Panasonic
INDUSTRY

SERVO DRIVES

MINAS A6 SERIES

Application areas:

- Pick-and-place machines
- Handling systems
- Machine tools
- Robots
- Printing machines
- Automated machines
- Materials handling
- Packaging machinery

Automation products from Panasonic Industry

With over 100 years of innovation and manufacturing expertise, Panasonic Industry Europe remains committed to its vision of creating "A Better Life, A Better World." Panasonic can look back on decades of experience in the electronics industry and, thanks to its dedicated customer orientation, is a competent and reliable partner for customers throughout Europe when it comes to technical expertise in combination with solution orientation. As a provider of tailor-made solutions, we focus on offering our customers products and services in the **Mobility**, **Living Space** and **Business** sectors that make a difference thanks to our proprietary innovations.

Smart automation technology

The factory of the future will achieve new levels of productivity, effectiveness and profitability through comprehensive networking. Equipment and components from Panasonic Industry Europe offer leading-edge **Industry 4.0** features, as connectivity, energy efficiency, reliability and sturdiness play a pivotal role in modern production environments.

The Panasonic Industry Europe portfolio not only offers key electronic components, devices, modules and software but also complete solutions for production lines in a wide variety of industries. Panasonic Industry's comprehensive know-how along the entire value chain, combined with a corporate culture geared to customer needs, enables it to offer customer-specific solutions.

Our experience as a manufacturer and a sales partner for components and products allows us to share our experience with our customers. Customer wishes are specifically integrated into the development of new products, so that we can surpass our role as a supplier and become a competent, long-term partner for our customers.

The most modern servo drives: the MINAS A6 series

With its **MINAS A6 series**, Panasonic Industry offers a highly dynamic servo driver family with a wide power range from 50W to 5kW for many different areas of applications. The servo drivers and motors of the **MINAS A6 series** are characterized by a consistently compact and robust but also lightweight design. In addition, they have been equipped with innovative functions for damping resonance frequencies and to eliminate vibration tendencies.

Highly dynamic drive technology in a 400V network for maximum performance

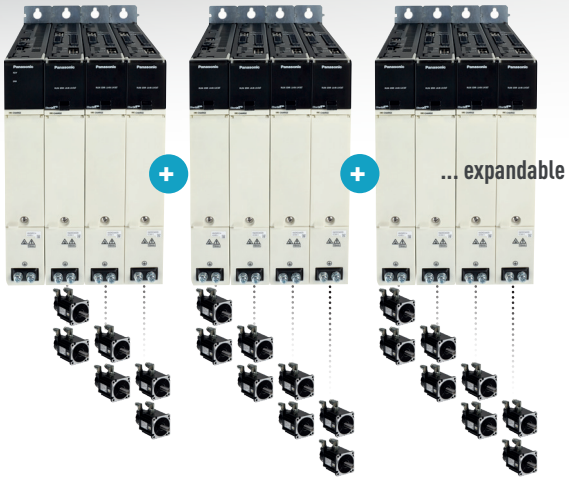
With around 70% market share, 400V applications represent the largest segment in industrial automation. Take advantage of the 400V three-phase network by using the servo drives from Panasonic, which cover a power range from 0.4–5kW (in future up to 22kW).

Proven technology paired with innovative functions and versatile control features such as pulse, analog and network technology with real-time communication characterize our solutions.

Service

Panasonic Industry Europe's comprehensive service includes an expert hotline, workshops and on-site service to ensure the reliable and effective use of our servo drives. In addition to its wide-ranging product portfolio of programmable logic controllers, Panasonic Industry Europe also offers sensors, operating panels, drive technology, energy management systems, ionisers, automation components and many other products and complete solutions.

NEW!



MINAS A6 Multi series: 400V servo drive system

Compact, modular design for maximum performance

400V servo drive system

- **Compact servo drive in book format:** Only 25mm width per axis on the two-axis-unit
- **Modular design:** One power supply unit supports several servo drivers
- **DC link bus system:** Reliable connection without tools
- **Quick servo control technology:** A frequency response of 3.2kHz enables high-speed operation for maximum productivity
- **Anti-vibration technology:** Suitable for highly precise applications thanks to vibration damping.
- **State-of-the-art network technology:** High-speed communication via EtherCAT with up to 10Mbit/s
- **18 advanced safety functions:** MINAS A6 Multi achieves safety class SIL3
- **Setup via EtherCAT:** Easy configuration and programming over EtherCAT (EoE) using the software tool PANATERM
- **Robust connectors:** Servo motors with round connectors according to IEC, CENELEC, and IEEE

Industries

Packaging industry

Plastics and metal processing

Presses

Quick-connect technology

The MINAS A6 Multi can be wired at the top and bottom. No tools are needed.

DC link bus

Beneath the front cover lies the DC link bus. Thanks to the screwless power bus system it allows quick and easy expansion of the servo drivers.

Modular construction

Several two-axis servo drivers (50mm) can be coupled to just one compact power supply unit (50mm or 100mm width). Thanks to the DC link bus, the expansion is fast and reliable.

Power supply units

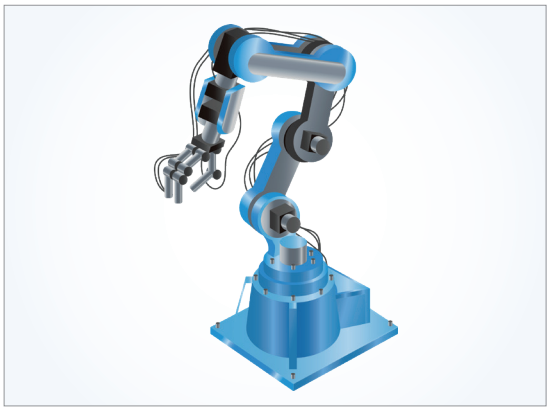
Product no.	Size	Input voltage	Rated power
MADMPN14	A	3-phase 380–480V AC	15kW
MBDMPN24	B	3-phase 380–480V AC	30kW

Servo driver units

Product no.	Size	Number of axes	Rated power
MADM2A4KBX	A	2	For motors 0.4–0.75kW**
MADM2A6KBX	A	2	For motors 0.75–1.5kW**
MADM2AAKBX	A	2	For motors 1.5–3.0kW**
MBDM1ABKBX	B	1	For motors 3.0–5.0kW

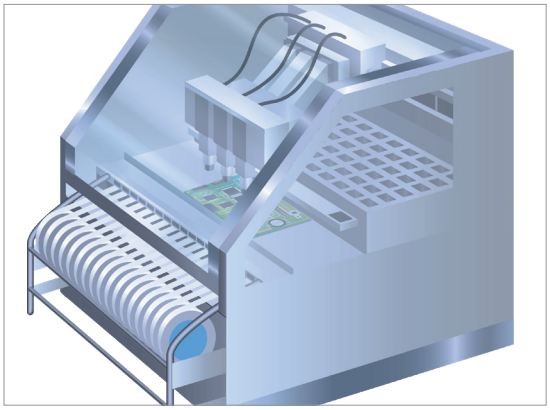
** Also combinable

The MINAS product family changes the world of industrial machine automation



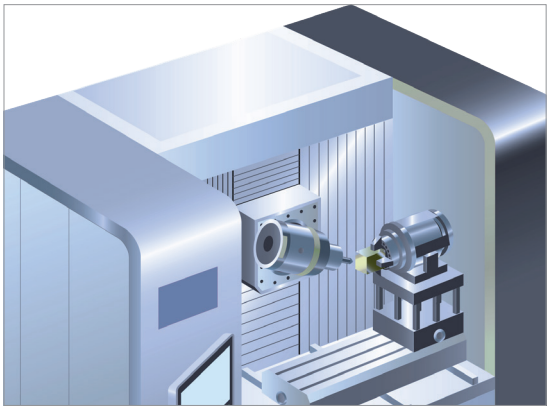
Robots

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.

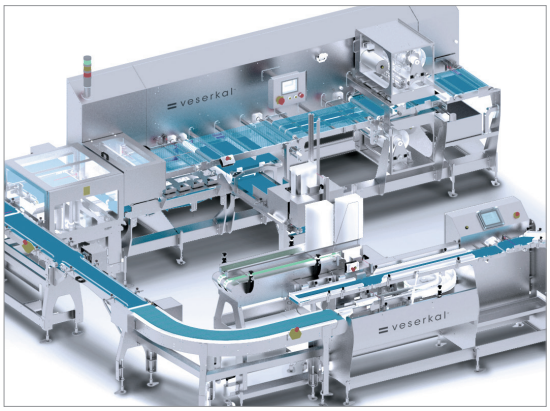


Pick-and-place machines

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.

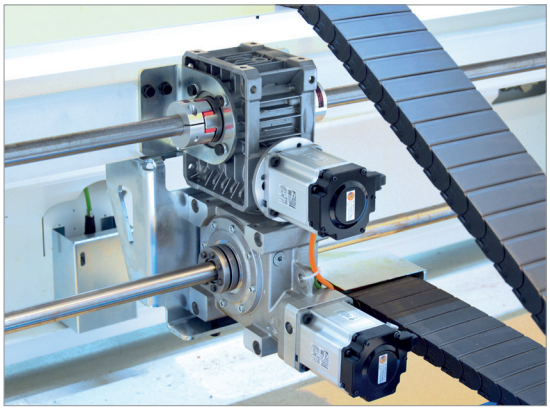
CNC milling machine

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 hamburgers and minced meat

Equipped with MINAS A5 servo motors, FP7 programmable controllers, inverters, touch terminals 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 39)

› **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

	200/400V AC				400V AC
MINAS A6 series	**A6SE**	**A6SG**	**A6SF**	**A6N/A6B**	**A6 Multi**
					
Rated power	50W–1.5kW (200V AC), 1kW–5kW (400V AC)				400W–5kW
Supply voltage	1/3-phase (200V AC), 3-phase (400V AC)				3-phase
Bandwidth (velocity response)	3200Hz				
Rated rotational speed	2000–3000rpm				
Max. rotational speed	3000–6500rpm				
Rated torque	0.16–15.9Nm (200V AC), 0.64–23.9Nm (400V AC)				
Peak torque	0.48–47.7Nm (200V AC), 2.23–71.6Nm (400V AC)				
Control functions	Position control		Position, velocity, torque control		
IP degree of protection (motor)	IP67				
Control input	Pulse		Pulse, analog	Network	Network

Compatible with MINAS A5 series

Connections designed for compatibility

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

MINAS A5

Identical accessories

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

MINAS A6

Compatible flange dimensions

The motor can be exchanged 1:1 at the machine or gear flange.

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 15%.

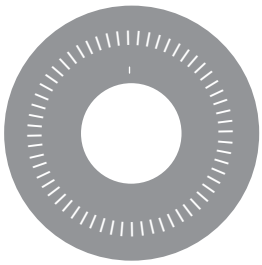
MHMF + MDMF models

200V: 10% lighter, 30% shorter

400V: 15% lighter and shorter

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

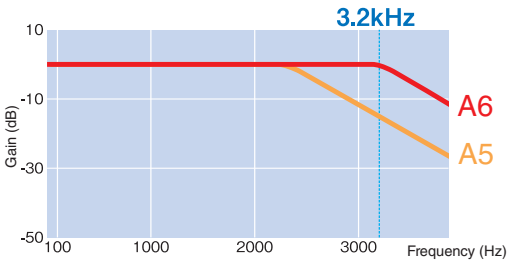
The 20-bit encoder (1048576 pulses per revolution = ppr) has been upgraded to 23 bit (8388608ppr).

