



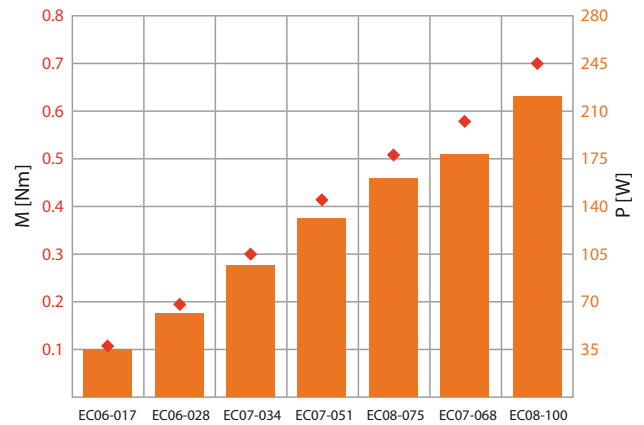
EC / BLDC Motors

Introduction

EC motors

EC motors are also called brushless DC motors. Their construction is equivalent to the construction of a three-phase synchronous motor with permanent magnet rotor. There are no service life limited parts (except for ball bearings), like for example the carbon brush for DC motors. However, the control behavior and characteristic curve of EC motors are similar to those of a DC motor. By means of the simple and robust design and the low requirements of control electronics this motor type can be used with a simplified frequency converter with block commutation. On the inside, a polymer-bonded neodymium magnet ring is employed. With its compact magnet ring it is particularly suitable for higher torques.

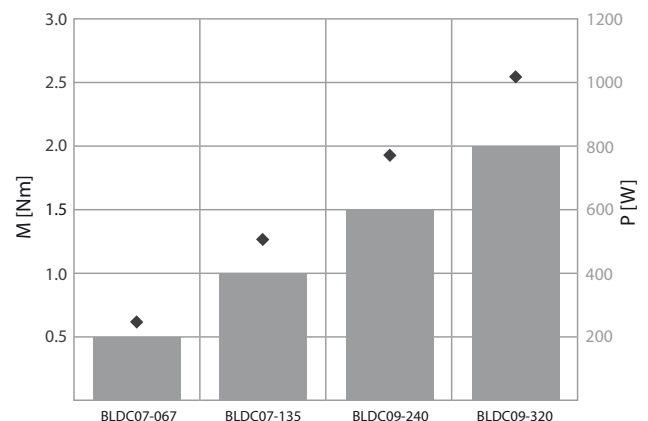
Compared to a common asynchronous motor an EC motor is characterized by a higher power density. In combination with a rotor position detection on Hall basis (RLE) it can also be used as variable-speed drive.



The EC series of Heidrive GmbH consists of three sizes with different lengths and is covering a power range from 35 W to 220 W. This corresponds to a nominal torque of 0.1 Nm to 0.7 Nm. The motors specified here have a triple overload capacity.

BLDC motors

The construction of BLDC motors is very similar to the construction of the previously described EC motors. However, here a highly efficient permanent magnet rotor is used. The utilized sintered rare earth magnet segments (NdFeB) entail a higher degree of efficiency and thus a higher power output. The higher power density of this motor type enables the realization of a more compact size. For BLDC motors a high-order and very robust encoder system on Hall basis (HES) is employed. BLDC motors are particularly suitable for dynamic drives in 4 Q operation.



The BLDC series of Heidrive GmbH consists of two sizes with two lengths in each case and is covering a power range from 200 W to 800 W. This corresponds to a nominal torque from 0.65 Nm to 2.55 Nm. The motors specified here have a fourfold overload capacity.

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General data

EC & BLDC motors basic performance values

Type	Model	U_{bus} [V _{DC}]	I_o [A]	I_n [A]	M_o [Nm]	M_n [Nm]	M_{max} [Nm]	n_n [rpm]	J [kg-cm ²]	P_n (S1) [W]
EC06	EC06-017	24*	2.6	1.7	0.17	0.11	0.5	3,000	1.30E-05	35
		48	1.3	0.9	0.17	0.11	0.5	3,000	1.30E-05	35
		320	0.2	0.1	0.17	0.11	0.5	3,000	1.30E-05	35
	EC06-028	24*	4.4	3.0	0.28	0.19	0.8	3,000	2.17E-05	60
		48	2.2	1.5	0.28	0.19	0.8	3,000	2.17E-05	60
		320	0.3	0.2	0.28	0.19	0.8	3,000	2.17E-05	60
EC07	EC07-034	48	2.8	2.5	0.34	0.30	1.0	3,000	3.19E-05	95
		320	0.4	0.4	0.34	0.30	1.0	3,000	3.19E-05	95
		560	0.3	0.2	0.34	0.30	1.0	3,000	3.19E-05	95
	EC07-051	48	4.0	3.2	0.51	0.41	1.5	3,000	4.79E-05	130
		320	0.7	0.5	0.51	0.41	1.5	3,000	4.79E-05	130
		560	0.4	0.3	0.51	0.41	1.5	3,000	4.79E-05	130
	EC07-068	48*	5.2	4.4	0.68	0.57	2.0	3,000	6.38E-05	180
		320	0.9	0.7	0.68	0.57	2.0	3,000	6.38E-05	180
		560	0.5	0.4	0.68	0.57	2.0	3,000	6.38E-05	180
EC08	EC08-075	48*	5.6	3.8	0.75	0.51	2.3	3,000	1.17E-04	160
		320	0.9	0.6	0.75	0.51	2.3	3,000	1.17E-04	160
		560	0.5	0.4	0.75	0.51	2.3	3,000	1.17E-04	160
	EC08-100	48*	7.4	5.2	1.0	0.70	3.0	3,000	1.61E-04	220
		320	1.2	0.8	1.0	0.70	3.0	3,000	1.61E-04	220
		560	0.7	0.5	1.0	0.70	3.0	3,000	1.61E-04	220
BLDC07	BLDC07-067	48	5.7	5.4	0.67	0.64	2.7	3,000	2.55E-05	200
		320	0.9	0.9	0.67	0.64	2.7	3,000	2.55E-05	200
		560	0.5	0.5	0.67	0.64	2.7	3,000	2.55E-05	200
	BLDC07-135	48	10.6	10.0	1.35	1.27	5.4	3,000	5.10E-05	400
		320	1.8	1.7	1.35	1.27	5.4	3,000	5.10E-05	400
		560	1.0	1.0	1.35	1.27	5.4	3,000	5.10E-05	400
BLDC09	BLDC09-240	48*	19.1	15.2	2.4	1.91	9.6	3,000	1.76E-04	600
		320	3.0	2.4	2.4	1.91	9.6	3,000	1.76E-04	600
		560	1.8	1.4	2.4	1.91	9.6	3,000	1.76E-04	600
	BLDC09-320	48*	24.9	19.9	3.2	2.55	12.8	3,000	2.35E-04	800
		320	4.0	3.2	3.2	2.55	12.8	3,000	2.35E-04	800
		560	2.2	1.8	3.2	2.55	12.8	3,000	2.35E-04	800

* on request

Ambient conditions & technical characteristics

	EC motor	BLDC motor
Motor types	Permanent magnet three-phase synchronous motor	
Ambient operating temperature	- 10 °C to + 40 °C	
Ambient storage temperature	- 20 °C to + 70 °C	
Humidity	< 90 % relative humidity (without condensation)	
Insulation class	Y (= up to 90 °C) $\Delta T = 50 \text{ K}$	E (= up to 120 °C) $\Delta T = 80 \text{ K}$
Protection class	IP40	
Cooling	Natural convective	
Bearing lifetime	20,000 h under rated operation conditions (M_r)	
Temperature sensor	Overheating protection	KTY 84-130
Voltage slew rate dU/dt	8 kV / μs	
Maximum altitude	4,000 meters above sealevel; derate 1% per 100 meters above 1,000 meters	
Concentricity, coaxiality and axial run-out	N (normal) per DIN 42955	
Vibration	Stage N in accordance to ISO 2373	
Coating	Stator core: Black top coat, RAL 9005 Bearing shield: Bright aluminium	
Magnet material	polymer-bonded neodymium ring	sintered NdFeB
Shaft end	Cylindrical shaft end	
Balancing quality	Q 2.5	
Encoder systems	RLE *	HES
Approvals	CE, UL isolation system of Heidrive GmbH	

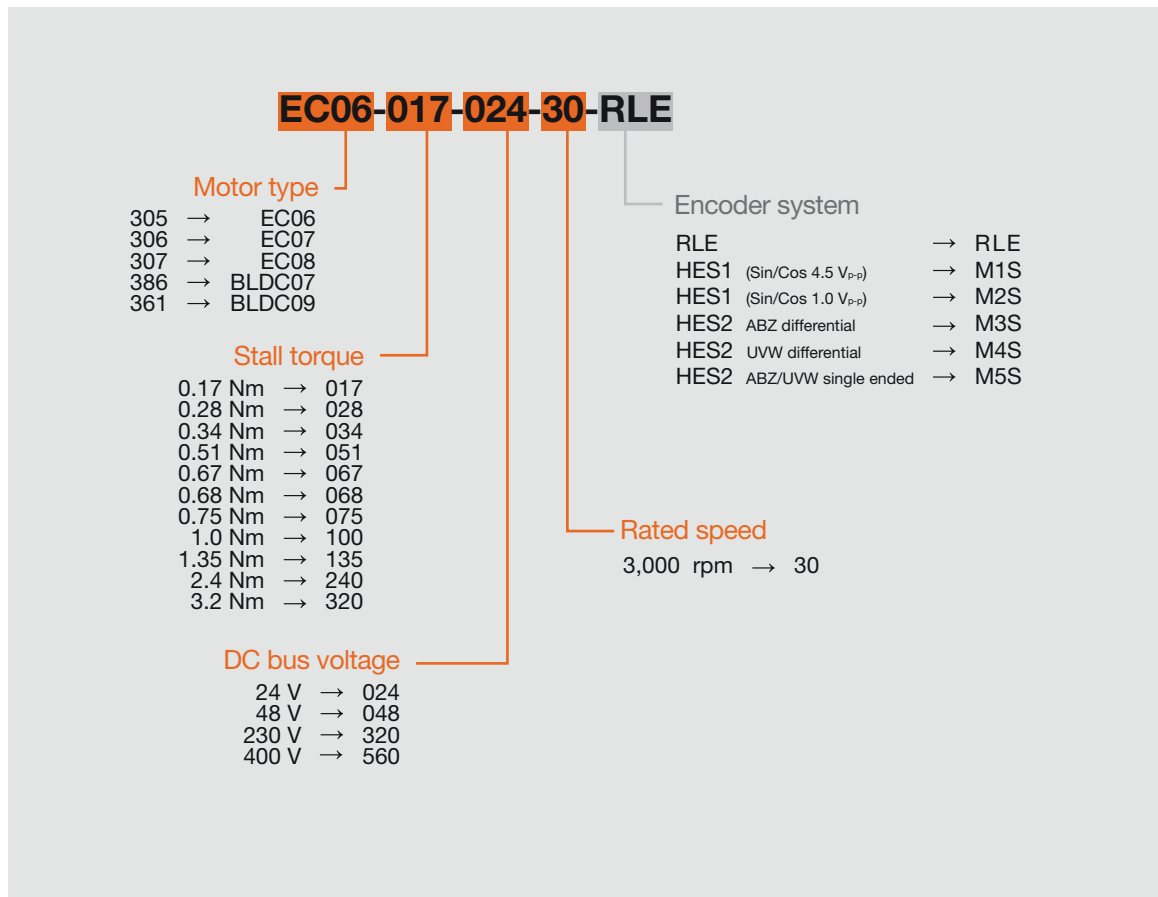
* for type EC07 also HES is applicable

■ General data

Abbreviations & definitions

Abbr.	Unit	Explanation
f_n	[Hz]	Rated frequency
I_0	[A _{rms}]	Stall current per phase (motor current at stall torque M_0)
I_n	[A _{rms}]	Rated current (rated current per phase)
I_{max}	[A _{rms}]	Peak current (maximum permissible current per phase)
J	[kg-cm ²]	Moment of inertia rotor (motor without brake)
k_e	[V _{rms} / krpm]	Voltage constant (induced voltage between two phases at 1,000 rpm) rms (root mean square value)
k_t	[Nm / A _{rms}]	Theoretical torque constant (rms), without losses at 20 °C
L_{p-p}	[mH]	Winding inductance (phase-to-phase) at rated current I_n
m	[kg]	Weight (motor without brake)
M_0	[Nm]	Stall torque (stall torque at S1)
M_n	[Nm]	Rated torque (continuous torque at S1)
M_{max}	[Nm]	Peak torque (Maximum permissible torque for short periods)
n_n	[rpm]	Rated speed
n_{max}	[rpm]	Maximum speed
P_n	[W]	Rated power (mechanical power at the shaft)
R_{p-p}	[Ω]	Winding resistance (phase-to-phase, at a winding temperature of 20 °C)
U_{mot}	[V _{rms}]	Rated motor voltage (phase-to-phase at rated working point), rms
U_{bus}	[V _{DC}]	DC bus voltage

