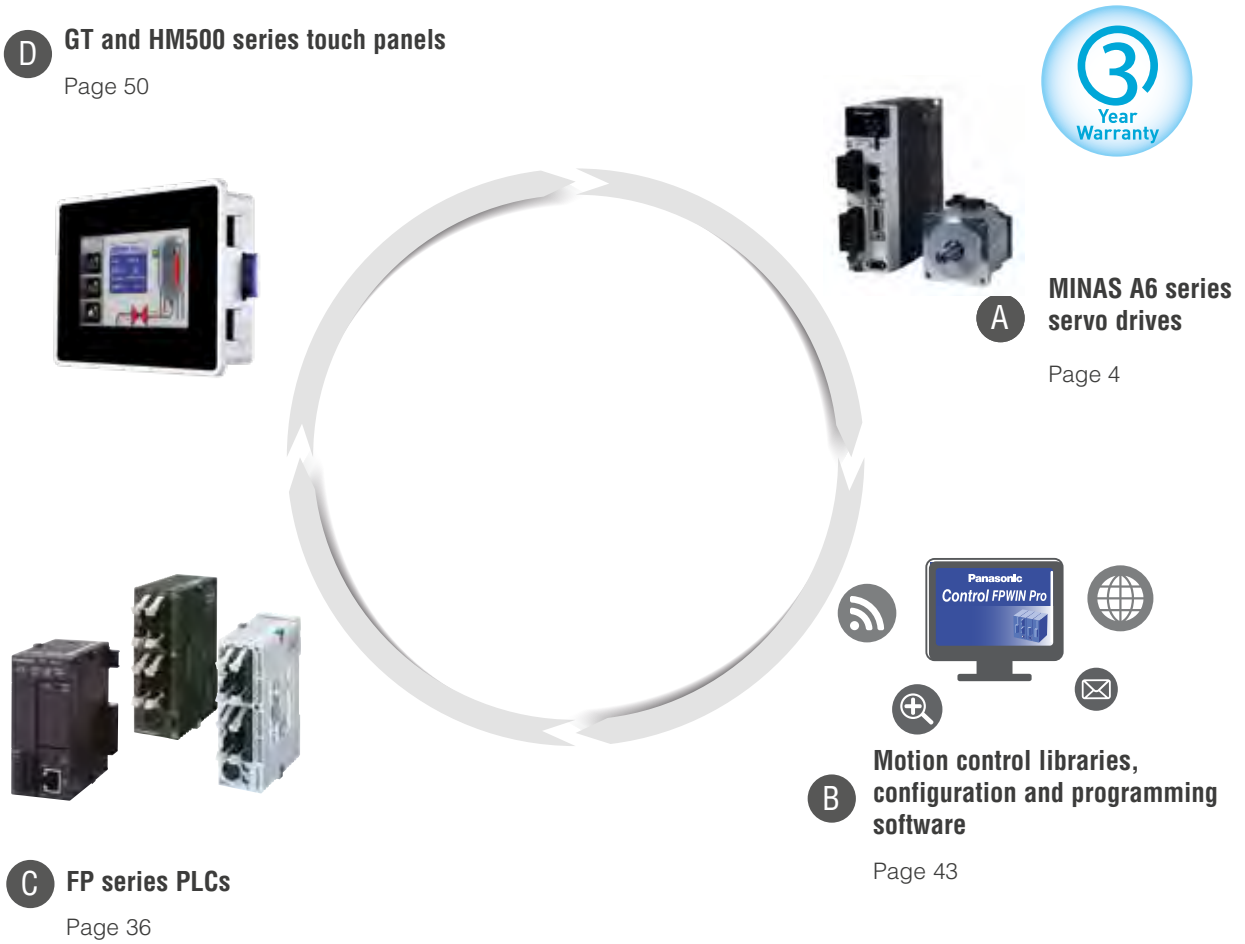
Panasonic

Overview

AC SERVO DRIVES & MOTION CONTROL

MINAS A6



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A MINAS A6 series servo drives

Highly dynamic servo drives with state-of-the-art technology. Large power range (50W-5kW) combined with a lightweight and compact design. Innovative functions to suppress resonance frequencies and vibrations. Multiple control features such as pulse, analog, and network technology in real-time communication (100Mbit/s).

B Motion control libraries, configuration and programming software

PLC programming software Control FPWIN Pro (compliant with IEC 61131-3). The free configuration software PANATERM and M-SELECT support users in the system setup, thus shortening the time required for commissioning. In addition, you can download motion control libraries for free. With the libraries' predefined function blocks, it is easy to solve even complex positioning tasks.

C FP series PLCs

The PLC comes already equipped with the hardware required for position control tasks. FP0R, FPΣ (Sigma), and FP-X are capable of controlling up to 4 axes independently. By using positioning units, the system can be expanded to control up to 10 axes. The FP7 can even control up to 64 axes. Add network technology in the shape of RTEX positioning units, and the FP series allows you to control up to 256 axes with the real-time Ethernet bus.

D GT and HM500 series touch panels

Touch panels allow humans and machines to interact with each other. The machine's role therein is to display data, results, messages, etc. and to receive instructions and execute tasks assigned by people. Panasonic's new touch panels are ideally suited for these tasks. They are optimally suited both for factory and building automation. Panasonic HMIs cover a wide spectrum, ranging in size from a compact 3" touch panel to a color 13" display for sophisticated applications.

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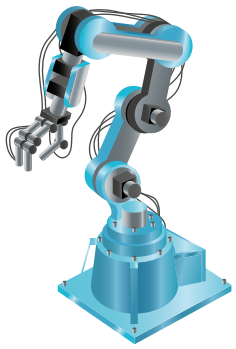
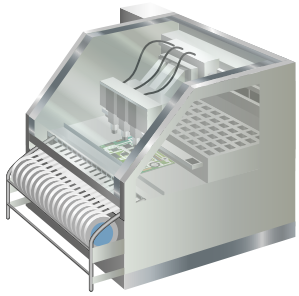
Other Panasonic products 50

- Machine tools
- Semiconductor production equipment
- Machines for LCD production
- Packaging machinery
- Conveyors
- Automated machines
- Printing machines
- Robots



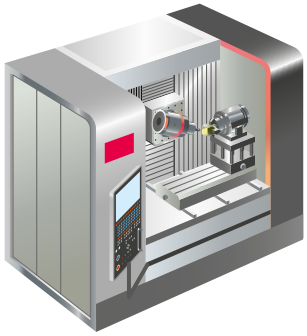
Robots

A robot is required to operate stably independent of the constantly changing position, workload, or other condition affecting the robot arm. The MINAS A6 servo drive family guarantees stable operation by reducing the effects of loads to a minimum with the help of "adaptive load control".



Processing machines

With metal-processing machines, it is very difficult to manufacture polygonal bodies with a mirror-like finishing. The MINAS A6 servo drive family realizes a frequency response of 3.2kHz to improve the feedback and to enable a mirror-like finish without lines or streaks.



Pick-and-place machines

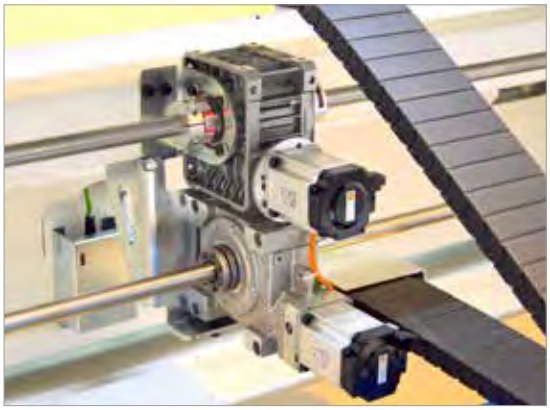
The MINAS A6 servo drive family shows its versatility especially when used with pick-and-place machines where speed and positional accuracy are a must.
In addition to the high-frequency response, the servo drives deal with random disturbances with the help of the built-in "adaptive load control", thus keeping productivity high.

CNC milling machine

Equipped with servo motors of the MINAS LIQI series for controlling 3 axes (X, Y, Z) and safety light curtains from Panasonic.

Packaging machine for hamburger and minced meat

Equipped with MINAS A5 servo motors, FP7 programmable controllers, inverters, touch panels and sensors from Panasonic.



Press brake for metal sheet

Machine system equipped with MINAS A5 motors with EtherCAT for moving back gauges.

The MINAS A6 series is also available in the EPLAN Data Portal!

Panasonic's new MINAS A6 series follows in the footsteps of the highly successful predecessor, the MINAS A5 series. The A6 series has been improved further. At the same time, compatibility with the A5 series has been maintained.

› **Simple communication connection**
Modbus RTU (see also page 44)

Analog/pulse type
MINAS A6
Servo driver

› **One of the smallest and lightest motors**
Up to 30% shorter than for MINAS A5

MINAS A6
Servo motor
Rated power:
50W to 5000W

› **Suitable for peak top performance demands**
Improved response frequency

Network types MINAS A6N (RTEX) and MINAS A6B (EtherCAT)
Servo driver

MINAS A6 series	A6SE	A6SG	A6SF	A6N/A6B
				
Rated power	50–5000W			
Supply voltage	1-/3–phase 200V AC			
Bandwidth (velocity response)	3200Hz			
Rated rotational speed	2000–3000rpm			
Max. rotational speed	3000–6500rpm			
Rated torque	0.16–26.3Nm			
Peak torque	0.48–71.6Nm			
Control functions	Position control		Position, velocity, and torque control	
IP degree of protection (motor)	IP67			
Control input	Pulse		Pulse, analog	Network

Compatible with MINAS A5 series

Identical interfaces

The same A5 series connector cables and connectors can also be used for the A6 series (except for MHMF motors 50W-1000W).

MINAS A5

Same accessories

EMC filter and braking resistor can be used for both the MINAS A5 series and the MINAS A6 series.

MINAS A6

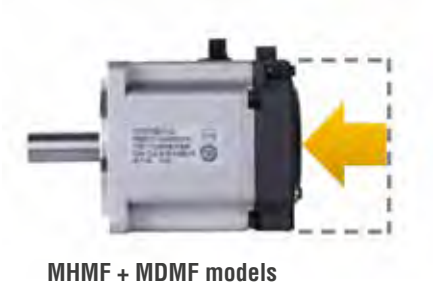
Same flange

The motor in the machine is 1:1 interchangeable.

Improvements and new features of the MINAS A6 series

Even more compact design

Thanks to the split core structure and a new housing, we have been able to reduce not only the length by 30%, but also the weight by up to 10%.

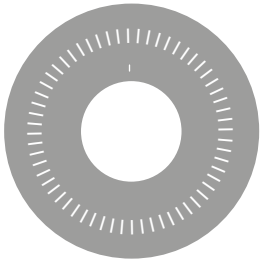


MHMF + MDMF models

10% lighter, 30% shorter

High-resolution 23-bit encoder – can be used as an absolute or incremental rotary encoder

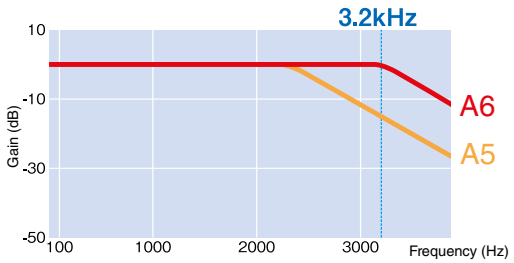
The 20-bit MINAS A5 encoder (1048576ppr = pulses per revolution) has been upgraded to 23 bit (8388608ppr).

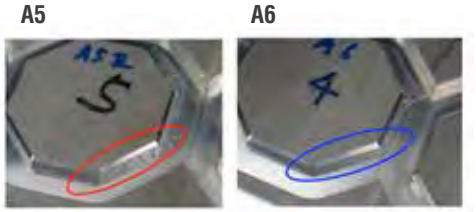


Improvements and new features of the MINAS A6 series

Advanced controller settings

3.2kHz frequency response

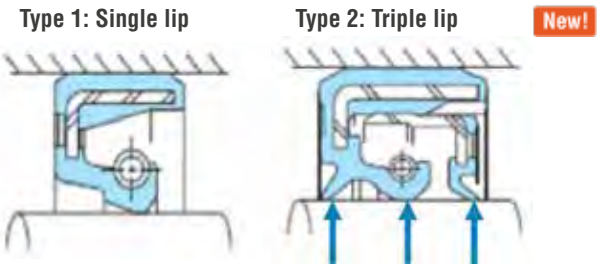




Numerous interference bands | Hardly any interference bands

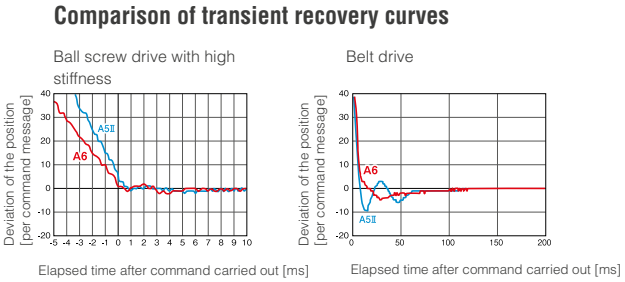
Available with two different seals (single/triple-lip)

An oil seal with triple lip has just been developed.
It is ideally suited for protection against ingress of dust and oil in poor ambient environments.

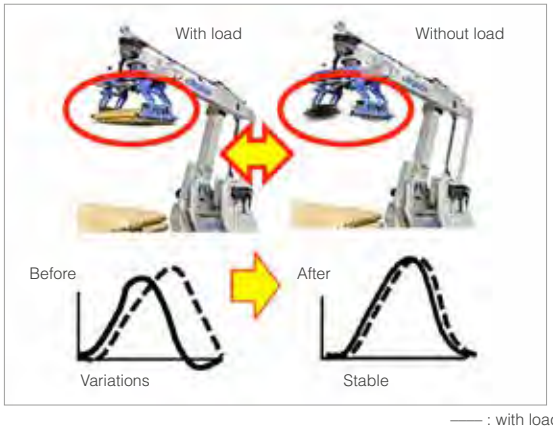


Improved vibration suppression

Vibrations when braking to a standstill have now been significantly reduced. This has shortened the transient recovery time.



Improved suppression of load variations



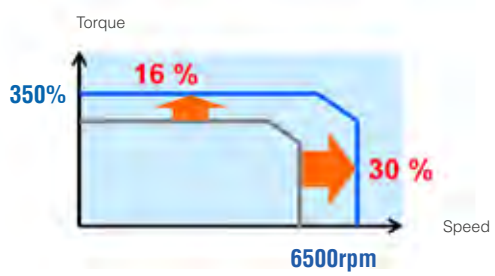
—— : with load
------ : without load

Max. torque

Up to 350% of the nominal torque (MHMF model)

Max. speed

Raised to max. 6500rpm (MHMF model)



Semi/fully enclosed position control loop

The A6 series enables a setting value of 8Mpps and a response with 4Mpps. This allows for high resolution as well as high-speed operation.

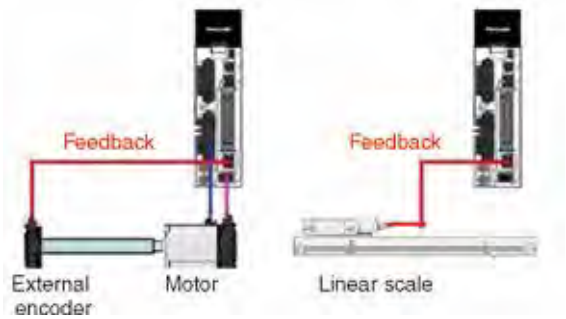
A5
Setting value 4Mpps

A6
Setting value 8Mpps

General features

External encoders for full-closed control

Using an external encoder ensures high-precision position control.



