Moog Animatics Class 5 D-Style SmartMotor™ Part Numbering Guidelines

Step 1: Basic Part Numbering

NEMA 17

NEMA 23

NEMA 34

The Brake option cannot be used with 24V I/O or CAN bus 24V I/O can be used in any combination; see part numbers below.

- SM17205D - C
- SM17205D - DN
- SM17205D - AD1
- SM17205D - C - AD1
- SM17205D - DN - AD1
- SM17205D - BRK

All three options (Brake, 24V I/O, CAN bus) are available in any combination for the following part numbers.

NEMA 23 FRAME	BRAKE -BRK	24V I/O -AD1	CAN bus -C or -DN
SM23375D			●
SM23375DT		●	
SM23105D		●	●
SM23205D	●		
SM23305D	●		●
SM23405D	●	●	
	●	●	●

The Brake option cannot be used with 24V I/O or CAN bus 24V I/O can be used in any combination; see part numbers below.

- SM23165D - C
- SM23165D - DN
- SM23165D - AD1
- SM23165D - C - AD1
- SM23165D - DN - AD1
- SM23165D - BRK
- SM23165DT - C
- SM23165DT - DN
- SM23165DT - AD1
- SM23165DT - C - AD1
- SM23165DT - DN - AD1
- SM23165DT - BRK

All three options (Brake, 24V I/O, CAN bus) are available in any combination for the following part numbers.

NEMA 34 FRAME	BRAKE -BRK	24V I/O -AD1	CAN bus -C or -DN
SM34165D**			●
SM34165DT**		●	
SM34105D		●	●
SM34205D	●		
SM34305D	●		●
SM34405D	●	●	
	●	●	●

**SM34165D & SM34165DT are the only models that can have an internal shunt.

For the CDS option, see page 18.

Step 2: Advanced Part Numbering

SM 23 16 5 D - DE - AD1

SMART Motor™

Frame Size

17 NEMA Frame

23 NEMA Frame

34 NEMA Frame

Motor

17	23	34
20	10 30	10 30
	16 37	16 40
	20 40	20 50

Class 5

Connector Style

D	D-Sub
DT	D-Sub High Torque

Options

DE	Drive enable*
BRK	Internal brake
SH	Internal shunt (select models only)**

Options

-C	CANopen option
-CDS	CANopen on D-sub
-DN	DeviceNet
-PB	PROFIBUS®^
-AD1	24V Expansion I/O
-F1	1 Flat on shaft
-F2	2 Flats on shaft
-K	Machined keyway on motor shaft
-SL	Reduced shaft length

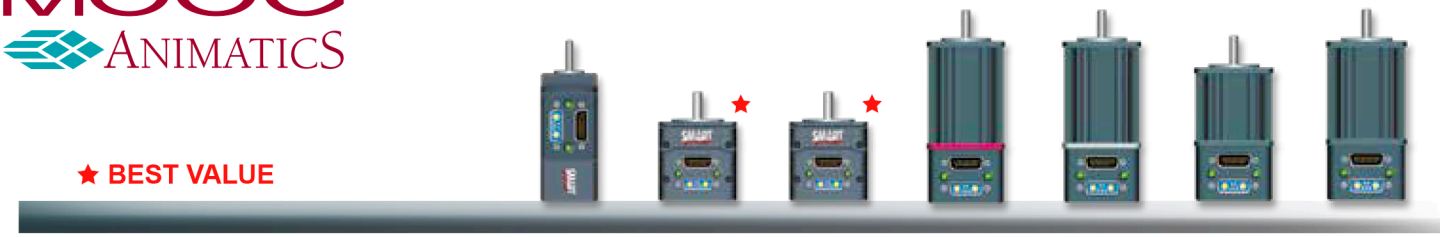
* Separate drive and control power
** SM34165D and SM34165DT are the only models that can have an internal shunt
^ PROFIBUS option only available on SM23165D and SM23165DT product with no additional options

NOTE: DMX protocol is standard on all Class 5 SmartMotors.

D-Style Motor Comparison Chart

MOOG ANIMATICS

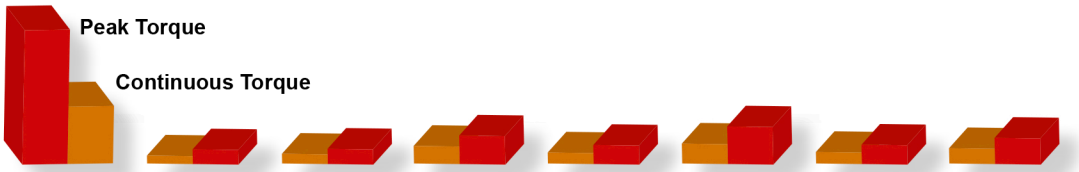
★ BEST VALUE



- All D-style SmartMotors have a primary RS-232 communications port
- All D-style SmartMotors have 7 channels 5V TTL non-isolated I/O
- Optional 10 channels expanded 24 VDC isolated I/O
- Dedicated encoder out

Relative Torque Comparison

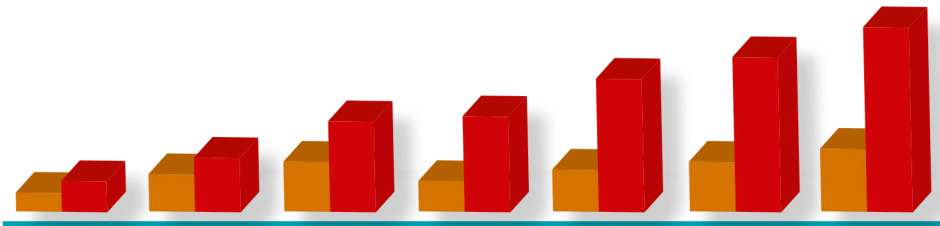
NOTE: All torque curves based on 25°C ambient. For ambient temperatures above 25°C, continuous torque must be linearly derated to 0% at 85°C.



