Motion Solutions Product Guide

NOTE

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Should information not covered in this document be required, contact the Customer Service Department, Sheffield Automation, 660 South Military Road, P.O. Box 1658, Fond du Lac, WI 54936-1658. Sheffield Automation can be reached by telephone at 920 921 7100.

Version 2.0

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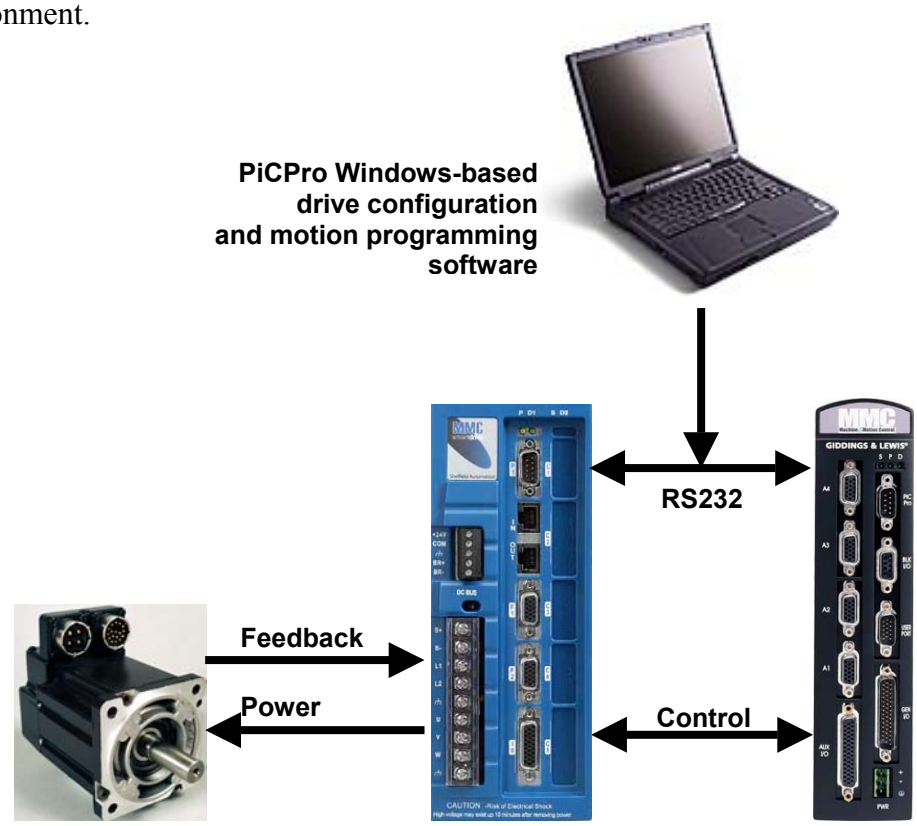
MMC Smart Drives - Digital Servo Amplifiers

The Sheffield Automation MMC Smart Drive line is a family of versatile servo amplifiers. These feature-rich, high performance drives offer flexibility in a wide range of applications. Configuration and tuning is simplified through the easy-to-use, Windows-based PiCPro software providing both drive setup and motion control programming in an integrated environment.



The MMC Smart Drive has the flexibility to operate a wide variety of motors so you can optimize the motor/drive system for your application. Using PiCPro, a Sheffield Automation standard motor file can be selected with a click of the mouse. The drive then automatically configures itself for operation with the selected motor. The majority of the motor families uses a 2000 line incremental encoder but also have a high resolution option. This single and multiturn absolute high-resolution encoder, used in conjunction with an MMC Smart Drive, provides superior velocity loop bandwidth for the most demanding applications.

Flexible System

- Integral power supply simplifies installation
- Choice of feedback types: Incremental Encoder, High Resolution Encoder, or Resolver
- Drive control power independent of drive line power - maintain drive control power while line voltage is off for diagnostics and feedback tracking
- Choose from seven standard motor families to get an exact fit for your application
- The same features, cabling and performance available in both the 230 volt and 460 volt drive families

Easy Set-up and Maintenance

- Windows-based PiCPro software provides simple troubleshooting and diagnostic tools
- All setup and tuning parameters are saved in non-volatile memory on the drive
- All drive configuration and tuning parameters can be set up off-line and saved to disk

Industry Leading Performance

- Advanced speed control algorithms for superior control
- Velocity loop bandwidth up to 400 Hz
- High frequency and high resolution encoder input capability

Reliability

- Tested for vibration, shock, humidity and temperature
- Built-in protection circuitry safeguards your system
- Software monitors Over Voltage, Over Current and Over Temperature conditions
- Wireless construction
- Highly integrated hardware design with custom ASICS and Intelligent Power Modules

Global Standards

- UL and C/UL listed
- CE marked

MMC Smart Drive - 230 Volt Amplifier Family Features

The MMC-SD-x-230 amplifiers deliver full-featured flexibility and performance in a compact size. This space-saving drive is also a time saver with its easy to use Windows-based configuration and maintenance software integrated within PiCPro, our IEC61131 motion control programming software. For superior performance in a variety of power ratings and sizes, the MMC Smart Drive is the one drive that can do it all.

- Available in 0.5 kW, 1.0 kW and 2.0 kW continuous output power ratings
- 100 to 240V AC single phase input
- External active shunt available
- Phase-to-phase and phase-to-ground short circuit protection
- Drives sinusoidal AC brushless motors
- Choice of Incremental Encoder, High Resolution Encoder or Resolver motor feedback
- Advanced control algorithms for leading edge velocity loop bandwidth. Current and velocity loops are digital
- 8 user-assignable, optically isolated digital inputs
- 4 user-assignable, optically isolated digital outputs
- 1 relay output (typically for brake control)
- RS232 Serial port for PiCPro Configuration
- UL, C/UL listed and CE marked

MMC Smart Drive 230 Volt Family

Model	Package	Cont. Current (amps)	Peak Current (amps)	Dimensions inches (mm) WxHxD
MMC-SD-0.5-230	Micro	2.5	7.5	3.15(80) x 9.65(245) x 7.87(200)
MMC-SD-1.0-230	Micro	5.0	15.0	4.33(110) x 9.65(245) x 7.87(200)
MMC-SD-2.0-230	Micro	10.0	30.0	4.33(110) x 9.65(245) x 7.87(200)

MMC Smart Drive - 460 Volt Amplifier Family Features

The MMC-SD-x-460 amplifiers deliver full-featured flexibility and performance over a broad power range. This drive family is also a time saver with its easy to use Windows-based configuration and maintenance software integrated within PiCPro, our IEC61131 motion control programming software. For superior performance in a variety of power ratings and sizes, the MMC Smart Drive is the one drive that can do it all.

- Available in 1.3 kW to 24.0 kW continuous output power ratings
- 200 to 480V AC three phase input
- External passive shunt available
- Phase-to-phase and phase-to-ground short circuit protection
- Drives sinusoidal AC brushless motors
- Choice of Incremental Encoder, High Resolution Encoder or Resolver motor feedback
- Advanced control algorithms for leading edge velocity loop bandwidth. Current and velocity loops are digital
- 8 user-assignable, optically isolated digital inputs
- 4 user-assignable, optically isolated digital outputs
- 1 brake driver output
- RS232 Serial port for PiCPro Configuration
- UL, C/UL listed and CE marked

MMC Smart Drive 460 Volt Family

Model	Package	Cont. Current (amps)	Peak Current (amps)	Dimensions inches (mm) WxHxD
MMC-SD-1.3-460	Size 1	3.0	6.0	4.17(106) x 12.20(310) x 10.63(270)
MMC-SD-2.4-460	Size 1	5.5	11.0	4.17(106) x 12.20(310) x 10.63(270)
MMC-SD-4.0-460	Size 2	9.0	18.0	4.17(106) x 15.75(400) x 13.19(335)
MMC-SD-6.0-460	Size 2	13.5	27.0	4.17(106) x 15.75(400) x 13.19(335)
MMC-SD-8.0-460	Size 2	18.0	36.0	4.17(106) x 15.75(400) x 13.19(335)
MMC-SD-12.0-460	Size 3	27.5	55.0	5.51(140) x 19.69(500) x 14.37(365)
MMC-SD-16.0-460	Size 3	36.5	73.0	5.51(140) x 19.69(500) x 14.37(365)
MMC-SD-24.0-460	Size 3	55.0	110.0	5.51(140) x 19.69(500) x 14.37(365)

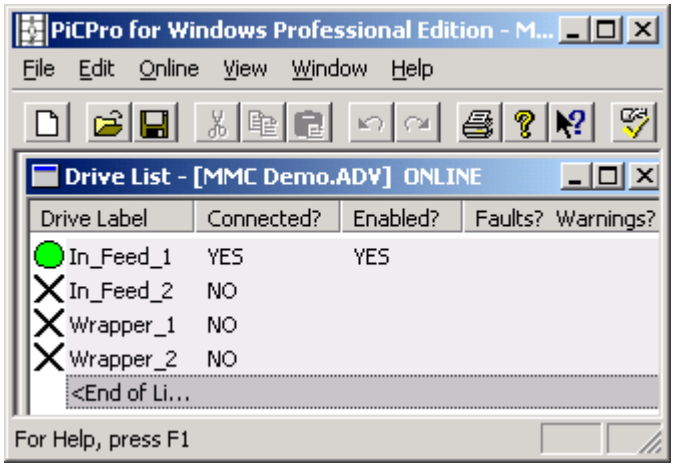
PiCPro for Windows Drive Configuration

PiCPro for Windows provides convenient point-and-click software for configuring, maintaining and tuning MMC Smart Drive servo amplifiers. The on-line help and Basic and Expert Drive Data views allow simple operation for any user. Tools such as the on-screen, digital oscilloscope provide simplified tuning and diagnosis. MMC Smart Drives keep a time-stamped history of error messages in its own non-volatile memory to save time in tracking down a problem. PiCPro can also be used off-line to configure a drive and save the set-up to disk for later downloading.

PiCPro Sample Screens

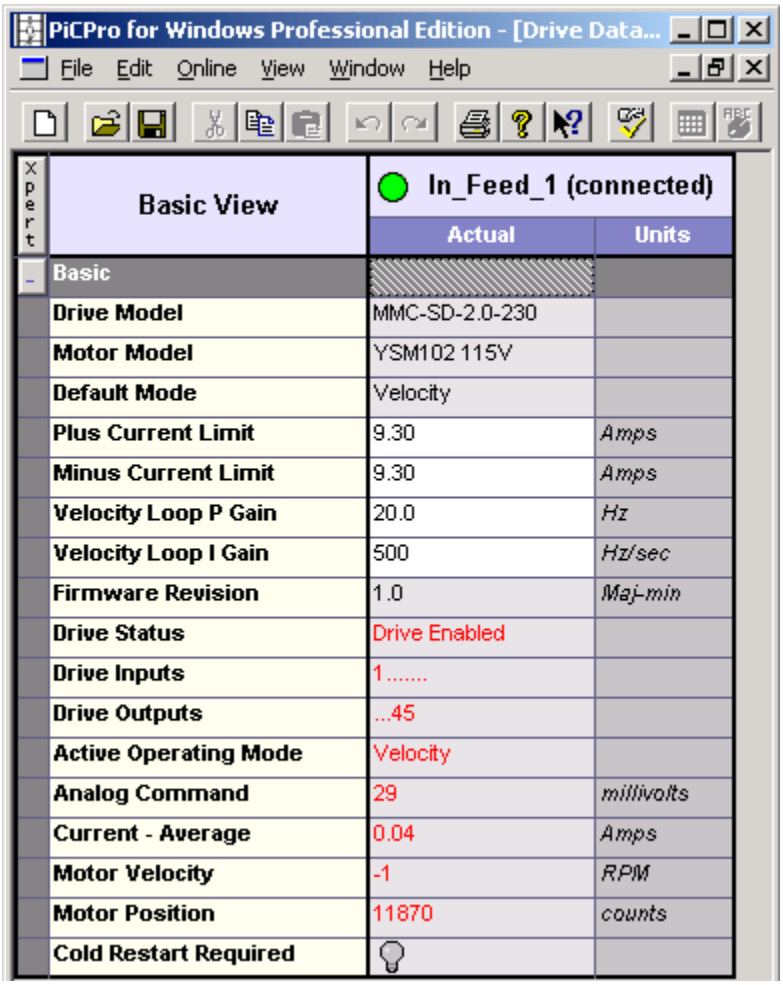
PiCPro has a complete set of easy to understand drive setup windows available via its pull down menus. Examples of PiCPro drive configuration and tuning screens are shown below.

Drive List



The Drive List is a list of all of the MMC Smart Drives in your application. The status of the drive you are presently connected to is presented. Double-click on any drive to access its configuration and tuning settings and monitor its operation.

Drive Data - Basic View

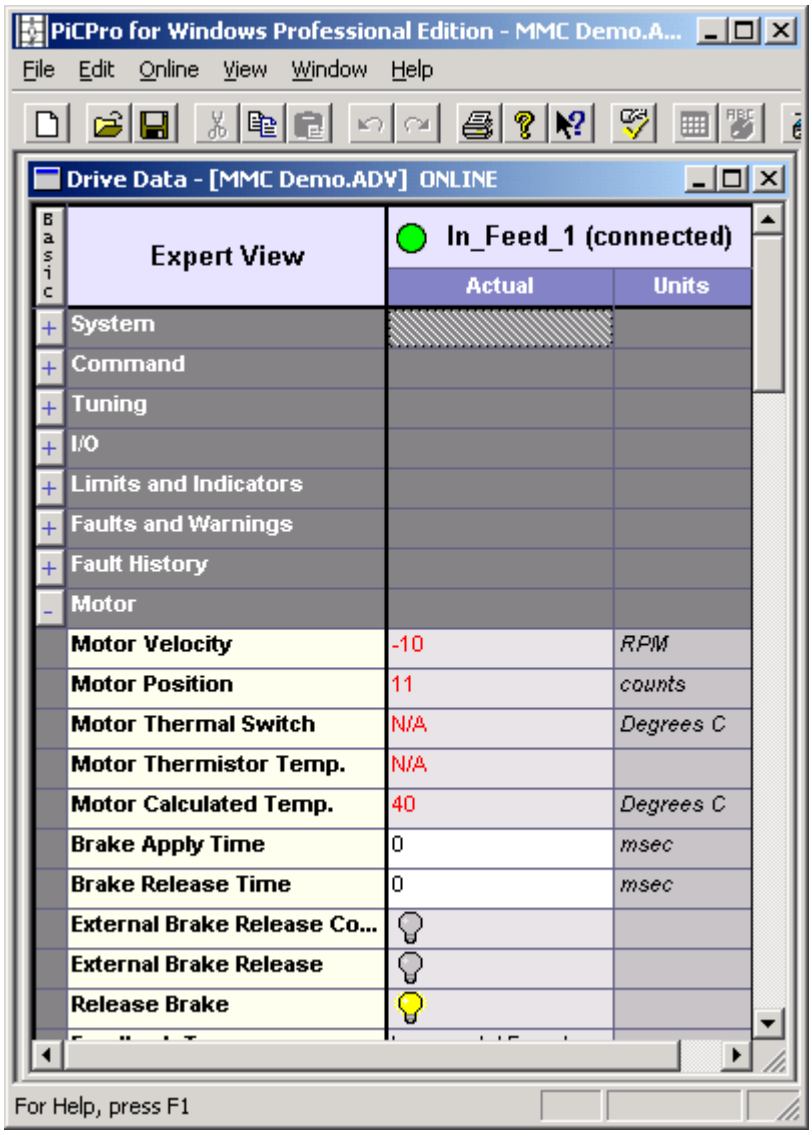


Drive Data - Basic View provides an overview of drive settings and performance in a single window. Select a motor and amplifier, set velocity loop gains and current limits and monitor drive output from one simple view.

Click "xpert" to toggle to the expert view where all drive parameters and monitor variables can be accessed.

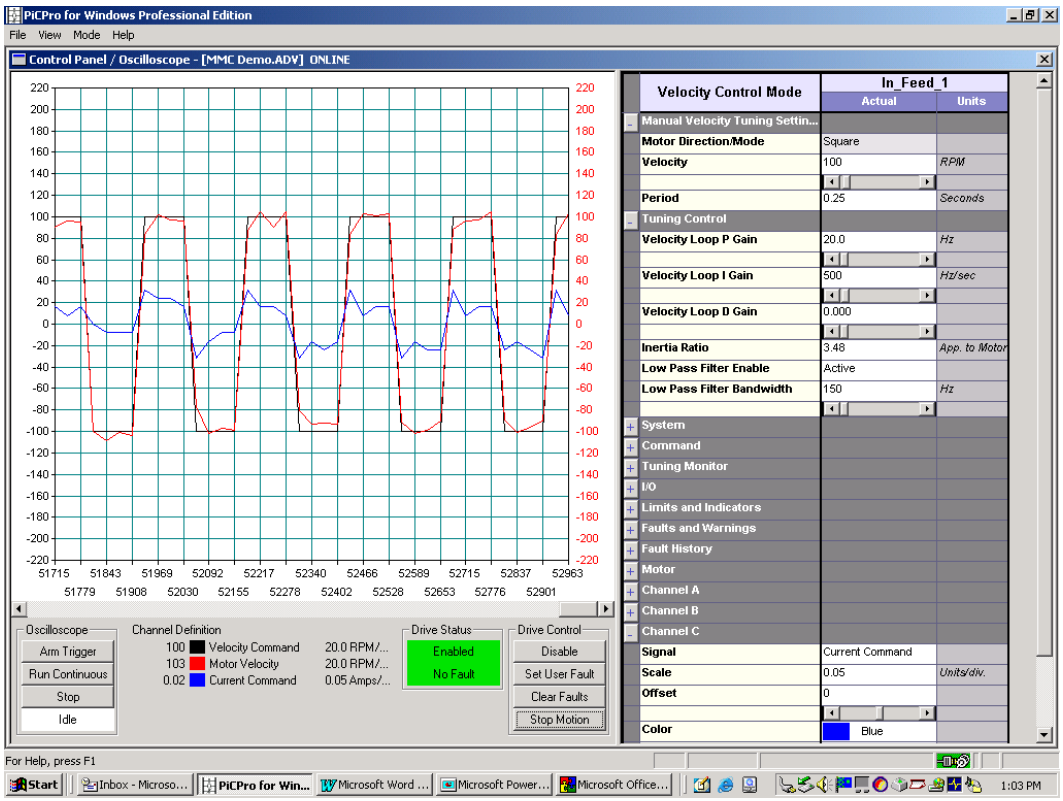
For on-line help simply select the cell of interest and press F1.

Drive Data - Expert View



Drive Data - Expert View provides access to all drive monitor variables and configuration parameters. Data is organized in categories for quick navigation.

Oscilloscope/Control Panel



The four-channel software oscilloscope provides graphical monitoring of drive performance. All drive monitor data is accessible using the oscilloscope and both scope setups and traces captured using the scope can be saved to disk for later reference. Additionally, three Control Panel operating modes are provided. Velocity Control, Current Control and Auto Tune allow drive control via PiCPro and are very useful tools during system start up.

MMC Smart Drive Configuration Software

PiCPro Edition	Description	Part Number
Professional Edition	Program and Monitor all PiC, MMC and MMC for PC Controls, Configure MMC Smart Drive servo amplifiers, includes cable	M.1300.7213
MMC-Limited Edition	Program and Monitor MMC-A2, A4, S8 Controls, Configure MMC Smart Drive servo amplifiers, includes cable	M.1300.7214
Monitor Edition	Monitor all PiC, MMC and MMC for PC Controls, Configure MMC Smart Drive servo amplifiers, includes cable, Available for free download from www.glcontrols.com	M.1300.7215

MMC Smart Drive Specifications

General Power Specifications and Requirements

Specification	Description		
	MMC-SD-0.5-230	**MMC-SD-1.0-230**	**MMC-SD-2.0-230**
AC Input Voltage	100-240VAC (nominal) single Phase, 88-265 VAC (absolute limits)		
AC Input Frequency	47 - 63 Hz		
AC Input Current Nominal Maximum inrush (230V AC input)	 $5A_{rms}$ 70A (0-peak)	 $9A_{rms}$ 70A (0-peak)	 $18A_{rms}$ 70A (0-peak)
DC Input Power (24V DC) Typical Current Inrush Current	 350 mA 1.5A for 10 ms	 350 mA 1.5A for 10 ms	 650 mA 1.5A for 10 ms
Continuous Output Current	2.5A (0-peak)	5A (0-peak)	10A (0-peak)
Peak Output Current	7.5A (0-peak)	15A (0-peak)	30A (0-peak)
Energy Absorption Capability 115V AC input 230V AC input	 94 Joules 38 Joules	 126 Joules 51 Joules	 126 Joules 51 Joules
Continuous Power Output 115V AC input 230V AC input	 0.25 kW 0.5 kW	 0.5 kW 1.0 kW	 1.0 kW 2.0 kW

Specification	Description		
	MMC-SD-1.3-460	**MMC-SD-2.4-460**	**MMC-SD-4.0-460**
AC Input Voltage	200-480VAC (nominal), three phase, 180-528 VAC (absolute limits)		
AC Input Frequency	47 - 63 Hz		
AC Input Current Nominal, 460V AC input Maximum inrush, 460V AC input	 $2.44A_{rms}$ $4.56A_{rms}$	 $4.18A_{rms}$ $7.81A_{rms}$	 $7A_{rms}$ $13.2A_{rms}$
DC Input Power (24 VDC) Typical Current Inrush Current	 700 mA 4A for 10 ms		 1050 mA 4A for 10 ms
Continuous Output Current	3.0A (0-peak)	5.5A (0-peak)	9.0A (0-peak)
Peak Output Current	6.0A (0-peak)	11.0A (0-peak)	18.0A (0-peak)
External Shunt Minimum resistance Maximum power Maximum current	 130 Ohms 4.5 kW 5.9A (AC)	 130 Ohms 5.0 kW 5.9A(AC)	 86 Ohms 7.0 kW 9A (AC)
Energy Absorption Capability 230V Motor w/230V AC input 460V Motor w/230V AC input 460V Motor w/460V AC input	 3 Joules 28 Joules 10 Joules	 7 Joules 60 Joules 22 Joules	 13 Joules 188 Joules 44 Joules
Continuous Power Output 230V AC input 460V AC input	 0.65 kW 1.3 kW	 1.2 kW 2.4 kW	 2.0 kW 4.0 kW

Specification	Description		
	MMC-SD-6.0-460	**MMC-SD-8.0-460**	**MMC-SD-12.0-460**
AC Input Voltage	200-480VAC (nominal), three phase, 180-528 VAC (absolute limits)		
AC Input Frequency	47 - 63 Hz		
AC Input Current Nominal, 460V AC input Maximum inrush, 460V AC input	 10.8A_{rms} 20.2A_{rms}	 14.8A_{rms} 27.7A_{rms}	 16.7A_{rms} 32.2A_{rms}
DC Input Power (24 VDC) Typical Current Inrush Current	 1050 mA 4A for 10 ms		
Continuous Output Current	13.5A (0-peak)	18.0A (0-peak)	27.5A (0-peak)
Peak Output Current	27.0A (0-peak)	36.0A (0-peak)	55.0A (0-peak)
External Shunt Minimum resistance Maximum power Maximum current	 60 Ohms 10 kW 9A (AC)	 44 Ohms 14 kW 9A (AC)	 22 Ohms 29 kW 36A (AC)
Energy Absorption Capability 230V Motor w/230V AC input 460V Motor w/230V AC input 460V Motor w/460V AC input	 13 Joules 188 Joules 44 Joules	 19 Joules 177 Joules 66 Joules	 22 Joules 206 Joules 76 Joules
Continuous Power Output 230V AC input 460V AC input	 3.0 kW 6.0 kW	 4.0 kW 8.0 kW	 6.0 kW 12.0 kW
Specification	**Description**		
	MMC-SD-16.0-460	**MMC-SD-24.0-460**	
AC Input Voltage	200-480VAC (nominal), three phase, 180-528 VAC (absolute limits)		
AC Input Frequency	47 - 63 Hz		
AC Input Current Nominal, 460V AC input Maximum inrush, 460V AC input	 21.1A_{rms} 39.2A_{rms}	 33.1A_{rms} 61.8A_{rms}	
DC Input Power (24 VDC) Typical Current Inrush Current	 1050 mA 4A for 10 ms		
Continuous Output Current	36.5A (0-peak)	55A (0-peak)	
Peak Output Current	73.0A (0-peak)	110.0A (0-peak)	
External Shunt Minimum resistance Maximum power Maximum current	 22 Ohms 29 kW 36A (AC)	 16 Ohms 40 kW 50A (AC)	
Energy Absorption Capability 230V Motor w/230V AC input 460V Motor w/230V AC input 460V Motor w/460V AC input	 33 Joules 309 Joules 114 Joules	 45 Joules 412 Joules 152Joules	
Continuous Power Output 230V AC input 460V AC input	 8.0 kW 16.0 kW	 12.0 kW 24.0 kW	

Physical and Environmental

Specification	Description
Weight MMC-SD-0.5-230 MMC-SD-1.0-230 MMC-SD-2.0-230 MMC-SD-1.3-460 MMC-SD-2.4-460 MMC-SD-4.0-460 MMC-SD-6.0-460 MMC-SD-8.0-460 MMC-SD-12.0-460 MMC-SD-16.0-460 MMC-SD-24.0-460	 4.9 lbs (2.23 kg) 5.6 lbs (2.55 kg) 5.7 lbs (2.59 kg) 10.0 lbs (4.54 kg) 10.0 lbs (4.54 kg) 16.0 lbs (7.27 kg) 16.0 lbs (7.27 kg) 16.0 lbs (7.27 kg) 35.0 lbs (15.9 kg) 35.0 lbs (15.9 kg) 35.0 lbs (15.9 kg)
Operating Temperature MMC-SD-x-230 MMC-SD-x-460	 0° C to 55° C (32° F to 131° F) 0° C to 50° C (32° F to 122° F)
Storage Temperature	-30° C to 70° C (-22° F to 158° F)
Humidity	5% to 95% non-condensing
Altitude	1500 m (5000 ft) Derate 3% for each 300 m above 1500m
Vibration Limits (per IEC68-2-6) Operating/Non-operating	 10-57 Hz (constant amplitude .15mg) 57-2000 Hz (acceleration 2g)
Shock (per IEC68-2-27) Non-operating	 Four shocks per axis (15 g/11 ms)
UL and C/UL Listed	E233454
CE Marked	Yes, see product manual

Power Dissipation

Use the following table to size an enclosure and calculate required ventilation for the MMC Smart Drive. Typical heat losses run approximately one-half maximum power losses. The maximum power losses are shown below.

Model Name	Maximum Loss (Watts)
MMC-SD-0.5-230	22 + dissipative shunt
MMC-SD-1.0-230	37 + dissipative shunt
MMC-SD-2.0-230	70 + dissipative shunt
MMC-SD-1.3-460	34 + dissipative shunt
MMC-SD-2.4-460	60 + dissipative shunt
MMC-SD-4.0-460	102 + dissipative shunt
MMC-SD-6.0-460	150 + dissipative shunt
MMC-SD-8.0-460	204 + dissipative shunt
MMC-SD-12.0-460	300 + dissipative shunt
MMC-SD-16.0-460	390 + dissipative shunt
MMC-SD-24.0-460	600 + dissipative shunt

Motor Feedback

User I/O Connector Encoder Emulation Output		
F1 Motor Feedback Type	**Input Limit**	**Encoder Emulation Output (A quad B Differential Output)**
Incremental Encoder	720 kHz 2.88 M counts/sec.	The motor encoder A/B/I inputs are electrically buffered and retransmitted via the User I/O connector.
High Resolution Encoder	100 kHz 400 K counts/sec	The encoder SIN/COS signals are electrically squared and retransmitted as A/B. The index mark "I" is synthesized by the drive control DSP. Absolute position information is not available via the Encoder Emulation Output.
Resolver	500 RPS 2.00 M counts/sec.	The field-installable resolver interface module converts the motor resolver to 1024 lines/4096 counts per revolution of A/B encoder output. The module synthesizes the index mark "I" once per revolution of the resolver. Absolute position information is not available via the Encoder Emulation Output.

