

Frequency converter

M-MAX

Quick Start Guide

12/08 AWB8230-1604en

MOELLER 

An Eaton Brand

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Danger! **Dangerous electrical voltage!**

Before commencing the installation

- Disconnect the power supply of the device.
- Ensure that devices cannot be accidentally restarted.
- Verify isolation from the supply.
- Earth and short circuit the device.
- Cover or enclose any adjacent live components.
- Follow the engineering instructions (AWA) for the device concerned.
- Only suitably qualified personnel in accordance with EN 50110-1/-2 (VDE 0105 Part 100) may work on this device/system.
- Before installation and before touching the device ensure that you are free of electrostatic charge.
- The functional earth (FE, PES) must be connected to the protective earth (PE) or the potential equalisation. The system installer is responsible for implementing this connection.
- Connecting cables and signal lines should be installed so that inductive or capacitive interference does not impair the automation functions.
- Install automation devices and related operating elements in such a way that they are well protected against unintentional operation.
- Suitable safety hardware and software measures should be implemented for the I/O interface so that an open circuit on the signal side does not result in undefined states in the automation devices.
- Ensure a reliable electrical isolation of the extra-low voltage of the 24 V supply. Only use power supply units complying with IEC 60364-4-41 (VDE 0100 Part 410) or HD384.4.41 S2.
- Deviations of the mains voltage from the rated value must not exceed the tolerance limits given in the specifications, otherwise this may cause malfunction and dangerous operation.
- Emergency stop devices complying with IEC/EN 60204-1 must be effective in all operating modes of the automation devices. Unlatching the emergency-stop devices must not cause a restart.
- Devices that are designed for mounting in housings or control cabinets must only be operated and controlled after they have been installed and with the housing closed. Desktop or portable units must only be operated and controlled in enclosed housings.
- Measures should be taken to ensure the proper restart of programs interrupted after a voltage dip or failure. This should not cause dangerous operating states even for a short time. If necessary, emergency-stop devices should be implemented.
- Wherever faults in the automation system may cause injury or material damage, external measures must be implemented to ensure a safe operating state in the event of a fault or malfunction (for example, by means of separate limit switches, mechanical interlocks etc.).
- Depending on their degree of protection, frequency inverters may contain live bright metal parts, moving or rotating components or hot surfaces during and immediately after operation.
- Removal of the required covers, improper installation or incorrect operation of motor or frequency inverter may cause the failure of the device and may lead to serious injury or damage.
- The applicable national accident prevention and safety regulations apply to all work carried on live frequency inverters.
- The electrical installation must be carried out in accordance with the relevant regulations (e. g. with regard to cable cross sections, fuses, PE).
- Transport, installation, commissioning and maintenance work must be carried out only by qualified personnel (IEC 60364, HD 384 and national occupational safety regulations).
- Installations containing frequency inverters must be provided with additional monitoring and protective devices in accordance with the applicable safety regulations. Modifications to the frequency inverters using the operating software are permitted.

- All covers and doors must be kept closed during operation.
- To reduce the hazards for people or equipment, the user must include in the machine design measures that restrict the consequences of a malfunction or failure of the drive (increased motor speed or sudden standstill of motor). These measures include:
 - Other independent devices for monitoring safety-related variables (speed, travel, end positions etc.).
 - Electrical or non-electrical system-wide measures (electrical or mechanical interlocks).
 - Never touch live parts or cable connections of the frequency inverter after it has been disconnected from the power supply. Due to the charge in the capacitors, these parts may still be live after disconnection. Fit appropriate warning signs.

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About This Manual

This manual is a quick start guide for the M-MAX series of frequency converters. It is aimed at experienced power drive specialists and describes how to handle and operate these devices in general.

We assume that you have a good knowledge of engineering fundamentals and that you are familiar with handling electrical systems and machines, as well as with reading technical drawings.

→ This manual was created in an electronic format. You can also order a hard copy version of it.

→ All the specifications in this manual refer to the hardware and software versions documented in it.


Writing Conventions


The symbols used in this manual have the following meanings:

▶ Indicates instructions to be followed

→ Indicates useful tips and additional information.

 **Caution!**
Warns about the possibility of minor property damage.

 **Warning!**
Warns about the possibility of serious property damage and minor injuries.

 **Danger!**
Warns about the possibility of major property damage and serious injuries or death.

In order to make it easier to follow the manual, the name of the current chapter is shown on the header of the left-hand page and the name of the current section is shown on the header of the right-hand page. This does not apply to pages at the start of a chapter or to empty pages at the end of a chapter.

→ In order to make it easier to understand some of the figures included in this manual, the housing of the frequency converter, as well as other safety-relevant parts, have been left out. However, it is important to note that the frequency converter must always be operated with its housing placed properly, as well as with all required safety-relevant parts.

→ Please follow the installation instructions in the AWA8230-2416 installation instructions document.

→ For more detailed indications and explanations on project planning, installation, and parameter configuration, please consult manual AWB8230-1603.

The complete documentation for the M-MAX series of frequency converters is stored electronically on a CD-ROM. This CD-ROM is part of the scope of supply.

For additional documentation, please visit www.moeller.net → Support → Download Center.

Abbreviations and Symbols

The abbreviations and symbols used in this manual have the following meanings:

EMC	Electromagnetic compatibility
FS	Frame Size
GND	Ground, 0 V potential
IGBT	Insulated-gate bipolar transistor
PDS	Power Drives System
PES	EMC connection to PE for shielded lines
PNU	Parameter number
UL	Underwriters Laboratories

M-MAX frequency converters are divided into two voltage categories:

- 230 V (MMX12..., MMX32...)
- 400 V (MMX34...)

These voltage categories are based on standardized nominal line voltage values (IEC 60038, VDE 017-1) at the electric utility's (EVU) supply terminal:

- 230 V ± 10 % (50/60 Hz)
- 400 V ± 10 % (50/60 Hz)

The wide tolerance range of frequency inverter M-MAX takes into account a permissible voltage drop of an additional 4 % ($U_{LN} - 14$ %) in load networks, while, in the 400 V category, it takes into account the North American line voltage of 480 V +10 % (60 Hz).

The permissible connection voltages for the M-MAX series are listed in the Technical Specifications section (→ section "Technical Specifications").

Units

Every physical dimension included in this manual uses international metric system units, otherwise known as SI (Système International d'Unités) units. For the purpose of the equipment's UL certification, some of these dimensions are accompanied by their equivalents in imperial units.

Table 1: Unit conversion examples

Designation	US-American value	SI value	Conversion value	US-American designation
Length	1 inch (")	25.4 mm	0.0394	Inch
Power	1 HP = 1.014 PS	0.7457 kW	1.341	Horsepower
Torque	1 lbf in	0.113 Nm	8.851	Pound-force inches
Temperature	1 °F (T_F)	-17.222 °C (T_C)	$T_F = T_C \times 9/5 + 32$	Fahrenheit
Speed	1 rpm	1 min ⁻¹	1	Revolutions per minute
Weight	1 lb	0.4536 kg	2.205	Pound

1 M-MAX Series

Checking the Delivery

M-MAX frequency converters have been carefully packaged and prepared for delivery. These devices should only be shipped in their original packaging with suitable transportation materials. Please take note of the labels and instructions on the packaging, as well as of those meant for the unpacked device. Open the packaging with adequate tools and inspect the contents immediately after receipt in order to ensure that they are complete and undamaged.

The packaging must contain the following parts:

- An M-MAX frequency converter
- An accessory kit for EMC-suitable installation,
- Installation instructions AWA8230-2416,
- A data carrier (CD-ROM) with documentation and parameter configuration software

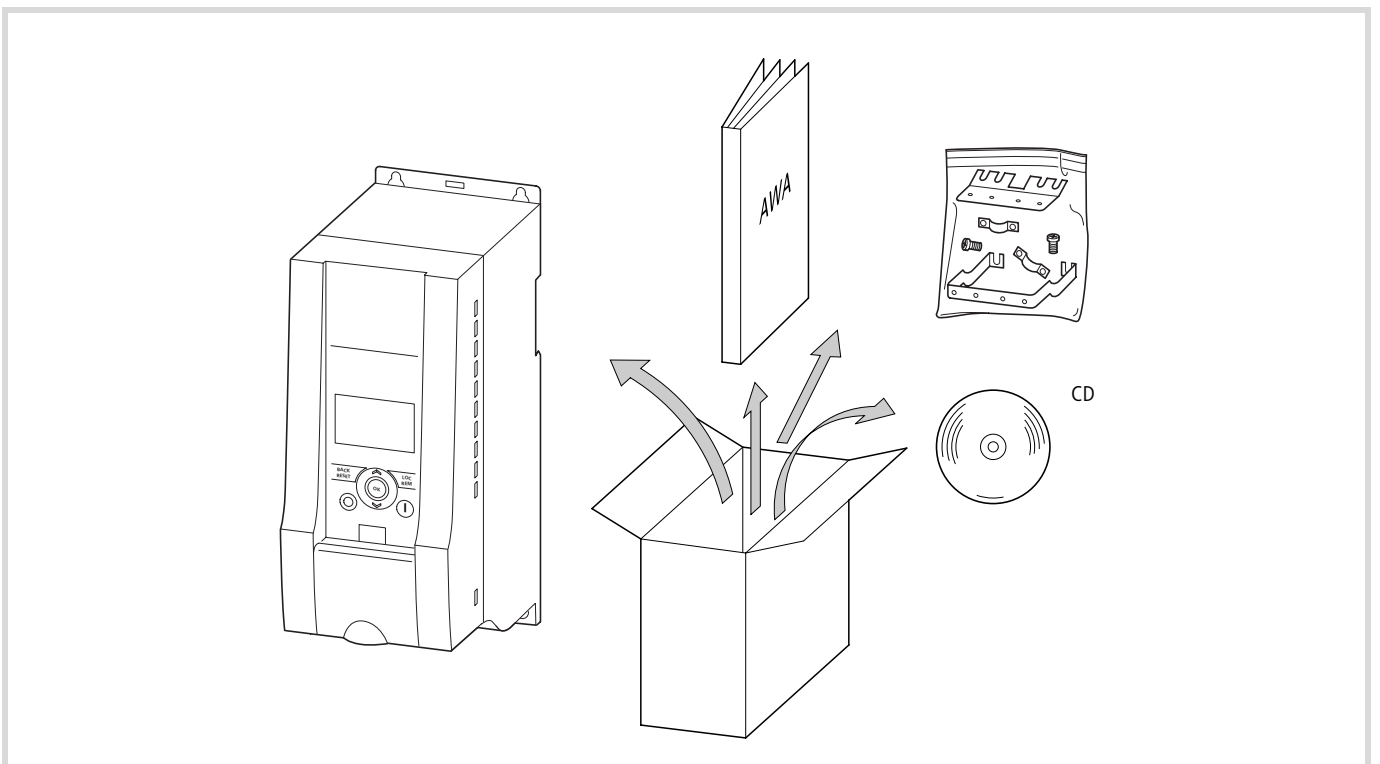


Figure 1: Scope of supply

Rating and Rating Plate

The rating for M-MAX frequency converters is indicated on the corresponding rating plate, located on the side of the device.




