HIWIN®

Torque Motors

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Note:
The technical data in this catalogue may
be changed without prior notice.

Motors, Drives & Accessories

Torque Motors

Alongside complete rotary tables, HIWIN also offers individual torque motor components for the customised design of directly driven rotary axes. The torque motor components each consist of a hollow shaft rotor and a stator with coils.

Assembly instructions and catalogue for download

Here you can download the corresponding assembly instructions and the current catalogue as PDF files.

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- Typical field of application: automation technology

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- New generation of TMRW series
- Torques up to 6,000 Nm
- Water cooling
- Typical field of application: machine tool

HIWIN torque motors IM-2 Page 43

- High speed motor with highest speed spectrum
- Torques up to 5,700 Nm
- Water cooling
- Typical field of application: machine tool, specially combined turning/milling axes

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2. General information

2.1 Typical features of the torque motors

HIWIN torque motors are high-pole synchronous servomotors. Due to the high-pole structure, no downstream transmission is required for speed reduction and torque increase. HIWIN torque motors are typically used as direct drives in high-precision rotary and tilting axes.
The power transmission between the input and output sides is contactless. Mechanical components in the drivetrain, as they are present in classic engine/gearbox combinations, are not required.
The result is a wear- and maintenance-free drive with maximum efficiency. Due to the very rigid load coupling, HIWIN torque motors are predestined for highly dynamic applications with rapid load changes that push classic motor/gearbox combinations to their limits. In order to avoid introducing additional process heat, especially in the machine tool sector, the torque motors are equipped with cooling channels for liquid cooling.

- Wear-free and maintenance-free direct drive
- High constant torque independent of speed
- Highly dynamic and silent
- Play-free and highly precise
- Fast speed changes and maximum rigidity
- High efficiency
- Compact design with hollow shaft
- Made ready for liquid cooling

2.2 General structure of the torque motors

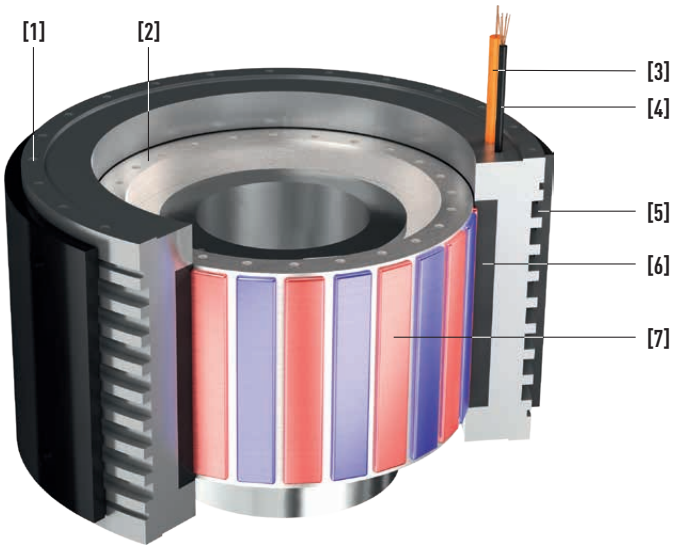
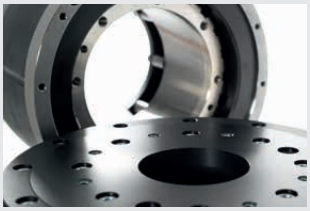
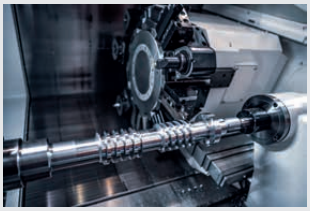
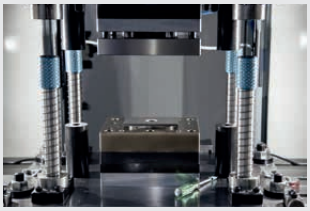


Table 2.1 **Main components of the torque motors**

Pos.	Component	Pos.	Component
1	Stator	5	Cooling channels for liquid cooling
2	Rotor with permanent magnets and hollow shaft	6	Winding package encapsulated in epoxy resin
3	Motor cable	7	Permanent magnets
4	Temperature sensor cable		

2.3 Typical application examples for torque motors

Table 2.2 **Typical application examples for torque motors**

Machine tools		Automation technology	
	Rotary and tilting axes (A, B, C axes)		Brake motors for roll-off drives
	Combined axes for turning and milling operations		Electronic rotary indexing tables
	Tool changer (turret)		Servo presses
	Infeed axes of pin chasing grinding machines (non-circular grinding)		Laser processing (B and C axes)

2.4 Glossary

Continuous current I_c / I_{c_WC} (A)
The continuous current or rated current I_c, or I_{c_WC} in the case of water cooling, is the current which in continuous operation heats the motor to the permissible motor temperature T_{max} at an ambient temperature of 25 °C.

Continuous torque T_c / T_{c_WC} (Nm)
The motor generates the continuous torque or rated torque in continuous operation (duty cycle = 100 %).

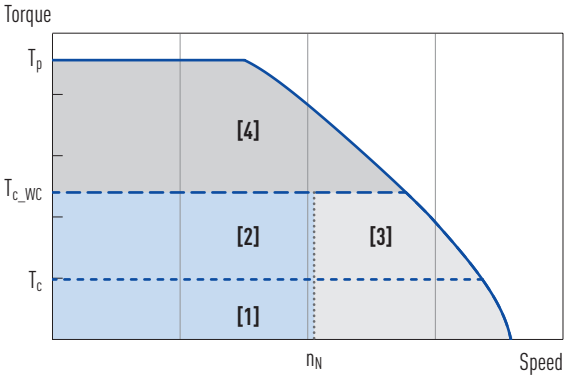
Stall current I_s / I_{s_WC} (A)
The stall current is the current that generates the maximum stall torque T_s or T_{s_WC} at a motor temperature of 25 °C.

Stall torque T_s / T_{s_WC} (Nm)
If the motor is operated with a frequency of 0 – 1 Hz, the motor torque must be reduced to the maximum stall torque T_s or T_{s_W}C in continuous operation.

Peak current I_p (A)
The peak current is applied briefly to generate the peak torque. The maximum permissible duration of the peak current is one second. The motor must then cool down to the nominal temperature before the peak current can be applied again.

Peak torque T_p (Nm)
The peak torque is the maximum torque that the motor can generate for about one second. For HIWIN products, it is at the end of the linear modulation range at the peak current Ip and is particularly important during acceleration and braking.

Torque-speed curve
The torque-speed curve describes the available torque T as a function of the speed n and the input voltage UDC.



- Range **[1]**
  Continuous operation without water cooling: When operating without water cooling, the motor can be operated continuously up to the maximum motor torque T_c and the maximum speed n_N.
- Ranges **[1]** + **[2]**
  Continuous operation with water cooling: When operating with water cooling, the motor can be operated in continuous operation up to the maximum motor torque T_{c_WC} and the maximum speed n_N.
- Range **[3]**
  Intermittent operation: When operating at a speed greater than n_N, the load cycle must be reduced to avoid thermal overload of the motor.
- Range **[4]**
  Intermittent operation: When operating with a torque greater than T_c (without water cooling) or T_{c_WC} (with water cooling), the load cycle must be reduced to avoid thermal overload of the motor.

Back emf constant K_u (V_{eff}/(rad/s))
The back EMF constant K_u is the ratio of the back EMF voltage (V_{eff}) to the motor speed (rad/s). The back EMF is an electromagnetic force generated by the movement of the coils in the magnetic field of the permanent magnets and acts contrary to the motor force.

Winding temperature T_{max} (°C)
Permissible winding temperature. The actual motor temperature depends on the installation conditions, the cooling conditions and the operating conditions and can therefore only be determined in the specific case and only inadequately calculated.

Winding resistance R_{25} (Ω)
Winding-specific parameter that specifies the winding resistance line to line at 25 °C winding temperature.

Winding inductance L_{25} (mH)
Winding-specific parameter indicating the inductance line to line at 25 °C winding temperature.

Motor constant K_m (Nm/√W)
Ratio of generated power to power loss, i. e. a measure of the efficiency of a motor.

Number of poles 2p
The number of poles 2p indicates the number of single poles of the motor, P the number of pole pairs.

Thermal resistance R_{th} (°C/W)
Thermal resistance is defined as the resistance below which the motor winding dissipates heat to the environment. Considered is the natural convection at an ambient temperature of 25 °C, and for the water-cooled versions at a water temperature of 25 °C.

Torque constant K_t (Nm/A)
Winding-specific parameter from which the resulting torque at 25 °C motor temperature is calculated by multiplication with the input current.
$T = I \times K_t$

Maximum speed n_{max} (min^{-1})
The maximum speed is defined as the speed at which a specific torque is still achieved. 3 maximum speeds are specified, n_{max} at T_c, n_{max} at T_{c_WC} and n_{max} at T_p.

Rated speed n_N (min^{-1})
The rated speed is defined as the speed at which the rotor does not heat up above 80 °C in continuous operation. At higher speeds, either the duty cycle must be reduced or suitable measures must be taken for rotor cooling.

Maximum input voltage U_{max} (VDC)
Maximum DC bus voltage of the drive amplifier, or the resulting maximum input voltage at the motor.

3. HIWIN torque motors DMR

3.1 Special characteristics of the torque motors DMR

DMR series torque motors are ready-to-install motor elements consisting of a stator and rotor, especially suitable for the field of automation technology.
The rotor is designed as a ring element. Due to their high continuous and peak torques, they enable high accelerations and thus short cycle times.