Order code



EC06-017

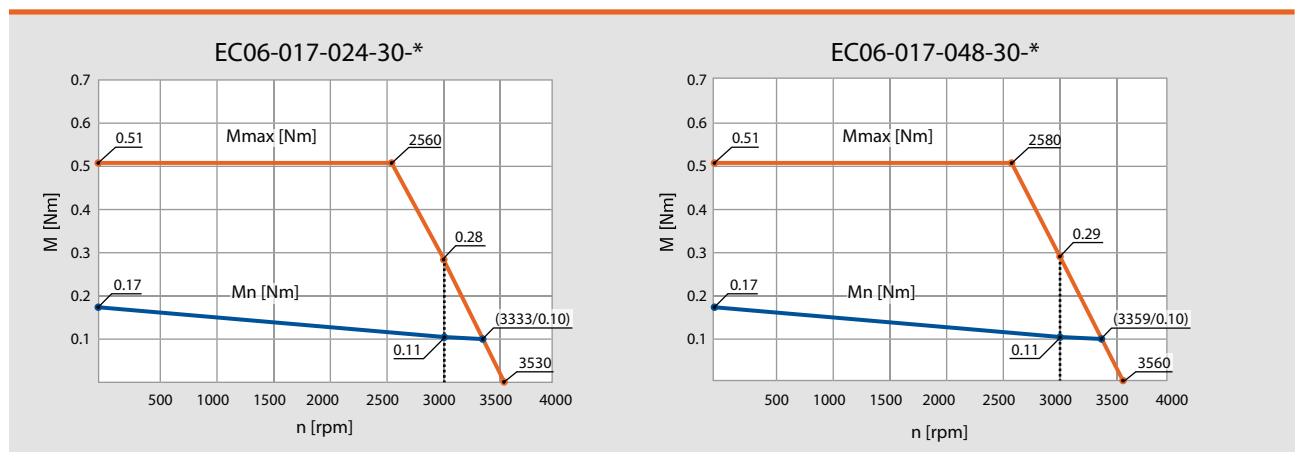


Specifications

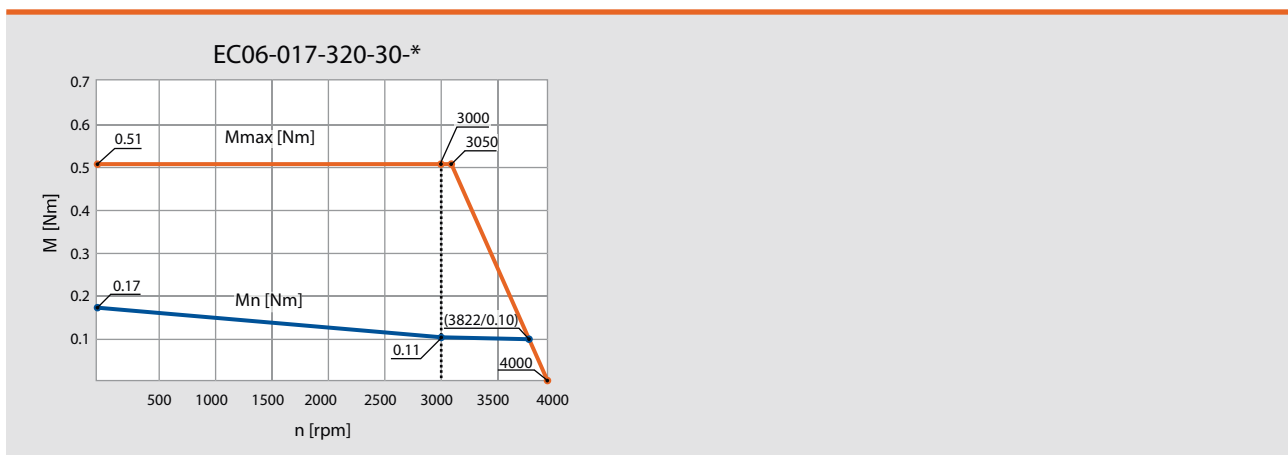
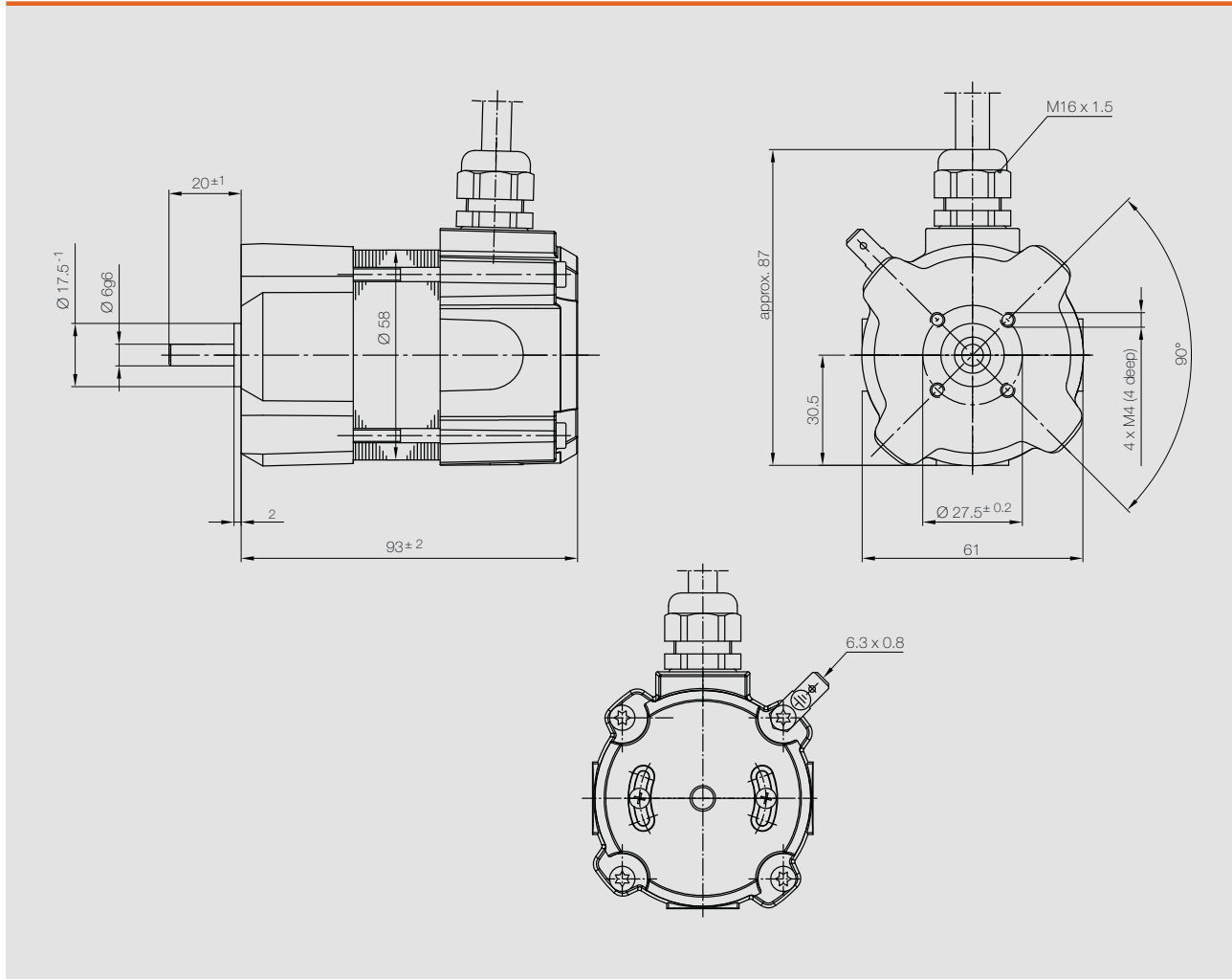
		EC06-017		
Rated speed [rpm]	n_n	3,000	3,000	3,000
Number of pole pairs		2	2	2
Wiring of the motor winding		Y	Y	Y
DC bus voltage [V _{DC}]	U_{bus}	24*	48	320
Rated voltage motor [V _{rms}]	U_{mot}	14	28	171
Rated power [W]	P_n	35	35	35
Rated torque [Nm]	M_n	0.11	0.11	0.11
Rated current per phase [A _{rms}]	I_n	1.7	0.9	0.1
Stall torque [Nm]	M_0	0.17	0.17	0.17
Stall current per phase [A _{rms}]	I_0	2.6	1.3	0.2
Peak torque [Nm]	M_{max}	0.5	0.5	0.5
Peak current [A _{rms}]	I_{max}	7.8	3.9	0.6
Maximum speed [rpm]	n_{max}	3,530	3,560	4,000
Voltage constant at 1,000 rpm [V _{rms}]	k_e	7.9	15.7	94.4
Torque constant [Nm / A _{rms}]	k_t	0.06	0.13	0.80
Winding resistance (2 phases) at 20 °C [Ω]	R_{p-p}	0.2	0.8	28.6
Winding inductance (2 phases) [mH]	L_{p-p}	0.6	2.2	80.0
Moment of inertia rotor [kg·cm ²]	J	1.30E-05	1.30E-05	1.30E-05
Weight motor [kg]	m	0.9	0.9	0.9

* on request

Performance



Dimensions



EC06-028

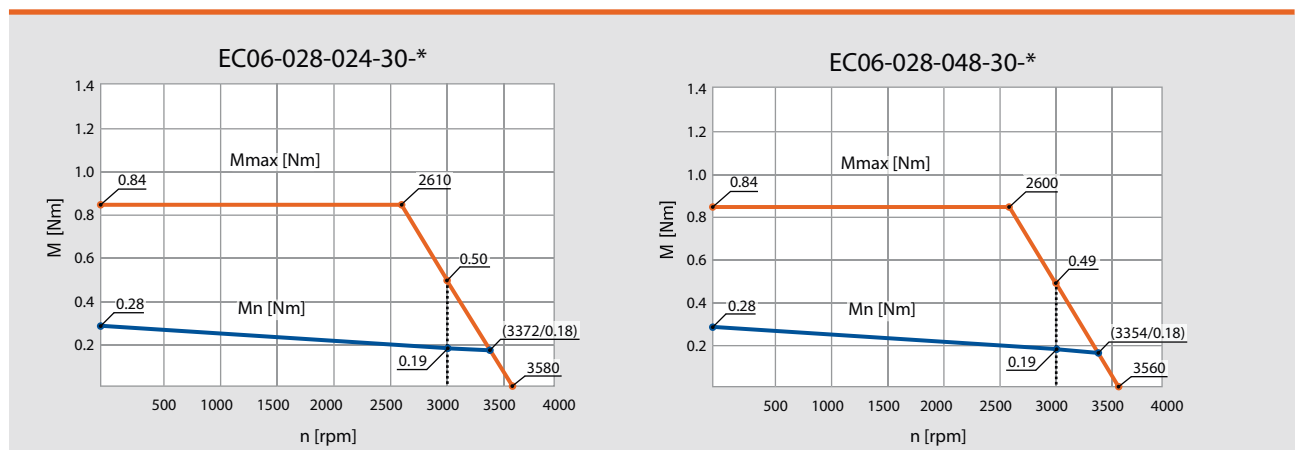


Specifications

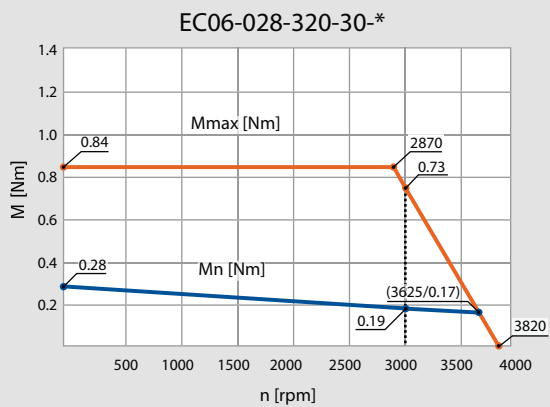
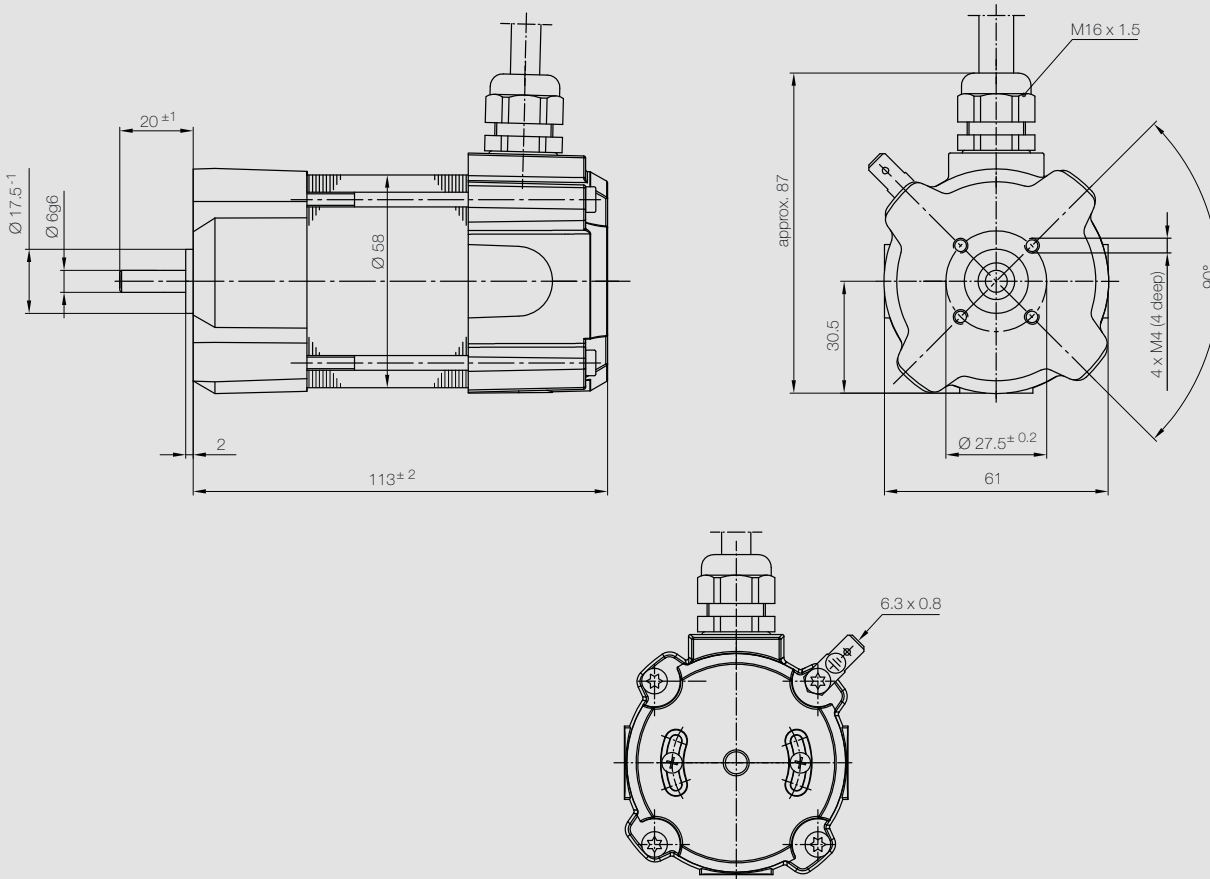
		EC06-028		
Rated speed [rpm]	n_n	3,000	3,000	3,000
Number of pole pairs		2	2	2
Wiring of the motor winding		Y	Y	Y
DC bus voltage [V _{DC}]	U_{bus}	24*	48	320
Rated voltage motor [V _{rms}]	U_{mot}	14	28	179
Rated power [W]	P_n	60	60	60
Rated torque [Nm]	M_n	0.19	0.19	0.19
Rated current per phase [A _{rms}]	I_n	3.0	1.5	0.2
Stall torque [Nm]	M_0	0.28	0.28	0.28
Stall current per phase [A _{rms}]	I_0	4.4	2.2	0.3
Peak torque [Nm]	M_{max}	0.8	0.8	0.8
Peak current [A _{rms}]	I_{max}	13.2	6.5	1.0
Maximum speed [rpm]	n_{max}	3,580	3,560	3,820
Voltage constant at 1,000 rpm [V _{rms}]	k_e	7.8	15.7	98.9
Torque constant [Nm / A _{rms}]	k_t	0.06	0.13	0.83
Winding resistance (2 phases) at 20 °C [Ω]	R_{p-p}	0.1	0.5	18.6
Winding inductance (2 phases) [mH]	L_{p-p}	0.4	1.6	64.8
Moment of inertia rotor [kg·cm ²]	J	2.17E-05	2.17E-05	2.17E-05
Weight motor [kg]	m	1.2	1.2	1.2

