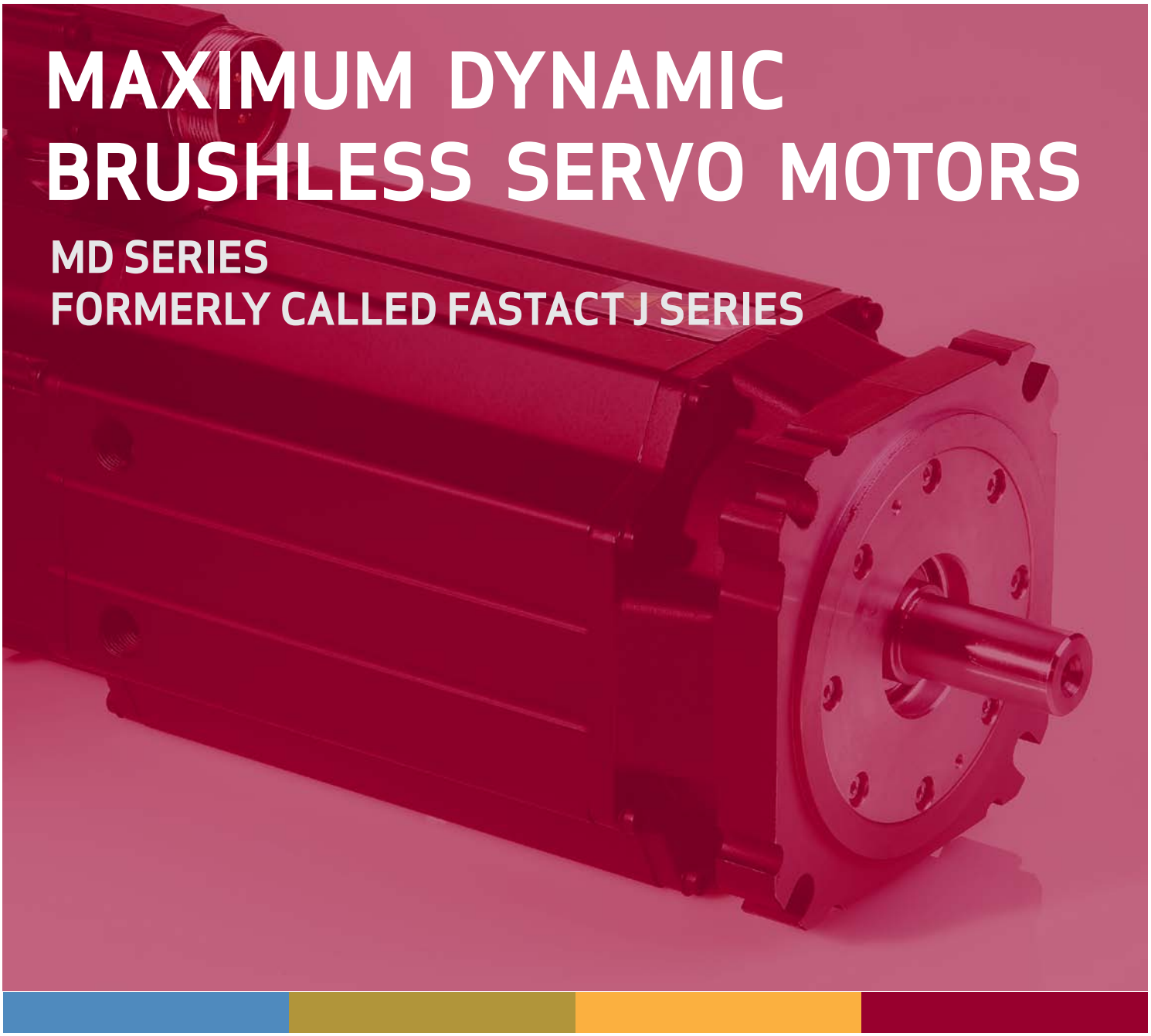
MAXIMUM DYNAMIC BRUSHLESS SERVO MOTORS

MD SERIES
FORMERLY CALLED FASTACT J SERIES



Rev 2, March 2011

OFFERING HIGHER PRODUCTIVITY
FOR HIGHLY DYNAMIC APPLICATIONS

Whenever the highest levels of motion control performance and design flexibility are required, you'll find Moog expertise at work. Through collaboration, creativity and world-class technological solutions, we help you overcome your toughest engineering obstacles. Enhance your machine's performance. And help take your thinking further than you ever thought possible.

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PRODUCT OVERVIEW

Highest Dynamics, Power Density and Reliability

For over two decades, the name Moog has been associated with Brushless Servo Motors and drives offering the highest dynamics, power density and reliability.

Moog offers a broad range of standard servo motors as well as custom solutions to meet your unique application requirements. Moog Brushless Servo Motors are needed for a variety of applications; especially where dynamics, compact size and reliability are important.

Positioning Times of 15 ms or less

Moog's Maximum Dynamic Brushless Servo Motors, MD Series, are electronically commutated synchronous AC motors with permanent magnet field excitation.

MD Series Servo Motors are designed for very highly dynamic servo applications where positioning times of 15 ms or less are often the norm. The MD Series Servo Motors offers very high angular acceleration which is unique and exceptional.

Modular Design and Long Life

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 using tight machining tolerances, precision balancing and thorough production testing guarantee a long operating life.

Exceptional Overload Capacity

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.

MD Series Servo Motors use a fully laminated, weight and inertia 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 rare earth magnets, and an efficient thermal construction.

PRODUCT OVERVIEW

Overview of MD Series Servo Motors

Motor type [1]	Continuous stall torque-natural cooling		Continuous stall torque-fan cooling		Continuous stall torque-liquid cooling		Maximum torque		Nominal speed-natural/fan/ liquid cooling [2]	Rotor inertia		Square flange-natural/fan/ liquid cooling	
	Nm	lbf in	Nm	lbf in	Nm	lbf in	Nm	lbf in	r/min	kg cm^2	lbf in s^2 x10^{-4}	mm	in
JSx3-020 [1]	2.2	19.5	-	-	-	-	10.0	88.5	5,400/ - / -	0.78	6.9	70	2,8
JSx3-040 [1]	4.1	36.3	-	-	-	-	20.0	177	4,700/ - / -	1.24	11.0	70	2,8
JSx3-050 [1]	5.1	45.1	-	-	-	-	25.0	221	3,700/ - / -	1.46	12,9	70	2,8
JSx3-060 [1]	6.0	53.1	-	-	-	-	30.0	266	3,100/ - / -	1.69	15.0	70	2,8
JSx3-075 [1]	7.4	65.5	-	-	-	-	37.0	327	2,400/ - / -	2.03	18.0	70	2,8
JSx4-026 [1]	4.9	43.4	-	-	-	-	19.0	168	5,100/ - / -	2.20	19.5	100	3.9
JSx4-040 [1]	6.8	60.2	-	-	-	-	29.0	257	4,300/ - / -	3.08	27.2	100	3,9
JSx4-053 [1]	8.5	75.2	-	-	-	-	38.0	336	4,100/ - / -	3.92	35.0	100	3,9
JSx4-067 [1]	10.2	90.3	-	-	-	-	48.0	425	3,200/ - / -	4.80	42.5	100	3,9
JSx4-080 [1]	11.7	104	-	-	-	-	58.0	513	2,700/ - / -	5.64	49,9	100	3.9
JHx5-047	21.5	190	30.8	273	46.1	408	64.2	568	2,500/2,300/2,000	10.8	96.6	140/145	5.5/5.7
JHx5-063	27.7	245	38.3	339	61.1	541	85.5	757	2,500/2,300/2,000	14.0	124	140/145	5.5/5.7
JHx5-079	33.3	295	44.8	397	75.3	666	107	947	2,500/2,400/2,000	17.1	151	140/145	5.5/5.7
JHx5-094	39.4	349	51.8	458	90.5	801	128	1,135	2,500/2,400/2,000	20.2	179	140/145	5.5/5.7
JSx5-063	29.3	259	39.3	348	63.6	563	135	1,193	3,500/3,400/3,000	28.8	255	140/145	5.5/5.7
JSx5-084	38.0	336	48.8	432	84.2	745	180	1,589	2,600/2,500/2,300	37.5	332	140/145	5.5/5.7
JSx5-105	46.6	412	58.0	513	105	930	225	1,991	2,100/2,000/1,800	46.1	408	140/145	5.5/5.7
JSx5-126	55.1	488	66.6	589	126	1,112	270	2,387	1,700/1,700/1,500	54.7	484	140/145	5.5/5.7
JHx6-079	70.8	627	95.4	844	114	1,004	276	2,440	1,900/1,800/1,700	78.4	694	190/190	7.5/7.5
JHx6-105	92.9	822	121	1,070	151	1,337	365	3,234	1,800/1,700/1,600	104	918	190/190	7.5/7.5
JHx6-131	115	1.014	145	1,284	188	1,664	456	4,038	1,600/1,500/1,500	135	1,192	190/190	7.5/7.5
JHx6-157	136	1,207	169	1,498	225	1,995	547	4,845	1,600/1,500/1,400	160	1,416	190/190	7.5/7.5
JSx6-100	84.0	743	119	1,049	138	1,226	583	5,160	2,400/2,300/2,300	260	2,302	190/190	7.5/7.5
JSx6-134	110	976	150	1,330	180	1,597	777	6,880	1,800/1,700/1,700	336	2,974	190/190	7.5/7.5
JSx6-167	136	1,207	181	1,604	222	1,964	972	8,600	1,400/1,400/1,400	411	2,974	190/190	7.5/7.5
JSx6-201	163	1,438	212	1,873	263	2,329	1,166	10,320	1,200/1,100/1,100	487	4,309	190/190	7.5/7.5
JSx7-122	315	2,787	-	-	495	4,381	1,000	8,853	1,000/ - /950	989	8,754	275/275	10.8/10.8
JSx7-163	418	3,698	-	-	655	5,799	1,339	11,850	725/ - /700	1,304	11,544	275/275	10.8/10.8
JSx7-204	520	4,598	-	-	813	7,198	1,674	14,822	575/ - /550	1,621	14,347	275/275	10.8/10.8
JSx7-245	616	5,455	-	-	964	8,533	2,012	17,808	600/ - /575	1,975	17,475	275/275	10.8/10.8

1) Under developement
2) Nominal speed can be easily adjusted by changing the stator windings. Please refer to your local Moog application engineer for information.
Note: Refer to page 59 for motor type definitions

FEATURES AND BENEFITS

✓ The unique design with superior dynamics enables an optimization of the available work space.	Smaller footprint
✓ Moog MD Series Servo Motor covers the widest range of torque. A consistent modular design through the whole series is supported by utilizing the same motors designed under the same characteristics. Customers can accelerate the design process of machines by selecting the suitable motor.	Reduce development time
✓ A range of maximum torque from 10 to 2,000 Nm (90 to 18,000 lbf in) and power from 1 to 55 kW (1 to 75 hp) is available.	Flexibility
✓ Seamless integration into existing infrastructure without the need for costly re-design. The modular design provides the flexibility to adapt to customer's specifications and provide seamless, e.g. windings, flanges, shafts, connector types and environments.	Modularity
✓ Built with tight machining tolerances, precision balancing and thorough testing to deliver the highest quality and reliability	Long service life
✓ Highly efficient design	Minimal energy consumption

TECHNICAL FEATURES

Moog Motor Performance Characteristics

Due to our experience with collaborating with a variety of industrial machine designers, Moog engineers realize the critical role that application sizing process plays in overall machine design.

Continuous Torque Curve

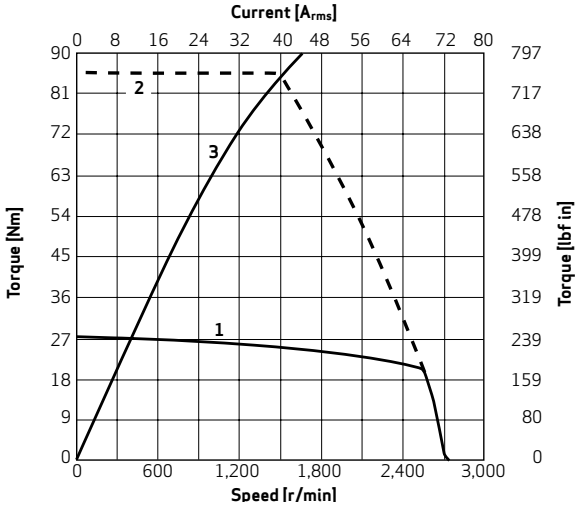
- This curve illustrates the motor torque available at 100 % duty cycle under the following conditions: Operation in still air with ambient temperatures up to 40 °C (104 °F)
- Winding temperature at 110 °C (230 °F) over ambient for resolver feedback motors
- Motor front flange attached to a steel mounting plate measuring 300 x 300 x 12 mm (11.81 x 11.81 x 0.47 in)

Maximum torque Curve

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

K_t Characteristic

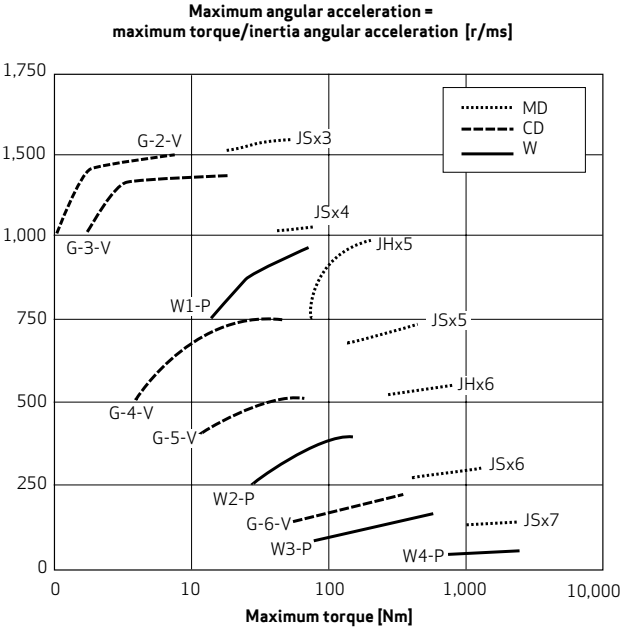
The motor K_t characteristic depicts stator saturation at various operating points and can be used to optimize sizing in low duty cycle applications.



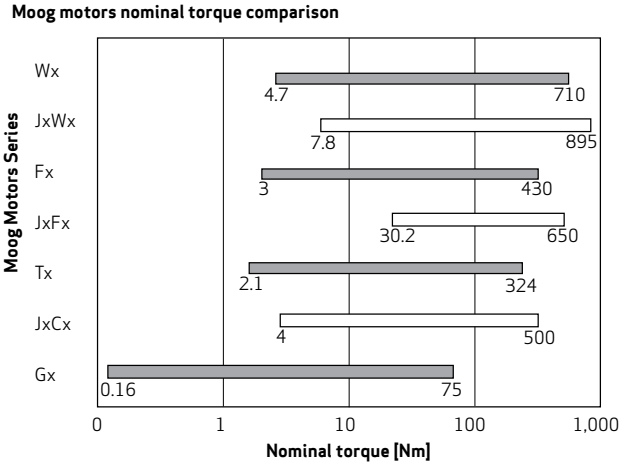
1 Continuous torque
2 Maximum torque
3 Torque constant, K_t

Positioning of Moog Servo Motors

In order to help choose which Moog motor series is best for your application, please contact your local Moog office. The following two plots broadly compare the various standard Moog motors. The first plot compares the maximum angular acceleration to maximum torque of the Moog MD, CD and W motors.



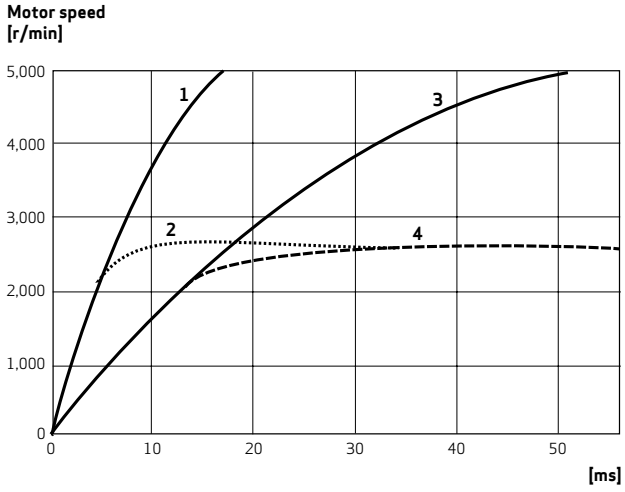
A continuous torque comparison of Moog standard motors is summarized in the following chart:



TECHNICAL FEATURES

In high acceleration, low duty cycle applications, designers can now use a smaller motor with higher angular acceleration. This leads to improved overall systems performance and cost competitiveness. Other typical benefits are longer tool life, improved quality of machine output and improved cycle times.

The new MD Series Servo Motors accelerate twice as fast as our reference W motors.



1 JHW6-157 with field weakening control
2 JHW6-157 w/o with field weakening control
3 W3P-8-022 with field weakening control
4 W3P-8-022 w/o field weakening control

Ruggedized, Low Maintenance, Design to Boost Overall System Availability

The MD Series Servo Motors are designed and manufactured in accordance with strict CE standards, using ruggedized components with proven reliability in harsh thermal and shock load environments. These all combine to offer years of reliable, low maintenance, operation and boost overall system availability.

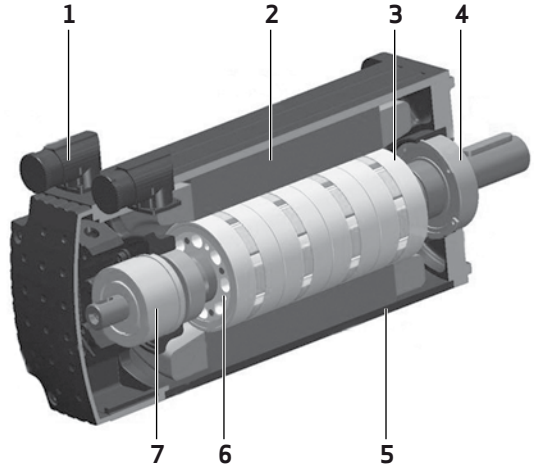
The use of high reliability feedback devices, sealed lifetime lubricated bearings, precision balanced rotors (Class G 6.3 of ISO 1940), runout machining tolerance according to (DIN 42955) and IP65 construction combine to extend service life.

Flexible Design Option Ease Integration

The MD Series Servo Motors are available with the following options:

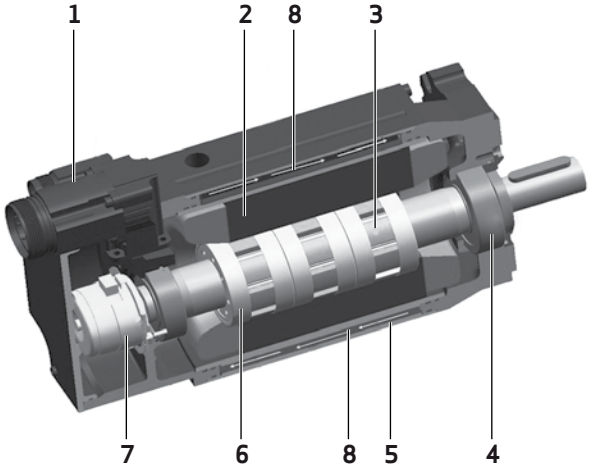
- Cooling options: Natural, fan or liquid cooling
- Integral holding brakes
- Resolver or encoder based feedback
- Various connector options
- Plain or slot and key type shafts
- Teflon shaft seal (IP67 sealing)

MOTOR NATURAL COOLING CUTAWAY DIAGRAM



1 Metal CE/UL compliant connectors
2 Proprietary stator design
3 Rare earth magnets
4 Sealed life-time lubricated bearings

MOTOR LIQUID COOLING CUTAWAY DIAGRAM



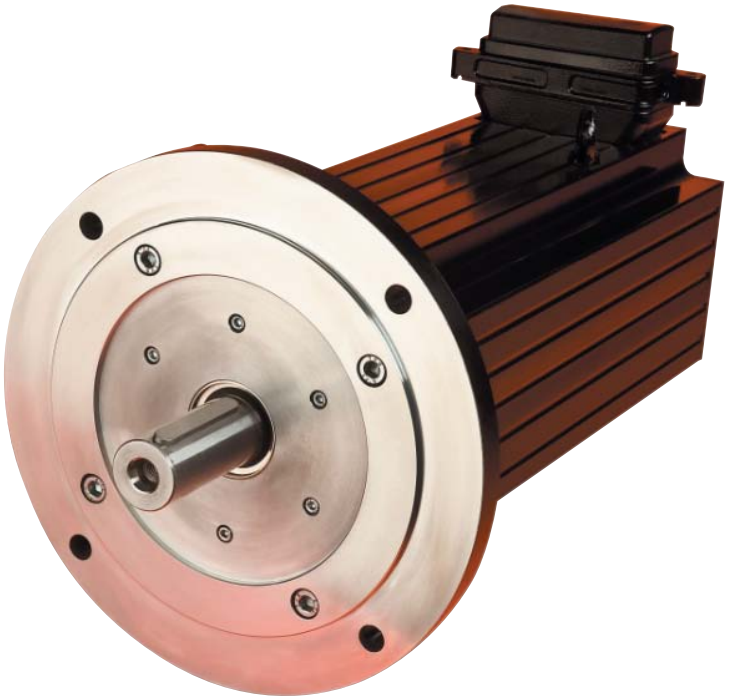
5 Lightweight extruded aluminum housing
6 Fully laminated low-inertia rotor
7 Feedback device
8 Liquid flow path

TECHNICAL FEATURES

Fully Customized Designs Support Unique Application Requirements

Moog can tailor motors to the exact specifications of customers including custom specifications for the following:

- Motor winding
- Shaft and flange
- Frameless design
- Connector configuration (including pigtail)
- Feedback device
- Design for unique environments including high temperature, high shock levels, oil and water immersion



SIZE 5
NATURAL COOLING, HIGH DYNAMIC, TYPE JHC5

Characteristics and nominal values with sinusoidal drive

Type		JHC5-047	JHC5-063	JHC5-079	JHC5-094	Units
Continuous stall torque	M_o	21.5 (190)	27.7 (245)	33.3 (295)	39.4 (349)	Nm (lbf in)
Nominal torque	M_N	17.1 (152)	21.0 (187)	24.4 (216)	27.9 (248)	Nm (lbf in)
Maximum torque	Mn	64.2 (568)	85.5 (757)	107 (947)	128 (1,136)	Nm (lbf in)
Nominal speed	n_N	2,500	2,500	2,500	2,500	r/min
Maximum speed	n_{max}	2,980	2,980	2,980	2,980	r/min
Continuous stall current	I_o	8.8	11.3	13.6	16.1	A_{rms}
Maximum current	I_m	30.8	41.0	51.3	61.5	A_{rms}
Nominal power	P_N	4.48 (6.01)	5,52 (7.41)	6.39 (8.57)	7.33 (9.83)	kW (hp)
Torque constant	k_T	2.45 (21.7)	2.45 (21.7)	2.45 (21.7)	2.45 (22.7)	Nm/A_{rms} ($lbf\ in/A_{rms}$)
Voltage constant	k_e	148	148	148	148	V_{rms}/k_{rpm}
Thermal time constant	t_{th}	2,950	3,400	3,750	3,882	s
Winding resistance at 25 °C (77 °C) (phase to phase)	R_{tt}	1.689	1.167	0.91	0.72	Ohm
Winding inductance (phase to phase)	L_{tt}	18.4	13.7	10.9	9.10	mH
Rotor inertia with resolver	J	10.8 (95.0)	14.0 (124)	17.1 (151)	20.2 (179)	$kg\ cm^2$ ($lbf\ in\ s^2 \times 10^{-4}$)
Rotor inertia with encoder	J	10.8 (96.0)	14.0 (124)	17.1 (151)	20.2 (179)	$kg\ cm^2$ ($lbf\ in\ s^2 \times 10^{-4}$)
Weight (without brake)	m	19.2 (42.3)	21.8 (48.1)	24.5 (54.0)	28.6 (63.1)	kg (lb)

Optional Holding Brake	Option 1	Option 2	Units
Holding torque	18 (159)	30 (266)	Nm (lbf in)
Extra weight	0.75 (2.0)	1.1 (2.4)	kg (lb)
Extra inertia with resolver	1.00 (8.9)	3.60 (31.9)	$kg\ cm^2$ ($lbf\ in\ s^2 \times 10^{-4}$)
Extra inertia with encoder	1.20 (10.6)	3.80 (33.6)	$kg\ cm^2$ ($lbf\ in\ s^2 \times 10^{-4}$)
Power requirement	15.6	17.0	W
Voltage requirement (+6 % -10 %)	24	24	V_{DC}

Notes:

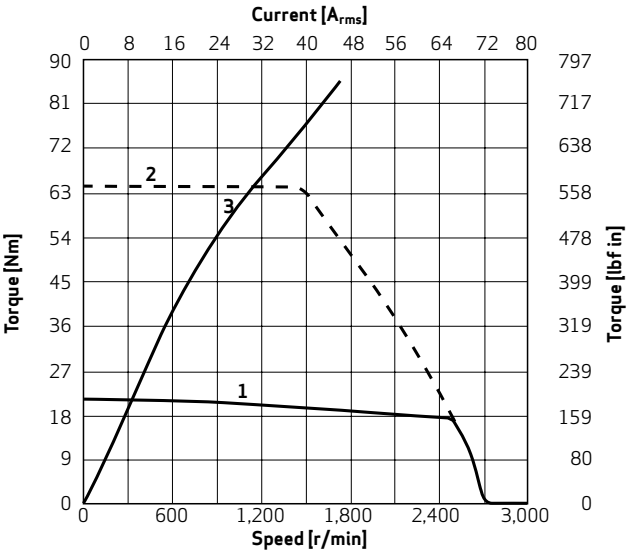
1. Different windings available to decrease or increase nominal speed
2. Motor performances as measured with Moog's Servo Drive of proper size
3. Motor Pole Count: 8
4. DC Link voltage 565 V