Key features of the torque motors DMR:

- Wear- and maintenance-free direct drive
- Play-free and highly precise
- UL-certified (DMR3, DMR7)

Typical fields of application for the torque motors DMR:

- Automation technology
- Rotary indexing tables

3.2 Order code for torque motors DMR

DMR	0	2	L	C

Series:
DMR

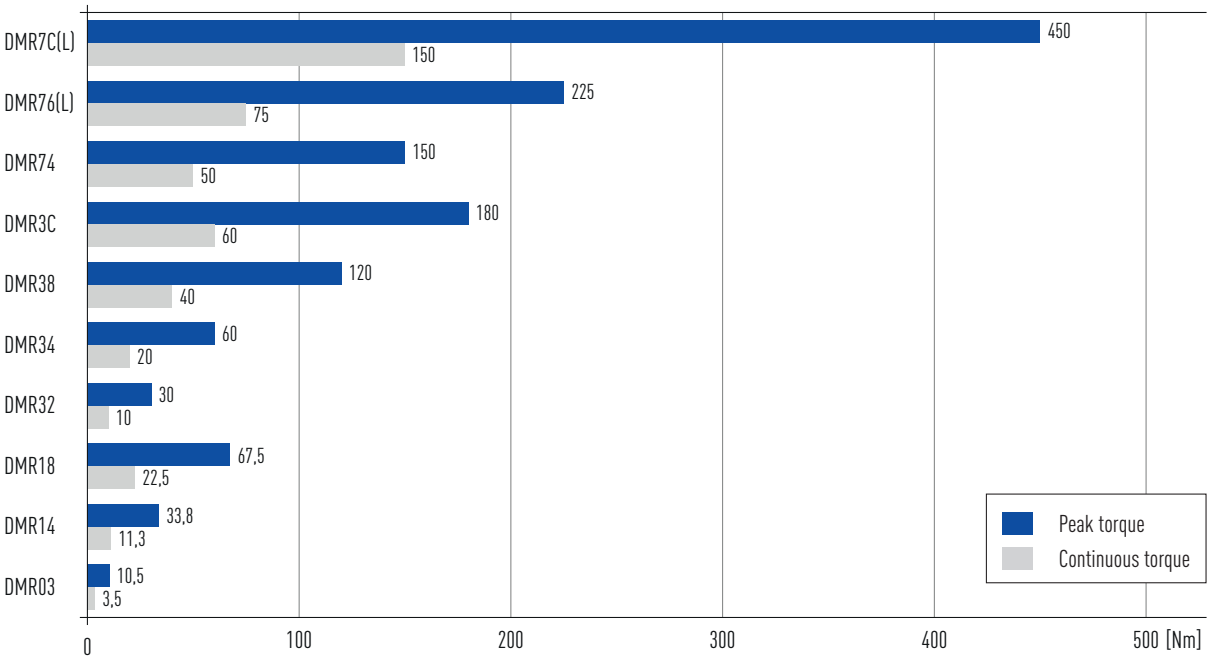
Outer diameter [mm]:
0: 110
1: 150
3: 193
7: 291

Rotor height [mm]:
2: 20
3: 30
4: 40
6: 60
7: 65
8: 80
C: 120

Winding variant:
None: Standard winding
L: For high rotary speed

Special equipment:
0: None
C: Customer specific

3.3 DMR torques



3.4 Torque motor DMR specifications

3.4.1 DMR0 specifications

Torque-speed curve (DC bus voltage: 600 VDC)

DMR03

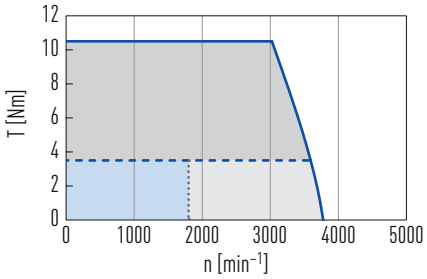
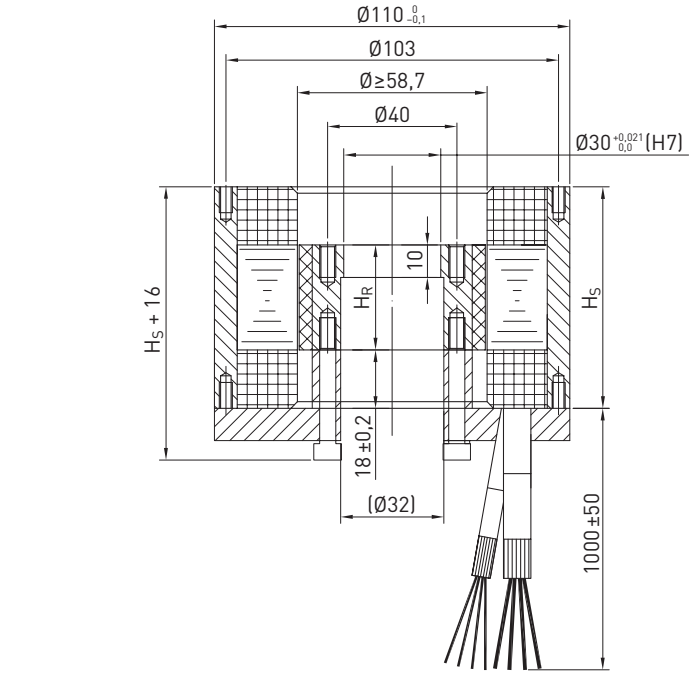


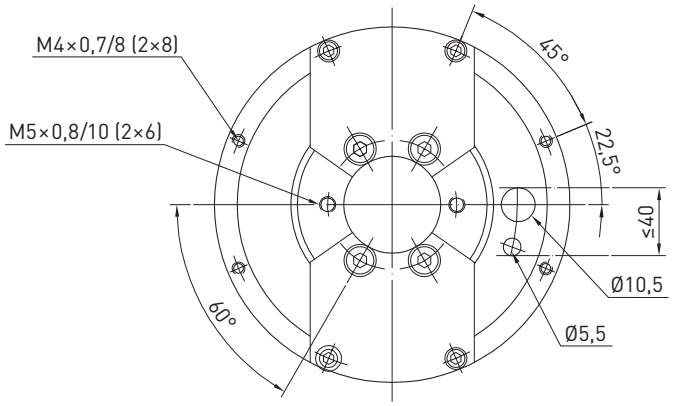
Table 3.1 **Technical data for DMR0**

	Symbol	Unit	DMR03
Torques and electrical parameters			
Peak torque (for 1 sec.)	T_p	Nm	10.5
Continuous torque [1]	T_c	Nm	3.5
Stall torque	T_s	Nm	2.5
Peak current (for 1 sec.)	I_p	A	6.8
Continuous current [1]	I_c	A	2.3
Stall current	I_s	A	1.6
Resistance [2]	R_{25}	Ω	7.1
Inductance [2]	L_{25}	mH	15.2
Motor constant	K_m	Nm/√W	0.5
Electrical time constant	K_e	ms	2.1
Torque constant	K_t	Nm/A	1.55
Back emf constant	K_u	V_{eff}/(rad/s)	0.82
Inertia of rotor	J	kgm^2	0.00018
Thermal resistance	R_{th}	°C/W	1.76
Thermal time constant	T_{th}	s	1,930
Max. DC bus voltage	U_{max}	VDC	600
Rated speed	n_N	min^{-1}	1,800
Mechanical parameters			
Number of poles	2p		10
Thermal sensor			PTC SNM 120
Stator height	H_S	mm	68.5
Rotor height	H_R	mm	32.5
Mass of motor	M_m	kg	2.6

All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature
[1] Coil temperature: 120 °C
[2] Line to line

Dimensions DMR0

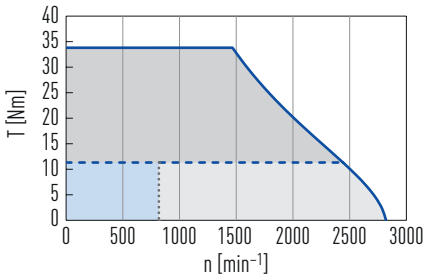




3.4.2 DMR1 specifications

Torque-speed curves (DC bus voltage: 600 VDC)