		SM17205D	SM23165D	SM23165DT	SM23375D	SM23375DT	SM23205D	SM23305D
Continuous Torque	in-lb	2.08	2.50	4.61	2.86	5.18	2.96	3.98
	oz-in	33	40	74	46	83	47	64
	N-m	0.24	0.28	0.52	0.32	0.59	0.33	0.45
Peak Torque	in-lb	3.82	4.00	7.40	5.00	9.80	5.03	6.86
	oz-in	61	64	118	80	157	80	110
	N-m	0.43	0.45	0.84	0.57	1.11	0.57	0.77
Nominal Continuous Power	Watts	145	181	204	191	186	226	220
No Load Speed	RPM	7,900	10,400	5,200	8,000	4,000	8,100	5,600
Max. Continuous Current	RPM	6,000	6,500	3,800	6,000	3,250	6,900	4,750
	Amps	3.81	3.545	5.074	5.072	4.52	6.02	5.57
Peak Power	RPM	4,200	6,100	3,400	4,750	2,450	5,995	4,100
	Watts	185	183	210	220	235	335	325
Voltage Constant	V/krpm	6.506	4.45	9.08	5.62	10.95	6.137	8.873
Inductance	mH	1.4	0.829	1.31	0.770	0.906	0.40	0.61
Encoder Resolution	Counts/Rev	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Rotor Inertia	oz-in-sec^2	0.00217	0.00099	0.001	0.0019	0.0019	0.00224	0.00332
	10^{-5} Kg-m^2	1.5325	0.6991	0.706	1.342	1.342	1.582	2.344
Weight	lb	1.2	1.0	1.3	2.1	2.2	1.7	2.3
	kg	0.55	0.45	0.59	0.95	0.98	0.79	1.03
Shaft Diameter	in	0.197	0.250	0.250	0.250	0.250	0.250	0.250
	mm	5.00	6.35	6.35	6.35	6.35	6.35	6.35
Shaft, Radial Load	lb	7	7	7	7	7	7	7
	kg	3.18	3.18	3.18	3.18	3.18	3.18	3.18
Shaft, Axial Thrust Load	lb	3	3	3	3	3	3	3
	kg	1.36	1.36	1.36	1.36	1.36	1.36	1.36
DeviceNet Option		Yes	Yes	Yes	Yes	Yes	Yes	Yes
PROFIBUS Option			Yes	Yes				
CANopen Option		Yes	Yes	Yes	Yes	Yes	Yes	Yes

Due to the variety of operating conditions and applications for Moog Animatics' products, the end user is solely responsible for making the final selection of the Moog Animatics products and systems based on their own analysis and testing, and ensuring that all performance, safety and warning requirements for the application and product are met. Please consult factory for any supporting hardware and cables needed, full details and latest information.

D-Style Motor Comparison Chart

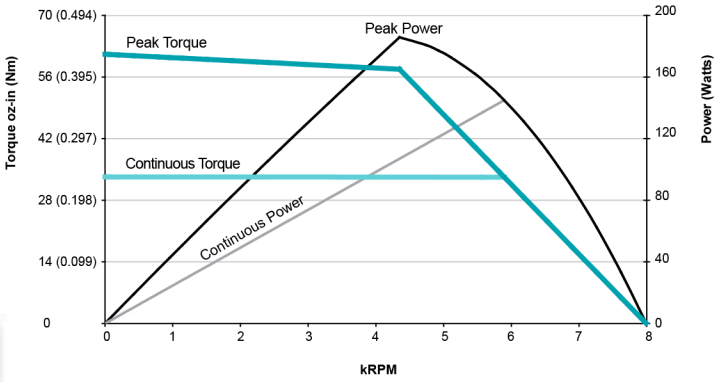


SM23405D	SM34165D	SM34165DT	SM34205D	SM34305D	SM34405D	SM34505D		
4.88	9.67	12.83	7.91	10.87	12.94	16.34	in-lb	Continuous Torque
78	155	205	126	174	207	261	oz-in	
0.55	1.09	1.45	0.89	1.23	1.46	1.85	N-m	
8.04	14.12	30.00	24.91	34.75	40.38	48.19	in-lb	Peak Torque
129	226	480	399	556	646	771	oz-in	
0.91	1.60	3.39	2.81	3.93	4.56	5.44	N-m	
253	235	615	324	400	438	527	Watts	Nominal Continuous Power
5,300	3,100	5,100	4,500	4,100	3,800	3,300	RPM	No Load Speed
4,500	2,400	4,500	3,750	3,600	3,300	3,100	RPM	Max. Continuous Current
6.76	6.02	16.93	8.28	10.31	11.69	14.37	Amps	
4,000	1,900	3,400	2,250	2,500	2,350	2,250	RPM	Peak Power
345	265	930	455	725	820	925	Watts	
9.612	14.98	8.9	10.8	12.1	12.9	14.049	V/krpm	Voltage Constant
0.49	1.72	0.32	0.596	0.490	0.913	0.871	mH	Inductance
4,000	8,000	8,000	8,000	8,000	8,000	8,000	Counts/Rev	Encoder Resolution
0.00439	0.014	0.0142	0.012	0.018	0.024	0.03	oz-in-sec^2	Rotor Inertia
3.100	9.890	10.031	8.448	12.56	17.02	20.92	10^{-5} Kg-m^2	
2.8	5.0	5.5	3.5	4.5	5.5	6.5	lb	Weight
1.27	2.27	2.49	1.59	2.04	2.49	2.95	kg	
0.250	0.375	0.500	0.375	0.375	0.375	0.375	in	Shaft Diameter
6.35	9.53	12.70	9.53	9.53	9.53	9.53	mm	
7	15	30	15	15	15	15	lb	Shaft, Radial Load
3.18	6.80	13.61	6.80	6.80	6.80	6.80	kg	
3	3	3	3	3	3	3	lb	Shaft, Axial Thrust Load
1.36	1.36	1.36	1.36	1.36	1.36	1.36	kg	
Yes	Yes	Yes	Yes	Yes	Yes	Yes		DeviceNet Option
	Yes	Yes						PROFIBUS Option
Yes	Yes	Yes	Yes	Yes	Yes	Yes		CANopen Option

