

## M-Max series adjustable frequency AC drives



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## M-Max Series Drives for Machinery Applications



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## M-Max Series Drives for Machinery Applications

### Product Description

Eaton's M-Max™ Series Sensorless Vector Adjustable Frequency AC Drives are the next generation of drives specifically engineered for today's machinery applications. These microprocessor-based drives have standard features that can be programmed to tailor the drive's performance to suit a wide variety of application requirements. The M-Max product line uses a 32-bit microprocessor and insulated gate bipolar transistors (IGBTs) that provide quiet motor operation, high motor efficiency, and smooth lowspeed performance. The size and simplicity of the M-Max make it ideal for hassle-free installation. Models rated at 575 volts, three-phase, 50/60 Hz are available in sizes ranging from 0.75kW to 3kW. Models rated at 400 volts, three-phase, 50/60 Hz are available in sizes ranging from 0.25kW to 18.5kW. Models rated at 220 volts, single- or three-phase, 50/60 Hz are available in sizes ranging from 0.25kW to 2.2kW. Models rated at 110 volts, single-phase, 50/60 Hz are available in the 0.25kW to 1.1kW size range.

The standard drive includes a digital display, and operating and programming keys on a visually appealing, efficient application programming interface. The display provides drive monitoring, as well as adjustment and diagnostic information. The keys are used for digital adjustment and programming of the drive, as well as for operator control. Separate terminal blocks for control and power wiring are provided for customer connections.

### Features

- Ease of use—preset application macros, startup wizard, diagnostic capabilities
- Compact, space-saving design
- Rugged and reliable—150% for one minute, 50°C rated, conformal coated boards
- DIN rail and screw mountable
- Side-by-side installation
- Industry leading efficiency delivers energy savings to the customer
- Integrated EMC filters make the unit suitable for commercial and industrial networks
- Available in the enclosure class IP20 as standard, options for IP21
- Brake chopper as standard in three-phase, applications of frames 2 (FS2) and larger
- Temperature-controlled fan
- RS-485/Modbus® as standard
- PID controller as standard
- Several fieldbus options

### Standards and Certifications

#### Product

- Complies with EN61800-3 (2004)

#### Safety ①

- 61800-5-1
- EN60204-1
- CE
- UL
- cUL
- IEC
- RoHS compliant

#### EMC (At Default Settings)

- EMC Category C2, C3, and C4 (Level H): With an internal RFI filter option

#### Note

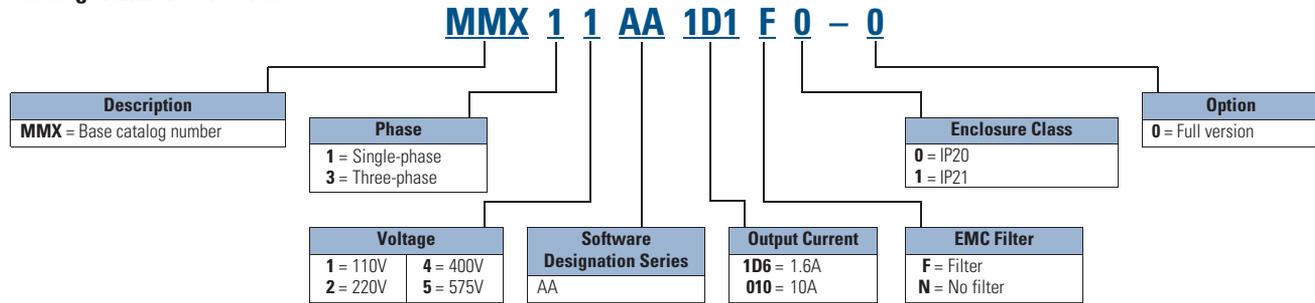
① See unit nameplate for more detailed approvals.