* on request

Performance



Dimensions



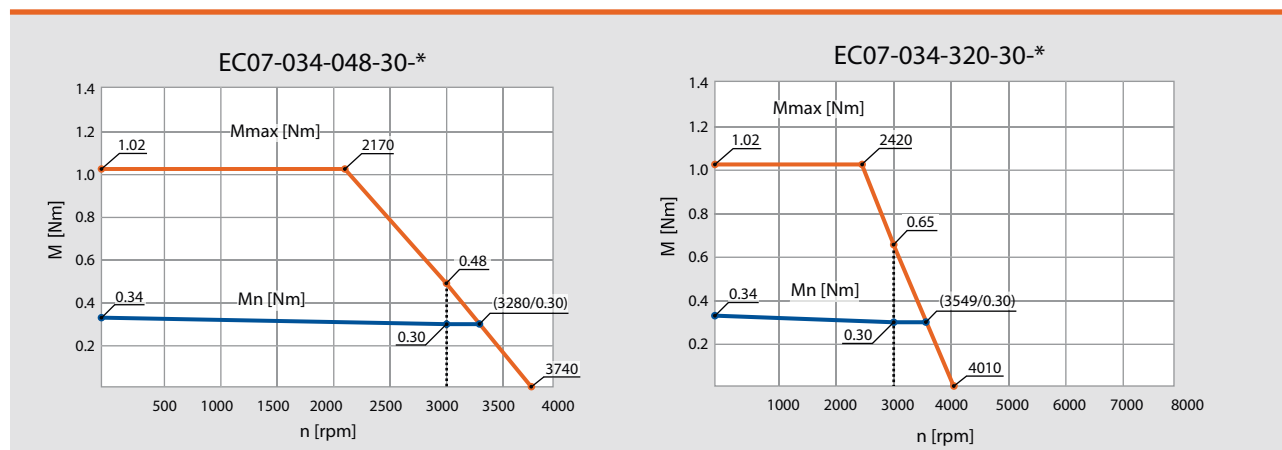
EC07-034



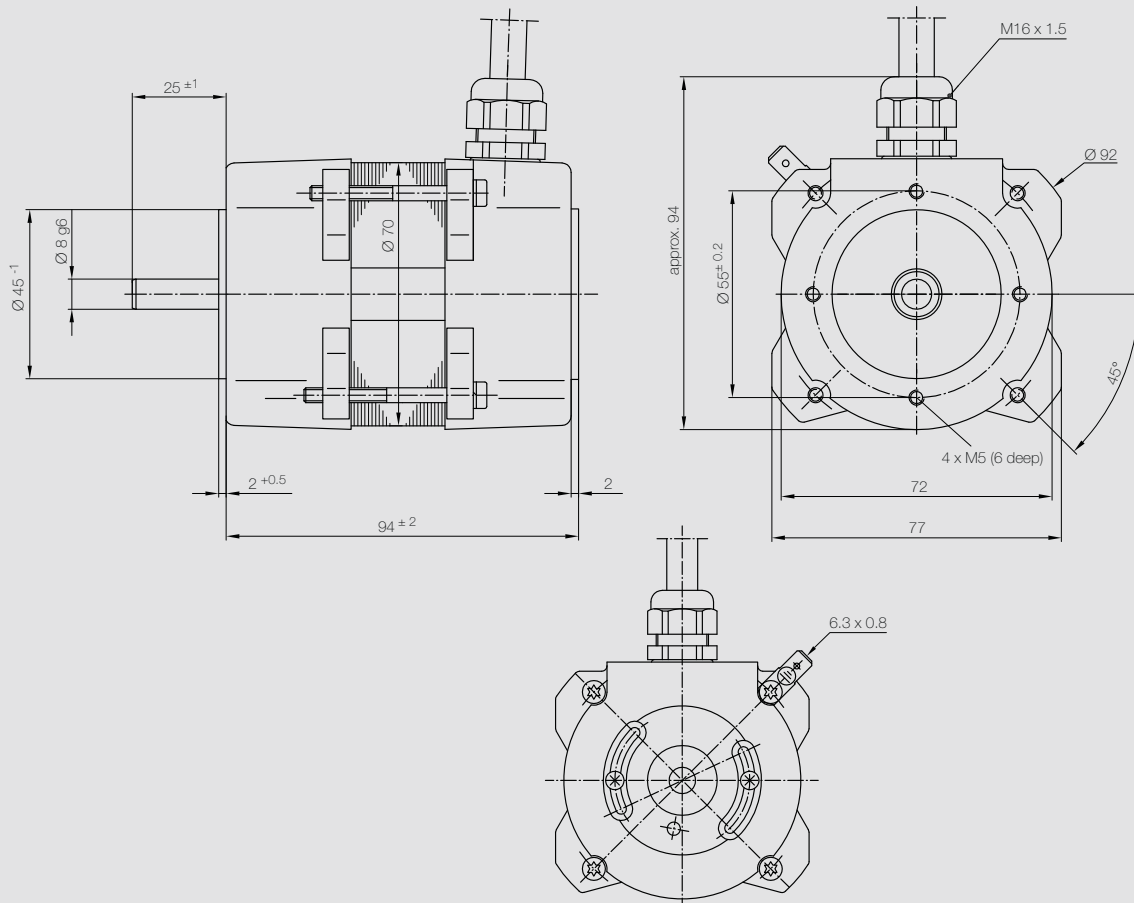
Specifications

		EC07-034		
Rated speed [rpm]	n_n	3,000	3,000	3,000
Number of pole pairs		2	2	2
Wiring of the motor winding		Y	Y	Y
DC bus voltage [V _{DC}]	U_{bus}	48	320	560
Rated voltage motor [V _{rms}]	U_{mot}	28	179	318
Rated power [W]	P_n	95	95	95
Rated torque [Nm]	M_n	0.30	0.30	0.30
Rated current per phase [A _{rms}]	I_n	2.5	0.4	0.2
Stall torque [Nm]	M_0	0.34	0.34	0.34
Stall current per phase [A _{rms}]	I_0	2.8	0.4	0.3
Peak torque [Nm]	M_{max}	1.0	1.0	1.0
Peak current [A _{rms}]	I_{max}	8.3	1.3	0.8
Maximum speed [rpm]	n_{max}	3,740	4,010	3,910
Voltage constant at 1,000 rpm [V _{rms}]	k_e	14.9	94.2	167.8
Torque constant [Nm / A _{rms}]	k_t	0.12	0.78	1.37
Winding resistance (2 phases) at 20 °C [Ω]	R_{p-p}	0.1	22.9	72.7
Winding inductance (2 phases) [mH]	L_{p-p}	1.4	55.0	174.3
Moment of inertia rotor [kg-cm ²]	J	3.19E-05	3.19E-05	3.19E-05
Weight motor [kg]	m	1.3	1.3	1.3

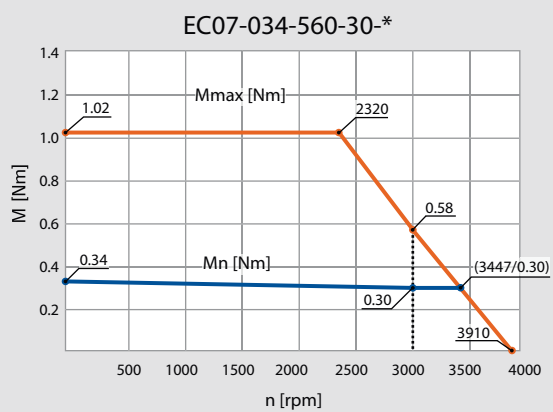
Performance



Dimensions



The RLE variant / HES version shown here is based on the BLDC variant (see drawing p. 23)



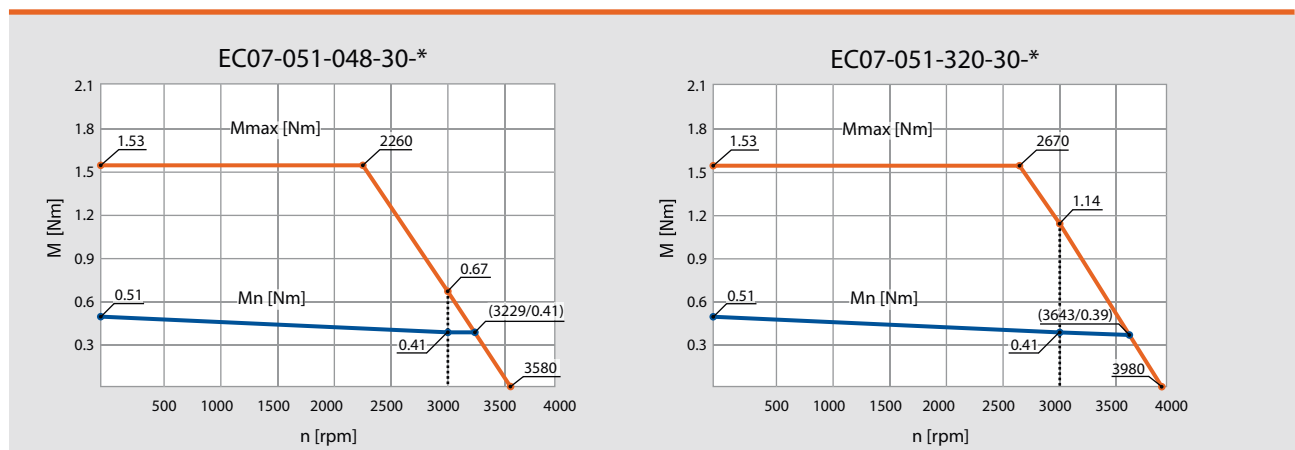
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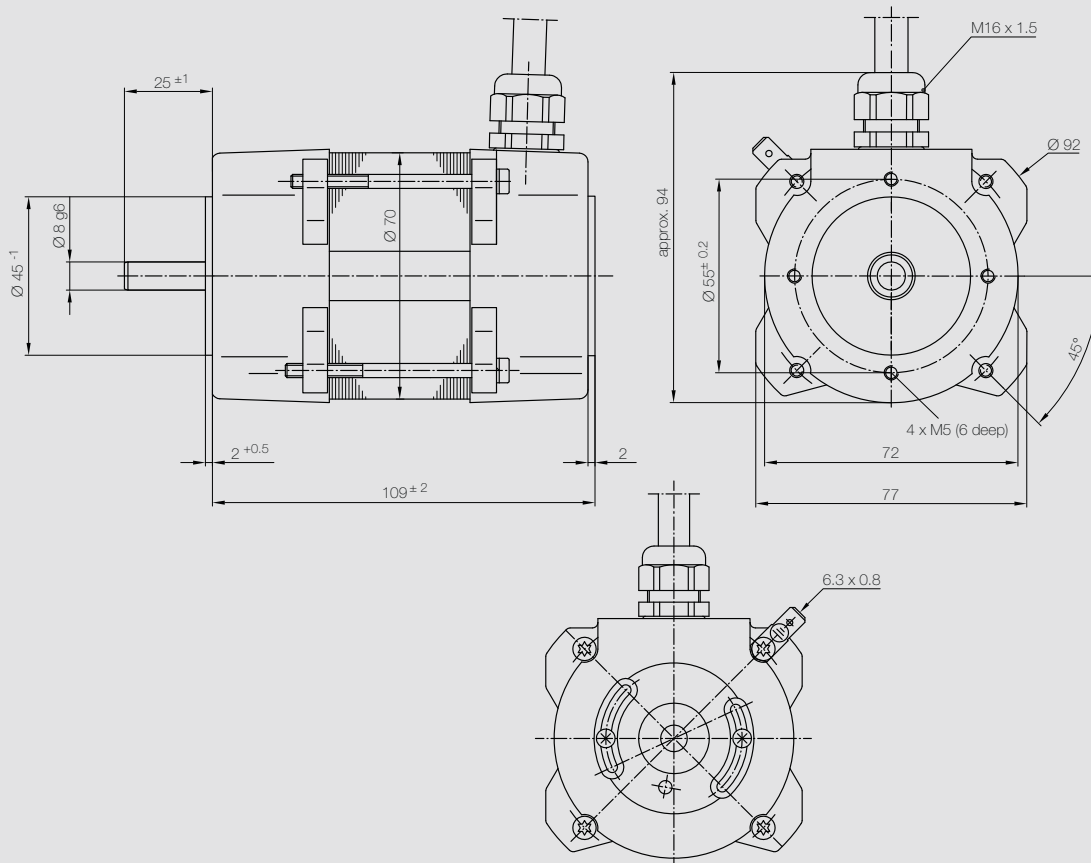
Specifications

		EC07-051		
Rated speed [rpm]	n_n	3,000	3,000	3,000
Number of pole pairs		2	2	2
Wiring of the motor winding		Y	Y	Y
DC bus voltage [V _{DC}]	U_{bus}	48	320	560
Rated voltage motor [V _{rms}]	U_{mot}	29	176	316
Rated power [W]	P_n	130	130	130
Rated torque [Nm]	M_n	0.41	0.41	0.41
Rated current per phase [A _{rms}]	I_n	3.2	0.5	0.3
Stall torque [Nm]	M_o	0.51	0.51	0.51
Stall current per phase [A _{rms}]	I_o	4.0	0.7	0.4
Peak torque [Nm]	M_{max}	1.5	1.5	1.5
Peak current [A _{rms}]	I_{max}	12.0	2.0	1.1
Maximum speed [rpm]	n_{max}	3,580	3,980	3,860
Voltage constant at 1,000 rpm [V _{rms}]	k_e	15.6	94.9	170.3
Torque constant [Nm / A _{rms}]	k_t	0.13	0.78	1.38
Winding resistance (2 phases) at 20 °C [Ω]	R_{p-p}	0.1	12.9	41.5
Winding inductance (2 phases) [mH]	L_{p-p}	1.0	38.8	125.1
Moment of inertia rotor [kg-cm ²]	J	4.79E-05	4.79E-05	4.79E-05
Weight motor [kg]	m	1.6	1.6	1.6

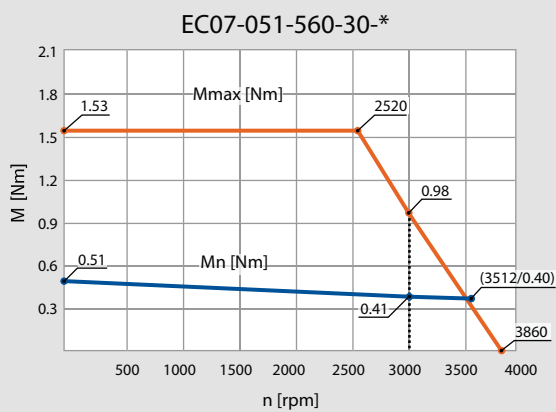
Performance



Dimensions



The RLE variant / HES version shown here is based on the BLDC variant (see drawing p. 23, with length 118 instead of 103)



