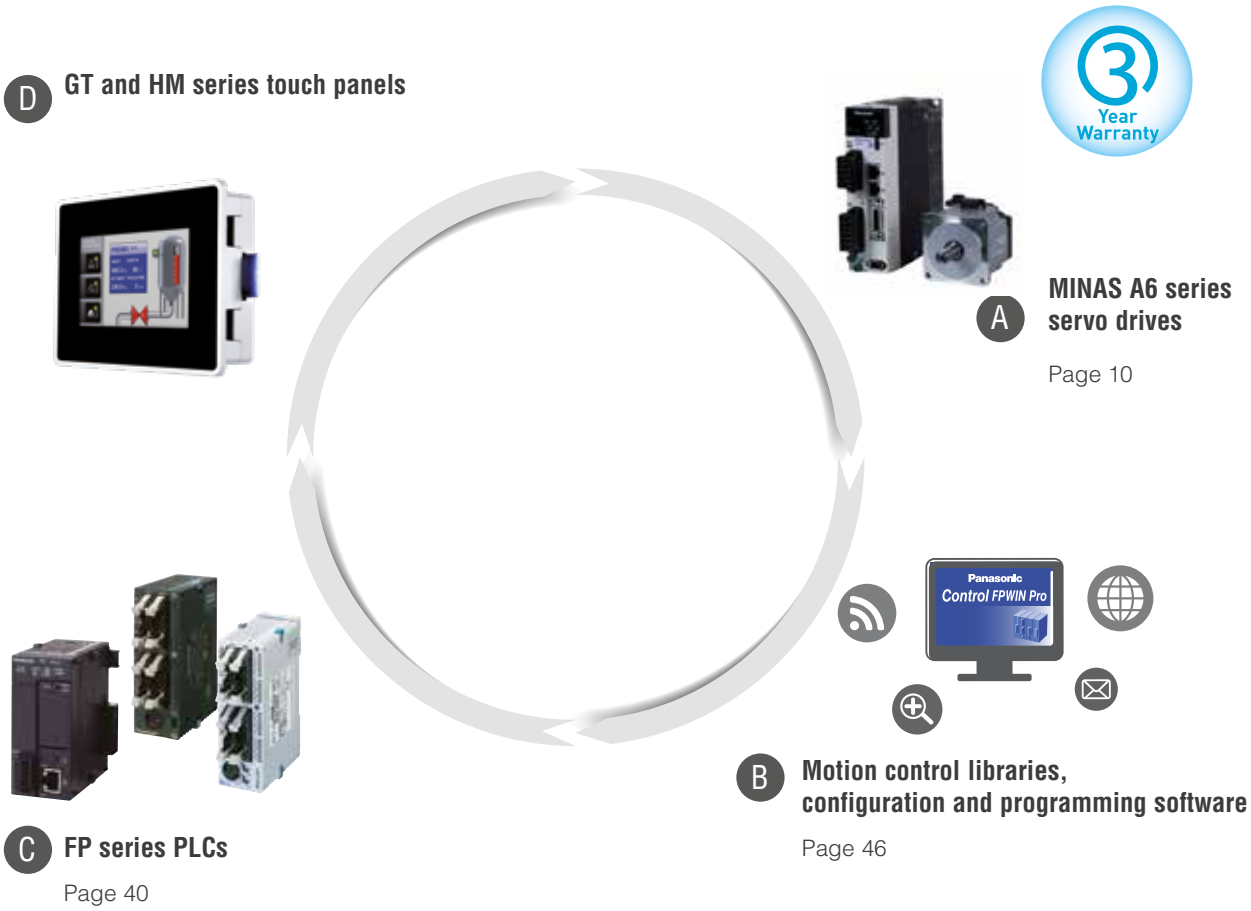
Panasonic

Overview

AC SERVO DRIVES & MOTION CONTROL

MINAS A6



D GT and HM series touch panels

A MINAS A6 series servo drives

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C FP series PLCs

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B Motion control libraries, configuration and programming software

Page 46

A MINAS A6 series servo drives

Highly dynamic servo drives with state-of-the-art technology. Large power range (50W to 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

The PLC programming software Control FPWIN Pro (compliant with IEC 61131-3) and the free configuration software PANATERM and M-SELECT shorten 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 independently.

D GT and HM 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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MINAS A6V servo drives (24/48V DC)

Low voltage, high performance

Now also for 24V or 48V DC input voltage. Panasonic expands the MINAS A6 servo drive series with the MINAS A6V.

Features:

- Servo drives and motors
- 24/48V DC input voltage
- 200W or 400W
- 23-bit absolute encoder
- Modbus RTU communication
- Position, rotational speed, and torque control
- Pulse train with up to 500kpps (kpps = thousand pulses/second)
- Rated rotational speed 3000rpm

Battery-driven DC drives are very common in drive technology for applications where there is no AC or three-phase current network available. Especially in the area of drive technology for vehicles and the medical field there is a need for motors with battery voltages. These motors round off Panasonic's portfolio of drive technology products.

Servo driver specifications:

Type		A6V	
Supply voltage		24/48V DC	48V DC
Rated current		8.6A	
Max. rated current		24.3A	
Rated power		200W	400W
Control mode		Position control, velocity control, torque control, full-closed control	
Positioning with digital I/Os ("block operation table")		Yes	
Control input		Pulse, analog	
Encoder feedback	Rotating	23-bit absolute, serial	
	Linear	-	
External encoder		Yes	
Communication		USB, RS232, RS485, Modbus	
Inputs		5 multifunction inputs, 2 pulse inputs, 1 analog input, Modbus	
Outputs		3 multifunction outputs, A/B/Z-phase pulse output	
Weight		0.35kg approx.	
Dimensions (W x H x D in mm)		90 x 30 x 180	

Servo motor specifications:

Type		A6V	
Rated power		200W	400W
Flange diameter		60mm	
Supply voltage		24/48V DC	48V DC
Rated rotational speed		3000rpm	
Max. rotational speed		3000rpm	
Motor length (without shaft)		79.5mm	99mm
External encoder		Yes	
Encoder	Resolution	23 bit absolute	
	Multi turn	23 bit	23 bit
IP degree of protection (motor)		IP65	
Rated torque		0.64–1.27Nm/0.64–1.91Nm	1.27–2.54Nm
Peak torque		1.27-2.54Nm	

Types:

MINAS A6V	Rated power	Supply voltage	Type
Servo drivers	200W/400W	24V DC	MVDLN5CSF
		48V DC	MVDLN5BSF
Motors	200W	24V DC	MSMD02CL1S
			MSMD02CL1T
		48V DC	MSMD02BL1S
			MSMD02BL1T
	400W		MSMD04BL1S
			MSMD04BL1T

Model codes:

Servo drivers	MVDLN5□SF
24V DC	C
48V DC	B

Servo motors	MSMD0□□L1□
200W	2
400W	4
24V DC	C
48V DC	B
Without holding brake	S
With holding brake	T

Applications:

Medical technology, laboratories

Robots

AGVs (automated guided vehicles in households and warehouses, lawnmowers, etc.)

MINAS A6SX servo drives (Advanced Safety)

Compact and safe

Servo drivers of the MINAS series with extensive safety functions according to EN 61800-5-2.
MINAS A6SX, a new highlight in the true-and-tested MINAS servo drive series.

Safety functions for:

- Speed monitoring
  SS1, SLS, SSR, SSM
- Position monitoring:
  SS2, SOS, SLI, SDI, SLA, SAR, SLP, SCA
- Other control functions:
  STO, SBC, SLT, STR, SMT
- Plus 9 safe inputs/outputs

Features:

- Elimination of external safety switches
- No production stop for maintenance work
- No danger to staff during configuration and commissioning
- Safe reduction of speed
- Less space required thanks to a drastic reduction in safety clearances and buffer zones.

Specifications:

- Rated power: 50W to 5kW
- Model codes see page 17

Applications:

Food processing | Packaging | Plastic processing | Automated machines | Robots | Chip and semiconductor production | Metal processing | Machines for LCD production | Textile industry | Paper and printing

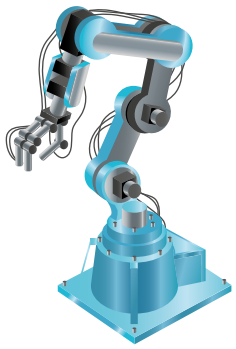
MINAS A6 SERIES:

Compact, light and powerful

As fast as our large motors!

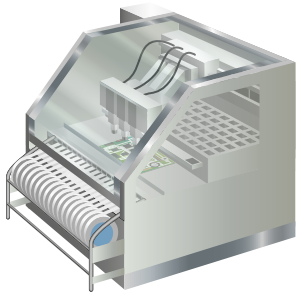
Illustration true to scale

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



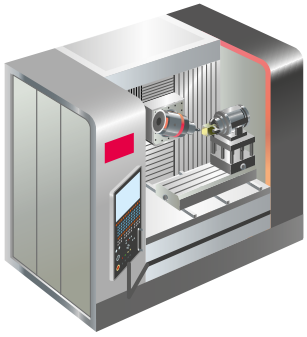
Robots

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.

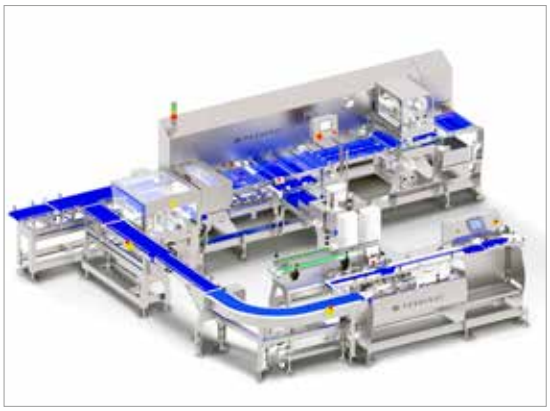


Pick-and-place machines

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.

