done via a connector, so there is no need for cumbersome wiring work

Wiring is all done by a connector, leading to a substantial decrease in wiring time. It is possible to mount on the front side or back side, resulting in high compatibility with the control box.

■ Specifications

■General specifications

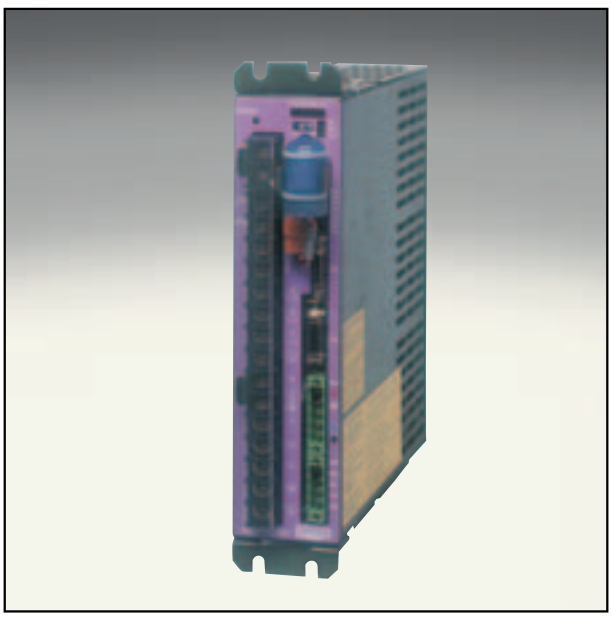
Item	1-axis indexing motion controller
Type	MC1KJ-U015V MC1KJ-U030V
Input power source	main circuit 3 Phase AC200～220V±15%　50/60Hz±3Hz
	Control circuit　Single phase AC200～220V±15%　50/60Hz±3Hz
Service ambient temperature	0-55℃
Service & storage humidity	90% RH under (No dew condensation)
Weight	MC1KJ-U015V: 1.5kg MC1KJ-U030V: 2.0kg
Structure	Front side / back side mountable
Display	Alarm and status display (LED)　Main circuit power source charging
Dynamic brake	Built-in
Regenerative control circuit	Built-in (Regenerative resistance is external) Unlike the MC1K-V, there is no built-in regenerative resistance.

(※) Functional specifications (Controller function mode, amplifier function mode) are the same as MC1K-V

■Applicable servomotor

Motor / Amplifier	AP-2M						AP-3M		AP-1M	
	005	010	020	030	040	050	048	066	075	100
MC1KJ-U015V	○	○	○	○						
MC1KJ-U030V			○	○	○	○	○	○	○	○

■Compatible with DeviceNet, which is the global network of MC1K



Complies with DeviceNet.

All communication usage complies with DeviceNet so that the connection to sequencers is the same as that of peripheral I/O equipment.

■ Specifications

Type	MC1K-U015D MC1K-U030D MC1K-U050D MC1K-U100D MC1K-U150D MC1K-U300D			
Power source for communication	DC11V～DC25V (Supplied from the communication terminal block)			
Communication speed	500kbps / 250kbps / 125kbps			
Communication distance	Communication speed	Total extension length	Branch line length	Total extension of branch line
	500kbps	100m under	6m under	39m under
	250kbps	250m under	6m under	78m under
	125kbps	500m under	6m under	156m under
No. of maximum connectable nodes	63 units (Master 1, Slave 63)			
Node address	00～63			
No. of slave I/O points	Maximum 512 points (Maximum 7 units of MC1K-D)			
I/O allocation	Minimum setting: in the unit of 8 points			

(Note 1) General specifications, functional specifications (Controller function mode), and applicable servomotor are the same as MC1K-V. (→P4)
(Note 2) Amplifier function mode is not provided.
(Note 3) DeviceNet is a trademark of ODVA.

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MA1K-Ls

■Multi-axis motion controller which specializes in the transfer process. This is the very product which aims for a reduction in lead time and cycle time.

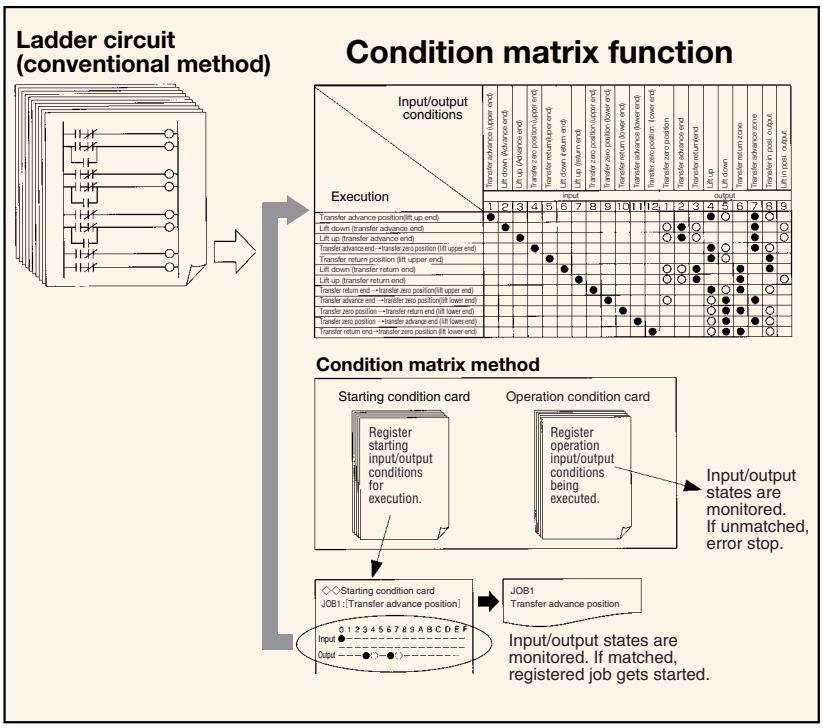


Specialized features incorporated

Single axis control is possible with multiple motors due to the twin-motor control.

Cut in designing time

A substantial reduction in PLC circuit designing time is possible by merely registering the input/output conditions for each actual operation in the form of a starting condition card and an operation condition card.