EC07-068

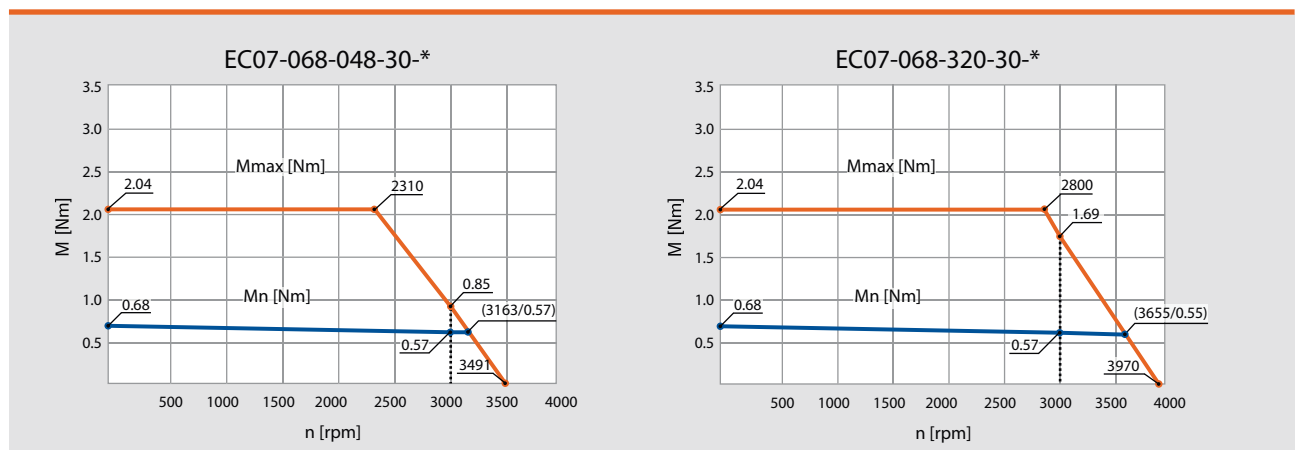


Specifications

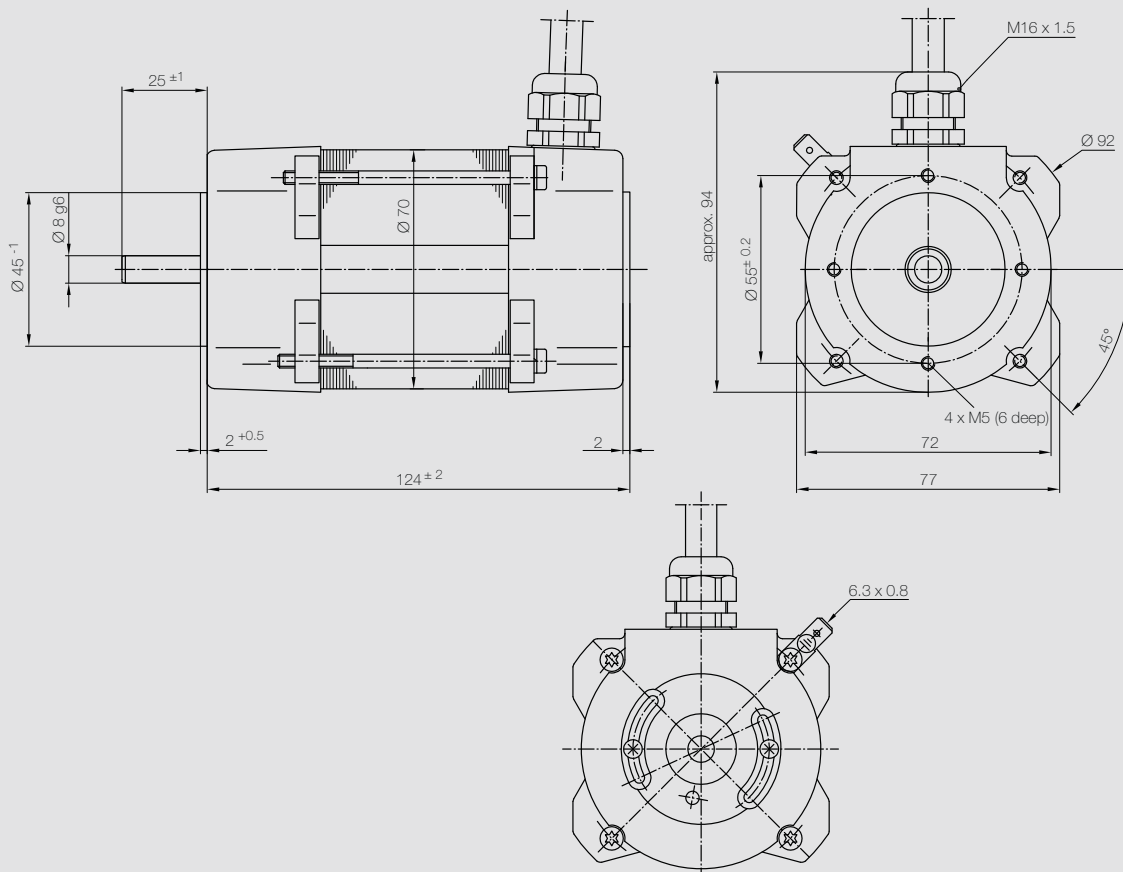
		EC07-068		
Rated speed [rpm]	n_n	3.000	3.000	3.000
Number of pole pairs		2	2	2
Wiring of the motor winding		Y	Y	Y
DC bus voltage [V _{DC}]	U_{bus}	48*	320	560
Rated voltage motor [V _{rms}]	U_{mot}	29	175	319
Rated power [W]	P_n	180	180	180
Rated torque [Nm]	M_n	0.57	0.57	0.57
Rated current per phase [A _{rms}]	I_n	4.4	0.7	0.4
Stall torque [Nm]	M_0	0.68	0.68	0.68
Stall current per phase [A _{rms}]	I_0	5.2	0.9	0.5
Peak torque [Nm]	M_{max}	2.0	2.0	2.0
Peak current [A _{rms}]	I_{max}	15.5	2.6	1.4
Maximum speed [rpm]	n_{max}	3,491	3,970	3,790
Voltage constant at 1,000 rpm [V _{rms}]	k_e	16.0	95.1	173.3
Torque constant [Nm / A _{rms}]	k_t	0.13	0.78	1.43
Winding resistance (2 phases) at 20 °C [Ω]	R_{p-p}	0.2	8.7	28.9
Winding inductance (2 phases) [mH]	L_{p-p}	0.9	30.7	102.1
Moment of inertia rotor [kg-cm ²]	J	6.38E-05	6.38E-05	6.38E-05
Weight motor [kg]	m	1.9	1.9	1.9

* on request

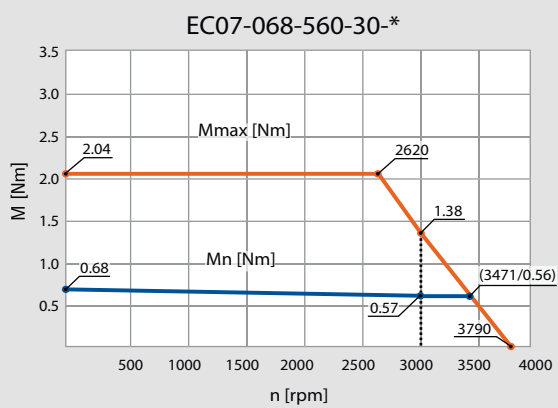
Performance



Dimensions



The RLE variant / HES version shown here is based on the BLDC variant (see drawing p. 25)



EC08-075

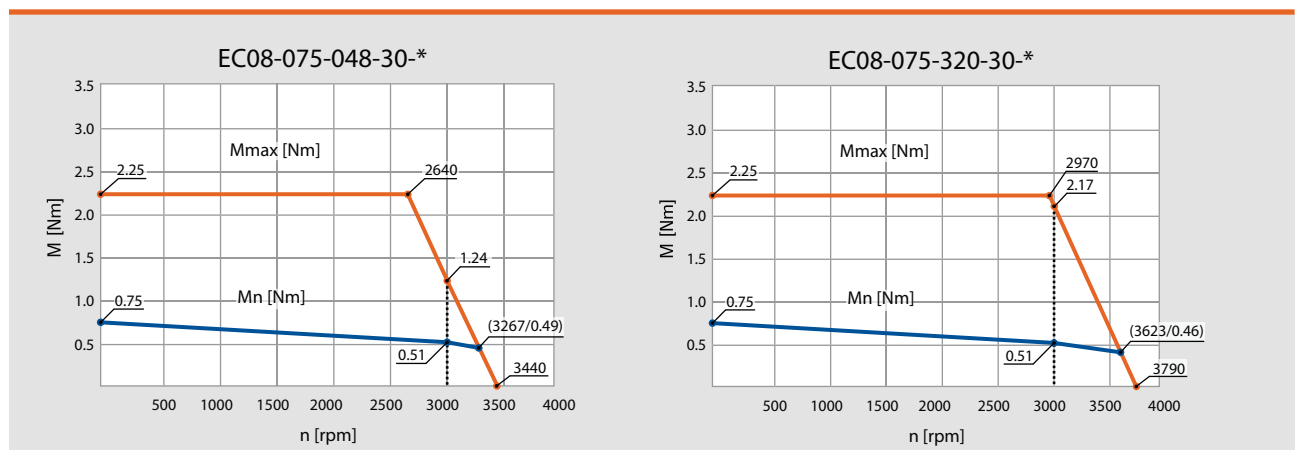


Specifications

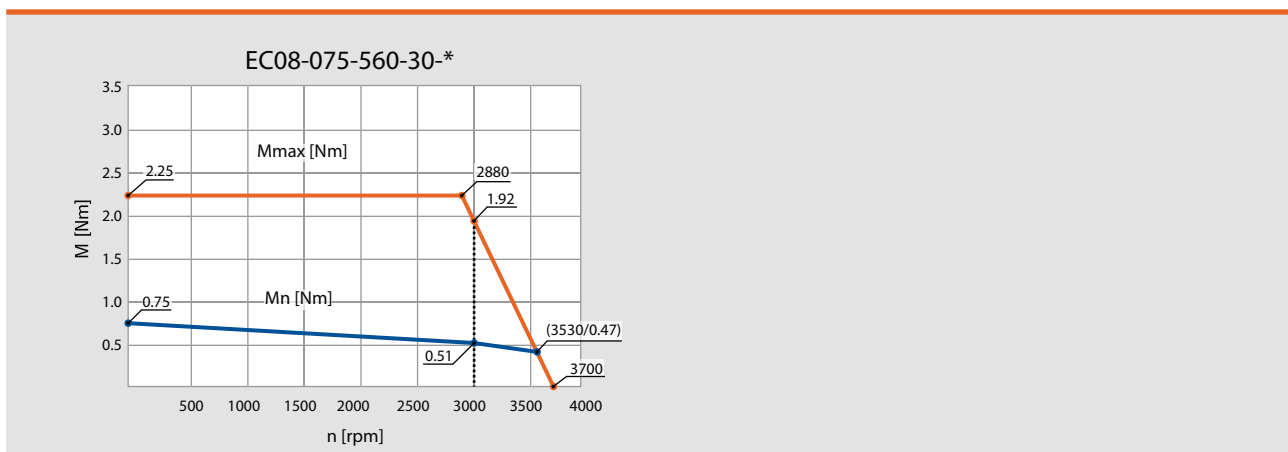
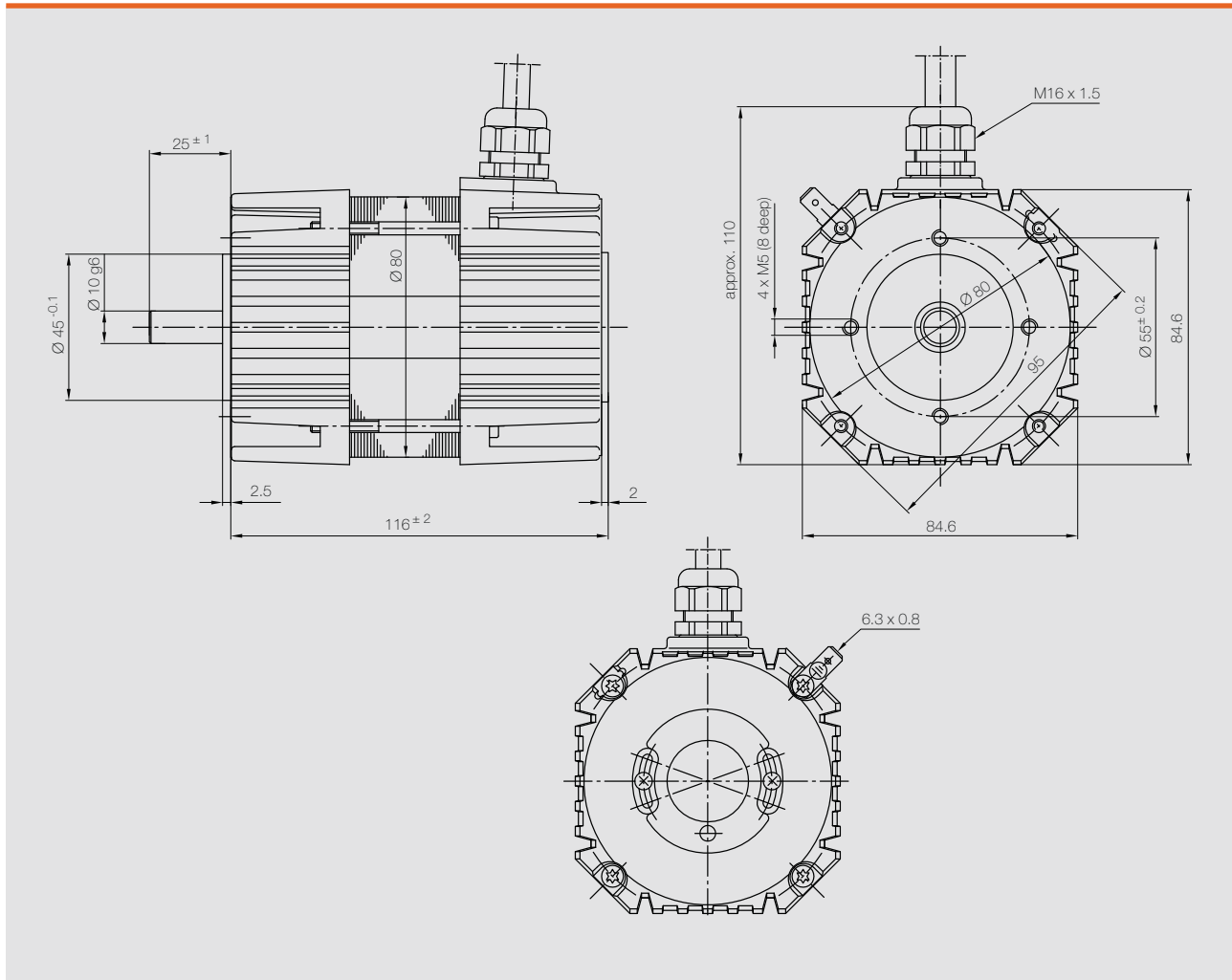
		EC08-075		
Rated speed [rpm]	n_n	3,000	3,000	3,000
Number of pole pairs		2	2	2
Wiring of the motor winding		Y	Y	Y
DC bus voltage [V _{DC}]	U_{bus}	48*	320	560
Rated voltage motor [V _{rms}]	U_{mot}	29	179	319
Rated power [W]	P_n	160	160	160
Rated torque [Nm]	M_n	0.51	0.51	0.51
Rated current per phase [A _{rms}]	I_n	3.8	0.6	0.4
Stall torque [Nm]	M_0	0.75	0.75	0.75
Stall current per phase [A _{rms}]	I_0	5.6	0.9	0.5
Peak torque [Nm]	M_{max}	2.3	2.3	2.3
Peak current [A _{rms}]	I_{max}	16.7	2.7	1.5
Maximum speed [rpm]	n_{max}	3,440	3,790	3,700
Voltage constant at 1,000 rpm [V _{rms}]	k_e	16.2	99.8	177.5
Torque constant [Nm / A _{rms}]	k_t	0.13	0.82	1.46
Winding resistance (2 phases) at 20 °C [Ω]	R_{p-p}	0.0	6.0	19.0
Winding inductance (2 phases) [mH]	L_{p-p}	0.6	22.3	70.7
Moment of inertia rotor [kg-cm ²]	J	1.17E-04	1.17E-04	1.17E-04
Weight motor [kg]	m	2.2	2.2	2.2