Control

Specification	Description
Commutation	3 Phase Sinusoidal, Space Vector Modulated (SVM)
Current Regulator	Digital PI 125 µsec update rate
Velocity Regulator	Digital PID - 250 µsec update rate

Inputs and Outputs

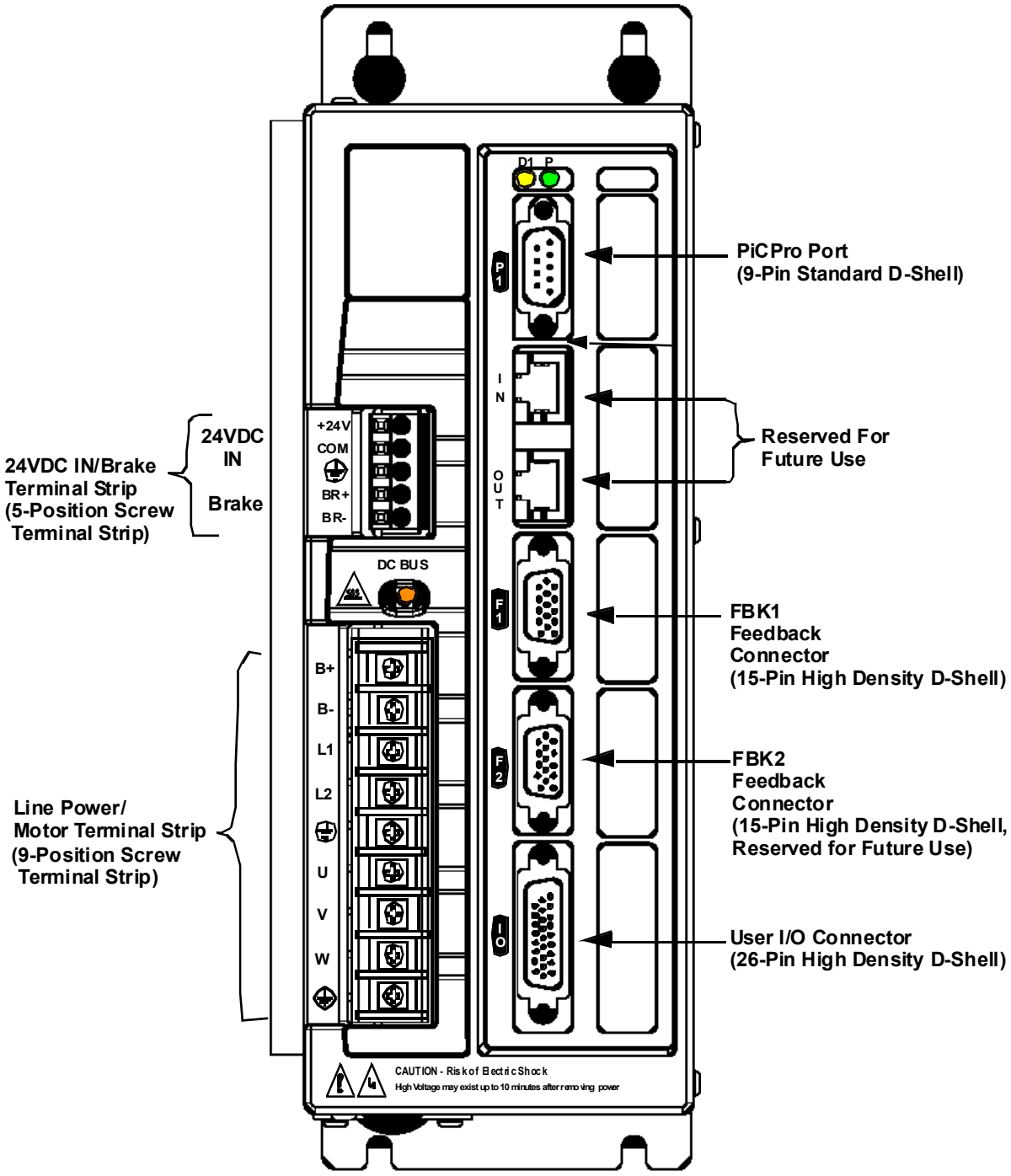
Specification	Description
Digital Inputs	8 Optically Isolated 24V DC Inputs, Active High, 6 current sourcing (current flow into input), 2 current sink or source
Digital Outputs	4 Optically Isolated 24V DC Outputs, Active High, Current Sourcing (current into load), short circuit and overload protected
Analog Input Command	- Analog velocity or torque, 0 to ±10 V - 14-bit effective resolution
Brake Control MMC-SD-x-230 MMC-SD-x-460	 Brake control relay Brake control driver

Connectors

Connector	Specification	Description
P1	PiCPro Serial Communications	9-pin standard D-shell
In	Reserved for future use	RJ45
Out	Reserved for future use	RJ45
F1	Motor Feedback Connector	15-pin high density, D-shell
F2	Reserved for future use	15-pin high density, D-shell
IO	I/O Connector Use	26-pin high density, D-shell

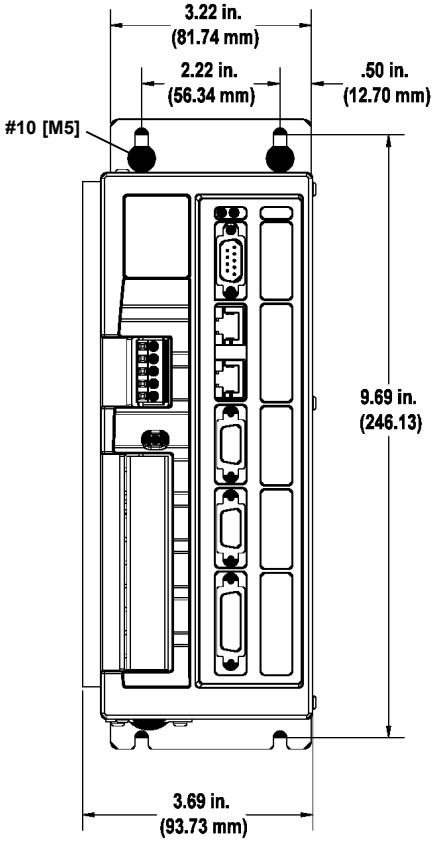
MMC-SD-0.5-230 Connector

Front Panel, 230v Single Phase (500W, 1kW, 2kW)

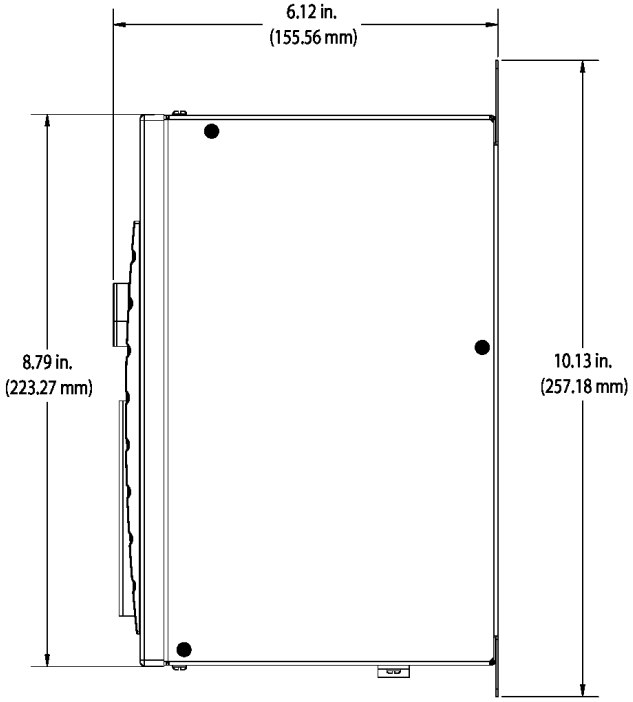


Dimensions and Mounting Diagrams for MMC-SD-0.5-230

230V 500W Drive – Front View

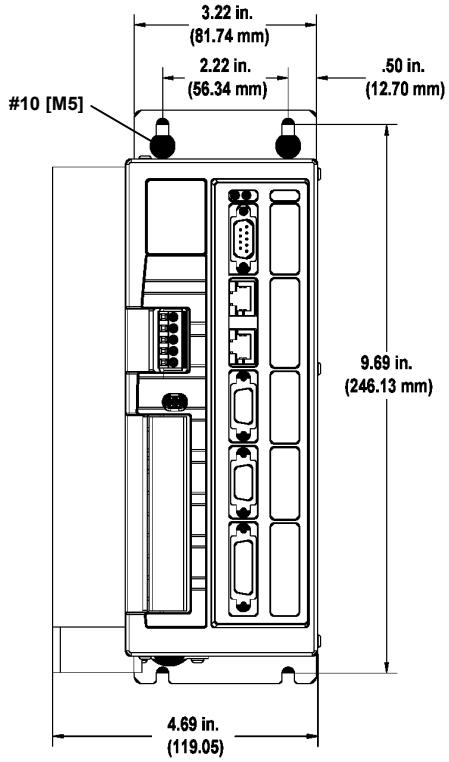


230V 500W Drive – Side View

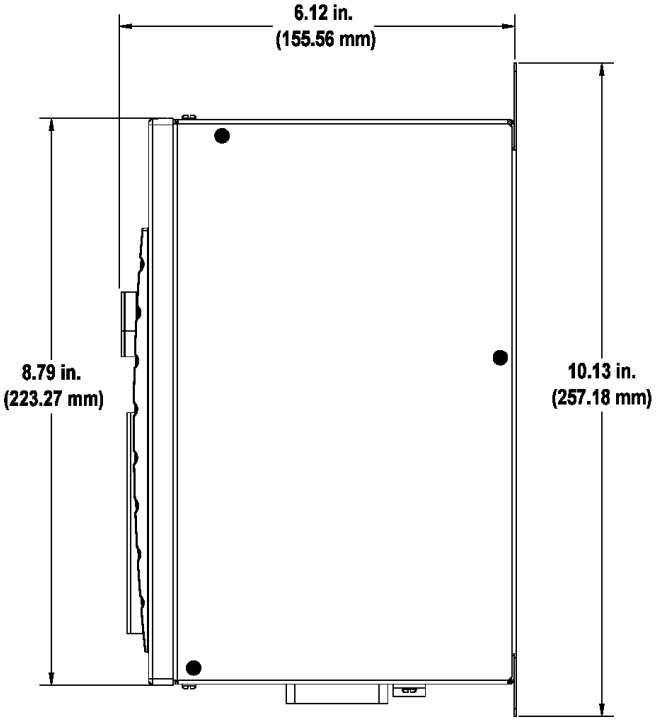


Dimensions and Mounting Diagram for MMC-SD-1.0-230 and MMC-SD-2.0-230

230V 1kW and 2kW Drive – Front View

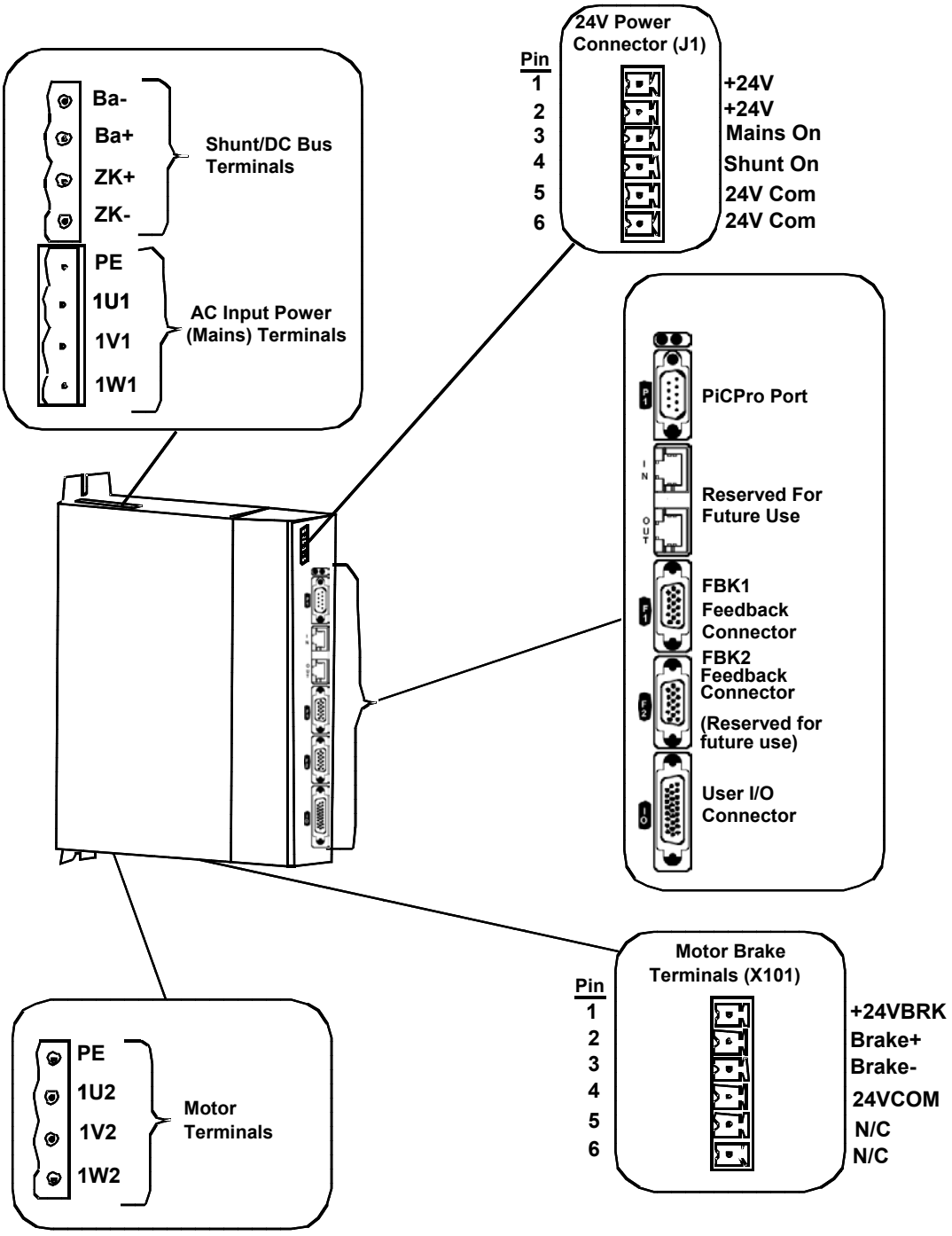


230 1kW and 2kW Drive – Side View



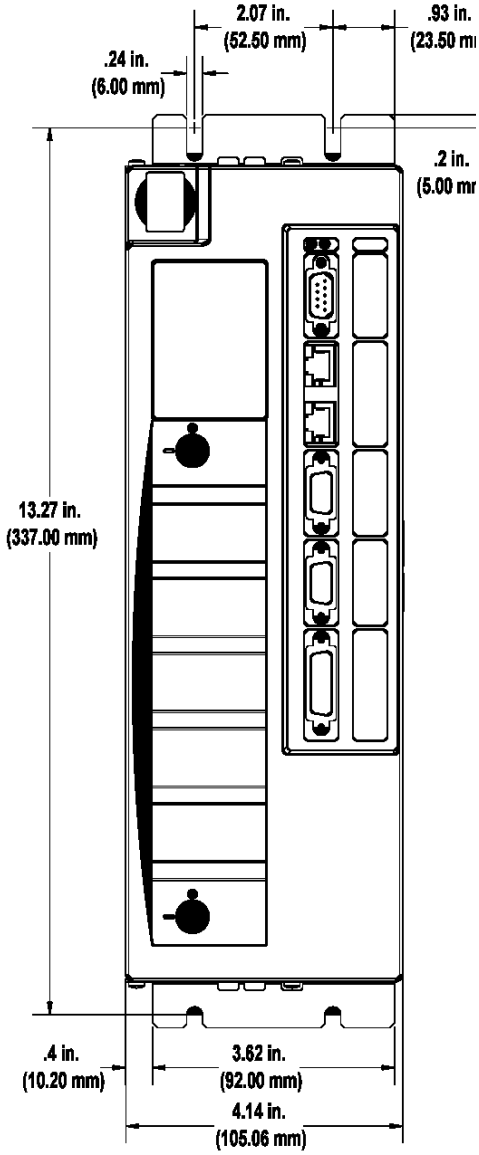
MMC-SD-1.3-460 and MMC-SD-2.4-460 Connectors

Connectors on the size 1 460V Drive

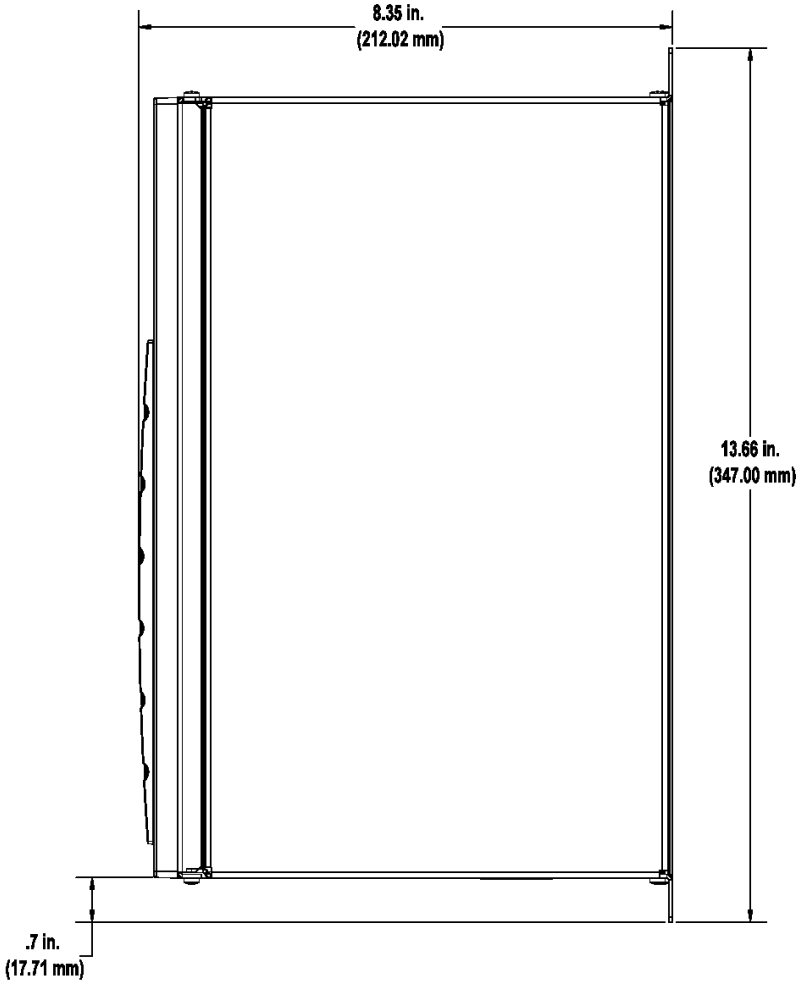


Dimensions and Mounting Diagram for MMC-SD-1.3-460 and MMC-SD-2.4-460

Size 1 460V Drive – Front View

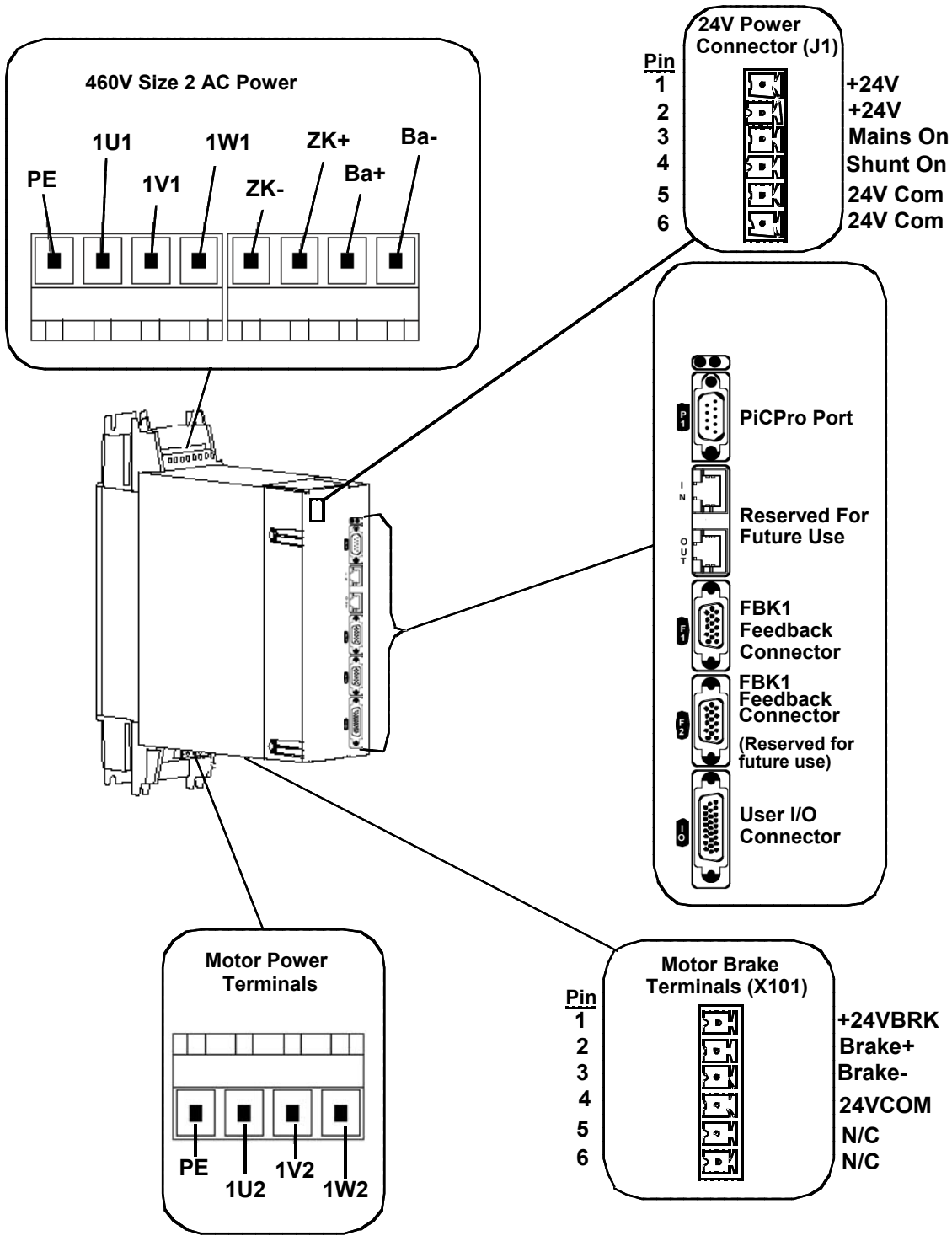


Size 1 460V Drive – Side View



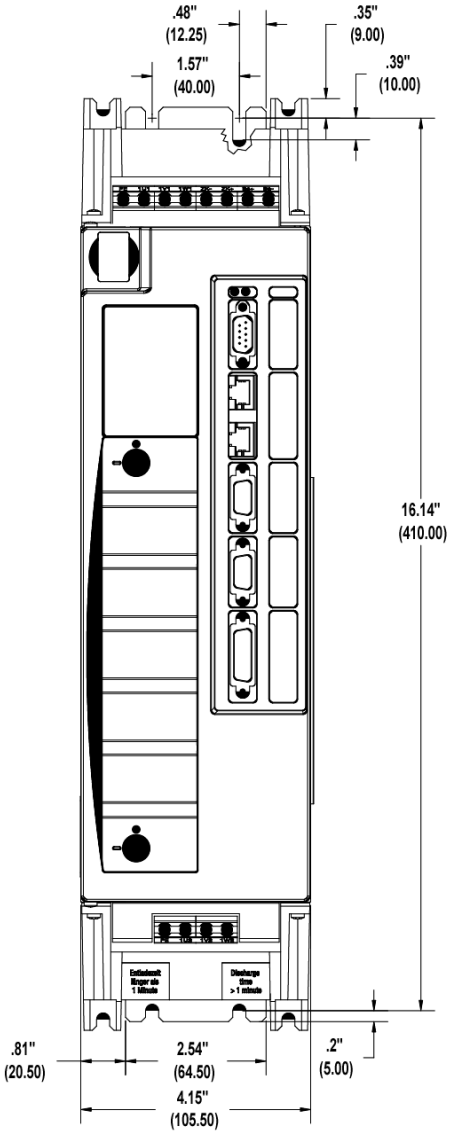
MMC-SD-4.0-460, MMC-SD-6.0-460, and MMC-SD-8.0-460 Connectors

Connectors on the Size 2 460V Drive

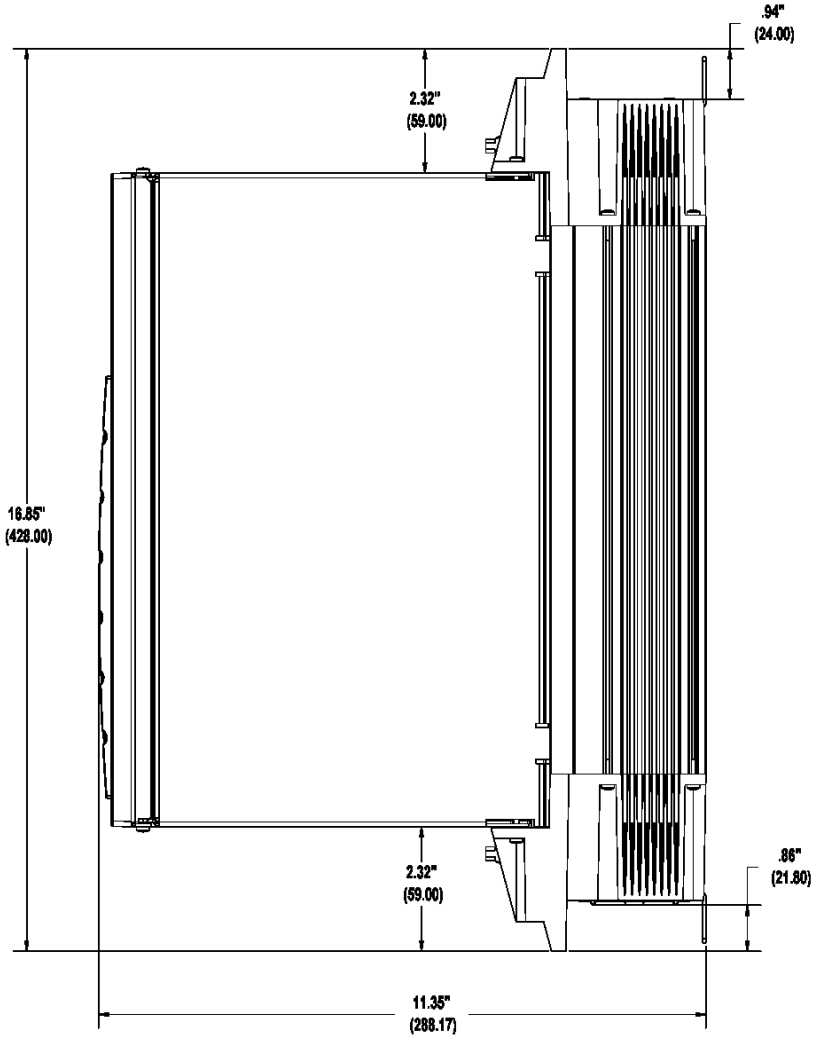


Dimensions and Mounting Diagram for MMC-SD-4.0-460, MMC-SD-6.0-460, and MMC-SD-8.0-460

Size 2 460V Drive – Front View

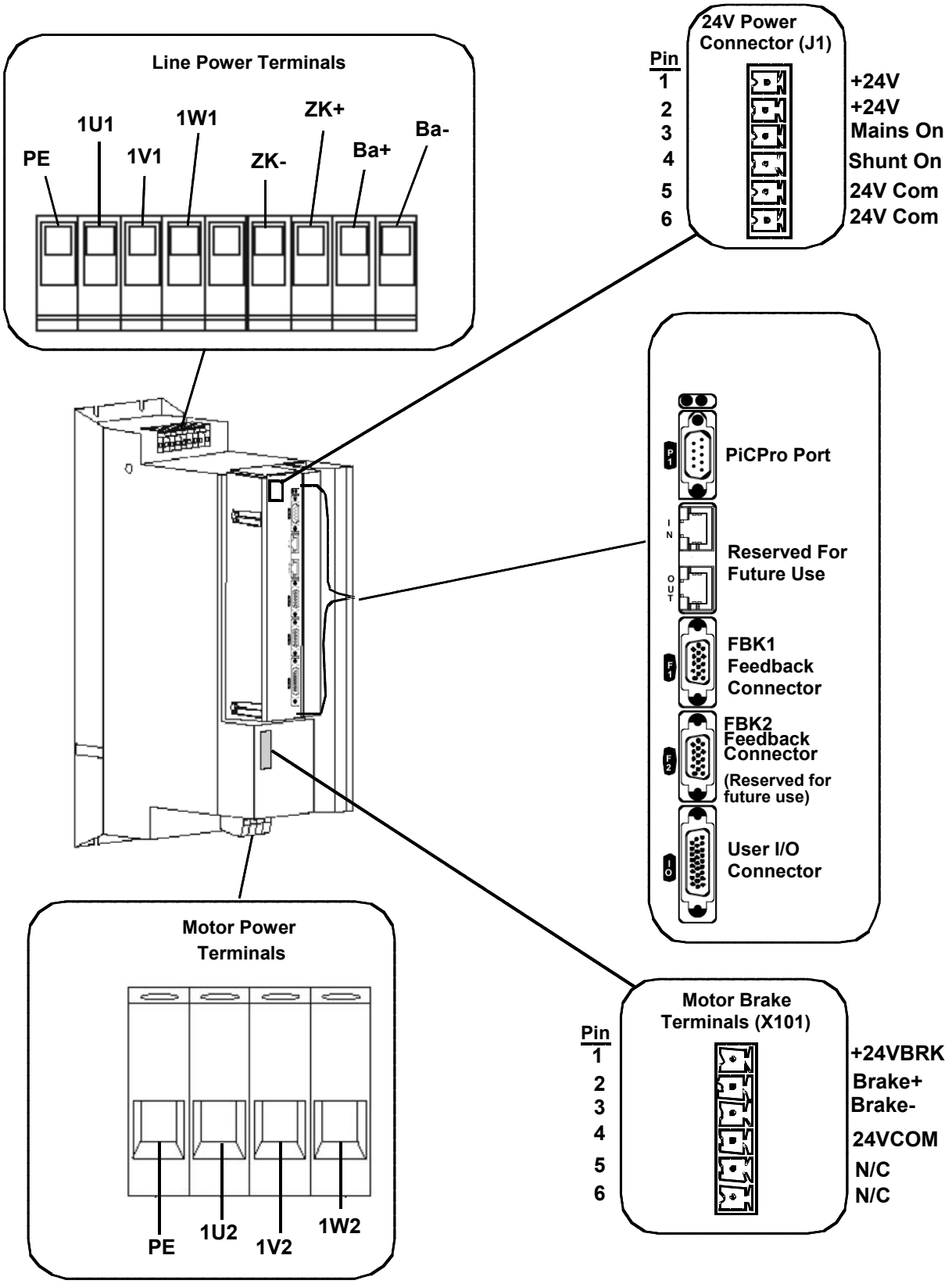


Size 2 460V Drive – Side View



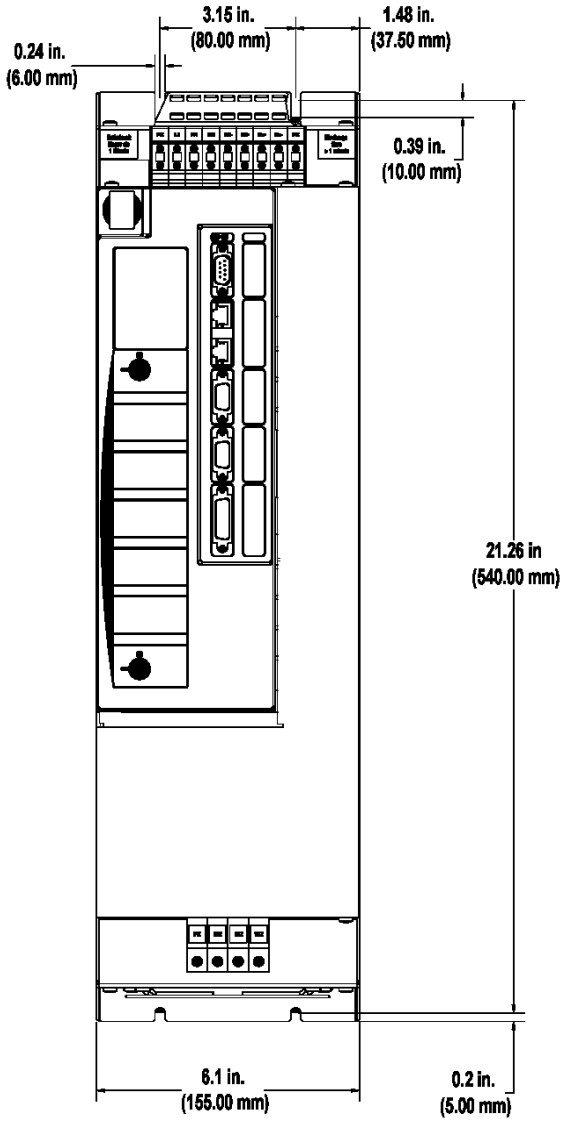
MMC-SD-12.0-460, MMC-SD-16.0-460, and MMC-SD-24.0-460 Connectors

Connectors on the Size 3 460V Drive

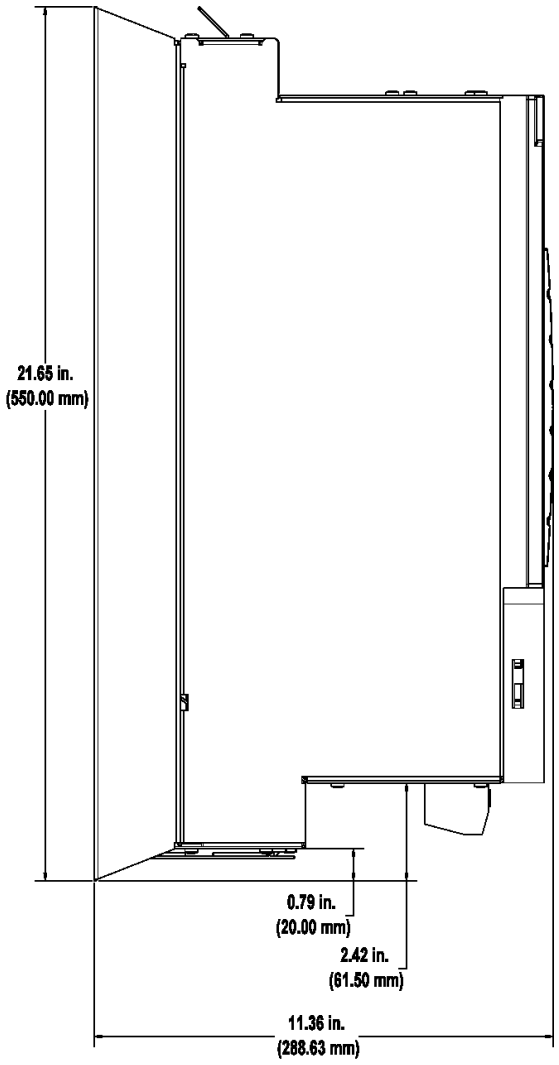


Dimensions and Mounting Diagram for MMC-SD-12.0-460, MMC-SD-16.0-460, and MMC-SD-24.0-460

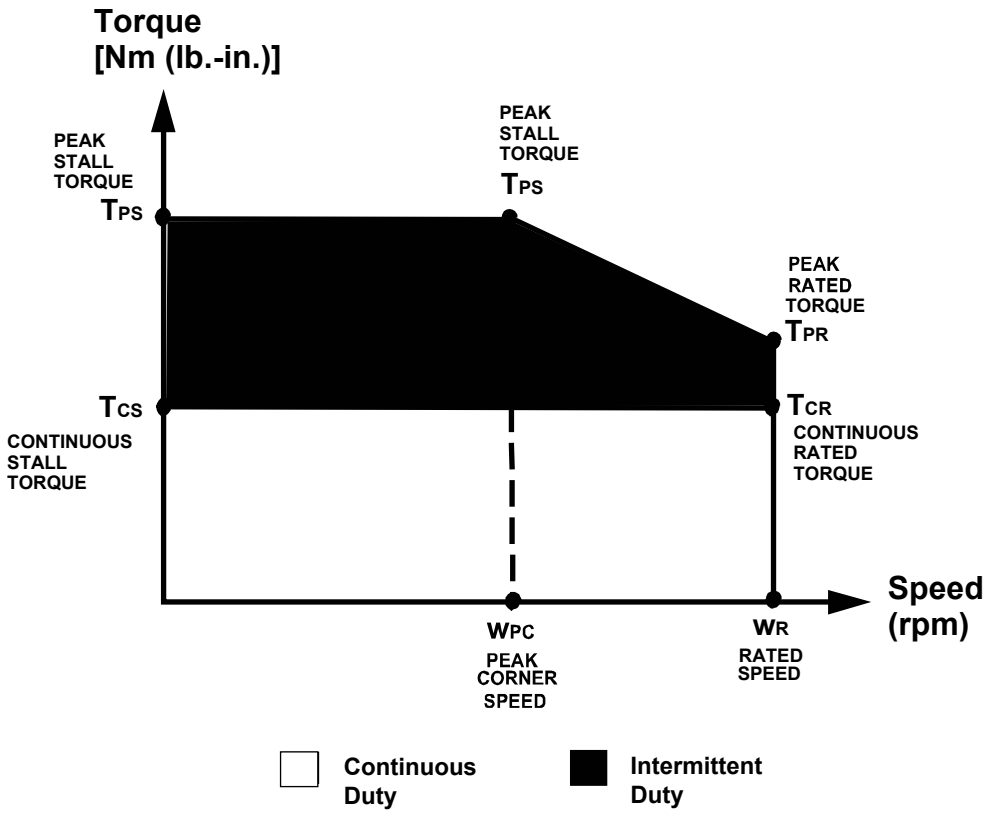
Size 3 460V Drive – Front View



Size 3 460V Drive – Side View



Selecting a Servo Drive and Motor Combination



The performance characteristics of a motor/drive combination are illustrated by a torque/speed range. The shaded areas represent continuous duty and intermittent duty zones for the system.

