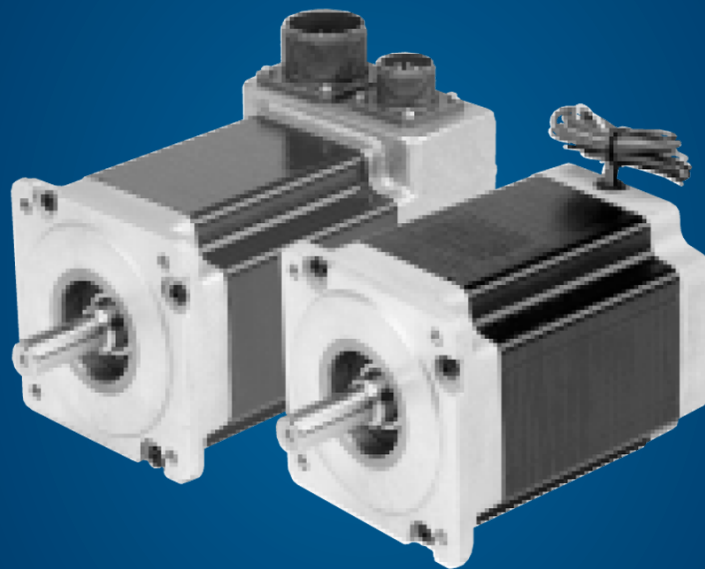


Kollmorgen SN Synchronous Motor

Selection Guide



KOLLMORGEN

A REGAL REXNORD BRAND

Kollmorgen: Your Partner, In Motion.

Every solution comes from a real understanding of the challenges facing machine designers and users.

Innovators consistently rate Kollmorgen as one of their best motion systems manufacturing partners. Whether you are looking for classic servo motors, direct-drive servo motors, stepper motors, drives & amplifiers, gearing, actuation, or multi-axis motion controllers, Kollmorgen is one of the few companies in the world that actually designs and manufactures all of these products.

Our customers are leaders in many industries such as Aerospace & Defense, Printing, Packaging & Converting, Food & Beverage Processing, Medical Imaging, In Vitro Diagnostics & Laboratory Automation, Pharmaceutical Manufacturing, Material Forming and Cutting, Oil & Gas, and Robotics. Kollmorgen is also a leader in Warehouse Automation, including complete AGV systems, software, awareness and autonomy.

Our Automation Solutions can be found on Mars and in space, ships and submarines, O&G drilling and metrology, surgical robots and laser eye surgery, even inside artificial hearts. These are just a few applications that demand high-performance and high-quality while satisfying their specific needs.

Because motion matters, it's our focus: Motion can distinctly differentiate a specific machine and deliver a marketplace advantage by increasing its performance and dramatically improving Overall Equipment Effectiveness (OEE).

High-performance motion can make your customer's machine more reliable and energy-efficient, enhance accuracy and improve operator safety. Motion also represents endless possibilities for innovation.

We've always understood this potential, and thus have kept motion at our core and in our Vision, Mission & Values, relentlessly developing products that offer precise control of torque, velocity and position accuracy in machines that rely on complex motion.

Removing the Barriers of Design, Sourcing, and Time

At Kollmorgen, we know that OEM engineers can achieve a lot more when obstacles aren't in the way. So, we clear obstacles in three important ways:

Integrating Standard and Custom Products

The optimal solution is often not clear-cut. Our application expertise allows us to modify standard products or develop totally custom solutions across our whole product portfolio so that designs can take flight.

Providing Motion Solutions, Not Just Components

As companies reduce their supplier base and focus their engineering manpower on the product design, they need a total system supplier with a wide range of integrated solutions. Kollmorgen offers complete solutions as well as motion subsystems that combine programming software, engineering services and best-in-class motion components.

Global Footprint

With direct sales, engineering support, manufacturing facilities, and distributors spanning the Americas, Europe, the Middle East, and Asia, we're close to OEMs worldwide. Our proximity helps speed delivery and lend support where and when they're needed.

Financial and Operational Stability

Kollmorgen is part of Regal Rexnord. A key driver in the growth of all Regal Rexnord segments is the Regal Rexnord Business System, which relies on the principle of "kaizen" – or continuous improvement. Using world-class tools, cross-disciplinary teams of exceptional people evaluate processes and develop plans that result in superior performance.

Kollmorgen: Your partner. In Motion.

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▶ SN Synchronous Motors

SN series synchronous motors deliver bidirectional motion for low velocity, constant speed motor drives. These motors are driven economically from standard AC line voltage and the synchronous speed is related to the line frequency.

SN Synchronous motor components are identical to step motors except for high impedance, serially connected stator windings designed for direct operation from AC line voltage.

SN Synchronous motors are often used rather than geared AC induction motors. The desired speed is easily accomplished by gearing up or down from the synchronous speed using a gear box or simple timing belt and pulleys.

Agency Approval

All NEMA 34 and 42 Frame synchronous motors are UL recognized; Class B motor insulation (File 103510).

Typical Applications

- » Automatic antennas
- » Carousel rotation
- » Conveyor systems
- » Dispensing machines
- » Door openers
- » Fluid metering
- » Labeling machines
- » Packaging machines
- » Pumps; medical, process and fuel
- » Sorting machines
- » Test equipment
- » Timing belt drives

Features and Benefits of SN Synchronous Motors

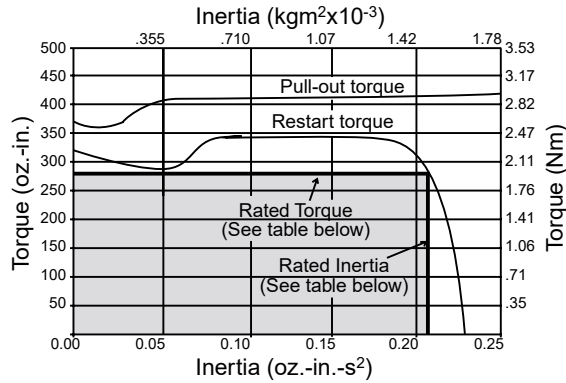
With rated torques to 1500 oz-in. (93.75 lb-in.), 10,5 Nm, POWERSYNC provides the highest rated output torque range in the industry	Optimized magnetics provide maximum performance in a small envelope, reducing space required for the motor. Exceptionally high torques provide unparalleled application freedom for AC synchronous motors
Runs cooler than other AC synchronous motors	Longer, more reliable motor life – backed by a two year warranty
Rugged “housingless” square frame	Efficient use of volume for optimal magnetic design
Sealed per NEMA and IP65	For splashproof requirements
Outer bearing races won’t turn – front locked (in steel insert) and rear held by O-ring	Long life bearings – also prevents axial shaft movement for encoder applications
Selection of terminations Special shaft configurations available	Match your requirements
Easy to apply	Simple, economical control components (resistor and capacitor)
Precise speed control	Synchronous speed for a broad range of applications
72 RPM, 120V ac, 60 Hz	For North American use
60 RPM, 120V ac, 50 Hz	For international requirements
Standard NEMA mounting	Widely recognized standard
Motors (unloaded) reach synchronous speed in as little as 2 milliseconds. Ask us about response time at your load	Fast response for on-off, precisely timed events