DMR14



DMR18

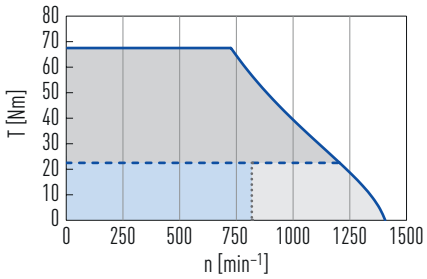


Table 3.2 **Technical data for DMR1**

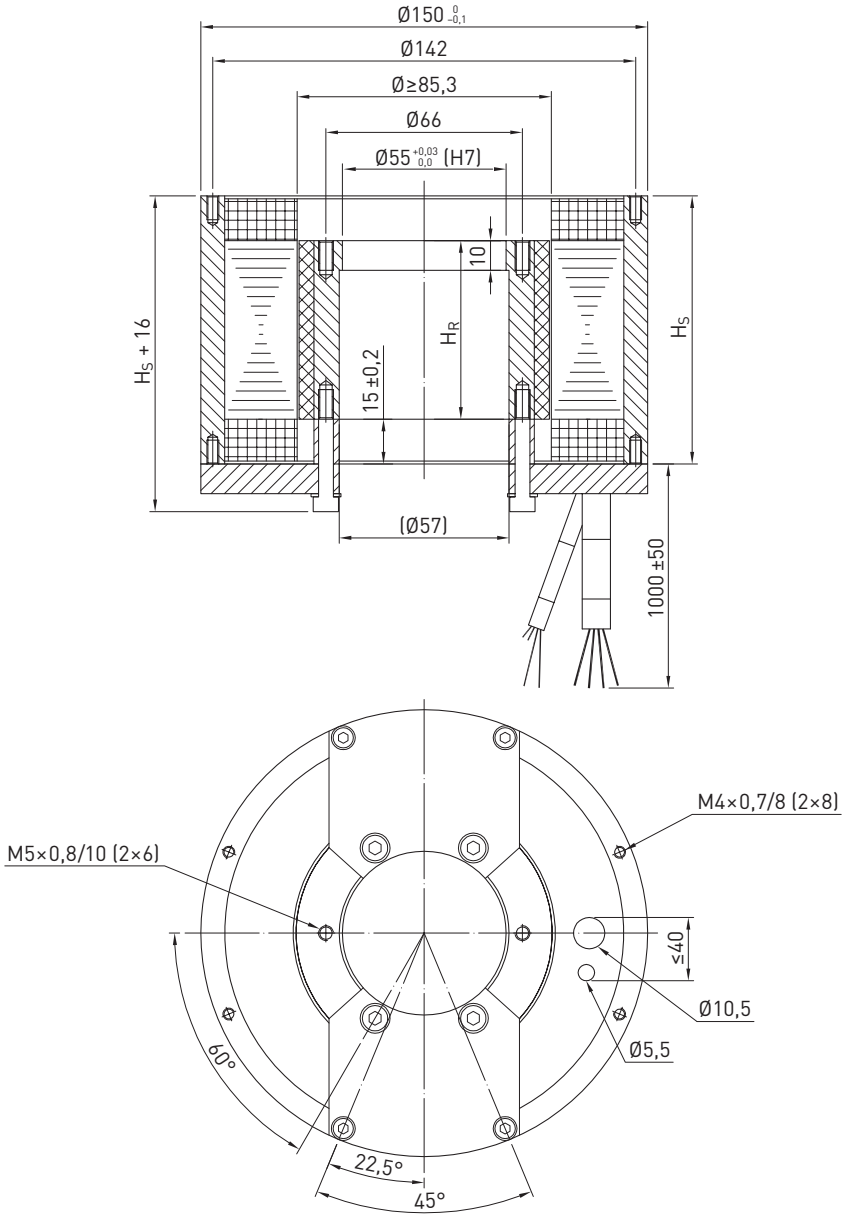
	Symbol	Unit	DMR14	DMR18
Torques and electrical parameters				
Peak torque (for 1 sec.)	T_p	Nm	33.8	67.5
Continuous torque [1]	T_c	Nm	11.3	22.5
Stall torque	T_s	Nm	7.9	15.8
Peak current (for 1 sec.)	I_p	A	13.5	13.5
Continuous current [1]	I_c	A	4.5	4.5
Stall current	I_s	A	3.2	3.2
Resistance [2]	R_{25}	Ω	3.9	6.5
Inductance [2]	L_{25}	mH	14	26
Motor constant	K_m	Nm/√W	1.0	1.6
Electrical time constant	K_e	ms	3.6	4.0
Torque constant	K_t	Nm/A	2.50	5.0
Back emf constant	K_u	V_{eff}/(rad/s)	1.2	2.4
Inertia of rotor	J	kgm^2	0.00088	0.00175
Thermal resistance	R_{th}	°C/W	0.80	0.48
Thermal time constant	T_{th}	s	2,290	2,520
Max. DC bus voltage	U_{max}	VDC	600	
Rated speed	n_N	min^{-1}	818	818
Mechanical parameters				
Number of poles	2p		22	
Thermal sensor			PTC SNM 120	
Stator height	H_S	mm	70	110
Rotor height	H_R	mm	40	80
Mass of motor	M_m	kg	4.8	8.3

All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature

[1] Coil temperature: 120 °C

[2] Line to line

Dimensions DMR1



3.4.3 DMR3 specifications

Torque-speed curves (DC bus voltage: 600 VDC)

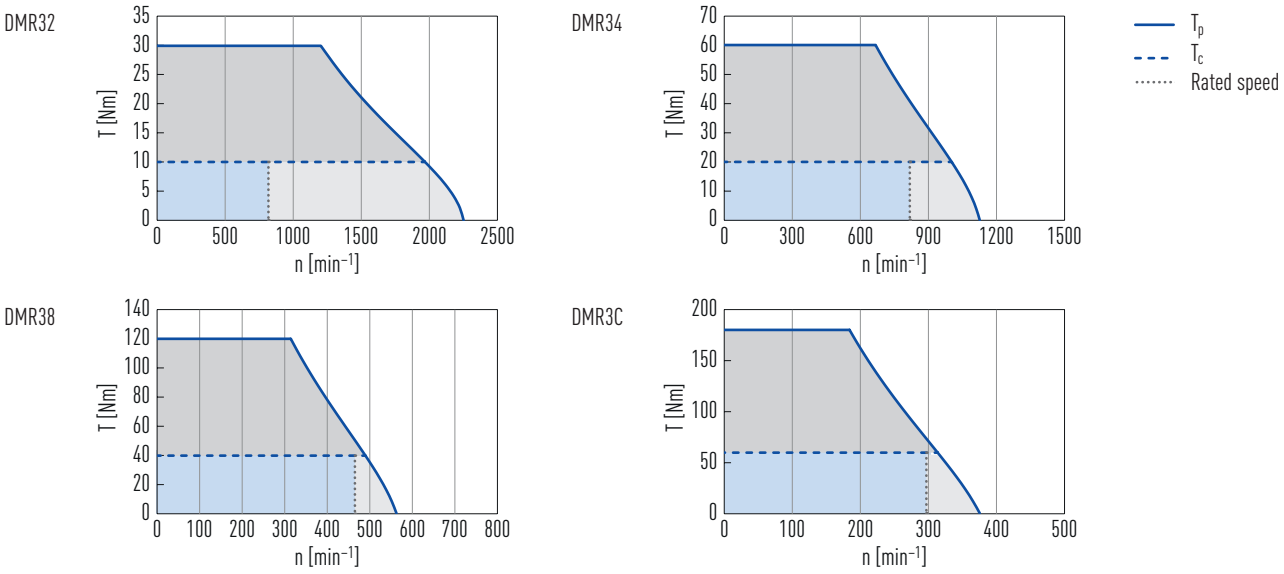
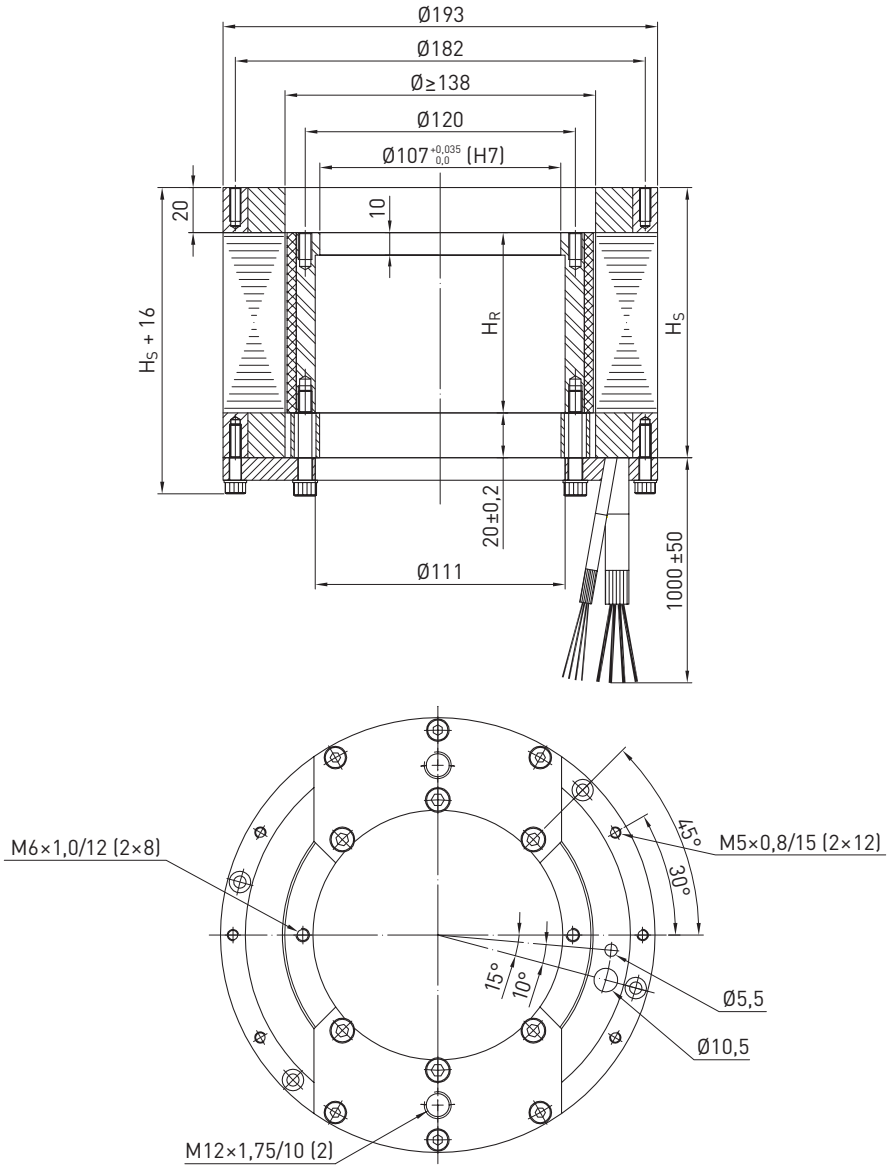


Table 3.3 **Technical data for DMR3**

	Symbol	Unit	DMR32	DMR34	DMR38	DMR3C
Torques and electrical parameters						
Peak torque (for 1 sec.)	T_p	Nm	30	60	120	180
Continuous torque [1]	T_c	Nm	10	20	40	60
Stall torque	T_s	Nm	7	14	28	42
Peak current (for 1 sec.)	I_p	A	10.2	10.2	10.2	10.2
Continuous current [1]	I_c	A	3.4	3.4	3.4	3.4
Stall current	I_s	A	2.4	2.4	2.4	2.4
Resistance [2]	R_{25}	Ω	5.0	7.5	12.0	17.1
Inductance [2]	L_{25}	mH	20.6	34.6	53.6	84.4
Motor constant	K_m	Nm/√W	1.1	1.8	2.8	3.6
Electrical time constant	K_e	ms	4.1	4.6	4.5	4.9
Torque constant	K_t	Nm/A	3	6	12	18
Back emf constant	K_u	V_{eff}/(rad/s)	1.5	3.0	6.0	9.0
Inertia of rotor	J	kgm^2	0.002	0.005	0.009	0.014
Thermal resistance	R_{th}	°C/W	1.1	0.73	0.46	0.32
Thermal time constant	T_{th}	s	1,980	2,020	2,130	2,170
Max. DC bus voltage	U_{max}	VDC	600			
Rated speed	n_N	min^{-1}	818	818	465	297
Mechanical parameters						
Number of poles	2p		22			
Thermal sensor			PTC SNM 120			
Stator height	H_S	mm	60	80	120	160
Rotor height	H_R	mm	20	40	80	120
Mass of motor	M_m	kg	5.7	8.2	13.2	18.1

All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature
[1] Coil temperature: 120 °C
[2] Line to line

