RBE Series Frameless Motors

Catalog

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.

KOLLMORGEN
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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.

Table of Contents

RBE Series Frameless Motors

The RBE series brushless motors provide a wide range of flexible motor solutions for frameless DDR (Direct Drive Rotary) motor applications.

- 10 frame sizes from 21.3 mm to 239 mm outside diameter
- Continuous Torque range from .01 Nm to 38 Nm
- Peak Torque range from .03 Nm to 200 Nm
- Speeds up to 35,000 rpm
- Standard and custom windings to match speed/torque performance

These motors come in either housed (RBEH) or frameless (RBE) mechanical configurations. The Housed models come with stainless steel shafts and can include any combination of Hall sensors, encoder, or resolver as rotor position feedback devices.

The frameless configuration is supplied as two separate components (rotor and stator) and does not include a shaft, bearings, or endbells. Frameless motors are integrated directly with the load where the same bearings which support the load also support the motor. This configuration eliminates shaft, bearings, endbells, and couplings offering reduced volume, weight, complexity and also results in improved servo stiffness and quicker response. Frameless motors can include integral Hall sensors and additional position feedback devices such as encoders or resolvers would be added as separate components.

Advantages of Brushless Systems

Brushless systems offer distinct mechanical advantages over conventional systems. Placement of brushless windings into the outer stationary member and field magnets onto the inner rotating member allows significant reductions in rotor inertia and increases in acceleration. Winding heat can be transferred directly from the outer member into adjacent heat sinks. Cooling and efficiency are improved. Generally, brushless systems can provide extra performance while surviving a great variety of operating conditions and offer improved efficiency and heat dissipation. Kollmorgen's brushless motors are available frameless or housed and are easily matched with Kollmorgen servo amplifiers. As new technologies emerge, Kollmorgen will continue providing the very finest motion control system components.

Brushless Motor System Components

There are four basic components in a brushless motor drive system. They are the armature, the field, the rotor position feedback and the servo amplifier.

The Armature

The armature is the wound member of the motor and consists of a three phase winding wound on a laminated iron core. The armature is the outer member and is stationary. It consists of low loss laminations bonded into a core which may have skewed winding slots. The core and slots are electri-cally insulated prior to inserting the winding. The winding consists of a series of coils for each motor phase. Phase interconnections are made inside the winding, resulting in a "wye" or "delta" connection. With a three wire termination, there is no reason for the customer to require either a "wye" or "delta" internal connection. Three leads are typically brought out for connection to the amplifier.

The Field

The field assembly or rotor typically consists of permanent magnet poles bonded to a flux carrying yoke ring. The magnet material selected will depend upon the application. Available magnet materials include Samarium Cobalt and the new high energy Neodymium-Iron-Boron compounds. For high speed applications, a magnet retaining band can be placed around the rotor to insure mechanical integrity.

Rotor Position Feedback

High performance Brushless DC systems require rotor position feedback to the amplifier to perform the commutation function, which is required for the Brushless DC motor to rotate. Kollmorgen Brushless DC motor systems typically will include one of the following rotor feedback configurations: Hall sensors, encoder, or resolver. Hall sensors have the advantage that they are an integral part of the armature and therefore do not require the customer to integrate a separate feedback device. For frameless motor applications which require a resolver or encoder, the customer will often need to add these as separate components in their system.

Servo Amplifier

The servo amplifier is required for a brushless motor to rotate. The servo amplifier acquires the rotor position feedback. This information is used to direct current into the appropriate windings of the armature to develop torque. As the rotor rotates, the servo amplifier uses the rotor position feedback to redirect the current into a different winding phase, as necessary to continue to generate torque as the rotor rotates. The servo amplifier will typically close an internal current loop. Optionally, the servo amplifier can use the rotor position feedback to control the velocity and / or the position of the motor.

RBE Series Frameless Motors

Frameless vs. Housed

Kollmorgen brushless motors can be supplied either frameless or housed. A housed motor includes a shaft, bearings, and endbells along with any feedback devices, into an integral assembly. This is the classical motor configuration. The customer mounts the motor housing into the desired system and provides a mechanical coupling to the motor shaft. The coupling can be a direct shaft coupling, gearing, or belts/pulleys. In many applications, the customer mounts the load directly to the motor shaft with the motor bearings supporting the load. Frameless motors are supplied two separate components: the rotor (field) and stator (armature). The Frameless motor does not include shaft, bearings, or end-bells. Frameless motors are used in applications where the customer desires to minimize the size and weight of the motor and / or obtain the maximum dynamic performance. Since the load is often supported on its own bearing structure, the Frameless motor can be integrated directly onto the system/load shaft and be suspended on the same bearings as the load.

This eliminates the need for an additional shaft, bearings, endbells, and any coupling between the motor shaft and the load. An advantage of Frameless motors is that, since there is no coupling between the shaft and the load, torsional play between the motor and load is minimized resulting in improved dynamic performance. Another advantage of Frameless motors is that inertia matching between the motor and load, which is typically required for housed motor applications, is not a critical requirement for Frameless motor applications, since the motor and load are one inertial mass.

System Performance and Communication

Careful selection of system components optimizes brushless system performance. Kollmorgen offers brushless components for two kinds of brushless systems: six step (trapezoidal) and sinusoidal. Selection should be made based on the application and on the performance requirements. For most servo applications, a six step sequence is appropriate unless very smooth operation under load at slow speed is required. For such applications, sinusoidal amplifiers with selected brushless motors offer exceptionally smooth operation with low torque ripple.

Brushless motors are not commutated mechanically, such as with a commutator and brushes, but electronically based on rotor magnet position information. Kollmorgen six step amplifiers are designed to utilize Hall device position signals for commutation. Hall devices mounted onto the stator convey rotor magnet position to the amplifier. This position information is necessary for commutation which changes the direction of current flow in the proper motor windings at the proper time. The Hall devices are accurately aligned with the stator winding back EMF at the factory on all motors supplied with Hall devices.

The Hall device and Motor Phase Output diagram shows proper alignment of the three Hall device outputs with the three motor back EMF waveforms. Externally rotating the motor field generates a back EMF voltage in each phase, which is used to align the Hall sensor in the optimum position. Current supplied to each phase will correspond with the Hall device switching points.

External motor phase connections are labeled A, B, and C, “$\underline{AB}$” refers to the back EMF voltage produced across leads A and B. “$\underline{BC}$” and “$\underline{CA}$” denote voltages produced across leads B and C and across C and A respectively. Corresponding Hall device outputs are labeled "H1"($\underline{AB}$), "H2" ($\underline{BC}$), and "H3" ($\underline{CA}$).

Kollmorgen sinusoidal amplifiers are designed to utilize resolver or encoder / Hall sensor position information for commutation. This feedback may be customer supplied or factory supplied for housed brushless motors. Feedback selection will vary depending on the motor selected and the application. Motor selection for a sinusoidal system may require factory consultation to assure performance goals are met. Although six step commutation systems can provide torque with ripple as low as five or six percent, sinusoidal system torque ripple can approach values of one percent. Amplifiers for both system types are pulse width modulated.

Motor Parameters

Motor parameters are listed on the individual data page for each motor. These parameters are dependent upon the size and shape of the model, but are independent of the winding used. Following is a brief description of the motor parameters.

Maximum Continuous Output Power at 25°C Ambient (HP Rated). This is the maximum continuous power output based on a 130°C temperature rise and a standard aluminum heat sink. (Standard heat sink size is listed just above the continuous performance curves). The maximum continuous power output can be increased if additional cooling is provided.

Speed at Rated Power (N Rated) is the speed at which the maximum continuous power is output.

Maximum Mechanical Speed (N Max) is the maximum speed which will not compromise rotor integrity.

Continuous Stall Torque at 25°C Ambient (Tc) is the maximum constant torque without rotation resulting in a steady state winding temperature rise of 130°C with the standard aluminum heat sink. The size of the standard heat sink is listed above the continuous performance curve for each RBE(H) series. The continuous stall torque can be increased if additional cooling is provided.

Peak Torque (Tp) is the maximum torque available from a given size of motor and is the torque the motor will provide when peak current **Ip** is provided. Peak torque is based on the maximum current density in the winding and is available for a maximum duration of 10 seconds.

Maximum Torque for Linear KT (Tsl) is the maximum torque for which Kt will be greater than 90 percent of **Kt** at low torque. As the torque increases above **Tsl, Kt** will drop below 90 percent of **Kt** at low torque and an incremental increase in current will yield a reduced increase in torque.

Motor Constant (Km) is the ratio of peak torque to the square root of power input at 25°C and at stall:
$Km = Tp/(Pp)^{0.5}$

This ratio is useful during the initial selection of a motor, because it indicates the ability of a motor to convert electrical power into torque. A common use of Km is to determine how much power a motor will dissipate in order to generate a certain amount of torque by using the following equation:

Watts Dissipated = $Torque^2$ / $\mathbf{Km^2}$

Thermal Resistance (Rth) is the ratio of winding temperature rise to average power losses continuously dissipated from the stator. Motor **Rth** values assume a standard aluminum heat sink which is specified above the continuous speed torque curve for each RBE(H) series. Customer supplied supplemental cooling can reduce the **Rth** value significantly resulting in increased continuous speed and torque operation.

Viscus Damping (Fi) is the torque loss due to rotational losses, mostly eddy current, which is proportional to speed. A lower **Fi** indicates less loss during high speed operation.

Maximum Static Friction (Tf) is the sum of the retarding torques at start-up or at stall within the motor. In a frameless brushless motor, retarding torques consist of magnetic frictional torque and cogging torque. Housed motor Tf includes bearing and other retarding torques.

Maximum Cogging Torque (Tcog) is a torque disturbance based on the magnets in the field attraction to the teeth in the armature. Cogging torque is minimized in the motor design by strategic selection of slot/pole combinations and by skewing the laminations in the armature.

Number of Poles (P) is the number of magnetic poles in the field. The electrical cycles per revolution is equal to the number of poles to the number of poles divided by 2.

RBE Series Frameless Motors

Winding Constants

There are six parameters, or winding constants, listed on the individual data page for each motor which vary according to the winding that is used in the model. The variations are governed by the number of wire turns per coil and the wire size. In some cases, values for more than one winding are listed. If none of the specified windings are suitable for a given application, additional windings are available by consulting the factory. The following is a brief description of each parameter.

Current at Continuous Torque (Ic) is the current required to obtain the nominal continuous torque from the motor with a nominal torque sensitivity **Kt.**

Current at Peak Torque (Ip) is the current required to obtain the nominal peak torque from the motor. At **Ip, Kt** will be reduced from the published **Kt** because **Kt** is reduced at torque above **Tsl. Ip** is based on the maximum current density in the winding and is available for a maximum duration of 10 seconds.

Torque Sensitivity (Kt) is the ratio of the developed torque to winding input current for the designated winding.

Back EMF Constant (Kb) is the ratio of voltage generated in the winding to the speed of the rotor. Since both **Kb** and **Kt** are determined by the same factors, **Kb** is directly proportional to **Kt.**

Motor Resistance (Rm) is the resistance measured between any two leads of the winding at 25°C.

Motor Inductance (Lm) is the winding inductance measured between any two leads of the winding. Factory tests are performed at 60 Hz with the rotor in place.

RBE Series Nomenclature

RBE Frameless Motor

RBE(H) B – 012 12 – A 00

Series

RB	Frameless Rotary Brushless Motor
RBE	Frameless Rotary Brushless Motor w/ Hall Sensors
RBEH	Housed Rotary Brushless Motor w/ Hall Sensors

Options

B	Fail-Safe Brake
E	Encoder
R	Resolver (Drop 1st E)

Frame Size

004, 005, 007, 012, 015, 018, 021, 030, 045, 062

Stack Length

10, 11, 12, etc.

Brake

A, B, C, etc.

Mechanical Deviations

00	Standard

RBE 00410 Motor Series

RBE(H) 00410 Motor Series Performance Data

RBE(H)-00410 to RBE(H)-00412

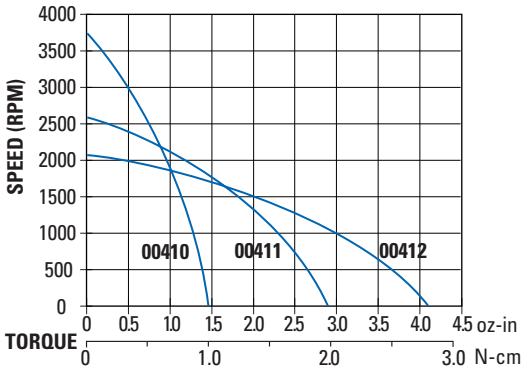
Motor Parameters		Symbols	Units	00410	00411	00412
Max Cont. Output Power at 25°C amb.		HP Rated	HP	0.019	0.027	0.032
		P Rated	Watts	14	20	24
Speed at Rated Power		N Rated	RPM	22400	15200	12550
Max Mechanical Speed		N Max	RPM	35000	35000	35000
Continuous Stall Torque at 25°C amb.		Tc	oz-in	1.54	2.93	4.13
			N-m	0.0109	0.0207	0.0292
Peak Torque		Tp	oz-in	3.49	7.13	11.0
			N-m	0.025	0.050	0.08
Max Torque for Linear KT		Tsl	oz-in	3.49	7.13	11.0
			N-m	0.025	0.050	0.078
Motor Constant		Tm	oz-in/ √W	0.65	1.09	1.46
			N-m/ √W	0.005	0.008	0.010
Thermal Resistance*		Rth	°C/Watt	8.00	7.11	6.64
Viscous Damping		Fi	oz-in/RPM	1.80E-05	3.40E-05	5.00E-05
			N-m/RPM	1.27E-07	2.40E-07	3.53E-07
Max Static Friction		Tf	oz-in	0.60	0.88	1.15
			N-m	0.0042	0.0062	0.0081
Max Cogging Torque Peak to Peak		Tcog	oz-in	0.37	0.58	0.80
			N-m	0.0026	0.0041	0.0060
Frameless Motor	Inertia	Jmf	oz-in-sec^2	1.70E-05	2.70E-05	3.80E-05
			Kg-m^2	1.20E-07	1.91E-07	2.68E-07
	Weight	Wtf	oz	1.1	1.6	2.0
			Kg	3.1E-02	4.4E-02	5.7E-02
Housed Motor	Inertia	Jmh	oz-in-sec^2	1.70E-05	2.70E-05	3.80E-05
			Kg-m^2	1.20E-07	1.91E-07	2.68E-07
	Weight	Wth	oz	1.7	2.2	2.7
			Kg	4.8E-02	6.2E-02	7.7E-02
No. of poles		P		6	6	6

*Rth assumes a housed motor mounted to a 7.5" x 7" x 0.375" aluminum heatsink or equivalent

			00410			00411			00412		
Winding Constants	Symbols	Units	A	B	C	A	B	C	A	B	C
Current at Cont. Torque	Ic	Amps	2.27	1.79	3.09	2.31	1.80	3.24	2.99	2.72	1.99
Current at Peak Torque	Ip	Amps	4.33	3.43	6.13	4.86	3.86	6.88	6.88	6.13	4.33
Torque Sensitivity	Kt	oz-in/Amp	0.945	1.20	0.693	1.65	2.12	1.18	1.76	1.94	2.65
		N-m/Amp	0.00667	0.00845	0.00489	0.0116	0.0150	0.0083	0.0125	0.0137	0.0187
Back EMF constant	Kb	V/KRPM	0.699	0.885	0.513	1.22	1.57	0.870	1.30	1.44	1.96
Motor Resistance	Rm	Ohms	2.11	3.37	1.08	2.28	3.72	1.17	1.46	1.78	3.48
Motor Inductance	Lm	mH	0.18	0.29	0.096	0.26	0.43	0.13	0.20	0.24	0.45

Continuous Duty Capability for 130°C Rise – RBE - 00410 Series

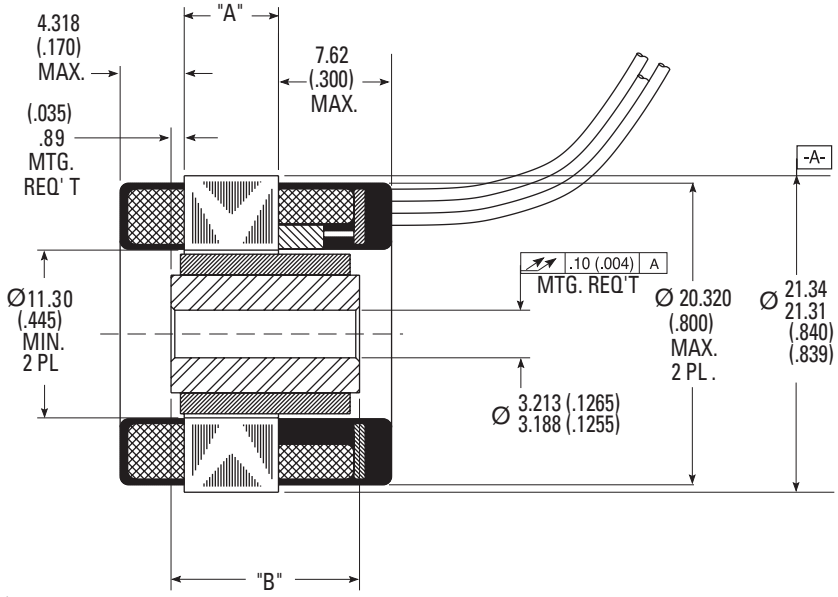
RBE(H)-00410 to RBE(H)-00412

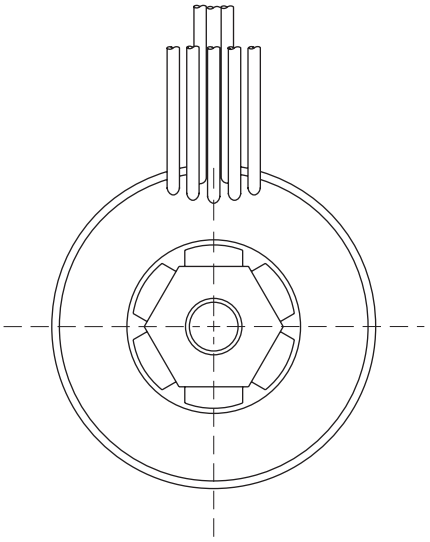


RBE(H) 00410 Motor Series Dimensional Drawings

Dimensions in mm [inches].
Product designed in inches.
Metric conversions provided for reference only.

RBE-0041X-X00





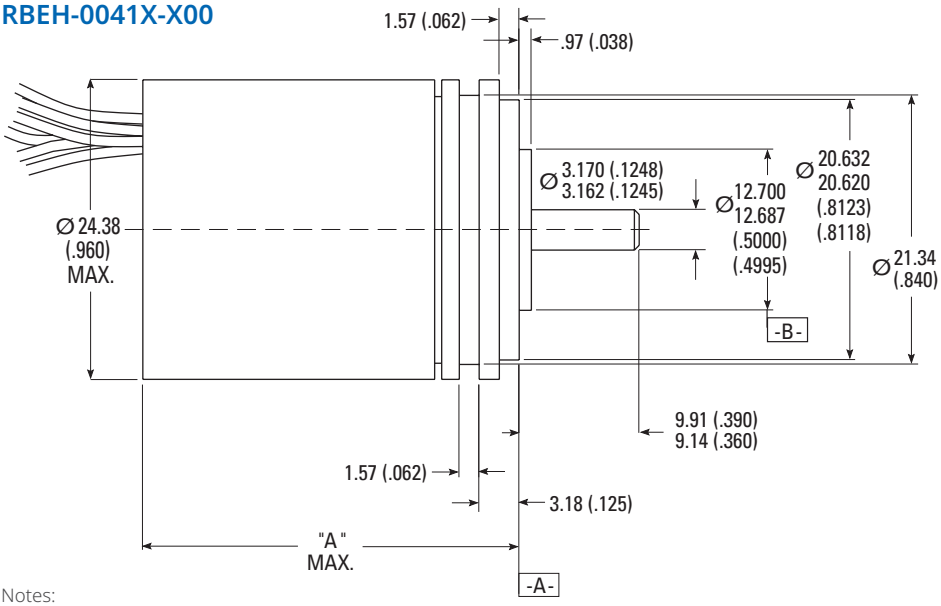
Model Number	"A" mm[inch]	"B" mm[inch]
RBE-00410	6.35 [0.250]	12.70 [0.500]
RBE-00411	12.70 [0.500]	19.05 [0.750]
RBE-00412	19.05 [0.750]	25.40 [1.000]

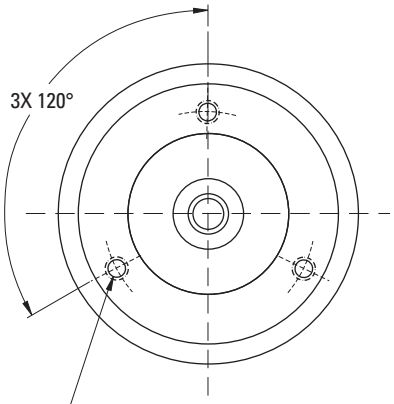
Tolerance ± 0010 on "A" Dimension

Notes:

1. For a C.W. rotation, as viewed from the lead end, energize per excitation sequence table.
2. V-AB, V-BC, and V-CA is back EMF of motor phases AB, BC, and CA respectively, aligned with sensor outputs as shown for C.W. rotation only.
3. Sensors optimized for bi-directional rotation.

RBEH-0041X-X00





Model Number	"A" mm[inch]
RBEH-00410	31.50 [1.240]
RBEH-00411	37.85 [1.490]
RBEH-00412	44.20 [1.740]

Notes:

1. Shaft end play: with a 1 lb. reversing load, the axial displacement shall be .015 - .152 (.0006 - .006).
2. For a C.C.W. rotation, as viewed from the pilot end, energize per excitation sequence table.
3. V-AB, V-BC, and V-CA is back EMF of motor phases AB, BC, and CA respectively, aligned with sensor outputs as shown for C.W. rotation only.

RBE(H)-0041x Leadwire Specifications

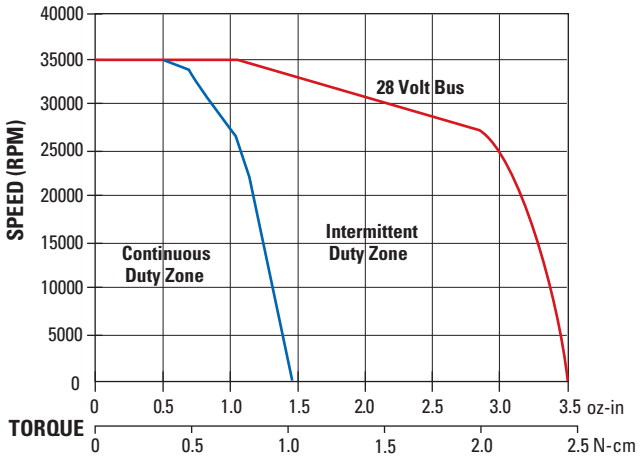
MOTOR LEADS: #26 AWG type "ET" Teflon® coated per MIL-W-16878, 3 leads, 152 mm [6.00 in] min. length ea., 1- Black, 1- White, 1-Red

SENSOR LEADS: #26 AWG type "ET" Teflon® coated per MIL-W-16878, 5 leads, 152 mm [6.00 in] min. length ea., 1-Yellow, 1-Green, 1-Orange, 1-Blue, 1-Brown.

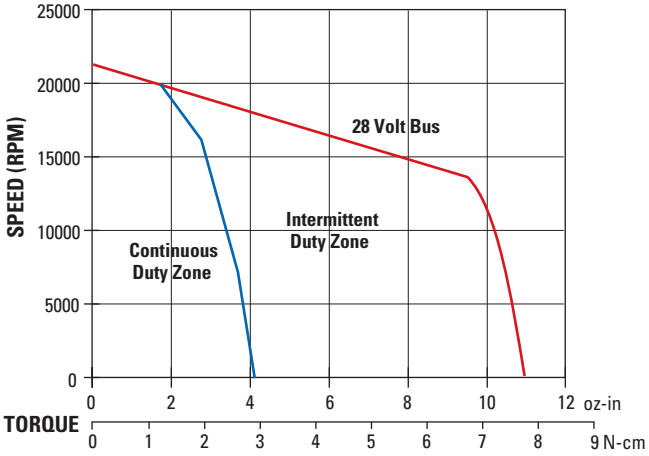
RBE 00410 Motor Series

RBE 00410 Motor Series Performance Curves

RBE-00410-A



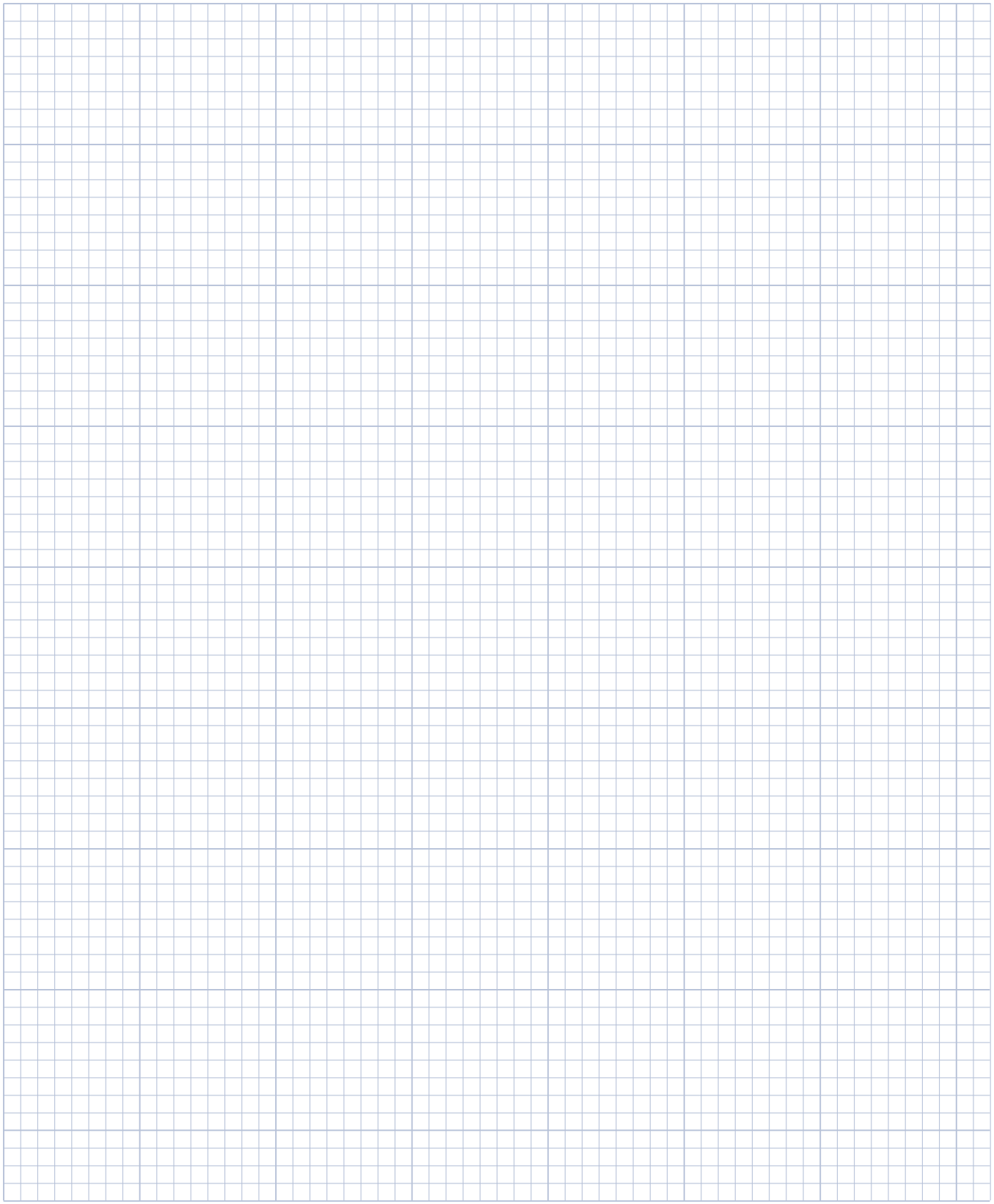
RBE-00412-A



Notes

RBE(H) – B 004 10 – A 00

Motor Series | Frame Size | Frame Size | Stack Length | Brake | Modifications



0.125 inch divisions

RBE 00510 Motor Series

RBE 00510 Motor Series Performance Data

RBE(H)-00510 to RBE(H)-00513

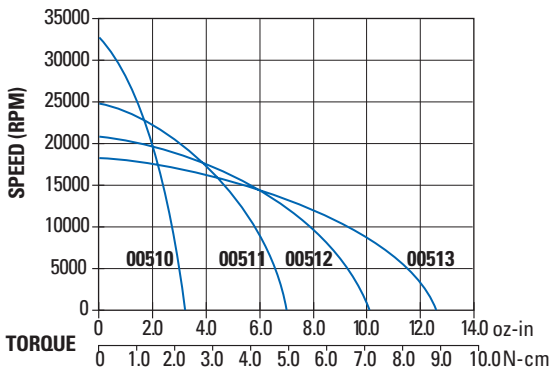
Motor Parameters	Symbols	Units	00510	00511	00512	00513
Max Cont. Output Power at 25°C amb.	HP Rated	HP	0.040	0.070	0.086	0.095
	P Rated	Watts	29	52	64	71
Speed at Rated Power	N Rated	RPM	20900	15700	13300	11700
Max Mechanical Speed	N Max	RPM	28000	28000	28000	28000
Continuous Stall Torque at 25°C amb.	Tc	oz-in	3.11	7.00	9.80	12.1
		N-m	0.0219	0.0494	0.0692	0.0854
Peak Torque	Tp	oz-in	7.05	15.8	24.4	32.1
		N-m	0.050	0.111	0.17	0.23
Max Torque for Linear KT	Tsl	oz-in	7.05	15.8	24.4	32.1
		N-m	0.050	0.111	0.172	0.227
Motor Constant	Tm	oz-in/ √W	1.00	1.91	2.53	3.03
		N-m/ √W	0.00704	0.0135	0.0179	0.0214
Thermal Resistance*	Rth	°C/Watt	6.23	5.20	4.75	4.51
Viscous Damping	Fi	oz-in/RPM	4.00E-05	6.63E-05	9.32E-05	1.20E-04
		N-m/RPM	2.83E-07	4.68E-07	6.58E-07	8.48E-07
Max Static Friction	Tf	oz-in	0.61	0.80	1.00	1.20
		N-m	0.0043	0.006	0.007	0.008
Max Cogging Torque Peak to Peak	Tcog	oz-in	0.38	0.55	0.73	0.90
		N-m	0.0027	0.0039	0.0051	0.0064
Frameless Motor Inertia	Jmf	oz-in-sec^2	4.50E-05	5.00E-05	5.60E-05	6.10E-05
		Kg-m^2	3.18E-07	3.53E-07	3.95E-07	4.31E-07
Frameless Motor Weight	Wtf	oz	1.3	2.0	2.6	3.3
		Kg	3.69E-02	5.55E-02	7.45E-02	9.36E-02
Housed Motor Inertia	Jmh	oz-in-sec^2	4.50E-05	5.00E-05	5.60E-05	6.10E-05
		Kg-m^2	3.18E-07	3.53E-07	3.95E-07	4.31E-07
Housed Motor Weight	Wth	oz	3.8	4.5	5.1	5.8
		Kg	1.08E-01	1.26E-01	1.45E-01	1.64E-01
No. of poles	P		6	6	6	6