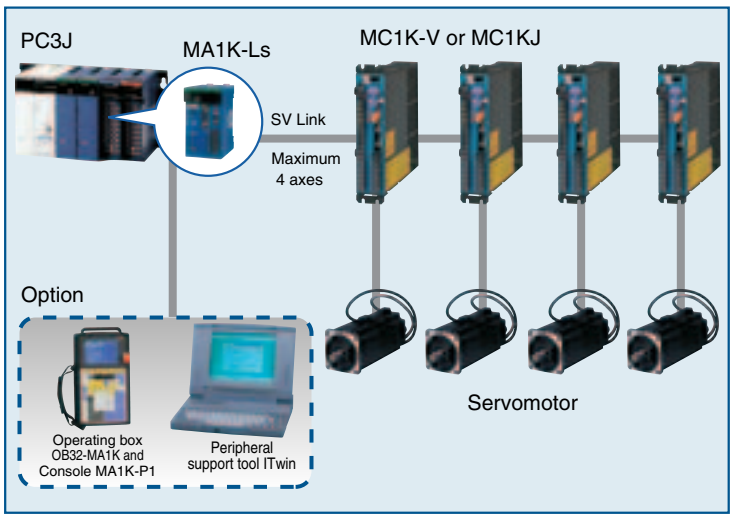
Cut in cycle time

4 axis arbitrary operation, allowing a composition of speed from any arbitrary point.

High speed/High accuracy

High speed interpolation control, S shape acceleration/ deceleration control, position, speed-floating gain function, feed forward function, and an integration compensation function... The provision of all of these features in the controller has led to the optimum acceleration/deceleration control.

■ Configuration



■ Specifications

Item	Multi-axis motion controller
Type	MA1K-Ls
Power source	5V dc ±5% (supplied from C3J)
Current consumption	At and under 1.0A , controller alone
Ambient temperature/ humidity	0-55℃/35-85% RH (No dew condensation)
No. of control axes	1-4 axes
Controlled mechanical construction	Any combination of rectangular type coordinates (X,Y,Z, θ) or special
Teaching method	Operating box (OB32), general-purpose panel
Memory capacity	192KB
Positioning points	Maximum 1,500 points
Position detector	Absolute encoder (Resolution 8,192 pulses/revolution)
Maximum detecting range	Traveling distance per motor revolution × 8,192 revolutions
Position setting increment	0.001mm or 0.001°
Language	Motion language "TL1-Ls"

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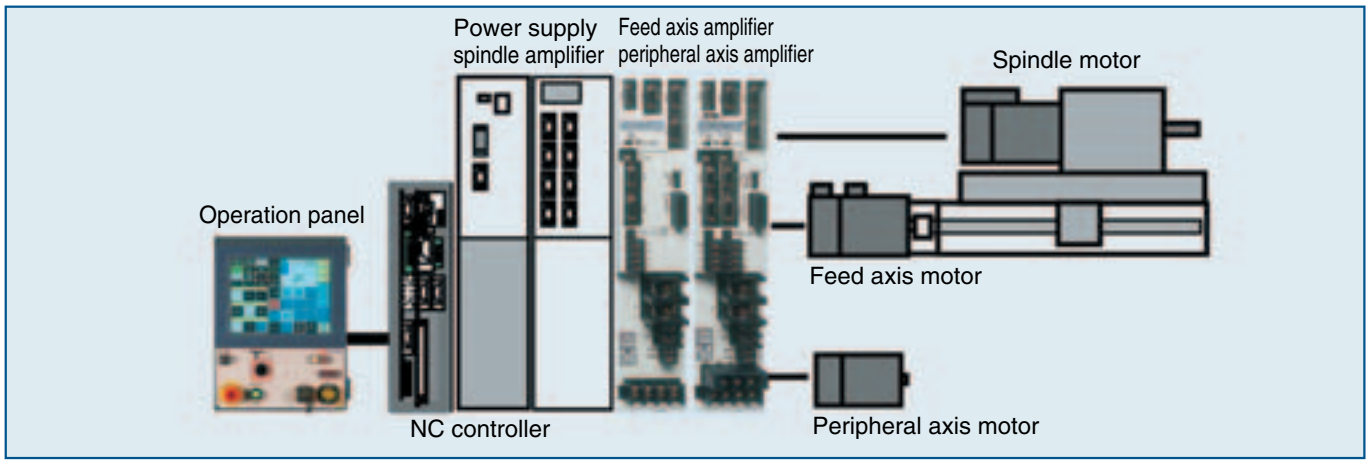
Integrated control system, AF10

AF10 is the name for the feed unit integrated control system. The system is comprised of the following four major elements:

- Operation panel
- NC controller (AF10)
- Feed axis amplifier (MC10)/feed axis motor
- Peripheral axis amplifier (MC10)/peripheral axis motor



Configuration



Operation panel (FP-12CXG)

The operation panel (FP-12CXG) not only has full functions as an operation panel but also works as a Windows CE panel controller to which tools for NC and PLC the FP-12CXG can be accessed. (Note 1)
This allows you to integrate operations and information such as NC programming, ladder circuit editing, and waveform monitor display.

(Note 1) Windows is a trademark of Microsoft, USA.

NC controller (AF10)

The NC controller (AF10) is a PLC-built in NC controller which controls the feed unit integrated control system. A maximum of 2 systems consisting of 4 axes (feed 2 axes, spindle 2 axes) and 6 peripheral axes, a total of 10 axes, can be controlled via program.

Feed axis amplifier (MC10)/feed axis motor •Peripheral axis amplifier (MC10)/ peripheral axis motor

The MC10 can operate not only as a servo amplifier for feed axes on the AF10 but can also work as a servo amplifier for peripheral axes.
When using it for peripheral axes, control can be made in the AF10 programming language using the field bass function. Control via a ladder circuit is also possible. The power source comes from the power supply which contains a power source regenerative function.
This power supply can be used together with a spindle amplifier.

Spindle amplifier/spindle motor

The amplifier/motor in the Mitsubishi Electric MELDAS series is used for spindles. (Note 2)
It is possible to control taps which are synchronized with a feed amplifier for the MC10 and spindles via orientation/S commands.

(Note 2) MELDAS is a trademark of Mitsubishi Electric Co.

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AF10/MC10

Here are the controller (AF10) and the servo amplifier (MC10) in the integrated control system, AF10.



Better cost performance

Process integration is possible via 2-system control. A large-capacity PLC and communication module are equipped as standard.

Improved design efficiency

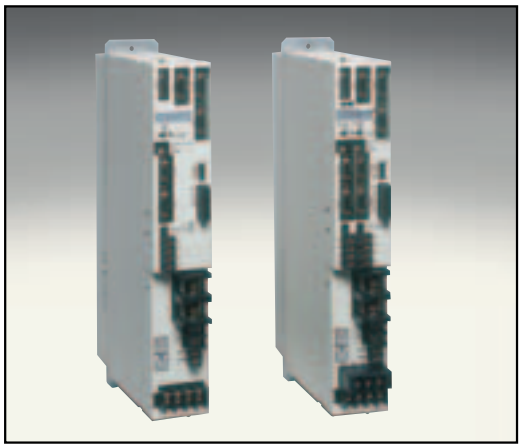
A reduction in circuit drawings and easy-to-maintain circuits was achieved through the use of library functions.
A single command system was achieved by controlling tap feed/return peripheral axes and the utilization of macro programming commands.