Real-time auto-gain tuning

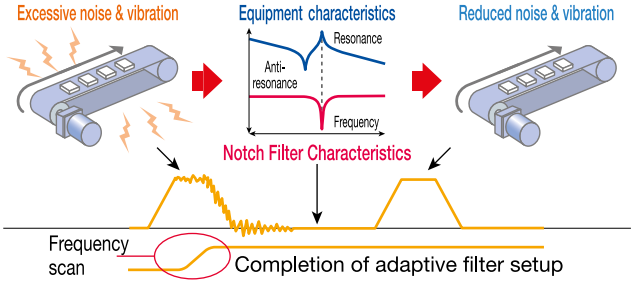
Automatic tuning after completion of multiple operations. The automatic vibration suppression function minimizes damage to the equipment. Additional mode and stiffness parameters enable easy response-frequency optimization for specific machine types such as high-friction, belt-driven machines or machines with low-friction ball screw drives.

Belt drive

Ball screw drive

Manual and automatic notch filters

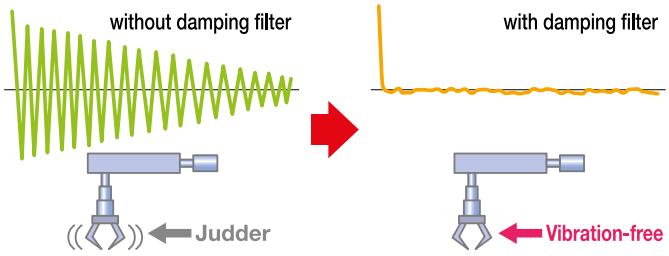
Highly sensitive notch filters log vibration frequencies and adapt them automatically.



General features

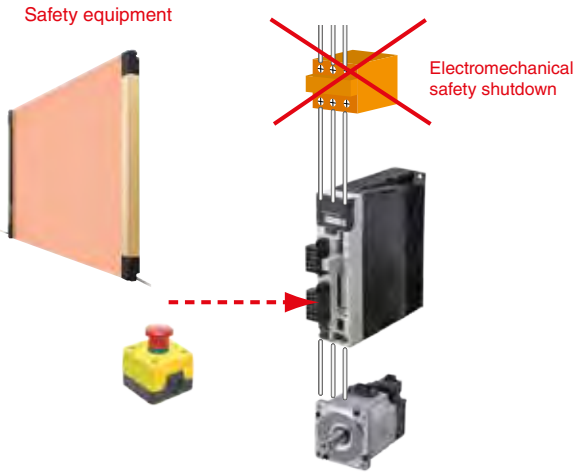
Manual and automatic damping controls

Damping filters that can be set automatically suppress the equipment's resonance and the natural vibration frequency component of the command input, which greatly reduces axis vibration at machine stoppage.



Integrated safety function STO (Safe Torque Off)

Safety functions based on safety standards:
ISO13849-1(PL e, CAT3), EN61508(SIL3), EN62061(SILCL3), EN61800-5-2(SIL3, STO), IEC61326-3-1, IEC60240-1.

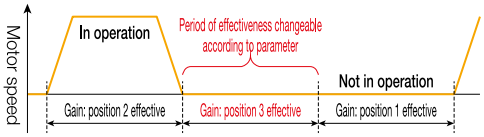


Dynamic brake

For dynamic braking that protects material.

Torque limit

Torque limit is an indispensable function for torque-controlled applications or generally for protection against mechanical damages.



3-step control setting

Control parameters are activated according to the operating condition (deceleration during operation, stopping during fast positioning, standstill). By controlling the motion it is possible to perform even faster positioning with less vibration.

Software tool PANATERM with motion simulation

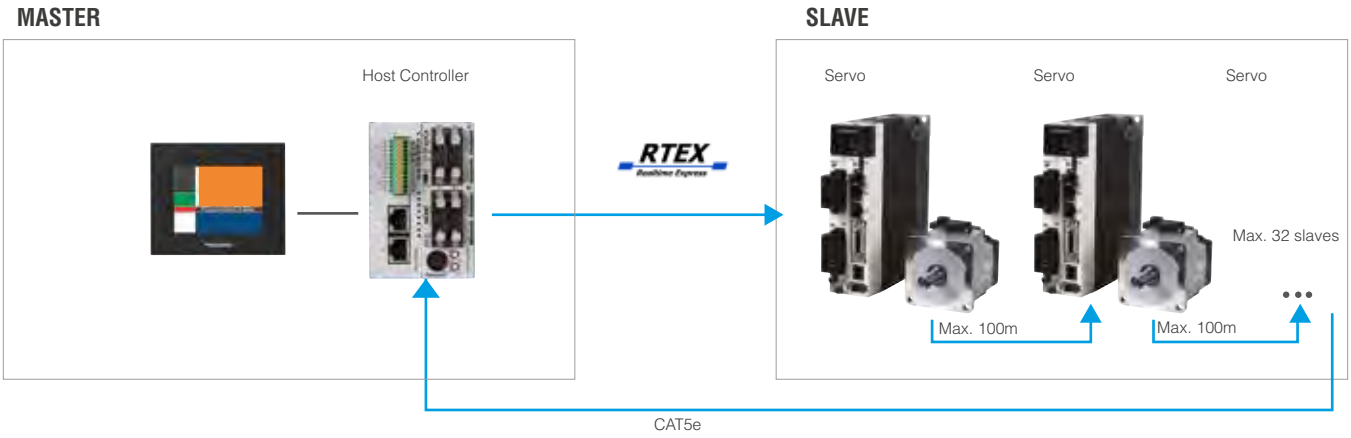
PANATERM reads response frequency data from the actual machine. A simplified simulation function allows you to check gain and filter effects without adjusting the actual equipment.

MINAS A6N with RTEX protocol

RTEX (Realtime Express)

Thanks to its high transmission speed and sampling rate, this fast, real-time Ethernet bus for automation is particularly well suited for highly dynamic single and multiple axes position control tasks. The communication between master and slaves happens in real time.

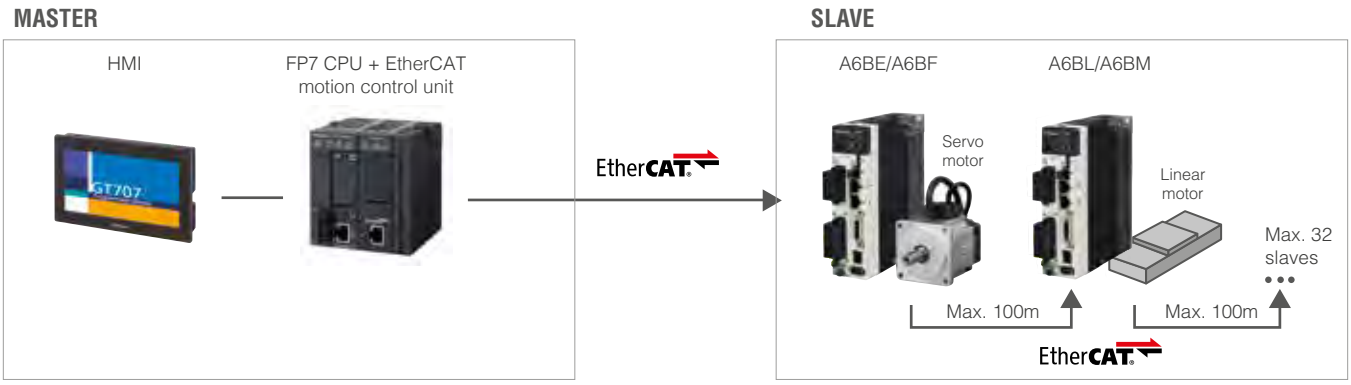
Easy mounting and reliable connections thanks to loop wiring:



MINAS A6B with EtherCAT protocol

EtherCAT (Ethernet for Control Automation Technology)

This ethernet-based fieldbus system also offers similar excellent features like RTEX. However, EtherCAT is an open, standardized field bus that allows an open data exchange with all other EtherCAT motion controllers.



Features	MINAS A6N RTEX	MINAS A6B EtherCAT
Supports position, velocity and torque control		
Manual and automatic vibration suppression (adjustable in the driver)		
Conforms to the following safety standards: ISO13849-1(PL e, CAT3), EN61508(SIL3), EN62061(SILCL3), EN61800-5-2(SIL3, STO), IEC61326-3-1, IEC60240-1		
Easy wiring using standard ethernet cables (CAT5e, up to 100m between units)		
Real-time communication 100Mbit/s	RTEX protocol	CAN over EtherCAT (CoE)
Full control of	up to 32 axes	up to 64 axes
Positioning units for	FPΣ (Sigma)	FP7

Servo drivers

Model	Standard	RS485 communication	Multifunction	Network	
	A6SE	A6SG	A6SF	A6N	A6B
					
RTEX	-	-	-	x	-
EtherCAT	-	-	-	-	x
Safety Connector (BBH)	-	-	x	x	
External encoder	-	-	x	x	
Safety STO	-	-	x	x	
RS232/485 (Modbus)	-	x	x	-	
Velocity control, torque control	-	-	x	x	
Position control with digital I/O (like MINAS A4P)	x	x	x	-	
Position control	x	x	x	x	

Motors

Model	MSMF				MDMF		MHMF			
	Low inertia				Medium inertia		High inertia			
										
Rated power W	Flange Ø mm	Rated rotation speed (max.) rpm	Flange Ø mm	Rated rotation speed (max.) rpm	Flange Ø mm	Rated rotation speed (max.) rpm	Flange Ø mm	Rated rotation speed (max.) rpm	Flange Ø mm	Rated rotation speed (max.) rpm
50	38	3000 (6000)	-	-	-	-	40	3000 (6500)	-	-
100			-	-	-	-			-	-
200	60		-	-	-	-	60		-	-
400			-	-	-	-			-	-
750	80		-	-	-	-	80	3000 (6000)	-	-
1000			100	3000 (5000)	130	2000 (3000)			130	2000 (3000)
1500	-	-					-	-		
Features	Low power range, low inertia, suitable for all kinds of applications, also suitable for high-speed applications		Medium power range, low inertia, suitable for machinery directly connected with a ball screw drive and with high machine rigidity and repetition rate		Medium power range, medium inertia, suitable for belt-driven machinery with low rigidity		Low power range, high inertia, suitable for belt-driven machinery with low rigidity		Medium power range, high inertia, suitable for belt-driven machinery with low rigidity	
Applications	Bonders, equipment for transistor production, packaging machines, etc.		SMD machinery Machines for food production and LCDs, etc.		Conveyor machinery, robots, textile machines, etc.		Conveyor machinery, robots, etc.		Conveyor machinery, robots, machines for LCD production, etc.	

Servo driver model codes

MAD	L	N	1	5	S	E

Frame:
MAD: A
MBD: B
MCD: C
MDD: D
MED: E
MFD: F

L: A6 series

Safety function:
N: Without safety
T: With safety

Maximum rated current:
0: 6A
1: 8A
2: 12A
3: 22A
4: 24A
5: 40A
8: 60A
A: 100A
B: 120A

Type:

Pulse/analog type:
SE: Standard (pulse)
SF: Multifunction (pulse, analog)
SG: RS485 (pulse)

Network type:
NE: Without safety (RTEX)
NF: With safety (RTEX)
BE: Without safety (EtherCAT)
BF: With safety (EtherCAT)

Supply voltage
1: 1-phase, 100V
3: 3-phase, 200V
5: 1-/3-phase 200V

Motor model codes

MSM	F	5A	Z	L	1	A1

Motor model
MSM: Low inertia
MDM: Medium inertia
MHM: High inertia

F: A6 series

Rated power:
5A: 50W
01: 100W
02: 200W
04: 400W
08: 750W
09: 1kW (Ø 80mm)
10: 1kW (Ø 100/130mm)
15: 1.5kW

Supply voltage
1: 100V
2: 200V
Z: 100V/200V

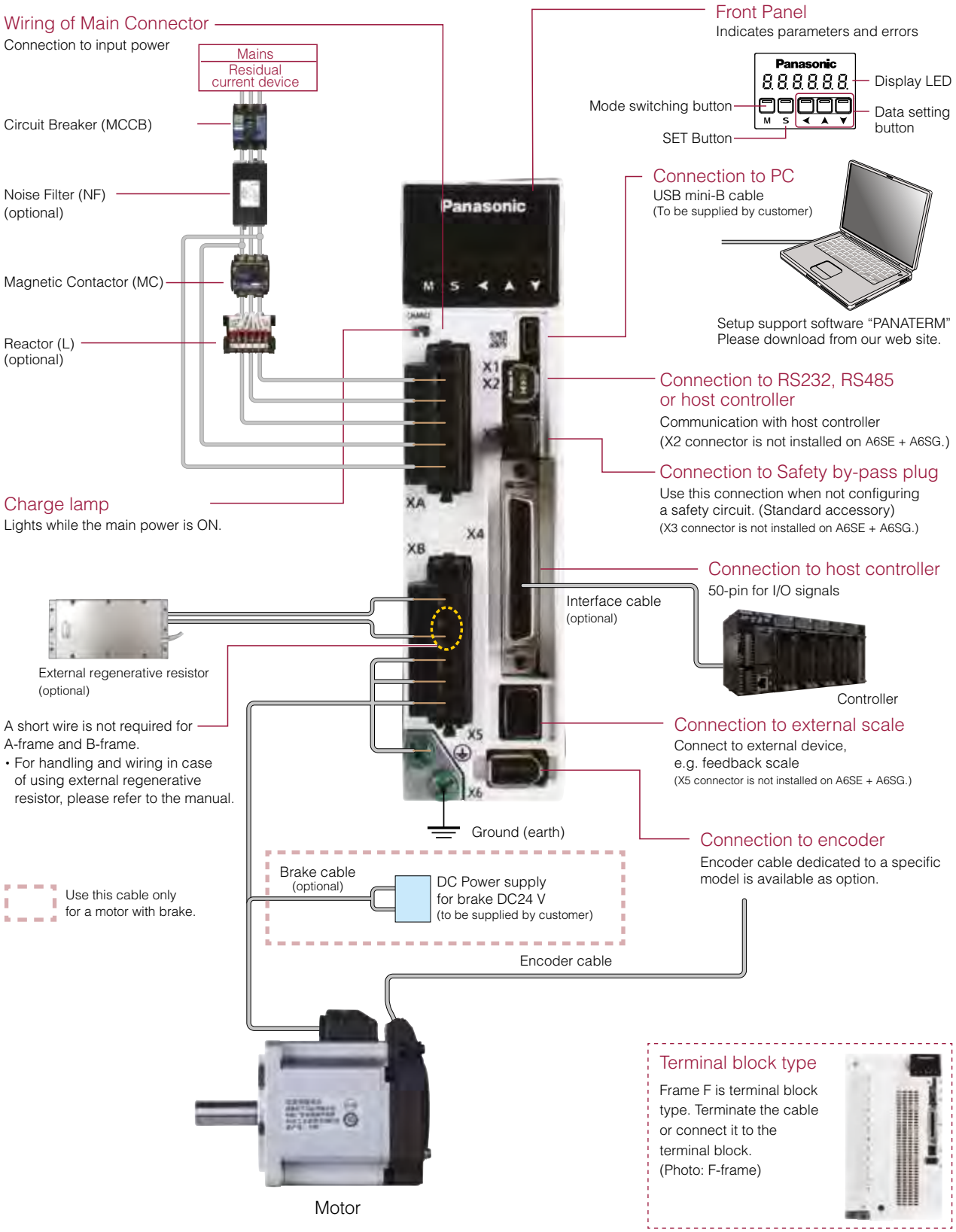
Motor specifications:
(shaft type, holding brake, oil seal, encoder clamp):
A-D,G,H,S-V; 1-8

1: Standard

L: 23 bit absolute, 8388608ppr

Connections and interfaces

Connector type (200V: frame A – F)



MINAS A6 SERIES:

Compact, light and powerful

As fast as our large motors!