Figure 2: Rating plate on side of device



Figure 3: M-MAX frequency converter rating plate (example)

The inscription of the nameplate has the following meaning (example):

Label	Meaning
MMX34AA3D3F0-0	Classification: MMX = M-MAX series frequency converter 3 = Three-phase power connection 4 = 400 V voltage category AA = Instance (Software version A and alphanumerical display) 3D3 = 3.3 A rated current (3-decimal-3) F = Integrated radio interference suppression filter 0 = IP20 protection type -0 = No integrated optional assembly
Input	Power connection rating: Three-phase AC voltage (U_e 3~ AC), 380 - 480 V voltage, 50/60 Hz frequency, input phase current (4.0 A)
Output	Load side (motor) rating: Three-phase AC voltage (0 - U_e), output phase current (3.3 A), output frequency (0 - 320 Hz)
Motor	Assigned motor rating 1.1 kW at 400 V/1.5 HP at 460 V for a four-pole internally-cooled or surface-cooled three-phase asynchronous motor (1500 min ⁻¹ at 50 Hz/ 1800 rpm at 60 Hz)
S/N	Serial number
	Frequency converters are electrical equipment. Please read the AWB8230-1603 manual before connecting them and/or placing them into operation.
Max amb. 50 °C	The maximum ambient temperature during operation may not exceed +50 °C.

Technical Specifications

Classification	Rated current	Overload current (150 %)	Assigned motor rating				Installation size
	I_e	I_{150}	P (230 V, 50 Hz)		P (230 V, 60 Hz)		
	[A]	[A]	[kW]	[A] ¹⁾	[HP]	[A] ¹⁾	

**Power connection voltage: 1 AC 230 V, 50/60 Hz
(177 - 264 V \pm 0 %, 45 - 66 Hz \pm 0 %)**

MMX12AA1D7F0-0	1.7	2.6	0.25	1.4	-	-	FS1
MMX12AA2D4F0-0	2.4	3.6	0.37	2	1/2	2.2	FS1
MMX12AA2D8F0-0	2.8	4.2	0.55	2.7	-	-	FS1
MMX12AA3D7F0-0	3.7	5.6	0.75	3.2	3/4	3.2	FS1
MMX12AA4D8F0-0	4.8	7.2	1.1	4.6	1	4.2	FS2
MMX12AA7D0F0-0	7	10.5	1.5	6.3	2	6.8	FS2
MMX12AA9D6F0-0	9.6	14.4	2.2	8.7	3	9.6	FS3

**Power connection voltage: 3AC 230 V, 50/60 Hz
(177 - 264 V \pm 0 %, 45 - 66 Hz \pm 0 %)**

MMX32AA1D7F0-0	1.7	2.6	0.25	1.4	-	-	FS1
MMX32AA2D4F0-0	2.4	3.6	0.37	2	1/2	2.2	FS1
MMX32AA2D8F0-0	2.8	4.2	0.55	2.7	-	-	FS1
MMX32AA3D7F0-0	3.7	5.6	0.75	3.2	3/4	3.2	FS1
MMX32AA4D8F0-0	4.8	7.2	1.1	4.6	1	4.2	FS2
MMX32AA7D0F0-0	7	10.5	1.5	6.3	2	6.8	FS2
MMX32AA9D6F0-0	9.6	14.4	2.2	8.7	3	9.6	FS3

1) Rated motor currents for normal four-pole internally-cooled and surface-cooled three-phase asynchronous motors (1500 min⁻¹ at 50 Hz, 1800 min⁻¹ at 60 Hz)

Classification	Rated current	Overload current (150 %)	Assigned motor rating				Installation size
	I_e [A]	I_{150} [A]	P (400 V, 50 Hz) [kW]	[A] ¹⁾	P (460 V, 60 Hz) [HP]	[A] ¹⁾	
Power connection voltage: 3AC 400 V, 50/60 Hz (323 - 528 V \pm0 %, 45 - 66 Hz \pm0 %)							
MMX34AA1D3F0-0	1.3	2	0.37	1.1	1/2	1.1	FS1
MMX34AA1D9F0-0	1.9	2.9	0.55	1.5	3/4	1.6	FS1
MMX34AA2D4F0-0	2.4	3.6	0.75	1.9	1	2.1	FS1
MMX34AA3D3F0-0	3.3	5	1.1	2.6	1-1/2	3	FS1
MMX34AA4D3F0-0	4.3	6.5	1.5	3.6	2	3.4	FS2
MMX34AA5D6F0-0	5.6	8.4	2.2	5	3	4.8	FS2
MMX34AA7D6F0-0	7.6	11.4	3	6.6	5	7.6	FS3
MMX34AA9D0F0-0	9	13.5	4	8.5	5	7.6	FS3
MMX34AA012F0-0	12	18	5.5	11.3	7-1/2	11	FS3
MMX34AA014F0-0	14	21	7.5 ²⁾	(15.2)	10 ²⁾	14	FS3

1) Rated motor currents for normal four-pole internally-cooled and surface-cooled three-phase asynchronous motors (1500 min⁻¹ at 50 Hz, 1800 min⁻¹ at 60 Hz)

2) Allocated motor output at a maximum ambient temperature of +40 °C and a maximum pulse frequency of 4 kHz

General Operational Characteristics

Designation	Explanation
Operating mode	Sensorless vector control / V/f control (changeable)
Output current	Rated current at max. temperature of +50 °C; overload capacity: 150 % for 60 seconds every 600 seconds Starting current: 200 % for 2 seconds every 20 seconds
Output frequency	0 - 320 Hz; factory setting: 50 Hz; increments: 0.01 Hz
Pulse frequency	1 - 16 kHz; factory setting: 6 kHz; increments: 0.1 kHz
Motor cable	Maximum length: 30 m
Ambient temperature during operation	-10 °C (without formation of ice) to +50 °C at rated current
Humidity	0 - 95 % relative humidity without condensate
Installation altitude	Up to 1,000 m above sea level with 100 % rated current; up to 2,000 m with a 1 % reduction for every 100 m
Protection type	<ul style="list-style-type: none"> • IP20 • IP21 (NEMA1) with one of the following options (assigned to the installation size): MMX-IP21-FS1, MMX-IP21-FS2, MMX-IP21-FS3
Protective functions	Overvoltage, undervoltage, ground fault detection in motor and motor line when starting, excessive temperature, overcurrent, motor overload, motor underload, motor blocking
EMC measures	Meets the EMC requirements of product standard IEC/EN 61800-3 for operation in the 1st and 2nd environments according to categories C2 and C3 with a shielded motor line, as well as the requirements of category C4 for IT networks.

M-MAX Designation

The following drawing shows an M-MAX device.