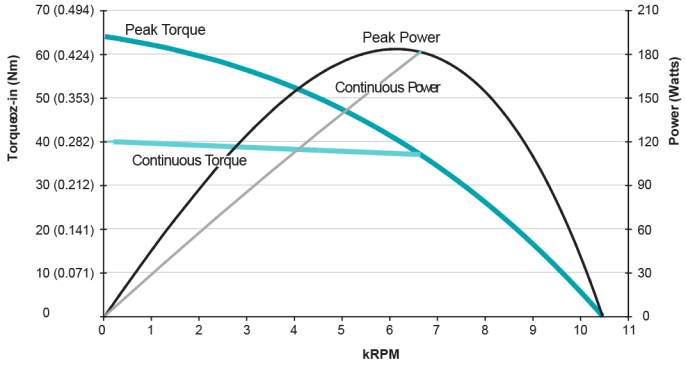
Due to the variety of operating conditions and applications for Moog Animatics' products, the end user is solely responsible for making the final selection of the Moog Animatics products and systems based on their own analysis and testing, and ensuring that all performance, safety and warning requirements for the application and product are met. Please consult factory for any supporting hardware and cables needed, full details and latest information.

D-Style Motor Torque Curves

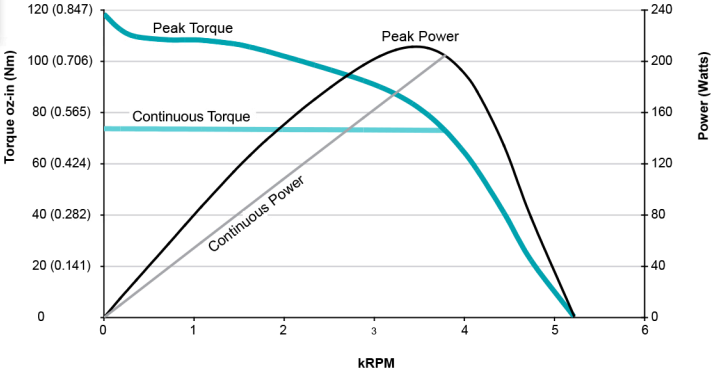
SM17205D



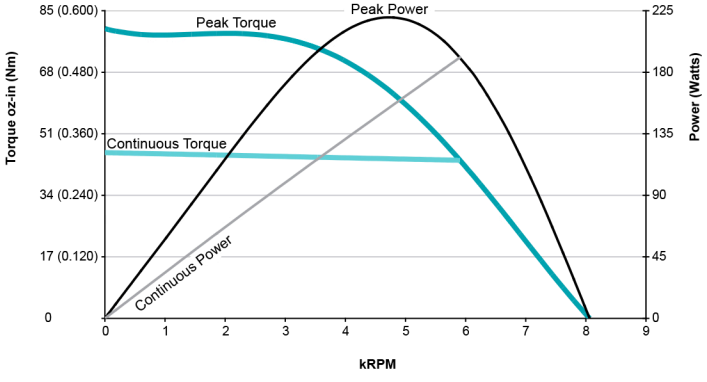
SM23165D



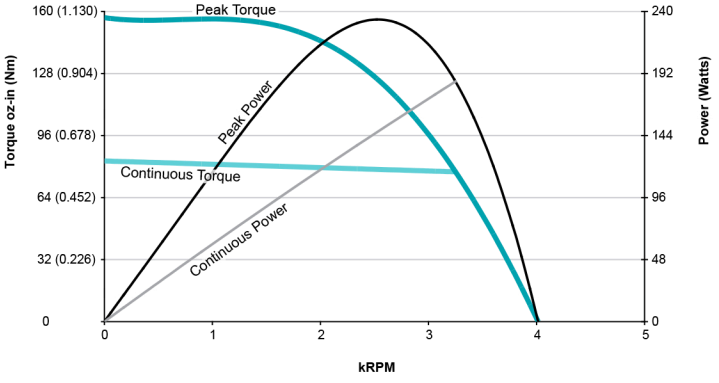
SM23165DT



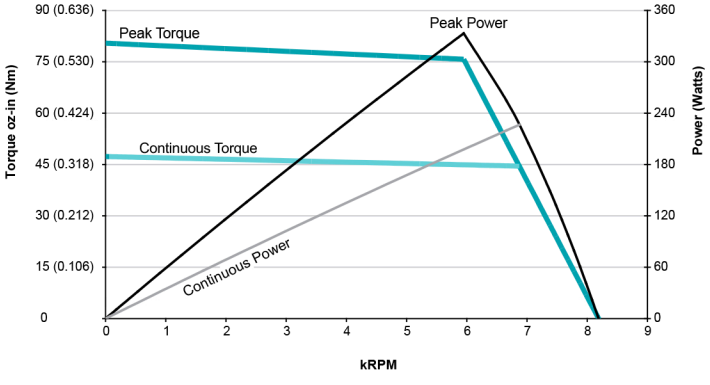
SM23375D



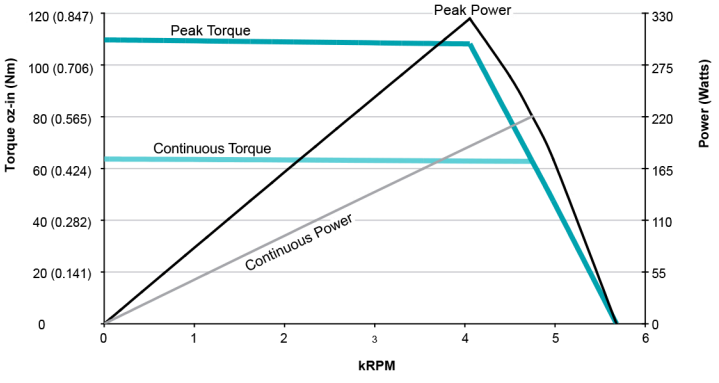
SM23375DT



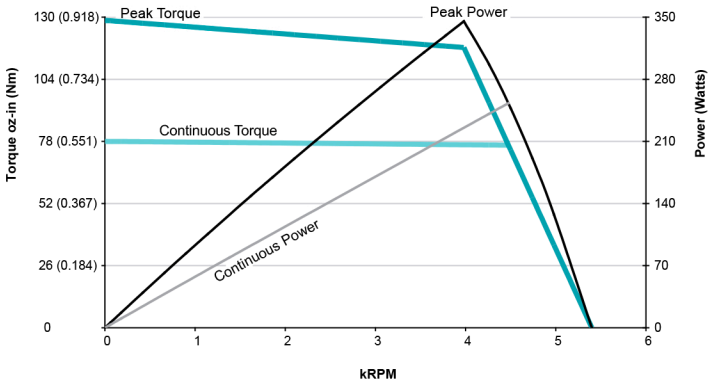
SM23205D



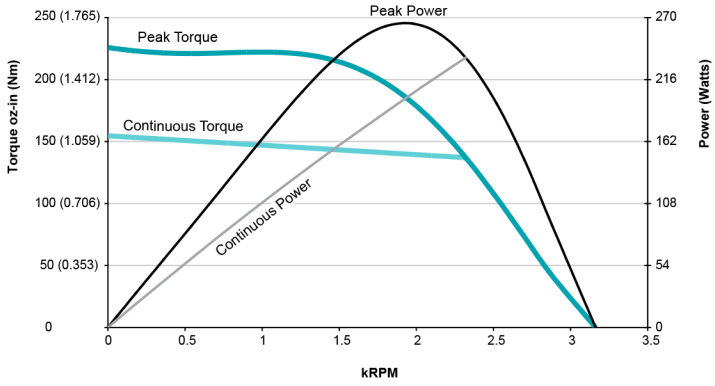
SM23305D



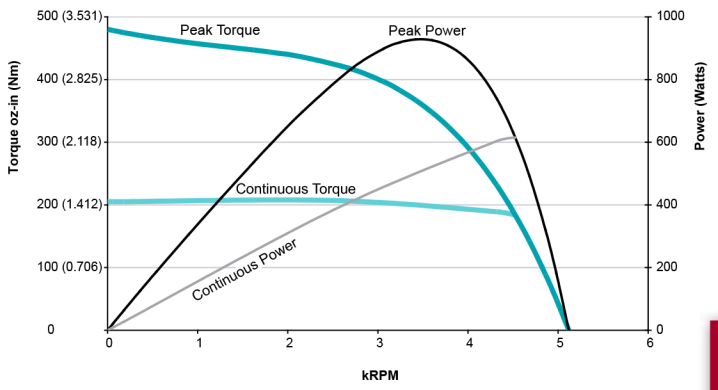
SM23405D



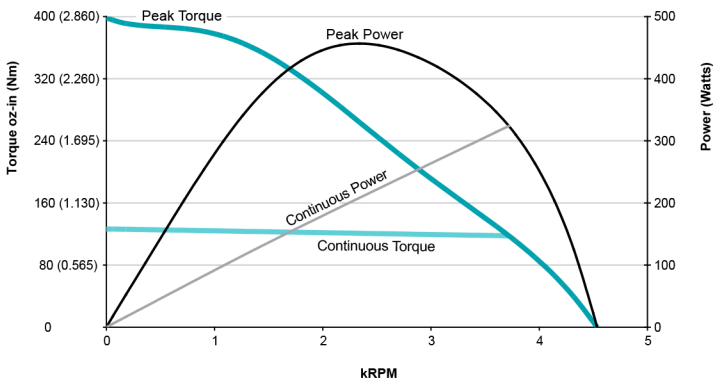
SM34165D



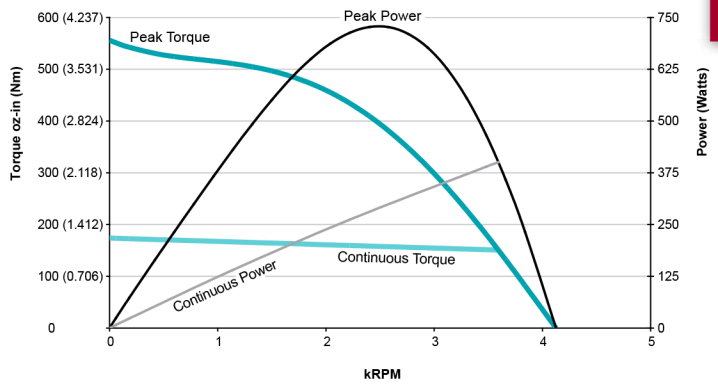
SM34165DT



