

## OVERVIEW

### AC SERVO DRIVES & MOTION CONTROL



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## **A** MINAS A5 series servo drives

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

## **B** Motion control libraries, configuration and programming software

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

## **C** FP series PLC

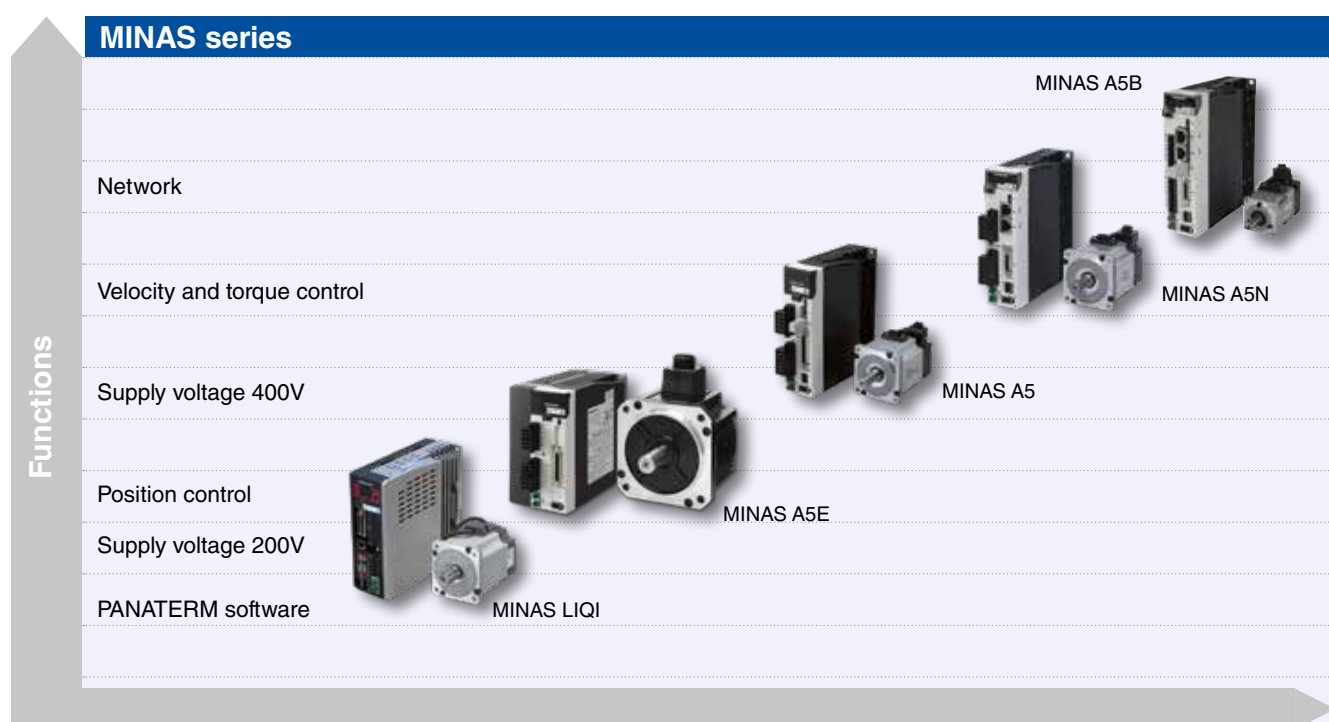
The PLC comes already equipped with the hardware required for positioning tasks. FP0R, FP $\Sigma$  (Sigma), and FP-X are capable of controlling up to 4 axes independently. By using positioning units, the system can be expanded to control up to 10 axes. The FP7 can even control up to 64 axes. Add network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

## **D** GT and HM500 series touch 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 people. Panasonic's new 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 panel to a color 13" display for sophisticated applications.

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| MINAS series                    |             | LIQI             | A5E         | A5                                     | A5N     | A5B |
|---------------------------------|-------------|------------------|-------------|----------------------------------------|---------|-----|
| Rated power                     |             | 50–1000W         | 50–5000W    | 50–15000W                              |         |     |
| Supply voltage                  | up to 1500W | 1-phase 200V AC  |             | 1-/3-phase 200V AC                     |         |     |
|                                 | from 1000W  | –                |             | 3-phase 400V AC                        |         |     |
| Bandwidth (velocity response)   |             | 1000Hz           | 2000Hz      |                                        |         |     |
| Rated rotational speed          |             | 1500–3000 (rpm)  |             |                                        |         |     |
| Max. rotational speed           |             | 2000–6000 (rpm)  |             |                                        |         |     |
| Rated torque                    |             | 0.16–3.2Nm       | 0.16–23.9Nm | 0.16–99.5Nm                            |         |     |
| Peak torque                     |             | 0.48–9.5Nm       | 0.48–71.6Nm | 0.48–224Nm                             |         |     |
| Control functions               |             | Position control |             | Position, velocity, and torque control |         |     |
| IP degree of protection (motor) |             | IP65             | IP67        |                                        |         |     |
| Control input                   |             | Pulse            |             | Pulse, analog                          | Network |     |

With its power range of 50 to 15,000W, Panasonic servo drives are ideally suited to solve both small (1 or 2 axes) and complex tasks (up to 256 axes) easily and quickly.

The following industries make use of servo drives: packaging, textile, plastics, wood, paper, metal and mounting, and processing.

## **Application examples:**

### **Packaging machine**

A complete solution with PLC, touch terminal, and servo drives from Panasonic. Our compact drives offer a great advantage over competitor's products for packaging machines (labeling, packing, etc.).



### **X-Y table**

Positioning XY axes to apply adhesive.

One FPΣ (Sigma) controls 2 servo drives as well as the adhesive-dispensing device according to the predefined profile.



### **Cutting machine**

The FP2SH PLC controls the positioning so that the machine can cut at high speed and with an accuracy of 10 micrometers.

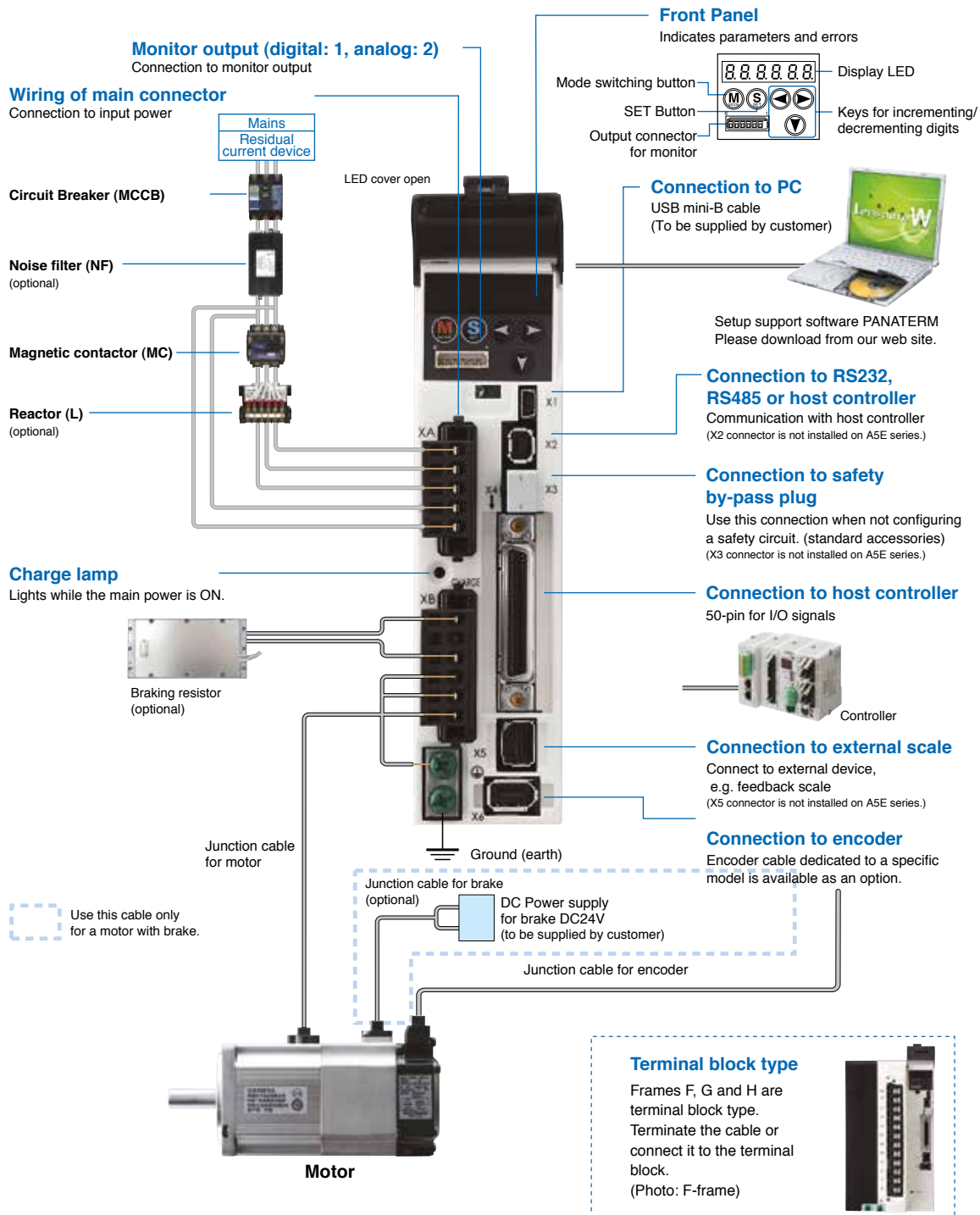


### **Food processing machine**

This solution from Panasonic includes an FP0R PLC, a GT32 touch terminal, a MINAS A5 driver, and a VF0 inverter. To make burgers, the movement of three axes has to be precisely synchronized.



## Connector type (100/200V: A to E frame)



## MINAS A5 series

The MINAS A5 series: Panasonic's standard AC servo drives.

The highly dynamic servo drives can be controlled by pulses or analog signals.

- Ultrafast response frequency: 2kHz bandwidth (velocity response)
- Pulse input and output with up to 4MHz
- Real-time autotuning function during operation
- 4 notch filters: manual/automatic
- 4 damping filters: manual/automatic
- PANATERM: Free software for configuration and motion simulation
- Conforms to the following safety standards:  
EN954-1(CAT3), ISO13849-1(PLd), EN61508(SIL2),  
EN62061(SIL2), EN61800-5-2(STO), IEC61326-3-1
- Full-closed control



| Rated power | Driver MINAS A5E 230V AC | Drivers MINAS A5; A5N; A5B 230V AC | Drivers MINAS A5; A5N; A5B 3x380V AC | Frame |
|-------------|--------------------------|------------------------------------|--------------------------------------|-------|
| 50/100W     | MADHT1505E               | MADHT1505***                       | —                                    | A     |
| 200W        | MADHT1507E               | MADHT1507***                       |                                      | B     |
| 400W        | MBDHT2510E               | MBDHT2510***                       |                                      | C     |
| 750W        | MCDHT3520E               | MCDHT3520***                       |                                      | D     |
| 1kW         | —                        | MDDHT5540***                       | MDDHT2412***                         | D     |
| 1.5kW       |                          | —                                  | MDDHT3420***                         |       |
| 2kW         |                          |                                    | MEDHT4430***                         | E     |
| 3kW         |                          |                                    | MFDHT5440***                         | F     |
| 4/5kW       |                          |                                    | MFDHTA464***                         |       |
| 7.5kW       |                          |                                    | MGDHTB4A2***                         | G     |
| 11/15kW     |                          |                                    | MHDHTB4A2***                         | H     |

### Ordering code for drivers

**M A D H T 1 5 0 5 \* . \* . \***

| Frame |                    | Max. current |      | Supply voltage |                  | Rated current |      | Series |                                |
|-------|--------------------|--------------|------|----------------|------------------|---------------|------|--------|--------------------------------|
| Code  | Type               | Code         | Type | Code           | Type             | Code          | Type | Code   | Type                           |
| MADH  | A5 series, A frame | T1           | 10A  | 1              | 1-phase, 100V    | 05            | 5A   |        | MINAS A5                       |
| MBDH  | A5 series, B frame | T2           | 15A  | 3              | 3-phase, 200V    | 07            | 7.5A | E      | MINAS A5E                      |
| MCDH  | A5 series, C frame | T3           | 30A  | 4              | 3-phase, 400V    | 10            | 10A  | N01    | MINAS A5N RTEKX with safety    |
| MDDH  | A5 series, D frame | T5           | 50A  | 5              | 1-/3-phase, 200V | 20            | 20A  | NA1    | MINAS A5N RTEKX                |
| MEDH  | A5 series, E frame | T7           | 70A  |                |                  | 30            | 30A  | BA1    | MINAS A5B EtherCAT             |
| MFDH  | A5 series, F frame | TA           | 100A |                |                  | 40            | 40A  | B01    | MINAS A5B EtherCAT with safety |
| MGDH  | A5 series, G frame | TB           | 150A |                |                  | 64            | 64A  |        |                                |
| MHDH  | A5 series, H frame |              |      |                |                  | 90            | 90A  |        |                                |
|       |                    |              |      |                |                  | A2            | 120A |        |                                |

# MINAS A5 network series

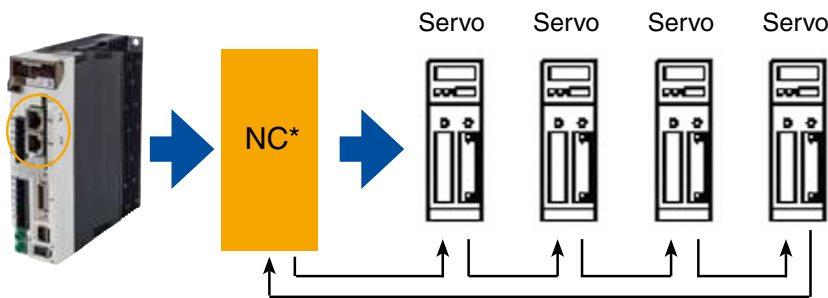
Thanks to its high transmission speed and sampling rate, RTEX (Realtime Express), the fast, real-time Ethernet bus for automation, is particularly well suited for highly dynamic single and multiple axes positioning tasks. The communication between master and slaves happens in real-time.

**EtherCAT** (Ethernet for Control Automation Technology) offers similar excellent features like RTEX. However, EtherCAT is an open, standardized field bus that allows an open data exchange with all other servo drivers which have an EtherCAT interface.



| Features                                                                                                                                     | MINAS A5N          | MINAS A5B               |
|----------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------------|
| Real-time communication 100Mbit/s                                                                                                            | RTEX protocol      | CAN over EtherCAT (CoE) |
| Supports position, velocity and torque control                                                                                               | ✓                  | ✓                       |
| Manual and automatic vibration suppression (adjustable in the driver)                                                                        | ✓                  | ✓                       |
| Full control of                                                                                                                              | up to 32 axes      | up to 64 axes           |
| Conforms to the following safety standards:<br>EN954-1(CAT3), ISO13849-1 (PLd), EN61508(SIL2), EN62061(SIL2), EN61800-5-2(STO), IEC61326-3-1 | ✓                  | ✓                       |
| Easy wiring using standard Ethernet cables (CAT5e, up to 100m between units)                                                                 | ✓                  | ✓                       |
| Positioning units for                                                                                                                        | FPΣ (Sigma), FP2SH | FP7                     |

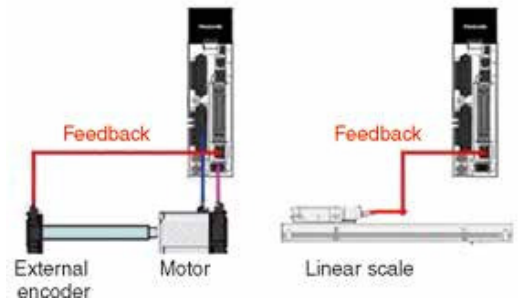
## Easy mounting and reliable connections thanks to loop wiring



\* NC: Numerical control (servo driver, positioning unit)

## External encoders for full-closed control

Using an external encoder ensures high-precision positioning. For most applications, positioning with a motor encoder works fine. However, mechanical parts may cause slight deviations that the motor encoder cannot control. This is where an external encoder or a linear scale is needed. They help to compensate even small inaccuracies so that positioning practically always works correctly.



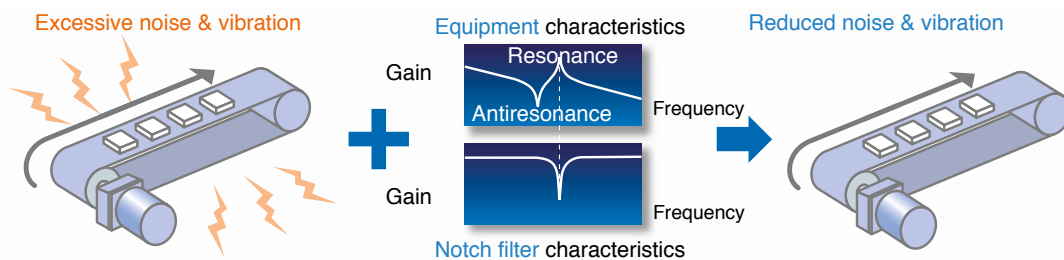
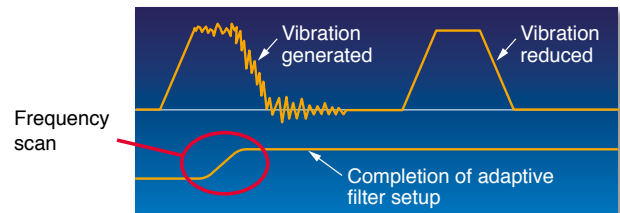
## Real-time auto-gain tuning

If this function is activated, tuning is performed automatically upon completion of several operations. When the response frequency has been adjusted, simple tuning results in a change to a single parameter value. Fine-tuning can be carried out by activating the gain adjustment mode in the setup software. 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.



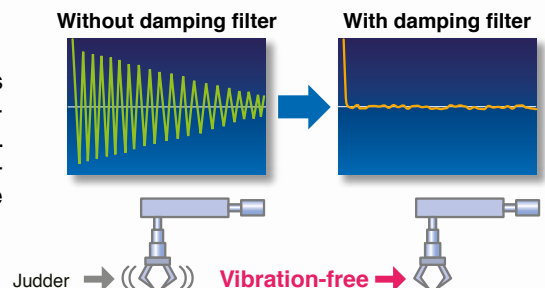
## Manual and automatic notch filters

Highly sensitive notch filters eliminate the need to monitor troublesome vibration frequencies. By automatically detecting vibration and defining a simple auto-gain setting, the MINAS A5's filters greatly reduce interference and vibration caused by equipment resonance. For depth adjustment, the A5 features a total of four notch filters, two of which share the auto setup. The setup frequency range for the filters is 50–5000Hz.



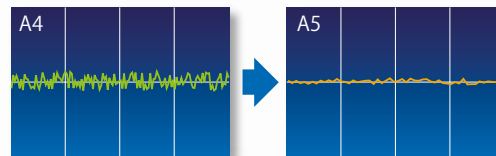
## Manual and automatic damping filters

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. The number of damping filters has been increased to four from the conventional two; of these four, two are for simultaneous use. The available frequency range has been extended significantly from 1 to 200Hz.



## Low cogging torque

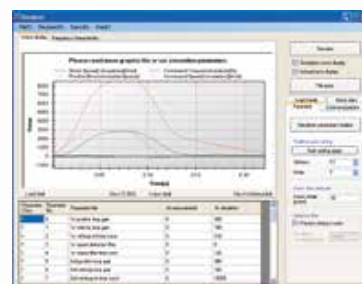
Compared to competitor products, the MINAS A5 achieves the industry's most stable speed and lowest cogging torque by minimizing pulse width. This was made possible by a new design featuring a 10-pole rotor for the motor as well as magnetic field analysis. With the reduction in torque variation, the MINAS A5's speed, stability and positioning behavior have been markedly improved.



Vibration reduced to only **1/8**

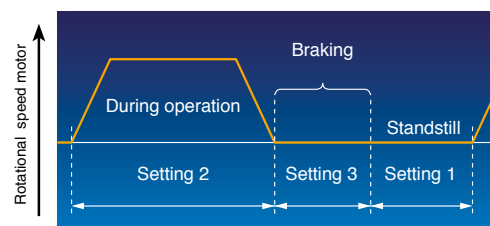
## Software tool PANATERM with motion simulation

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.



## 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.



## Integrated safety function (STO)

To insulate the motor power, MINAS A5 servo drivers feature independent, hardware-based, redundant circuits. Magnetic breakers prescribed for machines by the Low-Voltage Directive are thereby unnecessary. This saves both space and money. The servo driver's safety functions fulfill the following safety standards: EN954-1 (CAT3), ISO13849-1 (PLd), EN61508 (SIL2), EN62061 (SIL2), EN61800-5-2 (STO), IEC61326-3-1.

### Dynamic brake:

The dynamic brake is activated in case of an emergency, i.e. when:

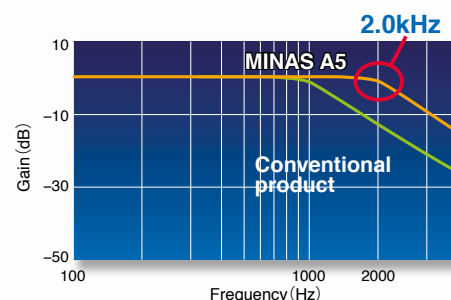
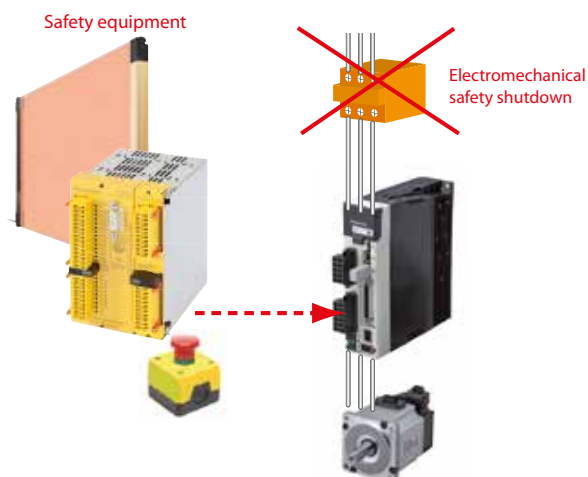
- The main switch has been turned off,
- The input SRV-OFF is not active,
- One of the protective functions is activated or,
- The input INH is not active.

### Torque limit

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

### Possible settings:

- As specified by analog value,
- Different values for positive and negative direction,
- 2 digital input points for fixed values.