# M-Max Series Adjustable Frequency AC Drives

## Catalog Number Selection

### Catalog Number Selection



### Product Selection



#### M-Max Basic Controller

kW <sup>①</sup>	Volts <sup>②</sup>	100% Continuous Current I <sub>N</sub> (A)	Nominal Input Current (A)	Frame Size	Catalog Number	
0.25	100–120V single-phase in 230V three-phase out	1.7	9.2	FS2	MMX11AA1D7N0-0 <sup>③</sup>	
0.37		2.4	11.6		MMX11AA2D4N0-0 <sup>③</sup>	
0.55		2.8	12.4		MMX11AA2D8N0-0 <sup>③</sup>	
0.75		3.7	15		MMX11AA3D7N0-0 <sup>③</sup>	
1.10	200–240V single-phase in 230V three-phase out	4.8	16.5	FS3	MMX11AA4D8N0-0 <sup>③</sup>	
0.25		1.7	4.2		FS1	MMX12AA1D7F0-0
0.37		2.4	5.7	MMX12AA2D4F0-0		
0.55		2.8	6.6	MMX12AA2D8F0-0		
0.75		3.7	8.3	FS2		MMX12AA3D7F0-0
1.10		4.8	11.2		MMX12AA4D8F0-0	
1.50	200–240V three-phase in 230V three-phase out	7	14.1	FS3	MMX12AA7D0F0-0	
2.20		9.6	15.8		MMX12AA9D6F0-0	
0.25		1.7	2.7	FS1	MMX32AA1D7N0-0 <sup>③</sup>	
0.37		2.4	3.5		MMX32AA2D4N0-0 <sup>③</sup>	
0.55		2.8	3.8		MMX32AA2D8N0-0 <sup>③</sup>	
0.75		3.7	4.3		FS2	MMX32AA3D7N0-0 <sup>③</sup>
1.10		4.8	6.8	MMX32AA4D8N0-0 <sup>③</sup>		
1.50		7	8.4	FS3	MMX32AA7D0N0-0 <sup>③</sup>	
2.20	11	13.4	MMX32AA11N0-0 <sup>③</sup>			
0.37	380–480V three-phase in 460V three-phase out	1.3	2.2		FS1	MMX34AA1D3F0-0
0.55		1.9	2.8			MMX34AA1D9F0-0
0.75		2.4	3.2			MMX34AA2D4F0-0
1.10		3.3	4			FS2
1.50		4.3	5.6	MMX34AA4D3F0-0		
2.20		5.6	7.3	FS3	MMX34AA5D6F0-0	
3.00		7.6	9.6		MMX34AA7D6F0-0	
4.00		9	11.5		MMX34AA9D0F0-0	
5.50	12	14.9	MMX34AA12F0-0			
7.50	14	18.7	FS5	MMX34AA14F0-0		
7.50	16	-		FS4	MMX34AA016F1-0 <sup>④</sup>	
11	23	23		FS4	MMX34AA023F1-0 <sup>④</sup>	
15	31	31	FS5	MMX34AA031F1-0 <sup>④</sup>		
18.5	38	38	FS5	MMX34AA038F1-0 <sup>④</sup>		
0.75	575V three-phase in 575V three-phase out	1.7	2.0	FS3	MMX35AA1D7N0-0 <sup>③</sup>	
1.10		2.7	3.6		MMX35AA2D7N0-0 <sup>③</sup>	
1.50		3.9	5.0		MMX35AA3D9N0-0 <sup>③</sup>	
2.20		6.1	7.6		MMX35AA6D1N0-0 <sup>③</sup>	
3.00		9.0	10.4		MMX35AA9D0N0-0 <sup>③</sup>	

#### Notes

① kW ratings are based on the use of a 220V, 400V, and 575V, four- or six-pole squirrel cage induction motor and are for reference only.

Units are to be selected such that the motor current is less than or equal to the MMX rated continuous output current.

② For 208V, 380V, or 415V applications, select the unit such that the motor current is less than or equal to the MMX rated continuous output current.

③ For MMX11\_, MMX32\_, and MMX35\_, there are no options for units with filters.

④ IP class: IP21.

## M-Max Copy/Paste Module

Description	Catalog Number
Module is plugged onto the front of the drive to provide: upload/download of all parameters, direct link to a PC via USB interface for parameter assignment via MaxConnect software, and copying of parameters for a series of devices or when exchanging devices. NoPCrequired	<b>MMX-COM-PC</b>

## Kits<sup>Ⓞ</sup>

Description	Catalog Number
Type 1 and IP21 kit for frame 1	<b>MMX-IP21-FS1</b>
Type 1 and IP21 kit for frame 2	<b>MMX-IP21-FS2</b>
Type 1 and IP21 kit for frame 3	<b>MMX-IP21-FS3</b>

## Optional Communication Modules

Description	Catalog Number
Communication adapter kit	<b>MMX-NET-XA</b>
CANopen network card	<b>XXM-NET-CO-A</b>
PROFIBUS DP network card with serial connection	<b>XXM-NET-PS-A</b>
PROFIBUS DP network card with Sub-D connection	<b>XXM-NET-PD-A</b>
DeviceNet network card	<b>XXM-NET-DN-A</b>

### Notes

<sup>Ⓞ</sup> Type 1 kit provides conduit entry plate.