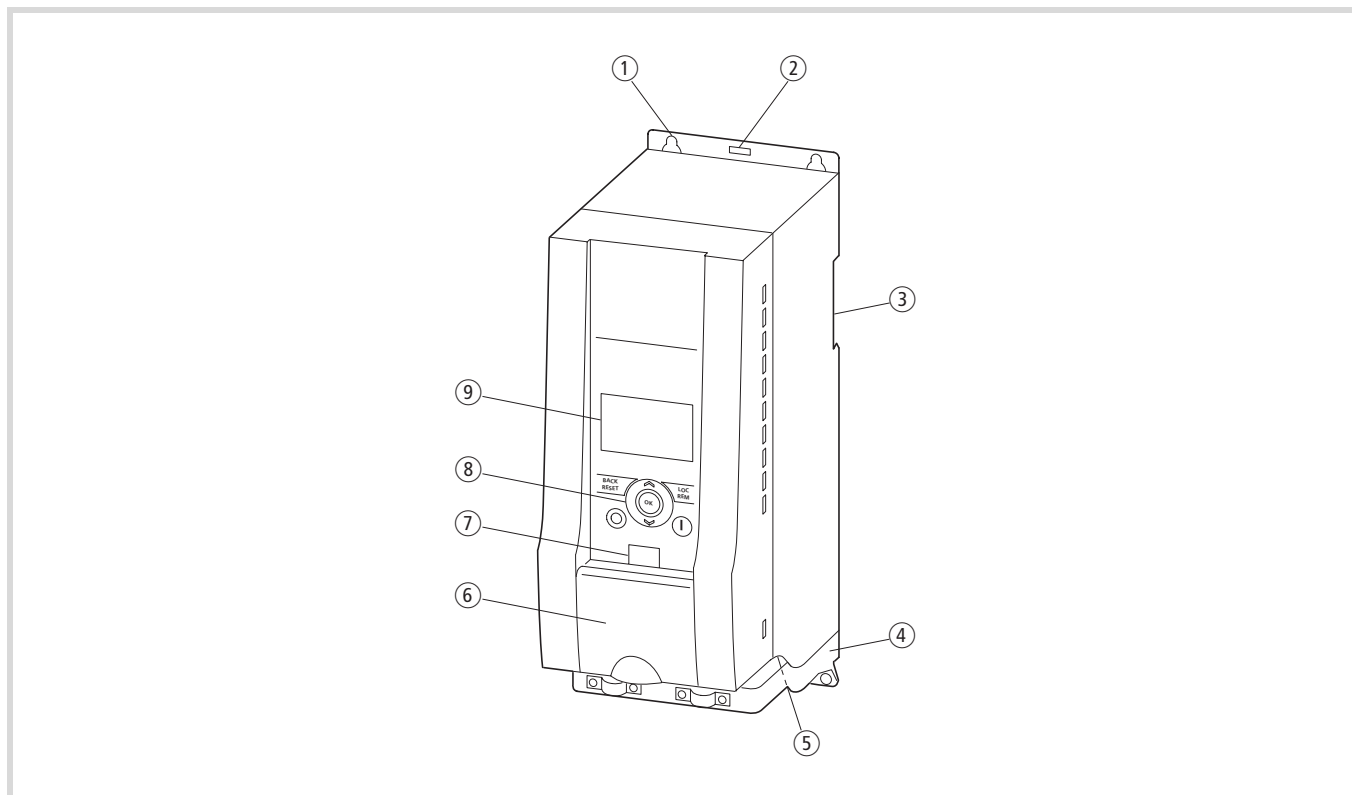


Figure 4: Designations on M-MAX

- ① Mounting holes (screw fastening)
- ② Release (removal from mounting rail)
- ③ Recess for mounting on mounting rail (DIN EN 50022-35)
- ④ EMC installation accessories
- ⑤ Power section terminals
- ⑥ Cover for control signal terminals
- ⑦ Interface for options
- ⑧ Control unit
- ⑨ Display unit (LCD)

2 Installation

The installation process for the M-MAX device is described below.

Safety Instructions


→ Please follow the installation instructions described in the AWA8230-2416 installation instructions document included with the scope of supply of the M-MAX unit.


→ Install the frequency converter only on a nonflammable mounting base (e.g., on a metal plate).


The M-MAX can be installed directly on a mounting rail (top hat rail) or with bolts. The corresponding dimensions for installing the device with bolts are listed on the back of the housing.


→ During installation, please take into account all the clearances required for air circulation and for sufficient cooling.

→ While installing and/or assembling the frequency converter, cover all ventilation slots in order to ensure that no foreign bodies can enter the device.

 **Warning!**
Carry out wiring work only after the frequency converter has been correctly mounted and secured.

 **Danger!**
Electric shock hazard - risk of injuries!
Carry out wiring work only if the unit is de-energized.

 **Caution!**
Fire hazard!
Only use cables, protective switches, and contactors that feature the indicated permissible nominal current value.

 **Caution!**
Ground contact currents in frequency converters are greater than 3.5 mA (AC). According to product standard IEC/EN 61800-5-1, an additional equipment grounding conductor must be connected, or the cross-section of the equipment grounding conductor must be at least 10 mm².

General Installation Instructions

- Always lay the motor cable at an adequate distance (> 300 mm) from other cables, and make sure not to have lines running parallel to each other. Cross other cables or lines at a 90-degree angle.
- Make sure that the motor cable, and the cables to the braking resistors if necessary, are shielded when laid. The cable shielding must be laid on a large area on both cable ends to ground potential (PES).
- The motor and the frequency converter require a connection with a ground lead (PE) at the terminal points marked for this purpose.
- Leads in control and signal lines should be twisted and shielded preferably. Cable shielding is placed on one face and on a large area to ground potential (PE) (preferably in the proximity of the control voltage source).
- Cable installations according to UL specifications require the use of approved copper cables with a heat resistance of +60/75 °C.
- During dielectric strength tests for motors, motor cables, and power cables, the connecting lines on the frequency converter (L1, L2/N, L3, U/T1, V/T2, W/T3) must be disconnected.
- Do not connect any cables to unmarked terminals in the power section. These terminals do not have any function (dangerous voltage).
- Carry out all installation work with the specified tools only, and without the use of force.

Control signal terminals

The control section, with the corresponding control signal terminals, is shown below.

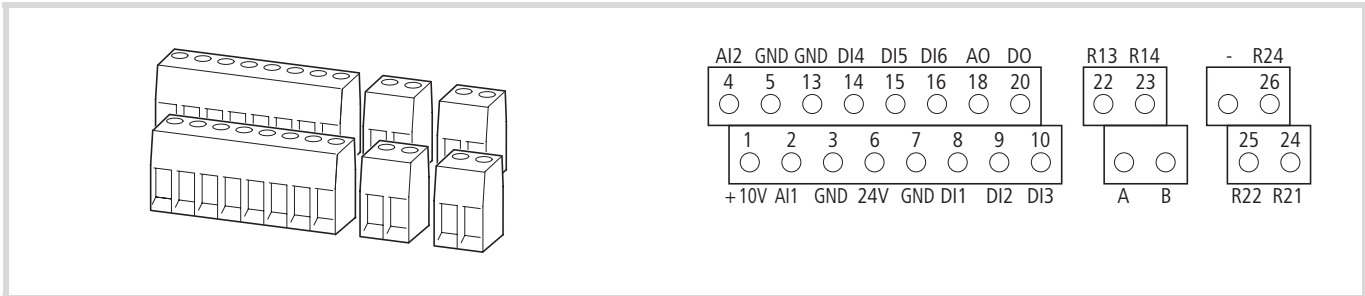


Figure 5: Schematic arrangement and designation of control signal terminals

Cable cross section (Cu): 0.5 - 1.5 mm²

Terminal	Signal	Factory setting	Description	
1	+10V	Output nominal voltage	-	Maximum load: 10 mA, reference potential: GND
2	AI1	Analog signal input 1	Frequency reference value ¹⁾	0 - +10 V ($R_i > 200 \text{ k}\Omega$)
3	GND	Reference potential	-	0 V
6	24V	Control voltage for DI1 - DI6, output (+24 V)	-	Maximum load: 50 mA, reference potential: GND
7	GND	Reference potential	-	0 V
8	DI1	Digital input 1	FWD start enable, forward ¹⁾	0 - +30 V ($R_i > 12 \text{ k}\Omega$)
9	DI2	Digital input 2	REV start enable, reverse ¹⁾	0 - +30 V ($R_i > 12 \text{ k}\Omega$)
10	DI3	Digital input 3	Fixed frequency B0	0 - +30 V ($R_i > 12 \text{ k}\Omega$)
4	AI2	Analog input 2	PI actual value ¹⁾	0/4 - 20 mA ($R_B = 200 \Omega$)
5	GND	Reference potential	-	0 V
13	GND	Reference potential	-	0 V
14	DI4	Digital input 4	Fixed frequency B1	0 - +30 V ($R_i = 12 \text{ k}\Omega$)
15	DI5	Digital input 5	Fault acknowledgment ¹⁾	0 - +30 V ($R_i = 12 \text{ k}\Omega$)
16	DI6	Digital input 6	PI controller deactivated ¹⁾	0 - +30 V ($R_i = 12 \text{ k}\Omega$)
18	AO	Analog output	Output frequency ¹⁾	0/4 - 20 mA ($R_B = 500 \Omega$)
20	DO	Digital output	Active = READY ¹⁾	Open collector, maximum load: 48 V, 50 mA, reference potential: GND
A	A	RS485 signal A	BUS-Communication	Modbus RTU
B	B	RS485 signal B	BUS-Communication	Modbus RTU
22	R13	Relay 1, normally open contact	Active = RUN ¹⁾	Maximum switching load: 250 V AC/2 A or 250 V DC/0.4 A
23	R14	Relay 1, normally open contact	Active = RUN ¹⁾	Maximum switching load: 250 V AC/2 A or 250 V DC/0.4 A
24	R21	Relay 2, changeover contact	Active = FAULT ¹⁾	Maximum switching load: 250 V AC/2 A or 250 V DC/0.4 A
25	R22	Relay 2, changeover contact	Active = FAULT ¹⁾	Maximum switching load: 250 V AC/2 A or 250 V DC/0.4 A
26	R24	Relay 2, changeover contact	Active = FAULT ¹⁾	Maximum switching load: 250 V AC/2 A or 250 V DC/0.4 A

1) Programmable function (→ parameters, page 27)

Block Diagram

The following block diagrams show all the terminals on an M-MAX frequency converter and default settings.