SN Series Synchronous Motor Performance Overview

RPM	Voltage	Frequency	Rated Torque oz-in. (Nm)	Rated Inertia oz-in-s ² (kg-cm ²)
72	120 V _{AC}	60 Hz	280 - 1500 (1.98 - 10.59)	0.21 - 0.92 (14.8 - 64.9)
60	120 V _{AC}	50 Hz	375 - 1400 (2.64 - 10.17)	0.29 - 1.3 (20.5 - 91.8)

SN Series AC Synchronous Motors

SN Series Motor Performance Specifications



Pull-out Torque – The maximum friction load, at a particular inertial load, that can be applied to the shaft of an AC synchronous motor (running at constant speed) and not cause it to lose synchronism.

Restart Torque – The maximum friction load, at a particular inertial load, that can be applied to the shaft of an AC synchronous motor without causing it to lose synchronism when accelerating to a constant speed from standstill.

SN3 & SN4 60 Hz, 120 V, Single Phase, 72 rpm

Model ¹	Rated Torque ^{2,3} oz-in (Nm)	Rated Inertia ^{2,3} oz-in-s ² (kg-cm ²)	Rotor Inertia oz-in-s ² (kg-cm ²)	Max. Pull-out Torque oz-in (Nm)	Current @ 80% Pull-out Torque Arms/phase	Weight lb (kg)	Shaft Loading		Phase Shifting Components		
							Max. Radial Force ⁴ lb	Max. Axial Force ⁴ lb	Resistor		Capacitor (370 VAC) μF
									Ohms	Watts	μF
SN31H	280 (1.98)	0.21 (14.8)	0.0202 (1.4)	410 (2.9)	0.38	5.0 (2.27)	65	305	200	50	6.0
SN32H	480 (3.39)	0.29 (20.5)	0.038 (2.7)	690 (4.87)	0.47	8.4 (3.81)	65	305	200	50	10.0
SN33H	690 (4.87)	0.53 (37.4)	0.0567 (4.0)	1015 (7.17)	0.78	11.9 (5.39)	110	305	100	100	10.0
SN34H	900 (6.36)	0.53 (37.4)	0.075 (5.3)	1520 (10.73)	1.43	15.1 (6.84)	110	305	50	100	17.5
SN41H	715 (5.05)	0.40 (28.2)	0.0783 (5.5)	1045 (7.38)	0.8	11 (4.98)	125	404	100	100	12.5
SN42H	1200 (8.47)	0.82 (57.9)	0.1546 (10.9)	1580 (11.16)	1.19	18.4 (8.34)	110	404	75	100	20.0
SN43H	1500 (10.59)	0.92 (64.9)	0.2293 (16.2)	2000 (14.12)	1.5	25.7 (11.64)	110	404	50	100	20.0

SN3 & SN4 50 Hz, 120 V, Single Phase, 60 rpm

Model ¹	Rated Torque ^{2,3} oz-in (Nm)	Rated Inertia ^{2,3} oz-in-s ² (kg-cm ²)	Rotor Inertia oz-in-s ² (kg-cm ²)	Max. Pull-out Torque oz-in (Nm)	Current @ 80% Pull-out Torque Arms/phase	Weight lb (kg)	Shaft Loading		Phase Shifting Components		
							Max. Radial Force ⁴ lb	Max. Axial Force ⁴ lb	Resistor		Capacitor (370 VAC) μF
									Ohms	Watts	μF
SN31H	375 (2.64)	0.29 (20.5)	0.0202 (1.4)	490 (3.46)	0.34	5.0 (2.27)	65	305	150	25	2.0
SN32H	600 (4.24)	0.52 (36.7)	0.038 (2.7)	870 (6.14)	0.64	8.4 (3.81)	65	305	100	50	4.0
SN33H	800 (5.65)	0.60 (42.3)	0.0567 (4.0)	1120 (7.91)	0.67	11.9 (5.39)	110	305	100	50	4.0
SN34H	990 (6.99)	0.53 (37.4)	0.075 (5.3)	1565 (11.05)	1.1	15.1 (6.84)	110	305	75	100	6.5
SN41H	700 (4.94)	0.53 (37.4)	0.0783 (5.5)	1060 (7.49)	0.71	11 (4.98)	125	404	100	50	4.0
SN42H	1020 (7.22)	1.16 (81.9)	0.1546 (10.9)	1575 (11.12)	0.93	18.4 (8.34)	110	404	100	100	6.5
SN43H	1440 (10.17)	1.30 (91.8)	0.2293 (16.2)	2000 (14.12)	1.6	25.7 (11.64)	110	404	50	225	10.5

Notes:

- See page 9 for full nomenclature options
- Rated Torque and Inertia are maximum values. The Rated Torque is the combination of load torque and friction torque. The Rated Inertia is a combination of the load inertia and the motor's Rotor Inertia
- Rated Torque and Inertia denote restart conditions with a stiff coupling of 0.3 arc-sec/oz-in. minimum
- See page 14 for shaft load and bearing fatigue life charts

SN Series Motor Phase R-C Phase Shift Networks

A phase shift network is required and values have been selected to eliminate reversing torque and motor oscillations during motor startup. The network is placed in the circuit as shown in the diagram below. It is important to use the recommended values for the resistor and capacitor which vary with each motor, see below. The resistors and capacitors are standard and are readily available from electronic component suppliers.