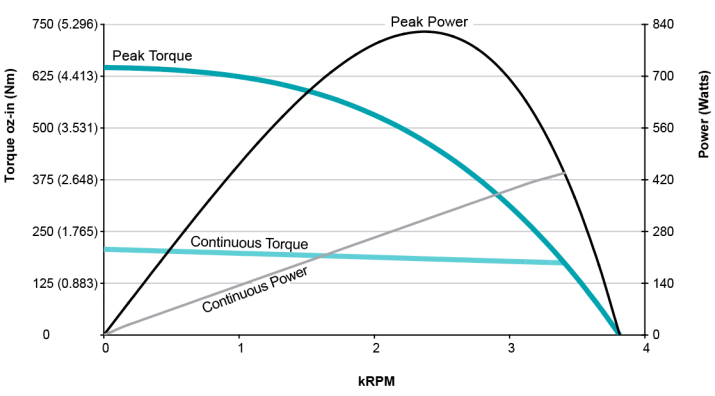
SM34205D



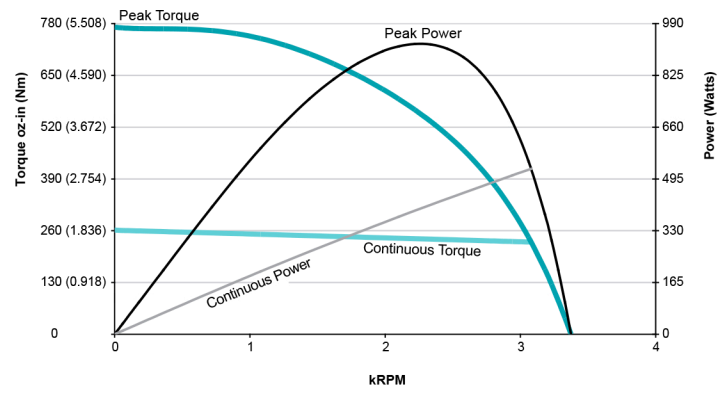
SM34305D



SM34405D

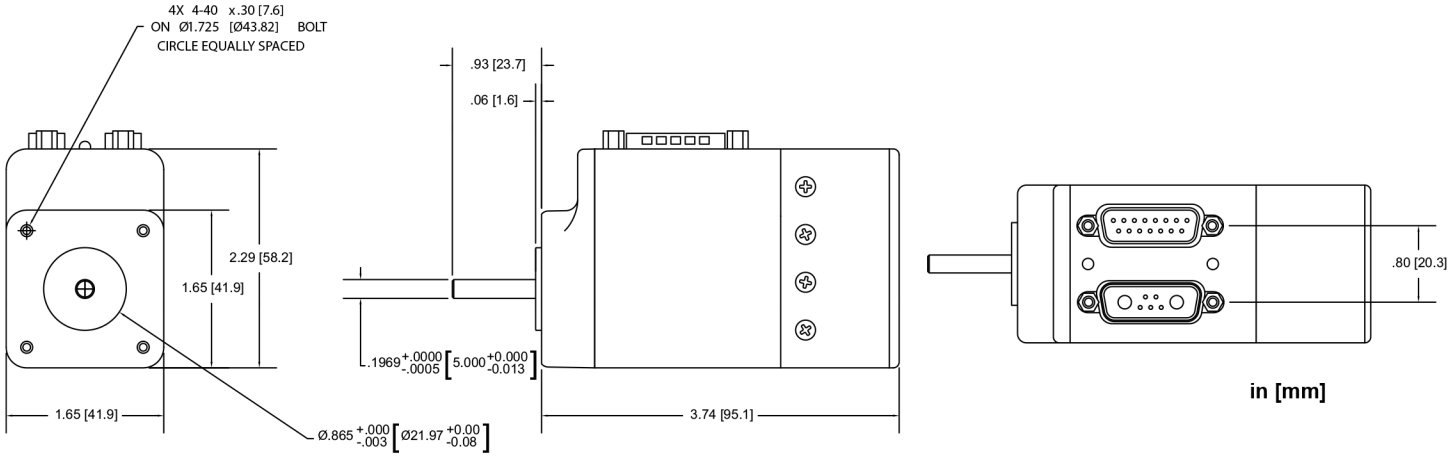


SM34505D

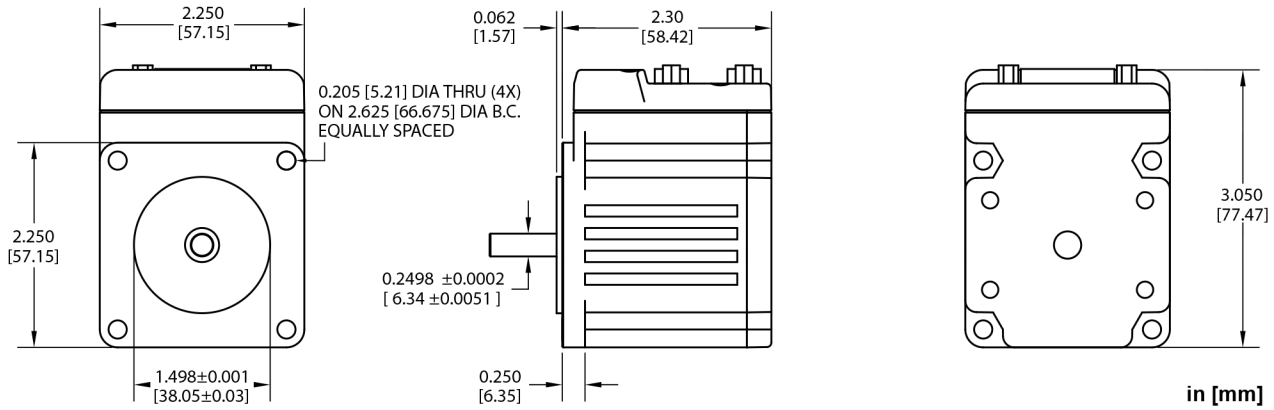


All torque curves based on 48 VDC at 25°C ambient with rise to 85°C.
Motors were operated using MDT (Trapezoidal Drive Mode) Commutation.
For ambient temperatures above 25°C, continuous torque must be linearly derated to 0% at 85°C.
Operating temperature range: 0°C – 85°C.
Storage temperature range: -10°C – 85°C, noncondensing.