Drive and Motor Performance Curve

Continuous Duty Zone

The system can operate continuously anywhere within this zone, provided the ambient temperature is 40 degrees Celsius or less and the motor is mounted properly.

Intermittent Duty Zone

The peak torque is limited by the motor characteristics and the maximum current that the drive can produce.

Definitions

TCS - The torque that the motor can produce continuously at zero speed.

TPS - The maximum torque that the motor will produce.

TCR - The torque that the motor can produce continuously at the rated speed.

TPR - The maximum torque that the motor can produce at rated speed

WR - Rated motor speed.

WPC - Peak torque is constant up to this speed.

Motor/Drive Performance Data, 115V AC, 165V DC bus

Motor Model	Drive Model MMC-SD-	Cont. Stall Torque T_{CS}[1] Nm (lb.-in.)	Cont. Rated Torque T_{CR}[1] Nm (lb.-in.)	Peak Stall Torque T_{PS}[1] Nm (lb.-in.)	Peak Rated Torque T_{PR}[1] Nm (lb.-in.)	Rated Speed W_R[1] rpm	Peak Corner Speed W_{PC}[1] rpm	Cont. Stall Current Ics	Inertia J kgm² (lb.-in-s²)	Motor Power Cable Gauge
FSM Series[2]										
430	**2.0-230**	3.5 (31)	3.5 (31)	11.3 (100)	11.3 (100)	1600	750	8.0	0.00102 (0.009)	14
460	**2.0-230**	5.2 (46)	4.9 (43.3)	13.6 (120)	13.6 (120)	1600	1000	15.9	0.00215 (0.019)	14
HSM Series[2]										
307	**1.0-230**	0.8 (7)	0.8 (7)	2.5 (22)	2.5 (22)	2500	1000	3.5	0.00003 (0.00027)	16
320	**2.0-230**	2.3 (20)	2.0 (18)	5.0 (44)	5.0 (44)	2500	2000	9.5	0.00008 (0.00072)	16
430	**2.0-230**	3.4 (30)	3.2 (28.6)	8.2 (73)	8.2 (73)	1750	1250	8.0	0.00025 (0.0022)	14
NSM Series[2]										
2302	**0.5-230**	0.2 (1.6	0.2 (1.6)	0.5 (4.6)	0.5 (4.6)	6000	6000	2.0	0.000009 (0.00008)	16
2304	**1.0-230**	0.5 (4.6)	0.5 (4.6)	1.4 (12.5)	1.4 (12.5)	4750	2750	3.2	0.00002 (0.00016)	16
3406	**1.0-230**	0.8 (6.8)	0.6 (5.2)	2.1 (18.5)	0.7 (6.1)	5000	3000	5.0	0.00008 (0.0007)	16
3412	**1.0-230**	1.5 (13)	1.4 (12.5)	4.1 (36)	4.1 (36)	2500	1750	5.2	0.00015 (0.0013)	16
4214	**1.0-230**	1.8 (15.5)	1.7 (14.9)	5.1 (45)	5.1 (45)	2250	1250	6.0	0.00024 (0.0021)	16
4220	**2.0-230**	2.5 (22)	2.1 (19)	7.1 (63)	7.1 (63)	3000	2000	11.0	0.00035 (0.0031)	16
5630	**2.0-230**	3.4 (30)	3.2 (28.5)	10.7 (95)	10.7 (95)	2250	1000	11.0	0.00090 (0.008)	16
5637	**2.0-230**	4.5 (40)	4.3 (38)	13.6 (120)	13.6 (120)	1750	1000	11.5	0.00113 (0.01)	16
5647	**2.0-230**	5.9 (52)	5.8 (51)	16.9 (150)	16.9 (150)	1250	750	10.5	0.00147 (0.013)	16
YSM Series[2]										
102-115V	**0.5-230**	0.2 (1.5)	0.1 (1.3)	0.5 (4.3)	0.5 (4.3)	4500	2000	2.1	0.000003 (0.000027)	16
103-115V	**1.0-230**	0.4 (3.1)	0.3 (2.3)	1.0 (8.6)	1.0 (8.6)	4500	4500	3.1	0.000005 (0.000045)	16
206-115V	**2.0-230**	0.7 (6.1)	0.5 (4.4)	1.9 (17)	1.7 (15)	4500	4500	7.1	0.000014 (0.000127)	16
212-115V	**2.0-230**	1.4 (12)	1.2 (10.3)	3.8 (33.7)	3.8 (33.7)	3750	2000	6.2	0.00003 (0.00023)	16

[1] See page 27 for definitions of ratings.

[2] In a 40° C ambient, with motors mounted on aluminum heatsinks. See Motor Specification tables for heatsink dimensions.

Note: For complete Speed/Torque Curves, refer to the motor information tables at *http://www.glcontrols.com*.

Motor/Drive Performance Data, 230V AC, 325V DC bus

Motor Model	Drive Model MMC-SD-	Cont. Stall Torque T_{CS}[1] Nm (lb.-in.)	Cont. Rated Torque T_{CR}[1] Nm (lb.-in.)	Peak Stall Torque T_{PS}[1] Nm (lb.-in.)	Peak Rated Torque T_{PR}[1] Nm (lb.-in.)	Rated Speed W_R[1] rpm	Peak Corner Speed W_{PC}[1] rpm	Cont. Stall Current I_{CS}	Inertia J kgm^2 ($lb.-in-s^2$)	Motor Power Cable Gauge
LSM Series[2]										
54-3-602	**0.5-230**	0.3 (3)	0.2 (1.6)	1.4 (12)	1.3 (11.7)	6000	1900	1.0	0.000006 (0.00005)	16
23N/63-6-602	**0.5-230**	0.7 (6)	0.4 (3.9)	2.8 (25)	2.6 (23.4)	6000	3100	2.1	0.000011 (0.0001)	16
23N/63-12-602	**1.0-230**	1.4 (12)	0.8 (7.4)	5.6 (50)	5.4 (47.9)	6000	2750	4.1	0.000023 (0.0002)	16
34N/75-10-602	**1.0-230**	1.1 (10)	0.7 (6)	4.4 (39)	3.5 (31.2)	6000	3000	3.1	0.000022 (0.000195)	16
34N/75-21-602	**2.0-230**	2.4 (21)	1.3 (11.9)	8.8 (78)	8.8 (78)	6000	2600	5.5	0.00003 (0.0003)	16
34N/75-29-602	**2.0-230**	3.3 (29)	2.0 (17.7)	12.0 (106.2)	12.0 (106.2)	6000	1950	8.3	0.00005 (0.0004)	16
100-22-454	**1.0-230**	2.5 (22)	2.1 (18.6)	11.0 (97)	11.0 (97)	2250	1250	3.3	0.00011 (0.001)	16
100-35-454	**1.0-230**	4.0 (35)	3.3 (28.8)	12.9 (114)	12.9 (114)	2250	1750	5.0	0.00015 (0.0013)	16
100-35-454	**2.0-230**	4.0 (35)	3.3 (28.8)	16.0 (142)	16.0 (142)	2250	1750	5.0	0.00015 (0.0013)	16
100-46-454	**2.0-230**	5.2 (46)	4.2 (37.4)	16.0 (142)	16.0 (142)	2250	1500	6.4	0.00017 (0.0015)	16
130-78-454	**6.0-460**	8.8 (78)	7.1 (62.8)	27.3 (242)	27.3 (242)	2250	1850	10.7	0.00041 (0.0036)	16
130-78-454	**8.0-460**	8.8 (78)	7.1 (62.8)	37.3 (330)	37.3 (330)	2250	1850	10.7	0.00041 (0.0036)	16
130-102-304	**2.0-230**	11.5 (102)	38.3 (339)	52.0 (460)	38.3 (339)	1500	1400	9.6	0.00055 (0.0049)	16
MSM Series[2]										
100-6-602	**1.0-230**	0.72 (6)	0.5 (4.8)	3.7 (33)	3.7 (33)	6000	2600	3.0	0.00015 (0.0013)	16
100-6-604	**0.5-230**	0.72 (6)	0.72 (6)	3.8 (34)	3.8 (34)	3000	1850	2.0	0.000147 (0.0013)	16
100-14-602	**2.0-230**	1.5 (13)	1.3 (11.1)	7.6 (67)	7.6 (67)	6000	3400	6.0	0.00021 (0.0019)	16
100-14-604	**1.0-230**	1.6 (14)	1.4 (12.8)	8.0 (71)	7.8 (69)	3000	2000	3.4	0.00021 (0.0019)	16
115-34-402	**2.0-230**	3.8 (34)	3.3 (29.2)	11.0 (97)	11.0 (97)	4000	2800	8.6	0.00056 (0.005)	16
115-34-404	**1.0-230**	3.8 (34)	3.7 (32.7)	12.0 (106)	12.0 (106)	2000	1300	4.5	0.00056 (0.005)	16
115-62-402	**8.0-460**	7.0 (62)	5.6 (49.6)	14.4 (128)	14.4 (128)	4000	3400	15.6	0.00102 (0.009)	12
115-62-402	**12.0-460**	7.0 (62)	5.6 (49.6)	21.0 (186)	21.0 (186)	4000	3400	15.6	0.00102 (0.009)	12
115-62-404	**2.0-230**	7.0 (62)	6.9 (61.1)	22.0 (195)	22.0 (195)	2000	1500	7.8	0.00102 (0.009)	16

[1] See page 27 for definitions of ratings.

[2] In a 40° C ambient, with motors mounted on aluminum heatsinks. See Motor Specification tables for heatsink dimensions.

Note: For complete Speed/Torque Curves, refer to the motor information tables at *http://www.glcontrols.com*.

Motor/Drive Performance Data, 230V AC, 325V DC bus

Motor Model	Drive Model MMC-SD-	Cont. Stall Torque T_{CS}[1] Nm (lb.-in.)	Cont. Rated Torque T_{CR}[1] Nm (lb.-in.)	Peak Stall Torque T_{PS}[1] Nm (lb.-in.)	Peak Rated Torque T_{PR}[1] Nm (lb.-in.)	Rated Speed W_R[1] rpm	Peak Corner Speed W_{PC}[1] rpm	Cont. Stall Current I_{CS}	Inertia J kgm² (lb.-in-s²)	Motor Power Cable Gauge
MSM Series[2] - Continued										
115-89-402	**12.0-460**	10.0 (89)	7.0 (62)	23.0 (204)	23.0 (204)	4000	3400	19.8	0.00157 (0.0139)	12
115-89-402	**16.0-460**	10.0 (89)	7.0 (62)	30.0 (266)	30.0 (266)	4000	3400	19.8	0.00157 (0.0139)	12
115-89-404	**6.0-460**	10.1 (89)	9.5 (84.1)	32.0 (283)	32.0 (283)	2000	1600	10.9	0.00160 (0.0142)	16
165-93-204	**2.0-230**	10.5 (93)	10.3 (91.2)	34.0 (301)	34.0 (301)	1000	550	6.2	0.00220 (0.0195)	14
165-146-304	**6.0-460**	16.5 (146)	15.7 (139)	41.8 (370)	41.8 (370)	1500	1200	13.6	0.00360 (0.0319)	14
165-146-304	**8.0-460**	16.5 (146)	15.7 (139)	54.0 (478)	54.0 (478)	1500	1200	13.6	0.00360 (0.0319)	14
FSM Series[2]										
430	**2.0-230**	3.5 (31)	3.5 (31)	11.3 (100)	11.3 (100)	3600	2000	8.0	0.00102 (0.009)	14
460	**2.0-230**	5.2 (46)	4.5 (40)	13.6 (120)	13.6 (120)	3500	2500	15.9	0.00215 (0.019)	14
460	**6.0-460**	6.9 (61)	5.9 (52)	13.6 (120)	13.6 (120)	4000	3000	15.9	0.00215 (0.019)	14
490	**6.0-460**	9.3 (82)	8.1 (72)	19.2 (170)	19.2 (170)	3000	2000	15.8	0.00327 (0.029)	14
610	**8.0-460**	14.1 (125)	14.1 (125)	31.6 (280)	31.6 (280)	3000	3000	22.8	0.00644 (0.057)	10
620	**12.0-460**	20.8 (184)	17.5 (155)	42.4 (375)	42.4 (375)	3000	3000	35.3	0.01073 (0.095)	10
630	**16.0-460**	24.9 (220)	21.5 (190)	49.7 (440)	49.7 (440)	3000	3000	47.0	0.01626 (0.144)	10
630	**24.0-460**	27.7 (245)	21.9 (194)	56.5 (500)	56.5 (500)	3000	3000	47.0	0.01626 (0.144)	10
HSM Series[2]										
307	**1.0-230**	0.8 (7)	0.7 (6.5)	2.5 (22)	2.5 (22)	5000	4000	3.5	0.00003 (0.00027)	16
320	**2.0-230**	2.3 (20)	1.8 (16)	5.0 (44)	5.0 (44)	5000	5000	9.5	0.00008 (0.00072)	16
430	**6.0-460**	3.4 (30)	2.9 (26)	6.8 (60)	6.8 (60)	4000	4000	8.0	0.00025 (0.0022)	14
430	**2.0-230**	3.4 (30)	2.9 (26)	8.2 (73)	8.2 (73)	4000	3000	8.0	0.00025 (0.0022)	14
460	**6.0-460**	6.8 (60)	5.4 (48)	13.6 (120)	13.6 (120)	4000	2000	16.0	0.00046 (0.0041)	14
460	**8.0-460**	6.8 (60)	5.4 (48)	21.5 (190)	21.5 (190)	4000	3000	16.0	0.00046 (0.0041)	14

[1] See page 27 for definitions of ratings.

[2] In a 40° C ambient, with motors mounted on aluminum heatsinks. See Motor Specification tables for heatsink dimensions.

Note: For complete Speed/Torque Curves, refer to the motor information tables at *http://www.glcontrols.com*.

Motor/Drive Performance Data, 230V AC, 325V DC bus

Motor Model	Drive Model MMC-SD-	Cont. Stall Torque T_{CS}[1] Nm (lb.-in.)	Cont. Rated Torque T_{CR}[1] Nm (lb.-in.)	Peak Stall Torque T_{PS}[1] Nm (lb.-in.)	Peak Rated Torque T_{PR}[1] Nm (lb.-in.)	Rated Speed W_R[1] rpm	Peak Corner Speed W_{PC}[1] rpm	Cont. Stall Current I_{CS}	Inertia J kgm^2 ($lb.-in-s^2$)	Motor Power Cable Gauge
HSM Series[2] - Continued										
490	**6.0-460**	9.9 (88)	8.2 (73)	20.3 (180)	20.3 (180)	3000	2000	17.0	0.00068 (0.006)	14
490	**8.0-460**	9.9 (88)	8.2 (73)	30.5 (270)	30.5 (270)	3000	1500	17.0	0.00068 (0.006)	14
610	**8.0-460**	11.3 (100)	7.9 (70)	25.4 (225)	25.4 (225)	3000	2000	23.0	0.00135 (0.012)	10
620	**12.0-460**	20.9 (185)	8.5 (75)	40.7 (360)	40.7 (360)	3000	2000	45.0	0.00237 (0.021)	10
620	**24.0-460**	22.6 (200)	14.0 (124)	54.2 (480)	54.2 (480)	3000	2500	45.0	0.00237 (0.021)	10
630	**24.0-460**	33.9 (300)	16.9 (150)	79.1 (700)	79.1 (700)	3000	2000	65.0	0.00339 (0.03)	10
835	**24.0-460**	39.5 (350)	23.4 (207)	67.8 (600)	67.8 (600)	2000	2000	54.0	0.00632 (0.056)	Consult Factory
845	**24.0-460**	50.8 (450)	29.5 (261)	108.5 (960)	108.5 (960)	2000	1500	70.0	0.00937 (0.083)	Consult Factory
NSM Series[2]										
2302	**0.5-230**	0.2 (1.6)	0.2 (1.6)	0.5 (4.6)	0.5 (4.6)	6000	6000	2.0	0.000009 (0.00008)	16
2304	**0.5-230**	0.4 (3.5)	0.4 (3.5)	1.1 (10)	1.1 (10)	6000	6000	3.2	0.000018 (0.00016)	16
2304	**1.0-230**	0.5 (4.6)	0.4 (3.9)	1.4 (12.5)	1.4 (12.5)	6000	6000	3.2	0.00002 (0.00016)	16
3406	**1.0-230**	0.8 (6.8)	0.5 (4.3)	2.1 (18.5)	2.1 (18.5)	6000	6000	5.0	0.00008 (0.0007)	16
3412	**1.0-230**	1.5 (13)	1.4 (12)	4.1 (36)	4.1 (36)	5500	4000	5.2	0.00015 (0.0013)	16
4214	**1.0-230**	1.8 (15.5)	1.6 (14.5)	5.1 (45)	5.1 (45)	4500	3250	6.0	0.00024 (0.0021)	16
4220	**2.0-230**	2.5 (22)	1.9 (17)	7.1 (63)	7.1 (63)	4000	4000	11.0	0.00035 (0.0031)	16
4220	**6.0-460**	2.5 (22)	1.7 (15)	7.1 (63)	7.1 (63)	5000	4000	11.0	0.00035 (0.0031)	16
5630	**2.0-230**	3.4 (30)	2.6 (23)	10.7 (95)	10.7 (95)	4000	3000	11.0	0.00090 (0.008)	16
5630	**6.0-460**	3.8 (34)	2.9 (26)	10.7 (95)	8.5 (75)	4000	4000	11.0	0.00090 (0.008)	16
5637	**2.0-230**	4.5 (40)	4.0 (35)	13.6 (120)	13.6 (120)	4000	3000	11.5	0.00113 (0.01)	16
5637	**6.0-460**	5.2 (46)	4.0 (35)	13.6 (120)	13.6 (120)	4000	3000	11.5	0.00113 (0.01)	16
5647	**2.0-230**	5.9 (52)	4.5 (40)	16.9 (150)	16.9 (150)	3000	2000	10.5	0.00147 (0.013)	16
5647	**6.0-460**	6.0 (53)	4.5 (40)	16.9 (150)	16.9 (150)	3000	2000	10.5	0.00147 (0.013)	16

[1] See page 27 for definitions of ratings.

[2] In a 40° C ambient, with motors mounted on aluminum heatsinks. See Motor Specification tables for heatsink dimensions.

Note: For complete Speed/Torque Curves, refer to the motor information tables at *http://www.glcontrols.com*.

Motor/Drive Performance Data, 230V AC, 325V DC bus

Motor Model	Drive Model MMC-SD-	Cont. Stall Torque T_{CS}[1] Nm (lb.-in.)	Cont. Rated Torque T_{CR}[1] Nm (lb.-in.)	Peak Stall Torque T_{PS}[1] Nm (lb.-in.)	Peak Rated Torque T_{PR}[1] Nm (lb.-in.)	Rated Speed W_R[1] rpm	Peak Corner Speed W_{PC}[1] rpm	Cont. Stall Current I_{CS}	Inertia J kgm² (lb.-in-s²)	Motor Power Cable Gauge
XSM Series[2]										
100-14-302	**1.0-230**	1.6 (14)	1.0 (9)	3.6 (32)	3.6 (32)	3000	1000	3.2	0.00004 (0.00039)	16
100-14-502	**1.0-230**	1.6 (14)	1.4 (12.5)	3.6 (32)	3.6 (32)	4000	3000	4.8	0.00004 (0.00039)	16
100-27-352	**2.0-230**	3.1 (27)	2.3 (20)	7.9 (70)	7.9 (70)	3000	1000	6.1	0.00009 (0.00078)	16
100-27-502	**2.0-230**	3.1 (27)	2.1 (19)	7.9 (70)	7.9 (70)	5000	2000	9.0	0.00009 (0.00078)	16
100-37-502	**6.0-460**	4.2 (37)	3.4 (30)	9.6 (85)	9.3 (82)	5000	3000	12.0	0.00011 (0.00097)	16
115-42-502	**6.0-460**	4.7 (42)	4.2 (37)	11.4 (101)	11.1 (98)	5000	3000	12.7	0.00026 (0.0023)	16
115-53-502	**6.0-460**	5.4 (48)	5.0 (44)	10.2 (90)	10.2 (90)	5000	3000	16.8	0.00038 (0.0034)	16
115-55-352	**6.0-460**	6.2 (55)	5.5 (49)	14.7 (130)	14.7 (130)	3500	2000	12.2	0.00038 (0.0034)	16
130-53-402	**6.0-460**	6.0 (53)	5.4 (48)	11.3 (100)	10.4 (92)	4000	3000	15.0	0.00027 (0.0024)	16
130-53-502	**8.0-460**	6.0 (53)	5.2 (46)	13.6 (120)	13.6 (120)	5000	3000	17.5	0.00027 (0.0024)	16
130-72-402	**8.0-460**	8.1 (72)	6.7 (59)	20.3 (180)	17.9 (158)	4000	3000	19.5	0.00038 (0.0034)	14
130-74-282	**6.0-460**	8.4 (74)	6.3 (56)	18.5 (164)	18.1 (160)	2800	2000	13.4	0.00038 (0.0034)	16
130-90-152	**2.0-230**	10.2 (90)	10.0 (88.5)	27.1 (240)	24.5 (217)	1500	1000	9.4	0.00050 (0.0044)	16
130-90-302	**8.0-460**	10.2 (90)	8.8 (78)	23.2 (205)	22.6 (200)	3000	2000	18.4	0.00050 (0.0044)	16
165-95-402	**12.0-460**	10.7 (95)	9.2 (81)	24.0 (212)	20.3 (180)	3500	2000	23.0	0.00078 (0.0069)	14
165-172-402	**24.0-460**	19.4 (172)	12.5 (111)	48.6 (430)	48.6 (430)	4000	2000	41.5	0.00147 (0.013)	10
YSM Series[2]										
102-230V	**0.5-230**	0.2 (1.5)	0.1 (1.3)	0.5 (4.3)	0.5 (4.3)	4500	4500	1.2	0.000003 (0.000027)	16
103-230V	**0.5-230**	0.4 (3.1)	0.3 (2.3)	1.0 (8.6)	1.0 (8.6)	4500	4500	1.8	0.000005 (0.000045)	16
206-230V	**1.0-230**	0.7 (6.1)	0.5 (4.4)	1.9 (17)	1.9 (17)	4500	4500	3.6	0.00001 (0.000127)	16
212-230V	**1.0-230**	1.4 (12)	1.1 (9.6)	3.6 (32)	3.6 (32)	4500	3000	4.1	0.00003 (0.00023)	16
212-230V	**2.0-230**	1.4 (12)	1.1 (9.6)	3.8 (33.7)	3.8 (33.7)	4500	3000	4.1	0.00003 (0.00023)	16
323-230V	**2.0-230**	2.5 (22.5)	1.9 (17.2)	7.1 (63)	7.1 (63)	4500	3500	8.1	0.00006 (0.00056)	16

[1] See page 27 for definitions of ratings.

[2] In a 40° C ambient, with motors mounted on aluminum heatsinks. See Motor Specification tables for heatsink dimensions.

Note: For complete Speed/Torque Curves, refer to the motor information tables at *http://www.glcontrols.com*.

Motor/Drive Performance Data, 460V AC, 650V DC bus

Motor Model	Drive Model MMC-SD-	Cont. Stall Torque T_{CS}[1] Nm (lb.-in.)	Cont. Rated Torque T_{CR}[1] Nm (lb.-in.)	Peak Stall Torque T_{PS}[1] Nm (lb.-in.)	Peak Rated Torque T_{PR}[1] Nm (lb.-in.)	Rated Speed W_R[1] rpm	Peak Corner Speed W_{PC}[1] rpm	Cont. Stall Current I_{CS}	Inertia J kgm² (lb.-in-s²)	Motor Power Cable Gauge
LSM Series[2]										
100-22-454	**1.3-460**	2.5 (22)	0.8 (6.8)	5.9 (51.8)	5.9 (51.8)	4500	2700	3.3	0.00011 (0.001)	16
100-22-454	**2.4-460**	2.5 (22)	1.9 (16.8)	10.4 (92)	10.4 (92)	4500	2700	3.3	0.00011 (0.001)	16
100-35-454	**2.4-460**	4.0 (35)	2.5 (22.1)	10.9 (96.6)	10.9 (96.6)	4500	3650	5.0	0.00015 (0.0013)	16
100-35-454	**4.0-460**	4.0 (35)	2.5 (22.1)	16.0 (142)	16.0 (142)	4500	3650	5.0	0.00015 (0.0013)	16
100-46-454	**2.4-460**	5.2 (46)	2.9 (25.7)	11.2 (99)	11.2 (99)	4500	3900	6.4	0.00017 (0.0015)	16
100-46-454	**4.0-460**	5.2 (46)	2.9 (25.7)	16.0 (142)	16.0 (142)	4500	3900	6.4	0.00017 (0.0015)	16
130-78-454	**4.0-460**	8.8 (78)	5.0 (44.3)	18.6 (165)	18.6 (165)	4500	4100	10.7	0.00041 (0.0036)	16
130-78-454	**6.0-460**	8.8 (78)	5.0 (44.3)	27.3 (242)	27.3 (242)	4500	4100	10.7	0.00041 (0.0036)	16
130-102-304	**4.0-460**	11.5 (102)	7.7 (68.1)	27.0 (239)	27.0 (239)	3000	2950	9.6	0.00055 (0.0049)	16
130-102-304	**6.0-460**	11.5 (102)	7.7 (68.1)	39.7 (351)	39.7 (351)	3000	2950	9.6	0.00055 (0.0049)	16
165-119-454	**8.0-460**	13.4 (119)	7.1 (63.1)	36.8 (326)	36.8 (326)	4500	3450	16.4	0.00091 (0.0081)	14
165-119-454	**12.0-460**	13.4 (119)	7.1 (63.1)	51.0 (451)	51.0 (451)	4500	3450	16.4	0.00091 (0.0081)	14
165-173-304	**8.0-460**	19.5 (173)	12.7 (112)	54.6 (483)	54.6 (483)	3000	2400	16.5	0.00128 (0.0113)	14
165-173-304	**12.0-460**	19.5 (173)	12.7 (112)	75.0 (664)	75.0 (664)	3000	2400	16.5	0.00128 (0.0113)	14
165-221-454	**12.0-460**	25.0 (221)	11.0 (97.4)	58.2 (515)	58.2 (515)	4500	3900	30.3	0.00165 (0.0146)	12
165-221-454	**16.0-460**	25.0 (221)	11.0 (97.4)	77.5 (686)	77.5 (686)	4500	3900	30.3	0.00165 (0.0146)	12
215-301-304	**12.0-460**	34.0 (301)	21.0 (186)	77.5 (686)	77.5 (686)	3000	2500	30.4	0.00425 (0.0376)	12
215-301-304	**16.0-460**	34.0 (301)	21.0 (186)	103.4 (915)	69.5 (615)	3000	2500	30.4	0.00425 (0.0376)	12
215-451-204	**12.0-460**	47.5 (420)	37.1 (328)	117.1 (1036)	117.1 (1036)	2000	1650	29.7	0.00599 (0.0531)	12
215-451-204	**16.0-460**	51.0 (451)	37.1 (328)	156.2 (1382)	156.2 (1382)	2000	1650	29.7	0.00599 (0.0531)	12
215-589-204	**16.0-460**	66.6 (589)	45.0 (398)	156.2 (1382)	156.2 (1382)	2000	1700	38.9	0.00769 (0.0681)	10
215-589-204	**24.0-460**	66.6 (589)	45.0 (398)	210.1 (1859)	210.1 (1859)	2000	1700	38.9	0.00769 (0.0681)	10

[1] See page 27 for definitions of ratings.

[2] In a 40° C ambient, with motors mounted on aluminum heatsinks. See Motor Specification tables for heatsink dimensions.

Note: For complete Speed/Torque Curves, refer to the motor information tables at *http://www.glcontrols.com*.

Motor/Drive Performance Data, 460V AC, 650V DC bus

Motor Model	Drive Model MMC-SD-	Cont. Stall Torque T_{CS}[1] Nm (lb.-in.)	Cont. Rated Torque T_{CR}[1] Nm (lb.-in.)	Peak Stall Torque T_{PS}[1] Nm (lb.-in.)	Peak Rated Torque T_{PR}[1] Nm (lb.-in.)	Rated Speed W_R[1] rpm	Peak Corner Speed W_{PC}[1] rpm	Cont. Stall Current I_{CS}	Inertia J kgm^2 ($lb.-in-s^2$)	Motor Power Cable Gauge
MSM Series[2]										
100-6-604	**1.3-460**	0.7 (6)	0.5 (4.8)	3.7 (32.7)	3.7 (32.7)	6000	3000	2.0	0.00015 (0.0013)	16
100-14-604	**1.3-460**	1.6 (14)	1.0 (8.9)	3.7 (32.7)	3.7 (32.7)	6000	4200	3.4	0.00021 (0.0019)	16
100-14-604	**2.4-460**	1.6 (14)	1.0 (8.9)	6.6 (58)	6.6 (58)	6000	4200	3.4	0.00021 (0.0019)	16
115-34-404	**2.4-460**	3.8 (34)	3.4 (30.1)	12.0 (106)	12.0 (106)	4000	2800	4.5	0.00056 (0.005)	16
115-62-404	**4.0-460**	7.0 (62)	5.6 (49.6)	21.0 (186)	21.0 (186)	4000	3700	7.8	0.00102 (0.009)	16
115-89-404	**6.0-460**	10.1 (89)	6.9 (61.1)	32.0 (283)	32.0 (283)	4000	3550	10.9	0.00160 (0.0142)	16
165-93-204	**4.0-460**	10.5 (93)	10.3 (91.2)	34.0 (301)	34.0 (301)	2000	1700	6.2	0.00224 (0.0198)	14
165-146-304	**6.0-460**	16.5 (146)	13.4 (119)	41.8 (370)	41.8 (370)	3000	1900	13.6	0.00360 (0.0319)	14
215-221-304	**8.0-460**	25.0 (221)	19.9 (176)	57.4 (508)	57.4 (508)	3000	2250	20.5	0.00739 (0.0655)	14
215-221-304	**12.0-460**	25.0 (221)	19.9 (176)	70.1 (620)	70.1 (620)	3000	2250	20.5	0.00739 (0.0655)	14
215-319-304	**12.0-460**	36.0 (319)	24.6 (218)	86.2 (763)	86.2 (763)	3000	2200	28.7	0.01079 (0.0956)	12
215-319-304	**16.0-460**	36.0 (319)	24.6 (218)	100.0 (885)	100.0 (885)	3000	2200	28.7	0.01079 (0.0956)	12
215-407-304	**16.0-460**	46.0 (407)	27.1 (240)	118.8 (1051)	118.8 (1051)	3000	2050	36.6	0.01409 (0.1248)	10
215-407-304	**24.0-460**	46.0 (407)	27.1 (240)	128.0 (1133)	128.0 (1133)	3000	2050	36.6	0.01409 (0.1248)	10
215-505-304	**24.0-460**	57.1 (505)	28.1 (249)	160.0 (1416)	160.0 (1416)	3000	2350	45.5	0.01749 (0.1549)	8
XSM Series[2]										
100-14-504	**1.3-460**	1.6 (14)	1.5 (13)	3.6 (32)	3.6 (32)	5000	3000	2.3	0.00004 (0.0004)	16
100-27-504	**2.4-460**	3.1 (27)	2.8 (25)	7.9 (70)	7.9 (70)	5000	2000	4.2	0.00008 (0.0007)	16
100-37-504	**2.4-460**	4.2 (37)	3.4 (30)	10.1 (89)	10.1 (89)	5000	3000	5.7	0.00011 (0.0010)	16
100-37-504	**4.0-460**	4.2 (37)	3.4 (30)	11.1 (98)	11.1 (98)	5000	2000	5.7	0.00011 (0.0010)	16
115-42-504	**4.0-460**	4.7 (42)	3.6 (32)	13.6 (120)	11.5 (102)	5000	4000	6.3	0.00026 (0.0023)	16
115-58-504	**4.0-460**	6.6 (58)	4.3 (38)	17.5 (155)	17.5 (155)	5000	4000	9.2	0.00037 (0.0033)	16
115-58-504	**6.0-460**	6.6 (58)	4.3 (38)	19.8 (175)	19.8 (175)	5000	3000	9.2	0.00037 (0.0033)	16
130-50-504	**4.0-460**	5.6 (50)	4.1 (36)	13.6 (120)	13.6 (120)	5000	3000	8.1	0.00027 (0.0024)	16

[1] See page 76 for definitions of ratings.