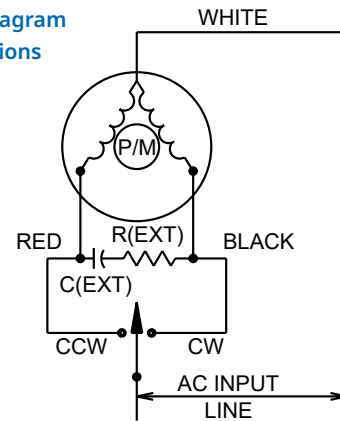
SN3 & SN4 60 Hz, 120 V, Single Phase, 72 rpm

Model Number	Resistor		Capacitor	
	(Ohms)	(Watts)	(μf)	(rated Vac)
SN31HXYX-LXK-XX-XX	200	50	6	370
SN32HXYX-LXK-XX-XX	200	50	10	370
SN33HXYX-LXK-XX-XX	100	100	10	370
SN34HXYX-LXK-XX-XX	50	100	17.5	370
SN41HXYX-LXK-XX-XX	100	100	12.5	370
SN42HXYX-LXK-XX-XX	75	100	20	370
SN43HXYX-LXK-XX-XX	50	100	20	370

SN3 & SN4 50 Hz, 120 V, Single Phase, 60 rpm

Model Number	Resistor		Capacitor	
	(Ohms)	(Watts)	(μf)	(rated Vac)
SN31HXYR-LXK-XX-XX	150	25	2	2.75
SN32HXYR-LXK-XX-XX	100	50	4	4.75
SN33HXYR-LXK-XX-XX	100	50	4	4.75
SN34HXYR-LXK-XX-XX	75	100	6.5	7.38
SN41HXYR-LXK-XX-XX	100	50	4	4.75
SN42HXYR-LXK-XX-XX	100	100	6.5	7.38
SN43HXYR-LXK-XX-XX	50	225	10.5	11.38

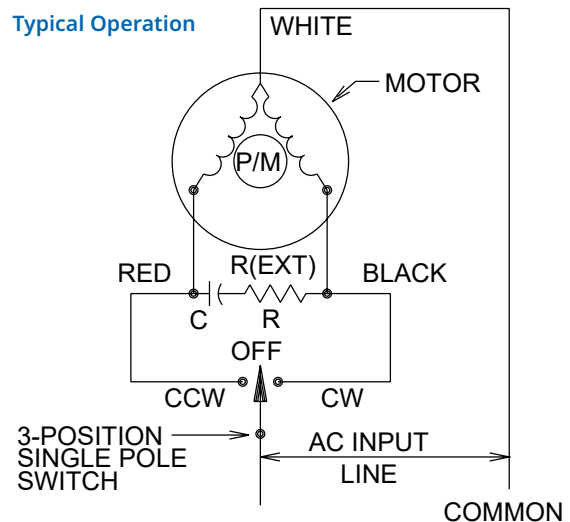
Schematic Diagram
All Constructions



R-C Network

Resistor and capacitor networks are specific to each motor offering. Reference the data contained in the data table for values and specifications. Deviations from recommended capacitor or resistor values can reduce forward torque and permit the motor to exhibit some of its forward torque in the reverse mode (vibration). This scenario is less of a problem if the load is substantially frictional. Other values can be recommended by the factory for specific applications. Capacitor and resistor values have been selected to provide the highest possible torque without sacrificing smooth operation throughout the safe operating area. Capacitor and resistor values may be adjusted by the factory to accommodate specific application needs. The figure to the right shows the connection diagram for AC synchronous motors.

Typical Operation

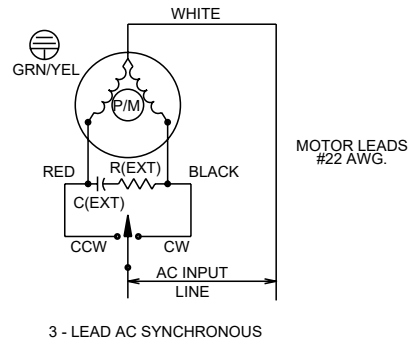


SN Series AC Synchronous Motors

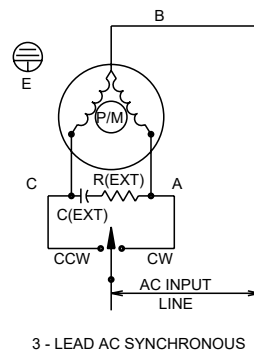
SN Series Synchronous Motor 3 Lead Connection Information

For all motor terminations refer to the following AC synchronous motor connection diagram to assure that proper connections are made. Consult our application engineers for assistance if necessary.

Flying Leads

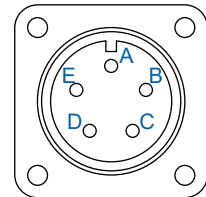


MS Connector



3-Lead Connection

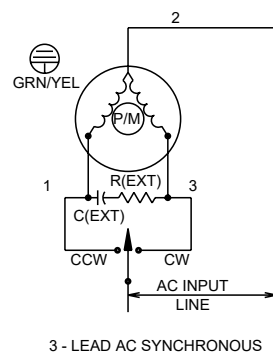
MS Connector Pinout	Lead Color
A	Black
B	White
C	Red
D	-
E	Green/Yellow