# M-Max Series Adjustable Frequency AC Drives

## Technical Data and Specifications

### Technical Data and Specifications

#### Ratings

##### M-Max Basic Controller IP20 Standard Ratings

Description	Specification
<b>Protections</b>	
Overcurrent protection	Trip limit $4.0 \times I_H$ instantaneously
Overvoltage protection	115/230V series: 437 Vdc; 400V series: 874 Vdc; 575V series: 1048 Vdc trip level
Undervoltage protection	115/230V series: 183 Vdc; 400V series: 333 Vdc; 575V series: 460 Vdc trip level
Ground fault protection	Ground fault is tested before every start. In case of ground fault in motor or motor cable, only the frequency converter is protected
Overtemperature protection	Yes
Motor overload protection	Yes
Motor stall protection	Yes
Motor underload protection	Yes

#### Programmable Parameters

Description
Application macros: basic, pump, fan and high load (hoist)
Programmable start/stop and reverse signal logic (sinking or sourcing)
Reference scaling
Programmable start and stop functions
DC-brake at start and stop
Programmable V/Hz curve
Adjustable switching frequency
Autorestart function after fault
Protections and supervisions (all fully programmable; off, warning, fault)
Current signal input fault
External fault
Fieldbus communication
Eight preset speeds
Analog input range selection, signal scaling and filtering
PID controller
Skip frequencies

#### Specifications

##### M-Max Series Drives

Description	Specification
<b>Input Ratings</b>	
Input voltage ( $V_{in}$ )	+10%/–15% (575V units: +15%/–15%)
Input frequency ( $f_{in}$ )	50/60 Hz (variation up to 45–66 Hz)
Connection to power	Once per minute or less (typical operation)
<b>Output Ratings</b>	
Output voltage	0 to $V_{in}^{\text{D}}$
Continuous output current	Continuous rated current $I_N$ at ambient temperature max. 122°F (50°C), overload $1.5 \times I_N$ max. 1 min/10 min
Output frequency	0 to 320 Hz
Frequency resolution	0.01 Hz
Initial output current ( $I_H$ )	Current $2 \times I_N$ for 2 seconds in every 20-second period Torque depends on motor
<b>Control Characteristics</b>	
Control method	Frequency control (V/Hz) open loop or sensorless vector control
Switching frequency	1.5 to 16 kHz; default 6 kHz
Frequency reference	Analog input: resolution 0.1% (10-bit), accuracy $\pm 1\%$ V/Hz Panel reference: resolution 0.01 Hz
Field weakening point	30 to 320 Hz
Acceleration time	0 to 3000 sec
Deceleration time	0 to 3000 sec
Braking torque	DC brake: $30\% \times T_n$ (without brake option)
<b>Brake Resistor (Minimum Values) <sup>Ⓓ</sup></b>	
230V Series	FS2 35 ohms and FS3 26 ohms
400V Series	FS2 75 ohms and FS3 54 ohms
575V Series	FS3 103 ohms
<b>Ambient Conditions</b>	
Ambient operating temperature	14°F (–10°C), no frost to 122°F (+50°C): Rated loadability $I_N$
Storage temperature	–40°F (–40°C) to 158°F (70°C)
Relative humidity	0 to 95% RH, noncondensing, non-corrosive, no dripping water
Air quality	Chemical vapors: IEC 721-3-3, unit in operation, Class 3C2; Mechanical particles: IEC 721-3-3, unit in operation, Class 3S2
Altitude	100% load capacity (no derating) up to 3280 ft (1000m); 1% derating for each 328 ft (100m) above 3280 ft (1000m); max. 6560 ft (2000m)
Vibration	EN 60068-2-6; 3 to 150 Hz, displacement amplitude 1 mm (peak) at 3 to 15.8 Hz, max. acceleration amplitude 1G at 15.8 to 150 Hz
Shock	EN 50178, IEC 68-2-27 UPS Drop test (for applicable UPS weights); storage and shipping: max. 15G, 11 ms (in package)
Enclosure class	IP20(FS1-3), IP21(FS4,5)

#### Notes

- Ⓓ Exception: 110V single-phase in, 220V three-phase out.
- Ⓔ Only three-phase FS2 and FS3 drives are equipped with brake chopper circuit.