SIZE 5

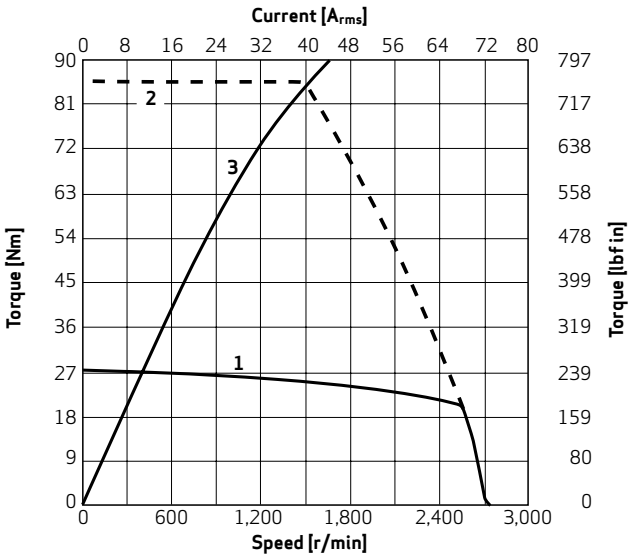
NATURAL COOLING, HIGH DYNAMIC, TYPE JHC5

Motor Characteristics

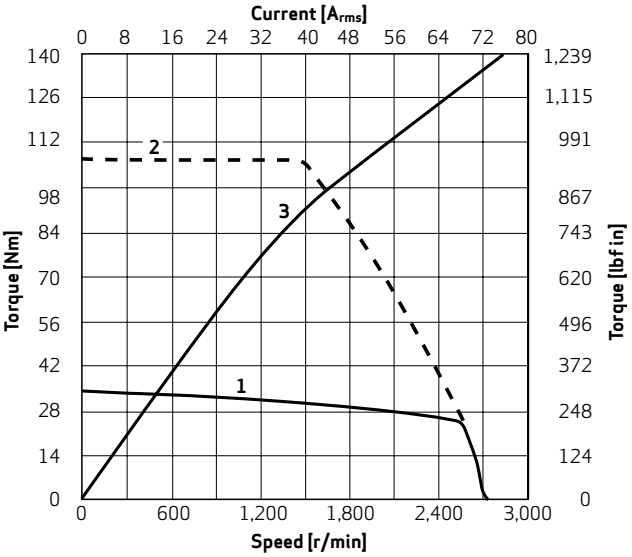
JHC5-047



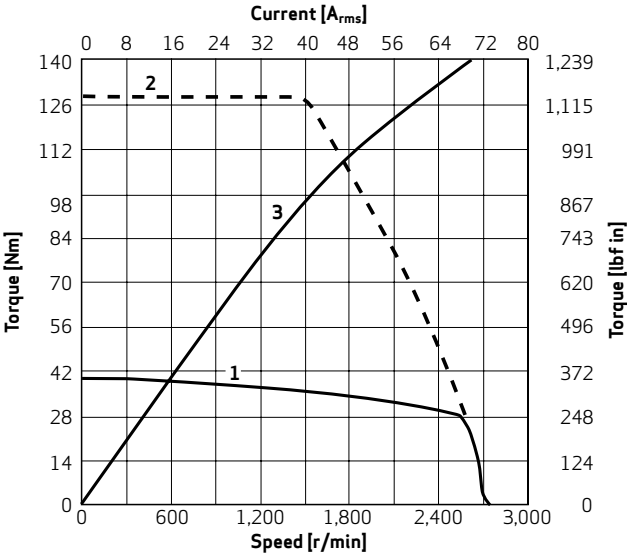
JHC5-063



JHC5-079



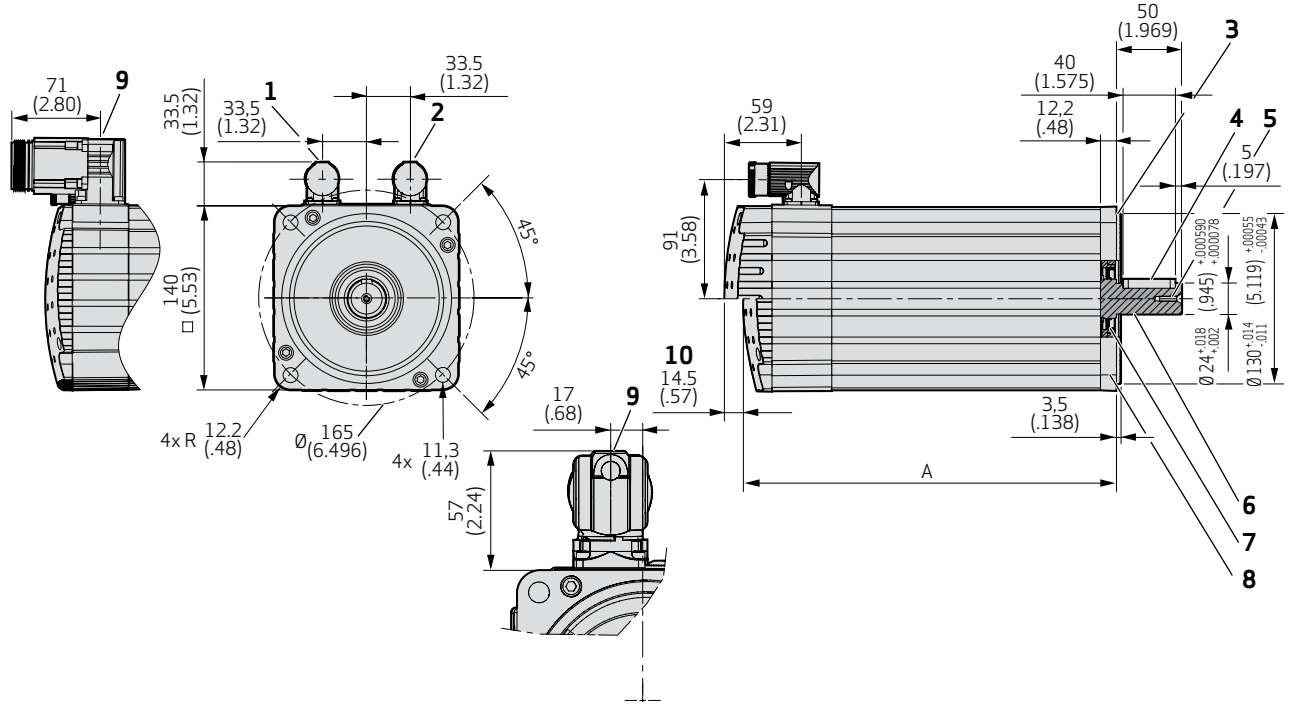
JHC5-094



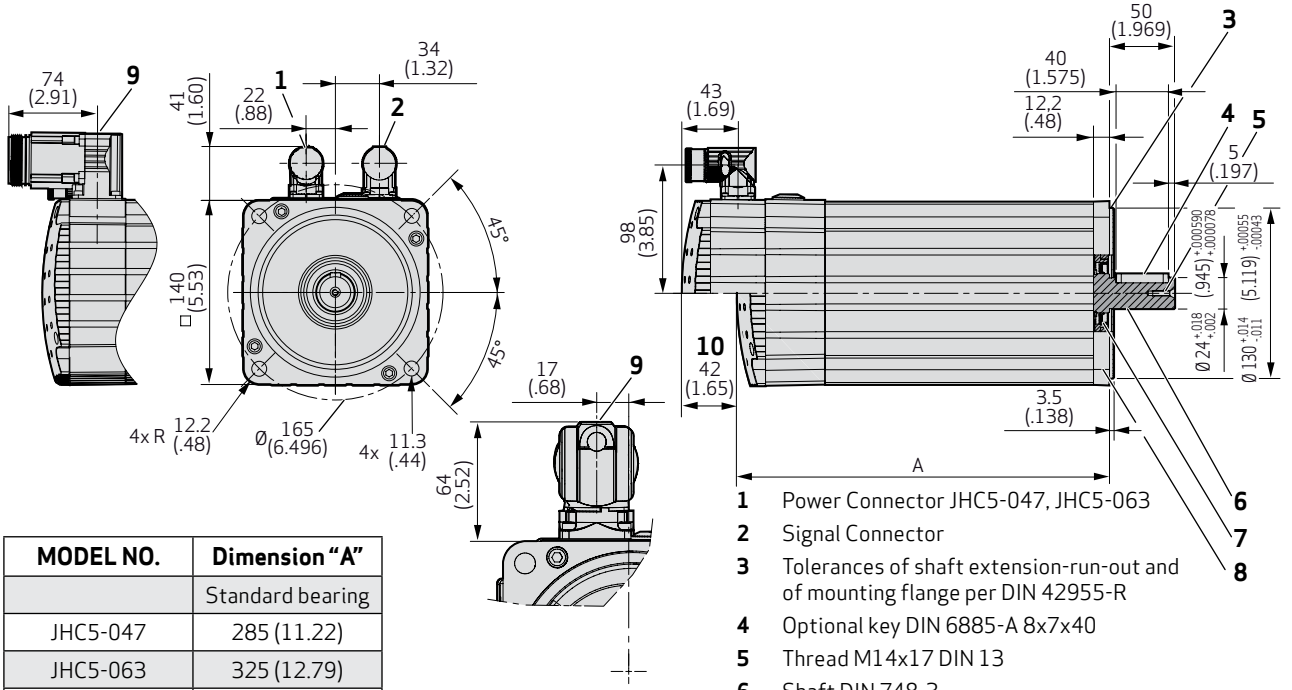
1 Continuous torque
2 Maximum torque
3 Torque constant, K_t

SIZE 5
NATURAL COOLING, HIGH DYNAMIC, TYPE JHC5

JHC5 with resolver



JHC5 with encoder



MODEL NO.	Dimension "A"
	Standard bearing
JHC5-047	285 (11.22)
JHC5-063	325 (12.79)
JHC5-079	365 (14.37)
JHC5-094	405 (15.94)

1 Power Connector JHC5-047, JHC5-063
2 Signal Connector
3 Tolerances of shaft extension-run-out and of mounting flange per DIN 42955-R
4 Optional key DIN 6885-A 8x7x40
5 Thread M14x17 DIN 13
6 Shaft DIN 748-3
7 Optional shaft seal
8 Flange DIN 42948
9 Power connector JHC5-079, JHC5-094
10 With brake

SIZE 5
FAN COOLING, HIGH DYNAMIC, TYPE JHF5

Characteristics and nominal values with sinusoidal drive

Type		JHF5-047	JHF5-063	JHF5-079	JHF5-094	Units
Continuous stall torque	M_o	30.8 (272)	38.3 (339)	44.8 (397)	51.8 (458)	Nm (lbf in)
Nominal torque	M_N	28.2 (250)	34.4 (305)	38.9 (345)	44.1 (391)	Nm (lbf in)
Maximum torque	M_P	64.2 (568)	85.5 (757)	107 (947)	128 (1,136)	Nm (lbf in)
Nominal speed	n_N	2,300	2,300	2,400	2,400	r/min
Maximum speed	n_{max}	2,980	2,980	2,980	2,980	r/min
Continuous stall current	I_o	12.5	15.6	18.2	21.1	A_{rms}
Maximum current	I_m	30.8	41.0	51.3	61.5	A_{rms}
Nominal power	P_N	6.8 (9.0)	8.3 (11.0)	9.8 (13.0)	11.0 (15.0)	kW (hp)
Torque constant	k_T	2.44 (21,6)	2.45 (21.7)	2.45 (21.7)	2.45 (21.7)	Nm/A_{rms} ($lbf\ in/A_{rms}$)
Voltage constant	k_e	148	148	148	148	V_{rms}/k_{rpm}
Thermal time constant	t_{th}	1,540	1,770	1,956	2,025	s
Winding resistance at 25 °C (77 °C) (phase to phase)	R_{tt}	1.689	1.167	0.91	0.72	Ohm
Winding inductance (phase to phase)	L_{tt}	18.4	13.7	10.9	9.1	mH
Rotor inertia with resolver	J	10.8 (96.0)	14.0 (124)	17.1 (151)	20.2 (179)	kg cm^2 ($lbf\ in\ s^2 \times 10^{-4}$)
Rotor inertia with encoder	J	10,8 (96.0)	14.0 (1240)	17.1 (151)	20.2 (179)	kg cm^2 ($lbf\ in\ s^2 \times 10^{-4}$)
Weight (without brake)	m	19.2 (42.3)	21.8 (48.1)	24.5 (54.0)	28.6 (63.1)	kg (lb)

Optional Holding Brake	Option 1	Option 2	Units
Holding torque	18 (159)	30 (266)	Nm (lbf in)
Extra weight	0.75 (1.7)	1.1 (2.4)	kg (lb)
Extra inertia with resolver	1 (8.9)	3.6 (31.9)	kg cm^2 ($lbf\ in\ s^2 \times 10^{-4}$)
Extra inertia with encoder	1.2 (10.6)	3.8 (33.6)	kg cm^2 ($lbf\ in\ s^2 \times 10^{-4}$)
Power requirement	15.6	17	W
Voltage requirement (+6 % -10 %)	24	24	V_{DC}

Notes:

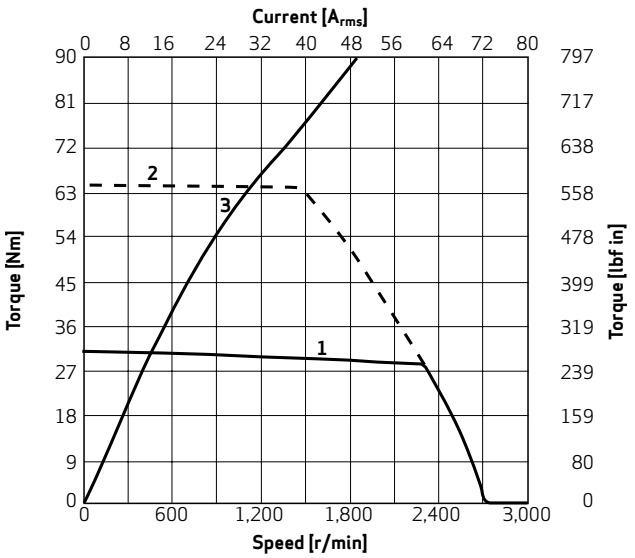
1. Different windings available to decrease or increase nominal speed
2. Motor performances as measured with Moog's Servo Drive of proper size
3. Motor Pole Count: 8
4. DC Link voltage 565 V

SIZE 5

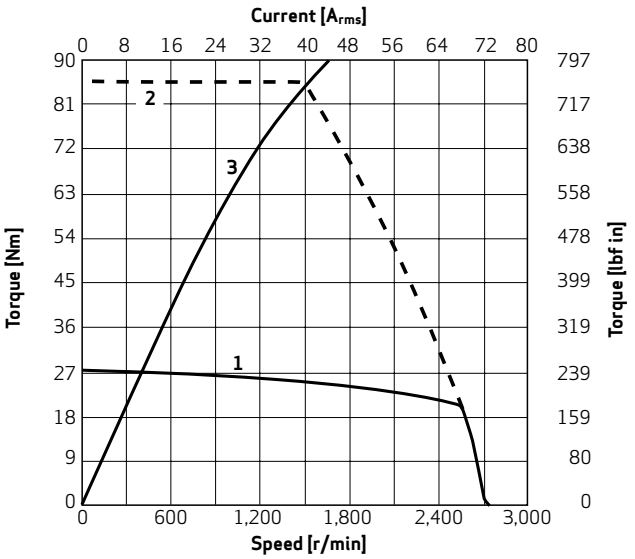
FAN COOLING, HIGH DYNAMIC, TYPE JHF5

Motor Characteristics

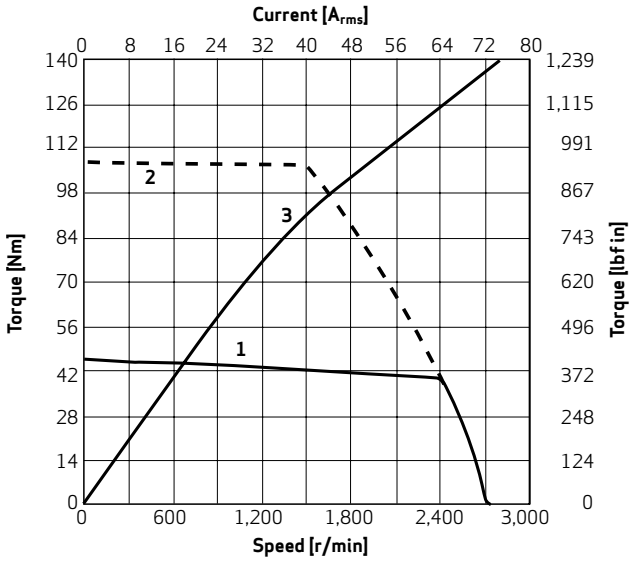
JHF5-047



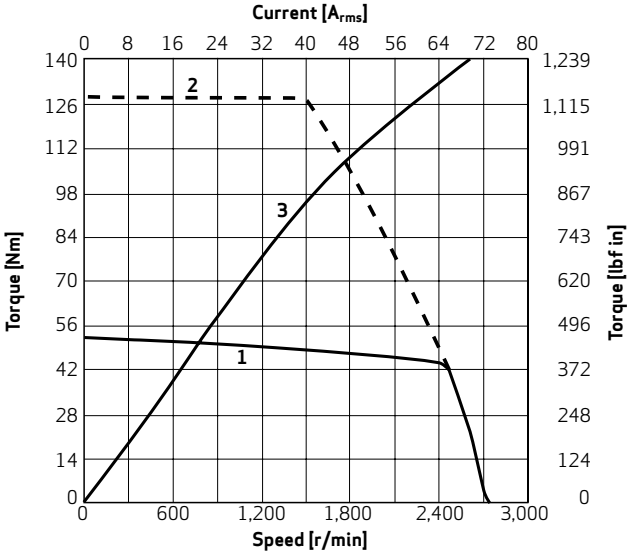
JHF5-063



JHF5-079



JHF5-094



1 Continuous torque
2 Maximum torque
3 Torque constant, K_t

Note: Dimensional drawings on request

SIZE 5
LIQUID COOLING, HIGH DYNAMIC, TYPE JHW5

Characteristics and nominal values with sinusoidal drive

Type		JHW5-047	JHW5-063	JHW5-079	JHW5-094	Units
Continuous stall torque	M_o	46.1 (408)	61.1 (541)	75.3 (667)	90.5 (801)	Nm (lbf in)
Nominal torque	M_N	44.6 (395)	59.5 (527)	73.2 (649)	87.9 (778)	Nm (lbf in)
Maximum torque	M_P	64.5 (571)	85.5 (757)	107 (947)	128 (1,136)	Nm (lbf in)
Nominal speed	n_N	2,000	2,000	2,000	2,000	r/min
Maximum speed	n_{max}	2,980	2,980	2,980	2,980	r/min
Continuous stall current	I_o	19.3	25.6	31.4	37.7	A_{rms}
Maximum current	I_m	31.0	41.0	51,3	61,5	A_{rms}
Nominal power	P_N	9.35 (12.5)	12.4 (16.7)	15.3 (21)	18.4 (24.6)	kW (hp)
Torque constant	k_T	2.38 (21.1)	2.39 (21.1)	2.40 (21.2)	2.40 (21.2)	Nm/A_{rms} (lbf in/A_{rms})
Voltage constant	k_e	148	148	148	148	V_{rms}/k_{rpm}
Thermal time constant	t_{th}	400	460	507	525	s
Winding resistance at 25 °C (77 °C) (phase to phase)	R_{tt}	1,640	1,140	0.89	0.71	Ohm
Winding inductance (phase to phase)	L_{tt}	17.4	13.0	10.3	8.6	mH
Rotor inertia with resolver	J	10.8 (96.0)	114.0 (124)	17.1 (151.2)	20.2 (179)	kg cm^2 (lbf in s^2 x 10^{-4})
Rotor inertia with encoder	J	11.0 (96.0)	14.0 (133)	17.1 (151)	20.2 (178)	kg cm^2 (lbf in s^2 x 10^{-4})
Weight (without brake)	m	22.6 (49.8)	24.1 (53.1)	26.4 (58.2)	31.5 (69.4)	kg (lb)

Optional Holding Brake	Option 1	Option 2	Units
Holding torque	N/A	30 (266)	Nm (lbf in)
Extra weight	N/A	1.1 (2.4)	kg (lb)
Extra inertia with resolver	N/A	3.6 (31.9)	kg cm^2 (lbf in s^2 x 10^{-4})
Extra inertia with encoder	N/A	3.8 (33.6)	kg cm^2 (lbf in s^2 x 10^{-4})
Power requirement	N/A	17	W
Voltage requirement (+6 % -10 %)	N/A	24	V_{DC}

Notes:

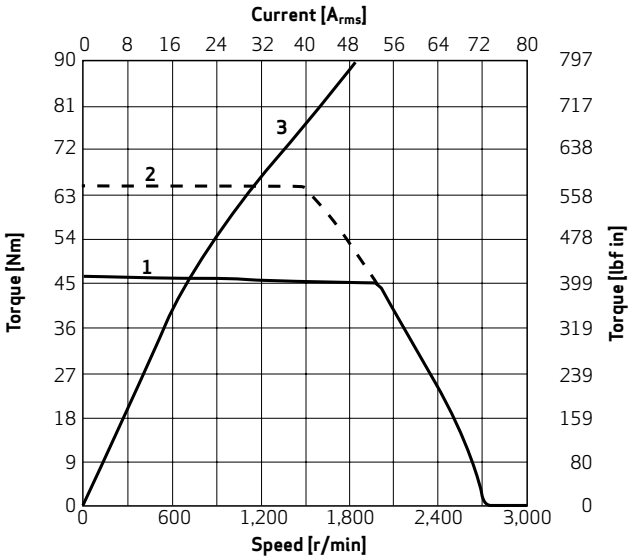
1. Different windings available to decrease or increase nominal speed
2. Motor performances as measured with Moog's Servo Drive of proper size
3. Motor Pole Count: 8
4. DC Link voltage 565 V

SIZE 5

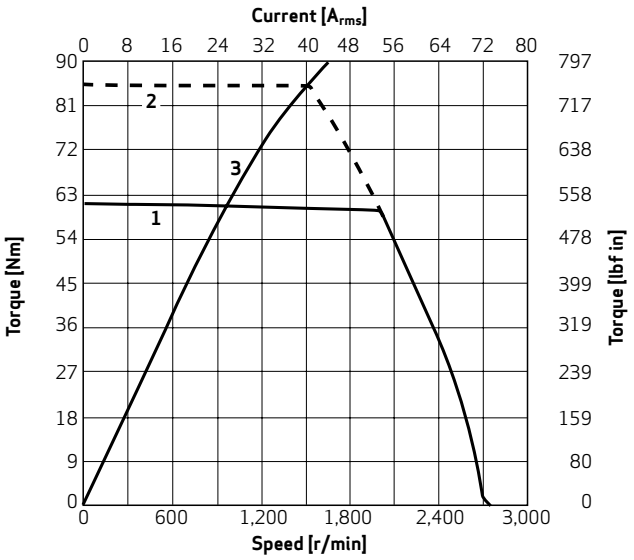
LIQUID COOLING, HIGH DYNAMIC, TYPE JHW5

Motor Characteristics

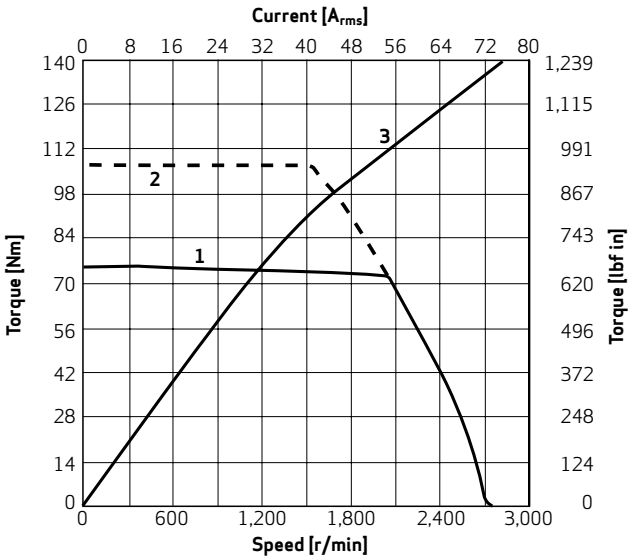
JHW5-047



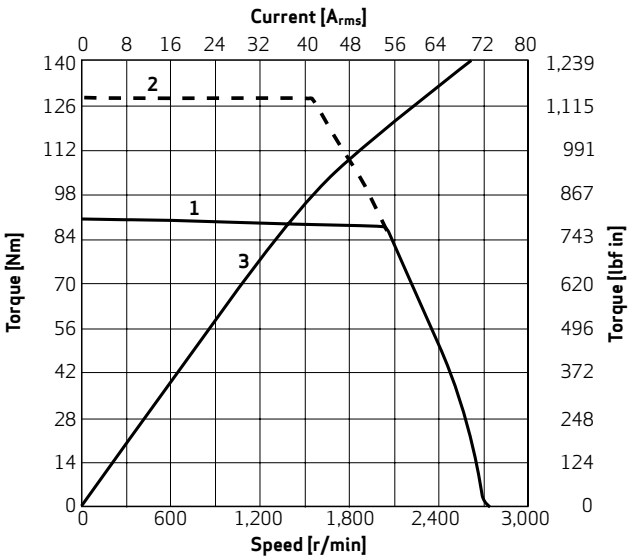
JHW5-063



JHW5-079



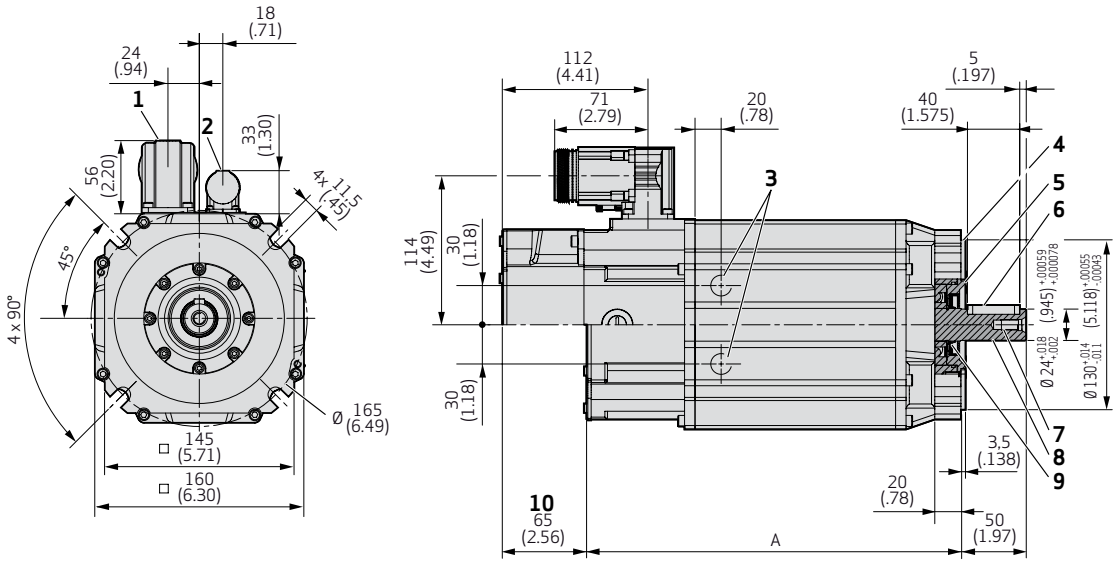
JHW5-094



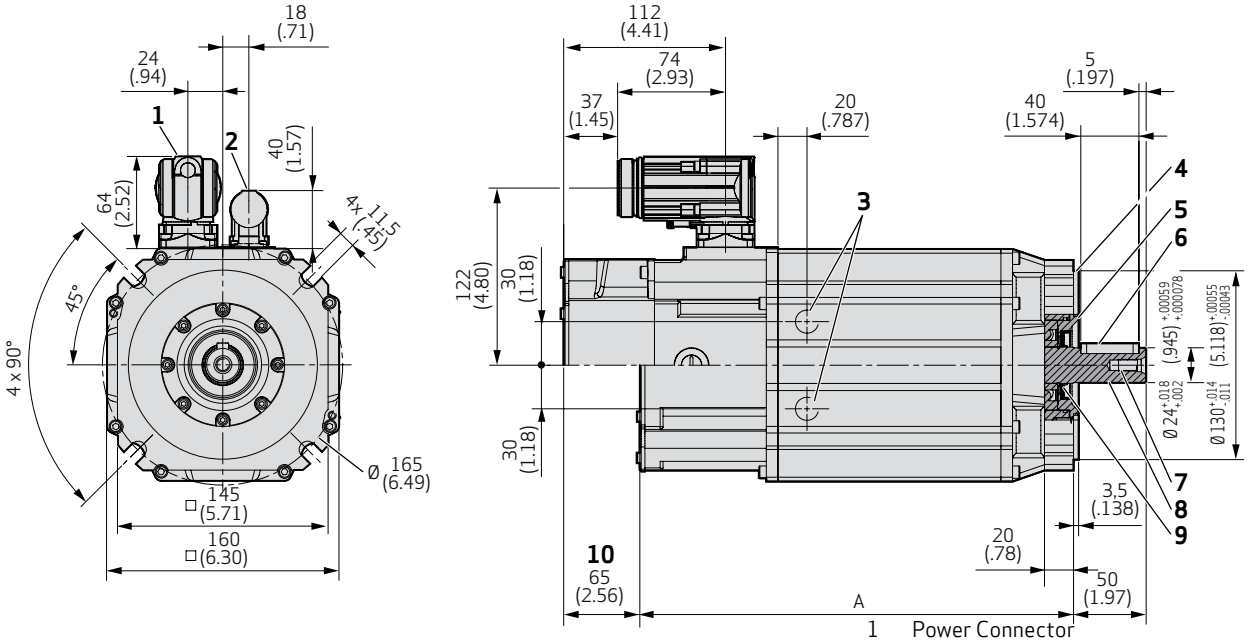
1 Continuous torque
2 Maximum torque
3 Torque constant, K_t