*Rth assumes a housed motor mounted to a 3.25" x 3.25" x 0.25" aluminum heatsink or equivalent

			00510			00511			00512			00513		
Winding Constants	Symbols	Units	A	B	C	A	B	C	A	B	C	A	B	C
Current at Cont. Torque	Ic	Amps	3.18	2.52	3.85	3.09	2.45	3.74	4.43	3.50	2.89	4.16	3.28	2.71
Current at Peak Torque	Ip	Amps	6.55	5.19	8.26	6.55	5.19	8.26	10.4	8.26	6.55	10.4	8.26	6.55
Torque Sensitivity	Kt	oz-in/Amp	1.17	1.47	0.966	2.53	3.19	2.09	2.44	3.09	3.74	3.20	4.05	4.90
		N-m/Amp	0.0083	0.0104	0.0068	0.0179	0.0225	0.0147	0.0172	0.0218	0.0264	0.0226	0.0286	0.0346
Back EMF constant	Kb	V/KRPM	0.865	1.09	0.715	1.87	2.36	1.54	1.81	2.29	2.77	2.36	2.99	3.62
Motor Resistance	Rm	Ohms	1.38	2.19	0.891	1.75	2.78	1.13	0.931	1.466	2.27	1.11	1.75	2.71
Motor Inductance	Lm	mH	0.22	0.34	0.15	0.38	0.60	0.26	0.25	0.40	0.59	0.34	0.55	0.80

Continuous Duty Capability for 130°C Rise – RBE - 00510 Series

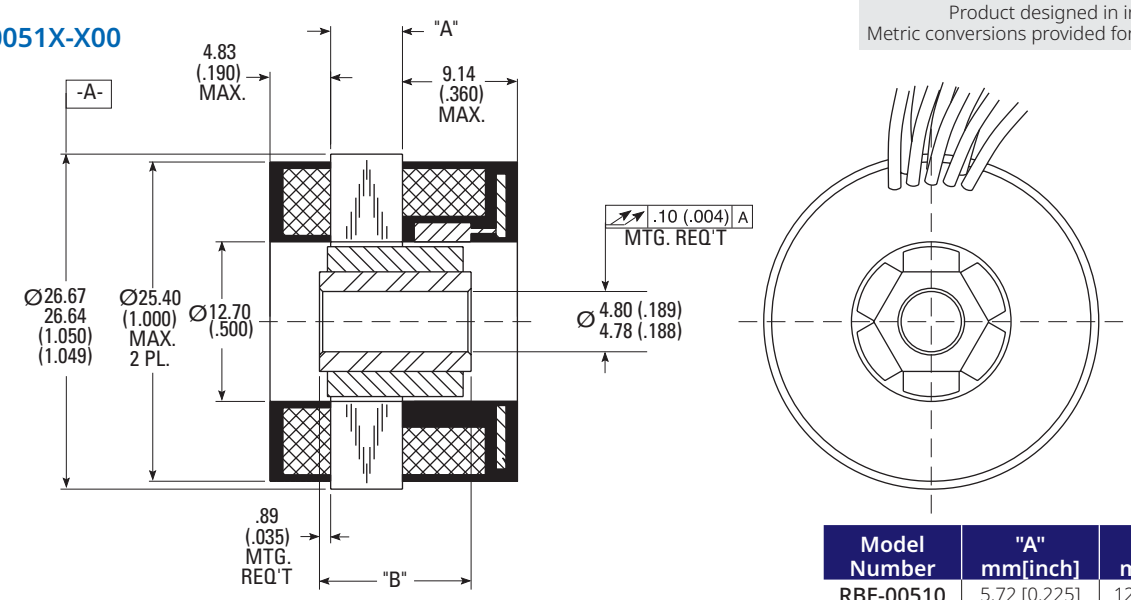
RBE(H)-00510 to RBE(H)-00513



RBE 00510 Motor Series Dimensional Drawings

Dimensions in mm [inches].
Product designed in inches.
Metric conversions provided for reference only.

RBE-0051X-X00



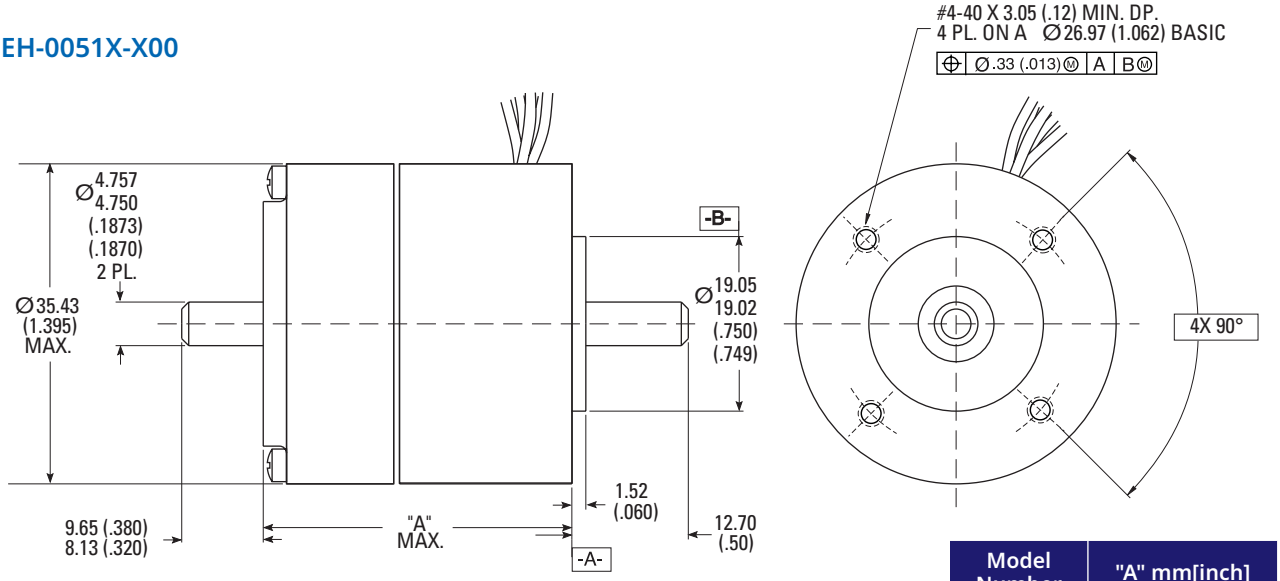
Model Number	"A" mm[inch]	"B" mm[inch]
RBE-00510	5.72 [0.225]	12.07 [0.475]
RBE-00511	12.19 [0.480]	18.54 [0.730]
RBE-00512	18.80 [0.740]	25.15 [0.990]
RBE-00513	25.4 [1.000]	31.75 [1.250]

Tolerance ± 0010 on "A" Dimension

Notes:

1. For a C.W. rotation, as viewed from the lead end, energize per excitation sequence table.
2. V-AB, V-BC, and V-CA is back EMF of motor phases AB, BC, and CA respectively, aligned with sensor outputs as shown for C.W. rotation only.

RBEH-0051X-X00



Model Number	"A" mm[inch]
RBEH-00510	34.29 [1.350]
RBEH-00511	40.77 [1.605]
RBEH-00512	47.37 [1.865]
RBEH-00513	53.98 [2.125]

Notes:

1. For a C.C.W. rotation, as viewed from the pilot end, energize per excitation sequence table.
2. V-AB, V-BC, and V-CA is back EMF of motor phases AB, BC, and CA respectively, aligned with sensor outputs as shown for C.W. rotation only.

RBE(H)-0051x Leadwire Specifications

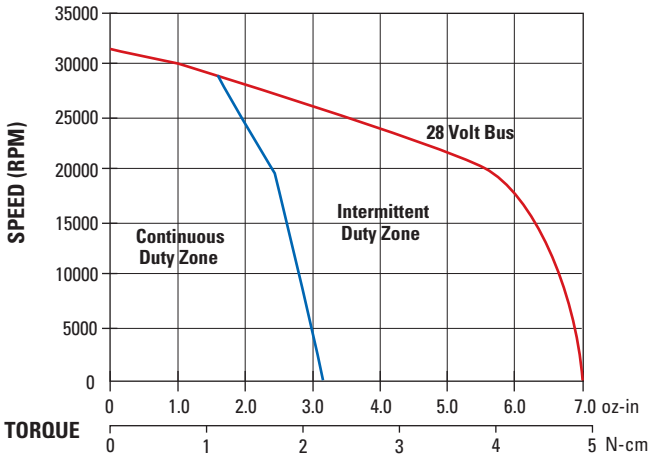
MOTOR LEADS: #26 AWG type "ET" Teflon® coated per MIL-W-22759/11, 3 leads, 152 mm [6.00 in] min. length ea., 1- Black, 1- White, 1-Red

SENSOR LEADS: #28 AWG type "ET" Teflon® coated per MIL-W-22759/11, 5 leads, 152 mm [6.00 in] min. length ea., 1-Yellow, 1-Green, 1-Orange, 1-Blue, 1-Brown.

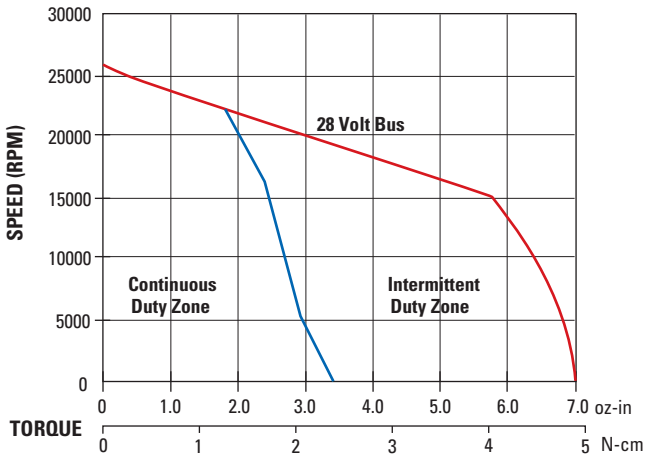
RBE 00510 Motor Series

RBE 00510 Motor Series Performance Curves

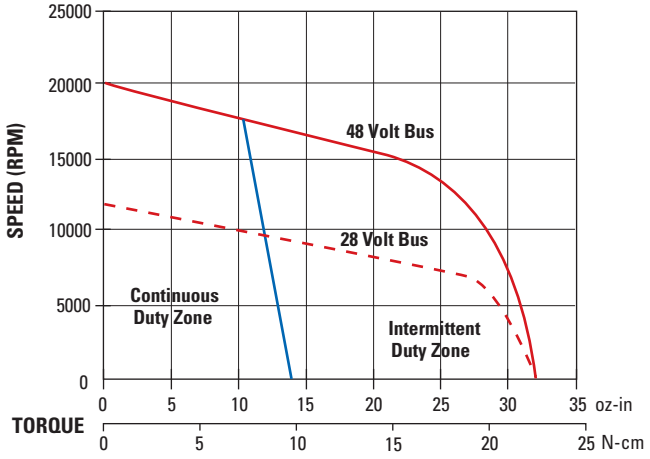
RBE-00510-A



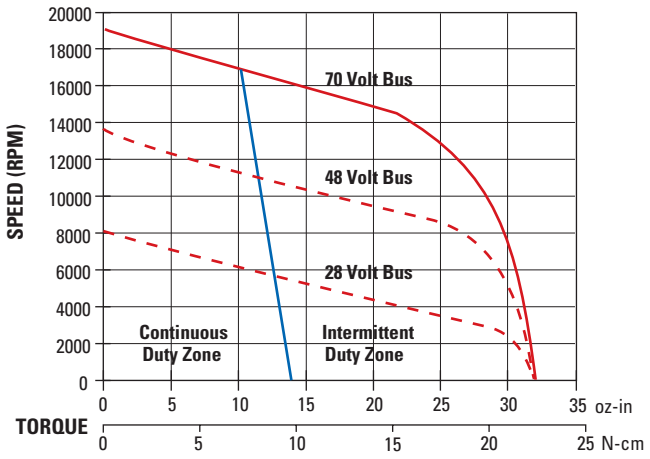
RBE-00510-B



RBE-00513-A



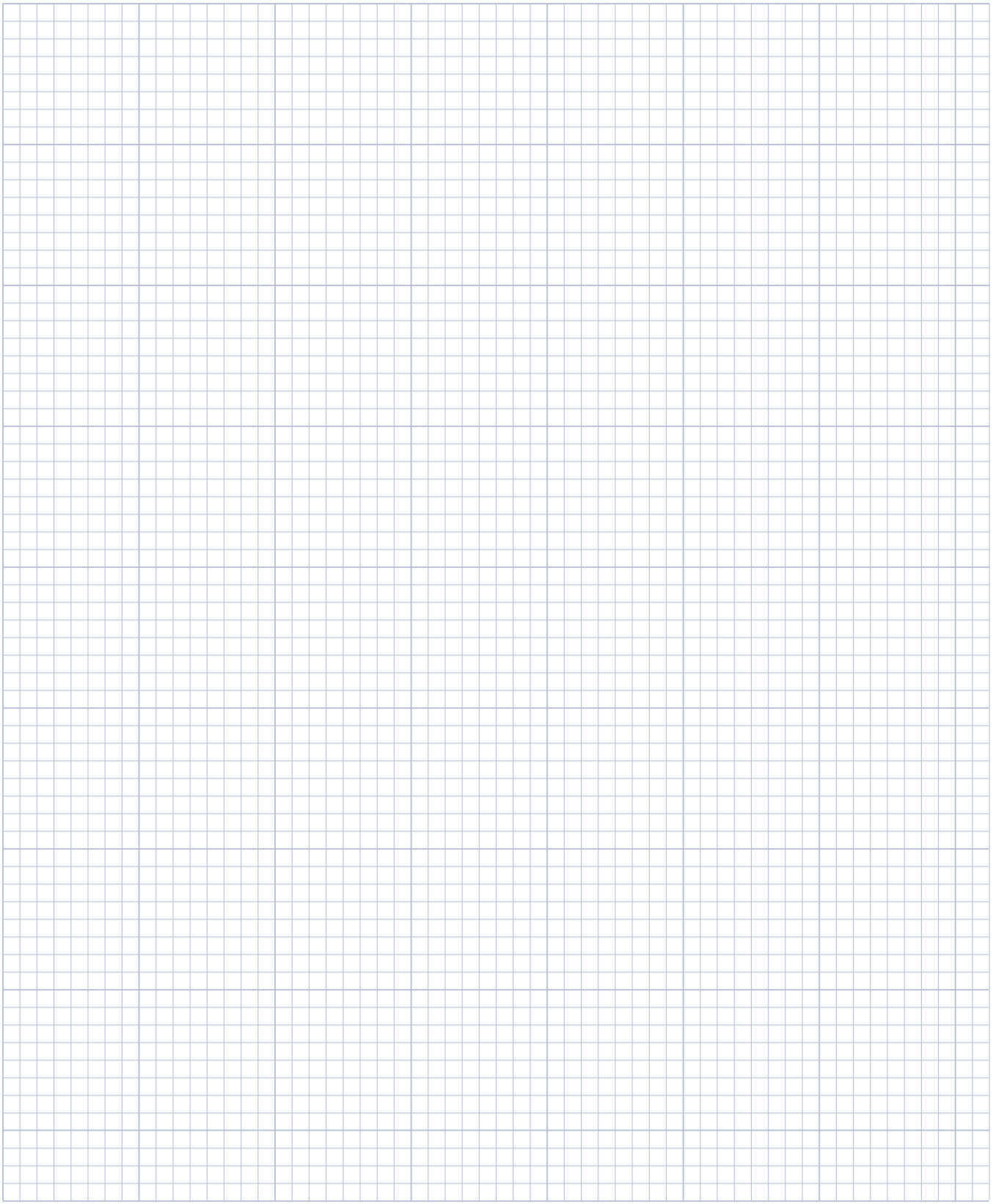
RBE-00513-C



Notes

RBE(H) – B 005 10 – A 00

Motor Series | Frame Size | Frame Size | Stack Length | Brake | Modifications



0.125 inch divisions

RBE 00710 Motor Series

RBE 0071x Motor Series Performance Data

RBE(H)-00710 to RBE(H)-00712

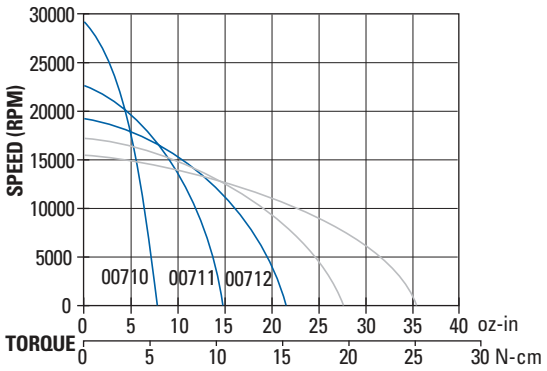
Motor Parameters		Symbols	Units	00710	00711	00712
Max Cont. Output Power at 25°C amb.		HP Rated	HP	0.0858	0.133	0.166
		P Rated	Watts	64	99	124
Speed at Rated Power		N Rated	RPM	17700	14110	12000
Max Mechanical Speed		N Max	RPM	20000	20000	20000
Continuous Stall Torque at 25°C amb.		Tc	oz-in	8.14	15.5	21.5
			N-m	0.057	0.109	0.152
Peak Torque		Tp	oz-in	22.7	43.8	63.3
			N-m	0.160	0.310	0.447
Max Torque for Linear KT		Tsl	oz-in	22.7	43.8	63.3
			N-m	0.160	0.310	0.447
Motor Constant		Tm	oz-in/ √W	2.36	4.05	5.38
			N-m/ √W	0.0166	0.029	0.038
Thermal Resistance*		Rth	°C/Watt	5.90	4.91	4.47
Viscous Damping		Fi	oz-in/RPM	4.40E-05	8.39E-05	1.20E-04
			N-m/RPM	3.11E-07	5.93E-07	8.49-E-07
Max Static Friction		Tf	oz-in	0.90	1.54	2.12
			N-m	0.0064	0.011	0.015
Max Cogging Torque Peak to Peak		Tcog	oz-in	0.75	1.38	1.95
			N-m	0.0053	0.0097	0.0137
Frameless Motor	Inertia	Jmf	oz-in-sec^2	1.30E-04	2.00E-04	2.80E-04
			Kg-m^2	9.18E-07	1.41E-06	1.98E-06
	Weight	Wtf	oz	2.8	4.4	5.8
			Kg	7.94E-02	1.24E-01	1.64E-01
Housed Motor	Inertia	Jmh	oz-in-sec^2	1.30E-04	2.00E-04	2.80E-04
			Kg-m^2	9.18E-07	1.41E-06	1.98E-06
	Weight	Wth	oz	7.8	9.3	11
			Kg	2.21E-01	2.65E-01	3.04E-01
No. of poles		P		6	6	6

*Rth assumes a housed motor mounted to a 3.25" x 3.25" x 0.25" aluminum heatsink or equivalent

			00710			00711			00712		
Winding Constants	Symbols	Units	A	B	C	A	B	C	A	B	C
Current at Cont. Torque	Ic	Amps	4.83	3.87	6.91	4.73	3.78	6.75	4.56	3.65	6.51
Current at Peak Torque	Ip	Amps	12.6	9.99	17.8	12.6	10.0	17.8	12.6	10.0	17.8
Torque Sensitivity	Kt	oz-in/Amp	1.87	2.34	1.31	3.60	4.50	2.52	5.19	6.49	3.63
		N-m/Amp	0.0132	0.0165	0.0092	0.0254	0.0318	0.0178	0.0367	0.0458	0.0257
Back EMF constant	Kb	V/KRPM	1.38	1.73	0.968	2.66	3.33	1.86	3.84	4.80	2.69
Motor Resistance	Rm	Ohms	0.629	0.991	0.311	0.790	1.24	0.390	0.933	1.47	0.461
Motor Inductance	Lm	mH	0.19	0.30	0.095	0.37	0.57	0.18	0.54	0.84	0.26

Continuous Duty Capability for 130°C Rise – RBE - 0071x Series

RBE(H)-00710 to RBE(H)-00712



RBE 0071x Motor Series Performance Data - Continued

RBE(H)-00713 to RBE(H)-00714

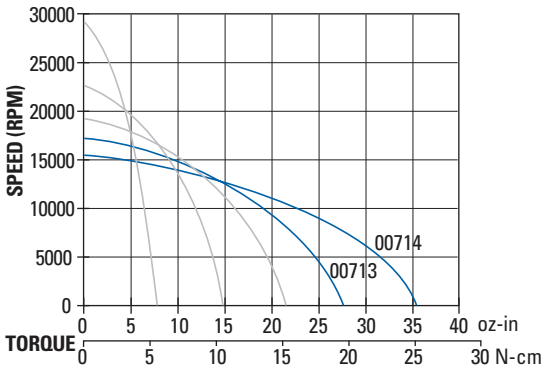
Motor Parameters		Symbols	Units	00713	00714
Max Cont. Output Power at 25°C amb.		HP Rated	HP	0.189	0.225
		P Rated	Watts	141	168
Speed at Rated Power		N Rated	RPM	10800	9750
Max Mechanical Speed		N Max	RPM	20000	20000
Continuous Stall Torque at 25°C amb.		Tc	oz-in	27.6	35.3
			N-m	0.195	0.249
Peak Torque		Tp	oz-in	84.5	114
			N-m	0.597	0.802
Max Torque for Linear KT		Tsl	oz-in	84.5	114
			N-m	0.597	0.802
Motor Constant		Tm	oz-in/ √W	6.67	8.25
			N-m/ √W	0.047	0.058
Thermal Resistance*		Rth	°C/Watt	4.19	3.94
Viscous Damping		Fi	oz-in/RPM	1.56E-04	2.00E-04
			N-m/RPM	1.11E-06	1.41E-06
Max Static Friction		Tf	oz-in	2.70	3.40
			N-m	0.019	0.024
Max Cogging Torque Peak to Peak		Tcog	oz-in	2.52	3.20
			N-m	0.0178	0.023
Frameless Motor	Inertia	Jmf	oz-in-sec^2	3.50E-04	4.40E-04
			Kg-m^2	2.47E-06	3.11E-06
	Weight	Wtf	oz	7.2	8.9
			Kg	2.04E-01	2.52E-01
Housed Motor	Inertia	Jmh	oz-in-sec^2	3.60E-04	4.50E-04
			Kg-m^2	2.54E-06	3.18E-06
	Weight	Wth	oz	12	14
			Kg	3.44E-01	3.91E-01
No. of poles		P		6	6

*Rth assumes a housed motor mounted to a 3.25" x 3.25" x 0.25" aluminum heatsink or equivalent

			00713			00714		
Winding Constants	Symbols	Units	A	B	C	A	B	C
Current at Cont. Torque	Ic	Amps	4.38	3.51	6.26	4.68	3.37	6.02
Current at Peak Torque	Ip	Amps	12.6	10.0	17.8	14.2	10.0	17.8
Torque Sensitivity	Kt	oz-in/Amp	6.92	8.65	4.85	8.26	11.5	6.43
		N-m/Amp	0.0489	0.0611	0.0342	0.0584	0.0810	0.0454
Back EMF constant	Kb	V/KRPM	5.12	6.40	3.58	6.11	8.49	4.75
Motor Resistance	Rm	Ohms	1.08	1.70	0.533	1.00	1.97	0.618
Motor Inductance	Lm	mH	0.72	1.1	0.35	0.76	1.5	0.46

Continuous Duty Capability for 130°C Rise – RBE - 0071x Series

RBE(H)-00713 to RBE(H)-00714

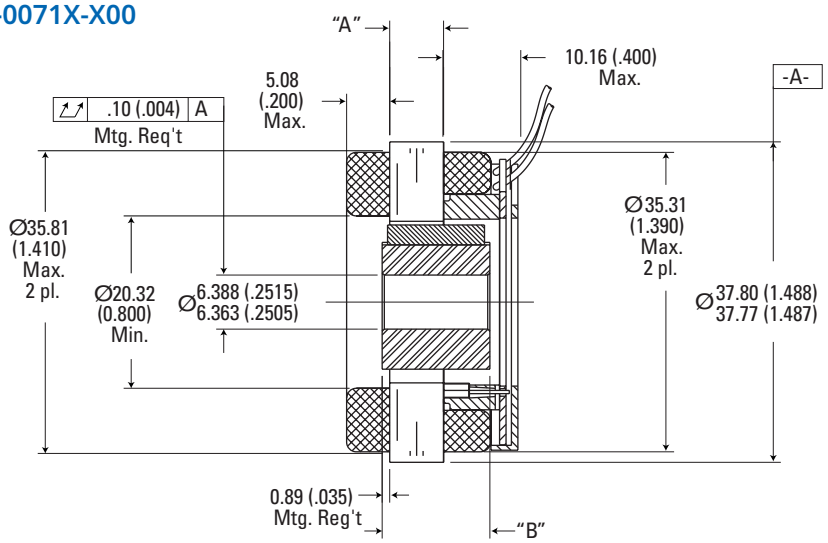


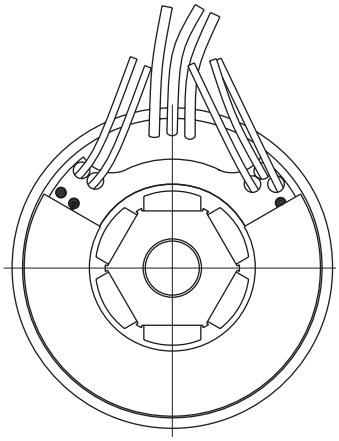
RBE 00710 Motor Series

RBE 00710 Motor Series Dimensional Drawings

Dimensions in mm [inches].
Product designed in inches.
Metric conversions provided for reference only.

RBE-0071X-X00





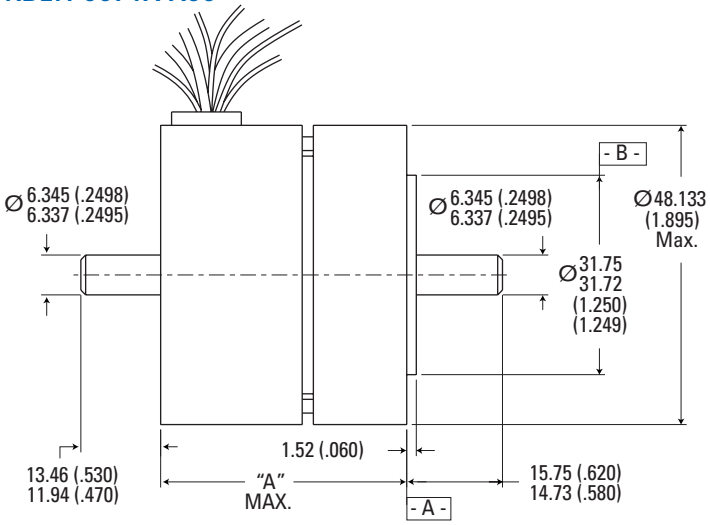
Model Number	"A" mm[inch]	"B" mm[inch]
RBE-00710	6.35 [0.250]	12.70 [0.500]
RBE-00711	12.70 [0.500]	19.05 [0.750]
RBE-00712	19.05 [0.750]	25.40 [1.000]
RBE-00713	25.40 [1.000]	31.75 [1.250]
RBE-00714	33.02 [1.300]	39.37 [1.550]

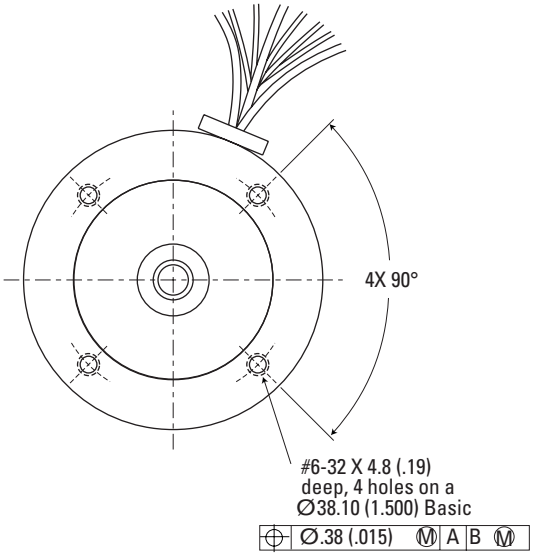
Tolerance ± .010 on "A" Dimension

Notes:

1. For a C.W. rotation, as viewed from the lead end, energize per excitation sequence table.
2. V-AB, V-BC, and V-CA is back EMF of motor phases AB, BC, and CA respectively, aligned with sensor outputs as shown for C.W. rotation only.
3. Mounting surface is between Ø 35.81 (1.410) and Ø 37.80 (1.488) on both sides.

