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G410 Series Brushless Servo Motors



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MOOG BRUSHLESS TECHNOLOGY

For two decades, the name Moog has been associated with brushless servo motors and drives offering the highest dynamics, power density and reliability. The servo motors and drives are designed as a system to deliver superior servo performance. Moog offers a broad range of standard servo motors and drives as well as custom solutions to meet your unique application requirements. Moog brushless servo motors and drives are found on a variety of applications; especially where dynamics, compact size and reliability are important.

G410 SERIES BRUSHLESS SERVOMOTORS

Moog's G410 Series motors are electronically commutated synchronous AC motors with permanent magnet field excitation. G410 Series motors are designed for highly dynamic servo applications where positioning times of 100 mSec or less are often the norm. The G410 Series offers one of the industry's widest power ranges with standard models available at continuous torque ratings from 0.2 to 100 Nm (2.2 to 885 lb-in). The modular design is supported by a variety of options with Moog's application staff capable of supplying fully customized solutions. All Moog servo motors are manufactured in-house and the use of tight machining tolerances, precision balancing and thorough production testing guarantee a long service life.

Moog Motor Performance Characteristics

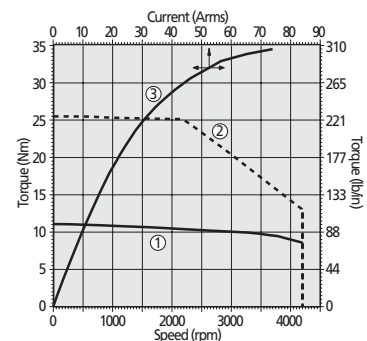
In collaborating with a variety of industrial machine designers, Moog realizes what a critical role the application sizing process plays in overall machine design. With global competition forcing designers to do more with less, there is an ever-increasing need to avoid unnecessary margin and "size" exactly to your application needs. It is for these reasons that Moog specifies motor performance characteristics in a manner that makes them practical for designing your system. Motor characteristics are specified under the same environmental conditions in which they will be used, with notes clearly articulating the operating conditions.

The motor performance characteristic contains three elements.

- The first element is the continuous torque curve. This curve illustrates the motor torque available at 100% duty cycle under the following conditions:
 - operation in still air with ambient temperatures up to 55°C
 - winding temperature at 100°C over ambient
 - motor front flange attached to a steel mounting plate measuring 300 x 300 x 12 mm

The second element is the peak torque curve. This curve reflects the motor torque available with a 10% duty cycle (1 out of 10 seconds). It is based on years of practical industry experience and is useful for typical servo applications.

The third element is the motor Kt characteristic. The motor Kt characteristic depicts stator saturation at various operating points and can be used to optimize sizing in low duty cycle applications. As shown by the "t" symbol on the motor Kt line, G400 motors can deliver a low duty cycle "impulse torque" which is typically 30% more than rated peak torque. While motors can be operated reliably at this operating point it is recommended that a member of Moog's application team review the application to ensure thermal restrictions are not violated.



The motors described herein are UL certified under file number 206936.



The motors described herein have successfully passed EMC tests required by EC Directive.



The motors described herein follow the design directives according to VDE standards.

FEATURES & BENEFITS

Superior Motor Dynamics Improves Cycle Time

The G410 Series motor combines a low inertia rotor with an electromagnetic design having exceptional overload capacity. The result is an increase in the effective torque available to accelerate and decelerate the load, enabling higher dynamics and improved cycle times.

G410 Series motors use a fully laminated, weight-optimized, rotor to provide a significant inertia reduction over conventional solid rotor designs. It is able to achieve a high overload capacity through the use of high-energy SmCo magnets, a high pole count electrical design, and an efficient thermal construction.

Compact, Lightweight, Construction Simplifies Machine Design

The G410 Series motor provides high torque in a compact, lightweight, package to achieve both high power density and a high torque-to-weight ratio. The compact, lightweight, package provides greater flexibility and often enables new cost-saving approaches to machine construction. In applications where the motor is mounted on a moving axis the high torque to weight ratio allows greater payloads and/or increased acceleration.

G410 Series motors leverage an all aluminum motor housing to achieve a significant weight reduction over low cost steel housings. A robust thermal design allows more power to be designed into a small, compact, package.

Proprietary, Low-Cogging, Design Delivers Smooth Low Speed Operation

The G410 Series motor includes several design enhancements to deliver smooth slow speed performance. The enhancements include the selection of a high pole count (8 to 12 poles) electromagnetic design, a stator with non-symmetric slot count and other proprietary features to minimize cogging.

Ruggedized, Maintenance-Free, Design to Boost Overall System Availability

The G410 Series motor is designed and manufactured in accordance with strict CE (VDE) standards, using ruggedized components with proven reliability in harsh thermal and shock load environments. These all combine to offer years of reliable, maintenance-free, operation and boost overall system availability.

G410 Series motors are designed using high grade SmCo magnets. SmCo magnets offer extremely stable operating characteristics and are highly resistant to demagnetization. This allows the G410 to deliver fully rated performance with ambient temperatures as high as 55°C. Lower cost magnet materials often require the motor to be derated in ambient environments above 25°C and can exhibit degrading performance in higher peak power applications.

The use of high reliability resolvers, sealed life-time lubricated bearings, precision balanced rotors (Class G 6.3 of ISO 1940), reduced runout machining tolerances (Class R of DIN 42955-R) and IP67 construction combine to extend service life.

Flexible Design Option Ease Integration

The G410 Series motor is available with the following options:

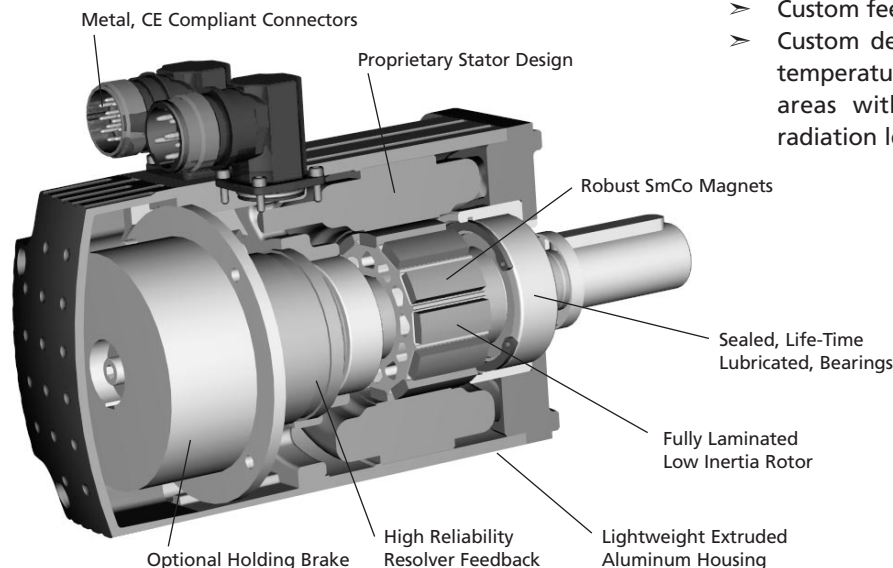
- > Integral holding brakes
- > Resolver (standard) or encoder based feedback
- > Plain or slot & key type shafts
- > Teflon shaft seal (IP68 sealing)
- > Convection (standard) or fan cooling (select models)

Fully Customized Designs Support Unique Application Requirements

Finally, our G410 Series motors can be customized to meet your unique needs.

The following are typical requests supported by Moog's application staff:

- > Custom motor windings
- > Custom shafts and flanges
- > Custom frameless designs
- > Custom connector configurations (including pigtails)
- > Custom feedback devices
- > Custom designs for unique environments including high temperature, high shock levels, oil and water immersion, areas with explosive gases and areas with elevated radiation levels.



PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

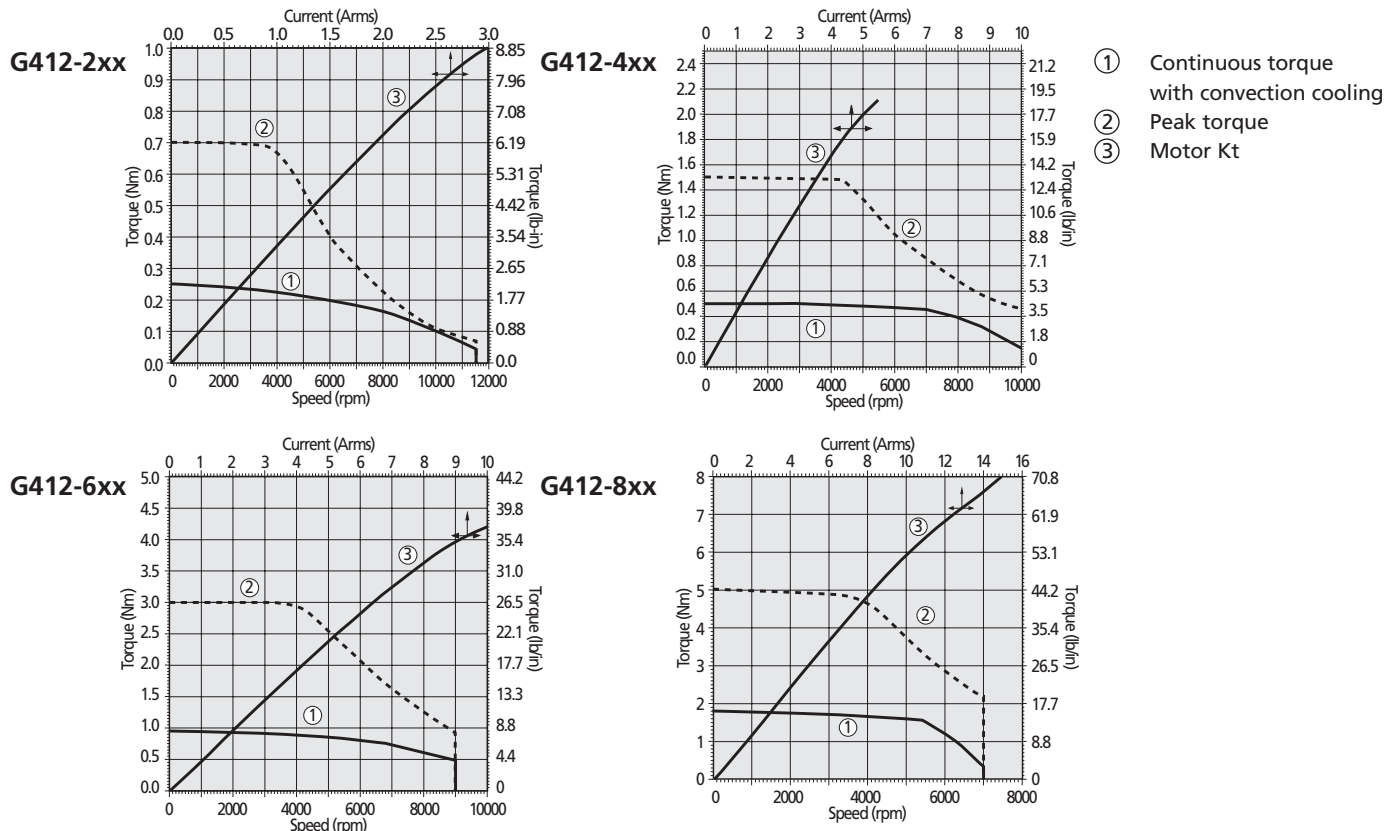
		Metric [English]	G412-2xx	G412-4xx	G412-6xx	G412-8xx
Continuous stall torque	M_o	Nm [lb-in]	0.25 [2.2]	0.50 [4.4]	0.95 [8.4]	1.8 [15.9]
Continuous stall current	I_o	Arms	0.65	1.2	2.2	2.9
Peak torque	M_{max}	Nm [lb-in]	0.70 [6.2]	1.5 [13.3]	3.00 [26.6]	5.0 [44.3]
Peak current	I_{max}	Arms	1.9	3.7	6.4	8.3
Nominal speed	n_N	rpm	8100	7400	6800	6200
Nominal power	P_N	kW [hp]	0.15 [0.20]	0.33 [0.44]	0.53 [0.71]	0.82 [1.1]
Maximum speed	n_{max}	rpm	11500	10000	9000	7000
Torque constant	k_T	Nm/Arms [lb-in/Arms]	0.37 [3.3]	0.42 [3.7]	0.46 [4.1]	0.60 [5.3]
Motor terminal resistance	R_{tt}	Ohm	50.9	20.7	9.9	6.3
Motor inductance	L_{tt}	mH	29.7	15.7	9.1	7.2
Inertia w/o brake	J	kg cm ² [lb-insec ² x 10 ⁻⁴]	0.09 [0.80]	0.13 [1.2]	0.22 [2.0]	0.41 [3.6]
Mass w/o brake	m	kg [lb]	1.0 [2.2]	1.2 [2.7]	1.5 [3.3]	2.3 [5.1]

Notes: Refer to page 17 for notes on performance specifications.

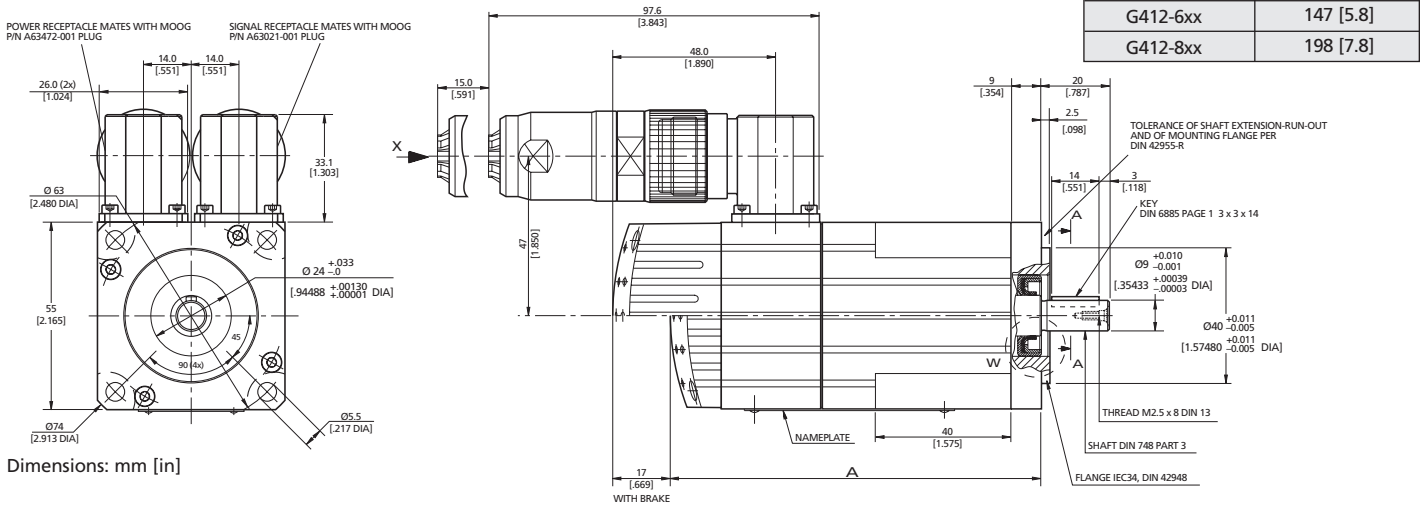
Optional Holding Brake	metric [english]	Option 1	Option 2
Holding torque	Nm [lb-in]	0.90 [8.0]	N/A
Extra weight	kg [lb]	0.18 [0.40]	N/A
Inertia	kg cm ² [lb-insec ² x 10 ⁻⁴]	0.02 [0.18]	N/A
Power requirement	Watt [Watt]	11.0 [11.0]	N/A

For a complete list of options and accessories, see pages 14-16.

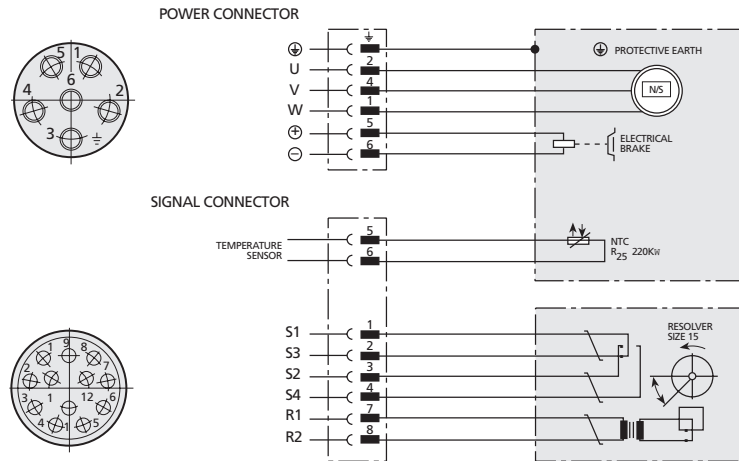
PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS



INSTALLATION DIAGRAM



WIRING DIAGRAM



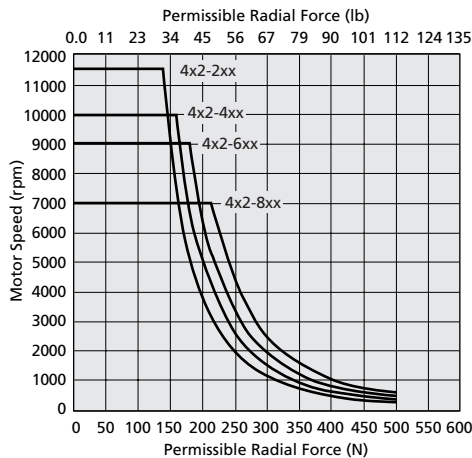
BEARING LOAD DIAGRAM

Maximum Permissible Shaft Load

The maximum permissible radial load depends on desired service length. The bearing load curves illustrated support an operational life of 20,000 hours (L10h) with axial loads up to 75 N. Consult Moog for extended service life requirements or alternate load conditions.