SIZE 5
LIQUID COOLING, HIGH DYNAMIC, TYPE JHW5

JHW5 with resolver



JHW5 with encoder



MODEL NO.	Dimension "A"
	Standard bearing
JHW5-047	287 (11.30)
JHW5-063	327 (12.87)
JHW5-079	367 (14.45)
JHW5-094	407 (16.02)

1 Power Connector
2 Signal Connector
3 Cooler outlets G3/8" left side
4 Tolerances of shaft extension-run-out and of mounting flange per DIN 42955-R
5 Flange DIN 42948
6 Optional key DIN 6885-A 8x7x40
7 Thread M8x19 DIN 13
8 Shaft DIN 748-3
9 Optional shaft seal
10 With brake

SIZE 5
NATURAL COOLING, STANDARD DYNAMIC, TYPE JSC5

Characteristics and nominal values with sinusoidal drive

Type		JSC5-063	JSC5-084	JSC5-105	JSC5-126	Units
Continuous stall torque	M_o	29.3 (260)	38.0 (336)	46.6(413)	55.1 (488)	Nm (lbf in)
Nominal torque	M_N	17.4(154)	26.5(234)	35.1 (310)	44.0 (389)	Nm (lbf in)
Maximum torque	M_P	135 (1,193)	180 (1,589)	225 (1,991)	270 (2,386)	Nm (lbf in)
Nominal speed	n_N	3,500	2,600	2,100	1,700	r/min
Maximum speed	n_{max}	4,030	3,030	2,420	2,020	r/min
Continuous stall current	I_o	17.0	16.0	16.0	16.0	A_{rms}
Maximum current	I_m	90.0	90.0	90.0	90.0	A_{rms}
Nominal power	P_N	6.37 (9.0)	7.21 (10.0)	8.0 (10.0)	8.0 (10.5)	kW (hp)
Torque constant	k_T	1.76 (15.5)	2.34 (20.7)	2.93 (25.9)	3.51 (31.1)	Nm/A_{rms} (lbf in/A_{rms})
Voltage constant	k_e	109	145	182	218	V_{rms}/k_{rpm}
Thermal time constant	t_{th}	2,600	3,467	4,333	5,200	s
Winding resistance at 25 °C (77 °C) (phase to phase)	R_{tt}	0.57	0.71	0.85	1.00	Ohm
Winding inductance (phase to phase)	L_{tt}	5.0	6.6	8.3	9.9	mH
Rotor inertia with resolver	J	28.8 (255)	37.5 (332)	46.1 (408)	54.7 (484)	kg cm^2 (lbf in s^2 x 10^{-4})
Rotor inertia with encoder	J	28.8(255)	37.5 (332)	46.1 (408)	54.7 (484)	kg cm^2 (lbf in s^2 x 10^{-4})
Weight (without brake)	m	22.1 (48.7)	25.1 (55.3)	31.3 (69.0)	35.6(78.5)	kg (lb)

Optional Holding Brake	Option 1	Option 2	Units
Holding torque	18 (159)	30 (266)	Nm (lbf in)
Extra weight	0.75 (1.70)	1.1 (2.40)	kg (lb)
Extra inertia with resolver	1.0 (8.90)	3.6 (31.9)	kg cm^2 (lbf in s^2 x 10^{-4})
Extra inertia with encoder	1.2 (10.6)	3.8 (33.6)	kg cm^2 (lbf in s^2 x 10^{-4})
Power requirement	15.6	17	W
Voltage requirement (+6 % -10 %)	24	24	V_{DC}

Notes:

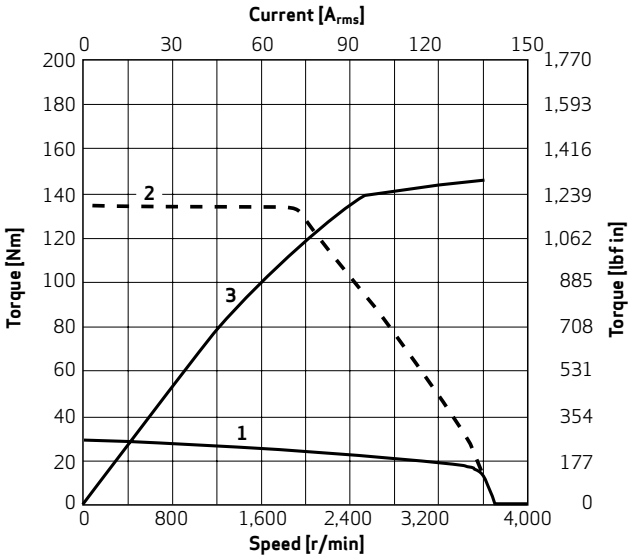
1. Different windings available to decrease or increase nominal speed
2. Motor performances as measured with Moog's Servo Drive of proper size
3. Motor Pole Count: 8
4. DC Link voltage 565 V

SIZE 5

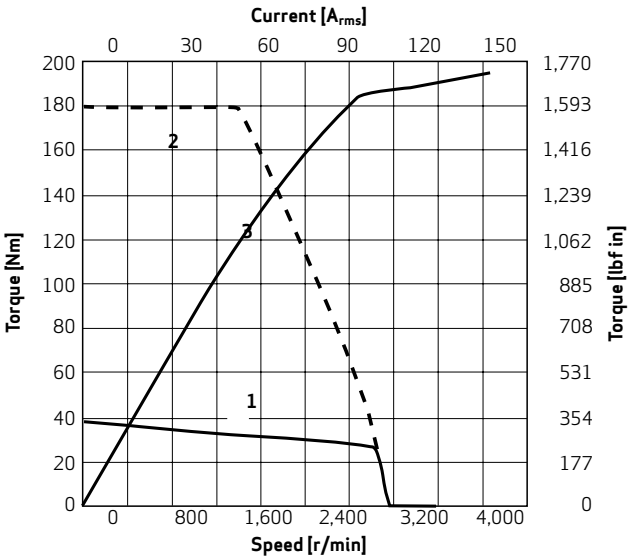
NATURAL COOLING, STANDARD DYNAMIC, TYPE JSC5

Motor Characteristics

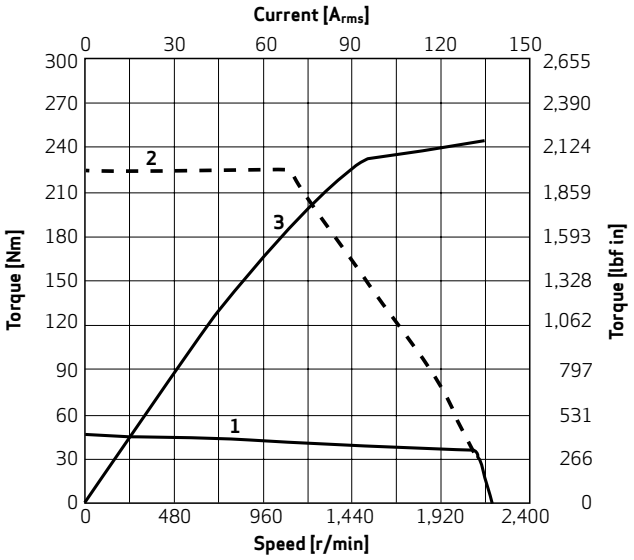
JSC5-063



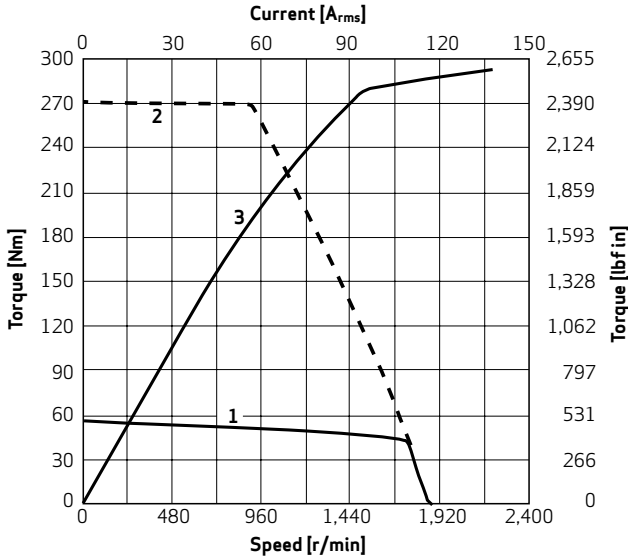
JSC5-084



JSC5-105



JSC5-126

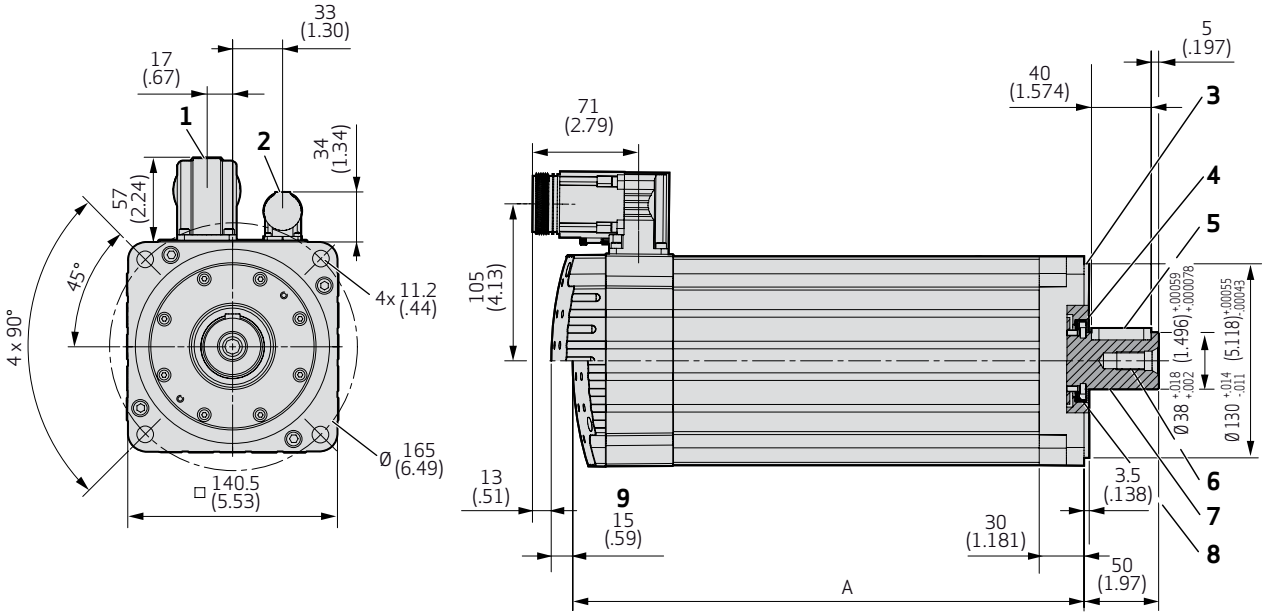


1 Continuous torque
2 Maximum torque
3 Torque constant, K_t

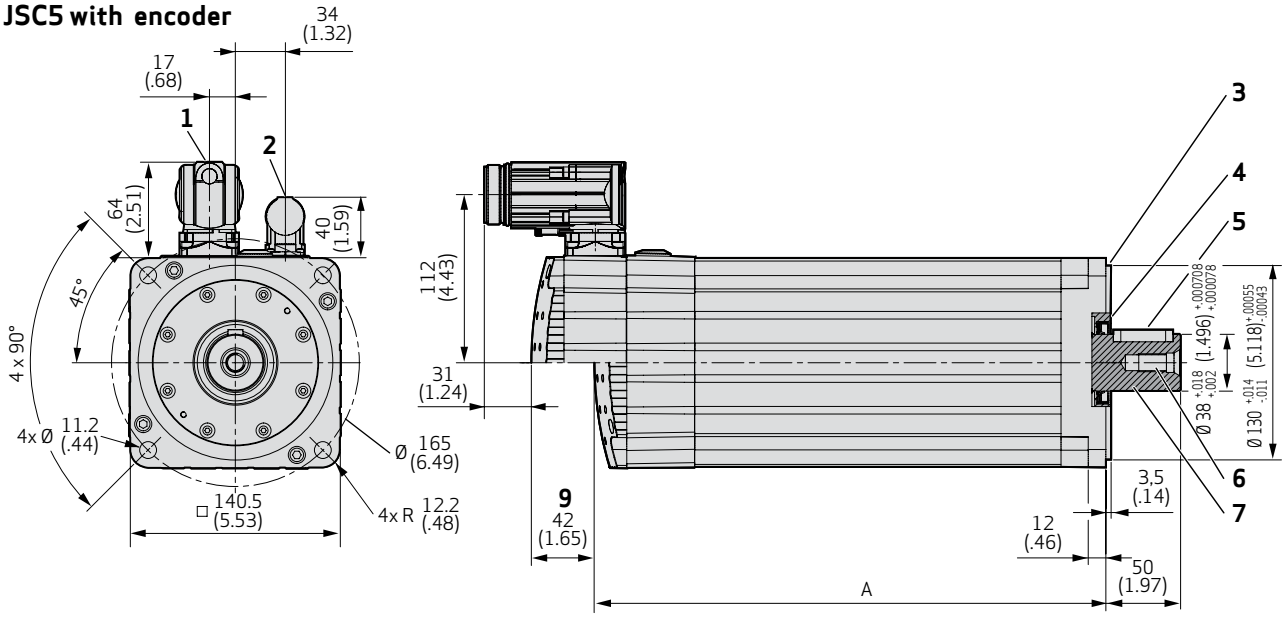
SIZE 5

NATURAL COOLING, STANDARD DYNAMIC, TYPE JSC5

JSC5 with resolver



JSC5 with encoder



MODEL NO.	Dimension "A"
	Standard bearing
JSC5-063	343 (13.50)
JSC5-084	396 (15.59)
JSC5-105	450 (17.71)
JSC5-126	503 (19.50)

1 Power Connector
2 Signal Connector
3 Tolerances of shaft extension-run-out and of mounting flange per DIN 42955-R
4 Flange DIN 42948
5 Optional key DIN 6885-A10x8x40
6 Thread M12x28 DIN 13
7 Shaft DIN 748-3
8 Optional shaft seal
9 With brake

SIZE 5
FAN COOLING, STANDARD DYNAMIC, TYPE JSF5

Characteristics and nominal values with sinusoidal drive

Type		JSF5-063	JSF5-084	JSF5-105	JSF5-126	Units
Continuous stall torque	M_o	39.3 (348)	48.8 (432)	58.0 (513)	66.6 (590)	Nm (lbf in)
Nominal torque	M_N	31.7 (281)	40.9 (362)	49.6 (439)	57.8 (511)	Nm (lbf in)
Maximum torque	M_P	135 (1,193)	180 (1,587)	225 (1,991)	270 (2,387)	Nm (lbf in)
Nominal speed	n_N	3,400	2,500	2,000	1,700	r/min
Maximum speed	n_{max}	4,030	3,030	2,420	2,020	r/min
Continuous stall current	I_o	22.4	20.9	19.7	18.98	A_{rms}
Maximum current	I_m	90.0	90.0	90.0	90.0	A_{rms}
Nominal power	P_N	11.2 (15.14)	11.0 (14.3)	10.3 (13.9)	10.2 (13.8)	kW (hp)
Torque constant	k_T	1.76 (15.5)	2.34 (20.7)	2.93 (25.9)	3.51 (31.1)	Nm/A_{rms} (lbf in/A_{rms})
Voltage constant	k_e	109	145	182	218	V_{rms}/k_{rpm}
Thermal time constant	t_{th}	1,357	1,810	2,262	2,714	s
Winding resistance at 25 °C (77 °C) (phase to phase)	R_{tt}	0.57	0.71	0.85	1.00	Ohm
Winding inductance (phase to phase)	L_{tt}	5.00	6,60	8.30	9.90	mH
Rotor inertia with resolver	J	28.8 (255)	37.5 (332)	46.1 (408)	54.7 (484)	kg cm^2 (lbf in s^2 x 10^{-4})
Rotor inertia with encoder	J	28.8 (255)	37.5 (332)	46.1 (408)	54.7 (484)	kg cm^2 (lbf in s^2 x 10^{-4})
Weight (without brake)	m	22.1 (48.7)	25.1 (55.3)	31.3 (69.0)	35.6 (78.5)	kg (lb)

Optional Holding Brake	Option 1	Option 2	Units
Holding torque	18 (159)	30 (266)	Nm (lbf in)
Extra weight	0.75 (1.7)	1.1 (2.40)	kg (lb)
Extra inertia with resolver	1 (8.9)	3.6 (31.9)	kg cm^2 (lbf in s^2 x 10^{-4})
Extra inertia with encoder	1.2 (10.60)	3.8 (33.6)	kg cm^2 (lbf in s^2 x 10^{-4})
Power requirement	15.6	17	W
Voltage requirement (+6 % -10 %)	24	24	V_{DC}

Notes:

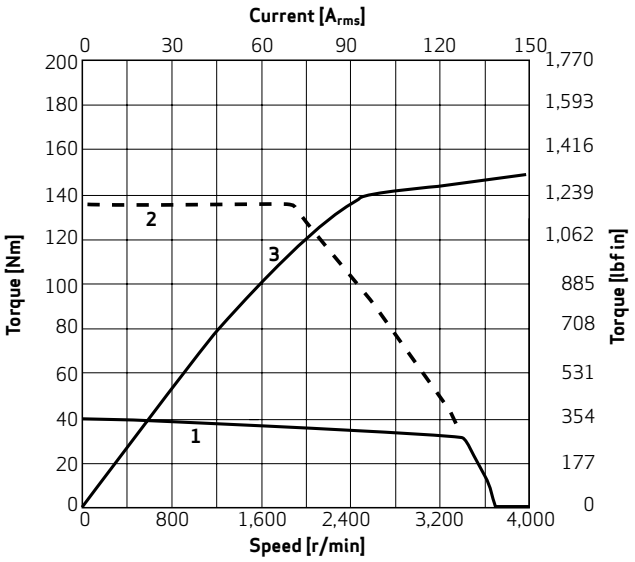
1. Different windings available to decrease or increase nominal speed
2. Motor performances as measured with Moog's Servo Drive of proper size
3. Motor Pole Count: 8
4. DC Link voltage 565 V

SIZE 5

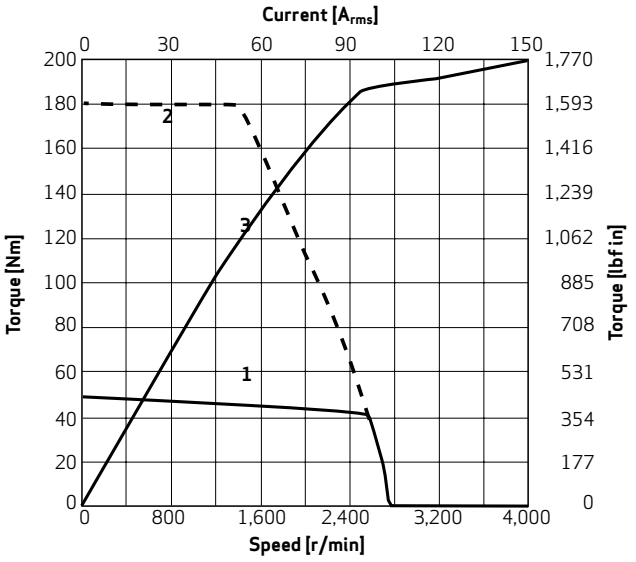
FAN COOLING, STANDARD DYNAMIC, TYPE JSF5

Motor Characteristics

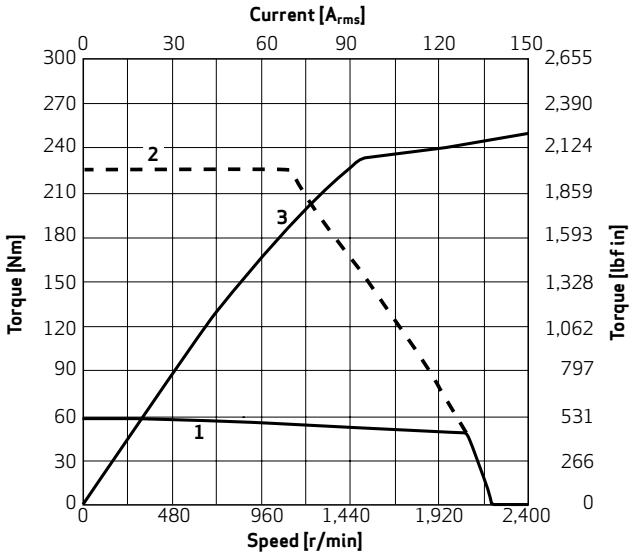
JSF5-063



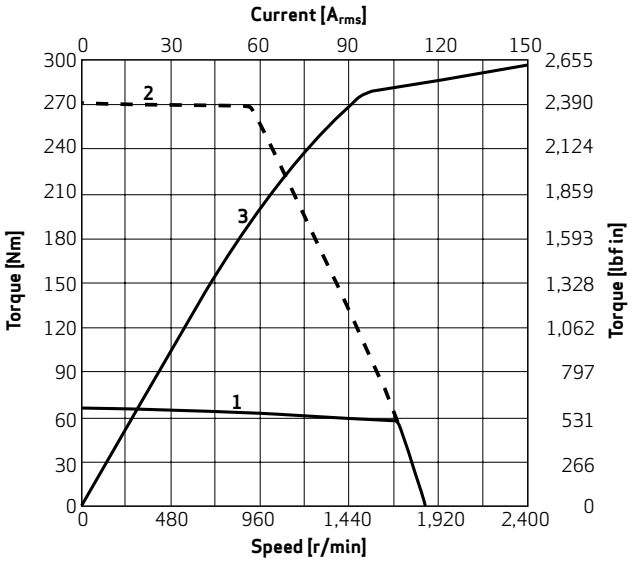
JSF5-084



JSF5-105



JSF5-126



1 Continuous torque
2 Maximum torque
3 Torque constant, K_t

Note: Dimensional drawings on request

SIZE 5
LIQUID COOLING, STANDARD DYNAMIC, TYPE JSW5

Characteristics and nominal values with sinusoidal drive

Type		JSW5-063	JSW5-084	JSW5-105	JSW5-126	Units
Continuous stall torque	M_o	63.6 (562)	84.2 (745)	105 (931)	126 (1.12)	Nm (lbf in)
Nominal torque	M_N	59.7 (528)	77.3 (684)	100 (888)	117 (1.40)	Nm (lbf in)
Maximum torque	M_P	135 (1,193)	179 (1,589)	225 (1,991)	270 (2.40)	Nm (lbf in)
Nominal speed	n_N	3,000	2,300	1,800	1,500	r/min
Maximum speed	n_{max}	4,030	3,030	2,420	2,020	r/min
Continuous stall current	I_o	36.2	36.0	35.9	35.8	A_{rms}
Maximum current	I_m	90.0	90.0	90.0	90.0	A_{rms}
Nominal power	P_N	18.7 (25.0)	18.6 (25.0)	18.9 (25.0)	18.3 (25.0)	kW (hp)
Torque constant	k_T	1.76 (15.5)	2.34 (20.7)	2.93 (25.9)	3.51 (31.1)	Nm/A_{rms} (lbf in/A_{rms})
Voltage constant	k_e	109	145	182	218	V_{rms}/k_{rpm}
Thermal time constant	t_{th}	353	470	588	706	s
Winding resistance at 25 °C (77 °C) (phase to phase)	R_{tt}	0.57	0.71	0.85	1.00	Ohm
Winding inductance (phase to phase)	L_{tt}	5.00	6.60	8.30	9.90	mH
Rotor inertia with resolver	J	28.8 (255)	37.5 (332)	46.1 (408)	54.7 (484)	kg cm^2 (lbf in s^2 x 10^{-4})
Rotor inertia with encoder	J	28.8 (255)	37.5 (332)	46.1 (408)	54.7 (484)	kg cm^2 (lbf in s^2 x 10^{-4})
Weight (without brake)	m	26.1 (57.5)	31.6 (67.5)	36.1 (79.9)	41.0 (90.4)	kg (lb)