MS Connector
MS3102R14S-5P

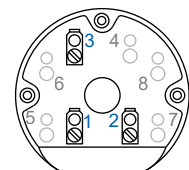
Mating Plug Type
MS3106F14S-5S

Terminal Board



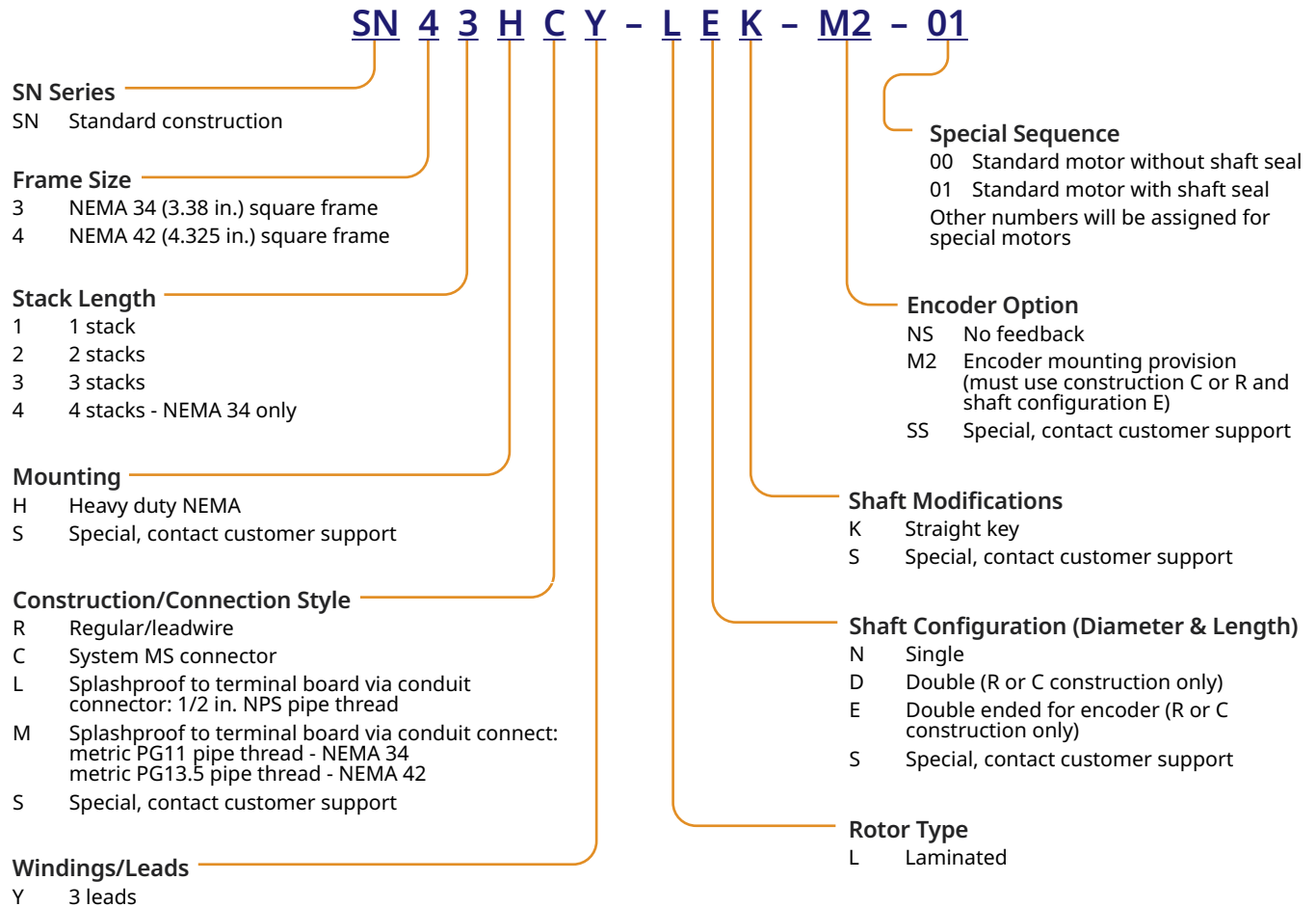
3-Lead Connection

Terminal Number	Lead Color
1	Red
2	White
3	Black



Terminal Board

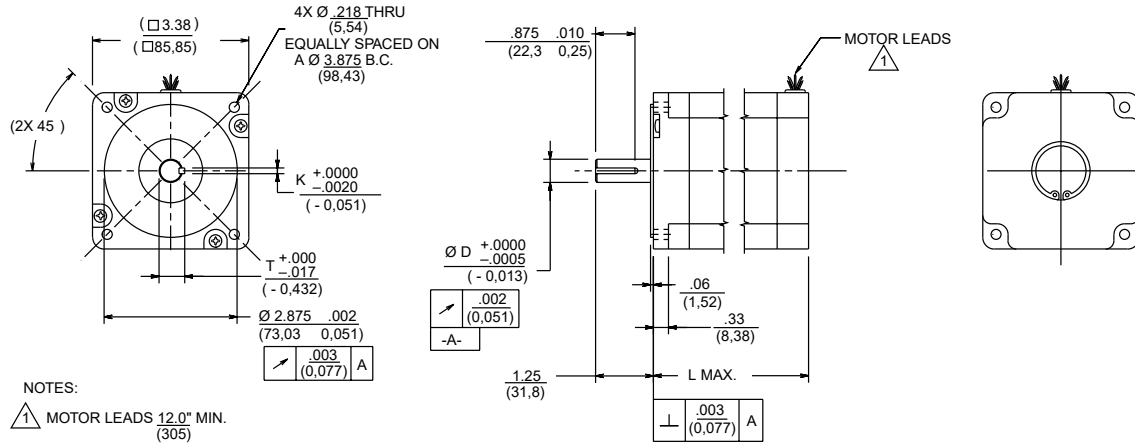
SN Series Synchronous Motor Nomenclature



SN Series NEMA 34 Motors

SN Series NEMA 34 Dimensional Drawings

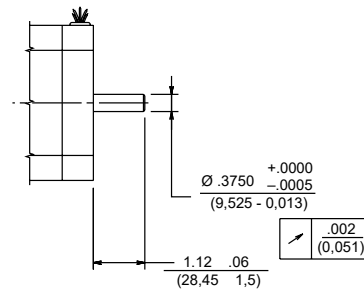
R- Construction Leadwire Hookup



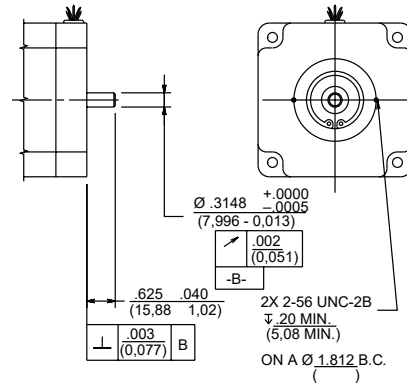
MOTOR*	D	K	T	L MAX.
31HR	.5000 (12,70)	.1250 (3,175)	.555 (14,09)	3.13 (79,5)
32HR	.5000 (12,70)	.1250 (3,175)	.555 (14,09)	4.65 (118,1)
33HR	.6250 (15,875)	.1875 (4,763)	.705 (17,91)	6.17 (156,7)
34HR	.6250 (15,875)	.1875 (4,763)	.705 (17,91)	7.68 (195,1)

Dimensions in in./mm (metric dimensions for reference only.)