Notes:

1. Load capacity referenced to middle of output shaft.
2. Maximum axial load during installation: 150N.



PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

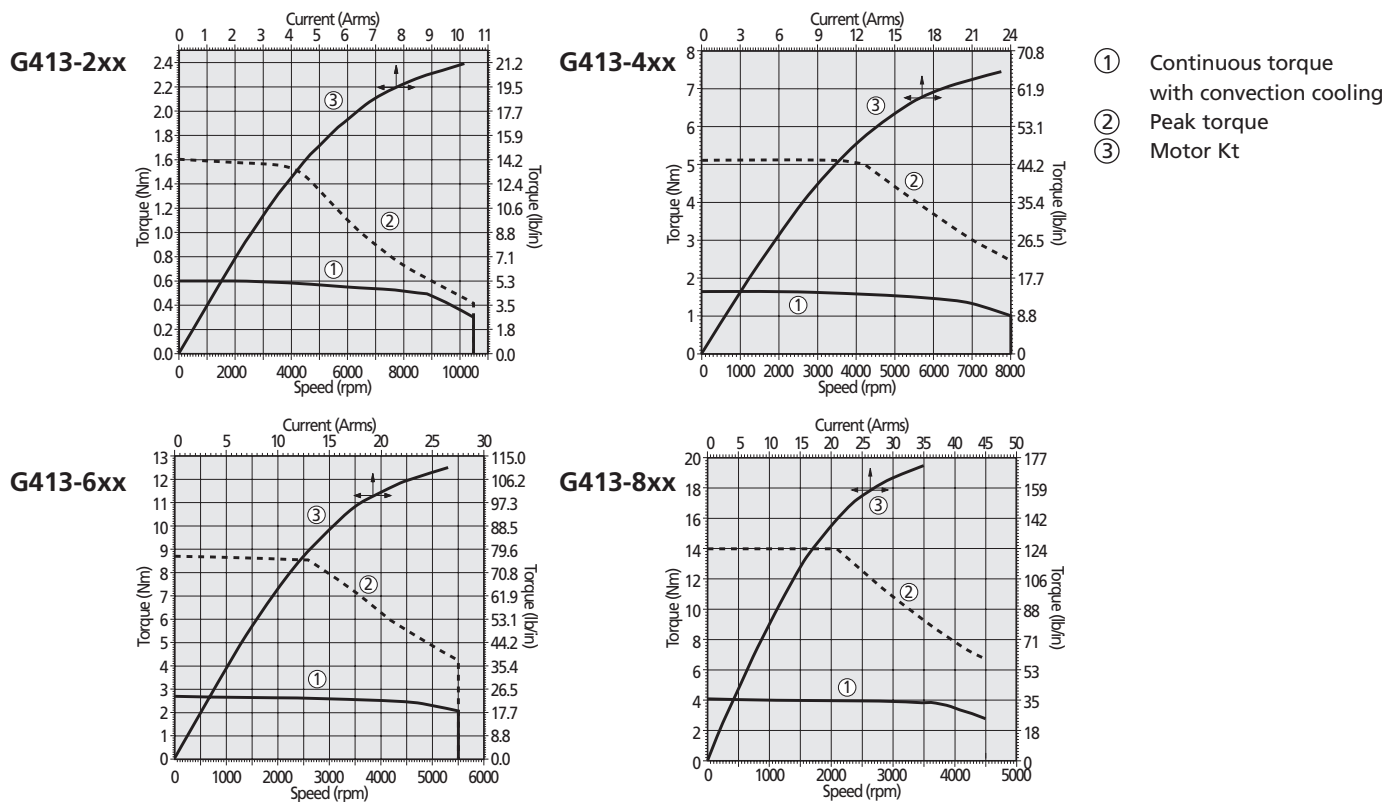
		Metric [English]	G413-2xx	G413-4xx	G413-6xx	G413-8xx
Continuous stall torque	M_o	Nm [lb-in]	0.60 [5.3]	1.7 [14.6]	2.7 [23.9]	4.0 [35.4]
Continuous stall current	I_o	Arms	1.5	3.1	3.4	4.4
Peak torque	M_{max}	Nm [lb-in]	1.6 [14.2]	5.1 [45.1]	8.7 [77.0]	14.0 [124]
Peak current	I_{max}	Arms	4.6	10.6	12.4	16.3
Nominal speed	n_N	rpm	8800	6300	4800	3900
Nominal power	P_N	kW [hp]	0.45 [0.60]	0.95 [1.3]	1.2 [1.5]	1.4 [1.9]
Maximum speed	n_{max}	rpm	10500	8000	5500	4500
Torque constant	k_T	Nm/Arms [lb-in/Arms]	0.40 [3.5]	0.53 [4.7]	0.80 [7.1]	0.90 [8.0]
Motor terminal resistance	R_{tt}	Ohm	15.2	4.9	5.1	4.1
Motor inductance	L_{tt}	mH	18.8	8.5	10.3	8.9
Inertia w/o brake	J	kg cm ² [lb-insec ² x 10 ⁻⁴]	0.16 [1.4]	0.39 [3.5]	0.62 [5.5]	0.97 [8.6]
Mass w/o brake	m	kg [lb]	1.4 [3.1]	2.0 [4.4]	2.6 [5.7]	3.5 [7.7]

Notes: Refer to page 17 for notes on performance specifications.

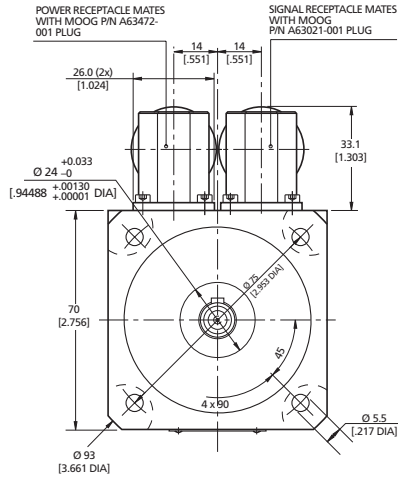
Optional Holding Brake	metric [english]	Option 1	Option 2
Holding torque	Nm [lb-in]	1.5 [13.3]	3.0 [26.6]
Extra weight	kg [lb]	0.20 [0.44]	0.32 [0.70]
Inertia	kg cm ² [lb-insec ² x 10 ⁻⁴]	0.07 [0.62]	0.18 [1.59]
Power requirement	Watt [Watt]	11.0 [11.0]	10.0 [10.0]

For a complete list of options and accessories, see pages 14-16.

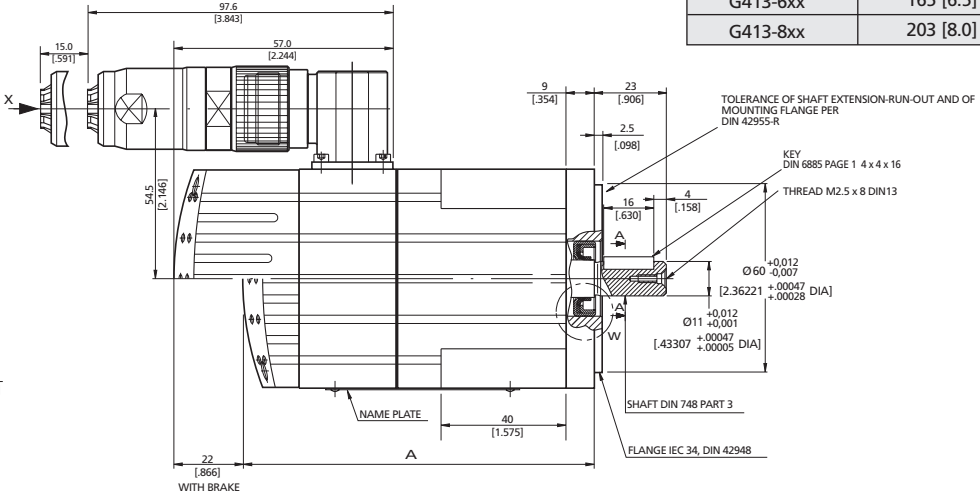
PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS



INSTALLATION DIAGRAM

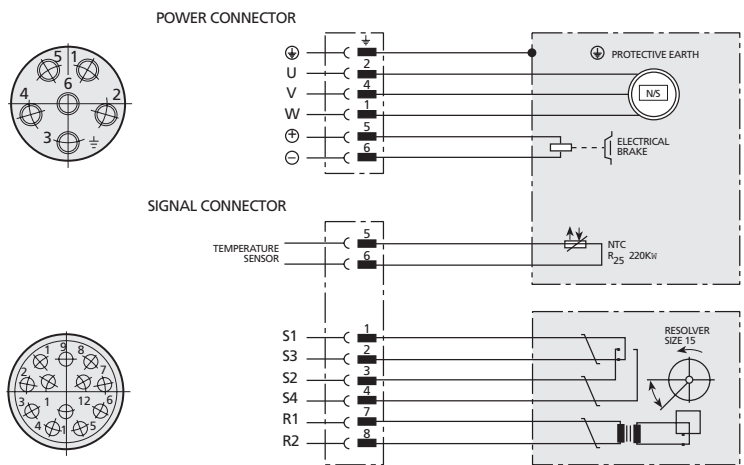


Dimensions: mm [in]



MODEL NO.	Dimension "A"
G413-2xx	114 [4.5]
G413-4xx	140 [5.5]
G413-6xx	165 [6.5]
G413-8xx	203 [8.0]

WIRING DIAGRAM



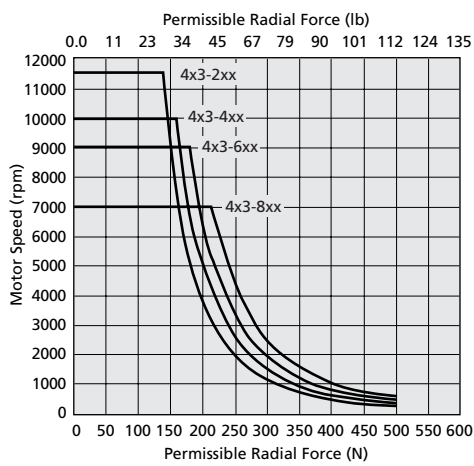
BEARING LOAD DIAGRAM

Maximum Permissible Shaft Load

The maximum permissible radial load depends on desired service length. The bearing load curves illustrated support an operational life of 20,000 hours (L10h) with axial loads up to 75 N. Consult Moog for extended service life requirements or alternate load conditions.

Notes:

1. Load capacity referenced to middle of output shaft.
2. Maximum axial load during installation: 150 N.



PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

		Metric [English]	G414-2xx	G414-4xx	G414-6xx	G414-8xx	G414-9xx
Continuous stall torque ¹	M _o	Nm [lb-in]	1.3 [11.5]	2.7 [24.0]	5.2 [46.0]	9.0 [79.7]	11.0 [97.4]
Continuous stall current ¹	I _o	Arms	3.1	4.8	6.7	9.2	9.5
Peak torque ²	M _{max}	Nm [lb-in]	3.0 [26.5]	6.6 [58.4]	12.6 [112]	23.0 [204]	31.0 [274]
Peak current ²	I _{max}	Arms	9.0	15.0	20.0	28.0	30.0
Nominal speed ⁴	n _N	rpm	5800	5500	4300	3500	3000
Nominal power ⁴	P _N	kW [hp]	0.58 [0.78]	0.95 [1.3]	1.8 [2.4]	2.3 [3.1]	2.4 [3.2]
Maximum speed ⁶	n _{max}	rpm	10000	8000	5800	4700	3800
Torque constant	k _T	Nm/Arms [lb-in/Arms]	0.42 [3.7]	0.56 [5.0]	0.8 [6.9]	0.99 [8.8]	1.2 [10.3]
Motor terminal resistance ⁷	R _{tt}	Ohm	5.1	2.7	1.5	0.90	0.96
Motor inductance ⁷	L _{tt}	mH	8.5	5.8	4.6	3.5	4.0
Inertia w/o brake	J	kg cm ² [lb-insec ² x 10 ⁻⁴]	1.05 [9.3]	1.5 [13.7]	2.6 [23.0]	4.7 [41.6]	6.8 [60.2]
Mass w/o brake	m	kg [lb]	3.0 [6.6]	3.6 [7.9]	4.7 [10.4]	6.9 [15.2]	9.1 [20.1]

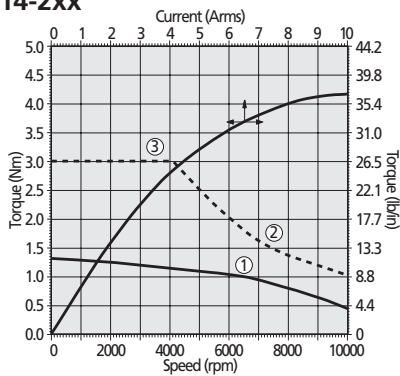
Notes: 1–7 refer to page 17.

Optional Holding Brake	metric [english]	Option 1	Option 2
Holding torque	Nm [lb-in]	6.0 [53.0]	15.0 [133]
Extra weight	kg [lb]	0.50 [1.1]	0.8 [1.8]
Inertia	kg cm ² [lb-insec ² x 10 ⁻⁴]	0.50 [4.4]	1.0 [8.9]
Power requirement	Watt [Watt]	13.0 [13.0]	19.0 [19.0]

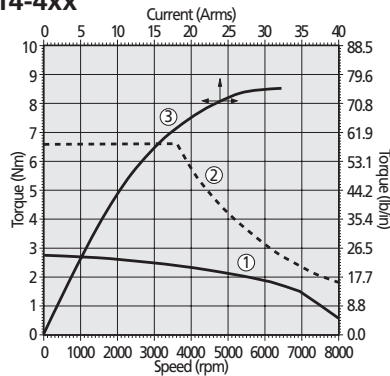
For a complete list of options and accessories, see pages 14-16.

PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

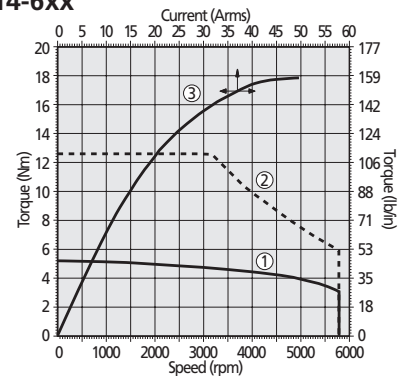
G414-2xx



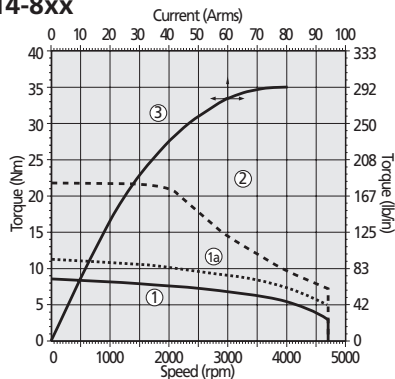
G414-4xx



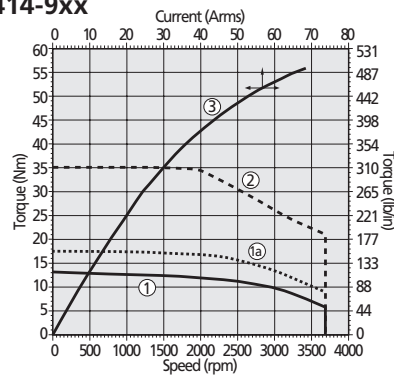
G414-6xx



G414-8xx

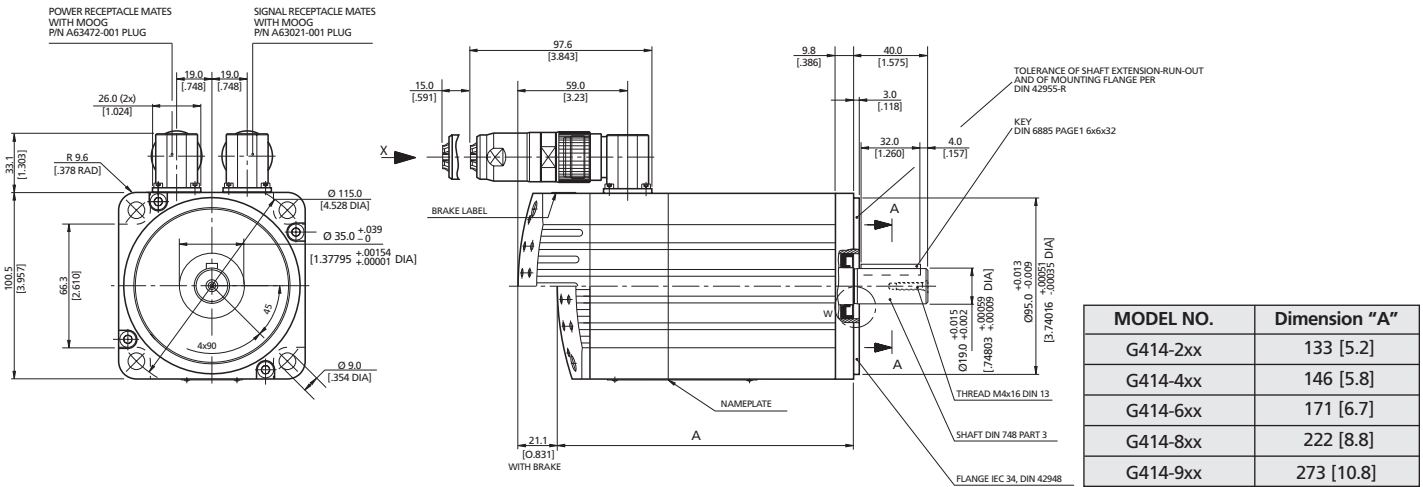


G414-9xx



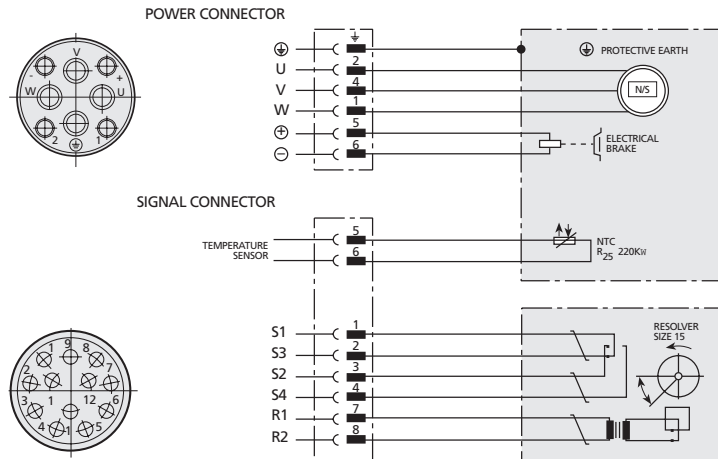
- ① Continuous torque with convection cooling
- ①a Continuous torque with optional fan cooling (select models)
- ② Peak torque
- ③ Motor K_t

INSTALLATION DIAGRAM



Dimensions: mm [in]

WIRING DIAGRAM



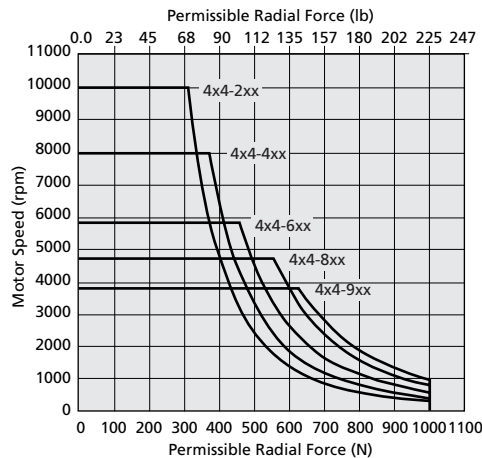
BEARING LOAD DIAGRAM

Maximum Permissible Shaft Load

The maximum permissible radial load depends on desired service length. The bearing load curves illustrated support an operational life of 20,000 hours (L10h) with axial loads up to 150 N. Consult Moog for extended service life requirements or alternate load conditions.

Notes:

1. Load capacity referenced to middle of output shaft.
2. Maximum axial load during installation: 300 N.



PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

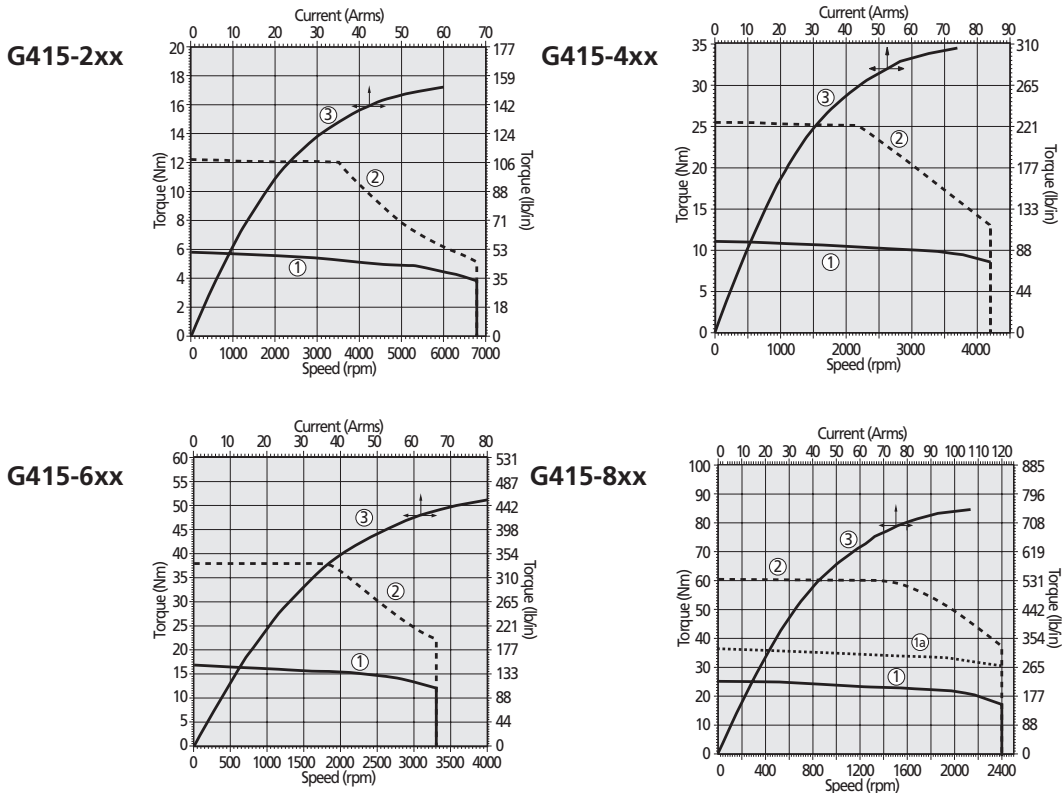
		Metric [English]	G415-2xx	G415-4xx	G415-6xx	G415-8xx
Continuous stall torque	M_o	Nm [lb-in]	5.8 [51.3]	12.0 [106]	16.6 [147]	26.0 [230]
Continuous stall current	I_o	Arms	9.5	11.0	12.9	14.8
Peak torque	M_{max}	Nm [lb-in]	12.2 [108]	26.0 [230]	36.0 [319]	60.0 [531]
Peak current	I_{max}	Arms	24.0	33.0	38.0	43.0
Nominal speed	n_N	rpm	4800	3500	2700	2200
Nominal power	P_N	kW [hp]	2.3 [3.1]	3.4 [4.5]	4.0 [5.3]	4.6 [6.2]
Maximum speed	n_{max}	rpm	6800	4200	3300	2400
Torque constant	k_T	Nm/Arms [lb-in/Arms]	0.61 [5.4]	1.1 [9.7]	1.3 [11.4]	1.8 [15.6]
Motor terminal resistance	R_{tt}	Ohm	0.86	0.74	0.64	0.56
Motor inductance	L_{tt}	mH	4.3	4.8	4.8	5.4
Inertia w/o brake	J	kg cm ² [lb-insec ² x 10 ⁻⁴]	4.6 [40.7]	8.0 [70.8]	11.5 [102]	18.4 [163]
Mass w/o brake	m	kg [lb]	7.7 [17.0]	9.9 [21.8]	12.1 [26.7]	16.6 [36.6]

Notes: Refer to page 17 for notes on performance specifications.