## I/O Specifications

- Digital inputs DI1–DI6 are freely programmable. The user can assign multiple functions to a single input
- Digital, relay, and analog outputs are freely programmable

## Includes:

- Six digital inputs
- Two analog inputs
  - 4–20 mA
  - 0–10V
- One analog output
- One digital output
- Two relay outputs
- RS-485 interface

## Reliability

- Pretested components: standard
- Computerized testing: standard
- Final test with full load: standard
- Conformal-coated boards
- 50°C rated
- 150% for one minute/10 mm
- 200% for two seconds/20 sec.
- Eaton Electrical Services and Systems: national network of AF drive specialists

## M-Max I/O Interface

Terminal	Signal	Factory Preset	Description
1	+10V	—	Ref. output voltage Maximum load 10 mA
2	AI1	Freq. reference <sup>P1</sup>	Analog signal in 1 0–+10V Ri = 200k ohms [min.]
3	GND	—	I/O signal ground
6	24V	—	24V output for DI's ±20%, max. load 50 mA
7	GND	—	I/O signal ground
8	DI1	Start forward <sup>P1</sup>	Digital input 1 0–+30V Ri = 12k ohms min.
9	DI2	Start reverse <sup>P1</sup>	Digital input 2
10	DI3	Preset speed <sup>P1</sup>	Digital input 3
A	A	FB communication	RS-485 signal A
B	B	FB communication	RS-485 signal B
4	AI2	PI actual value <sup>P1</sup>	Analog signal in 2 0[4]–20 mA, Ri = 200k ohms
5	GND	—	I/O signal ground
13	GND	—	I/O signal ground
14	DI4	Preset speed B1 <sup>P1</sup>	Digital input 4 0–+30V Ri = 12k ohms min.
15	DI5	Fault reset <sup>P1</sup>	Digital input 5 0–+30V Ri = 12k ohms min.
16	DI6	Disable PI contr. <sup>P1</sup>	Digital input 6 0–+30V Ri = 12k ohms min.
18	AO	Output frequency <sup>P1</sup>	Analog output 0[2]–10V, RL = 500 ohms
20	DO	Active = READY <sup>P1</sup>	Digital signal out Open collector, max. load 48V/50 mA
22	RO11	Relay out 1 Active = RUN <sup>P1</sup>	Max. switching load: 250 Vac/2A or 250 Vdc/0.4A
23	RO12		
24	RO21	Relay out 2 Active = FAULT <sup>P1</sup>	Max. switching load: 250 Vac/2A or 250 Vdc/0.4A
25	RO22		
26	RO23		

## Note

<sup>P1</sup> Parameter-selectable function.

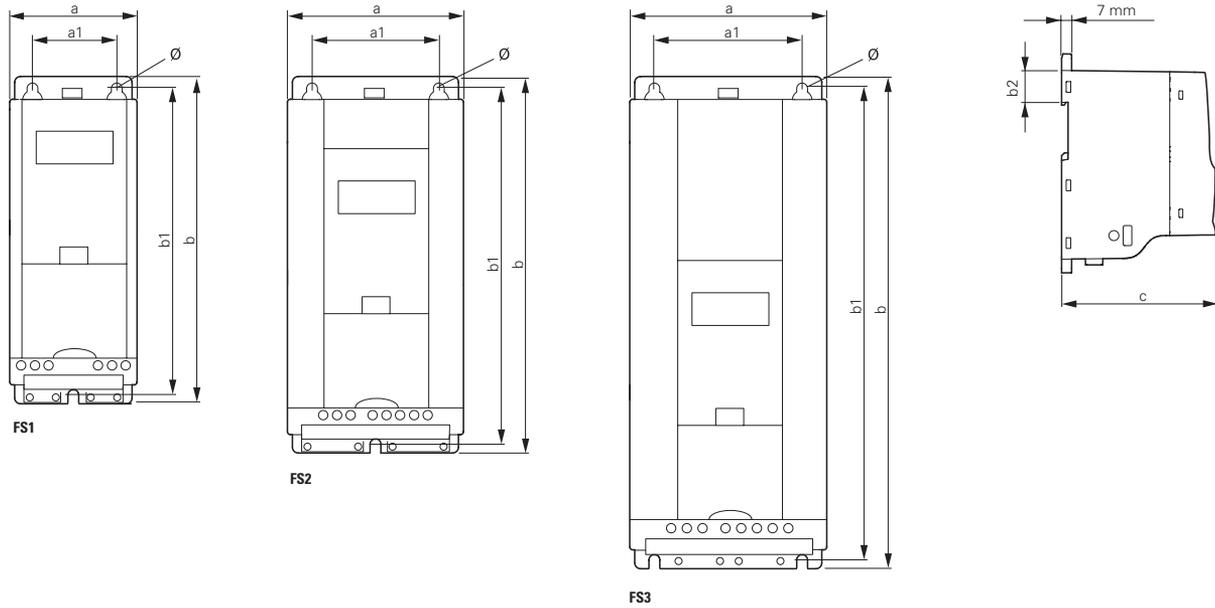
# M-Max Series Adjustable Frequency AC Drives