RBEH-0071X-X00





Notes:

1. Shaft end play: with a 6 lb. reversing load, the axial displacement shall be .013 - .15 (.0005 - .006).
2. For a C.C.W. rotation, as viewed from the pilot end, energize per excitation sequence table.
3. V-AB, V-BC, and V-CA is back EMF of motor phases AB, BC, and CA respectively, aligned with sensor outputs as shown for C.W. rotation only.

Model Number	"A" mm[inch]
RBEH-00710	39.38 [1.568]
RBEH-00711	46.18 [1.818]
RBEH-00712	52.53 [2.068]
RBEH-00713	58.88 [2.318]
RBEH-00714	66.500 [2.618]

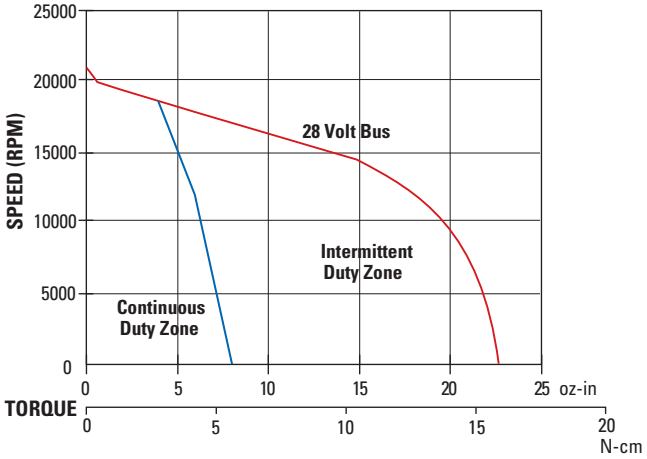
RBE(H)-0071x Leadwire Specifications

MOTOR LEADS: #24 AWG type "ET" Teflon® coated per MIL-W-22759/11, 3 leads, 152 mm [6.00 in] min. length ea., 1- Black, 1- White, 1-Red

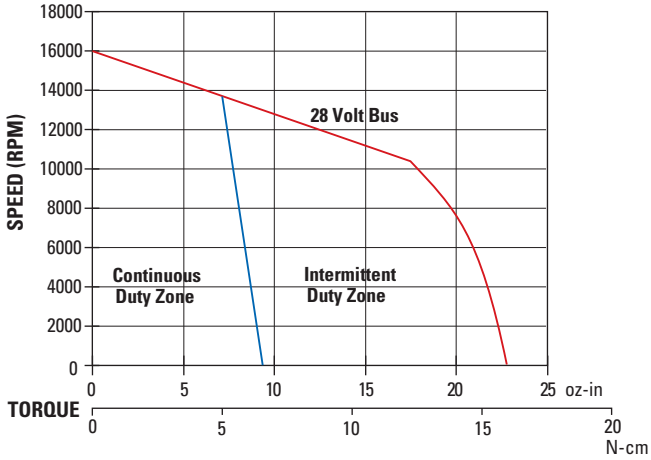
SENSOR LEADS: #26 AWG type "ET" Teflon® coated per MIL-W-22759/11, 5 leads, 152 mm [6.00 in] min. length ea., 1-Yellow, 1-Green, 1-Orange, 1-Blue, 1-Brown.

RBE 00710 Motor Series Performance Curves

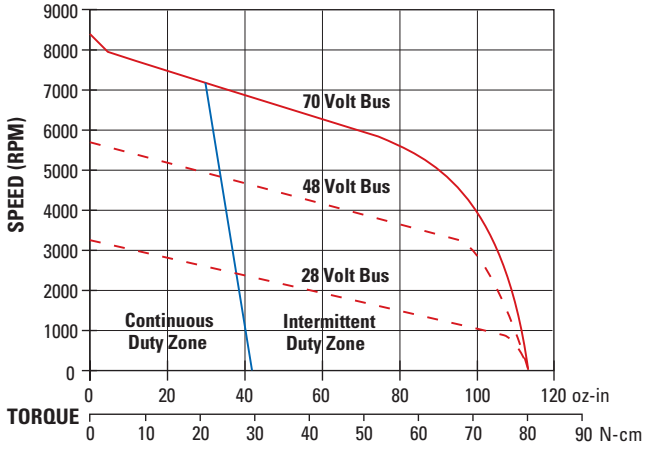
RBE-00710-A



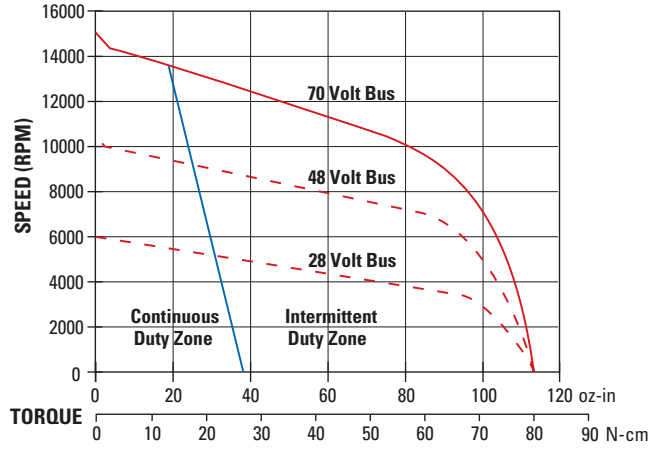
RBE-00710-B



RBE-00714-B



RBE-00714-C

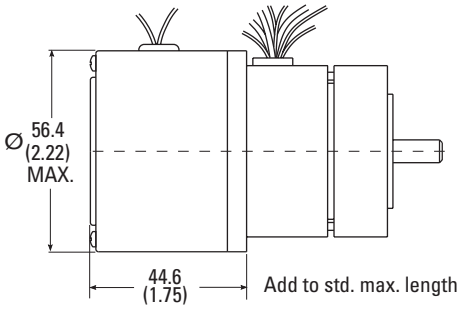


RBE 00710 Motor Series

RBE 00710 Motor Series Options

Dimensions in mm [inches].
Product designed in inches.
Metric conversions provided for reference only.

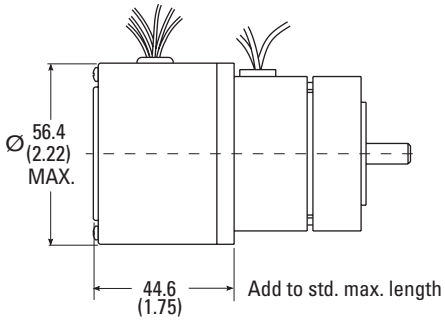
BRAKE OPTION



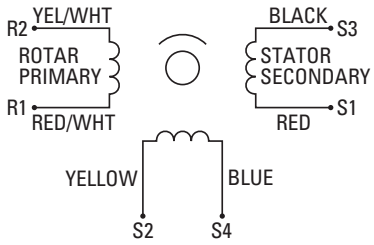
An integral electromagnetic fail-safe brake can be added to the rear of the motor. Operating in the POWER OFF/BRAKE ON mode, the brake provides 48 oz-in of torque for static parking and emergency braking. To release the brake, 24 VDC and 0.13 Amps max need to be applied.

- Fail-safe brake
- 48 oz-in holding torque
- Release voltage of 24 VDC (0.13 Amps)

RESOLVER OPTION



A frameless resolver is available to provide position feedback computable with a wide variety of CNC and other position loop controllers. This option is required for commutation when using a Kollmorgen servo drive or other resolver based controller.



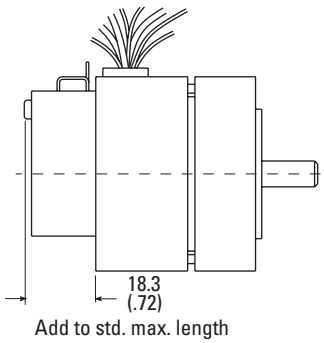
RESOLVER SCHEMATIC

PHASING EQUATIONS
E(S1-S3) = KE(R1-R2) COS Ø
E(S2-S4) = -KE(R1-R2) SIN Ø
WITH CCW ROTATION AS
VIEWED FROM SHAFT END

Normal Characteristics At 25 °C

Primary	Rotor
Input Voltage	4.25 V, 7 kHz
Input Current	55 mA max.
Input Power	0.12 W
Transformation Ratio (± 5%)	0.470
Phase Shift	4° Leading ±3°
Impedances (± 15%)	
Z_{RO}	48 + j70
Z_{SO}	62 + j80
Z_{SS}	53 + j63
Z_{RS}	42 + j55
D.C. Resistance (± 10%)	
Stator	33 Ohm
Rotor	16 Ohm
Null Voltage	20 mV max.
Electrical Error	±7 min. max.
Output Voltage	2.0 V ±5%
Operating Temperature	-55 °C to +155 °C

ENCODER OPTION



An incremental encoder is available having TTL quadrature and marker pulse outputs. 96 to 1024 lines are available. The standard is 512 lines with the marker pulse.

Parameter	Min	Max	Units
Temperature	-40	100	°C
Supply Voltage	4.5	5.5	Volts
Supply Current	30	85	mA
Count Frequency		100	kHz
Velocity		30K	RPM

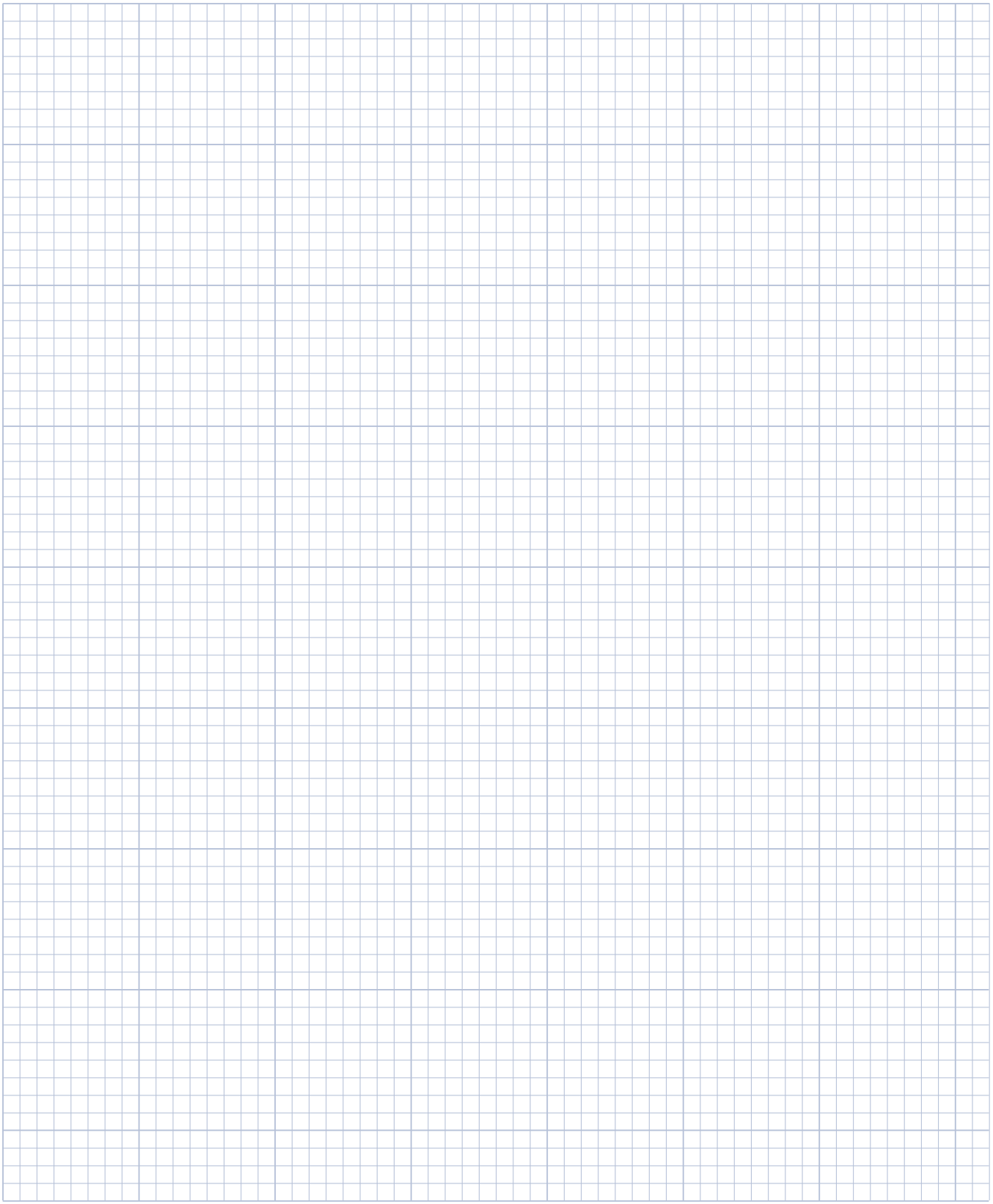
Resolution Cycles/Rev.
096
100
200
250
256
360
400
500
512
540*
1000*
1024*

*Index option not yet available for resolution

Notes

RBE(H) – B 007 10 – A 00

Motor Series | Frame Size | Frame Size | Stack Length | Brake | Modifications



0.125 inch divisions

RBE 01210 Motor Series

RBE 0121x Motor Series Performance Data

RBE(H)-01210 to RBE(H)-01212

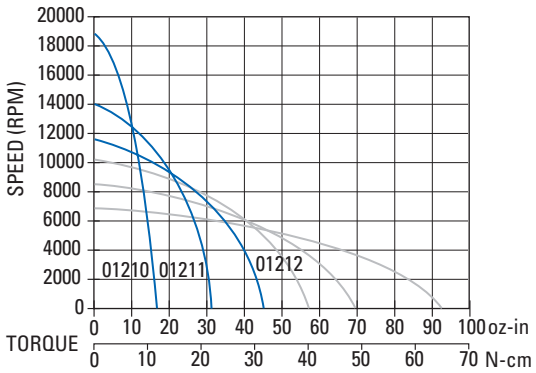
Motor Parameters		Symbols	Units	01210	01211	01212
Max Cont. Output Power at 25°C amb.		HP Rated	HP	0.142	0.204	0.243
		P Rated	Watts	106	152	181
Speed at Rated Power		N Rated	RPM	13800	9680	8100
Max Mechanical Speed		N Max	RPM	18000	18000	18000
Continuous Stall Torque at 25°C amb.		Tc	oz-in	16.4	31.6	43.5
			N-m	0.115	0.223	0.307
Peak Torque		Tp	oz-in	48.4	114	168
			N-m	0.342	0.806	1.18
Max Torque for Linear KT		Tsl	oz-in	48.4	114	168
			N-m	0.342	0.806	1.18
Motor Constant		Tm	oz-in/ √W	4.00	7.12	9.50
			N-m/ √W	0.028	0.050	0.067
Thermal Resistance*		Rth	°C/Watt	4.25	3.86	3.68
Viscous Damping		Fi	oz-in/RPM	1.30E-04	2.96E-04	4.46E-04
			N-m/RPM	9.18E-07	2.09E-06	3.15E-06
Max Static Friction		Tf	oz-in	1.70	2.13	2.53
			N-m	0.0120	0.015	0.018
Max Cogging Torque Peak to Peak		Tcog	oz-in	0.41	0.66	0.88
			N-m	0.0029	0.0046	0.0062
Frameless Motor	Inertia	Jmf	oz-in-sec^2	7.30E-04	1.20E-03	1.70E-03
			Kg-m^2	5.15E-06	8.47E-06	1.20E-05
	Weight	Wtf	oz	4.5	7.2	9.6
			Kg	1.26E-01	2.03E-01	2.74E-01
Housed Motor	Inertia	Jmh	oz-in-sec^2	7.60E-04	1.30E-03	1.80E-03
			Kg-m^2	5.37E-06	9.18E-06	1.27E-05
	Weight	Wth	oz	11.3	14.2	16.8
			Kg	3.20E-01	4.02E-01	4.77E-01
No. of poles		P		8	8	8

*Rth assumes a housed motor mounted to a 4.0" x 3.75" x 0.25" aluminum heatsink or equivalent

			01210			01211			01212		
Winding Constants	Symbols	Units	A	B	C	A	B	C	A	B	C
Current at Cont. Torque	Ic	Amps	5.41	3.89	6.95	5.81	3.63	9.06	5.42	3.38	8.45
Current at Peak Torque	Ip	Amps	15.0	10.6	18.9	20.0	10.6	26.8	20.0	10.6	26.8
Torque Sensitivity	Kt	oz-in/Amp	3.34	4.64	2.60	5.80	9.30	3.72	8.49	13.6	5.45
		N-m/Amp	0.0236	0.0328	0.0183	0.0410	0.0657	0.0263	0.0600	0.0962	0.0385
Back EMF constant	Kb	V/KRPM	2.47	3.43	1.92	4.29	6.88	2.75	6.28	10.1	4.03
Motor Resistance	Rm	Ohms	0.698	1.38	0.431	0.664	1.75	0.276	0.803	2.11	0.334
Motor Inductance	Lm	mH	0.280	0.54	0.17	0.32	0.83	0.13	0.44	1.1	0.18

Continuous Duty Capability for 130°C Rise – RBE - 01210 Series

RBE(H)-01210 to RBE(H)-01212



RBE 0121x Motor Series Performance Data - Continued

RBE(H)-01213 to RBE(H)-01215

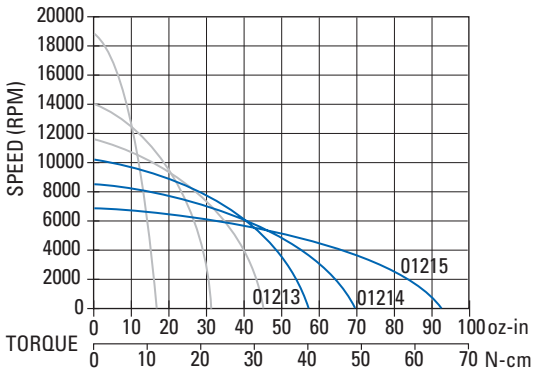
Motor Parameters		Symbols	Units	01213	01214	01215
Max Cont. Output Power at 25°C amb.		HP Rated	HP	0.272	0.290	0.310
		P Rated	Watts	203	216	231
Speed at Rated Power		N Rated	RPM	7152	6230	5100
Max Mechanical Speed		N Max	RPM	18000	18000	18000
Continuous Stall Torque at 25°C amb.		Tc	oz-in	54.8	66.2	90.4
			N-m	0.387	0.467	0.639
Peak Torque		Tp	oz-in	222	282	435
			N-m	1.57	1.99	3.07
Max Torque for Linear KT		Tsl	oz-in	222	282	435
			N-m	1.57	1.99	3.07
Motor Constant		Tm	oz-in/ √W	11.7	13.9	18.4
			N-m/ √W	0.083	0.098	0.130
Thermal Resistance*		Rth	°C/Watt	3.55	3.44	3.27
Viscous Damping		Fi	oz-in/RPM	5.97E-04	7.78E-04	1.20E-03
			N-m/RPM	4.22E-06	5.49E-06	8.48E-06
Max Static Friction		Tf	oz-in	2.92	3.40	4.50
			N-m	0.021	0.024	0.032
Max Cogging Torque Peak to Peak		Tcog	oz-in	1.10	1.37	2.00
			N-m	0.0078	0.0097	0.014
Frameless Motor	Inertia	Jmf	oz-in-sec^2	2.10E-03	2.70E-03	4.00E-03
			Kg-m^2	1.48E-05	1.91E-05	2.82E-05
	Weight	Wtf	oz	12.1	15.1	22.0
			Kg	3.44E-01	4.28E-01	6.24E-01
Housed Motor	Inertia	Jmh	oz-in-sec^2	2.20E-03	2.80E-03	4.20E-03
			Kg-m^2	1.55E-05	1.98E-05	2.97E-05
	Weight	Wth	oz	19.5	22.6	30.0
			Kg	5.52E-01	6.41E-01	8.50E-01
No. of poles		P		8	8	8

*Rth assumes a housed motor mounted to a 4.0" x 3.75" x 0.25" aluminum heatsink or equivalent

			01213			01214			01215		
Winding Constants	Symbols	Units	A	B	C	A	B	C	A	B	C
Current at Cont. Torque	Ic	Amps	5.77	4.00	8.88	6.15	3.73	8.61	5.46	3.31	7.64
Current at Peak Torque	Ip	Amps	22.5	13.4	30.1	25.3	13.4	35.8	25.3	13.4	35.8
Torque Sensitivity	Kt	oz-in/Amp	10.0	14.5	6.50	11.3	18.7	8.08	17.4	28.7	12.4
		N-m/Amp	0.0707	0.102	0.0459	0.0799	0.132	0.0571	0.123	0.203	0.0878
Back EMF constant	Kb	V/KRPM	7.41	10.7	4.81	8.36	13.8	5.97	12.9	21.2	9.19
Motor Resistance	Rm	Ohms	0.733	1.55	0.307	0.666	1.82	0.336	0.890	2.43	0.450
Motor Inductance	Lm	mH	0.47	0.97	0.20	0.48	1.3	0.25	0.71	1.9	0.36

Continuous Duty Capability for 130°C Rise – RBE - 01210 Series

RBE(H)-01213 to RBE(H)-01215

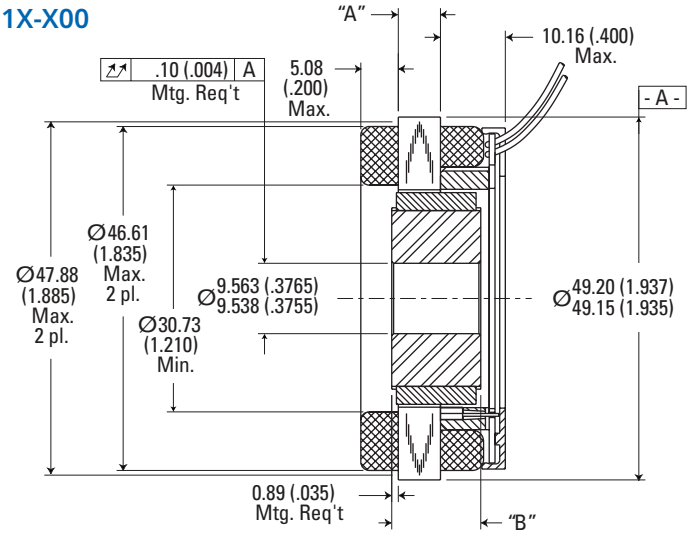


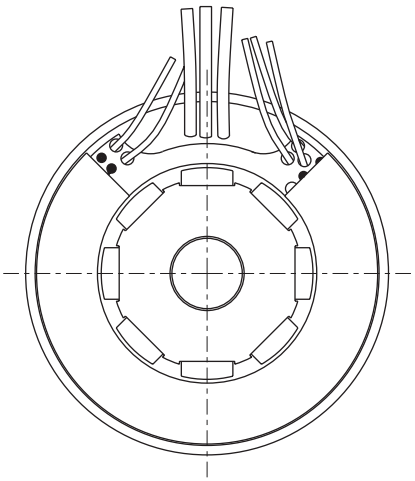
RBE 01210 Motor Series

RBE 01210 Motor Series Dimensional Drawings

Dimensions in mm [inches].
Product designed in inches.
Metric conversions provided for reference only.

RBE-0121X-X00





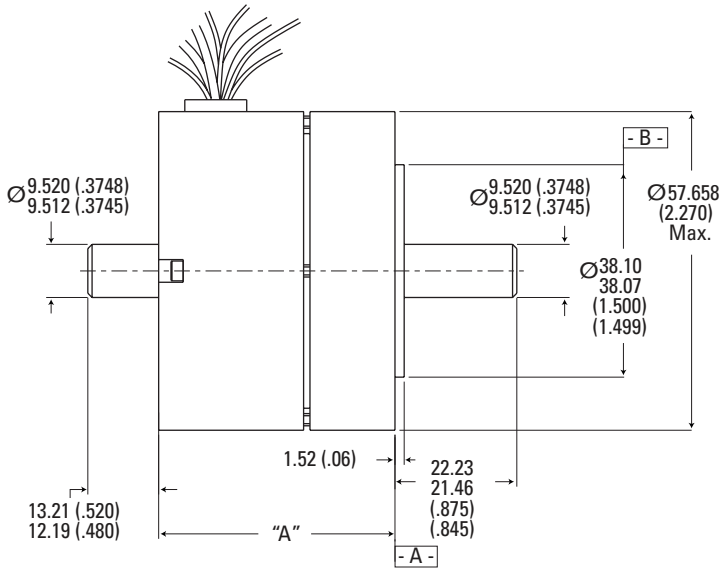
Model Number	"A" mm[inch]	"B" mm[inch]
RBE-01210	5.72 [0.225]	12.07 [0.475]
RBE-01211	12.70 [0.500]	19.05 [0.750]
RBE-01212	19.05 [0.750]	25.40 [1.000]
RBE-01213	25.40 [1.000]	31.75 [1.250]
RBE-01214	33.02 [1.300]	39.37 [1.550]
RBE-01215	50.80 [2.000]	57.15 [2.250]

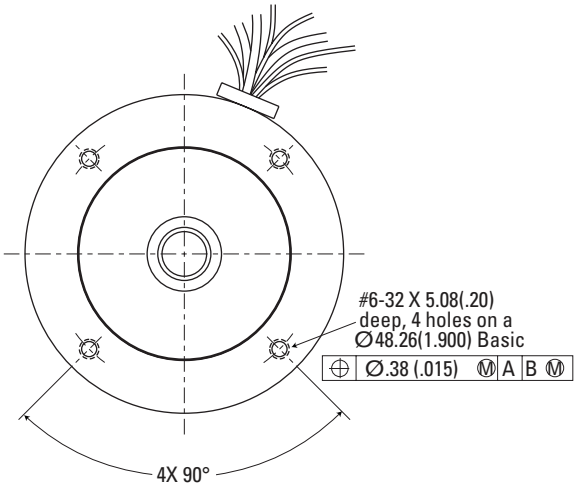
Tolerance ± .010 on "A" Dimension

Notes:

1. For a C.W. rotation, as viewed from the lead end, energize per excitation sequence table.
2. V-AB, V-BC, and V-CA is back EMF of motor phases AB, BC, and CA respectively, aligned with sensor outputs as shown for C.W. rotation only.
3. Mounting surface is between Ø 47.88 (1.885) and Ø 49.17 (1.936) on both sides.

RBEH-0121X-X00





Model Number	"A" mm[inch]
RBEH-01210	43.05 [1.695]
RBEH-01211	50.04 [1.970]
RBEH-01212	56.39 [2.220]
RBEH-01213	62.74 [2.470]
RBEH-01214	70.36 [2.770]
RBEH-01215	88.14 [3.470]

Notes:

1. Shaft end play: with a 9 lb. reversing load, the axial displacement shall be .013 - .15 (.0005 - .006).
2. For a C.C.W. rotation, as viewed from the pilot end, energize per excitation sequence table.
3. V-AB, V-BC, and V-CA is back EMF of motor phases AB, BC, and CA respectively, aligned with sensor outputs as shown for C.W. rotation only.

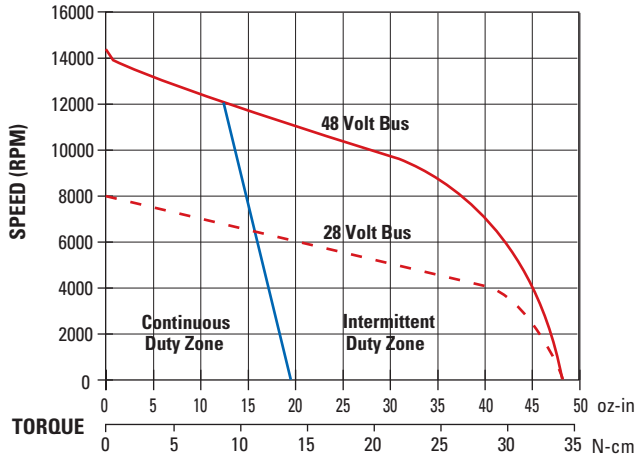
RBE(H)-0121x Leadwire Specifications

MOTOR LEADS: #20 AWG type "ET" Teflon® coated per MIL-W-22759/11, 3 leads, 152 mm [6.00 in] min. length ea., 1- Black, 1- White, 1-Red

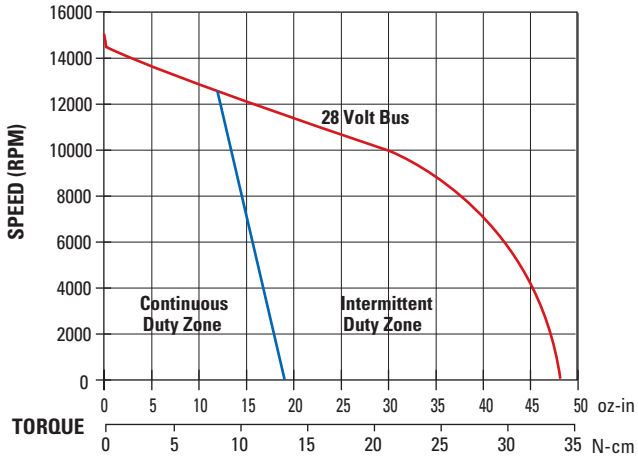
SENSOR LEADS: #26 AWG type "ET" Teflon® coated per MIL-W-16878, 5 leads, 152 mm [6.00 in] min. length ea., 1-Yellow, 1-Green, 1-Orange, 1-Blue, 1-Brown.

