CLASS 5 S-STYLE SMARTMOTOR™ WITH IP PROTECTION

Affordable IP65* protection, combined with the proven benefits of the Class 5 SmartMotor™ series

The fully-featured and integrated Class 5 S-Style SmartMotor™ with IP65 protection* is available in frame sizes NEMA 23 and 34. The SmartMotor™ products come equipped with industry-standard M connectors, as well as an optional brake.

The S-Style SmartMotor™ servos share many of the same components as the Class 5 D-style motors, which don't have IP protection. This significantly reduces production costs and sales prices, resulting in an excellent price-performance ratio.

The S-Style SmartMotor™ is suited for most applications where IP65 sealing is required. Additionally, the positioning of the rear-mounted M connectors, located at the back of the aerodynamically shaped cap, opens up new assembly options in confined spaces.

Features:

- IP65* protection
- Fully integrated brushless DC motor
- Robust and industry standard metric connectors
- Extended installation options available
- Sizes NEMA 23 and 34 available
- Combitronic™ technology is available on some models
- DE is standard, allows separate power supplies for motor and controller

The Class 5 S-Style SmartMotor™ includes all the benefits of our fully-integrated Class 5 design along with IP65 protection. It will efficiently solve your dust/wet-environment, motion-control applications and quickly get your products to market, providing high value for both you and your customers.

**The motor shaft is not sealed and must be mated to a sealed surface or mounted in a shaft-down orientation.*

ADVANTAGES

- Fully integrated, compact motion system
- IP65 sealing at an excellent price-performance ratio
- High noise immunity
- Low electrical noise emissions
- Very high tuning bandwidth (very stable)
- Full Class 5 controls with ability to handle complex applications

APPLICATIONS

- Wet surroundings (e.g., food industry, papermaking, painting machines)
- High dust exposure (e.g., lumber industries, warehousing and logistics)
- Outdoors (e.g., sliding and access systems, vehicles, radar units)

MOOG ANIMATICS

SPECIFICATIONS

TECHNICAL DATA

Dimension	Unit	SM23165S	SM23165ST	SM34165S	SM34165ST
Continuous torque	in-lb	2.50	4.61	9.67	12.83
	oz-in	40	74	155	205
	Nm	0.28	0.52	1.09	1.45
Peak torque	in-lb	4.00	7.40	14.12	30.00
	oz-in	64	118	226	480
	Nm	0.45	0.84	1.60	3.39
Nominal continuous power	Watts	181	204	235	615
No load speed	rpm	10,400	5,200	3,100	5,100
Max. Continuous current* @ 6500 RPM	Amps	5	6.1	7.4	15.5
Peak power @ 6500 RPM	Watts	183	210	265	930
Voltage constant	V/krpm	4.45	9.08	15.5	8.9
Inductance	mH	0.829	1.31	1.72	0.32
Terminal resistance	Ohm	1	0.7	0.6	0.06
Encoder type	Incremental Optical				
Encoder resolution	Count/Rev	4,000	4,000	8,000	8,000
Encoder A/B output	Count/Rev	4,000	4,000	8,000	8,000
Rotor inertia	oz-in-sec^2	0.00099	0.001	0.014	0.0142
	10^{-5}kg-m^2	0.6991	0.706	9.890	10.031
Weight	lb	1.37	1.65	5.0	5.5
	kg	0.62	0.75	2.27	2.49
Shaft diameter	in	0.250	0.250	0.375	0.500
	mm	6.35	6.35	9.53	12.70
Shaft, radial load	lb	7	7	15	30
	kg	3.18	3.18	6.80	13.61
Shaft, axial thrust load	lb	3	3	3	3
	kg	1.36	1.36	1.36	1.36
Communication protocols		CANopen	CANopen	CANopen	CANopen

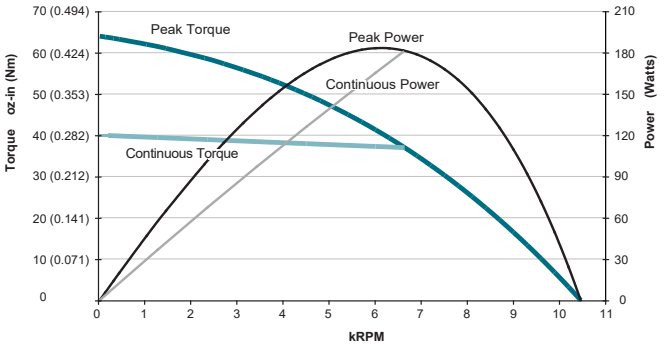
*Default voltage is 48 V. See graphs for additional voltages.