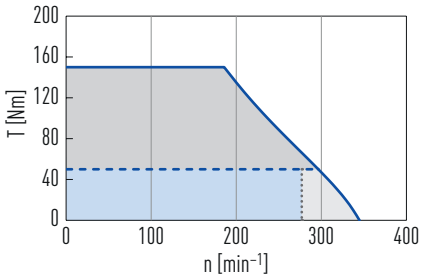
Dimensions DMR3



3.4.4 DMR7 specifications

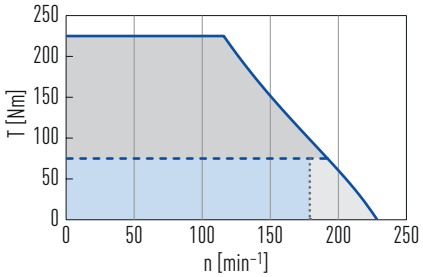
Torque-speed curves (DC bus voltage: 600 VDC)

DMR74

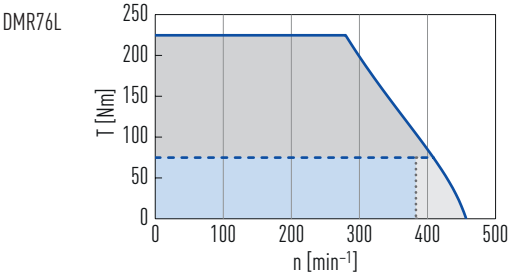


T_p
T_c
Rated speed

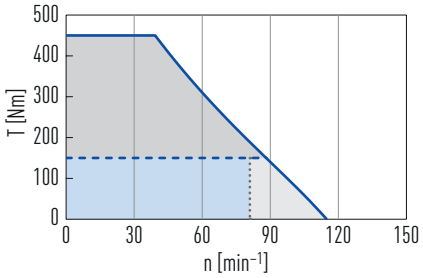
DMR76



DMR76L



DMR7C



DMR7CL

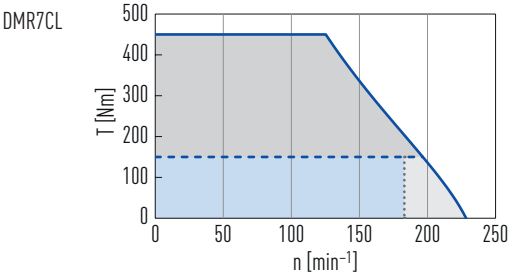


Table 3.4 **Technical data for DMR7**

	Symbol	Unit	DMR74	DMR76	DMR76L	DMR7C	DMR7CL
Torques and electrical parameters							
Peak torque (for 1 sec.)	T_p	Nm	150	225		450	
Continuous torque [1]	T_c	Nm	50	75		150	
Stall torque	T_s	Nm	35.0	52.5		105.0	
Peak current (for 1 sec.)	I_p	A	10.2	10.2	20.4	10.2	20.4
Continuous current [1]	I_c	A	3.4	3.4	6.8	3.4	6.8
Stall current	I_s	A	2.4	2.4	4.8	2.4	4.8
Resistance [2]	R_{25}	Ω	12.9	17.0	4.3	29.0	7.3
Inductance [2]	L_{25}	mH	55.0	76.0	19.0	145.0	36.3
Motor constant	K_m	Nm/√W	3.9	5.1	5.0	7.7	7.7
Electrical time constant	K_e	ms	4.3	4.5	4.4	5.0	5.0
Torque constant	K_t	Nm/A	17.0	25.6	12.8	51.1	25.5
Back emf constant	K_u	V_{eff}/(rad/s)	9.8	14.8	7.4	29.5	14.8
Inertia of rotor	J	kgm²	0.044	0.061		0.11	
Thermal resistance	R_{th}	°C/W	0.42	0.32		0.19	
Thermal time constant	T_{th}	s	2,230	2,330		2,350	
Max. DC bus voltage	U_{max}	VDC	600				
Rated speed	n_N	min^{-1}	277	179	383	81	183

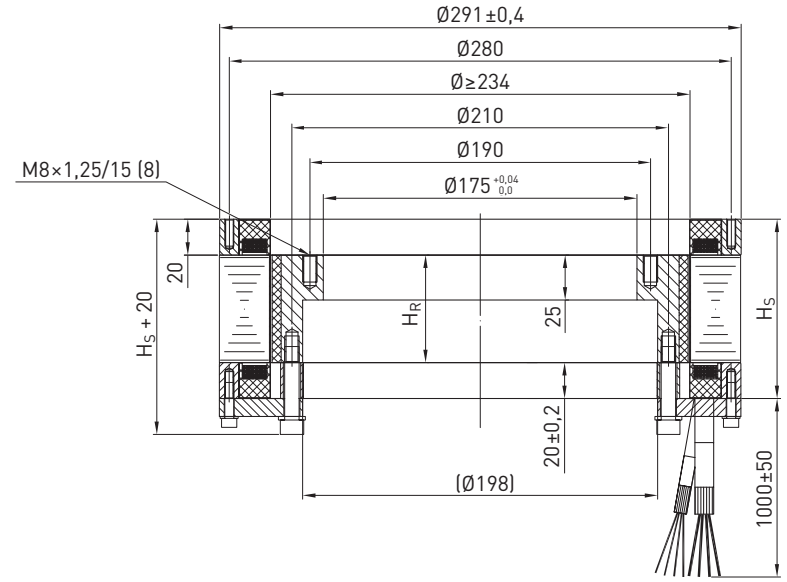
All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature
[1] Coil temperature: 120 °C
[2] Line to line

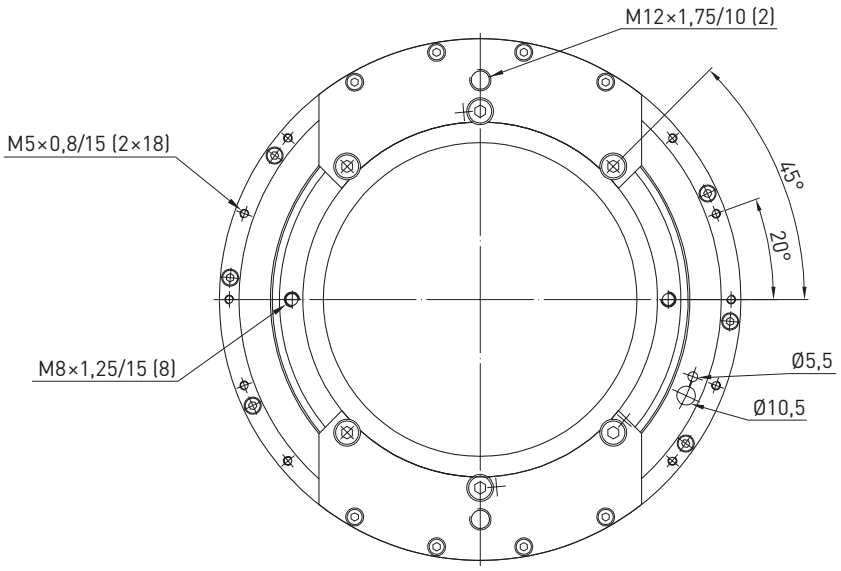
Table 3.4 **Technical data for DMR7**

	Symbol	Unit	DMR74	DMR76	DMR76L	DMR7C	DMR7CL
Mechanical parameters							
Number of poles	2p		44				
Thermal sensor			PTC SNM 120				
Stator height	H_S	mm	80	100		160	
Rotor height	H_R	mm	40	60		120	
Mass of motor	M_m	kg	15.9	20.4		33.7	

All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature
[1] Coil temperature: 120 °C
[2] Line to line

Dimensions DMR7





4. HIWIN torque motors TM-2

4.1 Special characteristics of the torque motors TM-2

TM-2 series torque motors are ready-to-install motor elements consisting of a stator and rotor, especially suitable for applications in machine tools.
Due to the integrated cooling channels, the torque motor can be operated with liquid cooling. No additional process heat is then introduced into the machine and higher continuous torques can be achieved.
The torque motors of the TM-2 series are based on the well-proven TMRW series. However, with identical dimensions, they are characterised by significantly higher torques as well as a reduced cogging moment.

Key features of the torque motors TM-2:

- Optimised for highest torques
- Wear- and maintenance-free direct drive
- Play-free and highly precise
- Prepared for liquid cooling
- UL-certified

Typical fields of application for the torque motors TM-2:

- Machine tools
- Servo presses
- Laser processing

4.2 Order code for torque motors TM-2

TM-2	7	5	SA0	1	20	S	00

Series:
TM-2

Outer diameter [mm]:
1: 160
2: 198
4: 230
7: 310
A: 385
D: 485
G: 565

Rotor height [mm]:
3: 30
5: 50
7: 70
A: 100
F: 150

Winding variant

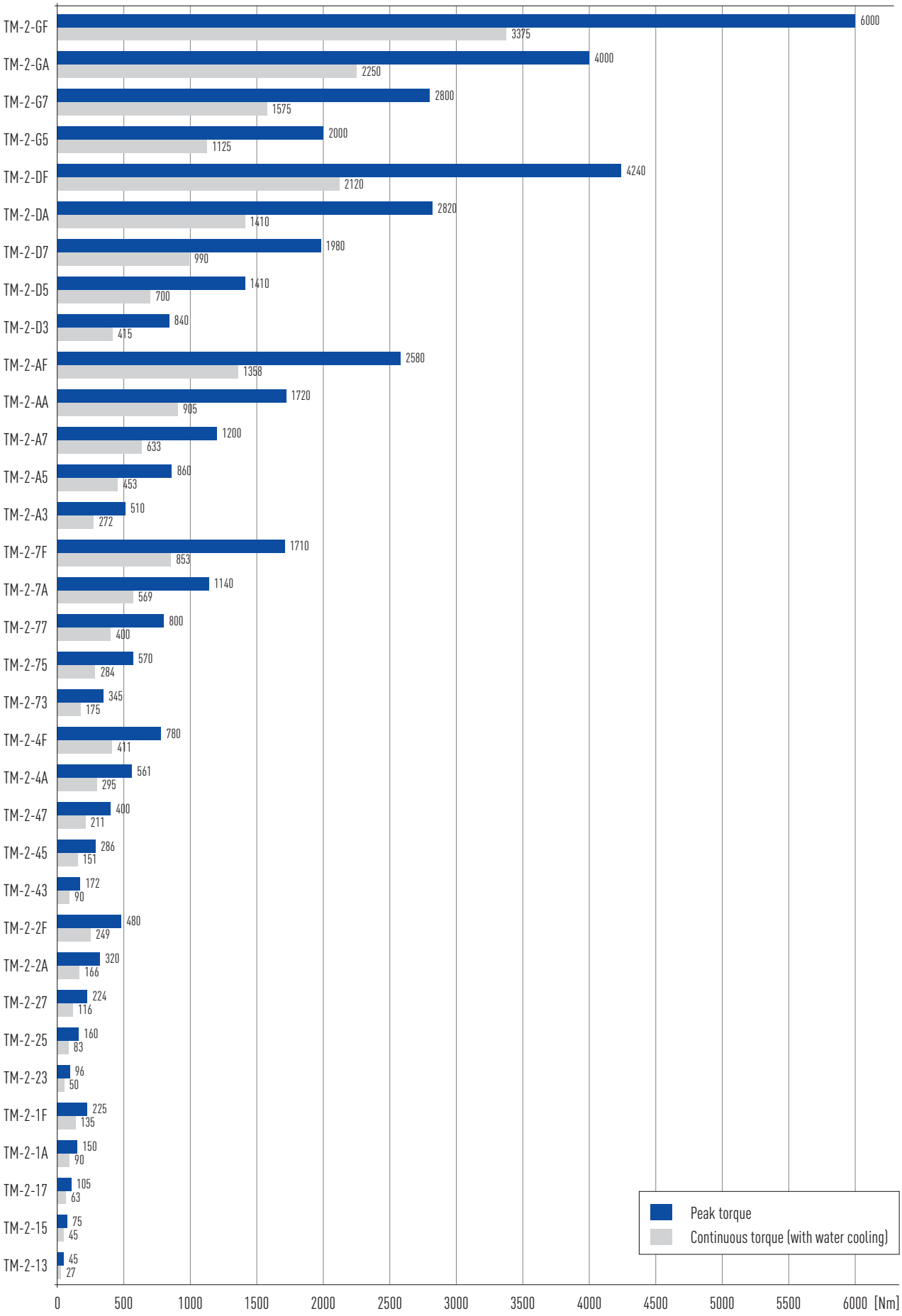
Special equipment:
00: Rotor and stator separately (standard)
03: Rotor and stator mounted with installation clamp

Cable outlet orientation:
S: Straight, potted in the stator
V: Straight, with strain relief plate
A: Straight, with PG screw connections
H: 90° motor cable outlet with strain relief plate

Cable length:
05: 500
10: 1,000
20: 2,000 (standard)

Thermal sensors:
0: 3 × PTC100, 3 × PTC130, 1 × PT1000 (standard)
1: 3 × PTC100, 3 × PTC130, 3 × PT1000

4.3 TM-2 torques

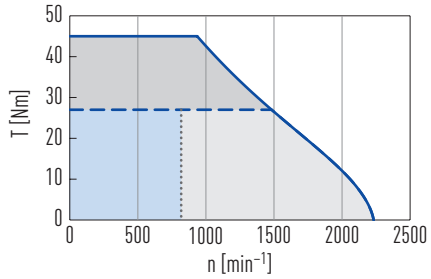


4.4 Torque motor TM-2 specifications

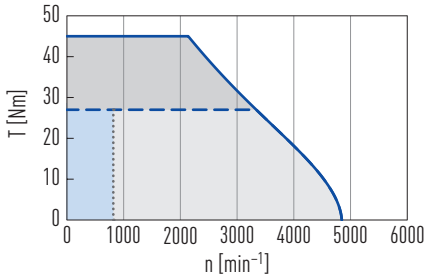
4.4.1 TM-2-1 specifications

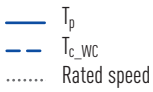
Torque-speed curves (DC bus voltage: 600 VDC)

TM-2-13-LA0

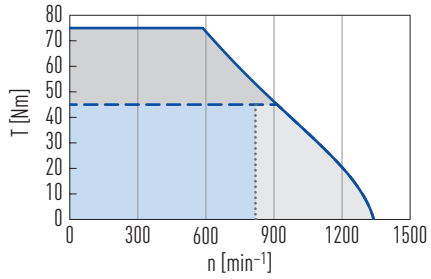


TM-2-13-SA0

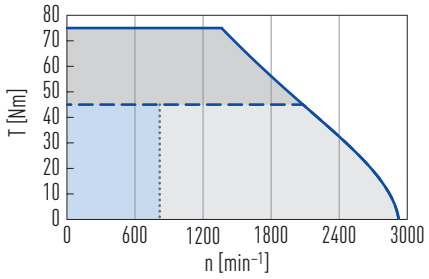




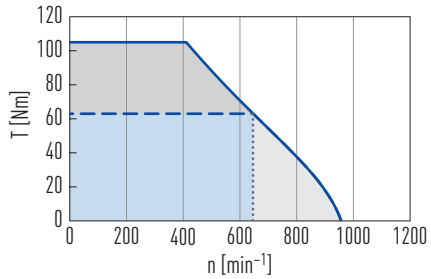
TM-2-15-LA0



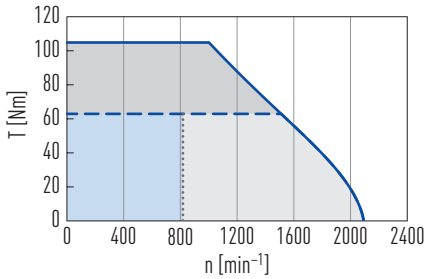
TM-2-15-SA0



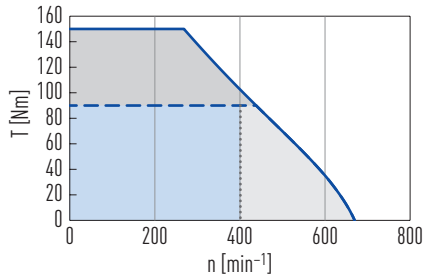
TM-2-17-LA0



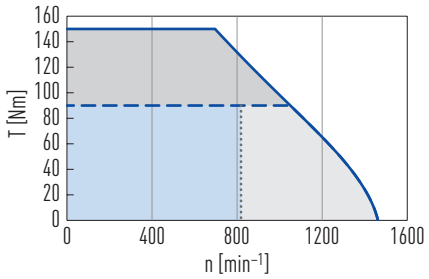
TM-2-17-SA0



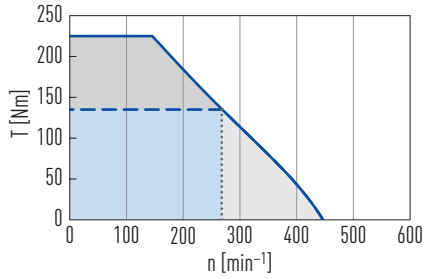
TM-2-1A-LA0



TM-2-1A-SA0



TM-2-1F-LA0



TM-2-1F-SA0

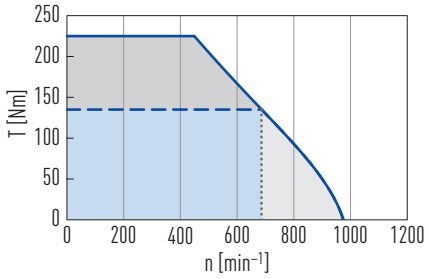
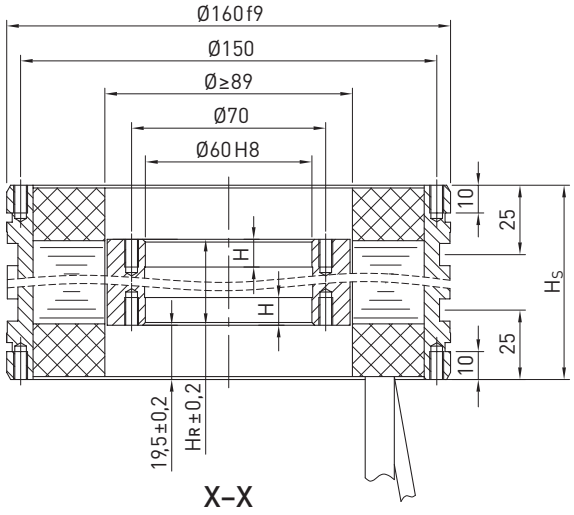