* on request

Performance



Dimensions



EC08-100

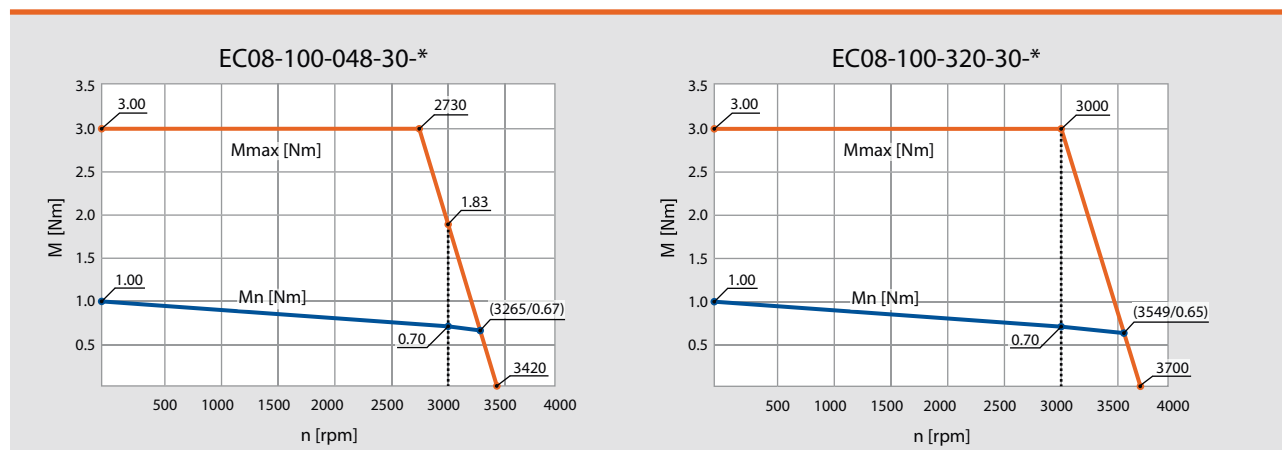


Specifications

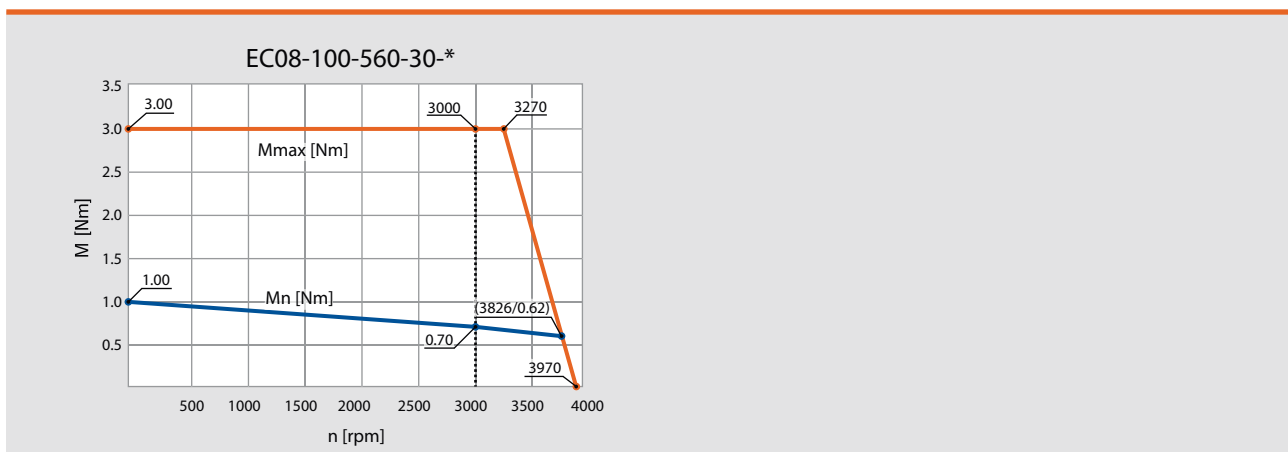
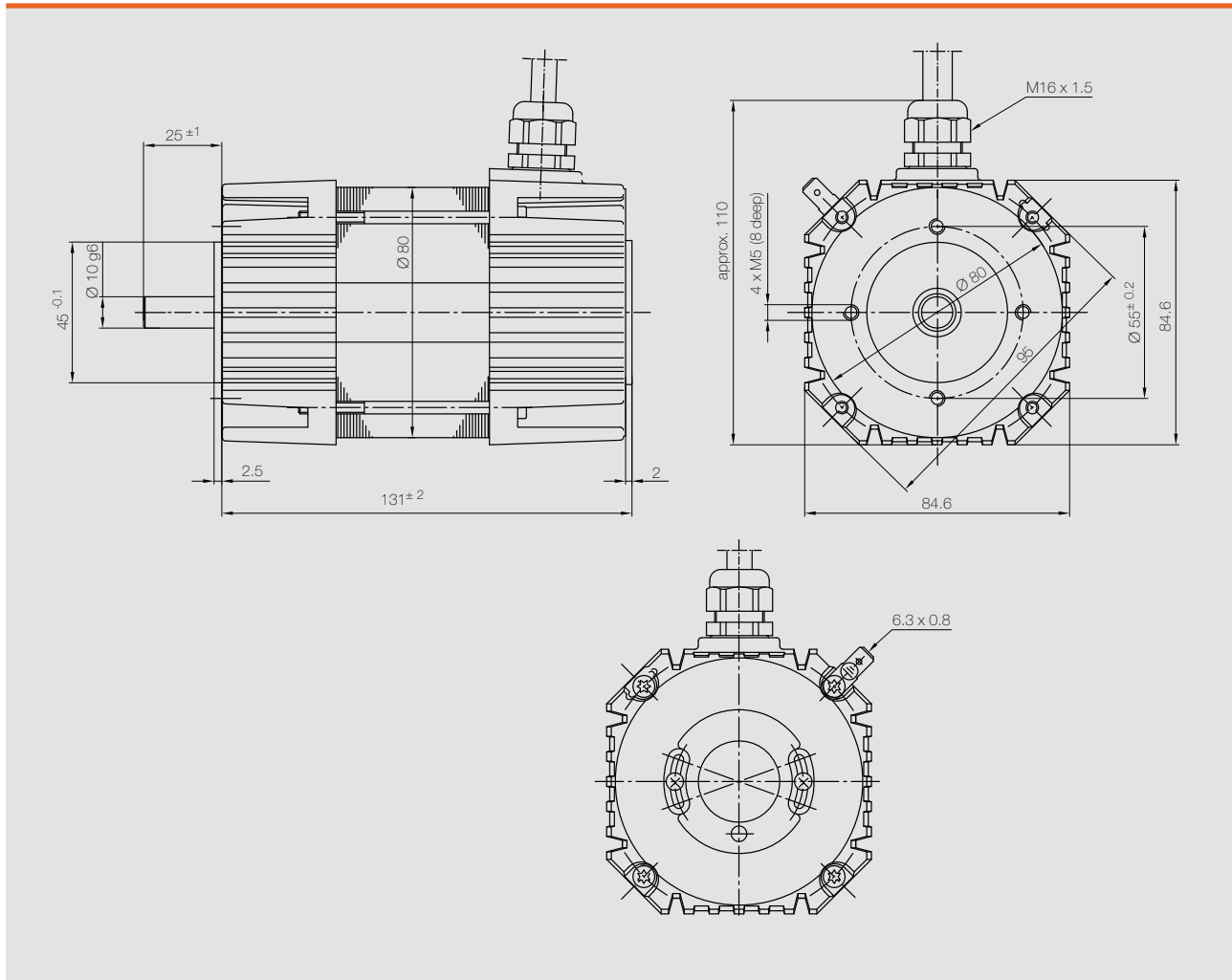
	EC08-100			
Rated speed [rpm]	n_n	3,000	3,000	3,000
Number of pole pairs		2	2	2
Wiring of the motor winding		Y	Y	Y
DC bus voltage [V _{DC}]	U_{bus}	48*	320	560
Rated voltage motor [V _{rms}]	U_{mot}	29	183	296
Rated power [W]	P_n	220	220	220
Rated torque [Nm]	M_n	0.70	0.70	0.70
Rated current per phase [A _{rms}]	I_n	5.2	0.8	0.5
Stall torque [Nm]	M_0	1.0	1.0	1.0
Stall current per phase [A _{rms}]	I_0	7.4	1.2	0.7
Peak torque [Nm]	M_{max}	3.0	3.0	3.0
Peak current [A _{rms}]	I_{max}	22.3	3.6	2.2
Maximum speed [rpm]	n_{max}	3,420	3,700	3,970
Voltage constant at 1,000 rpm [V _{rms}]	k_e	16.3	102.2	165.6
Torque constant [Nm / A _{rms}]	k_t	0.13	0.84	1.37
Winding resistance (2 phases) at 20 °C [Ω]	R_{p-p}	0.0	4.0	10.6
Winding inductance (2 phases) [mH]	L_{p-p}	0.4	17.4	45.9
Moment of inertia rotor [kg-cm ²]	J	1.61E-04	1.61E-04	1.61E-04
Weight motor [kg]	m	2.9	2.9	2.9