RBE 01210 Motor Series Performance Curves

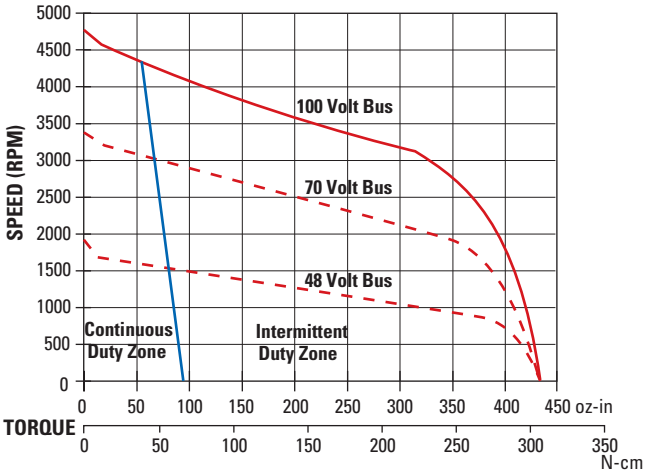
RBE-01210-B



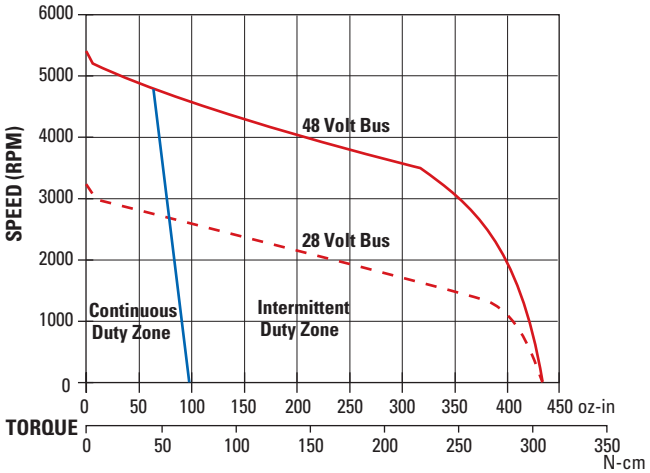
RBE-01210-C



RBE-01215-B



RBE-01215-C

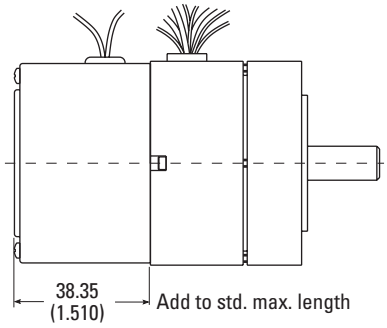


RBE 01210 Motor Series

RBE 01210 Motor Series Options

Dimensions in mm [inches].
Product designed in inches.
Metric conversions provided for reference only.

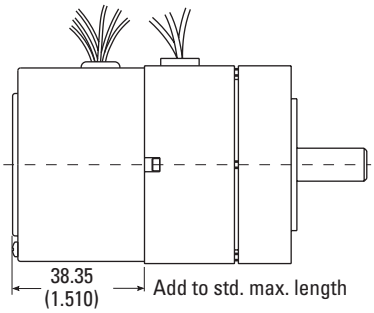
BRAKE OPTION



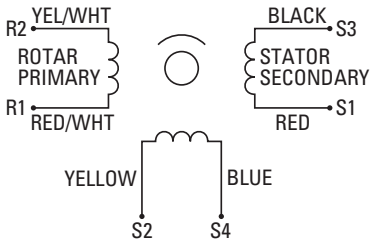
An integral electromagnetic fail-safe brake can be added to the rear of the motor. Operating in the POWER OFF/BRAKE ON mode, the brake provides 48 oz-in of torque for static parking and emergency braking. To release the brake, 24 VDC and 0.13 Amps max need to be applied.

- Fail-safe brake
- 48 oz-in holding torque
- Release voltage of 24 VDC (0.13 Amps)

RESOLVER OPTION



A frameless resolver is available to provide position feedback computable with a wide variety of CNC and other position loop controllers. This option is required for commutation when using a Kollmorgen servo drive or other resolver based controller.



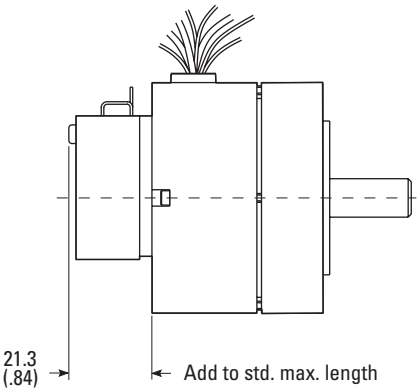
RESOLVER SCHEMATIC

PHASING EQUATIONS
E(S1-S3) = KE(R1-R2) COS Ø
E(S2-S4) = -KE(R1-R2) SIN Ø
WITH CCW ROTATION AS
VIEWED FROM SHAFT END

Normal Characteristics At 25 °C

Primary	Rotor
Input Voltage	4.25 V, 7 kHz
Input Current	55 mA max.
Input Power	0.12 W
Transformation Ratio (± 5%)	0.470
Phase Shift	4° Leading ±3°
Impedances (± 15%)	
Z_{RO}	48 + j70
Z_{SO}	62 + j80
Z_{SS}	53 + j63
Z_{RS}	42 + j55
D.C. Resistance (± 10%)	
Stator	33 Ohm
Rotor	16 Ohm
Null Voltage	20 mV max.
Electrical Error	±7 min. max.
Output Voltage	2.0 V ±5%
Operating Temperature	-55 °C to +155 °C

ENCODER OPTION



An incremental encoder is available having TTL quadrature and marker pulse outputs. 200 to 2048 lines are available. The standard is 1024 lines with the marker pulse.

Parameter	Min	Max	Units
Temperature	-40	100	°C
Supply Voltage	4.5	5.5	Volts
Supply Current	30	85	mA
Count Frequency		100	kHz
Velocity		10K	RPM

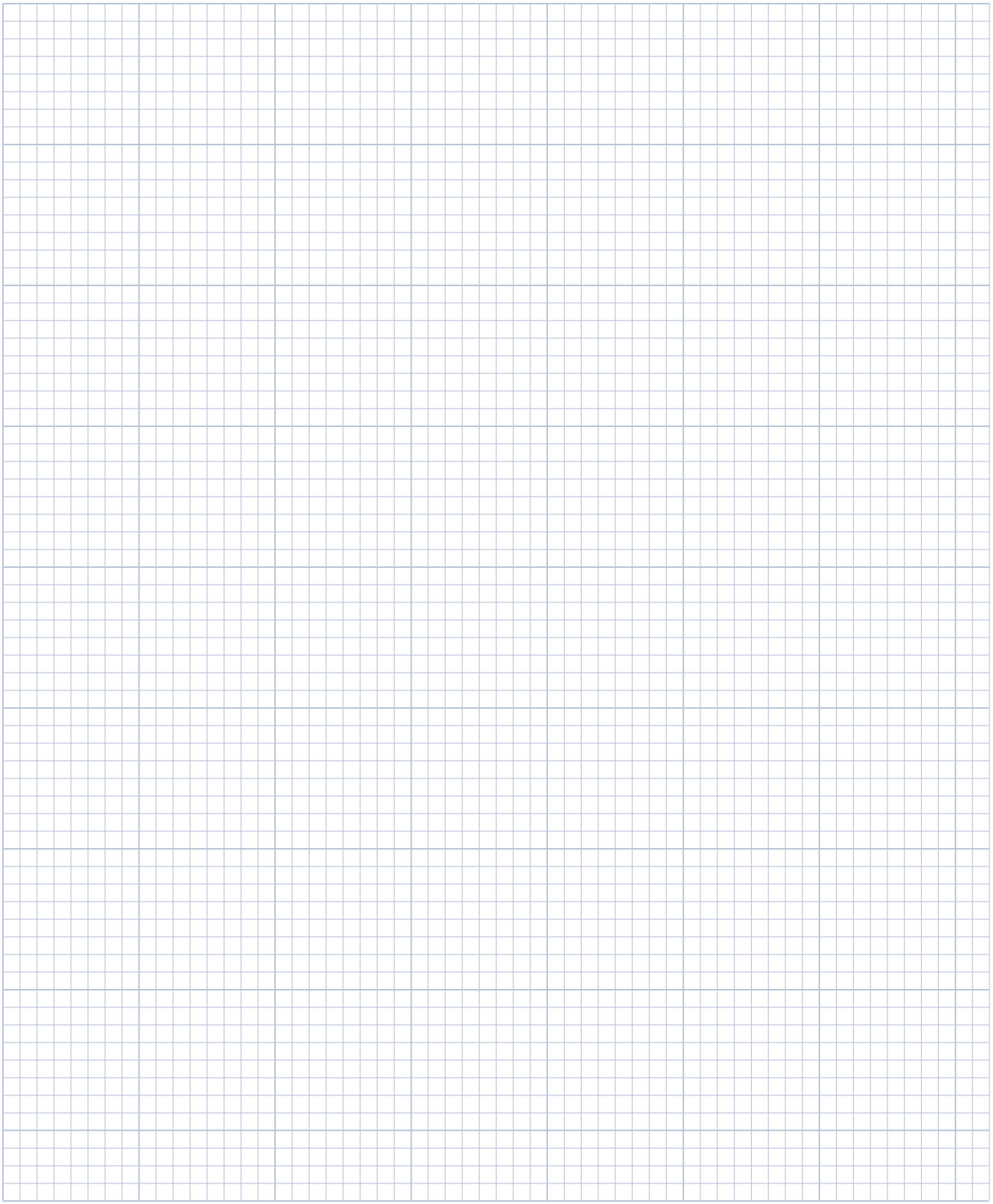
Resolution Cycles/Rev.
200
250
500
1000
1024
2000*
2048*

*Index option not yet available for resolution

Notes

RBE(H) – B 012 10 – A 00

Motor Series | Frame Size | Frame Size | Stack Length | Brake | Modifications



0.125 inch divisions

RBE 01510 Motor Series

RBE 0151x Motor Series Performance Data

RBE(H)-01510 to RBE(H)-01513

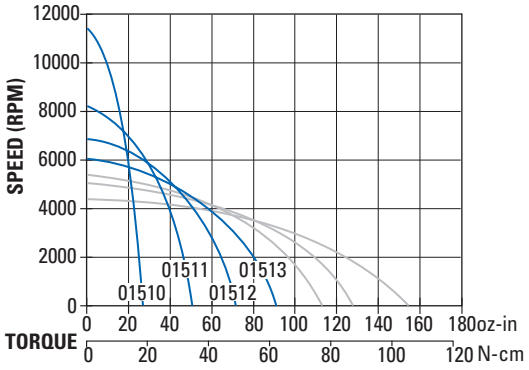
Motor Parameters	Symbols	Units	01510	01511	01512	01513
Max Cont. Output Power at 25°C amb.	HP Rated	HP	0.127	0.176	0.210	0.240
	P Rated	Watts	95	131	157	179
Speed at Rated Power	N Rated	RPM	7450	5400	4550	4050
Max Mechanical Speed	N Max	RPM	16500	16500	16500	16500
Continuous Stall Torque at 25°C amb.	Tc	oz-in	27.4	54.3	71.9	91.3
		N-m	0.193	0.384	0.508	0.645
Peak Torque	Tp	oz-in	78.6	162	234	313
		N-m	0.555	1.15	1.66	2.21
Max Torque for Linear KT	Tsl	oz-in	78.6	162	234	313
		N-m	0.555	1.16	1.66	2.21
Motor Constant	Tm	oz-in/ √W	6.38	11.6	14.8	18.2
		N-m/ √W	0.0451	0.0819	0.105	0.128
Thermal Resistance*	Rth	°C/Watt	4.10	3.55	3.30	3.13
Viscous Damping	Fi	oz-in/RPM	2.74E-04	1.05E-03	1.76E-03	2.47E-03
		N-m/RPM	1.94E-06	7.43E-06	1.24E-05	1.74E-05
Max Static Friction	Tf	oz-in	2.00	2.93	3.77	4.62
		N-m	0.0141	0.021	0.027	0.033
Max Cogging Torque Peak to Peak	Tcog	oz-in	0.950	1.22	1.47	1.71
		N-m	0.00671	0.00862	0.0104	0.0121
Frameless Motor Inertia	Jmf	oz-in-sec^2	2.10E-03	3.60E-03	4.90E-03	6.20E-03
		Kg-m^2	1.48E-05	2.54E-05	3.46E-05	4.38E-05
Frameless Motor Weight	Wtf	oz	6.30	10.5	14.3	18.1
		Kg	1.79E-01	2.98E-01	4.06E-01	5.14E-01
Housed Motor Inertia	Jmh	oz-in-sec^2	2.20E-03	3.70E-03	5.00E-03	6.30E-03
		Kg-m^2	1.55E-05	2.61E-05	3.53E-05	4.45E-05
Housed Motor Weight	Wth	oz	19.0	23.5	27.5	31.6
		Kg	5.39E-01	6.65E-01	7.80E-01	8.95E-01
No. of poles	P		12	12	12	12

*Rth assumes a housed motor mounted to a 4" x 3.25" x 0.25" aluminum heatsink or equivalent

			01510			01511			01512			01513		
Winding Constants	Symbols	Units	A	B	C	A	B	C	A	B	C	A	B	C
Current at Cont. Torque	Ic	Amps	5.10	3.89	6.95	4.85	3.53	4.98	4.44	3.23	7.90	4.22	3.07	7.50
Current at Peak Torque	Ip	Amps	14.0	10.6	18.9	14.0	9.89	16.7	14.0	9.89	25.0	14.0	9.89	25.0
Torque Sensitivity	Kt	oz-in/Amp	6.78	4.64	2.60	11.6	16.2	11.5	17.0	23.4	9.56	22.7	31.2	12.8
		N-m/Amp	0.0407	0.0328	0.0183	0.0833	0.115	0.0812	0.120	0.165	0.0675	0.160	0.220	0.0901
Back EMF constant	Kb	V/KRPM	4.26	3.43	1.92	8.73	12.0	8.50	12.6	17.3	7.07	16.8	23.1	9.43
Motor Resistance	Rm	Ohms	0.814	1.38	0.431	1.04	2.02	0.988	1.33	2.59	0.418	1.55	3.03	0.489
Motor Inductance	Lm	mH	0.32	0.54	0.17	0.58	1.1	0.55	0.87	1.6	0.27	1.2	2.3	0.38

Continuous Duty Capability for 130°C Rise – RBE - 01510 Series

RBE(H)-01510 to RBE(H)-01513



RBE 0151x Motor Series Performance Data - Continued

RBE(H)-01514 to RBE(H)-01516

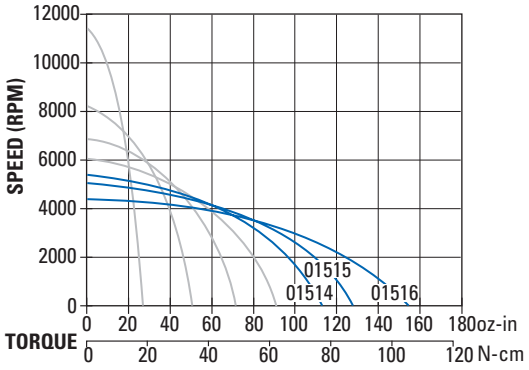
Motor Parameters		Symbols	Units	01514	01515	01516
Max Cont. Output Power at 25°C amb.		HP Rated	HP	0.264	0.284	0.307
		P Rated	Watts	197	212	229
Speed at Rated Power		N Rated	RPM	3570	3400	2970
Max Mechanical Speed		N Max	RPM	16500	16500	16500
Continuous Stall Torque at 25°C amb.		Tc	oz-in	114	127	154
			N-m	0.808	0.897	1.085
Peak Torque		Tp	oz-in	403	540	610
			N-m	2.85	3.81	4.31
Max Torque for Linear KT		Tsl	oz-in	403	540	610
			N-m	2.85	3.81	4.31
Motor Constant		Tm	oz-in/ √W	22.1	24.1	28.6
			N-m/ √W	0.156	0.170	0.202
Thermal Resistance*		Rth	°C/Watt	2.95	2.85	2.72
Viscous Damping		Fi	oz-in/RPM	3.32E-03	3.88E-03	5.30E-03
			N-m/RPM	2.34E-05	2.74E-05	3.74E-05
Max Static Friction		Tf	oz-in	5.63	6.31	8.00
			N-m	0.040	0.045	0.057
Max Cogging Torque Peak to Peak		Tcog	oz-in	2.01	2.21	2.70
			N-m	0.0142	0.0156	0.019
Frameless Motor	Inertia	Jmf	oz-in-sec^2	7.70E-03	8.80E-03	1.14E-02
			Kg-m^2	5.44E-05	6.21E-05	8.05E-05
	Weight	Wtf	oz	22.7	25.8	33.4
			Kg	6.44E-01	7.30E-01	9.47E-01
Housed Motor	Inertia	Jmh	oz-in-sec^2	7.80E-03	8.90E-03	1.15E-02
			Kg-m^2	5.51E-05	6.28E-05	8.12E-05
	Weight	Wth	oz	36.4	39.7	47.8
			Kg	1.03E+00	1.13E+00	1.38E+00
No. of poles		P		12	12	12

*Rth assumes a housed motor mounted to a 4" x 3.25" x 0.25" aluminum heatsink or equivalent

			01514			01515			01516		
Winding Constants	Symbols	Units	A	B	C	A	B	C	A	B	C
Current at Cont. Torque	Ic	Amps	4.62	2.94	7.18	5.13	2.83	6.91	5.18	2.59	6.34
Current at Peak Torque	Ip	Amps	15.7	9.89	25.0	21.0	9.89	25.0	19.8	9.89	25.0
Torque Sensitivity	Kt	oz-in/Amp	26.0	40.9	16.7	26.0	47.2	19.3	31.2	62.3	25.5
		N-m/Amp	0.184	0.289	0.118	0.184	0.333	0.136	0.220	0.440	0.18
Back EMF constant	Kb	V/KRPM	19.2	30.2	12.4	19.2	34.9	14.3	23.1	46.1	18.9
Motor Resistance	Rm	Ohms	1.38	3.45	0.557	1.16	3.86	0.623	1.19	4.75	0.76
Motor Inductance	Lm	mH	1.1	2.6	0.47	0.99	3.3	0.55	1.1	4.4	7.4

Continuous Duty Capability for 130°C Rise – RBE - 01510 Series

RBE(H)-01214 to RBE(H)-01216

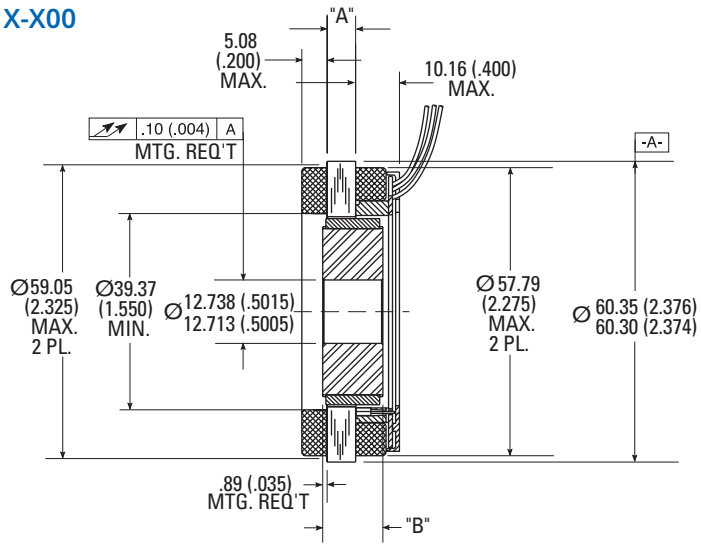


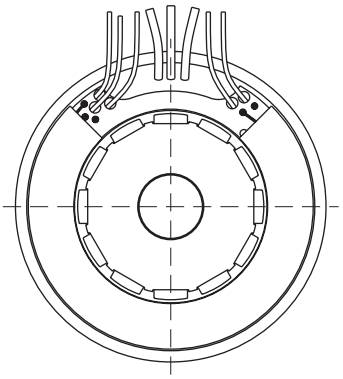
RBE 01510 Motor Series

RBE 01510 Motor Series Dimensional Drawings

Dimensions in mm [inches].
Product designed in inches.
Metric conversions provided for reference only.

RBE-0151X-X00





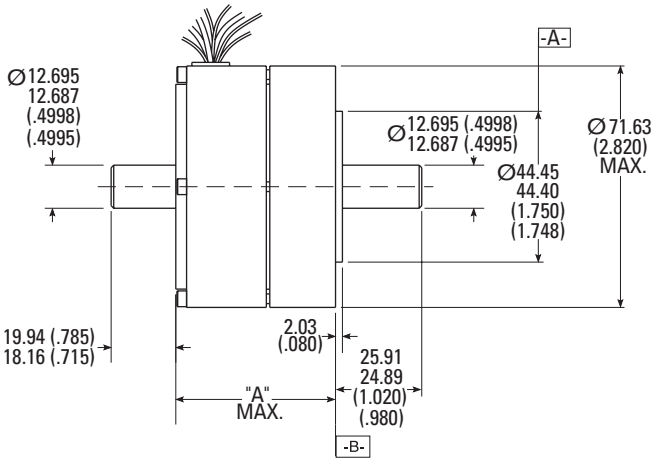
Notes:

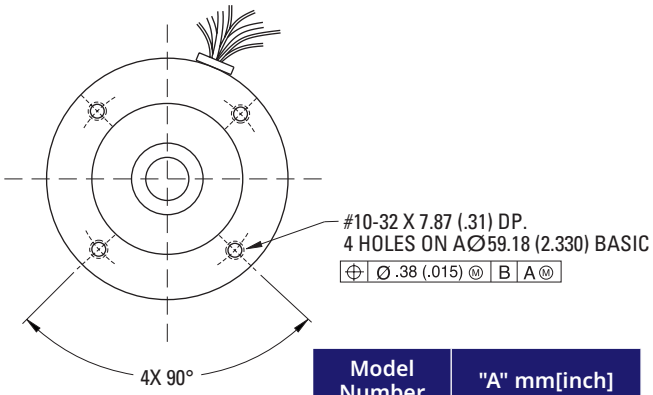
1. For a C.W. rotation, as viewed from the lead end, energize per excitation sequence table.
2. V-AB, V-BC, and V-CA is back EMF of motor phases AB, BC, and CA respectively, aligned with sensor outputs as shown for C.W. rotation only.
3. Mounting surface is between Ø 60.35 (2.376) and Ø 59.06 (2.325) on both sides.

Model Number	"A" mm[inch]	"B" mm[inch]
RBE-01510	5.72 [0.225]	12.07 [0.475]
RBE-01511	12.70 [0.500]	19.05 [0.750]
RBE-01512	19.05 [0.750]	25.40 [1.000]
RBE-01513	25.40 [1.000]	31.75 [1.250]
RBE-01514	33.02 [1.300]	39.37 [1.550]
RBE-01515	38.10 [1.500]	44.45 [1.750]
RBE-01516	50.80 [2.000]	57.15 [2.250]

Tolerance ± .010 on "A" Dimension

RBEH-0151X-X00





Notes:

1. Shaft end play: with a 11 lb. reversing load, the axial displacement shall be .013 - .15 (.0005 - .006).
2. For a C.C.W. rotation, as viewed from the pilot end, energize per excitation sequence table.
3. V-AB, V-BC, and V-CA is back EMF of motor phases AB, BC, and CA respectively, aligned with sensor outputs as shown for C.W. rotation only.

Model Number	"A" mm[inch]
RBEH-01510	47.75 [1.880]
RBEH-01511	54.74 [2.155]
RBEH-01512	61.09 [2.405]
RBEH-01513	67.44 [2.655]
RBEH-01514	75.06 [2.955]
RBEH-01515	80.14 [3.155]
RBEH-01516	92.84 [3.655]

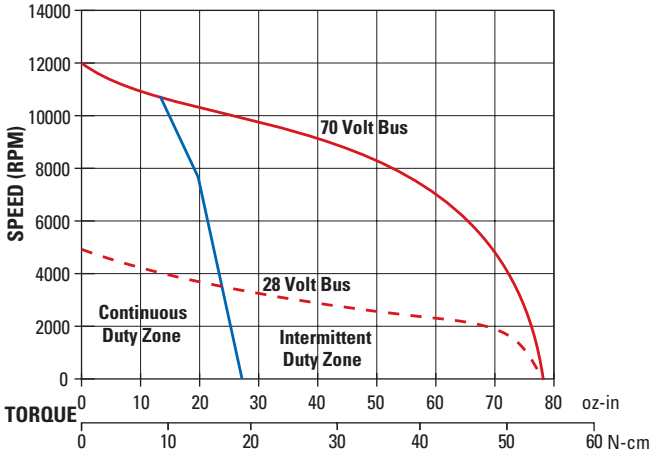
RBE(H)-0121x Leadwire Specifications

MOTOR LEADS: #20 AWG type "ET" Teflon® coated per MIL-W-22759/11, 3 leads, 152 mm [6.00 in] min. length ea., 1- Black, 1- White, 1-Red

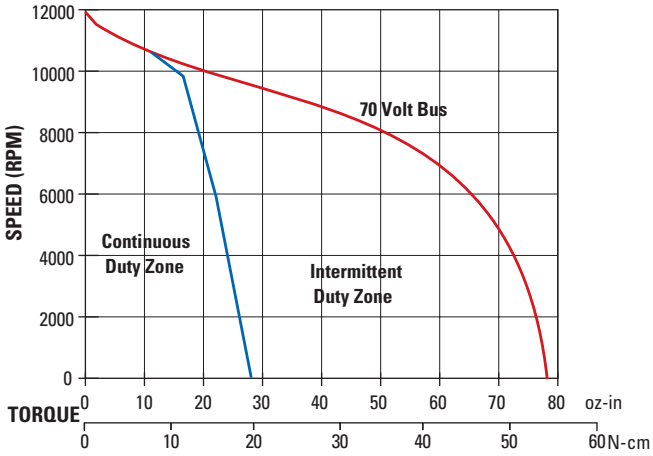
SENSOR LEADS: #26 AWG type "ET" Teflon® coated per MIL-W-16878, 5 leads, 152 mm [6.00 in] min. length ea., 1-Yellow, 1-Green, 1-Orange, 1-Blue, 1-Brown.

RBE 01510 Motor Series Performance Curves

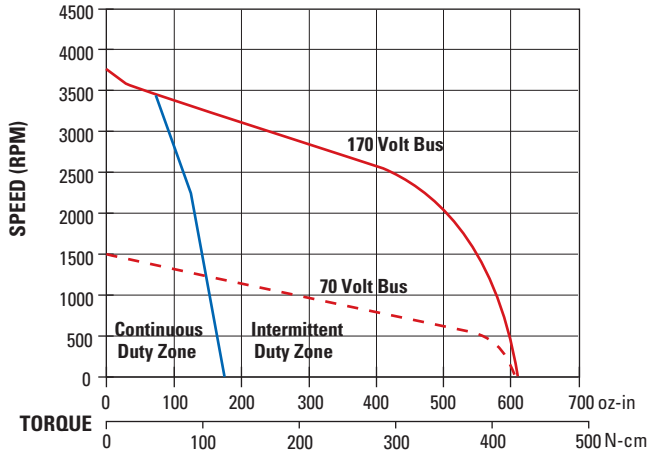
RBE-01510-B



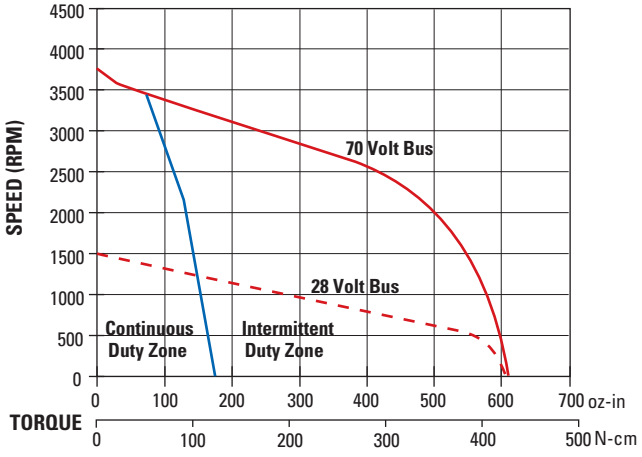
RBE-01510-C



RBE-01516-B



RBE-01516-C

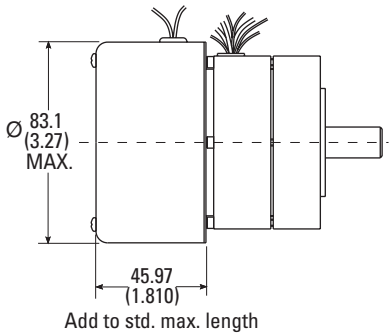


RBE 01510 Motor Series

RBE 01510 Motor Series Options

Dimensions in mm [inches].
Product designed in inches.
Metric conversions provided for reference only.

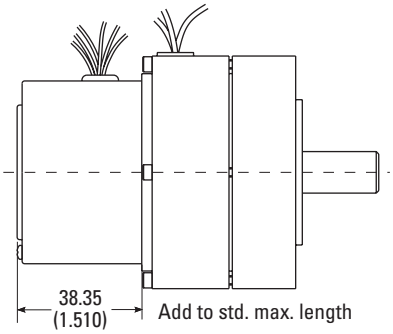
BRAKE OPTION



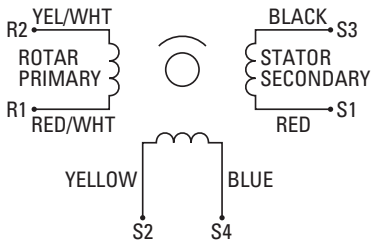
An integral electromagnetic fail-safe brake can be added to the rear of the motor. Operating in the POWER OFF/BRAKE ON mode, the brake provides 240 oz-in of torque for static parking and emergency braking. To release the brake, 24 VDC and 0.30 Amps max need to be applied.

- Fail-safe brake
- 240 oz-in holding torque
- Release voltage of 24 VDC (0.30 Amps)

RESOLVER OPTION



A frameless resolver is available to provide position feedback computable with a wide variety of CNC and other position loop controllers. This option is required for commutation when using a Kollmorgen servo drive or other resolver based controller.