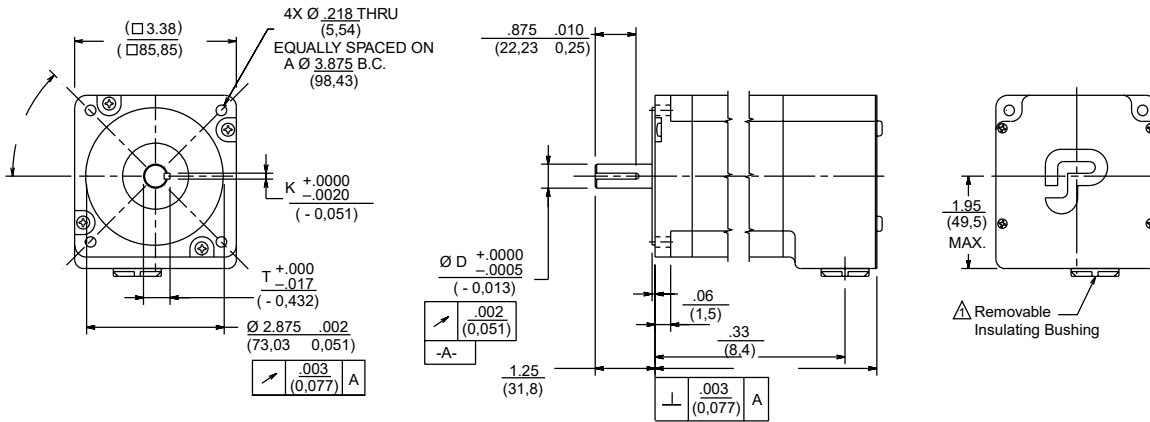
D- Construction Double Shaft Option



M2- Construction Encoder Mounting Provision



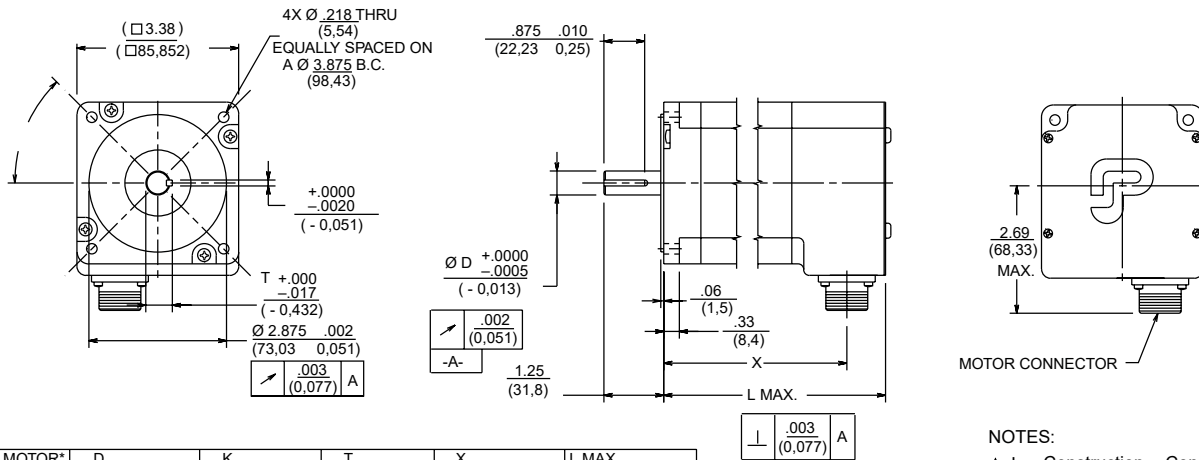
L-, M- Splashproof Construction / Terminal Board Connection



MOTOR*	D	K	T	X	L MAX.
31HR	.5000 (12.70)	.1250 (3.175)	.555 (14.09)	3.70 (93.9)	4.44 (112.8)
32HR	.5000 (12.70)	.1250 (3.175)	.555 (14.09)	5.22 (132.6)	5.96 (151.4)
33HR	.6250 (15.875)	.1875 (4.763)	.705 (17.91)	6.74 (171.20)	7.48 (189.9)
34HR	.6250 (15.875)	.1875 (4.763)	.705 (17.91)	8.25 (209.6)	8.99 (228.4)

Dimensions in in./mm (metric dimensions for reference only).

C/System- Splashproof Construction / MS Connector

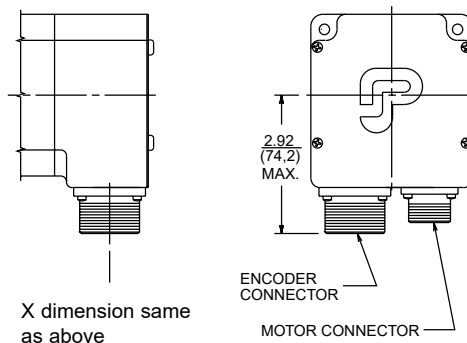


MOTOR*	D	K	T	X	L MAX.
31HR	.5000 (12.70)	.1250 (3.175)	.555 (14.09)	3.56 (90.42)	4.44 (112.8)
32HR	.5000 (12.70)	.1250 (3.175)	.555 (14.09)	5.07 (128.78)	5.96 (151.4)
33HR	.6250 (15.875)	.1875 (4.763)	.705 (17.91)	6.59 (167.39)	7.48 (189.9)
34HR	.6250 (15.875)	.1875 (4.763)	.705 (17.91)	8.11 (205.99)	8.99 (228.4)

NOTES:

- △ L Construction = Conduit connection (1/2 NPSC TAP) with .56 I.D. removable insulating bushing
- M Construction = Conduit connection (PG 11 TAP). (No insulating bushing supplied)

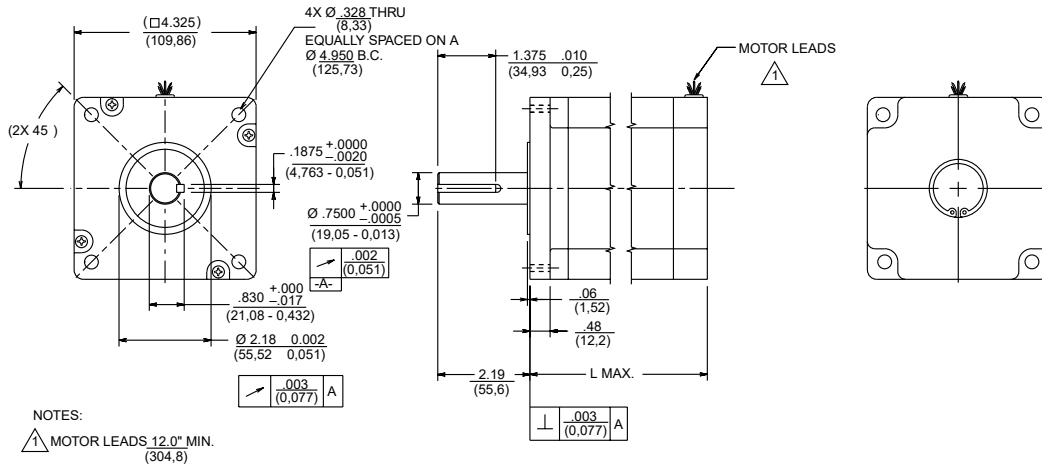
Encoder Splashproof Mounting Provision



SN Series NEMA 42 Motors

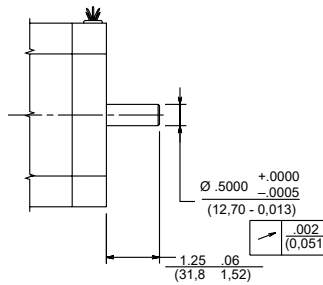
SN Series NEMA 42 Dimensional Drawings

R- Construction Leadwire Hookup



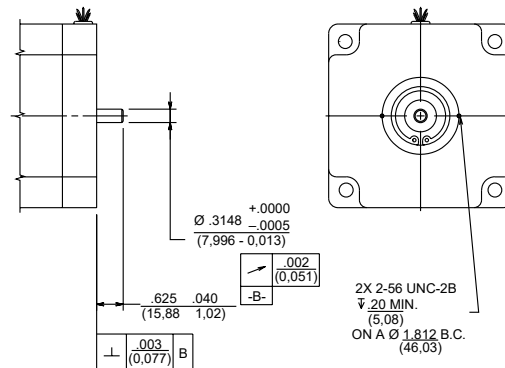
MOTOR*	L MAX.
41HR	3.89 (98.8)
42HR	5.91 (150.1)
43HR	7.92 (201.2)