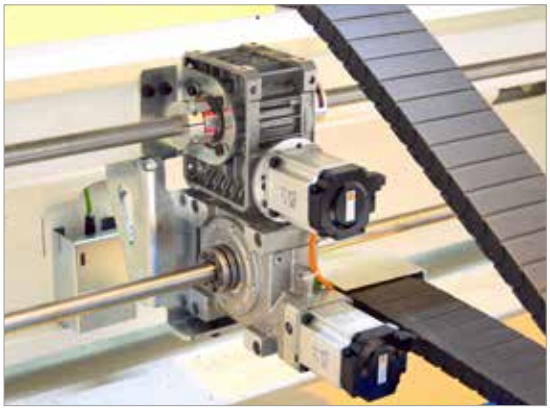
CNC milling machine

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 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 47)

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

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

Analog/pulse type MINAS A6 servo driver

MINAS A6 servo motor
Rated power:
50W to 5kW

Network types MINAS A6N (RTEX) and MINAS A6B (EtherCAT) servo drivers

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	3000–6500r/min			
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

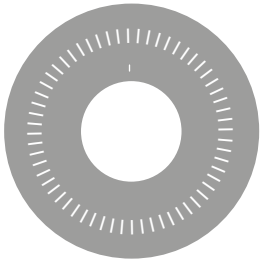
Thanks to the split core structure and a new housing, we have been able to reduce not only the length by 30%, but also the weight by up to 10%.

MHMF + MDMF models

10% lighter, 30% shorter

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

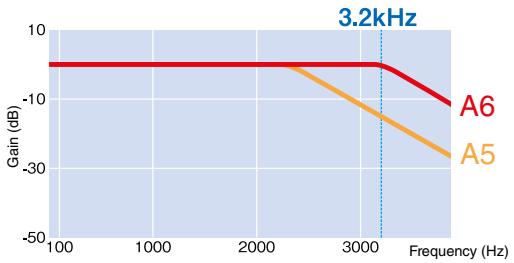
The 20-bit encoder (1048576 pulses per revolution = ppr) has been upgraded to 23 bit (8388608ppr).

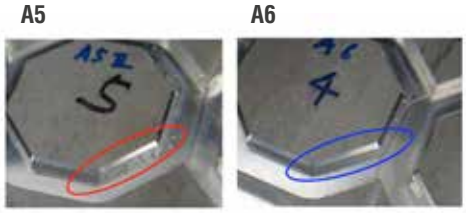


Improvements and new features of the MINAS A6 series

Advanced controller settings

3.2kHz frequency response

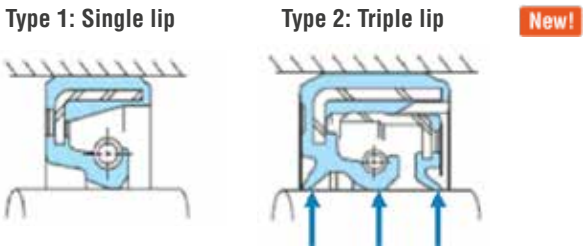




Numerous interference bands | Hardly any interference bands

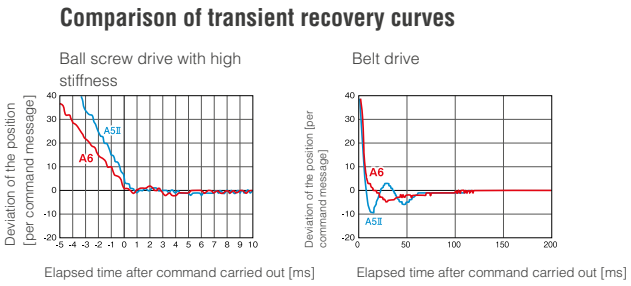
Available with two different seals (single/triple-lip)

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.

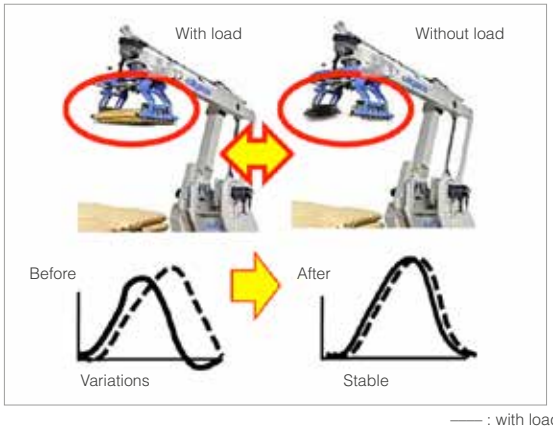


Improved vibration suppression

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



Improved suppression of load variations



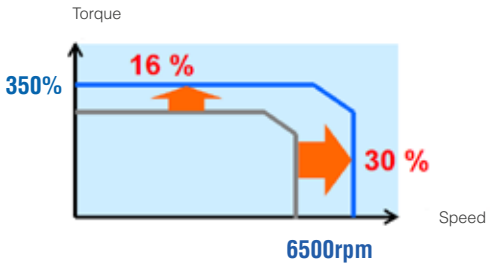
—— : with load
------ : without load

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.

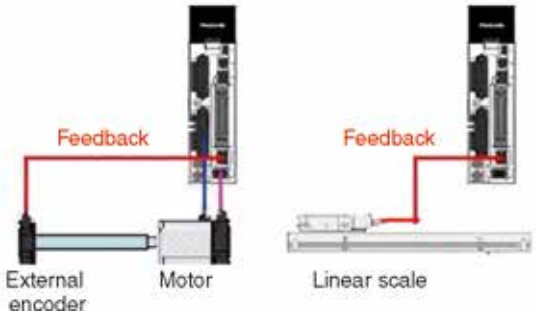
A5
Setting value 4Mpps

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

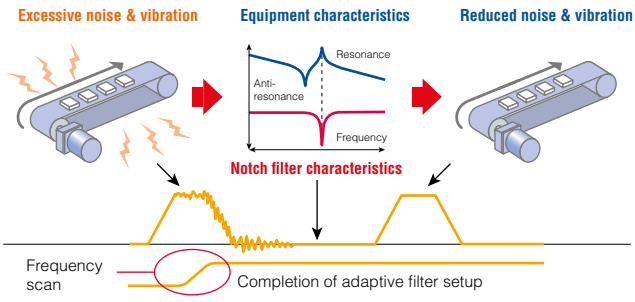
Automatic tuning after completion of multiple operations. The automatic vibration suppression function minimizes damage to the equipment. Additional mode and stiffness parameters enable easy response frequency-optimization for specific machine types such as high-friction, belt-driven machines or machines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

Belt drive

Ball screw drive

Manual and automatic notch filters

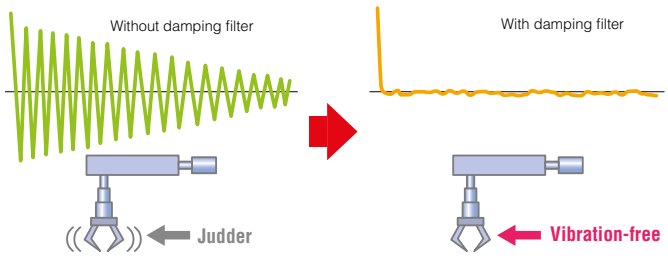
Highly sensitive notch filters log vibration frequencies and adapt them automatically.



General features

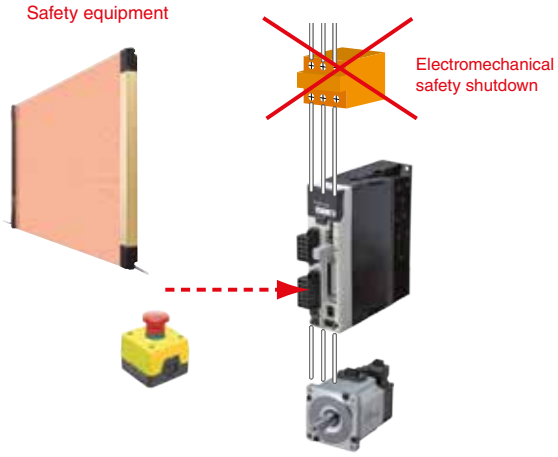
Manual and automatic damping filters

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.

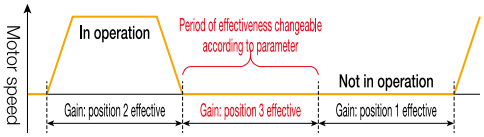


Dynamic brake

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.

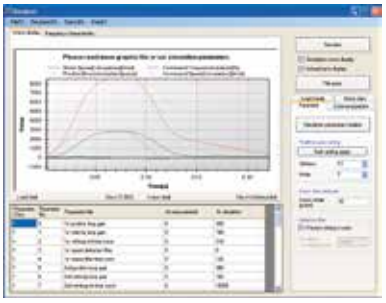


3-step control setting

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.

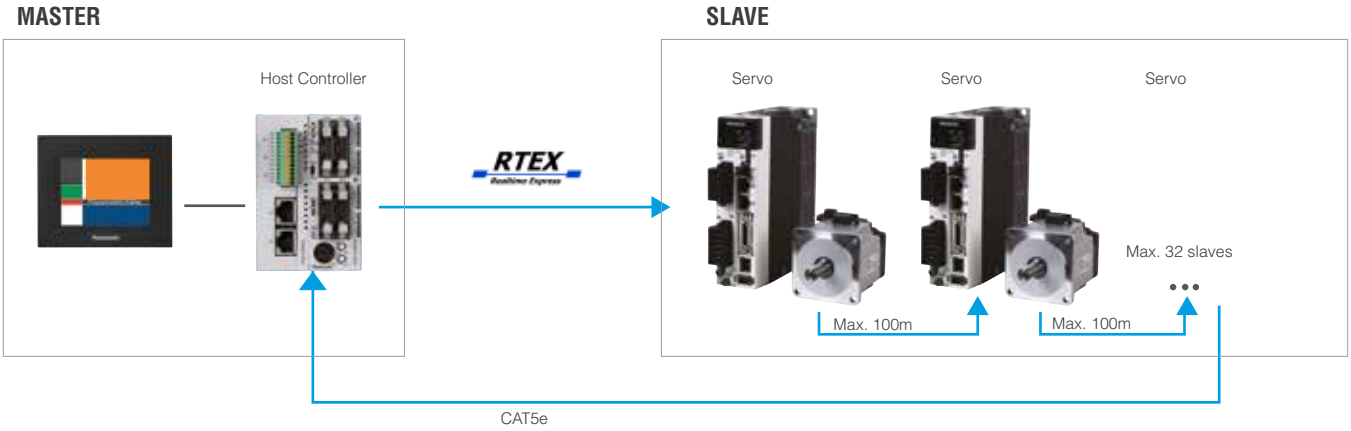


MINAS A6N with RTEX protocol

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.