# Overview MINAS A5 motors and accessories

| Overview MINAS A5 motors and accessories |                              |                                         |                |               |                              |           |              |                                          |                                          |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|------------------------------------------|------------------------------|-----------------------------------------|----------------|---------------|------------------------------|-----------|--------------|------------------------------------------|------------------------------------------|-------------------------------------|-----------------------|------------------------------------|------------------------------------|---------------------------------|------------------------------------|--------------|-----------|--|--|--|--|--|
| Motor                                    |                              |                                         |                |               |                              |           |              | Driver                                   | Cabel                                    |                                     |                       |                                    | Filter                             | Braking resistor                |                                    |              |           |  |  |  |  |  |
| Rated power<br>W                         | Max. torque<br>Nm            | Rated rotational<br>speed (max.)<br>rpm | Motor type     | Holding brake | IP67 degree of<br>protection | Key shaft | Encoder      | Type                                     | Motor<br>cable                           |                                     | Encoder<br>cable      |                                    | EMC filter                         | Type                            |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                |               |                              |           |              |                                          | For motors with-<br>out holding<br>brake | For motors with<br>holding<br>brake | 20 bit<br>incremental | 17 bit absolute                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
| Low inertia 200V AC class                |                              |                                         |                |               |                              |           |              |                                          |                                          |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
| Low inertia                              | 50                           | 0,16<br>(0,48)                          | 3000<br>(6000) | MSME5AZG1U    |                              | .         | x            | 20-bit incremental encoder<br>1048576ppr | MADHT1505                                | MFMCA0□□0WJD                        | MFCEA0□□0WJD          | MFCEA0□□0GJE<br>(with battery box) | FN2080-6-06<br>or<br>FS21238607    | BWD250100                       |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MSME5AZG1V    | x                            | x         | x            |                                          |                                          |                                     |                       |                                    |                                    |                                 | MFMCB0□□0PJT*                      |              |           |  |  |  |  |  |
|                                          | 100                          | 0,32<br>(0,95)                          | 3000<br>(6000) | MSME012G1U    |                              | x         | x            |                                          |                                          |                                     |                       |                                    |                                    |                                 | MFMCB0□□0PJT*                      |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MSME012G1V    | x                            | x         | x            |                                          |                                          |                                     |                       |                                    |                                    |                                 | MFMCB0□□0PJT*                      |              |           |  |  |  |  |  |
|                                          | 200                          | 0,64<br>(1,91)                          | 3000<br>(6000) | MSME022G1U    |                              | x         | x            |                                          |                                          |                                     |                       |                                    |                                    |                                 | MFMCB0□□0PJT*                      |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MSME022G1V    | x                            | x         | x            |                                          |                                          |                                     |                       |                                    |                                    |                                 | MFMCB0□□0PJT*                      |              |           |  |  |  |  |  |
|                                          | 400                          | 1,3<br>(3,8)                            | 3000<br>(6000) | MSME042G1U    |                              | x         | x            |                                          | MBDHT2510                                |                                     | --                    |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MSME042G1V    | x                            | x         | x            |                                          |                                          |                                     | MFMCB0□□0PJT*         |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                |               |                              |           |              |                                          |                                          |                                     | MFMCB0□□0PJT*         |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 750                          | 2,4<br>(7,1)                            | 3000<br>(6000) | MSME082G1U    |                              | x         | x            |                                          | MCDHT3520                                |                                     | --                    |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MSME082G1V    | x                            | x         | x            |                                          |                                          | MFMCB0□□0PJT*                       |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                |               |                              |           |              |                                          |                                          | MFMCB0□□0PJT*                       |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 1000                         | 3,18<br>(9,55)                          | 3000<br>(5000) | MSME102G1G    |                              | x         | x            |                                          | MDDHT5540                                | MFMCD0□□2GCD                        | MFCEA0□□0GTD          | MFCEA0□□0GTE<br>(with battery box) | FN2080-10-06                       | BWD500035                       |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         | MSME102G1H     | x             | x                            | x         | --           |                                          |                                          |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                |               |                              |           | MFMCB0□□2GCD |                                          |                                          |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                |               |                              |           | --           |                                          |                                          |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
| 1500                                     | 4,77<br>(13,3)               | 3000<br>(5000)                          | MSME152G1G     |               | x                            | x         |              |                                          |                                          |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
| Low inertia 400V AC class                |                              |                                         |                |               |                              |           |              |                                          |                                          |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
| Low inertia                              | 1000                         | 3,18<br>(9,55)                          | 3000<br>(5000) | MSME104G1G    |                              | x         | x            | 20-bit incremental encoder<br>1048576ppr | MDDHT3420                                | MFMCD0□□2GCD                        | --                    | MFCEA0□□0GTD                       | MFCEA0□□0GTE<br>(with battery box) | FN3268-7-44                     | BWD500150                          |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MSME104G1H    | x                            | x         | x            |                                          |                                          | --                                  | MFMCB0□□2HCD          |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 1500                         | 4,77<br>(13,3)                          | 3000<br>(5000) | MSME154G1G    |                              | x         | x            |                                          |                                          | MFMCDB0□□2GCD                       | --                    |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MSME154G1H    | x                            | x         | x            |                                          |                                          | --                                  | MFMCB0□□2HCD          |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 2000                         | 6,37<br>(19,1)                          | 3000<br>(5000) | MSME204G1G    |                              | x         | x            |                                          |                                          | MFMCDB0□□2GCD                       | --                    |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MSME204G1H    | x                            | x         | x            |                                          |                                          | --                                  | MFMCB0□□2HCD          |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 3000                         | 9,55<br>(28,6)                          | 3000<br>(5000) | MSME304G1G    |                              | x         | x            |                                          | MFDHT5440                                | MFMCDB0□□2GCT                       | --                    |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MSME304G1H    | x                            | x         | x            |                                          |                                          | --                                  | MFMCB0□□2HCT          |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 4000                         | 12,7<br>(38,2)                          | 3000<br>(4500) | MSME404G1G    |                              | x         | x            |                                          | MFDHTA464                                | MFMCAB0□□2GCT                       | --                    |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MSME404G1H    | x                            | x         | x            |                                          |                                          | --                                  | MFMCAB0□□2HCT         |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 5000                         | 15,9<br>(47,7)                          | 3000<br>(4500) | MSME504G1G    |                              | x         | x            |                                          | MFDHTA464                                | MFMCAB0□□2GCT                       | --                    |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MSME504G1H    | x                            | x         | x            |                                          |                                          | --                                  | MFMCAB0□□2HCT         |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | Medium inertia 200V AC class |                                         |                |               |                              |           |              |                                          |                                          |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
| Medium inertia                           | 1000                         | 4,7<br>(14,3)                           | 2000<br>(3000) | MDME102G1G    |                              | x         | x            | 20-bit incem.<br>encoder                 | MDDHT3530                                | MFMCDB0□□2GCD                       | --                    | MFCEA0□□0GTD                       | MFCEA0□□0GTE<br>(mit Batteriebox)  | FN2080-10-06                    | BWD500035                          |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MDME102G1H    | x                            | x         | x            |                                          |                                          | --                                  | MFMCAB0□□2HCD         |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 1500                         | 7,16<br>(21,5)                          | 2000<br>(3000) | MDME152G1G    |                              | x         | x            |                                          | MDDHT5540                                | MFMCDB0□□2GCD                       | --                    |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         | MDME152G1H     | x             | x                            | x         |              | --                                       | MFMCAB0□□2HCD                            |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
| Medium inertia 400V AC class             |                              |                                         |                |               |                              |           |              |                                          |                                          |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
| Medium inertia                           | 2000                         | 9,55<br>(28,6)                          | 2000<br>(3000) | MDME204G1G    |                              | x         | x            | 20-bit incremental encoder<br>1048576ppr | MEDHT4430                                | MFMCDB0□□2GCD                       | --                    | MFCEA0□□0GTD                       | MFCEA0□□0GTE<br>(with battery box) | FN3268-7-44                     | BWD500100                          |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MDME204G1H    | x                            | x         | x            |                                          |                                          | --                                  | MFMCB0□□2HCD          |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 3000                         | 14,3<br>(43,0)                          | 2000<br>(3000) | MDME304G1G    |                              | x         | x            |                                          | MFDHT5440                                | MFMCAB0□□2GCT                       | --                    |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MDME304G1H    | x                            | x         | x            |                                          |                                          | --                                  | MFMCAB0□□2HCT         |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 4000                         | 19,1<br>(57,3)                          | 2000<br>(3000) | MDME404G1G    |                              | x         | x            |                                          | MFDHTA464                                | MFMCAB0□□2GCT                       | --                    |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MDME404G1H    | x                            | x         | x            |                                          |                                          | --                                  | MFMCAB0□□2HCT         |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 5000                         | 23,9<br>(71,6)                          | 2000<br>(3000) | MDME504G1G    |                              | x         | x            |                                          | MFDHTA464                                | MFMCAB0□□2GCT                       | --                    |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MDME504G1H    | x                            | x         | x            |                                          |                                          | --                                  | MFMCAB0□□2HCT         |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 7500                         | 47,8<br>(119)                           | 1500<br>(2000) | MDME754G1G    |                              | x         | x            |                                          | MGDHTB4A2                                | Use<br>DV0PM20056                   | Use<br>DV0PM20057     |                                    |                                    | MFCEA0□□0GTD                    | MFCEA0□□0GTE<br>(with battery box) | FN3258-30-33 | BWD600027 |  |  |  |  |  |
|                                          |                              |                                         |                | MDME754G1H    | x                            | x         | x            |                                          |                                          |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 11000                        | 70<br>(175)                             | 1500<br>(2000) | MDMEC14G1G    |                              | x         | x            |                                          | MHDHTB4A2                                |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MDMEC14G1H    | x                            | x         | x            |                                          |                                          |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 15000                        | 95,5<br>(224)                           | 1500<br>(2000) | MDMEC54G1G    |                              | x         | x            |                                          |                                          |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         | MDMEC54G1H     | x             | x                            | x         |              |                                          |                                          |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
| High inertia 200V AC class               |                              |                                         |                |               |                              |           |              |                                          |                                          |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
| High inertia                             | 200                          | 0,64<br>(1,91)                          | 3000<br>(5000) | MHMD022G1U    |                              | IP65      | x            | 20-bit incem.<br>encoder                 | MADHT1507                                | MFMCA0□□□EEL                        | --                    | MFCEA0□□0EAM                       | MFCEA0□□0EAE<br>(with battery box) | FN2080-6-06<br>or<br>FS21238607 | BWD250072                          |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MHMD022G1V    | x                            | IP65      | x            |                                          |                                          |                                     | MFMCB0□□□0GET*        |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 400                          | 1,3<br>(3,8)                            | 3000<br>(5000) | MHMD042G1U    |                              | IP65      | x            |                                          | --                                       |                                     | MFMCB0□□□0GET*        |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MHMD042G1V    | x                            | IP65      | x            |                                          | --                                       |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 750                          | 2,4<br>(7,1)                            | 3000<br>(4500) | MHMD082G1U    |                              | IP65      | x            |                                          | --                                       |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MHMD082G1V    | x                            | IP65      | x            |                                          | MFMCB0□□□0GET*                           |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
| High inertia 400V AC class               |                              |                                         |                |               |                              |           |              |                                          |                                          |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
| High inertia                             | 1000                         | 4,77<br>(14,3)                          | 2000<br>(3000) | MHME104G1G    |                              | x         | x            | 20-bit incremental encoder<br>1048576ppr | MDDHT2412                                | MFMCD0□□2GCD                        | --                    | MFCEA0□□0GTD                       | MFCEA0□□0GTE<br>(with battery box) | FN3268-7-44                     | BWD500150                          |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MHME104G1H    | x                            | x         | x            |                                          |                                          | --                                  | MFMCB0□□2HCD          |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 1500                         | 7,16<br>(21,5)                          | 2000<br>(3000) | MHME154G1G    |                              | x         | x            |                                          | MDDHT3420                                | MFMCD0□□2GCD                        | --                    |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MHME154G1H    | x                            | x         | x            |                                          |                                          | --                                  | MFMCB0□□2HCD          |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 2000                         | 9,55<br>(43,0)                          | 2000<br>(3000) | MHME204G1G    |                              | x         | x            |                                          | MEDHT4430                                | MFMCB0□□2GCD                        | --                    |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MHME204G1H    | x                            | x         | x            |                                          |                                          | --                                  | MFMCB0□□2HCD          |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 3000                         | 14,3<br>(28,6)                          | 2000<br>(3000) | MHME304G1G    |                              | x         | x            |                                          | MFDHT5440                                | MFMCAB0□□2GCT                       | --                    |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MHME304G1H    | x                            | x         | x            |                                          |                                          | --                                  | MFMCAB0□□2HCT         |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 4000                         | 19,1<br>(57,3)                          | 2000<br>(3000) | MHME404G1G    |                              | x         | x            |                                          | MFDHTA464                                | MFMCAB0□□2GCT                       | --                    |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MHME404G1H    | x                            | x         | x            |                                          |                                          | --                                  | MFMCAB0□□2HCT         |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 5000                         | 23,9<br>(71,6)                          | 2000<br>(3000) | MHME504G1G    |                              | x         | x            |                                          | MFDHTA464                                | MFMCAB0□□2GCT                       | --                    |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MHME504G1H    | x                            | x         | x            |                                          |                                          | --                                  | MFMCAB0□□2HCT         |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          | 7500                         | 47,8<br>(119)                           | 1500<br>(3000) | MHME754G1G    |                              | x         | x            |                                          | MGDHTB4A2                                | Use<br>DV0PM20056                   | Use<br>DV0PM20057     |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |
|                                          |                              |                                         |                | MHME754G1H    | x                            | x         | x            |                                          |                                          |                                     |                       |                                    |                                    |                                 |                                    |              |           |  |  |  |  |  |

\* For motors with a holding brake < 1kW you need two cables: one for the motor, one for the brake.

□□ = Length

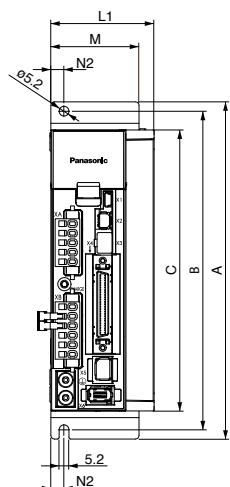
□1 = 1m

1□ = 10m

| Basic specifications | Frame                   |                       |                                                              | MINAS A5E                                                                                                                               | MINAS A5, A5N, A5B                                                                                                                                                                                  |                                                                           |
|----------------------|-------------------------|-----------------------|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
|                      | Input power             | Main circuit          | 200V                                                         | A, B, C, D                                                                                                                              | 1-phase, 3-phase, 200–240V (+10%, -15%), 50/60Hz                                                                                                                                                    |                                                                           |
|                      |                         | Control circuit       |                                                              | A, B, C, D                                                                                                                              | 1-phase, 200–240V (+10%, -15%), 50/60Hz                                                                                                                                                             |                                                                           |
|                      |                         |                       |                                                              | E, F                                                                                                                                    | 1-phase, 200-230V (+10%, -15%), 50/60Hz                                                                                                                                                             |                                                                           |
|                      |                         | Main circuit          | 400V                                                         | D, E, F, G, H                                                                                                                           | –                                                                                                                                                                                                   | 3-phase, 380–480V (+10%, -15%), 50/60Hz                                   |
|                      |                         | Control circuit       |                                                              | D, E, F, G, H                                                                                                                           | –                                                                                                                                                                                                   | 24V DC (±15%)                                                             |
|                      | Operating conditions    | Temperature           |                                                              | 0–50°C, storage temperature: -20 to +65°C (max. temperature 80°C for 72h)                                                               |                                                                                                                                                                                                     | 0-55°C, storage temperature: -20 to +65°C (max. temperature 80°C for 72h) |
|                      |                         | Ambient humidity      |                                                              | Operation and storage: 20–85% RH (non-condensing)                                                                                       |                                                                                                                                                                                                     |                                                                           |
|                      |                         | Altitude              |                                                              | Max. 1000m above sea level                                                                                                              |                                                                                                                                                                                                     |                                                                           |
|                      |                         | Vibration             |                                                              | Max. 5,88m/s², 10–60Hz (no continuous use at resonance frequency)                                                                       |                                                                                                                                                                                                     |                                                                           |
|                      | Control method          |                       |                                                              |                                                                                                                                         | IGBT sinusoidal PWM                                                                                                                                                                                 |                                                                           |
|                      | Encoder                 | Incremental (default) |                                                              | 20-bit incremental encoder (resolution 1048576ppr)                                                                                      |                                                                                                                                                                                                     |                                                                           |
|                      |                         | Absolute              |                                                              | –                                                                                                                                       | 17-bit absolute encoder on request (resolution 131072ppr)                                                                                                                                           |                                                                           |
|                      | External feedback scale |                       | A/B phase                                                    |                                                                                                                                         | –                                                                                                                                                                                                   | Initialization signal differential input                                  |
|                      |                         |                       | Serial                                                       |                                                                                                                                         | –                                                                                                                                                                                                   | Compatible with Mitutoyo (AT500, ST771)                                   |
|                      | Control signals         |                       | Input points                                                 |                                                                                                                                         | 10                                                                                                                                                                                                  |                                                                           |
|                      |                         |                       | Output points                                                |                                                                                                                                         | 6                                                                                                                                                                                                   |                                                                           |
|                      | Analog/digital signals  |                       | Input points                                                 |                                                                                                                                         | –                                                                                                                                                                                                   | 3<br>(16-bit A/D: 1, 12-bit A/D: 2)                                       |
|                      |                         |                       | Output points                                                |                                                                                                                                         | 2                                                                                                                                                                                                   |                                                                           |
|                      | Pulse signals           |                       | Input points                                                 |                                                                                                                                         | 2 line driver                                                                                                                                                                                       |                                                                           |
| Output points        |                         |                       | 3 line driver (A, B and Z-phase), 1 open collector (Z-phase) |                                                                                                                                         |                                                                                                                                                                                                     |                                                                           |
| Interface            |                         | USB                   |                                                              | Interface to PC, etc.                                                                                                                   |                                                                                                                                                                                                     |                                                                           |
|                      |                         | RS232                 |                                                              | –                                                                                                                                       | 1:1 communication                                                                                                                                                                                   |                                                                           |
|                      |                         | RS485                 |                                                              | –                                                                                                                                       | 1:n communication with up to 31 axes via host (FP series PLC)                                                                                                                                       |                                                                           |
| Safety functions     |                         |                       |                                                              | –                                                                                                                                       | IEC61800-5-2 STO                                                                                                                                                                                    |                                                                           |
| Front panel          |                         |                       |                                                              | 5 buttons (MODE, SET, UP, DOWN, SHIFT), LED (6 digits), analog output                                                                   | 5 buttons (MODE, SET, UP, DOWN, SHIFT), LED (6 digits), analog output, digital output                                                                                                               |                                                                           |
| Braking resistor     |                         |                       |                                                              | A, B, G, and H frame: only external braking resistor<br>C–F frame: built-in braking resistor (external braking resistor also possible)  |                                                                                                                                                                                                     |                                                                           |
| Dynamic brake        |                         |                       |                                                              | A–G frame: built-in braking resistor (G frame: external braking resistor can be implemented)<br>H frame: only external braking resistor |                                                                                                                                                                                                     |                                                                           |
| Control mode         |                         |                       |                                                              | Position control                                                                                                                        | 7 different control modes 1. Position control, 2. Velocity control, 3. Torque control, 4. Position/velocity control, 5. Position/torque control, 6. Velocity/torque control, 7. Full-closed control |                                                                           |

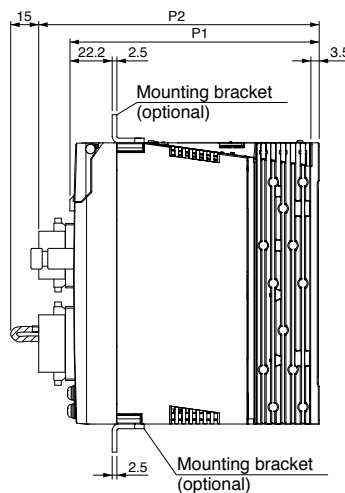
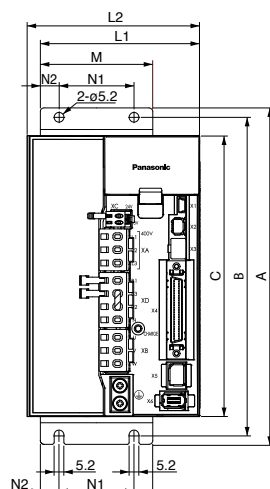
| Functions                                                |                                    |                                          | MINAS A5E                                                                                                               |                                                                                                                     | MINAS A5, A5N, A5B                                                                                                  |                                                                                                                                |                         |  |
|----------------------------------------------------------|------------------------------------|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-------------------------|--|
|                                                          | Position control                   | Control input                            |                                                                                                                         | 1. Clear deviation counter, 2. Command pulse inhibition, 3. Electronic gear switching, 4. Damping control switching |                                                                                                                     |                                                                                                                                |                         |  |
|                                                          |                                    | Control output                           |                                                                                                                         | Positioning complete etc.                                                                                           |                                                                                                                     |                                                                                                                                |                         |  |
|                                                          |                                    | Pulse input                              | Line driver A                                                                                                           |                                                                                                                     | 500kpps                                                                                                             |                                                                                                                                |                         |  |
|                                                          |                                    |                                          | Open collector                                                                                                          |                                                                                                                     | 200kpps                                                                                                             |                                                                                                                                |                         |  |
|                                                          |                                    |                                          | Line driver B                                                                                                           |                                                                                                                     | 4Mpps                                                                                                               |                                                                                                                                |                         |  |
|                                                          |                                    |                                          | Signal format                                                                                                           |                                                                                                                     | Differential input/square-wave pulse                                                                                |                                                                                                                                |                         |  |
|                                                          |                                    |                                          | Electronic gear                                                                                                         |                                                                                                                     | Scaling of pulse frequency from 1/1000 to 1000 times                                                                |                                                                                                                                |                         |  |
|                                                          |                                    |                                          | Smoothing filter                                                                                                        |                                                                                                                     | Primary delay filter or FIR filter, customizable                                                                    |                                                                                                                                |                         |  |
|                                                          |                                    | Analog input                             | Torque limit command                                                                                                    |                                                                                                                     | –                                                                                                                   | Individual torque limit for positive and negative direction                                                                    |                         |  |
|                                                          | Instantaneous speed observer       |                                          | Available                                                                                                               |                                                                                                                     |                                                                                                                     |                                                                                                                                |                         |  |
|                                                          | Damping control                    |                                          | Available                                                                                                               |                                                                                                                     |                                                                                                                     |                                                                                                                                |                         |  |
|                                                          | Velocity control                   | Control input                            |                                                                                                                         | –                                                                                                                   |                                                                                                                     | 1-3. Selection of internal velocities, 4. Zero speed clamp                                                                     |                         |  |
|                                                          |                                    | Control output                           |                                                                                                                         | –                                                                                                                   |                                                                                                                     | Set velocity has been reached, etc.                                                                                            |                         |  |
|                                                          |                                    | Analog input                             | Velocity command                                                                                                        |                                                                                                                     | –                                                                                                                   |                                                                                                                                | Velocity and direction  |  |
|                                                          |                                    |                                          | Torque limit command                                                                                                    |                                                                                                                     | –                                                                                                                   |                                                                                                                                | Available               |  |
|                                                          |                                    | Velocity range                           |                                                                                                                         | –                                                                                                                   |                                                                                                                     | 1–6000rpm                                                                                                                      |                         |  |
|                                                          |                                    | Internal velocity command                |                                                                                                                         | –                                                                                                                   |                                                                                                                     | 8 velocity set values                                                                                                          |                         |  |
|                                                          |                                    | Smooth start-up and stopping             |                                                                                                                         | –                                                                                                                   |                                                                                                                     | Individual setup of acceleration and deceleration from 0 to 10s/1000rpm<br>S-curve acceleration and deceleration ramp possible |                         |  |
|                                                          |                                    | Zero speed clamp                         |                                                                                                                         | –                                                                                                                   |                                                                                                                     | Available                                                                                                                      |                         |  |
|                                                          |                                    | Instantaneous speed observer             |                                                                                                                         | –                                                                                                                   |                                                                                                                     | Available                                                                                                                      |                         |  |
|                                                          |                                    | Velocity control filter                  |                                                                                                                         | –                                                                                                                   |                                                                                                                     | Available                                                                                                                      |                         |  |
|                                                          | Torque control                     | Control input                            |                                                                                                                         | –                                                                                                                   |                                                                                                                     | Zero speed clamp, Torque direction command etc.                                                                                |                         |  |
|                                                          |                                    | Control output                           |                                                                                                                         | –                                                                                                                   |                                                                                                                     | Set torque has been reached (at predefined velocity)                                                                           |                         |  |
|                                                          |                                    | Analog input                             | Velocity command                                                                                                        |                                                                                                                     | –                                                                                                                   |                                                                                                                                | Set speed can be scaled |  |
|                                                          |                                    |                                          | Speed limit function                                                                                                    |                                                                                                                     | –                                                                                                                   |                                                                                                                                | Speed can be scaled     |  |
| Full-closed control                                      | Control input                      |                                          | –                                                                                                                       |                                                                                                                     | 1. Clear deviation counter, 2. Command pulse inhibition, 3. Electronic gear switching, 4. Damping control switching |                                                                                                                                |                         |  |
|                                                          | Control output                     |                                          | –                                                                                                                       |                                                                                                                     | Full-closed control complete                                                                                        |                                                                                                                                |                         |  |
|                                                          | Pulse input                        | Line driver A                            |                                                                                                                         | –                                                                                                                   |                                                                                                                     | 500kpps                                                                                                                        |                         |  |
|                                                          |                                    | Open collector                           |                                                                                                                         | –                                                                                                                   |                                                                                                                     | 200kpps                                                                                                                        |                         |  |
|                                                          |                                    | Line driver B                            |                                                                                                                         | –                                                                                                                   |                                                                                                                     | 4Mpps                                                                                                                          |                         |  |
|                                                          |                                    | Signal format                            |                                                                                                                         | –                                                                                                                   |                                                                                                                     | Differential input/square-wave pulse                                                                                           |                         |  |
|                                                          |                                    | Electronic gear                          |                                                                                                                         | –                                                                                                                   |                                                                                                                     | Scaling of pulse frequency from 1/1000 to 1000 times                                                                           |                         |  |
|                                                          |                                    | Smoothing filter                         |                                                                                                                         | –                                                                                                                   |                                                                                                                     | Primary delay filter or FIR filter, customizable                                                                               |                         |  |
|                                                          | Analog input                       | Torque limit command                     |                                                                                                                         | –                                                                                                                   |                                                                                                                     | Torque limit available                                                                                                         |                         |  |
| Setup range of division/multiplication of feedback scale |                                    | –                                        |                                                                                                                         | 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 |                                                                                                                     |                                                                                                                     |                                                                                                                                |                         |  |
|                                                          | Division of encoder feedback pulse |                                          | Any value up to the maximal resolution of the encoder                                                                   |                                                                                                                     |                                                                                                                     |                                                                                                                                |                         |  |
|                                                          | Protective function                | Error messages causing switch-off        |                                                                                                                         | Overvoltage, undervoltage, overspeed, overload, over-heat, overcurrent, encoder error, etc.                         |                                                                                                                     |                                                                                                                                |                         |  |
|                                                          |                                    | Error messages requiring acknowledgement |                                                                                                                         | Excessive position deviation, command pulse division error, EEPROM error, etc.                                      |                                                                                                                     |                                                                                                                                |                         |  |
|                                                          | Alarm history                      |                                          | Can be logged for reference                                                                                             |                                                                                                                     |                                                                                                                     |                                                                                                                                |                         |  |

## Frame A, B, C

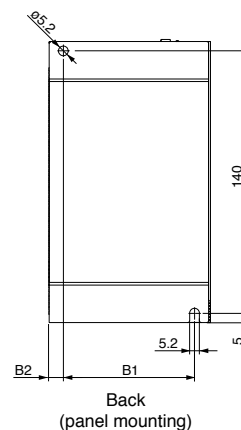


Rack mounting (mounting bracket optional)

## Frame D

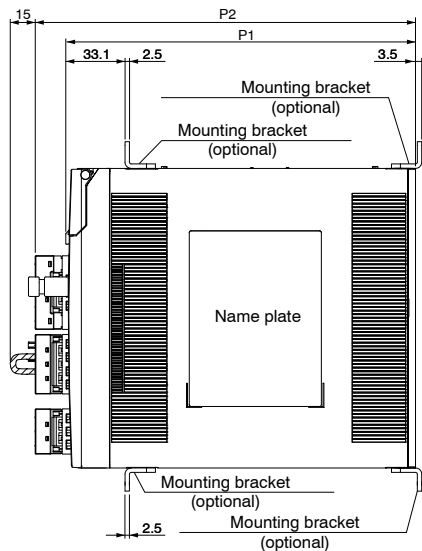
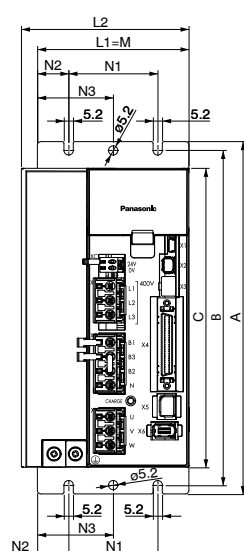