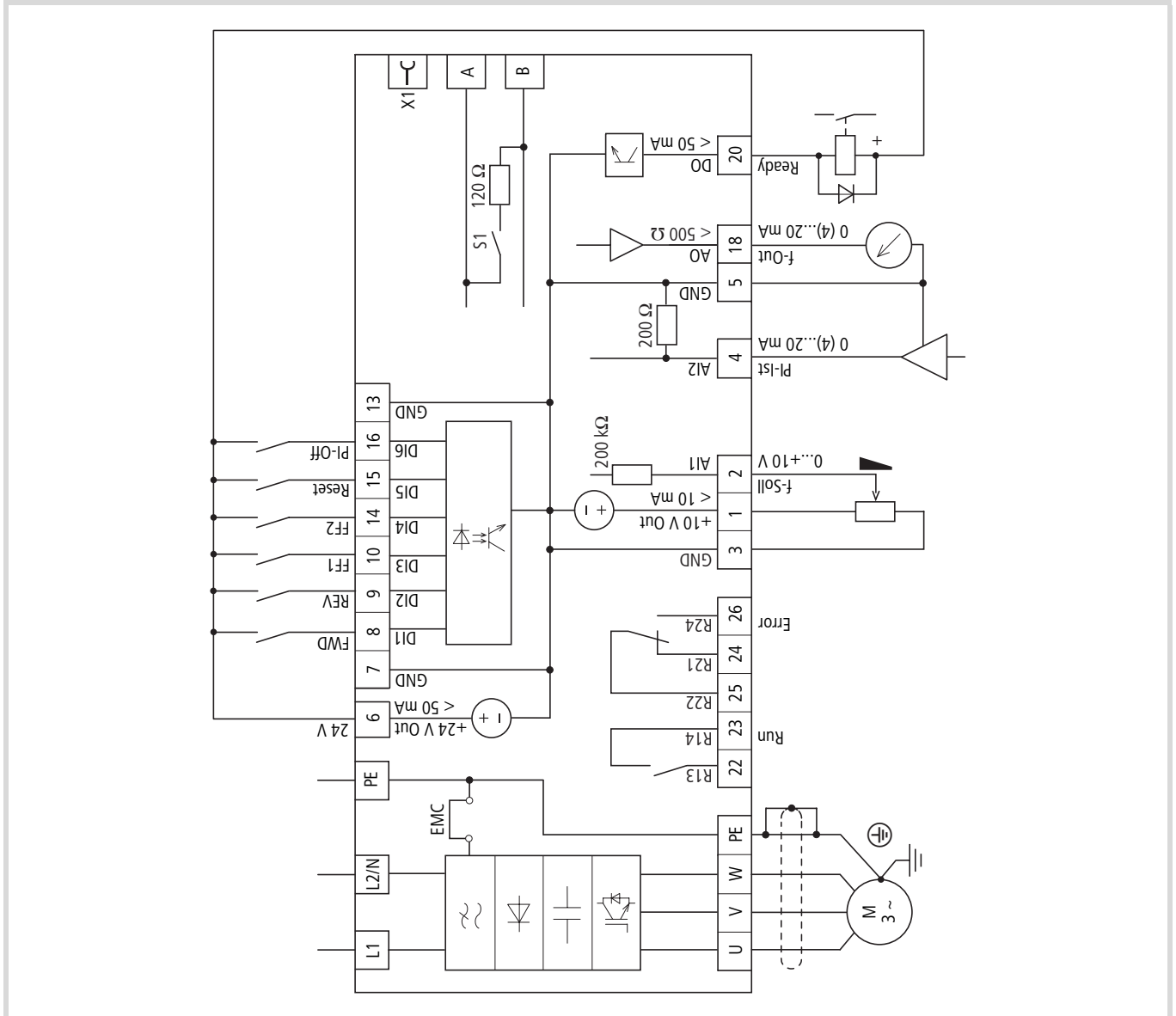


Figure 6: MMX12 block diagram

3 Operation

Placing into Operation

Before placing the frequency converter into operation, make sure to check the following (checklist):

No.	Activity	Note
1	Installation and wiring have been carried out in accordance with the corresponding installation instructions (→ AWA8230-2416).	
2	All wiring and line section leftovers, as well as all the tools used, have been removed from the frequency converter's proximity.	
3	All terminals in the power section and in the control section were tightened with the specified torque.	
4	The lines connected to the output terminals of the frequency converter (U/T1, V/T2, W/T3, R+, R-) are not short-circuited and are not connected to ground (PE).	
5	The frequency converter has been grounded properly (PE).	
6	All electrical terminals in the power section (L1, L2/N, L3, U/T1, V/T2, W/T3, R+, R-, PE) were implemented properly and were designed in line with the corresponding requirements.	
7	Each single phase of the supply voltage (L1, L2, L3) is protected with a fuse.	
8	The frequency converter and the motor have been adjusted for the corresponding line voltage (→ section "Rating and Rating Plate", page 6).	
9	The quality and volume of cooling air are in line with the environmental conditions required for the frequency converter.	
10	All connected control lines comply with the corresponding STOP conditions (e.g., switch in OFF position and setpoint = zero).	
11	The parameters that were preset at the factory have been checked with the list of parameters (→ section "List of parameters", page 27).	
12	The effective direction of a coupled machine will allow the motor to start.	
13	All emergency stop functions and safety functions are in an appropriate condition.	

Instructions**Danger!**

The components in the frequency converter's power section are energized if the supply voltage (line voltage) is connected.

For instance: power terminals L1, L2/N, L3, R+, R-, U/T1, V/T2, W/T3.

The control signal terminals are isolated from the line power potential.

However, there can be a dangerous voltage on the relay terminals (22 to 26) even if the frequency converter is not being supplied with line voltage (e.g., integration of relay contacts in control systems with 230 VAC).

**Danger!**

The components in the frequency converter's power section remain energized up to five (5) minutes after the supply voltage has been switched off (intermediate circuit capacitor discharging time).

Please note the following warning notice:

**Danger!**

Following a shutdown (fault, line voltage off), the motor can start automatically (when the supply voltage is switched back on) if the automatic restart function has been enabled. (→ parameter P6.13).

Control unit

The following figure shows and indicates the elements of the M-MAX's integrated control unit.

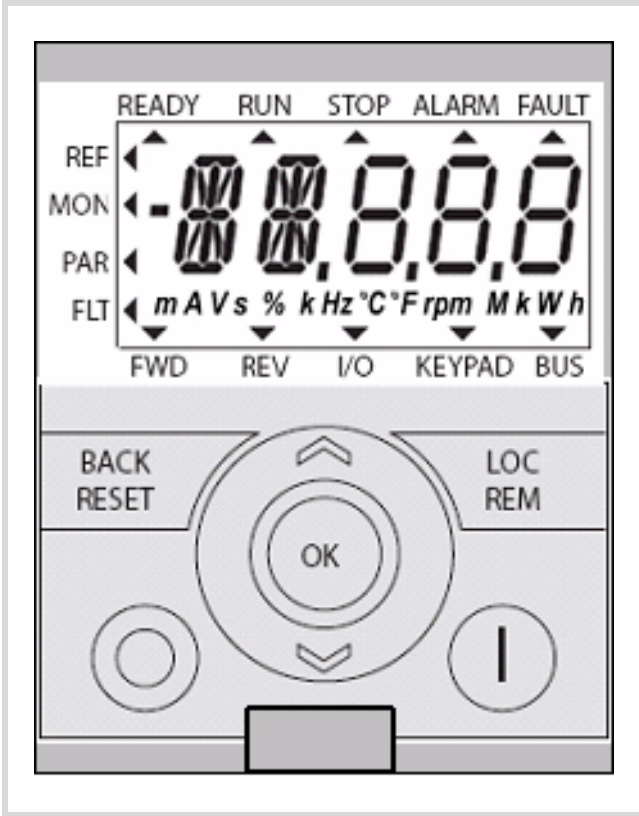


Figure 8: View: Control unit with LCD display, function keys, and interface

Table 2: Control unit elements

Operating unit element	Explanation
	Backlit liquid crystal display (LCD) Plain text with alphanumeric characters
	Switch between the different control levels (I/O – KEYPAD – BUS)
	Motor start with the pre-selected rotational direction. Active in the keypad control level. Motor start with the pre-selected rotational direction. Active in the keypad control level.
	Select a function and numerical value ^ increase the numerical value / FWD start enable
	Select a function and decrease the numerical value / REV start enable
	Confirm and activate selection (store)
	Stops the running motor, acknowledges error messages, and activates (press for 5 seconds) the initial operation wizards. Active in every operating mode.
	Return in menu. Leaves the edit mode. Resets the error message (Reset).
	Interface for options and field bus interface connections

Display Unit

The display unit (LCD display) is shown below.

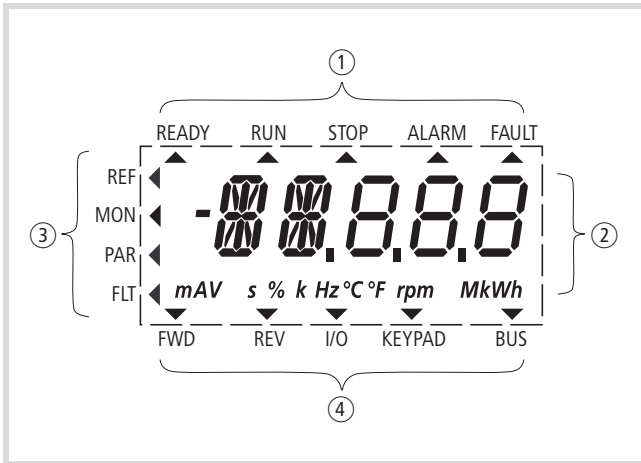


Figure 9: LCD display (areas)

The display unit consists of a backlit liquid crystal display (LCD). It is divided into four areas:

Area	Description
① Status display	The arrowheads (▲) on the top border show information regarding the drive <ul style="list-style-type: none"> • READY = Ready to start • RUN = Operating notification • STOP = Stop, stop command activated • ALARM = Alarm message activated • FAULT = The drive has been stopped due to an error message.
② Plain text display	Two 14-segment blocks and three 7-segment blocks display the measured values with their corresponding units (bottom line), as well as parameter numbers (PNU) and error codes (F)
③ Menu level	The arrowhead (◀) points at the selected main menu level: <ul style="list-style-type: none"> • REF = Reference value input (Reference) • MON = Operational data indicator (Monitor) • PAR =Parameter levels • FLT = Fault log (Fault)
④ Control commands	The arrowhead (▼) points to the selected rotating field direction and the active control level: <ul style="list-style-type: none"> • FWD = Clockwise rotating field (Forward Run) • REV = Counterclockwise rotating field (Reverse Run) • I/O = Via control terminals (Input/Output) • KEYPAD = Via control unit • BUS = Via field bus (interface)

Microswitches

The microswitches are located under the control signal terminals' cover.