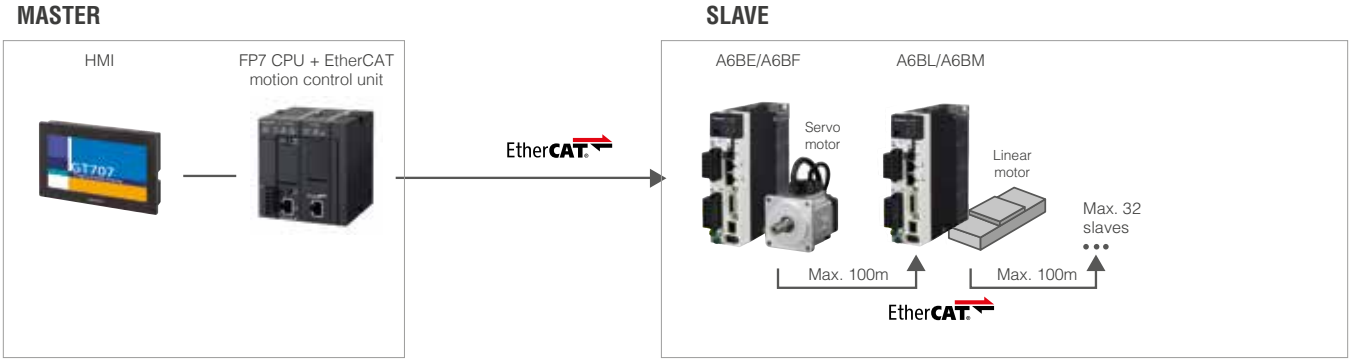
Easy mounting and reliable connections thanks to loop wiring



MINAS A6B with EtherCAT protocol

EtherCAT (Ethernet for Control Automation Technology)

This Ethernet-based field bus system offers similiarly outstanding features like RTEX. However, unlike RTEX, EtherCAT is an open, standardized field bus. This has the advantage that data can be exchanged with other servo drivers if they have an EtherCAT port.



Features	MINAS A6N RTEX	MINAS A6B EtherCAT
General features	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
Compatible positioning units	FPΣ (Sigma), FP0H	FP7

Servo drivers

Type	Standard	RS485 communication	Multifunction	Network	
	A6SE	A6SG	A6SF	A6N	A6B
					
RTEX	-	-	-	x	-
EtherCAT	-	-	-	-	x
External encoder	-	-	x	x	
Safety function STO	-	-	x	x	
RS232/485 (Modbus)	-	x	x	-	
Velocity control, torque control	-	-	x	x	
Position control with dig. 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 STO
T: With STO
A: Advanced safety function

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)
SX: Advanced safety function (pulse, analog)

Network type:

NE: Without STO (RTEX)
NF: With STO (RTEX)
BE: Without STO (EtherCAT)
BF: With STO (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

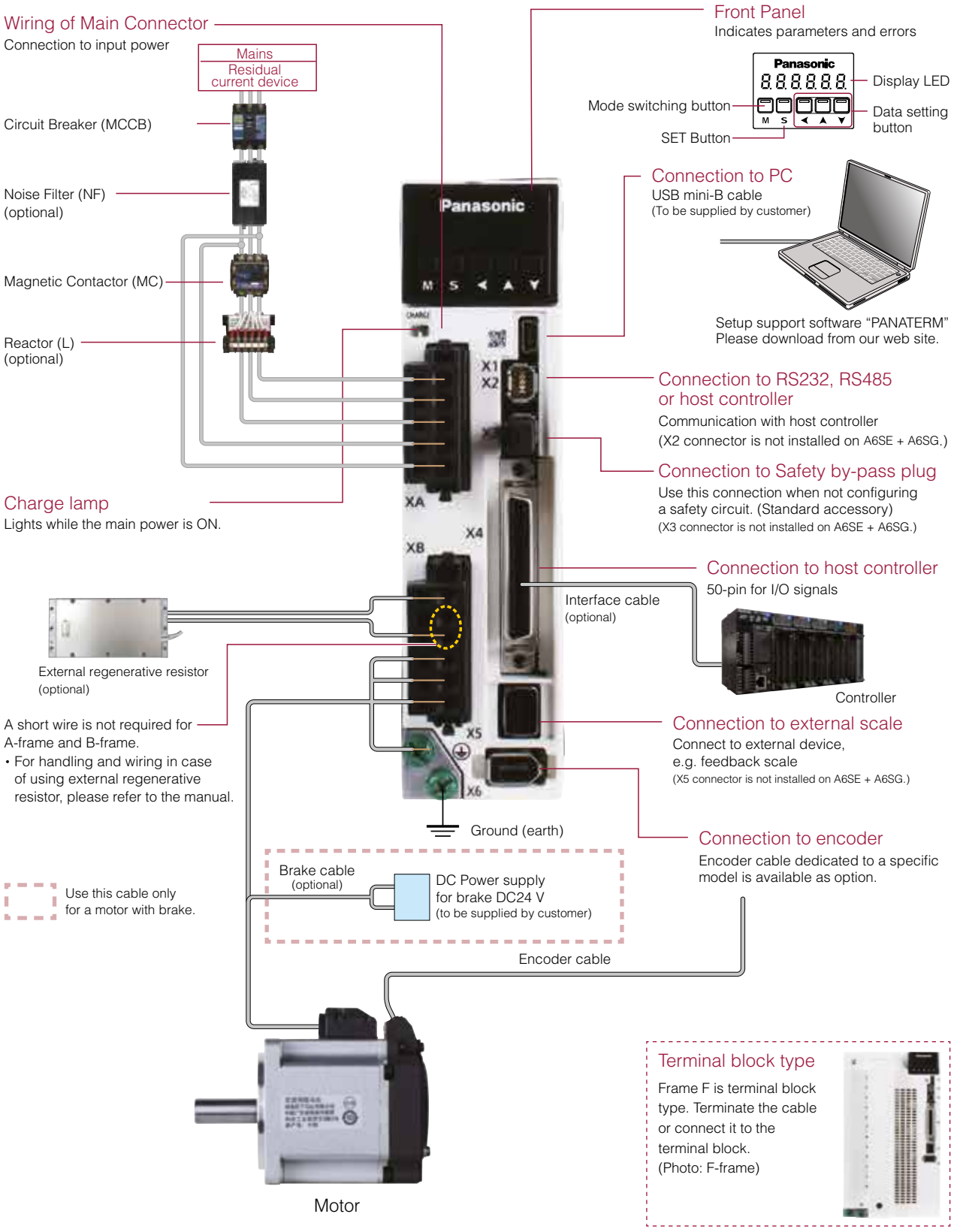
Motor specifications:
(shaft type, holding brake, oil seal, encoder clamp):
A-D,G,H,S-V; 1-8

1: Standard

L: 23 bit absolute, 8388608ppr

Connections and interfaces

Connector type (200V: frame A – F)



PRODUCT FINDER FOR SERVO DRIVES

Find the best servo drive within seconds!

	Overview of MINAS A6 motors, servo drivers and accessories								
	Motor								
	Rated power W	Flange Ø mm	Max. torque Nm	Max. nom. rotation speed rpm	Motor	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 drivers		Cables				Filter	Brake 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				

□, □□ servo driver model, see page page 17

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

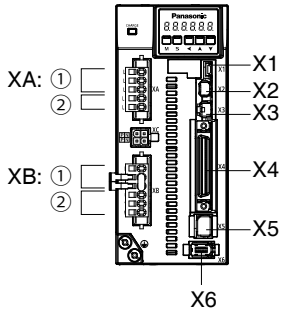
□□ = Cable length 0 1 = 1m 1 0 = 10m

Specifications

				Frame	MINAS A6SE, A6SG, A6SF	MINAS A6N	MINAS A6B
Basic specifications	Drive output	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)		
			Height		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)		Inputs		3 input points: (16-bit A/D: 1, 12-bit A/D: 2)	-	-
			Output points		2	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 switch, LEDs for operation indicator	
	Regeneration				For frame A, B: only external braking resistor, 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 control, 4. Position control/rotation speed, 5. Position control/torque control, 6. Rotation speed/torque control, 7. Ffull-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		1–6500r/min	
		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/1000r/min, 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 control	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	