R- Construction Double Shaft Option

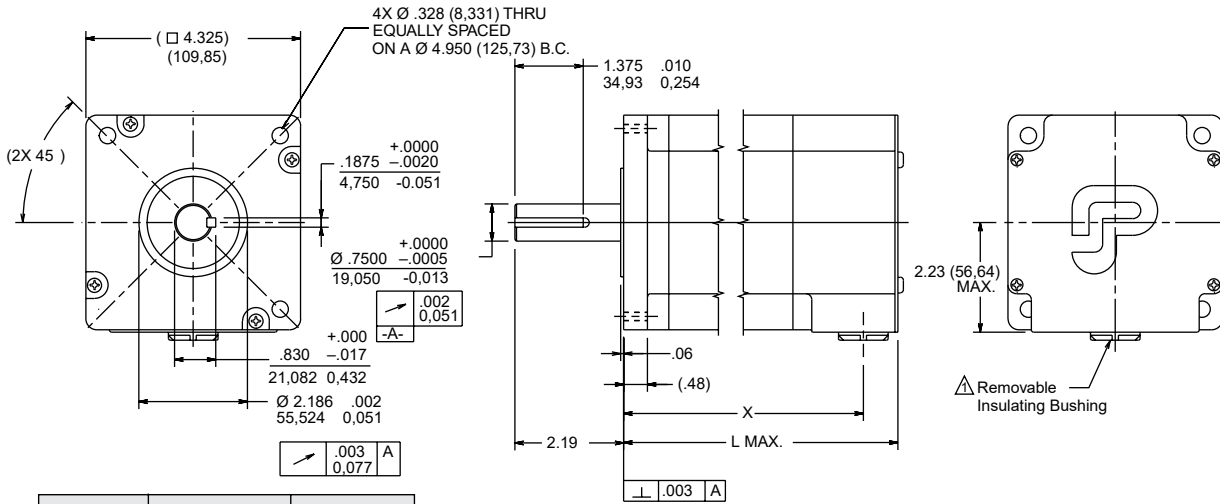


M2- Construction Encoder Mounting Option

See the Encoder Options on pages 16-17 for details

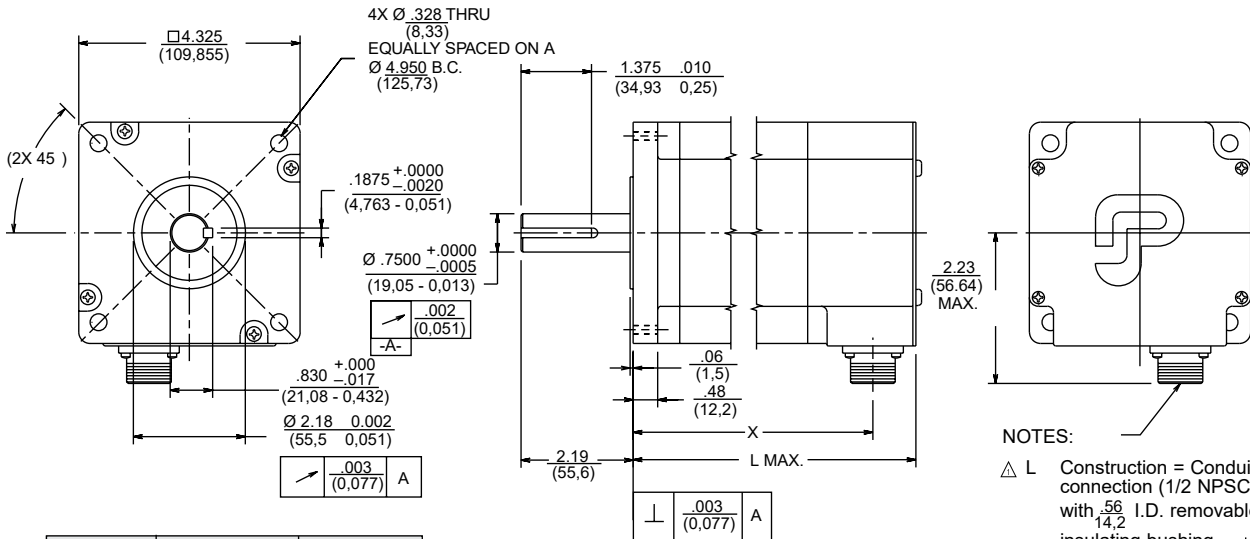


L-, M- Splashproof Construction / Terminal Board Connection



MOTOR*	X	L MAX.
41HR	4.46 (113,3)	3.89 (98,9)
42HR	6.48 (164,6)	5.91 (150,1)
43HR	8.49 (215,7)	7.92 (201,2)

C/System- Splashproof Construction / MS Connector

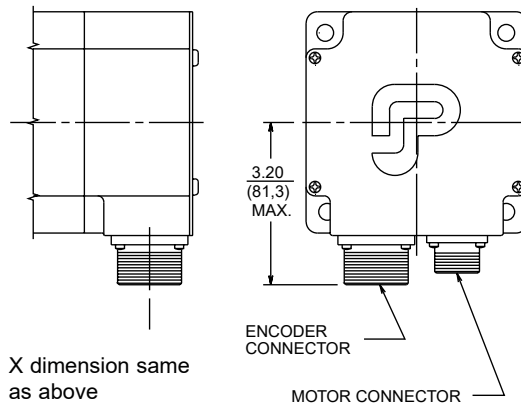


MOTOR*	X	L MAX.
41HR	4.32 (109,7)	5.20 (132,1)
42HR	6.33 (160,8)	7.22 (183,4)
43HR	8.35 (212,1)	9.23 (234,4)

- NOTES:
- △ L Construction = Conduit connection (1/2 NPSC TAP) with $\frac{56}{14,2}$ I.D. removable insulating bushing
 - M Construction = Conduit connection (PG 13, 5 TAP). (No insulating bushing supplied)

Encoder Splashproof Mounting Option

See the Encoder Options on pages 16-17 for details



SN Series Technical Data

Shaft Load and Bearing Fatigue Life

The POWERSYNC H-mount configuration has a heavy duty NEMA front end bell and a large diameter shaft to support the higher torque outputs.

Bearings are the only wearing component in an AC synchronous motor. Kollmorgen uses heavy duty, long life bearings to assure you the maximum useful life from every AC synchronous motor you purchase.