The specifications of the S-Style SmartMotor™ differ depending on the winding type:

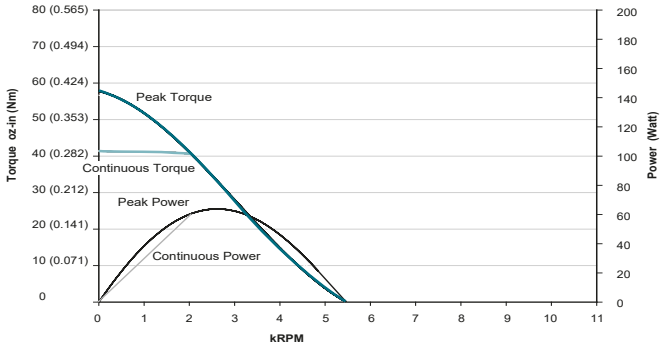
SM23165**S**/SM34165**S**: standard winding, optimized for 48 V
SM23165**ST**/SM34165**ST**: winding for maximum torque and optimized for 48 V
SM23165**Sx**/SM34165**Sx**: standard winding, optimized for 24 V (on request)
SM23165**SxT**/SM34165**SxT**: winding for maximum torque and optimized for 24 V (on request)

PERFORMANCE TORQUE AND POWER CURVES

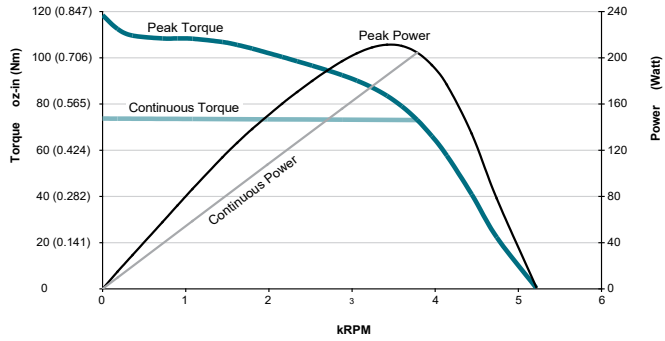
SM23165S
Standard winding for 48 V, operating with 48 V



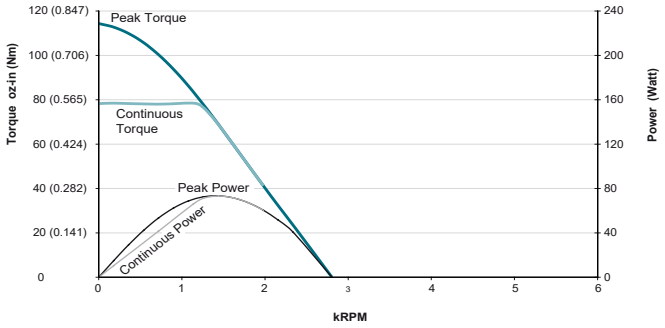
SM23165S
Standard winding for 48 V, operating with 24 V



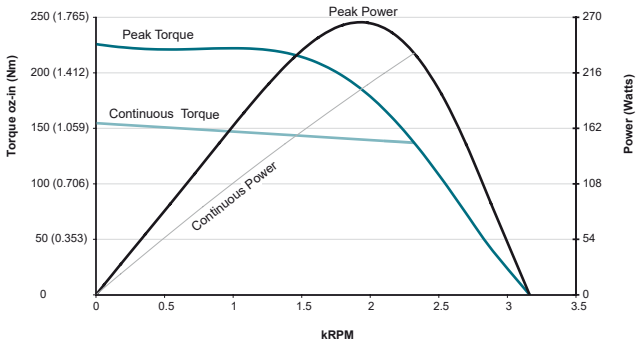
SM23165ST
Winding for max. torque and 48 V, operating with 48 V