All dimensions are in mm

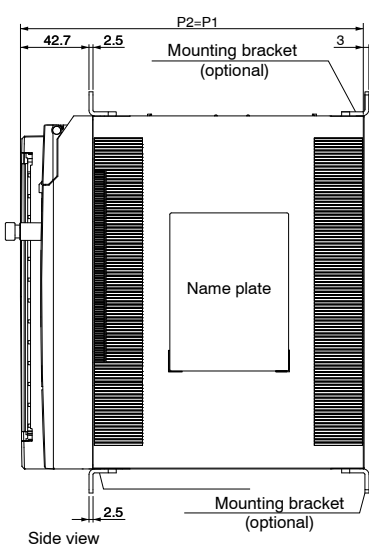
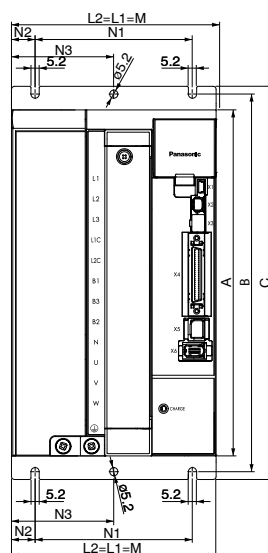


Back (panel mounting)

## Frame E



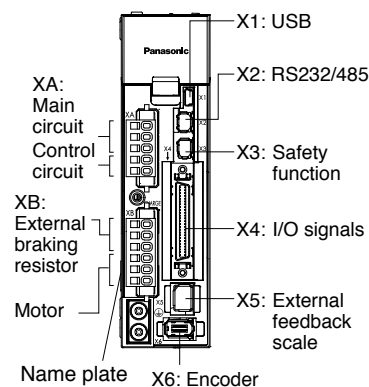
## Frame F



Side view

| Frame | Voltage | Width |     | Mounting bracket |     |      |      | Height |     |     | Depth |     | Control panel |     | Weight |
|-------|---------|-------|-----|------------------|-----|------|------|--------|-----|-----|-------|-----|---------------|-----|--------|
|       |         | L1    | L2  | M                | N1  | N2   | N3   | A      | B   | C   | P1    | P2  | B1            | B2  |        |
| A     | 200V    | 40    | -   | 40               | -   | 7    | -    | 180    | 170 | 150 | 133   | 151 | 28            | 6   | 0.8kg  |
| B     | 200V    | 55    | -   | 47               | -   | 7    | -    | 180    | 170 | 150 | 133   | 151 | 43            | 6   | 1.0kg  |
| C     | 200V    | 65    | -   | 40               | -   | 20   | -    | 180    | 170 | 150 | 173   | 191 | 50            | 7.5 | 1.6kg  |
| D     | 200V    | 85    | 86  | 60               | 40  | 10   | -    | 180    | 170 | 150 | 173   | 191 | 70            | 8.5 | 1.8kg  |
|       | 400V    | 85    | 92  | 60               | 40  | 10   | -    | 180    | 170 | 150 | 173   | 191 | 70            | 7.5 | 1.9kg  |
| E     | 200V    | 85    | 86  | 85               | 50  | 17.5 | 42.5 | 198    | 188 | 168 | 196   | 212 | *             | *   | 2.7kg  |
|       | 400V    | 85    | 94  | 85               | 50  | 17.5 | 42.5 | 198    | 188 | 168 | 196   | 212 | *             | *   | 2.7kg  |
| F     | 200V    | 130   | 130 | 130              | 100 | 15   | 65   | 250    | 240 | 220 | 214   | -   | *             | *   | 4.8kg  |
|       | 400V    | 130   | 130 | 130              | 100 | 15   | 65   | 250    | 240 | 220 | 214   | -   | *             | *   | 4.7kg  |

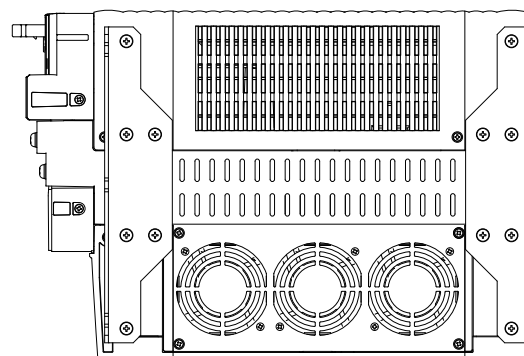
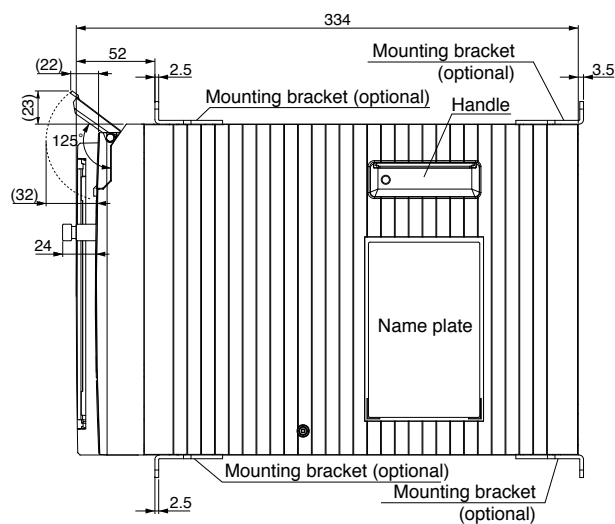
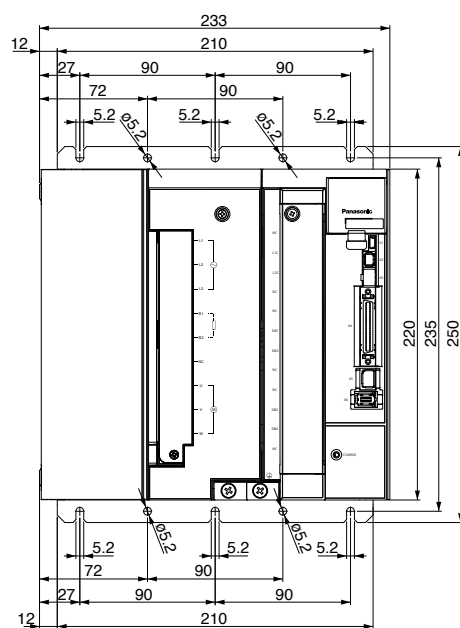
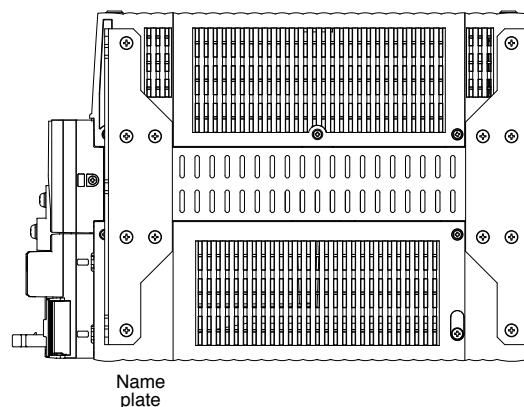
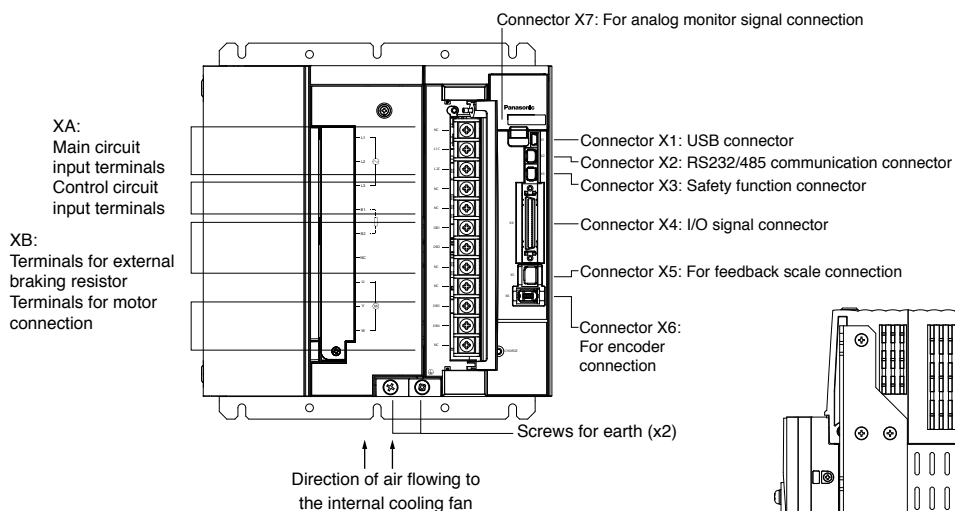
\* For the dimensions, please refer to the data sheet of the mounting bracket



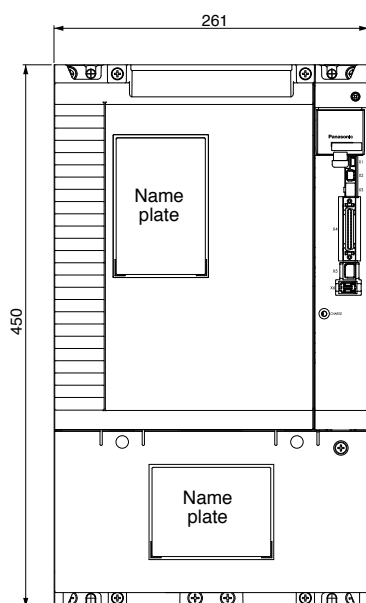
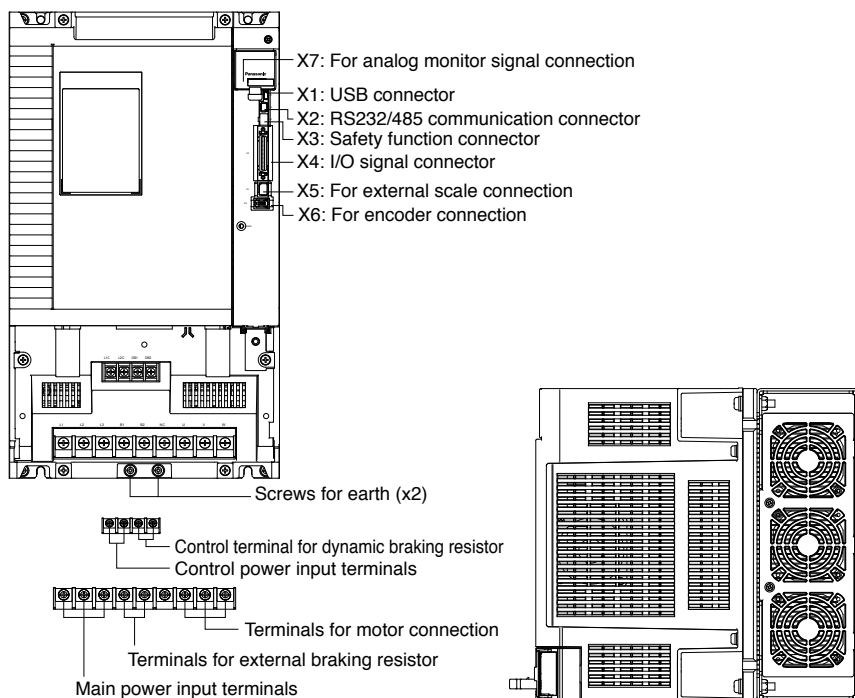
## Dimensions of drivers

### Frame G

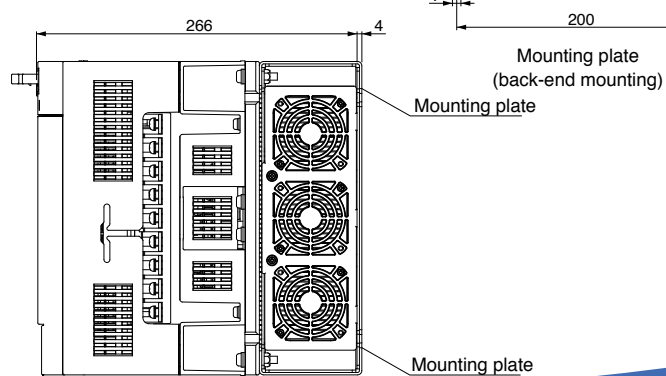
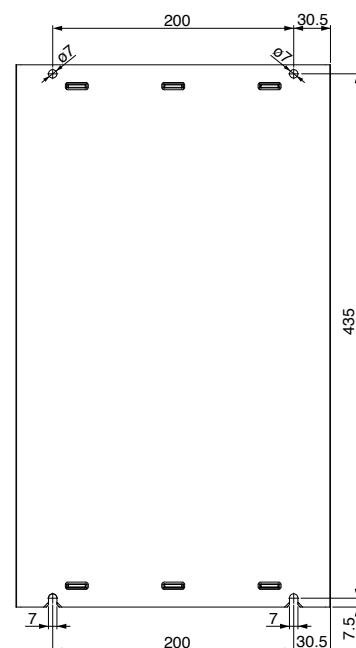
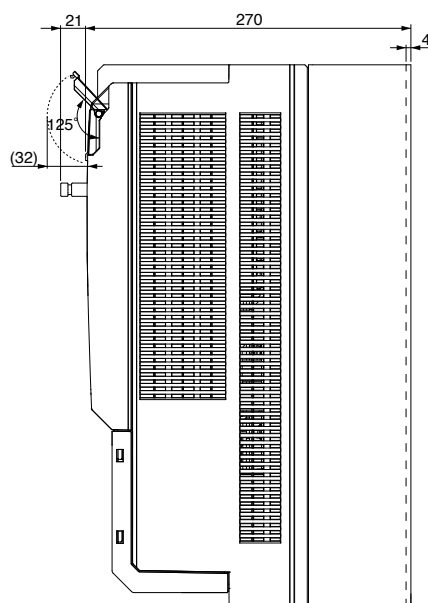
All dimensions are  
in mm



## Frame H



Direction of air flowing to the internal cooling fan



# MINAS A5 motor specifications

| MSME (low inertia) 50–1500W 200V AC                                                                                                                                    |                             |                                                      |            |            |            |            |            |            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------------------------------------------------------|------------|------------|------------|------------|------------|------------|
| Motor                                                                                                                                                                  |                             | MSME5AZG1□                                           | MSME012G1□ | MSME022G1□ | MSME042G1□ | MSME082G1□ | MSME102G1□ | MSME152G1□ |
| Rated power W                                                                                                                                                          |                             | 50                                                   | 100        | 200        | 400        | 750        | 1000       | 1500       |
| Required power kVA                                                                                                                                                     |                             | 0.5                                                  |            |            | 0.9        | 1.3        | 1.8        | 3.3        |
| Rated current A                                                                                                                                                        |                             | 1.1                                                  |            | 1.5        | 2.4        | 4.1        | 6.6        | 8.2        |
| Max. current A o-p                                                                                                                                                     |                             | 4.7                                                  |            | 6.5        | 10.2       | 17.4       | 28         | 35         |
| Rotational speed rpm                                                                                                                                                   | Rated rotational speed      | 3000                                                 |            |            |            |            |            |            |
|                                                                                                                                                                        | Max. rotational speed       | 6000                                                 |            |            |            |            | 5000       |            |
| Weight kg                                                                                                                                                              | Without holding brake       | 0.31                                                 | 0.46       | 0.78       | 1.2        | 2.3        | 3.5        | 4.4        |
|                                                                                                                                                                        | With holding brake          | 0.51                                                 | 0.66       | 1.2        | 1.6        | 3.1        | 4.5        | 5.4        |
| Torque Nm                                                                                                                                                              | Nominal                     | 0.16                                                 | 0.32       | 0.65       | 1.3        | 2.4        | 3.18       | 4.77       |
|                                                                                                                                                                        | Maximal                     | 0.48                                                 | 0.95       | 1.91       | 3.8        | 7.1        | 9.55       | 13.3       |
| Encoder                                                                                                                                                                |                             | 20-bit incremental encoder<br>resolution: 1048576ppr |            |            |            |            |            |            |
| Braking resistor frequency times/min                                                                                                                                   | With internal resistor      | No limit                                             |            |            |            |            |            |            |
|                                                                                                                                                                        | With external resistor      | No limit                                             |            |            |            |            |            |            |
| Moment of inertia of rotor (x10 <sup>-4</sup> kg · m <sup>2</sup> )                                                                                                    | Without holding brake       | 0.025                                                | 0.051      | 0.14       | 0.26       | 0.87       | 2.03       | 2.84       |
|                                                                                                                                                                        | With holding brake          | 0.027                                                | 0.054      | 0.16       | 0.28       | 0.97       | 2.35       | 3.17       |
| Recommended inertia ratio between load and rotor                                                                                                                       |                             | Max. 30:1                                            |            |            |            | Max. 20:1  | Max. 15:1  |            |
| Operating conditions                                                                                                                                                   | Temperature (without frost) | 0–40°C                                               |            |            |            |            |            |            |
|                                                                                                                                                                        | Ambient humidity            | 20–85% RH (non-condensing)                           |            |            |            |            |            |            |
|                                                                                                                                                                        | Altitude                    | Max. 1000m above sea level                           |            |            |            |            |            |            |
|                                                                                                                                                                        | Vibration                   | 49m/s <sup>2</sup>                                   |            |            |            |            |            |            |
| Holding brake specifications (The holding brake is engaged when the power for the servo driver is shut off. Do not use the holding brake when the motor is in motion.) |                             |                                                      |            |            |            |            |            |            |
| Static friction torque Nm                                                                                                                                              |                             | Min. 0.29                                            |            | Min. 1.27  |            | Min. 2.45  |            | Min. 7.8   |
| Engaging time ms                                                                                                                                                       |                             | Max. 35                                              |            | Max. 50    |            | Max. 70    |            | Max. 50    |
| Releasing time ms                                                                                                                                                      |                             | Max. 20                                              |            | Max. 15    |            | Max. 20    |            | Max. 15    |
| Excitation current A DC                                                                                                                                                |                             | 0.3                                                  |            | 0.36       |            | 0.42       |            | 0.81 ±10%  |
| Releasing voltage V DC                                                                                                                                                 |                             | Min. 1                                               |            |            |            |            |            |            |
| Excitation voltage V DC                                                                                                                                                |                             | 24 ±5%                                               |            |            |            |            |            |            |
| Permissible load and thrust at output shaft                                                                                                                            |                             |                                                      |            |            |            |            |            |            |
| During installation                                                                                                                                                    | Radial load,                | 147                                                  |            | 392        |            | 686        |            | 980        |
| During operation                                                                                                                                                       | P-direction N*              | 68.6                                                 |            | 245        |            | 392        |            | 490        |
| During installation                                                                                                                                                    | Axial thrust (push),        | 88                                                   |            | 147        |            | 294        |            | 588        |
| During operation                                                                                                                                                       | A-direction N*              | 58.8                                                 |            | 98         |            | 147        |            | 196        |
| During installation                                                                                                                                                    | Axial thrust (pull),        | 117.6                                                |            | 196        |            | 392        |            | 686        |
| During operation                                                                                                                                                       | B-direction N*              | 58.8                                                 |            | 98         |            | 147        |            | 196        |

| MSME (low inertia) 1000–5000W 400V AC                                                                                                                                  |                             |                                                      |            |            |            |            |            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------------------------------------------------------|------------|------------|------------|------------|------------|
| Motor                                                                                                                                                                  |                             | MSME104G1□                                           | MSME154G1□ | MSME204G1□ | MSME304G1□ | MSME404G1□ | MSME504G1□ |
| Rated power W                                                                                                                                                          |                             | 1000                                                 | 1500       | 2000       | 3000       | 4000       | 5000       |
| Required power kVA                                                                                                                                                     |                             | 1.8                                                  | 2.3        | 3.3        | 4.5        | 6.8        | 7.5        |
| Rated current A                                                                                                                                                        |                             | 3.3                                                  | 4.2        | 5.7        | 9.2        | 9.9        | 12         |
| Max. current A o-p                                                                                                                                                     |                             | 14                                                   | 18         | 24         | 39         | 42         | 51         |
| Rotational speed rpm                                                                                                                                                   | Rated rotational speed      | 3000                                                 |            |            |            |            |            |
|                                                                                                                                                                        | Max. rotational speed       | 5000                                                 |            |            |            | 4500       |            |
| Weight kg                                                                                                                                                              | Without holding brake       | 3.5                                                  | 4.4        | 5.3        | 8.3        | 11         | 14         |
|                                                                                                                                                                        | With holding brake          | 4.5                                                  | 5.4        | 6.3        | 9.4        | 12.6       | 16         |
| Torque Nm                                                                                                                                                              | Nominal                     | 3.18                                                 | 4.77       | 6.37       | 9.55       | 12.7       | 15.9       |
|                                                                                                                                                                        | Maximal                     | 9.55                                                 | 13.3       | 19.1       | 28.6       | 38.2       | 47.7       |
| Encoder                                                                                                                                                                |                             | 20-bit incremental encoder<br>resolution: 1048576ppr |            |            |            |            |            |
| Braking resistor frequency times/min                                                                                                                                   | With internal resistor      | No limit                                             |            |            |            |            |            |
|                                                                                                                                                                        | With external resistor      | No limit                                             |            |            |            |            |            |
| Moment of inertia of rotor (x10 <sup>4</sup> · kg · m <sup>2</sup> )                                                                                                   | Without holding brake       | 2.03                                                 | 2.84       | 3.68       | 6.5        | 12.9       | 17.4       |
|                                                                                                                                                                        | With holding brake          | 2.35                                                 | 3.17       | 4.01       | 7.85       | 14.2       | 18.6       |
| Recommended inertia ratio between load and rotor                                                                                                                       |                             | Max. 15:1                                            |            |            |            |            |            |
| Operating conditions                                                                                                                                                   | Temperature (without frost) | 0–40°C                                               |            |            |            |            |            |
|                                                                                                                                                                        | Ambient humidity            | 20–85% RH (non-condensing)                           |            |            |            |            |            |
|                                                                                                                                                                        | Altitude                    | Max. 1000m above sea level                           |            |            |            |            |            |
|                                                                                                                                                                        | Vibration                   | 49m/s <sup>2</sup>                                   |            |            |            |            |            |
| Holding brake specifications (The holding brake is engaged when the power for the servo driver is shut off. Do not use the holding brake when the motor is in motion.) |                             |                                                      |            |            |            |            |            |
| Static friction torque Nm                                                                                                                                              |                             | Min. 7.8                                             |            |            | Min. 11.8  |            | Min. 16.2  |
| Engaging time ms                                                                                                                                                       |                             | Max. 50                                              |            |            | Max. 80    |            | Max. 110   |
| Releasing time ms                                                                                                                                                      |                             | Max. 15                                              |            |            |            |            | Max. 50    |
| Excitation current A DC                                                                                                                                                |                             | 0.81 ±10%                                            |            |            |            |            | 0.9 ±10%   |
| Releasing voltage V DC                                                                                                                                                 |                             | Min. 2                                               |            |            |            |            |            |
| Excitation voltage V DC                                                                                                                                                |                             | 24 ±10%                                              |            |            |            |            |            |
| Permissible load and thrust at output shaft                                                                                                                            |                             |                                                      |            |            |            |            |            |
| During installation                                                                                                                                                    | Radial load,                | 980                                                  |            |            |            |            |            |
| During operation                                                                                                                                                       | P-direction N*              | 490                                                  |            |            |            | 784        |            |
| During installation                                                                                                                                                    | Axial thrust (push),        | 588                                                  |            |            |            |            |            |
| During operation                                                                                                                                                       | A-direction N*              | 196                                                  |            |            |            | 343        |            |
| During installation                                                                                                                                                    | Axial thrust (pull),        | 686                                                  |            |            |            |            |            |
| During operation                                                                                                                                                       | B-direction N*              | 196                                                  |            |            |            | 343        |            |

\*For details, please refer to page 19.  
□ = Motor type, please refer to page 10.