Preventative maintenance function

Preventative maintenance warning output is achieved through torque monitoring, and a life forecasting function through time management.

Free from maintenance tools due to the integration of operation and information

Use of the operation panel (FP-12CXG), which functions as an operation panel but also contains tools for NC and PLC, allows for the integration of operation and information. NC programming, ladder circuit editing, waveform monitor display, etc. are thereby possible.



Better cost performance

Lower priced and a compact design

Improved design efficiency

A reduction in circuit drawings and easy-to-maintain circuits was achieved through the use of library functions

Preventative maintenance function

Preventative maintenance warning output is achieved through torque monitoring, and a life forecasting function through time management.

Multiple functions

The MC10 can operate not only as a servo amplifier for feed axes but can also work as a controller and servo amplifier for peripheral axes. Its power source comes from a power supply with a power source regenerative function.

Free from maintenance tools due to the integration of operation and information

Use of the operation panel (FP-12CXG), which functions as an operation panel but also contains tools for NC and PLC, allows for the integration of operation and information. NC programming, ladder circuit editing, waveform monitor display, etc. are thereby possible.

Specifications

AF10 Specifications

Item		Feed unit controller		
Type		①AF10-C0(Without MELDAS digital spindle I/F) ②AF10-C1(With MELDAS digital spindle I/F)		
General specifications	Input power voltage	DC24V±5%		
	Service ambient temperature	0-55℃ (Inside-panel temperature)		
	Service moisture	75% Below (Below 95% maximum within a short period of time)		
	NC section	AP-DIS Ⅱ, MPG, SKIP I/F Each single piece		
		Console (MOWin concurrently used) I/F single piece		
	Servo section	SVLNK (maximum 2 axes, feed axis)		
		MELDAS Digital spindle I/F (maximum 2 axes) [Only on AF10-1]		
	PLC section	Built-in a unit which is equivalent to PC3JM.		
		PC Link/CMP Link/HPC Link Built-in, each one unit		
		External I/O Bus. Hellowin I/F each one unit		
Functional specifications	No. of control axes	Maximum no. of control axes	10	
		Standard no. of control axes	2	
		Maximum no. of axes	2	
		Maximum no. of additional axes	6	
		Maximum no. of spindles	2	
	Control system	No of control systems	2	
		Maximum No. of NC axes system	2	
		Maximum No. of NC axes within system	6	
		Maximum No. of spindle axes system	1	
	Interpolation	Linear interpolation		
		Linear acceleration/deceleration / S shape (Bell form) acceleration/deceleration		
		Quick feed Feed for cutting Multi-stage acceleration/deceleration		
	Mode	Program operation, Single block operation, Jogging operation, Step operation, Manual handwheel operation, Editing		
	program	No. of programs	56	(Starting programs: 32)
		No. of blocks	2800	(50 blocks × 56)
		Macro function	YES	(Scanning macro program of 2 systems)
		Quick feed/Feed for cutting	G000/G001·G215 (Low-speed feed for cutting)	
		Spindle command	G84/G85/M19～M26/S code	
		Peripheral axis command	G150/U code	
	Output	No. of positioning output	20	(per axis)
		No. of M outputs	16	(per unit)
		Flag output	8	
	Compensation	No. of registers	16	
		Level output	1	(It is possible to output Level 5 of compensation limit.)
		Addition/subtraction of compensation amount	8	
	Preventative maintenance function	Preventative maintenance warning output by monitoring torque. Measurement of accumulated time for power source ON/servo ON. Warning output in accumulated time. Memory of times of faulty detection Warning output of times of drive shut-down.		

MC10 Specifications

Item		Amplifier function built-in controller
Type		[Single axis type] MC10-U030 MC10-U050 MC10-U150 MC10-U300
		[Multi axis type] MC10-U050/030 MC10-U150/050 MC10-U150/150
General specifications	Control power source	Single phase AC200～220v±15% 50, 60Hz±3Hz
	Main circuit power source	DC240v～358v (Supplied from Power supplying unit MC10-PSA or MDS-C1-CV.)
	Service ambient temperature	0-55℃
	Service moisture	90% RH under (No dew condensation)
	Deterioration	Environment cleaner than Contamination Level 2 in accordance with IEC664
	Atmosphere	No corrosive gas, inflammable gas, oil mist or dust
	Control function	When operating indexing controller Speed control type When operating amplifier Position control type Spindle synchronization Erroneous pulse compensation function
	External interface	Link change-over Analog spindle interface Console (MOWin concurrently used) interface } Each one unit (Multi-axis type, each 2)
Functional specifications	Control axe	Linear 1 axis/rotating 1 axis
	Unit of setting	①0.01mm (Linear axis) /0.01° (rotating axis) ②Non integral speed reduction axis ----- 0.01mm/°, 0.1mm/°, 0.001mm/°
	Detection of position (AP-□M motor)	①Resolution to control Pulse/rotation 8192 pulses/revolution ②Detection range 1024 revolutions
	Indexing point	Standard 60 points Maximum 700 points
	Output for position	Output for position (PSW) 16 points In-position Standard 60 points Maximum 700 points
	Acceleration/deceleration function	Linear acceleration/deceleration / S shape acceleration/deceleration
	Speed feed forward	0～100%
	Indexing function	External positioning function, Compensation amount I/O input function, Addition/subtraction function, Compensation input function, one-direction indexing amount function 1/N endless operation, Short-cut control, Direction specification control Jog, Indexing inching function
	Electric current limit function	Parameter setting Setting per rotational direction I/O write setting
	Power shut-down	Drive shut-down function, 2 million times (power shut-down from servo-lock state)
	Falling-down protection	Falling-down protection function
	Out-of-position maintenance	Out-of-position detection function Position jumping detection function
	Preventative maintenance function	Preventative maintenance warning output by monitoring torque. Measurement of accumulated time for power source ON/servo ON. Warning output in accumulated time. Memory of times of faulty detection Warning output of times of drive shut-down.