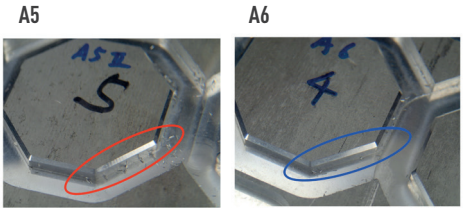


Improvements and new features of the MINAS A6 series

Advanced controller settings

3.2kHz frequency response





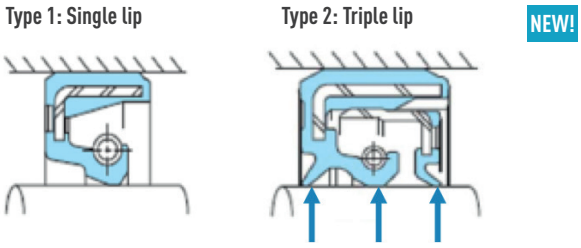
Numerous interference bands

Hardly any interference bands

Available with two different seals

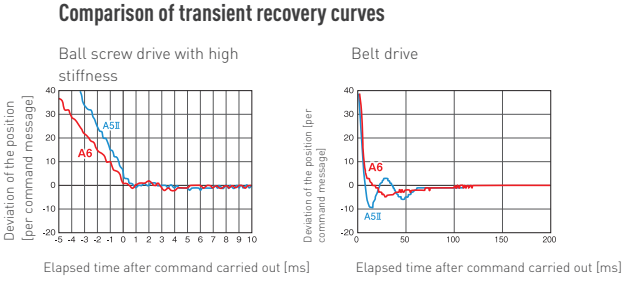
(single/triple lip)

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

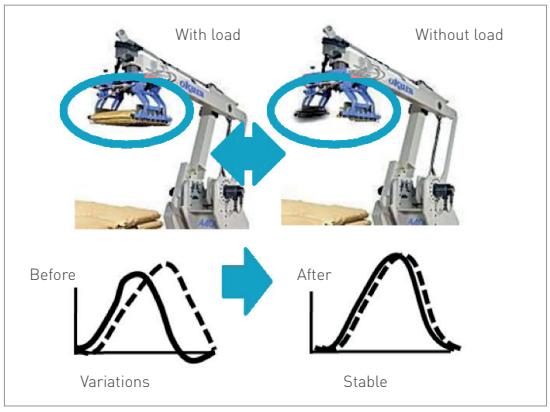


Improved suppression of vibrations

The tendency to vibrate when braking to a standstill is significantly reduced. This has shortened the transient recovery time.



Improved reaction and adjustment to load variations



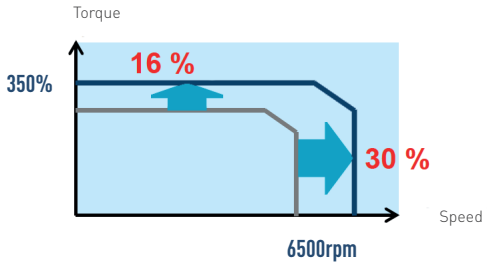
---- : with load
------ : without load

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.

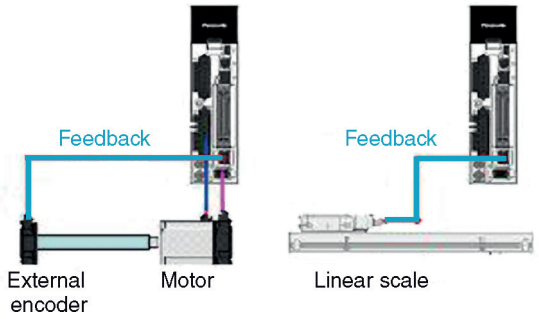
A5
Setting value 4Mpps

A6
Setting value 8Mpps

General features

External encoders for full-closed control

Using an external encoder or linear displacement measuring system ensures high-precision position control.

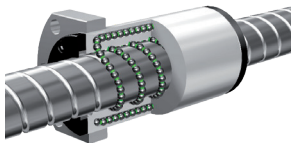


Real-time auto-gain tuning

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.

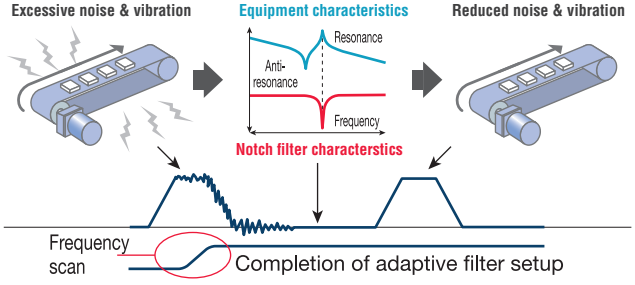
Belt drive

Ball screw drive



Manual and automatic notch filters

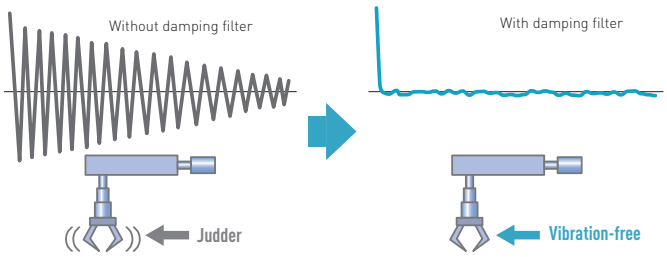
Highly sensitive notch filters log resonance frequencies and adapt them automatically.



General features

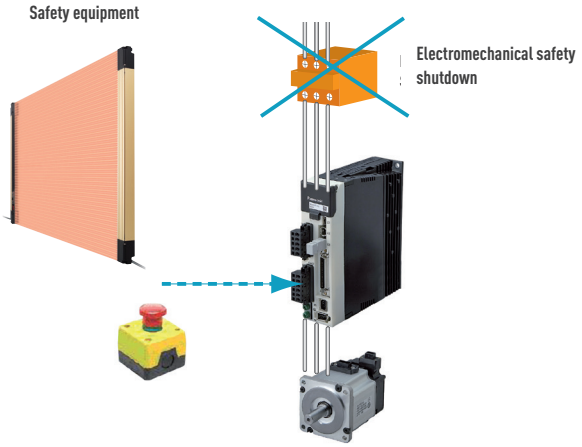
Manual and automatic damping filters

Damping filters that can be set automatically suppress the equipment's resonance, 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.

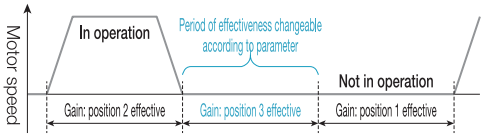


Dynamic brake

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.

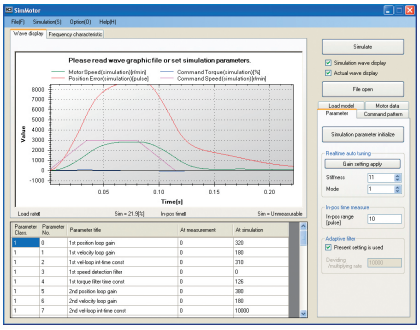


3-step control setting

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 a lower vibration tendency.

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 you having to adjust the actual parameter settings of the equipment.



Servo drivers and motors

		200/400V AC					400V AC
Servo drivers	Model	Standard	RS485 communication	Multifunction	Network		400V AC modular
		A6SE	A6SG	A6SF	A6N	A6B	A6 Multi
							
	RTEX	-	-	-	x	-	-
	EtherCAT	-	-	-	-	x	x
	External encoder	-	-	x	x		x
	Safety function STO	-	-	x	x		x
	Advanced safety function	-	-	-	-		x
	RS232/485 (Modbus)	-	x	x	-		-
	Velocity control, torque control	-	-	x	x		x
	Position control with dig. I/O (like MINAS A4P)	x	x	x	-		-
	Position control	x	x	x	x		x

		Model	MSMF		MDMF		MHMF	
			Low inertia		Medium inertia		High inertia	
								
		Rated power W	Flange Ø mm	Rated rotational speed (max.) rpm	Flange Ø mm	Rated rotational speed (max.) rpm	Flange Ø mm	Rated rotational speed (max.) rpm
Servo motors	200V AC	50	38	3000 (6000)	–	–	40	3000 (6500)
		100			–	–		
		200	60		–	–	60	
		400			–	–		
		750	80		–	–	80	3000 (6000)
		1000	80/100	3000 (6000)/ 3000 (5000)	130	2000 (3000)	80/130	3000 (6000)/ 2000 (3000)
		1500	100	3000 (5000)			130	2000 (3000)
	400V AC	200	-	-	-	-	60	3000 (6500)
		400	-	-	-	-		
		750	-	-	-	-	80	3000 (6000)
		1000	100	3000 (5500)	130	2000 (3500)	80/130	3000 (6000)/ 2000 (3500)
		1500					130	2000 (3500)
		2000					176	
		3000	120					
		4000	130	3000 (5000)	176			
		5000				2000 (3000)		2000 (3000)
		Features	Low to high power range, low inertia, suitable for all kinds of applications, also suitable for high-speed applications, especially for machinery with high rigidity and repetition rate		Medium to high power range, medium inertia, suitable for belt-driven machinery with low rigidity		Low to high power range, high inertia, suitable for belt-driven machinery with low rigidity	
		Applications	Equipment for transistor production (like bonders, SMD machinery), packaging machines, machines for food production, etc.		Conveyor machinery, robots, textile machines, etc.		Conveyor machinery, robots, machines for LCD production, etc.	