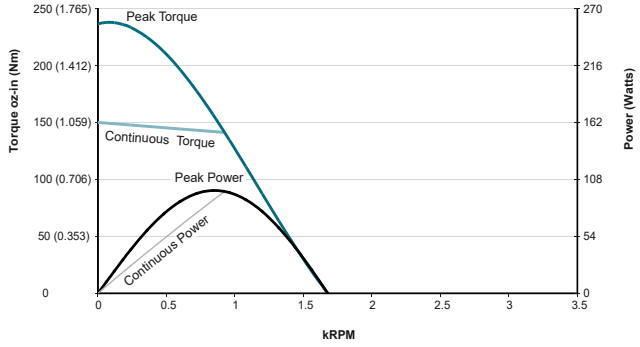
SM23165ST
Winding for max. torque and 48 V, operating with 24 V



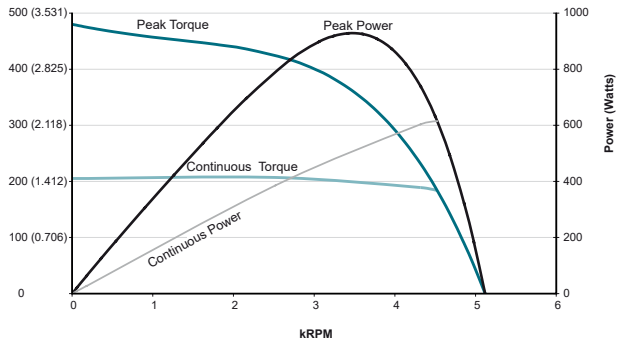
SM34165S
Standard winding for 48 V, operating with 48 V



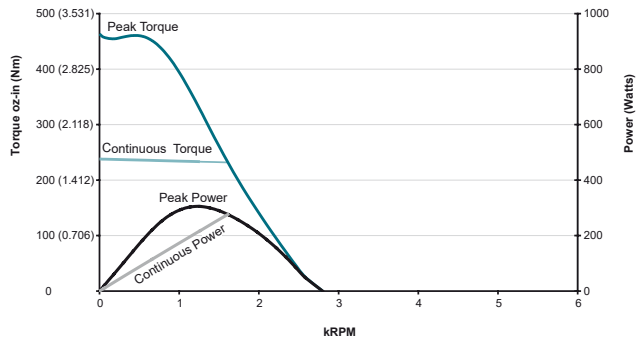
SM34165S
Standard winding for 48 V, operating with 24 V



SM34165ST
Winding for max. torque and 48 V, operating with 48 V



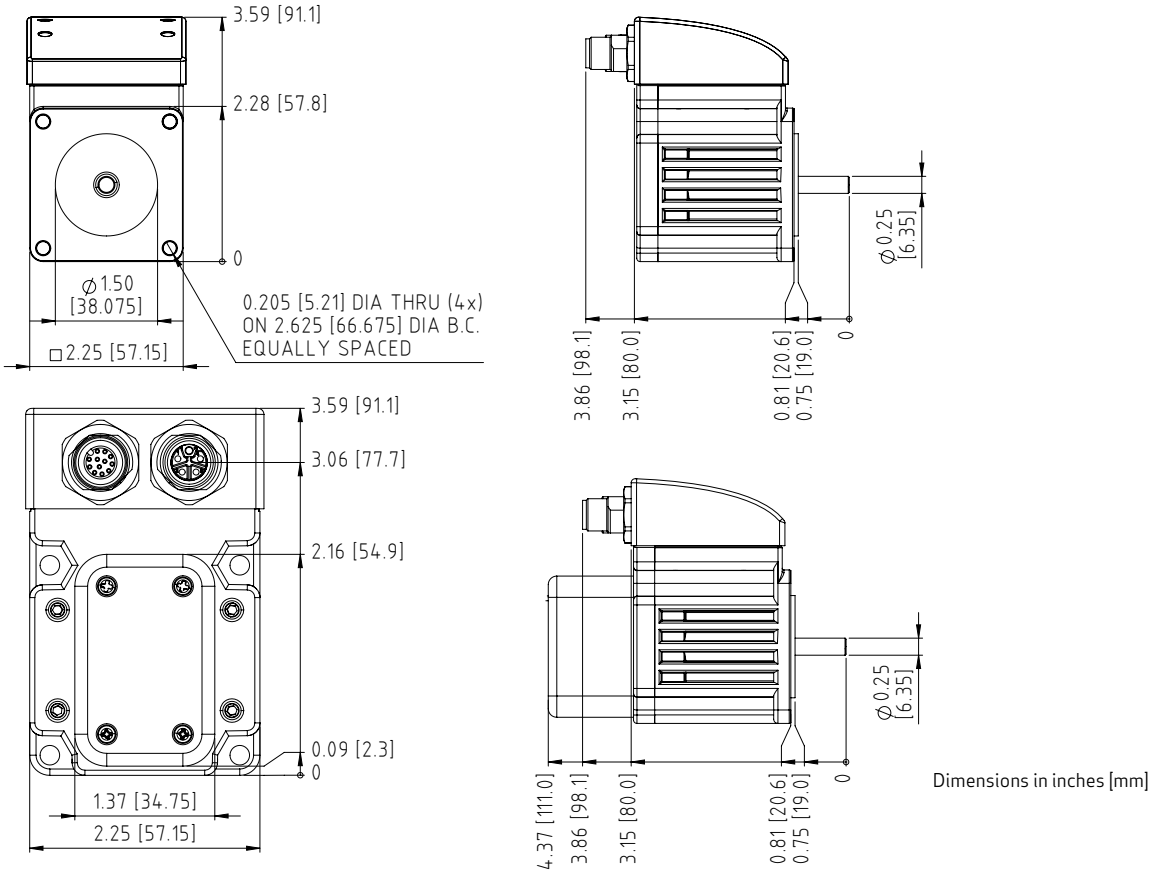
SM34165ST
Winding for max. torque and 48 V, operating with 24 V