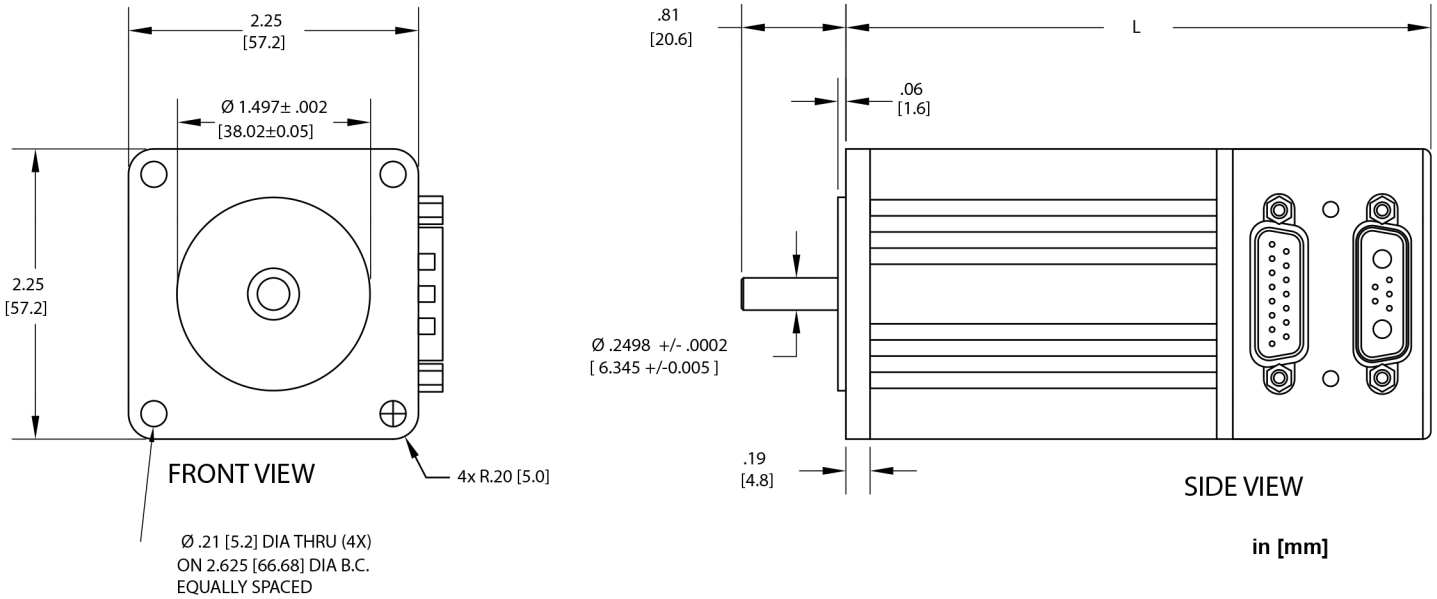
SM17205D (No Options) CAD Drawing



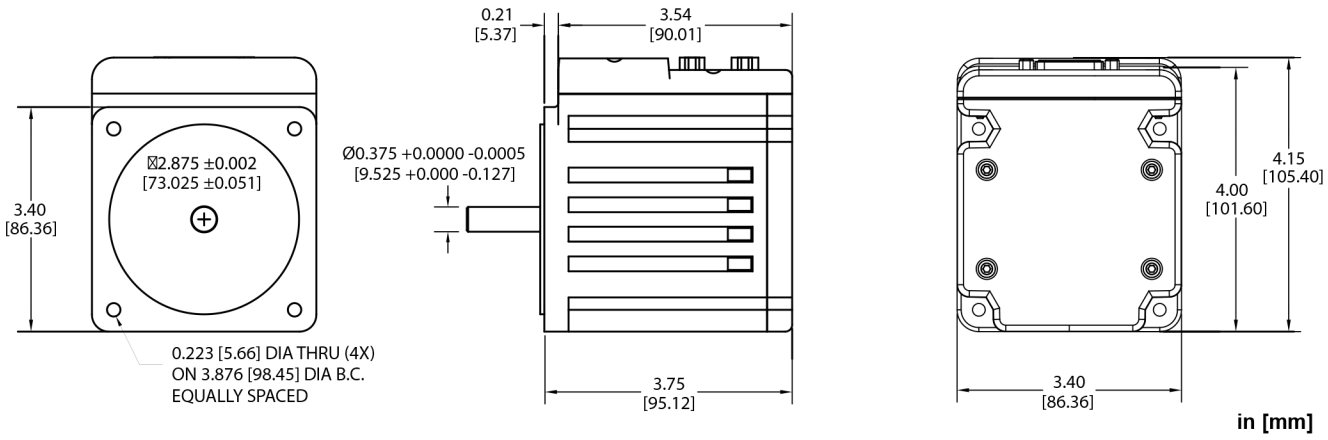
SM23165D/DT (No Options) CAD Drawing



SM232x5D-SM234x5D (No Options) CAD Drawing



SM34165D (No Options) CAD Drawing



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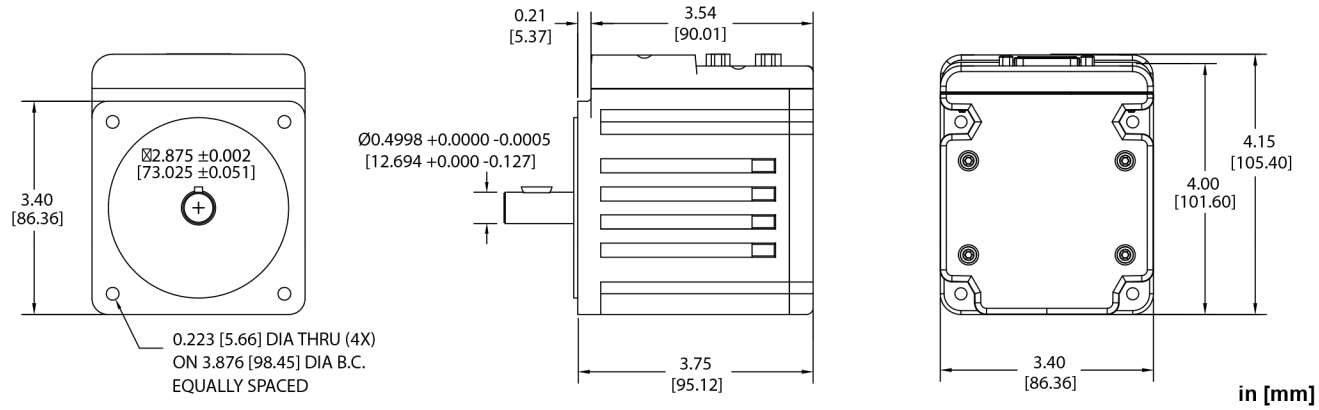
SM34165DT (No Options) CAD Drawing