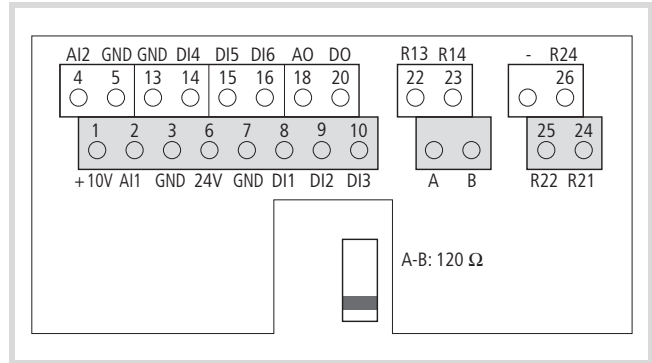


Figure 10: Microswitch factory settings

The factory settings have switch S1 open. When it is closed, a bus terminating resistor (120 Ω) is connected in parallel to input terminals A-B.

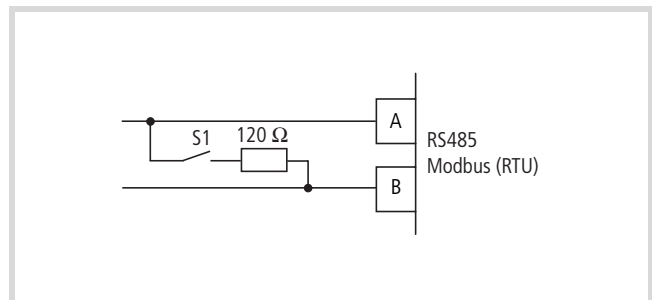


Figure 11: Bus interface Modbus RTU RS485

Menu Levels

The LCD display is illuminated (= Power ON) when the supply voltage (L1, L2/N, L3, → section "Technical Specifications", page 7) is applied.

The parameter number (M1.1) and the display value (0.00) are shown in automatic alternation.

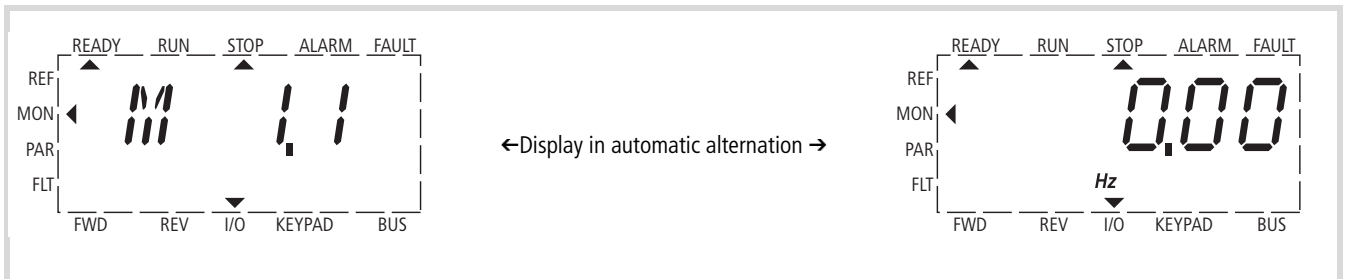


Figure 12: Operational data indicator

Operational data indicator (MON)

You can use the MON (Monitor) menu level to select the desired operational data indicator (parameter number M...) with the arrow buttons (▲ and ▼). The parameter number and the display value are shown in alternation automatically, and the display can be fixed on the selected display value with the OK button. If you wish to access a different operational data indicator, press the OK button once again. You can then make the selection with the arrow buttons (▲ and ▼) and confirm with the OK button. The appropriate unit is shown under the respective operational data indicator.

You can select operational data indicators during operation.

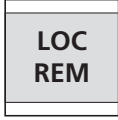
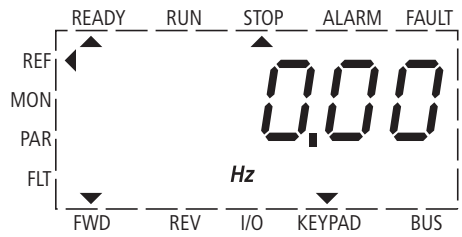




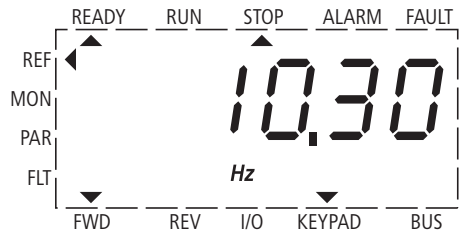

- The selected operational data indicator setting is erased when the supply voltage is switched off. If the supply voltage is switched back on, the parameter number (M1.1) and the display value (0.00) are shown in automatic alternation again (always).

PNU	ID	Designation	Display value	Unit	Description
M1.1	1	Output frequency	0.00	Hz	Frequency to motor
M1.2	25	Frequency reference value	0.00	Hz	Frequency reference value
M1.3	2	Motor shaft speed	0	rpm	Calculated motor speed (min ⁻¹)
M1.4	3	Motor current	0.00	A	Measured motor current
M1.5	4	Motor torque	0.0	%	Calculated ratio of actual torque to rated motor torque
M1.6	5	Motor output	0.0	%	Calculated ratio of actual output power to rated motor output
M1.7	6	Motor voltage	0.0	V	Measured output voltage to motor
M1.8	7	Intermediate circuit DC voltage	1)	V	Measured internal DC link voltage 1) Depends on the supply voltage
M1.9	8	Device temperature	00	°C	Measured heat sink temperature
M1.10		Motor temperature	00	°C	Calculated motor temperature
M1.11	13	Analog input 1	0.0	%	Value on AI1
M1.12	14	Analog input 2	0.0	%	Value on AI2
M1.13	26	Analog output 1	0.0	%	Value on AO1
M1.14	15	Digital input	0	-	DI1, DI2, DI3 status
M1.15	16	Digital input	0	-	DI4, DI5, DI6 status
M1.16	17	Digital output	1	-	RO1, RO2, DO status
M1.17	20	PI setpoint	0.0	%	Percentage of maximum setpoint
M1.18	21	PI feedback	0.0	%	Percentage of maximum actual value
M1.19	22	FI fault value	0.0	%	Percentage of maximum fault value
M1.20	23	PI output	0.0	%	Percentage of maximum output value

Example for Operation

The following table shows an example of the LCD display in operation.

Sequence	Example	Description
Control signal terminal (I/O) operating mode		
1	1AC: L1, L2/N 3AC: L1, L2/N, L3	Switch on the line voltage MMX12..., MMX32 ...: 208 - 240 V (50/60 Hz) MMX34 ...: 380 - 480 V (50/60 Hz)
2		Self-test, automatic procedure after switching on line power
3		<ul style="list-style-type: none"> • Ready to start: Display in factory setting • READY: Ready to start and operation • STOP: Stop, no enable signal • MON: Frequency display (Hz)
4(1)		<p>The factory settings have the control signal terminal (I/O) operating mode active (h parameter P6.2)</p> <p>You can switch between command levels with the LOC/REM button.</p> <p>Use the FWD start command (clockwise rotating field) or the REV (counterclockwise rotating field) start command</p> <p>The desired output frequency can be adjusted with the setpoint potentiometer (0 - 50 Hz).</p>
5(1)		<ul style="list-style-type: none"> • READY: Ready to start and operation • RUN: Run signal • FWD: Clockwise rotating field (selected rotational direction) • MON: frequency display (e.g. 50 Hz) <p>The drive is stopped by turning off the FWD or REV enable. (uncontrolled coasting, → parameter P6.8)</p>
6(1)		<p>The stop button is active in all operating levels.</p> <p>The drive can also be stopped with the stop button (uncontrolled coasting, → parameter P6.8)</p>

Sequence	Example	Description
Operating mode (KEYPAD)		
4(2)		You can use the LOC/REM button to switch to the Control unit (KEYPAD) command level.
5(2)		Control unit (KEYPAD) command level activated. <ul style="list-style-type: none"> • READY: Ready to start and operation • STOP: Stop, no enable signal • MON: Frequency display (Hz) • KEYPAD: Control unit
6(2)		You can use the OK button to select and activate the REF menu level.
7(2)		The frequency display flashes and the default rotational direction (FWD) is activated.
8(2)		The arrow buttons can be used to set the required frequency setpoint when the frequency display is flashing. The frequency for FWD is increased with the ^ arrow button (with the frequency starting at 0.00 Hz). The v arrow button activates the REV rotational direction and increases the frequency (-) (with the frequency starting at 0.00 Hz).
9(2)		Press the Start button. The frequency converter switches to the RUN mode and accelerates to the set frequency value.
10(2)		The flashing frequency setpoint (e.g., 10.30 Hz displayed) can be changed with the ^ and v arrow buttons even during ongoing operation (RUN). The current frequency setpoint is stored by pressing the OK button (continuous display). This setpoint is maintained even after the supply voltage has been switched off (L1, L2/N, L3).
11(2)		You can use the OK button to select and activate the REF menu level.

Parameter ranges

The M-MAX parameters are divided into two areas in order to make it easier to put it into operation:

- List of parameters
- Applications

You can select and edit all parameters in the **Parameter List** area. In the meantime, the **Applications** area shows selected control level parameters and motor data. You can configure the presettings for these parameters in a configuration pass run. These values are set at the end. These parameters can only be changed if you start the configuration pass run again. The factory settings are reloaded for application parameters during this process.