All torque curves based on 25 °C ambient. For ambient temperatures above 25 °C, continuous torque must be linearly derated to 0% at 85 °C.
Operating temperature range: from 0 to 85 °C. Storage temperature range: from -10 to 85 °C.
Relative humidity: <85%, noncondensing.
Motors were operated using MDT (Trapezoidal Drive Mode) commutation.

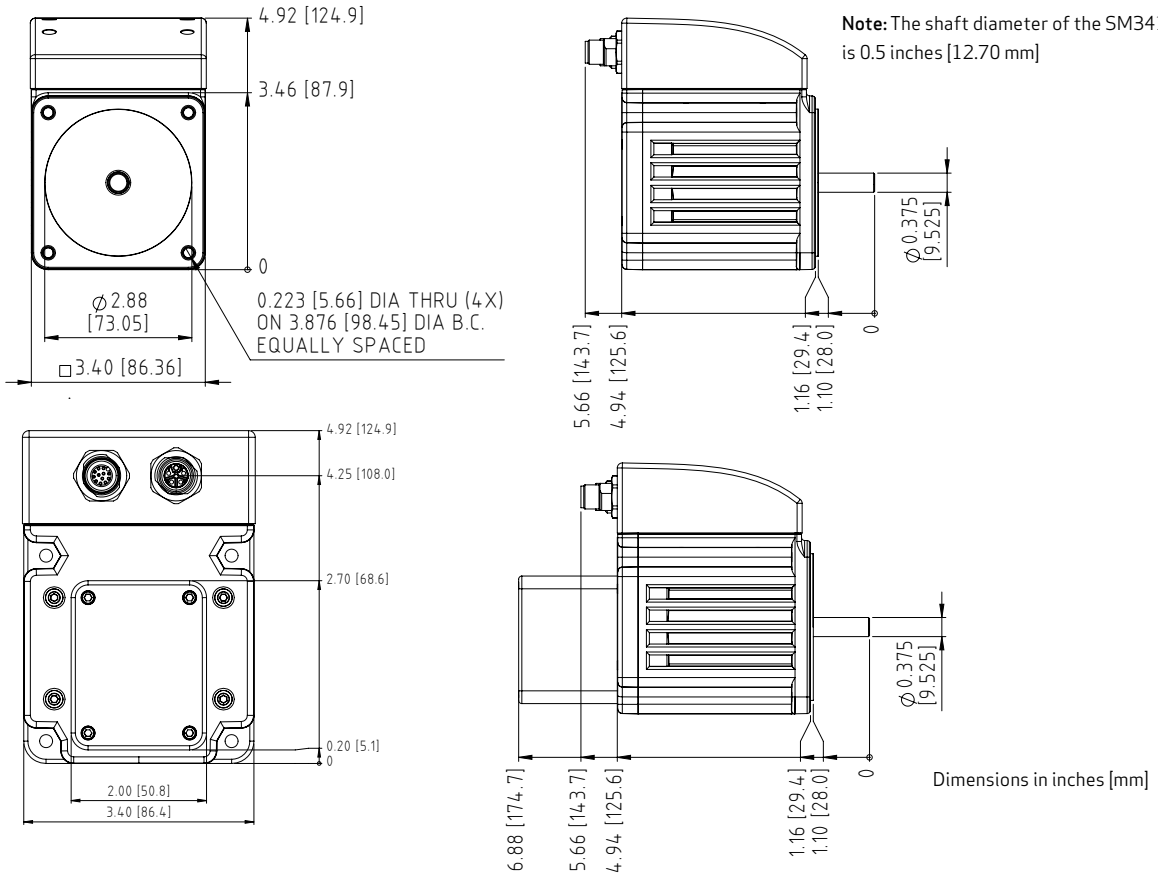
OUTLINE DRAWINGS

SM23165S



Dimensions in inches [mm]

SM34165S



Note: The shaft diameter of the SM34165ST is 0.5 inches [12.70 mm]

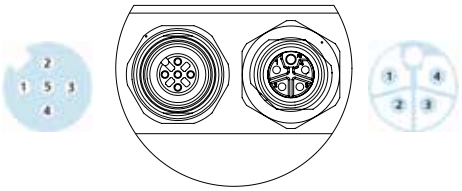
Dimensions in inches [mm]

OPTIONS

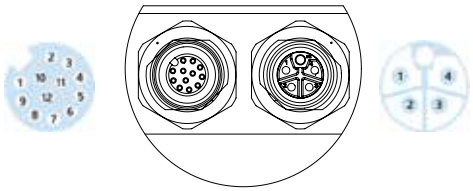
In addition to the winding options, all S-style motors can be configured:

1. With or without brake (see drawings on page 4)
2. With 12- or 5-pin connector, depending on desired communication/control options

For details, see Ordering Code on page 7.



Left connector: 5-pin female - CAN Bus
Right socket: 4-pin - power



Left connector: 12-pin female - communications/control
Right socket: 4-pin male - power

CONNECTORS

Power