| MDME (medium inertia) 1000–1500W 200V AC                                                                                                                                  |                             |                                                      |            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------------------------------------------------------|------------|
| Motor                                                                                                                                                                     |                             | MDME102G1□                                           | MDME152G1□ |
| Rated power W                                                                                                                                                             |                             | 1000                                                 | 1500       |
| Required power kVA                                                                                                                                                        |                             | 1.8                                                  | 2.3        |
| Rated current A                                                                                                                                                           |                             | 5.7                                                  | 9.4        |
| Max. current A o-p                                                                                                                                                        |                             | 24                                                   | 40         |
| Rotational speed rpm                                                                                                                                                      | Rated rotational speed      | 2000                                                 |            |
|                                                                                                                                                                           | Max. rotational speed       | 3000                                                 |            |
| Weight kg                                                                                                                                                                 | Without holding brake       | 5.2                                                  | 6.7        |
|                                                                                                                                                                           | With holding brake          | 6.7                                                  | 8.2        |
| Torque Nm                                                                                                                                                                 | Nominal                     | 4.77                                                 | 7.16       |
|                                                                                                                                                                           | Maximal                     | 14.3                                                 | 21.5       |
| Encoder                                                                                                                                                                   |                             | 20-bit incremental encoder<br>resolution: 1048576ppr |            |
| Braking resistor frequency times/min                                                                                                                                      | With internal resistor      | No limit                                             |            |
|                                                                                                                                                                           | With external resistor      | No limit                                             |            |
| Moment of inertia of rotor<br>(x10 <sup>-4</sup> kg · m <sup>2</sup> )                                                                                                    | Without holding brake       | 4.6                                                  | 6.7        |
|                                                                                                                                                                           | With holding brake          | 5.9                                                  | 7.99       |
| Recommended inertia ratio between load and rotor                                                                                                                          |                             | Max. 10:1                                            |            |
| Operating conditions                                                                                                                                                      | Temperature (without frost) | 0–40°C                                               |            |
|                                                                                                                                                                           | Ambient humidity            | 20–85% RH (non-condensing)                           |            |
|                                                                                                                                                                           | Altitude                    | Max. 1000m above sea level                           |            |
|                                                                                                                                                                           | Vibration                   | 49m/s <sup>2</sup>                                   |            |
| Holding brake specifications (The holding brake is engaged when the power for the servo driver is shut off.<br>Do not use the holding brake when the motor is in motion.) |                             |                                                      |            |
| Static friction torque Nm                                                                                                                                                 |                             | Min. 4.9                                             | Min. 13.7  |
| Engaging time ms                                                                                                                                                          |                             | Max. 80                                              | Max. 100   |
| Releasing time ms                                                                                                                                                         |                             | Max. 70                                              | Max. 50    |
| Excitation current A DC                                                                                                                                                   |                             | 0.59 ±10%                                            | 0.79 ±10%  |
| Releasing voltage V DC                                                                                                                                                    |                             | Min. 2                                               |            |
| Excitation voltage V DC                                                                                                                                                   |                             | 24 ±10%                                              |            |
| Permissible load and thrust at output shaft                                                                                                                               |                             |                                                      |            |
| During installation                                                                                                                                                       | Radial load,                | 980                                                  |            |
| During operation                                                                                                                                                          | P-direction N*              | 490                                                  |            |
| During installation                                                                                                                                                       | Axial thrust (push),        | 588                                                  |            |
| During operation                                                                                                                                                          | A-direction N*              | 196                                                  |            |
| During installation                                                                                                                                                       | Axial thrust (pull),        | 686                                                  |            |
| During operation                                                                                                                                                          | B-direction N*              | 196                                                  |            |

| MDME (medium inertia) 2000–15000W 400V AC                                                                                                                              |                             |                                                      |            |            |            |                      |            |            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------------------------------------------------------|------------|------------|------------|----------------------|------------|------------|
| Motor                                                                                                                                                                  |                             | MDME204G1□                                           | MDME304G1□ | MDME404G1□ | MDME504G1□ | MDME754G1□           | MDMEC14G1□ | MDMEC54G1□ |
| Rated power W                                                                                                                                                          |                             | 2000                                                 | 3000       | 4000       | 5000       | 7500                 | 11000      | 15000      |
| Required power kVA                                                                                                                                                     |                             | 3.3                                                  | 4.5        | 6.8        | 7.5        | 11                   | 17         | 22         |
| Rated current A                                                                                                                                                        |                             | 5.9                                                  | 8.7        | 10.6       | 13         | 22                   | 27.1       | 33.1       |
| Max. current A o-p                                                                                                                                                     |                             | 25                                                   | 37         | 45         | 55         | 83                   | 101        | 118        |
| Rotational speed rpm                                                                                                                                                   | Rated rotational speed      | 2000                                                 |            |            |            | 1500                 |            |            |
|                                                                                                                                                                        | Max. rotational speed       | 3000                                                 |            |            |            | 2000                 |            |            |
| Weight kg                                                                                                                                                              | Without holding brake       | 8                                                    | 11         | 15.5       | 18.6       | 36.4                 | 52.7       | 70.2       |
|                                                                                                                                                                        | With holding brake          | 9.5                                                  | 12.6       | 18.7       | 21.8       | 40.4                 | 58.9       | 76.3       |
| Torque Nm                                                                                                                                                              | Nominal                     | 9.55                                                 | 14.3       | 19.1       | 23.9       | 47.8                 | 70         | 95.5       |
|                                                                                                                                                                        | Maximal                     | 28.6                                                 | 43.0       | 57.3       | 71.6       | 119                  | 175        | 224        |
| Encoder                                                                                                                                                                |                             | 20-bit incremental encoder<br>resolution: 1048576ppr |            |            |            |                      |            |            |
| Braking resistor frequency times/min                                                                                                                                   | With internal resistor      | No limit                                             |            |            | 120        | No limit             |            |            |
|                                                                                                                                                                        | With external resistor      | No limit                                             |            |            |            |                      |            |            |
| Moment of inertia of rotor (x10 <sup>-4</sup> kg · m <sup>2</sup> )                                                                                                    | Without holding brake       | 8.72                                                 | 12.9       | 37.6       | 48         | 101                  | 212        | 302        |
|                                                                                                                                                                        | With holding brake          | 10                                                   | 14.2       | 38.6       | 48.8       | 107                  | 220        | 311        |
| Recommended inertia ratio between load and rotor                                                                                                                       |                             | Max. 10:1                                            |            |            |            | Max. 1:1             |            |            |
| Operating conditions                                                                                                                                                   | Temperature (without frost) | 0–40°C                                               |            |            |            |                      |            |            |
|                                                                                                                                                                        | Ambient humidity            | 20–85% RH (non-condensing)                           |            |            |            |                      |            |            |
|                                                                                                                                                                        | Altitude                    | Max. 1000m above sea level                           |            |            |            |                      |            |            |
|                                                                                                                                                                        | Vibration                   | 49m/s <sup>2</sup>                                   |            |            |            | 24.5m/s <sup>2</sup> |            |            |
| Holding brake specifications (The holding brake is engaged when the power for the servo driver is shut off. Do not use the holding brake when the motor is in motion.) |                             |                                                      |            |            |            |                      |            |            |
| Static friction torque Nm                                                                                                                                              |                             | Min. 13.7                                            | Min. 16.2  | Min. 24.5  |            | Min. 58.8            | Min. 100   |            |
| Engaging time ms                                                                                                                                                       |                             | Max. 100                                             | Max. 110   | Max. 80    |            | Max. 150             | Max. 300   |            |
| Releasing time ms                                                                                                                                                      |                             | Max. 50                                              |            | Max. 25    |            | Max. 50              | Max. 140   |            |
| Excitation current A DC                                                                                                                                                |                             | 0.79 ±10%                                            | 0.90 ±10%  | 1.3 ±10%   |            | 1.4 ±10%             | 1.08 ±10%  |            |
| Releasing voltage V DC                                                                                                                                                 |                             | Min. 2                                               |            |            |            |                      |            |            |
| Excitation voltage V DC                                                                                                                                                |                             | 24 ±5%                                               |            |            |            |                      |            |            |
| Permissible load and thrust at output shaft                                                                                                                            |                             |                                                      |            |            |            |                      |            |            |
| During installation                                                                                                                                                    | Radial load,                | 980                                                  |            |            | 1666       |                      | 2058       |            |
| During operation                                                                                                                                                       | P-direction N°              | 490                                                  |            |            | 784        |                      | 1176       |            |
| During installation                                                                                                                                                    | Axial thrust (push),        | 588                                                  |            |            | 784        |                      | 980        |            |
| During operation                                                                                                                                                       | A-direction N°              | 196                                                  |            |            | 343        |                      | 490        |            |
| During installation                                                                                                                                                    | Axial thrust (pull),        | 686                                                  |            |            | 980        |                      | 1176       |            |
| During operation                                                                                                                                                       | B-direction N°              | 196                                                  |            |            | 343        |                      | 490        |            |

\*For details, please refer to page 19.  
□ = Motor type, please refer to page 10.

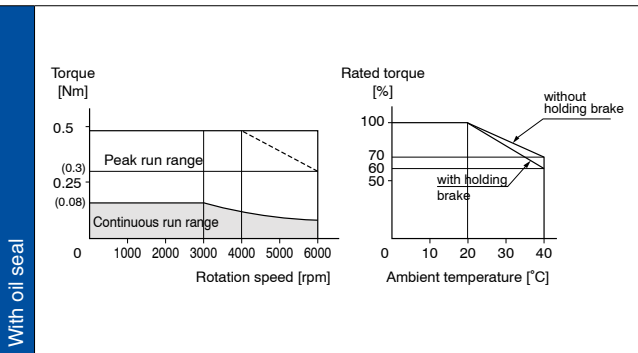
# MINAS A5 motor specifications

| MHMD (high inertia) 200~750W 200V AC                                                                                                                                   |                             |                                                      |            |            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------------------------------------------------------|------------|------------|
| Motor                                                                                                                                                                  |                             | MHMD022G1□                                           | MHMD042G1□ | MHMD082G1□ |
| Rated power W                                                                                                                                                          |                             | 200                                                  | 400        | 750        |
| Required power kVA                                                                                                                                                     |                             | 0.5                                                  | 0.9        | 1.3        |
| Rated current A                                                                                                                                                        |                             | 1.6                                                  | 2.6        | 4          |
| Max. current A o-p                                                                                                                                                     |                             | 6.9                                                  | 11         | 17         |
| Rotational speed rpm                                                                                                                                                   | Rated rotational speed      | 3000                                                 |            |            |
|                                                                                                                                                                        | Max. rotational speed       | 5000                                                 |            | 4500       |
| Weight kg                                                                                                                                                              | Without holding brake       | 0.96                                                 | 1.4        | 2.5        |
|                                                                                                                                                                        | With holding brake          | 1.4                                                  | 1.8        | 3.5        |
| Torque Nm                                                                                                                                                              | Nominal                     | 4.77                                                 | 7.16       | 9.55       |
|                                                                                                                                                                        | Maximal                     | 14.3                                                 | 21.5       | 43.0       |
| Encoder                                                                                                                                                                |                             | 20-bit incremental encoder<br>resolution: 1048576ppr |            |            |
| Braking resistor<br>frequency times/min                                                                                                                                | With internal resistor      | No limit                                             |            |            |
|                                                                                                                                                                        | With external resistor      | No limit                                             |            |            |
| Moment of inertia of<br>rotor (x10 <sup>-4</sup> kg · m <sup>2</sup> )                                                                                                 | Without holding brake       | 0.42                                                 | 0.67       | 1.51       |
|                                                                                                                                                                        | With holding brake          | 0.45                                                 | 0.7        | 1.61       |
| Recommended inertia<br>ratio between load and rotor                                                                                                                    | Max. 30:1                   |                                                      |            | Max. 20:1  |
|                                                                                                                                                                        | Temperature (without frost) | 0~40°C                                               |            |            |
| Operating condi-<br>tions                                                                                                                                              | Ambient humidity            | 20~85% RH (non-condensing)                           |            |            |
|                                                                                                                                                                        | Altitude                    | Max. 1000m above sea level                           |            |            |
|                                                                                                                                                                        | Vibration                   | 49m/s <sup>2</sup>                                   |            |            |
| Holding brake specifications (The holding brake is engaged when the power for the servo driver is shut off. Do not use the holding brake when the motor is in motion.) |                             |                                                      |            |            |
| Static friction torque Nm                                                                                                                                              |                             | Min. 1.27                                            |            | Min. 2.45  |
| Engaging time ms                                                                                                                                                       |                             | Max. 50                                              |            | Max. 70    |
| Releasing time ms                                                                                                                                                      |                             | Max. 30                                              |            | Max. 20    |
| Excitation current A DC                                                                                                                                                |                             | 0.36                                                 |            | 0.42       |
| Releasing voltage V DC                                                                                                                                                 |                             | Min. 1                                               |            |            |
| Excitation voltage V DC                                                                                                                                                |                             | 24 ±5%                                               |            |            |
| Permissible load and thrust at output shaft                                                                                                                            |                             |                                                      |            |            |
| During installation                                                                                                                                                    | Radial load,                | 392                                                  |            | 686        |
| During operation                                                                                                                                                       | P-direction N*              | 245                                                  |            | 392        |
| During installation                                                                                                                                                    | Axial thrust (push),        | 147                                                  |            | 294        |
| During operation                                                                                                                                                       | A-direction N*              | 98                                                   |            | 147        |
| During installation                                                                                                                                                    | Axial thrust (pull),        | 196                                                  |            | 392        |
| During operation                                                                                                                                                       | B-direction N*              | 98                                                   |            | 147        |

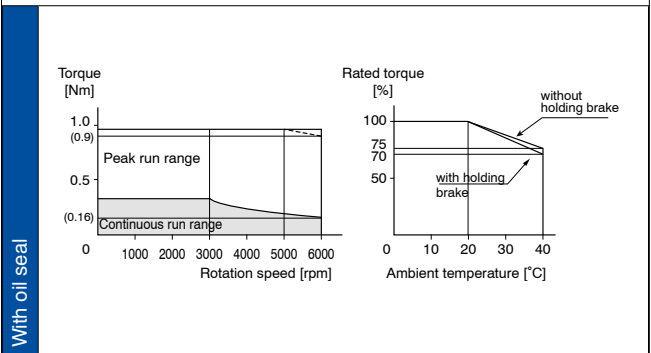
| MHME (high inertia) 1000–7500W 400V AC                                                                                                                                 |                                                   |                            |            |            |            |            |            |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|----------------------------|------------|------------|------------|------------|------------|----------|
| Motor                                                                                                                                                                  | MHME104G1□                                        | MHME154G1□                 | MHME204G1□ | MHME304G1□ | MHME404G1□ | MHME504G1□ | MHME754G1□ |          |
| Rated power W                                                                                                                                                          | 1000                                              | 1500                       | 2000       | 3000       | 4000       | 5000       | 7500       |          |
| Required power kVA                                                                                                                                                     | 1.8                                               | 2.3                        | 3.3        | 4.5        | 6.8        | 7.5        | 11         |          |
| Rated current A                                                                                                                                                        | 5.7                                               | 9.4                        | 11.1       | 16         | 21         | 25.9       | 44         |          |
| Max. current A o-p                                                                                                                                                     | 24                                                | 40                         | 47         | 68         | 83         | 110        | 165        |          |
| Rotational speed rpm                                                                                                                                                   | Rated rotational speed                            | 2000                       |            |            |            |            |            | 1500     |
| Weight kg                                                                                                                                                              | Max. rotational speed                             | 3000                       |            |            |            |            |            |          |
|                                                                                                                                                                        | Without holding brake                             | 6.7                        | 8.6        | 12.2       | 16         | 18.6       | 23         | 42.3     |
|                                                                                                                                                                        | With holding brake                                | 9.1                        | 10.1       | 15.5       | 19.2       | 21.8       | 26.2       | 46.2     |
| Torque Nm                                                                                                                                                              | Nominal                                           | 4.77                       | 7.16       | 9.55       | 14.3       | 19.1       | 23.9       | 47.8     |
|                                                                                                                                                                        | Maximal                                           | 14.3                       | 21.5       | 43.0       | 28.6       | 57.3       | 71.6       | 119      |
| Encoder                                                                                                                                                                | 20-bit incremental encoder resolution: 1048576ppr |                            |            |            |            |            |            |          |
| Braking resistor frequency times/min                                                                                                                                   | With internal resistor                            | 83                         | 22         | 45         | 19         | 17         | 10         | No limit |
|                                                                                                                                                                        | With external resistor                            | No limit                   | 130        | 142        | 42         | 125        | 76         | No limit |
| Moment of inertia of rotor (x10 <sup>-4</sup> kg · m <sup>2</sup> )                                                                                                    | Without holding brake                             | 24.7                       | 37.1       | 57.8       | 90.5       | 112        | 162        | 273      |
|                                                                                                                                                                        | With holding brake                                | 26                         | 38.4       | 59.6       | 92.1       | 114        | 164        | 279      |
| Recommended inertia ratio between load and rotor                                                                                                                       |                                                   |                            |            |            |            |            |            |          |
| Operating conditions                                                                                                                                                   | Temperature (without frost)                       | Max. 5:1<br>0–40°C         |            |            |            |            |            |          |
|                                                                                                                                                                        | Ambient humidity                                  | 20–85% RH (non-condensing) |            |            |            |            |            |          |
|                                                                                                                                                                        | Altitude                                          | Max. 1000m above sea level |            |            |            |            |            |          |
|                                                                                                                                                                        | Vibration                                         | 49m/s <sup>2</sup>         |            |            |            |            |            |          |
| Holding brake specifications (The holding brake is engaged when the power for the servo driver is shut off. Do not use the holding brake when the motor is in motion.) |                                                   |                            |            |            |            |            |            |          |
| Static friction torque Nm                                                                                                                                              | Min. 4.9                                          | Min. 13.7                  | Min. 24.5  |            |            |            | Min. 58.8  |          |
| Engaging time ms                                                                                                                                                       | Max. 80                                           | Max. 100                   | Max. 80    |            |            |            | Max. 150   |          |
| Releasing time ms                                                                                                                                                      | Max. 70                                           | Max. 50                    | Max. 25    |            |            |            | Max. 50    |          |
| Excitation current A DC                                                                                                                                                | 0.59 ±10%                                         | 0.79 ±10%                  | 1.3 ±10%   |            |            |            | 1.41 ±10%  |          |
| Releasing voltage V DC                                                                                                                                                 |                                                   |                            |            |            | Min. 2     |            |            |          |
| Excitation voltage V DC                                                                                                                                                |                                                   |                            |            |            | 24 ±5%     |            |            |          |
| Permissible load and thrust at output shaft                                                                                                                            |                                                   |                            |            |            |            |            |            |          |
| During installation                                                                                                                                                    | Radial load,                                      | 980                        | 1666       |            |            |            | 2058       |          |
| During operation                                                                                                                                                       | P-direction N*                                    | 490                        | 784        |            |            |            | 1176       |          |
| During installation                                                                                                                                                    | Axial thrust (push),                              | 588                        | 784        |            |            |            | 980        |          |
| During operation                                                                                                                                                       | A-direction N*                                    | 196                        | 343        |            |            |            | 490        |          |
| During installation                                                                                                                                                    | Axial thrust (pull),                              | 686                        | 980        |            |            |            | 1176       |          |
| During operation                                                                                                                                                       | B-direction N*                                    | 196                        | 343        |            |            |            | 490        |          |

\*For details, please refer to page 19.  
□ = Motor type, please refer to page 10.

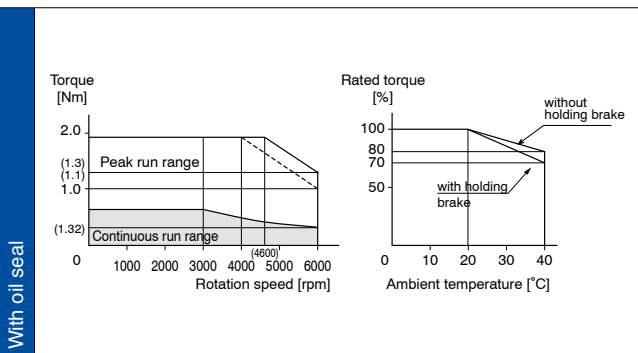
## MSME5AZG1□



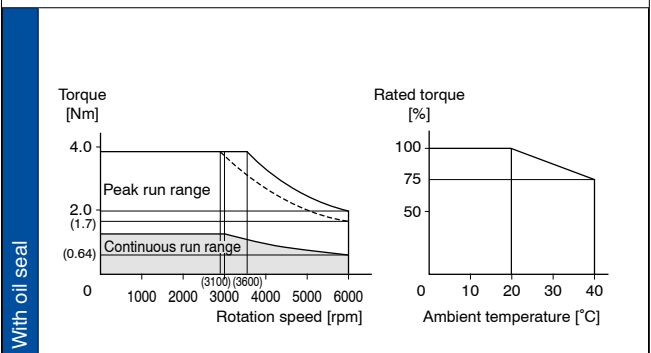
## MSME012G1□



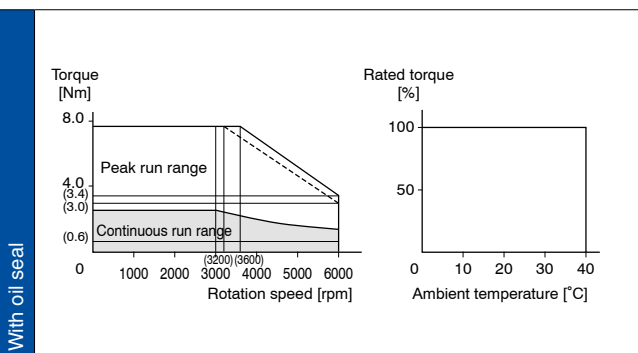
## MSME022G1□



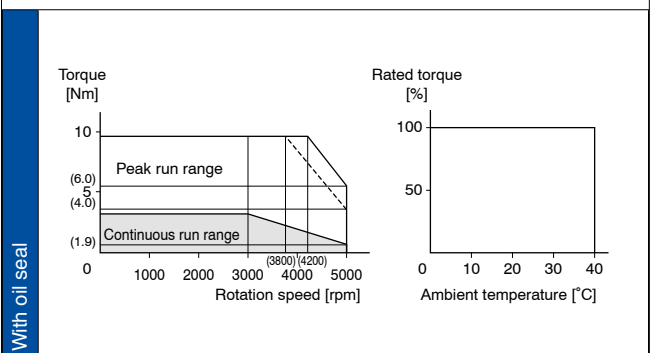
## MSME042G1□



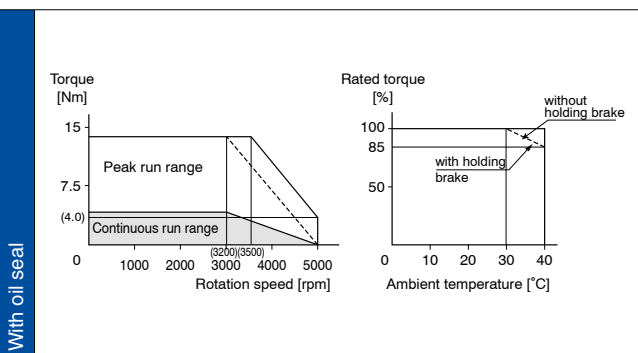
## MSME082G1□



## MSME102G1□

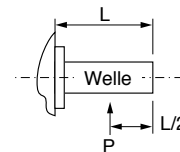


## MSME152G1□

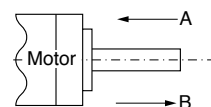


## Permissible load at output shaft

Radiale Kraft, P-Richtung



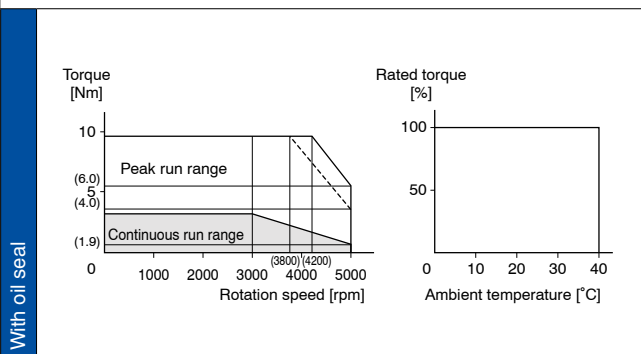
Axiale Kraft, A- und B-Richtung



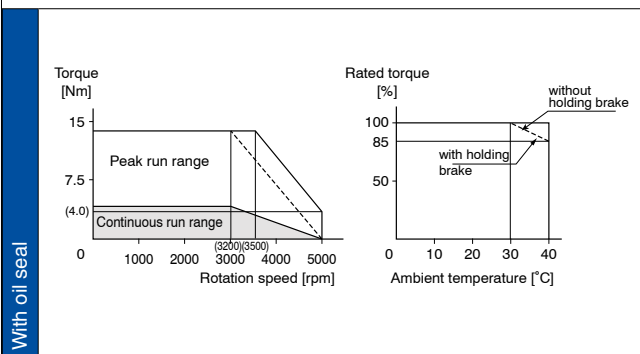
□ = Motor type, please refer to page 10.

# Torque characteristics

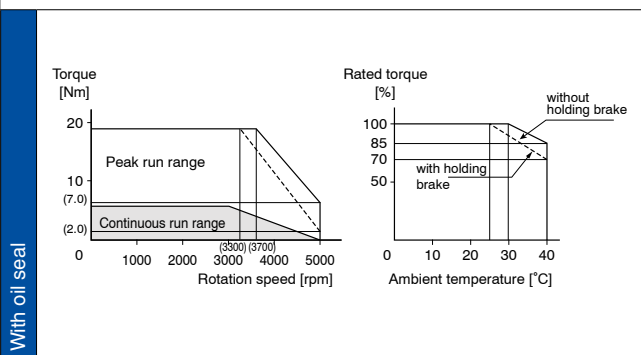
## MSME104G1□



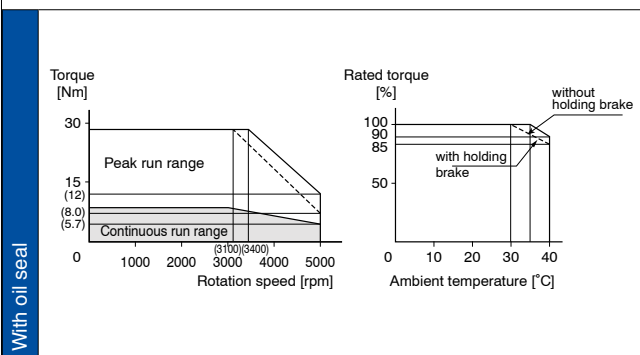
## MSME154G1□



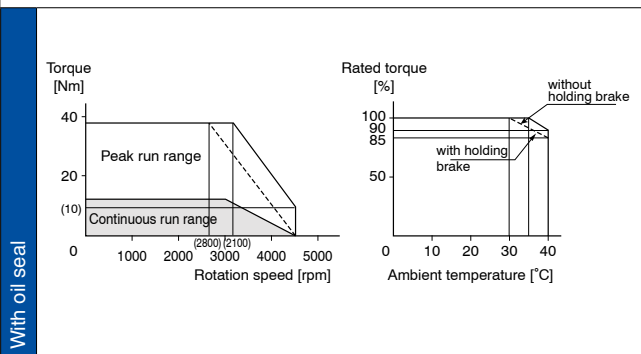
## MSME204G1□



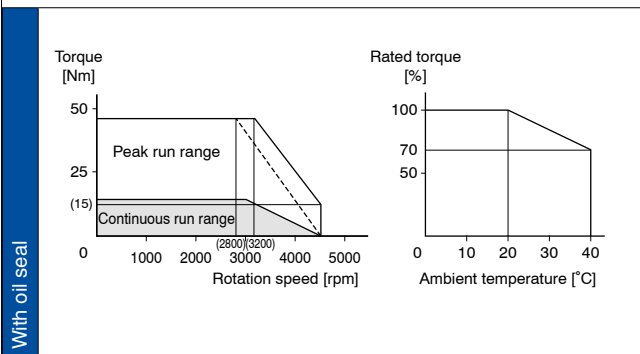
## MSME304G1□



## MSME404G1□

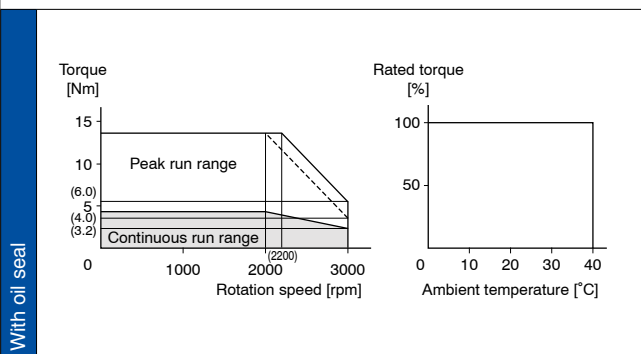


## MSME504G1□

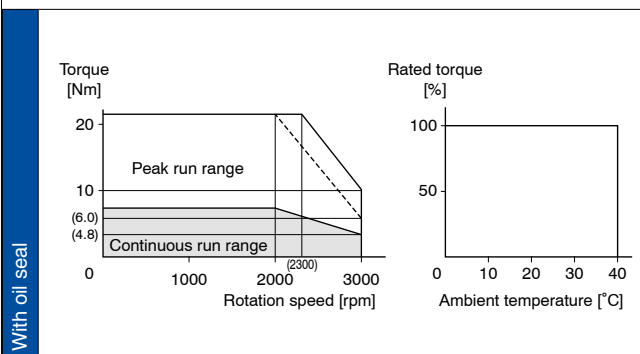


□ = Motor type, please refer to page 10.