[2] In a 40° C ambient, with motors mounted on aluminum heatsinks. See Motor Specification tables for heatsink dimensions.

Note: For complete Speed/Torque Curves, refer to the motor information tables at *http://www.glcontrols.com*.

Motor/Drive Performance Data, 460V AC, 650V DC bus

Motor Model	Drive Model MMC-SD-	Cont. Stall Torque T_{CS}[1] Nm (lb.-in.)	Cont. Rated Torque T_{CR}[1] Nm (lb.-in.)	Peak Stall Torque T_{PS}[1] Nm (lb.-in.)	Peak Rated Torque T_{PR}[1] Nm (lb.-in.)	Rated Speed W_R[1] rpm	Peak Corner Speed W_{PC}[1] rpm	Cont. Stall Current I_{CS}	Inertia J kgm² (lb.-in-s²)	Motor Power Cable Gauge
XSM Series[2] - Continued										
130-50-504	**6.0-460**	5.6 (50)	4.1 (36)	13.6 (120)	13.6 (120)	5000	3000	8.1	0.00027 (0.0024)	16
130-73-304	**4.0-460**	8.2 (73)	6.8 (60)	20.3 (180)	19.2 (170)	3000	2000	6.7	0.00041 (0.0036)	16
130-73-404	**4.0-460**	8.2 (73)	6.2 (55)	20.1 (178)	20.1 (178)	4000	3000	9.9	0.00041 (0.0036)	16
130-73-404	**6.0-460**	8.2 (73)	6.2 (55)	20.3 (180)	19.7 (174)	4000	3000	9.9	0.00041 (0.0036)	16
130-90-304	**4.0-460**	10.2 (90)	8.4 (74)	23.7 (210)	23.7 (210)	3000	2000	9.1	0.00052 (0.0046)	16
165-95-404	**6.0-460**	10.7 (95)	6.3 (56)	23.2 (205)	23.2 (205)	4000	1000	11.5	0.00078 (0.0069)	14
165-172-404	**8.0-460**	19.4 (172)	12.4 (110)	45.5 (403)	45.5 (403)	4000	2000	20.5	0.00147 (0.013)	14
215-325-304	**16.0-460**	36.7 (325)	18.6 (165)	72.3 (640)	72.3 (640)	3000	1500	32.1	0.00400 (0.0354)	12
215-425-304	**16.0-460**	48.0 (425)	16.4 (145)	101.1 (895)	101.1 (895)	3000	2000	38.5	0.00576 (0.0510)	10
215-531-304	**24.0-460**	60.0 (531)	20.3 (180)	108.5 (960)	108.5 (960)	3000	1500	48.0	0.00773 (0.0685)	8

[1] See page 27 for definitions of ratings.

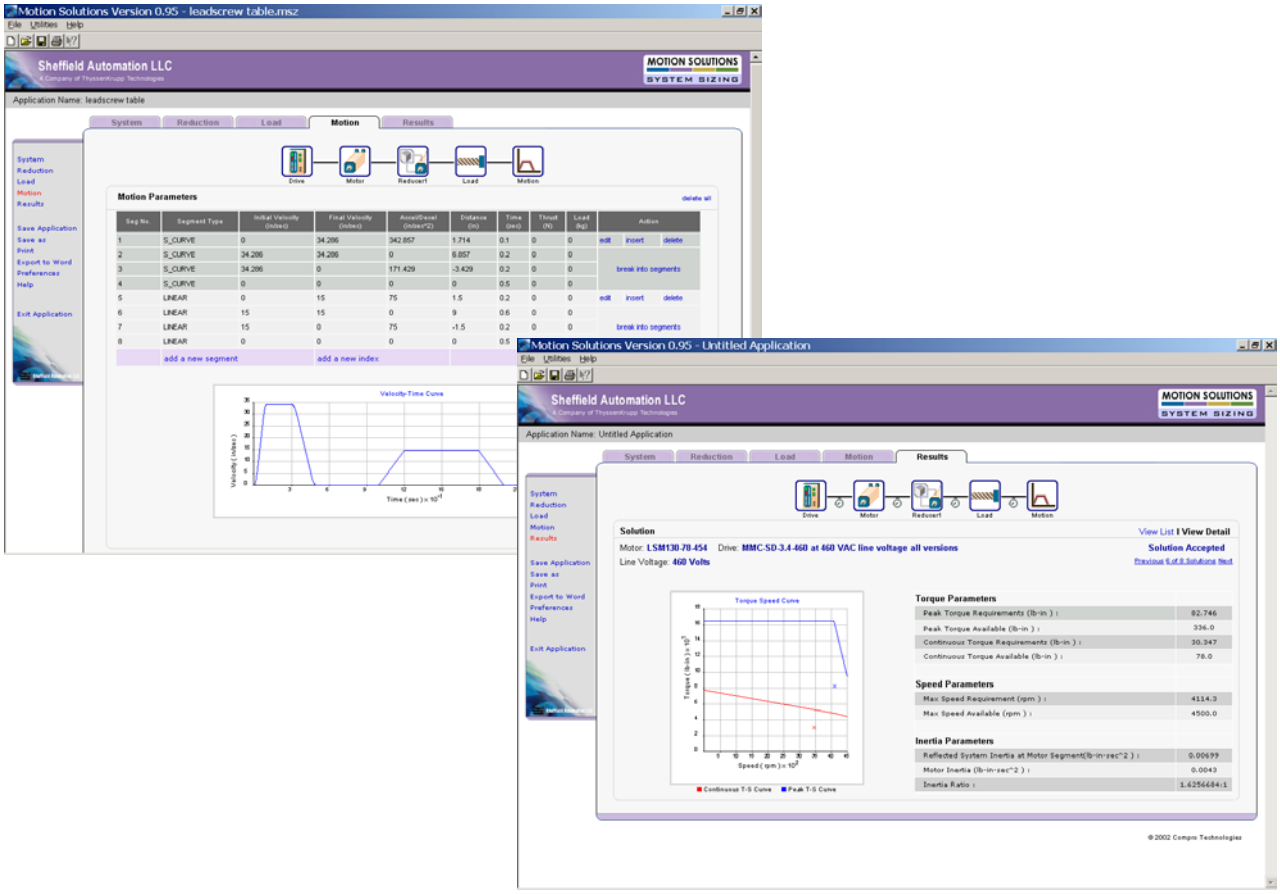
[2] In a 40° C ambient, with motors mounted on aluminum heatsinks. See Motor Specification tables for heatsink dimensions.

Note: For complete Speed/Torque Curves, refer to the motor information tables at *http://www.glcontrols.com*.

MMC Smart Drive System Component Selection

Use the Sheffield Automation Motion Solutions Sizing Software to select the right MMC Smart Drive servo amplifier and Centurion ServoMotor for your application.

Define Application



Identify Valid Motor/Drive Combination

Once the Drive and Motor models have been identified, follow the seven steps below to choose the components required to complete your MMC-SD system.

Select MMC Smart Drive
1 - Drive Model and Option(s)
2 - Drive Accessories
3 - Drive Configuration Software

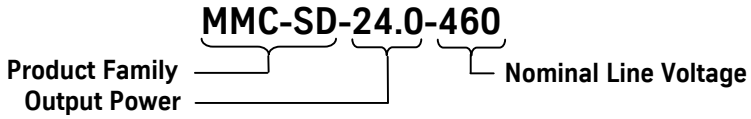
Select Centurion Servo Motor
4 - Motor Model

Select MMC Smart Drive Interface Cables/Components
5 - Drive to Motor Power Interface
6 - Drive to Motor Feedback Interface
7 - Drive to Control Interface

1 - Select MMC Smart Drive and Option(s)

MMC Smart Drive - 100 to 240 VAC				
Drive Model MMC-SD-	**Output Power Rating (kW)**	**Continuous Output Current Rating (Amps)**	**Peak Output Current Rating (Amps)**	**Part Number**
0.5-230	0.5	2.5	7.5	M.1302.5090
1.0-230	1.0	5.0	15.0	M.1302.5091
2.0-230	2.0	10.0	30.0	M.1302.5092
MMC Smart Drive - 180 to 528 VAC				
Drive Model MMC-SD-	**Output Power Rating (kW)**	**Continuous Output Current Rating (Amps)**	**Peak Output Current Rating (Amps)**	**Part Number**
1.3-460	1.3	3	6	M.1302.5093
2.4-460	2.4	5.5	11	M.1302.5094
4.0-460	4.0	9	18	M.1302.5095
6.0-460	6.0	13.5	27	M.1302.5096
8.0-460	8.0	18	36	M.1302.5097
12.0-460	12.0	27.5	55	M.1302.5098
16.0-460	16.0	36.5	72	M.1302.5099
24.0-460	24.0	55	110	M.1302.5100

MMC Smart Drive Model Number



MMC Smart Drive Option Modules		
Option Module	**Description**	**Part Number**
MMC-SD-RIO	MMC Smart Drive Resolver Interface Option Module	M.1302.4253

The field-installable MMC-SD-RIO is required when the Motor Feedback device is a resolver.

2 - Select MMC Smart Drive Accessories

MMC Smart Drive External Shunts		
Use with MMC-SD:	**Description**	**Part Number**
MMC-SD-0.5-230 MMC-SD-1.0-230 MMC-SD-2.0-230	Dynamic Shunt for MMC-SD-x-230 300 Watt, 100 Ohm, 230 Volt	M.1015.7046
MMC-SD-1.3-460 MMC-SD-2.4-460	Shunt Resistor - 450 Watt, 130 Ohm, 820 Volts, 5.4 kW peak, 240 sec.	M.1302.7048
MMC-SD-4.0-460	Shunt Resistor - 700 Watt, 95 Ohm, 820 Volts. 8 kW peak, 250 sec.	M.1302.7049
MMC-SD-6.0-460 MMC-SD-8.0-460	Shunt Resistor - 1400 Watt, 50 Ohm, 850 Volts, 17 kW peak, 250 sec.	M.1302.7060
MMC-SD-12.0-460 MMC-SD-16.0-460	Shunt Resistor - 2800 Watt, 25 Ohm, 850 Volts, 32 kW peak, 60 sec.	M.1302.7061
MMC-SD-24.0-460	Shunt Resistor - 3900 Watt, 18 Ohm, 850 Volts, 70 kW peak, 70 sec.	M.1302.7063

Select the External Shunt as indicated by the Motion Solutions Sizing Software.

2 - Select MMC Smart Drive Accessories (continued)

MMC Smart Drive - Line Filters		
Use with MMC-SD:	**Description**	**Part Number**
MMC-SD-0.5-230 MMC-SD-1.0-230	AC Line Filter - 5 Amps; 230 Volts; 1 Phase	M.1015.6922
MMC-SD-2.0-230	AC Line Filter - 10 Amps; 230 Volts; 1 Phase	M.1015.6917
MMC-SD-1.3-460 MMC-SD-2.4-460	AC Line Filter - 7 Amps; 460 Volts; 3 Phase	M.1302.5241
MMC-SD-4.0-460 MMC-SD-6.0-460 MMC-SD-8.0-460	AC Line Filter - 16 Amps; 460 Volts; 3 Phase	M.1302.5244
MMC-SD-12.0-460 MMC-SD-16.0-460	AC Line Filter - 30 Amps; 460 Volts; 3 Phase	M.1302.5245
MMC-SD-24.0-460	AC Line Filter - 42 Amps; 460 Volts; 3 Phase	M.1302.5246
Multiple Drives	AC Line Filter - 56 Amps; 460 Volts; 3 Phase	M.1302.5247
Multiple Drives	AC Line Filter - 75 Amps; 460 Volts; 3 Phase	M.1302.5248
MMC Smart Drive - Line Reactors		
Use with MMC-SD:	**Description**	**Part Number**
MMC-SD-12.0-460	AC Line Reactor - 25 Amps; 460 Volts; 3 Phase	M.1302.7373
MMC-SD-16.0-460	AC Line Reactor - 35 Amps; 460 Volts; 3 Phase	M.1302.7374
MMC-SD-24.0-460	AC Line Reactor - 45 Amps; 460 Volts; 3 Phase	M.1302.7375

AC Line Filter is required for CE compliant installations of the MMC Smart Drive.
AC Line Reactors are required for MMC-SD-12.0-460, MMC-SD-16.0-460 and MMC-SD-24.0-460.

3 - Select MMC Smart Drive Configuration Software

MMC Smart Drive Configuration Software		
PiCPro Edition	**Description**	**Part Number**
Professional Edition	Program and Monitor all PiC, MMC and MMC for PC Controls, Configure MMC Smart Drive servo amplifiers, includes cable	M.1300.7213
MMC-Limited Edition	Program and Monitor MMC-A2, A4, S8 Controls, Configure MMC Smart Drive servo amplifiers, includes cable	M.1300.7214
Monitor Edition	Monitor all PiC, MMC and MMC for PC Controls, Configure MMC Smart Drive servo amplifiers, includes cable, Available for free download from www.glcontrols.com	M.1300.7215

MMC Smart Drive Communication Cable	
Description	**Part Number**
PiCPro Programming Cable - 8 ft.	M.1016.9038

The PiCPro Programming Cable is used to interface your PC to the MMC Smart Drive.
Select a Programming Cable if you are downloading PiCPro Monitor Edition via the Internet.

MMC Smart Drive Hardware Manual	
Description	**Part Number**
MMC Smart Drive Hardware Manual, available for free download from www.glcontrols.com	M.1301.5524

Hardcopy included at no charge if requested at time of order.

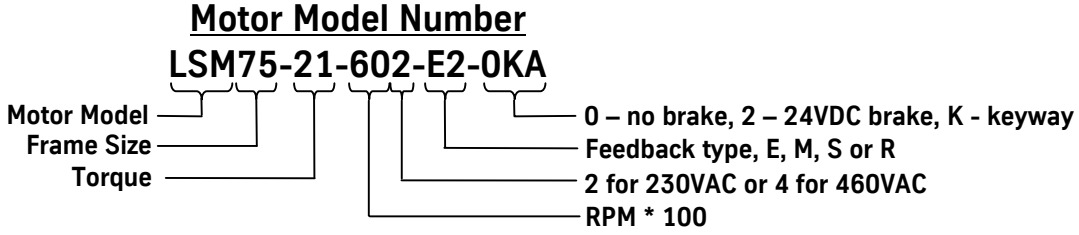
4 - Select Centurion Servo Motor - Metric Mount LSM Motors

LSM Motors - 230 Volt, Keyway						
Motor Model	**Feedback**			**Feedback**		
LSM	**-E1-**	**-S-**	**-M-**	**-E1-**	**-S-**	**-M-**
54-3-602-	**M.1302.1170**			M.1302.1313		
63-6-602-	**M.1302.1173**			M.1302.1314		
63-12-602-	**M.1302.1174**			M.1302.1315		
Option	**-0KA: No Brake, Keyway**			**-2KA: 24VDC Brake, Keyway**		
LSM Motors - 230 Volt, Keyway						
Motor Model	**Feedback**			**Feedback**		
LSM	**-E2-**	**-S-**	**-M-**	**-E2-**	**-S-**	**-M-**
75-10-602-	**M.1302.4080**					
75-21-602-	**M.1302.1175**	M.1302.1223	M.1302.1264	M.1302.1316	M.1302.1343	M.1302.1370
75-29-602-	**M.1302.1158**	M.1302.1225	M.1302.1266	M.1302.1318	M.1302.1345	M.1302.1372
Option	**-0KA: No Brake, Keyway**			**-2KA: 24VDC Brake, Keyway**		
LSM Motors - 460 Volt, Keyway						
Motor Model	**Feedback**			**Feedback**		
LSM	**-E2-**	**-S-**	**-M-**	**-E2-**	**-S-**	**-M-**
100-22-454-	**M.1302.1157**	M.1302.1224	M.1302.1265	M.1302.1317	M.1302.1344	M.1302.1371
100-35-454-	**M.1302.1159**	M.1302.1226	M.1302.1267	M.1302.1319	M.1302.1346	M.1302.1373
100-46-454-	**M.1302.1190**	M.1302.1227	M.1302.1268	M.1302.1320	M.1302.1347	M.1302.1374
130-78-454-	**M.1302.1191**	M.1302.1228	M.1302.1269	M.1302.1321	M.1302.1348	M.1302.1375
130-102-304-	M.1302.1192	M.1302.1229	**M.1302.1280**	M.1302.1322	M.1302.1349	M.1302.1376
165-119-454-	M.1302.1193	M.1302.1230	**M.1302.1281**	M.1302.1323	M.1302.1350	M.1302.1377
165-173-304-	M.1302.1194	M.1302.1231	**M.1302.1282**	M.1302.1324	M.1302.1351	M.1302.1378
165-221-454-	M.1302.1195	M.1302.1232	**M.1302.1283**	M.1302.1325	M.1302.1352	M.1302.1379
215-301-304-	M.1302.1196	M.1302.1233	**M.1302.1284**	M.1302.1326	M.1302.1353	M.1302.1380
215-451-204-	M.1302.1197	M.1302.1234	**M.1302.1285**	M.1302.1327	M.1302.1354	M.1302.1381
215-589-204-	M.1302.1198	M.1302.1235	**M.1302.1290**	M.1302.1328	M.1302.1355	M.1302.1382
Option	**-0KA: No Brake, Keyway**			**-2KA: 24VDC Brake, Keyway**		

Bold part numbers in highlighted cells are available with shorter lead times.

Feedback selection:
- Select -E2- for 2000 line incremental encoder, -E1- for 1000 line incremental encoder.
- Select -S- for High Resolution sin/cos feedback.
- Select -M- for High Resolution Multi-turn absolute feedback.

Brake selection:
- Select -0KA for no brake, keyway
- Select -2KA for 24VDC Brake, keyway



An LSM75-21-602-E2-0KA is part number M.1302.1175, an LSM motor with a 75 mm face, providing 21 in-lb of continuous torque with a maximum speed of 6000 RPM wound for 230 volt with a 2000 line incremental encoder (E2), no brake (0) and with a keyway (KA).

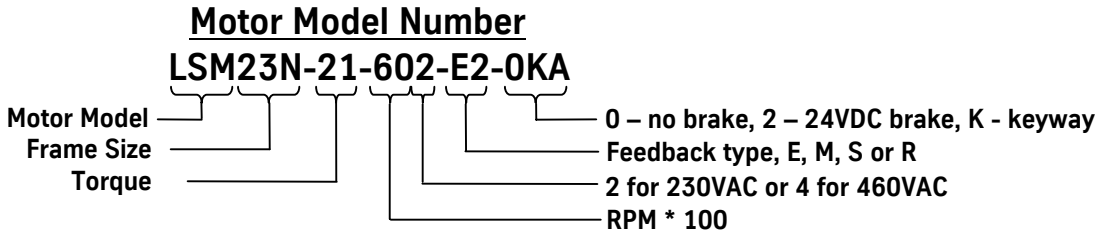
4 - Select Centurion Servo Motor - NEMA Mount LSM Motors

LSM Motors - 230 Volt, Keyway						
Motor Model LSM	**Feedback**			**Feedback**		
	-E1-	**-S-**	**-M-**	**-E1-**	**-S-**	**-M-**
23N-6-602-	M.1302.7084			M.1302.7089		
23N-12-602-	M.1302.7085			M.1302.7100		
Option	**-0KA: No Brake, Keyway**			**-2KA: 24VDC Brake, Keyway**		

LSM Motors - 230 Volt, Keyway						
Motor Model LSM	**Feedback**			**Feedback**		
	-E2-	**-S-**	**-M-**	**-E2-**	**-S-**	**-M-**
34N-10-602-	M.1302.7086			M.1302.7101		
34N-21-602-	M.1302.7087			M.1302.7102		
34N-29-602-	M.1302.7088			M.1302.7103		
Option	**-0KA: No Brake, Keyway**			**-2KA: 24VDC Brake, Keyway**		

Feedback selection:
- Select -E2- for 2000 line incremental encoder, -E1- for 1000 line incremental encoder.
- Select -S- for High Resolution sin/cos feedback.
- Select -M- for High Resolution Multi-turn absolute feedback.

Brake selection:
- Select -0KA for no brake, keyway
- Select -2KA for 24VDC Brake, keyway



An LSM23N-6-602-E1-0KA is part number M.1302.7084, an LSM motor with a Nema 23 face, providing 6 in-lb of continuous torque with a maximum speed of 6000 RPM wound for 230 volt with a 1000 line incremental encoder (E2), no brake (0) and with a keyway (KA).

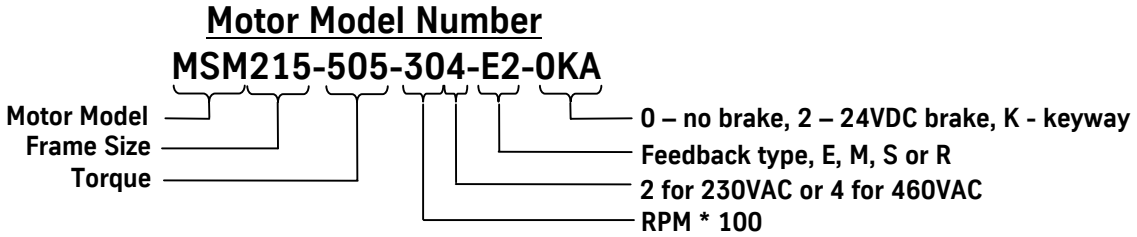
4 - Select Centurion Servo Motor - MSM Motors

MSM Motors - 230 Volt, Keyway						
Motor Model	**Feedback**			**Feedback**		
MSM	**-E2-**	**-S-**	**-M-**	**-E2-**	**-S-**	**-M-**
100-6-602-	M.1302.6874	M.1302.6895	M.1302.6939	M.1302.6879	M.1302.6920	M.1302.6944
100-14-602-	M.1302.6875	M.1302.5896	M.1302.6940	M.1302.6890	M.1302.6921	M.1302.6945
115-34-402-	M.1302.6876	M.1302.6897	M.1302.6941	M.1302.6891	M.1302.6922	M.1302.6946
115-62-402-	M.1302.6877	M.1302.6898	M.1302.6942	M.1302.6892	M.1302.6923	M.1302.6947
115-89-402-	M.1302.6878	M.1302.6899	M.1302.6943	M.1302.6893	M.1302.6924	M.1302.6948
Option	**-0KA: No Brake, Keyway**			**-2KA: 24VDC Brake, Keyway**		
MSM Motors - 460 Volt, Keyway						
Motor Model	**Feedback**			**Feedback**		
MSM	**-E2-**	**-S-**	**-M-**	**-E2-**	**-S-**	**-M-**
100-6-604-	**M.1302.1099**	M.1302.1199	M.1302.1250	M.1302.1291	M.1302.1329	M.1302.1356
100-14-604-	**M.1302.1160**	M.1302.1210	M.1302.1251	M.1302.1292	M.1302.1330	M.1302.1357
115-34-404-	**M.1302.1161**	M.1302.1211	M.1302.1252	M.1302.1293	M.1302.1331	M.1302.1358
115-62-404-	**M.1302.1162**	M.1302.1212	M.1302.1253	M.1302.1294	M.1302.1332	M.1302.1359
115-89-404-	**M.1302.1163**	M.1302.1213	M.1302.1254	M.1302.1295	M.1302.1333	M.1302.1360
165-93-204-	M.1302.1164	M.1302.1214	M.1302.1255	M.1302.1296	M.1302.1334	M.1302.1361
165-146-304-	M.1302.1165	M.1302.1215	**M.1302.1256**	M.1302.1297	M.1302.1335	M.1302.1362
215-221-304-	M.1302.1166	M.1302.1216	M.1302.1257	M.1302.1298	M.1302.1336	M.1302.1363
215-319-304-	M.1302.1167	M.1302.1217	M.1302.1258	M.1302.1310	M.1302.1337	M.1302.1364
215-407-304-	M.1302.1168	M.1302.1218	M.1302.1259	M.1302.1311	M.1302.1338	M.1302.1365
215-505-304-	M.1302.1169	M.1302.1219	**M.1302.1260**	M.1302.1312	M.1302.1339	M.1302.1366
Option	**-0KA: No Brake, Keyway**			**-2KA: 24VDC Brake, Keyway**		

Bold part numbers in highlighted cells are available with shorter lead times.

Feedback selection:
- Select -E2- for 2000 line incremental encoder.
- Select -S- for High Resolution sin/cos feedback.
- Select -M- for High Resolution Multi-turn absolute feedback.

Brake selection:
- Select -0KA for no brake, keyway
- Select -2KA for 24VDC Brake, keyway



An MSM215-505-304-E2-0KA is part number M.1302.1109, an MSM motor with a 215 mm face, providing 505 in-lb of continuous torque with a maximum speed of 3000 RPM wound for 460 volt with a 2000 line incremental encoder (E2), no brake (0) and with a keyway (KA).

4 - Select Centurion Servo Motor - XSM Motors

XSM Motors - 230 Volt, No Keyway						
Motor Model	**Feedback**			**Feedback**		
XSM	**-E2-**	**-S-**	**-M-**	**-E2-**	**-S-**	**-M-**
100-14-502-	M.1300.6120	M.1300.6319	M.1300.6351	M.1301.5452	M.1301.6666	M.1301.5348
100-14-302-	M.1300.6121	M.1300.6320	M.1300.6352	M.1301.5453	M.1301.6669	M.1301.6633
100-27-502-	M.1300.6123	M.1300.6322	M.1300.6353	M.1301.5454	M.1301.6680	M.1301.6634
100-27-352-	M.1300.6125	M.1300.6324	M.1300.6354	M.1301.5455	M.1301.6682	M.1301.6635
100-37-502-	M.1300.6164	M.1300.6329	M.1300.6355	M.1301.5456	M.1301.6683	M.1301.6636
115-42-502-	M.1300.6165	M.1300.6333	M.1300.6356	M.1301.5457	M.1301.6684	M.1301.6637
115-53-502-	M.1300.6308	M.1300.6334	M.1300.6357	M.1301.5458	M.1301.6686	M.1301.5349
115-55-352-	M.1300.6309	M.1300.6335	M.1300.6358	M.1301.5530	M.1301.6687	M.1301.6638
130-53-502-	M.1300.6311	M.1300.6336	M.1300.6359	M.1301.5531	M.1301.6688	M.1301.6639
130-53-402-	M.1300.6314	M.1300.6337	M.1300.6360	M.1301.5532	M.1301.6689	M.1301.6660
130-72-402-	M.1300.6315	M.1300.6338	M.1300.6361	M.1301.5533	M.1301.6690	M.1301.6661
130-74-282-	M.1300.6316	M.1300.6339	M.1300.6362	M.1301.5534	M.1301.6692	M.1301.6662
130-90-302-	M.1300.6317	M.1300.6350	M.1300.6363	M.1301.5535	M.1301.6693	M.1301.6663
130-90-152-	M.1301.4185	M.1301.4303	M.1301.4304	M.1301.5536	M.1301.6694	M.1301.6664
Option	**-0AA: No Brake, No Keyway**			**-2AA: 24VDC Brake, No Keyway**		

XSM Motors - 230 Volt, Keyway						
Motor Model	**Feedback**			**Feedback**		
XSM	**-E2-**	**-S-**	**-M-**	**-E2-**	**-S-**	**-M-**
165-95-402-		M.1301.7340	M.1301.7358		M.1301.7407	M.1301.7411
165-172-402-		M.1301.7341	M.1301.7359		M.1301.7408	M.1301.7412
Option	**-0KA: No Brake, Keyway**			**-2KA: 24VDC Brake, Keyway**		

XSM Motors - 460 Volt, No Keyway						
Motor Model	**Feedback**			**Feedback**		
XSM	**-E2-**	**-S-**	**-M-**	**-E2-**	**-S-**	**-M-**
100-14-504-		M.1301.7673	M.1301.7622		M.1301.7709	M.1301.7693
100-27-504-		M.1301.7674	M.1301.7623		M.1301.7730	M.1301.7694
100-37-504-		M.1301.7675	M.1301.7624		M.1301.7731	M.1301.7695
115-42-504-		M.1301.7676	M.1301.7625		M.1301.7732	M.1301.7696
115-58-504-		M.1301.7678	M.1301.7626		M.1301.7733	M.1301.7697
130-50-504-		M.1301.7679	M.1301.7627		M.1301.7734	M.1301.7698
130-73-404-		M.1301.7680	M.1301.7628		M.1301.7735	M.1301.7699
130-73-304-		M.1301.7681	M.1301.7629		M.1301.7736	M.1301.7710
130-90-304-		M.1301.7682	M.1301.7670		M.1301.7737	M.1301.7711
Option	**-0AA: No Brake, No Keyway**			**-2AA: 24VDC Brake, No Keyway**		

XSM Motors - 460 Volt, Keyway						
Motor Model	**Feedback**			**Feedback**		
XSM	**-E2-**	**-S-**	**-M-**	**-E2-**	**-S-**	**-M-**
165-95-404-		M.1301.7342	M.1301.7400		M.1301.7409	M.1301.7413
165-172-404-		M.1301.7343	M.1301.7401		M.1301.7410	M.1301.7414
215-325-304-			M.1301.7402			M.1301.7415
215-425-304-			M.1301.7403			M.1301.7416
215-531-304-			M.1301.7405			M.1301.7417
Option	**-0KA: No Brake, Keyway**			**-2KA: 24VDC Brake, Keyway**		

Select -E2- for 2000 line incremental encoder, or -S- for High Resolution sin/cos feedback, or -M- for High Resolution multi-turn absolute feedback. For example, an XSM100-14-502-E2-0AA is part number M.1300.6120, an XSM motor with a 100 mm face, providing 14 in-lb of continuous torque with a maximum speed of 5000 RPM wound for 230 volt with a 2000 line incremental encoder (E2) and no brake or keyway (0AA).