4-Pin Male Power

Pin	Function	Specification
1	MAIN POWER	+24-48 VDC
2	CONTROL POWER	+24-48 VDC (DE option)
3	GND_MAIN	Ground main power
4	GND_CONTROL	Ground control power

SMxx165S-C, SMxx165S-BRK-C
Communication/Control 5-Pin Female CAN Bus

Pin	Function	Specification
1	NC	No connection
2	NC	No connection
3	NC	No connection
4	CAN_H	Non-isolated, 1 MBaud max.
5	CAN_L	Non-isolated, 1 MBaud max.

SMxx165S, SMxx165S-BRK
Communication/Control 12-Pin Female Serial, 2xCAN and 4xIO

Pin	Function	Specification
1	I/O - 0	25 mA sink or source 10 bit 0 - 5 VDC A/D
2	I/O - 1	25 mA sink or source 10 bit 0 - 5 VDC A/D
3	I/O - 2	25 mA sink or source 10 bit 0 - 5 VDC A/D
4	I/O -3	25 mA sink or source 10 bit 0 - 5 VDC A/D
5	CAN_L	Non-isolated, 1 MBaud max.
6	CAN_H	Non-isolated, 1 MBaud max.
7	CAN_L	Non-isolated, 1 MBaud max.
8	CAN_H	Non-isolated, 1 MBaud max.
9	RS-232 Tx	115.2 kBaud max.
10	RS-232 Rx	115.2 kBaud max.
11	+5 VDC OUT	50 mA max. (total)
12	SIG GND	Signal ground

SMxx165S-E0, SMxx165S-BRK-E0
Communication/Control 12-Pin Female Serial, Encoder Out and 6xIO