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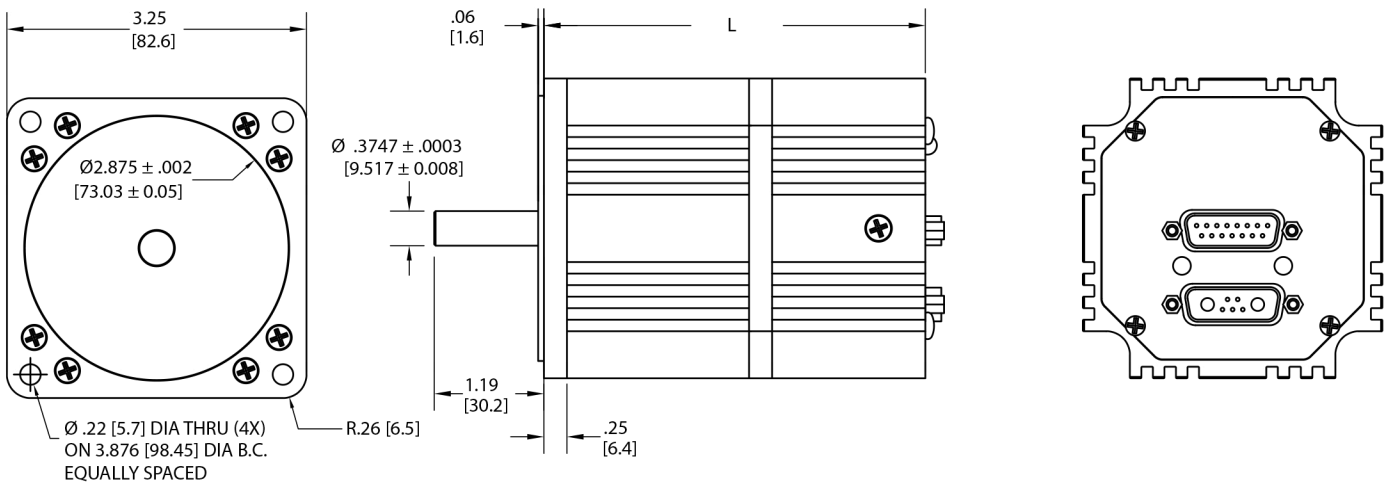
SM34205D-SM34505D (No Options) CAD Drawing



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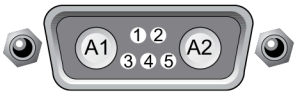
Class 5 D-Style Connector Pinouts

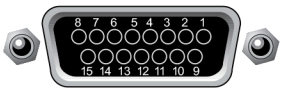
PIN	Main Power	Specifications	Notes	P1
1	I/O – 6 GP, Index Input or "G" Command	25 mAmp Sink or Source 10 Bit 0-5 VDC A/D	Redundant Connection on I/O Connector	
2	+5 VDC Out	50 mAmps Max. (Total)		
3	RS-232 Transmit	Com ch. 0	115.2 KBaud Max.	
4	RS-232 Receive	Com ch. 0	115.2 KBaud Max.	
5	SIG Ground			
A1	Main Power: +20-48 VDC			
A2	Ground			

7W2 Combo D-Sub Connector



PIN	I/O Connector (5VTTL I/O)	Specifications	Notes	P2
1	I/O – 0 GP or Encoder A or Step Input	25 mAmp Sink or Source 10 Bit 0-5 VDC A/D	1.5 MHz Max. as Encoder or Step Input	
2	I/O – 1 GP or Encoder B or Direction Input	25 mAmp Sink or Source 10 Bit 0-5 VDC A/D	1.5 MHz Max. as Encoder or Direction Input	
3	I/O – 2 Positive Over Travel or GP	25 mAmp Sink or Source 10 Bit 0-5 VDC A/D		
4	I/O – 3 Negative Over Travel or GP	25 mAmp Sink or Source 10 Bit 0-5 VDC A/D		
5	I/O – 4 GP, IIC or RS-485 A (Com ch. 1)	25 mAmp Sink or Source 10 Bit 0-5 VDC A/D	115.2 KBaud Max.	
6	I/O – 5 GP, IIC or RS-485 B (Com ch. 1)	25 mAmp Sink or Source 10 Bit 0-5 VDC A/D	115.2 KBaud Max.	
7	I/O – 6 GP, Index Input or "G" Command	25 mAmp Sink or Source 10 Bit 0-5 VDC A/D	Redundant Connection on Main Power Connector	
8	Phase A Encoder Output			
9	Phase B Encoder Output			
10	RS-232 Transmit	Com ch. 0	115.2 KBaud Max.	
11	RS-232 Receive	Com ch. 0	115.2 KBaud Max.	
12	+5 VDC Out	50 mAmp Max. (Total)		
13	SIG Ground			
14	Ground			
15	Main Power: +20-48 VDC	If DE Option, Control Power Separate from Main Power		

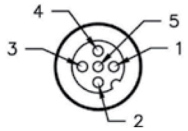
P2 DB-15 D-Sub Connector



Note: I/O ports input impedance = 5 kohm (5 kohm pull-up resistor)

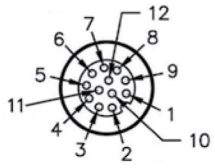
PIN	CAN bus	Connection	Notes	P3
1	NC	NC		
2	+V	NC Except DeviceNet	Input Current < 10 mA	
3	-V (Ground)	Common Ground	Isolated	
4	CAN-H	1 MBaud Max.		
5	CAN-L	1 MBaud Max.		