Optional Holding Brake	metric [english]	Option 1	Option 2
Holding torque	Nm [lb-in]	25.0 [221]	50.0 [443]
Extra weight	kg [lb]	1.3 [2.9]	3.3 [7.3]
Inertia	kg cm ² [lb-insec ² x 10 ⁻⁴]	3.6 [31.9]	15.1 [134]
Power requirement	Watt [Watt]	24.0 [24.0]	30.0 [30.0]

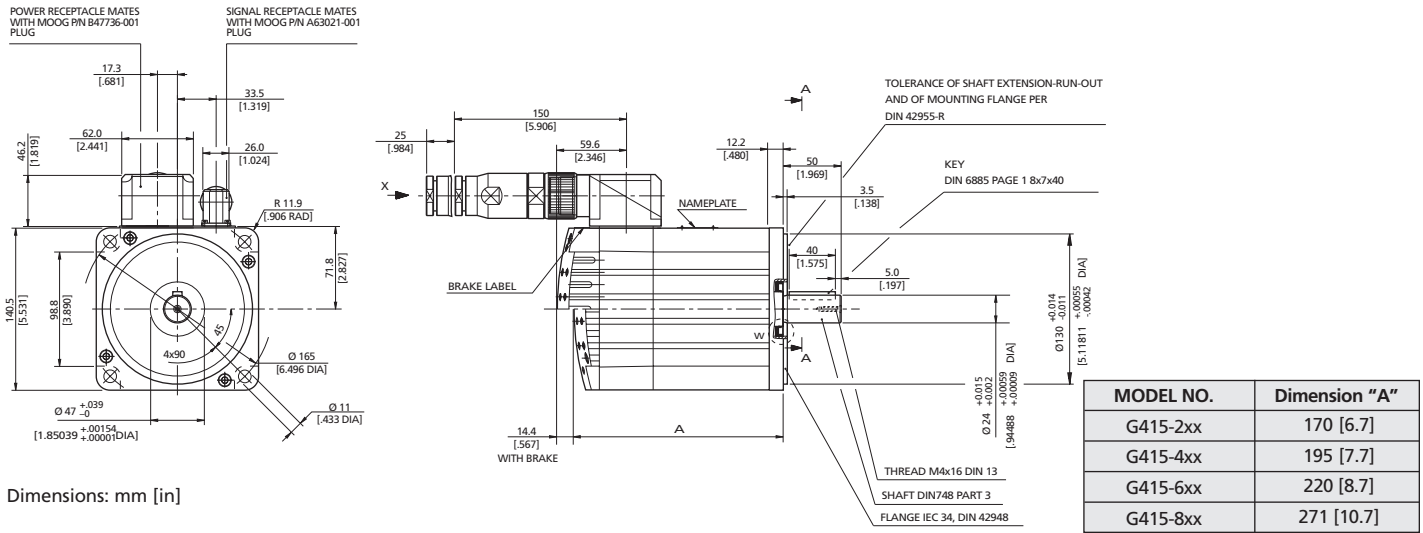
For a complete list of options and accessories, see pages 14-16.

PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS



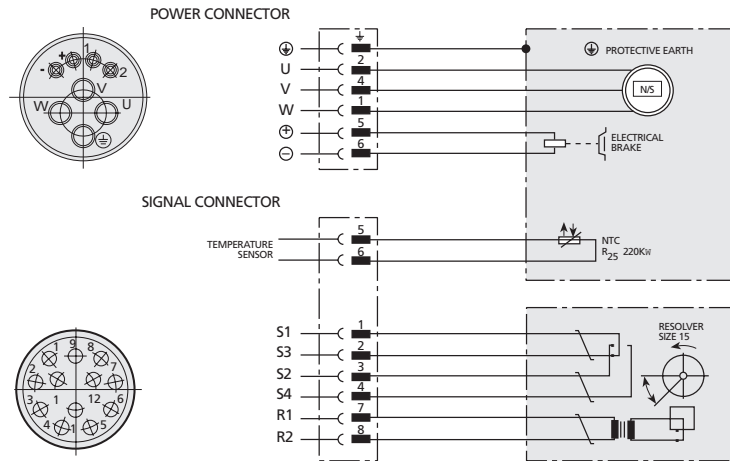
- ① Continuous torque with convection cooling
- ①a Continuous torque with optional fan cooling (select models)
- ② Peak torque
- ③ Motor Kt

INSTALLATION DIAGRAM



Dimensions: mm [in]

WIRING DIAGRAM



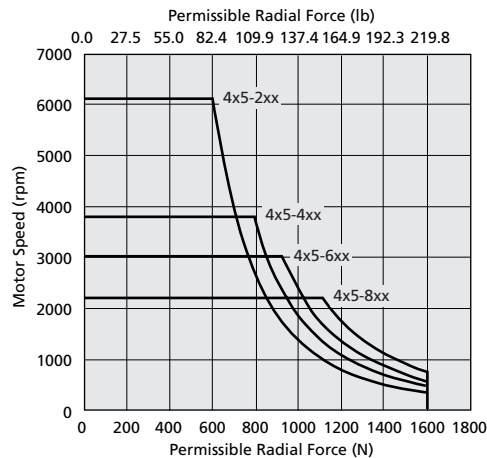
BEARING LOAD DIAGRAM

Maximum Permissible Shaft Load

The maximum permissible radial load depends on desired service length. The bearing load curves illustrated support an operational life of 20,000 hours (L10h) with axial loads up to 200 N. Consult Moog for extended service life requirements or alternate load conditions.

Notes:

1. Load capacity referenced to middle of output shaft.
2. Maximum axial load during installation: 400 N.



PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

		Metric [English]	G416-2xx	G416-4xx	G416-6xx	G416-8xx	G416-9xx
Continuous stall torque	M_o	Nm [lb-in]	14.0 [124]	27.0 [239]	40.0 [354]	51.0 [451]	70.0 [620]
Continuous stall current	I_o	Arms	22.0	30.0	38.0	43.0	45.0
Peak torque	M_{max}	Nm [lb-in]	40.0 [354]	73.0 [646]	110 [974]	150 [1328]	200 [1770]
Peak current	I_{max}	Arms	72.0	95.0	117	134	141
Nominal speed	n_N	rpm	4000	3000	2500	2200	2200
Nominal power	P_N	kW [hp]	3.8 [5.1]	4.9 [6.5]	6.7 [9.0]	7.8 [10.5]	11.3 [15.2]
Maximum speed	n_{max}	rpm	6300	4700	3900	3300	3000
Torque constant	k_T	Nm/Arms [lb-in/Arms]	0.64 [5.7]	0.90 [8.0]	1.1 [9.3]	1.2 [10.5]	1.6 [13.8]
Motor terminal resistance	R_{tt}	Ohm	0.23	0.14	0.11	0.10	0.11
Motor inductance	L_{tt}	mH	1.9	1.5	1.5	1.5	1.7
Inertia w/o brake	J	kg cm ² [lb-insec ² x 10 ⁴]	27.2 [241]	52.1 [461]	77.0 [682]	102 [903]	152 [1345]
Mass w/o brake	m	kg [lb]	15.1 [33.3]	21.1 [46.5]	27.1 [59.7]	33.1 [73.0]	40.0 [88.2]

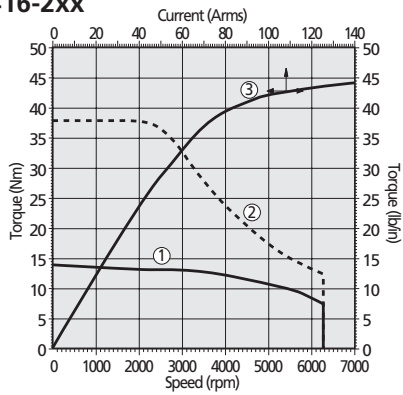
Notes: Refer to page 17 for notes on performance specifications.

Optional Holding Brake	metric [english]	Option 1	Option 2
Holding torque	Nm [lb-in]	15.0 [133]	25.0 [221]
Extra weight	kg [lb]	0.80 [1.8]	1.3 [2.9]
Inertia	kg cm ² [lb-insec ² x 10 ⁴]	0.50 [4.4]	3.6 [31.9]
Power requirement	Watt [Watt]	19.0 [19.0]	24.0 [24.0]

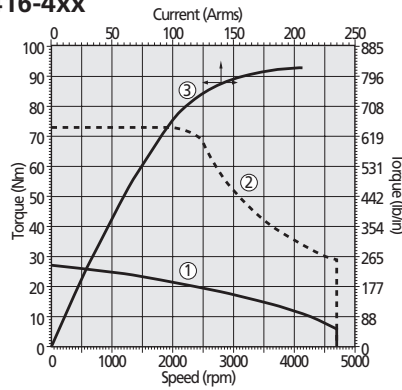
For a complete list of options and accessories, see pages 14-16.

PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

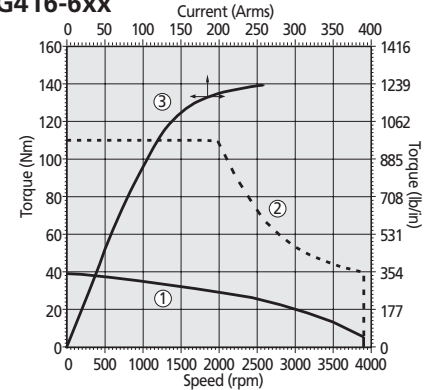
G416-2xx



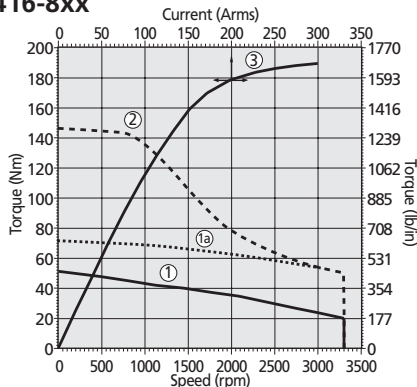
G416-4xx



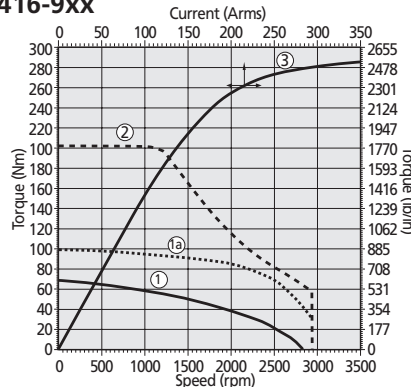
G416-6xx



G416-8xx

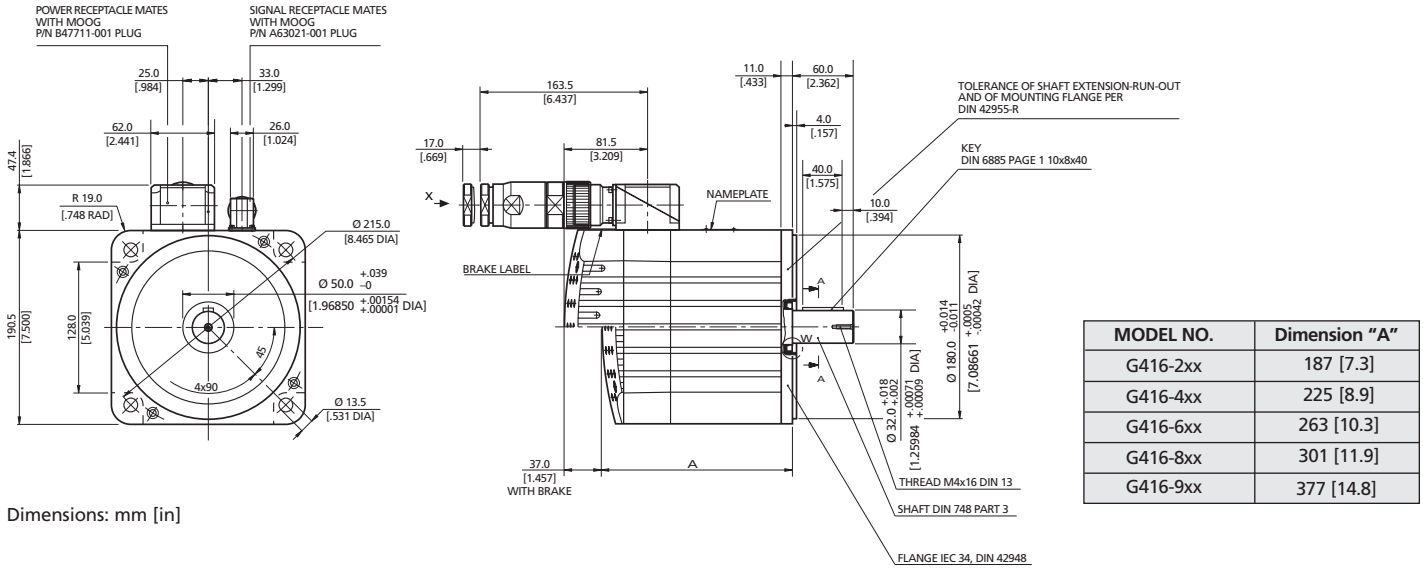


G416-9xx

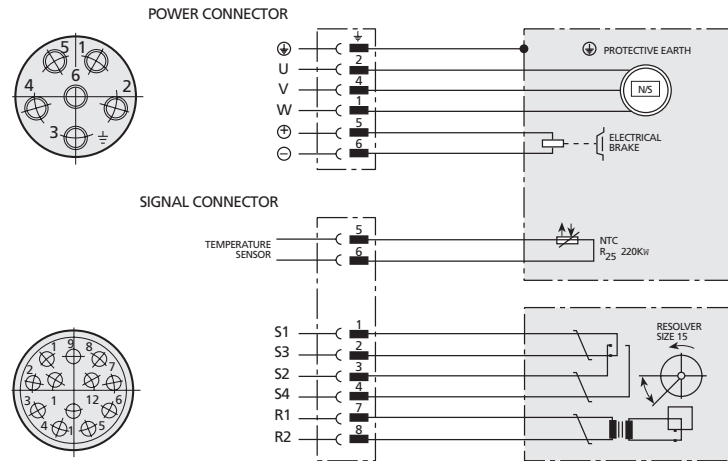


- ① Continuous torque with convection cooling
- ①a Continuous torque with optional fan cooling (select models)
- ② Peak torque
- ③ Motor Kt

INSTALLATION DIAGRAM



WIRING DIAGRAM



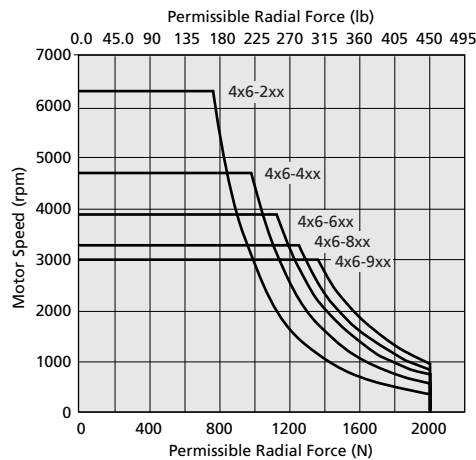
BEARING LOAD DIAGRAM

Maximum Permissible Shaft Load

The maximum permissible radial load depends on desired service length. The bearing load curves illustrated support an operational life of 20,000 hours (L10h) with axial loads up to 250 N. Consult Moog for extended service life requirements or alternate load conditions.

Notes:

1. Load capacity referenced to middle of output shaft.
2. Maximum axial load during installation: 500 N.



Moog's G410 motors are available with a variety of standard and custom options to address the unique requirements of your application. Moog's motor design and application teams are continually introducing new options to address the changing needs of the market place. As a result, if you need something that's not presently listed, don't hesitate to contact your local sales office – chances are we already have it.

STANDARD OPTIONS

Integral Holding Brake

Holding brakes are available for all standard G410 motors. The brake is a permanent magnet style that is designed to hold the axis in position even with power removed. This is especially useful in applications where the motor is on an axis controlling a weight-induced load (e.g., vertical axis on a gantry robot). Note, the brake is a holding brake and is not designed to stop dynamic loads. The servo drive is required to decelerate the axis and hold position before the brake is engaged.

The integral holding brake requires a regulated 24 VDC supply (see Motor Accessories) for proper operation. Brake power connections are through the standard motor power connector. Refer to motor technical data for brake current requirements.

Brake Holding Torque	Option 1	Option 2
G4x2 Series	0.9 [8.0]	N/A
G4x3 Series	1.5 [13.0]	3.0 [26.0]
G4x4 Series	6.0 [53.0]	15.0 [133]
G4x5 Series	15.0 [133]	25.0 [221]
G4x6 Series	25.0 [221]	50.0 [443]
Parameters in Nm [lb-in]		

Encoder Adapter

Encoder adapters are available as an option to all standard G410 motors. The encoder adapter incorporates the industry standard syncro flange mechanical interface providing compatibility with incremental and absolute encoders from a variety of suppliers (Heidenhain, Stegmann, Hengstler, ...etc.). The unique mechanical design allows standard encoders to be used without thermally derating motor performance.



Fan Cooling

To supply high dynamics in high duty cycle applications, Moog offers optional fan cooling on select G410 motor models. Fan cooling delivers up to 50% greater continuous torque output without increasing motor inertia.

Fans are powered by an unregulated 24 VDC supply (see Motor Accessories) with dedicated power connector. Current requirements are 1 ADC per motor.