Servo driver model codes 100/200/400V AC

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

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

Supply voltage:
1: 1-phase, 100V AC
3: 3-phase, 200V AC
5: 1-/3-phase , 200V AC
4: 3-phase, 400V AC

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

Type:

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

Servo motor model codes 100/200V AC

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: Standard absolute encoder (connector type)
A: Absolute encoder without battery (leadwire type)

Servo motor model codes 400V AC

MSM	F	10	4	A1	G	9	M

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

F: A6 series

Rated power:
10: 1kW
15: 1.5kW
20: 2kW
30: 3kW
40: 4kW
50: 5kW

Supply voltage:
4: 400V AC

Oil seal:
9: Single lip
A: Triple lip

M: Chinese magnet

Shaft type:
G: Without key way shaft, without holding brake
H: With key way shaft, with holding brake

Encoder type:
L1: Standard (connector type)
A1: Encoder without battery (leadwire type)

Power supply model codes A6 Multi

MAD	M	P	N	1	4

Frame:
MAD: A
MBD: B

M: A6 Multi series

Module type:
P: Power supply

Supply voltage:
4: 3-phase, 400V AC

Rated power:
1: 15kW
2: 30kW

Safety function:
N: Without safety function

Servo driver model codes A6 Multi 400V AC

MAD	M	2	A	4	K	B	X

Frame:
MAD: A
MBD: B

M: A6 Multi series

Axis unit type
1: 1-axis unit
2: 2-axis unit

Safety function:
A: With STO

Other Features:
X: Advanced safety function

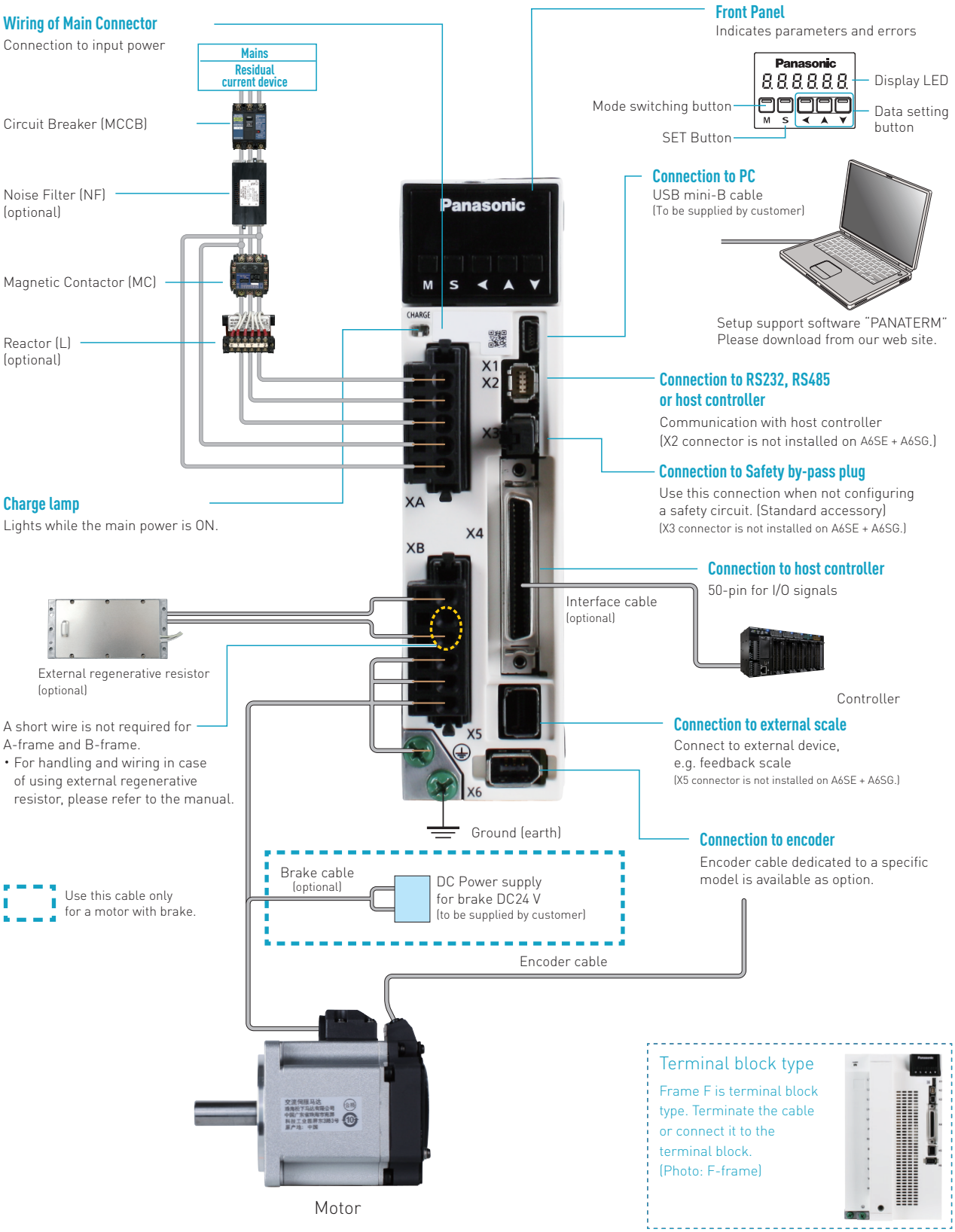
Network type:
B: EtherCAT

Supply voltage:
K: 560V DC

Rated power:
4: 750W
6: 1.5kW
A: 3kW
B: 5kW

Connections and interfaces

Connector type (200V DC: frame A – F)



Terminal block type

Frame F is terminal block type. Terminate the cable or connect it to the terminal block.
(Photo: F-frame)

PRODUCT FINDER: FOR SERVO DRIVES

Find the best servo drive within seconds!

Overview of MINAS A6 motors, servo drivers and accessories 200V AC

	Servo 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 200V AC class										
Low inertia	50	38	0.16 (0.48)	3000 (6000)	MSMF5AZL1U1		x	x	23 bit 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 200V AC class										
Medium inertia	1000	130	4.77 (14.3)	2000 (3000)	MDMF102L1G5		x	x	23 bit encoder 8388608ppr	
					MDMF102L1H5	x	x	x		
	1500		7.16 (21.5)		MDMF152L1G5		x	x		
					MDMF152L1H5	x	x	x		
High inertia 200V AC class										
High inertia	50	40	0.16 (0.56)	3000 (6500)	MHMF5AZL1U1		x	x	23 bit 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		

Motor type: □□□□L1□ = standard,

□□□□A1□ = encoder without battery
(For further information, please refer to the 'Catalogue of batteryless absolute encoder motor)

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	--			FN2090-10-06	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)	FN2090-10-06	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	BWD250100
		--	MFMCA0□□7XFD				
		MFMCA0□□7WFD	--				
		--	MFMCA0□□7XFD				
MADL□15□□		MFMCA0□□0WFD	--				BWD250072
		--	MFMCA0□□0XFD				
MBDL□25□□	B	MFMCA0□□0WFD	--				
		--	MFMCA0□□0XFD				
MCDL□35□□	C	MFMCA0□□0WFD	--				
		--	MFMCA0□□0XFD				
MDDL□55□□	D	MFMCA0□□0WFD	--			FN2090-10-06	BWD500035
		--	MFMCA0□□0XFD				
MDDL□45□□		MFMCD0□□2GCD	--	MFECA0□□0GTD	MFECA0□□0GTE (with battery box)		
		--	MFMCE0□□2HCD				
MDDL□55□□		MFMCD0□□2GCD	--				
		--	MFMCE0□□2HCD				

□ .. □□ **Servo driver type**, see page 16

□□ = **Cable length** (m)

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

Overview of MINAS A6 motors, servo drivers and accessories 400V AC

	Servo motor									
	Rated power W	Flange Ø mm	Max. torque Nm	Rated rotational speed (max.) rpm	Motor	Holding brake	Degree of protection IP67	Key shaft	Encoder	
Low inertia 400V AC class										
Low inertia	1000	100	3.18 (9M.55)	3000 (5500)	MSMF104□G9M		x	x	23-bit encoder 8388608ppr	
					MSMF104□H9M	x	x	x		
	1500		4.77 (14.3)		MSMF154□G9M		x	x		
					MSMF154□H9M	x	x	x		
	2000		6.37 (19M.1)		MSMF204□G9M		x	x		
					MSMF204□H9M	x	x	x		
	3000	120	9M.55 (28.7)		MSMF304□G9M		x	x		
					MSMF304□H9M	x	x	x		
	4000	130	12.7 (38.2)	3000 (5000)	MSMF404□G9M		x	x		
					MSMF404□H9M	x	x	x		
	5000		15.9M (47.8)		MSMF504□G9M		x	x		
					MSMF504□H9M	x	x	x		
Medium inertia 400V AC class										
Medium inertia	1000	130	4.77 (14.3)	2000 (3500)	MDMF104□G9M		x	x	23-bit encoder 8388608ppr	
					MDMF104□H9M	x	x	x		
	1500		7.16 (21.5)		MDMF154□G9M		x	x		
					MDMF154□H9M	x	x	x		
	2000		9M.55 (28.7)		MDMF204□G9M		x	x		
					MDMF204□H9M	x	x	x		
	3000		14.3 (43.0)		MDMF304□G9M		x	x		
					MDMF304□H9M	x	x	x		
	4000	176	19M.1 (57.3)		MDMF404□G9M		x	x		
					MDMF404□H9M	x	x	x		
	5000		23.87 (71.6)	2000 (3000)	MDMF504□G9M		x	x		
					MDMF504□H9M	x	x	x		
High inertia 400V AC class										
	200	60	0.64 (2.23)	3000 (6500)	MHMF024□U9M		x	x	23-bit encoder 8388608-ppr	
					MHMF024□V9M	x	x	x		
	400	60	1.27 (4.46)	3000 (6500)	MHMF044□U9M		x	x		
					MHMF044□V9M	x	x	x		
	750	80	2.39 (8.36)	3000 (6000)	MHMF084□U9M		x	x		
					MHMF084□V9M	x	x	x		
	1000		3.18 (11.1)		MHMF094□U9M		x	x		
					MHMF094□V9M	x	x	x		
High inertia	1000	130	4.77 (14.3)	2000 (3500)	MHMF104□G9M		x	x		
					MHMF104□H9M	x	x	x		
	1500		7.16 (21.5)		MHMF154□G9M		x	x		
					MHMF154□H9M	x	x	x		
	2000	176	9M.55 (28.7)		MHMF204□G9M		x	x		
					MHMF204□H9M	x	x	x		
	3000		14.3 (43.0)		MHMF304□G9M		x	x		
					MHMF304□H9M	x	x	x		
	4000		19M.1 (57.3)		MHMF404□G9M		x	x		
					MHMF404□H9M	x	x	x		
	5000		23.9M (71.6)	2000 (3000)	MHMF504□G9M		x	x		
					MHMF504□H9M	x	x	x		

□ **Motor type** (L1 = standard, A1 = encoder without battery)