Alternating display: M1.1 and 0.00 Hz					
Press BACK RESET button		Press the STOP button and keep it pressed for five seconds			
Change menu levels, MON → PAR		P1.2 = 0 Base	P1.2 = 1 Pump	P1.2 = 2 Fan	P1.2 = 3 Hoisting device
P1.1 = 1 Quick configuration (factory setting)	P1.1 = 0 All Parameters	P6.1 - P6.8	P6.1 - P6.8	P6.1 - P6.8	P6.1 - P6.8
P1.2	P1.2 ...	P7.1 - P7.6	P7.1 - P7.6	P7.1 - P7.6	P7.1 - P7.6
P6.1 - P6.8					
P7.1 - P7.6					
P11.7	P12.5	P11.7	P11.7	P11.7	P11.7
S1.2 - S4.2	S1.2 - S4.2	P1.1	P1.1	P1.1	P1.1
→ For the parameter list, see appendix, page 27					
→ Select and confirm settings by pressing the OK button					

4 Error and Fault Messages

M-MAX frequency converters have several internal monitoring functions. The inverter (frequency converter output) is automatically disabled if a malfunction is detected. After this, the connected motor comes to a stop freely.

Error and faults messages are shown on the display with an arrowhead (▲) under →↓ and with the error code F... (F1 = first fault, F2 = second fault, etc.).

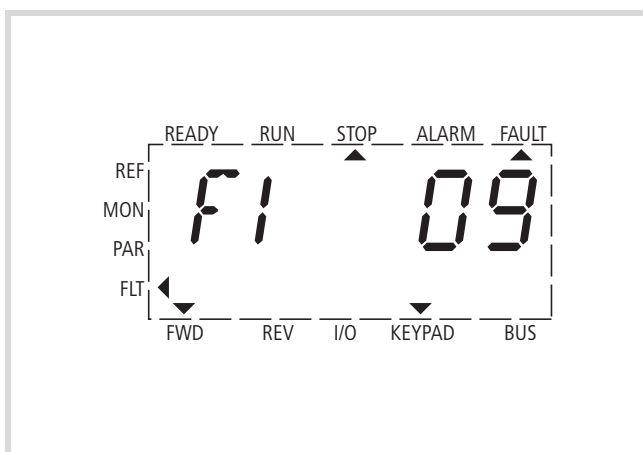


Figure 13: Error message example

The last nine errors can be called up and shown in succession in the fault log (FLT). If there is an active fault, the corresponding fault number (e.g., F1 09 = undervoltage) is shown alternating with the main menu. If you switch between faults, the error codes for active faults will flash. You can reset active faults by pressing the STOP button for one second. Faults that cannot be reset will continue to flash.

You can browse through the menu structure even if there are active faults. However, the error code will be shown again automatically if no button on the control unit is pressed. The operating hours, operating minutes, and operating seconds are shown on the value menu when a fault occurs (operating hours = shown value × 1000 h).

The fault can be reset with the BACK/RESET button on the control unit, with control signal terminals (→ parameter P3.7), or via the Fieldbus (ID 414).

→ If the fault log (FLT) is activated and you keep the STOP button pressed for five seconds in the Stop status, the fault log will be deleted.

The following table shows all error codes, their causes, and how to correct them.

Table 3: Error codes

Display	Designation	Possible cause	Instructions
01	Overcurrent	<ul style="list-style-type: none"> The frequency converter has detected an excessive current ($> 4 \times I_N$) in the motor cable. Sudden load increase Short circuit in motor cable Inadequate motor 	<ul style="list-style-type: none"> Check the load Check the motor size Check the cable (→ parameter P6.6)
02	Overvoltage	<ul style="list-style-type: none"> The DC intermediate circuit voltage has exceeded the internal safety limit. The delay time is too short. High overvoltage peaks in line power 	Increase braking time
03	Ground fault	<ul style="list-style-type: none"> An additional leakage current was detected when starting by means of a current measurement. Insulation fault in the cables or in the motor 	Check the motor cable and the motor
08	System fault	<ul style="list-style-type: none"> Component fault Malfunction 	Reset the fault and restart If the fault occurs again, please contact your closest Moeller representative.
09	Undervoltage	<p>The DC intermediate circuit voltage has exceeded the internal safety limit.</p> <p>Probable cause:</p> <ul style="list-style-type: none"> The supply voltage is too low Internal device fault Power failure 	<ul style="list-style-type: none"> If a brief power failure takes place, reset the fault and restart the frequency converter. Check the supply voltage. If it is OK, there is an internal fault. If this is the case, please contact your closest Moeller representative.
13	Frequency converter, temperature too low	The IGBT switch temperature is below -10 °C	Check the ambient temperature

Display	Designation	Possible cause	Instructions
14	Frequency converter, temperature too high	The IGBT switch temperature is above 120 °C. An excessive temperature warning is issued if the IGBT switch temperature goes above 110 °C.	<ul style="list-style-type: none"> • Make sure that there is an unobstructed flow of cooling air • Check the ambient temperature • Make sure that the switching frequency is not too high in relation to the ambient temperature and to the motor load
15	Motor blocked	The motor blocking protection mechanism has been triggered.	Check the motor
16	Motor, temperature too high	The frequency converter's motor temperature model has detected motor overheating. The motor is overloaded.	Decrease the motor load If the motor is not overloaded, check the temperature model parameters.
22	EEPROM checksum error	<ul style="list-style-type: none"> • Error when storing parameters • Malfunction • Component fault 	Please contact your closest Moeller representative.
25	Error in microprocessor monitoring (watchdog)	<ul style="list-style-type: none"> • Malfunction • Component fault 	Reset the fault and restart If the fault occurs again, please contact your closest Moeller representative.
34	Internal bus communications	Environment interferences or faulty hardware	If the fault occurs again, please contact your closest Moeller representative.
35	Application error	The application is not working.	Please contact your closest Moeller representative.
50	Analog input $I_{in} < 4 \text{ mA}$ (selected signal range: 4 - 20 mA, → parameter P2.1)	<ul style="list-style-type: none"> • The current on the analog input is smaller than 4 mA. • The control cable is broken or has become loose. • The signal source is faulty. 	Check the analog input's current source and circuit.
51	External fault	Error message on digital input. The digital input was programmed as an input for external error messages. The input is active.	<ul style="list-style-type: none"> • Check the programming and check the device indicated by the error message. • Check the cabling for the respective device as well.
53	Fieldbus error	The communication link between the master device and the drive's field bus has been interrupted.	Check the installation. If the installation is OK, please contact your closest Moeller representative.

Appendix

List of parameters

By default, only the parameters required for a quick configuration are shown in the parameter menu. In order to open additional, expanded parameter groups, please enter the appropriate value for parameter P1.1 = 0.

For a detailed description of the individual parameters, please consult the manual (AWB8230-1603) page specified.

Press the OK button in order to select the parameter level (PAR).

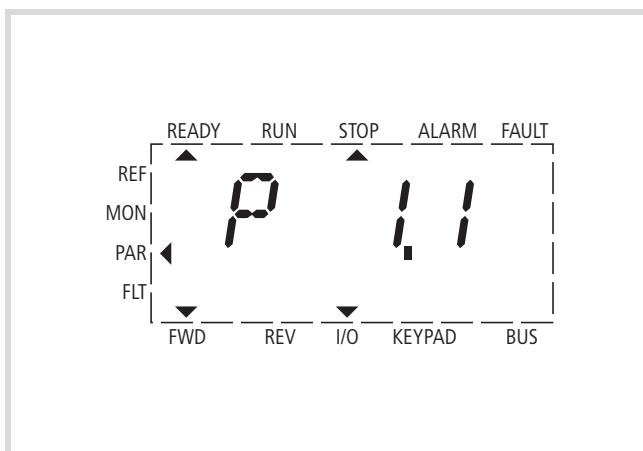


Figure 14: PNU = Parameter number shown on the control unit's display.

The parameter number (PNU) flashes, alternating with the set parameter value. You can use the OK button to activate the value range for the parameter shown, and then use the \wedge and \vee arrow buttons to change the parameter value. The selected value is stored if you press the OK button. After this, the parameter number continues to flash once again, alternating with the parameter value. You can use the \wedge and \vee arrow buttons to select individual parameters.

Changing parameters is possible in STOP status. The marked parameters (access rights RUN = \checkmark) can also be changed during operation (RUN). The acceptance and confirmation of the values is done by actuating the OK button.

→ Parameters marked with "M" (Monitor) are values currently being measured, variables calculated from these measured values, or status values from control signals.

They cannot be edited.

Parameters marked with "S" (System) are specific extensions (system parameters for specialists and servicing)

In order to achieve an optimum operating state, you should enter the data from the motor's rating label into the motor parameters.

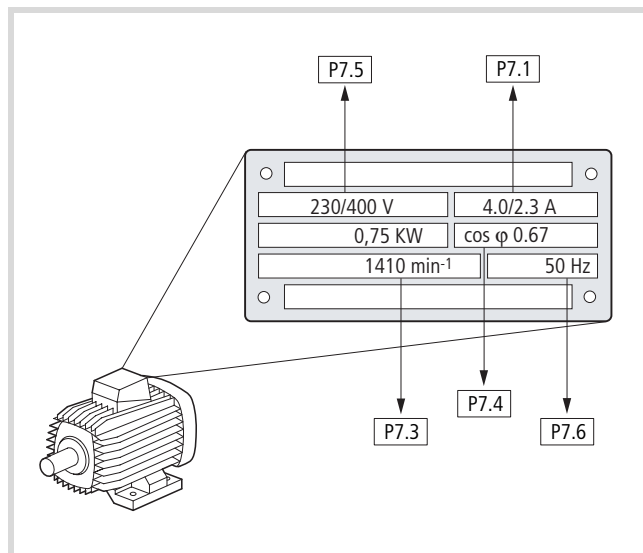


Figure 15: Sample motor rating label (→ motor parameters)