Motors

Smaller than a business card

Illustration true to scale

	Overview of MINAS A6 motors, servo drivers and accessories								
	Motor								
	Rated power W	Flange Ø mm	Max. torque Nm	Rated rotation speed (max.) rpm	Type	Holding brake	Degree of protection IP67	Key shaft	Encoder
Low inertia	50	38	0.16 (0.48)	3000 (6000)	MSMF5AZL1U1		x	x	23-bit absolute encoder 8388608ppr
					MSMF5AZL1V1	x	x	x	
	100		0.32 (0.95)		MSMF012L1U1		x	x	
					MSMF012L1V1	x	x	x	
	200	60	0.64 (1.91)		MSMF022L1U1		x	x	
					MSMF022L1V1	x	x	x	
	400		1.27 (3.82)		MSMF042L1U1		x	x	
					MSMF042L1V1	x	x	x	
	750	80	2.39 (7.16)		MSMF082L1U1		x	x	
					MSMF082L1V1	x	x	x	
	1000		3.18 (9.55)		MSMF092L1U1		x	x	
					MSMF092L1V1	x	x	x	
		100	3.18 (9.55)	3000 (5000)	MSMF102L1G5		x	x	
					MSMF102L1H5	x	x	x	
	1500		4.77 (14.3)		MSMF152L1G5		x	x	
					MSMF152L1H5	x	x	x	
Medium inertia	1000	130	4.77 (14.3)	2000 (3000)	MDMF102L1G5		x	x	23-bit absolute encoder 8388608ppr
					MDMF102L1H5	x	x	x	
	1500		7.16 (21.5)		MDMF152L1G5		x	x	
					MDMF152L1H5	x	x	x	
High inertia	50	40	0.16 (0.56)	3000 (6500)	MHMF5AZL1U1		x	x	23-bit absolute encoder 8388608ppr
					MHMF5AZL1V1	x	x	x	
	100		0.32 (1.11)		MHMF012L1U1		x	x	
					MHMF012L1V1	x	x	x	
	200	60	0.64 (2.23)		MHMF022L1U1		x	x	
					MHMF022L1V1	x	x	x	
	400		1.27 (4.46)		MHMF042L1U1		x	x	
					MHMF042L1V1	x	x	x	
	750	80	2.39 (8.36)	3000 (6000)	MHMF082L1U1		x	x	
					MHMF082L1V1	x	x	x	
	1000		3.18 (11.1)		MHMF092L1U1		x	x	
					MHMF092L1V1	x	x	x	
		130	4.77 (14.3)	2000 (3000)	MHMF102L1G5		x	x	
					MHMF102L1H5	x	x	x	
	1500		7.16 (21.5)		MHMF152L1G5		x	x	
					MHMF152L1H5	x	x	x	

□, □□ servo driver model, see page 13

* For MSMF motors with a holding brake < 1.5kW, an additional brake cable MFMCB0□□0PJT is required for the motor cable.

□□ = Cable length 0 1 = 1m 1 0 = 10m

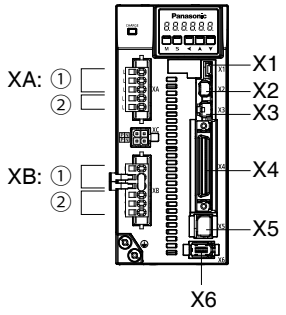
Driver		Cable				Filter	Braking resistor
Model	Frame	Motor cable		Encoder cable		EMC filter	Model
		For motors without holding brake	For motors with holding brake	23 bit incremental	23 bit absolute		
							Low inertia 200V AC class
MADL□05□□	A	MFMCA0□□0WJD	--	MFECA0□□0WJD	MFECA0□□0GJE (with battery box)	FN2080-6-06 or FS21238607	BWD250100
		--	MFMCA0□□0WJD*				
		MFMCA0□□0WJD	--				
		--	MFMCA0□□0WJD*				
MADL□15□□		MFMCA0□□0WJD	--				BWD250072
		--	MFMCA0□□0WJD*				
MBDL□25□□	B	MFMCA0□□0WJD	--				
		--	MFMCA0□□0WJD*				
MCDL□35□□	C	MFMCA0□□0WJD	--				
		--	MFMCA0□□0WJD*				
MDDL□45□□	D	MFMCA0□□0WJD	--			FN2080–10-06	BWD500035
		--	MFMCA0□□0WJD*				
MDDL□55□□		MFMCD0□□2GCD	--	MFECA0□□0GTD	MFECA0□□0GTE (with battery box)		
		--	MFMCA0□□2HCD				
		MFMCD0□□2GCD	--				
		--	MFMCA0□□2HCD				
							Medium inertia 200V AC class
MDDL□45□□	D	MFMCD0□□2GCD	--	MFECA0□□0GTD	MFECA0□□0GTE (with battery box)	FN2080–10-06	BWD500035
		--	MFMCA0□□2HCD				
MDDL□55□□		MFMCD0□□2GCD	--				
		--	MFMCA0□□2HCD				
							High inertia 200V AC class
MADL□05□□	A	MFMCA0□□7WFD	--	MFECA0□□0WJD	MFECA0□□0GJE (with battery box)	FN2080-6-06 or FS21238607	BWD250072
		--	MFMCA0□□7XFD				
		MFMCA0□□7WFD	--				
		--	MFMCA0□□7XFD				
MADL□15□□		MFMCA0□□0WFD	--				
		--	MFMCA0□□0XFD				
MBDL□25□□	B	MFMCA0□□0WFD	--				
		--	MFMCA0□□0XFD				
MCDL□35□□	C	MFMCA0□□0WFD	--				
		--	MFMCA0□□0XFD				
MDDL□55□□	D	MFMCA0□□0WFD	--			FN2080–10-06	BWD500035
		--	MFMCA0□□0XFD				
MDDL□45□□		MFMCD0□□2GCD	--	MFECA0□□0GTD	MFECA0□□0GTE (with battery box)		
		--	MFMCE0□□2HCD				
MDDL□55□□		MFMCD0□□2GCD	--				
		--	MFMCE0□□2HCD				

Specifications

				Frame	MINAS A6SE, A6SG, A6SF	MINAS A6N	MINAS A6B
Basic specifications	Input power	Main circuit	200V	A–D	1-phase, 3-phase, 200–240V (+10%, -15%), 50/60Hz		
				E, F	3-phase, 200–240V (+10%, -15%), 50/60Hz		
		Control circuit		A, B, C, D, E, F	1-phase, 200–240V (+10%, -15%), 50/60Hz		
	Operating conditions		Temperature		0–55°C, storage temperature: -20 to +65°C (max. temperature 80°C for 72 h)		
			Ambient humidity		Operation and storage: 20–85% RH (non-condensing)		
			Altitude		Max. 1000m above sea level		
			Vibration		Max. 5.88m/s^2, 10–60Hz (no continuous use at resonance frequency)		
	Control method				IGBT sinusoidal PWM		
	Encoder		Absolute		23 bit (resolution 8388608ppr)		
			Incremental		23 bit, no battery required, set parameter Pr.015 to 1		
	External feedback scale (X5 connector)		A/B phase		Initialization signal differential input (X5 connector only available for A6SF + A6N + A6B)		
			Serial		Compatible with Mitutoyo series AT500, ST771 (X5 connector only available for A6SF + A6N + A6B)		
	Control signals (multifunctional)		Input points		10	8	8
			Output points		6	3	3
	Analog signals (A6SF only)		Input points		3 input points: (16-bit A/D: 1, 12-bit A/D: 2)	-	-
			Output points		2		2
	Pulse signals		Input points		2 input points (opto coupler, line receiver)	-	-
			Output points		4 output points (line driver: encoder A, B and Z-phase output or EXA/EXB and EXZ output, open collector: Z-phase output or EXZ output)	2 output points (line driver: encoder A, B-phase output)	
	Interface		Realtime Express (RTEX)		-	Available	-
			EtherCAT		-	-	Available
			USB		Interface to PC, etc.		
			RS232		1:1 communication (not for A6SE)	-	-
			RS485		1:n communication with up to 31 axes via host (FP series PLC) (not for A6SE)	-	-
	Safety functions				IEC61800-5-2 (SIL3, STO), A6N and A6B also available without safety function		
	Front panel				5 buttons (MODE, SET, UP, DOWN, SHIFT), LED (6 digits)	2 rotary switches, LEDs for operation indicator	
	Regeneration				For frame A, B: external braking resistor only For frame C to F: built-in braking resistor (external braking resistor also possible)		
	Dynamic brake				For frame A to F: built-in		
	Control mode				7 different control modes (A6SF): 1. Position control, 2. Rotation speed, 3. Torque, 4. Position control/rotation speed, 5. Position control/torque, 6. Rotation speed/torque control, 7. Full-closed control	4 different control modes: Profile position mode (PP) Cyclic position mode (CP) Cyclic velocity mode (CV) Cyclic torque mode (CT)	7 different control modes: 1. Profile position mode (pp), 2. Cyclic synchronous position mode (csp), 3. Homing mode (hm), 4. Profile velocity mode (pv), 5. Cyclic synchronous velocity mode (csv), 6. Torque profile mode (tq) 7. Cyclic synchronous torque mode (cst)

Functions

				MINAS A6SE, A6SG, A6SF	MINAS A6N/A6B
Functions	Position control	Control input		Clear deviation counter, pulse enable, electronic gear switching, damping control switching, etc.	Controller enable, reference signal, measurement value signal, etc.
		Control output		Position control complete, torque reached, controller status, etc.	Position control complete, torque reached, controller status, etc.
		Pulse input	Pulse input A	500kpps (opto coupler)	A6B: Via RTEX network (100MBit) A6N: Via EtherCAT network
			Pulse input B	8Mpps (line receiver)	A6B: Via RTEX network (100MBit) A6N: Via EtherCAT network
			Signal format	Differential input/square-wave pulse	A6B: Via RTEX network (100MBit) A6N: Via EtherCAT network
			Electronic gear	Scaling from 1/1000 to 1000 times	
			Smoothing filter	First order low pass filter or FIR filter, customizable	
		Analog input (A6SF only)	Torque limit command	Individual torque limit for positive and negative direction	-
		Instantaneous speed observer		Available	
		Vibration suppression		Manual/automatic	
	Velocity control	Control input		1.–3. Selection of internal velocity setup, 4. Speed clamp, etc.	
		Control output		Set velocity has been reached, etc.	Set velocity has been reached, etc.
		Analog input (A6SF only)	Velocity command	Velocity and direction	-
			Torque limit	Available	-
		Velocity range		1–6500rpm	
		Internal velocity command		8 velocity set values	A6B: Via RTEX network A6N: Via EtherCAT network
		Smooth start-up and stopping		Individual setup of acceleration and deceleration from 0 to 10s/1000rpm, S-curve acceleration/deceleration ramp possible.	
		Zero speed clamp		Speed clamp input	
		Instantaneous speed observer		Available	
		Velocity control filter		Available	
	Torque control	Control input		Speed clamp input, "Torque under control" input, etc.	Reference signal, limit switch evaluation, etc.
		Control output		Set torque has been reached (at predefined velocity), etc.	Set rotation speed reached, torque reached, etc.
		Analog input	Velocity command	Set speed can be scaled	-
			Speed limit function	Speed can be scaled	-
	Full-closed control	Control input		1. Reset counter, 2. Command pulse inhibition, 3. Electronic gear, 4. Filter switching	-
		Control output		Position control complete (in position)	-
		Pulse input	Opto coupler (pulse input A)	500kpps	-
			Line receiver (pulse input B)	4Mpps	-
			Signal format	Differential input/square-wave pulse	-
			Electronic gear	Scaling of pulse frequency from 1/1000 to 1000 times	-
			Smoothing filter	First order low pass filter or FIR filter, Customizable	-
		Analog input	Torque limit command	Torque limit available	-
		Vibration suppression		Manual/automatic	-
		Scaling of counter pulses		From 1/40 to 160 times	-
	Other features	Autotuning		Automatic adjustment of the driver's rigidity to the vibration behavior of the mechanical parts and changes to the load.	
		Encoder resolution		Any value up to the maximal resolution of the encoder	
		Protective function	Error messages causing switch-off	Overvoltage, undervoltage, overspeed, overload, overheat, overcurrent, encoder error, etc.	
			Error messages requiring acknowledgement	Exceeding the position deviation, command pulse division error, EPROM error, etc.	
		Alarm history		Can be logged for reference	



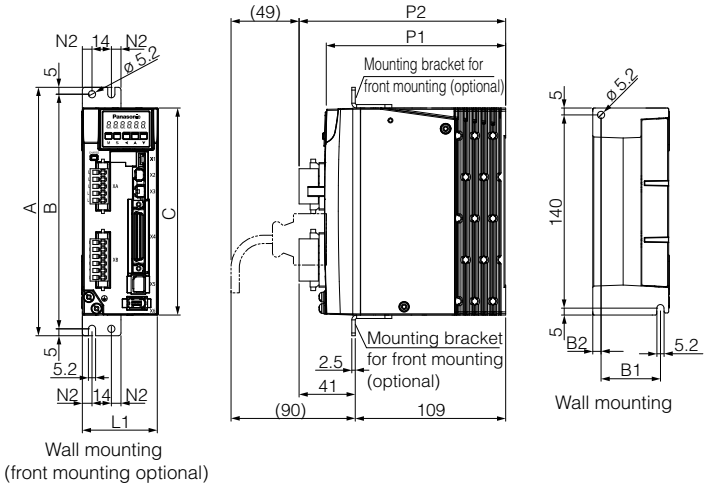
XA:
1. Main circuit
2. Control circuit

XB:
1. Braking resistor
2. Motor

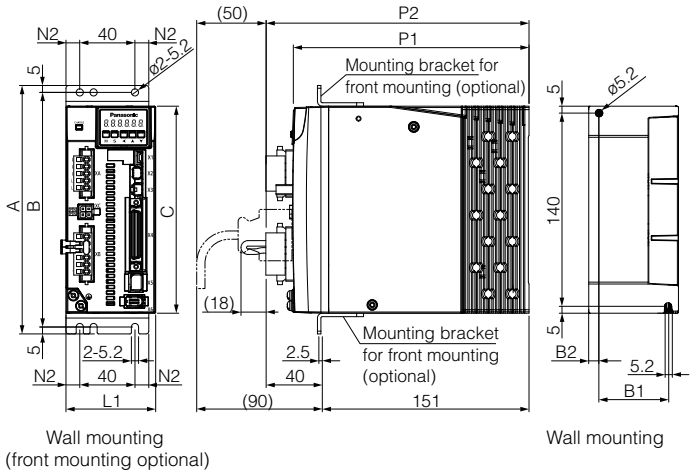
X1: USB
X2: RS232/485
X3: Safety function connector
X4: I/O signals
X5: External encoder (encoder, linear scale, etc.)
X6: Encoder