Pin	Function	Specification
1	I/O - 0	25 mA sink or source 10 bit 0 - 5 VDC A/D
2	I/O - 1	25 mA sink or source 10 bit 0 - 5 VDC A/D
3	I/O - 2	25 mA sink or source 10 bit 0 - 5 VDC A/D
4	I/O - 3	25 mA sink or source 10 bit 0 - 5 VDC A/D
5	I/O - 4	Or configurable as RS-485 A channel 1
6	I/O - 5	Or configurable as RS-485 B channel 1
7	ENC A OUT	Phase A encoder output
8	ENC B OUT	Phase B encoder output
9	RS-232 Tx	115.2 kBaud max.
10	RS-232 Rx	115.2 kBaud max.
11	+5 VDC OUT	50 mA max. (total)
12	SIG GND	Signal ground

SMxx165S-I06, SMxx165S-BRK-I06
Communication/Control 12-Pin Female Serial, CAN and 6xIO

Pin	Function	Specification
1	I/O - 0	25 mA sink or source 10 bit 0 - 5 VDC A/D
2	I/O - 1	25 mA sink or source 10 bit 0 - 5 VDC A/D
3	I/O - 2	25 mA sink or source 10 bit 0 - 5 VDC A/D
4	I/O - 3	25 mA sink or source 10 bit 0 - 5 VDC A/D
5	I/O - 4	Or configurable as RS-485 A channel 1
6	I/O - 5	Or configurable as RS-485 B channel 1
7	CAN_L	Non-isolated, 1 MBaud max.
8	CAN_H	Non-isolated, 1 MBaud max.
9	RS-232 Tx	115.2 kBaud max.
10	RS-232 Rx	115.2 kBaud max.
11	+5 VDC OUT	50 mA max. (total)
12	SIG GND	Signal ground

POWER CABLES AND ADAPTER

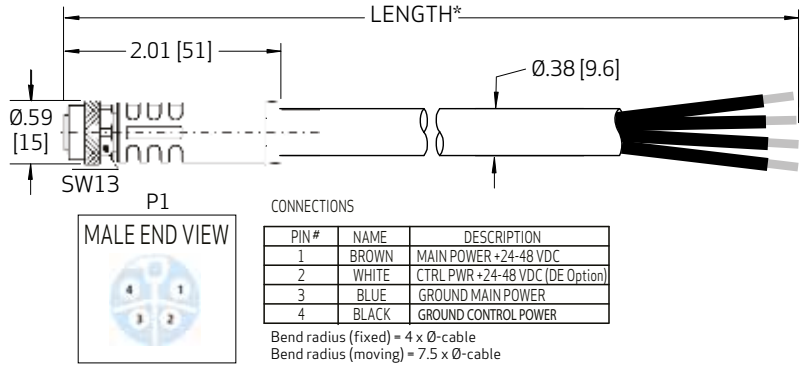
S-style to Flying Leads SmartMotor™ Power Cable has an M12 male "L" threaded connector at one end and flying leads at the other, used for connecting power to the Class 5 S-style SmartMotor™. It is available in 1, 3, 5 and 10 meter lengths. Use part number CBLIP-S-PWR-FL-xM, where "x" denotes the cable length; for a right-angle end, use part number CBLIP-S-PWR-FL-xMRA.

S-style SmartMotor™ Power Extension Cable has an M12 male "L" threaded connector at one end and female connector at the other, used for extending power to additional Class 5 S-style SmartMotor™ servos. It is available in 1, 3, 5 and 10 meter lengths. Use part number CBLIP-S-PWR-EXT-xM, where "x" denotes the cable length; for a right-angle end, use part number CBLIP-S-PWR-EXT-xMRA.

S-style SmartMotor™ Power T-adapter is also available for daisy-chaining power, use part number CBLIP-S-T-FFM.