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 400V AC class								
	MDDL□64□□	D	MFMCA0□□4YUD	--	MFECA0□□0YYE	MFECA0□□0YYD (with battery box)	FN3268-7-44 Undergoing tests	BWD500150
			--	MFMCA0□□4ZUD				
			MFMCA0□□4YUD	--				
			--	MFMCA0□□4ZUD				
	MEDL□84□□	E	MFMCA0□□4YUD	--				BWD500100
			--	MFMCA0□□4ZUD				
	MFDL□A4□□	F	MFMCA0□□5YUD	--			FN3268-16-44 Undergoing tests	BWD600047
			--	MFMCA0□□5ZUD				
	MFDL□B4□□		MFMCA0□□5YUD	--				
			--	MFMCA0□□5ZUD				
			MFMCA0□□5YUD	--				
			--	MFMCA0□□5ZUD				
Medium inertia 400V AC class								
	MDDL□54□□	D	MFMCA0□□4YUD	--	MFECA0□□0YY	MFECA0□□0YYD (with battery box)	FN3268-7-44 Undergoing tests	BWD500150
			--	MFMCA0□□4ZUD				
	MDDL□64□□		MFMCA0□□4YUD	--				
			--	MFMCA0□□4ZUD				
	MEDL□84□□	E	MFMCA0□□4YUD	--				BWD500100
			--	MFMCA0□□4ZUD				
	MFDL□A4□□	F	MFMCA0□□5YUD	--			FN3268-16-44 Undergoing tests	BWD600047
			--	MFMCA0□□5ZUD				
	MFDL□B4□□		MFMCA0□□5YUD	--				
			--	MFMCA0□□5ZUD				
			MFMCA0□□5YUD	--				
			--	MFMCA0□□5ZUD				
High inertia 400V AC class								
	MDDL□44□□ Undergoing tests	D	MFMCA0□□3YUD	--	MFECA0□□0YYE	MFECA0□□0YYD (with battery box)	Undergoing tests	On request
			--	MFMCA0□□3ZUD				
			MFMCA0□□3YUD	--				
			--	MFMCA0□□3ZUD				
	MDDL□54□□		MFMCA0□□3YUD	--				BWD500150
			--	MFMCA0□□3ZUD				
	MDDL□64□□		MFMCA0□□3YUD	--				
			--	MFMCA0□□3ZUD				
	MDDL□54□□		MFMCA0□□4YUD	--			FN3268-7-44 Undergoing tests	
			--	MFMCA0□□4ZUD				
	MDDL□64□□		MFMCA0□□4YUD	--				
			--	MFMCA0□□4ZUD				
	MEDL□84□□	E	MFMCA0□□4YUD	--				BWD500100
			--	MFMCA0□□4ZUD				
	MFDL□A4□□	F	MFMCA0□□5YUD	--			FN3268-16-44 Undergoing tests	BWD600047
			--	MFMCA0□□5ZUD				
	MFDL□B4□□		MFMCA0□□5YUD	--				
			--	MFMCA0□□5ZUD				
			MFMCA0□□5YUD	--				
			--	MFMCA0□□5ZUD				

□,□□ **Servo driver type**, see page 16

□□ = **Cable length** (m)

MINAS A6 motors, MINAS A6 Multi servo drivers and accessories 400V AC

	Servo motor									
	Rated power W	Flange Ø mm	Max. torque Nm	Rated rotational speed (max.) rpm	Motor	Holding brake	Degree of protection IP67	Key shaft	Encoder	
	Low inertia MINAS A6 Multi 400V AC class									
	1000	100	3.18 (9.55)	3000 (5500)	MSMF104□G9M		x	x	23 bit encoder 8388608ppr	
					MSMF104□H9M	x	x	x		
	1500		4.77 (14.3)		MSMF154□G9M		x	x		
					MSMF154□H9M	x	x	x		
	2000		6.37 (19.1)		MSMF204□G9M		x	x		
					MSMF204□H9M	x	x	x		
	3000	120	9.55 (28.7)		MSMF304□G9M		x	x		
					MSMF304□H9M	x	x	x		
	4000	130	12.7 (38.2)	3000 (5000)	MSMF404□G9M		x	x		
					MSMF404□H9M	x	x	x		
	5000		15.9 (47.8)		MSMF504□G9M		x	x		
					MSMF504□H9M	x	x	x		
	Medium inertia MINAS A6 Multi 400V AC class									
	1000	130	4.77 (14.3)	2000 (3500)	MDMF104□G9M		x	x	23 bit encoder 8388608ppr	
					MDMF104□H9M	x	x	x		
	1500		7.16 (21.5)		MDMF154□G9M		x	x		
					MDMF154□H9M	x	x	x		
	2000		9.55 (28.7)		MDMF204□G9M		x	x		
					MDMF204□H9M	x	x	x		
	3000		14.3 (43.0)		MDMF304□G9M		x	x		
					MDMF304□H9M	x	x	x		
	4000	176	19.1 (57.3)		MDMF404□G9M		x	x		
					MDMF404□H9M	x	x	x		
	5000		23.87 (71.6)	2000 (3000)	MDMF504□G9M		x	x		
					MDMF504□H9M	x	x	x		
	High inertia MINAS A6 Multi 400V AC class									
High inertia	400	60	1.27 (4.46)	3000 (6500)	MHMF044□U9M		x	x	23 bit encoder 8388608ppr	
					MHMF044□V9M	x	x	x		
	750	80	2.39 (8.36)	3000 (6000)	MHMF084□U9M		x	x		
					MHMF084□V9M	x	x	x		
	1000		3.18 (11.1)		MHMF094□U9M		x	x		
					MHMF094□V9M	x	x	x		
	1000	130	4.77 (14.3)	2000 (3500)	MHMF104□G9M		x	x		
					MHMF104□H9M	x	x	x		
	1500		7.16 (21.5)		MHMF154□G9M		x	x		
					MHMF154□H9M	x	x	x		
	2000	176	9.55 (28.7)		MHMF204□G9M		x	x		
					MHMF204□H9M	x	x	x		
	3000		14.3 (43.0)		MHMF304□G9M		x	x		
					MHMF304□H9M	x	x	x		
	4000		19.1 (57.3)		MHMF404□G9M		x	x		
					MHMF404□H9M	x	x	x		
	5000		23.9 (71.6)	2000 (3000)	MHMF504□G9M		x	x		
					MHMF504□H9M	x	x	x		
					□ **Motor type** (L1 = standard, A1 = encoder without battery)					

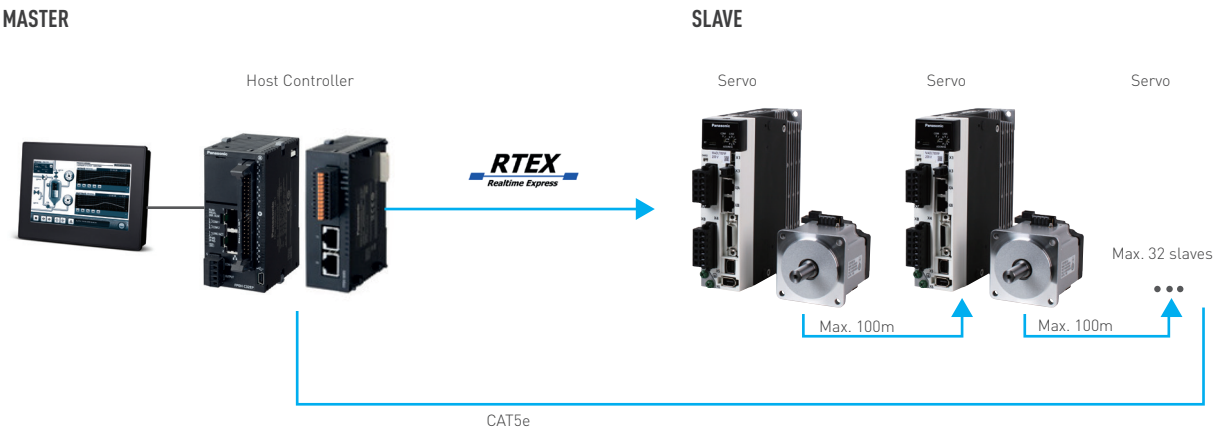
Servo drivers			Cables				Filter	Brake resistor
			Motor cable		Encoder cable			
	Model	Frame	For motors without holding brake	For motors with holding brake	23-bit, incremental	23-bit, absolute	EMC filter	Model
Low inertia MINAS A6 Multi 400V AC class								
	MADM2A6KBX	A	MFMCA0□□1YUD	--	MFECA0□□0YYE	MFECA0□□0YYD (with battery box)	FN3288-80-34 (Undergoing tests)	Motor design depending on application
			--	MFMCA0□□1ZUD				
	MADM2AAKBX		MFMCA0□□1YUD	--				
			--	MFMCA0□□1ZUD				
			MFMCA0□□2YUD	--				
			--	MFMCA0□□2ZUD				
	MBDM1ABKBX	B	MFMCA0□□2YUD	--			FN3288-160-40 (Undergoing tests)	
			--	MFMCA0□□2ZUD				
			MFMCA0□□2YUD	--				
			--	MFMCA0□□2ZUD				
Medium inertia MINAS A6 Multi 400V AC class								
		A	MFMCA0□□1YUD	--	MFECA0□□0YYE	MFECA0□□0YYD (with battery box)	FN3288-80-34 (Undergoing tests)	Motor design depending on application
			--	MFMCA0□□1ZUD				
			MFMCA0□□1YUD	--				
			--	MFMCA0□□1ZUD				
	MADM2AAKBX		MFMCA0□□1YUD	--				
			--	MFMCA0□□1ZUD				
			MFMCA0□□2YUD	--				
			--	MFMCA0□□2ZUD				
	MBDM1ABKBX	B	MFMCA0□□2YUD	--			FN3288-160-40 (Undergoing tests)	
			--	MFMCA0□□2ZUD				
			MFMCA0□□2YUD	--				
			--	MFMCA0□□2ZUD				
High inertia MINAS A6 Multi 400V AC class								
	MADM2A4KBX	A	MFMCA0□□0YUD	--	MFECA0□□0YYE	MFECA0□□0YYD (with battery box)	FN3288-80-34 (Undergoing tests)	Motor design depending on application
			--	MFMCA0□□0ZUD				
	MADM2A4KBX,		MFMCA0□□0YUD					
			--	MFMCA0□□0ZUD				
	MADM2A6KBX		MFMCA0□□0YUD	--				
			--	MFMCA0□□0ZUD				
			MFMCA0□□1YUD	--				
			--	MFMCA0□□1ZUD				
	MADM2A6KBX, MADM2AAKBX		MFMCA0□□1YUD	--				
			--	MFMCA0□□1ZUD				
	MADM2AAKBX		MFMCA0□□1YUD	--				
			--	MFMCA0□□1ZUD				
	MADM2AAKBX, MBDM1ABKBX		MFMCA0□□2YUD	--				
			--	MFMCA0□□2ZUD				
		B	MFMCA0□□2YUD	--			FN3288-160-40 (Undergoing tests)	
			--	MFMCA0□□2ZUD				
			MFMCA0□□2YUD	--				
			--	MFMCA0□□2ZUD				
			□□ = **Cable length** (m)					

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.

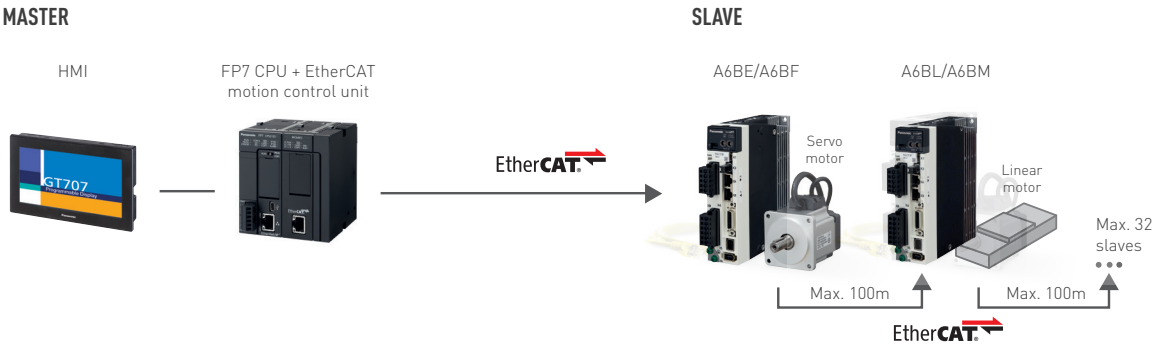
Easy mounting and reliable connections thanks to ring topology



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.