RESOLVER SCHEMATIC

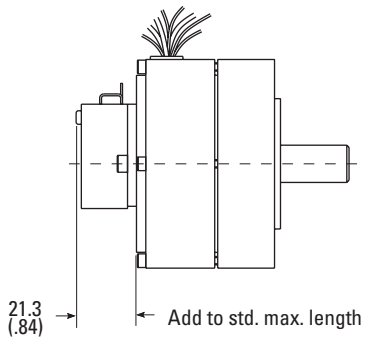
PHASING EQUATIONS

E(S1-S3) = KE(R1-R2) COS Ø
E(S2-S4) = -KE(R1-R2) SIN Ø
WITH CCW ROTATION AS
VIEWED FROM SHAFT END

Normal Characteristics At 25 °C

Primary	Rotor
Input Voltage	4.25 V, 7 kHz
Input Current	55 mA max.
Input Power	0.12 W
Transformation Ratio (± 5%)	0.470
Phase Shift	4° Leading ±3°
Impedances (± 15%)	
Z_{RO}	48 + j70
Z_{SO}	62 + j80
Z_{SS}	53 + j63
Z_{RS}	42 + j55
D.C. Resistance (± 10%)	
Stator	33 Ohm
Rotor	16 Ohm
Null Voltage	20 mV max.
Electrical Error	±7 min. max.
Output Voltage	2.0 V ±5%
Operating Temperature	-55 °C to +155 °C

ENCODER OPTION



An incremental encoder is available having TTL quadrature and marker pulse outputs. 200 to 2048 lines are available. The standard is 1024 lines with the marker pulse.

Parameter	Min	Max	Units
Temperature	-40	100	°C
Supply Voltage	4.5	5.5	Volts
Supply Current	30	85	mA
Count Frequency		100	kHz
Velocity		10K	RPM

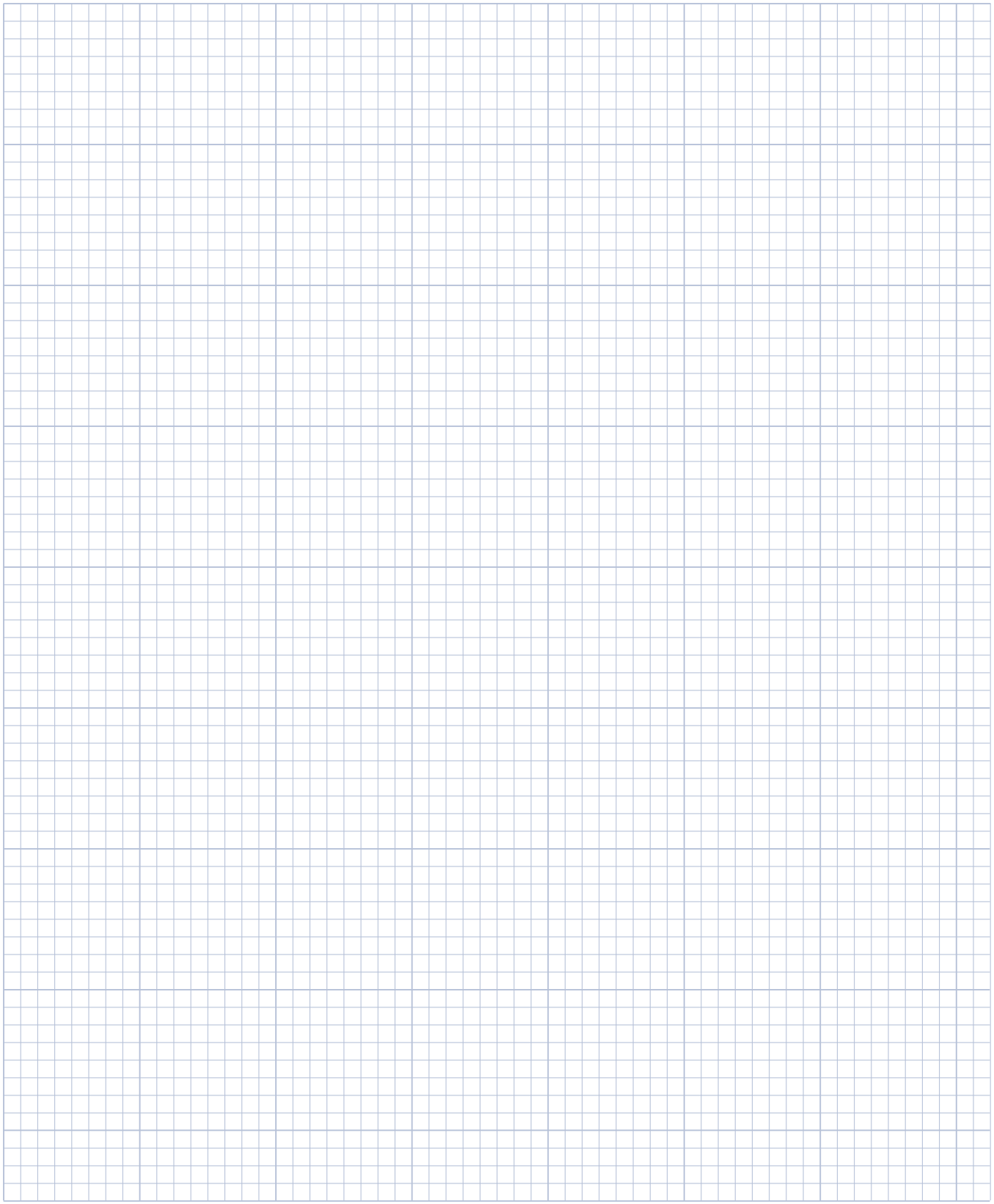
Resolution Cycles/Rev.
200
250
500
1000
1024
2000*
2048*

*Index option not yet available for resolution

Notes

RBE(H) – B 015 10 – A 00

Motor Series | Frame Size | Frame Size | Stack Length | Brake | Modifications



0.125 inch divisions

RBE 01810 Motor Series

RBE 0181x Motor Series Performance Data

RBE(H)-01810 to RBE(H)-01812

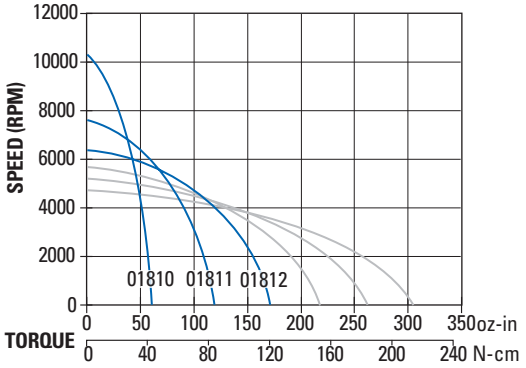
Motor Parameters		Symbols	Units	01810	01811	01812
Max Cont. Output Power at 25°C amb.		HP Rated	HP	0.280	0.402	0.488
		P Rated	Watts	209	300	364
Speed at Rated Power		N Rated	RPM	7040	5250	4350
Max Mechanical Speed		N Max	RPM	14000	14000	14000
Continuous Stall Torque at 25°C amb.		Tc	oz-in	60.8	121	173
			N-m	0.429	0.856	1.22
Peak Torque		Tp	oz-in	216	430	654
			N-m	1.53	3.04	4.62
Max Torque for Linear KT		Tsl	oz-in	136	273	413
			N-m	0.96	1.93	2.92
Motor Constant		Tm	oz-in/ √W	11.0	19.6	26.5
			N-m/ √W	0.077	0.139	0.187
Thermal Resistance*		Rth	°C/Watt	2.55	2.11	1.91
Viscous Damping		Fi	oz-in/RPM	9.00E-04	1.83E-03	2.71E-03
			N-m/RPM	6.36E-06	1.29E-05	1.91E-05
Max Static Friction		Tf	oz-in	3.10	4.49	5.81
			N-m	0.0219	0.032	0.041
Max Cogging Torque Peak to Peak		Tcog	oz-in	1.50	1.79	2.08
			N-m	0.0106	0.0127	0.0147
Frameless Motor	Inertia	Jmf	oz-in-sec^2	5.10E-03	8.70E-03	1.22E-02
			Kg-m^2	3.60E-05	6.14E-05	8.62E-05
	Weight	Wtf	oz	12.0	19.8	27.2
			Kg	3.40E-01	5.61E-01	7.72E-01
Housed Motor	Inertia	Jmh	oz-in-sec^2	5.30E-03	8.80E-03	1.24E-02
			Kg-m^2	3.74E-05	6.21E-05	8.76E-05
	Weight	Wth	oz	30.0	38.2	46.0
			Kg	8.50E-01	1.08E+00	1.30E+00
No. of poles		P		12	12	12

*Rth assumes a housed motor mounted to a 7" x 7.5" x 0.75" aluminum heatsink or equivalent

			01810			01811			01812		
Winding Constants	Symbols	Units	A	B	C	A	B	C	A	B	C
Current at Cont. Torque	Ic	Amps	5.28	2.85	7.39	5.24	2.82	7.34	4.91	2.64	6.87
Current at Peak Torque	Ip	Amps	21.3	10.0	30.2	21.3	10.0	30.2	21.3	10.0	30.2
Torque Sensitivity	Kt	oz-in/Amp	12.1	22.5	8.64	24.0	44.5	17.1	36.4	67.5	26.0
		N-m/Amp	0.0855	0.159	0.0610	0.170	0.315	0.121	0.257	0.477	0.184
Back EMF constant	Kb	V/KRPM	8.95	16.6	6.39	17.8	32.9	12.7	26.9	50.0	19.2
Motor Resistance	Rm	Ohms	1.22	4.16	0.615	1.49	5.10	0.753	1.88	6.42	0.949
Motor Inductance	Lm	mH	0.90	3.1	0.46	1.8	6.2	0.92	2.5	8.5	1.3

Continuous Duty Capability for 130°C Rise – RBE - 01810 Series

RBE(H)-01810 to RBE(H)-01812



RBE 0181x Motor Series Performance Data - Continued

RBE(H)-01813 to RBE(H)-01815

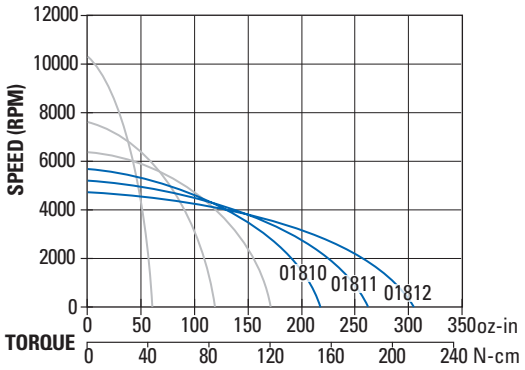
Motor Parameters		Symbols	Units	01813	01814	01815
Max Cont. Output Power at 25°C amb.		HP Rated	HP	0.572	0.611	0.646
		P Rated	Watts	427	456	482
Speed at Rated Power		N Rated	RPM	3850	3520	3230
Max Mechanical Speed		N Max	RPM	14000	14000	14000
Continuous Stall Torque at 25°C amb.		Tc	oz-in	218	262	305
			N-m	1.54	1.85	2.16
Peak Torque		Tp	oz-in	871	1069	1297
			N-m	6.15	7.55	9.16
Max Torque for Linear KT		Tsl	oz-in	554	679	825
			N-m	3.91	4.80	5.83
Motor Constant		Tm	oz-in/ √W	32.8	37.8	43.1
			N-m/ √W	0.231	0.267	0.304
Thermal Resistance*		Rth	°C/Watt	1.83	1.70	1.62
Viscous Damping		Fi	oz-in/RPM	3.56E-03	4.39E-03	5.30E-03
			N-m/RPM	2.52E-05	3.10E-05	3.74E-05
Max Static Friction		Tf	oz-in	7.09	8.33	9.70
			N-m	0.050	0.059	0.069
Max Cogging Torque Peak to Peak		Tcog	oz-in	2.35	2.61	2.90
			N-m	0.0166	0.0184	0.020
Frameless Motor	Inertia	Jmf	oz-in-sec^2	1.55E-02	1.88E-02	2.23E-02
			Kg-m^2	1.09E-04	1.33E-04	1.57E-04
	Weight	Wtf	oz	34.5	41.4	49.1
			Kg	9.77E-01	1.17E+00	1.39E+00
Housed Motor	Inertia	Jmh	oz-in-sec^2	1.58E-02	1.91E-02	2.27E-02
			Kg-m^2	1.12E-04	1.35E-04	1.60E-04
	Weight	Wth	oz	53.6	60.9	69.0
			Kg	1.52E+00	1.73E+00	1.96E+00
No. of poles		P		12	12	12

*Rth assumes a housed motor mounted to a 7" x 7.5" x 0.75" aluminum heatsink or equivalent

			01813			01814			01815		
Winding Constants	Symbols	Units	A	B	C	A	B	C	A	B	C
Current at Cont. Torque	Ic	Amps	5.87	3.49	10.2	5.73	3.41	9.93	5.51	3.28	9.54
Current at Peak Torque	Ip	Amps	26.9	14.2	40.3	26.9	14.2	40.3	26.9	14.2	40.3
Torque Sensitivity	Kt	oz-in/Amp	38.4	64.5	22.2	47.1	79.2	27.2	57.2	96.1	33.0
		N-m/Amp	0.271	0.456	0.157	0.333	0.559	0.192	0.404	0.679	0.233
Back EMF constant	Kb	V/KRPM	28.4	47.7	16.4	34.9	58.6	20.1	42.3	71.1	24.4
Motor Resistance	Rm	Ohms	1.38	3.79	0.458	1.55	4.28	0.518	1.76	4.85	0.588
Motor Inductance	Lm	mH	1.9	5.5	0.65	2.2	6.2	0.73	2.7	7.6	0.90

Continuous Duty Capability for 130°C Rise – RBE - 01810 Series

RBE(H)-01813 to RBE(H)-01815

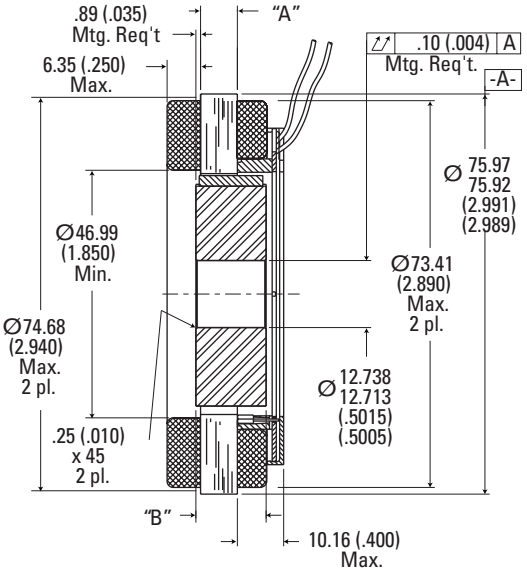


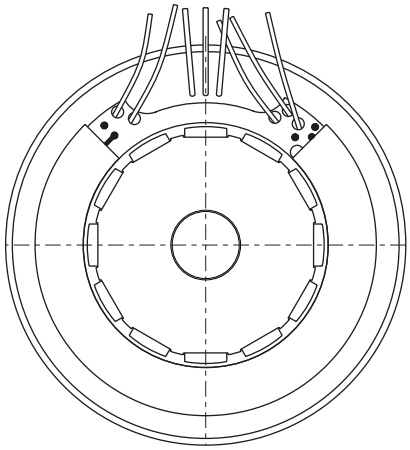
RBE 01810 Motor Series

RBE 01810 Motor Series Dimensional Drawings

Dimensions in mm [inches].
Product designed in inches.
Metric conversions provided for reference only.

RBE-0181X-X00





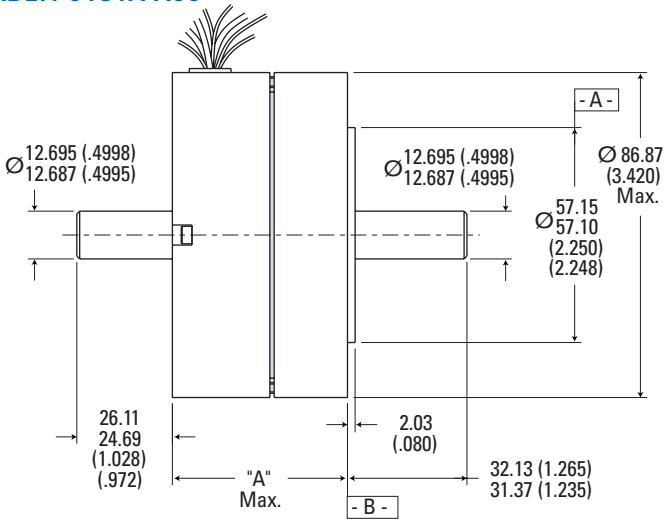
Model Number	"A" mm[inch]	"B" mm[inch]
RBE-01810	6.99 [0.275]	13.34 [0.525]
RBE-01811	15.24 [0.600]	21.59 [0.850]
RBE-01812	23.11 [0.910]	29.46 [1.160]
RBE-01813	30.37 [1.210]	37.08 [1.460]
RBE-01814	38.10 [1.500]	44.45 [1.750]
RBE-01815	46.23 [1.820]	52.58 [2.070]

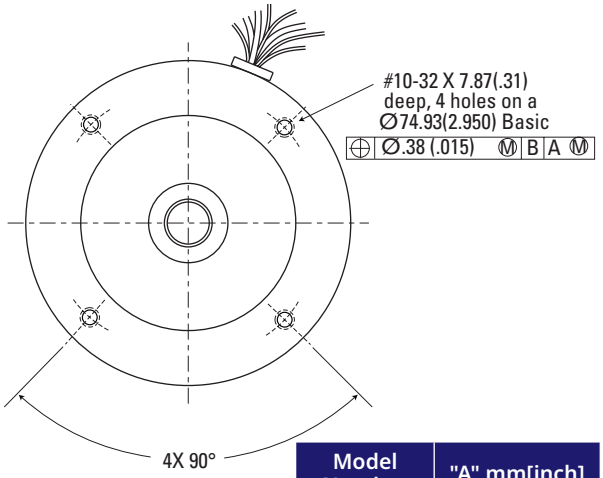
Tolerance ± .010 on "A" Dimension

Notes:

1. For a C.W. rotation, as viewed from the lead end, energize per excitation sequence table.
2. V-AB, V-BC, and V-CA is back EMF of motor phases AB, BC, and CA respectively, aligned with sensor outputs as shown for C.W. rotation only.
3. Mounting surface is between Ø 74.68 (2.940) and Ø 75.95 (2.990) on both sides.

RBEH-0181X-X00





Model Number	"A" mm[inch]
RBEH-01810	47.17 [1.857]
RBEH-01811	55.42 [2.182]
RBEH-01812	63.30 [2.492]
RBEH-01813	70.92 [2.792]
RBEH-01814	78.28 [3.082]
RBEH-01815	86.41 [3.402]

Notes:

1. Shaft end play: with a 9 lb. reversing load, the axial displacement shall be .013 - .15 (.0005 - .006).
2. For a C.C.W. rotation, as viewed from the pilot end, energize per excitation sequence table.
3. V-AB, V-BC, and V-CA is back EMF of motor phases AB, BC, and CA respectively, aligned with sensor outputs as shown for C.W. rotation only.

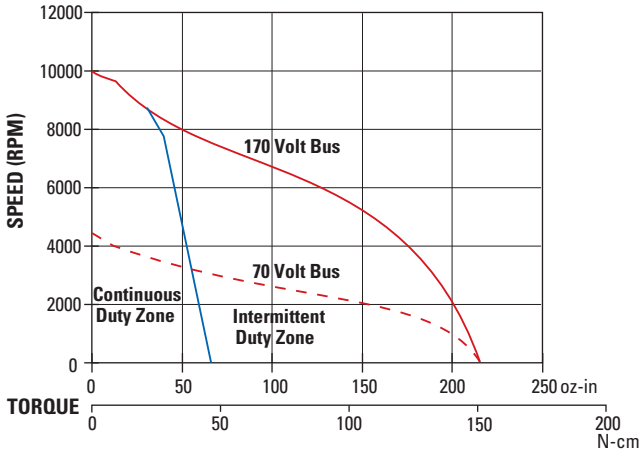
RBE(H)-0181x Leadwire Specifications

MOTOR LEADS: #20 AWG type "ET" Teflon® coated per MIL-W-22759/11, 3 leads, 152 mm [6.00 in] min. length ea., 1- Black, 1- White, 1-Red

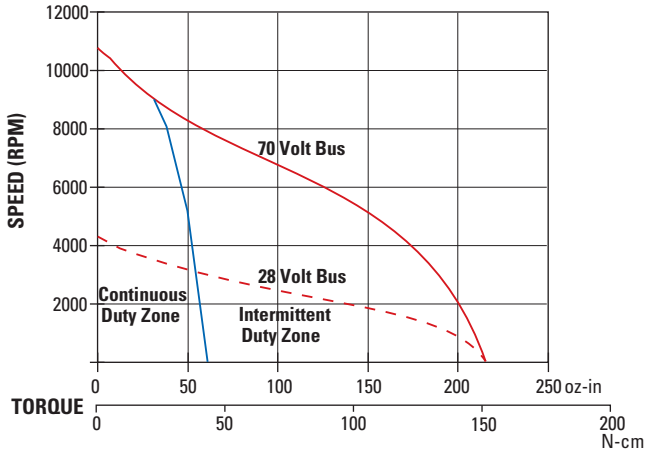
SENSOR LEADS: #26 AWG type "ET" Teflon® coated per MIL-W-16878, 5 leads, 152 mm [6.00 in] min. length ea., 1-Yellow, 1-Green, 1-Orange, 1-Blue, 1-Brown.

RBE 01810 Motor Series Performance Curves

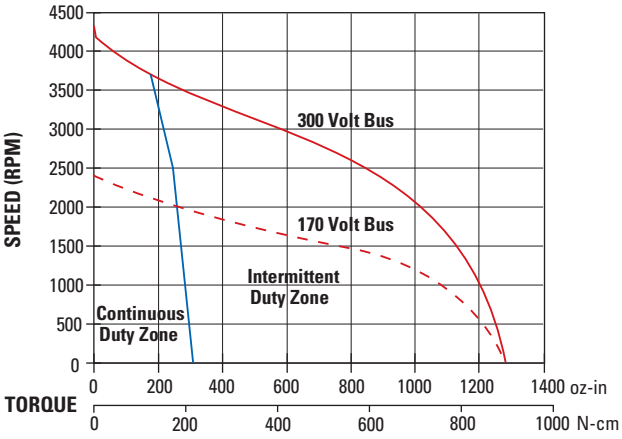
RBE-01810-B



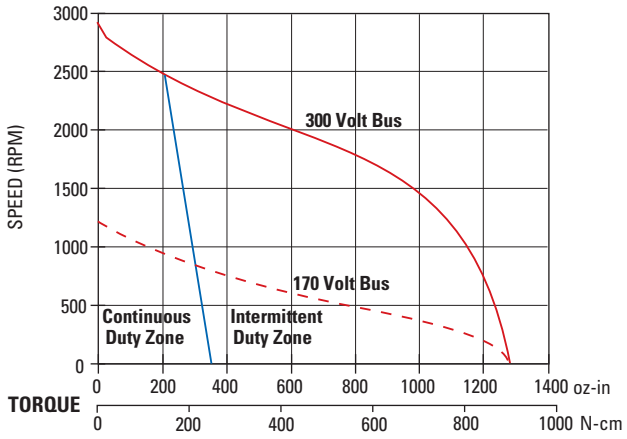
RBE-01810-C



RBE-01815-B



RBE-01815-C

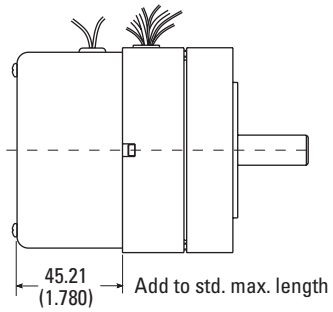


RBE 01810 Motor Series

RBEH 01810 Motor Series Options

Dimensions in mm [inches].
Product designed in inches.
Metric conversions provided for reference only.

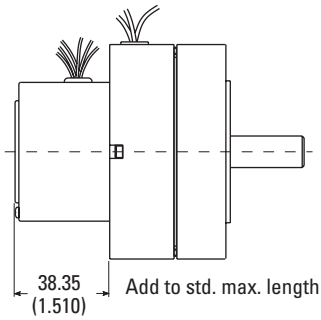
BRAKE OPTION



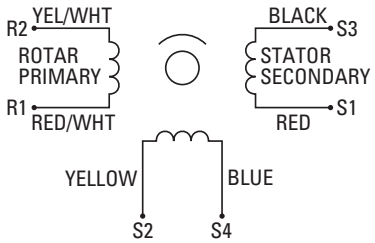
An integral electromagnetic fail-safe brake can be added to the rear of the motor. Operating in the POWER OFF/BRAKE ON mode, the brake provides 240 oz-in of torque for static parking and emergency braking. To release the brake, 24 VDC and 0.30 Amps max need to be applied.

- Fail-safe brake
- 240 oz-in holding torque
- Release voltage of 24 VDC (0.30 Amps)

RESOLVER OPTION



A frameless resolver is available to provide position feedback computable with a wide variety of CNC and other position loop controllers. This option is required for commutation when using a Kollmorgen servo drive or other resolver based controller.



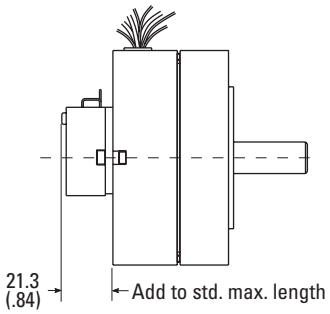
RESOLVER SCHEMATIC

PHASING EQUATIONS
E(S1-S3) = KE(R1-R2) COS Ø
E(S2-S4) = -KE(R1-R2) SIN Ø
WITH CCW ROTATION AS
VIEWED FROM SHAFT END

Normal Characteristics At 25 °C

Primary	Rotor
Input Voltage	4.25 V, 7 kHz
Input Current	55 mA max.
Input Power	0.12 W
Transformation Ratio (± 5%)	0.470
Phase Shift	4° Leading ±3°
Impedances (± 15%)	
Z_{RO}	48 + j70
Z_{SO}	62 + j80
Z_{SS}	53 + j63
Z_{RS}	42 + j55
D.C. Resistance (± 10%)	
Stator	33 Ohm
Rotor	16 Ohm
Null Voltage	20 mV max.
Electrical Error	±7 min. max.
Output Voltage	2.0 V ±5%
Operating Temperature	-55 °C to +155 °C

ENCODER OPTION



An incremental encoder is available having TTL quadrature and marker pulse outputs. 200 to 2048 lines are available. The standard is 1024 lines with the marker pulse.