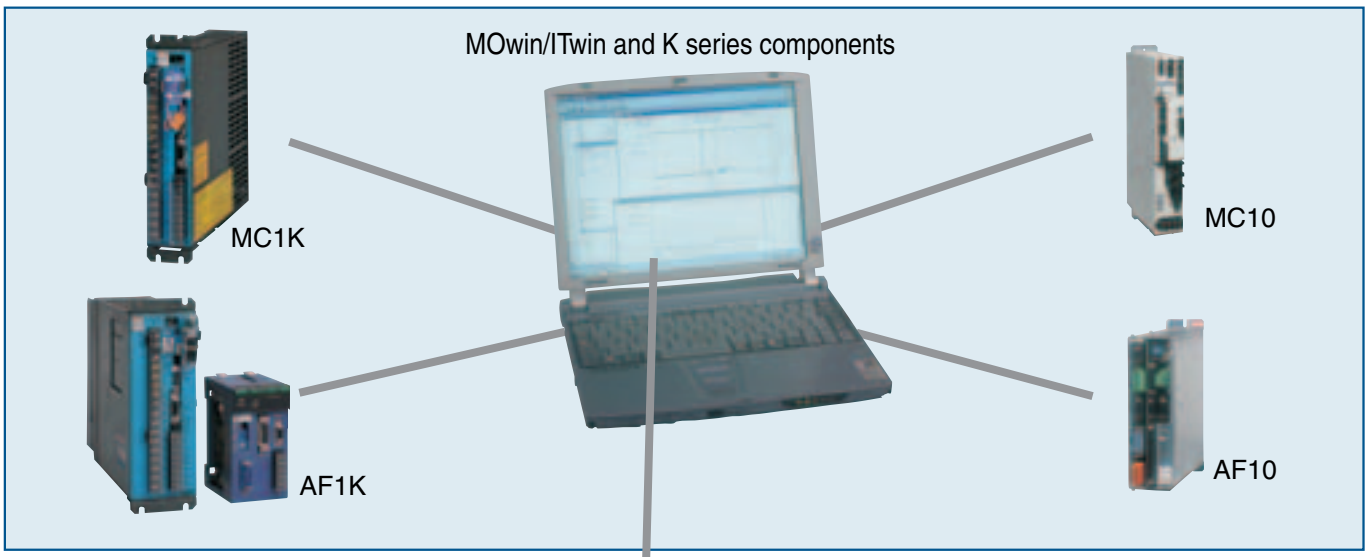
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MOwin®/ITwin

(MOwin: Windows95/98/NT MOwin5: Windows2000/XP
ITwin: Windows3.1/95/98 ITwin5: Windows2000/XP)
Windows is a trademark of Microsoft, USA.

The peripheral software for the motion controller K-series and the components comprising the series. MOWin/ITwin both allow you to easily edit programs and monitor I/Os. MOWin is for AF1K·AF10/MC1K/MC10 while ITwin is for MA1K series.

Configuration



Features



Spsecifications

Functions / Models	MOwin / MOwin5		ITwin / ITwin5
	MC1K/MC10	AF1K/AF10	MA1K
Creation	Parameter PSW Setting data	Parameter PSW NC program	Job Table Parameter data
Edit	Parameter PSW Setting data	Parameter PSW NC program	Job Table Parameter data
Monitor	Current position Run mode Indexing state Speed command · Monitor speed · Electric current value	Current position of machine/workpiece coordinate system Controller state Execution block Speed command value Motor speed·Electric current value·Deviation in position, etc.	Current position display (Joint/world coordinates) Execution state display Cycle time Information on running time
Display	Input/Output signal Parameter Error information	Input/Output signal System parameter Parameter Error information	Display of information on current tools Display of I/O state
Transfer	Parameter PSW Setting data	Parameter PSW NC program	Data on MA1K Maintenance information Read/Write
Setting	Individual parameter settings	Individual parameter settings	

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Item

■MC1K controller

Item		Icon	Index	Meaning
MC1K−□ □□□□□ □□ (A / B / C)	Single unit	A	U	Single unit
		B	□□□V or □□□VS	Maximum output current 015 : 15A 030 : 30A 050 : 50A 100 : 100A 150 : 150A 300 : 300A □□□V: standard; □□□VS: with spindle function
	Combination	A	1～5	Combination with servomotor 1 : Combination with 1M motor 2 : Combination with 2M motor 3 : Combination with 3M motor 5 : Combination with 5M motor
		B	□□□V or □□□VS	Motor capacity (×10W) (Refer to the servomotor specifications) □□□V: combination with MC1K-U□□□V; □□□VS: with spindle function
		C	XC/BC XCT/BCT	X C: Retaining brake NO B C: Retaining brake YES XCT: CE mark-correspondent brake NO BCT: CE mark-correspondent brake YES

■AF1K controller

Item		Icon	Index	Meaning
AF1K−□ □□□□□ □□ (A / B / C)	Single unit	A	C	Single unit
	Combination	A	4, 6, 7	Combination with servomotor 4 : Combination with 4M motor 6 : Combination with 6M motor 7 : Combination with 7M motor
		B	□□□V or □□□VS	Motor capacity (×10W) (Refer to the servomotor specifications) □□□V: combination with MC1K-U□□□V □□□VS: combination with MC1K-U□□□VS
		C	XC/BC XCT/BCT	X C: Retaining brake NO B C: Retaining brake YES XCT: CE mark-correspondent brake NO BCT: CE mark-correspondent brake YES

■MA1K controller

Item		Icon	Index	Meaning
MA1K−□ (A)	Single unit	A	C	Single unit
	Combination	A	–	No combination name

■Servomotor

Item	Icon	Index	Meaning
AP−□M□□□ □□□□ (A / B / C)	A	1～7	Motor type 1 : 1M motor Square type (750W～1kW) 2 : 2M motor Square type (50W～1kW) 3 : 3M motor Flat type (480W～4.5kW) 4 : 4M motor Square type (500W～5.5kW) 【For Exclusive use of AF1K】 5 : 5M motor Square type (1.5kW～15kW) 6 : 6M motor Square type (500W～4.5kW) 【For Exclusive use of AF1K】 7 : 7M motor Square type (5.5kW～15kW) 【For Exclusive use of AF1K】
	B	□□□	Motor capacity (×10W) (Refer to the servomotor specifications)
	C	XXC1 B1C1 XXCT BTCT	XXC1 : Retaining brake NO With cannon connector B1C1 : Retaining brake YES With cannon connector XXCT : CE mark-correspondent brake NO With cannon connector BTCT : CE mark-correspondent brake YES With cannon connector

■MC1KJ controller

Item	Icon	Index	Meaning
MC1KJ−U□□□V (A)	A	□□□	Maximum output current 015 : 15A 030 : 30A

■MC1K-D controller

Item	Icon	Index	Meaning
MC1K−U□□□D (A)	A	□□□D	Maximum output current 015 : 15A 030 : 30A 050 : 50A 100 : 100A 150 : 150A 300 : 300A

■AF10 controller

Item	Icon	Index	Meaning
AF10−C□ (A)	A	0, 1	Amplifier I/F 0 : Mitsubishi spindle I/F NO 1 : Mitsubishi spindle I/F YES