Optional Holding Brake	Option 1	Option 2	Units
Holding torque	N/A	30 (266)	Nm (lbf in)
Extra weight	N/A	1.1 (2.4)	kg (lb)
Extra inertia with resolver	N/A	3.60 (31.9)	kg cm^2 (lbf in s^2 x 10^{-4})
Extra inertia with encoder	N/A	3.8 (33.6)	kg cm^2 (lbf in s^2 x 10^{-4})
Power requirement	N/A	17	W
Voltage requirement (+6 % -10 %)	N/A	24	V_{DC}

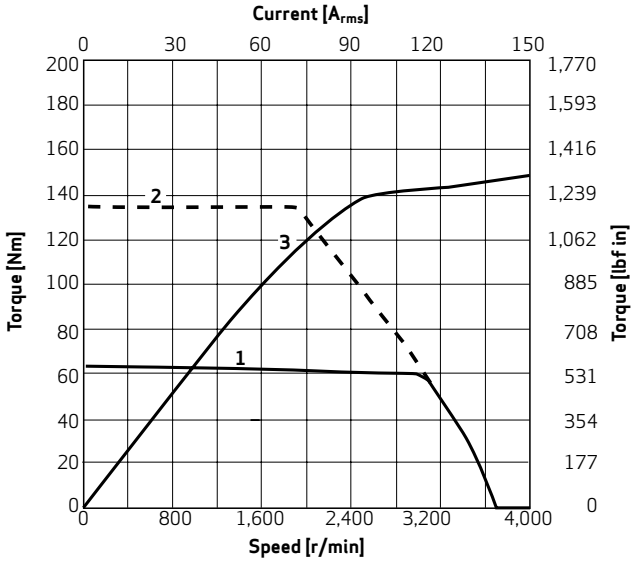
Notes:

1. Different windings available to decrease or increase nominal speed
2. Motor performances as measured with Moog's Servo Drive of proper size
3. Motor Pole Count: 8
4. DC Link voltage 565 V

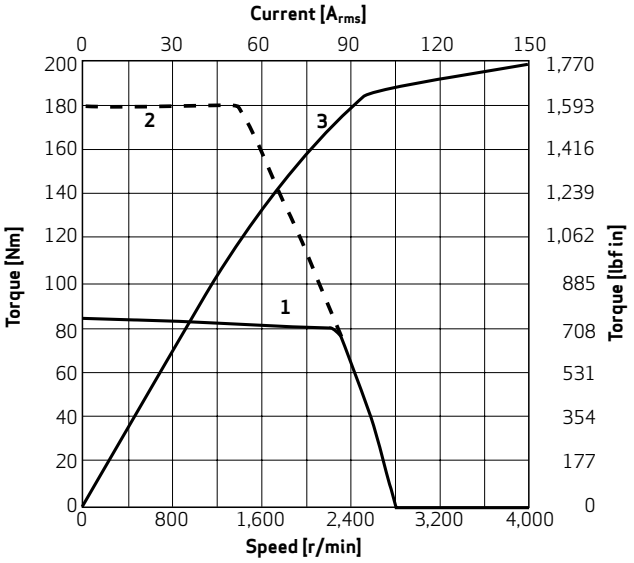
SIZE 5

LIQUID COOLING, STANDARD DYNAMIC, TYPE JSW5
Motor Characteristics

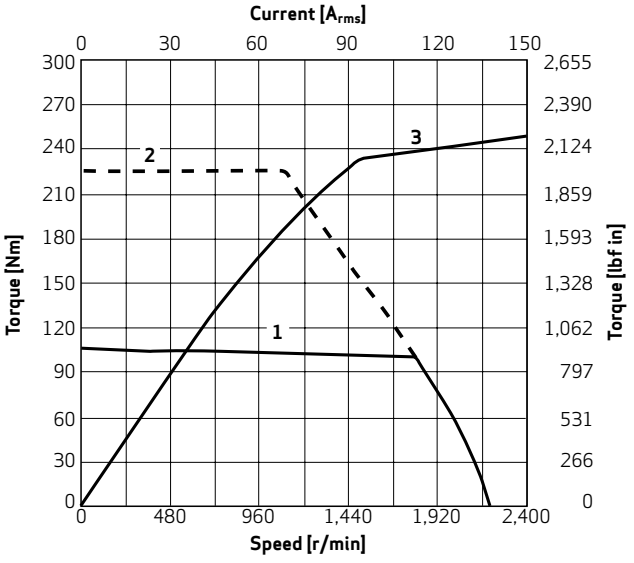
JSW5-063



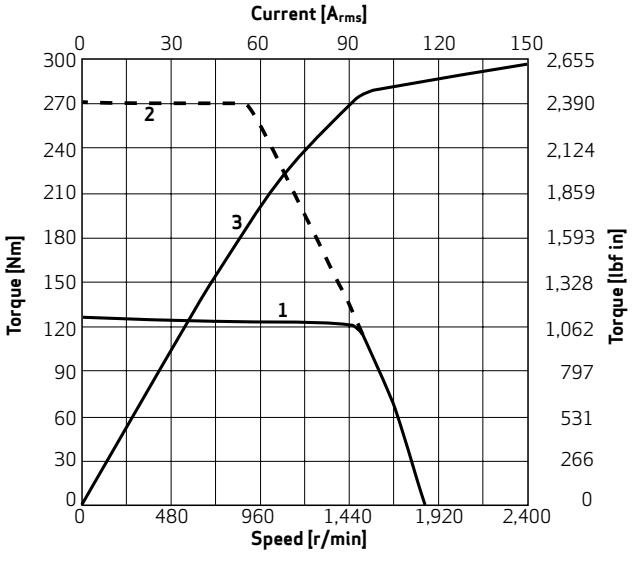
JSW5-084



JSW5-105



JSW5-126

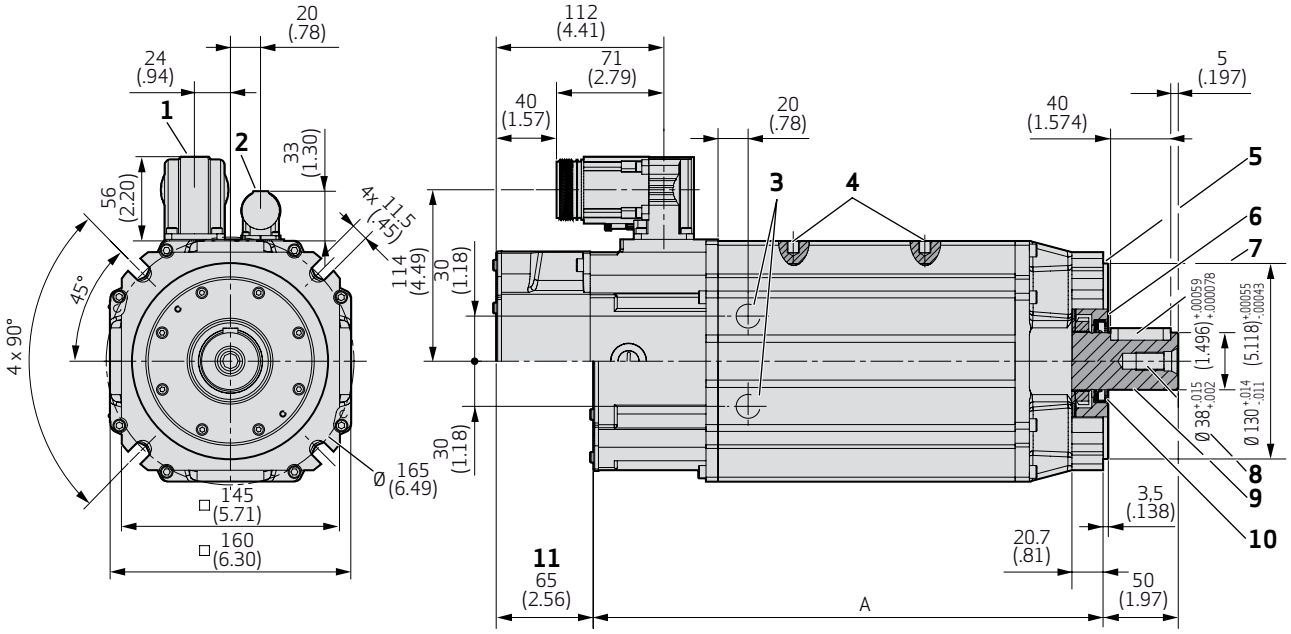


1 Continuous torque
2 Maximum torque
3 Torque constant, K_t

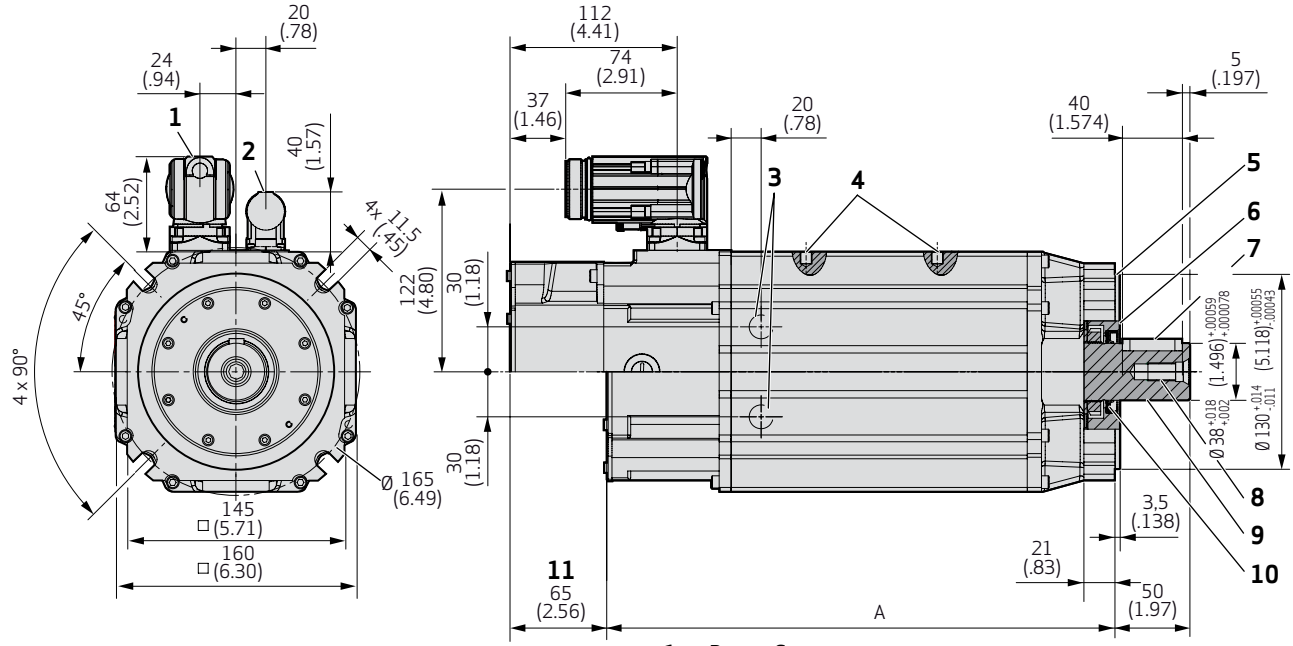
Note: Dimensional drawings on request

SIZE 5
LIQUID COOLING, STANDARD DYNAMIC, TYPE JSW5

JSW5 with resolver



JSW5 with encoder



MODEL NO.	Dimension "A"
	Standard bearing
JSC5-063	339 (13.35)
JSC5-084	392 (15.43)
JSC5-105	446 (17.56
JSC5-126	499 (19.65)

1 Power Connector
2 Signal Connector
3 Cooler outlets G3/8"
4 Motor lifting holes M8 DIN 332
5 Tolerances of shaft extension-run-out and of mounting flange per DIN 42955-R
6 Flange DIN 42948
7 Optional key DIN 6885-A 10x8x40
8 Thread M12x28 DIN 13
9 Shaft DIN 748-3l
10 Optional shaft seal
11 With brake

SIZE 6
NATURAL COOLING, HIGH DYNAMIC, TYPE JHC6

Characteristics and nominal values with sinusoidal drive

Type		JHC6-079	JHC6-105	JHC6-131	JHC6-157	Units
Continuous stall torque	M_o	70.8 (627)	92.9 (822)	115 (1,014)	136 (1,207)	Nm (lbf in)
Nominal torque	M_N	50.2 (444)	64.4 (570)	82,1 (727)	95.5 (845)	Nm (lbf in)
Maximum torque	Mn	276 (2,440)	365 (3,234)	456 (4,038)	547 (4,845)	Nm (lbf in)
Nominal speed	n_N	1,900	1.800	1.600	1,600	r/min
Maximum speed	n_{max}	2,200	2,060	1,880	1,830	r/min
Continuous stall current	I_o	21.4	26.3	29.6	34.3	A_{rms}
Maximum current	I_m	92.0	114	130	152.0	A_{rms}
Nominal power	P_N	9.9 (13.0)	12.1 (16.29)	13.7 (18.0)	16.0 (21.46)	kW (hp)
Torque constant	k_T	3.31 (29.3)	3.53 (31.3)	3.8 (34.2)	3.9 (35.1)	Nm/A_{rms} (lbf in/A_{rms})
Voltage constant	k_e	200	213	233	240	V_{rms}/k_{rpm}
Thermal time constant	t_{th}	4,000	4,200	4,620	5,200	s
Winding resistance at 25 °C (77 °C) (phase to phase)	R_{tt}	0.48	0.38	0.35	0.30	Ohm
Winding inductance (phase to phase)	L_{tt}	8.3	7.0	6.7	5.9	mH
Rotor inertia with resolver	J	78.4 (694)	104 (918)	129 (1,142)	154 (1,365)	kg cm^2 (lbf in s^2 x 10^{-4})
Rotor inertia with encoder	J	78.4 (694)	104 (918)	129 (1,142)	154 (1,365)	kg cm^2 (lbf in s^2 x 10^{-4})
Weight (without brake)	m	53.6 (118)	64.7 (143)	75.4 (166)	88.4 (195)	kg (lb)

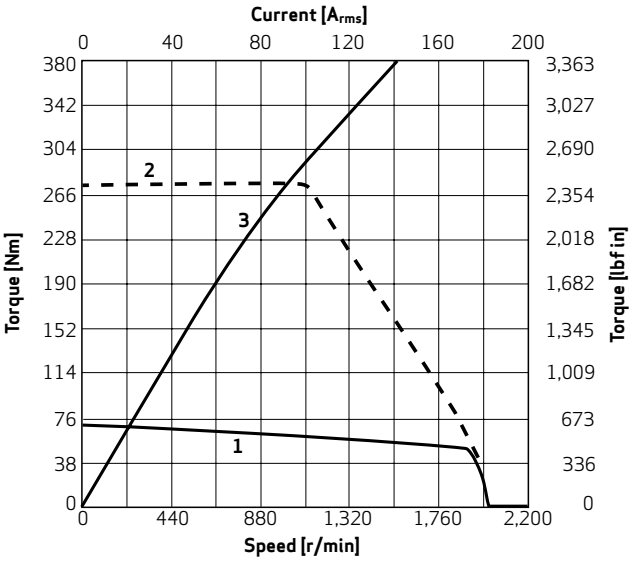
Optional Holding Brake	Option 1	Option 2	Units
Holding torque	30 (266)	72 (637)	Nm (lbf in)
Extra weight	1.10 (2.40)	2.90 (6,40)	kg (lb)
Extra inertia with resolver	3.60 (31.9)	16.0 (142)	kg cm^2 (lbf in s^2 x 10^{-4})
Extra inertia with encoder	3.80 (33.6)	16.1 (142)	kg cm^2 (lbf in s^2 x 10^{-4})
Power requiremesnt	17	40	W
Voltage requirement (+6 % -10 %)	24	24	V_{DC}

Notes:

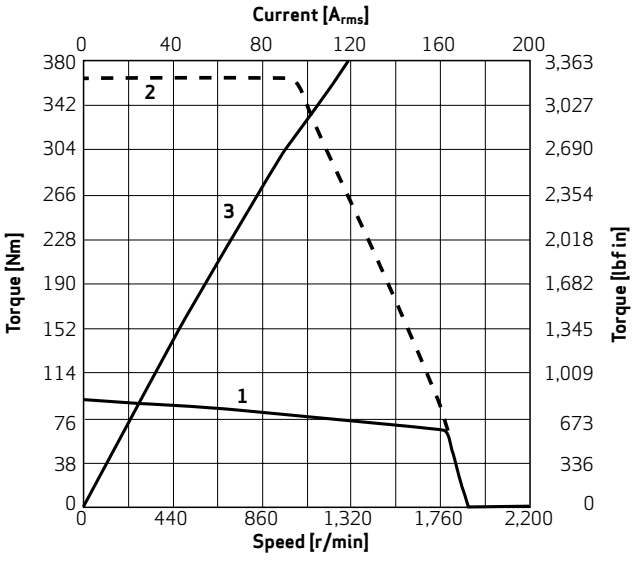
1. Different windings available to decrease or increase nominal speed
2. Motor performances as measured with Moog's Servo Drive of proper size
3. Motor Pole Count: 8
4. DC Link voltage 565 V

SIZE 6
NATURAL COOLING, HIGH DYNAMIC, TYPE JHC6
Motor Characteristics

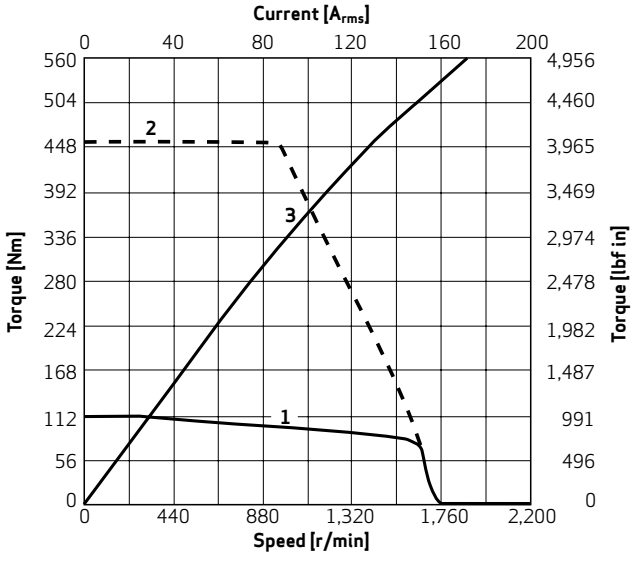
JHC6-079



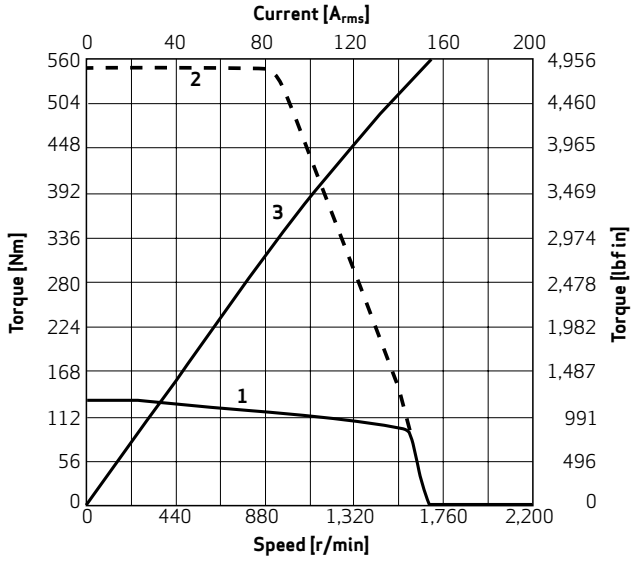
JHC6-105



JHC6-131



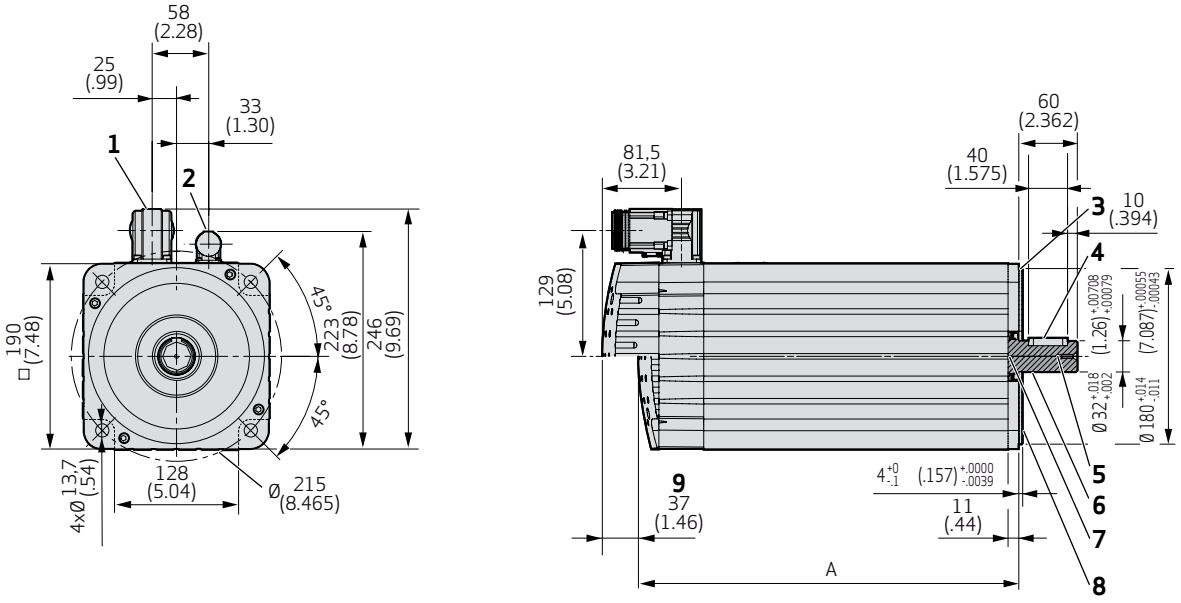
JHC6-157



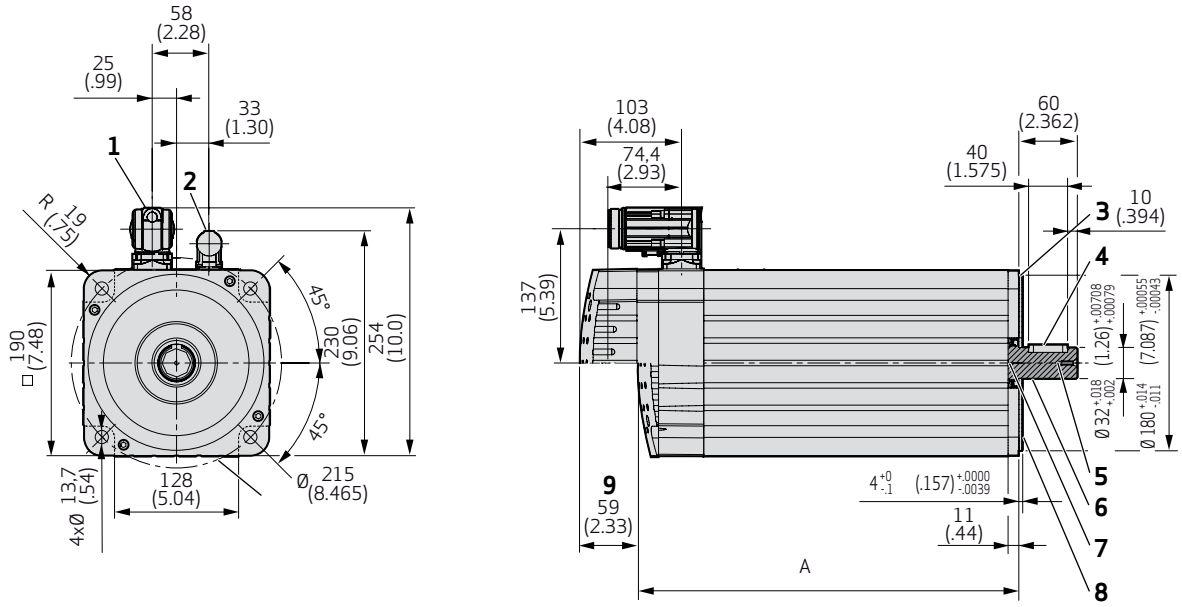
1 Continuous torque
2 Maximum torque
3 Torque constant, K_t

SIZE 6
NATURAL COOLING, HIGH DYNAMIC, TYPE JHC6

JHC6 with resolver



JHC6 with encoder



MODEL NO.	Dimension "A"
	Standard bearing
JHC6-079	390 (15.35)
JHC6-105	457 (17.99)
JHC6-131	524 (20.63)
JHC6-157	590 (23.23)

1 Power Connector
2 Signal Connector
3 Tolerances of shaft extension-run-out and of mounting flange per DIN 42955-R
4 Optional key DIN 6885-A 10x8x40
5 Thread M4x17 DIN 13
6 Shaft DIN 748-3
7 Optional shaft seal
8 Flange DIN 42948
9 With brake

SIZE 6
FAN COOLING, HIGH DYNAMIC, TYPE JHF6

Characteristics and nominal values with sinusoidal drive

Type		JHF6-079	JHF6-105	JHF6-131	JHF6-157	Units
Continuous stall torque	M_o	95.4 (844)	121 (1,070)	145 (1,285)	169 (1,498)	Nm (lbf in)
Nominal torque	M_N	82.1 (727)	102 (903)	123 (1,089)	141 (1,247)	Nm (lbf in)
Maximum torque	Mn	276 (2,440)	365 (3,234)	456 (4,038)	547 (4,845)	Nm (lbf in)
Nominal speed	n_N	1,800	1,700	1,500	1,500	r/min
Maximum speed	n_{max}	2,200	2,060	1,880	1,830	r/min
Continuous stall current	I_o	28.8	34.2	37.6	42.7	A_{rms}
Maximum current	I_m	92.0	114	130	152	A_{rms}
Nominal power	P_N	15.4 (20.7)	18.1 (24.3)	19.3 (26)	22.1 (30.0)	kW (hp)
Torque constant	k_T	3.3 (29.0)	3.5 (31.2)	3.8 (34.0)	4.0 (34.2)	Nm/A_{rms} (lbf in/A_{rms})
Voltage constant	k_e	200	213	233	240	V_{rms}/k_{rpm}
Thermal time constant	t_{th}	1,040	1,088	1,197	1,348	s
Winding resistance at 25 °C (77 °C) (phase to phase)	R_{tt}	0.48	0.38	0.35	0.30	Ohm
Winding inductance (phase to phase)	L_{tt}	8.3	7.0	6.7	5.9	mH
Rotor inertia with resolver	J	78.4 (694)	104 (918)	129 (1,142)	154 (1,365)	kg cm^2 (lbf in s^2 x 10^{-4})
Rotor inertia with encoder	J	78.4 (694)	104 (918)	129 (1,142)	154.0 (1,365)	kg cm^2 (lbf in s^2 x 10^{-4})
Weight (without brake)	m	53.6 (118)	64.7 (143)	75.4 (166)	88.4 (195)	kg (lb)