4 - Select Centurion Servo Motor - FSM, HSM, NSM and YSM Motors

FSM Motors - 230 Volt			
Motor Model	**Brake Option**		
FSM	**no brake**	**B24**	**B90**
430	M.1015.7855	M.1015.7856	M.1015.7860
460	M.1015.7862	M.1015.7864	M.1015.7868
490	M.1015.7871	M.1015.7872	M.1015.7878
610	M.1015.7880	M.1015.7881	M.1015.7883
620	M.1015.7885	M.1015.7886	M.1015.7889
630	M.1015.7891	M.1015.7892	M.1015.7894

HSM Motors - 230 Volt			
Motor Model	**Brake Option**		
HSM	**no brake**	**B24**	**B90**
205	M.1007.1090		
307	M.1015.7985	M.1015.7986	M.1015.7987
320	M.1007.1091	M.1015.7988	M.1015.7990
430	M.1015.7991	M.1015.7993	M.1015.7994
460	M.1015.7996	M.1015.7998	M.1015.8000
490	M.1015.8001	M.1015.8003	M.1015.8005
610	M.1015.8007	M.1015.8008	M.1015.8009
620	M.1015.8010	M.1015.8011	M.1015.8012
630	M.1015.8013	M.1015.8014	M.1015.8015
835	M.1015.8016	M.1015.8017	M.1015.8018
845	M.1015.8019	M.1015.8020	M.1015.8021

NSM Motors			
	Option		
Motor Model	**std. encoder,**	**std. encoder,**	**5000 line enc,**
NSM	**no brake**	**B24**	**no brake**
2302	M.1015.6946	M.1300.3486	
2304	M.1015.6949	M.1015.6950	
3406	M.1015.6952	M.1015.6953	M.1015.6954
3412	M.1015.6955	M.1015.6956	M.1015.6957
4214	M.1015.6958	M.1300.3487	M.1015.6959
4220	M.1015.6960	M.1300.3488	M.1015.6961
5630	M.1015.6962	M.1300.3500	M.1015.6963
5637	M.1015.6964	M.1300.3501	M.1015.6965
5647	M.1015.6966	M.1300.3502	M.1015.6967

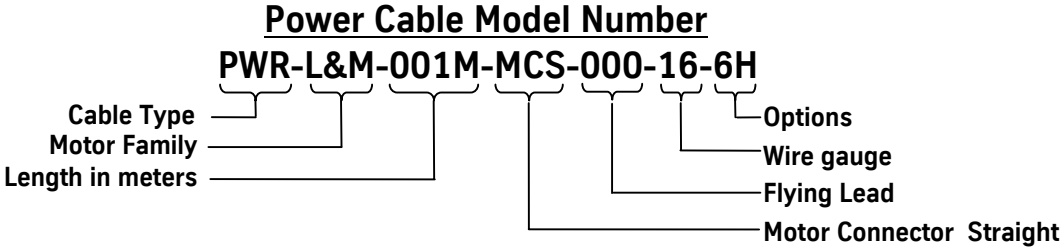
YSM Motors				
	Option			
Motor Model	**no brake,**	**B24,**	**no brake,**	**B24,**
YSM	**115V**	**115V**	**230V**	**230V**
102	M.1015.6968	M.1300.3503	M.1015.6973	M.1300.3506
103	M.1015.6969	M.1015.6970	M.1015.6974	M.1300.3507
206	M.1015.6971	M.1300.3504.	M.1015.6975	M.1015.6976
212	M.1015.6972	M.1300.3505	M.1015.6977	M.1015.6978
323			M.1015.6979	M.1015.6980

B24 - 24VDC Brake, B90 - 90VDC Brake

5 - Select Motor Power Interface

MSM and LSM Series Motor Power Cables - Flex Rated					
	xx = Length in meters				
Cable Model	**1**	**3**	**9**	**15**	**30**
PWR-L&M-0xxM-MCS-000-16-6H	M.1302.1114	M.1302.1115	M.1302.1116	M.1302.1117	M.1302.1118
PWR-L&M-0xxM-MCS-000-14-6H	M.1302.1119	M.1302.1130	M.1302.1131	M.1302.1132	M.1302.1133
PWR-L&M-0xxM-MCS-000-12-6H	M.1302.1134	M.1302.1135	M.1302.1136	M.1302.1137	M.1302.1139
PWR-L&M-0xxM-MCS-000-10-6H	M.1302.1140	M.1302.1142	M.1302.1143	M.1302.1144	M.1302.1145
PWR-L&M-0xxM-MCS-000-08-6H	M.1302.1146	M.1302.1147	M.1302.1148	M.1302.1149	M.1302.1150
XSM Series Motor Power Cables for 230 Volt Motors – Non-Flex					
	xx = Length in meters				
Cable Model	**1**	**3**	**9**	**15**	**30**
PWR-XSM-0xxM-MCS-000-16-AA	M.1301.3938	M.1301.3939	M.1301.3940	M.1301.3942	M.1301.3945
PWR-XSM-0xxM-MCS-000-14-AA	M.1301.3956	M.1301.3958	M.1301.3959	M.1301.3960	M.1301.3961
PWR-XSM-0xxM-MCS-000-10-AA	M.1301.3962	M.1301.3963	M.1301.3964	M.1301.3965	M.1301.3966
XSM Series Motor Power Cables for 460 Volt Motors – Non-Flex					
	xx = Length in meters				
Cable Model	**1**	**3**	**9**	**15**	**30**
PWR-XSM-0xxM-MCS-000-16-4A	M.1301.7636	M.1301.7637	M.1301.7639	M.1301.7640	M.1301.7641
PWR-XSM-0xxM-MCS-000-14-4A	M.1301.7643	M.1301.7644	M.1301.7645	M.1301.7646	M.1301.7647
PWR-XSM-0xxM-MCS-000-10-4A	M.1301.7648	M.1301.7649	M.1301.7650	M.1301.7651	M.1301.7652
PWR-XSM-0xxM-MCS-000-08-4A	M.1301.7653	M.1301.7654	M.1301.7655	M.1301.7656	M.1301.7657
HSM and FSM Series Motor Power Cables – Non-Flex					
	xx = Length in meters				
Cable Model	**1**	**3**	**9**	**15**	**30**
PWR-H&F-0xxM-MCS-000-16-AA	M.1301.3968	M.1301.3969	M.1301.3970	M.1301.3971	M.1301.3972
PWR-H&F-0xxM-MCS-000-14-AA	M.1301.3973	M.1301.3974	M.1301.3975	M.1301.3976	M.1301.3977
PWR-H&F-0xxM-MCS-000-10-AA	M.1301.3978	M.1301.3979	M.1301.3980	M.1301.3981	M.1301.3982
NSM Series Motor Power Cables – Non-Flex					
	xx = Length in meters				
Cable Model	**1**	**3**	**9**	**15**	**30**
PWR-NSM-0xxM-MCS-000-16-AA	M.1301.3930	M.1301.3931	M.1301.3932	M.1301.3933	M.1301.3934
YSM Series Motor Power Cables – Non-Flex					
	xx = Length in meters				
Cable Model	**1**	**3**	**9**	**15**	**30**
PWR-YSM-0xxM-MCS-000-16-AA	M.1301.3889	M.1301.3910	M.1301.3911	M.1301.3912	M.1301.3913

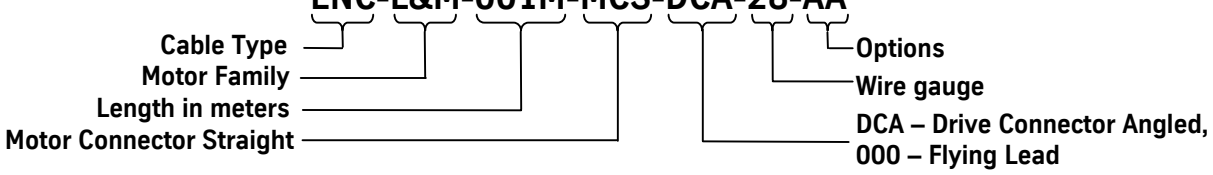
Select the appropriate motor power cable gauge as indicated in the Motor Power Cable Gauge column of the Motor/Drive combination table.



6 - Select Motor Feedback Interface

MSM and LSM Series Motor Feedback Cables - Flex Rated - Drive and Motor Connector					
	xx = Length in meters				
Cable Model	**1**	**3**	**9**	**15**	**30**
ENC-L&M-0xxM-MCS-DCA-28-AA	M.1302.5834	M.1302.5835	M.1302.5836	M.1302.5837	M.1302.5838
MSM and LSM Series Motor Feedback Cables - Non-Flex - Drive and Motor Connector					
	xx = Length in meters				
Cable Model	**1**	**3**	**9**	**15**	**30**
ENC-L&M-0xxM-MCS-DCA-28-NA	M.1302.0944	M.1302.0945	M.1302.0946	M.1302.0947	M.1302.0948
XSM Series Motor Encoder Feedback Cables - Non-Flex - Drive and Motor Connector					
	xx = Length in meters				
Cable Model	**1**	**3**	**9**	**15**	**30**
ENC-XSM-0xxM-MCS-DCA-28-AA	M.1301.4021	M.1301.4022	M.1301.4023	M.1301.4024	M.1301.4025
XSM Series Motor Encoder Feedback Cables - Non-Flex - Motor Connector Only					
	xx = Length in meters				
Cable Model	**1**	**3**	**9**	**15**	**30**
ENC-XSM-0xxM-MCS-000-28-AA	M.1301.4026	M.1301.4027	M.1301.4028	M.1301.4029	M.1301.4030
HSM and FSM Series Motor Feedback Cables - Non-Flex - Drive and Motor Connector					
	xx = Length in meters				
Cable Model	**1**	**3**	**9**	**15**	**30**
ENC-H&F-0xxM-MCS-DCA-28-AA	M.1301.3927	M.1301.4011	M.1301.4012	M.1301.4013	M.1301.4014
HSM and FSM Series Motor Feedback Cables - Non-Flex - Motor Connector Only					
	xx = Length in meters				
Cable Model	**1**	**3**	**9**	**15**	**30**
ENC-H&F-0xxM-MCS-000-28-AA	M.1301.4015	M.1301.4016	M.1301.4017	M.1301.4018	M.1301.4019
NSM Series Motor Feedback Cables - Non-Flex - Drive and Motor Connector					
	xx = Length in meters				
Cable Model	**1**	**3**	**9**	**15**	**30**
ENC-NSM-0xxM-MCS-DCA-28-AA	M.1301.3993	M.1301.3994	M.1301.3995	M.1301.3996	M.1301.3997
NSM Series Motor Feedback Cables - Non-Flex - Motor Connector Only					
	xx = Length in meters				
Cable Model	**1**	**3**	**9**	**15**	**30**
ENC-NSM-0xxM-MCS-000-28-AA	M.1301.3998	M.1301.4001	M.1301.4002	M.1301.4003	M.1301.4004
YSM Series Motor Feedback Cables - Non-Flex - Drive and Motor Connector					
	xx = Length in meters				
Cable Model	**1**	**3**	**9**	**15**	**30**
ENC-YSM-0xxM-MCS-DCA-28-AA	M.1301.3983	M.1301.3984	M.1301.3985	M.1301.3986	M.1301.3987
YSM Series Motor Feedback Cables - Non-Flex - Motor Connector Only					
	xx = Length in meters				
Cable Model	**1**	**3**	**9**	**15**	**30**
ENC-YSM-0xxM-MCS-000-28-AA	M.1301.3988	M.1301.3989	M.1301.3990	M.1301.3991	M.1301.3992

Feedback Cable Model Number



6 - Select Motor Feedback Interface (continued)

MMC Smart Drive - Drive F1/F2 Connector Breakout, Drive Mounted	
Description	**Part Number**
Drive Mounted Drive F1/F2 Connector Breakout Board	M.1302.6970

MMC Smart Drive - Drive F1/F2 Connector Breakout, Panel Mounted					
	Length in meters				
Cable Description	**1**	**3**	**9**	**15**	
Drive F1/F1 Panel Mount Breakout Kit	M.1302.7005	M.1302.7006	M.1302.7007	M.1302.7008	

If a flying lead Motor Feedback cable is used then select a drive or panel mount breakout to simplify wiring by providing screw terminations for the cable.

7 - Select Drive to Control Interface

MMC Smart Drive - Drive to MMC Control or MMC for PC ASIU Cable					
	Length in meters				
Cable Description	**0.5**	**1**	**1.5**	**3**	
MMC-SD to MMC/ASIU	M.1302.5990	M.1302.5991	M.1302.5992	M.1302.5993	

When controlling the MMC-Smart Drive with an MMC or MMC for PC control select a plug-and-play cable for a direct connection between the control and drive.

MMC Smart Drive - Drive I/O Connector Breakout, Drive Mounted	
Description	**Part Number**
Drive Mounted Drive I/O Connector Breakout Board	M.1302.6971

MMC Smart Drive - Drive I/O Connector Breakout, Panel Mounted					
	Length in meters				
Cable Description	**1**	**3**	**9**		
Drive I/O Panel Mount Breakout Kit	M.1302.7009	M.1302.7030	M.1302.7031		

When developing a custom interface between the MMC Smart Drive and an external control system use a drive or panel mount breakout kit to simplify wiring by providing screw terminations for the cable.

MMC Smart Drive Accessories

Resolver Interface Option Module

The field installable Resolver Interface Option module allows the MMC Smart Drive to operate motors using a resolver as the feedback device. The module digitizes the resolver position into 4096 counts per revolution at speeds up to 500 revolutions per second. The MMC Smart Drive provides an A quad B emulated incremental encoder output on the I/O connector for use by an external control. Additionally, the index mark, I, is synthesized by the Resolver Interface Option Module once per resolver revolution. Installation of the module is performed by removing the MMC Smart Drive cover and snapping the unit in place. When installed the module is completely enclosed by the MMC-SD case and does not change the installation dimensions of the unit.

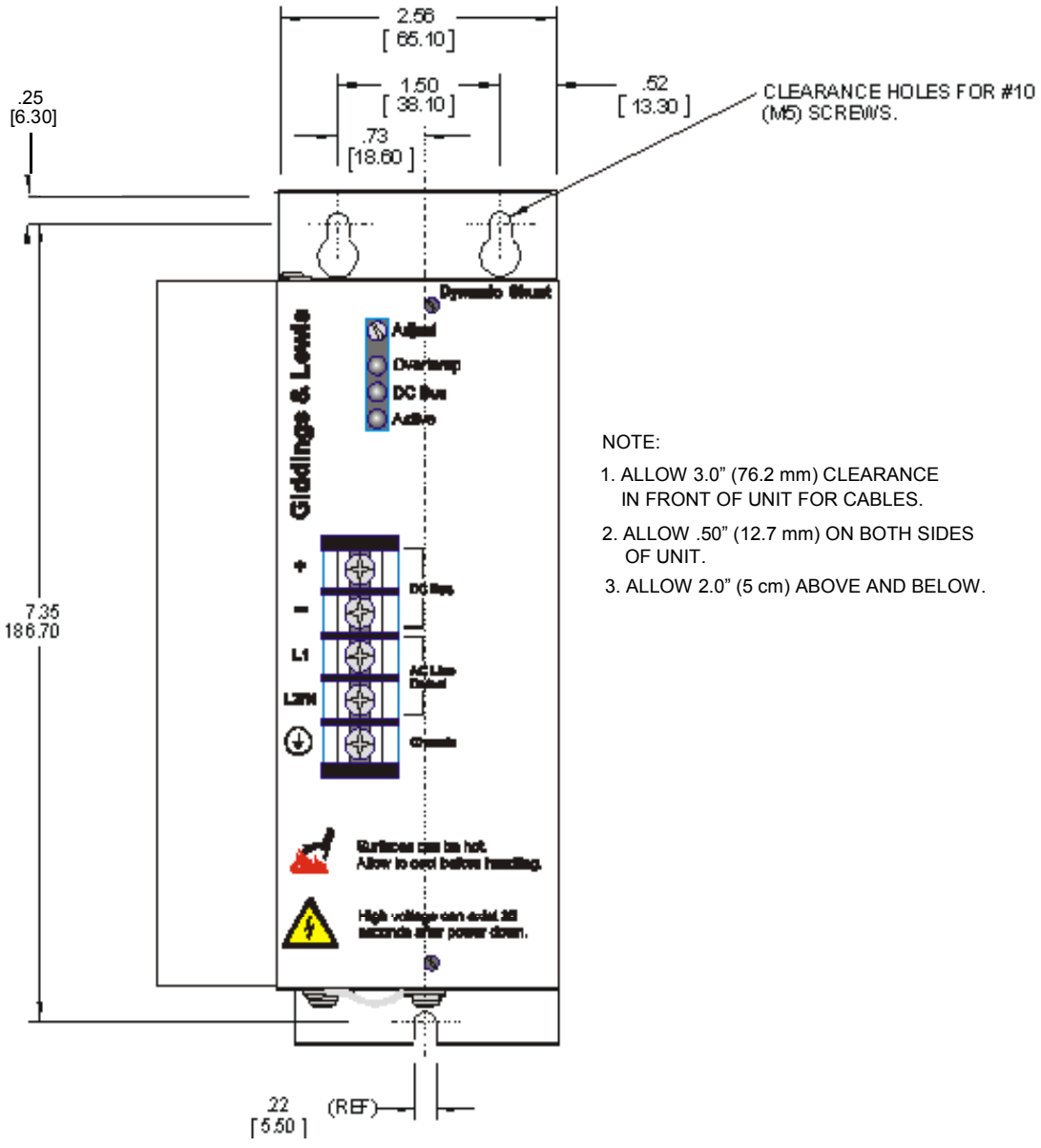
MMC Smart Drive Option Modules		
Option Module	**Description**	**Part Number**
MMC-SD-RIO	MMC Smart Drive Resolver Interface Option Module	M.1302.4253

Dynamic Shunt for MMC-SD-x-230

The MicroDSA Dynamic shunt is used with MMC-SD-x-230 amplifiers to prevent the back EMF of the motor from causing drive bus overvoltage faults during motor deceleration. Use the Motion Solutions servo sizing software to determine whether your application will require a dynamic shunt.

MMC Smart Drive External Shunts		
Use with MMC-SD:	**Description**	**Part Number**
MMC-SD-0.5-230 MMC-SD-1.0-230 MMC-SD-2.0-230	Dynamic Shunt for MMC-SD-x-230 300 Watt, 100 Ohm, 230 Volt	M.1015.7046

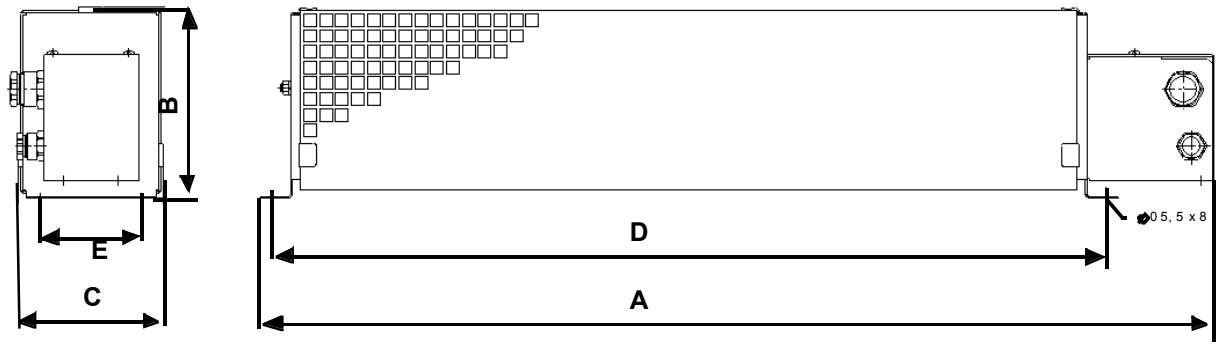
Dynamic Shunt Dimensions



Passive Shunt Resistors for MMC-SD-x-460

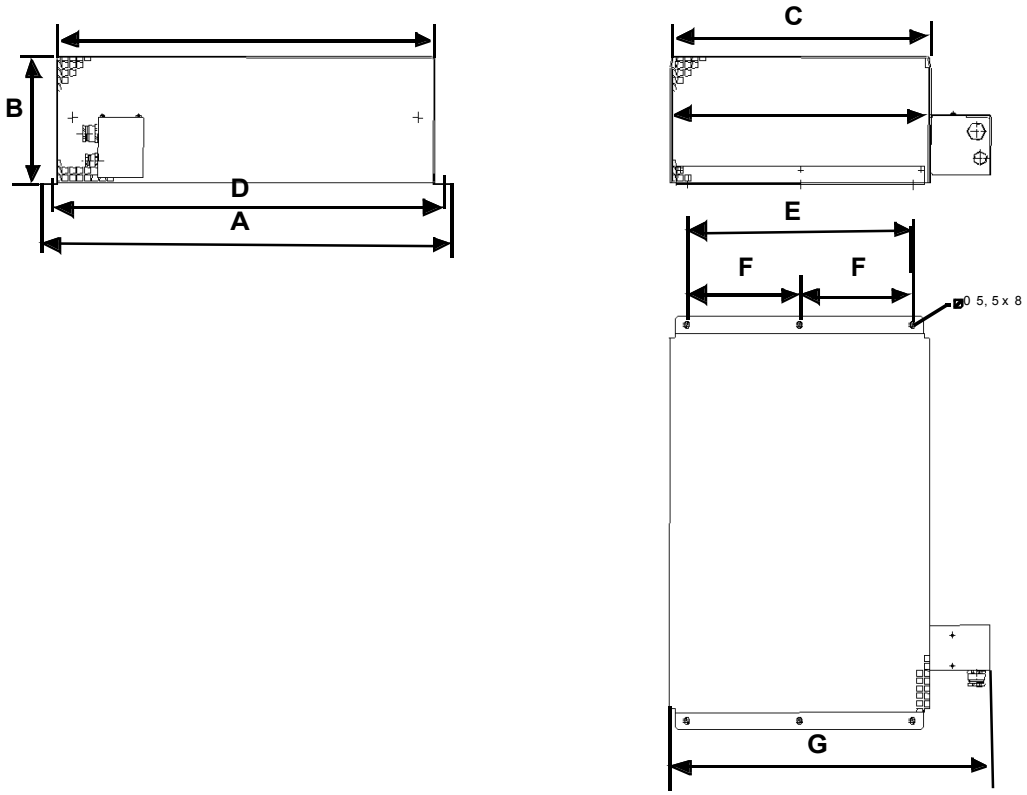
Passive shunt resistors are used with MMC-SD-x-460 amplifiers to prevent the back EMF of the motor from causing drive bus overvoltage faults during motor deceleration. Use the Motion Solutions servo sizing software to determine whether your application will require a shunt resistor.

MMC Smart Drive External Shunts		
Use with MMC-SD:	**Description**	**Part Number**
MMC-SD-1.3-460 MMC-SD-2.4-460	Shunt Resistor - 450 Watt, 130 Ohm, 820 Volts, 5.4 kW peak, 240 sec.	M.1302.7048
MMC-SD-4.0-460	Shunt Resistor - 700 Watt, 95 Ohm, 820 Volts. 8 kW peak, 250 sec.	M.1302.7049
MMC-SD-6.0-460 MMC-SD-8.0-460	Shunt Resistor - 1400 Watt, 50 Ohm, 850 Volts, 17 kW peak, 250 sec.	M.1302.7060
MMC-SD-12.0-460 MMC-SD-16.0-460	Shunt Resistor - 2800 Watt, 25 Ohm, 850 Volts, 32 kW peak, 60 sec.	M.1302.7061
MMC-SD-24.0-460	Shunt Resistor - 3900 Watt, 18 Ohm, 850 Volts, 70 kW peak, 70 sec.	M.1302.7063



	M.1302.7048		M.1302.7049		M.1302.7060	
Dim.	Inch	mm	Inch	mm	Inch	mm
A	23.82	605	27.76	705	23.82	605
B	4.76	121	4.76	121	5.12	130
C	3.66	93	3.66	93	7.28	185
D	20.71	526	24.65	626	20.71	526
E	2.52	64	2.52	64	5.90	150

Mounting Dimensions for 460V External Shunt



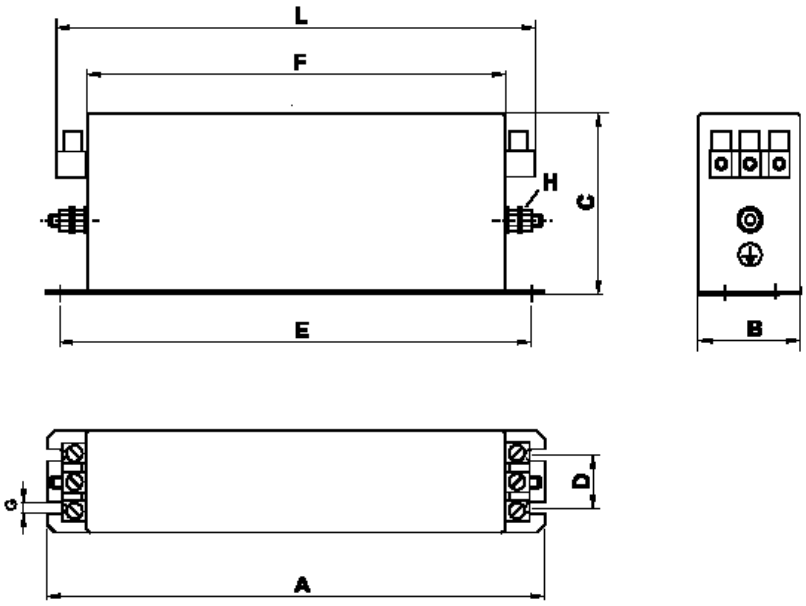
	M.1302.7061		M.1302.7063	
Dim	Inch	mm	Inch	mm
A	21.65	550	21.65	550
B	6.73	171	6.73	171
C	13.62	346	13.62	346
D	20.70	526	20.70	526
E	11.81	300	11.81	300
F	5.91	150	5.91	150
G	16.93	430	16.93	430

MMC-SD AC Line Filters

Use of an AC Line Filter with the MMC Smart Drive is required for CE Compliant applications.

MMC Smart Drive - Line Filters		
Use with MMC-SD:	**Description**	**Part Number**
MMC-SD-0.5-230 MMC-SD-1.0-230	AC Line Filter - 5 Amps; 230 Volts; 1 Phase	M.1015.6922
MMC-SD-2.0-230	AC Line Filter - 10 Amps; 230 Volts; 1 Phase	M.1015.6917
MMC-SD-1.3-460 MMC-SD-2.4-460	AC Line Filter - 7 Amps; 460 Volts; 3 Phase	M.1302.5241
MMC-SD-4.0-460 MMC-SD-6.0-460 MMC-SD-8.0-460	AC Line Filter - 16 Amps; 460 Volts; 3 Phase	M.1302.5244
MMC-SD-12.0-460 MMC-SD-16.0-460	AC Line Filter - 30 Amps; 460 Volts; 3 Phase	M.1302.5245
MMC-SD-24.0-460	AC Line Filter - 42 Amps; 460 Volts; 3 Phase	M.1302.5246
Multiple Drives	AC Line Filter - 56 Amps; 460 Volts; 3 Phase	M.1302.5247
Multiple Drives	AC Line Filter - 75 Amps; 460 Volts; 3 Phase	M.1302.5248

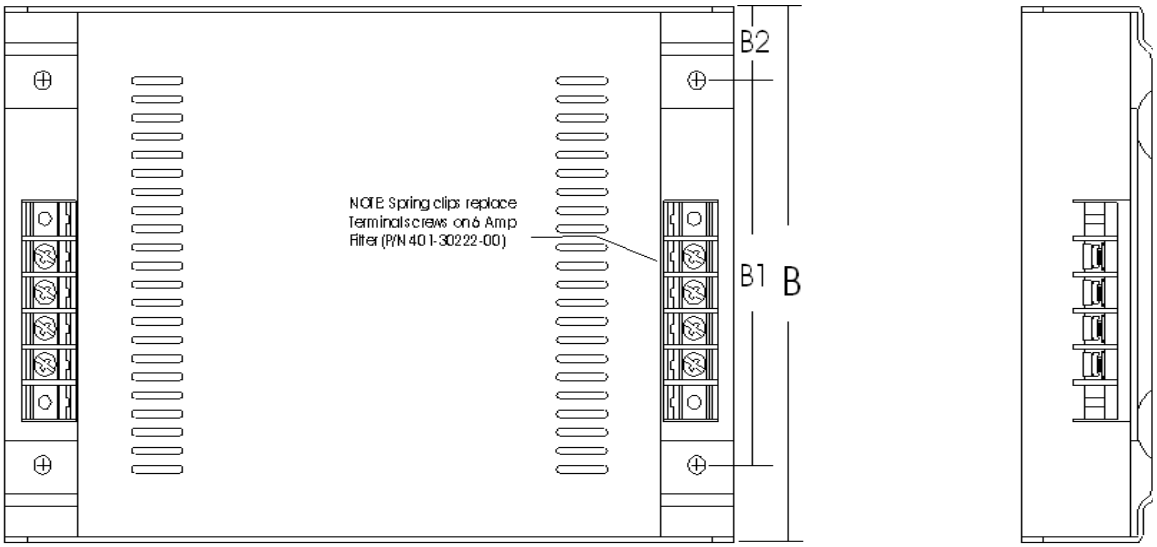
460V Line Filter Dimensions

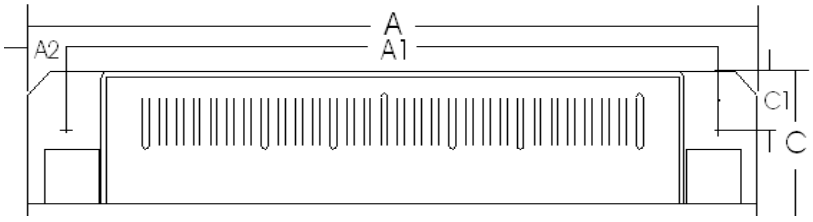


Part Number	A	B	C	D	E	F	L	G	H
M.1302.5241	190	40	70	20	180	160	185	5.4	M5
M.1302.5244	250	50	70	25	235	220	245		
M.1302.5245	270	50	85	30	255	240	265		
M.1302.5246	310	50	85	30	295	280	305		M6
M.1302.5247	250	85	90	60	235	220	258		
M.1302.5248	270	80	135	60	255	240	278	6.5	

Dimensions for AC Line Filters

230V Line Filter Dimensions





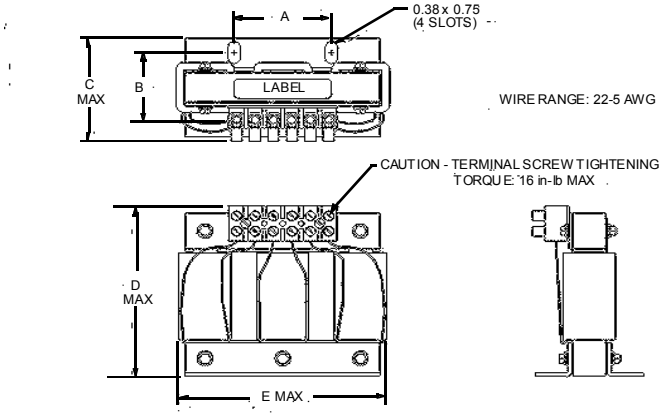
	Single Phase 6A M.1015.6922		Single Phase 10A M.1015.6917		Single Phase 23A M.1015.6918	
Measurement	**mm**	**In**	**mm**	**In**	**mm**	**In**
A	170	6.7	214	8.4	214	8.4
A1	152	6.0	192	7.6	192	7.6
A2	9	0.4	11	0.4	11	0.4
B	92	3.6	145	5.7	204	8.0
B1	55	2.2	104	4.1	164	6.6
B2	18	0.7	20	0.8	20	0.8
C	25	1.0	40	1.6	47	1.8
C2	10	0.4	16	0.6	19	0.8

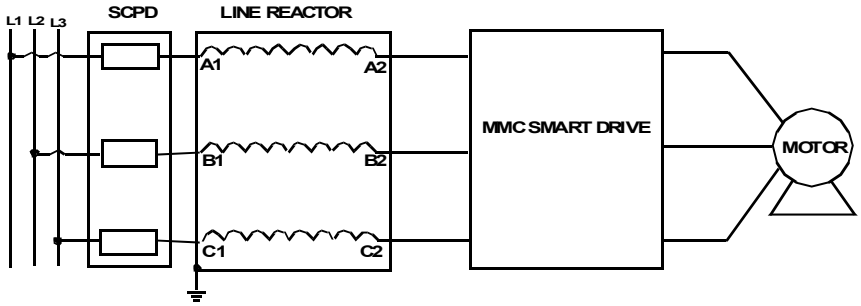
MMC Smart Drive Line Reactors

Use of Line Reactors with the MMC Smart Drive is required for applications of the MMC-SD-12.0-460, MMC-SD-16.0-460 and MMC-SD-24.0-460 amplifiers.

MMC Smart Drive - Line Reactors				
Use with MMC-SD:	**Description**	**Power Loss**	**Inductance**	**Part**
MMC-SD-12.0-460	AC Line Reactor - 25 Amps; 460 Volts; 3 Phase	52 W	1.2 mH	M.1302.7373
MMC-SD-16.0-460	AC Line Reactor - 35 Amps; 460 Volts; 3 Phase	54 W	0.8 mH	M.1302.7374
MMC-SD-24.0-460	AC Line Reactor - 45 Amps; 460 Volts; 3 Phase	62 W	0.7 mH	M.1302.7375

MMC-SD Line Reactor Dimensions





Line reactors are not necessary for the 230V MMC Smart Drives or the 460V size 1 and 2 MMC Smart Drives. Line reactors are required for the 460V size 3 MMC Smart Drives.

	M.1302.7373		M.1302.7374		M.1302.7375	
Measurement	**mm**	**in**	**mm**	**in**	**mm**	**in**
A	76	3.0	76	3.0	76	3.0
B	60	2.35	67	2.63	80	3.16
C	87	3.43	102	4.0	121	4.75
D	152	6.0	146	5.75	187	7.35
E	184	7.25	184	7.25	229	9.0

Feedback Connector Interface Kits

Typically a factory terminated feedback cable, e.g. ENC-L&M-030M-DCA-28-AA, is used to make the connection between the MMC Smart Drive F1/F2 feedback connector and the servo motor feedback connector. In some applications it is preferable to manually terminate the feedback interface cable in the control cabinet. In MMC Smart Drive applications this can be accomplished using either the Drive Mounted - Drive F1/F2 Connector Breakout or the Panel Mounted - Drive F1/F2 Connector Breakout.

Drive Mounted - Drive F1/F2 Connector Breakout

The Drive Mounted F1/F2 breakout provides a screw terminal interface for the motor feedback cable. The breakout unit is 2.00 inches deep.