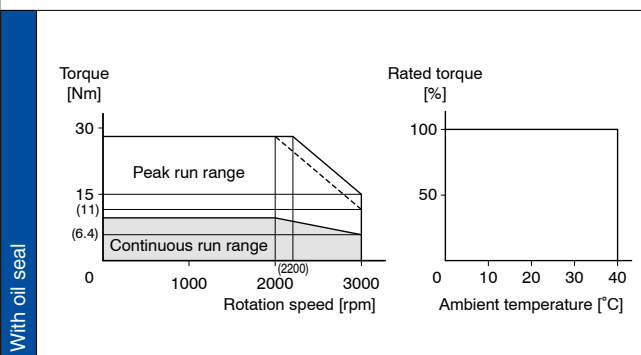
### MDME102G1□



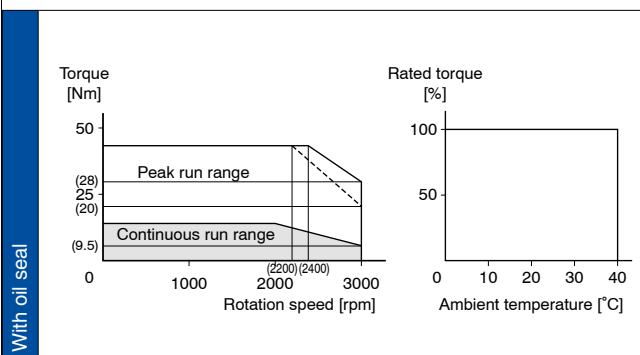
### MDME152G1□



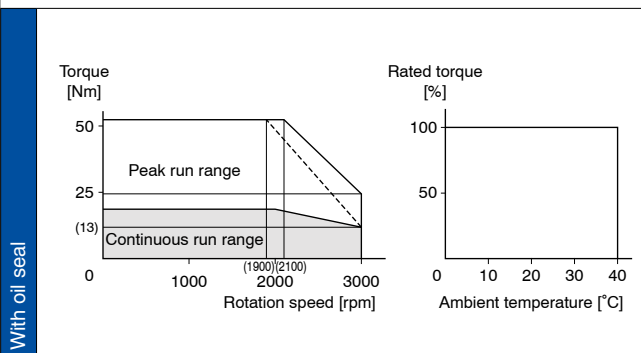
### MDME204G1□



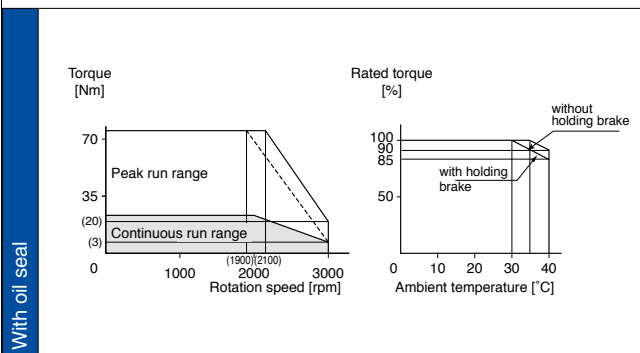
### MDME304G1□



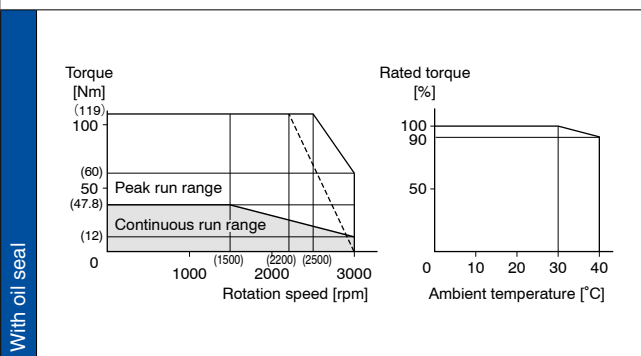
### MDME404G1□



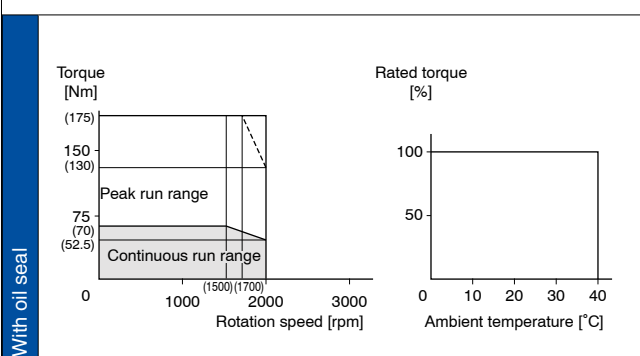
### MDME504G1□



### MDME754G1□



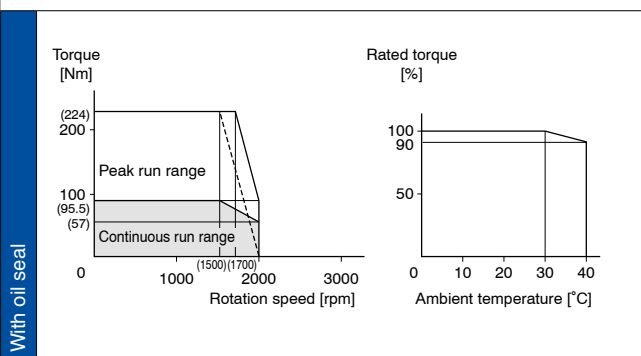
### MDMEC14G1□



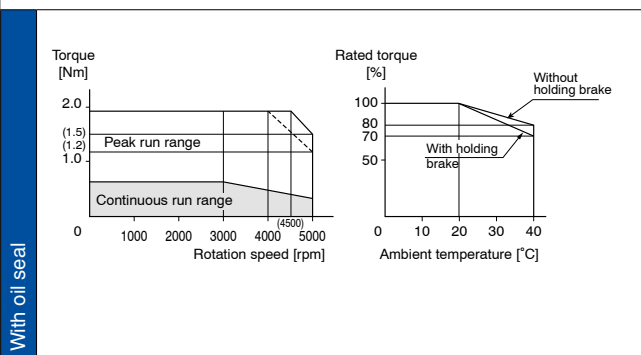
□ = Motor type, please refer to page 10.

# Torque characteristics

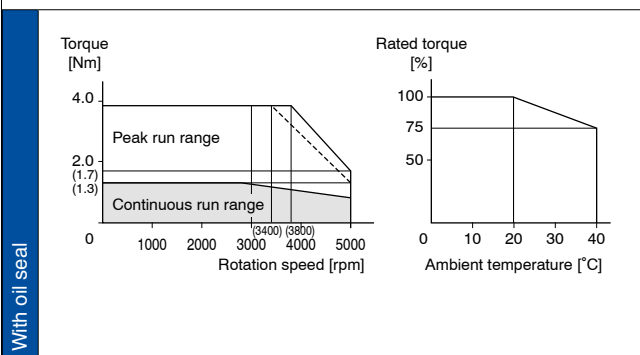
## MDMEC54G1□



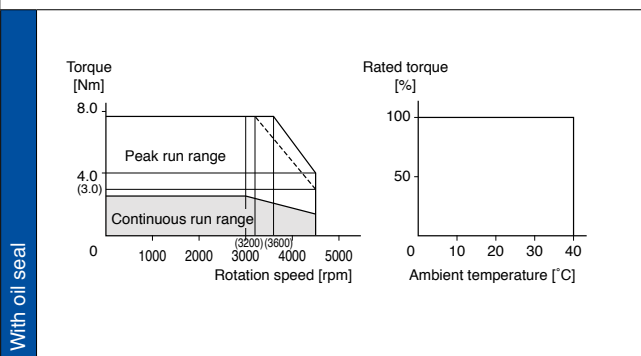
## MHMD022G1□



## MHMD042G1□

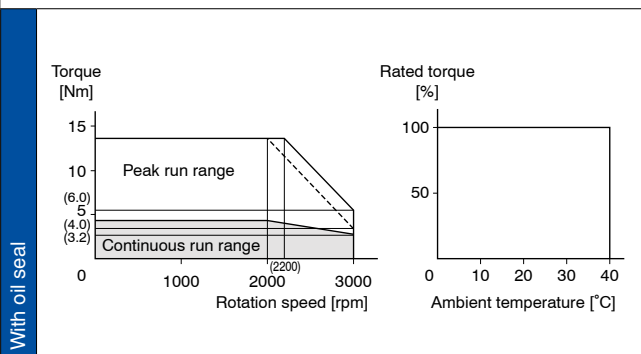


## MHMD082G1□

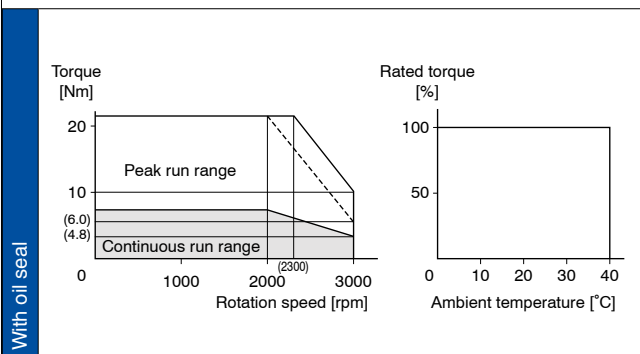


□ = Motor type, please refer to page 10.

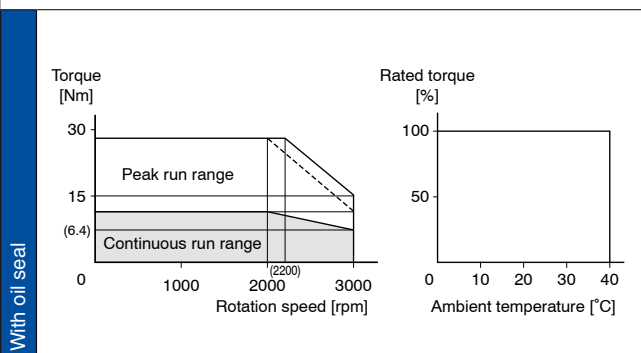
### MHME104G1□



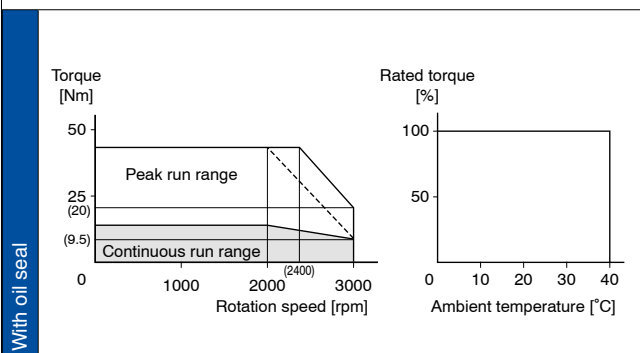
### MHME154G1□



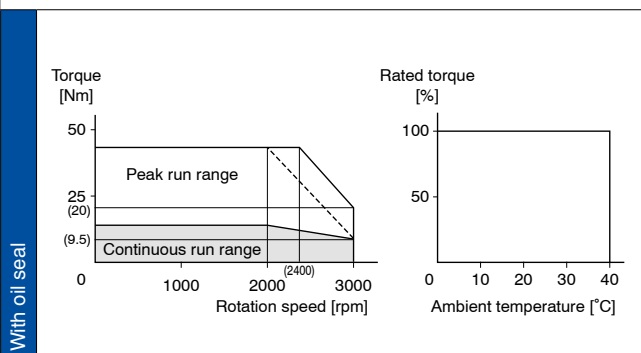
### MHME204G1□



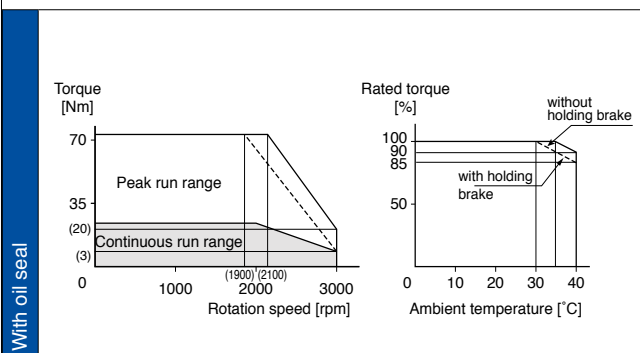
### MHME304G1□



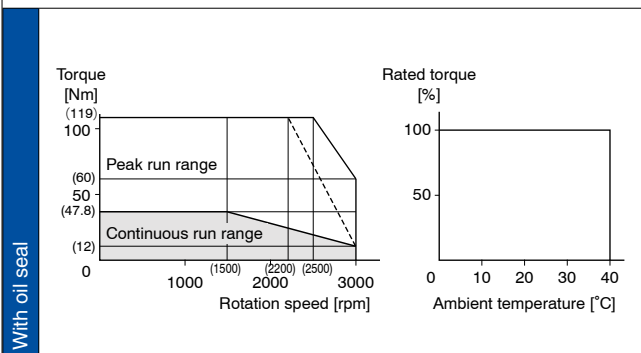
### MHME404G1□



### MHME504G1□



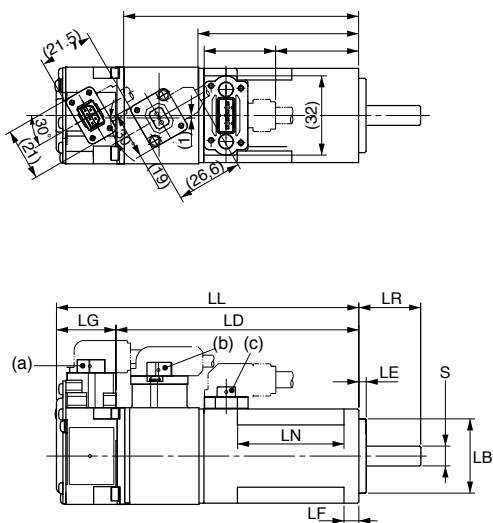
### MHME754G1□



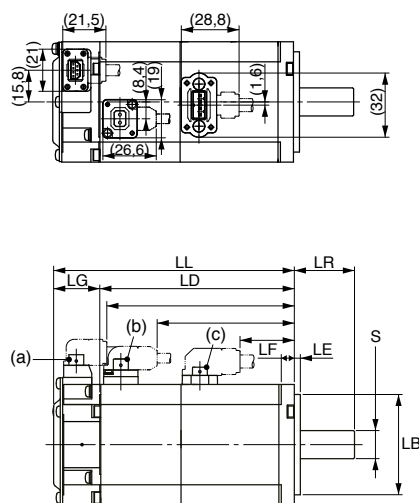
□ = Motor type, please refer to page 10.

# MINAS A5 motor dimensions

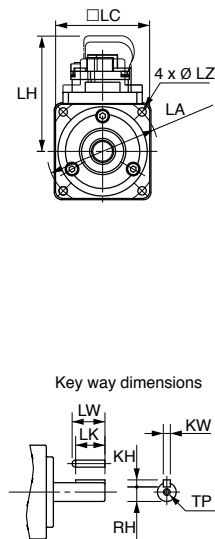
50W–100W



200W–750W



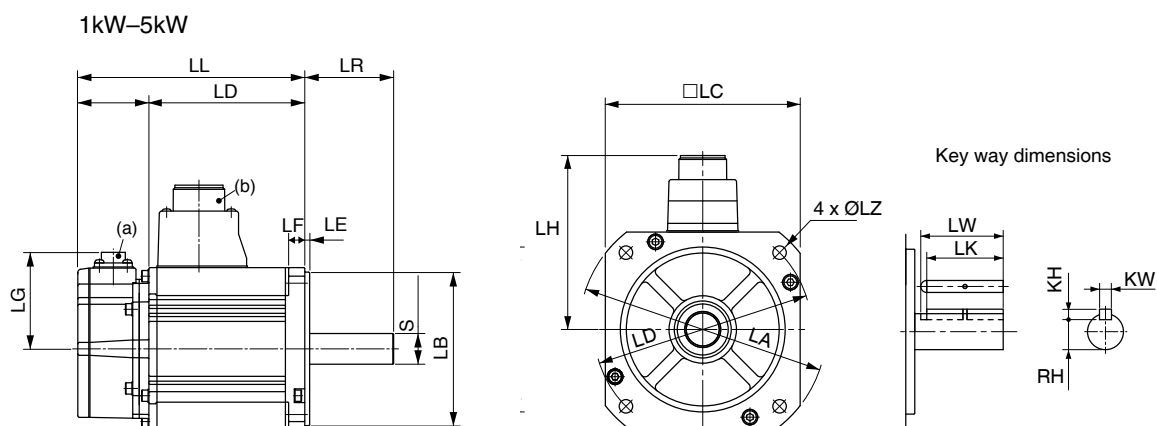
50W–750W



- a) Encoder connector
- b) Brake connector
- c) Motor connector

| MSME (low inertia) 50–750W 200V AC  |    |      |                                                      |      |            |      |             |      |             |       |              |       |
|-------------------------------------|----|------|------------------------------------------------------|------|------------|------|-------------|------|-------------|-------|--------------|-------|
| Rated power                         |    | W    | 50                                                   |      | 100        |      | 200         |      | 400         |       | 750          |       |
| Motor                               |    | Type | MSME5AZG1□                                           |      | MSME012G1□ |      | MSME022G1□  |      | MSME042G1□  |       | MSME082G1□   |       |
| Encoder                             |    |      | 20-bit incremental encoder<br>resolution: 1048576ppr |      |            |      |             |      |             |       |              |       |
| Motor with/without<br>holding brake |    |      | Without                                              | With | Without    | With | Without     | With | Without     | With  | Without      | With  |
| LL                                  |    | mm   | 72                                                   | 102  | 92         | 122  | 79.5        | 116  | 99          | 135.5 | 112          | 148.2 |
| LR                                  |    | mm   | 25                                                   |      |            |      | 30          |      |             |       | 35           |       |
| S                                   |    | mm   | ∅ 8 h6                                               |      |            |      | ∅ 11 h6     |      | ∅ 14 h6     |       | ∅ 19 h6      |       |
| LA                                  |    | mm   | ∅ 45 ±0.2                                            |      |            |      | ∅ 70 ±0.2   |      |             |       | ∅ 90 ±0.2    |       |
| LB                                  |    | mm   | ∅ 30 h7                                              |      |            |      | ∅ 50 h7     |      |             |       | ∅ 70 h7      |       |
| LC                                  |    | mm   | 38                                                   |      |            |      | 60          |      |             |       | 80           |       |
| LD                                  |    | mm   | 48                                                   | 78   | 68         | 98   | 56.5        | 93   | 76          | 112.5 | 86.2         | 122.2 |
| LE                                  |    | mm   | 3                                                    |      |            |      | 3           |      |             |       | 3            |       |
| LF                                  |    | mm   | 6                                                    |      |            |      | 6.5         |      |             |       | 8            |       |
| LG                                  |    | mm   | 24                                                   |      |            |      | 23          |      |             |       | 26           |       |
| LH                                  |    | mm   | (46.6)                                               |      |            |      | (52.5)      |      |             |       | (61.6)       |       |
| LN                                  |    | mm   | 43                                                   |      |            |      | -           |      |             |       | -            |       |
| LZ                                  |    | mm   | 4 x ∅ 3.4                                            |      |            |      | 4 x ∅ 3.4   |      | 4 x ∅ 4.5   |       | 4 x ∅ 6      |       |
| Key way                             | LW | mm   | 14                                                   |      |            |      | 20          |      | 25          |       | 25           |       |
|                                     | LK | mm   | 12.5                                                 |      |            |      | 18          |      | 22.5        |       | 22           |       |
|                                     | KW | mm   | 3 h9                                                 |      |            |      | 4 h9        |      | 5 h9        |       | 6 h9         |       |
|                                     | KH | mm   | 3                                                    |      |            |      | 4           |      | 5           |       | 6            |       |
|                                     | RH | mm   | 6.2                                                  |      |            |      | 8.5         |      | 11          |       | 15.5         |       |
| TP                                  |    | mm   | M3, depth 6                                          |      |            |      | M4, depth 8 |      | M5, depth 8 |       | M5, depth 10 |       |
| Weight                              |    | kg   | 0.32                                                 | 0.53 | 0.47       | 0.68 | 0.82        | 1.30 | 1.2         | 1.7   | 2.3          | 3.1   |

□ = Motor type, please refer to page 10.



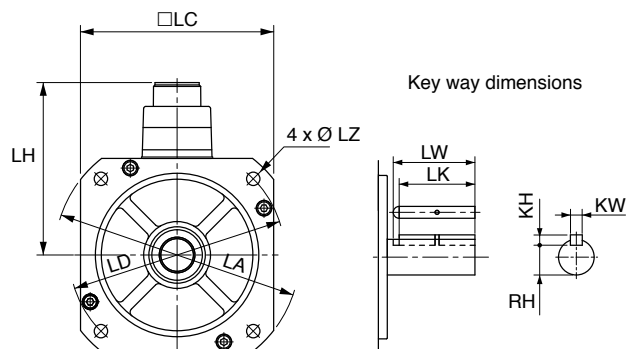
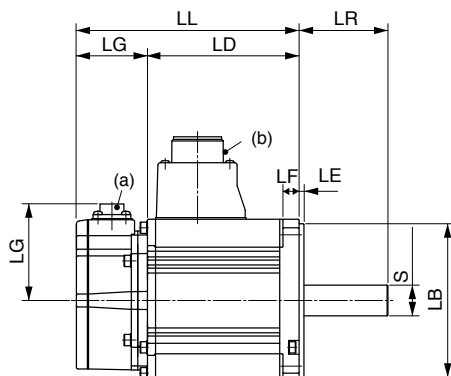
- a) Encoder connector  
b) Motor connector

| MSME (low inertia) 1kW–1.5kW 200VAC, 1kW–5kW 400VAC |                       |      |            |            |            |            |            |            |
|-----------------------------------------------------|-----------------------|------|------------|------------|------------|------------|------------|------------|
| Rated power                                         |                       | kW   | 1.0        | 1.5        | 2.0        | 3.0        | 4.0        | 5.0        |
| Motor                                               | 200V AC               | Type | MSME102G1□ | MSME152G1□ | -          | -          | -          | -          |
|                                                     | 400V AC               |      | MSME104G1□ | MSME154G1□ | MSME204G1□ | MSME304G1□ | MSME404G1□ | MSME504G1□ |
| LL                                                  | Without holding brake | mm   | 141        | 159.5      | 178.5      | 190        | 208        | 243        |
|                                                     | With holding brake    | mm   | 168        | 186.5      | 205.5      | 215        | 233        | 268        |
| LR                                                  |                       | mm   | 55         |            |            | 55         | 65         |            |
| S                                                   |                       | mm   | Ø 19 h6    |            |            | Ø 22 h6    | Ø 24 h6    |            |
| LA                                                  |                       | mm   | Ø 135      |            |            | Ø 162      | Ø 165      |            |
| LB                                                  |                       | mm   | Ø 95 h7    |            |            | Ø 110 h7   |            |            |
| LC                                                  |                       | mm   | 100        |            |            | 120        | 130        |            |
| LD                                                  |                       | mm   | Ø 115      |            |            | Ø 145      |            |            |
| LE                                                  |                       | mm   | 3          |            |            |            | 6          |            |
| LF                                                  |                       | mm   | 10         |            |            | 12         | 12         |            |
| LG                                                  |                       | mm   | (60)       |            |            | (60)       |            |            |
| LH                                                  |                       | mm   | (101)      |            |            | (113)      | (118)      |            |
| LZ                                                  |                       | mm   | 4 x Ø 9    |            |            |            |            |            |
| Key way                                             | LW                    | mm   | 45         |            |            |            | 55         |            |
|                                                     | LK                    | mm   | 42         |            |            | 41         | 51         |            |
|                                                     | KW                    | mm   | 6 h9       |            |            | 8 h9       |            |            |
|                                                     | KH                    | mm   | 6          |            |            | 7          |            |            |
|                                                     | RH                    | mm   | 15.5       |            |            | 18         | 20         |            |
| Weight                                              | Without holding brake | kg   | 3.5        | 4.4        | 5.3        | 8.3        | 11         | 14         |
|                                                     | With holding brake    | kg   | 4.5        | 5.4        | 6.3        | 9.4        | 12.6       | 16         |

□ = Motor type, please refer to page 10.