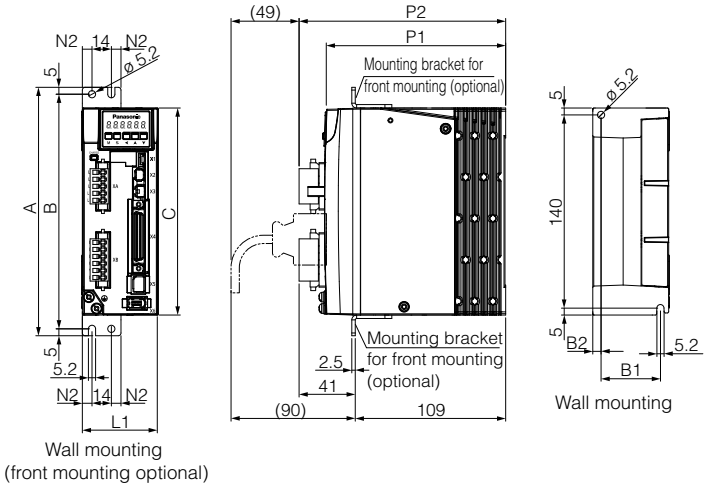
XA:
1. Main circuit
2. Control circuit

XB:
1. Braking resistor
2. Motor

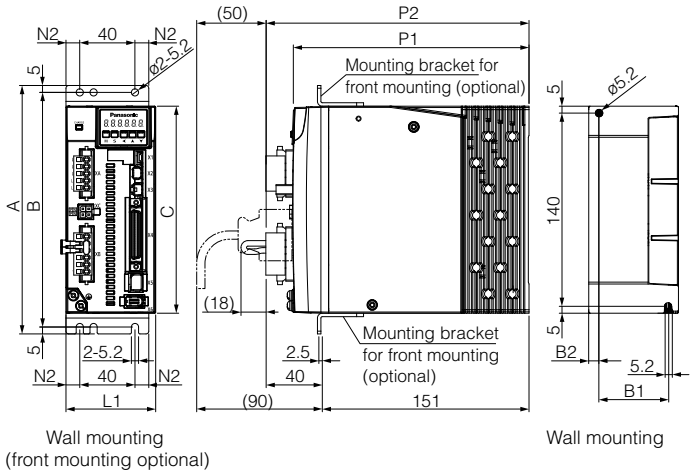
X1: USB
X2: RS232/485
X3: Safety function connector
X4: I/O signals
X5: External encoder (encoder, linear scale, etc.)
X6: Encoder

Frame A, B

All dimensions are in mm

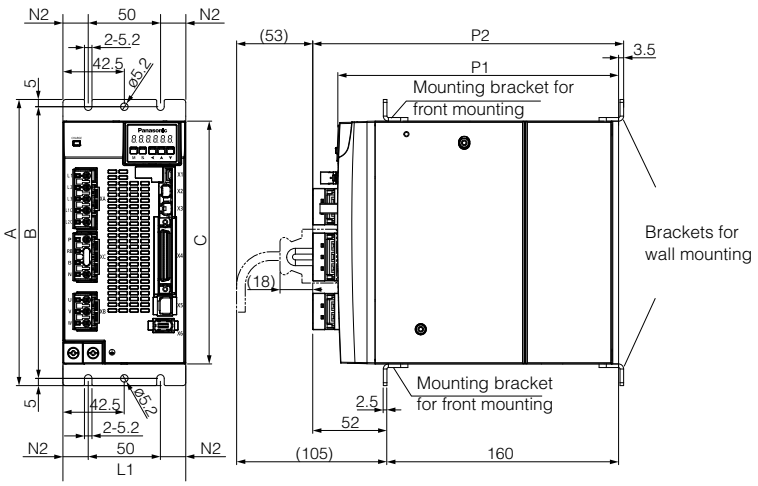


Frame C, D

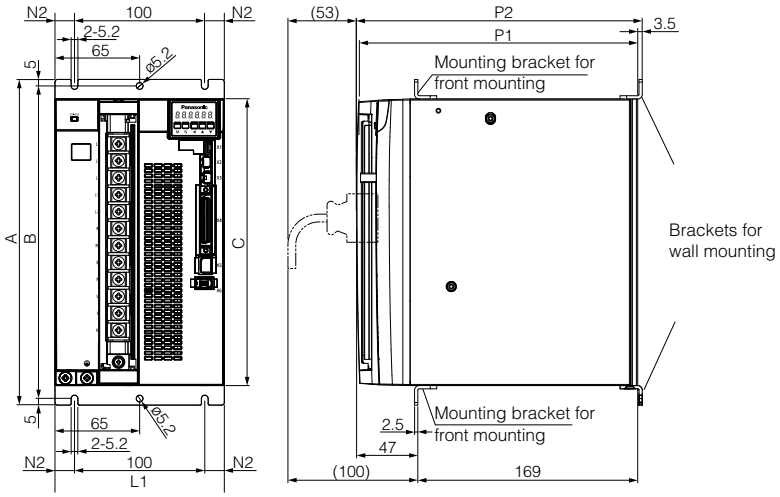


Frame E

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 -> Downloadcenter-> 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 r/min	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) N*	During installation	88		147		
	During operation	58.8		98		
Axial thrust (pull) N*	During installation	117.6		196		
	During operation	58.8		98		

□□ motor type, see page 20
* Explanation see page 28

	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%	
	1 min.		Min. 2	
	24 ±1.2%	24 ±2.4%		
	686		980	
	392		490	
	294		588	
	147		196	
	392		686	
	147		196	

Specifications

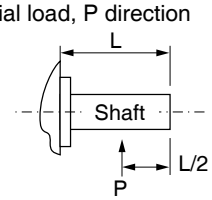
MDMF (medium inertia) 1000–1500W, 200V AC			
Motor		MDMF102L1□□	MDMF152L1□□
Rated power		1000	1500
Required power kVA		1.8	2.3
Rated current A		5.2	8
Max. current A o-p		22	32
Rotational speed r/min	Rated rotational speed	2000	
	Max. rotational speed	3000	
Weight kg	Without holding brake	4.6	5.7
	With 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		13.7 min.	
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 (push) N*	During installation	588	
	During operation	196	
Axial thrust (pull) N*	During installation	689	
	During operation	196	

□□ motor type, see page 20

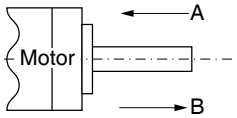
*

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 r/min	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							

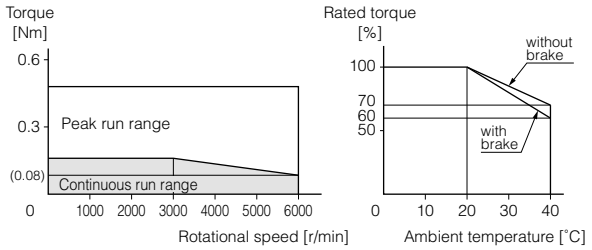
Holding brake specifications (The holding brake is engaged when the power for the servo driver is shut off. Do not use the holding brake when the motor is in motion.)					
Static friction torque Nm	0.38 min.	1.6 min.	3.8 min.	Min. 13.7	
Engaging time ms	Max. 35	Max. 50	Max. 70	Max. 100	
Releasing time 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) N*	During installation	88	88	147	294	588
	During operation	49	58.8	98	147	196
Axial thrust (pull) N*	During installation	117.6	117.6	196	392	686
	During operation	49	58.8	98	147	196

□□ motor type, see page 20
* Explanation see page 28

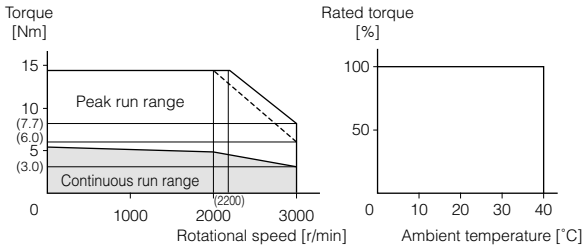
Example of a motor with low moment of inertia:

MSMF5AZL1□□ With oil seal



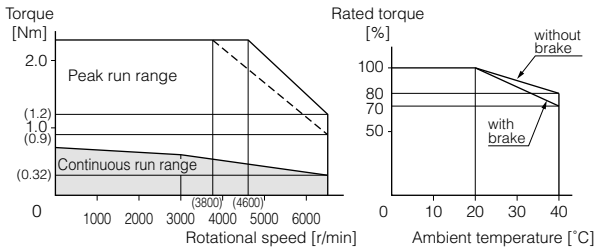
Example of a motor with medium moment of inertia:

MDMF102L1□□ With oil seal



Example of a motor with high moment of inertia:

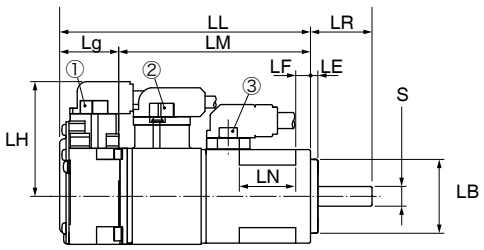
MHMF022L1□□ With oil seal

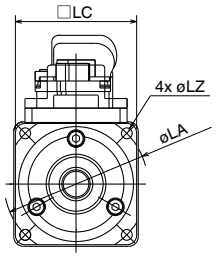


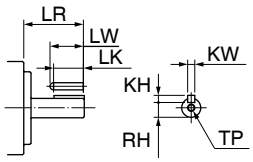
Additional data related to torque characteristics can be downloaded from the Panasonic website:
https://www.panasonic-electric-works.com/eu/downloadcenter.htm
Home -> Downloadcenter -> Automation products -> Servo drives -> MINAS A6 -> Catalogue / Shortform