Parameter	Min	Max	Units
Temperature	-40	100	°C
Supply Voltage	4.5	5.5	Volts
Supply Current	30	85	mA
Count Frequency		100	kHz
Velocity		10K	RPM

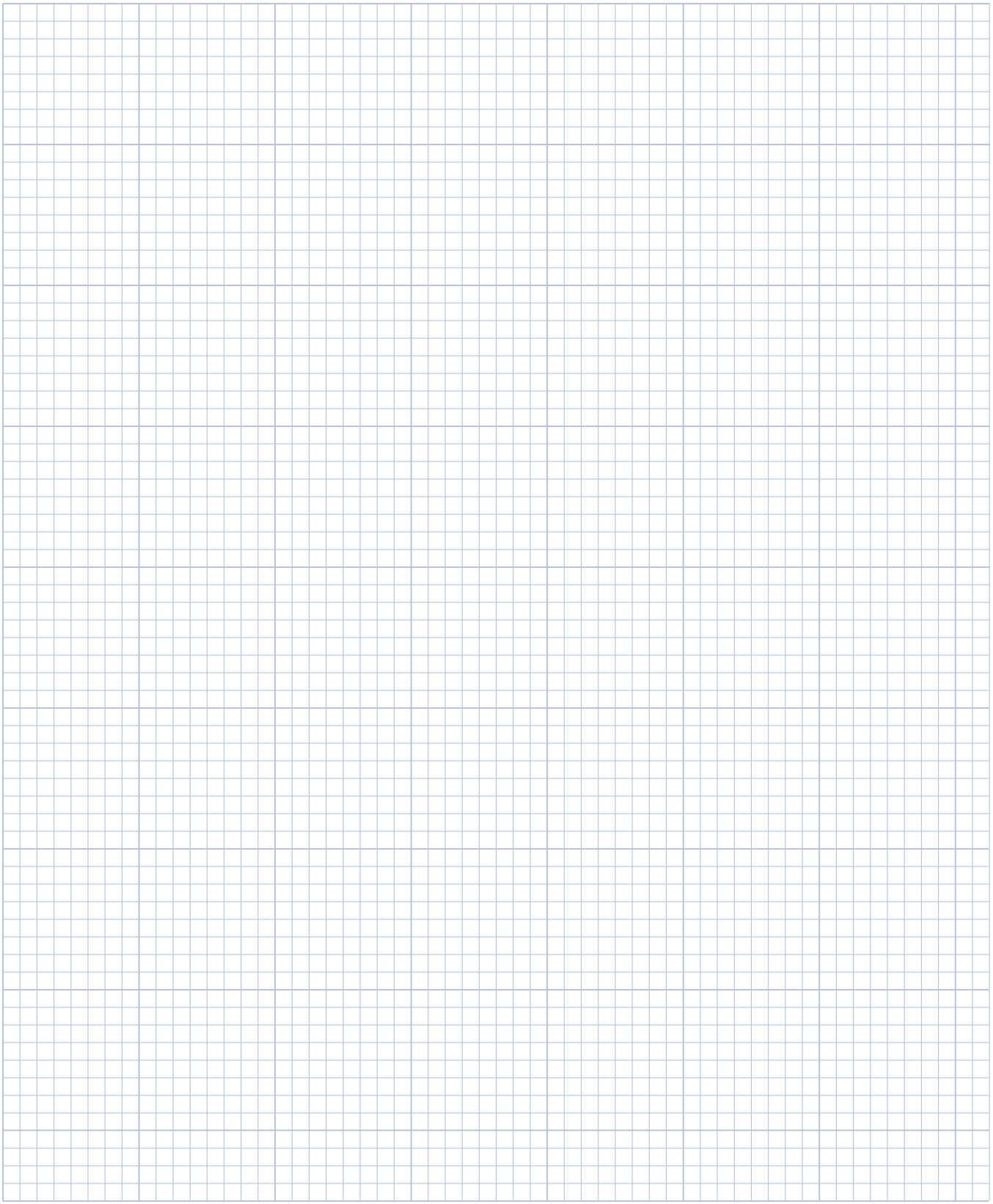
Resolution Cycles/Rev.
200
500
1000
1024
2000*
2048*

*Index option not yet available for resolution

Notes

RBE(H) – B 018 10 – A 00

Motor Series | Frame Size | Frame Size | Stack Length | Brake | Modifications



0.125 inch divisions

RBE 02110 Motor Series

RBE 0211x Motor Series Performance Data

RBE(H)-02110 to RBE(H)-02112

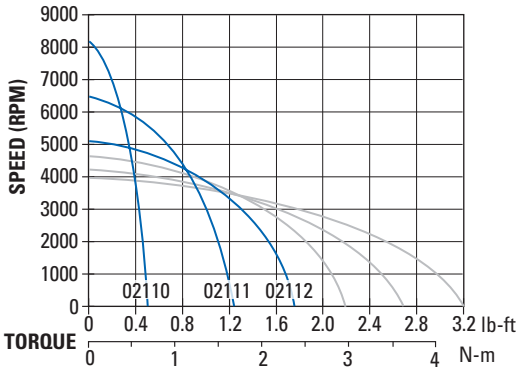
Motor Parameters		Symbols	Units	02110	02111	02112
Max Cont. Output Power at 25°C amb.		HP Rated	HP	0.323	0.672	0.761
		P Rated	Watts	241	501	568
Speed at Rated Power		N Rated	RPM	5300	4242	3500
Max Mechanical Speed		N Max	RPM	12000	12000	12000
Continuous Stall Torque at 25°C amb.		Tc	oz-in	0.703	1.23	1.77
			N-m	0.952	1.67	2.40
Peak Torque		Tp	oz-in	1.87	3.37	5.10
			N-m	2.55	4.57	6.92
Max Torque for Linear KT		Tsl	oz-in	1.26	2.56	3.75
			N-m	1.72	3.47	5.08
Motor Constant		Tm	oz-in/ √W	0.102	0.175	0.243
			N-m/ √W	0.139	0.237	0.329
Thermal Resistance*		Rth	°C/Watt	1.70	1.60	1.50
Viscous Damping		Fi	oz-in/RPM	1.04E-05	2.36E-05	3.59E-05
			N-m/RPM	1.41E-05	3.19E-05	4.87E-05
Max Static Friction		Tf	oz-in	0.026	0.052	0.077
			N-m	0.035	0.071	0.104
Max Cogging Torque Peak to Peak		Tcog	oz-in	0.016	0.039	0.061
			N-m	0.022	0.053	0.083
Frameless Motor	Inertia	Jmf	oz-in-sec^2	5.50E-05	9.70E-05	1.40E-04
			Kg-m^2	7.46E-05	1.32E-04	1.90E-04
	Weight	Wtf	oz	1.29	2.21	3.07
			Kg	0.585	1.00	1.41
Housed Motor	Inertia	Jmh	oz-in-sec^2	5.60E-05	1.10E-04	1.41E-04
			Kg-m^2	7.59E-05	1.49E-04	1.91E-04
	Weight	Wth	oz	2.00	3.22	4.37
			Kg	0.907	1.46	2.00
No. of poles		P		12	12	12

*Rth assumes a housed motor mounted to a 7" x 7.5" x 0.75" aluminum heatsink or equivalent

			02110			02111			02112		
Winding Constants	Symbols	Units	A	B	C	A	B	C	A	B	C
Current at Cont. Torque	Ic	Amps	6.34	2.53	10.6	5.71	2.27	9.74	5.42	2.17	9.03
Current at Peak Torque	Ip	Amps	25.3	10.0	40.2	25.3	10.0	40.2	25.3	10.0	40.2
Torque Sensitivity	Kt	oz-in/Amp	0.115	0.287	0.0690	0.225	0.566	0.132	0.341	0.851	0.204
		N-m/Amp	0.156	0.390	0.0935	0.305	0.768	0.179	0.462	1.15	0.277
Back EMF constant	Kb	V/KRPM	16.3	40.8	9.80	31.9	80.4	18.7	48.4	121	29.1
Motor Resistance	Rm	Ohms	1.27	8.05	0.479	1.66	10.6	0.611	1.97	12.5	0.743
Motor Inductance	Lm	mH	1.7	10	0.60	3.2	20	1.1	5.1	32	1.8

Continuous Duty Capability for 130°C Rise – RBE - 02110 Series

RBE(H)-02110 to RBE(H)-02112



RBE 0211x Motor Series Performance Data - Continued

RBE(H)-02113 to RBE(H)-02115

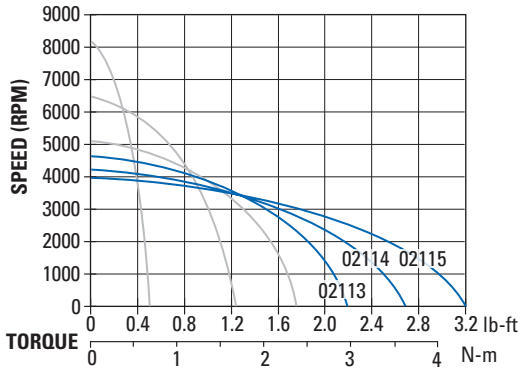
Motor Parameters		Symbols	Units	02113	02114	02115
Max Cont. Output Power at 25°C amb.		HP Rated	HP	0.854	0.944	1.07
		P Rated	Watts	637	704	796
Speed at Rated Power		N Rated	RPM	3050	2770	2650
Max Mechanical Speed		N Max	RPM	12000	12000	12000
Continuous Stall Torque at 25°C amb.		Tc	oz-in	2.20	2.69	3.20
			N-m	2.99	3.64	4.33
Peak Torque		Tp	oz-in	6.80	8.27	10.2
			N-m	9.22	11.2	13.8
Max Torque for Linear KT		Tsl	oz-in	5.00	6.37	7.49
			N-m	6.78	8.64	10.2
Motor Constant		Tm	oz-in/ √W	0.293	0.345	0.394
			N-m/ √W	0.396	0.467	0.534
Thermal Resistance*		Rth	°C/Watt	1.40	1.30	1.20
Viscous Damping		Fi	oz-in/RPM	4.82E-05	6.06E-05	7.29E-05
			N-m/RPM	6.54E-05	8.21E-05	9.88E-05
Max Static Friction		Tf	oz-in	0.10	0.13	0.15
			N-m	0.136	0.171	0.203
Max Cogging Torque Peak to Peak		Tcog	oz-in	0.082	0.104	0.125
			N-m	0.111	0.141	0.169
Frameless Motor	Inertia	Jmf	oz-in-sec^2	1.74E-04	2.13E-04	2.66E-04
			Kg-m^2	2.36E-04	2.89E-04	3.61E-04
	Weight	Wtf	oz	3.94	4.80	5.66
			Kg	1.77	2.18	2.59
Housed Motor	Inertia	Jmh	oz-in-sec^2	1.75E-03	2.14E-04	2.62E-04
			Kg-m^2	2.37E-03	2.90E-04	3.55E-04
	Weight	Wth	oz	5.51	6.66	7.80
			Kg	2.50	3.04	3.54
No. of poles		P		12	12	12

*Rth assumes a housed motor mounted to a 7" x 7.5" x 0.75" aluminum heatsink or equivalent

			02113			02114			02115		
Winding Constants	Symbols	Units	A	B	C	A	B	C	A	B	C
Current at Cont. Torque	Ic	Amps	5.07	2.03	8.46	8.13	3.95	3.05	8.67	3.98	1.77
Current at Peak Torque	Ip	Amps	25.3	10.0	40.3	40.3	20.1	15.9	45.3	20.1	10.6
Torque Sensitivity	Kt	oz-in/Amp	0.454	1.14	0.272	0.347	0.714	0.925	0.386	0.840	1.89
		N-m/Amp	0.62	1.54	0.37	0.471	0.968	1.24	0.523	1.14	2.56
Back EMF constant	Kb	V/KRPM	64.5	161	38.6	49.2	101	130	54.8	119	268
Motor Resistance	Rm	Ohms	2.40	15.2	0.904	1.01	4.17	6.83	0.961	4.74	23.2
Motor Inductance	Lm	mH	6.2	39	2.2	2.8	12	20	3.0	14	72

Continuous Duty Capability for 130°C Rise – RBE - 02110 Series

RBE(H)-02113 to RBE(H)-02115

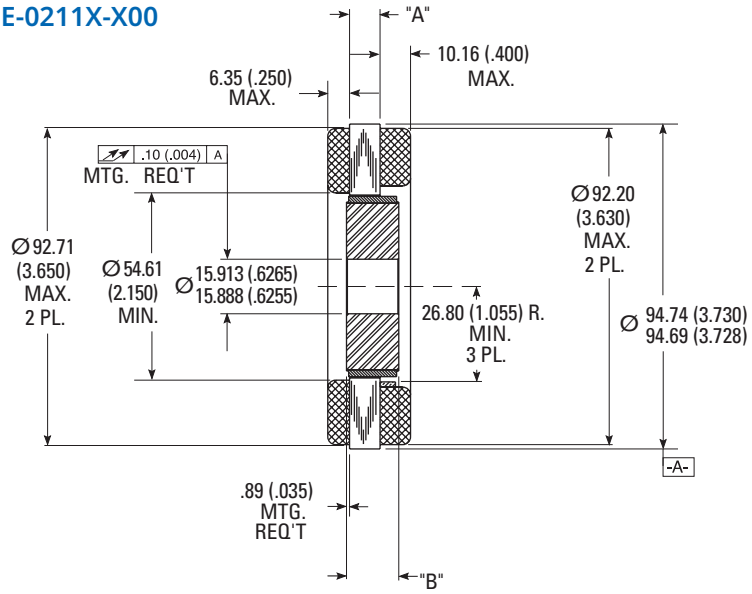


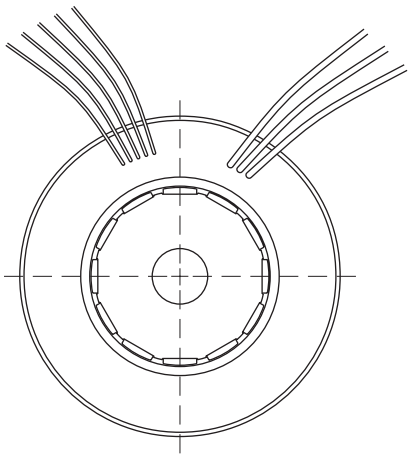
RBE 02110 Motor Series

RBE 02110 Motor Series Dimensional Drawings

Dimensions in mm [inches].
Product designed in inches.
Metric conversions provided for reference only.

RBE-0211X-X00





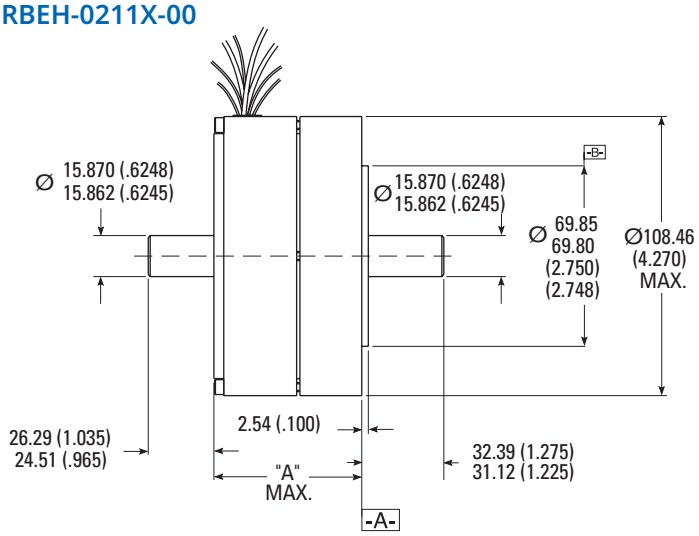
Model Number	"A" mm[inch]	"B" mm[inch]
RBE-02110	8.89 [0.350]	15.24 [0.600]
RBE-02111	19.05 [0.750]	25.40 [1.000]
RBE-02112	28.58 [1.125]	34.93 [1.375]
RBE-02113	38.10 [1.500]	44.45 [1.750]
RBE-02114	47.63 [1.875]	53.98 [2.125]
RBE-02115	57.15 [2.250]	63.50 [2.500]

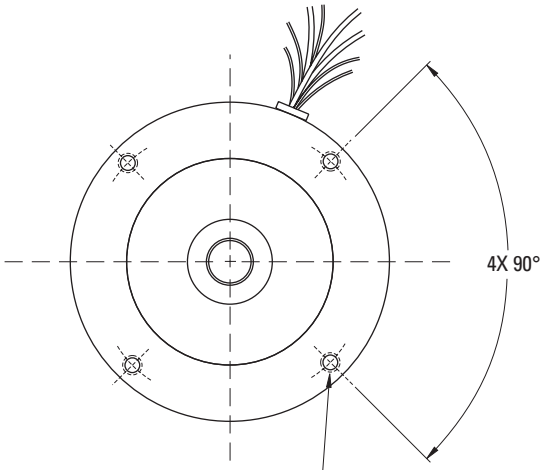
Tolerance ± .010 on "A" Dimension

Notes:

1. For a C.W. rotation, as viewed from the lead end, energize per excitation sequence table.
2. V-AB, V-BC, and V-CA is back EMF of motor phases AB, BC, and CA respectively, aligned with sensor outputs as shown for C.W. rotation only.
3. Mounting surface is between Ø 92.71 (3.650) and Ø 94.72 (3.729) on both sides.

RBEH-0211X-00





Model Number	"A" mm[inch]
RBEH-02110	57.86 [2.278]
RBEH-02111	68.02 [2.678]
RBEH-02112	77.55 [3.053]
RBEH-02113	87.07 [3.428]
RBEH-02114	96.60 [3.803]
RBEH-02115	106.12 [4.178]

Notes:

1. Shaft end play: with a 18 lb. reversing load, the axial displacement shall be .013 - .13 (.0005 - .005).
2. For a C.C.W. rotation, as viewed from the pilot end, energize per excitation sequence table.
3. V-AB, V-BC, and V-CA is back EMF of motor phases AB, BC, and CA respectively, aligned with sensor outputs as shown for C.W. rotation only.

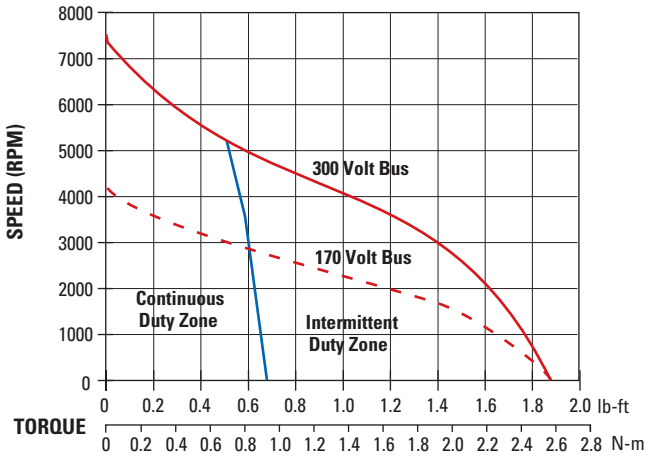
RBE(H)-0211x Leadwire Specifications

MOTOR LEADS: #18 AWG type "ET" Teflon® coated per MIL-W-22759/11, 3 leads, 152 mm [6.00 in] min. length ea., 1- Black, 1- White, 1-Red

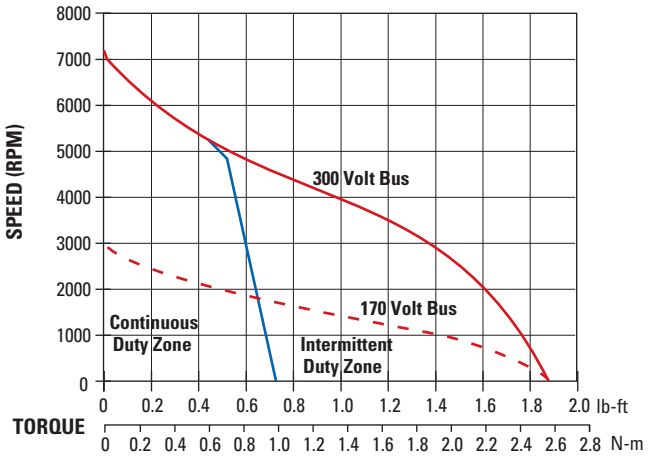
SENSOR LEADS: #26 AWG type "ET" Teflon® coated per MIL-W-16878, 5 leads, 152 mm [6.00 in] min. length ea., 1-Yellow, 1-Green, 1-Orange, 1-Blue, 1-Brown.

RBE 02110 Motor Series Performance Curves

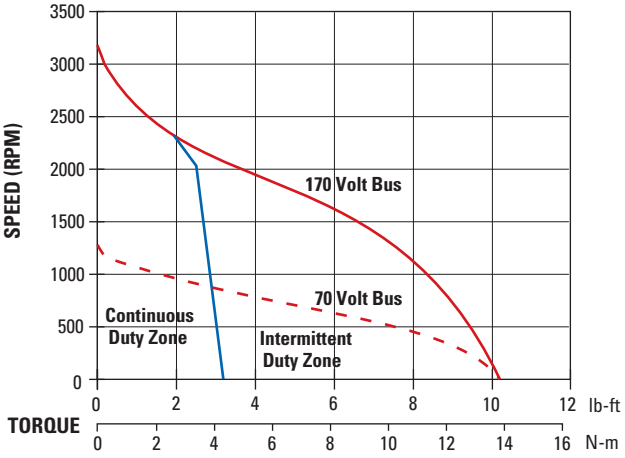
RBE-02110-B



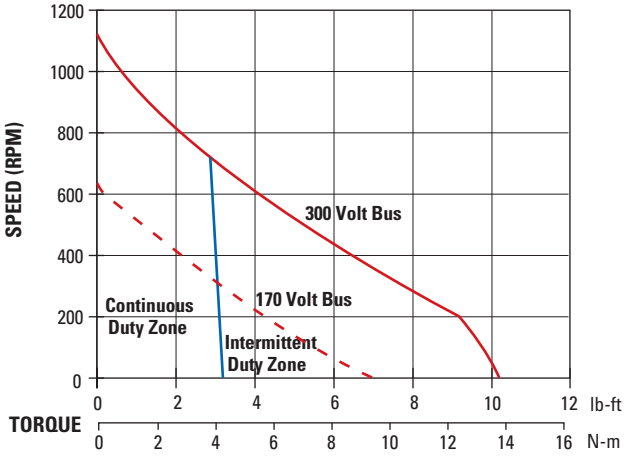
RBE-02110-C



RBE-02115-A



RBE-02115-C

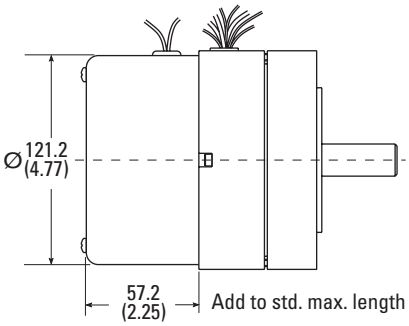


RBE 02110 Motor Series

RBE 02110 Motor Series Options

Dimensions in mm [inches].
Product designed in inches.
Metric conversions provided for reference only.

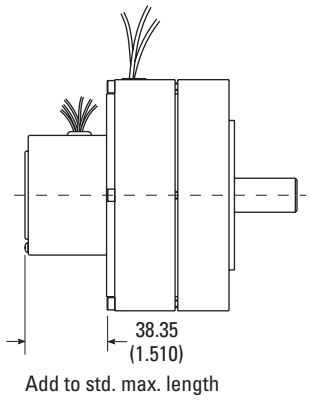
BRAKE OPTION



An integral electromagnetic fail-safe brake can be added to the rear of the motor. Operating in the POWER OFF/BRAKE ON mode, the brake provides 4.2 lb-ft of torque for static parking and emergency braking. To release the brake, 24 VDC and 0.39 Amps max need to be applied.

- Fail-safe brake
- 4.2 lb-ft holding torque
- Release voltage of 24 VDC (0.39 Amps)

RESOLVER OPTION



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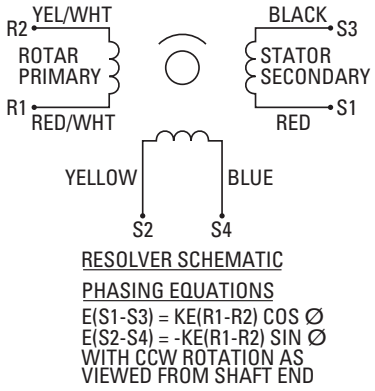


RESOLVER SCHEMATIC

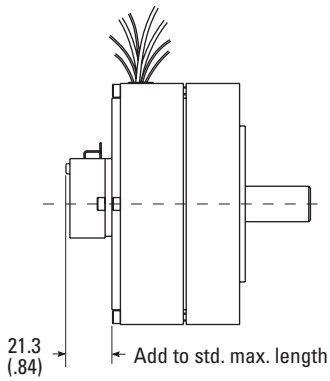
PHASING EQUATIONS

E(S1-S3) = KE(R1-R2) COS Ø
E(S2-S4) = -KE(R1-R2) SIN Ø
WITH CCW ROTATION AS
VIEWED FROM SHAFT END

Normal Characteristics At 25 °C

Primary	Rotor
Input Voltage	4.25 V, 7 kHz
Input Current	55 mA max.
Input Power	0.12 W
Transformation Ratio (± 5%)	0.470
Phase Shift	4° Leading ±3°
Impedances (± 15%)	
Z_{RO}	48 + j70
Z_{SO}	62 + j80
Z_{SS}	53 + j63
Z_{RS}	42 + j55
D.C. Resistance (± 10%)	
Stator	33 Ohm
Rotor	16 Ohm
Null Voltage	20 mV max.
Electrical Error	±7 min. max.
Output Voltage	2.0 V ±5%
Operating Temperature	-55 °C to +155 °C

ENCODER OPTION



An incremental encoder is available having TTL quadrature and marker pulse outputs. 200 to 2048 lines are available. The standard is 1024 lines with the marker pulse.

Parameter	Min	Max	Units
Temperature	-40	100	°C
Supply Voltage	4.5	5.5	Volts
Supply Current	30	85	mA
Count Frequency		100	kHz
Velocity		10K	RPM

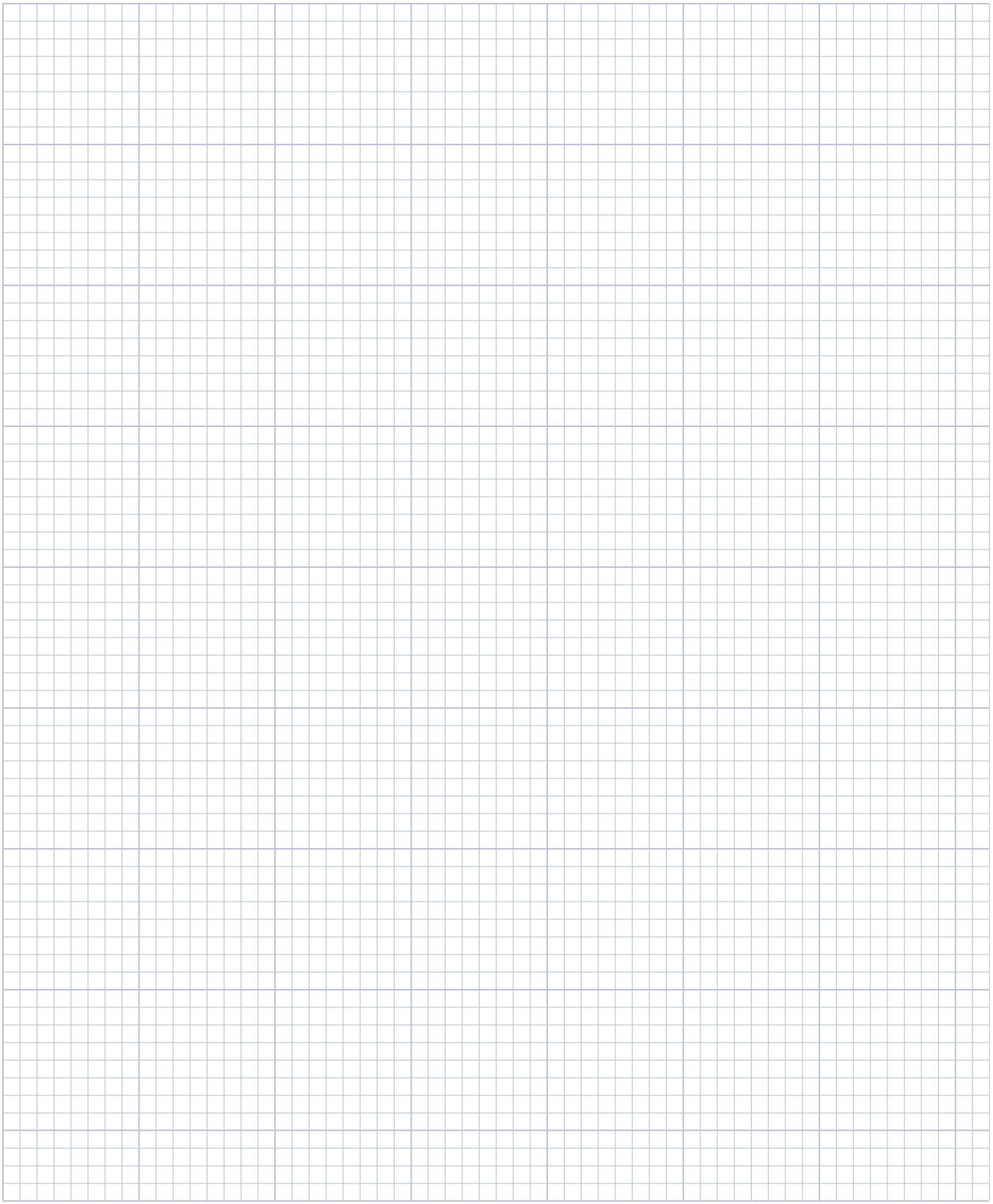
Resolution Cycles/Rev.
200
500*
1000
1024
2000*
2048*

*Index option not yet available for resolution

Notes

RBE(H) – B 021 10 – A 00

Motor Series | Frame Size | Frame Size | Stack Length | Brake | Modifications



0.125 inch divisions

RBE 03010 Motor Series

RBE 0301x Motor Series Performance Data

RBE(H)-03010 to RBE(H)-03013

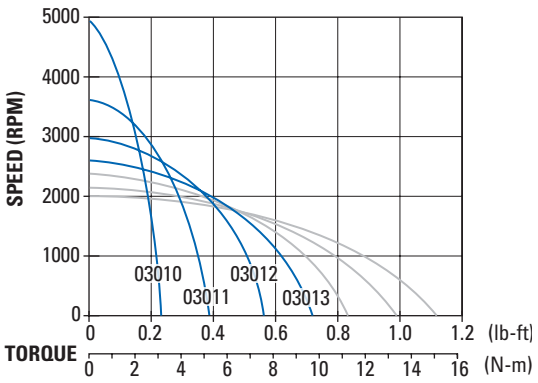
Motor Parameters		Symbols	Units	03010	03011	03012	03013
Max Cont. Output Power at 25°C amb.		HP Rated	HP	0.863	1.12	1.32	1.48
		P Rated	Watts	644	832	981	1107
Speed at Rated Power		N Rated	RPM	3000	2230	1830	1630
Max Mechanical Speed		N Max	RPM	8300	8300	8300	8300
Continuous Stall Torque at 25°C amb.		Tc	oz-in	2.21	3.73	5.75	7.04
			N-m	3.00	5.06	7.81	9.55
Peak Torque		Tp	oz-in	15.2	23.7	43.0	56.3
			N-m	20.6	32.2	58.3	76.3
Max Torque for Linear KT		Tsl	oz-in	6.26	11.7	18.9	24.7
			N-m	8.49	15.9	25.6	33.5
Motor Constant		Tm	oz-in/ √W	0.308	0.482	0.707	0.846
			N-m/ √W	0.418	0.653	0.958	1.15
Thermal Resistance*		Rth	°C/Watt	1.55	1.32	1.20	1.14
Viscous Damping		Fi	oz-in/RPM	5.06E-05	8.44E-05	1.21E-04	1.55E-04
			N-m/RPM	6.86E-05	1.14E-04	1.64E-04	2.10E-04
Max Static Friction		Tf	oz-in	0.0938	0.171	0.255	0.332
			N-m	0.127	0.231	0.345	0.450
Max Cogging Torque Peak to Peak		Tcog	oz-in	0.0521	0.103	0.159	0.210
			N-m	0.0706	0.140	0.216	0.285
Frameless Motor	Inertia	Jmf	oz-in-sec^2	2.03E-04	3.54E-04	5.16E-04	6.67E-04
			Kg-m^2	2.75E-04	4.80E-04	7.00E-04	9.04E-04
	Weight	Wtf	oz	3.25	5.36	7.68	9.79
			Kg	1.41	2.43	3.48	4.44
Housed Motor	Inertia	Jmh	oz-in-sec^2	3.33E-04	5.78E-04	8.44E-04	1.09E-03
			Kg-m^2	4.52E-04	7.84E-04	1.14E-03	1.48E-03
	Weight	Wth	oz	7.56	10.1	13.0	15.5
			Kg	3.43	4.60	5.90	7.05
No. of poles		P		12	12	12	12

*Rth assumes a housed motor mounted to a 7.5" x 7" x 0.375" aluminum heatsink or equivalent