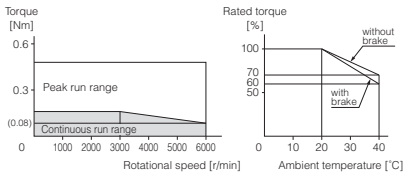
Features	MINAS A6N RTEX		MINAS A6B EtherCAT
General features	Supports position, velocity and torque control		
	Manual and automatic vibration suppression (adjustable in the driver)		
	Conforms to the following safety standards: ISO13849-1(PL e, CAT3), EN61508(SIL3), EN62061(SILCL3), EN61800-5-2(SIL3, 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 16 axes	up to 8 axes	up to 64 axes
PLC + Compatible positioning units	FP0H + AFP0HM4N / AFP0HM8N	AFPXHM8N16PD	FP7 + AFP7MC16EC / AFP7MC32EC / AFP7MC64EC

For more data about MINAS A6 servo controllers and motors such as technical data, dimensional diagrams, and torque characteristics, please use this download link:

Examples of servo motor torque characteristics

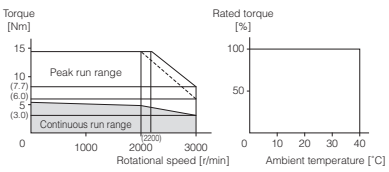
Motor with low inertia:

MSMF5AZL1□□	With oil seal



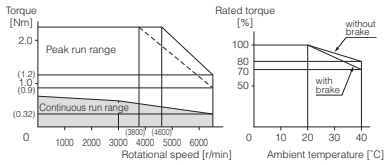
Motor with middle inertia:

MDMF102L1□□	With oil seal



Motor with high inertia:

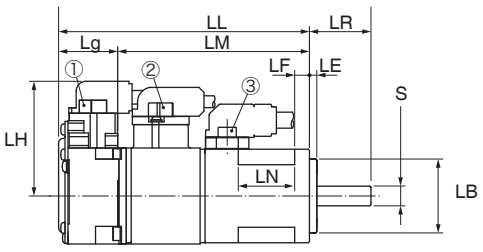
MHMF022L1□□	With oil seal

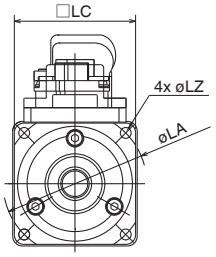


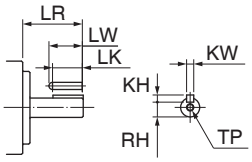
Examples of servo motor dimension diagrams

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

50-100W	Side	Front	Key way dimensions

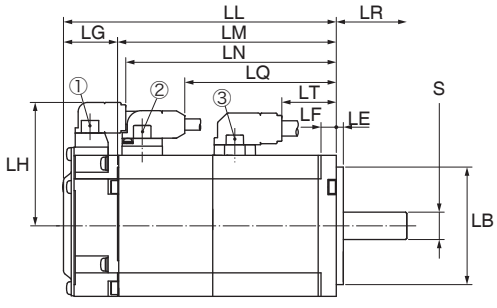


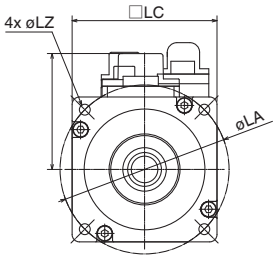


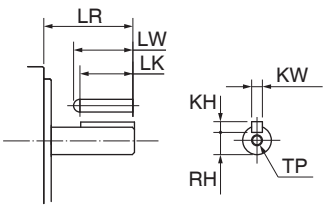


1) Encoder connector (JN2)
2) Brake connector
3) Motor connector

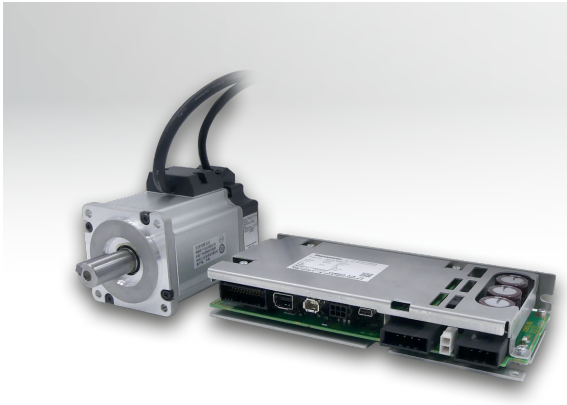
200-1000W	Side	Front	Key way dimensions







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



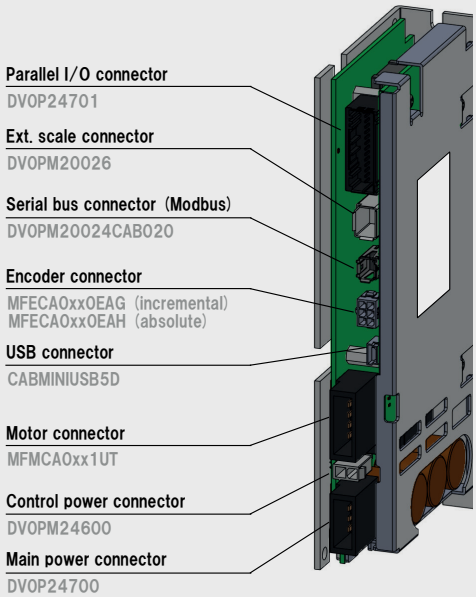
MINAS A6V servo drives (24/48V DC)

Low voltage, high performance

Features:

- Servo drives and servo motors
- 24/48V DC input voltage
- 200W or 400W
- 23-bit absolute encoder
- Modbus RTU communication
- Network types: EtherCAT, RTEX (Realtime Express)
- 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, EtherCAT, RTEX	
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	Output	Voltage	Type
Servo driver	200W/400W	24V DC	MVDLN5CS□
	200W/400W	48V DC	MVDLN5BS□
Servo motor	100W	24V DC	MQMD01CL1□
	100W	48V DC	MQMD01BL1□
	200W	24V DC	MSMD02CL1□
	200W	48V DC	MSMD02BL1□
	400W	48V DC	MSMD04BL1□

Servo driver
□ F = Multifunction
□ G = RS485 communication

Servo motor
□ S = With key and srew tap shaft, without oil seal, without brake
□ T = With key and srew tap shaft, without oil seal, with brake

Applications:

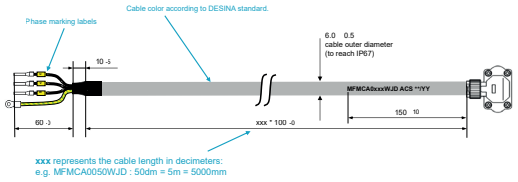
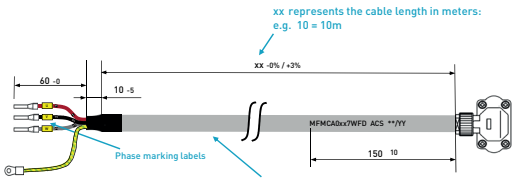
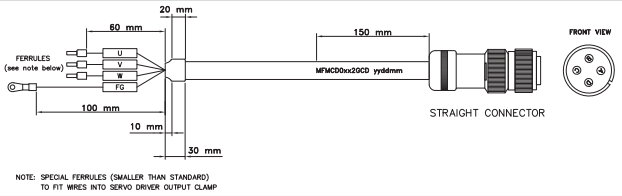
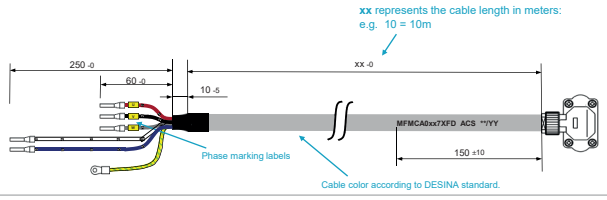
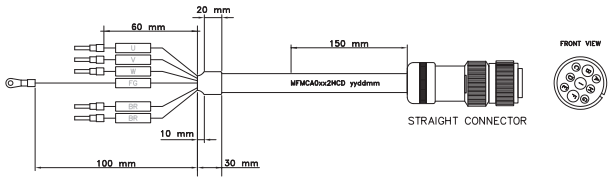
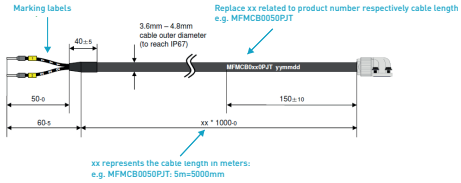
Medical technology, laboratories

Robots

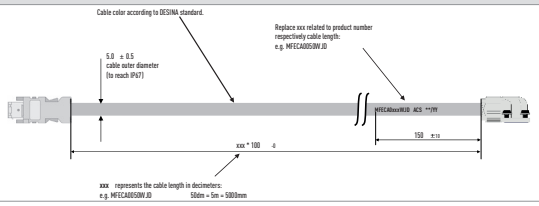
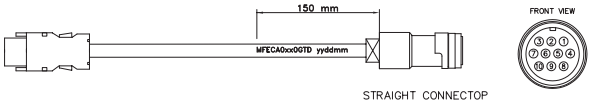
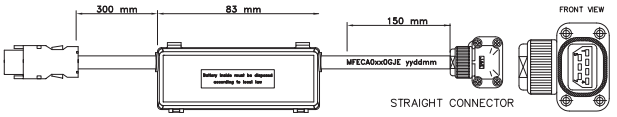
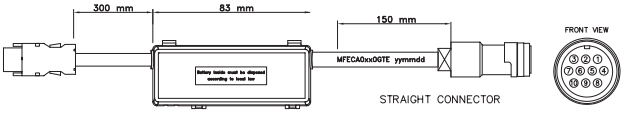
AGVs (automated guided vehicles in households and warehouses, lawnmowers, etc.)