Shaft Loading

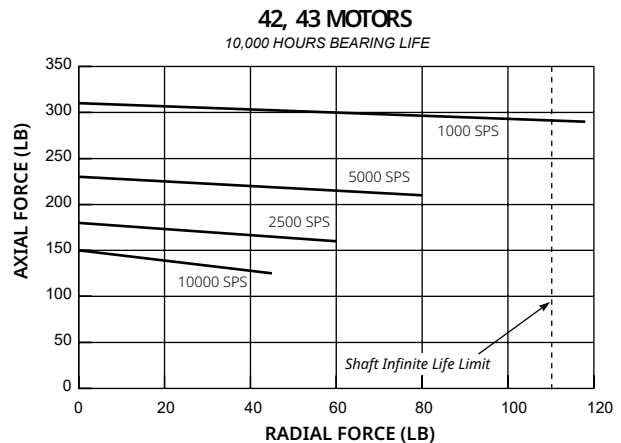
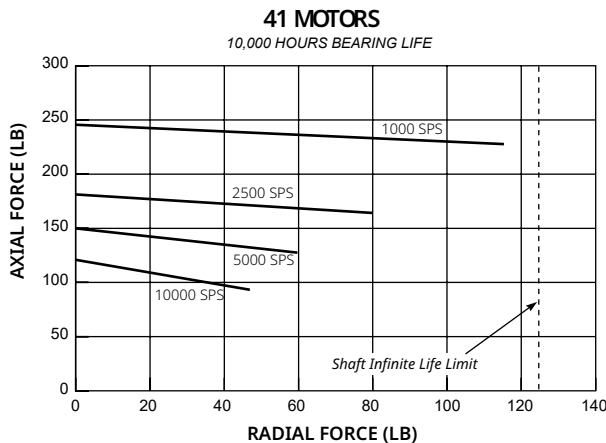
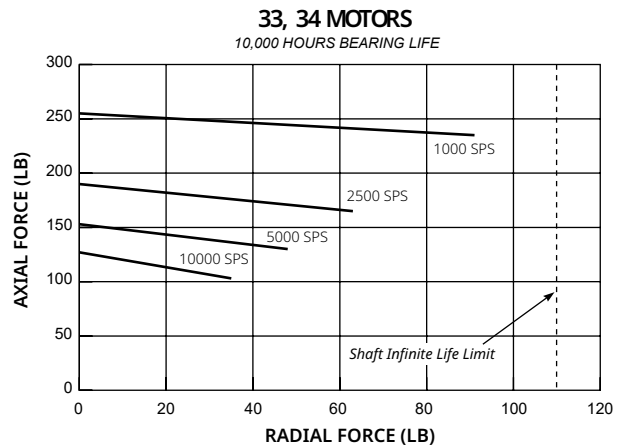
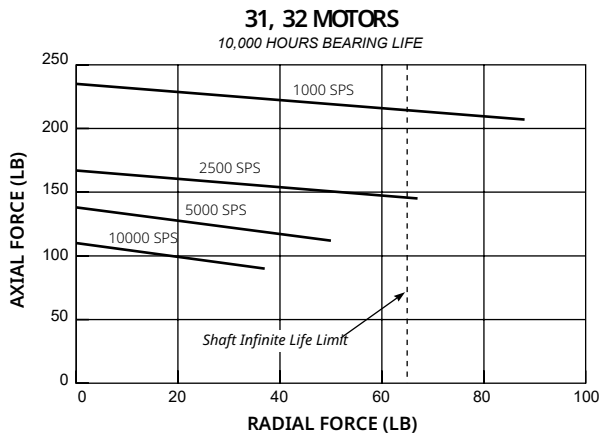
The maximum radial fatigue load ratings reflect the following assumptions:

1. Motors are operated at 1* rated torque
2. Fully reversed radial load applied in the center of the keyway extension
3. Infinite life with 99% reliability
4. Safety factory = 2

Motor	Max. Radial Force (Lb.)	Max. Axial Force (Lb.)
31, 32	65	305
33, 34	110	305
41	125	404
42, 43	110	404

Bearing Fatigue Life (L₁₀)

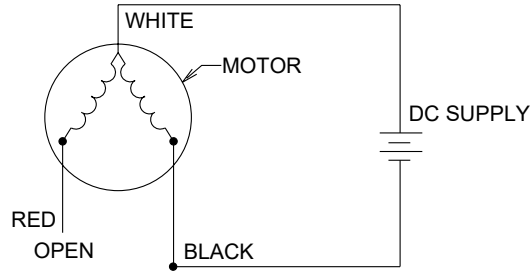
Note: SPS = Speed, Full Steps Per Second



Holding Torque

Attach a DC power supply across the neutral line and one of the phase wires (there are only 3 wires, Neutral, Phase A and Phase B). Make sure the voltage and current values do not exceed those shown in the table below. These values will provide holding torque approximately 1.15 times the specified pull-out torque rating.

Additional Holding Torque



Motor	Speed (RPM)	Voltage (V rms)	Freq (Hz)	Holding Torque Current	DC Supply Voltage (Volts)
SN31HXYY-LXK-XX-XX	72	120	60	0.53	45
SN32HXYY-LXK-XX-XX	72	120	60	0.92	35
SN33HXYY-LXK-XX-XX	72	120	60	1.12	36
SN34HXYY-LXK-XX-XX	72	120	60	1.76	28
SN41HXYY-LXK-XX-XX	72	120	60	1.27	27
SN42HXYY-LXK-XX-XX	72	120	60	2.22	22
SN43HXYY-LXK-XX-XX	72	120	60	3.03	21
SN31HXYY-LXK-XX-XX	60	120	50	0.42	57
SN32HXYY-LXK-XX-XX	60	120	50	0.78	41
SN33HXYY-LXK-XX-XX	60	120	50	1.07	37
SN34HXYY-LXK-XX-XX	60	120	50	1.65	30
SN41HXYY-LXK-XX-XX	60	120	50	1.01	33
SN42HXYY-LXK-XX-XX	60	120	50	1.81	27