Fan cooling is available as a standard option on the following motors:

- > G4x4-8xx
- > G4x4-9xx
- > G4x5-8xx
- > G4x6-8xx
- > G4x6-9xx



Shaft Options

Standard G410 motors are available with plain or slot and key metric shafts per NEMA MG7. For custom motor shafts such as spline or english dimension shafts see Custom Options.

Shaft Seal

In applications where the shaft/flange mating surface is immersed in fluids, an IP68 shaft seal is required to maintain motor integrity. Moog offers PTFE (teflon) type shaft seals which have excellent operating characteristics (resistant to shrinkage and thermal stress).

CUSTOM OPTIONS

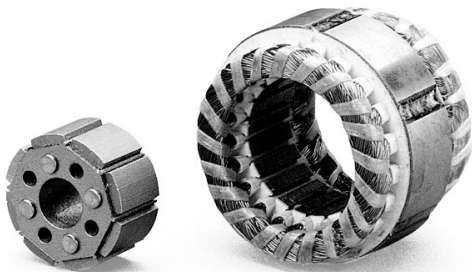
Motor Windings

Moog's standard G410 motors are designed to address the needs of most dynamic motion control applications. However, Moog recognizes that OEMs have unique needs which can not always be addressed by catalog products. This is why Moog offers custom motor windings. Custom motor windings may be used to optimize motor performance in applications with non-standard bus voltages or deliver customized performance characteristics for applications with unique speed or current requirements.

Frameless Options

In addition to offering our compact G410 motors in a frameless package, Moog's motor design and application teams are able to develop specialty motors meeting your unique specifications. Moog's high power density design allows our motor to be packaged in envelopes where other motors simply won't fit. In addition, Moog's design expertise includes motors adapted for operation in extreme environments:

- Elevated Temperatures
- Explosive/Flammable Gases
- Underwater Application
- High Shock Loads
- Radiation Zones



Our G410 frameless motor offering is based on the following standard stator dimensions:

Model	Stator Outer Diameter (nominal) mm [in]
G412	48.0 [1.9]
G413	63.5 [2.5]
G414	91.9 [3.6]
G415	130 [5.1]
G416	178 [7.0]

Custom Shafts and Flanges

To support legacy products or meet unique application needs, moog's modular G410 motor design is capable of supporting custom shafts (length, diameter or spline fittings) and custom flanges.



Custom Connectors

Moog's standard G410 motors are equipped with quick connect right angle connectors. In applications where straight connectors or flying leads are required, Moog can adapt the design to best meet your needs.

Custom Feedback Options

In addition to encoder adapter kits (see Standard Options), Moog can support requests for special feedback devices. Options presently offered include integral encoders (incremental or absolute), tachometers and hall sensors.

Custom Coatings

Moog's standard G410 motors are rated for spraydown environments. Moog is capable of coating the motors with FDA required coatings for applications in the food processing industry.

To speed your design cycle, Moog offers a variety of accessories which have been specified and tested for compatibility with our motors and drives. These accessories will also minimize assembly activities, allowing you to reduce production time.

PREASSEMBLED MOTOR CABLES

To reduce wiring time, Moog offers preassembled motor cables which have been sized and tested for compatibility with Moog's servo motors and drives. Cables are specially selected for high duty cycle moving cable track applications.

➤ **Power Cables**

These cables provide motor power and brake connections. A variety of standard as well as custom lengths are available. Contact your local sales office regarding cable lengths and any special regulatory requirements.

➤ **Signal (Resolver) Cables**

These cables provide connections for the resolver and internal thermal sensor. Cables are shielded and selected for high noise immunity. A variety of standard as well as custom lengths are available. Contact your local sales office regarding cable lengths and any special regulatory requirements.

CRIMP TOOLS

To support in-field cable repairs, Moog sells motor connector crimp tools and kits. Complete kits are available to replace motor power, brake power and resolver/thermistor signal pins on all our standard G410 motors.

POWER SUPPLIES

Moog offers UL, cUL and CE marked 24 VDC power supplies for the integral holding brakes and optional cooling fans on standard G410 motors. These power supplies are compact and support panel or DIN rail mounting. Screw terminal type connections simplify wiring. Power supply options include 230 or 110 VAC input voltage and a variety of output power ratings.

➤ **Regulated 24 VDC Power Supplies**

These power supplies have been tested for compatibility with the integral holding brakes on standard G410 motors. Power supplies should be selected based on total brake continuous power requirements as noted in the motor technical specification section. These regulated supplies will also support applications where brake motors and fan motors are intermixed.

➤ **Unregulated 24 VDC Fan Power Supplies**

These power supplies have been tested for compatibility with the optional cooling fans available on standard G410 motors. Power supplies should be selected based on total continuous power requirements as noted in motor technical specification section.

Caution! Unregulated power supplies can not be used for motor brake applications, as proper operation can not be guaranteed.

GENERAL INFORMATION

1. Motors designed to EN 60034 (VDE 0530).
2. Runout class R per DIN 42955-R.
3. Rotors balanced to Class G 6.3 per ISO 1940.
4. Sealing to IP68 (excluding shaft) with Moog specified mating connectors.
5. Operating temperature -40 to 55°C (up to 130°C with derated output).
6. Class H winding insulation.
7. Motor flange dimensions per IEC 34, NEMA MG7, DIN 42948, ISO 286.
8. Motor shaft dimensions per DIN 748.
9. Motor shaft keyway per DIN 6885.
10. Resolver electrical specifications as follows:
 - a. Resolver Type: Transmitter
 - b. Pole Count: 2
 - c. Input Voltage: 4 Vrms
 - d. Carrier frequency: 3.4 to 8 kHz
 - e. Input Current: 35 mA max.
 - f. Transformer Ratio: 0.5
11. The following metric conversions were used:
 - a. 1 Nm = 8.85 lb-in
 - b. 1 N = 0.225 lb
 - c. 1 kW = 1.34 hp
 - d. 1 kg-cm² = 8.85 lb-in-sec² x 10⁻⁴

NOTES

1. Continuous ratings based upon:
 - a. Operation in still air with ambient temperatures up to 55°C.
 - b. Winding temperature at 100°C over ambient.
 - c. Motor front flange attached to a steel mounting plate measuring 300 x 300 x 12 mm.
2. Peak ratings based on:
 - a. Duty cycle of 10% (1 out of 10 seconds).
 - b. Iron saturation of 15% or less.
3. Kt-line show non-linearity between current and torque at high end.
4. Nominal speed and power values at maximum continuous output power with conditions per note 1.
5. Maximum speed based on back EMF of 360 VDC.
6. Resistance and inductance measurement based on "cold" values (i.e., measured at 25°C).
7. Current ratings are Arms per phase.
8. Motor performance as measured with Moog's T200 servo drive. Performance with other drives may vary.
9. Specification tolerances are ±10%.

In addition to high performance servo motors, Moog also offers a broad range of servo drives. Moog's drive products represent two decades of evolution and refinement with 3 separate product families to best match your price and performance goals.

To boost system reliability, Moog uses a conservative thermal management approach in all drive designs. The combination of forced air cooling and multi-tiered fault protection system

provides fully rated performance in temperatures up to 55°C (50°C for the L180 Series).

Each drive is supported with an easy to use Windows® based graphical user interface to speed setup and commissioning. This includes a virtual oscilloscope, data logger, motor database and system status displays.

COMPATIBLE DRIVE OPTIONS



T200 Programmable Servo Drive

The T200 Series servo drive is Moog's full featured drive offering with standalone motion control and on-board fieldbus support. An optional integral power supply makes this drive well suited for single or multi-axis applications. Drives are sized to operate Moog's full range of standard servo motors.

- High bandwidth control loops and advanced signal processing algorithms deliver superior servo control.
- Highly integrated design eliminates many accessories to reduce wiring runs and free up valuable cabinet real estate.
- Integral motion control support eliminates the cost of separate motion control hardware in many applications.

L180 Series Servo Drive

The L180 Series servo drive is Moog's value priced drive offering with a streamlined set of features targeted at making high performance servo control available for general-purpose applications. Each drive comes standard with an integral power supply and high power regen. Drives are sized to operate motors up to 4.5 kW (G415-800).

- Digital control loop design supports high dynamic and smooth low speed control.
- Compact, low profile, package compatible with reduced clearance electronic panels.

T161 Digital Servo Drive

The T161 Series servo drive is Moog's value priced offering for higher axis count applications. The rack-mounted design is available for 2 to 6 axes of servo control (multiple racks can be used for higher axis count applications). Drives are sized to operate motors up to 3.5 kW (G415-600).

- Rack mounted design with backplane and pluggable system connectors greatly reduces assembly time.
- Optional CAN fieldbus interface supports up to 32 axes of distributed control, including drive parameterization and advanced system control and diagnostics.



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