All dimensions are in mm

Cables

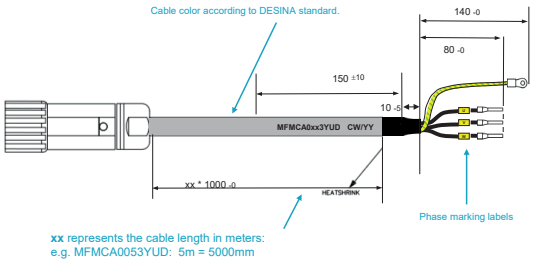
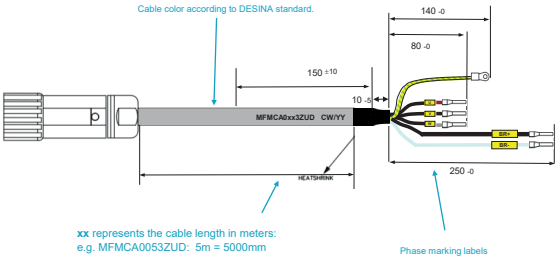
Motor cable MINAS A6 200V AC				
For motors without holding brake	MFMCA0□□0WJD (Please see also related brake cable: *)	MSMF	50W–1kW	
	MFMCA0□□7WFD	MHMF	50W–100W	
	MFMCA0□□0WFD	MHMF	200W–1kW	
	MFMCD0□□2GCD	MSMF, MDMF, MHMF	1kW–2kW	
For motors with holding brak	MFMCA0□□7XFD	MHMF	50W–100W	
	MFMCA0□□0XFD	MHMF	200W–1kW	
	MFMCA0□□ 2HCD	MSMF, MDMF, MHMF	1kW–2kW	
*Brake cable	MFMCB0□□0PJT	MSMF	50W–1kW	
		□□ = **Cable length** (m)		

All dimensions are in mm

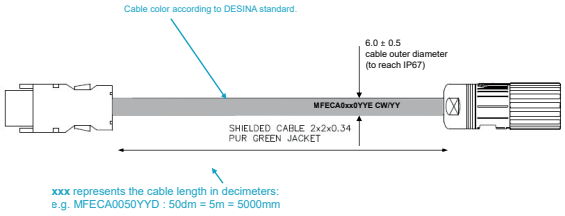
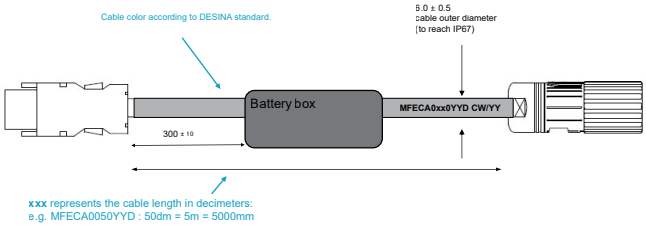
Encoder cable MINAS A6 200V AC				
For motors with 23-bit incremental encoder	MFECA0□□0WJD	MSMF, MHMF	50W–1kW	
	MFECA0□□0GTD	MSMF, MDMF, MHMF	1kW–5kW	
For motors 23-bit absolute encoder (with battery box)	MFECA0□□0GJE	MSMF, MHMF	50W–1kW	
	MFECA0□□0GTE	MSMF, MDMF, MHMF	1kW–5kW	
		□□ = **Cable length** (m)		

All dimensions are in mm

Motor cable MINAS A6 400V AC

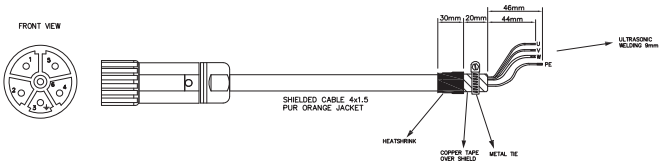
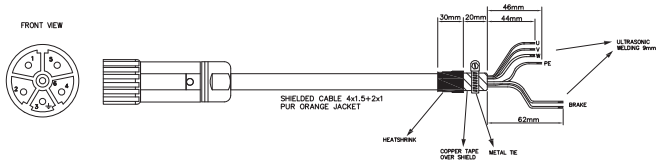
For motors without holding brake	MFMCA0□□3YUD	200W–1kW	
	MFMCA0□□4YUD	1kW–2kW	
	MFMCA0□□5YUD	3kW–5kW	
For motors with holding brake	MFMCA0□□3ZUD	200W–1kW	
	MFMCA0□□4ZUD	1kW–2kW	
	MFMCA0□□5ZUD	3kW–5kW	
		□□ = **Cable length** (m)	

Encoder cable MINAS A6 400V AC & MINAS A6 Multi

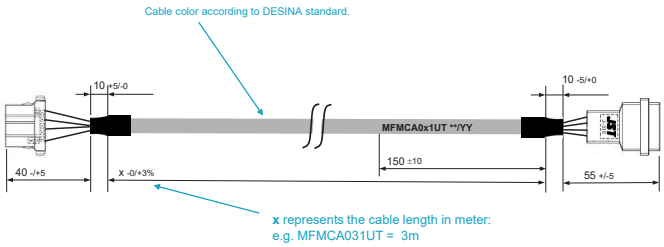
For motors with 23-bit incremental encoder	MFECA0□□0YYE	200W–5kW	
For motors 23-bit absolute encoder (with battery box)	MFECA0□□0YYD	200W–5kW	
		□□ = **Cable length** (m)	

All dimensions are in mm

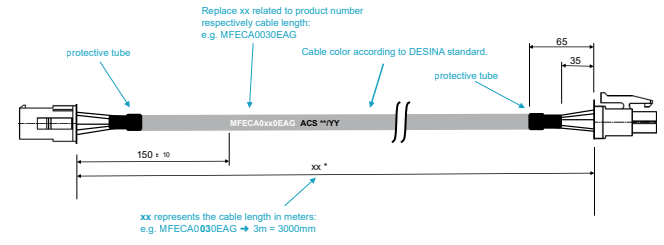
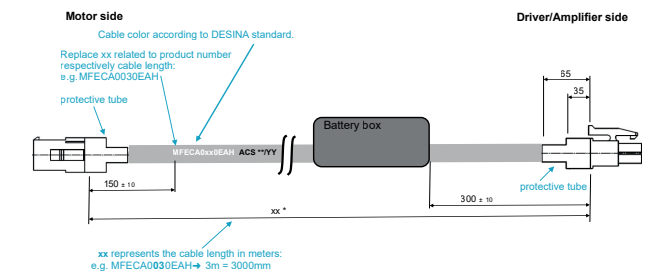
Motor cable MINAS A6 Multi

For motors without holding brake	MFMCA0□□0YUD	400W–1kW	
	MFMCA0□□1YUD	1kW–1.5kW	
	MFMCA0□□2YUD	2kW–5kW	
For motors with holding brake	MFMCA0□□0ZUD	400W–1kW	
	MFMCA0□□1ZUD	1kW–1.5kW	
	MFMCA0□□2ZUD	2kW–5kW	
		□□ = **Cable length** (m)	

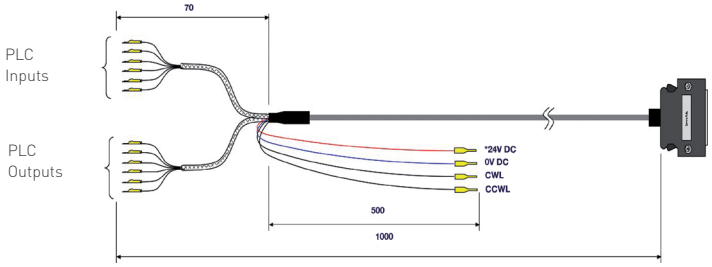
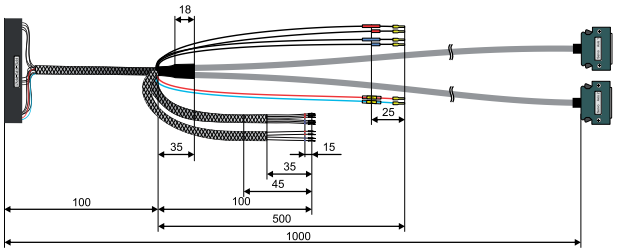
Motor cable MINAS A6V 24/48V DC

For motors with/without holding brake	MFMCA0□□UT	200/400W	
		□□ = **Cable length** (m)	

Encoder cable MINAS A6V 24/48V DC

For motors with 23-bit incremental encoder	MFECA0□□0EAG	200/400W	
For motors 23-bit absolute encoder (with battery box)	MFECA0□□0EAH-EU	200/400W	
		□□ = **Cable length** (m)	

All dimensions are in mm

Control cable (PLC – MINAS A6 servo driver), 200/400V AC			
For direct connections with FP series programmable controllers	FP0R	For 1 axis DV0P0988W-1 (PNP types) DV0P0989W-1 (NPN types)	
	FP0H, FP0R	For 1 axis DV0P0988WP-1 (PNP types)	
	FP7 positioning unit	For 2 axes DV0P0976W1 (line driver) DV0P0975W1 (transistor)	

Other accessories:

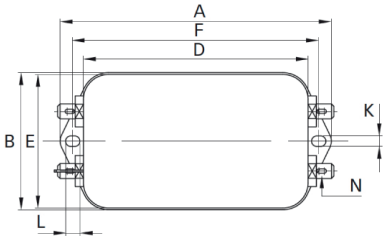
	Product no.	Details/Comments/Dimensions			
Cables	**Control cable 200/400V AC**				
	DV0P4360	50W–5kW	50-pin	I/O cable X4, loose wires, 2m	
	DVOP4360P	50W–5kW	50-pin	I/O cable X4, loose wires, 2m, position control	
	DVOP4360V	50W–5kW	50-pin	I/O cable X4, loose wires, 2m, velocity control	
	DV0PM20024CAB020	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-EU	50W–5kW	26-pin	I/O cable X4, loose wires, 2m	
	Programming cable 200/400V AC				
	CABMINIUSB5D	50W–5kW	USB		
Connector set	**Connector set for servo driver 200V AC**				
	DV0P4350-EU	50W–5kW	50-pin	I/Os, X4	
	DV0P0770-EU	50W–5kW	26-pin	I/Os, X4	
	DV0PM20026-EU	50W–5kW	–	External encoder connector X5	
	Connector set encoder, servo motor without holding brake 200V AC				
	DV0PM24581-EU	50/100W	–	MINAS A6 MHMF, IP67	
	DV0PM24582-EU	200W-1kW	–	MINAS A6 MHMF, IP67	
	DV0PM20035-EU	50W-1kW	–	MINAS A6 MSMF, IP67	
	DV0PM20036-EU	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, servo motor with holding brake 200V AC				
	DV0PM20040-EU	50W-1kW	–	MINAS A6 MSMF, IP67	
	DV0PM20038-EU	1kW-2kW	–	MINAS A6 MSMF, MDMF; MHMF 1–1,5kW	
	DV0PM20038A	1kW-2kW	–	Angled type; MINAS A6 MSMF, MDMF; MHMF 1–1,5kW	
	Connector set for servo drives 400V AC & MINAS A6 400V Multi				
	DV0PM14576-EU	1kW–5kW	–	For mounting motor and encoder cables	
Miscellaneous	**EMC filter 200V AC**				
	FN2080-6-06	50W-750W	1-phase	250V AC	
	FN2090-10-06	1kW-1.5kW	1-/3-phase	250V AC	
	FS21238607	50W-750W	1-phase	Footprint filter, 250V AC	
	FN3268-7-44	1kW-3kW	3-phase	400V AC	
	FN3268-16-44	4kW-5kW	3-phase	400V AC	
	DV0P1460	50W-22kW	1-phase	Ferrite core, noise filter	
	Braking resistors 200V AC				
	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 400V AC (undergoing tests)				
	FN3268-7-44	1kW-2kW	3-phase	400V AC	
	FN3268-16-44	3kW-5kW	3-phase	400V AC	
	Braking resistors 400V AC				
	BWD500150	1kW-1.5kW	3-phase	150Ω, 100W, 600V AC	216 x 80 x 15 (L x W x D in mm)
	BWD500100	2kW	3-phase	100Ω, 100W, 600V AC	216 x 80 x 15 (L x W x D in mm)
	BWD600047	3kW-5kW	3-phase	47Ω, 240(400)W, 600V AC	216 x 80 x 30 (L x W x D in mm)
	EMC filter MINAS A6 Multi 400V AC (undergoing tests)				
	FN3268-7-44	1kW-3kW	3-phase	530V AC, MINAS A6 Multi power supply 15kW	
	FN3268-16-44	4kW-5kW	3-phase	530V AC, MINAS A6 Multi power supply 30kW	
	Braking resistors MINAS A6 Multi 400V AC				
	Motor design depending on application				
	Miscellaneous MINAS A6 Multi 400V AC				
	DV0PM24621-EU	USB license dongle "PANATERM for Safety"			