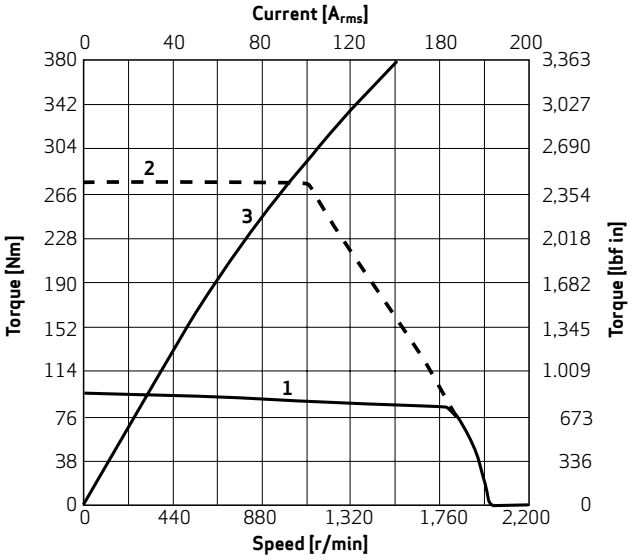
Optional Holding Brake	Option 1	Option 2	Units
Holding torque	30 (266)	72 (637)	Nm (lbf in)
Extra weight	1.10 (2.40)	32.9 (6.4)	kg (lb)
Extra inertia with resolver	3.60 (31.9)	16.0 (142)	kg cm^2 (lbf in s^2 x 10^{-4})
Extra inertia with encoder	3.80 (33.6)	16.1 (143)	kg cm^2 (lbf in s^2 x 10^{-4})
Power requiremesnt	17	40	W
Voltage requirement (+6 % -10 %)	24	24	V_{DC}

Notes:

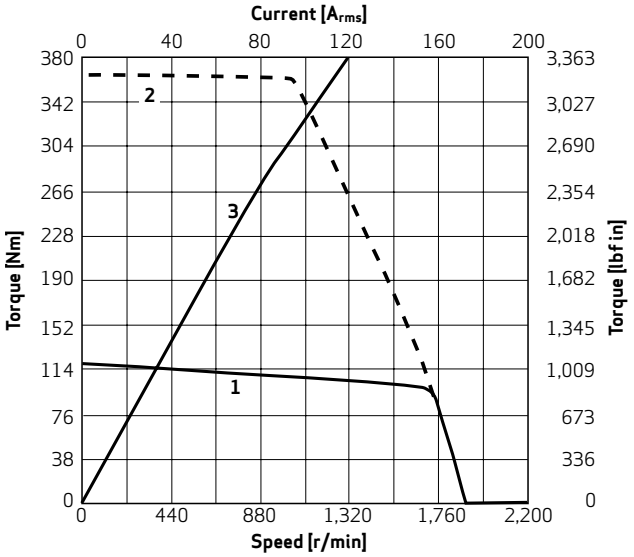
1. Different windings available to decrease or increase nominal speed
2. Motor performances as measured with Moog's Servo Drive of proper size
3. Motor Pole Count: 8
4. DC Link voltage 565 V

SIZE 6
FAN COOLING, HIGH DYNAMIC, TYPE JHF6
Motor Characteristics

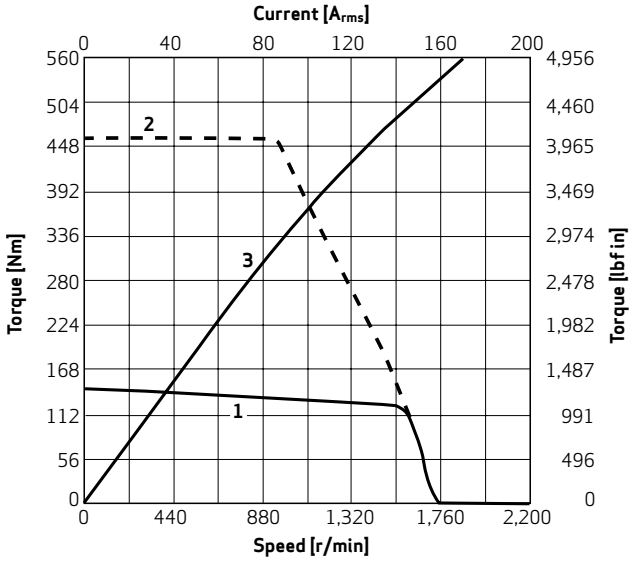
JHF6-079



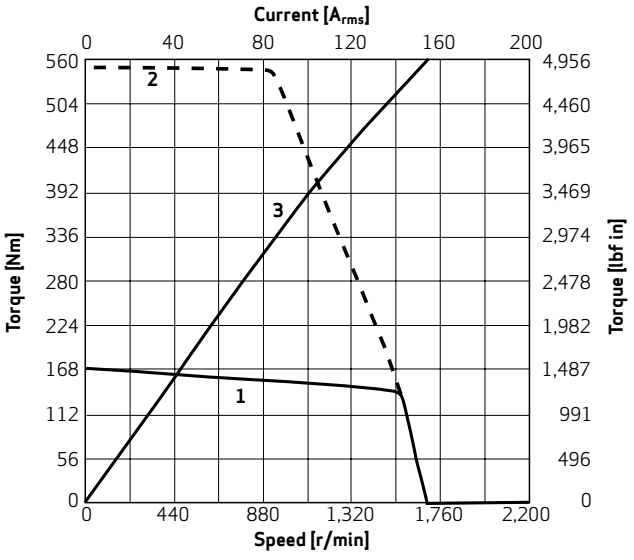
JHF6-105



JHF6-131



JHF6-157



1 Continuous torque
2 Maximum torque
3 Torque constant, K_t

SIZE 6
LIQUID COOLING, HIGH DYNAMIC, TYPE JHW6

Characteristics and nominal values with sinusoidal drive

Type		JHW6-079	JHW6-105	JHW6-131	JHW6-157	Units
Continuous stall torque	M_o	114 (1,005)	151 (1,337)	188 (1,664)	225 (1,995)	Nm (lbf in)
Nominal torque	M_N	104 (917)	138 (1,219)	171 (1,516)	207 (1,831)	Nm (lbf in)
Maximum torque	M_P	276 (2,440)	365 (3,234)	456 (4,038)	547 (4,845)	Nm (lbf in)
Nominal speed	n_N	1,700	1,600	1,500	1,400	r/min
Maximum speed	n_{max}	2,200	2,060	1,880	1,830	r/min
Continuous stall current	I_m	34.5	42.9	48.8	57.0	A_{rms}
Maximum current	I_p	92.0	114	130	152	A_{rms}
Nominal power	P_N	18.4 (24.7)	23.0 (30.9)	26.9 (36.0)	30.3 (40.6)	kW (hp)
Torque constant	k_T	3.29 (29.1)	3.52 (31.1)	3.85 (34.1)	3.95 (35.0)	Nm/A_{rms} (lbf in/A_{rms})
Voltage constant	k_e	200	213	233	240	V_{rms}/k_{rpm}
Thermal time constant	t_{th}	541	568	660	704	s
Winding resistance at 25 °C (77 °C) (phase to phase)	R_{tt}	0.48	0.38	0.35	0.30	Ohm
Winding inductance (phase to phase)	L_{tt}	8.3	7.1	6.8	5.9	mH
Rotor inertia with resolver	J	84.2 (745)	110 (969)	135 (1,192)	160 (1,416)	kg cm^2 (lbf in s^2 x 10^{-4})
Rotor inertia with encoder	J	84.2 (745)	110 (969)	135 (1,192)	160 (1,416)	kg cm^2 (lbf in s^2 x 10^{-4})
Weight (without brake)	m	59.1 (130)	66.8 (147)	77.8 (172)	90.6 (200)	kg (lb)

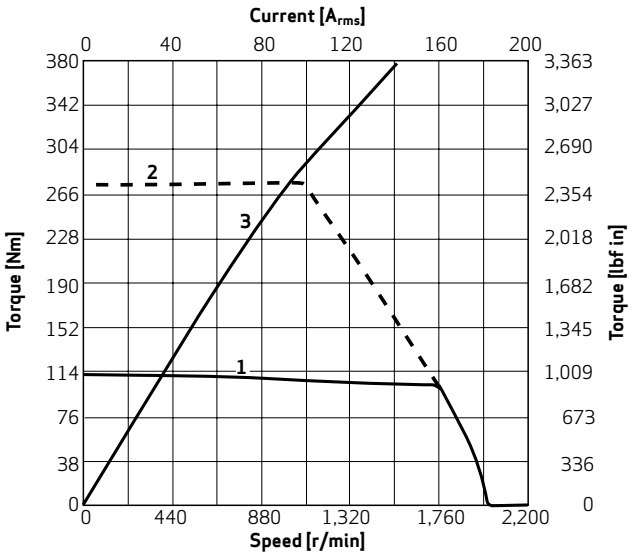
Optional Holding Brake	Option 1	Option 2	Units
Holding torque	N/A	72 (637)	Nm (lbf in)
Extra weight	N/A	2.90 (6.4)	kg (lb)
Extra inertia with resolver	N/A	16.0 (142)	kg cm^2 (lbf in s^2 x 10^{-4})
Extra inertia with encoder	N/A	16.1 (143)	kg cm^2 (lbf in s^2 x 10^{-4})
Power requiremesnt	N/A	40	W
Voltage requirement (+6 % -10 %)	N/A	24	V_{DC}

Notes:

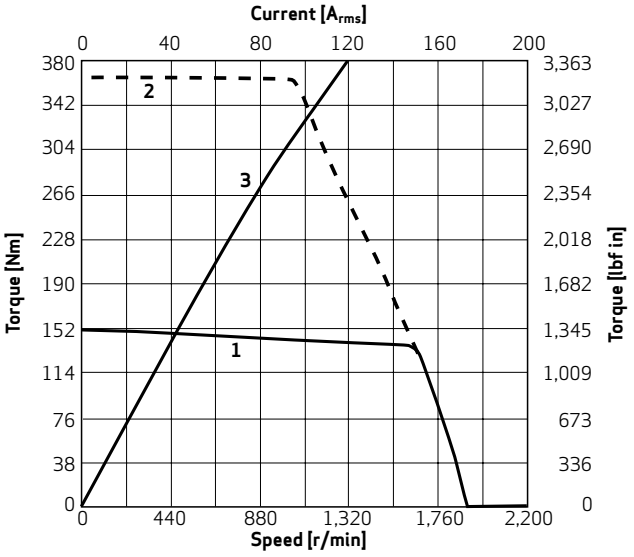
1. Different windings available to decrease or increase nominal speed
2. Motor performances as measured with Moog's Servo Drive of proper size
3. Motor Pole Count: 8
4. DC Link voltage 565 V

SIZE 6
LIQUID COOLING, HIGH DYNAMIC, TYPE JHW6
Motor Characteristics

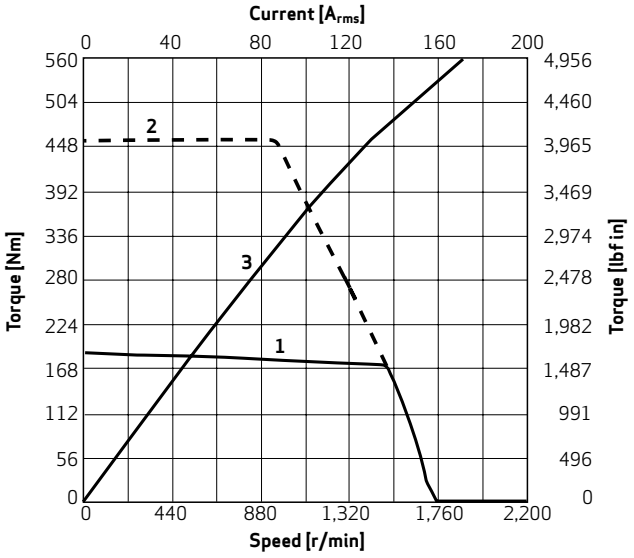
JHW6-079



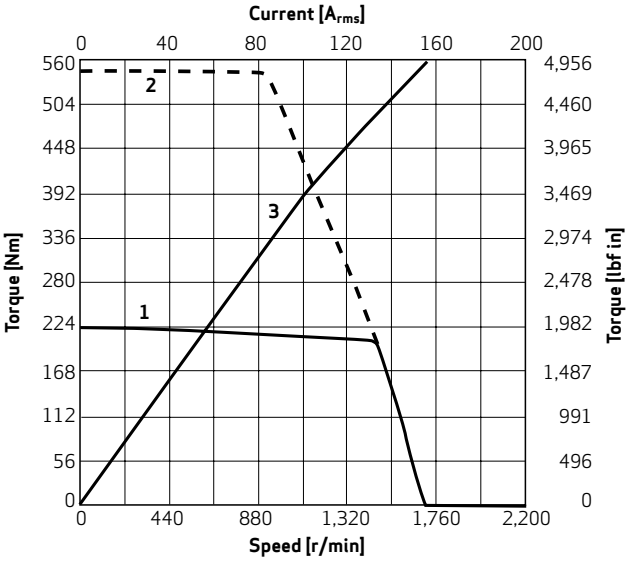
JHW6-105



JHW6-131



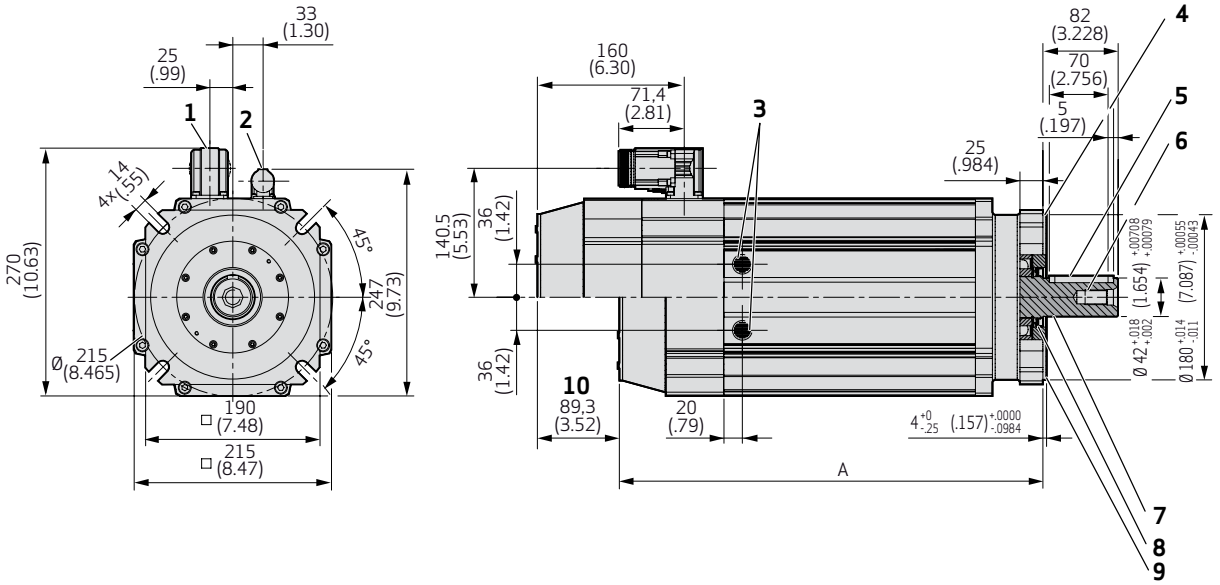
JHW6-157



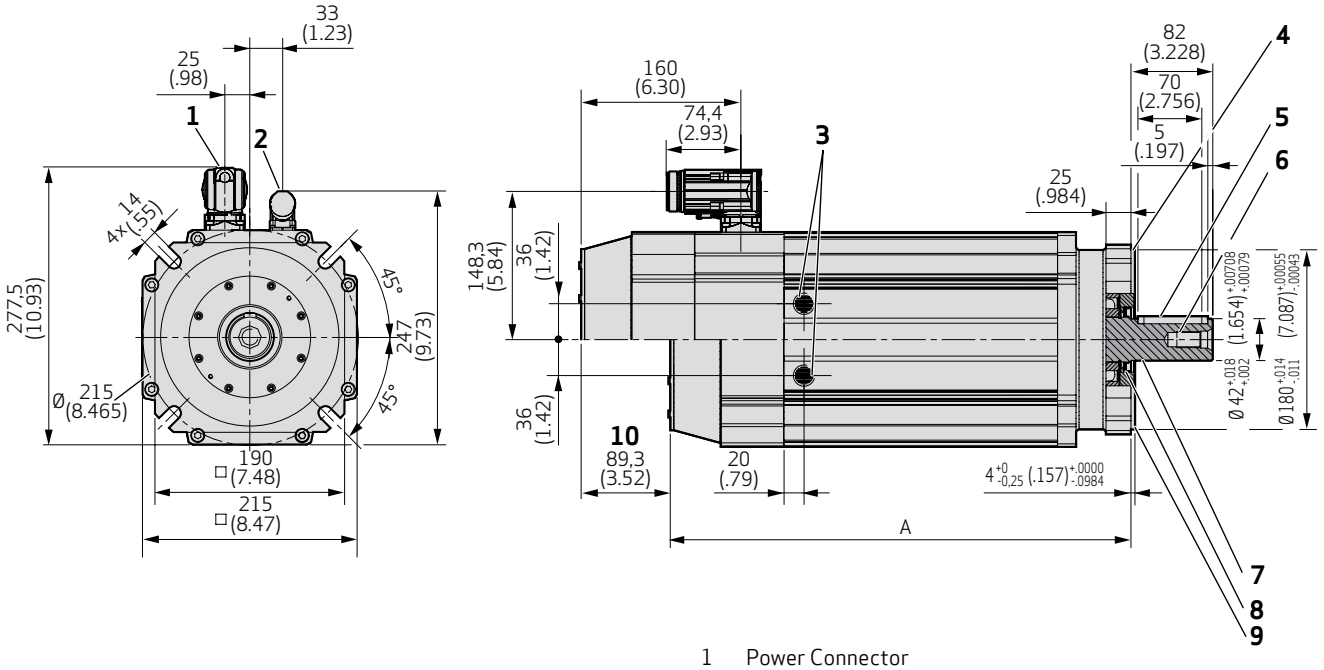
1 Continuous torque
2 Maximum torque
3 Torque constant, K_t

SIZE 6
LIQUID COOLING, HIGH DYNAMIC, TYPE JHW6

JHW6 with resolver [1)]



JHW6 with encoder [1)]



MODEL NO.	Dimension "A"
	Standard bearing
JHW6-079	461.5 (18.17)
JHW6-105	528.5 (20.81)
JHW6-131	595.5 (23.44)
JHW6-157	661.5 (26.04)

1 Power Connector
2 Signal Connector
3 Cooler outlets G1/2" left side
4 Tolerances of shaft extension-run-out and of mounting flange per DIN 42955-R
5 Optional key DIN 6885-A 12x8x70
6 Thread M 16x36 DIN 13
7 Shaft DIN 748-3
8 Optional shaft seal
9 Flange DIN 42948
10 With brake

[1)] Power connector box for the models: JHW6-131, JHW6-157. For these models there are changes in motor length, connector position and height. For further details please contact Moog.

SIZE 6
NATURAL COOLING, STANDARD DYNAMIC, TYPE JSC6

Characteristics and nominal values with sinusoidal drive

Type		JSC6-100	JSC6-134	JSC6-167	JSC6-201	Units
Continuous stall torque	M_o	84.0 (744)	110 (976)	136 (1,208)	163 (1,438)	Nm (lbf in)
Nominal torque	M_N	46.0 (407)	72,6 (643)	100 (887)	125 (1,107)	Nm (lbf in)
Maximum torque	M_P	583 (5,160)	777 (6,880)	972 (8,600)	1,166 (10,320)	Nm (lbf in)
Nominal speed	n_N	2,400	1,800	1,400	1,200	r/min
Maximum speed	n_{max}	2,720	2,040	1,630	1,380	r/min
Continuous stall current	I_o	33.2	32.7	32.3	32.1	A_{rms}
Maximum current	I_m	255	255	255	255	A_{rms}
Nominal power	P_N	11.5 (15.5)	13.7 (18.3)	14.6 (21.0)	15.7 (21.0)	kW (hp)
Torque constant	k_T	2.53 (22.4)	3.37 (29.9)	4.22 (37.3)	5.0 (44.8)	Nm/A_{rms} (lbf in/A_{rms})
Voltage constant	k_e	162	215	269	323	V_{rms}/k_{rpm}
Thermal time constant	t_{th}	4,180	4,622	5,300	6,000	s
Winding resistance at 25 °C (77 °C) (phase to phase)	R_{tt}	0.20	0.25	0.31	0.36	Ohm
Winding inductance (phase to phase)	L_{tt}	2.30	3.00	3.70	4.50	mH
Rotor inertia with resolver	J	230 (2,036)	303 (2,678)	375 (3,322)	448 (3,965)	kg cm^2 (lbf in s^2 x 10^{-4})
Rotor inertia with encoder	J	230 (2,036)	303 (2,678)	375 (3,322)	448 (3,965)	kg cm^2 (lbf in s^2 x 10^{-4})
Weight (without brake)	m	62.4 (138)	79.3 (175)	93.0 (205)	105 (232)	kg (lb)

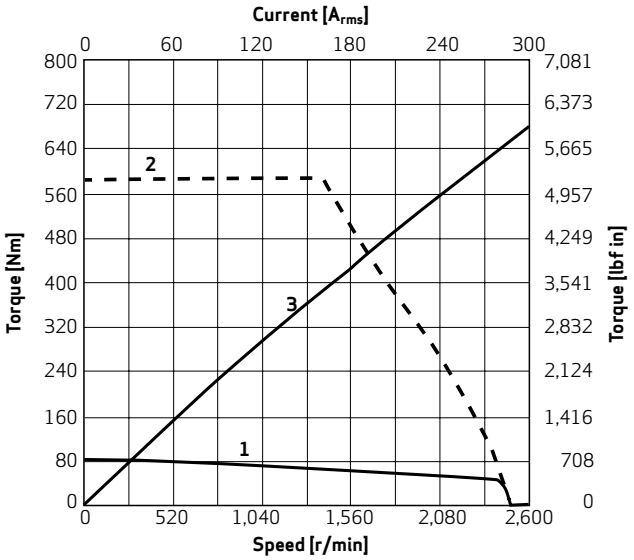
Optional Holding Brake	Option 1	Option 2	Units
Holding torque	30 (266)	72 (637)	Nm (lbf in)
Extra weight	1.10 (2.40)	2.90 (6.40)	kg (lb)
Extra inertia with resolver	3.60 (31.9)	16.0 (142)	kg cm^2 (lbf in s^2 x 10^{-4})
Extra inertia with encoder	3.80 (33.6)	16.1 (143)	kg cm^2 (lbf in s^2 x 10^{-4})
Power requirement	17	40	W
Voltage requirement (+6 % -10 %)	24	24	V_{DC}

Notes:

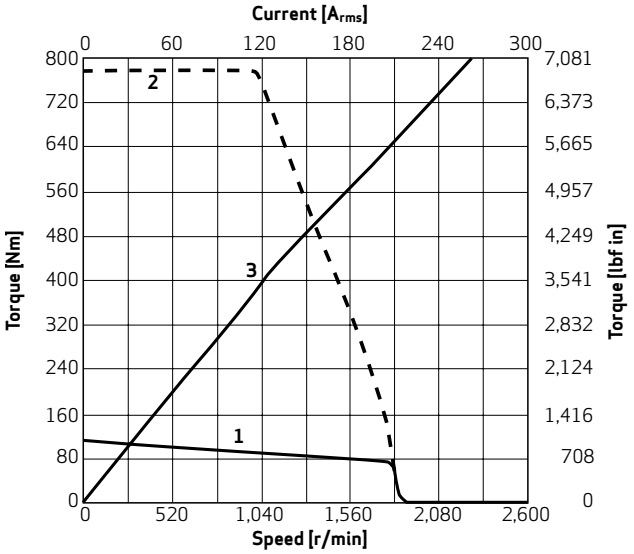
1. Different windings available to decrease or increase nominal speed
2. Motor performances as measured with Moog's Servo Drive of proper size
3. Motor Pole Count: 8
4. DC Link voltage 565 V