■MC10 Servoamplifier

Item	Icon	Index	Meaning
MC10−U□□□ (A)	A	U□□□	Servo amplifier type □□□: Single axis amplifier with maximum output current 030 : 30A 050 : 50A 150 : 150A 300 : 300A □□□/□□□: "2 axes one piece" amplifier 050/030 : 50A+30A 150/050 : 150A+50A 150/150 : 150A+150A
MC10−PSA□□□ (A)	A	PSA□□□	Power source unit □□□: Power source capacity 037 : Total capacity 3.7 kW or below 055 : Total capacity 5.5 kW or below 075 : Total capacity 7.5 kW or below 110 : Total capacity 11.0 kW or below 150 : Total capacity 15.0 kW or below
MC10−ALA□□□ (A)	A	ALA□□□	AC Reactor □□□: Power source capacity 075 : Total capacity 7.5 kW or below 110 : Total capacity 11.0 kW or below 150 : Total capacity 15.0 kW or below
MC10−BT□□□ (A)	A	BT□	Battery box □: No. of batteries (No. of amplifiers connected) 2, 4, 6, 8

■MA1K-Ls controller

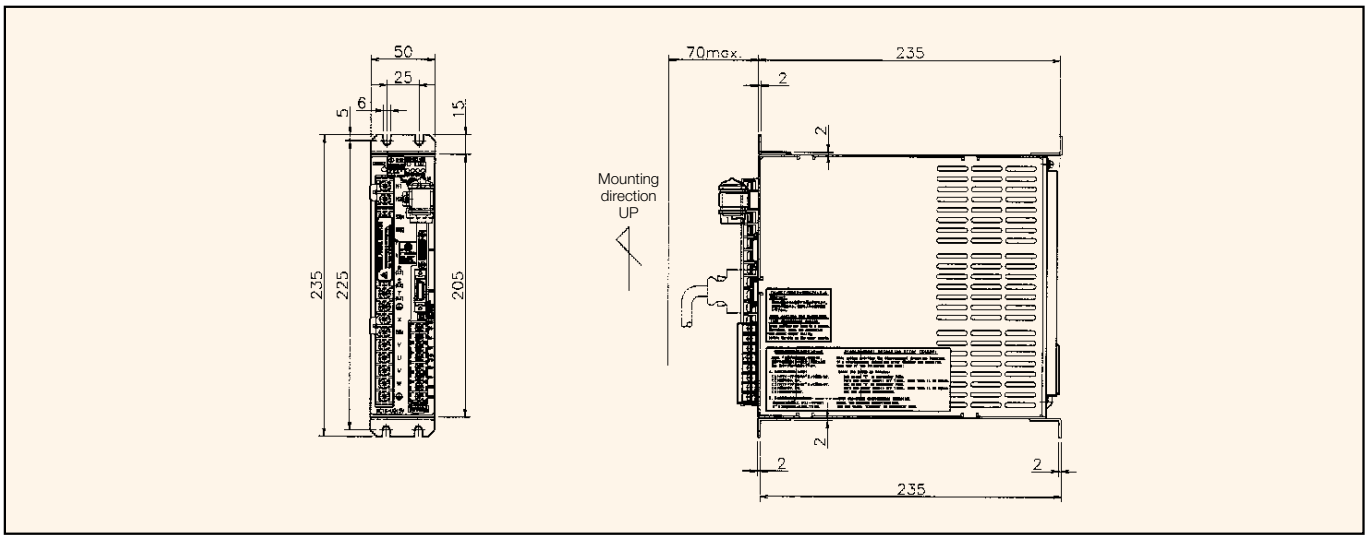
Item	Icon	Index	Meaning
MA1K−Ls−□ (A)	A	C	MA1K-Ls Controller single unit

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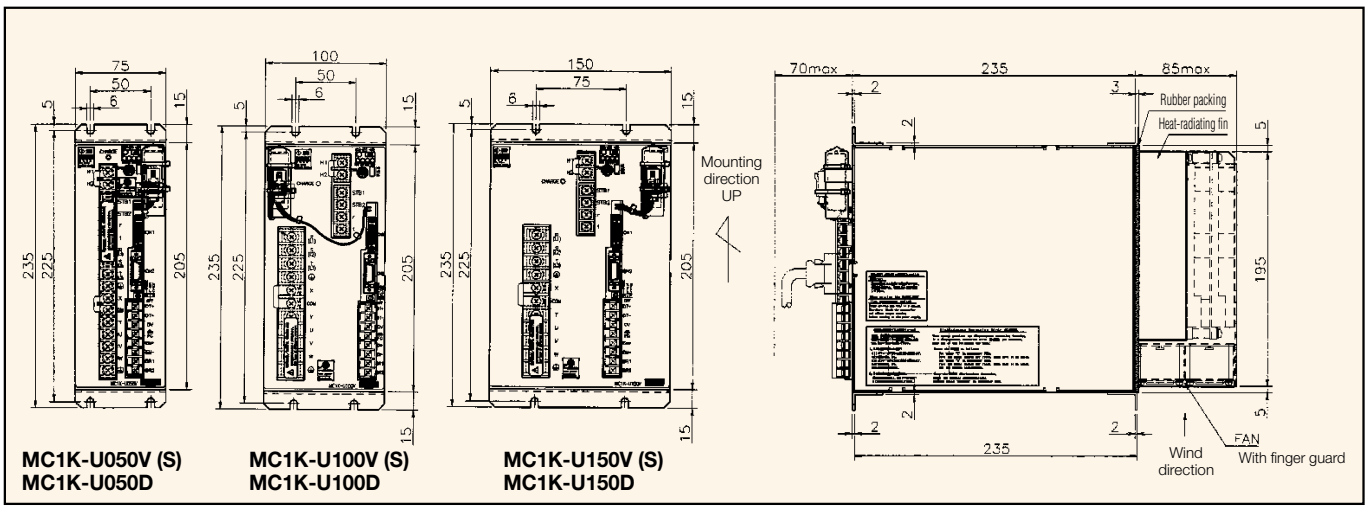
External dimensions

■ MC1K controller (servoamplier)