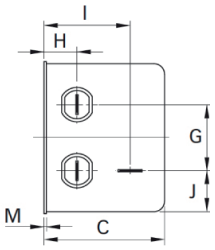
EMC filter

All dimensions are in mm

200V AC:

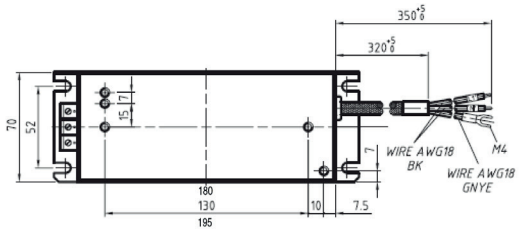
FN2080-6-06 for servo driver MINAS A6 50–750W, 1-phase / FN2090-10-06 for servo driver MINAS A6 1–1.5kW, 1-phase



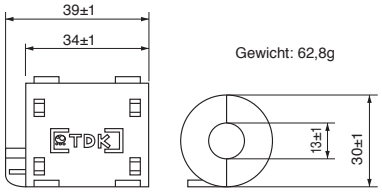


Dimensions (mm)	FN2080-6-06	FN2080-10-06
A	113.5	156
B	57.5	57.5
C	45.4	45.4
D	94	130.5
E	56	56
F	103	143
G	25	25
H	12.4	12.4
I	32.4	32.4
J	15.5	15.5
K	4.4	5.3
L	6	6
M	1	1
N	6.3 x 0.8	6.3 x 0.8

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

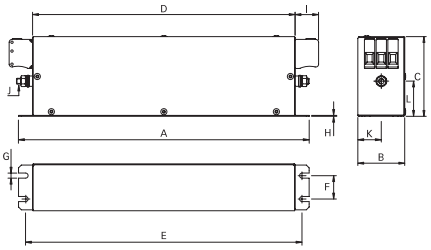


DV0P1460 with ferrite core



400V AC (filters are undergoing tests):

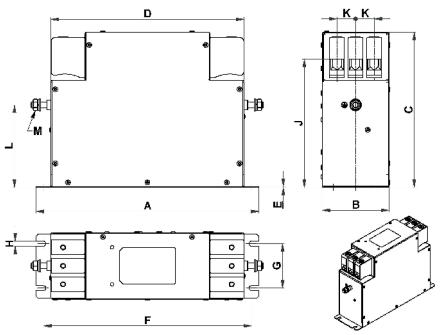
FN3268-7-44 for servo driver MINAS A6 1–2kW, 3-phase / FN3268-16-44 for servo driver MINAS A6 3–5kW, 3-phase



Dimensions (mm)	FN3268-7-44	FN3268-16-44
A	190	250
B	40	45
C	70	70
D	160	220
E	180	235
F	20	25
G	4.5	5.4
H	1	1
I	22	22
J	M5	M5
K	20	22.5
L	29.5	29.5

MINAS A6 Multi 400V AC (filters are undergoing tests):

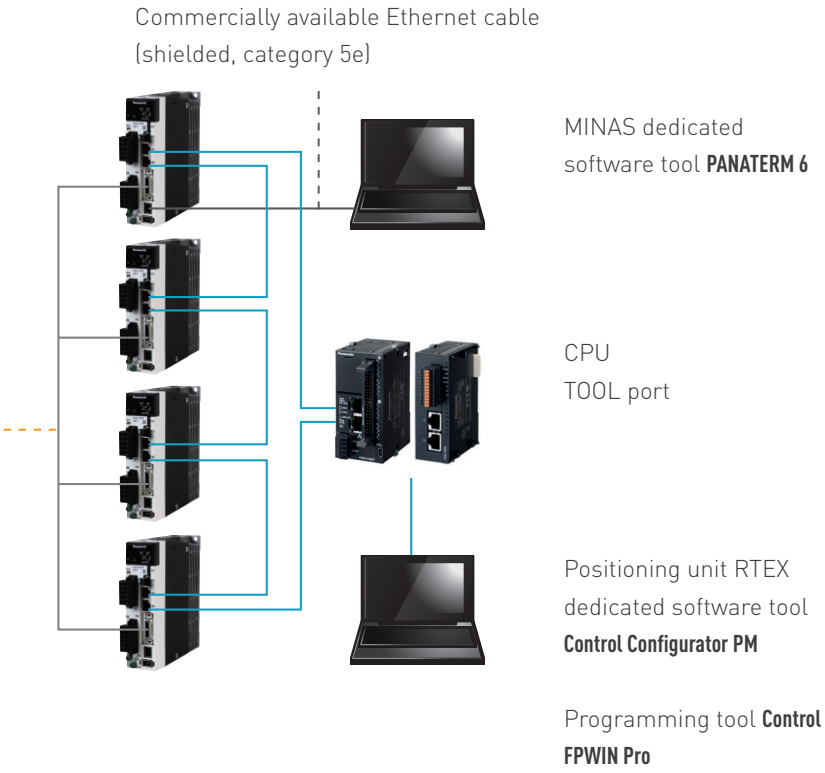
FN3288-80-34 for servo driver MINAS A6 Multi 1–3kW / FN3288-160-40 for servo driver MINAS A6 4–5kW



Dimensions (mm)	FN3288-80-34	FN3288-160-40
A	175	4.5
B	180	5.4
C	195	5.4
D	220	5.4
E	240	5.4
F	270	6.5
G	280	6.5
H	290	6.5
I	220	4.5
J	215	5.4
K	230	5.4
L	250	5.4
M	250	5.4
N	290	6.5
O	300	6.5
P	310	6.5
Q	170	4.5
R	185	5.4
S	190	5.4
T	200	5.4
U	205	5.4

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 4 or 8 axes for servo drivers with Ethernet (RTEX) interface.
- **Easy** configuration with the software Control Configurator PM instead of complex programming.
- Includes manual pulser input allowing support for **precision teaching**.

System configuration

Panasonic's compact PLC FP0H can be easily expanded with up to 2 RTEX positioning units (max. 2 x 8 axes + 4 axes (CPU)).

Product	Number of axes	Output type		Product no.
Positioning units FP0H 	4	RTEX Ethernet	Electronic gear, electronic clutch, electronic cam control	AFP0HM4N
	8			AFP0HM8N
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, FP-X, FPXH, FP0H, FP7)

PP Motion Control Library

- Positioning with PP motion control unit FP0H
- FP7: Library is included in the PLC programming software Control FPWIN Pro.

RTEX Motion Control Library

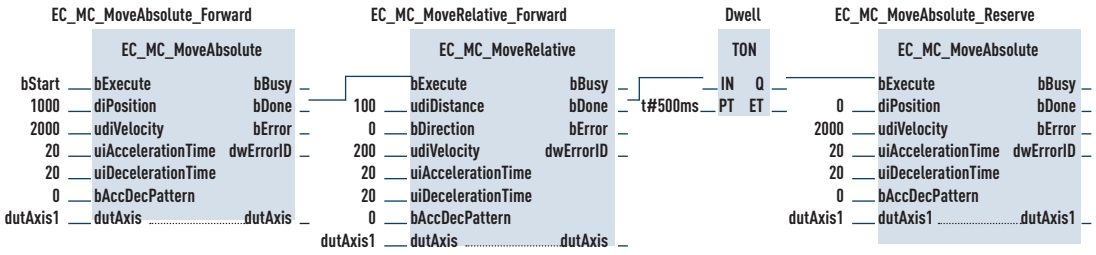
Positioning with RTEX positioning unit FP0H

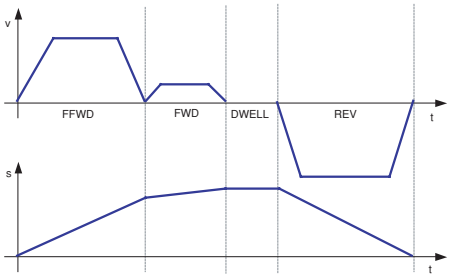
Simply download the software from the Panasonic website: https://industry.panasonic.eu/downloads

Advantages of PLC programs using the Motion Control Library

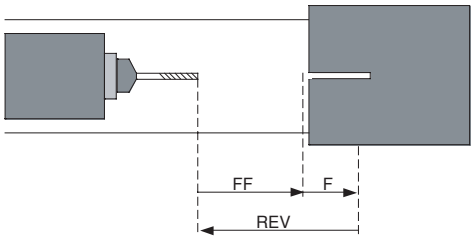
- **Free** – just download it from Panasonic's website
- **Simple** – easy programming and installation
- **Efficient** – ready-made function blocks, set parameters instead of writing complex programs
- **Compliant** – compliant with IEC 61131- 3
- **Universal** – hardware-independent (works for every 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

- No position deviation caused by lost pulse signals (considerably 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 of machines)

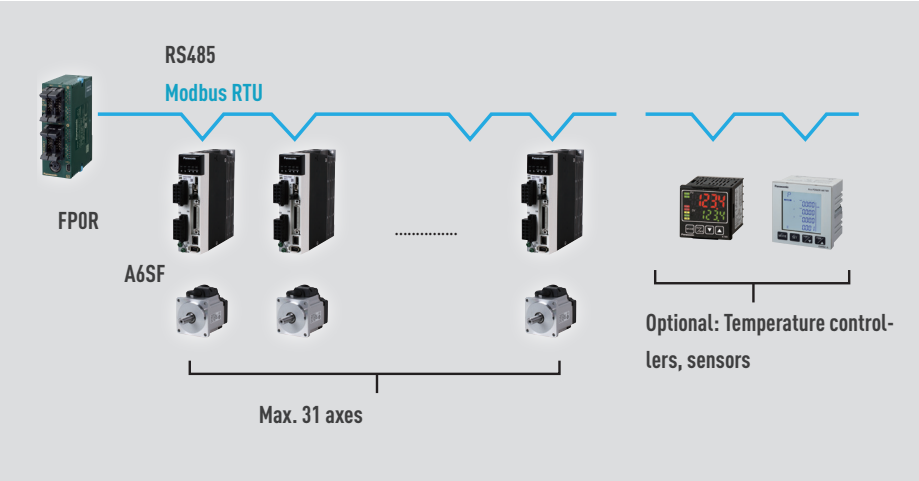
Reduced cost

- Easy adding and removing of axes (simplified wiring thanks to bus system)
- Less time needed for commissioning, e.g. thanks to instantaneous registration of the axis position

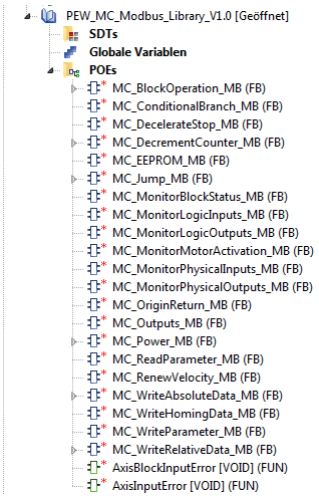
Features

- 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
- Controlling a servo drive system based on the CANopen motion control profile CiA is possible