* on request

Performance



Dimensions



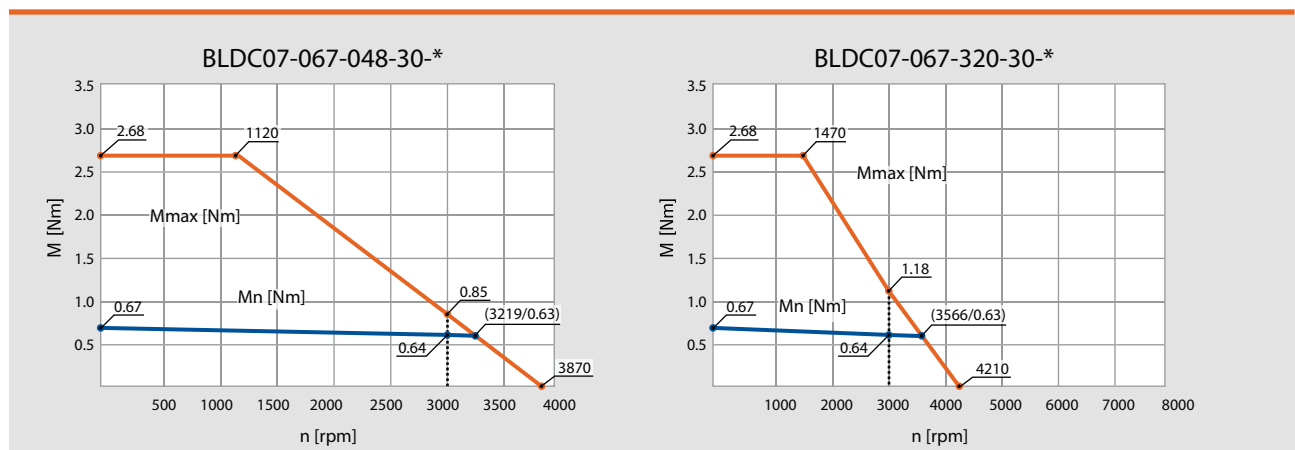
BLDC07-067



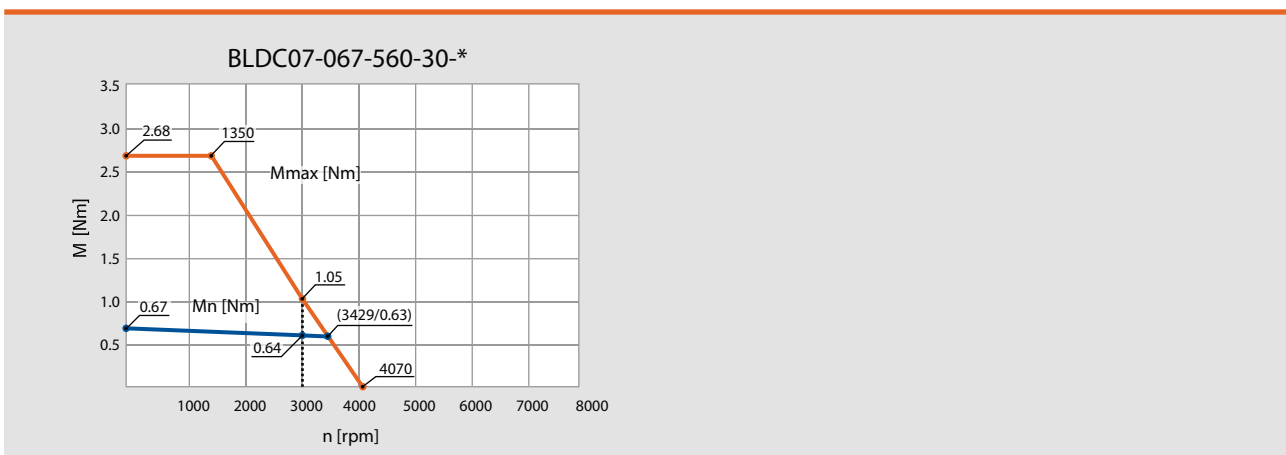
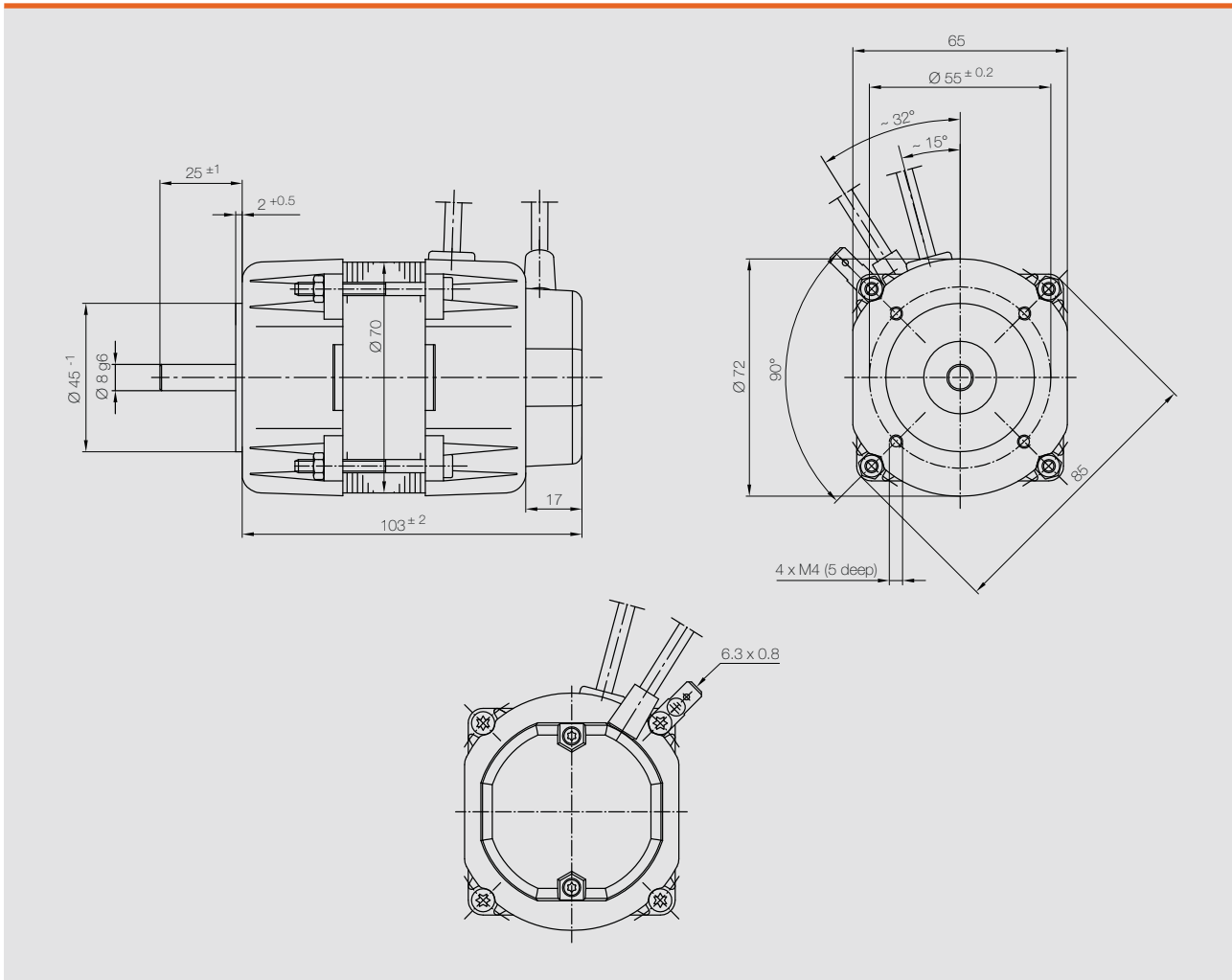
Specifications

		BLDC07-067		
Rated speed [rpm]	n_n	3,000	3,000	3,000
Number of pole pairs		2	2	2
Wiring of the motor winding		Y	Y	Y
DC bus voltage [V _{dc}]	U_{bus}	48	320	560
Rated voltage motor [V _{rms}]	U_{mot}	28	177	319
Rated power [W]	P_n	200	200	200
Rated torque [Nm]	M_n	0.64	0.64	0.64
Rated current per phase [A _{rms}]	I_n	5.4	0.9	0.5
Stall torque [Nm]	M_0	0.67	0.67	0.67
Stall current per phase [A _{rms}]	I_0	5.7	0.9	0.5
Peak torque [Nm]	M_{max}	2.7	2.7	2.7
Peak current [A _{rms}]	I_{max}	22.8	3.7	2.0
Maximum speed [rpm]	n_{max}	3,870	4,210	4,070
Voltage constant at 1,000 rpm [V _{rms}]	k_e	14.4	89.7	161.3
Torque constant [Nm / A _{rms}]	k_t	0.12	0.73	1.33
Winding resistance (2 phases) at 20 °C [Ω]	R_{p-p}	0.1	13.6	43.7
Winding inductance (2 phases) [mH]	L_{p-p}	0.9	35.3	114.0
Moment of inertia rotor [kg-cm ²]	J	2.55E-05	2.55E-05	2.55E-05
Weight motor [kg]	m	1.4	1.4	1.4

Performance



Dimensions



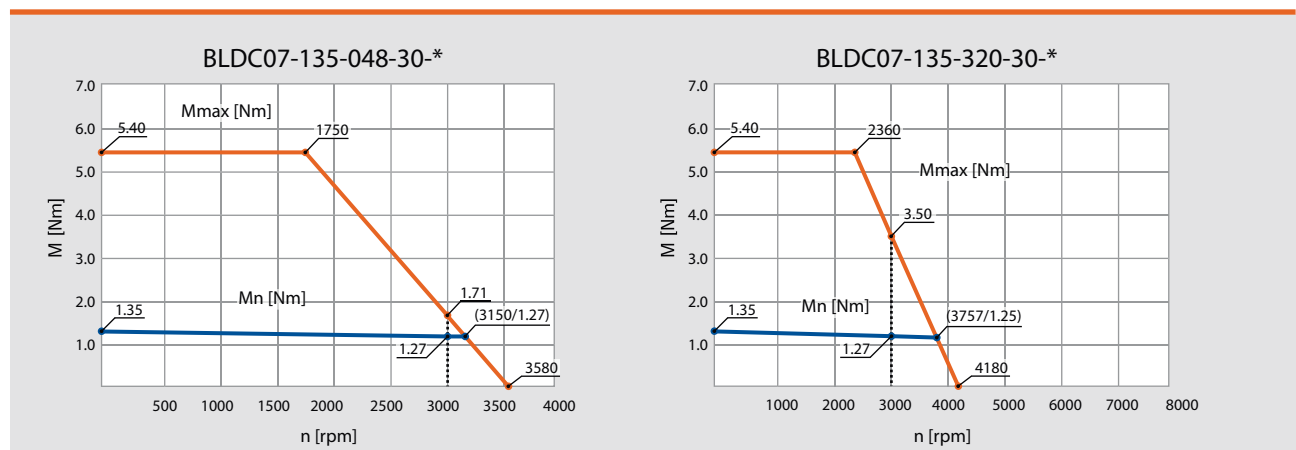
BLDC07-135



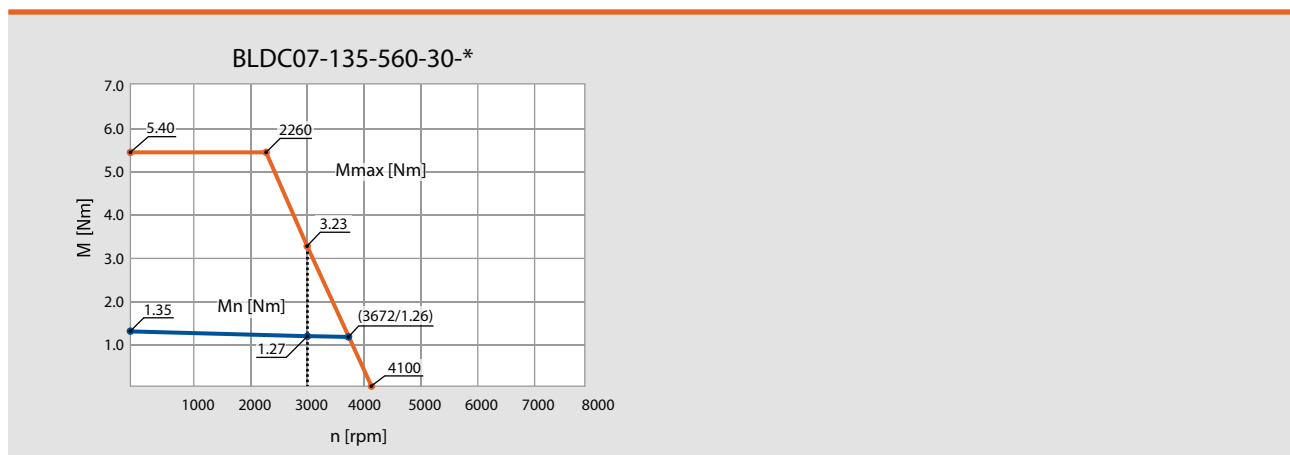
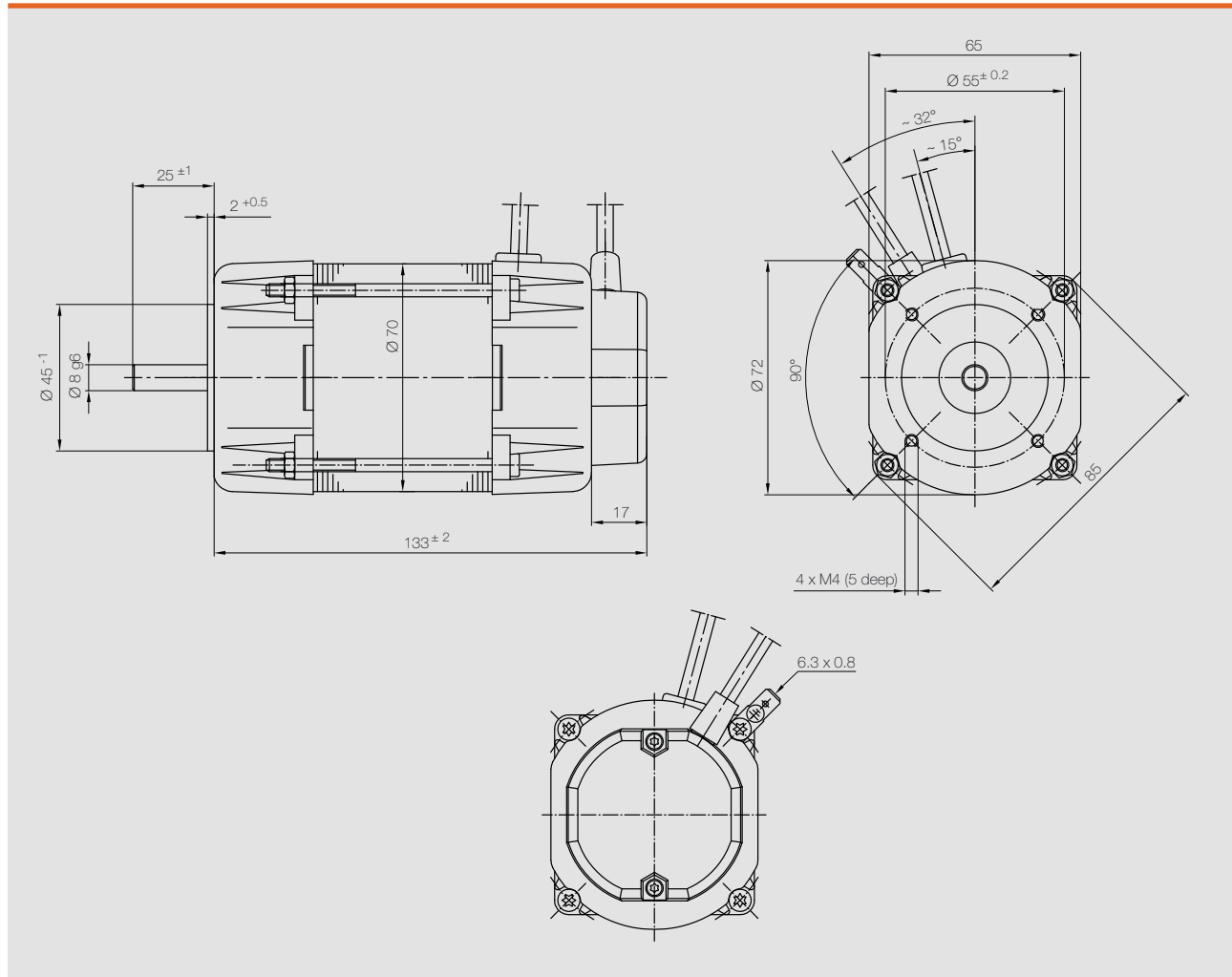
Specifications

		BLDC07-135		
Rated speed [rpm]	n_n	3,000	3,000	3,000
Number of pole pairs		2	2	2
Wiring of the motor winding		Y	Y	Y
DC bus voltage [V _{dc}]	U_{bus}	48	320	560
Rated voltage motor [V _{rms}]	U_{mot}	29	171	302
Rated power [W]	P_n	400	400	400
Rated torque [Nm]	M_n	1.27	1.27	1.27
Rated current per phase [A _{rms}]	I_n	10.0	1.7	1.0
Stall torque [Nm]	M_0	1.35	1.35	1.35
Stall current per phase [A _{rms}]	I_0	10.6	1.8	1.0
Peak torque [Nm]	M_{max}	5.4	5.4	5.4
Peak current [A _{rms}]	I_{max}	42.3	7.3	4.1
Maximum speed [rpm]	n_{max}	3,580	4,180	4,100
Voltage constant at 1,000 rpm [V _{rms}]	k_e	15.6	90.4	160.2
Torque constant [Nm / A _{rms}]	k_t	0.13	0.74	1.30
Winding resistance (2 phases) at 20 °C [Ω]	R_{p-p}	0.1	4.6	14.3
Winding inductance (2 phases) [mH]	L_{p-p}	0.5	16.8	52.9
Moment of inertia rotor [kg-cm ²]	J	5.10E-05	5.10E-05	5.10E-05
Weight motor [kg]	m	2.0	2.0	2.0