Table 4.1 **Technical data for TM-2-1**

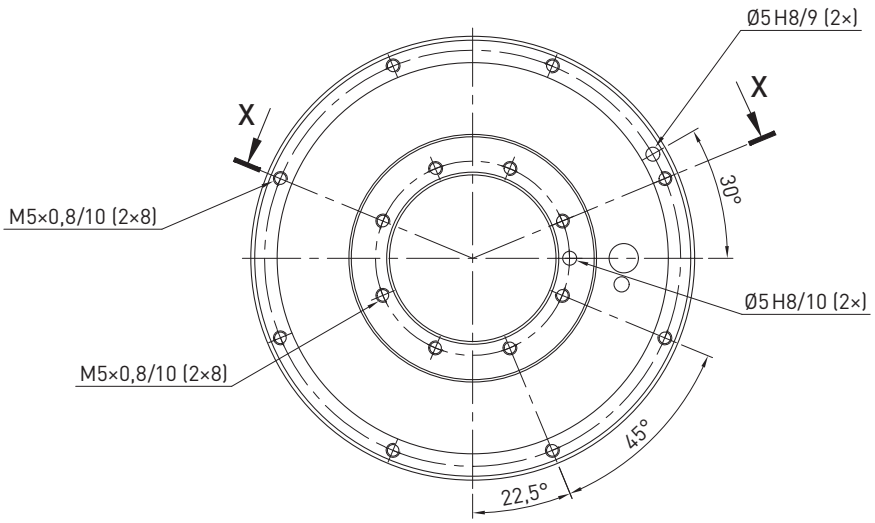
	Symbol	Unit	TM-2-13-LA0	TM-2-13-SA0	TM-2-15-LA0	TM-2-15-SA0	TM-2-17-LA0	TM-2-17-SA0	TM-2-1A-LA0	TM-2-1A-SA0	TM-2-1F-LA0	TM-2-1F-SA0
Torques and electrical parameters												
Peak torque (for 1 sec.)	T_p	Nm	45		75		105		150		225	
Continuous torque (WC)	T_{c_WC}	Nm	27		45		63		90		135	
Stall torque (WC)	T_{s_WC}	Nm	22		37		52		74		111	
Peak current (for 1 sec.)	I_p	A	20.0	43.4	20.0	43.4	20.0	43.4	20.0	43.4	20.0	43.4
Continuous current (WC)	I_{c_WC}	A	10.3	22.3	10.3	22.3	10.3	22.3	10.3	22.3	10.3	22.3
Stall current (WC)	I_{s_WC}	A	8.2	17.8	8.2	17.8	8.2	17.8	8.2	17.8	8.2	17.8
Resistance [1]	R_{25}	Ω	3.5	0.7	5.1	1.1	6.8	1.4	9.2	2.0	13.3	2.8
Inductance [1]	L_{25}	mH	17.1	3.6	25.2	5.4	33.3	7.1	45.5	9.7	65.8	14.0
Motor constant	K_m	Nm/√W	1.25	1.26	1.72	1.68	2.09	2.09	2.57	2.49	3.20	3.16
Electrical time constant	K_e	ms	4.9	5.1	4.9	4.9	4.9	5.1	4.9	4.9	4.9	5.0
Torque constant	K_t	Nm/A	2.86	1.32	4.76	2.18	6.67	3.05	9.53	4.36	14.29	6.55
Back emf constant	K_u	V_{eff}/(rad/s)	1.65	0.76	2.75	1.26	3.85	1.76	5.50	2.52	8.25	3.78
Inertia of rotor	J	kgm²	0.0010		0.0016		0.0023		0.0033		0.0049	
Thermal resistance (WC)	R_{th_WC}	°C/W	0.189	0.201	0.129	0.128	0.097	0.101	0.072	0.070	0.050	0.050
Max. DC bus voltage	U_{max}	VDC	750									
Max. speed at T_{c_WC}	n	min^{-1}	1,482	3,338	913	2,080	646	1,510	401	1,049	268	686
Max. speed at T_p	n	min^{-1}	935	2,138	585	1,362	410	1,001	245	695	145	448
Rated speed	n_N	min^{-1}	818	818	818	818	646	818	401	818	268	686
Mechanical parameters												
Number of poles	2p		22									
Thermal sensors			PTC SNM 100; PTC SNM 130; PT1000									
Stator height	H_S	mm	70		90		110		140		190	
Rotor height	H_R	mm	31		51		71		101		151	
Length of rotor centring fit	H	mm	10		15		15		15		15	
Rotor mass	M_r	kg	0.7		1.2		1.6		2.3		3.5	
Stator mass	M_s	kg	4.5		6.4		8.0		11.1		16.0	

All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature
WC: with water cooling
[1] Line to line

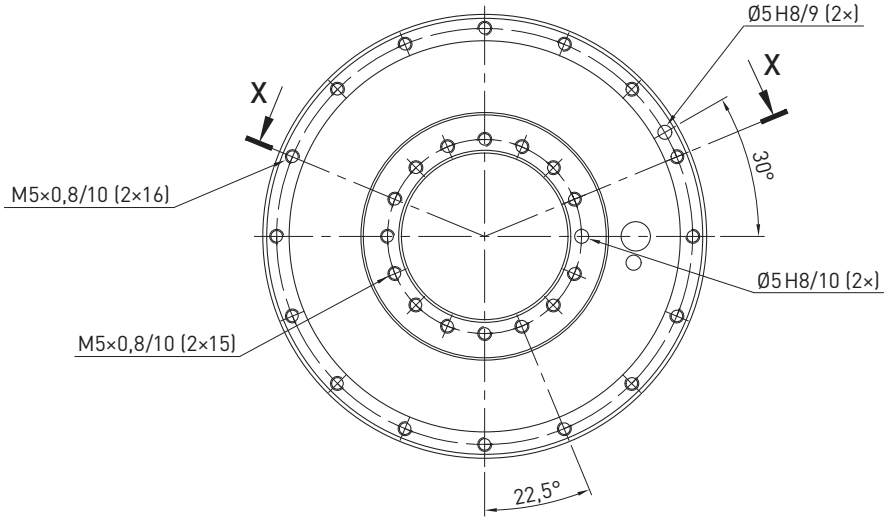
Dimensions TM-2-1



TM-2-13, TM-2-15, TM-2-17



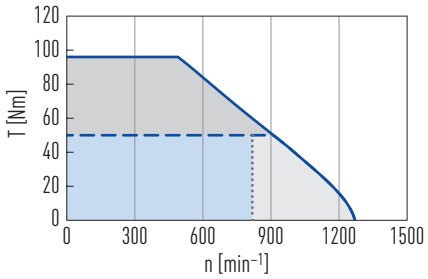
TM-2-1A, TM-2-1F



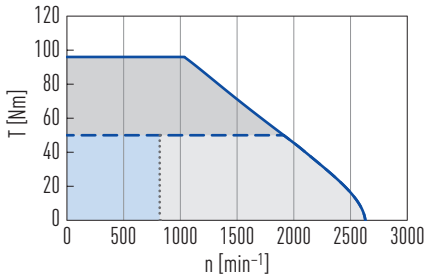
4.4.2 TM-2-2 specifications

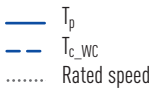
Torque-speed curves (DC bus voltage: 600 VDC)

TM-2-23-PA0

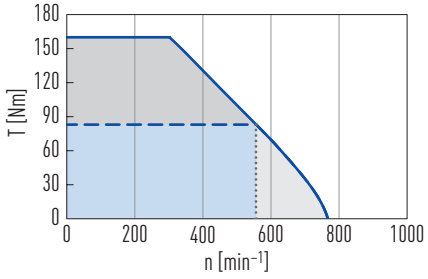


TM-2-23-PB0

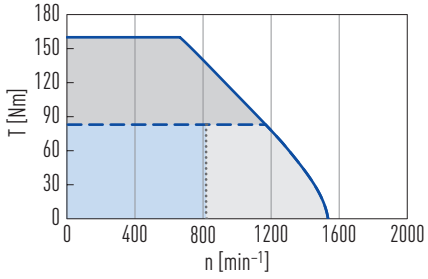




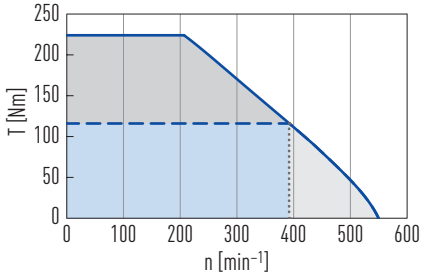
TM-2-25-PA0



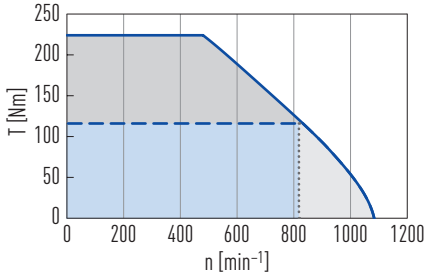
TM-2-25-PB0



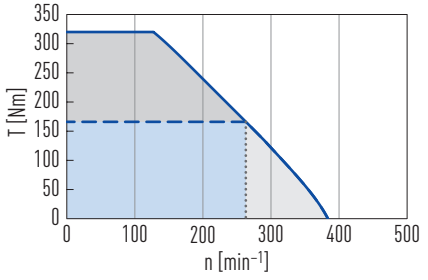
TM-2-27-PA0



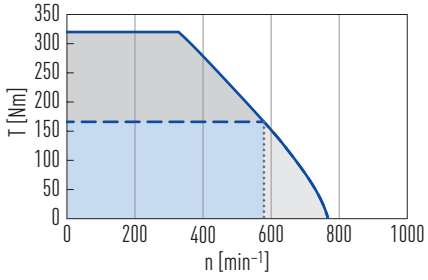
TM-2-27-PB0



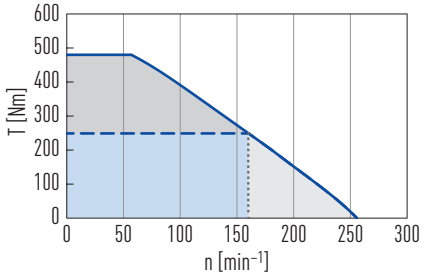
TM-2-2A-PA0



TM-2-2A-PB0



TM-2-2F-PA0



TM-2-2F-PB0

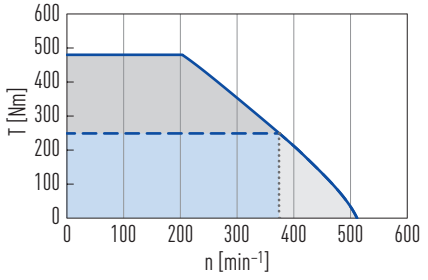
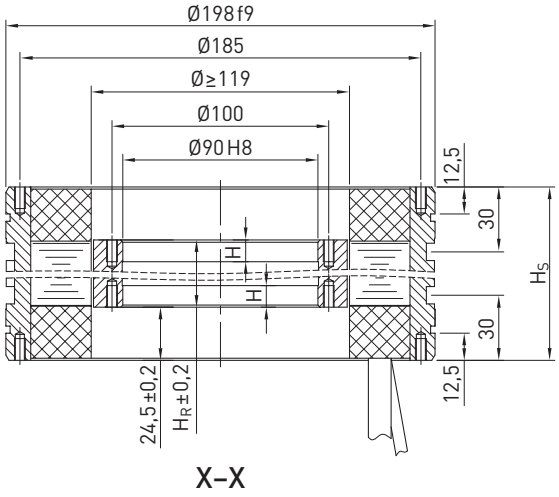