# MINAS A5 motor dimensions

1kW–5kW

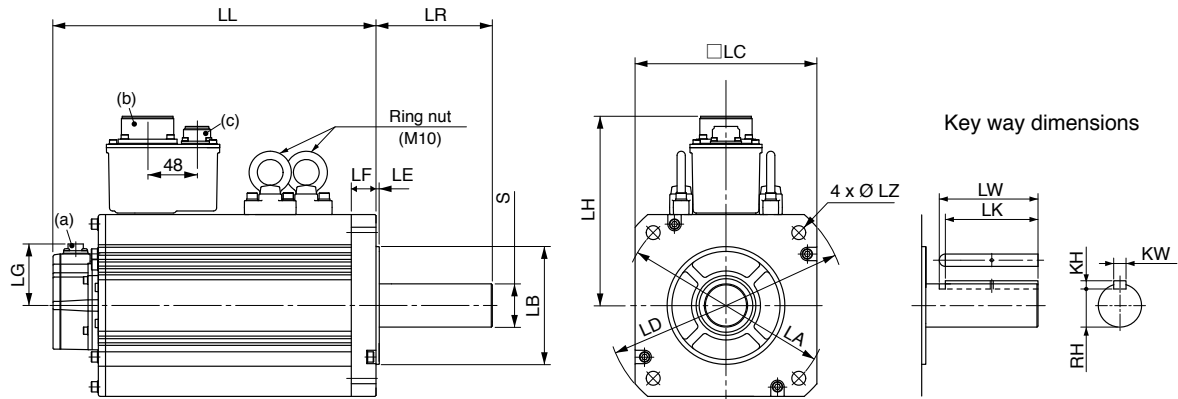


- a) Encoder connector  
b) Motor connector

| MDME (medium inertia) 1kW–1.5kW 200V AC, 2–5kW 400V AC |                       |      |            |            |            |            |            |            |
|--------------------------------------------------------|-----------------------|------|------------|------------|------------|------------|------------|------------|
| Rated power                                            |                       | kW   | 1.0        | 1.5        | 2.0        | 3.0        | 4.0        | 5.0        |
| Motor                                                  | 200V AC               | Type | MDME102G1□ | MDME152G1□ | –          | –          | –          | –          |
|                                                        | 400V AC               |      | –          | –          | MDME204G1□ | MDME304G1□ | MDME404G1□ | MDME504G1□ |
| LL                                                     | Without holding brake | mm   | 138        | 155.5      | 173        | 208        | 177        | 196        |
|                                                        | With holding brake    | mm   | 163        | 180.5      | 198        | 233        | 202        | 221        |
| LR                                                     |                       | mm   | 55         |            | 55         | 65         | 70         |            |
| S                                                      |                       | mm   | Ø 22 h6    |            |            | Ø 24 h6    | Ø 35 h6    |            |
| LA                                                     |                       | mm   | Ø 165      |            |            |            | Ø 233      |            |
| LB                                                     |                       | mm   | Ø 110 h7   |            |            |            | Ø 114.3 h7 |            |
| LC                                                     |                       | mm   | 130        |            |            |            | 176        |            |
| LD                                                     |                       | mm   | Ø 145      |            |            |            | Ø 200      |            |
| LE                                                     |                       | mm   | 6          |            |            |            | 3.2        |            |
| LF                                                     |                       | mm   | 12         |            |            |            | 18         |            |
| LG                                                     |                       | mm   | (84)       |            |            |            |            |            |
| LH                                                     |                       | mm   | (116)      |            | (118)      |            | (140)      |            |
| LZ                                                     |                       | mm   | 4 x Ø 9    |            |            |            | 4 x Ø 13.5 |            |
| Key way                                                | LW                    | mm   | 45         |            |            |            | 55         |            |
|                                                        | LK                    | mm   | 41         |            | 51         |            | 50         |            |
|                                                        | KW                    | mm   | 8 h9       |            |            |            | 10 h9      |            |
|                                                        | KH                    | mm   | 7          |            |            |            | 8          |            |
|                                                        | RH                    | mm   | 18         |            | 20         |            | 30         |            |
| Weight                                                 | Without holding brake | kg   | 5.2        | 6.7        | 8.0        | 11.0       | 15.6       | 18.6       |
|                                                        | With holding brake    | kg   | 6.7        | 8.2        | 9.5        | 12.6       | 18.7       | 21.8       |

□ = Motor type, please refer to page 10.

7.5kW–15kW

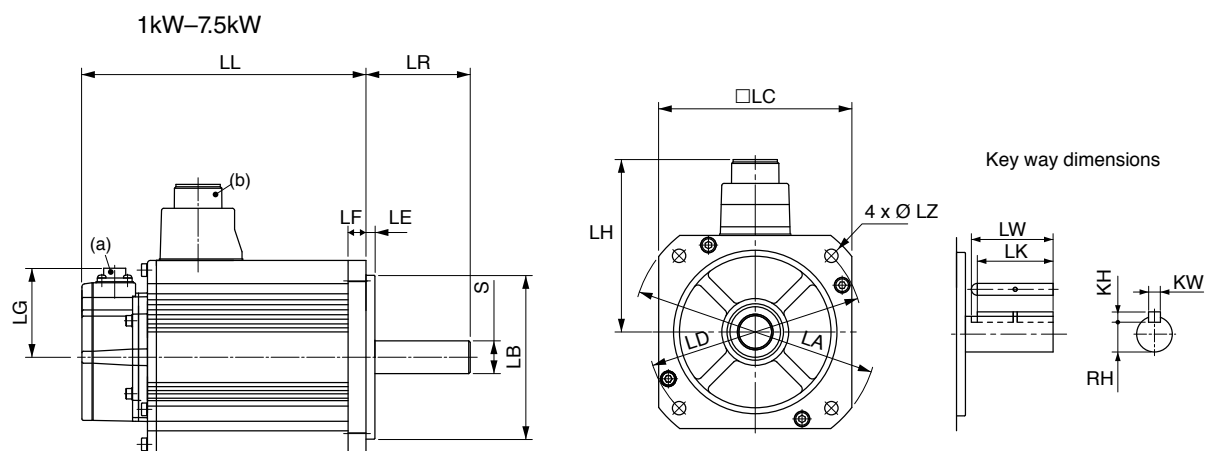


- a) Encoder connector  
b) Brake connector  
c) Motor connector

| MDME (medium inertia) 7.5kW–15kW 400VAC |                       |      |            |            |            |
|-----------------------------------------|-----------------------|------|------------|------------|------------|
| Rated power                             |                       | kW   | 7.5        | 11         | 15         |
| Motor                                   | 400V AC               | Type | MDME754G1□ | MDMEC14G1□ | MDMEC54G1□ |
| LL                                      | Without holding brake | mm   | 312        | 316        | 384        |
|                                         | With holding brake    | mm   | 337        | 364        | 432        |
| LR                                      |                       | mm   | 113        | 116        |            |
| S                                       |                       | mm   | Ø 42 h6    | Ø 55 h6    |            |
| LA                                      |                       | mm   | Ø 233      | Ø 268      |            |
| LB                                      |                       | mm   | Ø 114.3 h7 | Ø 200 h7   |            |
| LC                                      |                       | mm   | 176        | 220        |            |
| LD                                      |                       | mm   | Ø 200      | Ø 235      |            |
| LE                                      |                       | mm   | 3.2        | 4          |            |
| LF                                      |                       | mm   | 24         | 32         |            |
| LG                                      |                       | mm   | (60)       |            |            |
| LH                                      |                       | mm   | (184)      | (205)      |            |
| LZ                                      |                       | mm   | 4 x Ø 13.5 |            |            |
| Key way                                 | LW                    | mm   | 96         | 98         |            |
|                                         | LK                    | mm   | 90         |            |            |
|                                         | KW                    | mm   | 12 h9      | 16 h9      |            |
|                                         | KH                    | mm   | 8          | 10         |            |
|                                         | RH                    | mm   | 37         | 49         |            |
| Weight                                  | Without holding brake | kg   | 36.4       | 52.7       | 70.2       |
|                                         | With holding brake    | kg   | 40.4       | 58.9       | 76.3       |

□ = Motor type, please refer to page 10.

# MINAS A5 motor dimensions



- a) Encoder connector  
b) Motor connector

| MHME (high inertia) 1kW–7.5kW 400V AC |                          |      |            |            |                 |            |                 |                 |                 |
|---------------------------------------|--------------------------|------|------------|------------|-----------------|------------|-----------------|-----------------|-----------------|
| Rated power                           |                          | kW   | 1.0        | 1.5        | 2.0             | 3.0        | 4.0             | 5.0             | 7.5             |
| Motor                                 | 400V AC                  | Type | MHME104G1□ | MHME154G1□ | MH-<br>ME204G1□ | MHME304G1□ | MH-<br>ME404G1□ | MH-<br>ME504G1□ | MH-<br>ME754G1□ |
| LL                                    | Without<br>holding brake | mm   | 173        | 190.5      | 177             | 196        | 209.5           | 238.5           | 357             |
|                                       | With<br>holding brake    | mm   | 198        | 215.5      | 202             | 221        | 234.5           | 263.5           | 382             |
| LR                                    |                          | mm   | 70         |            | 80              |            |                 |                 | 113             |
| S                                     |                          | mm   | Ø 22 h6    |            | Ø 35 h6         |            |                 |                 | Ø 42 h6         |
| LA                                    |                          | mm   | Ø 165      |            | Ø 233           |            |                 |                 |                 |
| LB                                    |                          | mm   | Ø 110 h7   |            | Ø 114.3 h7      |            |                 |                 |                 |
| LC                                    |                          | mm   | 130        |            | 176             |            |                 |                 |                 |
| LD                                    |                          | mm   | Ø 145      |            | Ø 200           |            |                 |                 |                 |
| LE                                    |                          | mm   | 6          |            | 3.2             |            |                 |                 |                 |
| LF                                    |                          | mm   | 12         |            | 18              |            |                 |                 | 24              |
| LG                                    |                          | mm   | (60)       |            |                 |            |                 |                 |                 |
| LH                                    |                          | mm   | (116)      |            | (140)           |            |                 |                 | (184)           |
| LZ                                    |                          | mm   | 4 x Ø 9    |            | 4 x Ø 13.5      |            |                 |                 |                 |
| Key way                               | LW                       | mm   | 45         |            | 55              |            |                 |                 | 96              |
|                                       | LK                       | mm   | 41         |            | 50              |            |                 |                 | 90              |
|                                       | KW                       | mm   | 8 h9       |            | 10 h9           |            |                 |                 | 12 h9           |
|                                       | KH                       | mm   | 7          |            | 8               |            |                 |                 |                 |
|                                       | RH                       | mm   | 18         |            | 30              |            |                 |                 | 37              |
| Weight                                | Without<br>holding brake | kg   | 6.7        | 8.6        | 12.2            | 16         | 18.6            | 23              | 42.3            |
|                                       | With<br>holding brake    | kg   | 8.1        | 10.1       | 15.5            | 19.2       | 21.8            | 26.2            | 46.2            |

□ = Motor type, please refer to page 10.

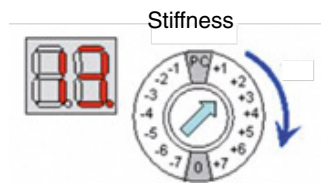
## MINAS LIQI

MINAS LIQI, the simple and cost-effective servo drive solution from Panasonic. Especially for dynamic applications MINAS LIQI offers many advantages as far as reliability, speed, and precision is concerned compared to stepping motors, asynchronous motors or pneumatic solutions. As for the MINAS A5 series, the PANATERM software and the MINAS SELECTION TOOL assist users in setting up and configuring the MINAS LIQI series. The series is optimally suited for the processing industries involving food, packaging, printing, metals, and plastics.



### Features

- Incremental encoder: 2500 pulses per revolution
- Response frequency: 1kHz bandwidth (velocity response)
- PANATERM: Free software for configuration and motion simulation via USB port
- Real-time autotuning function during operation
- Damping (1-200Hz) and notch filters (50-5000Hz)
- Rotary switch (RSW): to set the stiffness manually



| Driver (50W–1000V AC 1-phase)                  |                                       |      |                                                   |               |             |                               |                         |
|------------------------------------------------|---------------------------------------|------|---------------------------------------------------|---------------|-------------|-------------------------------|-------------------------|
| Driver                                         | MINAS LIQI                            | Type | MBDJT2207                                         |               |             | MBDJT2210                     | MCDJT3220               |
|                                                | Frame                                 | mm   | B (D: 55.5 x H: 150 x W: 150)                     |               |             | C (D: 65.5 x H: 150 x W: 190) |                         |
| Rated power                                    |                                       | W    | 50                                                | 100           | 200         | 400                           | 750 1000                |
| Motor (MSMD***J1* low inertia)                 |                                       |      |                                                   |               |             |                               |                         |
| Motor                                          | Type                                  |      | MSMD5AZJ1□                                        | MSMD012J1□    | MSMD022J1□  | MSMD042J1□                    | MSMD082J1□ MSMD102J1□   |
| Nominal torque (peak torque)                   | Nm                                    |      | 0.16 (0.48)                                       | 0.32 (0.95)   | 0.64 (1.91) | 1.3 (3.8)                     | 2.4 (7.1) 3.2 (9.5)     |
| Rated rotational speed (max. rotational speed) | rpm                                   |      | 3000 (5000)                                       |               |             |                               | 3000 (4500) 3000 (4000) |
| Inertia (with holding brake)                   | x10 <sup>-4</sup> kg · m <sup>2</sup> |      | 0.025 (0.027)                                     | 0.051 (0.054) | 0.14 (0.16) | 0.26 (0.28)                   | 0.87 (0.97) 1.16 (1.26) |
| Encoder                                        |                                       |      | 2500ppr, incremental, resolution: 10000           |               |             |                               |                         |
| Degree of protection                           |                                       |      | IP65 (excluding shaft feedthrough and connectors) |               |             |                               |                         |

□ = Motor type

T = With holding brake

S = Without holding brake

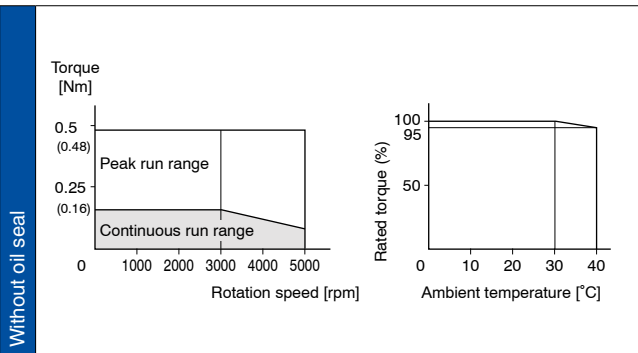
# MINAS LIQI driver functions

| Basic specifications |                      |                       | Frame         | MINAS LIQI |                                                                            |
|----------------------|----------------------|-----------------------|---------------|------------|----------------------------------------------------------------------------|
|                      | Supply voltage       | Main circuit          | 200V          | B          | 1-phase, 220–240V +5%, -10%, 50/60Hz                                       |
|                      |                      |                       |               | C          | 1-phase, 220-240V (+5%, -10%), 50/60Hz                                     |
|                      |                      | Control circuit       |               | B          | 1-phase, 220-240V (+5%, -10%), 50/60Hz                                     |
|                      |                      |                       |               | C          | 1-phase, 220-240V (+5%, -10%), 50/60Hz                                     |
|                      | Operating conditions | Temperature           |               |            | 0–50°C, storage temperature: -20 to +65°C (max. temperature 80°C for 72 h) |
|                      |                      | Ambient humidity      |               |            | Operation and storage: 20–85% RH (non-condensing)                          |
|                      |                      | Altitude              |               |            | Max. 1000m above sea level                                                 |
|                      |                      | Vibration             |               |            | Max. 5.88m/s², 10–60Hz (no continuous use at resonance frequency)          |
|                      | Control method       |                       |               |            | IGBT sinusoidal PWM                                                        |
|                      | Encoder              | Incremental (default) |               |            | 2500ppr (resolution 10000, serial incremental encoder)                     |
|                      | Control signals      |                       | Input points  |            | 6 (multifunctional, customizable)                                          |
|                      |                      |                       | Output points |            | 3 (multifunctional, customizable)                                          |
|                      | Pulse signals        |                       | Input points  |            | 2 (photocoupler, line driver)                                              |
|                      |                      |                       | Output points |            | 3 line driver (A, B and Z-phase) and 1 open collector (Z-phase)            |
|                      | Interface            |                       | USB           |            | Interface to PC, etc.                                                      |
|                      | Front panel          |                       |               |            | 2 digital 7-segment LED displays, 2 digital rotary switches                |
|                      | Braking resistor     |                       |               |            | External braking resistor only                                             |
|                      | Dynamic brake        |                       |               |            | Built-in                                                                   |
|                      | Control mode         |                       |               |            | Position control                                                           |

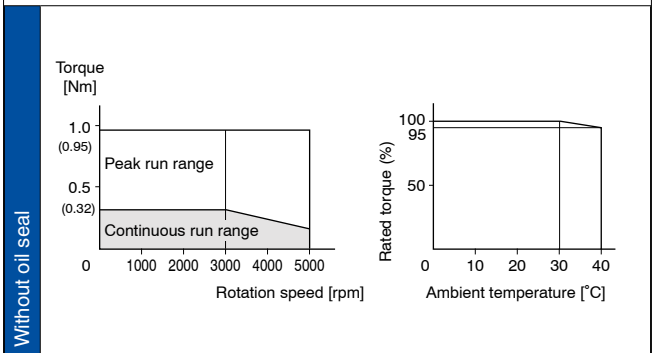
| Functions |                  |                                    |                                          | MINAS LIQI                                                                                                                        |
|-----------|------------------|------------------------------------|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
|           | Position control | Control input                      |                                          | 1. Clear deviation counter<br>2. Command pulse inhibition<br>3. Damping control switching                                         |
|           |                  | Control output                     |                                          | Positioning complete etc.                                                                                                         |
|           |                  | Pulse input                        | Line driver                              | 500kpps                                                                                                                           |
|           |                  |                                    | Signal format                            | Differential input/square-wave pulse                                                                                              |
|           |                  |                                    | Electronic gear                          | Scaling of pulse frequency from 1/1000 to 1000 times                                                                              |
|           |                  |                                    | Smoothing filter                         | Primary delay filter or FIR filter, customizable                                                                                  |
|           |                  | Damping control                    |                                          | Available                                                                                                                         |
|           | Other features   | Autotuning                         |                                          | Automatic adjustment of the servo controller's rigidity to the vibration behavior of the mechanical parts and changes to the load |
|           |                  | Division of encoder feedback pulse |                                          | Any value up to the max. number of encoder pulses                                                                                 |
|           |                  | Protective function                | Error messages causing switch-off        | Overvoltage, undervoltage, overspeed, overload, overheat, overcurrent and encoder error, etc.                                     |
|           |                  |                                    | Error messages requiring acknowledgement | Excessive position deviation, command pulse division error, EEPROM error, etc.                                                    |
|           |                  | Alarm history                      |                                          | Can be logged for reference                                                                                                       |

□ = Motor type, please refer to page 10.

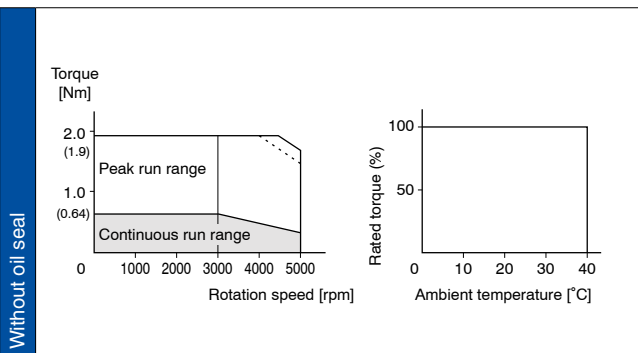
## MSMD5AZJ1□



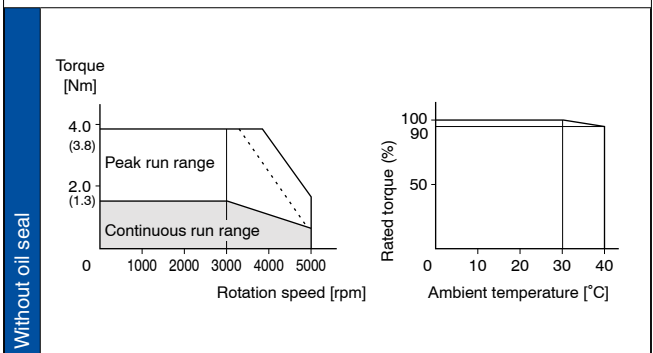
## MSMD012J1□



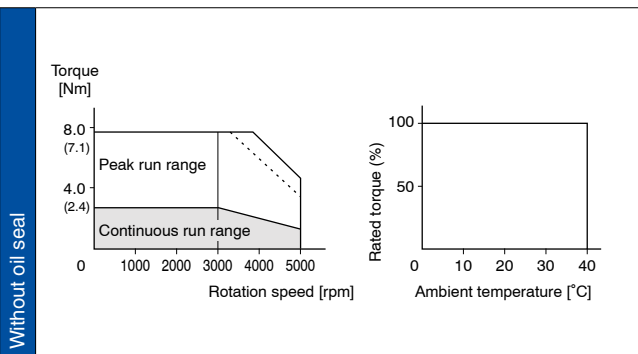
## MSMD022J1□



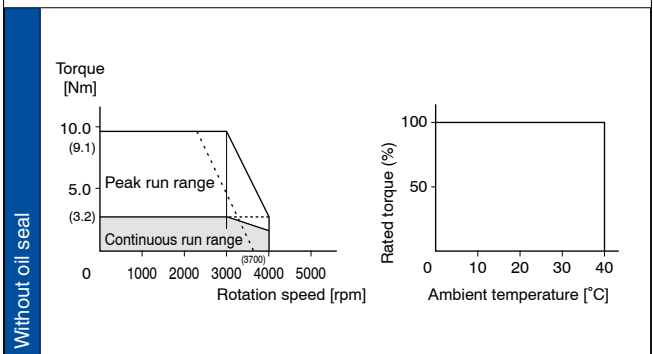
## MSMD042J1□



## MSMD08J1□

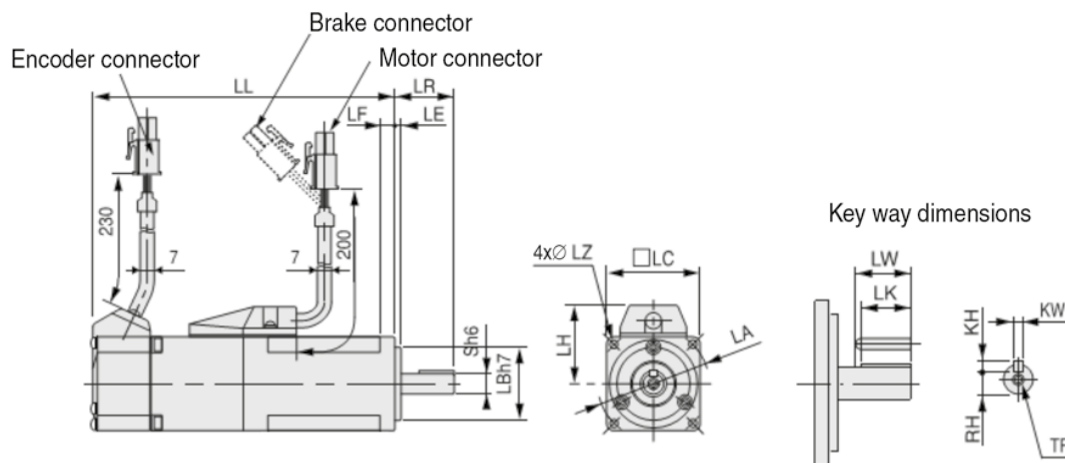


## MSMD102J1□



□ = Motor type, please refer to page 10.

# MINAS LIQI motor dimensions



| MINAS LIQI motors (low inertia)  |    |      |                                            |      |            |      |            |      |            |       |             |       |            |       |
|----------------------------------|----|------|--------------------------------------------|------|------------|------|------------|------|------------|-------|-------------|-------|------------|-------|
| Motor                            |    | Type | MSMD5AZJ1□                                 |      | MSMD012J1□ |      | MSMD022J1□ |      | MSMD042J1□ |       | MSMD082J1□  |       | MSMD102J1□ |       |
| Encoder                          |    |      | 2500ppr, incremental,<br>resolution: 10000 |      |            |      |            |      |            |       |             |       |            |       |
| Motor with/without holding brake |    |      | With-out                                   | With | With-out   | With | With-out   | With | With-out   | With  | With-out    | With  | With-out   | With  |
| LL                               |    | mm   | 72                                         | 102  | 92         | 122  | 79.5       | 116  | 99         | 135.5 | 112         | 149.2 | 127.2      | 164.2 |
| LR                               |    | mm   | 25                                         |      |            |      | 30         |      |            |       | 35          |       |            |       |
| S                                |    | mm   | Ø 8 h6                                     |      |            |      | Ø 11 h6    |      | Ø 14 h6    |       | Ø 19 h6     |       |            |       |
| LA                               |    | mm   | Ø 45 ± 0.2                                 |      |            |      | Ø 70 ± 0.2 |      |            |       | Ø 90 ± 0.2  |       |            |       |
| LB                               |    | mm   | Ø 30 h7                                    |      |            |      | Ø 50 h7    |      |            |       | Ø 70 h7     |       |            |       |
| LC                               |    | mm   | 38                                         |      |            |      | 60         |      |            |       | 80          |       |            |       |
| LE                               |    | mm   | 3                                          |      |            |      |            |      |            |       |             |       |            |       |
| LF                               |    | mm   | 6                                          |      |            |      | 6.5        |      |            |       | 8           |       |            |       |
| LZ                               |    | mm   | 4 x Ø 3.4                                  |      |            |      | 4 x Ø 4.5  |      |            |       | 4 x Ø 6     |       |            |       |
| Key way                          | LW | mm   | 14                                         |      |            |      | 20         |      | 25         |       | 25          |       |            |       |
|                                  | LK | mm   | 12.5                                       |      |            |      | 18         |      | 22.5       |       | 22          |       |            |       |
|                                  | KW | mm   | 3 h9                                       |      |            |      | 4 h9       |      | 5 h9       |       | 6 h9        |       |            |       |
|                                  | KH | mm   | 3                                          |      |            |      | 4          |      | 5          |       | 6           |       |            |       |
|                                  | RH | mm   | 6.2                                        |      |            |      | 8.5        |      | 11         |       | 15.5        |       |            |       |
|                                  | TP | mm   | M3 depth 6                                 |      |            |      | M4 depth 8 |      | M5 depth 8 |       | M5 depth 10 |       |            |       |
| Weight                           |    | kg   | 0.32                                       | 0.53 | 0.47       | 0.68 | 0.82       | 1.30 | 1.2        | 1.7   | 2.3         | 3.1   | 2.8        | 3.6   |

□ = Motor type, please refer to page 10.