Performance



Dimensions



BLDC09-240

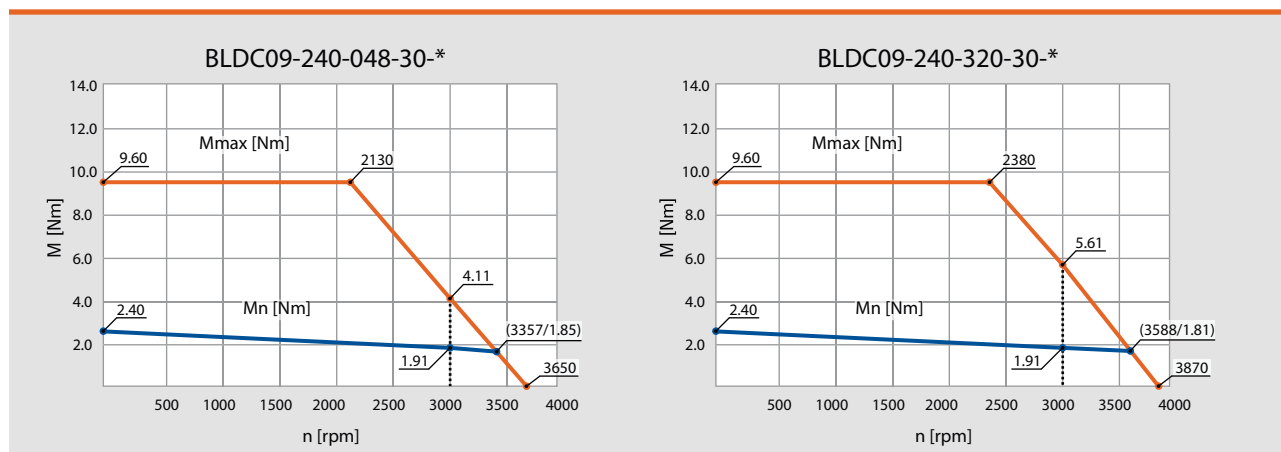


Specifications

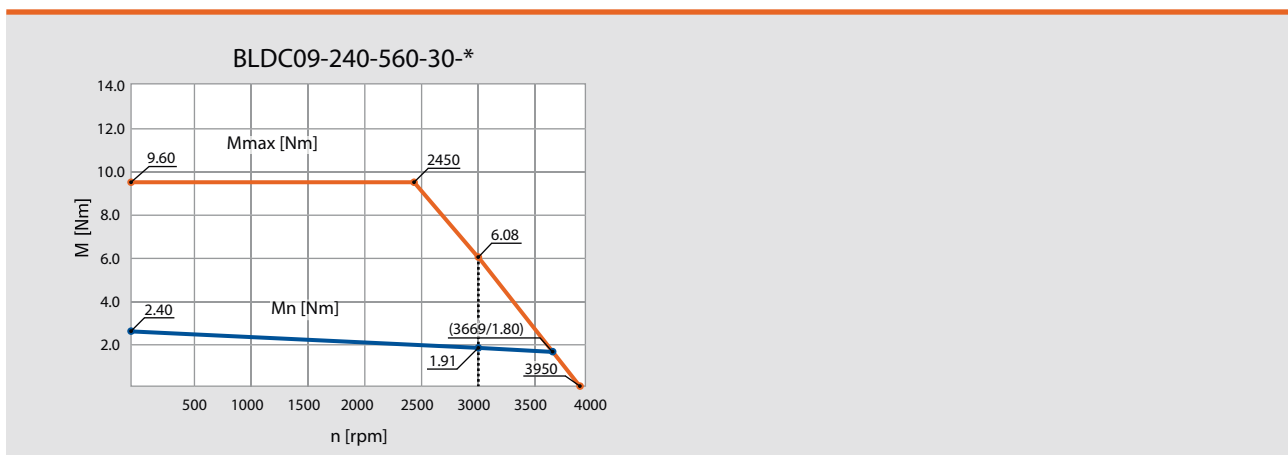
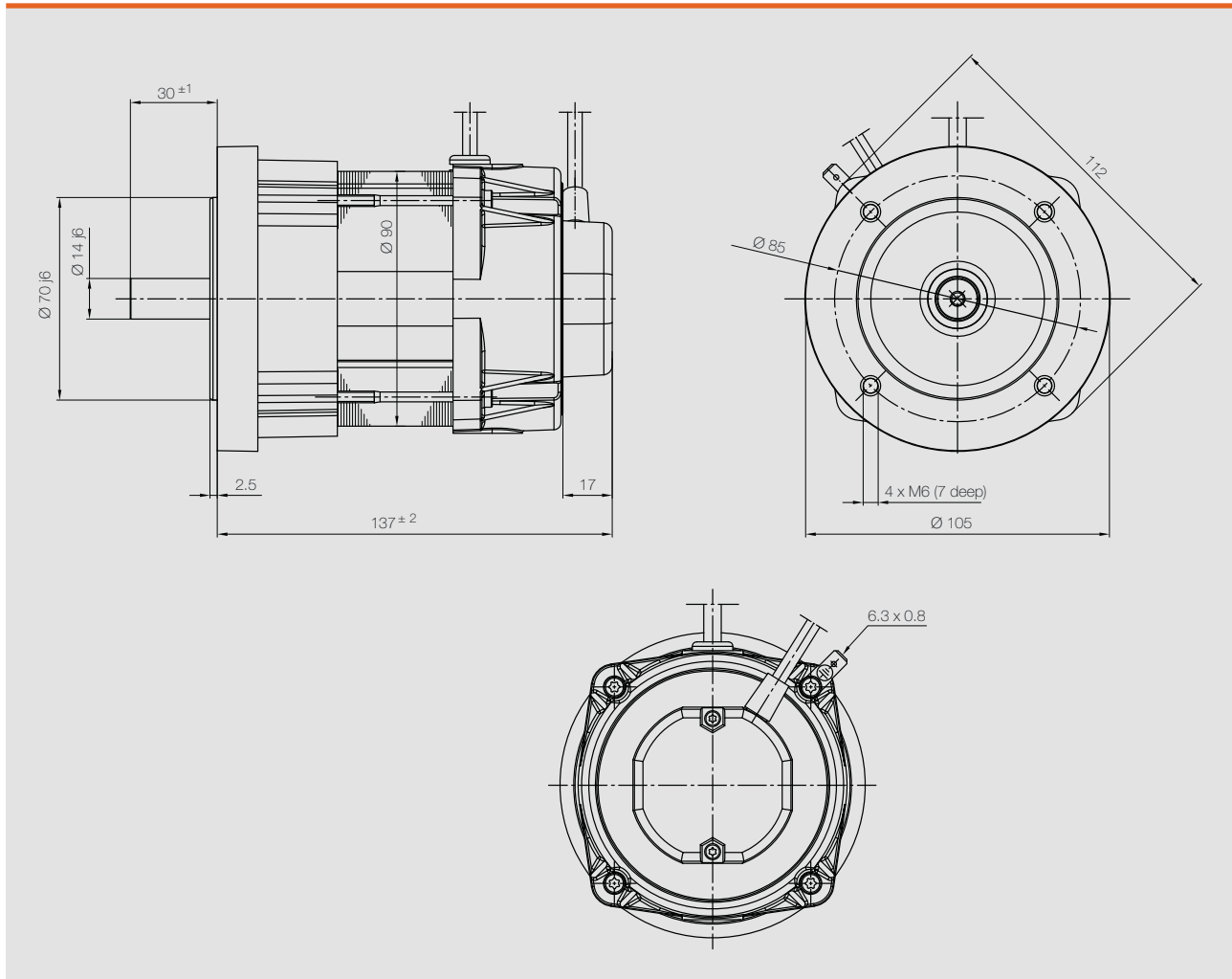
		BLDC09-240		
Rated speed [rpm]	n_n	3,000	3,000	3,000
Number of pole pairs		2	2	2
Wiring of the motor winding		Y	Y	Y
DC bus voltage [V _{DC}]	U_{bus}	48*	320	560
Rated voltage motor [V _{rms}]	U_{mot}	28	179	305
Rated power [W]	P_n	600	600	600
Rated torque [Nm]	M_n	1.91	1.91	1.91
Rated current per phase [A _{rms}]	I_n	15.2	2.4	1.4
Stall torque [Nm]	M_0	2.4	2.4	2.4
Stall current per phase [A _{rms}]	I_0	19.1	3.0	1.8
Peak torque [Nm]	M_{max}	9.6	9.6	9.6
Peak current [A _{rms}]	I_{max}	76.3	12.0	7.1
Maximum speed [rpm]	n_{max}	3,650	3,870	3,950
Voltage constant at 1,000 rpm [V _{rms}]	k_e	15.3	97.5	166.1
Torque constant [Nm / A _{rms}]	k_t	0.13	0.80	1.35
Winding resistance (2 phases) at 20 °C [Ω]	R_{p-p}	0.1	2.5	7.1
Winding inductance (2 phases) [mH]	L_{p-p}	0.3	12.0	34.8
Moment of inertia rotor [kg-cm ²]	J	1.76E-04	1.76E-04	1.76E-04
Weight motor [kg]	m	3.0	3.0	3.0

* on request

Performance



Dimensions



BLDC09-320

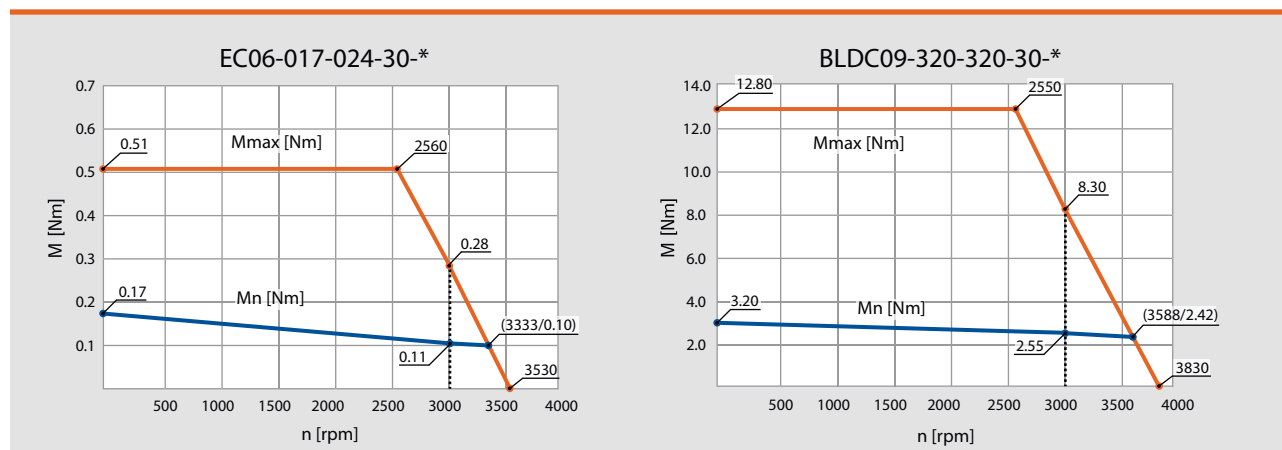


Specifications

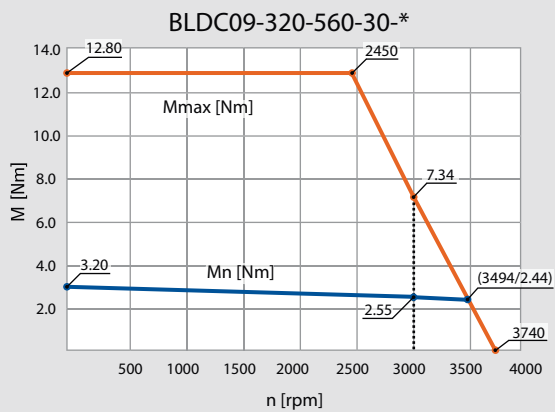
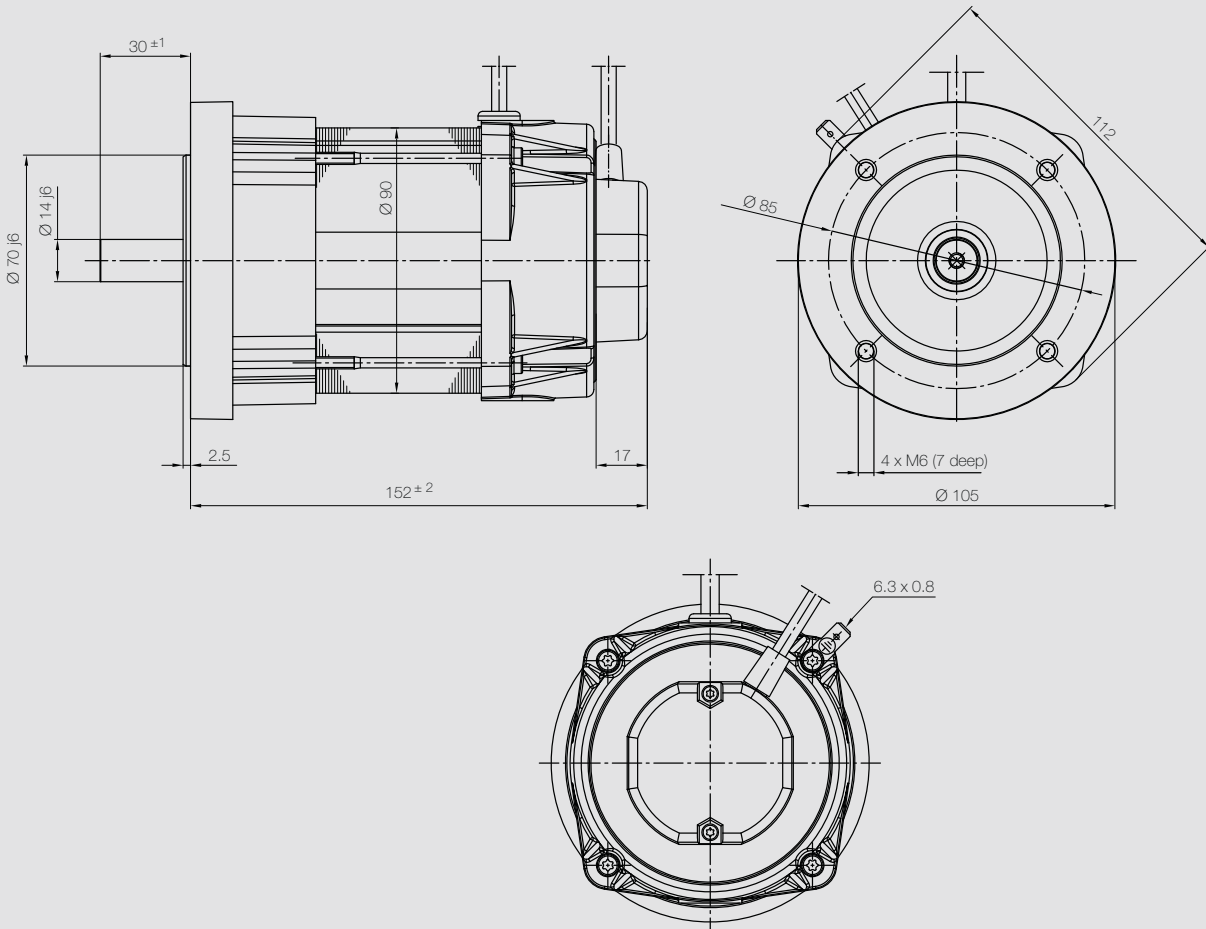
		BLDC09-320		
Rated speed [rpm]	n_n	3,000	3,000	3,000
Number of pole pairs		2	2	2
Wiring of the motor winding		Y	Y	Y
DC bus voltage [V _{DC}]	U_{bus}	48*	320	560
Rated voltage motor [V _{rms}]	U_{mot}	28	180	320
Rated power [W]	P_n	800	800	800
Rated torque [Nm]	M_n	2.55	2.55	2.55
Rated current per phase [A _{rms}]	I_n	19.9	3.2	1.8
Stall torque [Nm]	M_0	3.2	3.2	3.2
Stall current per phase [A _{rms}]	I_0	24.9	4.0	2.2
Peak torque [Nm]	M_{max}	12.8	12.8	12.8
Peak current [A _{rms}]	I_{max}	99.7	15.8	8.9
Maximum speed [rpm]	n_{max}	3,550	3,830	3,740
Voltage constant at 1,000 rpm [V _{rms}]	k_e	15.7	98.7	175.8
Torque constant [Nm / A _{rms}]	k_t	0.13	0.81	1.44
Winding resistance (2 phases) at 20 °C [Ω]	R_{p-p}	0.0	1.6	5.1
Winding inductance (2 phases) [mH]	L_{p-p}	0.2	8.9	28.4
Moment of inertia rotor [kg·cm ²]	J	2.35E-04	2.35E-04	2.35E-04
Weight motor [kg]	m	3.6	3.6	3.6