Frame A, B

All dimensions are in mm

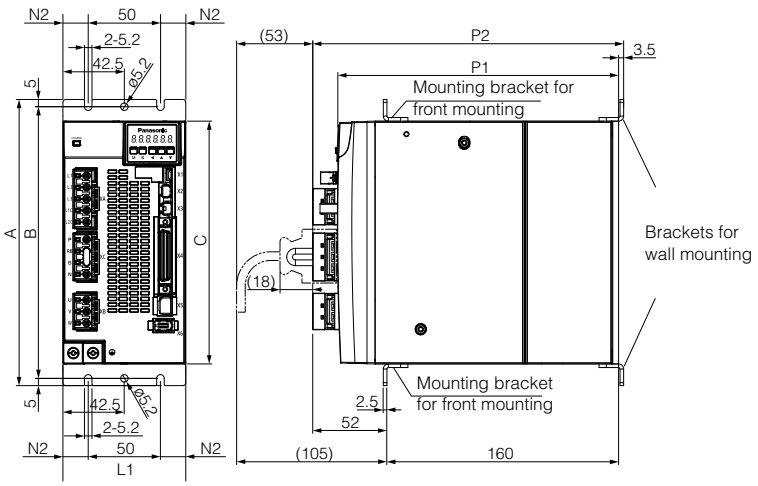


Frame C, D

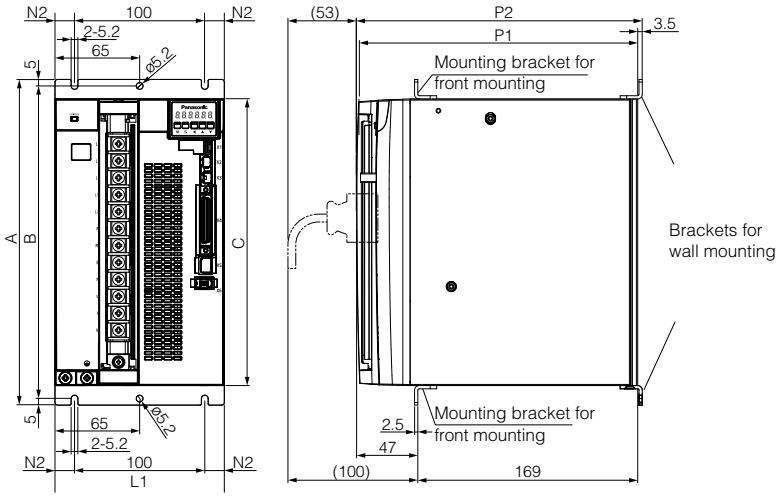


Frame E

All dimensions are in mm



Frame F



Frame	Voltage	Width						Depth		Control panel		
		L1	N1	N2	A	B	C	P1	P2	B1	B2	Weight
A	200V	40	-	7	180	170	150	130	150	28	6	0.8kg
B	200V	55	-	7	180	170	150	130	150	43	6	1.0kg
C	200V	65	40	10	180	170	150	170	191	50	7.5	1.6kg
D	200V	85	40	10	180	170	150	170	191	70	7.6	2.1kg
E	200V	85	50	17.5	198	188	168	216	193	-	-	2.5kg
F	200V	130	100	17.5	250	240	220	219.5	216	-	-	4.8kg

3D-CAD data is available in stp format for downloading from our website:
https://www.panasonic-electric-works.com/eu/downloadcenter.htm
Home -> Download center -> Automation products -> Servo drives -> CAD

Specifications

MSMF (low inertia) 50–1500W, 200V AC						
Motor		MSMF5AZL1□□	MSMF012L1□□	MSMF022L1□□	MSMF042L1□□	
Rated power W		50	100	200	400	
Required power kVA		0.5			0.9	
Rated current A		1.1		1.5	2.4	
Max. current A o-p		4.7		6.5	10.2	
Rotational speed rpm	Rated rotational speed	3000				
	Max. rotational speed	6000				
Weight kg	Without holding brake	0.32	0.47	0.82	1.2	
	With holding brake	0.53	0.68	1.3	1.7	
Torque Nm	Nominal	0.16	0.32	0.64	1.27	
	Maximal	0.48	0.95	1.91	3.82	
Encoder	Pulses	23 bit incremental				
	Resolution	8388608ppr				
Braking resistor frequency times/min	Without external braking resistor	No limit				
	With external braking resistor	No limit				
Moment of inertia of rotor ($x10^{-4}kg \cdot m^2$)	Without holding brake	0.026	0.048	0.14	0.27	
	With holding brake	0.029	0.051	0.17	0.3	
Recommended inertia ratio between load and rotor		Max. 30:1				
Operating conditions	Temperature (without frost)	0–55°C				
	Ambient humidity	20–85% RH (non-condensing)				
	Altitude	Max. 1000m above sea level				
	Vibration	$5.88m/s^2$				
Holding brake specifications (The holding brake is engaged when the power for the servo driver is shut off. Do no						
Static friction torque Nm		0.294 min.		Min. 1.27		
Engaging time ms		Max. 35		Max. 50		
Releasing time ms		Max. 20		Max. 15		
Excitation current A DC		0.3		0.36		
Releasing voltage V DC		Min. 1				
Excitation voltage V DC		24 ±1.2%				
Permissible load and thrust at output shaft						
Radial load P direction N*	During installation	147		392		
	During operation	68.6		245		
Axial thrust (push), A direction N*	During installation	88		147		
	During operation	58.8		98		
Axial thrust (pull), B direction N*	During installation	117.6		196		
	During operation	58.8		98		

□□ Motor model, see page 16
* For explanation see page 24

	MSMF082L1□□	MSMF092L1□□	MSMF102L1□□	MSMF152L1□□
	750	1000		1500
	1.3	1.8	2.3	
	4.1	5.7	6.6	8.2
	17.4	24.2	28	35
			5000	
	2.3	2.8	3.6	4.6
	3.1	3.6	4.7	5.6
	2.39	3.18	3.18	4.77
	7.16	9.55	9.55	14.3
	0.96	1.26	2.15	3.1
	1.06	1.36	2.47	3.45
	Max. 20:1	Max. 15:1		
t use the holding brake when the motor is in motion.)				
	Min. 2.45	3.8 min.	8 min.	
	Max. 70		Max. 50	
	Max. 20		Max. 15	
	0.42		0.81 ±10%	
	Min. 1		Min. 2	
	24 ±1.2%	24 ±2.4%		
	686		980	
	392		490	
	294		588	
	147		196	
	392		686	
	147		196	

Specifications

MDMF (medium inertia) 1000–1500W, 200V AC			
Motor		MDMF102L1□□	MDMF152L1□□
Rated power		1000	1500
Required power kVA		1.8	2.3
Rated current A		5.2	8
Max. current A o-p		22	32
Rotational speed rpm	Rated rotational speed	2000	
	Max. rotational speed	3000	
Weight kg	Without holding brake	4.6	5.7
	With holding brake	6.1	7.2
Torque Nm	Nominal	4.77	7.16
	Maximal	14.3	21.5
Encoder	Pulses	23 bit incremental	
	Resolution	8388608ppr	
Braking resistor frequency times/min	Without external braking resistor	No limit	
	With external braking resistor	No limit	
Moment of inertia of rotor (x10^{-4}kg · m^2)	Without holding brake	6.18	9.16
	With holding brake	7.4	10.4
Recommended inertia ratio between load and rotor		Max.10:1	
Operating conditions	Temperature (without frost)	0–55°C	
	Ambient humidity	20–85% RH (non-condensing)	
	Altitude	Max. 1000m above sea level	
	Vibration	5.88m/s^2	
Holding brake specifications (The holding brake is engaged when the power for the servo driver is shut off. Do not use the holding brake when the motor is in motion.)			
Static friction torque Nm		Min. 13.7	
Engaging time ms		100 max	
Releasing time ms		Max. 50	
Excitation current A DC		0.79 ±10%	
Releasing voltage V DC		Min. 2	
Excitation voltage V DC		24 ±2.4%	
Permissible load and thrust at output shaft			
Radial load P direction N*	During installation	980	
	During operation	490	
Axial thrust (pull), B direction N*	During installation	588	
	During operation	196	
Axial thrust (pull), B direction N*	During installation	689	
	During operation	196	

□□ = Motor model, see page 16

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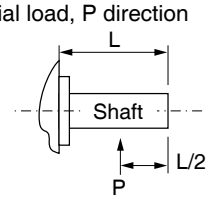
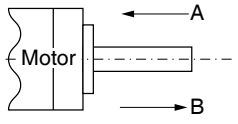
Permissible load and thrust at output shaft

Radial load, P direction



Thrust load, A and B direction



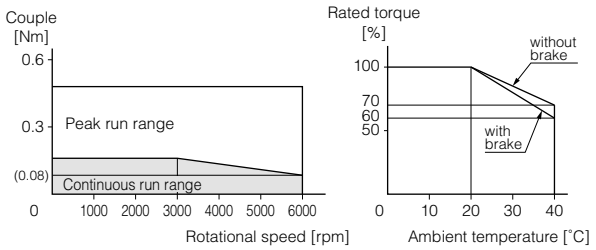
MHMF (high inertia) 50–1500W, 200V AC									
Motor		MHMF5AZL1□□	MHMF012L1□□	MHMF022L1□□	MHMF042L1□□	MHMF082L1□□	MHMF092L1□□	MHMF102L1□□	MHMF152L1□□
Rated power W		50	100	200	400	750	1000		1500
Required power kVA		0.5		0.5	0.9	1.3	2.3	1.8	2.3
Rated current A		1.1		1.4	2.1	3.8	5.7	5.2	8
Max. current A o-p		5.5		6.9	10.4	18.8	28.2	22	34
Rotational speed rpm	Rated rotational speed	3000						2000	
	Max. rotational speed	6500				6000		3000	
Weight kg	Without holding brake	0.31	0.42	0.78	1.2	2.3	2.8	6.1	7.7
	With holding brake	0.53	0.64	1.2	1.6	3	3.5	7.6	9.2
Torque Nm	Nominal	0.16	0.32	0.64	1.27	2.39	3.18	4.77	7.16
	Maximal	0.56	1.11	2.23	4.46	8.36	11.1	14.3	21.5
Encoder	Pulses	23 bit incremental							
	Resolution	8388608ppr							
Braking resistor frequency times/min	Without external braking resistor	No limit							
	With external braking resistor	No limit							
Moment of inertia of rotor ($x10^{-4}$kg · m^2)	Without holding brake	0.038	0.071	0.29	0.56	1.56	2.03	22.9	33.4
	With holding brake	0,042	0.074	0.31	0.58	1.66	2.13	24.1	34.6
Recommended inertia ratio between load and rotor		Max. 30:1				Max. 20:1		Max. 5:1	
Operating conditions	Temperature (without frost)	0–55°C							
	Ambient humidity	20–85% RH (non-condensing)							
	Altitude	Max. 1000m above sea level							
	Vibration	5.88m/s^2							
Holding brake specifications (The holding brake is engaged when the power for the servo driver is shut off. Do not use the holding brake when the motor is in motion.)									
Static friction torque Nm		0.38 min.		1.6 min.		3.8 min.		Min. 13.7	
Engaging time ms		Max. 35		Max. 50		Max. 70		Max. 100	
Releasing time ms		Max. 20		Max. 20		Max. 20		Max. 50	
Excitation current A DC		0.3		0.36		0.42		0.79 ±10%	
Releasing voltage V DC		Min. 1						Min. 2	
Excitation voltage V DC		24 ±2.4%							
Permissible load and thrust at output shaft									
Radial load P direction N*	During installation	147	147	392		686		980	
	During operation	68.6	68.6	245		392		490	
Axial thrust (push), A direction N*	During installation	88	88	147		294		588	
	During operation	49	58.8	98		147		196	
Axial thrust (pull), B direction N*	During installation	117.6	117.6	196		392		686	
	During operation	49	58.8	98		147		196	

□□ = Motor model, see page 16

* For explanation see page 24

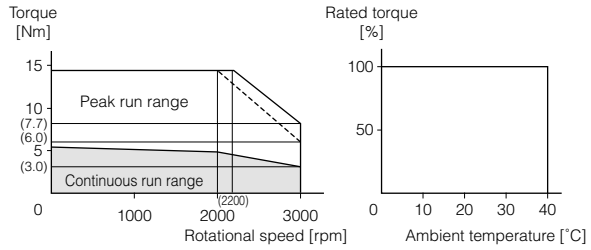
Example of a motor with low moment of inertia:

MSMF5AZL1□□	With oil seal



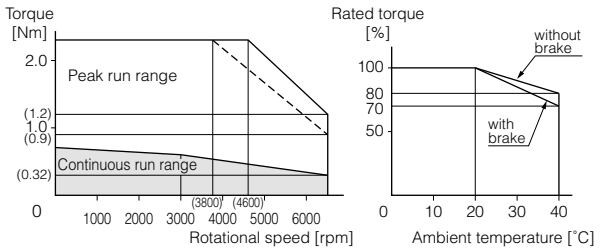
Example of a motor with medium moment of inertia:

MDMF102L1□□	With oil seal



Example of a motor with high moment of inertia:

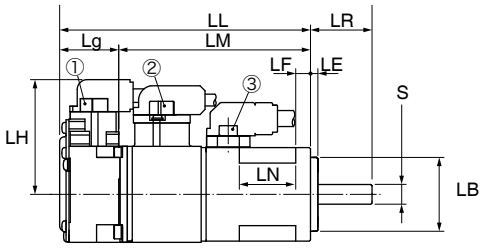
MHMF022L1□□	With oil seal

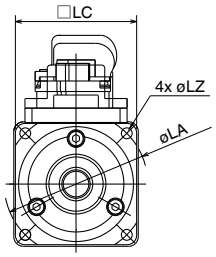


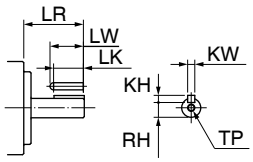
Additional data related to torque characteristics can be downloaded from the Panasonic website:
https://www.panasonic-electric-works.com/eu/downloadcenter.htm
Home -> Download center -> Automation products -> Servo drives -> MINAS A6 -> Catalogue / Shortform

MSMF – low inertia (50–1500W, 200V AC)

50–100W | Side | Front | Key way dimensions

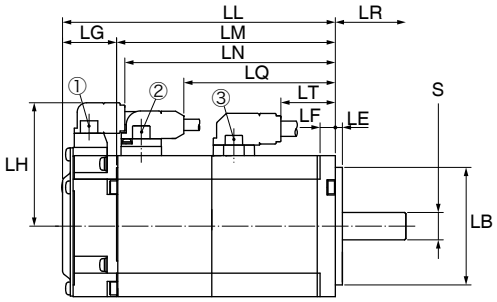


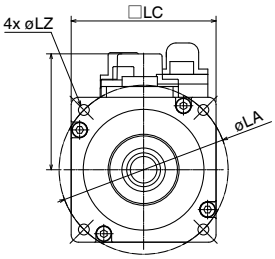


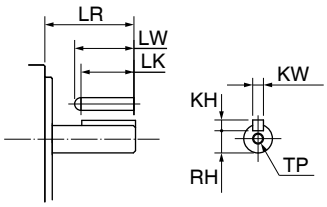


1) Encoder connector (JN2)
2) Brake connector
3) Motor connector

200–1000W | Side | Front | Key way dimensions

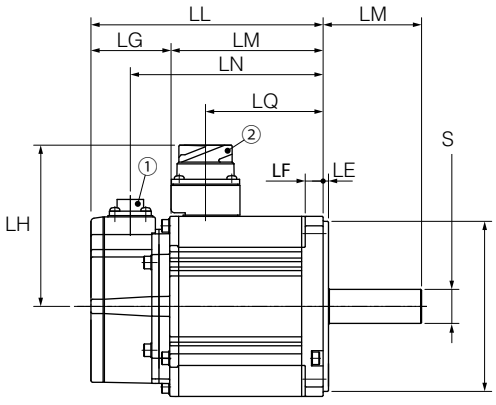


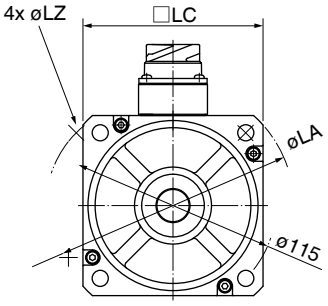


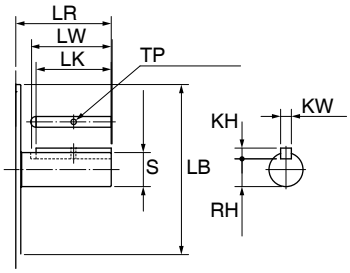


1) Encoder connector (JN2)
2) Brake connector
3) Motor connector

1000–1500W | Side | Front | Key way dimensions







1) Encoder connector (JN2)
2) Motor/brake connector

Comments:

- All illustrations show motors with holding brake.
- Top view: Encoder connection is rotated 30° to the axial direction of the motor for MSMF5AZL1□□ and MSMF012L1□□ (without/with holding brake).
- Top view: Brake connection is rotated 30° to the axial direction of the motor for MSMF5AZL1□□ and MSMF012L1□□ (with holding brake).
- The corresponding dimensional diagrams (top view) can be downloaded here:

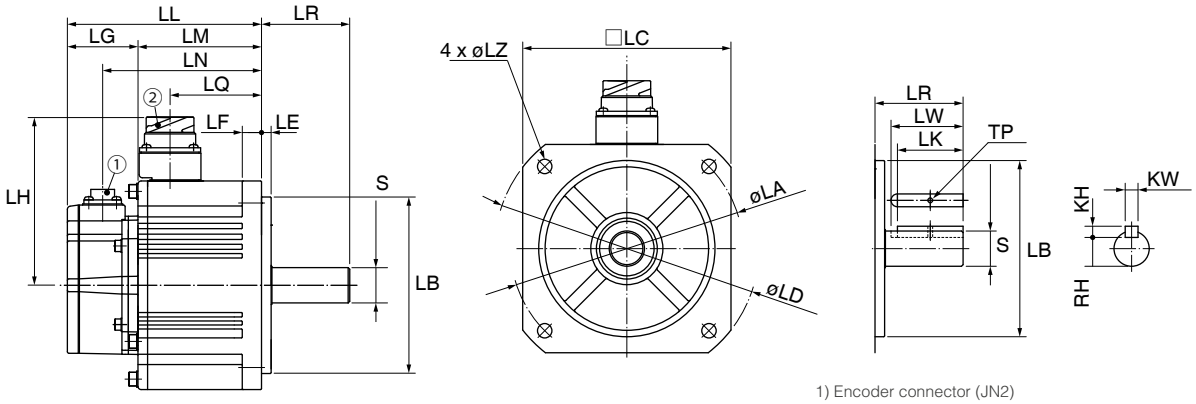
(QR code: Home -> Download center -> Automation products -> Servo drives -> MINAS A6 -> Catalogue / Short-form)

MSMF (low inertia) 50–1500W, 200V AC										
Rated power		W	50	100	200	400	750	1000		1500
Motor		200V AC	MSMF5AZL1□□	MSMF012L1□□	MSMF022L1□□	MSMF042L1□□	MSMF082L1□□	MSMF092L1□□	MSMF102L1□□	MSMF152L1□□
Encoder		ppr	23 bit absolute, 8388608							
LL	Without holding brake	mm	72	92	79.5	99	112.2	127.2	136	154.5
	With holding brake	mm	102	122	116	135.5	148.2	163.2	163	181.5
LR		mm	25	25	30	30	35	35	55	55
LG		mm	24	24	23	23	26	26	44	44
LM	Without holding brake	mm	48	68	56.5	76	86.2	101.2	92	110.5
	With holding brake	mm	78	98	93	112.5	122.2	137.2	119	137.5
LN	Without holding brake	mm	23	43	53	72.5	85.7	100.7	114	132.5
	With holding brake	mm	-	-	89.5	109	121.7	136.7	141	159.5
LQ	Without holding brake	mm	-	-	-	-	-	-	72	90.5
	With holding brake	mm	-	-	64.7	83.9	94.8	109.8	59	77.5
LT		mm	-	-	23.1	42.6	52.4	67.4	-	-
LH	Without holding brake	mm	46.6	46.6	52.5	52.5	60	60	90	90
	With holding brake	mm	46.6	46.6	52.5	52.5	61.6	61.6	101	101
LF		mm	6	6	6.5	6.5	8	8	10	10
LE		mm	3	3	3	3	3	3	3	3
S		mm	Ø 8 h6	Ø 8 h6	Ø 11 h6	Ø 14 h6	Ø 19 h6	Ø 19 h6	Ø 19 h6	Ø 19 h6
LB		mm	Ø 30 h7	Ø 30 h7	Ø 50 h7	Ø 50 h7	Ø 70 h7	Ø 70 h7	Ø 95 h7	Ø 95 h7
LC		mm	□38	□38	□60	□60	□80	□80	□100	□100
LZ		mm	4 x Ø 3.4	4 x Ø 3.4	4 x Ø 4.5	4 x Ø 4.5	4 x Ø 6	4 x Ø 6	4 x Ø 9	4 x Ø 9
LA		mm	Ø 45 ±0.2	Ø 45 ±0.2	Ø 70 ±0.2	Ø 70 ±0.2	Ø 90 ±0.2	Ø 90 ±0.2	Ø 115	Ø 115
LD		mm	-	-	-	-	-	-	Ø 135	Ø 135
Key way	LW	mm	14	14	20	25	25	25	45	45
	LK	mm	12.5	12.5	18	22.5	22	22	42	42
	KW	mm	3 h9	3 h9	4 h9	5 h9	6 h9	6 h9	6 h9	6 h9
	KH	mm	3	3	4	5	6	6	6	6
	RH	mm	6.2	6.2	8.5	11	15.5	15.5	15.5	15.5
	TP	mm	M3, depth 6	M3, depth 6	M4, depth 8	M5, depth 10	M5, depth 10	M5, depth 10	M3, through-hole	M3, through-hole
Weight	Without holding brake	kg	0.32	0.47	0.82	1.2	2.3	2.8	3.6	4.6
	With holding brake	kg	0.53	0.68	1.3	1.7	3.1	3.6	4.7	5.6

□□ = Motor model, see page 16

MDMF – medium inertia (1000–1500W, 200V AC)

1000–1500W Side Front Key way dimensions



1) Encoder connector (JN2)
2) Motor/brake connector

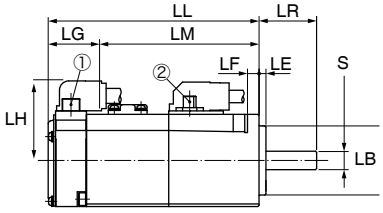
Note: Illustration shows motor with holding brake

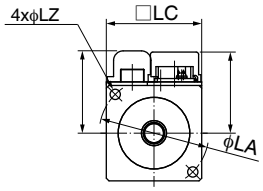
MDMF (medium moment of inertia) 1000–1500W, 200V AC				
Rated power		W	1000	1500
Motor		200V AC	MDMF102L1□□	MDMF152L1□□
Encoder		ppr	23 bit absolute, 8388608	
LL	Without holding brake	mm	121	135
	With holding brake	mm	149	163
LR		mm	55	55
LG		mm	44	44
LM	Without holding brake	mm	77	91
	With holding brake	mm	105	119
LN	Without holding brake	mm	99	113
	With holding brake	mm	127	141
LQ	Without holding brake	mm	57	71
	With holding brake	mm	43	57
LH	Without holding brake	mm	105	105
	With holding brake	mm	116	116
LF		mm	12	12
LE		mm	6	6
S		mm	Ø 22 h6	Ø 22 h6
LB		mm	Ø 110 h7	Ø 110 h7
LC		mm	□130	□130
LZ		mm	4 x Ø 9	4 x Ø 9
LA		mm	Ø 145	Ø 145
LD		mm	Ø 165	Ø 165
Key way	LW	mm	45	45
	LK	mm	41	41
	KW	mm	8 h9	8 h9
	KH	mm	7	7
	RH	mm	18	18
	TP	mm	M3, through-hole	M3, through-hole
Weight	Without holding brake	kg	4.6	5.7
	With holding brake	kg	6.1	7.2

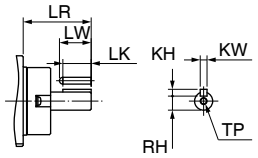
□□ = Motor model, see page 16

MHMF – high inertia (50–1500W, 200V AC)

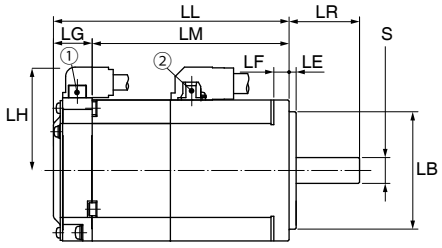
50–100W	Side	Front	Key way dimensions

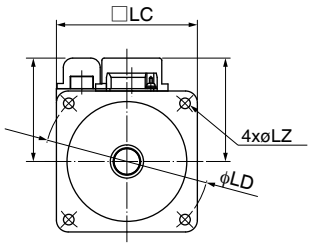


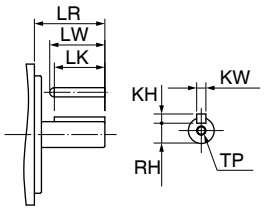




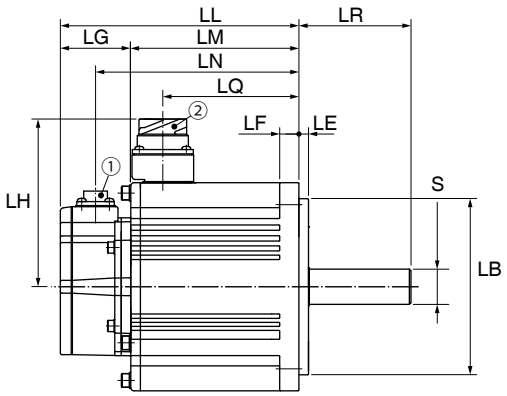
200–1000W	Side	Front	Key way dimensions

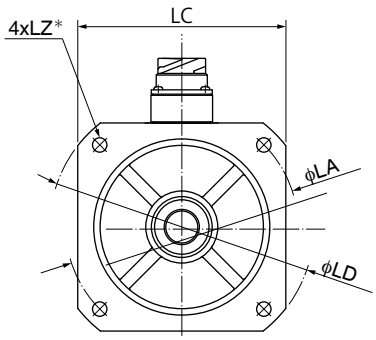


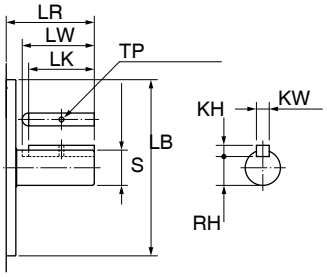




1000–1500W	Side	Front	Key way dimensions







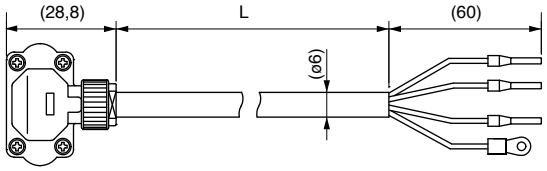
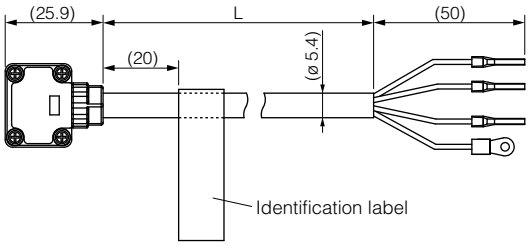
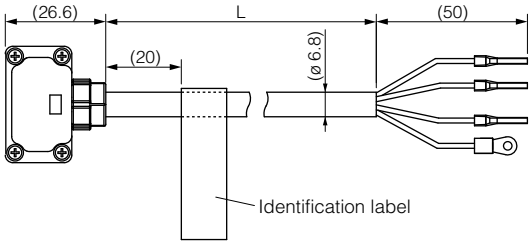
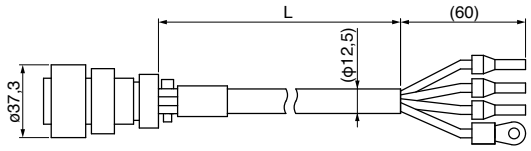
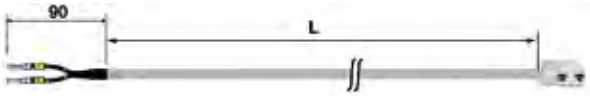
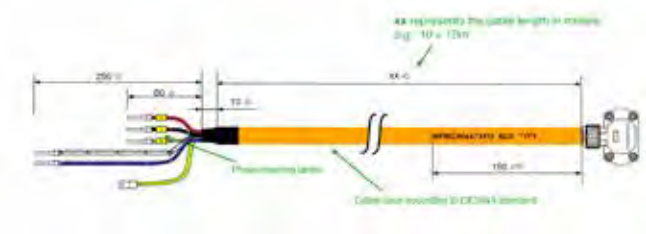
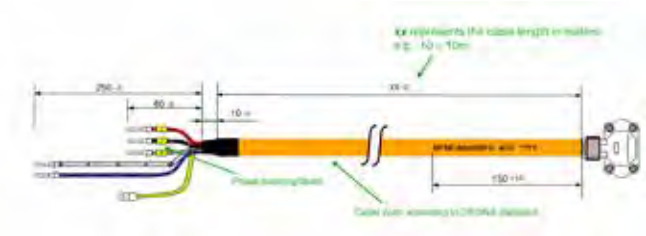
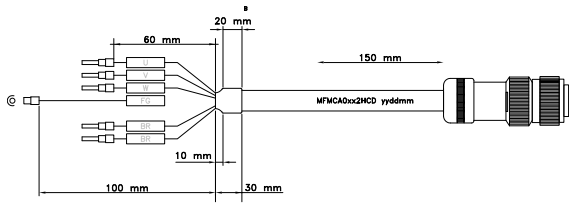
1) Encoder connector (JN2)
2) Motor/brake connector
Note: All illustrations show motors with holding brake.