MMC Smart Drive - Drive F1/F2 Connector Breakout, Drive Mounted	
Description	**Part Number**
Drive Mounted Drive F1/F2 Connector Breakout Board	M.1302.6970

Panel Mounted - Drive F1/F2 Connector Breakout

The Panel Mounted F1/F2 Breakout provides a DIN rail mounted screw terminal interface for the motor feedback cable. The kit includes a factory terminated interface cable between the Drive F1/F2 Connector and the panel mount breakout unit. The dimensions of the panel mount unit are 1.94" W x 3.35" H x 2.05 " D.

MMC Smart Drive - Drive F1/F2 Connector Breakout, Panel Mounted					
	Length in meters				
Cable Description	**1**	**3**	**9**	**15**	
Drive F1/F1 Panel Mount Breakout Kit	M.1302.7005	M.1302.7006	M.1302.7007	M.1302.7008	

I/O Connector Interface Kits

Typically a factory terminated plug-and-play cable is used to make the connection between the MMC Smart Drive I/O connector and an MMC control or ASIU module. In some applications it is preferable to manually terminate the control interface cable. In MMC Smart Drive applications this can be accomplished using either the Drive Mounted - Drive I/O Connector Breakout or the Panel Mounted - Drive I/O Connector Breakout.

Drive Mounted - Drive I/O Connector Breakout

The Drive Mounted I/O breakout provides a screw terminal interface for the motor feedback cable. The breakout unit is 2.75 inches deep.

MMC Smart Drive - Drive I/O Connector Breakout, Drive Mounted	
Description	**Part Number**
Drive Mounted Drive I/O Connector Breakout Board	M.1302.6971

Panel Mounted - Drive I/O Connector Breakout

The Panel Mounted I/O Breakout provides a DIN rail mounted screw terminal interface for the motor feedback cable. The kit includes a factory terminated interface cable between the Drive I/O Connector and the panel mount breakout unit. The dimensions of the panel mount unit are 3.12" W x 3.06" H x 2.05 " D.

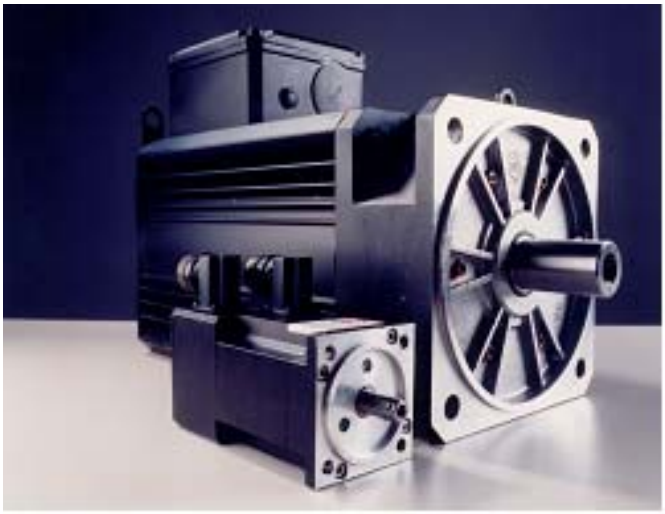
MMC Smart Drive - Drive I/O Connector Breakout, Panel Mounted				
	Length in meters			
Cable Description	**1**	**3**	**9**	
Drive I/O Panel Mount Breakout Kit	M.1302.7009	M.1302.7030	M.1302.7031	

MMC SMART DRIVES AND MOTORS MOTION SOLUTIONS PRODUCT GUIDE

Centurion™ Brushless Servo Motors

Guide to Brushless Motor Section:

LSM Brushless Servo Motors



Typical Applications

- "Smart" conveyors
- Packaging machinery
- Punch press/material feeding
- Robotic pick and place
- High duty cycle applications

Characteristics

- High acceleration and peak torque
- High speed point-to-point positioning
- Environmentally rugged

Standard Features

- High energy neodymium magnet rotors provide high acceleration/deceleration
- Temperature sensors built into windings allow intelligent shut down in overload conditions
- Unique stator design provides optimal thermal transfer, allowing successful automation of high hit rate, demanding applications
- Use direct mount pinions and belt pulleys for cost-effective application
- Standard cable sets simplify machine design, build, and commissioning
- Incremental encoder standard, high resolution, and multi-turn absolute encoder available
- Machine design simplified using standard gearboxes and mounting plates
- Industrial packaging ensures reliable operation in harsh environments
- CE Mark allow worldwide application
- Maintenance-free design manufactured in ISO9000 facility
- Use available CAD (.DXF) drawings for easy design into your machine

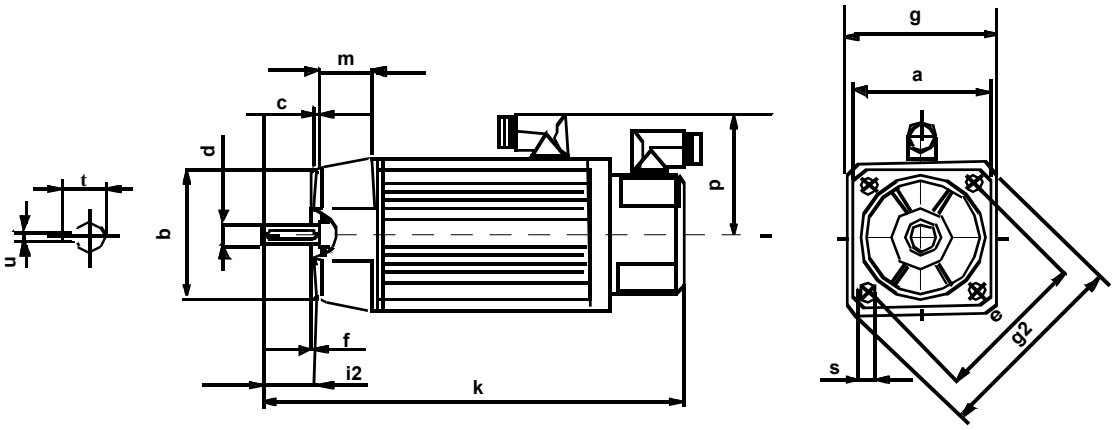
LSM Motor Data

LSM Motors - 230 Volt								
	Mechanical Data		Winding Data				Torque	
Motor Model LSM	**Rotor Inertia** kg-m² (lb-in-s²)	**Wt.** kg (lb)	**KT** Nm/ Amp	**K_E** Volts/ kRPM	**Winding Resistance** Phase to phase @ 25°C	**Winding Inductance** Phase to phase (mH)	**Cont. Torque** Nm (lb-in)	**Peak Torque** Nm (lb-in)
54-3-602-	0.000006 (0.00005)	0.7 (1.5)	0.35	43	30.29	57.5	0.3 (3)	1.3 (12)
23N/63-6-602-	0.000011 (0.0001)	1.4 (3.1)	0.35	43	8.49	26.2	0.7 (6)	2.8 (25)
23N/63-12-602-	0.000023 (0.0002)	1.8 (4.0)	0.36	43	3.68	13.0	1.4 (12)	5.6 (50)
34N/75-10-602-	0.000022 (0.000195)	2.3 (5.1)	0.37	45	4.0	23.8	1.1 (10)	4.4 (39)
34N/75-21-602-	0.00003 (0.0003)	3.1 (6.8)	0.42	49	2.26	17.9	2.4 (21)	8.8 (78)
34N/75-29-602-	0.00005 (0.0004)	3.9 (8.6)	0.40	49	1.32	12.4	3.3 (29)	13.2 (117)

LSM Motors - 460 Volt								
	Mechanical Data		Winding Data				Torque	
Motor Model LSM	**Rotor Inertia** kg-m² (lb-in-s²)	**Weight** kg (lb)	**KT** Nm/ Amp	**K_E** Volts/ kRPM	**Winding Resistance** Phase to phase @ 25°C	**Winding Inductance** Phase to phase (mH)	**Cont. Torque** Nm (lb-in)	**Peak Torque** Nm (lb-in)
100-22-454-	0.00011 (0.001)	4.2 (9.3)	.82	99	10.7	25.8	2.5 (22)	11.0 (97)
100-35-454-	0.00015 (0.0013)	5.3 (11.7)	.86	103	5.9	16.8	4.0 (35)	16.0 (142)
100-46-454-	0.00017 (0.0015)	6.3 (13.9)	.88	106	3.9	12.44	5.2 (46)	16.0 (142)
130-78-454-	0.00041 (0.0036)	10.0 (22)	.88	107	1.68	8.46	8.8 (78)	38.0 (336)
130-102-304-	0.00055 (0.0049)	11.8 (26)	1.28	154	2.2	12.4	11.5 (102)	52.0 (460)
165-119-454-	0.00091 (0.0081)	16.2 (35.7)	.87	105	0.76	6.68	13.4 (119)	51.0 (451)
165-173-304-	0.00128 (0.0113)	18.7 (41.2)	1.29	1.56	0.98	9.6	19.5 (173)	75.0 (664)
165-221-454-	0.00011 (0.001)	4.2 (9.3)	.82	99	10.7	25.8	25.0 (221)	100.0 (885)
215-301-304-	0.00015 (0.0013)	5.3 (11.7)	.86	103	5.9	16.8	34.0 (301)	105.0 (929)
215-451-204-	0.00017 (0.0015)	6.3 (13.9)	.88	106	3.9	12.44	51.0 (451)	158.0 (1398)
215-589-204-	0.00041 (0.0036)	10.0 (22)	.88	107	1.68	8.46	66.6 (589)	210.0 (1859)

Speed/torque ratings specified for motor operating in a 40°C ambient with motor mounted on an aluminum heatsink. Motors LSM100/130/165 0/5" x 10" x 10", LSM165/215 0.5" x 16" x 16".

LSM Standard Motor Dimensions



Note: Motors manufactured to millimeter dimensions

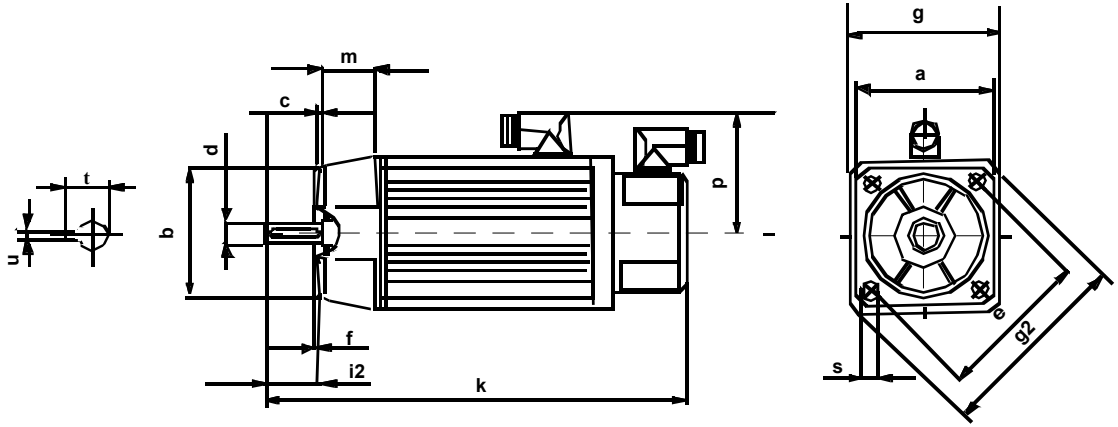
Shaft End Threaded Hole		
Motor	**Thread**	**Thread Depth**
LSM100-XXX	M5 x 0.8 mm	12.5
LSM130-XXX	M8 x 1.25 mm	19
LSM165-XXX	M10 x 1.5 mm	22
LSM215-XXX	M12 x 1.75 mm	28

	Dimensions															
	Flange							**Shaft**			**Motor**					
Model	**a** mm	**b** mm	**c** mm	**e** mm	**f** mm	**i2** mm	**s** mm	**d** mm	**u** mm	**u+d-t (key depth)** mm	**k**[1] mm	**k-i2**[1] **(length from face)** mm	**p** mm	**m** mm	**g** mm	**g2** mm
LSM54-3-602	45	40	6	54	2.5	20	4.4	9	3	1.8	119	99	59.5	50	55	75.5
LSM63-6-602	55	40	6	63	2.5	20	5.4	9	3	1.8	124	104	60	56	55	75.5
LSM63-12-602											154	134				
LSM75-10-03	70	60	8	75	2.5	23	5.5	11	4	2.5	141	118	67	56	70	94
LSM75-10-602	70	60	8	75	2.5	23	5.5	11	4	2.5	141	118	67	56	70	94
LSM75-21-602	70	60	8	75	2.5	23	5.5	11	4	2.5	171	148	67	56	70	94
LSM75-29-602											201	178				
LSM100-22-454	90/94	80	8	100	3	30	7	14	5	3	235	205	77	NA[2]	94	115
LSM100-35-454											265	235				
LSM100-46-454											295	265				
LSM130-78-454	120	110	9	130	3.5	50	9	24	8	5	320	270	90	28	115	150
LSM130-102-304											358	308				
LSM165-119-454	142	130	10	165	3.5	58	12	28	8	5	338	280	126	31.4	142	186
LSM165-173-304											388	330				
LSM165-221-454											428	370				
LSM215-301-304	190	180	12	215	4	80	14	38	10	7	400	320	150	37	190	250
LSM215-451-204											452	372				
LSM215-589-204											504	424				

[1]Add 38mm for LSM54 motors with brake, 42mm for LSM63 motors with brake, 49mm for LSM75 motors with brake, 67mm for LSM100 motors with brake, 79mm for LSM130 motors with brake, 78mm for LSM165 motors with brake, 113mm for LSM215 motors with brake. Add 25mm for LSM75 motor with Sin/Cos feedback. LSM100-215 are the same length with Sin/Cos feedback. [2]Not Applicable

Speed/torque ratings specified for motor operating in a 40°C ambient with motor mounted on an aluminum heatsink. Motors LSM100/130 250 0.5" x 10" x10", LSM165/215 0.5"x 16"x 16".

LSM NEMA Mount Motor Dimensions



Model	Dimensions (Nema face dimensions in inch units, all others in metric units)															
	Flange							Shaft			Motor					
	a mm	b inch	c mm	e inch	f mm	i2 mm	s mm	d inch	u mm	u+d-t mm	k[1] mm	k-i2[1] (length from face) mm	p mm	m mm	g mm	g2 mm
LSM23N-6-602	55	1.5	6	2.625	1.6	20.8	5.54	0.375	X	X	120.8	100	60	56	55	75.5
LSM23N-12-602											150.8	130				
LSM34N-10-602	85	2.875	8	3.875	2.36	30.2	5.54	0.5	X	X	148.2	118	67	56	70	94
LSM34N-21-602											178.2	148				
LSM34N-29-602											208.2	178				

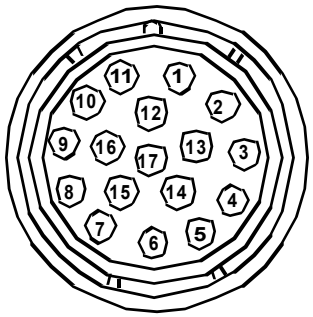
[1]Add 42mm for LSM23N motors with brake, 49mm for LSM34N motors with brake.

LSM Motor Connector Ordering Information

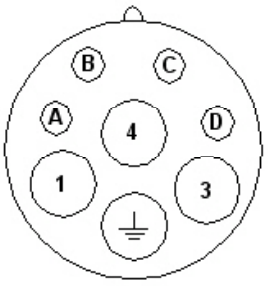
Connector	Part Number
Power Connectors	
Size 1, 16AWG	M.1302.0479
Size 1.5, 12-14AWG	M.1302.1998
Size 1.5, 8-10AWG	M.1302.2354
Size 1.5, 6-8AWG	M.1302.1999
Size3, 4-6AWG	M.1302.7343
Encoder Feedback Connector	
17 Pin	M.1302.0510

LSM Motor Connector Data Tables

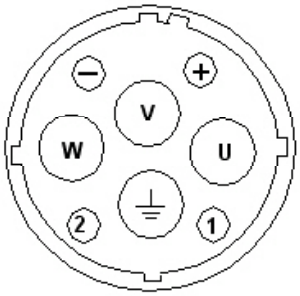
Feedback Connector			
Pin	**2000 Line Encoder**	**High Resolution Encoder (SRS 50)**	**Absolute Encoder (SRM 50)**
1	A	Sine	
2	A /	Sine /	
3	B	Cos	
4	B /	Cos /	
5	I	RS-485 Data +	
6	I /	RS-485 Data -	
7	No connection		
8	Reserved	Reserved	Reserved
9	No connection	8-12 VDC	8-12 VDC
10	+5VDC	No Connection	No Connection
11	Common	Common	Common
12	Reserved	Reserved	Reserved
13	Temperature +	Temperature +	
14	Temperature -	Temperature -	
15	Commutation Track S1	No Connection	No Connection
16	Commutation Track S2	No Connection	No Connection
17	Commutation Track S3	No Connection	No Connection



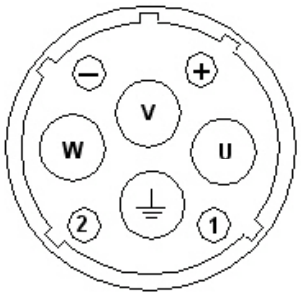
Motor Power Connector					
Size 1 Power Connector		**Size 1.5 Power**		**Size 3 Power**	
Pin	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**
1	Phase U	Phase U	Phase U	Phase U	Phase U
GND	PE	GND	GND	GND	PE
3	Phase V	Phase V	Phase V	Phase V	Phase V
4	Phase W	Phase W	Phase W	Phase W	Phase W
A	Brake +	+	Brake +	+	Brake +
B	Brake -	-	Brake -	-	Brake -
C		1		1	
D		2		2	



Size 1; I < 13.5 Amps RMS



Size 1.5; I < 44 Amps RMS



Size 3; I < 97 Amps RMS

Standard Motor Radial Load Force Ratings For LSM Motors

Motors are capable of operating with the maximum radial or maximum axial shaft loads listed in the following tables. Radial loads are applied midway along the shaft extension. The table represents 20,000-hour L10 bearing fatigue life. This 20,000-hour life does not account for possible application-specific life reduction that may occur due to bearing grease contamination from external sources.

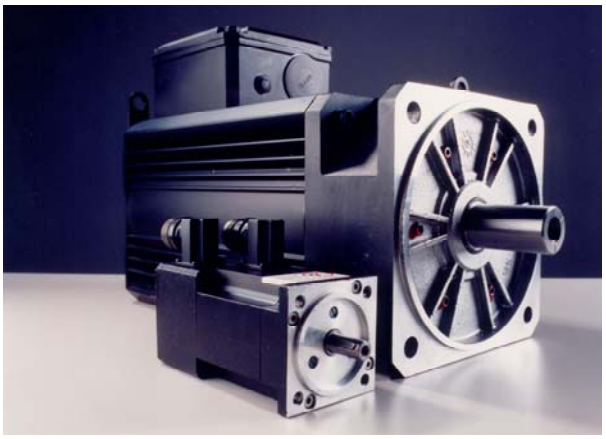
RADIAL LOAD FORCE RATINGS (Maximum Radial Load)														
	500 RPM		**1000 RPM**		**2000 RPM**		**3000 RPM**		**4000 RPM**		**5000 RPM**		**6000 RPM**	
	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)
LSM54	24	53	23	51	22	48	21	47	21	46	20	44	20	43
LSM63	28	61	27	60	26	58	25	55	24	53	24	52	23	50
LSM75	29	65	29	63	28	62	27	59	26	57	25	56	24	54
LSM100	56	123	56	123	48	106	42	94	36	80	34	76	33	73
LSM130	127	281	91	202	68	151	58	129	53	118	49	110	45	101
LSM165	147	325	107	236	76	168	63	140	56	123	46	103	43	95
LSM215	214	472	158	348	112	247	89	196	76	168	63	140	58	129

Note: The axial Load Force must always be zero.

— Axial Load Force

Radial Load Force - lbs (Kg) applied at center

MSM Brushless Servo Motors



Typical Applications

- Web and film processing
- Machine tool/metal cutting
- Textile machinery
- CAM replacements

Characteristics

- Higher inertia matching capability
- Heavy duty continuous operations
- Environmentally rugged

Standard Features

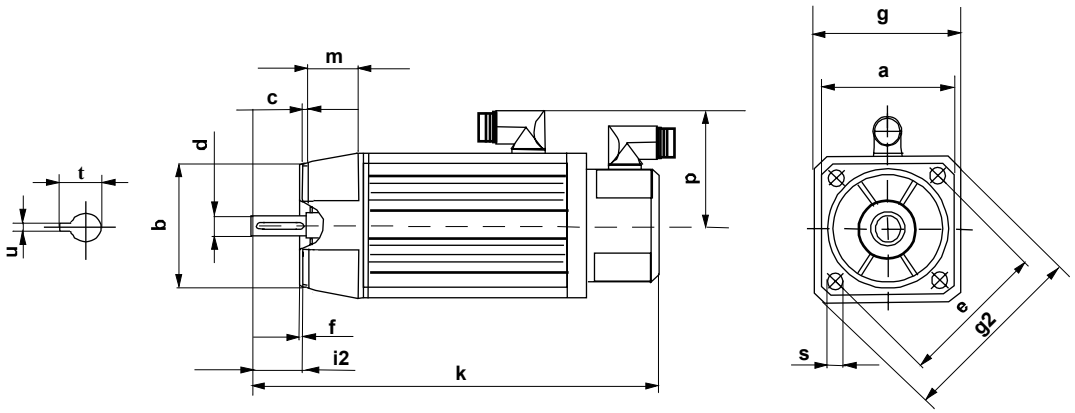
- High energy neodymium magnet rotors provide high acceleration/deceleration
- Temperature sensors built in to windings allow intelligent shut down in overload conditions
- Unique stator design provides optimal thermal transfer, allowing successful automation of high-hit rate, demanding applications
- Use direct-mount pinions and belt pulleys for cost-effective application
- Standard cable sets simplify machine design, build and commissioning
- Incremental encoder standard, high resolution and multi-turn absolute encoder available
- Machine design simplified using standard gearboxes and mounting plates
- Industrial packaging ensures reliable operation in harsh environments
- UL, cUL and CE Mark allow worldwide application
- Maintenance-free design manufactured in ISO9000 facility.
- Use available CAD (.DXF) drawings for easy design into your machine.

MSM Motor Data

MSM Motors - 230 Volt								
	Mechanical Data		Winding Data				Torque	
Motor Model MSM	Rotor Inertia kg-m^2 (lb-in-s^2)	Weight kg (lb)	KT Nm/ Amp	K_E Volts/ kRPM	Winding Resistance Phase to phase @ 25°C	Winding Inductance Phase to phase (mH)	Cont. Torque Nm (lb-in)	Peak Torque Nm (lb-in)
100-6-602-	0.00015 (0.0013)	4.9 (10.8)	0.28	33	12.3	15.7	0.72 (6)	3.8 (34)
100-14-602-	0.00021 (0.0019)	5.9 (13.0)	0.27	33	3.9	6.9	1.6 (14)	8.0 (71)
115-34-402-	0.00056 (0.005)	6.6 (14.6)	0.46	55	3.1	8.6	3.8 (34)	12.0 (106)
115-62-402-	0.00102 (0.009)	8.5 (18.7)	0.46	55	1.1	4.2	7.0 (62)	22.0 (195)
115-89-402-	0.00160 (0.0142)	11.0 (24.3)	0.50	61	0.74	3.3	10.0 (89)	32.0 (283)
MSM Motors - 460 Volt								
	Mechanical Data		Winding Data				Torque	
Motor Model MSM	Rotor Inertia kg-m^2 (lb-in-s^2)	Weight kg (lb)	KT Nm/ Amp	K_E Volts/ kRPM	Winding Resistance Phase to phase @ 25°C	Winding Inductance Phase to phase (mH)	Cont. Torque Nm (lb-in)	Peak Torque Nm (lb-in)
100-6-604-	0.00015 (0.0013)	4.9 (10.8)	0.46	55	24.4	48.0	0.7 (6)	3.8 (34)
100-14-604-	0.00021 (0.0019)	5.9 (13.0)	0.52	62	9.0	22.0	1.6 (14)	8.0 (71)
115-34-404-	0.00056 (0.005)	6.6 (14.6)	0.95	115	8.4	32.0	3.8 (34)	12.0 (106)
115-62-404-	0.00102 (0.009)	8.5 (18.7)	0.99	120	3.4	15.8	7.0 (62)	22.0 (195)
115-89-404-	0.00160 (0.0142)	11.0 (24.3)	1.03	123	2.0	12.0	10.1 (89)	32.0 (283)
165-93-204-	0.00224 (0.0198)	12.0 (26.5)	1.86	225	5.7	60.0	10.5 (93)	34.0 (301)
165-146-304-	0.00360 (0.0319)	16.3 (35.9)	1.34	161	1.56	18.5	16.5 (146)	54.0 (478)
215-221-304-	0.00739 (0.0655)	26.0 (57.3)	1.36	164	0.76	15.8	25.0 (221)	70.0 (620)
215-319-304-	0.01079 (0.0956)	33.0 (72.8)	1.36	164	0.40	10.6	36.0 (319)	100.0 (885)
215-407-304-	0.01409 (0.1248)	40.0 (88.2)	1.40	170	0.28	8.2	46.0 (407)	128.0 (1133)
215-505-304-	0.01749 (0.1549)	49.0 (108.0)	1.39	168	0.24	6.5	57.1 (505)	160.0 (1416)

Speed/torque ratings specified for motor operating in a 40°C ambient with motor mounted on an aluminum heatsink. Motors MSM100/115/265 0.5" x 10" x10", MSM165/215 0.5"x 16"x 16".

MSM Standard Motor Dimension



Shaft End Threaded Hole		
Motor	**Thread**	**Thread Depth**
MSM100-XXX	M5 x 0.8 mm	12.5
MSM115-XXX	M6 x 1.0 mm	16
MSM165-XXX	M8 x 1.25 mm	19
MSM215-XXX	M12 x 1.75 mm	28

Note: Motors manufactured to millimeter dimensions

	Dimensions															
	Flange							Shaft			Motor					
Model	a mm	b mm	c mm	e mm	f mm	i2 mm	s mm	d mm	u mm	u+d-t (key depth) mm	k[1] mm	k-i2[1] (length from face) mm	p mm	m mm	g mm	g2 mm
MSM100-6-604	90	80	8	100	3	30	7	14	5	3	224	194	81	27	99	120
MSM100-14-604	-	-	-	-	-	-	-	-	-	-	249	219	-			
MSM115-34-404	105	95	8	115	3	40	9	19	6	3.5	277	237	90	27	115	150
MSM115-62-404	-	-	-	-	-	-	-	-	-	-	317	277				
MSM115-89-404	-	-	-	-	-	-	-	-	-	-	357	317				
MSM165-93-204	142	130	12	165	3.5	50	12	24	8	5	316	266	126	32	142	186
MSM165-146-304	-	-	-	-	--	-	-	-	-	-	366	316				
MSM215-221-304	190	180	13	215	4	58	14	32	10	7	367	309	150	45	190	250
MSM215-319-304	-	-	-	-	-	-	-	-	-	-	415	357	-			
MSM215-407-304	-	-	-	-	-	-	-	-	-	-	463	405	-			
MSM215-505-304	-	-	-	-	-	-	-	-	-	-	511	453	-			

[1] Add 3mm for MSM100 motors with Sin/Cos feedback, 0 mm for MSM115 motors with Sin/Cos feedback, 21mm for MSM215 motors with Sin/Cos feedback, and 22mm for MSM165 motors with Sin/Cos feedback.
Motors manufactured to millimeter dimensions shown. Inch dimensions can be obtained by dividing by 25.4. For further motor detail, engineering specification drawings are available.
Sin/Cos feedback is used with Single turn high resolution (-S) and Multiturn high resolution (-M) feedback options.
Brake motors are the same length as non-brake motors.

MSM Motor Connector Ordering Information

Ordering options include the following:

- 24 VDC Brake (Consult factory for brake motor availability
- Single turn high resolution
- Multi-turn high resolution

Consult the factory for information on any of these items.

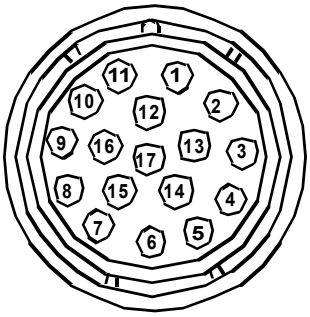
Note: Optional configurations or encoder line counts have extended lead times and additional charges.

Note: All options are not available.

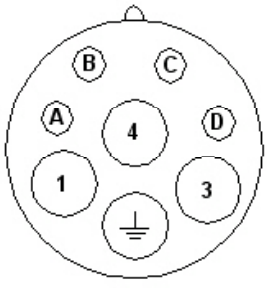
Connector	Part Number
Power Connectors	
Size 1, 16AWG	M.1302.0479
Size 1.5, 12-14AWG	M.1302.1998
Size 1.5, 8-10AWG	M.1302.2354
Size3, 4-6AWG	M.1302.7343
Encoder Feedback Connector	
17 Pin	M.1302.0510

MSM Motor Connector Tables

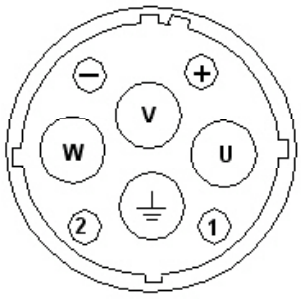
Feedback Connector			
Pin	**2000 Line Encoder**	**High Resolution Encoder (SRS 50)**	**Absolute Encoder (SRM 50)**
1	A	Sine	
2	A /	Sine /	
3	B	Cos	
4	B /	Cos /	
5	I	RS-485 Data +	
6	I /	RS-485 Data -	
7	No connection		
8	Reserved	Reserved	Reserved
9	No connection	8-12 VDC	8-12 VDC
10	+5VDC	No Connection	No Connection
11	Common	Common	Common
12	Reserved	Reserved	Reserved
13	Temperature +	Temperature +	
14	Temperature -	Temperature -	
15	Commutation Track S1	No Connection	No Connection
16	Commutation Track S2	No Connection	No Connection
17	Commutation Track S3	No Connection	No Connection



Motor Power Connector					
Size 1 Power Connector		**Size 1.5 Power**		**Size 3 Power**	
Pin	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**
1	Phase U	Phase U	Phase U	Phase U	Phase U
GND	PE	GND	GND	GND	PE
3	Phase V	Phase V	Phase V	Phase V	Phase V
4	Phase W	Phase W	Phase W	Phase W	Phase W
A	Brake +	+	Brake +	+	Brake +
B	Brake -	-	Brake -	-	Brake -
C		1		1	
D		2		2	



Size 1; I < 13.5 Amps RMS



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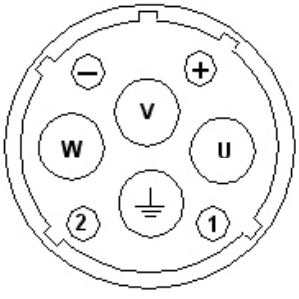


Size 3; I < 97 Amps RMS

Standard Motor Radial Load Force Ratings For MSM Motors

Motors are capable of operating with the maximum radial or maximum axial shaft loads listed in the following tables. Radial loads are applied midway along the shaft extension. The table represents 20,000-hour L10 bearing fatigue life. This 20,000-hour life does not account for possible application-specific life reduction that may occur due to bearing grease contamination from external sources.

	500 RPM		1000 RPM		2000 RPM		3000 RPM		4000 RPM		5000 RPM		6000 RPM	
Motor	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb
MSM100	84	185	65	143	50	112	44	98	38	85	36	80	34	76
MSM115	95	211	82	182	63	139	54	119	48	106	44	98	42	93
MSM165	122	269	89	197	67	148	56	123	48	107	45	101	42	93
MSM215	209	469	163	359	122	269	101	224	86	191	81	179	77	170
MSM307	51.4	113	40.9	90	32.3	71	28.2	62	25.5	56	53	24.1		

Note: The axial Load Force must always be zero.