* on request

Performance



Dimensions



Connection technology

	Motor model	AWG	Length [mm]
EC motors	EC06-017	20	200
	EC06-028	20	200
	EC07-034	20	200
	EC07-051	20	200
	EC07-068	20	200
	EC08-075	20	200
	EC08-100	20	200
BLDC motors	BLDC07-067	20	200
	BLDC07-135 (48 V)	18	200
	BLDC07-135	20	200
	BLDC09-240 (48 V)	14	200
	BLDC09-240	20	200
	BLDC09-320 (48 V)	14	200
	BLDC09-320	20	200

Strand ends open

Encoder

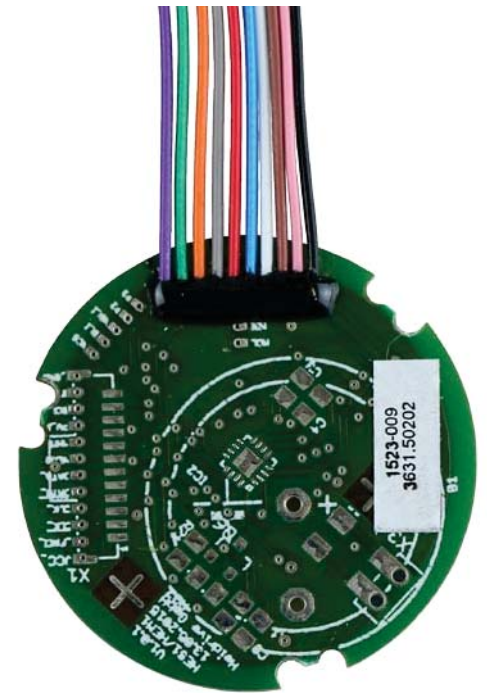
In their standard version, all EC motors are equipped with a rotor position detection (RLE). Optionally the motors of type EC07 (type 306) are also available with a HES encoder.

In the standard version of the entire BLDC motor series the HES encoder is installed.

Overview of encoders that can be used:

	Motor model	RLE	HES
EC motors	EC06-017	X	
	EC06-028	X	
	EC07-034	X	X
	EC07-051	X	X
	EC07-068	X	X
	EC08-075	X	
	EC08-100	X	
BLDC motors	BLDC07-067		X
	BLDC07-135		X
	BLDC09-240		X
	BLDC09-320		X

■ Hall encoder HES 1



Features:

Motor feedback angle sensor with a resolution of 12 bit (interpolated 14 bit) and numerous initial configurations:

- SSI interface, up to 14 bit, differential and single ended
- Sin/Cos with 1 V_{p-p} or 4.5 V_{p-p}

Application:

- Rotor position detection for EC and BLDC motors
- Resolver replacement for servo motors

General specifications

Sensor principle		Magnetoresistive effect
Maximum speed:		80,000 rpm at 12 bit 10,000 rpm at 14 bit
Signals:	SSI sin/cos	single ended and differential differential, 1 period per turn, 1 V _{p-p} or 4.5 V _{p-p}
Sensor accuracy	sin/cos	± 0.09° at 12 bit
Resolution	SSI	12 bit (14 bit interpolated)

Electrical specifications

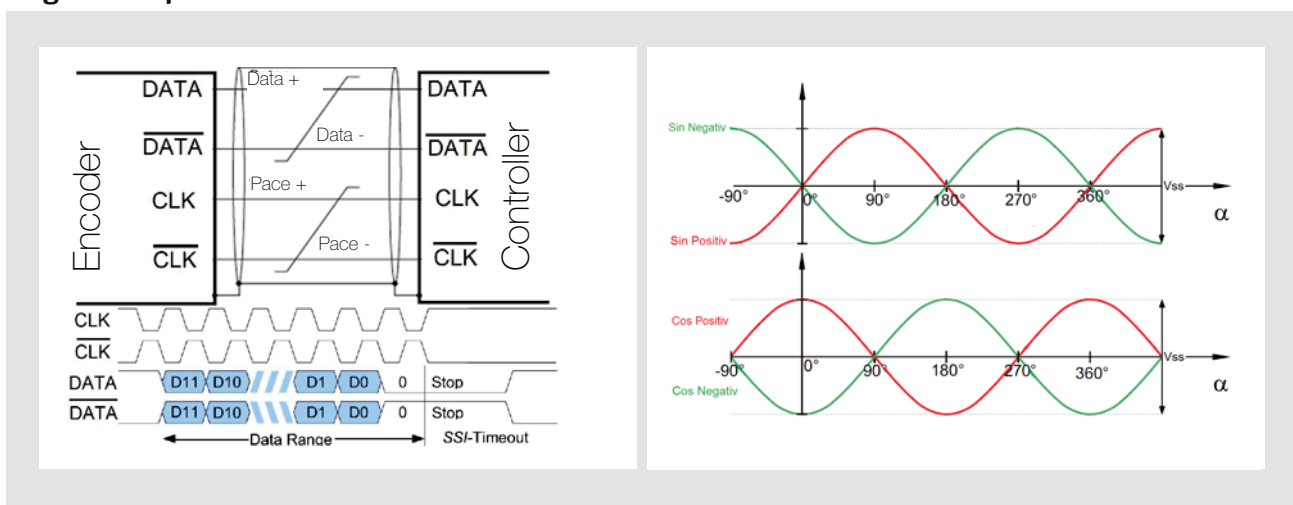
ESD voltage (all pins)		2 kV
Power supply voltage		5.0 V _{DC} ± 10%
Input voltage SSI CLK (RS422)	high	minimum 2.0 V
	low	maximum 0.8 V
Output voltage SSI DATA (RS422)	high	minimum 4.1 V
	low	maximum 0.4 V
Output voltage sin/cos		1.0 V _{p-p} or 4.5 V _{p-p} ± 10%
Output frequency sin/cos	sin/cos	10 kHz
	SSI	4 MHz

Output signals

HES1 with leads on X2

- SSI-interface (differential)
- Differential sin/cos with 1 V_{p-p} or 4.5 V_{p-p}

Signal output



Leads functions

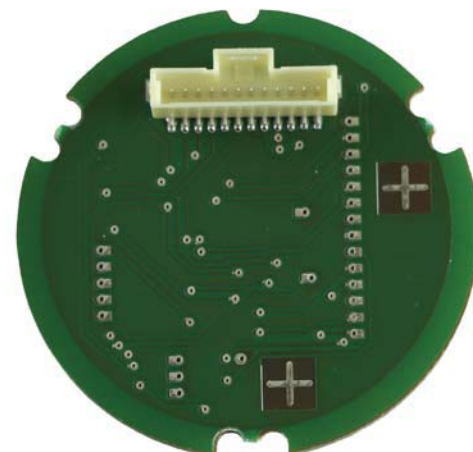
Pin	Leads functions X2	Color
X2.1	SSI CLK/	purple
X2.2	SSI DATA/	green
X2.3	SSI CLK	orange
X2.4	SSI DATA	grey
X2.5	V _{CC}	red
X2.6	GND	blue
X2.7	SIN	white
X2.8	SIN/	brown
X2.9	COS	pink
X2.10	COS/	black

■ Hall encoder HES 2

Features:

Motor feedback angle sensor with a resolution of 10 bit (interpolated 12 bit) and numerous initial configurations:

- SSI interface, up to 12 bit, single ended
- 10 bit incremental ABZ outputs, differential and single ended
- Hall signal outputs for 2, 4 and 8 pole motors, differential and single ended



General specifications

Sensor principle		Magnetostrictive effect
Maximum speed:		120,000 rpm
Signals:	SSI ABZ/UWW	single ended single ended and differential commutation signals for 2, 4 and 8 pole motors
Absolute accuracy	SSI/ABZ	10 bit ($2^{10} = 1,024$ pulses per rotation)
Relative accuracy	SSI	12 bit ($2^{12} = 4,096$ pulses per rotation)

Electrical specifications

ESD voltage (all pins)		2 kV
Power supply voltage		$5.0 V_{DC} \pm 10\%$
Input voltage SSI CLK (RS422)	high	minimum 2.0 V
	low	maximum 0.8 V
Output voltage SSI DATA (RS422)	high	minimum 4.1 V
	low	maximum 0.4 V
Output voltage ABZ/UWW	high	minimum 3.8 V
	low	maximum 0.7 V
Output frequency		4 MHz

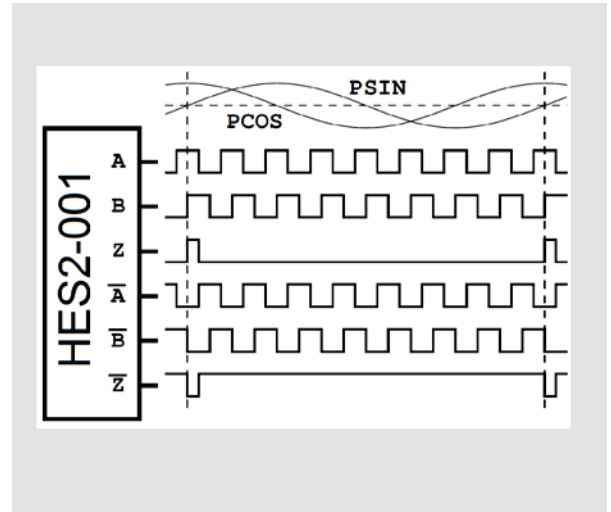
Output signals

3 variants with different output signals

HES2 - ABZ differential

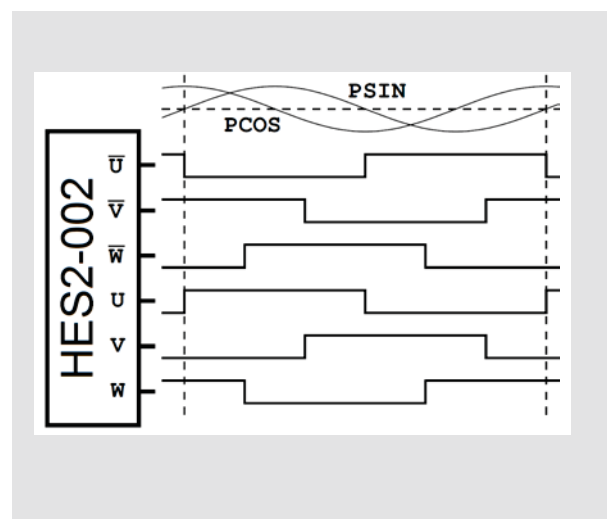
Pin	Pin assignment X1	Function
X1.1	VCC	+5 V
X1.2	VZAP	Zapping-voltage
X1.3	PTE	Test Enable Pin
X1.4	CLK	SSI interface CLK input
X1.5	Z/	Incremental signal Z, negative
X1.6	DATA	SSI interface data output
X1.7	B/	Incremental signal B, negative
X1.8	A	Incremental signal A, positive
X1.9	B	Incremental signal B, positive
X1.10	Z	Incremental signal Z, positive
X1.11	A/	Incremental signal A, negative
X1.12	GND	Ground

Signal output



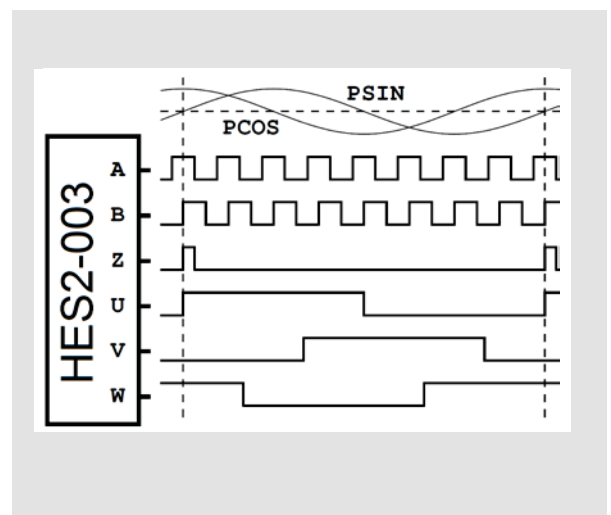
HES2 - UVW differential

Pin	Pin assignment X1	Function
X1.1	V _{CC}	+5 V
X1.2	VZAP	Zapping-voltage
X1.3	PTE	Test Enable Pin
X1.4	CLK	SSI interface CLK input
X1.5	W	Commutation signal W, positive
X1.6	DATA	SSI interface data output
X1.7	V	Commutation signal V, positive
X1.8	U/	Commutation signal U, negative
X1.9	V/	Commutation signal V, negative
X1.10	W/	Commutation signal W, negative
X1.11	U	Commutation signal U, positive
X1.12	GND	Ground



HES2 - ABZ/UVW differential

Pin	Pin assignment X1	Function
X1.1	V _{CC}	+5V
X1.2	VZAP	Zapping-voltage
X1.3	PTE	Test Enable Pin
X1.4	CLK	SSI interface CLK input
X1.5	W	Commutation signal W
X1.6	DATA	SSI interface data output
X1.7	V	Commutation signal V
X1.8	A	Incremental signal A
X1.9	B	Incremental signal B
X1.10	Z	Incremental signal Z
X1.11	U	Commutation signal U
X1.12	GND	Ground



Technical data subject to change! Last changes 11/2016



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