Part Number	Description	Length
CBLIP-S-PWR-FL-1M	S-style to flying leads	1 meter
CBLIP-S-PWR-FL-3M	S-style to flying leads	3 meters
CBLIP-S-PWR-FL-5M	S-style to flying leads	5 meters
CBLIP-S-PWR-FL-10M	S-style to flying leads	10 meters
CBLIP-S-PWR-EXT-1M	S-style to S-style extension	1 meter
CBLIP-S-PWR-EXT-3M	S-style to S-style extension	3 meters
CBLIP-S-PWR-EXT-5M	S-style to S-style extension	5 meters
CBLIP-S-PWR-EXT-10M	S-style to S-style extension	10 meters
CBLIP-S-T-FFM	S-style to S-style T-adapter	N/A

S-Style Power Cable with Flying Leads



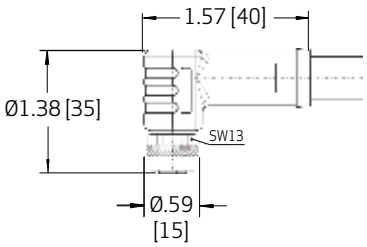
CONNECTIONS

PIN #	NAME	DESCRIPTION
1	BROWN	MAIN POWER +24-48 VDC
2	WHITE	CTRL PWR +24-48 VDC (DE Option)
3	BLUE	GROUND MAIN POWER
4	BLACK	GROUND CONTROL POWER

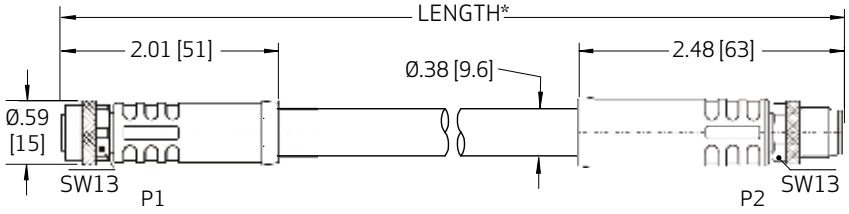
Bend radius (fixed) = 4 x Ø-cable
Bend radius (moving) = 7.5 x Ø-cable

Dimensions in inches [mm]

Right-angle connector



S-Style Power Extension Cable

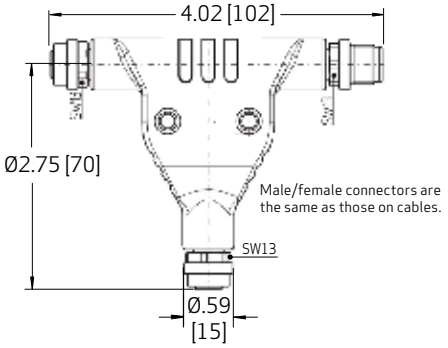


CONNECTIONS

PIN #	NAME	DESCRIPTION	PIN #
1	BROWN	MAIN POWER +24-48VDC	1
2	WHITE	CTRL PWR +24-48VDC (DE Option)	2
3	BLUE	GROUND MAIN POWER	3
4	BLACK	GROUND CONTROL POWER	4

Bend radius (fixed) = 4 x Ø-cable
Bend radius (moving) = 7.5 x Ø-cable

T-adapter



*Minimum Bend Radius - Fixed 1.51 [38.4], Moving 2.83 [72.0]

PART NUMBERING GUIDELINES

ORDERING CODE

SM 23 16 5 S ☐ - ☐

SmartMotor™
SMART Motor™

NEMA Frame Size
23
34

Motor
16

Class 5

NOTE: DMX protocol is available on the -EO option motors

Custom Winding	
-	48 V winding
T	48 V winding high torque
x	24 V winding (on request)
xT	24 V winding high torque (on request)

Configuration and Brake Options	
-	12 pin connector (5 V TTL, 4xIOs and 2xCAN)
-BRK	12 pin connector (5 V TTL, 4xIOs and 2xCAN) + internal brake
-C	5 pin connector (dedicated CAN)
-BRK-C	5 pin connector (dedicated CAN) + internal brake
-EO	12 pin connector (5 V TTL, 6xIOs and encoder OUT)
-BRK-EO	12 pin connector (5 V TTL, 6xIOs and encoder OUT) + internal brake
-IO6	12 pin connector (5 V TTL, 6xIOs and 1xCAN)
-BRK-IO6	12 pin connector (5 V TTL, 6xIOs and 1xCAN) + internal brake

Style	
S	S = sloped cap and sealed All S-style motors have IP65* protection and metric axial connectors DE is standard

* Motor shaft is not sealed

For product information, visit **www.animatics.com**

For more information or the office nearest you, contact us online, **animatics_sales@moog.com**

Moog Animatics Class 5 S-style SmartMotor™ With IP Protection Technical Data Sheet
MA1031-0122

MOOG ANIMATICS