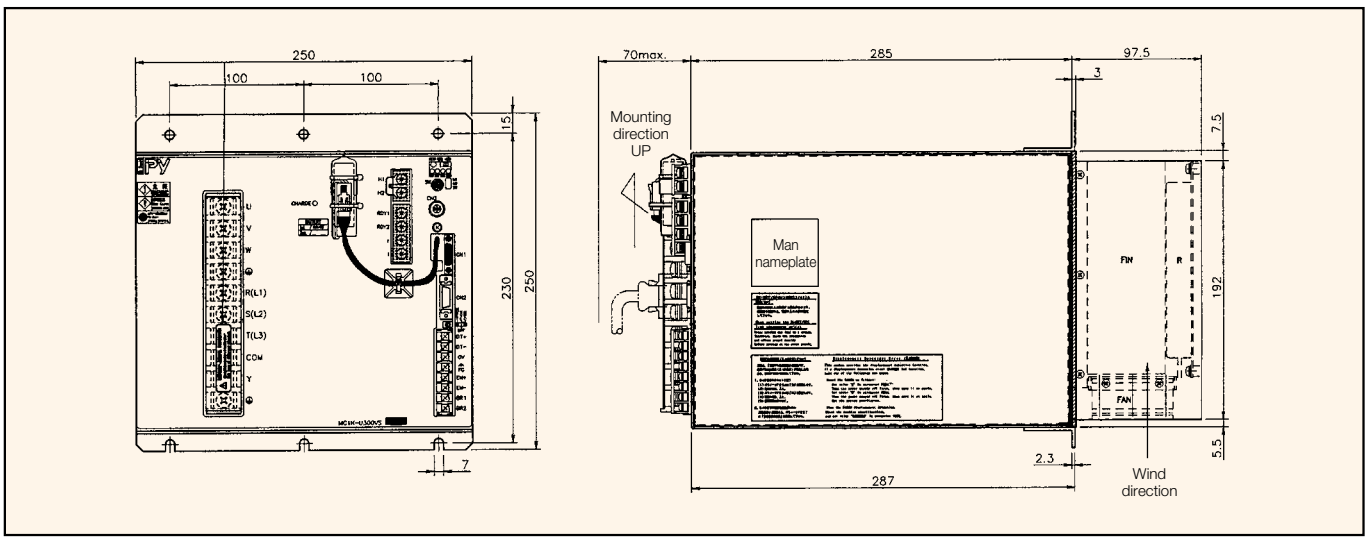
MC1K-U015V/MC1K-U030V/MC1K-U015D/MC1K-U030D



MC1K-U050V (S) MC1K-U050D / MC1K-U100V (S) MC1K-U100D / MC1K-U150V (S) MC1K-U150D

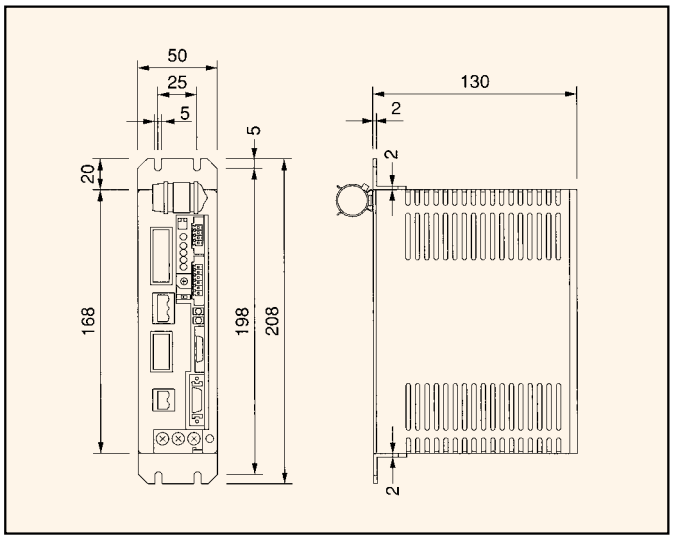


MC1K-U300VS/MC1K-U300D

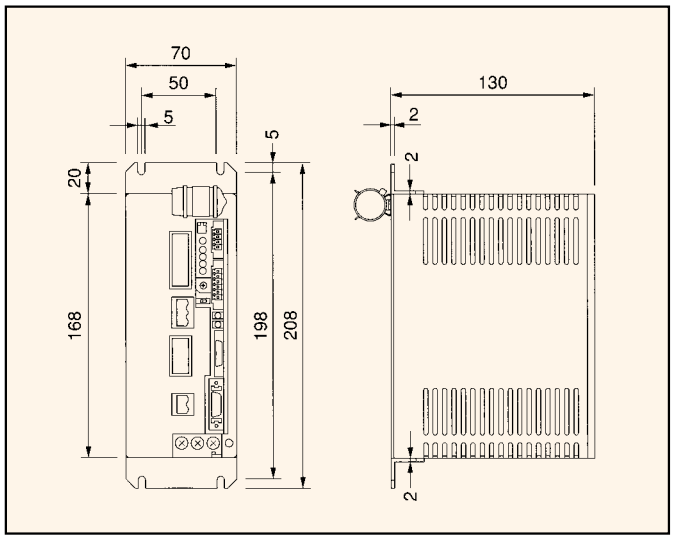


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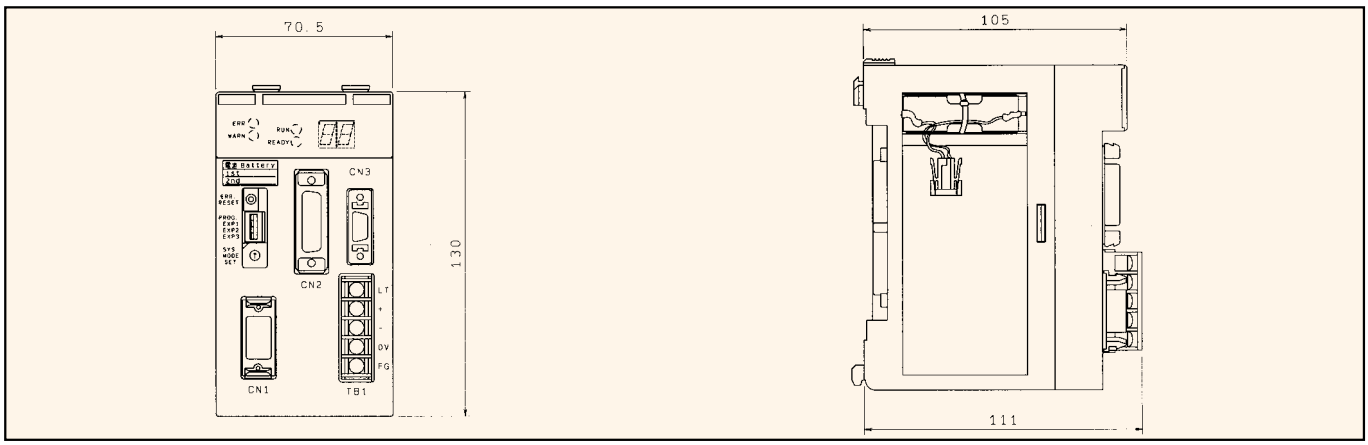
MC1KJ-U015V