MHMF (high inertia) 50–1500W, 200V AC										
Rated power		W	50	100	200	400	750	1000		1500
Motor		200V AC	MHMF5AZL1w□□	MHMF012L1□□	MHMF022L1□□	MHMF042L1□□	MHMF082L1□□	MHMF092L1□□	MHMF102L1□□	MHMF152L1□□
Encoder		ppr	23 bit absolute, 8388608							
LL	Without holding brake*	mm	57.5	71.5	71	88	95.4	108.2	-	-
	Without holding brake	mm	53.5	67.5	67.5	84.5	91.9	104.7	149	163
	With holding brake*	mm	91.4	105.4	100.3	117.3	129	141.8	-	-
	With holding brake	mm	87.4	101.4	96.8	113.8	125.5	138.3	177	191
LR		mm	25	25	30	30	35	35	70	70
LG		mm	16.6	16.6	16.5	16.5	16.5	16.5	44	44
LM	Without holding brake*	mm	40.9	54.9	54.5	71.5	78.9	91.7	-	-
	Without holding brake	mm	36.9	50.9	51	68	75.4	88.2	105	119
	With holding brake*	mm	74.8	88.8	83.8	100.8	112.5	125.3	-	-
	With holding brake	mm	70.8	84.8	80.3	97.3	109	121.8	133	147
LN	Without holding brake	mm	-	-	-	-	-	-	127	141
	With holding brake	mm	-	-	-	-	-	-	155	169
LQ	Without holding brake		-	-	-	-	-	-	85	99
	With holding brake		-	-	-	-	-	-	71	83
LH	Without holding brake	mm	34.5	34.5	44	44	54	54	85	105
	With holding brake	mm	34.5	34.5	44	44	54	54	71	116
LF		mm	5	5	6.5	6.5	8	8	12	12
LE		mm	3	3	3	3	3	3	6	-
S		mm	Ø 8 h6	Ø 8 h6	Ø 11 h6	Ø 14 h6	Ø 19 h6	Ø 19 h6	Ø 22 h6	Ø 22 h6
LB		mm	Ø 30 h7	Ø 30 h7	Ø 50 h7	Ø 50 h7	Ø 70 h7	Ø 70 h7	Ø 110 h7	Ø 110 h7
LC		mm	□40	□40	□60	□60	□80	□80	□130	□130
LZ		mm	2 x Ø 4.3	2 x Ø 4.3	4 x Ø 4.5	4 x Ø 4.5	4 x Ø 6	4 x Ø 6	4 x Ø 9	4 x Ø 9
LA		mm	Ø 46 ±0.2	Ø 46 ±0.2	Ø 70 ±0.2	Ø 70 ±0.2	Ø 90 ±0.2	Ø 90 ±0.2	Ø 145	Ø 145
LD		mm	-	-	-	-	-	-	Ø 165	Ø 165
Key way	LW	mm	14	14	20	20.5	25	25	45	45
	LK	mm	12.5	12.5	18	18	22	22	41	41
	KW	mm	3 h9	3 h9	4 h9	5 h9	6 h9	6 h9	8 h9	8 h9
	KH	mm	3	3	4	5	6	6	7	7
	RH	mm	6.2	6.2	8.5	11	15.5	15.5	18	18
	TP	mm	M3, depth 6	M3, depth 6	M4, depth 8	M5, depth 10	M5, depth 10	M5, depth 10	M3, through-hole	M3, through-hole
Weight	Without holding brake	kg	0.31	0.42	0.78	1.2	2.3	2.8	6.1	7.7
	With holding brake	kg	0.53	0.64	1.2	1.6	3	3.5	7.6	9.2

□□ = Motor model, see page 16
* With oil seal

Cables (motor – servo driver)

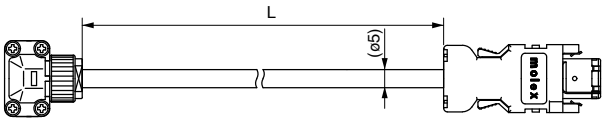
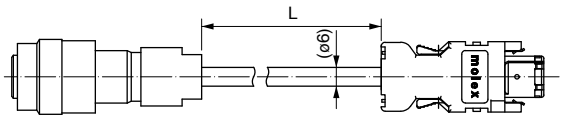
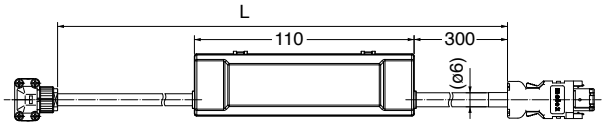
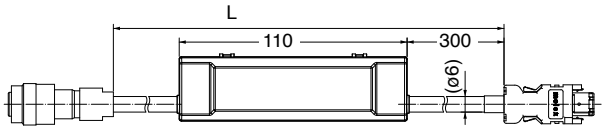
All dimensions are in mm

For motors without holding brake	MSMF motors 50W–1kW	MFMCA0□□0WJD	
	MHMF motors 50/100W	MFMCA0□□7WFD	
	MHMF motors 200W–1kW	MFMCA0□□0WFD	
	MSMF motors 1–2kW MDMF motors 1–2kW MHMF motors 1–1.5kW	MFMCD0□□2GCD	
For holding brake	MSMF motors 50W–1kW	MFMCB0□□0PJT	
For motors with holding brake	MHMF motors 50/100W	MFMCA0□□7XFD	
	MHMF motors 200W–1kW	MFMCA0□□0XFD	
	MSMF motors 1–2kW 200V MDMF motors 1–2kW 200V	MFMCA0□□ 2HCD	

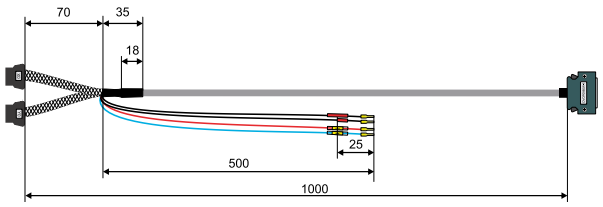
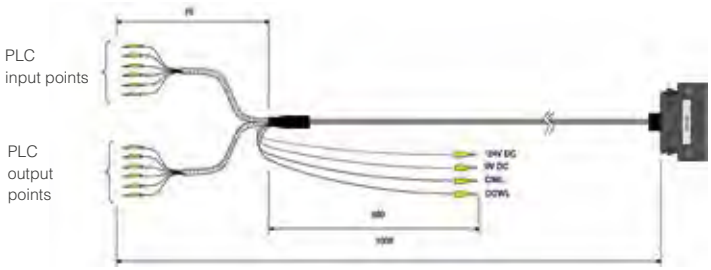
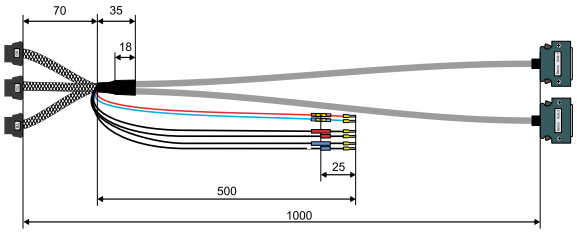
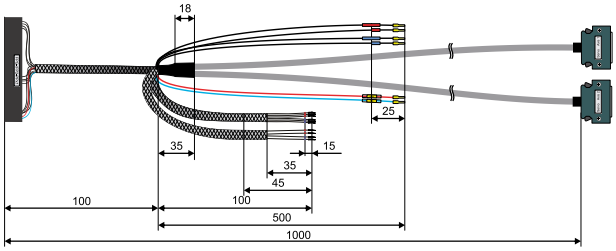
□□ = Length 0 1 = 1m 1 0 = 10m

Encoder cables (motor – servo driver)

All dimensions are in mm

For motors with 23-bit incremental encoder	MSMF, MHMF motors 50W–1kW	MFECA0□□0WJD	
	MSMF, MDMF, MHMF motors 1kW–5kW	MFECA0□□0GTD	
For motors with 23-bit absolute encoder (battery box)	MSMF, MHMF motors 50W–1kW	MFECA0□□0GJE	
	MSMF, MDMF, MHMF motors 1kW–5kW	MFECA0□□0GTE	

Control cable (PLC – MINAS A6 driver)

For direct connections with FP series programmable controllers	FPΣ (Sigma)	For 1 axis DVOP0980W-1 (NPN types) DVOP0982W-1 (PNP types)	
	FPΣ (Sigma), FP0R	For 1 axis DV0P0988W-1 (PNP types) DV0P0989W-1 (NPN types)	
	FPΣ (Sigma)	For 2 axes DVOP0981W-1 (NPN types) DVOP0983W-1 (PNP types)	
	FPΣ (Sigma) Positioning unit	For 2 axes DVOP0985W1 (transistor) DVOP0986W1 (line driver)	
	FP7 Positioning unit	For 2 axes DV0P0976W1 (line driver) DV0P0975W1 (transistor)	

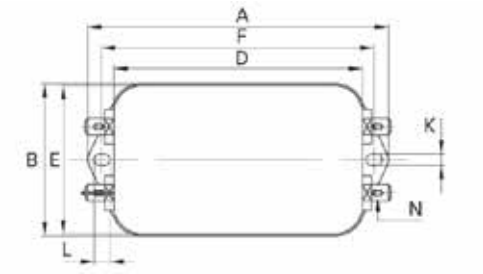
□□ = Length 0 1 = 1m 1 0 = 10m

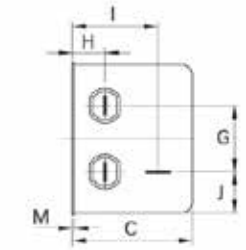
	Product no.	Details/Comments/Dimensions			
Cables	**Control cable**				
	DV0P4360	50W–5kW	50-pin	I/O cable X4, loose wires, 2m	
	DVOP4360P	50W–5kW	50-pin	I/O cable X4, loose wires, 2m, position control	
	DVOP4360V	50W–5kW	50-pin	I/O cable X4, loose wires, 2m, velocity control	
	DV0PM20024CAB020	50W–5kW	8-pin	Communication cable X2, RS485, RS232, loose wires, 2m	
	DV0PM20025CAB020	50W–5kW	8-pin	Safety cable X3, loose wires, 2m	
	DVOP0800	50W–5kW	26-pin	I/O cable X4, loose wires, 2m	
	Programming cable				
	CABMINIUSB5D	50W–5kW	USB		
Connector set	**Connector set for servo driver**				
	DV0P4350	50W–5kW	50-pin	I/Os, X4	
	DVOP0770	50W–5kW	26-pin	I/Os, X4	
	DV0PM20026	50W–5kW	–	External encoder connector X5	
	Connector set encoder, motor without holding brake				
	DV0PM24581	50/100W	–	MINAS A6 MHMF, IP67	
	DV0PM24582	200W–1kW	–	MINAS A6 MHMF, IP67	
	DV0PM20035	50W–1kW	–	MINAS A6 MSMF, IP67	
	DV0PM20036	1kW–2kW	–	MINAS A6 MSMF, MDMF; MHMF 1–1,5kW	
	DV0PM20036A	1kW–2kW	–	Angled type; MINAS A6 MSMF, MDMF; MHMF 1–1,5kW	
	Connector set encoder, motor with holding brake				
	DV0PM20040	50W–1kW	–	MINAS A6 MSMF, IP67	
	DV0PM20038	1kW–2kW	–	MINAS A6 MSMF, MDMF; MHMF 1–1,5kW	
	DV0PM20038A	1kW–2kW	–	Angled type; MINAS A6 MSMF, MDMF; MHMF 1–1,5kW	
Miscellaneous	**EMC filter**				
	FN2080-6-06	50W–750W	1-phase	250V AC	
	FN2080-10-06	1kW–1.5kW	1-/3-phase	500V AC	
	FS21238607	50W–750W	1-phase	Footprint filter, 250V AC	
	DV0P1460	50W–22kW	1-phase	Ferrite core, noise filter	
	Braking resistors				
	BWD250100	50W–100W	1-phase	100Ω,100W, 600V AC	110 x 80 x 15 (L x W x D in mm)
	BWD250072	200W–750W	1-phase	72Ω,100W, 600V AC	
	BWD500035	1kW–1.5kW	1-phase	35Ω, 200W, 600V AC	216 x 80 x 15 (L x W x D in mm)

EMC filter

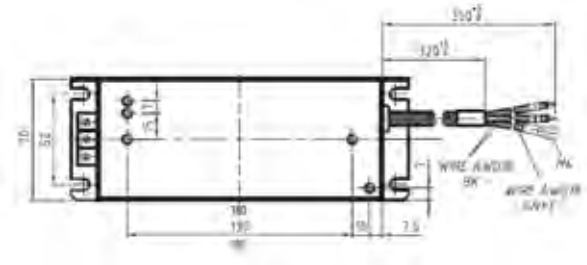
FN2080-6-06 for servo driver MINAS A6 50–750W, 1-phase / FN2080-10-06 for servo driver MINAS A6 1–1.5kW, 1-phase

Dimensions (mm)	FN2080-6-06	FN2080-10-06
A	113.5	156
B	57.5	57.5
C	45.4	45.4
D	94	130.5
E	56	56
F	103	143
G	25	25
H	12.4	12.4
I	32.4	32.4
J	15.5	15.5
K	4.4	5.3
L	6	6
M	0.9	1
N	6.3 x 0.8	6.3 x 0.8

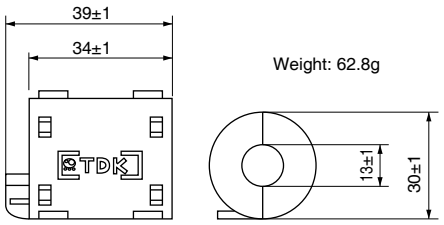




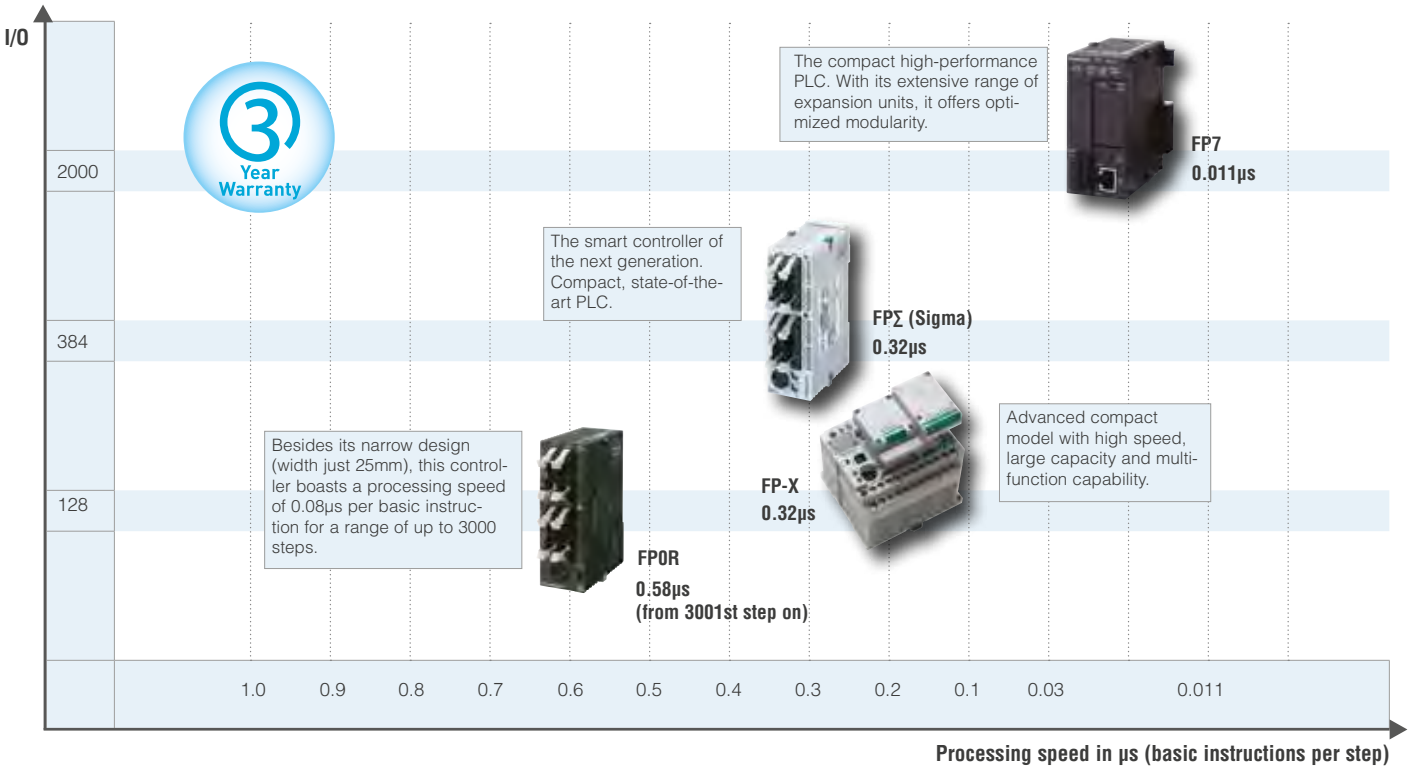
FS21238607 for servo driver MINAS A6 50–750W, 1-phase



DV0P1460 with ferrite core



Braking resistor



FP0R

New Standard For Compact PLCs

Pocket-size ultra-compact controller ideal for use in extremely narrow spaces

- Max. number of digital I/Os: 64 inputs / 64 transistor outputs or 54 relay outputs
- Max. number of analog I/Os: 24 inputs / 12 outputs
- 2 x RS232C interfaces, USB 2.0 port
- Program memory: 16000 to 32000 steps
- Data memory: 12315 to 32765 words
- PROFIBUS, Ethernet TCP/IP, Modbus, S-Link, CC-Link, PLC Link
- Advanced built-in motion control functions

FPΣ (Sigma)

The latest generation of compact machine controllers

USB port for direct connection to a PC. Also Ethernet-compatible.