			03010			03011			03012			03013		
Winding Constants	Symbols	Units	A	B	C	A	B	C	A	B	C	A	B	C
Current at Cont. Torque	Ic	Amps	7.58	5.87	3.60	7.30	5.62	3.49	6.98	5.38	3.34	6.54	5.03	3.12
Current at Peak Torque	Ip	Amps	60.5	40.3	24.3	53.9	35.9	22.6	60.5	40.3	25.4	60.5	40.3	25.4
Torque Sensitivity	Kt	oz-in/Amp	0.304	0.392	0.640	0.535	0.695	1.12	0.862	1.12	1.80	1.13	1.47	2.37
		N-m/Amp	0.412	0.531	0.868	0.725	0.942	1.52	1.17	1.52	2.45	1.53	1.99	3.21
Back EMF constant	Kb	V/KRPM	43.1	55.6	90.9	75.9	99	159	122	159	256	160	208	336
Motor Resistance	Rm	Ohms	0.974	1.63	4.23	1.23	2.09	5.33	1.49	2.51	6.43	1.78	3.00	7.70
Motor Inductance	Lm	mH	1.9	3.2	8.4	3.3	5.6	14	4.8	8.1	21	6.2	10	27

Continuous Duty Capability for 130°C Rise – RBE - 03010 Series

RBE(H)-03010 to RBE(H)-03013



RBE 0301x Motor Series Performance Data - Continued

RBE(H)-03014 to RBE(H)-03016

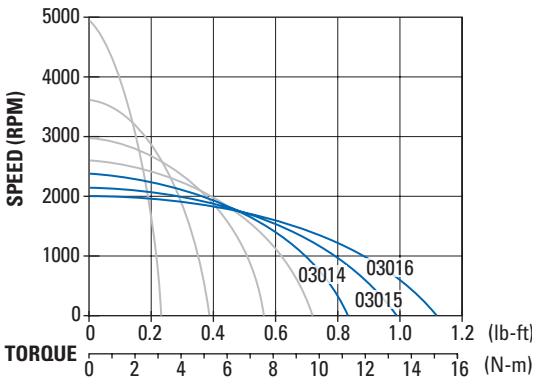
Motor Parameters	Symbols	Units	03014	03015	03016
Max Cont. Output Power at 25°C amb.	HP Rated	HP	1.49	1.60	1.61
	P Rated	Watts	1110	1190	1200
Speed at Rated Power	N Rated	RPM	1460	1320	1200
Max Mechanical Speed	N Max	RPM	8300	8300	8300
Continuous Stall Torque at 25°C amb.	Tc	oz-in	8.22	9.83	11.3
		N-m	11.1	13.3	15.3
Peak Torque	Tp	oz-in	68.8	85.1	101
		N-m	93.2	115	137
Max Torque for Linear KT	Tsl	oz-in	30.1	37.3	41.8
		N-m	40.9	50.6	56.7
Motor Constant	Tm	oz-in/ √W	0.958	1.13	1.27
		N-m/ √W	1.30	1.53	1.73
Thermal Resistance*	Rth	°C/Watt	1.07	1.03	1.00
Viscous Damping	Fi	oz-in/RPM	1.86E-04	2.26E-04	2.58E-04
		N-m/RPM	2.52E-04	3.06E-04	3.50E-04
Max Static Friction	Tf	oz-in	0.401	0.493	0.566
		N-m	0.544	0.668	0.767
Max Cogging Torque Peak to Peak	Tcog	oz-in	0.257	0.317	0.366
		N-m	0.348	0.430	0.496
Frameless Motor Inertia	Jmf	oz-in-sec^2	8.02E-04	9.84E-04	1.13E-03
		Kg-m^2	1.09E-03	1.33E-03	1.53E-03
Frameless Motor Weight	Wtf	oz	11.7	14.2	16.2
		Kg	5.31	6.45	7.37
Housed Motor Inertia	Jmh	oz-in-sec^2	1.31E-03	1.61E-03	1.84E-03
		Kg-m^2	1.78E-03	2.18E-03	2.49E-03
Housed Motor Weight	Wth	oz	17.9	20.9	23.4
		Kg	8.10	9.50	10.6
No. of poles	P		12	12	12

*Rth assumes a housed motor mounted to a 7.5" x 7" x 0.375" aluminum heatsink or equivalent

			03014			03015			03016		
Winding Constants	Symbols	Units	A	B	C	A	B	C	A	B	C
Current at Cont. Torque	Ic	Amps	6.26	4.82	2.99	6.05	4.66	2.89	5.84	8.19	2.82
Current at Peak Torque	Ip	Amps	60.5	40.3	25.4	60.5	40.3	25.3	60.5	72.0	25.3
Torque Sensitivity	Kt	oz-in/Amp	1.38	1.79	2.88	1.72	2.23	3.60	2.03	1.45	4.21
		N-m/Amp	1.87	2.43	3.92	2.33	3.03	4.88	2.75	1.96	5.70
Back EMF constant	Kb	V/KRPM	196	255	410	244	317	511	288	206	597
Motor Resistance	Rm	Ohms	2.07	3.48	8.95	2.30	3.87	9.94	2.54	1.32	10.9
Motor Inductance	Lm	mH	7.6	13	33	8.9	15	39	11	5.6	47

Continuous Duty Capability for 130°C Rise – RBE - 03010 Series

RBE(H)-03014 to RBE(H)-03016

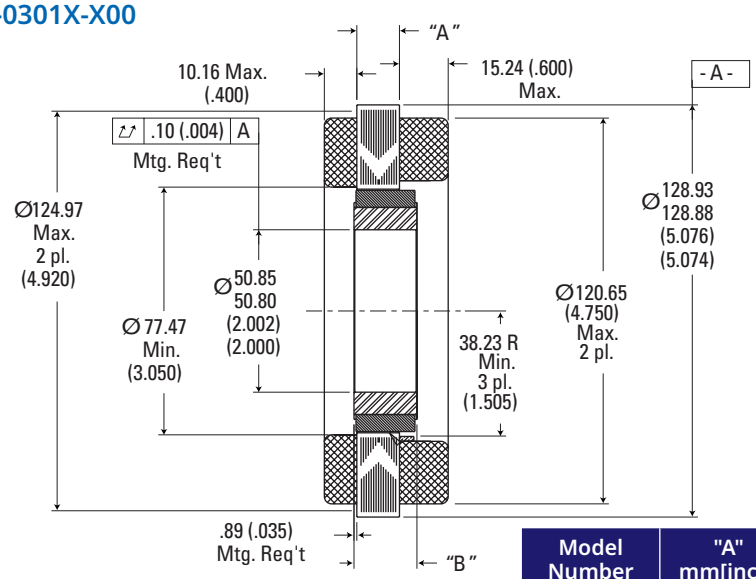


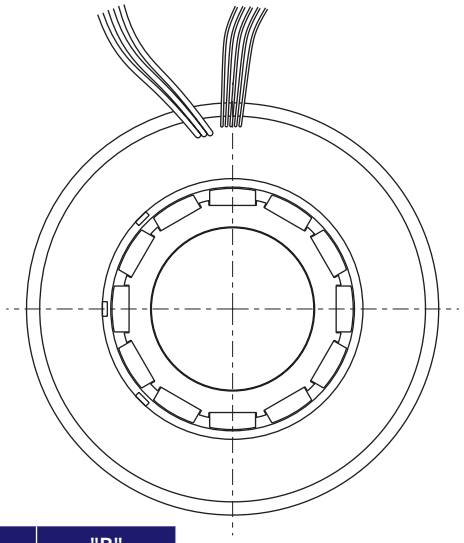
RBE 03010 Motor Series

RBE 03010 Motor Series Dimensional Drawings

Dimensions in mm [inches].
Product designed in inches.
Metric conversions provided for reference only.

RBE-0301X-X00





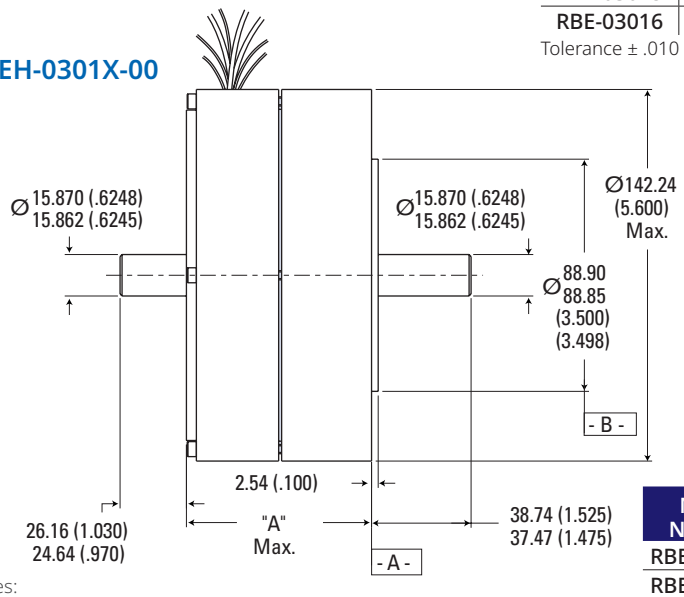
Notes:

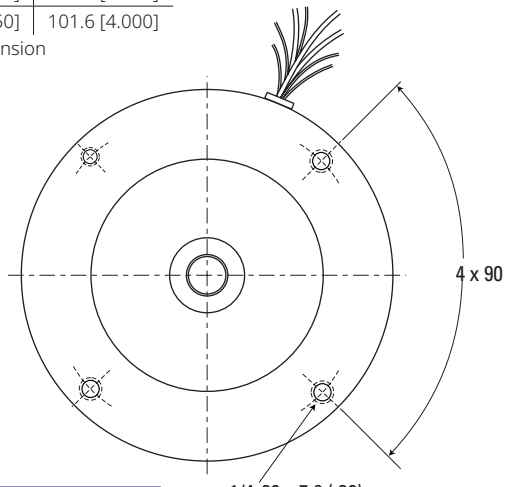
1. For a C.W. rotation, as viewed from the lead end, energize per excitation sequence table.
2. V-AB, V-BC, and V-CA is back EMF of motor phases AB, BC, and CA respectively, aligned with sensor outputs as shown for C.W. rotation only.
3. Mounting surface is between Ø 124.97 (4.920) and Ø 128.91 (5.075) on both sides.

Model Number	"A" mm[inch]	"B" mm[inch]
RBE-03010	13.34 [0.525]	19.69 [0.775]
RBE-03011	26.67 [1.050]	32.02 [1.300]
RBE-03012	41.275 [1.625]	47.63 [1.875]
RBE-03013	54.61 [2.150]	60.96 [2.400]
RBE-03014	66.68 [2.625]	73.02 [2.875]
RBE-03015	82.55 [3.250]	88.90 [3.500]
RBE-03016	95.25 [3.750]	101.6 [4.000]

Tolerance ± .010 on "A" Dimension

RBEH-0301X-00





Notes:

1. Shaft end play: with a 24 lb. reversing load, the axial displacement shall be .013 - .13 (.0005 - .0050).
2. For a C.C.W. rotation, as viewed from the pilot end, energize per excitation sequence table.
3. V-AB, V-BC, and V-CA is back EMF of motor phases AB, BC, and CA respectively, aligned with sensor outputs as shown for C.W. rotation only.

Model Number	"A" mm[inch]
RBEH-03010	71.63 [2.820]
RBEH-03011	84.96 [3.345]
RBEH-03012	99.57 [3.920]
RBEH-03013	112.90 [4.445]
RBEH-03014	124.97 [4.920]
RBEH-03015	140.84 [5.545]
RBEH-03016	153.54 [6.045]

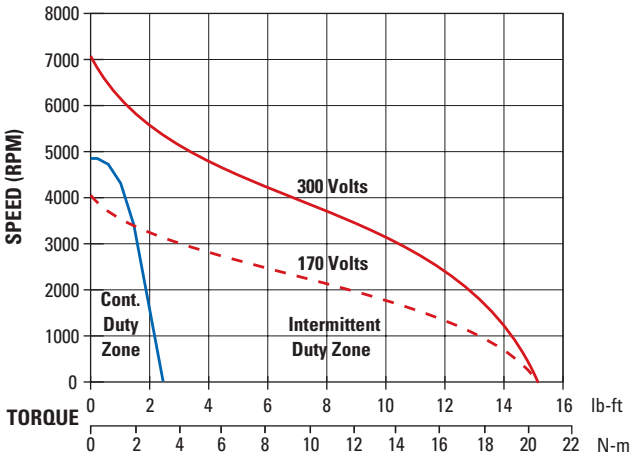
RBE(H)-0301x Leadwire Specifications

MOTOR LEADS: #18 AWG type "ET" Teflon® coated per MIL-W-22759/11, 3 leads, 152 mm [6.00 in] min. length ea., 1- Black, 1- White, 1-Red

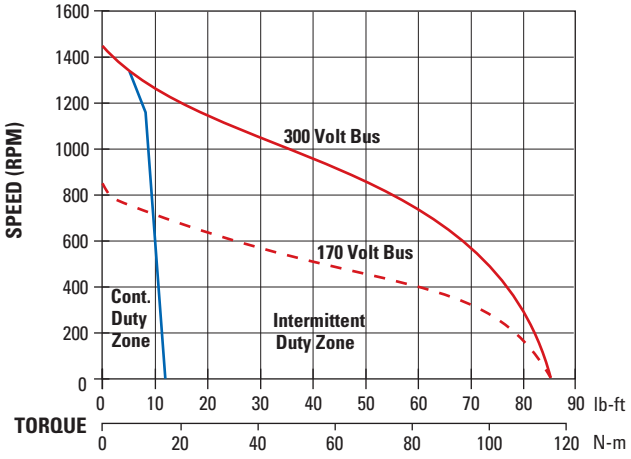
SENSOR LEADS: #26 AWG type "ET" Teflon® coated per MIL-W-16878, 5 leads, 152 mm [6.00 in] min. length ea., 1-Yellow, 1-Green, 1-Orange, 1-Blue, 1-Brown.

RBE 03010 Motor Series Performance Curves

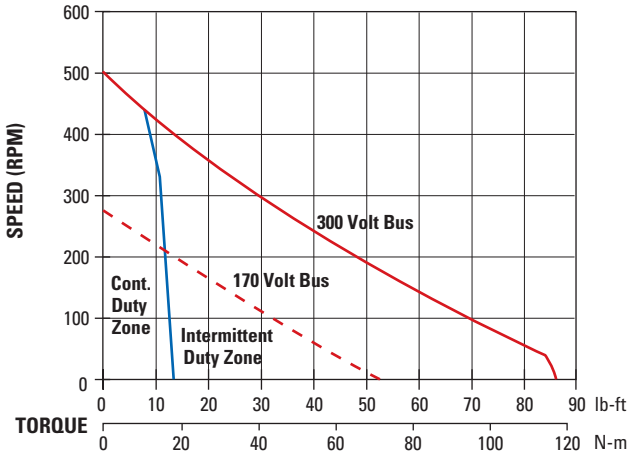
RBE-03010-A



RBE-03016-B



RBE-03016-C

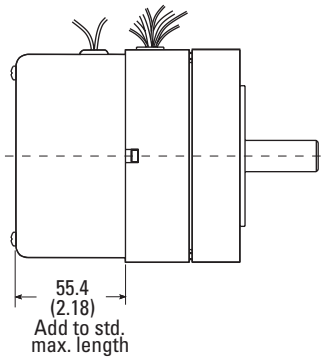


RBE 03010 Motor Series

RBE 03010 Motor Series Options

Dimensions in mm [inches].
Product designed in inches.
Metric conversions provided for reference only.

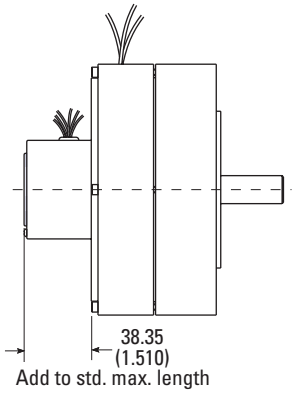
BRAKE OPTION



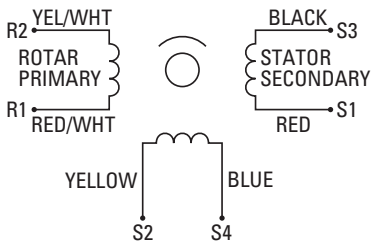
An integral electromagnetic fail-safe brake can be added to the rear of the motor. Operating in the POWER OFF/BRAKE ON mode, the brake provides 4.2 lb-ft of torque for static parking and emergency braking. To release the brake, 24 VDC and 0.39 Amps max need to be applied.

- Fail-safe brake
- 4.2 lb-ft holding torque
- Release voltage of 24 VDC (0.39 Amps)

RESOLVER OPTION



A frameless resolver is available to provide position feedback computable with a wide variety of CNC and other position loop controllers. This option is required for commutation when using a Kollmorgen servo drive or other resolver based controller.



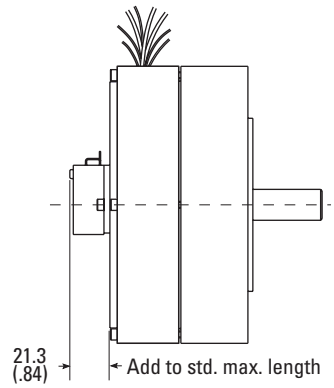
RESOLVER SCHEMATIC

PHASING EQUATIONS
E(S1-S3) = KE(R1-R2) COS Ø
E(S2-S4) = -KE(R1-R2) SIN Ø
WITH CCW ROTATION AS
VIEWED FROM SHAFT END

Normal Characteristics At 25 °C

Primary	Rotor
Input Voltage	4.25 V, 7 kHz
Input Current	55 mA max.
Input Power	0.12 W
Transformation Ratio (± 5%)	0.470
Phase Shift	4° Leading ±3°
Impedances (± 15%)	
Z_{RO}	48 + j70
Z_{SO}	62 + j80
Z_{SS}	53 + j63
Z_{RS}	42 + j55
D.C. Resistance (± 10%)	
Stator	33 Ohm
Rotor	16 Ohm
Null Voltage	20 mV max.
Electrical Error	±7 min. max.
Output Voltage	2.0 V ±5%
Operating Temperature	-55 °C to +155 °C

ENCODER OPTION



An incremental encoder is available having TTL quadrature and marker pulse outputs. 200 to 2048 lines are available. The standard is 1024 lines with the marker pulse.

Parameter	Min	Max	Units
Temperature	-40	100	°C
Supply Voltage	4.5	5.5	Volts
Supply Current	30	85	mA
Count Frequency		100	kHz
Velocity		10K	RPM

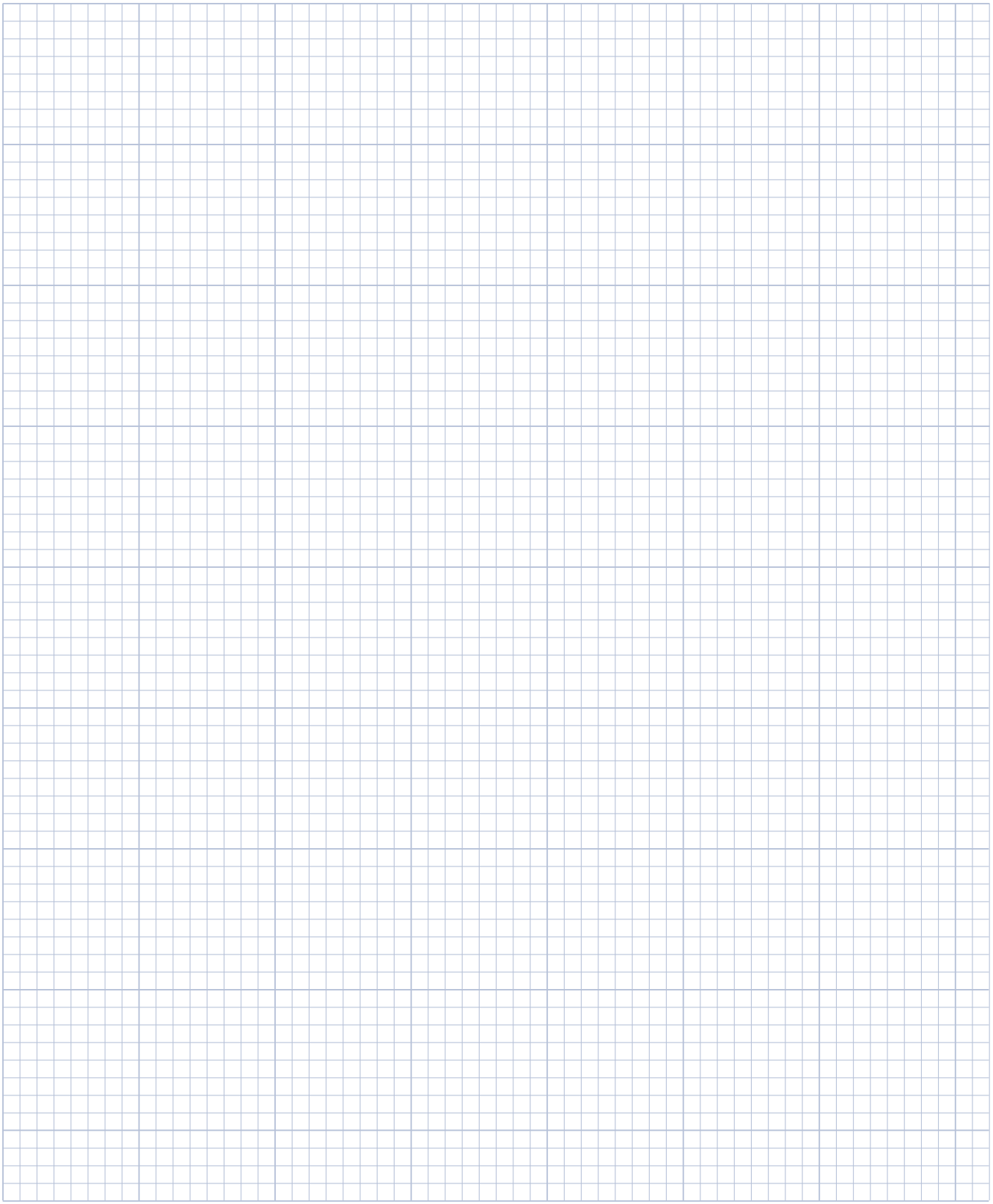
Resolution Cycles/Rev.
200
500*
1000
1024
2000*
2048*

*Index option not yet available for resolution

Notes

RBE(H) – B 030 10 – A 00

Motor Series | Frame Size | Frame Size | Stack Length | Brake | Modifications



0.125 inch divisions

RBE 04510 Motor Series

RBE 0451x Motor Series Performance Data

RBE(H)-04510 to RBE(H)-04512

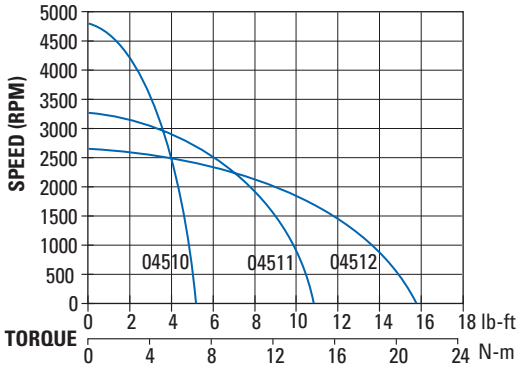
Motor Parameters		Symbols	Units	04510	04511	04512
Max Cont. Output Power at 25°C amb.		HP Rated	HP	2.10	3.03	3.54
		P Rated	Watts	1568	2262	2640
Speed at Rated Power		N Rated	RPM	3240	2210	2100
Max Mechanical Speed		N Max	RPM	6000	6000	6000
Continuous Stall Torque at 25°C amb.		Tc	oz-in	4.83	10.6	15.9
			N-m	6.55	14.4	21.5
Peak Torque		Tp	oz-in	20.5	46.8	72.5
			N-m	27.7	63.5	98.3
Max Torque for Linear KT		Tsl	oz-in	9.83	24.9	41.1
			N-m	0.069	0.176	0.290
Motor Constant		Tm	oz-in/ √W	0.489	0.99	1.42
			N-m/ √W	0.662	1.34	1.93
Thermal Resistance*		Rth	°C/Watt	0.83	0.71	0.65
Viscous Damping		Fi	oz-in/RPM	1.60E-04	2.90E-04	4.20E-04
			N-m/RPM	2.17E-04	3.93E-04	5.69E-04
Max Static Friction		Tf	oz-in	0.16	0.35	0.53
			N-m	0.217	0.468	0.719
Max Cogging Torque Peak to Peak		Tcog	oz-in	0.07	0.10	0.13
			N-m	0.096	0.133	0.169
Frameless Motor	Inertia	Jmf	oz-in-sec^2	1.20E-03	2.30E-03	3.40E-03
			Kg-m^2	1.63E-03	3.12E-03	4.61E-03
	Weight	Wtf	oz	6.0	10.5	15.0
			Kg	2.72	4.76	6.80
Housed Motor	Inertia	Jmh	oz-in-sec^2	1.60E-03	2.35E-03	3.40E-03
			Kg-m^2	2.17E-03	3.19E-03	4.61E-03
	Weight	Wth	oz	14.0	18.5	23.0
			Kg	6.35	8.39	10.4
No. of poles		P		12	12	12

*Rth assumes a housed motor mounted to a 13" x 12.5" x 0.5" aluminum heatsink or equivalent

			04510			04511			04512		
Winding Constants	Symbols	Units	A	B	C	A	B	C	A	B	C
Current at Cont. Torque	Ic	Amps	11.7	6.20	17.1	11.3	10.3	16.4	19.5	15.9	10.9
Current at Peak Torque	Ip	Amps	80.8	48.0	114	80.8	72.0	114	144	114	80.8
Torque Sensitivity	Kt	oz-in/Amp	0.425	0.805	0.292	0.973	1.60	0.669	0.844	1.03	1.50
		N-m/Amp	0.576	1.09	0.396	1.32	1.44	0.907	1.14	1.40	2.03
Back EMF constant	Kb	V/KRPM	60.4	114	41.5	138	151	95.0	120	146	213
Motor Resistance	Rm	Ohms	0.757	2.78	0.366	0.964	1.18	0.465	0.352	0.542	1.12
Motor Inductance	Lm	mH	3.6	13	1.7	4.6	5.4	2.2	2.2	3.3	7.0

Continuous Duty Capability for 130°C Rise – RBE - 04510 Series

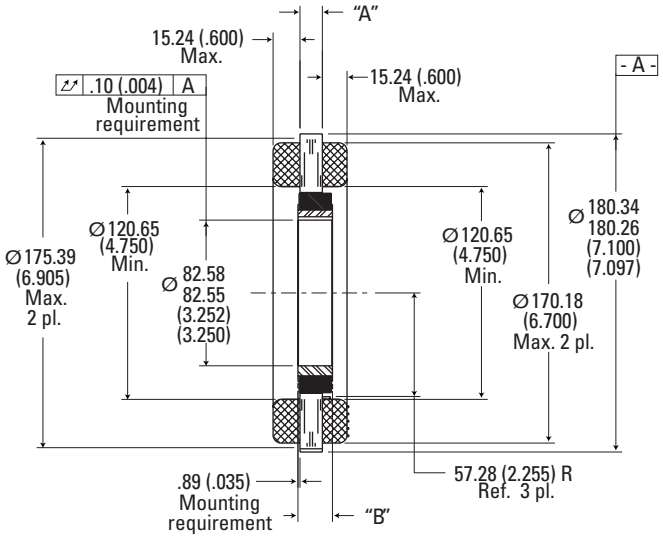
RBE(H)-04510 to RBE(H)-04512

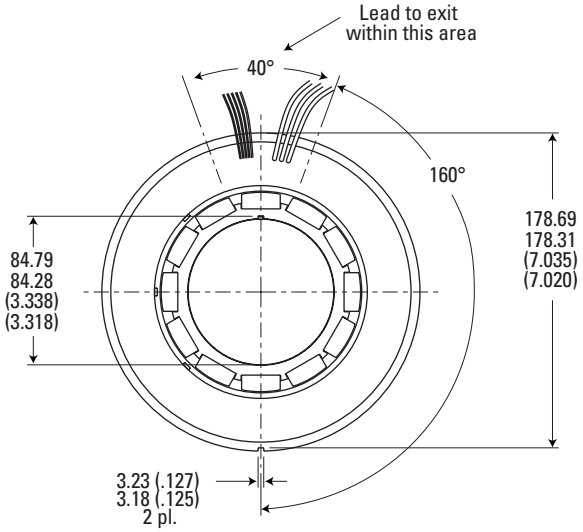


RBE 0451X Motor Series Dimensional Drawings

Dimensions in mm [inches].
Product designed in inches.
Metric conversions provided for reference only.

RBE-0451X-X00





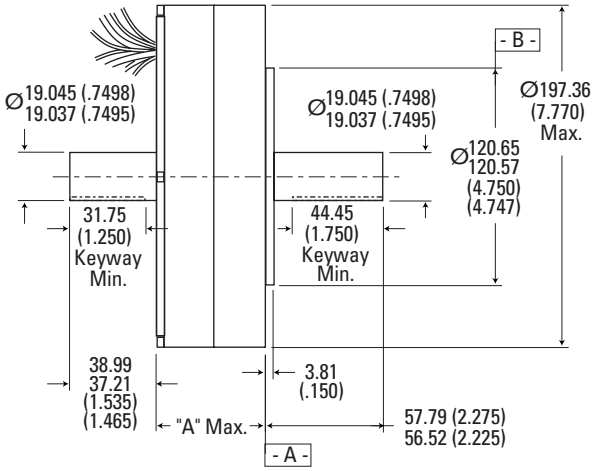
Notes:

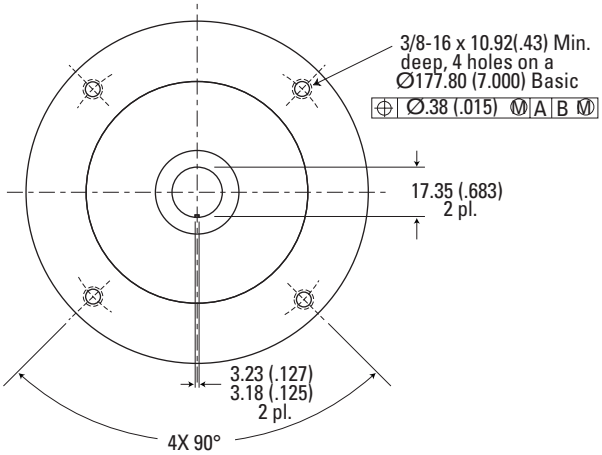
1. For a C.W. rotation, as viewed from the lead end, energize per excitation sequence table.
2. V-AB, V-BC, and V-CA is back EMF of motor phases AB, BC, and CA respectively, aligned with sensor outputs as shown for C.W. rotation only.
3. Mounting surface is between Ø 175.39 (6.905) and Ø 180.31 (7.099) on both sides.