## Dimensions

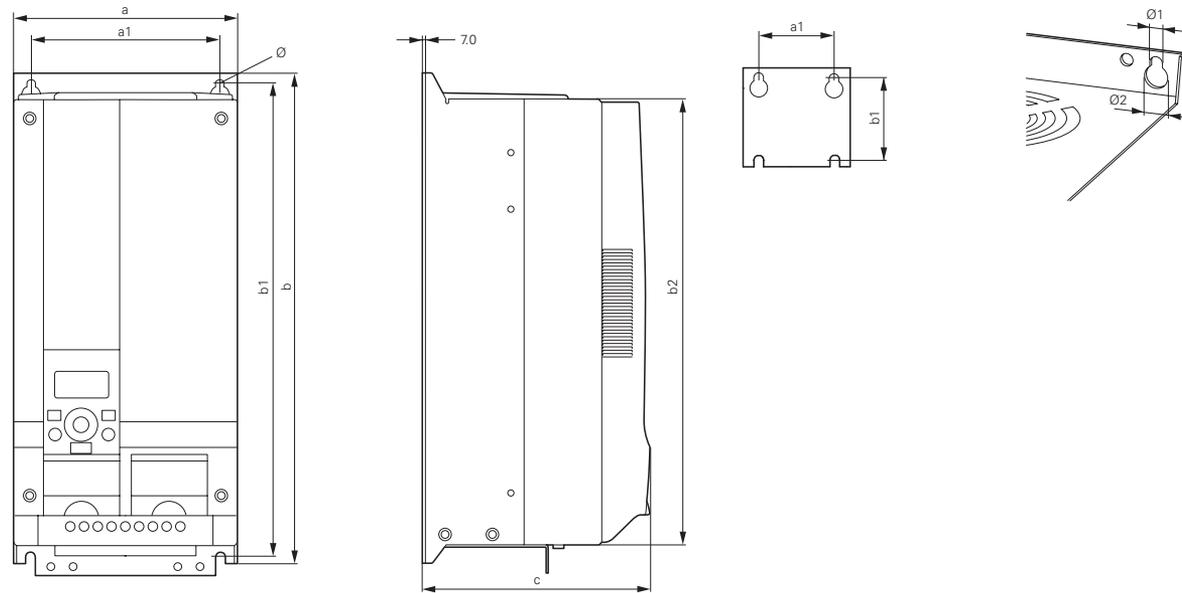
### Dimensions

Approximate Dimensions in Inches (mm)

#### Frame Type FS1, FS2, FS3



#### Frame Type FS4, FS5



Frame Type	Size (mm)							Weight (kg)	
	a	a1	b	b1	b2	c	Ø, Ø1	Ø2	
FS1	66	38	160	147	32	102	4.5	-	0.550
FS2	90	62.5	195	182	32	105	5.5	-	0.699
FS3	100	75	253	242	34	112	5.5	-	0.990
FS4	165.0	140.0	370.0	351.0	337.0	168.0	7.0	14.0	8
FS5	165.0	140.0	414.0	398.0	383.0	205.0	7.0	14.0	10

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M-MAX-SEA  
May 2014

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