SIZE 6
NATURAL COOLING, STANDARD DYNAMIC, TYPE JSC6
Motor Characteristics

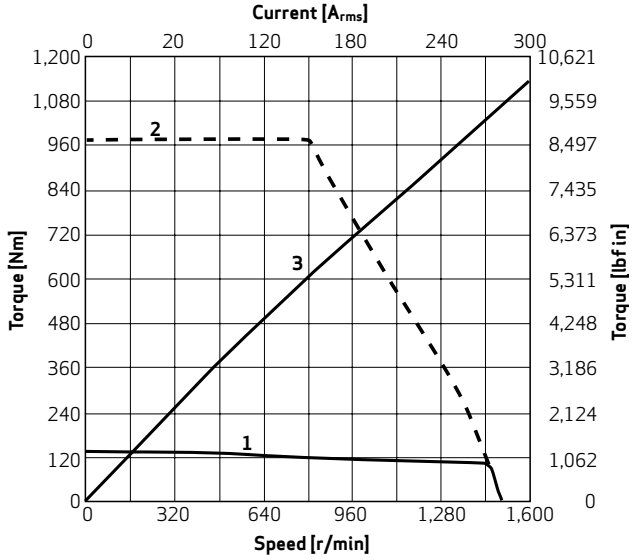
JSC6-100



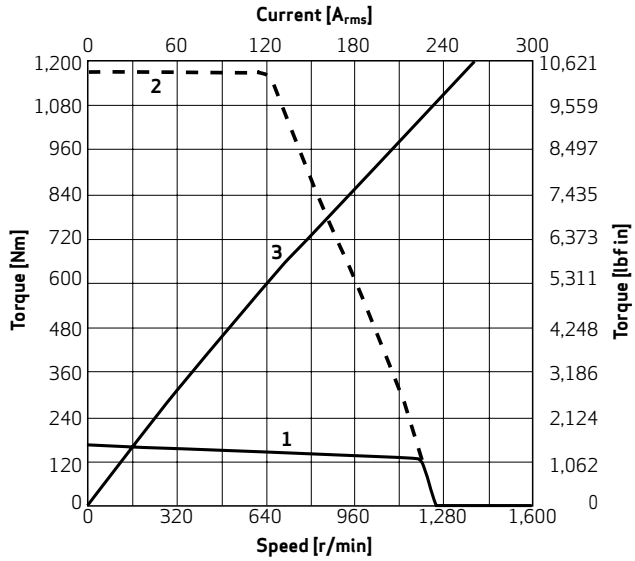
JSC6-134



JSC6-167



JSC6-201

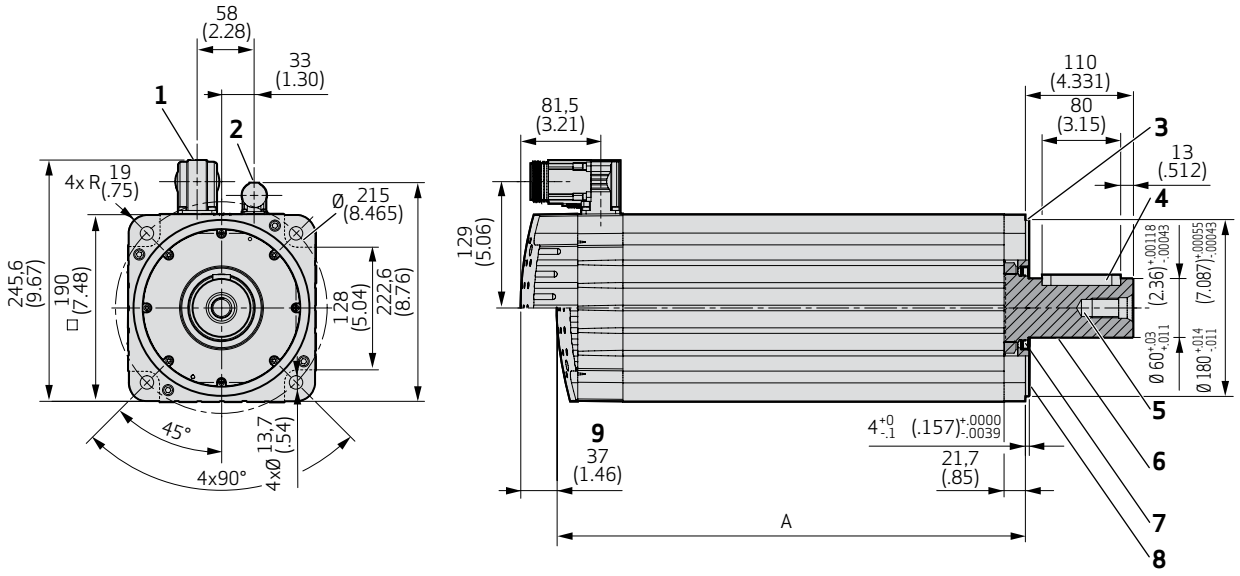


1 Continuous torque
2 Maximum torque
3 Torque constant, K_t

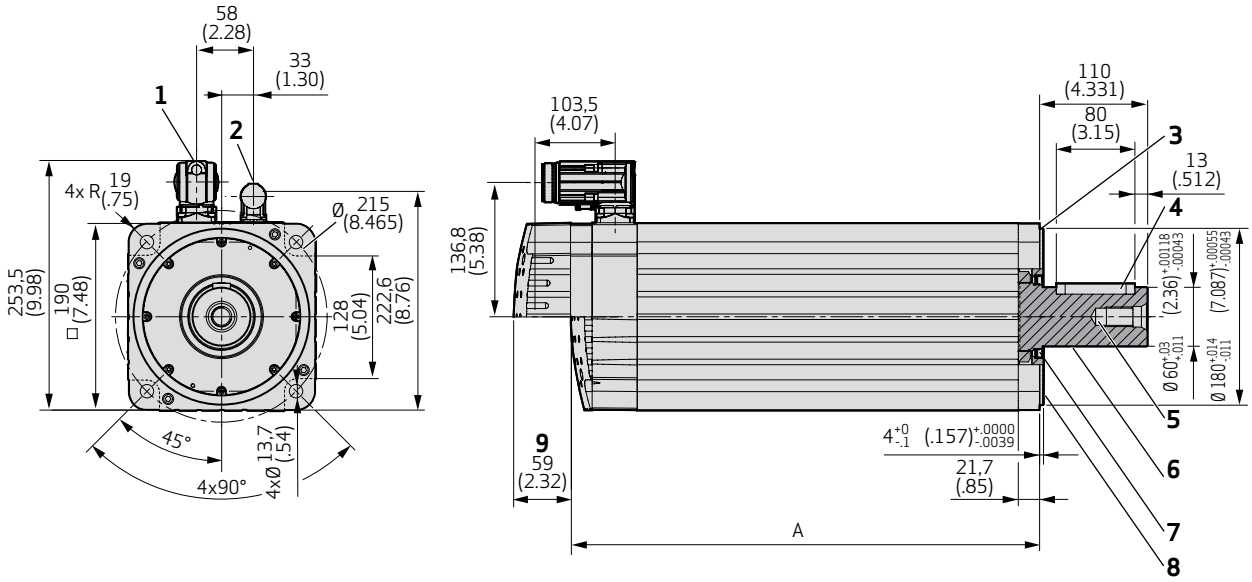
Note: Dimensional drawings on request

SIZE 6
NATURAL COOLING, STANDARD DYNAMIC, TYPE JSC6

JSC6 with resolver



JSC6 with encoder



MODEL NO.	Dimension "A"
	Standard bearing
JSC6-100	477 (18.77)
JSC6-134	562 (12.12)
JSC6-167	647 (25.4)
JSC6-201	732 (28.81)

1 Power Connector
2 Signal Connector
3 Tolerances of shaft extension-run-out and of mounting flange per DIN 42955-R
4 Optional key DIN 6885-A 18x11x80
5 Thread M 20x42 DIN 13
6 Shaft DIN 748-3
7 Optional shaft seal
8 Flange DIN 42948
9 With brake

SIZE 6
FAN COOLING, STANDARD DYNAMIC, TYPE JSF6

Characteristics and nominal values with sinusoidal drive

Type		JSF6-100	JSF6-134	JSF6-167	JSF6-201	Units
Continuous stall torque	M_o	119 (1,050)	150 (1,330)	181 (1,604)	212 (1,873)	Nm (lbf in)
Nominal torque	M_N	97 (856)	126 (1,118)	154 (1,364)	186 (1,634)	Nm (lbf in)
Maximum torque	M_P	583 (5,160)	777 (6,880)	972 (8,600)	1,166.(10„320)	Nm (lbf in)
Nominal speed	n_N	2,300	1,700	1,400	1,100	r/min
Maximum speed	n_{max}	2,720	2,040	1,630	1,360	r/min
Continuous stall current	I_o	46.6	44.2	42.6	41.4	A_{rms}
Maximum current	I_m	255	255	255	255	A_{rms}
Nominal power	P_N	23.3 (31.2)	22.4 (30.1)	22.6 (30.3)	21.3 (28.5)	kW (hp)
Torque constant	k_T	2.54 (22.5)	3.40 (30.1)	4.25 (37.6)	5.11 (45.2)	Nm/A_{rms} ($lbf\ in/A_{rms}$)
Voltage constant	k_e	161	215	269	323	V_{rms}/k_{rpm}
Thermal time constant	t_{th}	2,177	2,432	2,718	3,077	s
Winding resistance at 25 °C (77 °C) (phase to phase)	R_{tt}	0.20	0.25	0.31	0.37	Ohm
Winding inductance (phase to phase)	L_{tt}	2.2	3.0	3.7	4.4	mH
Rotor inertia with resolver	J	230 (2,036)	303 (2,678)	375 (3,322)	448 (3,965)	$kg\ cm^2$ ($lbf\ in\ s^2 \times 10^{-4}$)
Rotor inertia with encoder	J	230 (2,036)	303 (2,678)	375 (3,322)	448 (3,965)	$kg\ cm^2$ ($lbf\ in\ s^2 \times 10^{-4}$)
Weight (without brake)	m	62.4 (138)	79.0 (175)	92.8 (205)	105 (232)	kg (lb)

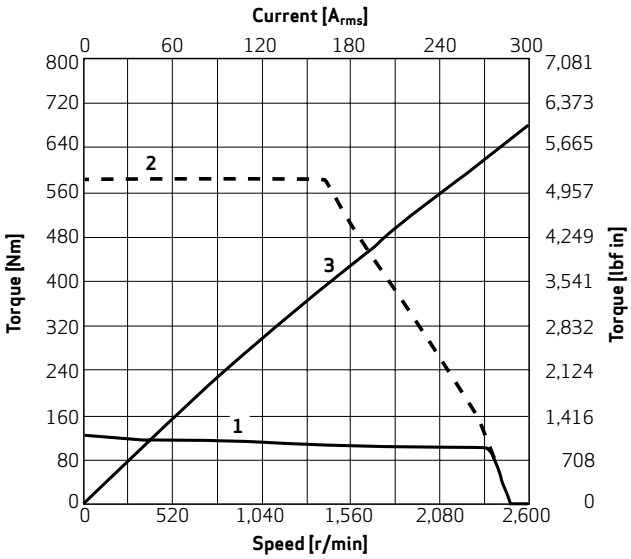
Optional Holding Brake	Option 1	Option 2	Units
Holding torque	30 (266)	72 (637)	Nm (lbf in)
Extra weight	1.10 (2.40)	2.90 (6.40)	kg (lb)
Extra inertia with resolver	3.60 (31.9)	16.0 (142)	$kg\ cm^2$ ($lbf\ in\ s^2 \times 10^{-4}$)
Extra inertia with encoder	3.80 (34.0)	16.1 (143)	$kg\ cm^2$ ($lbf\ in\ s^2 \times 10^{-4}$)
Power requirement	17	40	W
Voltage requirement (+6 % -10 %)	24	24	V_{DC}

Notes:

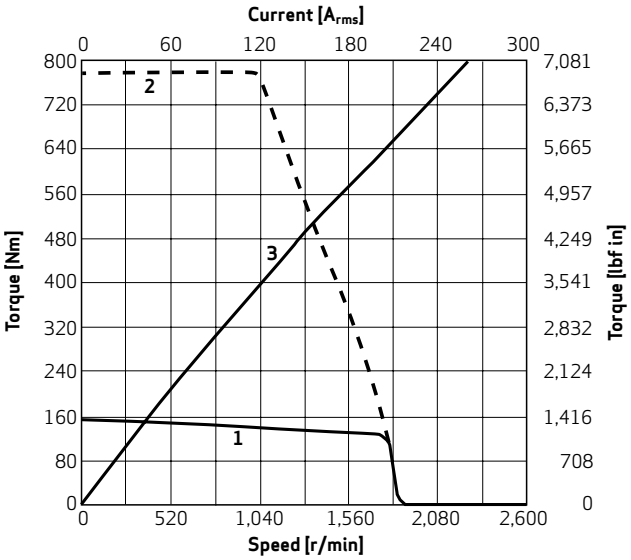
1. Different windings available to decrease or increase nominal speed
2. Motor performances as measured with Moog's Servo Drive of proper size
3. Motor Pole Count: 8
4. DC Link voltage 565 V

SIZE 6
FAN COOLING, STANDARD DYNAMIC, TYPE JSF6
Motor Characteristics

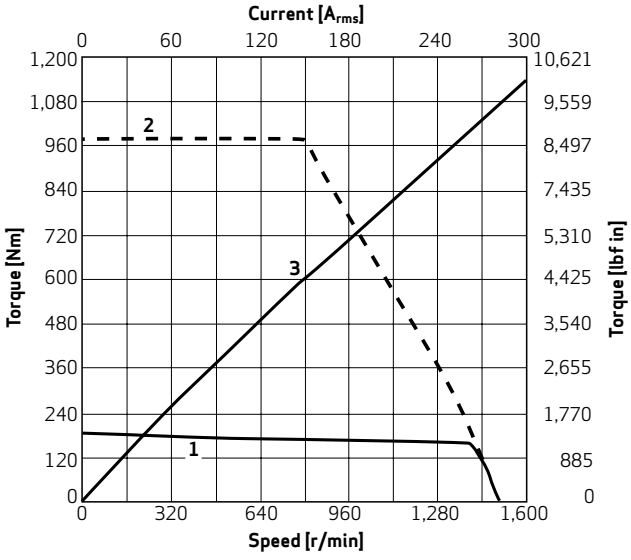
JSF6-100



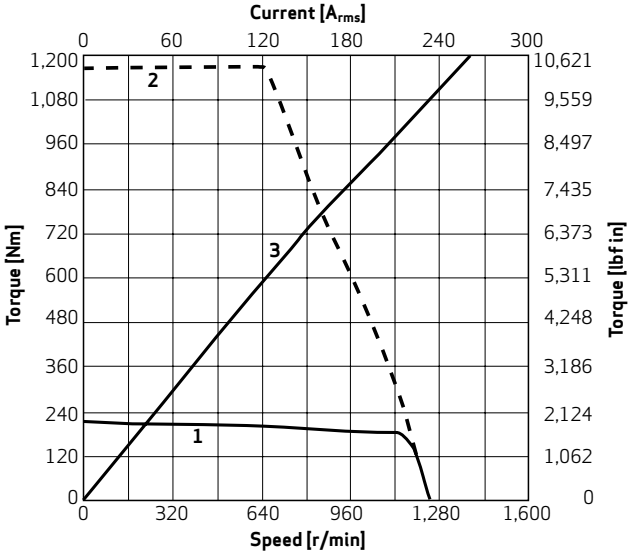
JSF6-134



JSF6-167



JSF6-201



1 Continuous torque
2 Maximum torque
3 Torque constant, K_t

Note: Dimensional drawings on request

SIZE 6
LIQUID COOLING, STANDARD DYNAMIC, TYPE JSW6

Characteristics and nominal values with sinusoidal drive

Type		JSW6-100	JSW6-134	JSW6-167	JSW6-201	Units
Continuous stall torque	M_o	139 (1,226)	180 (1,600)	222 (1,964)	263 (2,329)	Nm (lbf in)
Nominal torque	M_N	121 (1,071)	162 (1,434)	196 (1,735)	244 (2,161)	Nm (lbf in)
Maximum torque	M_P	583 (5,160)	777 (6,880)	972 (8,600)	1,166 (10,320)	Nm (lbf in)
Nominal speed	n_N	2,300	1,700	1,400	1,100	r/min
Maximum speed	n_{max}	2,720	2,040	1,630	1,360	r/min
Continuous stall current	I_o	54.7	53.3	52.5	51.8	A_{rms}
Maximum current	I_m	255	255	255	255	A_{rms}
Nominal power	P_N	29.1 (39.0)	28.8 (38.6)	28.7 (38.5)	28.13 (37.7)	kW (hp)
Torque constant	k_T	3.00 (22.0)	3.00 (30.0)	4.00 (37.0)	5.00 (45)	Nm/A_{rms} ($lbf\ in/A_{rms}$)
Voltage constant	k_e	162	215	269	323	V_{rms}/k_{rpm}
Thermal time constant	t_{th}	566	625	717	812	s
Winding resistance at 25 °C (77 °C) (phase to phase)	R_{tt}	0.20	0.25	0.31	0.36	Ohm
Winding inductance (phase to phase)	L_{tt}	2.3	3.0	3,7	4.5	mH
Rotor inertia with resolver	J	260 (2,302)	336 (2,974)	411 (3,41)	487 (4,309)	$kg\ cm^2$ ($lbf\ in\ s^2 \times 10^{-4}$)
Rotor inertia with encoder	J	260 (2,302))	336 (2,974)	411 (3,641)	487 (4,309)	$kg\ cm^2$ ($lbf\ in\ s^2 \times 10^{-4}$)
Weight (without brake)	m	66.2 (146)	81.1 (179)	96 (213)	119 (263)	kg (lb)

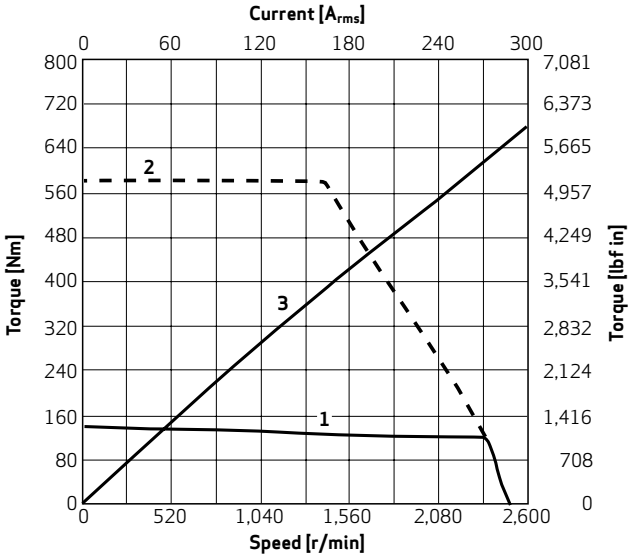
Optional Holding Brake	Option 1	Option 2	Units
Holding torque	N/A	72 (637)	Nm (lbf in)
Extra weight	N/A	2.90 (6.4)	kg (lb)
Extra inertia with resolver	N/A	16.0 (142)	$kg\ cm^2$ ($lbf\ in\ s^2 \times 10^{-4}$)
Extra inertia with encoder	N/A	16.1 (143)	$kg\ cm^2$ ($lbf\ in\ s^2 \times 10^{-4}$)
Power requirement	N/A	40	W
Voltage requirement (+6 % -10 %)	N/A	24	V_{DC}

Notes:

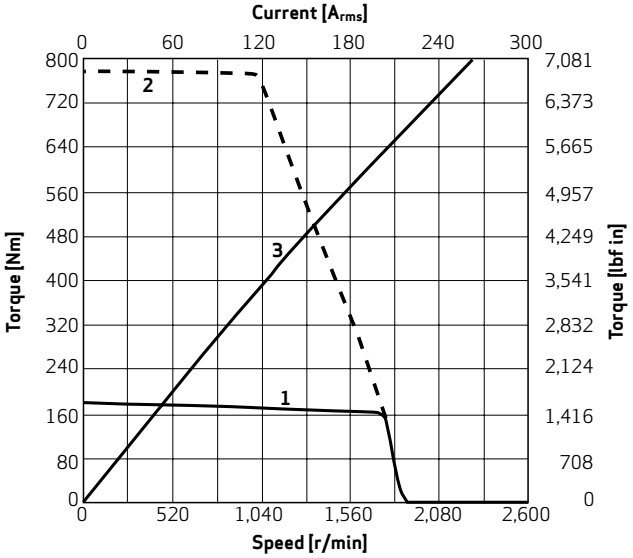
1. Different windings available to decrease or increase nominal speed
2. Motor performances as measured with Moog's Servo Drive of proper size
3. Motor Pole Count: 8
4. DC Link voltage 565 V

SIZE 6
LIQUID COOLING, STANDARD DYNAMIC, TYPE JSW6
Motor Characteristics

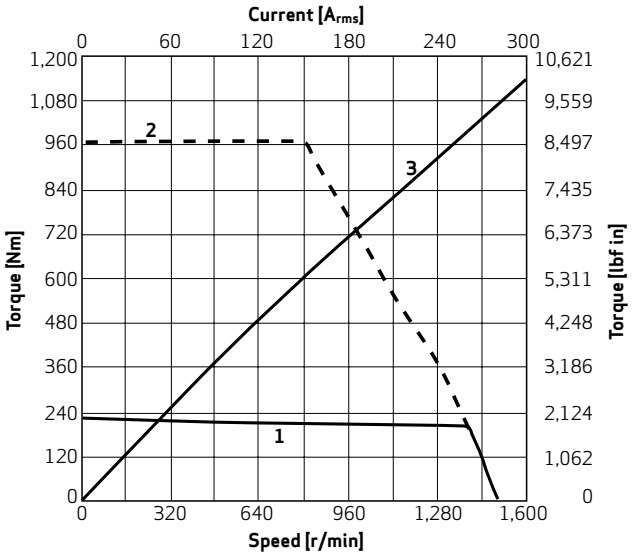
JSW6-100



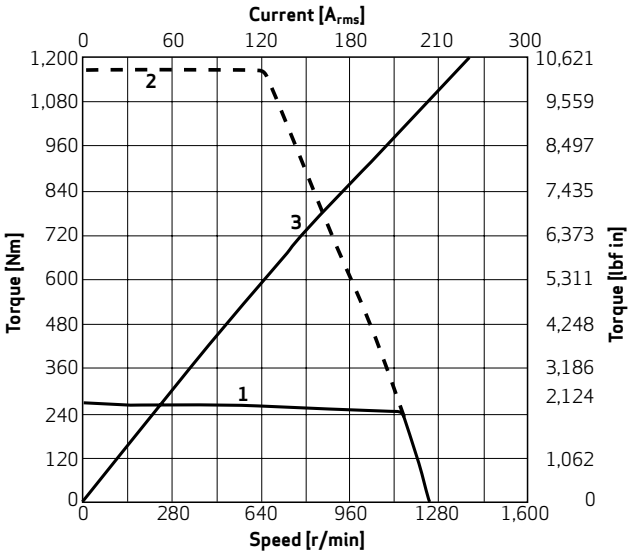
JSW6-134



JSW6-167



JSW6-201



1 Continuous torque
2 Maximum torque
3 Torque constant, K_t

Note: Dimensional drawings on request

SIZE 7
NATURAL COOLING, STANDARD DYNAMIC, TYPE JSC7

Characteristics and nominal values with sinusoidal drive

Type		JSC7-122	JSC7-163	JSC7-204	JSC7-245	Units
Continuous stall torque	M_o	315 (2,787)	418 (3,699)	520 (4,599)	616 (5,455)	Nm (lbf in)
Nominal torque	M_N	253 (2,237)	364 (3,221)	469 (4,154)	551 (4,874)	Nm (lbf in)
Maximum torque	M_P	1,000 (8,853)	1,339 (11,851)	1,675 (14,822)	2,012 (17,809)	Nm (lbf in)
Nominal speed	n_N	1,000	725	575	600	r/min
Maximum speed	n_{max}	1,150	860	690	710	r/min
Continuous stall current	I_o	51.8	51.4	51.1	63.1	A_{rms}
Maximum current	I_m	198	198	198	248	A_{rms}
Nominal power	P_N	26.5 (35.4)	27.6 (37.0)	28.3 (37.9)	34.6 (46.4)	kW (hp)
Torque constant	k_T	6.07 (53.8)	8.13 (72.0)	10.1 (90.0)	9.76 (86.4)	Nm/A_{rms} (lbf in/A_{rms})
Voltage constant	k_e	383	513	641	616	V_{rms}/k_{rpm}
Thermal time constant	t_{th}	5,900	6,850	7,800	8,600	s
Winding resistance at 25 °C (77 °C) (phase to phase)	R_{tt}	0.16	0.20	0.24	0.18	Ohm
Winding inductance (phase to phase)	L_{tt}	3.4	4.5	5.6	4.3	mH
Rotor inertia with resolver	J	925 (8,185)	1,221 (10,810)	1,515 (13,410)	1,809 (16,010)	kg cm^2 (lbf in s^2 x 10^{-4})
Rotor inertia with encoder	J	925 (8,185)	1,221 (10,810)	1,515 (13,410)	1,809 (16,010)	kg cm^2 (lbf in s^2 x 10^{-4})
Weight (without brake)	m	129 (284)	162 (357)	196 (432)	229 (505)	kg (lb)

Optional Holding Brake	Option 1	Option 2	Units
Holding torque	90 (797)	N/A	Nm (lbf in)
Extra weight	0.77 (1.7)	N/A	kg (lb)
Extra inertia with resolver	232 (2,053)	N/A	kg cm^2 (lbf in s^2 x 10^{-4})
Extra inertia with encoder	232 (2,053)	N/A	kg cm^2 (lbf in s^2 x 10^{-4})
Power requirement	55	N/A	W
Voltage requirement (+6 % -10 %)	24	N/A	V_{DC}

Notes:

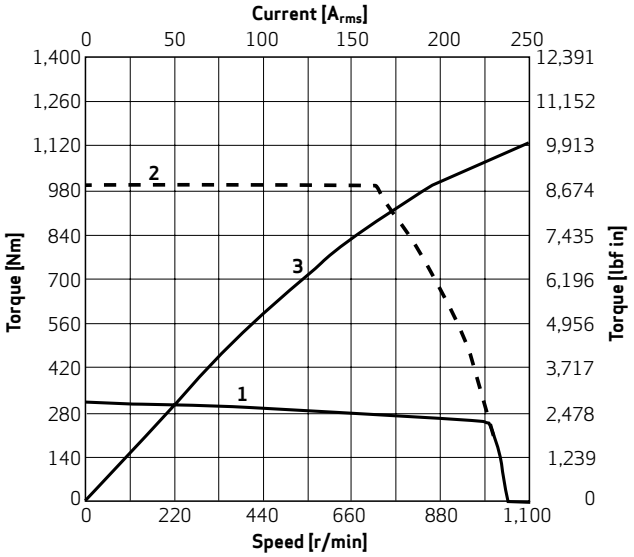
1. Different windings available to decrease or increase nominal speed
2. Motor performances as measured with Moog's Servo Drive of proper size
3. Motor Pole Count: 12
4. DC Link voltage 565 V

SIZE 7

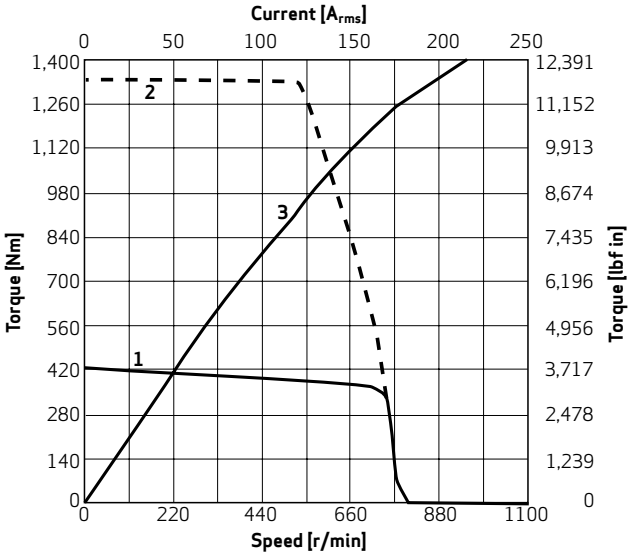
NATURAL COOLING, STANDARD DYNAMIC, TYPE JSC7