— Axial Load Force

Radial Load Force - lbs (Kg) applied at center

NSM Brushless Servo Motors

Typical Applications

- Semi-conductor manufacturing
- Material handling
- Web processing
- Robotics
- Packaging machinery

Standard Features

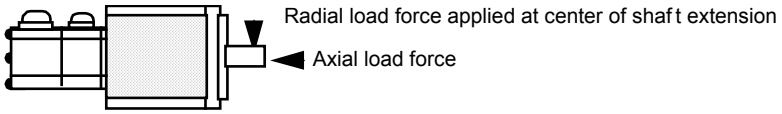
- Rugged industrial construction
- High torque to size ratio
- High energy ring magnet rotor
- Integral encoder
- Provision for optional shaft seal
- NEMA 23, 34, 42, 56 style mounting frames

NSM Motor Data

NSM Motors - 230 Volt								
	Mechanical Data		Winding Data				Torque	
Motor Model NSM	Rotor Inertia kg-m^2 (lb-in-s^2)	Weight kg (lb)	KT Nm/ Amp	K_E Volts/ kRPM	Winding Resistance Phase to phase @ 25°C	Winding Inductance Phase to phase (mH)	Cont. Torque Nm (lb-in)	Peak Torque Nm (lb-in)
2302	0.000009 (0.00008)	1.0 (2.3)	0.08	10	3.18	4.1	0.2 (1.7)	0.5 (4.7)
2304	0.000018 (0.00016)	1.5 (3.4)	0.18	22	4.9	8.1	0.5 (4.6)	1.4 (13)
3406	0.00008 (0.0007)	2.6 (5.7)	0.17	21	2.2	6.1	0.8 (6.8)	2.5 (18.5)
3412	0.00015 (0.0013)	3.5 (7.6)	0.34	41	2.7	8.6	1.5 (13)	4.1 (36)
4214	0.00024 (0.0021)	4.7 (10.4)	0.41	49	2.8	11.0	1.8 (15.5)	5.7 (50)
4220	0.00035 (0.0031)	5.9 (13.0)	0.28	34	0.77	2.9	2.5 (22)	7.1 (63)
5630	0.00090 (0.008)	9.1 (20.0)	0.38	47	0.89	4.3	3.8 (34)	10.7 (95)
5637	0.00113 (0.01)	11.0 (24.2)	0.50	60	1.0	5.2	5.2 (46)	13.0 (120)
5647	0.00147 (0.013)	13.0 (28.7)	0.63	77	1.23	7.0	6.0 (53)	17.0 (150)
Speed/torque ratings specified for motor operating in a 40°C ambient with motor mounted on an aluminum heatsink. NSM 2302/2304: 0.25" x 8" x 8", NSM 3406/3412: 0.25" x 10" x 10", NSM4214/4220/5630/5637/5647: 0.50" x 12" x 12".								

Motors are capable of carrying an axial load in most applications. The following table provides guidelines for 20,000 hour bearing life with a specified radial load applied to the center of the shaft. Please consult with Sheffield Automation regarding loads, operating speeds and bearing life in your particular application to ensure the proper selection of motors.

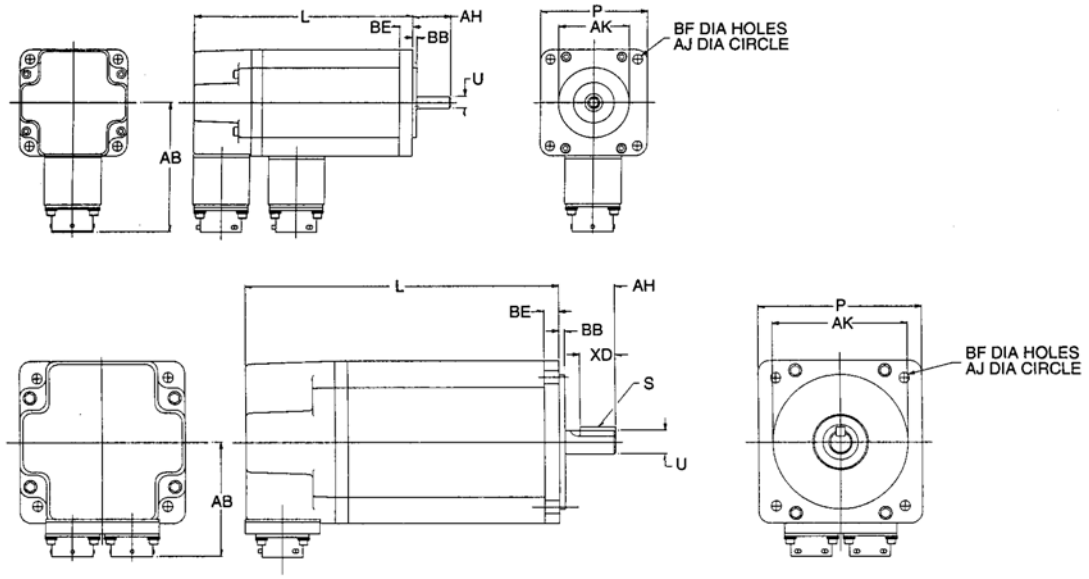
	500 RPM		1000 RPM		2000 RPM		3000 RPM		4000 RPM		5000 RPM		6000 RPM	
Motor	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb
NSM2302	8	17	7	16	6	14	6	12	5	11	4	9	3	8
NSM2304	9	19	8	17	7	15	6	14	5	12	5	10	4	8
NSM3406	47	103	37	82	29	65	26	56	23	51	22	48	20	45
NSM3412	51	113	40	89	32	71	28	62	26	56	24	53	22	49
NSM4214	62	137	49	109	39	86	34	76	31	68	29	64		
NSM4220	66	146	52	116	41	92	36	80	33	73	31	68		
NSM5630	85	188	67	149	53	118	47	103	43	94				
NSM5637	89	197	71	156	56	124	49	108	45	98				
NSM5647	92	203	73	161	58	128	51	112						



NOTE: When motor shaft has no radial load, axial load rating = 100% of radial load rating above.

When motor shaft has both a radial load and an axial load, axial load rating = 44% of radial load rating above

NSM Motor Dimensions



Model	AB	AH	AJ	AK	BB	BE	BF	L
	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in
NSM2302	69/2.75	21/.81[1]	67/2.625	38/1.50[2]	2/.09	7/.275	5/.205	118/4.634
NSM2304	69/2.75	21/.81[1]	67/2.625	38/1.50[2]	2/.09	7/.275	5/.205	156/6.134
NSM3406	64/2.48	30/1.19[1]	98/3.875	73/2.875[4]	3/.12	8/.315	6/.220	147/5.67
NSM3412	64/2.48	30/1.19[1]	98/3.875	73/2.875[4]	3/.12	8/.315	6/.220	173/6.67
NSM4214	63/2.45	35/1.38[1]	126/4.95	56/2.187[7]	3/.12	10/.394	7/.280	174/6.845
NSM4220	63/2.45	35/1.38[1]	126/4.95	56/2.187[7]	3/.12	10/.394	7/.280	200/7.845
NSM5630	76/2.96	50/1.97[1]	149/5.875	114/4.50[8]	3/.12	12/.472	9.5/.375 in UNC	199/7.825
NSM5637	76/2.96	50/1.97[1]	149/5.875	114/4.50[8]	3/.12	12/.472	9.5/.375 in UNC	225/8.825
NSM5647	76/2.96	50/1.97[1]	149/5.875	114/4.50[8]	3/.12	12/.472	9.5/.375 in UNC	250/9.825

Model	LA	LB	P	S	U	XD
	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in
NSM2302	62/2.43	106/4.05	58/2.27	N/A	6/.25[3]	N/A
NSM2304	100/3.93	141/5.55	58/2.27	N/A	6/.25[3]	N/A
NSM3406	124/4.87	N/A	89/3.48	3.2 x 3.2/0.125 x 0.125[5]	13/.5[3]	20/.75[6]
NSM3412	149/5.87	N/A	89/3.48	3.2 x 3.2/0.125 x 0.125[5]	13/.5[3]	20/.75[6]
NSM4214	152/5.99	N/A	102/4.0	4.8 x 4.8/0.1875 x 0.1875[5]	16/.625[3]	25/0.94[6]
NSM4220	178/6.99	N/A	102/4.0	4.8 x 4.8/0.1875 x 0.1875[5]	16/.625[3]	25/0.94[6]
NSM5630	178/7.0	N/A	127/5.0	4.8 x 4.8/0.1875 x 0.1875[5]	19/.75[3]	40/1.5[6]
NSM5637	203/8.0	N/A	127/5.0	4.8 x 4.8/0.1875 x 0.1875[5]	19/.75[3]	40/1.5[6]
NSM5647	229/9.0	N/A	127/5.0	4.8 x 4.8/0.1875 x 0.1875[5]	19/.75[3]	40/1.5[6]

[1]Tolerance is ±0.03/0.76, [2]-0.005/0.05, [3]-0.005/0.13 diameter, [4]-0.006/0.15, [5]-0.002/0.005 width -0.014/0.36 depth, [6]-0.06/1.5, [7]-0.001/0.025 diameter, [8]-0.003/0.076
NOTE: Motors are manufactured to inch dimensions. Millimeter dimensions are approximate conversions from inches.

NSM Motor Connector Ordering Information

Ordering options include the following:

- 24 VDC Brake (Consult factory for brake motor availability)
- Encoder Line Count – 2,000 or 5,000 line
- Motor Winding Voltage – 115 V or 230 V Drive Input Voltage

Consult the factory for information on any of these items.

Note: Options are not available on all sizes. Using optional configurations or encoder line counts may extend lead times and involve additional charges.

Note: 5000 line count encoder, motor top speed is limited to 3600 RPM due to frequency output limit of encoder-check drive system configuration data for any additional restrictions imposed by drive input.

NSM Connector Data

MOTOR MATING CONNECTORS

Description	Part Number
Mating Power	M.1015.8056
Mating Encoder	M.1015.8057

NSM MOTOR SHAFT SEAL KITS

Description	Part Number
NSM 2300 Series	M.1300.0422
NSM 3400 Series	M.1015.8058
NSM 4200 Series	M.1015.8059
NSM 5600 Series	M.1300.0003

YSM Brushless Servo Motors

Typical Applications

- Robotics
- Material handling
- Specialty machinery
- Medical and laboratory equipment
- X-Y tables
- Light packaging machines
- Office machinery
- Postal sorting

Standard Features

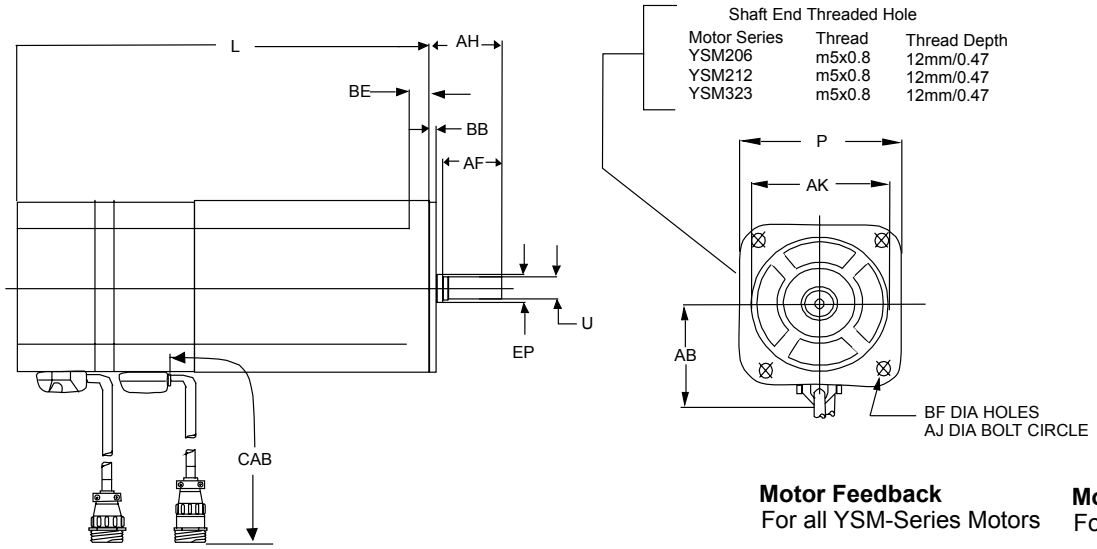
- 115V and 230V windings
- Popular metric mounting dimensions
- Three frame sizes, 10 models
- Torque range 1.5 – 2.22 lb-in (.17 – 2.4 Nm)
- Motor-mounted optical encoder with differential line driver data (2,000 line) and commutation signals
- Low inertia rotor
- High energy neodymium magnets
- 4500 rpm maximum
- Optional internally-mounted spring-set, magnetic-release 24VDC holding brake
- IP-43 package

YSM Motor Data

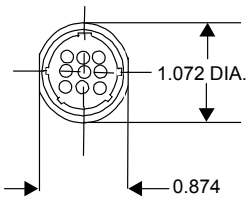
YSM Motors - 115 Volt and 230 Volt								
	Mechanical Data		Winding Data				Torque	
Motor Model YSM	**Rotor Inertia** kg-m^2 (lb-in-s^2)	**Weight** kg (lb)	**KT** Nm/ Amp	**K_E** Volts/ kRPM	**Winding Resistance** Phase to phase @ 25°C	**Winding Inductance** Phase to phase (mH)	**Cont. Torque** Nm (lb-in)	**Peak Torque** Nm (lb-in)
102-115V	0.000003 (0.000027)	0.54 (1.2)	0.08	10	4.6	5.5	0.2 (1.5)	0.48 (4.3)
102-230V	0.000003 (0.000027)	0.54 (1.2)	0.16	20	18.8	22.3	0.2 (1.5)	0.48 (4.3)
103-115V	0.000005 (0.000045)	0.68 (1.5)	0.11	14	3.2	3.8	0.4 (3.1)	0.97 (8.6)
103-230V	0.000005 (0.000045)	0.68 (1.5)	0.21	25	8.9	11.5	0.4 (3.1)	0.97 (8.6)
206-115V	0.00001 (0.000127)	1.36 (3.0)	0.1	13	0.79	2.7	0.7 (6.1)	1.9 (17)
206-230V	0.00001 (0.000127)	1.36 (3.0)	0.22	27	3.2	12.0	0.7 (6.1)	1.9 (17)
212-115V	0.00003 (0.00023)	1.90 (4.2)	0.24	29	1.32	5.1	1.4 (12)	3.8 (33.7)
212-230V	0.00003 (0.00023)	1.90 (4.2)	0.37	45	2.9	12.4	1.4 (12)	3.8 (33.7)
323-230V	0.00006 (0.00056)	3.54 (7.8)	0.37	40	0.78	6.0	2.5 (22.5)	7.1 (63)

Speed/torque ratings specified for motor operating in a 40°C ambient with motor mounted on an aluminum heatsink. YSM 102/103: 0.125" x 6" x 6", YSM 206/212: 0.250" x 8" x 8", YSM 232: 0/25" x 10" x 10".

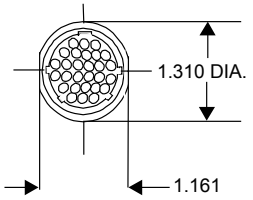
YSM102, YSM103, YSM206, YSM212, YSM323



Motor Feedback
For all YSM-Series Motors



Motor Power
For all YSM-Series Motors



Model	AB	AJ	AK	P	U	EP	AH	BB	BE	BF	AF	CAB	L	with Brake
	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in
YSM102	30/1.18	46/1.81	30/1.18	40/1.57	8/0.31	-	25/0.98	2.5/0.10	5/0.20	4.5/0.18	-	1000/39.37	70/2.75	108/4.25
YSM103	30/1.18	46/1.81	30/1.18	40/1.57	8/0.31	-	25/0.98	2.5/0.10	5/0.20	4.5/0.18	-	1000/39.37	88/3.46	126/4.96
YSM206	41/1.61	70/2.75	50/1.97	60/2.36	14/0.55	-	30/1.18	3/0.12	6/0.24	5.5/0.22	-	1000/39.37	95/3.74	133/5.24
YSM212	41/1.61	70/2.75	50/1.97	60/2.36	14/0.55	-	30/1.18	3/0.12	6/0.24	5.5/0.22	-	1000/39.37	123/4.84	161/6.34
YSM323	52/2.05	90/3.54	70/2.75	80/3.15	16/0.63	19/0.75	40/1.57	3/0.12	8/0.31	6.5/0.25	35/1.38	1000/39.37	140/5.57	180/7.09

Motors are manufactured to millimeter dimensions shown. Inch dimensions shown are approximate conversions from millimeters.

For further motor detail, engineering specification drawings are available upon request.

Added length for motors with brake option: 1.47 inches for YSM1xx, 1.46 inches for YSM2xx, 1.61 inches for YSM3xx.

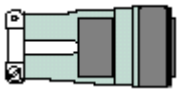
Speed/torque ratings specified for motor operating in a 40°C ambient with motor mounted on an aluminum heatsink. YSM 102/103: 0.125” x 6” x 6”, YSM 206/212: 0.250” x 8” x 8”, YSM 323: 0.25” x 10” x 10”.

YSM Motor Connector Ordering Information

Ordering options include the following:

- 24 VDC Brake (Consult factory for brake motor availability)
- Motor Winding Voltage – 115 V or 230 V Drive Input Voltage
- Various NEMA style frame sizes

MOTOR MATING CONNECTORS
CONNECTOR KITS FOR YSM MOTORS



All YSM Motors
M.1301.4098

This kit includes connector, pins, and backshell for both the power and encoder connections.

YSM Connector Data
All YSM

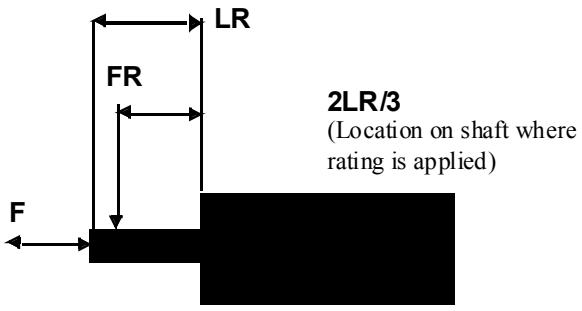
Motor Power Connector	
Pin	**Signal**
1	Phase R
2	Phase S
3	Phase T
4	-
5	Ground
6	-
7	Brake + [1]
8	-
9	Brake + [1]

[1]No connection for nonbrake motors

Motor Feedback	
Pin	**Signal**
1-8	-
9	A+
10	A-
11	B+
12	B-
13	I+
14	I-
15	HALL A+
16	HALL A-
17	HALL B+
18	HALL B-
19	HALL C+
20	HALL C-
21	--
22	+5 VDC
23	Com
24	Encoder Case
25	--
26	--
27	--
28	--

YSM Brake and Shaft Load Data

Motor	Brake Holding Torque	Current at 24 VDC	Shaft Radial Load (FR)	Shaft Axial Load (F)
YSM102	0.157 Nm		10 kg	3 kg
YSM103	0.32 Nm	Consult	10 kg	3 kg
YSM206	0.637 Nm	Factory	20 kg	8 kg
YSM212	1.27		25 kg	10 kg
YSM323	2.38 Nm		35 kg	20 kg



NOTE: Above mating connector kit is not CE compliant. Please contact the factory for more information.

FSM Medium Inertia Brushless Servo Motors

Typical Applications

- Web and film processing
- Machine tool/metal cutting
- Textile machinery
- CAM replacements

Characteristics

- Higher inertia matching capability
- Heavy duty continuous operations
- Environmentally rugged

Standard Features

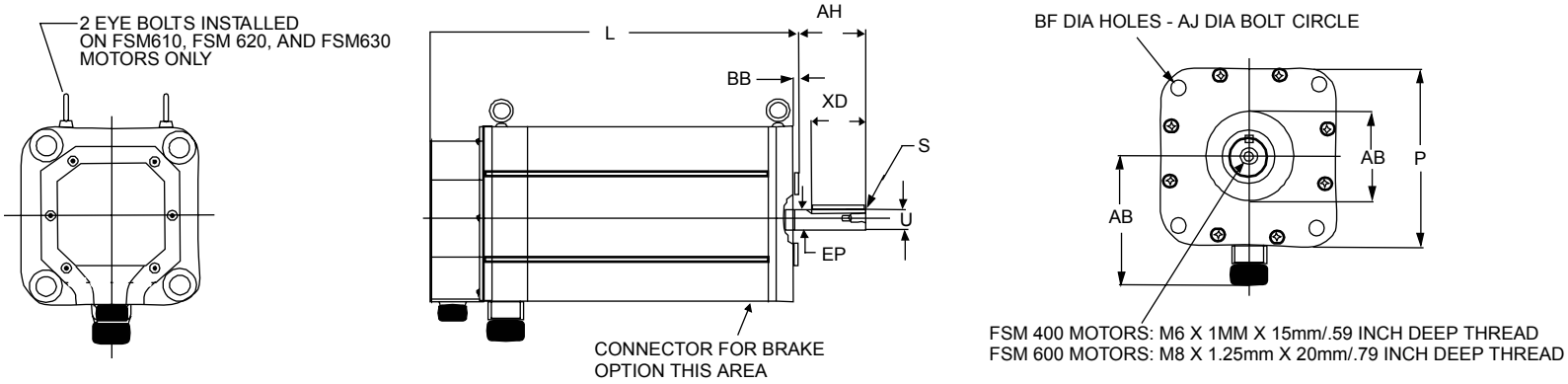
- Compact design is mechanically interchangeable with the FSM family
- Two frame sizes – six models
- Continuous torque from 31 to 245 lb-in (3.5 to 28 Nm)
- Speeds to 4000 RPM
- Ferrite permanent magnet rotors provide approximately four times greater rotor inertia than the FSM family for matching larger load inertias
- Internal thermal switch indicates overheating
- Motor mounted optical encoder includes 2000 quadrature pulses, index pulse and standard commutation channels for trapezoidal drives.
- Water-tight MS connections are compatible with standard cable assemblies; in addition, the extruded aluminum housing and environmental connectors provide an IP65 package (with the addition of the optional shaft seal kit)
- Economical, compact design ready for harsh environments
- Optional spring-set holding brakes available with 24VDC or 90 VDC
- Axially trapped front bearing in a steel insert for long life at high speeds
- Vibration: 2.5 g peak 30-200 Hz
- Shock: 10.0 g peak 6msec duration
- CE d UL recognized

FSM Motor Data

FSM Motors - 230 Volt								
	Mechanical Data		Winding Data				Torque	
Motor Model FSM	**Rotor Inertia** kg-m^2 (lb-in-s^2)	**Weight** kg (lb)	**KT** Nm/ Amp	**K_E** Volts/ kRPM	**Winding Resistance** Phase to phase @ 25°C	**Winding Inductance** Phase to phase (mH)	**Cont. Torque** Nm (lb-in)	**Peak Torque** Nm (lb-in)
430	0.00102 (0.009)	8.9 (19.6)	0.54	66	2.24	6.8	3.5 (31)	11.3 (100)
460	0.00215 (0.019)	14.1 (31.0)	0.54	66	0.89	3.3	6.9 (61)	15.3 (135)
490	0.00327 (0.029)	14.1 (31.0)	0.73	89	0.98	3.4	9.3 (82)	19.2 (170)
610	0.00644 (0.057)	22.3 (49.2)	0.71	86	0.51	3.3	14.1 (125)	31.6 (280)
620	0.01073 (0.095)	30.9 (68.2)	0.70	85	0.26	1.7	20.8 (184)	42.4 (375)
630	0.01626 (0.144)	43.2 (95.2)	0.73	89	0.16	1.1	27.7 (245)	56.5 (500)

Speed/torque ratings specified for motor operating in a 40ºC ambient with motor mounted on an aluminum heatsink. Motors FSM 430/460/490/61-/620/630: 0/5" x 12" x 12".

FSM Standard Motor Dimensions



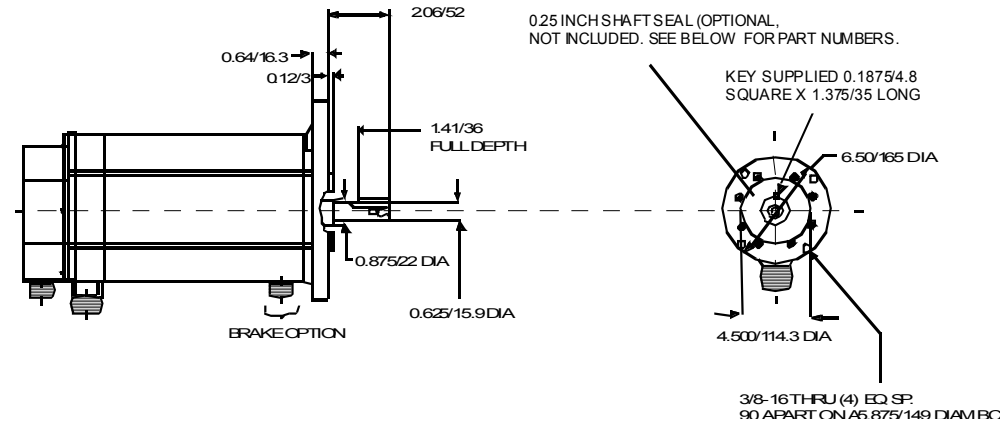
Model	AB	AJ	AK	P	U	EP	AH	BB	BF	XD	S	L	with Brake
	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in
FSM430	102/4.02	145/5.71	110/4.33	127/5.00	19/.75	22.2/8.75	50/1.97	3/.12	10/.39	38/1.49	6X6/.24X.24	194/7.64	257/10.12
FSM460	102/4.02	145/5.71	110/4.33	127/5.00	19/.75	22.2/8.75	50/1.97	3/.12	10/.39	38/1.49	6X6/.24X.24	272/10.71	335/13. 19
FSM490	102/4.02	145/5.71	110/4.33	127/5.00	19/.75	22.2/8.75	50/1.97	3/.12	10/.39	38/1.49	6X6/.24X.24	350/13.78	413/16.26
FSM610	131/5.16	200/7.87	114.3/4.50	173/6.81	35/1.38	36.5/1.438	80/3.15	4.16	13.5/53	60/2.36	10X8/.39X.32	255/10.04	326/12.83
FSM620	131/5.16	200/7.87	114.3/4.50	173/6.81	35/1.38	36.5/1.438	80/3.15	4.16	13.5/53	60/2.36	10X8/.39X.32	320/12.60	390/15.35
FSM630	131/5.16	200/7.87	114.3/4.50	173/6.81	35/1.38	36.5/1.438	80/3.15	4.16	13.5/53	60/2.36	10X8/.39X.32	420/16.53	490/19.29

Motors are manufactures to millimeter dimensions shown. Inch dimensions are approximate conversations from millimeters.
For further motor detail, engineering specification drawings are available upon request.
Added length for motors with brake option: 2.48 inches for FSM4xx, 2.79 inches for FSM6xx.
Speed/torque ratings specified for motor operating in a 40°C ambient with motor mounted on an aluminum heatsink. Motors FSM 430/460/490/610/620/630: 0.5" x 12" x 12".

NEMA 56C ON FSM400 MOTORS

FSM Motor Connector Ordering Information

	L	L with Brake
FSM430 FSM460	7.64/144 10.71/272	10.12/257 13.19/335
FSM490	13.78/350	16.26/413



Ordering options include the following:

- 24 or 90 VDC Brake (Consult factory for brake motor availability
- Encoder Line Count – 1,000, 2,000, 5,000, 500, or 3,000 line
- Special order motor windings available
- Various NEMA style frame sizes

Consult the factory for information on any of these items.

NOTE: Options are not available on all sizes. Optional configurations or encoder line counts have extended lead times and additional charges.

Motor Mating Connectors

MS Conn Kits FSM Motor Power:

	Straight	Right Angle
FSM400	M.1015.7801	M.1015.7802
FSM600	M.1015.7804	M.1015.7805

MS Conn Kit FSM Encoder Feedback:

FSM Encoder Feedback

Straight
M.1015.7808

Right Angle
M.1015.7809

MS Conn Kit FSM Brake Power:

Brake Power

Straight
M.1015.7813

Right Angle
M.1015.7815

FSM Motor Shaft Seal Kits:

FSM400: M.1015.7904
FSM600: M.1015.7905

Shaft seals generally require the presence of a lubricant to reduce premature wear.

NOTE: Above mating connector kits are not CE compliant. Please contact the factory for more information.

FSM Connector Data

FSM400, 600

ALL FSM

Motor Encoder Connector	
Pin	**Signal**
A	A+
B	A-
C	B+
D	B-
E	I+
F	I-
G	ENCODER CASE
H	ABS
J	+5VDC
K	-5VDC
L	COM
M	COM
N	Hall B
P	Hall C
R	TS+
S	TS-
T	Hall A

Motor Power Connector	
Pin	**Signal**
A	R
B	S
C	T
D	MOTOR CASE

Motor Brake Connector	
PIN	**SIGNAL**
A	BR+
B	BR-

HSM Low Inertia Brushless Servo Motors

Typical Applications

- "Smart" conveyors
- Packaging machinery
- Punch press/material feeding
- Robotic pick and place
- High duty cycle applications

Typical Applications

- High acceleration and peak torques
- High speed point-to-point positioning
- Environmentally rugged

Standard Features

- Compact design is mechanically interchangeable with the HSM400 and HSM600 motors
- Five frame sizes – twelve models
- Continuous torque from 5 to 450 lb-in (0.5 to 50 Nm)
- Speeds to 6000 RPM
- Neodymium-iron-boron permanent magnet rotors provide low intertias and high accelerations
- Internal thermal switch indicates overheating
- Motor mounted optical encoder include 2000 quadrature pulses, index pulse and standard commutation channels for trapezoidal drives
- Watertight MS connections are compatible with standard cable assemblies; in addition, the extruded aluminum housing and environmental connectors provide an IP65 package (with the addition of the optional shaft seal kit)
- Economical, compact design ready for harsh environments
- Optional spring-set holding brakes available with 24 VDC or 90 VDC
- Axially trapped front bearing (in a steel insert in HSM4XX-, HSM6XX, and HSM8XX series) for long life at high speeds
- Vibration: 2.5 g peak 30-2000 H
- Shock: 10.0 g peak 6 msec duration
- CE and UL recognized

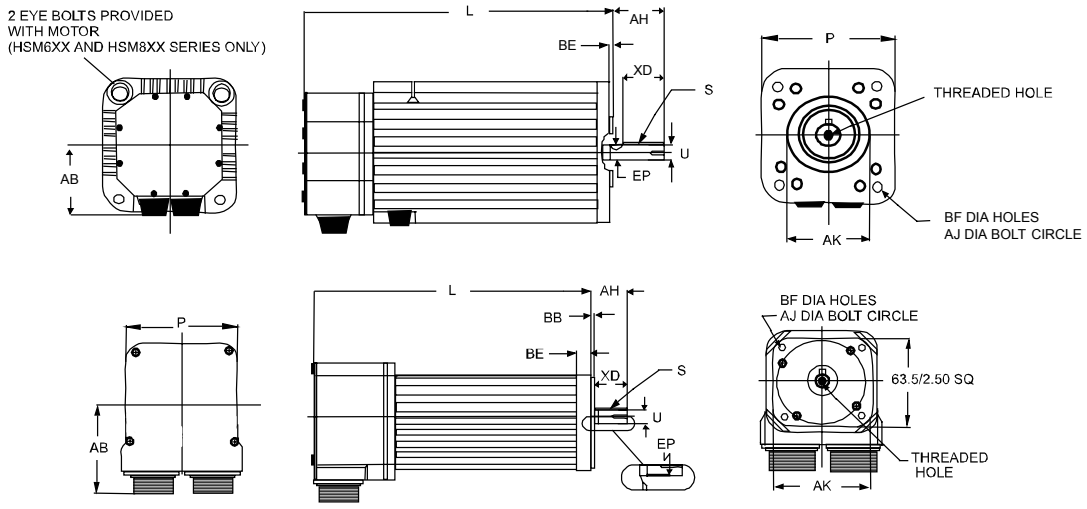
HSM Motor Data

HSM Motors - 230 Volt								
	Mechanical Data		Winding Data				Torque	
Motor Model HSM	**Rotor Inertia** kg-m^2 (lb-in-s^2)	**Weight** kg (lb)	**KT** Nm/ Amp	**K_E** Volts/ kRPM	**Winding Resistance** Phase to phase @ 25°C	**Winding Inductance** Phase to phase (mH)	**Cont. Torque** Nm (lb-in)	**Peak Torque** Nm (lb-in)
205	0.00013 (0.000015)	2.2 (4.9)	0.14	16	2.6	4.1	0.56 (5)	1.81 (16)
307	0.00003 (0.00027)	2.6 (5.8)	0.31	34	6.6	12	0.8 (7)	2.94 (26)
320	0.00008 (0.00072)	3.8 (8.4)	0.31	34	1.3	3.4	2.3 (20)	6.78 (60)
430	0.00025 (0.0022)	6.2 (13.7)	0.54	60	2.0	9	3.4 (30)	11.3 (100)
460	0.00046 (0.0041)	9.1 (20.1)	0.54	60	0.69	3.3	6.8 (60)	21.5 (190)
490	0.00068 (0.006)	12.2 (26.9)	0.81	90	0.90	5.4	9.9 (88)	30.5 (270)
610	0.00135 (0.012)	18.3 (40.4)	0.74	82	0.49	4.4	11.3 (100)	25.4 (225)
620	0.00237 (0.021)	27.0 (59.4)	0.72	80	0.18	2.2	20.9 (185)	52.2 (480)
630	0.00339 (0.03)	34.8 (76.8)	0.77	85	0.12	1.2	33.9 (300)	79.1 (700)
835	0.00632 (0.056)	44.1 (97.0)	0.94	104	0.13	2.5	39.5 (350)	70.1 (620)
845	0.00937 (0.083)	56.1 (123.6)	1.0	112	0.10	2.4	50.8 (450)	124.3 (1100)

Speed/torque ratings specified for motor operating in a 40°C ambient with motor mounted on an aluminum heatsink. Motors HSM 307/320: .25" x 10" x 10". HSM 430, 460, 490: 0.5" x 12" x as", HSM 61-/620/630/835/845: 1" x 12" x 12".