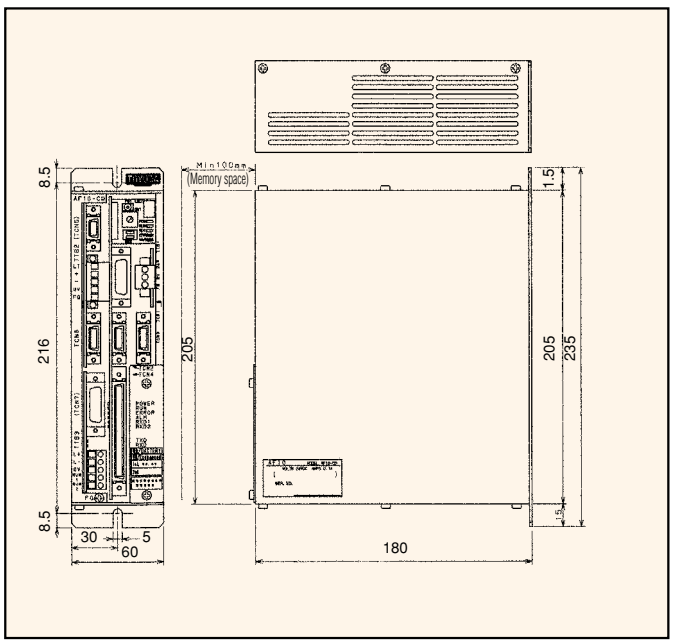
MC1KJ-U030V



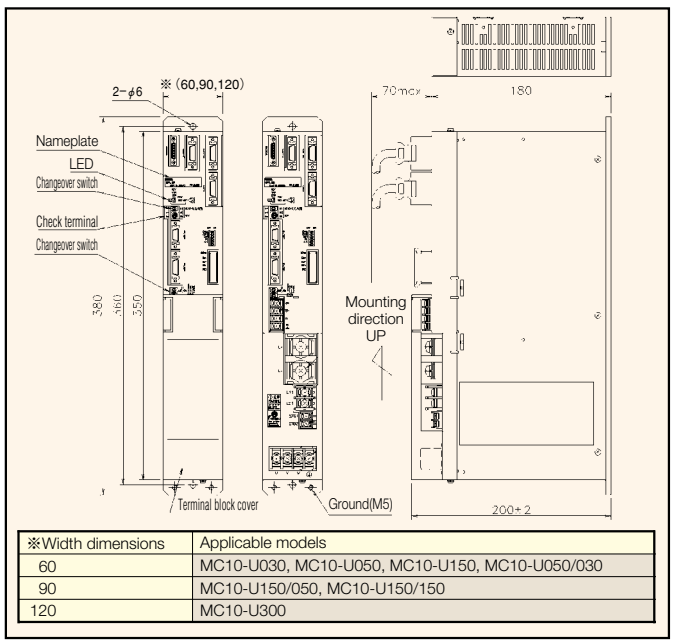
■ AF1K·MA1K·MA1K-Ls controller



■ AF10 controller



■ MC10 servoamplier



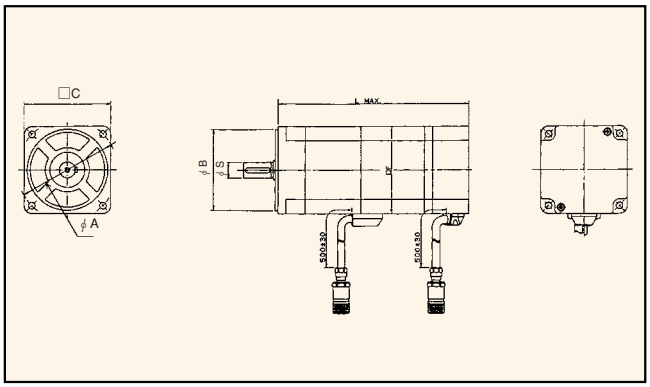
※Width dimensions	Applicable models
60	MC10-U030, MC10-U050, MC10-U150, MC10-U050/030
90	MC10-U150/050, MC10-U150/150
120	MC10-U300

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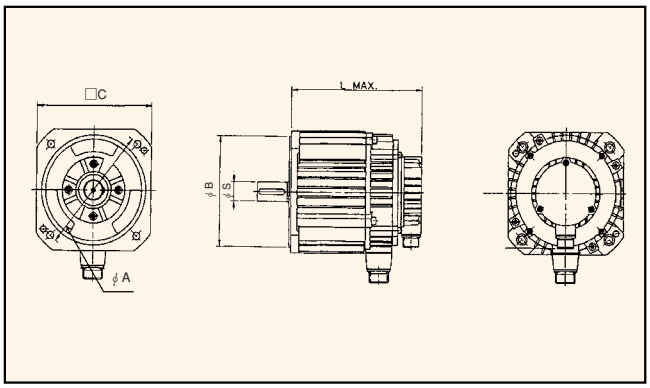
External dimensions