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

50-100W	Side	Front	Key way dimensions

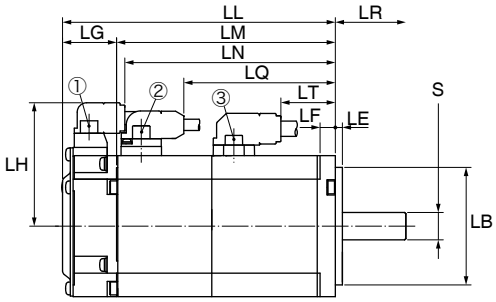


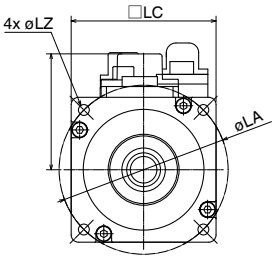


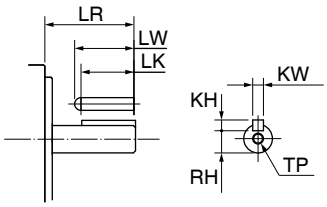


1) Encoder connector (JN2)
2) Brake connector
3) Motor connector

200-1000W	Side	Front	Key way dimensions

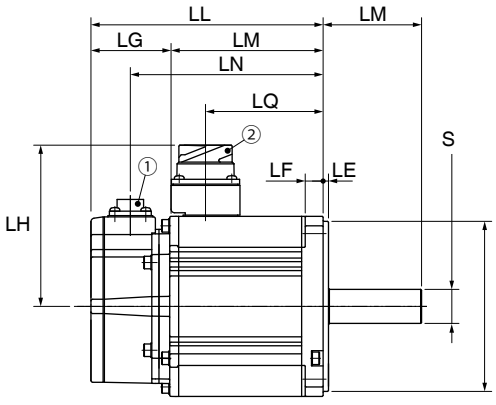


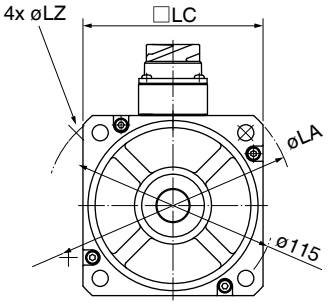


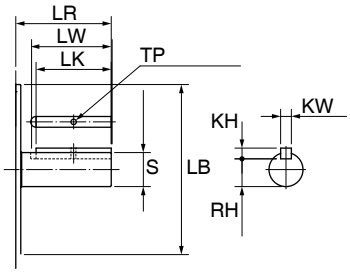


1) Encoder connector (JN2)
2) Brake connector
3) Motor connector

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 mote for MSMF5AZL1□□ and MSMF012L1□□ (without/with holding brake).
- The corresponding dimensional diagrams (top view) can be downloaded here:

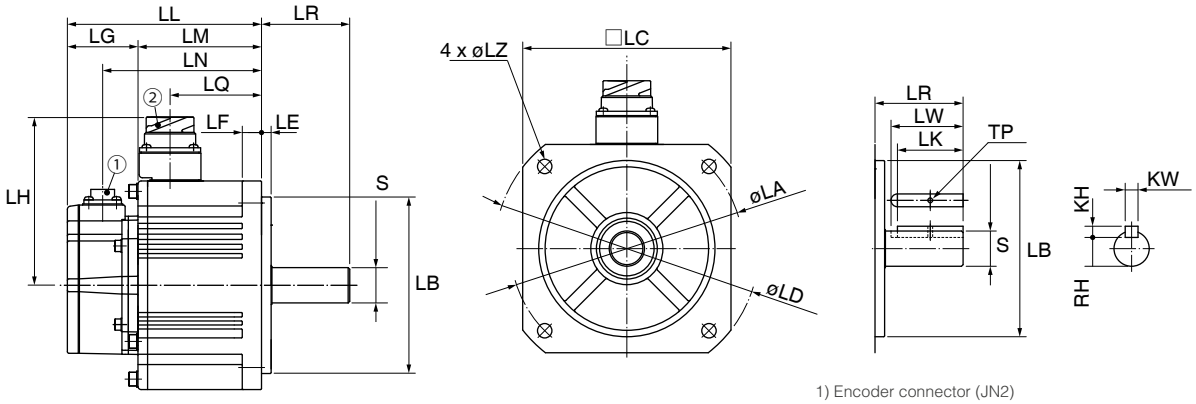
https://www.panasonic-electric-works.com/eu/downloadcenter.htm
Home -> Downloadcenter -> Automation products -> Servo drives -> MINAS A6 -> Catalogue / Shortform

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 type, see page 20

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

1000-1500W Side Front Key way dimensions



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

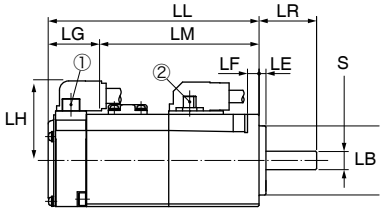
Note: Illustration shows motor with holding brake

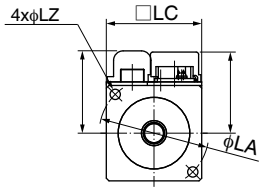
MDMF (medium moment of inertia) 1000–1500W, 200V AC				
Rated power		W	1000	1500
Motor		200V AC	MDMF102L1□□	MDMF152L1□□
Encoder		ppr	23-bit absolute, 8388608	
LL	Without holding brake	mm	121	135
	With holding brake	mm	149	163
LR		mm	55	55
LG		mm	44	44
LM	Without holding brake	mm	77	91
	With holding brake	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

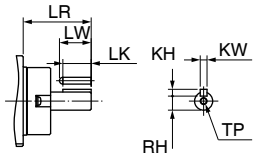
□□ motor type, see page 20

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

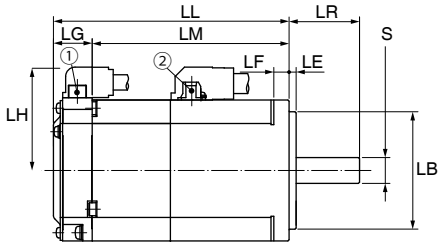
50-100W	Side	Front	Key way dimensions

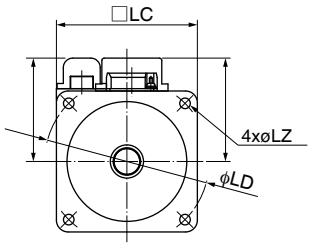


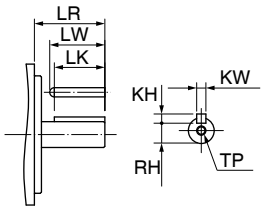




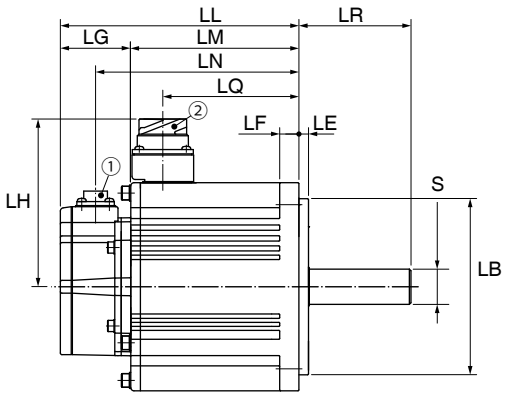
200-1000W	Side	Front	Key way dimensions

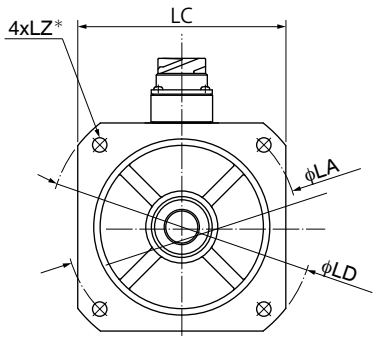


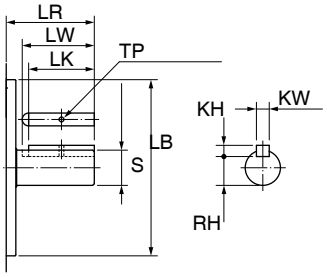




1000-1500W	Side	Front	Key way dimensions







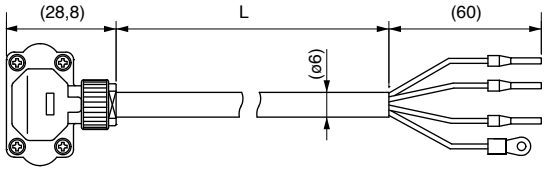
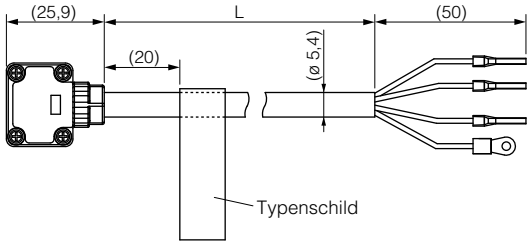
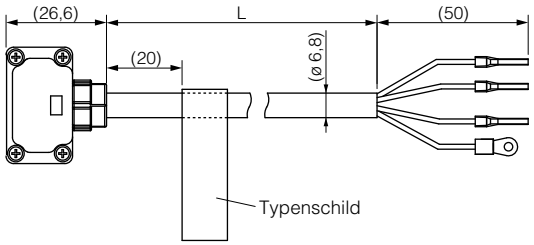
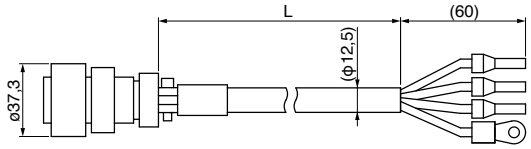
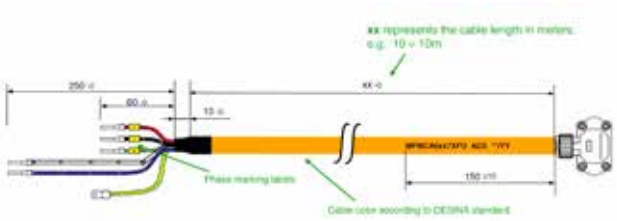
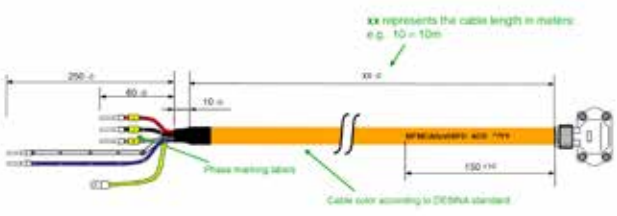
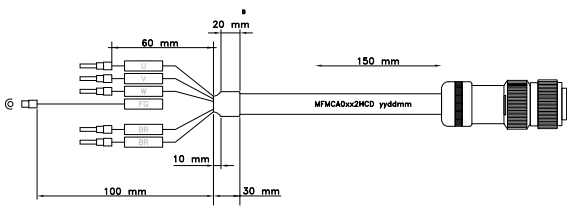
1) Encoder connector (JN2)
2) Motor/brake connector
Note: All illustrations show motors with holding brake.