HSM Standard Motor Dimensions

HSM300, HSM400, HSM600, HSM800



Shaft End Threaded Hole

Motor	Thread	Thread Depth
HSM200	M3 x 0.5mm	10mm/.39in
HSM300	M4 x 0.7mm	10mm/.39in
HSM400	M6 x 1.0mm	15mm/.59in
HSM600	M8 x 1.25mm	20mm/.79
HSM800	M8 x 1.25mm	20mm/.79in

NOTE: Motors manufactured to millimeter dimensions.

Model	AB mm/in	AH mm/in	AJ mm/in	AK mm/in	BB mm/in	BE mm/in	BF mm/in
HSM205	75/2.95	23/0.93[3]	75/2.95	60/2.36[1]	2.4/0.09[4]	15.2/.60	5.8/0.23
HSM307	75/2.95	30/1.18[3]	100/3.94	80/3.15[1]	3/.12[4]	10.9/.43	7/.28
HSM320	75/2.95	30/1.18[3]	100/3.94	80/3.15[1]	3/.12[4]	10.9/.43	7/.28
HSM430	76/3.00	50/1.97[3]	145/5.71	110/4.33[5]	3/.12[4]	15.5/.61	10/.39
HSM460	76/3.00	50/1.97[3]	145/5.71	110/4.33[5]	3/.12[4]	15.5/.61	10/.39
HSM490	76/3.00	50/1.97[3]	145/5.71	110/4.33[5]	3/.12[4]	15.5/.61	10/.39
HSM610	101/4.00	80/3.15[3]	200/7.87	114.3/4.50[5]	4/.16[4]	21.3/.84	13.5/.53
HSM620	101/4.00	80/3.15[3]	200/7.87	114.3/4.50[5]	4/.16[4]	21.3/.84	13.5/.53
HSM630	101/4.00	80/3.15[3]	200/7.87	114.3/4.50[5]	4/.16[4]	21.3/.84	13.5/.53
HSM835	112/4.41	85/3.35[3]	265/10.43	230/9.06[8]	4/.16[4]	22.4/.88	15/.59
HSM845	112/4.41	85/3.35[3]	265/10.43	230/9.06[8]	4/.16[4]	22.4/.88	15/.59

Model	EP	L	L Brake	P	S	U	XD
HSM205	12/0.47	197/7.7	-	80/3.15	4x4/.16x.16	11/0.43[2]	18/0.71
HSM307	15/0.59	172/6.77	211/8.31	89/3.50	5x5/.20x.20	14/0.55[2]	20/0.79
HSM320	15/0.59	223/8.77	262/10.31	89/3.50	5x5/.20x.20	14/0.55[2]	20/0.79
HSM430	20/0.79	213/8.39	266/10.47	121/4.76	6x6/.24x.24	19/0.75[6]	40/1.57
HSM460	20/0.79	264/10.39	317/12.48	121/4.76	6x6/.24x.24	19/0.75[6]	40/1.57
HSM490	20/0.79	315/12.40	368/14.49	121/4.76	6x6/.24x.24	19/0.75[6]	40/1.57
HSM610	38/1.50	277/10.91	330/12.99	178/7.01	10x8/.39x.31	35/1.38[7]	60/2.36
HSM620	38/1.50	353/13.90	406/15.98	178/7.01	10x8/.39x.31	35/1.38[7]	60/2.36
HSM630	38/1.50	429/16.89	482/17.40	178/7.01	10x8/.39x.31	35/1.38[7]	60/2.36
HSM835	45/1.77	375/14.76	478/18.82	241/9.49	12x8/.47x.31	42/1.65[7]	60/2.36
HSM845	45/1.77	426/16.77	529/20.83	241/9.49	12x8/.47x.31	42/1.65[7]	60/2.36

[1]Tolerance is -0.03/-0.0012 [2]Tolerance is -0.01/-0.0004 [3]Tolerance is +/- 0.5/ +/- 0.0196 [4]Tolerance is +/- 0.2 / +/-0.0079 [5]Tolerance is -0.035/-0.0014 [6]Tolerance is -0.013/-0.0051 [7]Tolerance is -0.16/-0.006 [8]Tolerance is -0.46/-0.0181

Motors are manufactured to millimeter dimensions shown. Inch dimensions shown are approximate conversions from millimeters.

For further motor detail, engineering specification drawings are available upon request.

Added length for motors with brake option: 1.54 inches for HSM3xx, 2.09 inches for HSM4xx, 2.08 inches for HSM6xx, 4.06 inches for HSM8xx

Speed/torque ratings specified for motor operating in a 40°C ambient with motor mounted on an aluminum heatsink. Motors HSM 307/320: .25" x 10" x 10", HSM 430, 460, 490: 0.5" x 12" x 12", HSM 610/ 620/ 630/ 835/ 845: 1" x 12" x 12".

HSM Motor Connector Ordering Information

Ordering options include the following:

- 24 or 90 VDC Brake (Consult factory for brake motor availability)
- Encoder Line Count* - 1,000, 2,000, or 5,000** line
- Various NEMA style frame sizes

Consult the factory for information on any of these items.

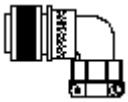
*NOTE: Optional configurations or encoder line counts have extended lead times and additional charges.

**NOTE: 5000 Line count encoder motor top speed is limited to 3600 RPM due to frequency output limit of encoder. Check drive system configuration data for any additional restrictions imposed by drive input.

NOTE: All options are not available.

NOTE: Above mating connector kits are not CE compliant. Please contact the factory for more information.

Motor Mating Connectors

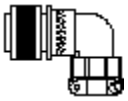


Straight	Motor	Right Angle
M.1015.7798	**HSM200 & HSM300**	M.1015.7799
M.1015.7801	**HSM400**	M.1015.7802
M.1015.7804	**HSM600**	M.1015.7805
M.1015.7807	**HSM800**	M.1300.3509

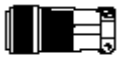
Brake Power Connectors

Straight M.1015.7813

Right Angle M.1015.7815

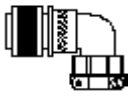


Encoder Feedback Connectors



Straight M.1015.7808

Right Angle M.1015.7809



HSM Motor Shaft Seal Kits

HSM200: M.1300.3484
HSM300: M.1007.0803
HSM400: M.1015.6923
HSM600: M.1015.6924
HSM800: M.1300.3485

Motor Encoder Connector	
Pin	Signal
A	A+
B	A-
C	B+
D	B-
E	I+
F	I-
G	Encoder Case
H	ABS
J	+5VDC
K	-5VDC
L	COM
M	COM
N	Hall B
P	Hall C
R	TS+
S	TS-
T	Hall A

All HSM Connector Data

Motor Power Connector	
Pin	**Signal**
A	R
B	S
C	T
D	Motor Case

Motor Brake Connector	
Pin	**Signal**
A	BR+
B	BR-

Standard Motor Radial Load Force Ratings For NSM, HSM and FSM Motors

(Loads applied at center of shaft) For 20,000 HR Bearing Life

Motor	500 RPM		1000 RPM		2000 RPM		3000 RPM		4000 RPM		5000 RPM		6000 RPM	
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
NSM2302	17	8	16	7	14	6	12	6	11	5	9	4	8	3
NSM2304	19	9	17	8	15	7	14	6	12	5	10	5	8	4
NSM3406	103	47	82	37	65	29	56	26	51	23	48	22	45	20
HSM205	105	47.7	84	38.2	66	30.0	58	26.4	53	24.1	49	22.3	45	20.5
HSM307	113	51.4	90	40.9	71	32.3	62	28.2	56	25.5	53	24.1		
NSM3412	113	51	89	40	71	32	62	28	56	26	53	24	49	22
HSM320	126	57.3	101	45.9	79	21.6	69	31.4	63	28.6	59	26.8		
NSM4214	137	62	109	49	86	39	76	34	68	31	64	29		
NSM4220	146	66	116	52	92	41	80	36	73	33	68	31		
HSM430	169	76.8	152	69.1	120	54.5	105	47.7	95	43.2				
NSM5630	188	85	149	67	118	53	103	47	94	43				
NSM5637	197	89	156	71	124	56	108	49	98	45				
FSM430	203	92.3	161	73.2	129	58.6	113	51.4	101	45.9				
NSM5647	203	92	161	73	128	58	112	51						
HSM460	205	93.2	164	74.5	129	58.6	113	51.4	103	46.8				
FSM460	229	104.1	184	83.6	144	65.5	126	57.3	116	52.7				
HSM490	215	97.7	173	78.6	137	62.3	118	53.6	108	49.1				
FSM490	244	110.9	194	88.2	154	70.0	133	60.5	121	55.0				
HSM610	435	197.7	345	156.8	274	124.5	240	109.1						
FSM610	428	194.5	341	155.0	268	121.8	236	107.3						
HSM620	469	213.2	375	170.5	296	134.5	259	117.7						
FSM620	465	211.4	368	167.3	293	133.2	255	115.9						
HSM630	495	225.0	390	177.3	311	141.4	270	122.7						
FSM630	495	225.0	390	177.3	311	141.4	270	122.7						
HSM835	495	225.0	394	179.1	311	141.4								
HSM845	518	235.4	413	187.7	326	148.2								

NOTE: Motors are capable of carrying an axial load in most applications per the following general guidelines which should be used only as an approximation. Please consult with Giddings & Lewis to discuss your application loads to ensure the proper selection of motors.

- When motor shaft has no radial load, Axial load rating = 100% of radial load rating from table above.
- When motor shaft has both a radial load and an axial load, axial load rating = 44% of radial load rating from table above.

XSM Low Inertia Brushless Servo Motors

Typical Applications

- "Smart" conveyors
- Packaging machinery
- Punch press/material feeding
- Robotic pick and place
- High duty cycle applications

Typical Applications

- High acceleration and peak torques
- High speed point-to-point positioning
- Environmentally rugged

Standard Features

- High energy neodymium magnet rotors provide high acceleration/deceleration in minimum
- Temperature sensors built into windings allow intelligent shut down in overload conditions
- Unique stator design provides optimal thermal transfer allowing successful automation of high hit rate, demanding applications
- Use direct-mount pinions and belt pulleys for cost-effective application
- Standard cable sets simplify machine design, build and commissioning
- Incremental encoder standard, high resolution and multi-turn absolute encoder available
- Machine design simplified using standard gearboxes and mounting plates
- Industrial packaging ensures reliable operation in harsh environments
- UL, cUL and CE Mark allow worldwide application
- Maintenance-free design manufactured in ISO9000 facility
- Use available CAD (.DXF) drawings for easy design into your machine

XSM Motor Data

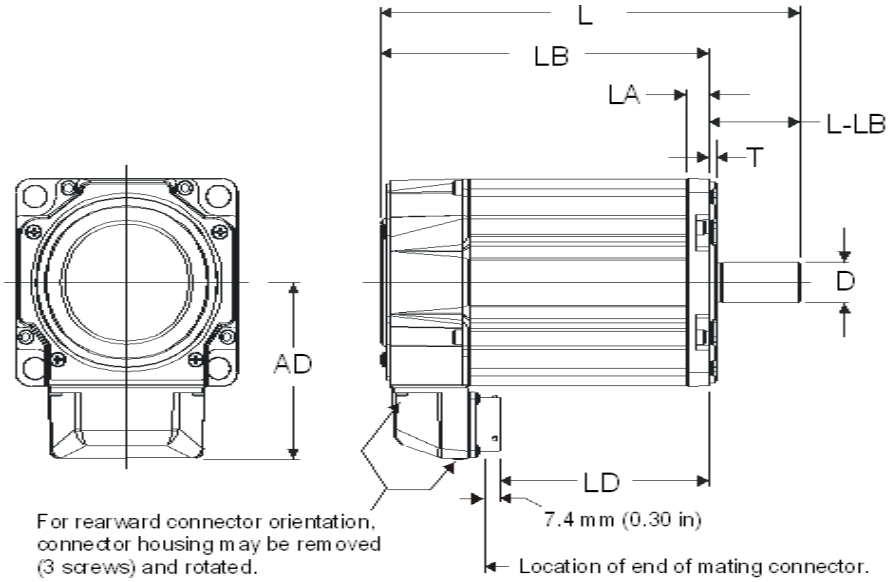
XSM Motors - 230 Volt								
	Mechanical Data		Winding Data				Torque	
Motor Model XSM	Rotor Inertia kg-m^2 (lb-in-s^2)	Weight kg (lb)	KT Nm/ Amp	K_E Volts/ kRPM	Winding Resistance Phase to phase @ 25°C	Winding Inductance Phase to phase (mH)	Cont. Torque Nm (lb-in)	Peak Torque Nm (lb-in)
100-14-302-	0.00004 (0.00039)	2.6 (5.7)	0.60	80	12.0	55	1.6 (14)	3.6 (32)
100-14-502-	0.00004 (0.00039)	2.6 (5.7)	0.40	52	4.7	25	1.6 (14)	3.6 (32)
100-27-352-	0.00009 (0.00078)	3.6 (7.9)	0.56	72	3.9	24	3.1 (27)	7.9 (70)
100-27-502-	0.00009 (0.00078)	3.6 (7.9)	0.40	52	1.8	12	3.1 (27)	7.9 (70)
100-37-502-	0.00011 (0.00097)	4.6 (10.0)	0.40	52	1.2	7.5	4.2 (37)	11.1 (98)
115-42-502-	0.00026 (0.0023)	4.2 (9.3)	0.41	52	1.0	5.6	4.7 (42)	13.5 (120)
115-53-502-	0.00038 (0.0034)	5.5 (12)	0.41	50	0.64	3.3	6.0 (53)	19.8 (175)
115-55-352-	0.00038 (0.0034)	5.5 (12)	0.60	76	1.3	7.5	6.2 (55)	19.8 (175)
130-53-402-	0.00027 (0.0024)	5.9 (13)	0.48	62	0.88	7.6	6.0 (53)	13.5 (120)
130-53-502-	0.00027 (0.0024)	5.9 (13)	0.40	52	0.58	5.6	6.0 (53)	13.5 (120)
130-72-402-	0.00038 (0.0034)	7.3 (16)	0.48	62	0.51	4.7	8.1 (72)	20.3 (180)
130-74-282-	0.00038 (0.0034)	7.3 (16)	0.73	92	1.2	12.0	8.4 (74)	20.3 (180)
130-90-152-	0.00050 (0.0044)	8.6 (19)	1.31	173	2.6	30.0	10.2 (90)	27.1 (240)
130-90-302-	0.00050 (0.0044)	8.6 (19)	0.66	86	0.75	7.5	10.2 (90)	27.1 (240)
165-95-402-	0.00078 (0.0069)	9.8 (21.5)	0.54	65	0.4	7.0	10.7 (95)	24.3 (215)
165-172-402-	0.00147 (0.013)	15 (33.0)	0.54	65	0.167	3.3	19.4 (172)	48.6 (430)

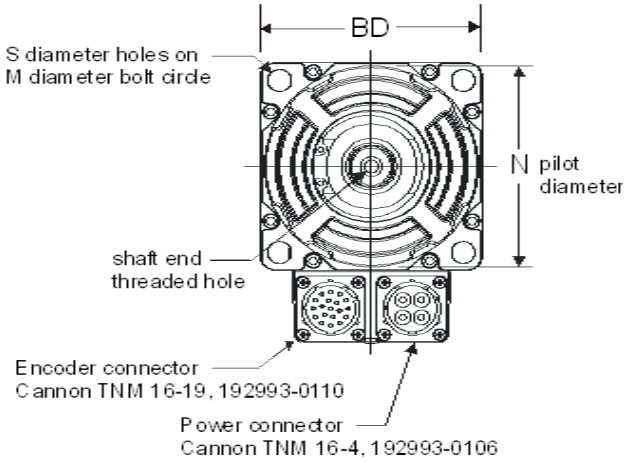
Speed/torque ratings specified for motor operating in a 40ºC ambient with motor mounted on an aluminum heatsink. Motors XSM 100/115/130/165: 0.5" x 12" x 12", XSM 215: 1.0" x 12" x 12".

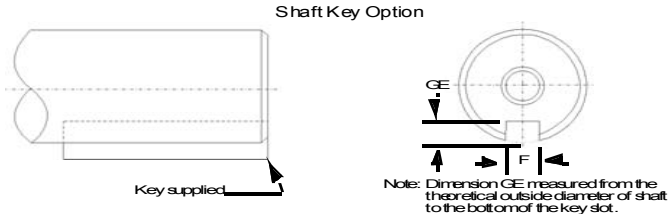
XSM Motor Data

XSM Motors - 460 Volt								
	Mechanical Data		Winding Data				Torque	
Motor Model XSM	**Rotor Inertia** kg-m^2 (lb-in-s^2)	**Weight** kg (lb)	**KT** Nm/ Amp	**K_E** Volts/ Krpm	**Winding Resistance** Phase to phase @ 25°C	**Winding Inductance** Phase to phase (mH)	**Cont. Torque** Nm (lb-in)	**Peak Torque** Nm (lb-in)
100-14-504-	0.00004 (0.0004)	2.7 (5.8)	0.79	96	20.0	93	1.6 (14)	3.6 (32)
100-27-504-	0.00008 (0.0007)	3.7 (8.0)	0.79	96	7.5	42	3.1 (27)	7.9 (70)
100-37-504-	0.00011 (0.0010)	4.6 (10.0)	0.79	96	4.61	28	4.2 (37)	11.1 (98)
115-42-504-	0.00026 (0.0023)	4.3 (9.4)	0.83	100	3.8	21	4.7 (42)	13.5 (120)
115-58-504-	0.00037 (0.0033)	5.5 (12.0)	0.83	100	2.4	13	6.6 (58)	19.8 (175)
130-50-504-	0.00027 (0.0024)	5.9 (13.0)	0.79	96	2.5	21	5.6 (50)	13.5 (120)
130-73-304-	0.00041 (0.0036)	7.3 (16.0)	1.49	180	4.2	41	8.2 (73)	20.3 (180)
130-73-404-	0.00041 (0.0036)	7.3 (16.0)	0.95	115	2.0	18	8.2 (73)	20.3 (180)
130-90-304-	0.00052 (0.0046)	8.6 (19.0)	1.31	158	2.6	25	10.2 (90)	27.1 (240)
165-95-404-	0.00078 (0.0069)	9.8 (21.5)	1.07	130	1.49	27	10.7 (95)	23.2 (205)
165-172-404-	0.00147 (0.013)	15 (33.0)	1.07	130	0.65	13	19.4 (172)	48.6 (430)
215-325-404-	0.00400 (0.0354)	26.8 (59.0)	1.39	168	0.35	11	36.7 (325)	72.3 (640)
215-425-404-	0.00576 (0.0510)	35 (77.0)	1.39	168	0.25	7.2	48.0 (425)	101.0 (895)
215-531-404-	0.00773 (0.0685)	40.5 (89.0)	1.39	168	0.19	5.5	60.0 (531)	108.5 (960)

XSM Standard Motor Dimensions







Shaft End Thread Hole		
Motor	**Thread**	**Thread Depth**
XSM100-14, 27, 37	M5 x .08mm	12.5 mm (0.49 in)
XSM115-42, 53/55	M6 X 1.0 mm	16 mm (0.63 in)
XSM130-53, 72/74, 90	M8 x 1.25 mm	19 mm (0.74 in)
XSM165-95, 172	M10 x 1.5-6 mm	22 mm (0.87 in)
XSM215-325, 425, 531	M12 x 1.75 mm	28.0 mm (1.19 in)

Added length for motors with brake option: 1.368 inches to XSM100, 1.91 inches to XSM115/XSM130, 2.03 inches to XSM165 and 3.5 inches to XSM215

Speed/torque ratings specified for motor operating in a 40°C ambient with motor mounted on an aluminum heatsink. Motors XSM 100/ 115/130/165: 0.5” x 12” x 12”, XSM 215: 1.0” x 12” x 12”.

DIMENSIONS														
	AD	**BD**	**D**	**F**	**GE**	**L**	**LA**	**LB**	**L-LB**	**M**	**N**	**S**	**T**	**TOLERANCES**
Model	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in	mm/in
XSM100-14	80.9 (3.19)	89.4 (3.52)	16.0 (0.6299)	5.0 (0.197)	30 (0.118)	163.9 (6.46)	9.9 (0.39)	123.9 (4.88)	40.0 (1.575)	100 (3.937)	80 (3.150)	7.0 (0.276)	2.87 (0.113)	D: +0.008/-0.003 (+0.0003/0.0001) L-LB: ±0.7 (±0.028) N: +0.012/-0.007 (+0.0005/-0.0003) S: +0.36/-0.0 (+0.014/-0.0)
XSM100-27						189.3 (7.46)		149.3 (5.88)						
XSM100-37						214.7 (8.46)		174.7 (6.88)						
XSM115-42	83.9 (3.30)	98.3 (3.87)	19.0 (0.7480)	3.5 (0.14)	6.0 (0.2)	185.7 (7.32)	10.2 (0.40)	145.7 (5.74)	40.0 (1.575)	115 (4.528)	95 (3.7402)	10.0 (0.394)	2.87 (0.113)	D: +0.009/-0.004 (+0.0004/-0.0002) L-LB: ±0.7 (±0.028) N: +0.013/-0.009 (+0.0005/-0.0004) S: +0.36/-0.0 (+0.014/-0.0)
XSM115-53/55						211.1 (8.32)		171.1 (6.74)						
XSM130-53	91.5 (3.60)	113.7 (4.48)	24.0 (0.9449)	8.0 (0.315)	4.0 (0.158)	199 (7.84)	12.2 (0.48)	149 (5.87)	50 (1.969)	130 (5.118)	110 (4.3307)	10.0 (0.394)	3.38 (0.133)	
XSM130-72/74						224.4 (8.84)		174.4 (6.87)						
XSM130-90						249.8 (9.84)		199.8 (7.87)						
XSM165-95	Non-Brake 106.2 (4.18) 24Vdc Brake 105.4 (4.15)	143.5 (5.65)	28.0 (1.1024)	8.0 (0.315)	4.10 (0.1615)	233 (9.173)	13.97 (0.55)	173 (6.81)	60 (2.362)	165.0 (6.496)	130 (5.1181)	12 (0.481)	3.38 (0.133)	D: +0.009/-0.004 (+0.0003/0.0002) F: -0.0036 (-0.0002) GE: ±0.10 (±0.0035) L-LB: ±0.7 (±0.028) N: +0.014/-0.009 (+0.0006/-0.0003) S: +0.43/-0.0 (±0.008)
XSM 165-172						283.8 (11.173)		223.8 (8.81)						
XSM215-325	Non-Brake 142.9 (5.625) 24Vdc Brake 141.1 (5.56	184.60 (7.27)	38.001 (1.4961)	10.00 (0.3937)	5.10 (0.201)	303.6 (11.95)	17.80 (0.70)	223.6 (8.80)	80 (3.150)	215.00 (8.465)	180.00 (7.0866)	14.175 (8.465)	3.86 (0.152)	D: +0.006/-0.0 (±0.0006/-0.0) F: +0.0/-0.036 (+0.0/-0.0014) GE: ±0.10 (±0.004) L-LB: ±0.7 (±0.028) N: +0.014/-0.009 (+0.0006/-0.0004) S: +0.215 (±0.008)
XSM215-425						354.4 (13.95)		274.4 (10.8)						
XSM215-531						405.2 (15.95)		325.2 (12.8)						

[1]Tolerance is -0.03/-0.0012 [2]Tolerance is -0.01/-0.0004 [3]Tolerance is +/- 0.5/ +/- 0.0196 [4] Tolerance is +/- 0.2 / +/-0.0079 [5]Tolerance is -0.035/-0.0014 [6]Tolerance is -0.013/-0.0051 [7] Tolerance is -0.16/-0.006
[8]Tolerance is -0.46/-0.0181
Motors are manufactured to millimeter dimensions shown. Inch dimensions shown are approximate conversions from millimeters.
For further motor detail, engineering specification drawings are available upon request.

XSM Motor Connector Ordering Information

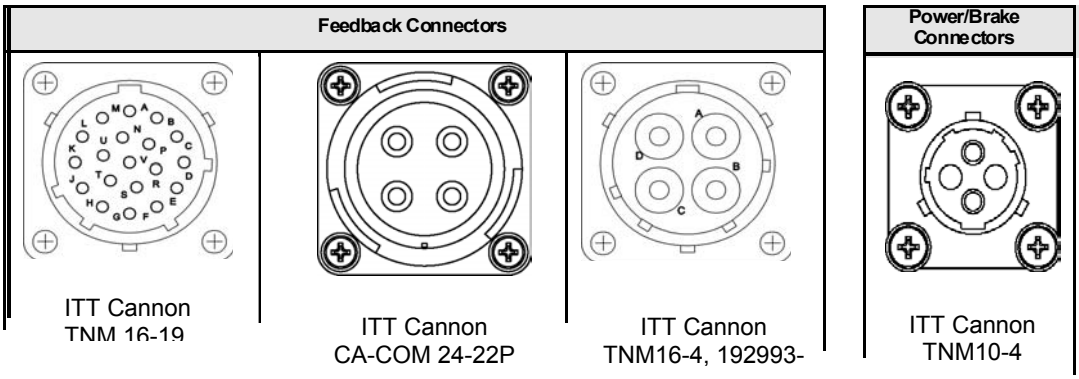
Ordering options include the following:

- 24VDC (Consult factory for brake motor availability)
- Encoder Line Count* - 2,000, line
- Single and line multiturn high resolution encoders yielding up to 1,048,576 counts per revolution

*Note: Optional configurations or encoder line counts may have extended lead times and additional charges. Not all options are available with all motor sizes.

Item	Motor Model	Part No.	Cable
Power Connector	XSM100, 115, 130, 165	M.1301.4035	CONN-PWR-XSM-ST-10
	XSM215	M.1301.9160	CONN-PWR-XSM-ST-08
Encoder Connector	All XSM motors	M.1301.4036	CONN-ENC-XSM-ST-22
Brake Connector	All XSM motors	M.1301.4037	CONN-BRK-XSM-ST-14
Motor Shaft Seal Kits	XSM100	M.1301.4031	N/A
	XSM115	M.1301.4032	N/A
	XSM130	M.1301.4033	N/A
	XSM165	M.1301.9161	N/A
	XSM215	M.1301.9162	N/A

XSM Connector Data



Pin	2000 Line Encoder	High Resolution Encoder for XSM 230VAC Motor	High Resolution Encoder for XSM 460VAC Motor
A	A+	Sin+	Sin+
B	A-	Sin-	Sin-
C	B+	Cos+	Cos+
D	B-	Cos-	Cos-
E	I+	Data+	Data+
F	I-	Data-	Data-
G	GROUND	Reserved	Reserved
H	ABS		
J	Reserved		
K	+5VDC	+5VDC	
L	Common	Common	
M	Reserved	Reserved	
N			+9VDC
P			Common
R	TS+	TS+	TS+
S	TS	TS-	TS-
T	S1	Reserved	Reserved
U	S2		
V	S3		

Power Connector	
Pin	**Signal**
A	PHASE R
B	PHASE S
C	PHASE T
D	GROUND

Brake Connector	
Pin	**Signal**
A	BR+
B	Reserved
C	BR-
D	Reserved

Standard Motor Radial Load Force Ratings For XSM Motors

Motors are capable of operating with the maximum radial or maximum axial shaft loads listed in the following tables. Radial loads are applied midway along the shaft extension. The table represents 20,000-hour L10 bearing fatigue life. This 20,000-hour life does not account for possible application-specific life reduction that may occur due to bearing grease contamination from external sources

RADIAL LOAD FORCE RATINGS (Maximum Radial Load)							
MOTOR	**500 rpm kg (lb)**	**1000 rpm kg (lb)**	**2000 rpm kg (lb)**	**3000 rpm kg (lb)**	**3500 rpm kg (lb)**	**4000 rpm kg (lb)**	**5000 rpm kg (lb)**
XSM100-14	78 (171)	62 (136)	49 (108)	-	40 (89)	-	36 (79)
XSM100-27	87 (192)	69 (152)	55 (121)	-	45 (100)	-	40 (89)
XSM100-37	-	74 (163)	59 (129)	-	49 (107)	-	43 (95)
XSM115-42	-	78 (172)	62 (136)	-	51 (113)	-	45 (100)
XSM115-53/55	106 (234)	84 (186)	67 (148)	-	55 (122)	-	49 (109)
XSM130-53	-	97 (213)	77 (169)	67 (147)	64 (140)	61 (134)	56 (124)
XSM130-72/74	133 (292)	105 (232)	84 (184)	73 (161)	-	66 (146)	-
XSM130-90	140 (309)	111 (245)	89 (195)	77 (170)	-	-	-
XSM165-95	-	127 (280)	100 (222)	88 (194)	-	80 (176)	-
XSM165-172	-	143 (316)	114 (251)	99 (219)	-	90 (199)	-
XSM215-325	253 (552)	200 (442)	159 (351)	139 (307)	-	-	-
XSM215-425	275 (607)	219 (482)	173 (382)	151 (334)	-	-	-
XSM215-531	291 (641)	230 (509)	183 (404)	160 (353)	-	-	-

AXIAL LOAD FORCE RATINGS (Maximum Radial Load)							
MOTOR	**500 rpm kg (lb)**	**1000 rpm kg (lb)**	**2000 rpm kg (lb)**	**3000 rpm kg (lb)**	**3500 rpm kg (lb)**	**4000 rpm kg (lb)**	**5000 rpm kg (lb)**
XSM100-14	30 (66)	23 (50)	16 (36)	-	13 (29)	-	11 (24)
XSM100-27	34 (74)	25 (56)	19 (41)	-	15 (32)	-	13 (28)
XSM100-37	-	27 (59)	20 (44)	-	16 (35)	-	13 (29)
XSM115-42	-	36 (80)	27 (59)	-	21 (47)	-	18 (39)
XSM115-53/55	52 (115)	39 (86)	29 (63)	-	22 (49)	-	19 (42)
XSM130-53	-	31 (68)	23 (50)	19 (42)	18 (39)	17 (37)	15 (33)
XSM130-72/74	45 (100)	34 (74)	25 (55)	21 (46)	-	19 (41)	-
XSM130-90	49 (107)	36 (80)	27 (59)	22 (49)	-	-	-
XSM165-95	-	42 (94)	30 (68)	26 (58)	-	22 (50)	-
XSM165-172	-	48 (107)	35 (79)	30 (66)	-	26 (58)	-
XSM215-325	89 (197	66 (146)	48 (107)	41 (90)	-	-	-
XSM215-425	98 (217)	72 (159)	53 (118)	45 (99)	-	-	-
XSM215-531	104 (230)	77 (169)	34 (125)	47 (104)	-	-	-

AXIAL LOAD FORCE RATINGS (Zero Radial Load)							
MOTOR	**500 rpm kg (lb)**	**1000 rpm kg (lb)**	**2000 rpm kg (lb)**	**3000 rpm kg (lb)**	**3500 rpm kg (lb)**	**4000 rpm kg (lb)**	**5000 rpm kg (lb)**
XSM100-14	49 (109)	36 (80)	27 (59)	-	21 (47)	-	18 (40)
XSM100-27	49 (109)	36 (80)	27 (59)	-	21 (47)	-	18 (40)
XSM100-37	-	36 (80)	27 (59)	-	21 (47)	-	18 (40)
XSM115-42	-	51 (112)	38 (83)	-	30 (65)	-	25 (55)
XSM115-53/55	69 (152)	51 (112)	38 (83)	-	30 (65)	-	25 (55)
XSM130-53	-	51 (112)	38 (83)	31 (69)	30 (65)	28 (61)	25 (55)
XSM130-72/74	69 (152)	51 (112)	38 (83)	31 (69)	-	28 (61)	-
XSM130-90	69 (152)	51 (112)	38 (83)	31 (69)	-	-	-
XSM165-95	-	67 (149)	49 (109)	41 (92)	-	26 (81)	-
XSM165-172	-	67 (149)	49 (109)	41 (92)	-	26 (81)	-
XSM215-325	136 (300)	99 (219)	74 (163)	62 (137)	-	-	-
XSM215-425	136 (300)	99 (219)	74 (163)	62 (137)	--	-	-
XSM215-531	136 (300)	99 (219)	74 (163)	62 (137)	--	-	-

——Axial Load Force

Radial Load Force applied at center