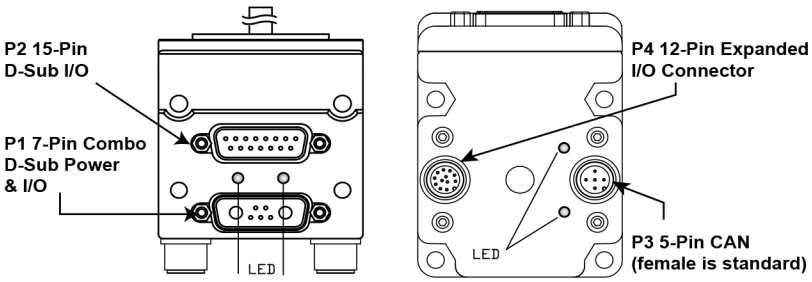
M12 5-PIN FEMALE END VIEW



PIN	Isolated 24 VDC I/O Connector	Max. Load (Sourcing)	Notes	P4
1	I/O – 16 GP	150 mAmps		
2	I/O – 17 GP	150 mAmps		
3	I/O – 18 GP	150 mAmps		
4	I/O – 19 GP	150 mAmps		
5	I/O – 20 GP	300 mAmps	These I/O ports also support analog input	
6	I/O – 21 GP	300 mAmps		
7	I/O – 22 GP	300 mAmps		
8	I/O – 23 GP	300 mAmps		
9	I/O – 24 GP	300 mAmps		
10	I/O – 25 GP	300 mAmps		
11	+24 Volts Input	18-32 VDC		
12	GND-I/O			

M12 12-PIN FEMALE END VIEW





CAUTION: P2 DB-15 D-Sub Connector pins 14 and 15 are intended for use with DE series motors for control power only. Attempting to supply main servo-drive power to a non-DE motor through those pins will result in immediate damage to the electronics and void the warranty.

CANopen

CANopen Pinout:

1 Not Connected
2 Not Connected
3 CAN ground
4 CAN H
5 CAN L

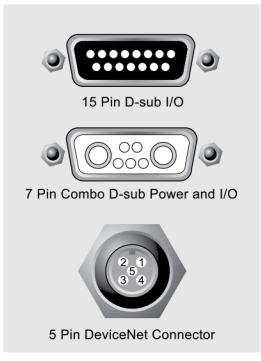
Moog Animatics CANopen SmartMotor™

Features include:

- All basic motion commands available via CiA V4.02 specification
- Ability to read/write all SmartMotor variables
- Use of onboard I/O via CANopen gateway, SmartMotor program, or RS-232 commands
- Ability to run 1000 SmartMotor subroutines via CANopen
- Online diagnostics of the SmartMotor™ via SMI software and RS-232 connection
- Up to 127 nodes
- 250 microsecond interrupt-driven subroutine
- Baud rates: 20K, 50K, 125K, 250K, 500K, 1 Mbps default 125 Kbps

NOTE: This option DOES NOT apply to all models, refer to website or factory.

DeviceNet™



DeviceNet Pinout:

1 Not Connected
2 +24V
3 Common
4 CAN H
5 CAN L

Moog Animatics DeviceNet SmartMotor™

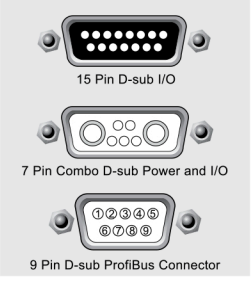
Features include:

- Polled I/O and Explicit Messages from your PLC to control all SmartMotor™ operation
- Read/Write control over all ODVA Position Controller parameters
- Use of onboard I/O via DeviceNet, SmartMotor™ program or RS-232 commands
- Ability to run 1000 SmartMotor subroutines via DeviceNet and read/write four 32-bit user variables
- Online diagnostics of the SmartMotors via SMI software and RS-232 connection
- Up to 64 DeviceNet nodes
- 250 microsecond interrupt-driven subroutine
- Baud rates: 125K, 250K, 500K, 1 Mbps default 125 Kbps

NOTE: This option DOES NOT apply to all models, refer to website or factory.

ODVA™

PROFIBUS



ProfiBus Pinout:

1	NC	6	+5V
2	NC	7	NC
3	BUS-B	8	BUS-A
4	NC	9	NC
5	ground		

Moog Animatics PROFIBUS SmartMotor™

Features include:

- Command/Response Codes for all Class 5 SmartMotor commands
- Use of onboard I/O via PROFIBUS, SmartMotor program, or RS-232 commands
- Ability to run 1000 SmartMotor™ subroutines via PROFIBUS
- Ability to read/write all SmartMotor variables
- Online diagnostics of the SmartMotors via SMI software and RS-232 connection
- Up to 127 PROFIBUS nodes
- 250 microsecond interrupt-driven subroutine
- Baud rates: default 1.5 Mbps
  - 9.6, 19.2, 31.25, 45.45, 93.75, 187.5, 500 Kbps, 1.5, 3, 6, 12 Mbps

NOTE: PROFIBUS baud rates are achievable only with proper cable length and termination connectors. The minimum cable length when operating >=1 MBaud is 1 meter (3 feet). If the cable is too short, reflected impedance can cause loss of communications data packets and spurious node errors.