- Max. number of digital I/Os: 192 inputs / 192 transistor outputs or 56 relay outputs
- Max. number of analog I/Os: 40 inputs / 28 outputs
- 3 x RS232C or 2 x RS232 + 1 x RS485
- Program memory: 32000 steps
- Data memory: 32k to 1056k words
- PROFIBUS, Ethernet TCP/IP, Modbus, CC-Link, S-Link, CANopen, DeviceNet
- Motion control functions

FP-X

Powerful compact PLC

High performance ultra-compact controller

- Max. 382 I/Os
- Max. number of analog I/Os: 28 inputs / 16 outputs
- 3 x RS232C or 2 x RS232 + 1 x RS485
- USB programming interface
- Program memory: 16000 or 32000 steps
- Data memory: 32765 words
- PROFIBUS, Ethernet TCP/IP, Modbus
- Motion control functions

FP7

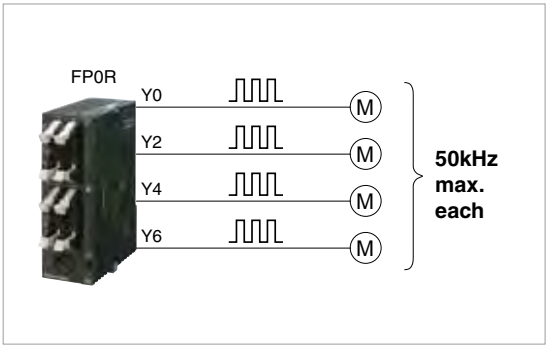
Modular high-performance PLC

A new era: Visualize local production conditions by collecting and transferring data

- Compact size with room for expansion functions
- Equipped with a cassette interface.
- Add-on cassettes can be added to the CPU to increase functionality without increasing the footprint of the system.
- Built-in Ethernet port with protocols MEWTOCOL-COM (client/server) or Ethernet/IP. Up to 272 connections can be active simultaneously.
- Functions available: SMTP, FTP client/server, HTTP client, e-mails; integrated web server
- Up to 64 different units can be connected to a single CPU.
- High-capacity SD (SDHC) memory cards of up to 32GB are supported.
- High performance (min. scan time 1ms, max. 20µs for 60k steps); the processing speed is less affected by frequent Ethernet communication.

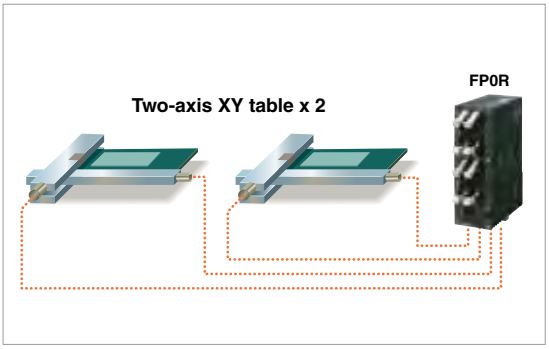
FP0R – position control

Equipped with 2 independent pulse outputs for position control and fast counter for PWM output support.



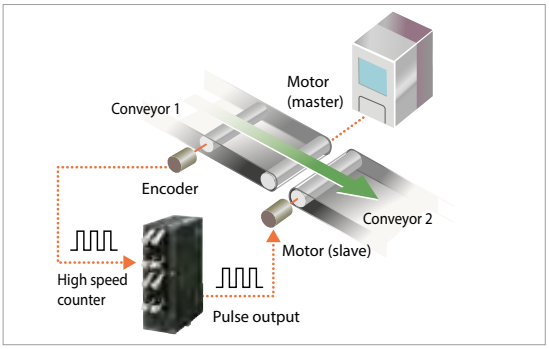
Integrated 4-axis feedback outputs (transistor output type)

No expansion units are required for multi-axis position control with e.g. 4 axes.

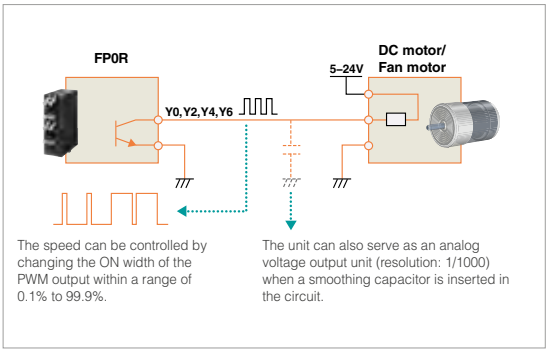


Two-axis linear interpolation (F175 command message)

Two-axis linear interpolation can be performed on two XY tables simultaneously with command message F175.



Simultaneous use: Fast counter (6 channels) and feedback outputs (4 channels)



Integrated multipoint PWM outputs (4 channels)

A single FP0R can be used to control the speed of up to 6 DC motors/ fan motors. The FP0R can also be used as an analog voltage output unit.

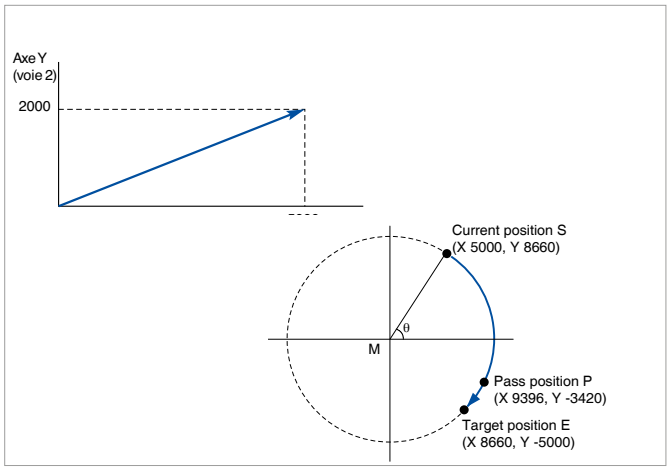
PLC	Product no.	Voltage	Output	Input points (counters)	Output points (axes)
	AFP0RC16	24V DC	Transistor NPN	8 (6)	8 (4)
	AFP0RC32			16 (6)	16 (4)
	AFP0RF32				

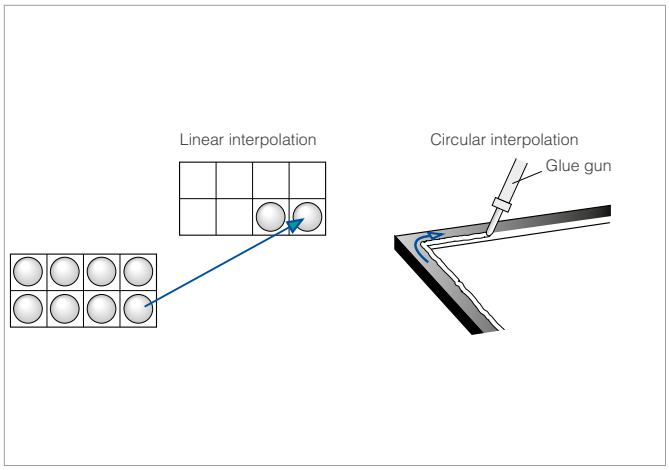
FPΣ (Sigma) – position control

Up to 16 axes can be controlled and extensive applications are possible

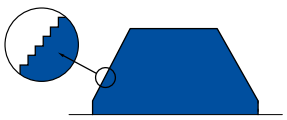
Reliable and precise control of high-speed drives

- Integrated linear and circular interpolation control
- Simple and intuitive programming
- Clockwise/counter-clockwise output method
- Smooth acceleration/deceleration
- Home position return
- Pulse outputs up to 100kHz
  A high output frequency and a rapid 0.02ms start allow for a precise and very fast positioning





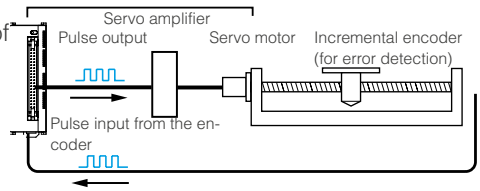
Deceleration ramp



Application example

Counting feedback pulses for identification of a failure

Positioning unit of the FPΣ (Sigma) CPU



PLC	Product no.	Voltage	Output	Input points	Output points (axes)
	FPGC32T2HTM	24V DC	Transistor NPN	16	16 (2)
	FPGC28P2HTM	24V DC	Transistor PNP	16	12 (2)

Positioning unit	Product no.	Output type	Output type
	FPGPP11	1-axis type	Transistor
	FPGPP21	2-axis type	
	FPGPP12	1-axis type	Line driver
	FPGPP22	2-axis type	

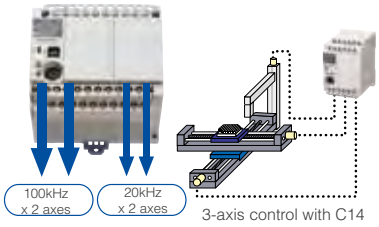
FP-X – position control

Low cost and space-saving for multi-axis position control tasks

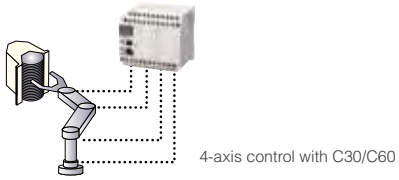
Built-in 3 or 4-axis pulse output (transistor types)

- Max. output frequency:
  C14: 100kHz(CH0,1), 20kHz(CH2)
  C30, C38, C60: 100kHz (channels 0, 1),
  20kHz (channels 2, 3)
- Signal output: CW/CCW, Pulse + Direction Output
- Functions supported:
  Trapezoidal control, multi-stage operation,
  JOG operation, origin return, 2-axis linear interpolation

XY table + processing head



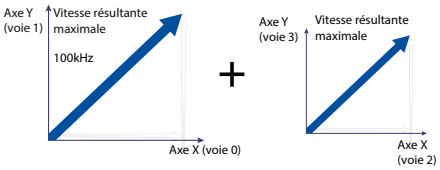
Semiconductor wafer takeout blade



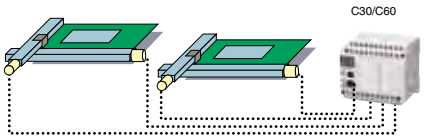
Linear interpolation simultaneously in 2 sets of axes (transistor output type)

- Easy control of two drive shafts for diagonal movement of a robot arm
- Considerably expands the range of applications that can be implemented
- Possible applications
  Palletizing, component pick and place,
  X/Y table control, contour cutting of a PC board

Simultaneous control of 2 mechanisms



Controls two units of 2-axis XY table



PLC	Product no.	Voltage	Output	Input points	Output points (axes)
	AFPXC14TDJ	24V DC	Transistor NPN	8	6 (3)
	AFPXC14TJ	100–240V AC			
	AFPXC14PDJ	24V DC	Transistor PNP		
	AFPXC14PJ	100–240V AC			
	AFPXC30TDJ	24V DC	Transistor NPN	16	14 (4)
	AFPXC30TJ	100–240V AC			
	AFPXC30PDJ	24V DC	Transistor PNP		
	AFPXC30PJ	100–240V AC			

PLC	Product no.	Voltage	Output	Input points	Output points (axes)
	AFPXC60TDJ	24V DC	Transistor NPN	32	28 (4)
	AFPXC60TJ	100–240V AC			
	AFPXC60PDJ	24V DC	Transistor PNP		
	AFPXC60PJ	100–240V AC			

FP7 – position control

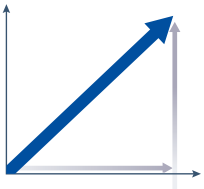
For complex position control tasks

Features

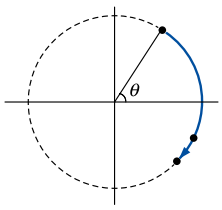
- Linear, circular, and spiral interpolation
- Max. speed 4Mpps (line driver), 500Kpps (transistor)
- Up to 600 points for each axis
- Integrated configurator software PM7 for parameter setting, JOG operation, home return, creation of data tables, etc.
- Electronic cam control and electronic gear.

Interpolation

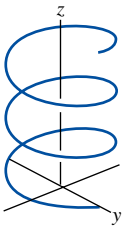
Linear



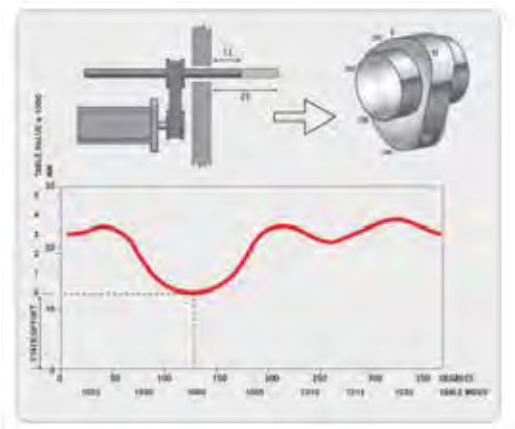
Circle



Spiral



Electronic cam table and gearbox



PLC	Product no.	Program capacity	Other features
	AFP7CPS21	64k steps	No Ethernet
	AFP7CPS31	120k steps	No Ethernet
	AFP7CPS31E	120k steps	With Ethernet
	AFP7CPS41E	196k steps	With Ethernet

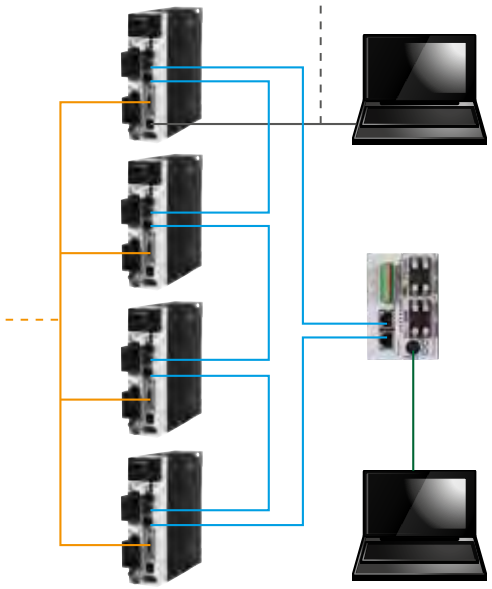
Positioning unit	Product no.	Functions	Output	Output points (axes)
	AFP7PP02T	With interpolation	Open collector	2
	AFP7PP04T			4
	AFP7PP02L		Line driver	2
	AFP7PP04L			4

RTEX unit – positioning

RTEX – the multiaxis Ethernet servo system

The RTEX positioning units support MINAS A6N network servo drives. A mutually optimized system consisting of PLC and servo driver greatly simplifies installation.

Standard commercial Ethernet cable
(shielded type, category 5e)



MINAS software for parameter setup

I/O signals, for example from limit and origin proximity switches are directly wired to the servo amp of each axis.

CPU
TOOL port

Software for the RTEX positioning unit
Control Configurator PM

Programming software
Control FPWIN Pro

The main advantages of the RTEX positioning units:

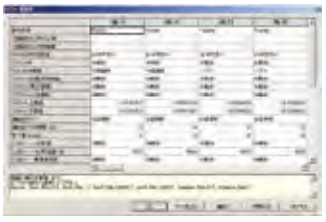
- Unique: Allows easy control of network servos with an ultra-compact PLC.
- Allows highly accurate control of multi-axis position control using high-speed 100Mbit/s communication.
- Minimization of wiring costs by using commercially available Ethernet cables.
- Position control of 2, 4, or 8 axes for servo drivers with Ethernet (RTEX) interface.
- Dedicated tool software Control Configurator PM supports operations from setup to startup and monitoring.
- Includes manual pulser input allowing support for precision teaching.