## Motor cables (motor – servo driver)

All dimensions are in mm

|                                                                                                                                     |               |  |
|-------------------------------------------------------------------------------------------------------------------------------------|---------------|--|
| MSME motors 50–750W                                                                                                                 | MFMC A0□□0WJD |  |
| MSME motors 1–2kW<br>MDME motors 1–2kW<br>MHME motors 1-1.5kW                                                                       | MFMC D0□□2GCD |  |
| MHME motors 2kW                                                                                                                     | MFMC E0□□2GCD |  |
| MSME motors 3–5kW<br>MDME motors 3–5kW<br>MHME motors 3–5kW                                                                         | MFMC A0□□2GCT |  |
| MSME motors 1–2kW 200V with holding brake<br>MDME motors 1–2kW 200V with holding brake                                              | MFMC A0□□2HCD |  |
| MSME motors 1–2kW 400V with holding brake<br>MDME motors 1–2kW 400V with holding brake<br>MHME motors 1–2kW 400V with holding brake | MFMC E0□□2HCD |  |
| MSME motors 3–5kW with holding brake<br>MDME motors 3–5kW with holding brake<br>MHME motors 3–5kW with holding brake                | MFMC A0□□2HCT |  |
| MSMD motors 50–750W<br>MHMD motors 200–750W<br>MINAS LIQI motors 50W–1kW                                                            | MFMC A0□□0EEL |  |

□□ = Length

01 = 1m

10 = 10m

## Brake cable (motor – servo driver)

All dimensions are in mm

|                                                                          |              |  |
|--------------------------------------------------------------------------|--------------|--|
| MSME motors 50–750W                                                      | MFMCB0□□0PJT |  |
| MSMD motors 50–750W<br>MHMD motors 200–750W<br>MINAS LIQI motors 50W–1kW | MFMCB0□□0GET |  |

## Encoder cable (motor – servo driver)

|                                                                                    |              |  |
|------------------------------------------------------------------------------------|--------------|--|
| MSME motors 50–750W<br>with 17/20-bit incremental encoder                          | MFECA0□□0WJD |  |
| MSME, MDME, MHME motors 900W–15kW<br>with 17/20-bit incremental encoder            | MFECA0□□0GTD |  |
| MINAS LIQI motors 50W–1kW<br>MHMD, MSMD motors 200W–750W                           | MFECA0□□0EAM |  |
| MSME motors 50–750W<br>with 17-bit absolute encoder (battery box)                  | MFECA0□□0GJE |  |
| MSME, MDME, MHME motors 900W–15kW<br>with 17-bit absolute encoder<br>(battery box) | MFECA0□□0GTE |  |

## Control cable (PLC – MINAS LIQI driver)

### Direct connection to FP series PLCs

|                   |                                          |  |
|-------------------|------------------------------------------|--|
| FPΣ (Sigma), FP0R | For 1 axis<br>DV0P0800T01<br>(PNP types) |  |
|-------------------|------------------------------------------|--|

□□ = Length

01 = 1m

10 = 10m

## Control cable (PLC – MINAS A5 driver)

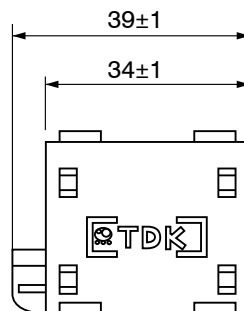
All dimensions are in mm

### Direct connection to FP series PLCs

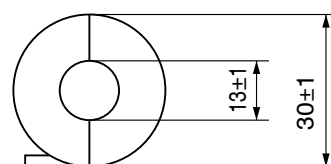
|                                                               |                                                                         |  |
|---------------------------------------------------------------|-------------------------------------------------------------------------|--|
| FPΣ (Sigma)                                                   | For 1 axis<br>DVOP0980W-1<br>(NPN types)<br>DVOP0982W-1<br>(PNP types)  |  |
| FPΣ (Sigma),<br>FP0R                                          | For 1 axis<br>DVOP0988W-1<br>(PNP types)<br>DVOP0989W-1<br>(NPN types)  |  |
| FPΣ (Sigma)                                                   | For 2 axes<br>DVOP0981W-1<br>(NPN types)<br>DVOP0983W-1<br>(PNP types)  |  |
| FPΣ (Sigma)<br>Positioning unit<br>FP2SH<br>Positioning units | For 2 axes<br>DVOP0985W1<br>(transistor)<br>DVOP0986W1<br>(line driver) |  |
| FP7<br>Positioning unit                                       | For 2 axes<br>DVOP0976W1<br>(line driver)<br>DVOP0975W1<br>(transistor) |  |

| Product no.                                        | Details/Comments/Dimensions |             |                                                       |                                 |
|----------------------------------------------------|-----------------------------|-------------|-------------------------------------------------------|---------------------------------|
| Control cable                                      |                             |             |                                                       |                                 |
| DV0P4360                                           | 50W–15kW                    | 50-pin type | I/O cable X4, loose wires, 2m                         |                                 |
| DVOP4360P                                          | 50W–15kW                    | 50-pin type | I/O cable X4, loose wires, 2m, position control       |                                 |
| DVOP4360V                                          | 50W–15kW                    | 50-pin type | I/O cable X4, loose wires, 2m, velocity control       |                                 |
| DV0PM20024CAB020                                   | 50W–15kW                    | 8-pin type  | Communication cable X2, RS485, RS232, loose wires, 2m |                                 |
| DV0PM20025CAB020                                   | 50W–15kW                    | 8-pin type  | Safety cable X3, loose wires, 2m                      |                                 |
| DV0P0800T02                                        | 50W–15kW                    | 26-pin type | I/O cable X4, loose wires, 2m                         |                                 |
| Programming cable                                  |                             |             |                                                       |                                 |
| CABMINIUSB5D                                       | 50W–15kW                    | USB         |                                                       |                                 |
| Connector set for servo driver                     |                             |             |                                                       |                                 |
| DV0P4350                                           | 50W–15kW                    | 50-pin type | I/Os, X4                                              |                                 |
| DVOP0770                                           | 50W–15kW                    | 26-pin type | I/Os, X4                                              |                                 |
| DV0PM20026                                         | 50W–15kW                    | –           | External encoder connector X5                         |                                 |
| Connector set encoder, motor without holding brake |                             |             |                                                       |                                 |
| DVOP4380                                           | 50W–1kW                     | –           | MINAS LIQI/A4                                         |                                 |
| DV0PM20035                                         | 50W–750W                    | –           | MINAS A5, IP67                                        |                                 |
| DV0PM20036                                         | 1kW–2kW                     | –           | MINAS A5 MSME, MDME, MHME 1–1.5kW                     |                                 |
| DV0PM20036A                                        | 1kW–2kW                     | –           | Angled type; MINAS A5 MSME, MDME, MHME 1–1.5kW        |                                 |
| DV0PM20037                                         | 2kW–5kW                     | –           | MINAS A5 MSME 3–5kW, MDME, MHME                       |                                 |
| DV0PM20037A                                        | 2kW–5kW                     | –           | Angled type; MINAS A5 MSME 3–5kW, MDME, MHME          |                                 |
| DV0PM20056                                         | 7.5kW–15kW                  | –           | MINAS A5 MDME; MHME 7.5kW                             |                                 |
| Connector set encoder, motor with holding brake    |                             |             |                                                       |                                 |
| DV0P4390                                           | 50W–1kW                     | –           | MINAS LIQI/A4                                         |                                 |
| DV0PM20040                                         | 50W–750W                    | –           | MINAS A5, IP67, holding brake connector kit           |                                 |
| DV0PM20038                                         | 1kW–2kW                     | –           | MINAS A5 MSME, MDME, MHME 1–1.5kW                     |                                 |
| DV0PM20038A                                        | 1kW–2kW                     | –           | Angled type; MINAS A5 MSME, MDME, MHME 1–1.5kW        |                                 |
| DV0PM20039                                         | 2kW–5kW                     | –           | MINAS A5 MSME 3–5kW, MDME, MHME                       |                                 |
| DV0PM20039A                                        | 2kW–5kW                     | –           | Angled type; MINAS A5 MSME 3–5kW, MDME, MHME          |                                 |
| DV0PM20057                                         | 7.5kW–15kW                  | –           | MINAS A5 MDME; MHME 7.5kW                             |                                 |
| EMC filter                                         |                             |             |                                                       |                                 |
| FN2080-6-06                                        | 50W–1000W                   | 1-phase     | 250VAC, MINAS A5 50W–750W, MINAS LIQI 50W–1000W       |                                 |
| FS21238607                                         | 50W–750W                    | 1-phase     | Footprint filter, 250VAC                              |                                 |
| FN2080-10-06                                       | 1kW–1.5kW                   | 1-/3-phase  | 500V AC                                               |                                 |
| FN3268-7-44                                        | 1kW–3kW                     | 3-phase     | 500V AC                                               |                                 |
| FN3268-16-44                                       | 4kW–5kW                     | 3-phase     | 500V AC                                               |                                 |
| FN3258-30-33                                       | 15kW                        | 3-phase     | 400V AC                                               |                                 |
| DV0P1460                                           | 50W–15kW                    | 1-phase     | Ferrite core, noise filter                            |                                 |
| Braking resistors                                  |                             |             |                                                       |                                 |
| BWD250100                                          | 50W–100W                    | 1-phase     | 100Ω, 100W, 600VAC                                    | 110 x 80 x 15 (L x W x D in mm) |
| BWD250072                                          | 200W–750W                   | 1-phase     | 72Ω, 100W, 600VAC                                     |                                 |
| BWD500035                                          | 1kW–1.5kW                   | 1-phase     | 35Ω, 200W, 600VAC                                     |                                 |
| BWD500150                                          | 1kW–1.5kW                   | 3-phase     | 150Ω, 200W, 600VAC                                    | 216 x 80 x 15 (L x W x D in mm) |
| BWD500100                                          | 2kW                         | 3-phase     | 100Ω, 200W, 600VAC                                    |                                 |
| BWD600047                                          | 3kW–5kW                     | 3-phase     | 47Ω, 240W, 600VAC                                     |                                 |
| BWD600027                                          | 7.5kW                       | 3-phase     | 27Ω, 240W, 600VAC                                     |                                 |
| BWD600027K02LV                                     | 11/15kW                     | 3-phase     | 13.5Ω, 480W, 600VAC                                   |                                 |

Braking resistor



Ferrite core: DVOP1460  
Weight: 62.8g

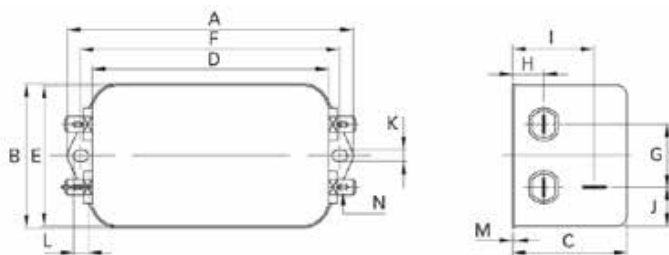


All dimensions are in mm.

## EMC filter

200V AC:

FN2080-6-06 and FS21238607 for MINAS A5 50–750W and MINAS LIQI 50–1000W 1-phase drivers



FN2080-6-06

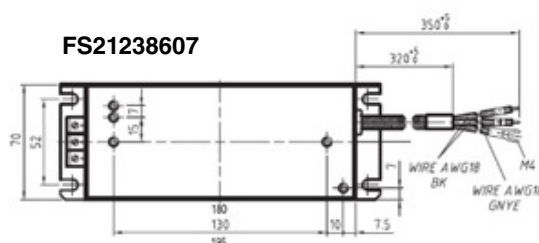
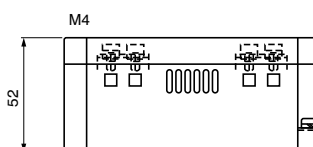
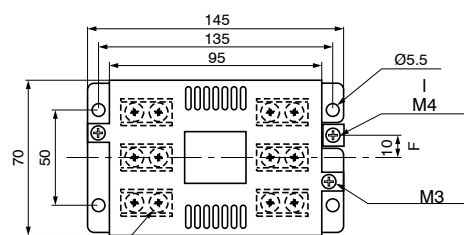


| Dimensions (mm) | FN2080-6-06 |
|-----------------|-------------|
| A               | 113.5       |
| B               | 57.5        |
| C               | 45.4        |
| D               | 94          |
| E               | 56          |
| F               | 103         |
| G               | 25      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

All dimensions  
are in mm.

200V AC:

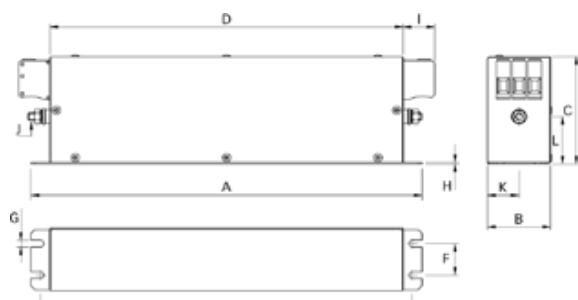
FN2080-10-06 for 1–1.5kW 1-phase driver



FS21238607

400V AC:

FN3268-7-44 for 1–3kW 3-phase driver, FN3268-16-44 for 4–5kW 3-phase driver



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

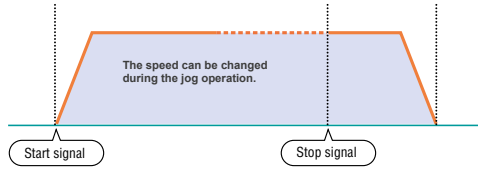
| FP7                                                                                                                                                                                                                                                                                                                                                                    | FP2SH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <p>Modular high-performance PLC</p> <ul style="list-style-type: none"> <li>• Scan time of 11ns/step</li> <li>• Program capacity of 196k steps</li> <li>• Additional program capacity with SDHC memory card</li> <li>• Batteryless data backup</li> <li>• Ethernet 100BASE-TX/10BASE-TX</li> <li>• Expandable with up to 16 units for different applications</li> </ul> | <p>Modular high-performance PLC</p> <ul style="list-style-type: none"> <li>• Scan time of 1ms for 20k steps</li> <li>• As a high-performance PLC with fast scan times ideally suited for electronic device manufacturing</li> <li>• High program capacity of 120k steps</li> <li>• 32k, 60k step type also available</li> <li>• Compatible with Small PC Cards, which serve as a program backup or extended memory for processing a large volume of data</li> <li>• 8192 I/O points max. (remote I/O system)</li> </ul> |

| FPΣ (Sigma)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | FP0R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <p>Very compact high-performance PLC reliably supports the control of higher speed equipment with more functions featured</p> <ul style="list-style-type: none"> <li>• Excellent basic performance, including program capacity of 32k steps, operation speed of 0.32μs/step and 384 I/O points</li> <li>• Built-in 2-axis 100kHz pulse output capable of interpolation control</li> <li>• Positioning units capable of controlling network motion controllers</li> <li>• Can be equipped with up to 3 ports for program controlled communication without expansion unit</li> <li>• Compatible with PROFIBUS, DeviceNet, CANopen and other open field networks</li> </ul> | <p>Pocket-size ultracompact controller ideal for use in extremely narrow spaces</p> <ul style="list-style-type: none"> <li>• Ultrahigh processing speed of 80ns/step within a range of 0 to 3000 steps</li> <li>• Program capacity from 16k–32k steps</li> <li>• 10–128 I/Os</li> <li>• Up to 24 thermocouple input points connectable for multipoint temperature control</li> <li>• Multiaxis control for up to 4 axes available without expansion units</li> <li>• Batteryless backup of all data</li> </ul> |

| FP-X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | FP-X0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                       |
| <p>High-performance compact terminal-block type controller. Wide selection of add-on cassettes allows space saving use of the controller for a variety of purposes</p> <ul style="list-style-type: none"> <li>• Up to three add-on cassettes can be attached to the top of the control unit. The unit is of the terminal block type, but is space saving and allows a variety of applications</li> <li>• Ethernet cassette available for data collection</li> <li>• Built-in 4-axis pulse output. Two axes for linear interpolation</li> <li>• Comment memory for simple maintenance work</li> <li>• USB port for direct connection to a PC</li> </ul> | <p>Entry level, compact, multifunctional PLC</p> <ul style="list-style-type: none"> <li>• Max. 216 I/Os</li> <li>• Combined relay and transistor output (NPN) types</li> <li>• 2 analog input points and a clock/calendar function</li> <li>• Max. 2 serial ports: 1 x RS232C, 1 x RS485</li> <li>• Program capacity: from 2.5k to 8k steps</li> <li>• Data registers: 2550 to 8192 words</li> <li>• Ethernet TCP/IP, Modbus RTU, PLC Link</li> <li>• Motion control functions</li> </ul> |

## Jog positioning control (F171 instruction)

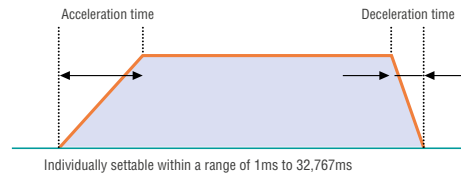
Motion can be started without a preset target value. When a stop signal is input, the target value is set, and the motion is slowed to a stop.



### Useful for

- Labelers: Stopping the motion at a constant distance from the point where a label end detection signal is triggered
- Processing machines: Stopping the motion at a constant distance from the point where a processing object edge detection signal is triggered, and cut/drill the object

## Individual settings for acceleration and deceleration (F171, F172, F174, and F175 instructions)

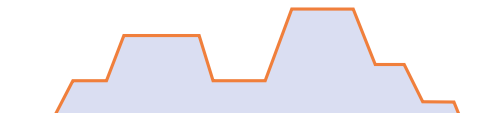


### Useful for

- Labelers: Starting the operation at a relatively low acceleration to prevent tape from breaking
- Stopping the operation at high deceleration when detecting the label end to save the tape

## Changing the speed (F171 and F172 instructions)

The target speed can be changed by an external signal input during the jog or trapezoidal control operation.

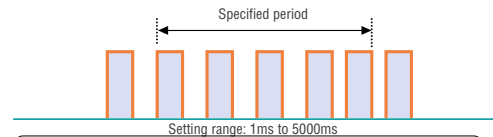


### Useful for

- Speed synchronization of transfer/processing equipment

## Measuring the pulse frequency (F178 instruction)

Pulses input in a specified period by a single instruction are counted, and the frequency is calculated.

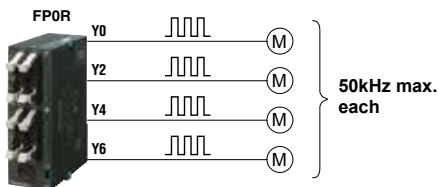


### Useful for

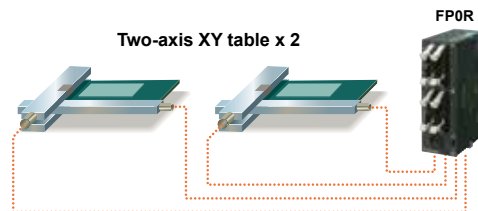
- Detection of motor rotation speed for encoder feedback control

## Built-in 4-axis pulse outputs (Transistor output type)

Multi-axis (4-axis) control is available without expansion units.

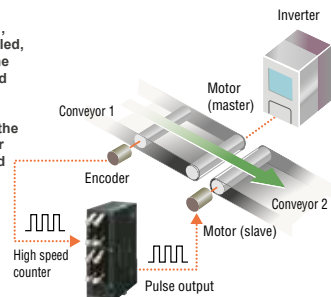


Two sets can simultaneously undergo two-axis linear interpolation (F175 instruction).



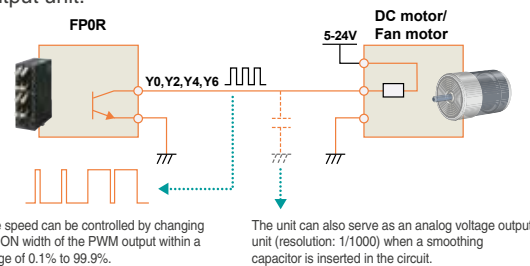
## Simultaneously usable high speed counters (6 channels) and pulse outputs (4 channels)

The speed of conveyor 1, which is inverter-controlled, is measured based on the encoder pulse count, and pulses are output to the slave motor (for jog operation) according to the measured speed in order to synchronize the speed of conveyor 2.



## Built-in multipoint PWM outputs (4 channels)

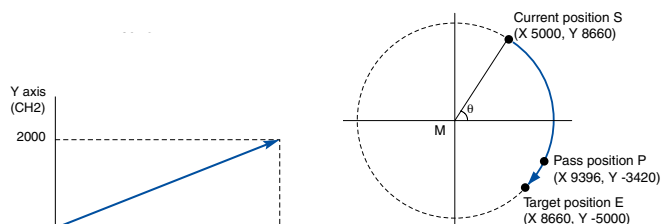
A single FP0R unit can control the speeds of up to six DC motors/fan motors. It also can serve as an analog voltage output unit.



| PLC | Product number | Voltage | Output         | Input points (counters) | Output points (axes) |
|-----|----------------|---------|----------------|-------------------------|----------------------|
|     | AFP0RC16□□     | 24V DC  | Transistor NPN | 8 (6)                   | 8 (4)                |
|     | AFP0RC32□□     |         |                | 16 (6)                  | 16 (4)               |
|     | AFP0RF32□□     |         |                |                         |                      |

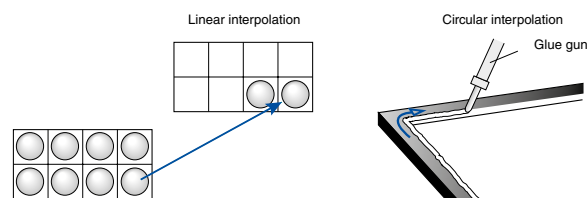
## Integrated linear and circular interpolation control

Interpolation functions enable simultaneous control of two axes. Applications that a compact PLC couldn't previously cope with are no longer a challenge. With linear interpolation, the PLC achieves a coordinated, linear movement of the two axes and controls the speed of each axis. Circular interpolation allows points to be smoothly traversed by arced paths for which the user specifies the orientation plane, the radius of curvature, motion path profile and direction of motion.



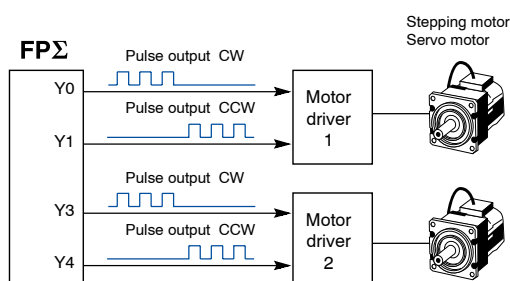
## Simple and intuitive programming

For programming, a preset value table for starting speed, target speed, acceleration/deceleration time, and other factors will be used. Comes with dedicated instructions for each mode: trapezoidal control, home return, JOG operation, free table operation, linear interpolation and circular interpolation.



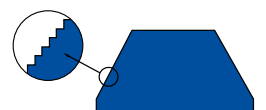
## Clockwise/counter-clockwise output method

Reduce overall costs by designing systems that combine with servo motors and small stepping motors without support for Pulse and Sign method.



## Smooth acceleration/deceleration

You can choose to set up to 60 steps of acceleration/deceleration. This allows for a smoother movement during long acceleration/ deceleration periods of stepping motors.



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

## Home position return

Home search automatically reverses the motor rotation when the positive or negative limit switch is reached and searches for the home position or near home position.

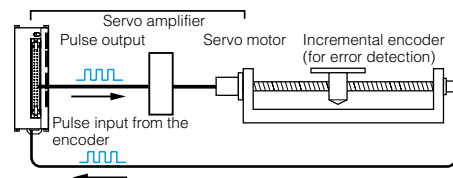
## Pulse output up to 100kHz

A high output frequency and a rapid 0.02ms start allow for a precise and very fast positioning.

### Example:

Positioning unit of the FPΣ (Sigma) CPU

Counts feedback pulses from the encoder to detect errors



| 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 |             |

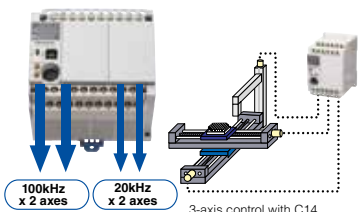
## For low cost multi-axis position control

### Built-in 4-axis pulse output (transistor output type)

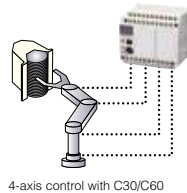
The transistor output type C14 comes with 3-axis while C30/C38 and C60 come with 4-axis pulse output inside the control unit. The multi-axis control, which previously required a higher-level PLC or additional positioning unit, or two or more PLC units, can now be achieved with only one FP-X transistor output type unit in a small space at a low cost. In addition, as this type does not require a pulse I/O cassette as needed for a relay output type, other function expansion cassettes such as communication or analog input can be attached for more diversified applications.

| Characteristic       | Specification                                                                                         |
|----------------------|-------------------------------------------------------------------------------------------------------|
| Max. pulse output    | C14: 100kHz (CH0,1), 20kHz (CH2) C30, C38, C60: 100kHz (CH0,1), 20kHz (CH2,3)                         |
| Pulse output methods | CW/CCW, Pulse + direction                                                                             |
| Function             | Trapezoidal control, multi-stage operation, jog operation, origin return, 2-axis linear interpolation |

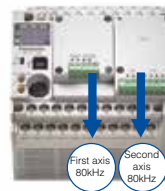
#### XY table + processing head



#### Semiconductor wafer takeout blade



#### 2-axis control with expansion cassettes for relay output types



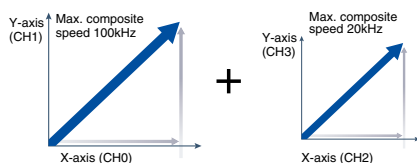
Pulse output up to 2-axis 80kHz is possible by loading 2 pulse I/O cassettes (AFPX-PLS). Also capable of performing 2-axis linear interpolation.

Note:  
Pulse I/O cassette does not work with transistor CPU output type.

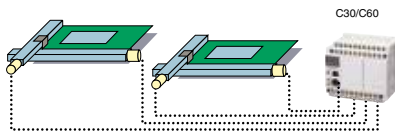
### Linear interpolation simultaneously in 2 sets (transistor output type)

2-axis linear interpolation refers to moving a robot arm or equipment head diagonally on a straight line by simultaneously controlling 2 motor shafts. It is used for palletizing, component pick and place, XY table control, contour cutting of a PC board, etc. This makes the FP-X transistor output type the first compact pulse-output PLC capable of simultaneously controlling linear interpolation for 2 sets of axes. This unit dramatically expands the range of applications along with the added convenience of programming by using the linear interpolation command F175\_PulseOutput\_Linear.