Motor Characteristics

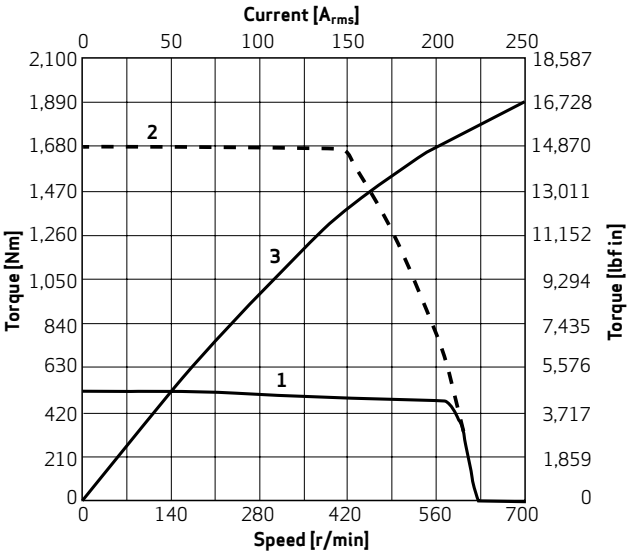
JSC7-122



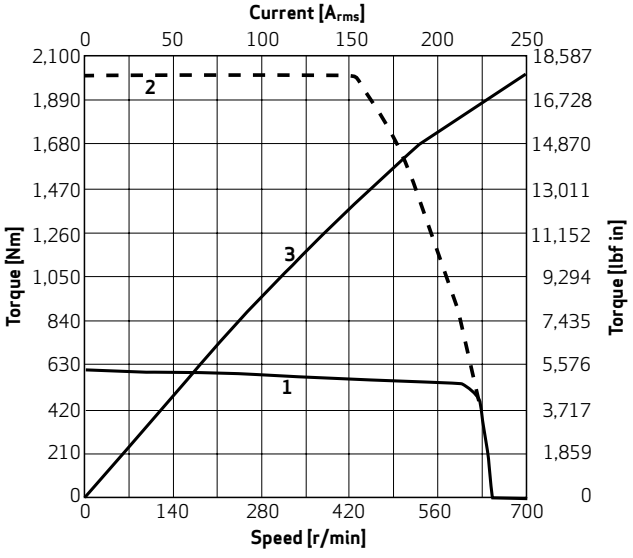
JSC7-163



JSC7-204



JSC7-245



1 Continuous torque
2 Maximum torque
3 Torque constant, K_t

Note: Dimensional drawings on request

SIZE 7
LIQUID COOLING, STANDARD DYNAMIC, TYPE JSW7

Characteristics and nominal values with sinusoidal drive

Type		JSW7-122	JSW7-163	JSW7-204	JSW7-245	Units
Continuous stall torque	M_o	495 (4,381)	655 (5,799)	813 (7,198)	964 (8,533)	Nm (lbf in)
Nominal torque	M_N	464 (4,107)	627 (5,547)	787 (6,962)	929 (8,226)	Nm (lbf in)
Maximum torque	M_P	1,000 (8,853)	1,339 (1,1851)	1,675 (1,4822)	2,012 (17,809)	Nm (lbf in)
Nominal speed	n_N	950	700	550	575	r/min
Maximum speed	n_{max}	1150	860	690	710	r/min
Continuous stall current	I_o	83.0	82.0	81.0	100	A_{rms}
Maximum current	I_m	198	198	198	248	A_{rms}
Nominal power	P_N	46.2 (62.0)	45.9 (62.0)	45.3 (61.0)	56.0 (75.0)	kW (hp)
Torque constant	k_T	5.9 (52.9)	8.01 (70.9)	10.0 (88.7)	9.6 (85.3)	Nm/A_{rms} (lbf in/A_{rms})
Voltage constant	k_e	383	513	641	616	V_{rms}/k_{rpm}
Thermal time constant	t_{th}	1,680	1,970	2,250	2,500	s
Winding resistance at 25 °C (77 °C) (phase to phase)	R_{tt}	0.16	0.20	0.24	0.18	Ohm
Winding inductance (phase to phase)	L_{tt}	3.4	5.0	6.0	4.4	mH
Rotor inertia with resolver	J	989 (8,755)	1304 (11,545)	1.621 (14,348)	1974 (17,476)	kg cm^2 (lbf in s^2 x 10^{-4})
Rotor inertia with encoder	J	989 (8,755)	1304 (11,545)	1,621 (14,348)	1,974 (17,476)	kg cm^2 (lbf in s^2 x 10^{-4})
Weight (without brake)	m	146 (322)	182 (401)	217 (478)	253 (558)	kg (lb)

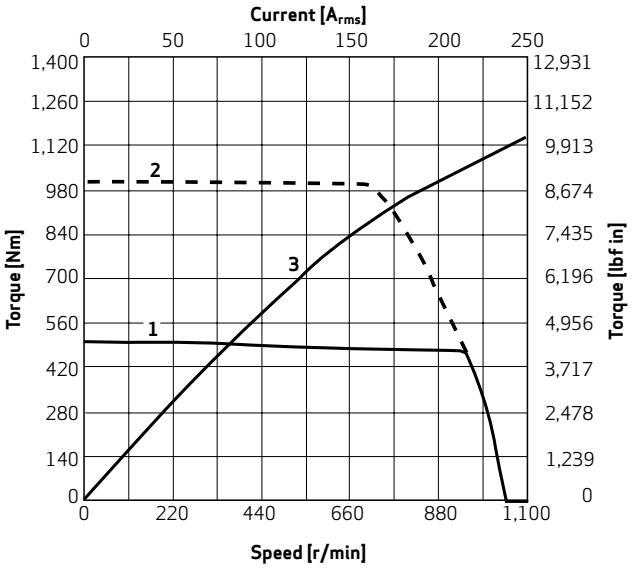
Optional Holding Brake	Option 1	Option 2	Units
Holding torque	90 (797)	N/A	Nm (lbf in)
Extra weight	0.77 (1.7)	N/A	kg (lb)
Extra inertia with resolver	232 (2,053)	N/A	kg cm^2 (lbf in s^2 x 10^{-4})
Extra inertia with encoder	232 (2,053)	N/A	kg cm^2 (lbf in s^2 x 10^{-4})
Power requirement	55	N/A	W
Voltage requirement (+6 % -10 %)	24	N/A	V_{DC}

Notes:

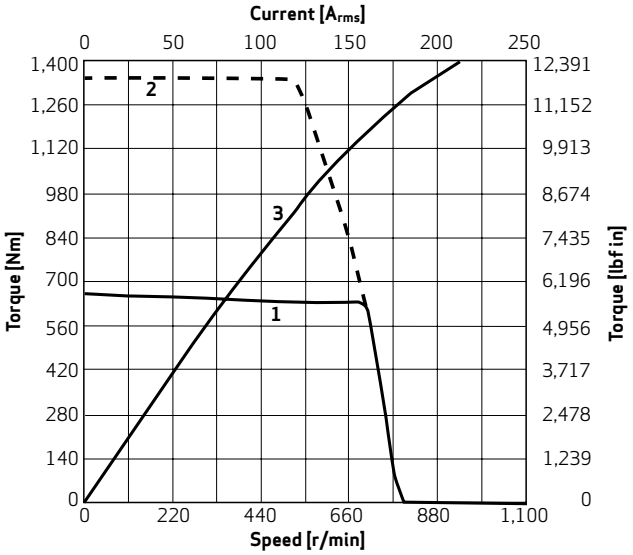
1. Different windings available to decrease or increase nominal speed
2. Motor performances as measured with Moog's Servo Drive of proper size
3. Motor Pole Count: 12
4. DC Link voltage 565 V

SIZE 7
LIQUID COOLING, STANDARD DYNAMIC, TYPE JSW7
Motor Characteristics

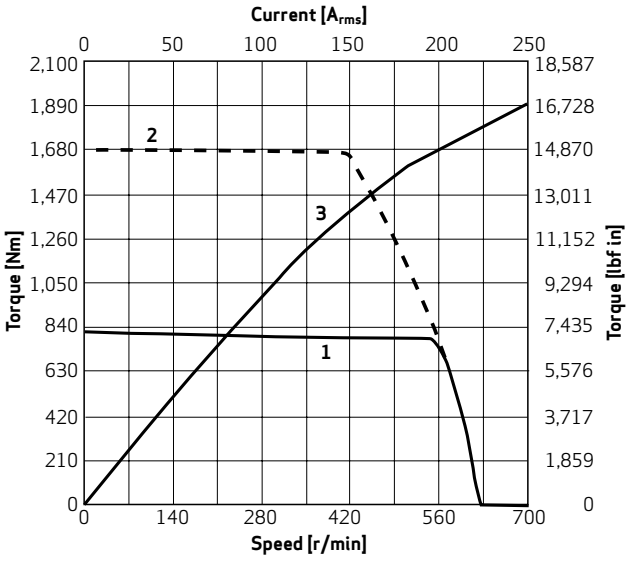
JSW7-122



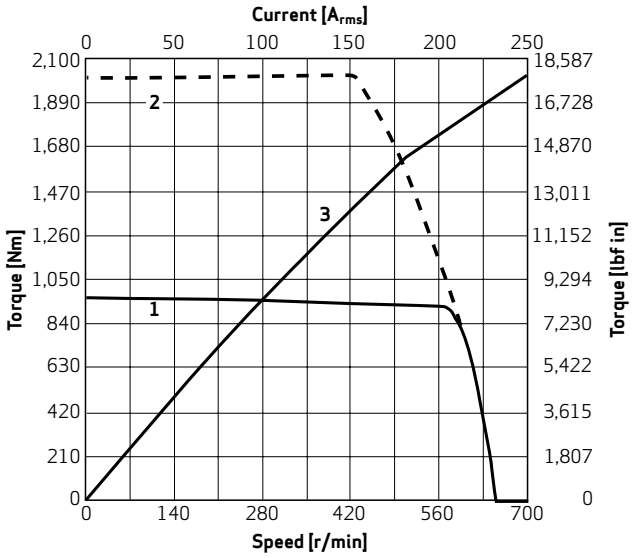
JSW7-163



JSW7-204



JSW7-245

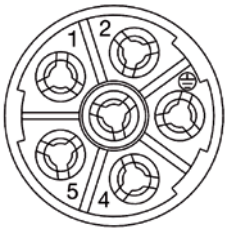


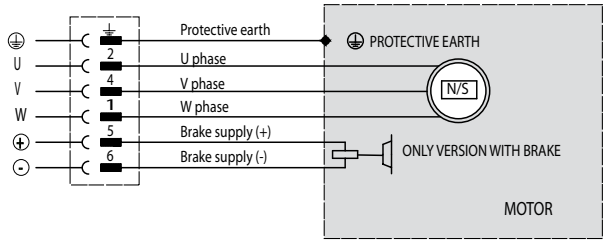
1 Continuous torque
2 Maximum torque
3 Torque constant, K_t

Note: Dimensional drawings on request

WIRING DIAGRAMS

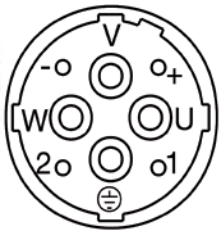
Power Connector Size 1

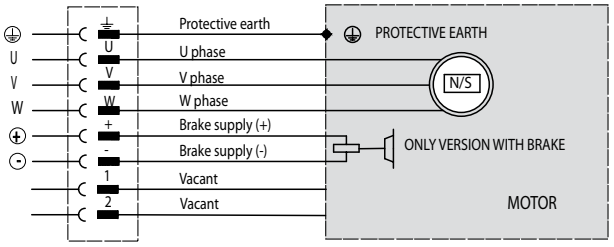




TYPE
JSC5
JSF5
JHC5-047
JHC5-063

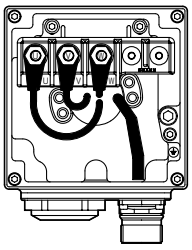
Power Connector Size 1.5

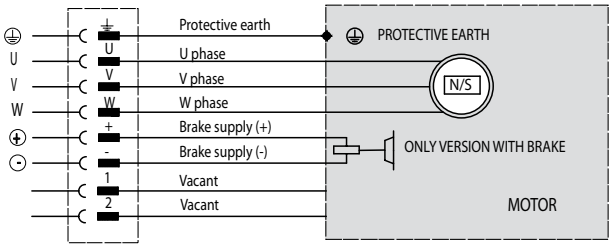




TYPE
JSW5
JHC5-079
JHC5-094
JHW5
JSC6
JSF6
JSW6
JHC6
JHW6-079
JHW6-105
JHW6-131

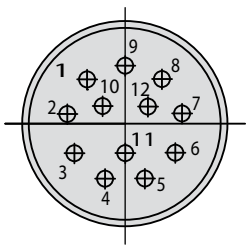
Connector Box Details

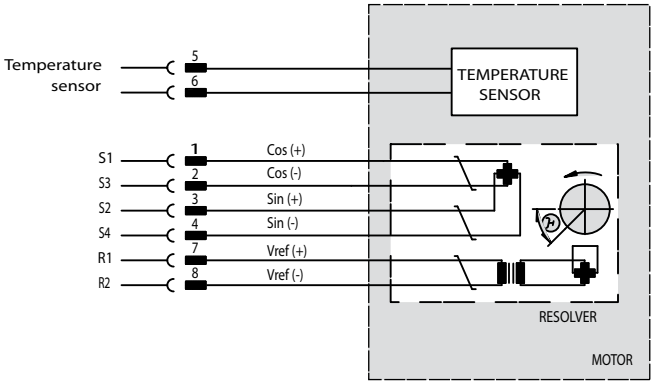




TYPE
JHW6-131
JHW6-157 [1)]
JSC7
JSW7

Signal Resolver Connector

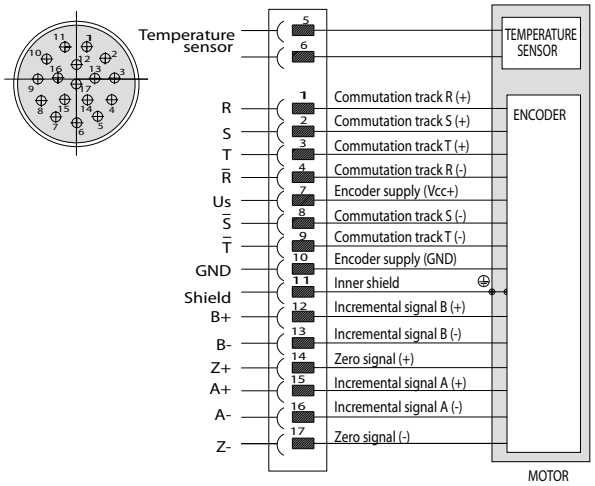




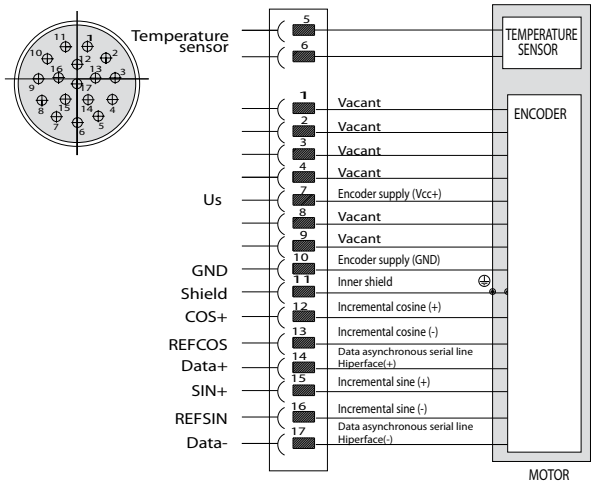
WIRING DIAGRAMS

Signal encoder connector [1)]

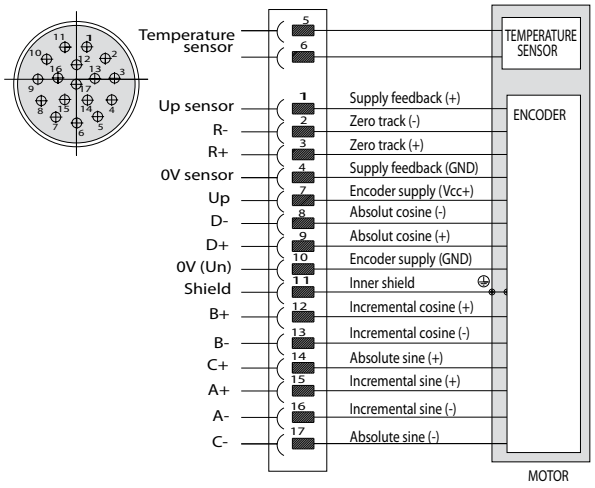
Stegmann Incremental



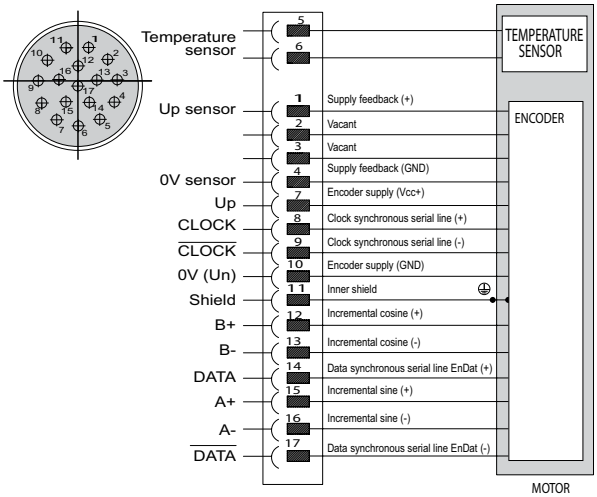
Stegmann Absolute



Heidenhain Incremental



Heidenhain Absolute



[1)] See ordering information; Feedback option

BEARING LOAD DIAGRAMS

Maximum Permissible Shaft Load

The maximum permissible radial load depends on the desired service life.

The bearing load curves display servo motor configurations (motor speed:radial loads) that support an operational life of 20,000 hours (L10h).

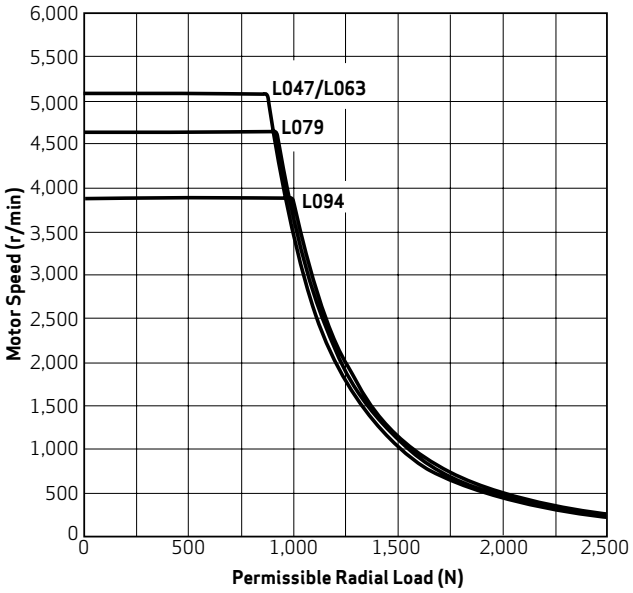
For maximum axial loads values for individual servo motor models, see the table below . Consult Moog for extended service life requirements or alternate load conditions.

Note:
Load capacity referenced to middle of output shaft.

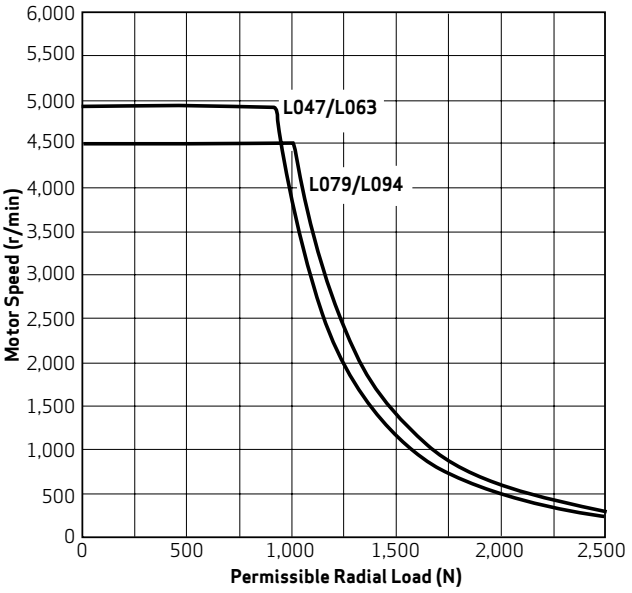
TYPE	Axial load during operation	Axial load during installation
JHC5, JHF5	200	400
JHW5	200	400
JSC5, JSF5	350	700
JSW5	350	700
JHC6, JHF6	350	700
JHW6	600	1200
JSC6	800	1600

BEARING LOAD DIAGRAMS

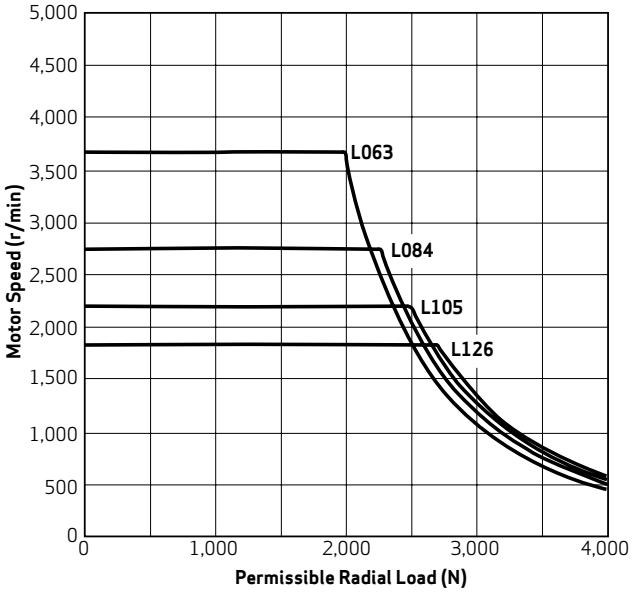
Size 5, natural and fan cooling, high dynamic, type JHC5, JHF5



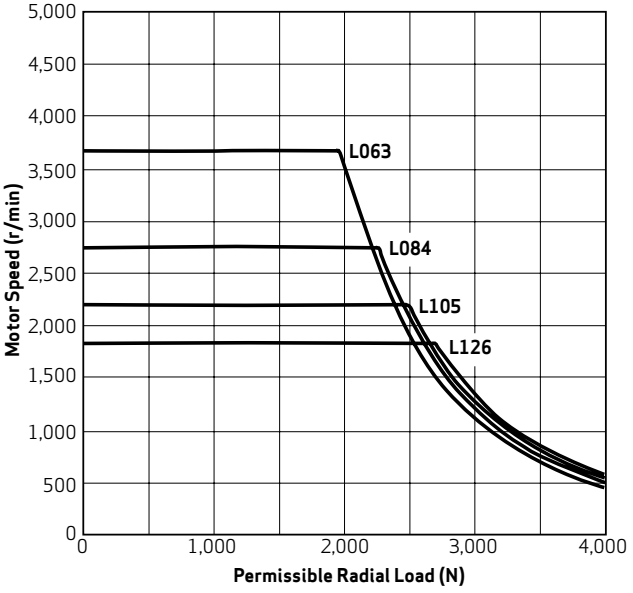
Size 5, liquid cooling, high dynamic, type JHW5



Size 5, natural and fan cooling, standard dynamic, type JSC5, JSF5

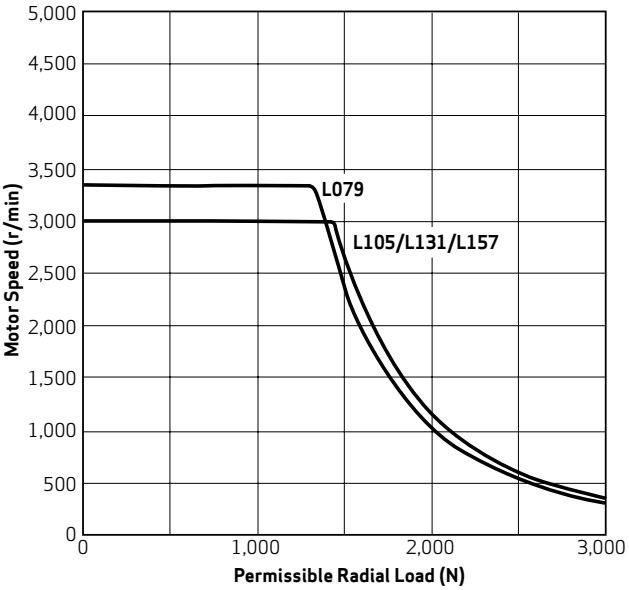


Size 5, liquid cooling, standard dynamic, type JSW5

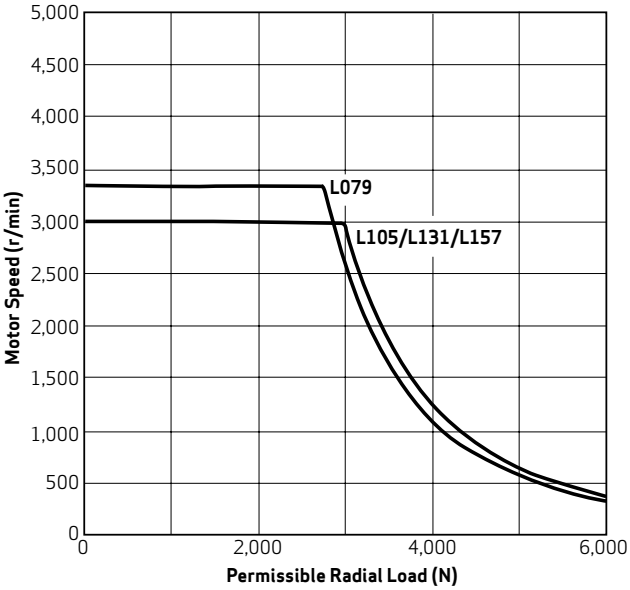


BEARING LOAD DIAGRAMS

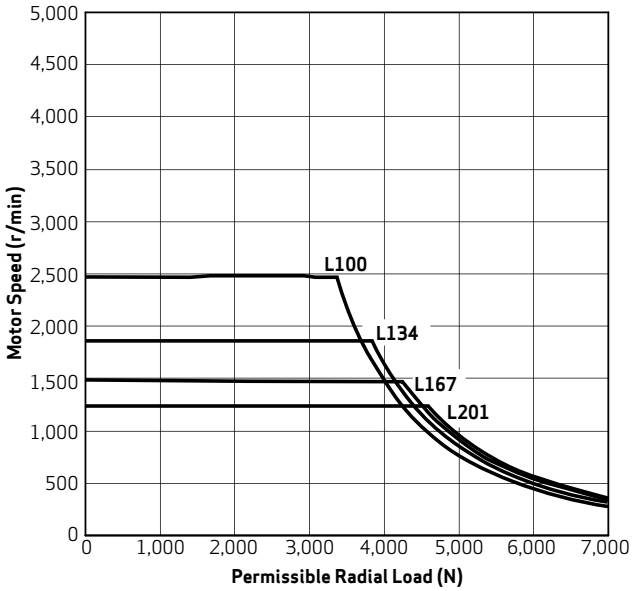
Size 6, natural and fan cooling, high dynamic, type JHC6, JHF6



Size 6, liquid cooling, high dynamic, type JHW6



Size 6, natural cooling, standard dynamic, type JSC6



Note:

Contact Moog application engineers for information on bearing load diagrams for the types JSF6/JSW6/JSC7/JSW7.
Contact Moog application engineers for information on bearing load diagrams under specific shock and vibration requirements.