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

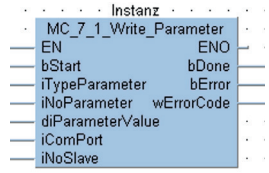
Libraries

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

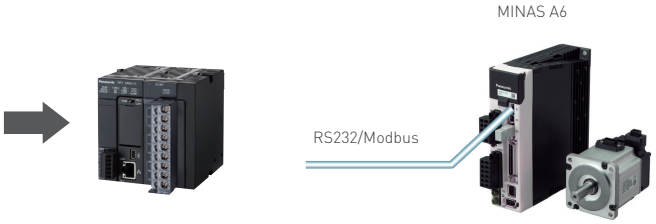
- The communication protocols for the drivers are also included in the libraries.
- The libraries allow full read and write access to the parameters.
- They also record the status and position data of the axes.
- The RS232 interface (optional RS485) is already included with the FP series.
- With RS232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

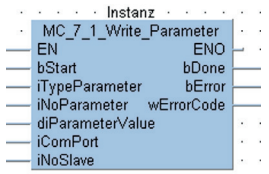


FP series PLCs

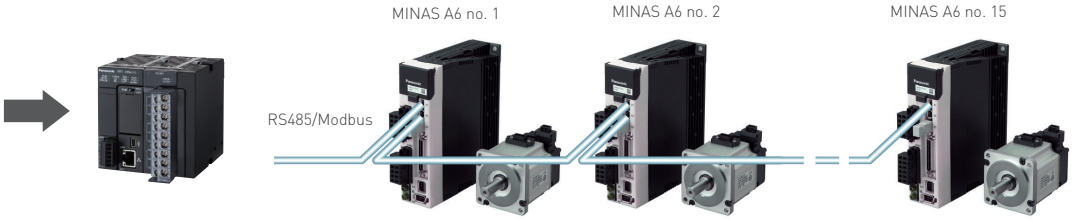


Communication via RS485

Communication software



FP series PLCs



Download the software free of charge from Panasonic's website: https://industry.panasonic.eu/downloads

Software Configurator PM for RTEX

User-friendly, user-friendly commissioning

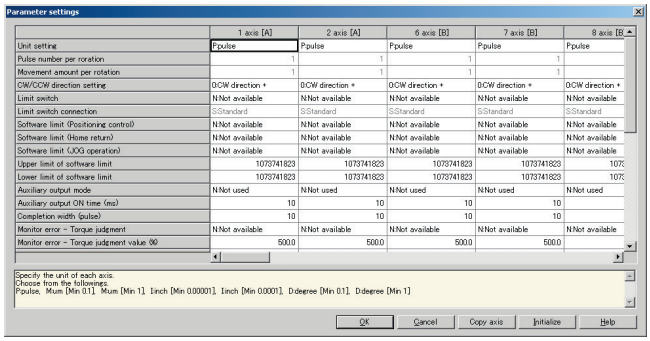
The Configurator PM offers numerous configuration options

- 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.

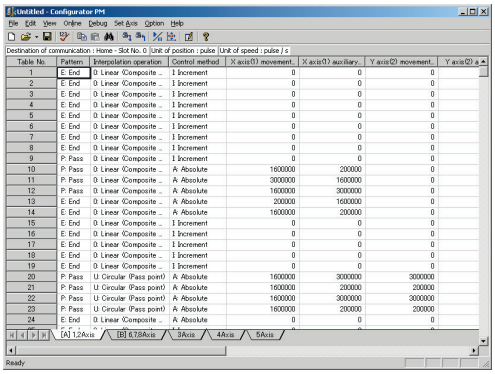
Advantage: In instances where many settings are shared among the axes, this can reduce the number of repeat inputs.



Data table creation

- User-friendly data entry similar to an Excel sheet
- 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)

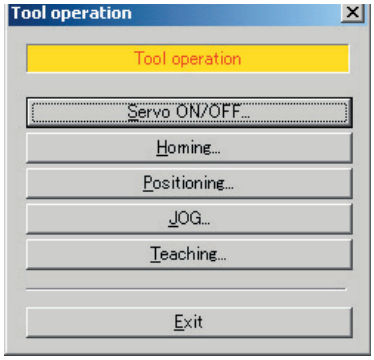
Advantage: Data is clearly arranged for fast easy handling



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



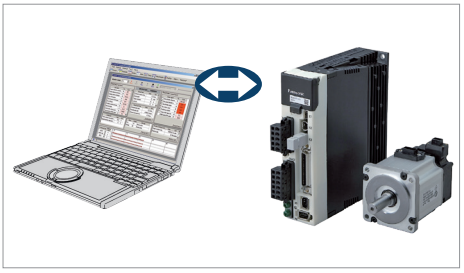
Configuring servo drivers

PANATERM

PANATERM configuration software

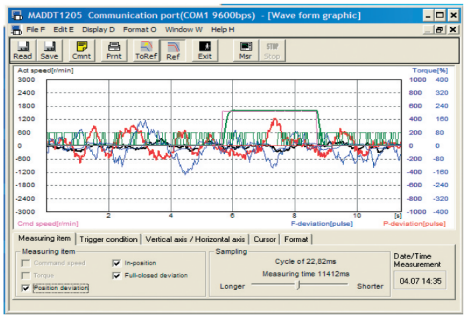
For MINAS AC servo motors & drive amplifiers

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

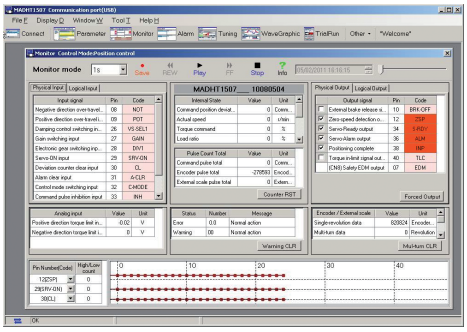
- Auto-tuning
- Gain adjustment and inertia ratio measurement
- Line graph display
  The line graph diagram shows command and current velocity, torque, and the tracking error.
- Display of the absolute encoder settings
- Parameter setting
  After a parameter has been defined on the screen, it will immediately 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://industry.panasonic.eu/downloads

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.).

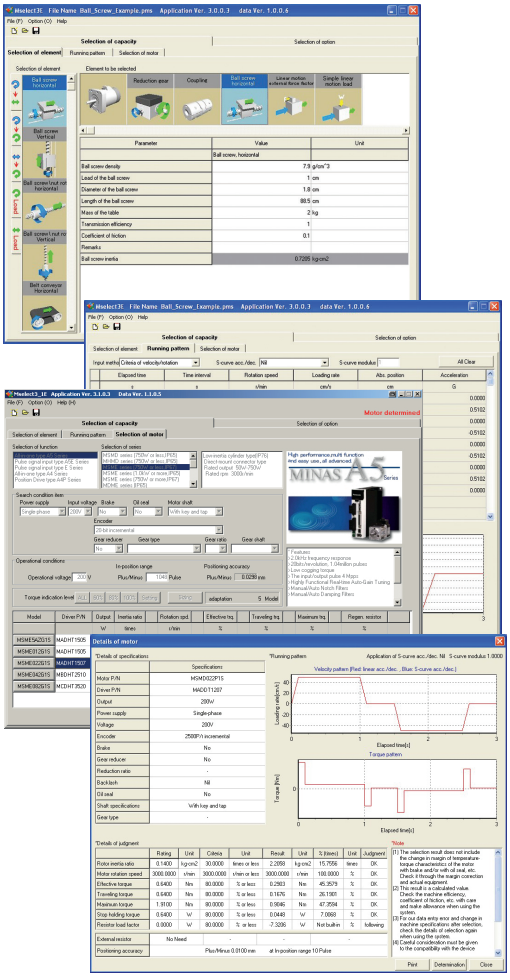
2. Determine the motion profile (figure 2)
Display and determine speed, position and ramps, etc.

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



Simply download the software from Panasonic's website:
https://industry.panasonic.eu/downloads

Quick start guides

The Quick start guides are intended to help you set up a MINAS servo drive system.

They are based on information from the MINAS series manuals and the practical experience of our engineers.
Step-by-step instructions will guide you through connecting a PLC to a MINAS servo driver and setting the most important parameters in the PC configuration software PANATERM.

Available Quick start guides in our download center (also in other languages):

Easy download from the Panasonic website: https://industry.panasonic.eu/downloads

QS2000, Position control by pulse and direction signals (MINAS A5/A5E/A6SG/A6SF)

QS2001, Position control by block operation using input signals (MINAS A6SG/A6SF)

QS2002, Position control by block operation using Modbus commands (MINAS A6)

QS2003, Position control in EtherCAT networks (MINAS A5B/A6B)

QS2004, Position control using RTEX (MINAS A5N/A6N)

QS3000, Velocity control (MINAS A5/A6F)

QS4000, Torque control (MINAS A5/A6)

QS5000, PANATERM – Trial run

QS5001, PANATERM – Auto-tuning

QS5002, PANATERM – Fit gain tuning

QS10000, Position control with Beckhoff host controller over EtherCAT (MINAS A6 Multi)

QS10001, PANATERM Ethernet over EtherCAT (EoE) (MINAS A6 Multi)

QS10002, PANATERM for Safety Safe Torque Off (STO) (MINAS A6 Multi)

QS10003, PANATERM for Safety Safe Stop 1 (SS1) (MINAS A6 Multi)

QS10004, PANATERM for Safety Safe Speed Monitoring (SSM) (MINAS A6 Multi)

QS10005, Position control with Omron host controller over EtherCAT (MINAS A6 Multi)

QS10006, Position control with TRIO host controller over EtherCAT (MINAS A6 Multi)

More Quick start guides for the MINAS series are being prepared.

A MINAS A6 series servo drives

Highly dynamic servo drives with state-of-the-art technology. Large power range (50W to 15kW) combined with a light-weight and compact design. Innovative functions for damping resonance frequencies and to eliminate vibration tendencies. Multiple control features such as pulse, analog, and network technology in real-time communication (100Mbit/s). (See page 10)

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. By using the function blocks integrated in the freely available motion control libraries, complex positioning tasks can be solved quickly and efficiently. (See page 38)

C HM and GT series touch terminals

Touch terminals 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 operators. Panasonic's innovative touch terminals 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 terminal to a color 21" display for sophisticated applications.

D FP series PLCs

The PLC comes already equipped with the functionality required for position control tasks. FP0R and FP-X are capable of controlling up to 4 axes independently. The FP-XH has an integrated Ethernet-based communication bus (RTEX), and the CPU of the FP0H can be expanded with modular positioning units to control up to 20 axes. The modular FP7 series can control 64 axes independently or synchronously in the network.

MINAS A6 SERIES:
COMPACT, LIGHT AND POWERFUL

As fast as our large motors!

Motors
smaller than a
business card

Illustration true to scale

Global Network

North America | Europe | Asia Pacific | China | Japan

Panasonic Electric Works

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