Model Number	"A" mm[inch]	"B" mm[inch]
RBE-45010	12.70 [0.500]	19.56 [0.770]
RBE-45011	29.21 [1.150]	36.07 [1.420]
RBE-45012	45.72 [1.800]	52.58 [2.070]

Tolerance ± .010 on "A" Dimension

RBEH-0451X-X00





Notes:

1. Shaft end play: with a 34 lb. reversing load, the axial displacement shall be .013 - .15 (.0005 - .006).
2. For a C.C.W. rotation, as viewed from the pilot end, energize per excitation sequence table.
3. V-AB, V-BC, and V-CA is back EMF of motor phases AB, BC, and CA respectively, aligned with sensor outputs as shown for C.W. rotation only.

Model Number	"A" mm[inch]
RBEH-04510	76.45 [3.010]
RBEH-04511	92.96 [3.660]
RBEH-04512	109.47 [4.310]

RBE(H)-0451x Leadwire Specifications

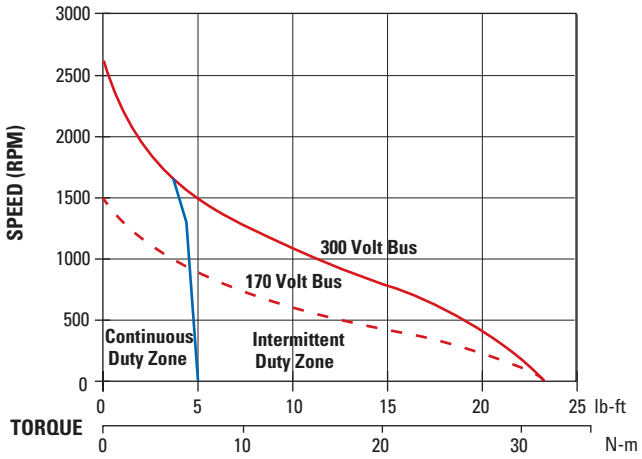
MOTOR LEADS: #14 AWG type "ET" Teflon® coated per MIL-W-22759/11, 3 leads, 152 mm [6.00 in] min. length ea., 1- Black, 1- White, 1-Red

SENSOR LEADS: #26 AWG type "ET" Teflon® coated per MIL-W-16878, 5 leads, 152 mm [6.00 in] min. length ea., 1-Yellow, 1-Green, 1-Orange, 1-Blue, 1-Brown.

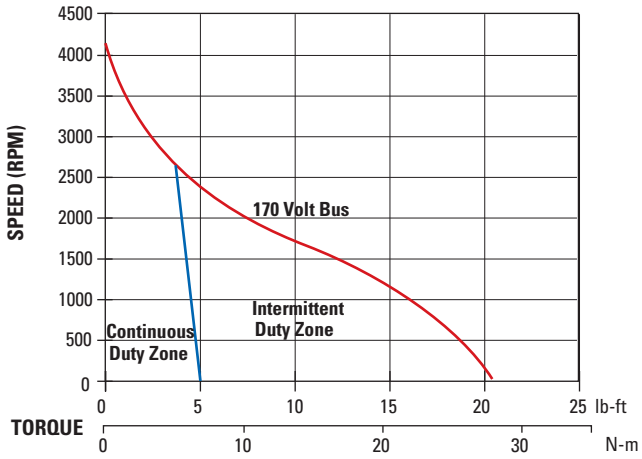
RBE 04510 Motor Series

RBE 04510 Motor Series Performance Curves

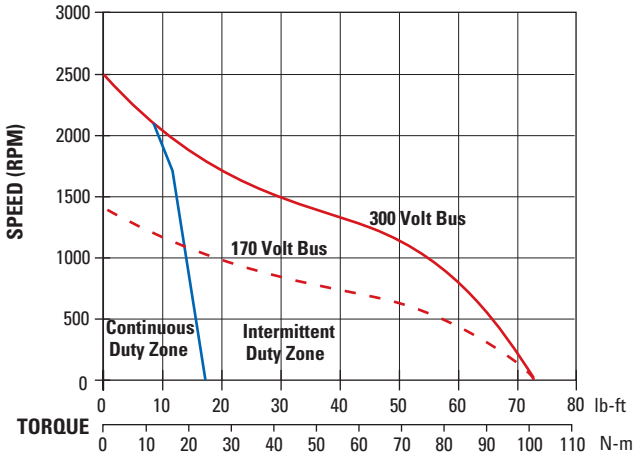
RBE-04510-B



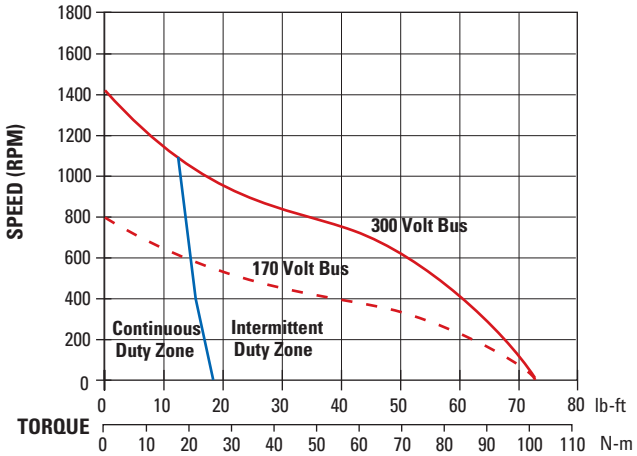
RBE-04510-C



RBE-04512-A



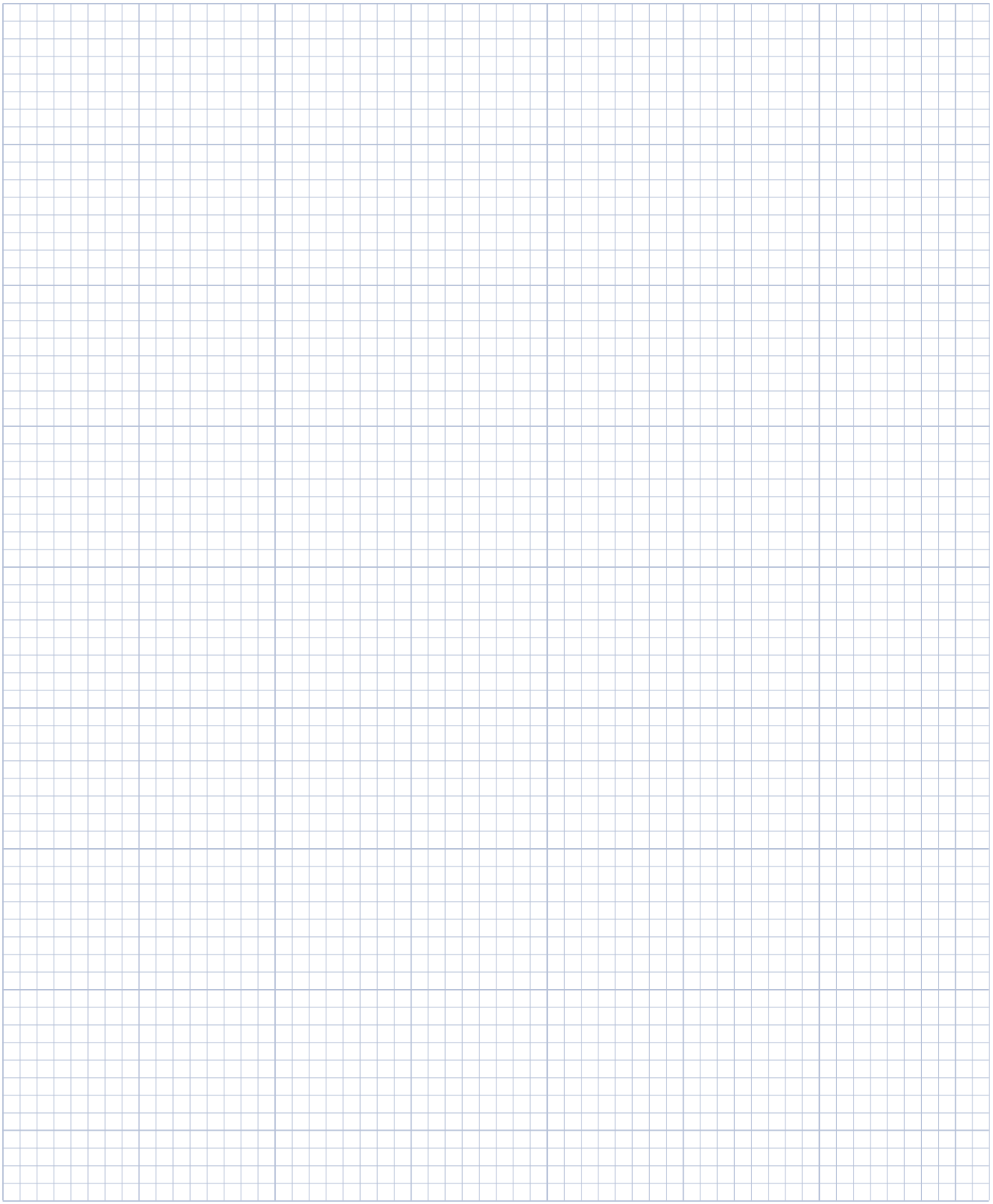
RBE-04512-C



Notes

RBE(H) – B 045 10 – A 00

Motor Series | Frame Size | Frame Size | Stack Length | Brake | Modifications



0.125 inch divisions

RBE 06210 Motor Series

RBE 0621x Motor Series Performance Data

RBE(H)-06210 to RBE(H)-06212

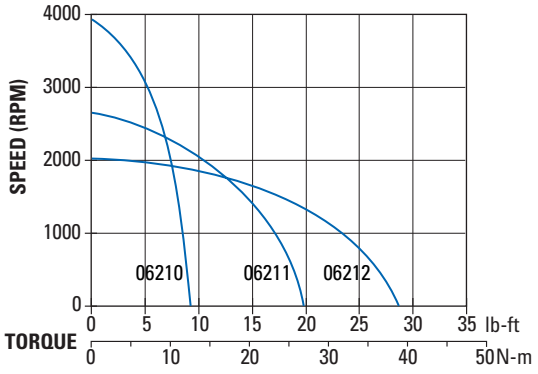
Motor Parameters		Symbols	Units	06210	06211	06212
Max Cont. Output Power at 25°C amb.		HP Rated	HP	3.06	4.31	4.95
		P Rated	Watts	2286	3212	3690
Speed at Rated Power		N Rated	RPM	2650	1750	1390
Max Mechanical Speed		N Max	RPM	4500	4500	4500
Continuous Stall Torque at 25°C amb.		Tc	oz-in	8.67	19.0	28.4
			N-m	11.8	25.8	38.4
Peak Torque		Tp	oz-in	41.9	94.6	145
			N-m	56.8	128	197
Max Torque for Linear KT		Tsl	oz-in	20.2	45.5	97
			N-m	27.4	61.7	131
Motor Constant		Tm	oz-in/ √W	0.80	1.64	2.37
			N-m/ √W	1.09	2.23	3.22
Thermal Resistance*		Rth	°C/Watt	0.70	0.62	0.58
Viscous Damping		Fi	oz-in/RPM	1.50E-04	5.75E-04	1.00E-03
			N-m/RPM	2.03E-04	7.80E-04	1.36E-03
Max Static Friction		Tf	oz-in	0.24	0.47	0.70
			N-m	0.325	0.637	0.949
Max Cogging Torque Peak to Peak		Tcog	oz-in	0.13	0.18	0.23
			N-m	0.176	0.244	0.312
Frameless Motor	Inertia	Jmf	oz-in-sec^2	3.60E-03	7.30E-03	1.11E-02
			Kg-m^2	4.88E-03	9.90E-03	1.50E-02
	Weight	Wtf	oz	10.8	18.2	25.6
			Kg	4.90	8.26	11.6
Housed Motor	Inertia	Jmh	oz-in-sec^2	3.70E-03	1.15E-02	1.20E-02
			Kg-m^2	5.02E-03	1.56E-02	1.63E-02
	Weight	Wth	oz	22.3	29.8	37.3
			Kg	10.1	13.5	16.9
No. of poles		P		12	12	12

*Rth assumes a housed motor mounted to a 13" x 12.5" x 0.5" aluminum heatsink or equivalent

			06210			06211			06212		
Winding Constants	Symbols	Units	A	B	C	A	B	C	A	B	C
Current at Cont. Torque	Ic	Amps	17.5	8.0	12.4	16.9	7.8	12.0	18.5	29.6	11.7
Current at Peak Torque	Ip	Amps	162	85.7	114	162	85.7	114	182	289	114
Torque Sensitivity	Kt	oz-in/Amp	0.510	1.11	0.718	1.15	2.51	1.62	1.57	0.981	2.49
		N-m/Amp	0.691	1.51	0.973	1.56	3.40	2.19	2.13	1.33	3.37
Back EMF constant	Kb	V/KRPM	72.4	158	102	163	356	230	223	139	353
Motor Resistance	Rm	Ohms	0.405	1.93	0.804	0.489	2.33	0.970	0.438	0.172	1.10
Motor Inductance	Lm	mH	2.1	9.9	4.1	3.6	17	7.2	4.0	1.6	10

Continuous Duty Capability for 130°C Rise – RBE - 06210 Series

RBE(H)-06210 to RBE(H)-06212

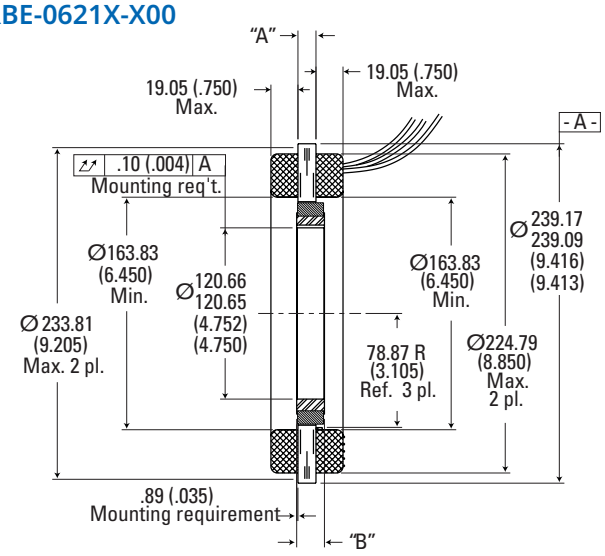


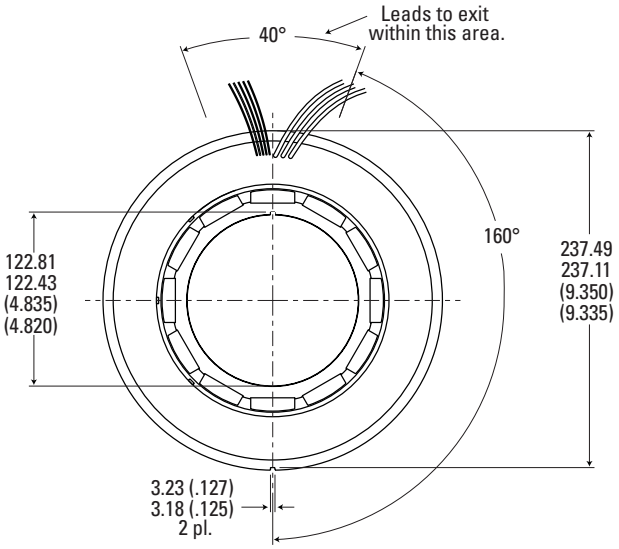
RBE 06210 Motor Series

RBE 0621x Motor Series Dimensional Drawings

Dimensions in mm [inches].
Product designed in inches.
Metric conversions provided for reference only.

RBE-0621X-X00





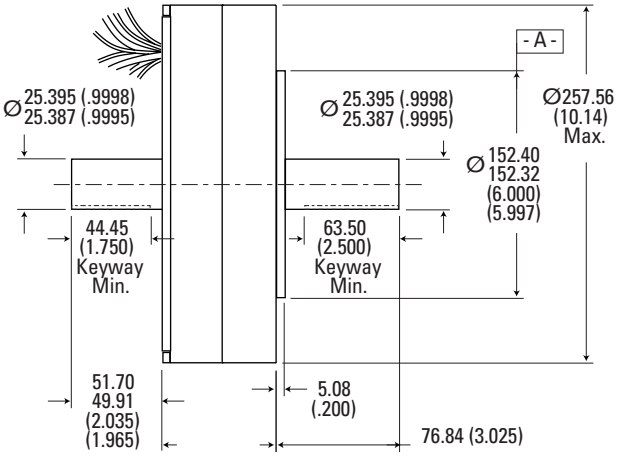
Notes:

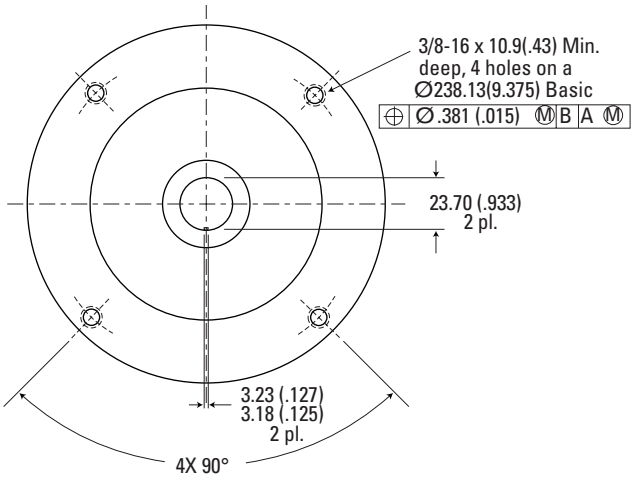
1. For a C.W. rotation, as viewed from the lead end, energize per excitation sequence table.
2. V-AB, V-BC, and V-CA is back EMF of motor phases AB, BC, and CA respectively, aligned with sensor outputs as shown for C.W. rotation only.
3. Mounting surface is between Ø 233.81 (9.205) and Ø 239.17 (9.416) on both sides.

Model Number	"A" mm[inch]	"B" mm[inch]
RBE-06210	12.70 [0.500]	19.56 [0.770]
RBE-06211	29.21 [1.150]	36.07 [1.420]
RBE-06212	45.72 [1.800]	52.58 [2.070]

Tolerance ± .010 on "A" Dimension

RBEH-0621X-X00





Notes:

1. Shaft end play: with a 34 lb. reversing load, the axial displacement shall be .013 - .15 (.0005 - .006).
2. For a C.C.W. rotation, as viewed from the pilot end, energize per excitation sequence table.
3. V-AB, V-BC, and V-CA is back EMF of motor phases AB, BC, and CA respectively, aligned with sensor outputs as shown for C.W. rotation only.

Model Number	"A" mm[inch]
RBEH-06210	82.30 [3.240]
RBEH-06211	98.81 [3.890]
RBEH-06212	115.32 [4.540]

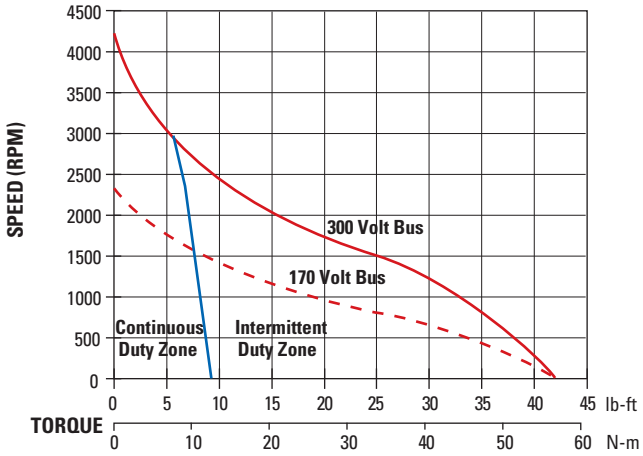
RBE(H)-0621x Leadwire Specifications

MOTOR LEADS: #12 AWG type "ET" Teflon® coated per MIL-W-22759/11, 3 leads, 152 mm [6.00 in] min. length ea., 1- Black, 1- White, 1-Red

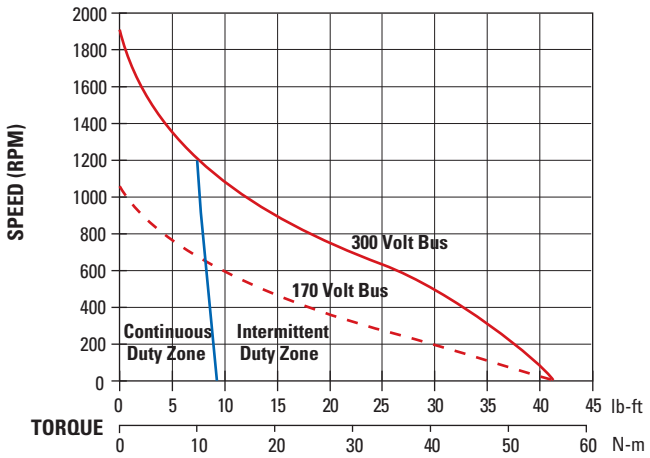
SENSOR LEADS: #26 AWG type "ET" Teflon® coated per MIL-W-16878, 5 leads, 152 mm [6.00 in] min. length ea., 1-Yellow, 1-Green, 1-Orange, 1-Blue, 1-Brown.

RBE 06210 Motor Series Performance Curves

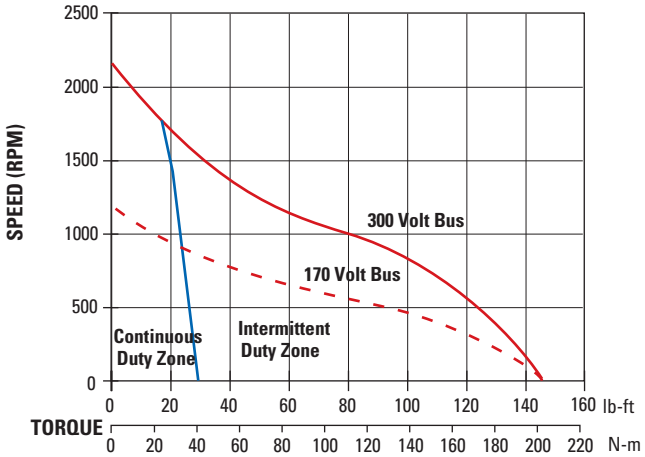
RBE-06210-A



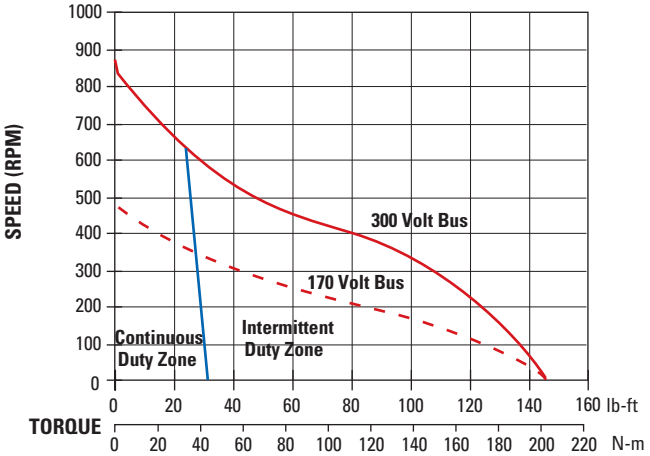
RBE-06210-B



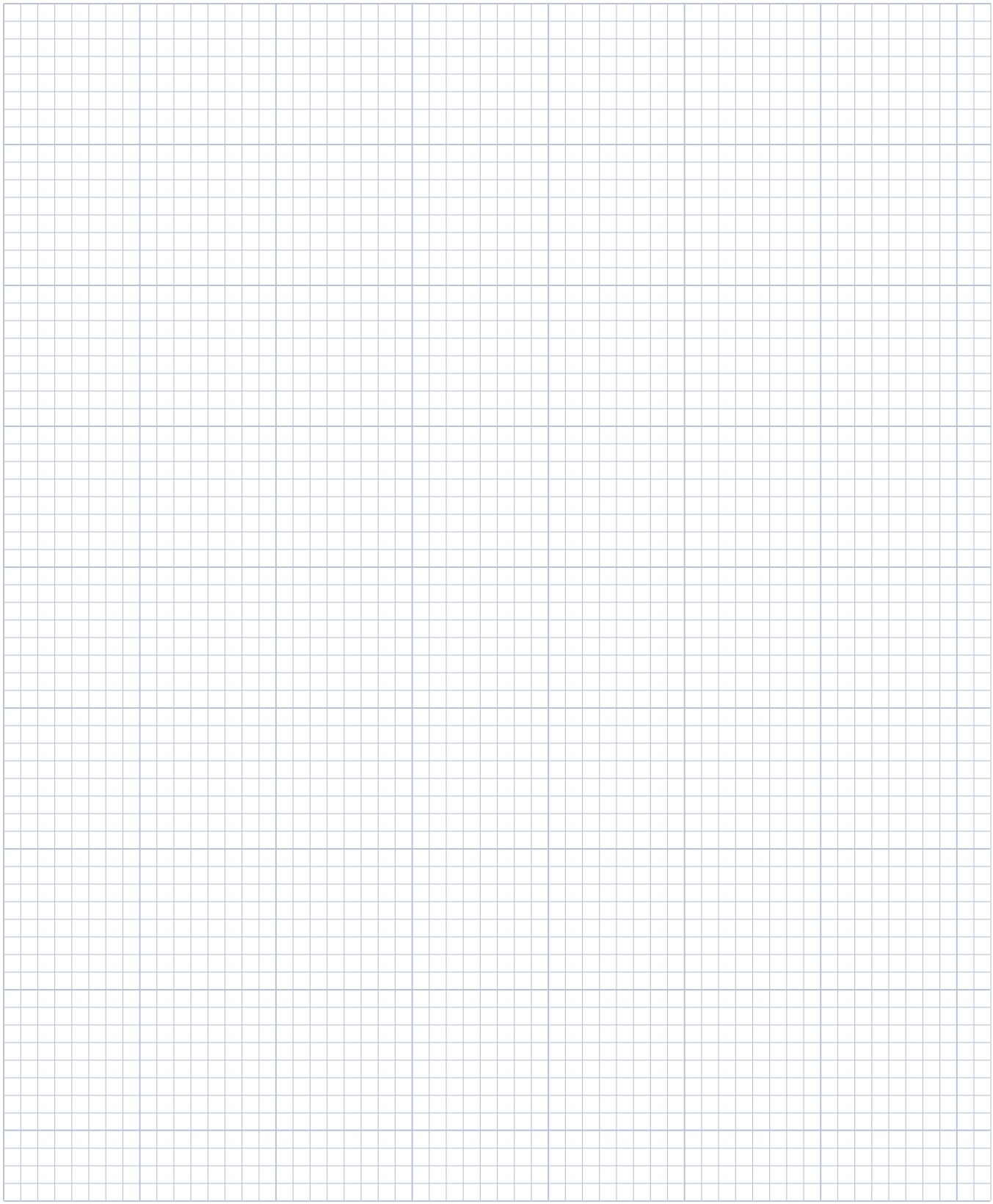
RBE-06212-B



RBE-06212-C



Notes



0.125 inch divisions

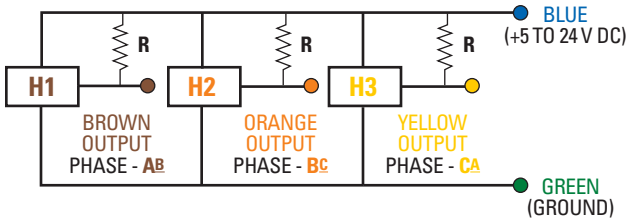
RBE Series Frameless Motors

Commutation and Connection Diagrams

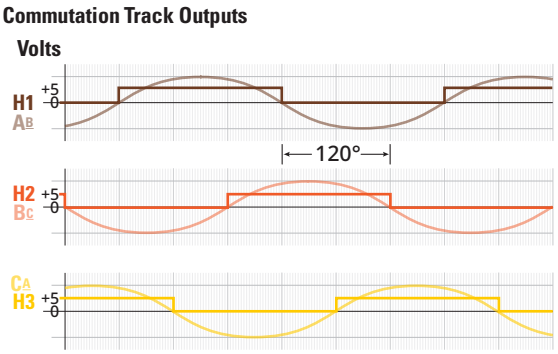
Motor Excitation Sequence and Sensor Output Logic for C.W. Rotation Viewing Leadwire End

	Motor Power Leads			Sensor Outputs		
STEP	Phase 'A' Red	Phase 'B' White	Phase 'C' Black	H1 Brown	H2 Orange	H3 Yellow
1	⊕	⊖	○	1	0	0
2	⊕	○	⊖	1	1	0
3	○	⊕	⊖	0	1	0
4	⊖	⊕	○	0	1	1
5	⊖	○	⊕	0	0	1
6	○	⊖	⊕	1	0	1
1	⊕	⊖	○	1	0	0

Hall Sensor Wiring Diagram

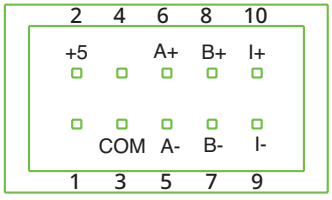


Hall and Motor Phase Output



Encoder Wiring Table
CH A Leads CH B, C.C.W

PIN #	Function
1	NC
2	+5 V
3	GROUND
4	NC
5	DATA A-
6	DATA A+
7	DATA B-
8	DATA B+
9	INDEX Z-
10	INDEX Z+



Δ on connector indentifies Pin #1 on both LD and module

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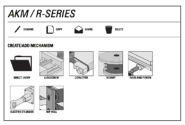

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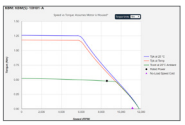

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