Quick configuration

PNU	ID	Access right RUN	Designation	Value range	Factory setting	Page in AWB8230-1603 manual	User setting
Menu Quickstart							
P1.1	115	✓	Parameter ranges	0 = All parameters 1 = Only quick configuration parameters	1		
P1.2	540	-	Applications	0 = Basic 1 = Pump drive 2 = Fan drive 3 = Hoisting device (high load)	0		
P6.1	125	✓	Control level	1 = Control signal terminals (I/O) 2 = Control unit 3 = Interface (BUS)	1		
P6.2	117	✓	Setpoint input	0 = Fixed speed (FF0 - FF7) 1 = Control unit (UP/DOWN) 2 = Interface (BUS) 3 = AI1 (analog setpoint 1) 4 = AI2 (analog setpoint 2)	3		
P6.3	101	-	Minimum frequency	0.00 - P6.4 Hz	0.00		
P6.4	102	-	Maximum frequency	P6.3 - 320 Hz	50.00		
P6.5	103	-	Acceleration time	0.1 - 3000 s	3.0		
P6.6	104	-	Delay time	0.1 - 3000 s	3.0		
P6.7	505	-	Start function	0 = Ramp (acceleration) 1 = Flying start	0		
P6.8	506	-	Stop function	0 = Free coasting 1 = Ramp (deceleration)	0		
P7.1	113	-	Rated motor current	$0.2 \times I_e - 1.5 \times I_e$ (→ motor rating label)	I_e		
P7.3	112	-	Nominal motor speed	300 - 20000 min ⁻¹ (→ motor rating label)	1440		
P7.4	120	-	Motor power factor (cos φ)	0.30 - 1.00 (→ motor rating label)	0.85		
P7.5	110	-	Nominal motor voltage	180 - 500 V (→ motor rating label)	230 400		
P7.6	111	-	Nominal motor frequency	30 - 320 Hz (→ motor rating label)	50.00		
P11.7	109	-	Torque increase	0 = Not enabled 1 = Enabled	0		
System							
S1.1	833	-	Software package	-	-		
S1.2	834	-	Power software version	-	-		
S1.3	835	-	Control part software version	-	-		
S1.4	836	-	Firmware interface	-	-		
S1.5	837	-	Application ID	-	-		
S1.6	838	-	Application revision	-	-		
S1.7	838	-	System load	-	-		

PNU	ID	Access right RUN	Designation	Value range	Factory setting	Page in AWB8230-1603 manual	User setting
S2.1	808	-	Communication status	RS485 in xx.yyy format xx = Number of error messages (0 - 64) yyy = Number of correct messages (0 - 999)			
S2.2	809	-	Error bus protocol	0 = FB disabled 1 = Modbus	0		
S2.3	810	-	Slave address	1 - 255	1		
S2.4	811	-	Baud rate	0 = 300 1 = 600 2 = 1200 3 = 2400 4 = 4800 5 = 9600			
S2.5	812	-	Number of stop bits	0 = 1 1 = 2	1		
S2.6	813	-	Parity type	0 = None (inaccessible)	0		
S2.7	814	-	Communication timeout	0 = Not used 1 = 1 s 2 = 2 s ...	0		
S2.8	815	-	Reset communication status	0 = Not used 1 = Resets parameter S2.1	0		
S3.1	827	-	MWh counter	MWh	-		
S3.2	828	-	Operating days	d	-		
S3.3	829	-	Operating hours	h	-		
S4.1	830	-	Display contrast	0 - 15	7		
S4.2	831	-	Factory setting (WE)	0 = Factory setting or changed value 1 = Restores factory settings for all parameters	0		

All Parameters

PNU	ID	Access right RUN	Designation	Value range	Factory setting	Page in AWB8230- 1603 manual	User setting
Parameter selection							
P1.1	115	✓	Parameter ranges	0 = All parameters 1 = Only quick configuration parameters	1		
P1.2	540	-	Applications	0 = Basic 1 = Pump drive 2 = Fan drive 3 = Hoisting device (high load)	0		
Analog input							
P2.1	379	✓	AI1 signal source	0 = 0 - 10 V 1 = 2 - 10 V	0		
P2.2	380	✓	AI1, minimum value	-100.0 - 100.0 %	0.0		
P2.3	381	✓	AI1, maximum value	-100.0 - 100.0 %	100.0		
P2.4	378	✓	AI1, filter time constant	0.0 - 10.0 s	0.1		
P2.5	390	✓	AI2 signal source	2 = 0 - 20 mA 3 = 4 - 20 mA	3		
P2.6	391	✓	AI2, minimum value	-100.0 - 100.0 %	0.0		
P2.7	392	✓	AI2, maximum value	-100.0 - 100.0 %	100.0		
P2.8	389	✓	AI2, filter time constant	0.0 - 10.0 s	0.1		
Digital input							
P3.1	300	✓	Sart/stop logic	0 = DI1 (FWD), DI2 (REV) 1 = DI1 = DI2 (REV) 2 = DI1 (Start pulse), DI2 (Stop pulse) 3 = DI1 (FWD), DI2 (REV) REAF	0		
P3.2	403	✓	Start signal 1	0 = Deactivated 1 = DI1 2 = DI2 3 = DI3 4 = DI4 5 = DI5 6 = DI6	1		
P3.3	404	✓	Start signal 2	like P3.2	2		
P3.4	412	✓	Reverse	like P3.2	0		
P3.5	405	✓	External fault (High signal)	like P3.2	0		
P3.6	406	✓	External fault (Low signal)	like P3.2	0		
P3.7	414	✓	Error acknowledgment	like P3.2	5		
P3.8	407	✓	Start enable	like P3.2	0		
P3.9	419	✓	Fixed speed B0	like P3.2	3		
P3.10	420	✓	Fixed speed B1	like P3.2	4		
P3.11	421	✓	Fixed speed B2	like P3.2	0		
P3.12	1020	✓	Deactivate PI controller	like P3.2	6		

PNU	ID	Access right RUN	Designation	Value range	Factory setting	Page in AWB8230-1603 manual	User setting
Analog output							
P4.1	307	✓	AO Signal	0 = Deactivated 1 = Output frequency (0 - f_{max}) 2 = Output current (0 - $I_{N Motor}$) 3 = Torque (0 - M_N) 4 = PI controller, output	1		
P4.2	310	✓	AO, minimum value	0 = 0 mA 1 = 4 mA	1		
Digital output							
P5.1	314	✓	RO1 Signal	0 = Not used 1 = Ready to start 2 = Operation (RUN) 3 = Error message 4 = Error message (inverted) 5 = Warning 6 = Reverse 7 = Setpoint reached 8 = Motor controller active	2		
P5.2	313	✓	RO2 Signal	Like P5.1	3		
P5.3	312	✓	DO1 Signal	Like P5.1	1		
Drives control							
P6.1	125	✓	Control level	1 = Control signal terminals (I/O) 2 = Control unit (KEYPAD) 3 = Interface (BUS)	1		
P6.2	117	✓	Setpoint input	0 = Fixed frequency (FF0 - FF7) 1 = Control unit (UP/DOWN) 2 = Interface (BUS) 3 = AI1 (analog setpoint 1) 4 = AI2 (analog setpoint 2)	3		
P6.3	101	-	Minimum frequency	0.00 - P6.4 Hz	0.00		
P6.4	102	-	Maximum frequency	P6.3 - 320 Hz	50.00		
P6.5	103	-	Acceleration time	0.1 - 3000 s	1.0		
P6.6	104	-	Delay time	0.1 - 3000 s	1.0		
P6.7	505	-	Start function	0 = Ramp (acceleration) 1 = Flying start	0		
P6.8	506	-	Stop function	0 = Free coasting 1 = Ramp (deceleration)	0		
P6.9	500	-	Wave form, time-based S-form	0.0 = linear 0.1 - 10.0 s (S-shaped)	0.0		
P6.10	717	-	Waiting time before an automatic restart (→ P6.13 = 1)	0.10 - 10.00 s	0.50		
P6.11	718	-	Testing period across three automatic restarts (→ P6.13 = 1)	0.00 - 60.00 s	30.00		
P6.12	719	-	Start function at automatic restart	0 = Ramp 1 = Flying start 2 = according to P6.5	0		

PNU	ID	Access right RUN	Designation	Value range	Factory setting	Page in AWB8230-1603 manual	User setting
P6.13	731	-	Automatic restart	0 = Not enabled 1 = Enabled	0		
P6.14	-	✓	Reference input, operating unit (UP – STOP – DOWN)	0 = Changes the direction of rotation (FWD/REV) when set value of zero passes through 1 = Stops the drive with a set value of zero	1		
Motor							
P7.1	113	-	Rated motor current	$0.2 \times I_e - 1.5 \times I_e$ (→ motor rating label)	I_e		
P7.2	107	-	Current limit	$0.2 \times I_e - 2 \times I_e$ (→ motor rating label)	$1.5 \times I_e$		
P7.3	112	-	Nominal motor speed	$300 - 20000 \text{ min}^{-1}$ (→ motor rating label)	1440		
P7.4	120	-	Motor power factor (cos φ)	0.30 - 1.00 (→ motor rating label)	0.85		
P7.5	110	-	Nominal motor voltage	180 - 500 V (→ motor rating label)	230 400		
P7.6	111	-	Nominal motor frequency	30 - 320 Hz (→ motor rating label)	50.00		
Protective functions							
P8.1	700	-	Response to 4 mA reference value error	0 = Deactivated 1 = Warning 2 = Error, stop according to P6.8	1		
P8.2	727	-	Response to undervoltage error	Like P8.1	2		
P8.3	703	-	Ground fault protection	Like P8.1	2		
P8.4	709	-	Blocking protection mechanism	Like P8.1	0		
P8.5	713	-	Underload protection	Like P8.1	0		
P8.6	704	-	Motor temperature protection	Like P8.1	0		
P8.7	705	-	Motor ambient temperature	-20 - +100 °C	40		
P8.8	706	-	Cooling factor at zero frequency	0.0 - 150 %	40.0		
P8.9	707	-	Motor temperature time constant	1 - 200 min	45		
PI controller							
P9.1	163	✓	PI controller	0 = Deactivated 1 = PI for drive control 2 = PI for external application	0		
P9.2	118	✓	PI controller, P amplification	0.0 - 1000 %	100.0		
P9.3	119	✓	PI controller, I time constant	0.00 - 320.0 s	10.0		
P9.4	167	✓	PI controller, setpoint via control unit	0.0 - 100.0 %	0.0		
P9.5	332	✓	PI controller, setpoint source	0 = Control unit 1 = Interface (BUS) 2 = AI1 3 = AI2	0		