#### Simultaneous control of 2 mechanisms



#### Controls two units of 2-axis XY table



#### 2-axis linear interpolation with relay output types

By adding 2 pulse I/O cassettes (AFPX-PLS), linear interpolation is possible at the maximum composite speed of 80kHz. The command used for this unit is F175\_PulseOutput\_Linear, the same as that for the transistor output types.

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

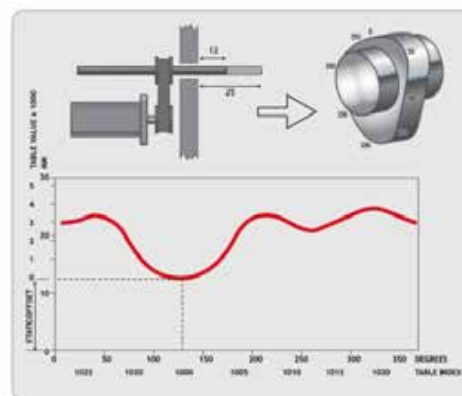
| PLC                                                                                 | Product no. | Voltage     | Output         | Input points | Output points (axes) |
|-------------------------------------------------------------------------------------|-------------|-------------|----------------|--------------|----------------------|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

## FP7

### Features

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

| Product no. | Function           | Output         | Output points (axes) |
|-------------|--------------------|----------------|----------------------|
| AFP7PP02T   | With interpolation | Open collector | 2                    |
| AFP7PP04T   |                    |                | 4                    |
| AFP7PP02L   |                    | Line driver    | 2                    |
| AFP7PP04L   |                    |                | 4                    |



## FP2SH

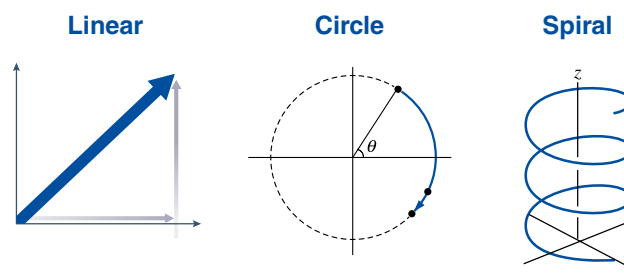
### Positioning units (interpolation type)

#### Features

- A pulse output of up to 4Mpps allows high-speed, high-precision positioning.
- 0.005ms high-speed drive reduces tact-time (start-up time is the time from reception of the CPU unit start-up command to release of the pulse output by the positioning unit).
- 4 axes per unit means versatility and saves space.
- The four types of S-curve acceleration/deceleration control allow for smooth startup and stoppage.
- Feedback pulse count function makes output pulse counting possible for encoders, etc.
- The pulse input function allows users to generate pulses manually to adjust machines, for example

#### Functions

- Linear, circular, and spiral interpolation
- Synchronization operations
- E-point control
- P-point control
- JOG operation function
- Smooth acceleration/deceleration: Linear or in 4 curves sine curve, square curve, cycloid curve, and cubic curve

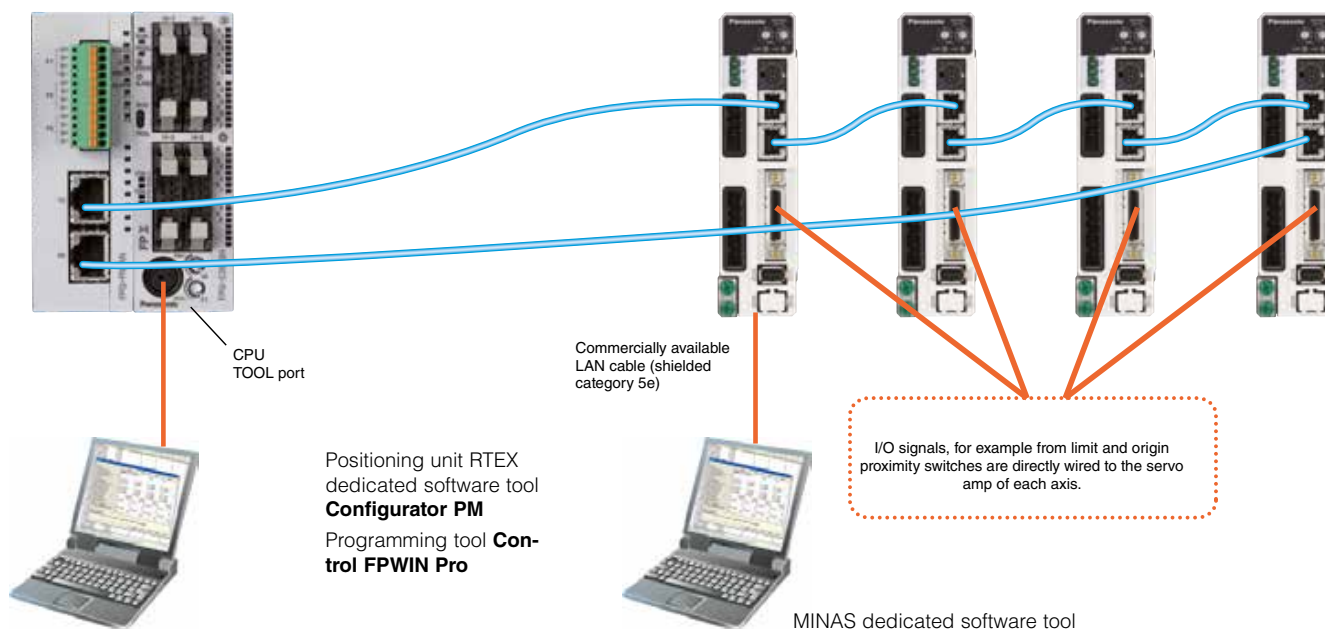


| PLC | Product no. | Program-capacity | Other features           |
|-----|-------------|------------------|--------------------------|
|     | FP2C2LJ     | 32k steps        | -                        |
|     | FP2C2J      | 60k steps        |                          |
|     | FP2C2PJ     | 60k steps        | IC memory card interface |

| Positioning unit | Product no. | Functions             | Output         | Output points (axes) |
|------------------|-------------|-----------------------|----------------|----------------------|
|                  | FP2-PP2T    | With Interpolation    | Open collector | 2                    |
|                  | FP2-PP4T    |                       |                | 4                    |
|                  | FP2-PP2L    |                       | Line driver    | 2                    |
|                  | FP2-PP4L    |                       |                | 4                    |
|                  | FP2PP21     | Without Interpolation | Open collector | 2                    |
|                  | FP2PP41     |                       |                | 4                    |
|                  | FP2PP22     |                       | Line driver    | 2                    |
|                  | FP2PP42     |                       |                | 4                    |

## RTEX - the multiaxis Ethernet servo system

The RTEX positioning units support MINAS A5N network servo drives. A mutually optimized system consisting of PLC and servo driver greatly simplifies installation.



### 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 positioning using high-speed 100Mbit/s communication.
- Minimization of wiring costs by using commercially available Ethernet cables. Position control of 2, 4, or 8 axes for servo drivers with Ethernet (RTEX) interface.
- Dedicated tool software Control Configurator PM supports operations from setup to startup and monitoring.
- Includes manual pulser input allowing support for precision teaching.

### System configuration

Number of positioning units per RTEX unit

FPΣ (Sigma): 2 units (16 axes)

FP2SH: 32 units (256 axes)

### Software Configurator PM for RTEX

The Configurator PM provides powerful yet simple full support ranging from configuration (axis and parameter settings, data table creation, JOG operation, home return, data monitor settings, etc.) to startup and operation monitoring. This saves time and makes commissioning considerably easier.

| Product name                              | FPΣ (Sigma)        | FP2SH | Number of axes | Output type   | Product no. |
|-------------------------------------------|--------------------|-------|----------------|---------------|-------------|
| Positioning units<br>(interpolation type) | •                  |       | 2              | RTEX Ethernet | FPGPN2AN    |
|                                           |                    | •     |                |               | FP2SHPN2AN  |
|                                           | •                  |       | 4              |               | FPGPN4AN    |
|                                           |                    | •     |                |               | FP2SHPN4AN  |
|                                           | •                  |       | 8              |               | FPGPN8AN    |
|                                           |                    | •     |                |               | FP2SHPN8AN  |
| Control Configurator PM                   | for all RTEX units |       |                |               | AFPS66510   |

## Motion control libraries for Control FPDWIN Pro (PLC)

The motion control library contains the most important function blocks, e.g. for relative or absolute positioning and for home returns with linear axes. Panasonic offers libraries for all motion control tasks.

1. CPU Motion Control Library: Position control with FP series control units (FP0R, FPΣ (Sigma), FP-X, FP7)
2. PP Motion Control Library: Positioning with PP motion control units (FPΣ (Sigma), FP2SH),  
FP7: Library is included in the PLC programming software Control FPDWIN Pro.
3. RTEK Motion Control Library: Positioning with RTEK motion control units (FPΣ (Sigma), FP2SH)

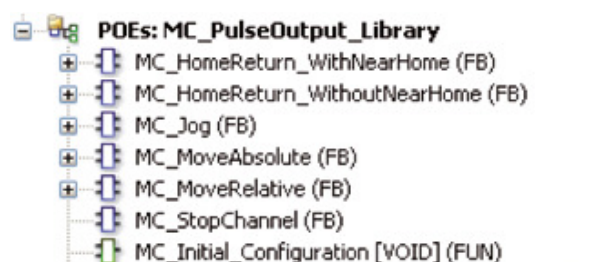
### Advantages of PLC programs using the Motion Control Library

- Free** – just download it from Panasonic's website
- Simple** – easy programming and installation
- Efficient** – ready-to-use function blocks, only 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** – short and easy commissioning (ready-to-use example programs)

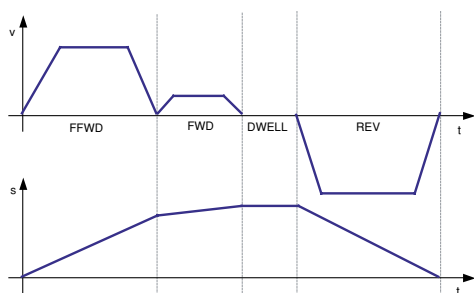
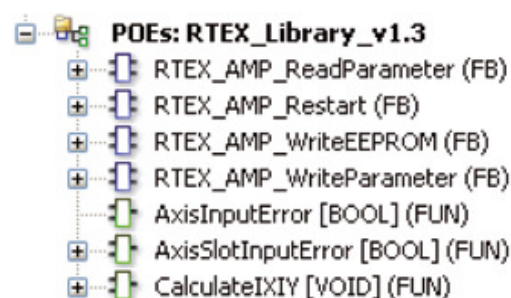


Download the software free of charge from Panasonic's website:  
Home → Downloads → SPS → FPDWIN Pro → Library

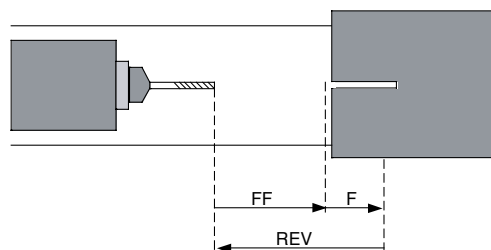
#### MC\_CPU\_Library Motion



#### RTEK Motion Control Library



Time chart



Drilling setup

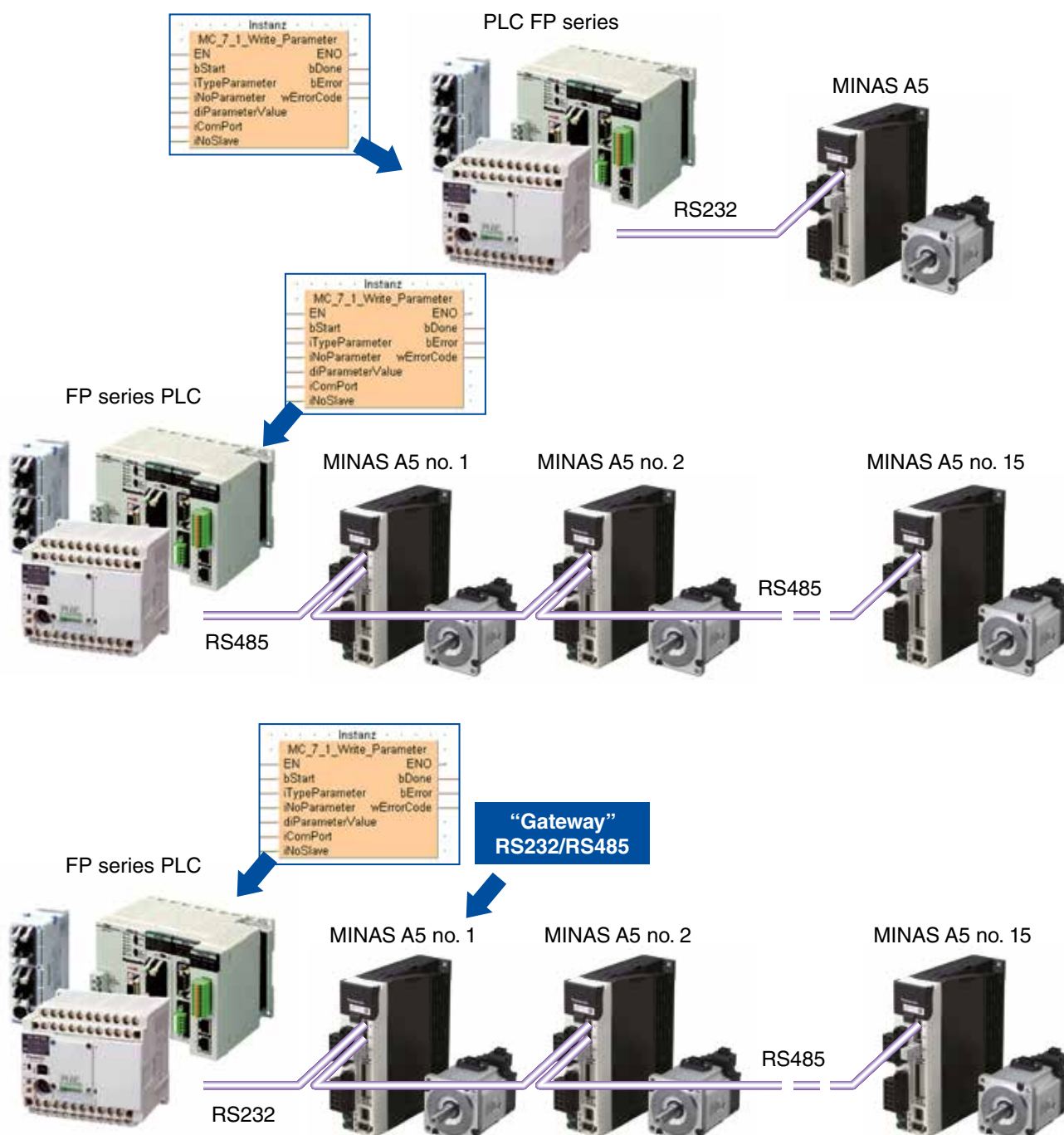
**Free of charge!**

## Direct access to servo drive parameters from the PLC

The libraries enable serial communication (RS232, RS485) between the FP series PLCs and the drivers of the MINAS A5 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. All FP series PLCs come with an RS232 port (RS485 optional).

With RS232 connections, the first driver can be used as a gateway to downstream drivers so that all drivers can communicate with the PLC.



Download the software free of charge from Panasonic's website:  
Home → Downloads → SPS → FPLIN Pro → Library

## Software Configurator PM for RTEX

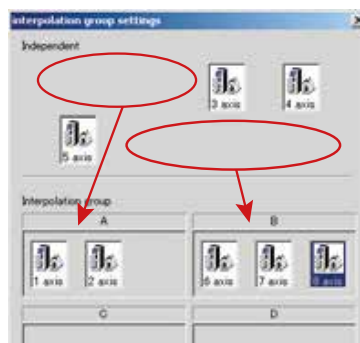
The Configurator PM offers multiple support from configuration (axis and parameter settings, data table creation, JOG operation, home return, data monitor settings, etc.) to startup and operation. This saves time and makes commissioning considerably easier.

### Axis settings

Check the axes to be used. Select the number of axes to be used.

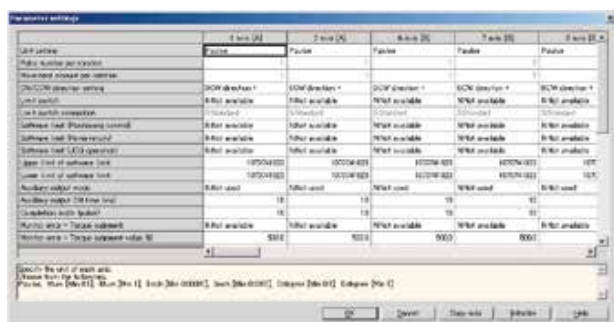


Grouping of axes for interpolation operations is carried out simply by dragging and dropping the relevant axes.



### Parameter settings

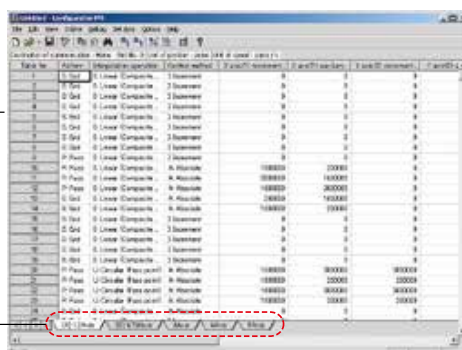
The details of the settings can be displayed in a table. Details on how to create settings for each category are explained in the box below.



### Data table creation

Simple input as in Excel.

Each axis (or each interpolation axis group) has a separate sheet, and data tables for each axis are displayed in an easy-to-understand manner.



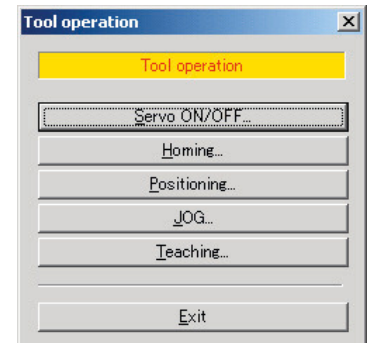
Data tables can be exported as text files in CSV format. This is effective when making printouts for document management.

You can copy parts of a CSV file to a data table using cut & paste.

# Software Configurator PM for RTEX

## Tool operations

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

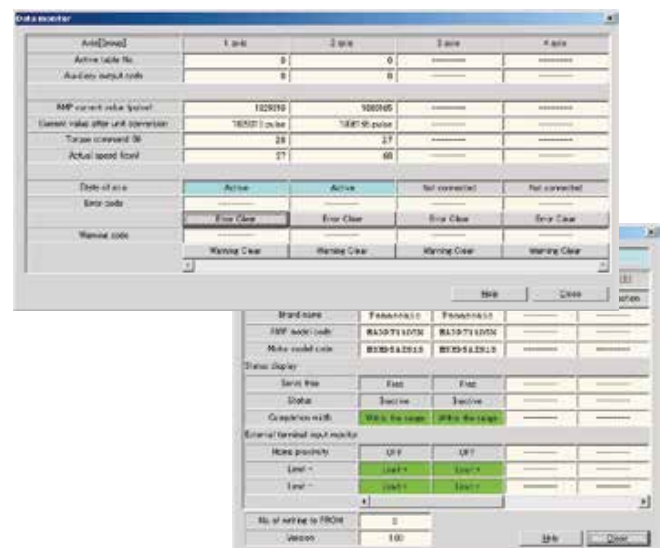


## Data monitor

- Data table no. during operation
- Auxiliary output
- Current position, speed and vector
- Error code, warning code (errors and warnings can also be cleared)

## Status monitor

- Connection status of each axis
- Model code of each motor amp and motor connected
- Servo lock status
- Near home input, limit input

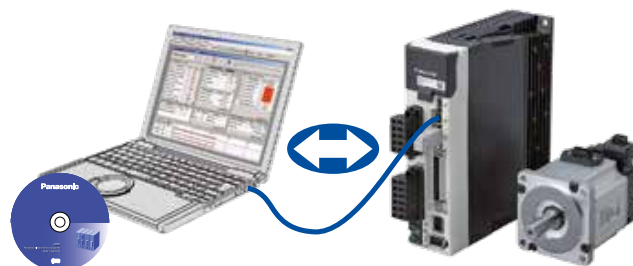


Free of charge!

## Configuring servo drivers

### Configuration software PANATERM for MINAS AC servo motors & drivers

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



#### Basic functions

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

#### Monitoring control conditions

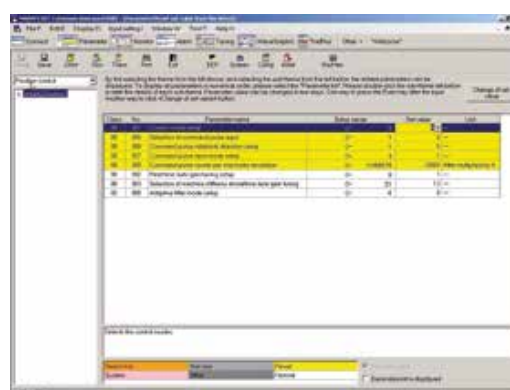
- Monitor
- Settings: control mode, velocity, torque, error and warning
- Driver input signal
- Load conditions: Overview of command/feedback pulses, load ratio, regenerative resistive load ratio
- Alarm
- Display/delete number and contents of the current alarm and the last 14 error events

#### Setup

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

#### Analysis of mechanical operation data (frequency analysis)

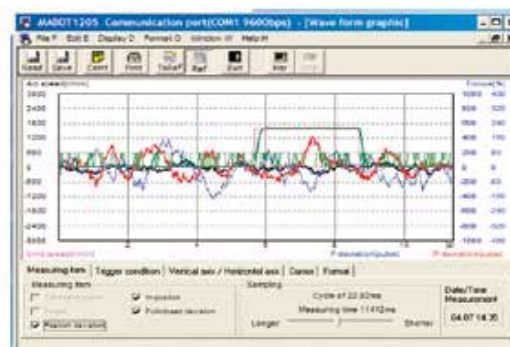
- Measures frequency characteristics of the machine; displays Bode diagram



Parameters



Monitor



Line graph display

Download the software free of charge from Panasonic's website:  
Home → Downloads → SPS → FWIN Pro → Library

**Free of charge!**

# Motor capacity selection software

## M-SELECT software

M-SELECT is a software 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 A5 series in all sizes.

Figure 1



Figure 2



Selecting the motor capacity is done in 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)

Speed, position, ramps, etc.

Figure 3

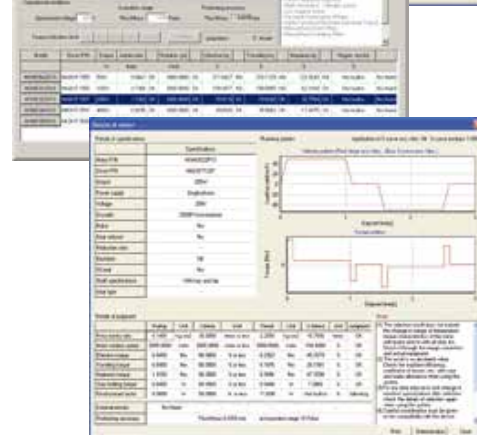


### 3. Select the correct motor series (figure 3)

1- or 3-phase, input voltage, torque, etc. The software calculates the parameters for the series selected and displays the different criteria with OK or NG (not good).

### 4. Check and print result (figure 4)

Figure 4



## MINAS SELECTION TOOLS

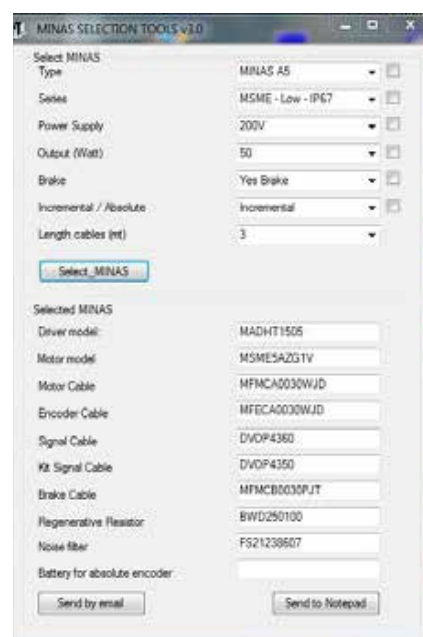
This is an easy-to-use software to help you select the accessories. The software can be installed on any commercially available PC.

### 1. Enter motor data, encoder selection, and cable length

### 2. Click [Select\_MINAS] to display all matching accessories

Drivers, filters, cables, etc.

### 3. You can even have the data sent to you or your customer by e-mail.



Download the software free of charge from Panasonic's website:  
Home → Downloads → SPS → FPWIN Pro → Library

# Memo

## Other Panasonic products

Panasonic Electric Works offers a wide product range from one source, from individual components to complete systems. Technology support for advice, design-in, installation and commissioning by our qualified application engineers round off the Panasonic service profile.



### Human machine interfaces

Our compact size, bright and easy-to-read human machine interfaces can be used to visualize inspection results. Touch panels can even replace the standard keypad if you so desire.



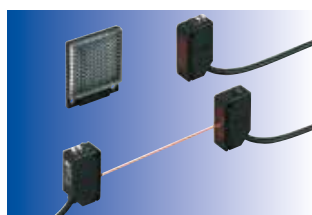
### UV curing systems

Aicure UJ30 is a LED curing system that quickly hardens UV-sensitive resins such as adhesives, ink and coatings. Its cutting edge LED technology is especially suited for precise, high-intensity curing.



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Components such as Eco-POWER METERS, timers/counters, temperature controllers, limit switches and fans round off our wide factory automation product range.



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As a pioneering manufacturer of sensors, Panasonic provides high performance sensors for a wide range of applications, facilitating factory automation in various types of production lines, such as those used for the manufacturing of semiconductors.



### Laser Markers

Panasonic Laser Markers are ideal for non-contact, permanent labeling of most materials, e.g. metal, plastics, glass, paper, wood and leather. Several CO<sub>2</sub> laser marking systems and a unique FAYb fiber laser marker can be easily integrated into existing production systems for a great variety of marking tasks.



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