APPLICATION NOTE

This application note to provide some tools and guidelines for the correct motor sizing for a new application. When a fully optimized system is required, please contact your local Moog application engineers.

FUNDAMENTAL APPLICATION DATA

- A motor is selected to meet four characteristics:

  1. Inertia ratio
  2. RMS torque
  3. Maximum torque
  4. Speed

- Inertia ratio is generally the most important characteristic when selecting a servo system. It is the ratio of reflected total load inertia to the motor shaft inertia. As a general guideline, the more dynamic the system must be, the more important it is to configure these two characteristics with a 1:1 ratio. Higher inertia ratios may not tolerate any significant load change and even become unstable.

- The continuous stall torque is the torque rating at zero speed. This torque is generally higher than the continuous torque at operating speed. The achievable torque depends on a combination of the motor and the drive used.

- Maximum torque is declared for maximum capacity for a duration of 1 s. Lower Maximum torques can be tolerated for longer durations. For critical applications it is recommended to contact Moog application support.

Special Considerations

- Brushless servo motor based systems are not like a standard asynchronous motors: They are complete control systems. Because there is more freedom of design, there are also more parameters (e.g. mechanical, electric, electronics) to be identified in comparison to a conventional motor-based system.

- Attention must be paid to applications that place heavy load on the motor (typically vertical load applications when decelerating in the downwards direction). The regeneration capacity must not be overloaded.

- A brushless servo motor has a very short response time and closely tracks changes in the control signals.

- Correctly sized servo motors can run with high case temperature. It is important to ensure that motor heat is properly dissipated. Dissipation may be through a volume of “still” air, heatsinks, fan cooling or liquid cooling.

- The speed accuracy depends much more on the quality of the sensor signal (and on the control algorithm of the drive) than on the motor and the load.

- The time lag between a load disturbance and speed adjustment depends on the resolution of the position transducer and on the parameters of the drive.

SELECTION AND OPTIMIZATION OF SYSTEM PARAMETERS

- Transmission ratio
- Mechanical transmission
- Position transducer
- Electronic drive type
- Control approach

Transmission Ratio Considerations

Motors are sized on output torque, so that a high transmission ratio is useful to minimize the motor mass and cost, but it might not be the best choice in terms of overall cost and of dynamic performance.

When a motor is applied directly to the load, maximum stiffness and bandwidth (optimal position/following accuracy in the minimum time) is achieved.

APPLICATION NOTE

Mechanical Transmission Considerations

The following are the most common mechanical transmissions:

- Timing belt
- Cycloid and epicycloid reducer
- Rack and pinion
- Ball screw
- Where N = transmission ratio, the load parameters are transferred to the motor axis according to the following relationships:

-Motor speed=load speed x N
-Motor torque=load torque/N
-Load inertia reflected to the motor axis=load inertia/ N^2

In order to identify the optimal mechanical transmission for an application, two main application areas can be identified:

- Low dynamic applications: The main objective of the motion is the supply of power, the dynamic performances are not important, involved power is quite large, the motor cost is a significant percentage of the overall system cost.

- High dynamic applications: The main objective of the motion is mainly positioning with the most of energy used to accelerate, to brake and to position the load in a minimum time with maximum accuracy.

For low dynamic applications, simple speed reducers are acceptable.

For high dynamic applications, the required torques are mainly inertial. Moog's general recommendation is to orientate the choice towards inertial matching (e.g. transmission ratio which makes the load inertia translated to the motor axis equal to the motor inertia).

When the load inertia transferred to the motor is more than a few times the motor inertia, a high control bandwidth is necessary to electronically compensate for the inertia mismatch and mechanical linkages must be stiff and with no backlash.

Based onto these considerations, it is important to consider whether to generate the torque with a long and narrow motor or with a short and compact motor:

- Long motors are optimized for of minimum inertia so that they meet the requirement of high acceleration with low inertia loads

- Short and compact motors are optimized for torsional stiffness so that they meet the requirements of high inertia loads

In applications with large inertia and short positioning time a check must be made on the torsional resonance frequency to ensure it remains above 1,000 Hz assuming that a closed loop bandwidth of 300 Hz is achieved by the high dynamic performances of MD Series Servo Motors. The frequency of torsional resonance of a load with inertia Jl connected to an axis with torsional stiffness S_m subscrpt is :

$$f = \frac{1}{2} \times \pi \times \sqrt{\frac{S_m}{J1}}$$

The torsional stiffness of a steel shaft with diameter D and with length L is:

$$Sm = \frac{\pi \times D^4 \times 2.466 \times 10^{-3}}{L}$$

Considerations on Position Transducers

A high performance brushless motor is required to have low inertia, high torque and high torsional stiffness. The next considerations are the mechanics of the feed system and the position transducer.

Most common position tansducers are resolvers and encoders.

Performances can dramatically be improved with encoders as they have:

- 1,000 times better resolution than a resolver

- 20 times better accuracy

- 1,000 times better signal/noise ratio

By using sinusoidal encoders, the rotational uniformity and the velocity dynamics are much higher. In other words, the sinusoidal encoder dramatically improves performance in terms of response time, servo error, overshoot and axis residual vibrations.

With a sinusoidal encoder the static positioning accuracy is about 20 arcs and, more importantly, the accuracy is not affected by the cabling quality. The dynamic error is limited by the signal/noise ratio.

A limitation to the adoption of encoders is the maximum allowed temperature which is on the order of 110 °C (230 °F) while a resolver is able to tolerate the 155 °C (331 °F) of Class F.
Encoders are typically more expensive than resolvers.

APPLICATION NOTE

Considerations on Servo Drive Type

In order to get the highest rotation uniformity at any speed, torque ripple must be minimized. To achieve this, careful choice of both sinusoidal motor and control system must be made. The motor is matched to a sinusoidal PWM inverter, of which amplitude, frequency and phase are separately controlled.

The PWM frequency used should be at least 10 KHz. Currently, all Moog Servo Dives are fully digital with position, velocity, torque digital loops.

Sampling time should be as short as possible to achieve wide system bandwidth.

Reference signals (position or speed) are provided in analog or digital form.

Analog reference is ±10 V while digital reference can be provided using various protocols.

Considerations on Control Strategy

Control systems can be configured according to three control strategies:

- Torque control: The speed depends on the load
- Velocity control: The torque depends on the load
- Position control: The torque depends on the load

The torque control strategy is used when it is needed to control a force or pull (e.g. winders, unwinders, paper processing, textile). Torque control is intrinsic to brushless motors as they are controlled by electrical current. Hence, torque control does not need accurate transducers.

Velocity control is the most traditional strategy. It uses an integration term so that the speed error is limited to the system offsets.

Position control is carried out only by digital drives, so that the steady state position and speed following error is limited to a few points of the sensor (for an encoder with 4,096 pulse/revolutions this implies 1/16,000 of a revolution). Position loop capability is necessary to synchronize several axes.

MOTOR SELECTION

After the choice of the transmission ratio, based on load, speed and other load data, a first preliminary selection of a motor model can be performed.

The following sequence is suggested:

1. Trace the speed/time diagram of the load cycle
2. Transfer the inertia and the loads of the system to the motor shaft
3. Calculate the cycle of the accelerations and the inertial torques
4. Add the load on the motor axis to the inertial torque
5. Calculate the root mean square value of the torque
6. Calculate the root mean square of the speed
7. Calculate the maximum torque in the cycle
8. Calculate the maximum duration time of the maximum torque in the cycle
9. Calculate the required torque at the maximum speed
10. Calculate the maximum torque

With this data, a preliminary choice of the motor (and the drive) can be performed.

Validation is necessary at this point to ensure the correct thermal and electric sizing of the motor. A motor is considered properly sized when it achieves a maximum temperature of 50 °C (122 °F) above room temperature.

The following sequence is suggested to verify the selection:

- Check the Maximum torque
- Check the rise in temperature
- Check that the maximum speed that can be reached

Points 1 and 2 can be solved by the selection of a larger motor, while point 3 can be solved by the selection of a motor with a higher speed winding. Also a higher drive current will be necessary.

APPLICATION NOTE

GENERAL INFORMATION

1. Motors designed to EN 60034 (VDE 0530)
2. Runout class R per DIN 42955-R, IEC 72-1
3. Rotors balanced to Class G 6.3 per ISO 1940
4. Sealing to IP65 (excluding shaft seal) with Moog specified mating connectors
5. Operating ambient temperature -40 to +40 °C (-40 to +104 °F)
   (up to 130 °C (260 °F) with derated output)
6. Class F winding insulation
7. Motor flange dimensions per IEC 34, DIN 42948, ISO 286
8. Motor shaft dimensions per DIN 748
9. Motor shaft keyway per DIN 6885, IEC 72-1
10. Feedback Sensors

    a. Resolver

	Option 00	Option 01
Type	Transmitter	Transmitter
Pole Count	8	2
Input Voltage	7 V_{rms}	4 V_{rms}
Carrier Frequency	10 kHz	3.4 to 8 kHz
Maximum Input Current	15 mA	35 mA
Transformation Ratio	0.29	0.5

    b. Encoder
    - Incremental
    - Absolute Single-turn
    - Absolute Multi-turn
11. Winding temperature sensors (standard version): PTC with threshold at 155 °C (311 °F)
12. Sealed life-time lubricated bearing

NOTES

1. Continuous ratings based upon:
   a. Operation in still air with ambient temperatures at 25 °C (77 °F)
   b. Winding temperature at 110 °C (230 °F) over ambient
   c. Motor front flange attached to a steel mounting plate measuring 300 x 300 x 12 mm (11.81 x 11.81 x 0.47 in)
2. Peak ratings based on:
   a. Duty cycle: Please contact Moog application engineering
   b. Iron saturation of 15 % or less
3. K_t-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. Resistance and inductance measurement based on cold values [i.e. measured at 25 °C (77 °F)]
6. Current ratings are A_{rms} per phase
7. Motor performance as measured with Moog Servo Drives at 565 V_{DC} link. For other drives and voltage levels, please talk to your local Moog application engineers.
8. Specification tolerances are ±10 %
9. For motors with Encoder feedback, please use a lower Nominal Torque, Continuous Duty, Nominal Speed rating [80 °C (176 °F) temperature rise above Ambient of 40 °C (104 °F)], due to operating temperature limitations [120 ° C (248 °F)] of encoder devices
10. The maximum speed, n_{max}, is the maximum allowable operating speed. This speed is either limited by the voltage limiting Back E.M.F. characteristic or mechanically by centrifugal forces and/or bearing-stressing, whichever value is lower
11. Resolver feedback motor installation diagrams shown in this catalog assume the use of fixed angled connectors. Encoder feedback motor installation diagrams shown in this catalog assume the use of rotatable angled connectors
12. Although very low maintenance, we advise you talk to your local Moog customer service team to determine an appropriate maintenance schedule for these Servo Motors based on loading and usage

ABOUT MOOG

Moog Inc is a wordwide designer, manufacturer and integrator of precision control components and systems. Moog's Industrial Group designs and manufactures high performance motion control solutions combining electric, hydraulic and hybrid technologies with expert consultative support in a range of applications including energy production and generation machinery, industrial production machinerey, simulation and test equipment. We help performance-driven compagnies design and develop their next-generation machines.

Moog Industrial Group, with fiscal year 2010 sales of 540 USD million is part of Moog Inc. (NYSE:MOG. A and MOG B) which has sales of USD 2.1 billion.

Moog maintains facilities in 25 countries around the globe. This vast scope ensures that our engineers remain close to the needs of machine builders and provide flexible design solutions and technical expertise tailored to our customers' toughest challenges.

Moog experts work in close collaboration with machine builders and application engineers to design motion control systems for greater productivity, higher reliability, superior connectivity, less costly maintenance and more effective operations. Our regional presence, industry knowledge and design flexibility ensures Moog motion control solutions are tailored to their environment—from meeting operating regulations and performance standards, to taking machine performance to a higher level.

Products

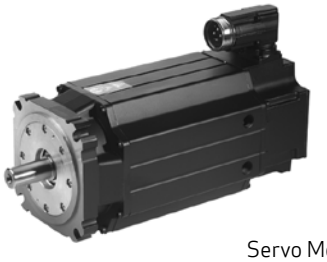
At the heart of every Moog solution is an array of products engineered for precision, high performance and reliability. For more than five decades, Moog products have been specified for critical machine applications.

Some are developed specifically for unique operating environments. Others are standard equipment on machines across many industries. All are continuously improved to take advantage of the latest technology breakthroughs and advancements.

Moog products include:

- Servo Valves and Proportional Valves
- Servo Motors and Servo Drives
- Servo Controllers and Software
- Radial Piston Pumps
- Actuators
- Integrated Hydraulic Manifold Systems and Cartridge Valves
- Slip Rings
- Motion Bases

Servo Drives


Servo Motors


Servo Valves

Radial Piston Pumps

SOLUTIONS

Hydraulic solutions

Since Bill Moog invented the first commercially viable servo Valve in 1951, Moog has set the standard for world-class hydraulic technology. Today, Moog products are used in a variety of applications - providing high power, enhanced productivity and ever better performance for some of the worlds most demanding applications.

Electric solutions

Clean operation, low noise generation, less maintenance and reduced power consumption make Moog electric solutions ideal for applications worldwide. Moog is the ideal partner for applications where transitioning technologies requires special expertise.

Hybrid solutions

By incorporating the advantages of existing hydraulic and electric technologies - including modular flexibility, increased efficiency and cleanliness - into innovative hybrid solutions, Moog offers new performance potential in specialized applications.

Moog Global Support

Moog Global Support™ is our promise to offer world-class Repair and Maintenance Services delivered expertly by our trained technicians. With the reliability only available from a leading manufacturer with facilities around the world, Moog offers you service and expertise you can count on to keep your equipment operating as it should.

This promise offers many benefits to our customers including:

- Reduce your downtime by keeping critical machines running in peak performance
- Protect your investment by ensuring reliability, versatility and long-life of products
- Better plan your maintenance activities and make systematic upgrades
- Leverage our flexible programs to meet the unique service requirements of your facility

Look to Moog for global support including:

- Repair services using OEM parts are performed by trained technicians to the latest specifications
- Stock management of spare parts and products to prevent unplanned downtime
- Flexible programs, tailored to your needs such as upgrades, preventative maintenance and annual/ multi-year contracts
- On-site services bring the expertise to you, providing quicker commissioning, set-up and diagnostics
- Access to reliable services that are guaranteed to offer consistent quality anywhere in the world

For more information on Moog Global Support™, visit www.moog.com/industrial/service.

MOOG GLOBAL SUPPORT™

OPTIONS

FLEXIBLE DESIGN OPTIONS

Moog's MD Series Servo Motors are available with a variety of standard and customized 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. As a result, if you need something that is not at present listed, contact your local Moog office to see if it is already available.

STANDARD OPTIONS

The standard options for the MD Series Servo Motors are detailed in the type boxcar.

1. Cooling

Natural Convection Cooling

Moog's MD Series Servo Motors are designed to supply high dynamics to normal duty cycle applications. They offer very high angular acceleration in a given package size.

Fan Cooling

To supply high dynamics in high duty cycle applications, Moog offers optional fan cooling on select MD motor models. Fan cooling delivers up to 40 % greater continuous torque output without increasing motor inertia. Fans are powered by an unregulated 24 V_{DC} supply (see Motor Accessories) with dedicated power connector.

Current requirements are 1 A_{DC} per motor.

Liquid Cooling

To supply high dynamics in very high duty cycle applications, Moog offers liquid cooling as standard on all sizes of the MD Series Servo Motors. Liquid cooling can deliver up to 100 % greater continuous torque without adding any additional inertia.

2. Integral Holding Brake

Holding brakes are available for all MD Series Servo 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).

Please note that 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 V_{DC} supply (see Accessories) for proper operation. Brake power connections are through the standard motor power connector. Refer to motor technical data for brake current requirements.

3. Connectors

Standard connection options included fixed angled connectors, rotatable angled connectors, straight connectors and connection boxes on size 5 and 6 liquid cooling version.

4. Thermal Sensor

In order to help protect the motor from overheating, a single thermal sensor in the stator is supplied as standard. This thermal sensor can be a PTC, NTC or KTY sensor.

For liquid cooling versions of the MD Series Servo Motors, a rear bearing thermal sensor is available as option.

5. Shaft Options

MD Series Servo Motors are available with plain or slot and key metric shafts. For custom motor shafts such as spline or english dimension shafts see Custom Options.

6. Heavy Bearing

Under some load conditions, heavy bearings are required. The MD Series Servo motors have the inclusion of heavy bearings as a standard option (Please contact Moog for details).

7. Shaft Seal

In applications where the shaft/flange mating surface is immersed in fluids, a 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).

8. Feedback Devices

As detailed on type code in ordering information, the MD Series Servo Motors boast a variety of resolvers, incremental encoders and single turn and multiturn optical encoders as standard.

OPTIONS

CUSTOMIZABLE OPTIONS

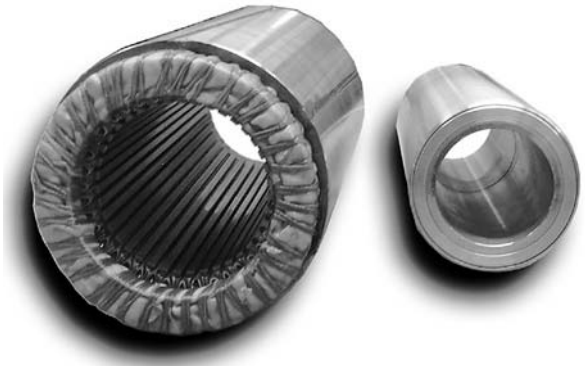
Motor Windings

Moog's MD Series Servo 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 MD Series Servo 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 applications
- High shock loads
- Radiation zones



Moog´s MD frameless motor offering is based on the following standard stator dimensions:

TYPE	Stator Diameter (nominal) [mm (in)]
JH5	130 (5.1)
JS5	130 (5.1)
JH6	178 (7)
JS6	178 (7)
JS7	250 (9.84)

Custom Shafts and Flanges

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

Custom Connectors

Moog's MD Series Servo Motors standard connector options are detailed in the Ordering Information.

For non standard options, please contact your local Moog office.

Custom Feedback Options

In addition to standard resolver and encoder options as detailed in the Ordering Information, Moog can support requests, where practical, for special feedback devices such as other resolver or encoders types, tachometers and hall effect sensors.

Custom Coatings

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

ACCESSORIES

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.

To obtain preassembled motor cables, crimp tools, power supplies, please contact Moog staff.

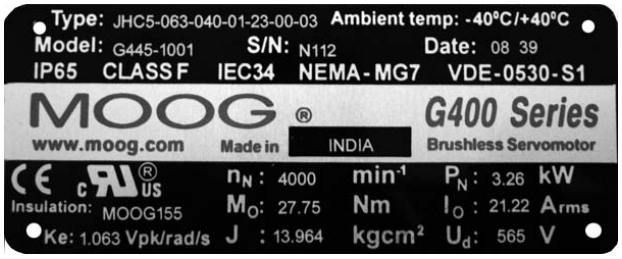
NAMEPLATE

Ordering Information and Motor Nameplate

To order a motor, choose the various type options by filling in the boxcar on the inside back page of the catalog.

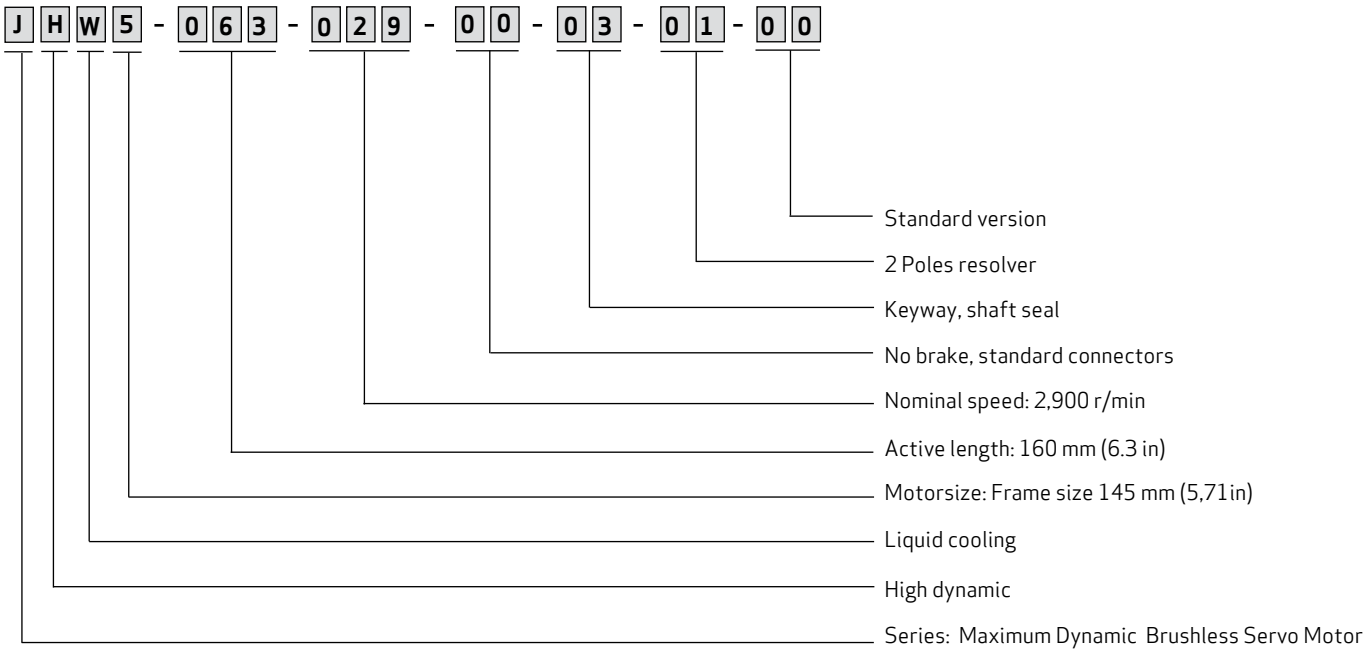
Moog sales department will provide the corresponding model number suitable for the order.

Both model number and boxcar (model and type respectively, as in picture) will be present on the motor nameplate.



ORDERING CODE

EXAMPLE:



ORDERING CODE

J □□□ - □□□ - □□□ - □□ - □□ - □□ - □□

S	Standard dynamic
H[1]	High dynamic

1) Only available for motorsize 5 & 6

Motor size	
5	140 mm (Flange)
6	190 mm (Flange)
7[1]	275 mm (Flange)

1) Not currently available, Development planned in 2011

Nominal speed	
xxx	r/100 min

Example:
r/min = 3500 xxx = 035

Special version	
00	Standard version

Cooling	
C	Natural cooling
F[1]	Fan cooling
W[2]	Liquid cooling

1) With straight connections only
2) With high torque brake option only.

Stack length	
xxx	Active length in 0.1 in

Example: Active length 0.1 in
160 mm = 0.63 in; xxx = 0.63

Electrical options

	Brake options [1]		Straight connector	Rotable connector	Connector box [2]	NTC Thermal sensor	KTY Thermal sensor
	Low-T	High-T					
00	Standard[3]						
01			■				
02				■			
03					■		
04	■						
05	■		■				
06	■			■			
07	■				■		
08		■					
09		■	■				
10		■		■			
11		■			■		
12						■	
13			■			■	
14				■		■	
15					■	■	
16	■					■	
17	■		■			■	
18	■			■		■	
19	■				■	■	
20		■				■	
21		■	■			■	
22		■		■		■	
23		■			■	■	
24							■
25			■				■
26				■			■
27					■		■
28	■						■
29	■		■				■
30	■			■			■
31	■				■		■
32		■					■
33		■	■				■
34		■		■			■
35		■			■		■
99	Special						

1) Liquid cooling motors have only the high torque brake option.
2) Applicable only for JxW5 and JxW6 as standard.
3) Fixed angled connectors, PTC sensor, no brake

Mechanical options

	Keyway	Shaft exit seal	Heavy bearing	Bearing thermal sensor [1]
00	Standard [2]			
01	■			
02		■		
03	■	■		
07			■	
08	■		■	
09		■	■	
10	■	■	■	
14				■
15	■			■
16		■		■
17	■	■		■
21			■	■
22	■		■	■
23		■	■	■
24	■	■	■	■
99	Special			

1) Only available for liquid cooling
2) Plain shaft, standard bearing, no shaft seal, no bearing thermal sensor

Feedback options

	Motor size			Resolver / Encoder Type	
	5	6	7		
00	Resolver with same number of poles of the motor				
01	2 poles resolver				
02	CNS50			Incremental	Stegmann
03	SRS50			Absolute single turn	Stegmann
04	SRM50			Absolute multi turn	Stegmann
05	ERN1185			Incremental	Heidenhain
06	ECN1313			Absolute single turn	Heidenhain
07	EQN1325			Absolute multi turn	Heidenhain
99	Special				

Brake options

		Jx5	Jx6	JS7
1	Low torque	18 Nm	30 Nm	On request
2	High torque	30 Nm	72 Nm	On request

TAKE A CLOSER LOOK.

Moog designs a range of motion control products that complement the performance of those featured in this catalog. Visit our website for more information and contact the Moog facility nearest you.

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