PNU	ID	Access right RUN	Designation	Value range	Factory setting	Page in AWB8230-1603 manual	User setting
P9.6	334	✓	PI controller, actual value	0 = Interface (BUS) 1 = AI1 2 = AI2	2		
P9.7	336	✓	PI controller, actual value limiting, minimum	0.0 - 100.0 %	0.0		
P9.8	337	✓	PI controller, actual value limiting, maximum	0.0 - 100.0 %	100.0		
P9.9	340	✓	PI controller, difference value	0 = No inversion (actual value < setpoint → increase PI output value) 1 = Inversion (actual value < setpoint → decrease PI output value)	0		
Fixed frequency							
P10.1	124	✓	Fixed frequency FF0	0.00 - P6.4 Hz	5.00		
P10.2	105	✓	Fixed frequency FF1	0.00 - P6.4 Hz	10.00		
P10.3	106	✓	Fixed frequency FF2	0.00 - P6.4 Hz	15.00		
P10.4	126	✓	Fixed frequency FF3	0.00 - P6.4 Hz	20.00		
P10.5	127	✓	Fixed frequency FF4	0.00 - P6.4 Hz	25.00		
P10.6	128	✓	Fixed frequency FF5	0.00 - P6.4 Hz	30.00		
P10.7	129	✓	Fixed frequency FF6	0.00 - P6.4 Hz	40.00		
P10.8	130	✓	Fixed frequency FF7	0.00 - P6.4 Hz	50.00		
U/f characteristic							
P11.1	108	-	V/f characteristic curve	0 = Linear 1 = Quadratic 2 = Configurable	0		
P11.2	602	-	Cut-off frequency	30.00 - 320 Hz	50.00		
P11.3	603	-	Output voltage	10.00 - 200 % of nominal motor voltage (P6.5)	100.00		
P11.4	604	-	V/f characteristic curve, mean frequency value	0.00 - P10.2 %	25.00		
P11.5	605	-	V/f characteristic curve, mean voltage value	0.00 - P10.3 %	50.00		
P11.6	606	-	Output voltage at 0 Hz	0.00 - 40.00 %	0.00		
P11.7	109	-	Torque increase	0 = Not enabled 1 = Enabled	0		
P11.8	600	-	Motor control mode	0 = Frequency control (U/f) 1 = Speed control (sensorless vector)	0		
P11.9	601	-	Pulse frequency	1.5 - 16 kHz	6.0		
Braking							
P12.1	504	-	DC braking, current	A, dependent on I _e	I _e		
P12.2	516	-	DC braking, braking time at start	0.00 - 600.00 s	0		
P12.3	515	-	DC braking, start frequency during delay ramp	0.00 - 10.00 Hz	1.50		

PNU	ID	Access right RUN	Designation	Value range	Factory setting	Page in AWB8230- 1603 manual	User setting
P12.4	508	-	DC braking, braking time in case of STOP	0.00 - 600.00 s	0		
P12.5	504	-	Brake chopper	0 = Deactivated 1 = Active in RUN 2 = Active in RUN and STO	0		
System							
S1.1	833	-	Software package	-	-		
S1.2	834	-	Power software version	-	-		
S1.3	835	-	Control part software version	-	-		
S1.4	836	-	Firmware interface	-	-		
S1.5	837	-	Application ID	-	-		
S1.6	838	-	Application revision	-	-		
S1.7	838	-	System load	-	-		
S2.1	808	-	Communication status	RS485 in xx.yyy format xx = Number of error messages (0 - 64) yyy = Number of correct messages (0 - 999)			
S2.2	809	-	Error bus protocol	0 = FB disabled 1 = Modbus	0		
S2.3	810	-	Slave address	1 - 255	1		
S2.4	811	-	Baud rate	0 = 300 1 = 600 2 = 1200 3 = 2400 4 = 4800 5 = 9600			
S2.5	812	-	Number of stop bits	0 = 1 1 = 2	1		
S2.6	813	-	Parity type	0 = None (inaccessible)	0		
S2.7	814	-	Communication timeout	0 = Not used 1 = 1 s 2 = 2 s ... 255	0		
S2.8	815	-	Reset communication status	0 = Not used 1 = Resets parameter S2.1	0		
S3.1	827	-	MWh counter	MWh	-		
S3.2	828	-	Operating days	d	-		
S3.3	829	-	Operating hours	h	-		
S4.1	830	-	Display contrast	0 - 15	7		
S4.2	831	-	Factory setting (WE)	0 = Factory setting or changed value 1 = Restores factory settings for all parameters	0		

PNU	ID	Access right RUN	Designation	Value range	Factory setting	Page in AWB8230- 1603 manual	User setting
Display value							
M1.1	1	-	Output frequency	Hz	0.00		
M1.2	25	-	Frequency reference value	Hz	0.0		
M1.3	2	-	Motor shaft speed	rpm (calculated value, min ⁻¹)	0		
M1.4	3	-	Motor current	A	0.00		
M1.5	4	-	Motor torque	% (calculated value)	0.0		
M1.6	5	-	Motor output	% (calculated value)	0.0		
M1.7	6	-	Motor voltage	V	0.0		
M1.8	7	-	Intermediate circuit DC voltage	V	000.0		
M1.9	8	-	Device temperature	°C	00		
M1.10		-	Motor temperature	°C (calculated value)	00		
M1.11	13	-	Analog input 1	%	0.0		
M1.12	14	-	Analog input 2	%	0.0		
M1.13	26	-	Analog output 1	%	0.0		
M1.14	15	-	Digital input	DI1, DI2, DI3 status	0		
M1.15	16	-	Digital input	DI4, DI5, DI6 status	0		
M1.16	17	-	Digital output	RO1, RO2, DO status	1		
M1.17	20	-	PI setpoint	%	0.0		
M1.18	21	-	PI feedback	%	0.0		
M1.19	22	-	FI fault value	%	0.0		
M1.20	23	-	PI output	%	0.0		

Application parameters

→ Every single parameter value is reset to factory settings every time that the application menu is activated.

You can only activate the application menu from the menu level (flashing display: arrow, REF or MON or PAR or FLT) by pressing the STOP button and holding it down for five seconds.

The application parameters must be stored by pressing the OK button, even if the value wasn't modified. The system switches to the next parameter automatically.

PNU	ID	Access right RUN	Designation	Value range	Factory setting	Page in AWB8230-1603 manual	User setting
P1.2	540	-	Applications	0 = Basic 1 = Pump drive 2 = Fan drive 3 = Hoisting device (high load)	0		
P6.1	125	✓	Control level	1 = Control signal terminals (I/O) 2 = Control unit (KEYPAD) 3 = Interface (BUS)	1		
P6.2	117	✓	Setpoint input	0 = Fixed speed (FF0 - FF7) 1 = Control unit (UP/DOWN) 2 = Interface (BUS) 3 = AI1 (analog setpoint 1) 4 = AI2 (analog setpoint 2)	3		
P6.3	101	-	Minimum frequency	0.00 - P6.4 Hz			
				Basic (P1.2 = 0)	0		
				Pump drive (P1.2 = 1)	20		
				Fan drive (P1.2 = 2)	20		
			Hoisting device (P1.2 = 3)	0			
P6.4	102	-	Maximum frequency	P6.3 - 320 Hz	50.00		
P6.5	103	-	Acceleration time	0.1 - 3000 s			
				Basic (P1.2 = 0)	3.0		
				Pump drive (P1.2 = 1)	5.0		
				Fan drive (P1.2 = 2)	5.0		
			Hoisting device (P1.2 = 3)	1.0			
P6.6	104	-	Delay time	0.1 - 3000 s			
				Basic (P1.2 = 0)	3.0		
				Pump drive (P1.2 = 1)	5.0		
				Fan drive (P1.2 = 2)	5.0		
			Hoisting device (P1.2 = 3)	1.0			
P6.7	505	-	Start function	0 = Ramp (acceleration) 1 = Flying start	0		

PNU	ID	Access right RUN	Designation	Value range	Factory setting	Page in AWB8230- 1603 manual	User setting
P6.8	506	-	Stop function	0 = Free coasting 1 = Ramp (deceleration)	0		
				Basic (P1.2 = 0)	0		
				Pump drive (P1.2 = 1)	1		
				Fan drive (P1.2 = 2)	0		
				Hoisting device (P1.2 = 3)	0		
P7.1	113	-	Rated motor current	$0.2 \times I_e - 1.5 \times I_e$ (→ motor rating label)	I_e		
P7.2	107	-	Current limit	$0.2 \times I_e - 2 \times I_e$ (→ motor rating label)	$1.5 \times I_e$		
P7.3	112	-	Nominal motor speed	$300 - 20000 \text{ min}^{-1}$ (→ motor rating label)	1440		
P7.4	120	-	Motor power factor ($\cos \varphi$)	0.30 - 1.00 (→ motor rating label)	0.85		
P7.5	110	-	Nominal motor voltage	180 - 500 V (→ motor rating label)	230 400		
P7.6	111	-	Nominal motor frequency	30 - 320 Hz (→ motor rating label)	50.00		
P11.7	109	-	Torque increase	0 = Not enabled 1 = Enabled	0		
				Basic (P1.2 = 0)	0		
				Pump drive (P1.2 = 1)	0		
				Fan drive (P1.2 = 2)	0		
				Hoisting device (P1.2 = 3)	1		
P1.1	115	✓	Parameter ranges	0 = All parameters 1 = Only quick configuration parameters	1		

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