Table 4.2 **Technical data for TM-2-2**

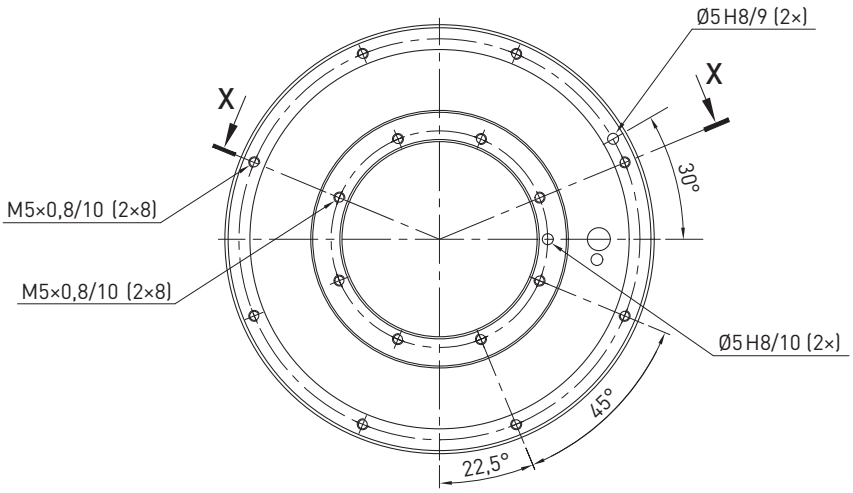
	Symbol	Unit	TM-2-23-PA0	TM-2-23-PB0	TM-2-25-PA0	TM-2-25-PB0	TM-2-27-PA0	TM-2-27-PB0	TM-2-2A-PA0	TM-2-2A-PB0	TM-2-2F-PA0	TM-2-2F-PB0
Torques and electrical parameters												
Peak torque (for 1 sec.)	T_p	Nm	96		160		224		320		480	
Continuous torque (WC)	T_{c_WC}	Nm	50		83		116		166		249	
Stall torque (WC)	T_{s_WC}	Nm	41	41	68	68	95	95	136	135	204	203
Peak current (for 1 sec.)	I_p	A	25.5	51.0	25.5	51.0	25.5	51.0	25.5	51.0	25.5	51.0
Continuous current (WC)	I_{c_WC}	A	10.2	20.4	10.2	20.4	10.2	20.4	10.2	20.4	10.2	20.4
Stall current (WC)	I_{s_WC}	A	8.2	16.3	8.2	16.3	8.2	16.3	8.2	16.3	8.2	16.3
Resistance [1]	R_{25}	Ω	3.5	0.9	5.2	1.3	6.9	1.7	9.4	2.4	13.6	3.4
Inductance [1]	L_{25}	mH	25.5	6.4	37.6	9.4	49.7	12.4	68.0	17.0	98.2	24.6
Motor constant	K_m	Nm/√W	2.17	2.14	2.98	2.98	3.62	3.65	4.43	4.38	5.52	5.52
Electrical time constant	K_e	ms	7.3	7.1	7.2	7.2	7.2	7.3	7.2	7.1	7.2	7.2
Torque constant	K_t	Nm/A	5.02	2.42	8.31	4.16	11.60	5.89	16.63	8.31	24.94	12.47
Back emf constant	K_u	V_{eff}/(rad/s)	2.9	1.4	4.8	2.4	6.7	3.4	9.6	4.8	14.4	7.2
Inertia of rotor	J	kgm²	0.0010		0.0016		0.0023		0.0033		0.0049	
Thermal resistance (WC)	R_{th_WC}	°C/W	0.192	0.187	0.129	0.129	0.098	0.099	0.072	0.070	0.049	0.049
Max. DC bus voltage	U_{max}	VDC	750									
Max. speed at T_{c_WC}	n	min^{-1}	911	1,911	556	1,167	392	832	263	579	160	374
Max. speed at T_p	n	min^{-1}	489	1,034	301	663	206	479	127	328	56	203
Rated speed	n_N	min^{-1}	818	818	556	818	392	818	263	579	160	374
Mechanical parameters												
Number of poles	2p		22									
Thermal sensors			PTC SNM 100; PTC SNM 130; PT1000									
Stator height	H_S	mm	80		100		120		150		200	
Rotor height	H_R	mm	31		51		71		101		151	
Length of rotor centring fit	H	mm	10		15		15		15		15	
Rotor mass	M_r	kg	1.0		1.7		2.3		3.3		5.5	
Stator mass	M_s	kg	6.9		10.5		12.0		16.7		23.9	

All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature
WC: with water cooling
[1] Line to line

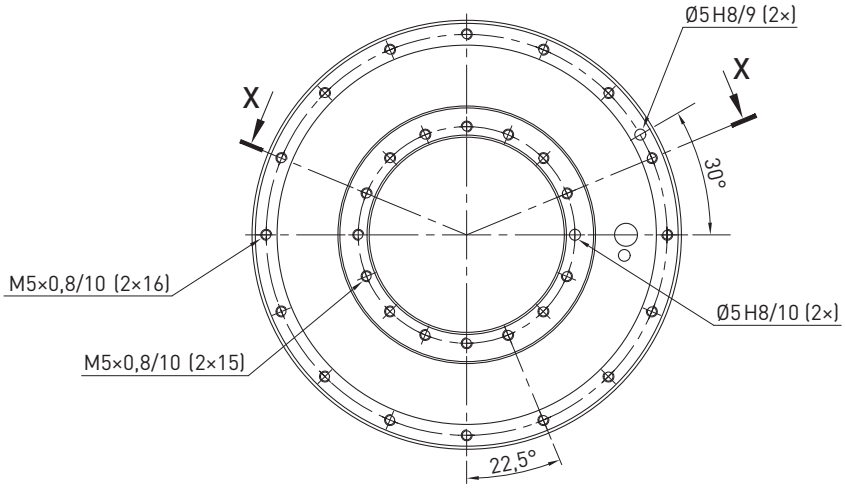
Dimensions TM-2-2



TM-2-23, TM-2-25, TM-2-27



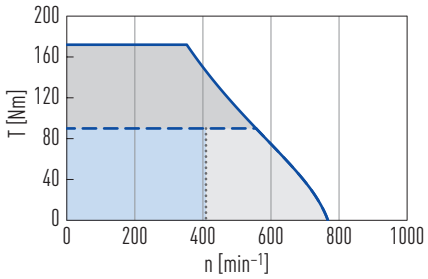
TM-2-2A, TM-2-2F



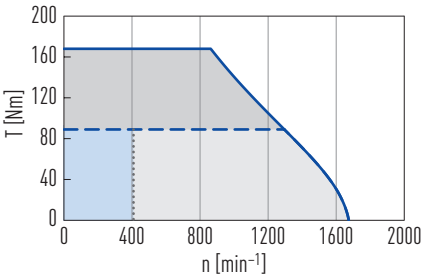
4.4.3 TM-2-4 specifications

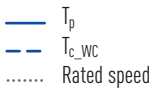
Torque-speed curves (DC bus voltage: 600 VDC)

TM-2-43-LA0

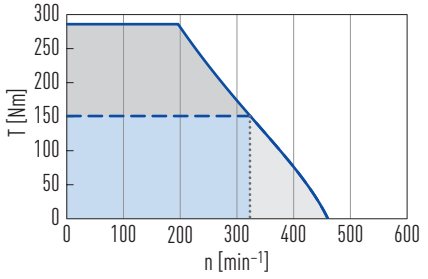


TM-2-43-SA0

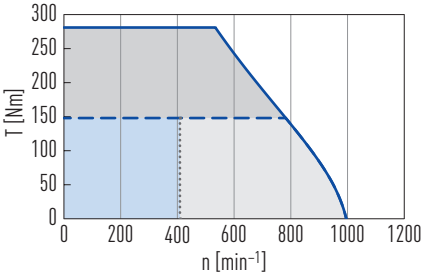




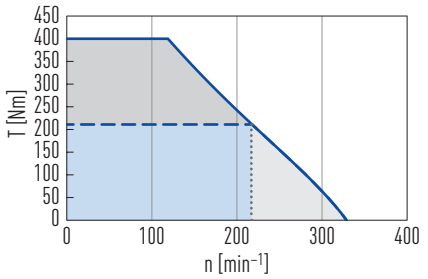
TM-2-45-LA0



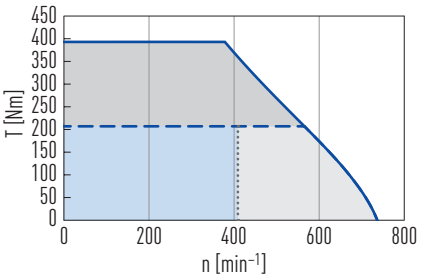
TM-2-45-SA0



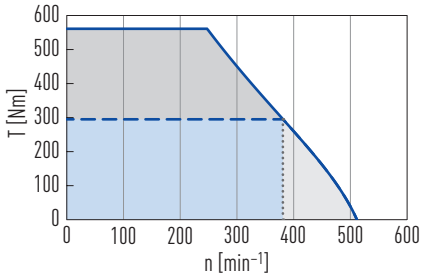
TM-2-47-LA0



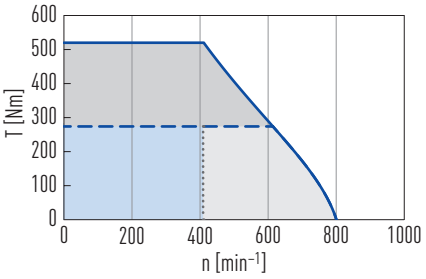
TM-2-47-SA0



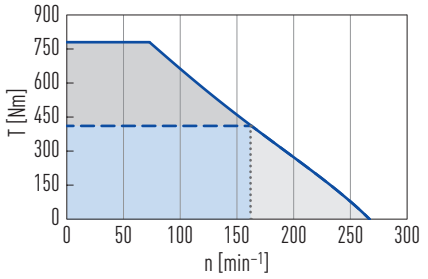
TM-2-4A-SA0



TM-2-4A-PB0



TM-2-4F-PA0



TM-2-4F-PB0

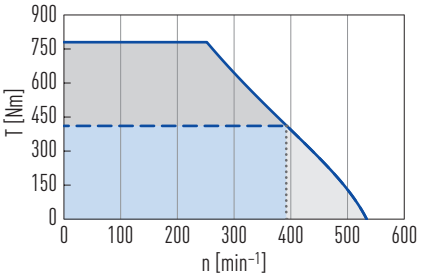
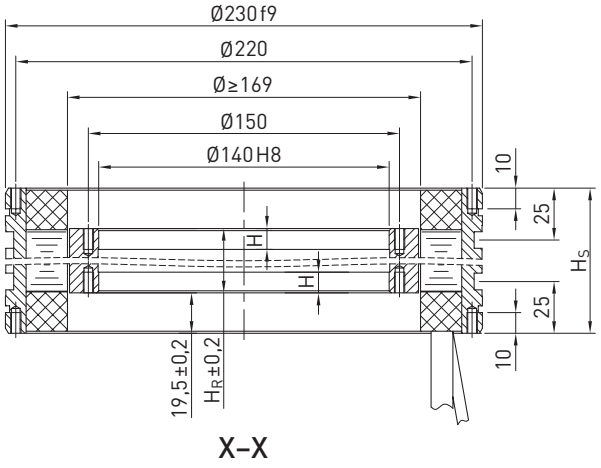