MHMF (high inertia) 50–1500W, 200V AC										
Rated power		W	50	100	200	400	750	1000		1500
Motor		200V AC	MHMF5AZL1□□	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 type, see page 20
* With oil seal

Cables (motor – servo driver)

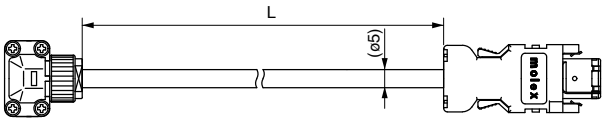
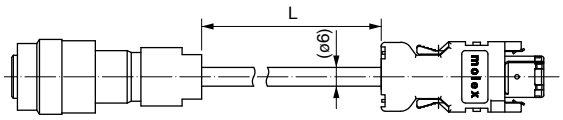
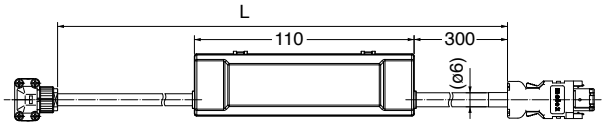
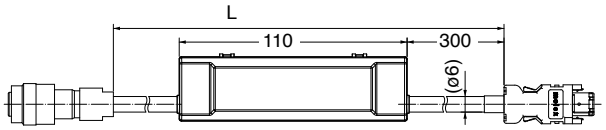
All dimensions are in mm

For motors without holding brake	MSMF motors 50W–1kW	MFMCA0□□0WJD	
	MHMF motors 50W/100W	MFMCA0□□7W	
	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 50W/100W	MFMCA0□□7XFD	
	MHMF motors 200W–1kW	MFMCA0□□0XFD	
	MSMF motors 1–2kW 200V MDMF motors 1–2kW 200V	MFMCA0□□ 2HCD	

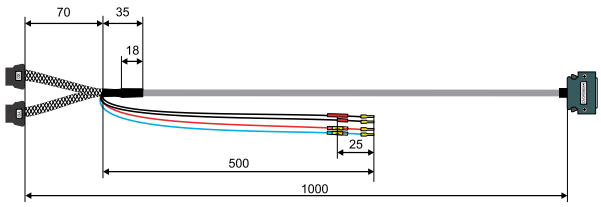
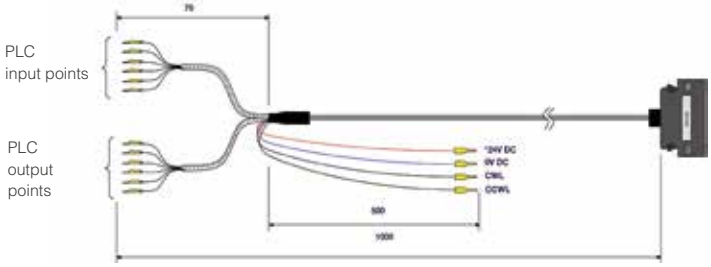
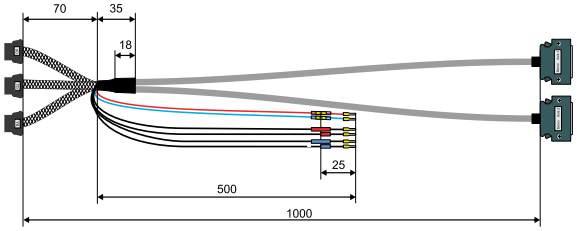
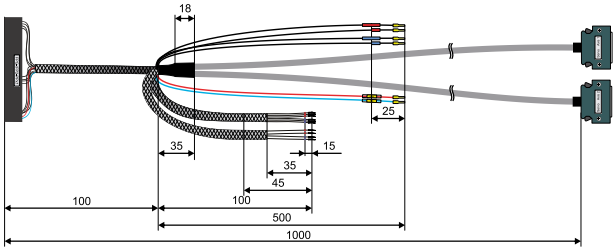
□□ = Length 0 1 = 1m 1 0 = 10m

Encoder cables (motor – servo drivers)

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 encoder (battery box)	MSMF, MHMF motors 50W-1kW	MFECA0□□0GJE	
	MSMF-, MDMF-, MHMF motors 1kW–5kW	MFECA0□□0GTE	

Control cable (PLC – MINAS A6 servo 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

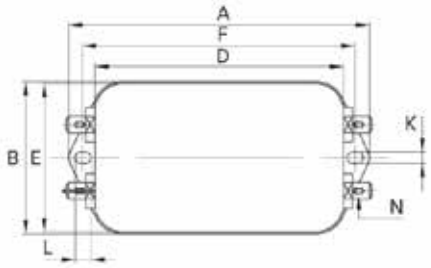
	Product no.	Details/Comments/Dimensions			
Cables	**Control cable**				
	DV0P4360	50W–5kW	50-pin	I/O cable X4, loose wires, 2m	
	DVOP4360P	50W–5kW	50-pin	I/O cable X4, loose wires, 2m, position control	
	DVOP4360V	50W–5kW	50-pin	I/O cable X4, loose wires, 2m, velocity control	
	DV0PM20024CAB020	50W–5kW	8-pin	Communication cable X2, RS485, RS232, loose wires, 2m	
	DV0PM20025CAB020	50W–5kW	8-pin	Safety function cable X3, loose wires, 2m	
	DV0P0800	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	
	DV0P0770	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)

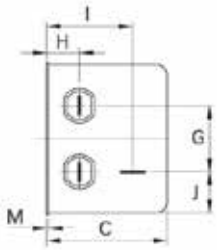
All dimensions are in mm

EMC filter

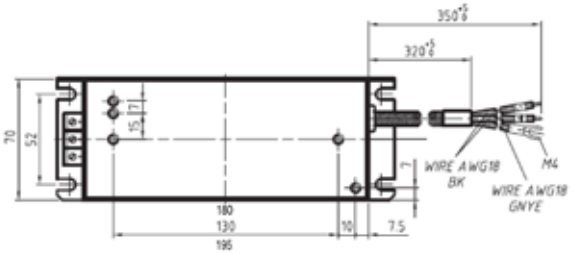
FN2080-6-06 for servo driver MINAS A6 50-750W, 1-phase / FN2080-10-06 for servo driver MINAS A6 1-1.5kW, 1 phase

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

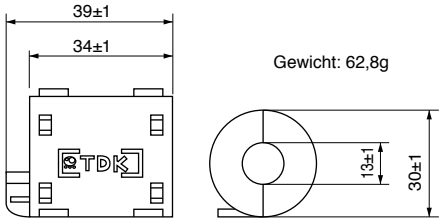




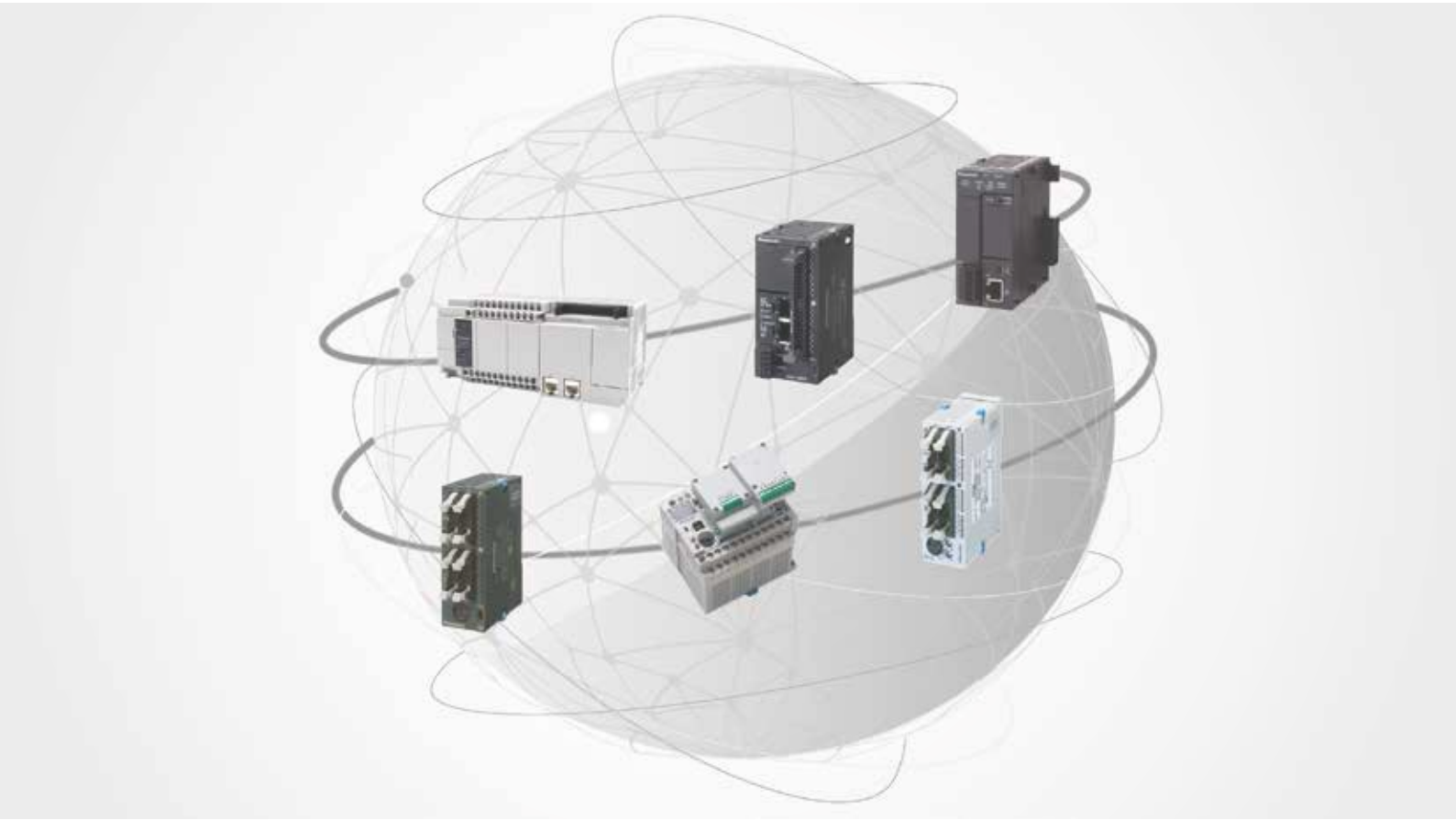
FS21238607 for servo driver MINAS A6 50–750W, 1-phase