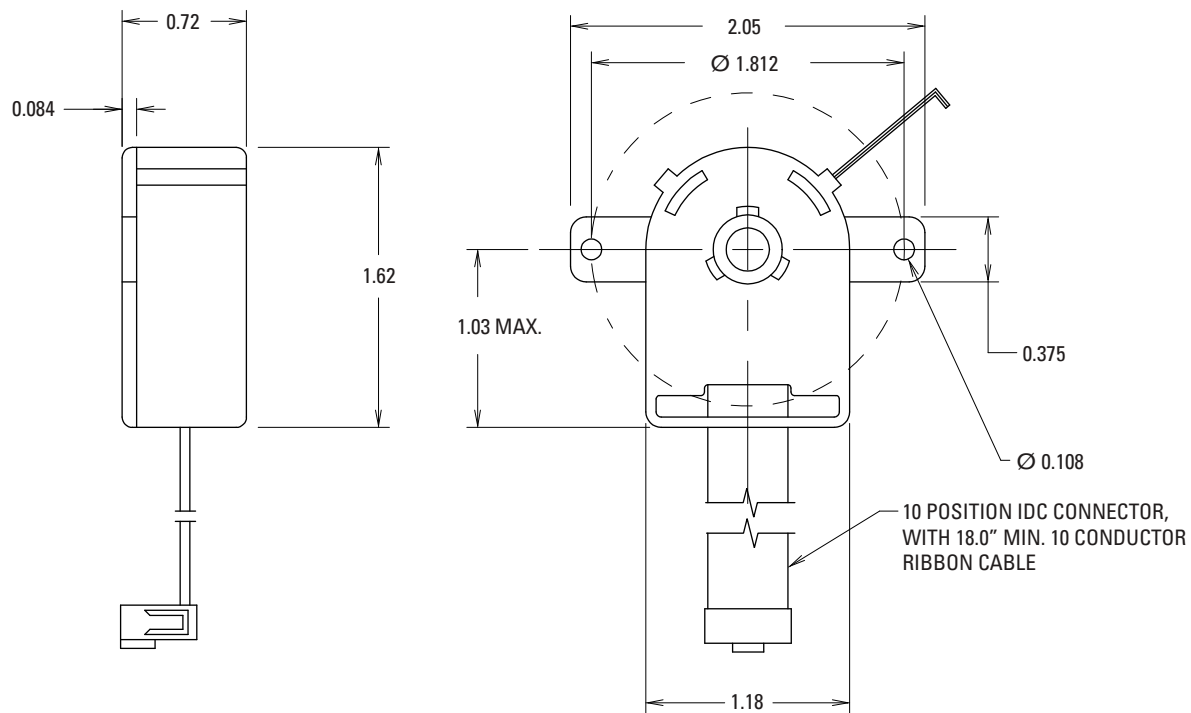
SN Series Encoder Options

SN Encoder Options

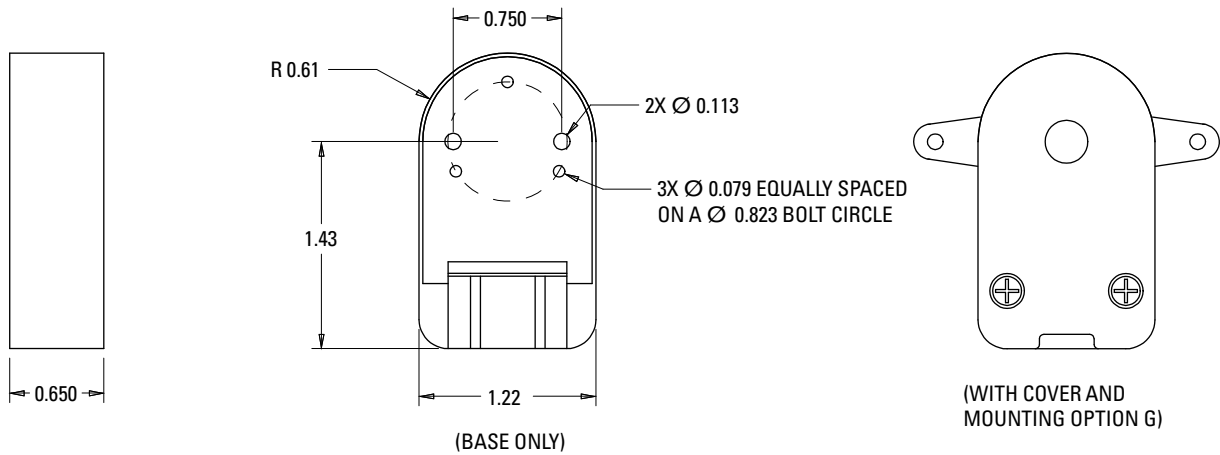
Encoder Specifications

Parameter	Code	
	PD	PF
Type	Optical Incremental	
Supply Voltage	5 Vdc \pm 10%	
Lines per Revolution	500	1000
Output Format	Dual Channel Quadrature with Index (Z)	
Output Type	Differential Line Drive (with compliments)	
Output Frequency (kHz)	100	
Operating Temperature ($^{\circ}$ C)	-40 to 100	
Storage Temperature ($^{\circ}$ C)	-40 to 100	

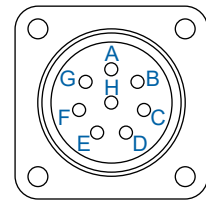
PD Encoder Dimensional Drawings



PF Encoder Dimensional Drawings



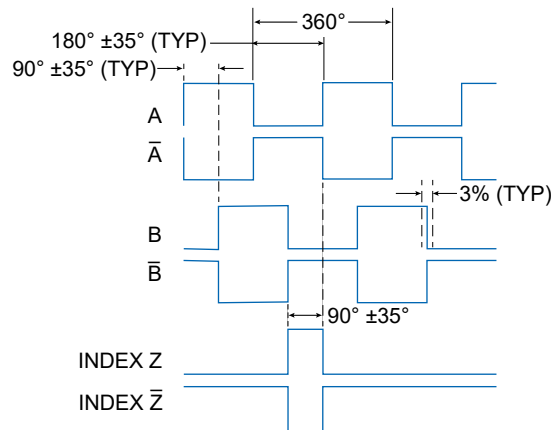
Color	Function	MS Connector
Brown	N/C	-
Red	+5 V	G
Orange	GROUND	H
Yellow	N/C	-
Green	\bar{A}	A
Blue	A	B
Violet	\bar{B}	C
Gray	B	D
White	Z (Index)	E
Black	\bar{Z} (Index)	F



**MS Connector
MS3102E20-7P**

Mating Plug Type
MS3106F20-7S

PD, PF Encoder Phase Diagram



OUTPUT FORMAT FOR CCW ROTATION VIEWED
FROM ENCODER END

More Expertise for a More Successful Machine

Our global engineering, service and support network provides deep knowledge of all the major industries that rely on advanced motion control and automation technology. We offer world-class engineering expertise, self-service design tools, personalized field service, and easy access to our design, application and manufacturing centers in strategic locations across the globe.

About Kollmorgen

Kollmorgen, a Regal Rexnord brand, has more than 100 years of motion experience, proven in the industry's highest-performing, most reliable motors, drives, linear actuators, AGV (Automated Guided Vehicle) control solutions, and automation control platforms. We deliver breakthrough solutions that combine exceptional performance, reliability and ease of use, giving machine builders an irrefutable marketplace advantage.

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