■ Servomotor

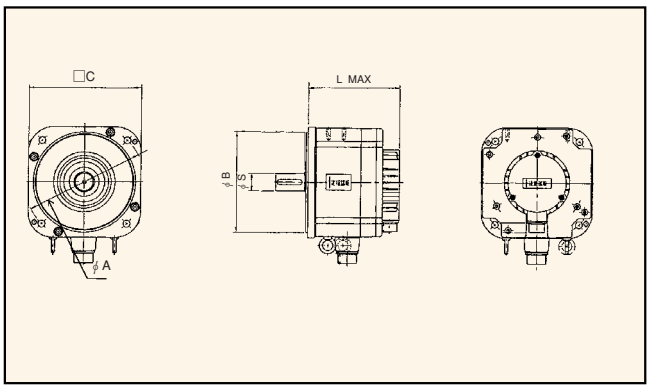
AP-1M series /AP-2M series



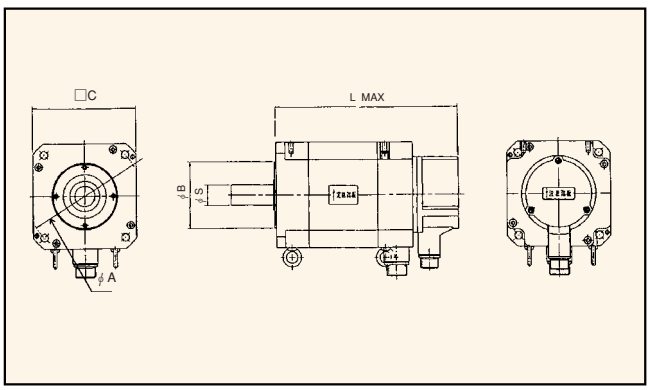
AP-3M series



AP-5M series /AP-7M series



AP-4M series /AP-6M series



Motor type \ Signs		Flange □C	Total length LMAX	Shaft diameter ϕ	Mounting hole diameter ϕA	Centering location diameter ϕB
AP-1M	075	86	154 (194)	$16^{\ 0}_{-0.011}$	100	$80^{\ 0}_{-0.030}$
	100		177 (217)			
AP-2M	005	54	95.5 (124.5)	$7^{\ 0}_{-0.009}$	60	$50^{\ 0}_{-0.025}$
	010		105.5 (134.5)	$8^{\ 0}_{-0.009}$		
	020	76	102 (129)	$11^{\ 0}_{-0.011}$	90	$70^{\ 0}_{-0.030}$
	030		108 (135)			
	040	86	121 (161)	$16^{\ 0}_{-0.011}$	100	$80^{\ 0}_{-0.030}$
	050		131 (171)			
	075		154 (194)			
	100		177 (217)			
AP-3M	048	150	170 (170)	$14^{\ 0}_{-0.018}$	165	$130^{\ 0}_{-0.040}$
	066	180	178 (178)	$19^{\ 0}_{-0.021}$	200	$114.3^{\ 0}_{-0.035}$
	120		198 (198)	$22^{\ 0}_{-0.021}$		
	160	220	200 (200)	$28^{\ 0}_{-0.021}$	235	$200^{\ 0}_{-0.046}$
	250					
	360		253 (253)	$35^{\ 0}_{-0.025}$		
	450		263 (263)			
AP-5M	150	130	152 (189)	$22^{\ 0}_{-0.013}$	145	$110^{\ 0}_{-0.055}$
	200	180	144 (179)	$35^{\ 0}_{-0.016}$	200	$114.3^{\ 0}_{-0.056}$
	350		169 (204)			
	450		192 (227)			
	550	220	209 (256)	$55^{\ 0}_{-0.019}$	235	$200^{\ 0}_{-0.046}$
	700		285 (332)			
	750	180	332 (379)	$42^{\ 0}_{-0.016}$	200	$114.3^{\ 0}_{-0.035}$
	11K	220	352 (399)	$55^{\ 0}_{-0.019}$	235	$200^{\ 0}_{-0.046}$
	15K		395 (442)			
AP-7M	050	130	123 (153)	$22^{\ 0}_{-0.013}$	145	$110^{\ 0}_{-0.035}$
	100		143 (176)			
	150		162 (195)			
	200	180	154 (189)	$35^{\ 0}_{-0.016}$	200	$114.3^{\ 0}_{-0.035}$
	350		179 (214)			
	450		202 (237)			
	550	180	277 (324)	$35^{+0.01}_{\ 0}$	200	$114.3^{\ 0}_{-0.035}$
	750		342 (389)	$42^{\ 0}_{-0.016}$		
	11K	220	362 (409)	$55^{\ 0}_{-0.019}$	235	$200^{\ 0}_{-0.046}$
	15K		405 (452)			
AP-4M	050	130	214 (253)	$19^{\ 0}_{-0.013}$	145	$110^{\ 0}_{-0.035}$
	100		259 (298)			
	150		310 (349)	$22^{\ 0}_{-0.013}$		
	200	180	269 (317)	$35^{+0.01}_{\ 0}$	200	$114.3^{\ 0}_{-0.035}$
	350		319 (367)			
	450		389 (437)			
	550	550	544 (604)	$42^{\ 0}_{-0.013}$		
AP-6M	050	130	214 (253)	$19^{\ 0}_{-0.013}$	145	$110^{\ 0}_{-0.035}$
	100		259 (298)			
	150		310 (349)	$22^{\ 0}_{-0.013}$		
	200	180	269 (317)	$35^{+0.01}_{\ 0}$	200	$114.3^{\ 0}_{-0.035}$
	350		319 (367)			
	450		389 (437)			

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Servomotor specifications

Motor type \ Signs		Applicable servoamplier MC1K-U	Rated output (W)	Rated rotation speed (min-1)	Maximum rotation speed (min-1)	Rated torque (N·m)	Instantaneous maximum stall torque (N·m)	Note
AP-1M	075	030V	750	3,000	3,000	2.38	8.82	For MC1K · MA1K · MC10
	100		1,000			3.18		
AP-2M	005	015V	50	3,000	4,500	0.159	0.49	
	010		100			0.319	0.98	
	020		200			0.637	1.96	
	030		300			0.930	2.94	
	040	030V	400			1.27	3.92	
	050		500			1.58	5.88	
	075	050V(S)	750			2.38	8.82	
	100		1,000			3.18	11.7	
AP-3M	048	015V	480	2,000	3,000	2.35	5.40	
	066	030V	660			3.24	7.85	
	120	050V(S)	1,200			5.59	14.2	
	160		1,600			7.65	19.6	
	250	100V(S)	2,500			12.2	29.4	
	360		3,500		2,500	17.5	47.1	
	450	150V(S)	4,500			21.6	70.6	
AP-5M	150	050V(S)	1,500	2,000	3,000	7.50	20.0	
	200	100V(S)	2,000			9.50	30.0	
	350	150V(S)	3,500			17.0	50.0	
	450		4,500		2500	21.5	70.0	
	550		5,500	1,500	1,500	35.0	90.0	
	700		7,000	1,000	1,000	67.0	150.0	
	750	300VS	7,500	1,500	2,500	48.0	118.0	
	11K		11,000		2,000	70.0	181.0	
	15K		15,000			95.5	240.0	
AP-7M	050	050V(S)	500	2,000	3,000	2.5	7.0	For MC1K · AF10
	100		1,000			5.0	15.0	
	150		1,500			7.50	20.0	
	200	150V(S)	2,000			9.50	30.0	
	350		3,600			17.0	50.0	
	450		4,500		2,500	21.5	70.0	
	550		5,500	1,500		35.0	88.3	
	750	300VS	7,500	1,500	2,500	48.0	118.0	
	11K		11,000		2,000	70.0	181.0	
	15K		15,000			95.5	240.0	
AP-4M	050	050V(S)	500	2,000	2,000	2.4	8.80	
	100		1,000			4.7	15.2	
	150		1,500			7.4	19.6	
	200		2,000			9.3	29.4	
	350	100V(S)	3,500			16.7	45.6	
	450		4,500			21.6	69.6	
	550	150V(S)	5,500	1,500	1,500	35.3	118.0	
AP-6M	050	050V(S)	500	2,000	3,000	4.7	15.2	
	100		1,000			7.4	18.6	
	150		1,500			9.3	29.4	
	200	100V(S)	2,000			9.3	29.4	
	350	150V(S)	3,500			16.7	55.9	
	450		4,500			21.6	67.7	

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