DV0P1460 with ferrite core



Brake resistor



FP0R

Compact and powerful programmable controller for narrow spaces

Multifunctional
Compact
Max. 4 axes

General features

- Max. number of digital I/Os: 64 inputs / 64 transistor outputs or 54 relay outputs
- Max. 24 analog inputs / 12 analog outputs
- Communication: **PROFIBUS slave, Ethernet TCP/IP, Modbus-RTU, S-Link, CC-Link, PLC Link**
- Max. 2 serial ports
- Memory: 16k to 32k steps (program), 12315 to 32765 words (data)
- Max. 3 expansion units
- High-speed counter: 1-phase 6 channels (50kHz), 2-phase 3 channels (15kHz)

Position control

- PWM output: 4 channels (≤4.8kHz)
- Integrated pulse output: 4 channels (≤50kHz), 2 channels can be controlled individually
- Position control of 4 axes without an additional expansion unit
- 2 x 2-axis linear interpolation

PLC	Product no.	Voltage	Output	Input points (counters)	Outputs (axes)
	AFP0RC16□, AFPORC16□□	24V DC	Transistor PNP or NPN	8 (6)	8 (4)
	AFP0RC32□, AFPORC32□□			16 (6)	16 (4)
	AFP0RF32□□				
	AFP0RT32□□				

□= P, T □□ = CP, CT, MP, MT

FP-X

Durable compact PLC

Powerful
Fast
Max. 4 axes

General features

- Max. 208 transistor inputs / 174 transistor outputs or 174 relay outputs
- Max. 28 analog inputs / 16 analog outputs
- Communication: **PROFIBUS, Ethernet TCP/IP, Modbus-RTU**
- Max. 3 serial ports
- Memory: 16k to 32k steps (program), 32765 words (data)
- Max. 8 expansion units + 3 add-on cassettes
- High-speed counter: 1-phase 8 channels (≤100kHz), 2-phase 4 channels (≤35kHz)

Position control

- PWM output 4 channels (≤12.5kHz)
- Integrated pulse output: 4 channels (≤100kHz), 2 channels can be controlled individually
- Position control of 4 axes without an additional expansion unit
- 2 x 2-axis linear interpolation

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

FPΣ (Sigma)

High-performance programmable controller in a compact design

Small
Compact
Max. 16 axes

General features

- Max. number of digital I/Os: 192 inputs / 192 transistor outputs or 56 relay outputs
- Max. 40 analog inputs / 28 analog outputs
- Communication: **PROFIBUS, Ethernet TCP/IP, Modbus-RTU, Modbus-TCP, CC-Link, S-Link, CANopen, DeviceNet**
- Max. 3 serial ports
- Memory: 32k steps (program), 32k to 1056k words (data)
- Max. 7 expansion units
- High-speed counter: 1-phase 4 channels (≤50kHz), 2-phase 2 channels (≤100kHz)

Position control

- PWM output 2 channels (≤12.5kHz)
- Integrated pulse output: 2 channels (≤60kHz)
- Linear and circular interpolation for up to 2 axes
- Expandable with up to 2 RTEX positioning units (2 x 8 axes)

PLC	Product no.	Voltage	Output	Input points	Outputs (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-XH

Fast motion control PLC – the all-in-one solution

Compact
Real time bus
Max. 8 axes

General features

- Number of digital I/Os: 8 inputs / 8 transistor outputs, expandable to max. 256 I/Os
- Max. 28 analog inputs / 16 analog outputs
- Communication: **RTEX (built in), Modbus-RTU**
- Max. 2 Ethernet ports + one serial port
- Shared memory: max. 40k steps (program) or max. 64k words (data) depending on system register setting
- Max. 8 expansion units + 4 add-on cassettes
- High-speed counter: 1-phase 8 channels (10kHz), 2-phase 4 channels (10kHz)

Position control

- 2- and 3-axes linear and circular interpolation
- 3-axes linear and spiral interpolation
- Electronic cam, gear, clutch, and main shaft
- Independent control of up to a maximum of 8 axes
- Max. 8 slaves of the MINAS A6N/A5N series

PLC	Product no.	Voltage	Output	Input points (counters)	Outputs (axes)
	AFPXHM8N16PD	24V DC	Transistor PNP	8 (4)	8 (8)

FP0H

Compact PLC developed for IoT

Large memory
Powerful processor
Max. 20 axes

General features

- Number of digital I/Os: 16 inputs / 16 transistor outputs, expandable to max. 384 I/Os
- Max. 24 analog inputs / 12 analog outputs (via I/O unit)
- Communication: **MEWTOCOL Master/Slave, MODBUS-TCP Master/Slave, EtherNet/IP, FTP-Server/Client**
- Max. 2 Ethernet ports + one serial port
- Shared memory: max. 64k steps (program) or max. 64k words (data) depending on system register setting
- Max. 7 expansion units
- High-speed counter: 1-phase 4 channels (100kHz), 2-phase 2 channels (50kHz)

Miscellaneous

- Datalogging with SD card

Position control

- PWM output 4 channels (≤100kHz)
- Integrated pulse output: 4 channels (≤100kHz)
- 2 x 2-axis linear interpolation
- Expandable with up to 2 RTEX positioning units (max. 2 x 8 axes + 4 axes (CPU))

Positioning unit	Product no.	Processing speed	Functions	Number of axes	Output type
	AFP0HPG01T	Max. 500kpps	Linear or S-curve acceleration an deceleration	1	Transistor
	AFP0HPG02T			2 (independent)	
	AFP0HPG01L	Max. 4Mpps		1	Line driver
	AFP0HPG02L			2 (independent)	

FP7

Modular high-performance PLC

Modular
High connectivity
Max. 64 axes

General features

- Max. number of digital I/Os: 2048 inputs, 2048 outputs
- Max. 512 analog inputs / 256 analog outputs (via I/O unit)
- Communication: **MEWTOCOL, Modbus TCP, Ethernet/IP**
- Ethernet port
- Memory: 64k to 196k steps (program), 131k to 262k words (data)
- Max. 64 expansion units

Miscellaneous

- Integrated web-server function
- Datalogging with SD card

Position control

- PWM output: max. 500kHz (via multi I/O unit)
- Pulse output: via multi I/O unit (500kpps) and positioning unit (4Mpps)
- 2- and 3-axes linear and circular interpolation
- 3-axes linear and spiral interpolation
- Electronic cam, gear, clutch, and main shaft
- Expandable with EtherCAT unit (max. 64 axes)

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

FP7 EtherCAT unit	Product no.	Number of axes	Scan time
	AFP7MC16EC	16 (real), 8 (virtual)	0.5ms
	AFP7MC32EC	32 (real), 16 (virtual)	1ms
	AFP7MC64EC	64 (real), 32 (virtual)	2ms

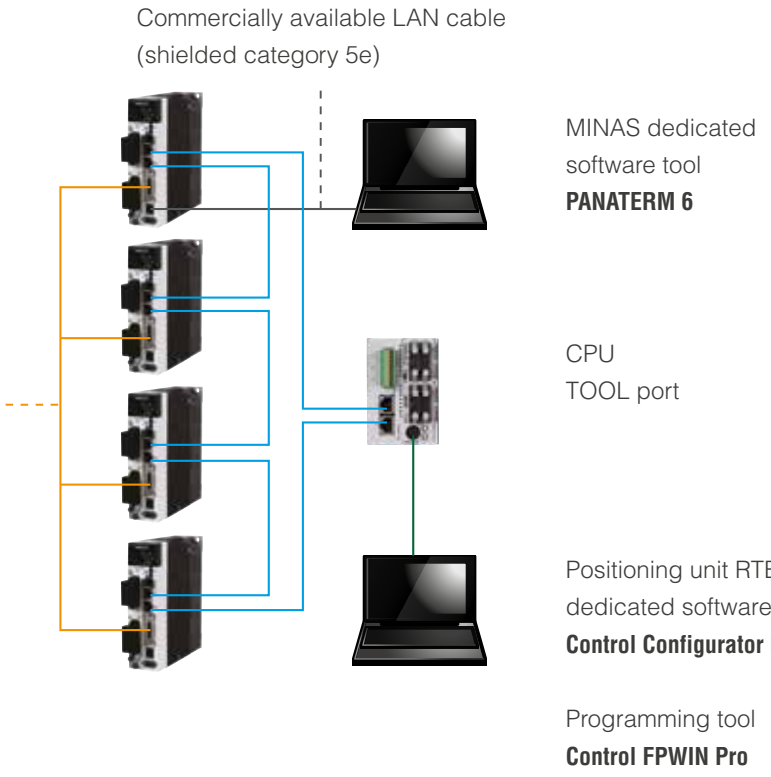
Positioning unit	Product no.	Functions	Output	Outputs (axes)
	AFP7PP02T	With interpolation	Open collector	2
	AFP7PP04T			4
	AFP7PP02L		Line driver	2
	AFP7PP04L			4

Pulse output unit	Product no.	Max. processing speed	Functions	Number of axes	Output type
	AFP7PG02T	Max. 500kpps	Linear or S-curve acceleration an deceleration	2 (independent)	Transistor
	AFP7PG04T			4 (independent)	
	AFP7PG02L	Max. 4Mpps		2 (independent)	Line driver
	AFP7PG04L			4 (independent)	

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 and reduces time needed for design.



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.
- **Easy configuration** instead of time-consuming programming thanks to dedicated tool software Control Configurator PM.
- Includes manual pulser input allowing support for **precision teaching**.

Panasonic's compact PLCs FPΣ (Sigma) and FP0H can be expanded easily with the RTEX positioning unit (max. 2 RTEX units).

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

Free!