System configuration

Number of positioning units per RTEX unit
FPΣ (Sigma): 2 units (16 axes)

Software Control Configurator PM

User-friendly configuration tool for fast and easy commissioning



Product name	FPΣ (Sigma)	Number of axes	Output type	Product no..
Positioning unit (interpolation type) 	x	2	RTEX Ethernet	FPGPN2AN
	x	4		FPGPN4AN
	x	8		FPGPN8AN
Control Configurator PM	for all RTEX units			AFPS66510

Motion control libraries for Control FPWIN Pro (PLC)

The motion control library contains the most important function blocks, e.g.

- for relative or absolute position control
- and for home returns with linear axes.

Panasonic offers libraries for all motion control tasks.

CPU Motion Control Library

Position control with FP series control units (FP0R, FPΣ (Sigma), FP-X, FP7)

PP Motion Control Library

- Positioning with PP motion control units (FPΣ (Sigma))
- FP7: Library is included in the PLC programming software Control FPWIN Pro.

RTEX Motion Control Library

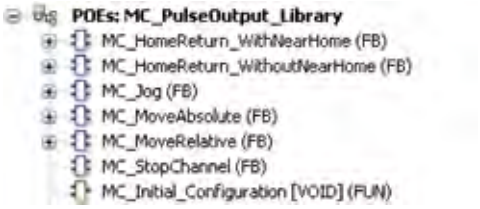
Positioning with RTEX motion control unit (FPΣ (Sigma))

Simply download the software from Panasonic's website: https://www.panasonic-electric-works.com/eu/downloadcenter.htm
Home -> Download center -> Automation products -> PLC -> FPWIN Pro -> Software

Advantages of PLC programs using the Motion Control Library

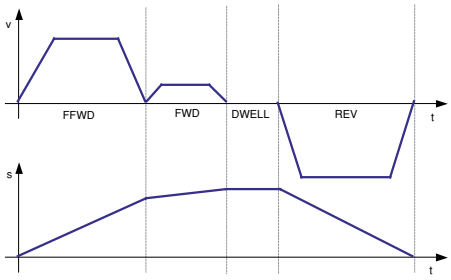
- **Free** – just download it from Panasonic's website
- **Simple** – easy programming and installation
- **Efficient** – ready-to-use function blocks, just set the parameters
- **Consistent** – compliant with IEC 61131-3
- **Universal** – hardware-independent (works for every Panasonic PLC)
- **Flexible** – expandable for up to 256 axes
- **Fast** – fast and easy commissioning (ready-to-use example programs)

Example of a Motion Control Library

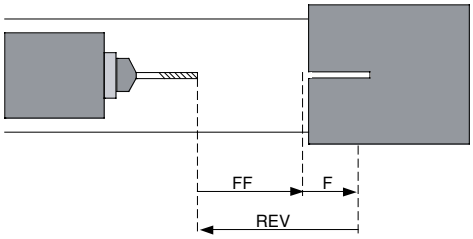


MC_CPU_Library Motion

Function block from the library used for an application



Time chart



Drilling setup

Modbus RTU protocol

Field Bus

Advantages

Improved performance

- High-resolution control (minor vibrations, high stopping accuracy)
- No position deviation caused by noise (improved reliability)

Improved functions

- Editing parameters (moment of inertia, damping frequency)
- Servo data logging (collection of data related to the utilization factor and torque for remote monitoring)

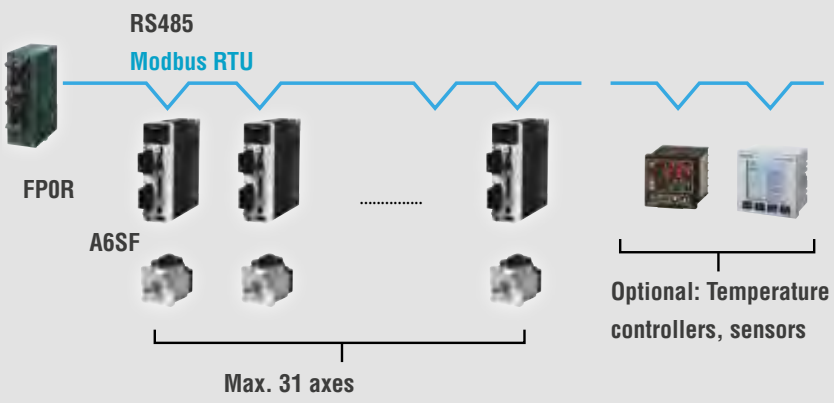
Reduced cost

- Axes are easy to add and remove (simplified wiring by using a bus system)
- Less time required for drafting and programming (simplified logging of absolute position data)

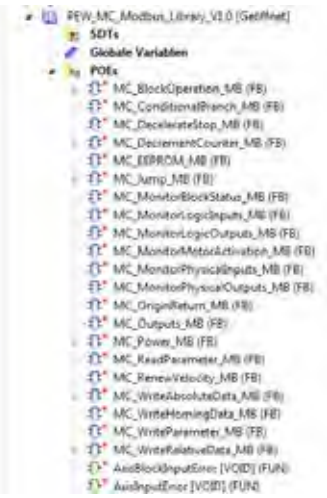
Features

- MINAS A6 series field bus
- Modbus RTU is an open, serial (RS232 or RS485) protocol based on a master/slave or client/server architecture.
- Widely used protocol due to its ease of operation and reliability.
- Cost-effective solution for programmable controllers based on RS485.
- Servo drives can be controlled based on a CANopen CiA drive profile

Simple complete motion control solution with one Panasonic compact PLC:



Modbus RTU library for Motion Control



Direct access to servo drive parameters from the PLC

Libraries

The libraries enable serial communication (RS232, RS485) between the FP series PLCs and servo drivers of the MINAS A6 series.

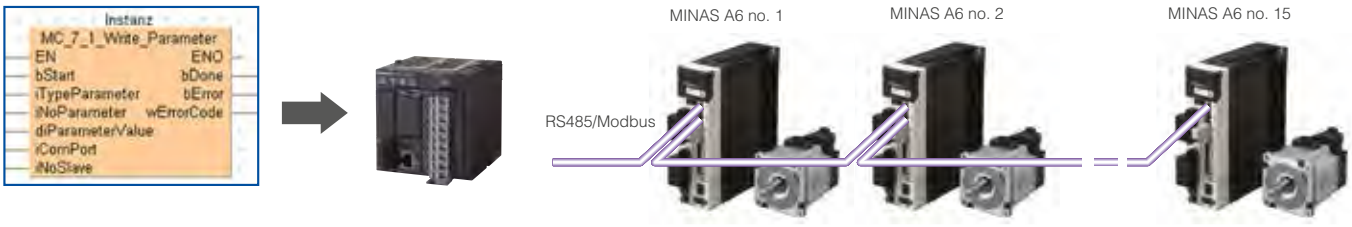
- The communication protocols for the drivers are also included in the libraries.
- The libraries allow full read and write access to the parameters.
- They also record the status and position data of the axes.
- The RS232 interface (optional RS485) is already included with the FP series.
- With RS232 connections, the first driver can be used as a gateway to downstream drivers so that all drivers can communicate with the PLC.

Communication via RS232

Communication software **FP series PLCs**

Communication via RS485

Communication software **FP series PLCs**



Simply download from the Panasonic website: https://www.panasonic-electric-works.com/eu/downloadcenter.htm
Home -> Download center -> Automation products -> PLC -> FPWIN Pro -> Software

Software Configurator PM for RTEX

User-friendly, time-saving commissioning

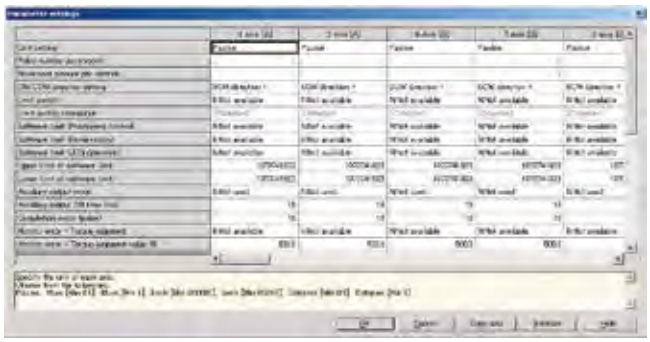
The Configurator PM offers numerous configuration options

- Axis and parameter settings
- Data table creation
- JOG operations
- Home return
- Data monitor settings
- and other settings for easy test operation

Parameter settings

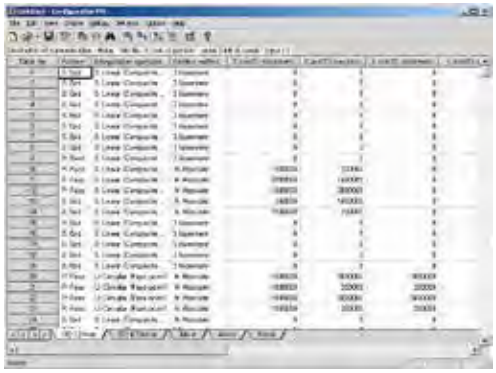
The details of the settings can be displayed in a table. Details on how to create settings for each category are explained in the box below. Parameters can be copied between axes.

Advantage: In instances where many settings are shared among the axes, this can reduce the number of repeat inputs.



Data table creation

- Simple input as in Excel.
- Data tables are displayed in an easy-to-understand manner
- Export of data tables to CSV format for document management systems, etc.
- Data ranges of a CSV file can be added to a table quickly with cut and paste
- A separate table for each axis (or each set of interpolation axes).

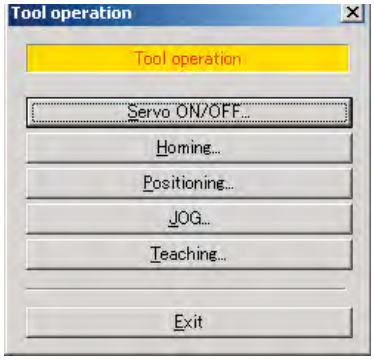


Advantage: Data is clearly arranged for fast easy handling

Tool operations

Each axis can be operated by test sequences independently of the operation modes (PROG and RUN) of the RTEX unit (or the programmable controllers).
JOG operation and teaching can be carried out easily to index positioning points. Test operation is possible without having to create a rudder program.

Advantage: Trial operation in advance saves time



Configuring servo drivers

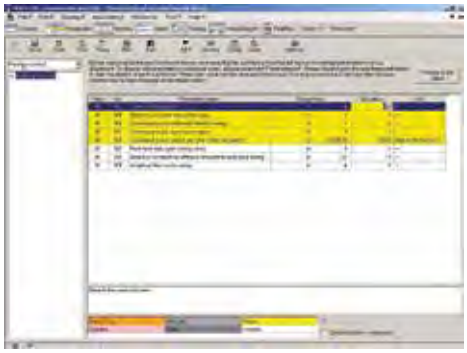
PANATERM configuration software

For MINAS AC servo motors & drive amplifiers

PANATERM assists users in making parameter and control settings as well as creating and analyzing data tables during operation. The software can be installed on any commercially available personal computer. The connection to the MINAS series is established via the USB port.

Basic functions

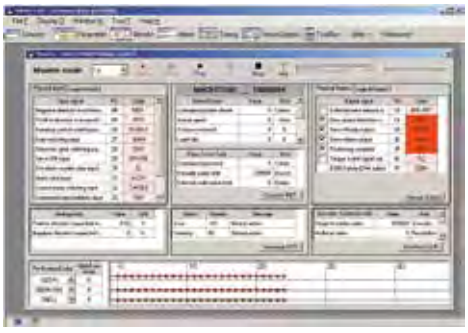
- Parameter setup
- After a parameter has been defined on the screen, it will immediately be sent to the driver.
- Frequently used parameters can be listed separately in a second display.



Parameter

Monitoring function

- Monitor
- Settings: control mode, velocity, torque, error and warning.
- Driver input signal.
- Load conditions: Overview of command/feedback pulses, load ratio, regenerative resistive load ratio.
- Alarm
- Display/delete number and contents of the current alarm and the last 14 error events.



Monitor

Free!

PANATERM configuration software

Setup

- Auto-tuning
- Gain adjustment and inertia ratio measurement
- Line graph display
- The line graph diagram shows command and current velocity, torque, and the tracking error.
- Absolute encoder setup
- Clears absolute encoder at the origin
- Displays single-turn/multi-turn data
- Displays absolute encoder status

Line graph display

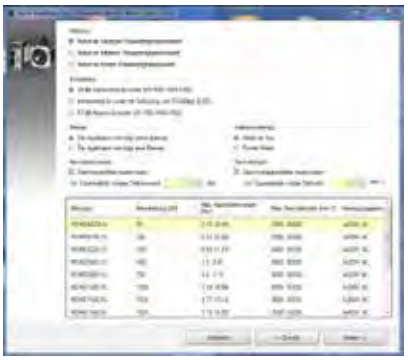
Analysis of mechanical operation data (frequency analysis)

Measures frequency characteristics of the machine; displays Bode diagram

Simply download the software from the Panasonic website: https://www.panasonic-electric-works.com/eu/downloadcenter.htm
Home -> Download center -> Automation products -> Servo drives -> All products -> Software

Servo Selection Tool

The Servo Selection Tool is an easy-to-use tool that helps you select accessory parts. The software can be installed on any commercially available PC.



Simply download the software from the Panasonic website: https://www.panasonic-electric-works.com/eu/downloadcenter.htm
Home -> Download center -> Automation products -> Servo drives -> All products -> Software

Software for designing drives

M-SELECT software

M-SELECT is a software program to help you select the correct motor capacity and servo driver from Panasonic's MINAS series. Find the optimal type of motor with regards to the mechanical layout and the dynamic requirements. It is a very valuable tool for mechanical engineering as it also provides CAD data in 2D and 3D. The software offers a complete analysis and detailed usage instructions for the MINAS series in all sizes.

Selecting the motor capacity in just four steps:

1. Select mechanical parts and input their parameters (figure 1)
The user can select parts from a database with all mechanical standard parts (gears, coupling, spindle axis, etc.).

2. Determine the motion profile (figure 2)
Display and determine speed, position and ramps, etc.

3. Select the correct motor series (figure 3)

- 1- or 3-phase
- Input voltage
- Specify torque, etc.

The software calculates the parameters for the selected series. The various criteria are evaluated with OK or NG (not good).

4. Result (figure 4)
Check and print result

Panasonic Electric Works offers a wide product range from one source, from individual components to complete systems. Panasonic's service profile also includes consulting, design-in, installation and commissioning by qualified application engineers.

Human machine interfaces

Our compact, bright and easy-to-read human machine interfaces are ideally suited for visualizing inspection results. The usual keypads can be replaced by touch panels on request.

MINAS LIQI servo drives

The inexpensive servo driver solution, especially for reliability and performance. MINAS LIQI servo drivers can be used to implement applications such as machinery for simple food processing, packaging, printing, metal processing and smaller linear robots.

ACD components

Rounding off the extensive product portfolio for automated manufacturing are components including Eco-POWER METERS, timers/counters, temperature controllers, limit switches and fans.

Sensors

Panasonic is a pioneer in the manufacturing of especially powerful sensors for almost any conceivable application areas. Our sensors facilitate factory automation for a wide variety of production lines, for example semiconductor manufacturing.

Laser markers

Panasonic laser markers are ideal for non-contact, permanent labeling of most materials, including metal, plastics, glass, paper, wood and leather. CO_2 laser markers and fiber laser markers can easily be integrated into existing production lines for a great variety of marking tasks.

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Panasonic Electric Works

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MINAS BL GV

MINAS BL GP