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, FP-X, FPΣ (Sigma), FP-XH, FP0H, FP7)

PP Motion Control Library

- Positioning with PP motion control unit (FPΣ (Sigma), FP0H)
- FP7: Library is included in the PLC programming software Control FPWIN Pro

RTEX Motion Control Library

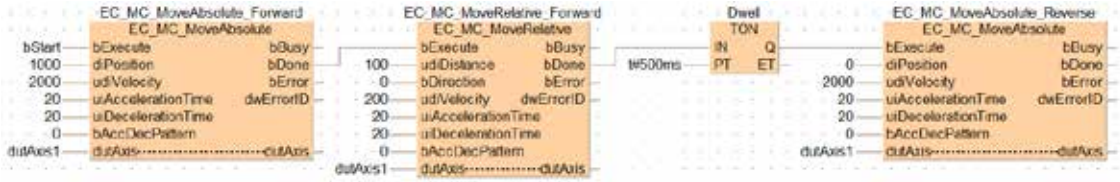
Positioning with RTEX motion control unit (FPΣ (Sigma), FP0H)

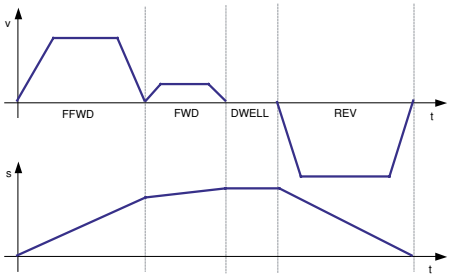
Simply download the software from Panasonic's website: https://www.panasonic-electric-works.com/eu/downloadcenter.htm
Home-> Downloadcenter-> Automation products-> PLC-> FPWIN Pro-> Software

Advantages of PLC programs using the Motion Control Library

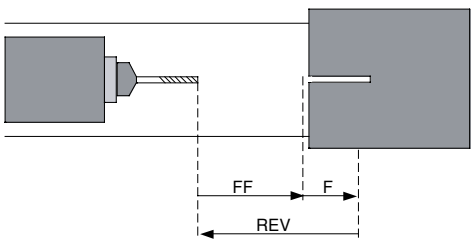
- **Free** – just download it from Panasonic's website
- **Simple** – easy programming and installation
- **Efficient** – ready-to-use function blocks, just set the parameters
- **Consistent** – compliant with IEC 61131-3
- **Universal** – hardware-independent (works for every Panasonic PLC)
- **Flexible**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

Function block from the MC_CPU_Library Motion 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)

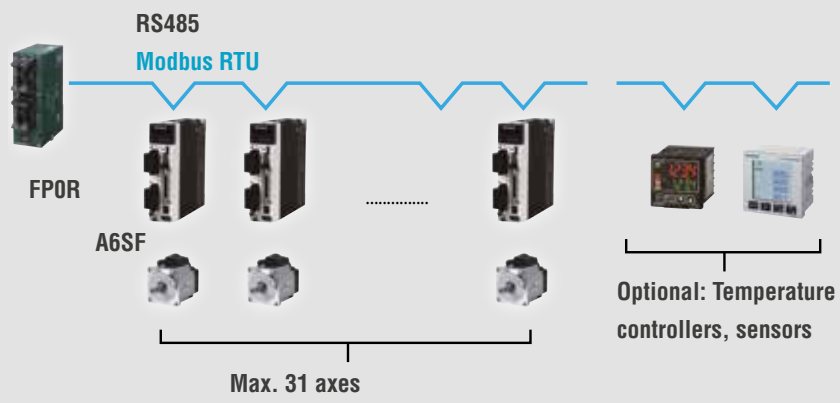
Reduced cost

- 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

Free!

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.

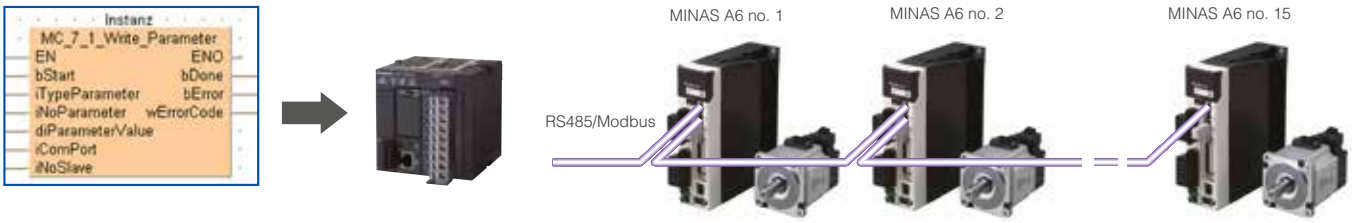
- The communication protocols for the drivers are also included in the libraries.
- The libraries allow full read and write access to the parameters.
- They also record the status and position data of the axes.
- The RS232 interface (optional RS485) is already included with the FP series.
- With RS232 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**



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

Software Configurator PM for RTEX

User-friendly, user-friendly commissioning

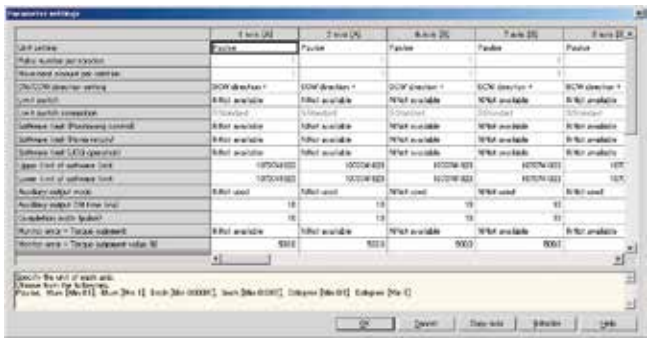
The Configurator PM offers numerous configuration options

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

Parameter settings

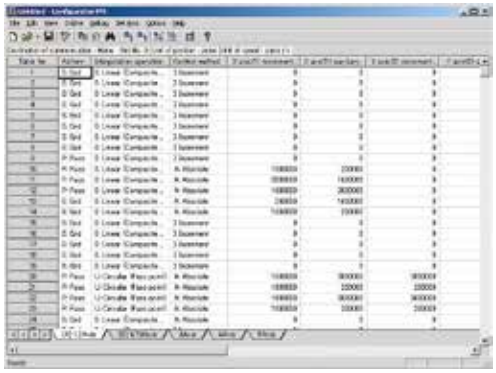
The details of the settings can be displayed in a table. Details on how to create settings for each category are explained in the box below. Parameters can be copied between axes.

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).

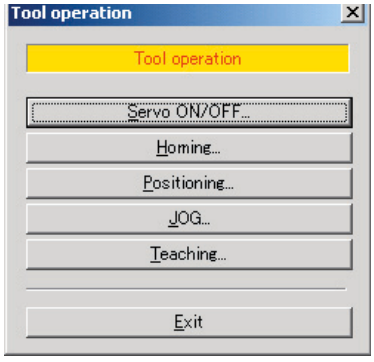


Advantage: Data is clearly arranged for fast easy handling

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

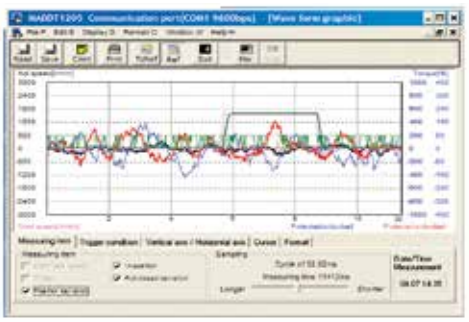
PANATERM configuration software

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.

Setup and basic functions

- 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.
- Display of the absolute encoder settings
- Parameter setting
  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.



Line graph display

Monitoring function

Parameters and status can be monitored, e.g. operation mode, speed, torque, error and warning. overview of command/feedback pulses, load ratio, regenerative resistive load ratio and many more.

Monitor

Analysis of mechanical operation data (frequency analysis)

Frequency characteristics of a machine can be measured for display in a Bode diagram.

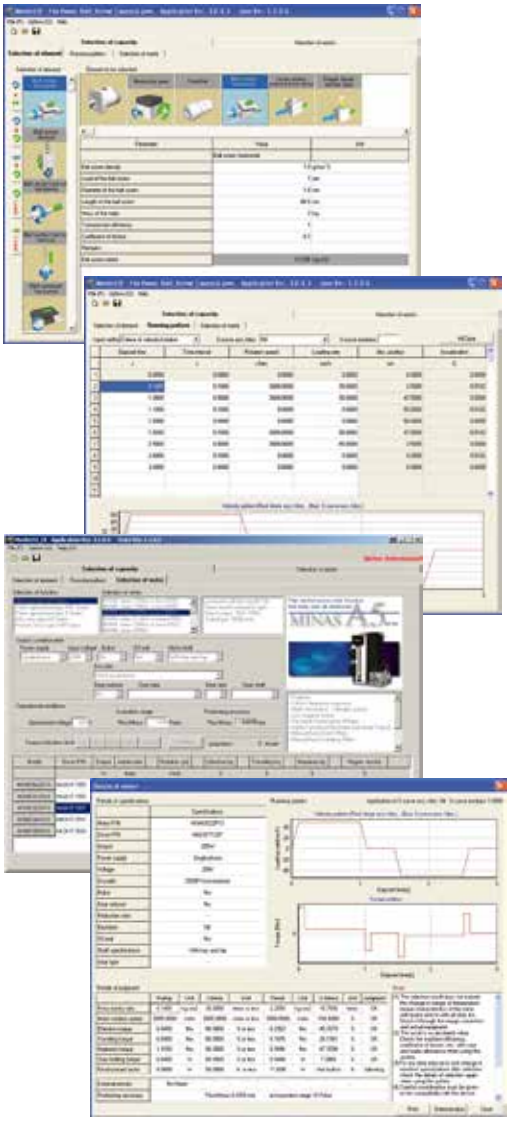
Simply download the software from Panasonic's website: https://www.panasonic-electric-works.com/eu/downloadcenter.htm
Home -> Downloadcenter-> Automation products -> Servo drives -> All products -> Software

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

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