Table 4.3 **Technical data for TM-2-4**

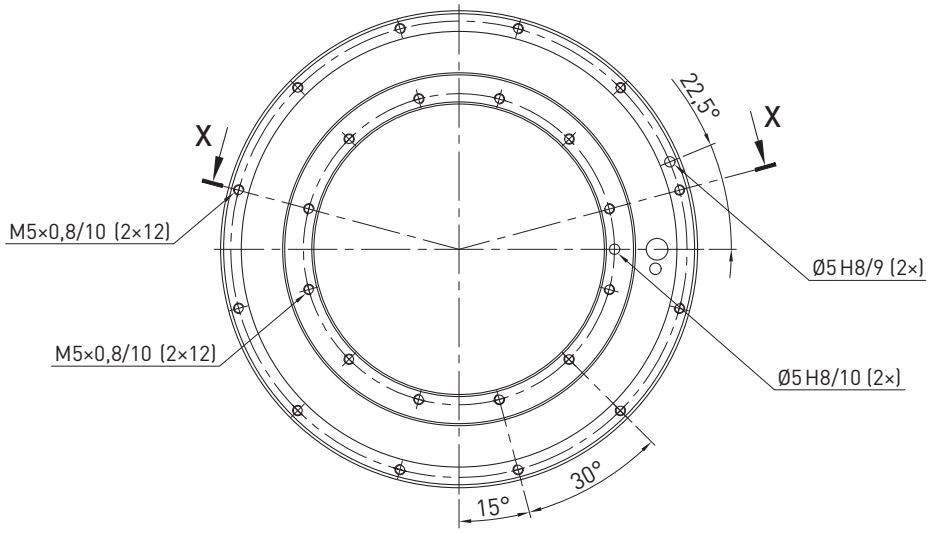
	Symbol	Unit	TM-2-43-LA0	TM-2-43-SA0	TM-2-45-LA0	TM-2-45-SA0	TM-2-47-LA0	TM-2-47-SA0	TM-2-4A-SA0	TM-2-4A-PB0	TM-2-4F-PA0	TM-2-4F-PB0
Torques and electrical parameters												
Peak torque (for 1 sec.)	T_p	Nm	172	168	286	281	400	393	561	520	780	780
Continuous torque (WC)	T_{c_WC}	Nm	90	89	151	148	211	207	295	274	411	411
Stall torque (WC)	T_{s_WC}	Nm	73	72	122	120	171	168	239	222	334	334
Peak current (for 1 sec.)	I_p	A	23.7	52.0	23.7	52.0	23.7	52.0	52.0	75.0	37.5	75.0
Continuous current (WC)	I_{c_WC}	A	11.4	24.9	11.4	24.9	11.4	24.9	24.9	36.0	18.0	36.0
Stall current (WC)	I_{s_WC}	A	9.1	19.9	9.1	19.9	9.1	19.9	19.9	28.8	14.4	28.8
Resistance [1]	R_{25}	Ω	5.60	1.20	8.30	1.72	11.00	2.30	3.10	1.50	8.70	2.17
Inductance [1]	L_{25}	mH	15.80	3.30	23.30	4.84	30.80	6.41	8.75	4.20	24.30	6.08
Motor constant	K_m	Nm/√W	2.86	2.84	3.89	3.93	4.71	4.60	5.74	5.27	6.59	6.60
Electrical time constant	K_e	ms	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Torque constant	K_t	Nm/A	8.31	3.81	13.86	6.41	19.40	8.66	12.47	7.97	23.90	11.95
Back emf constant	K_u	V_{eff}/(rad/s)	4.8	2.2	8.0	3.7	11.2	5.0	7.2	4.6	13.8	6.9
Inertia of rotor	J	kgm²	0.0085		0.0140		0.0220		0.0290		0.0450	
Thermal resistance (WC)	R_{th_WC}	°C/W	0.096	0.094	0.065	0.066	0.049	0.049	0.036	0.036	0.025	0.025
Max. DC bus voltage	U_{max}	VDC	750									
Max. speed at T_{c_WC}	n	min^{-1}	556	1,295	323	782	217	565	381	614	162	392
Max. speed at T_p	n	min^{-1}	352	862	196	533	118	378	247	410	72	251
Rated speed	n_N	min^{-1}	409	409	323	409	217	409	381	409	162	392
Mechanical parameters												
Number of poles	2p		44									
Thermal sensors			PTC SNM 100; PTC SNM 130; PT1000									
Stator height	H_S	mm	70		90		110		140		190	
Rotor height	H_R	mm	31		51		71		101		151	
Length of rotor centring fit	H	mm	10		15		15		15		15	
Rotor mass	M_r	kg	1.5		2.6		3.5		5.0		7.6	
Stator mass	M_s	kg	6.5		9.0		11.2		15.0		22.2	

All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature
WC: with water cooling
[1] Line to line

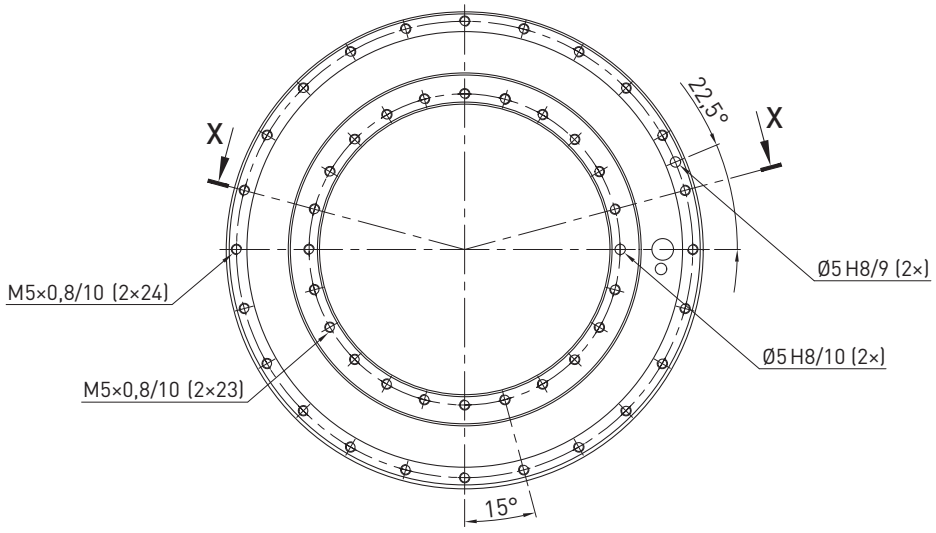
Dimensions TM-2-4



TM-2-43, TM-2-45, TM-2-47



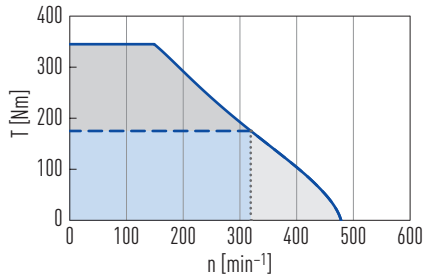
TM-2-4A, TM-2-4F



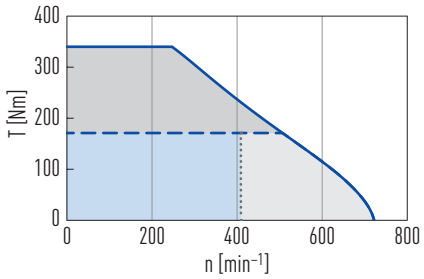
4.4.4 TM-2-7 specifications

Torque-speed curves (DC bus voltage: 600 VDC)

TM-2-73-LB0

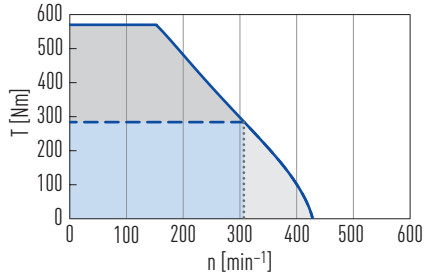


TM-2-73-PB0

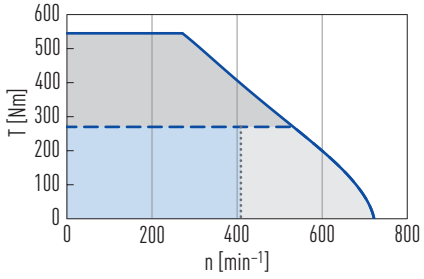


T_p
T_{c_WC}
Rated speed

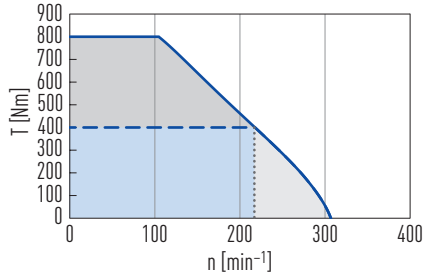
TM-2-75-PB0



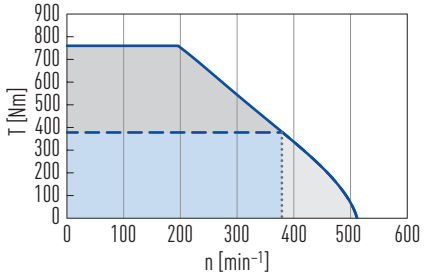
TM-2-75-SB0



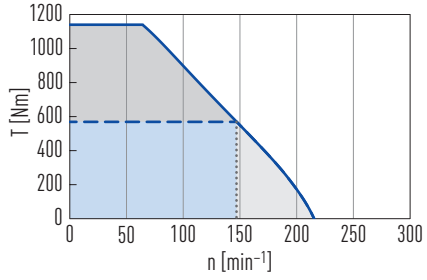
TM-2-77-PB0



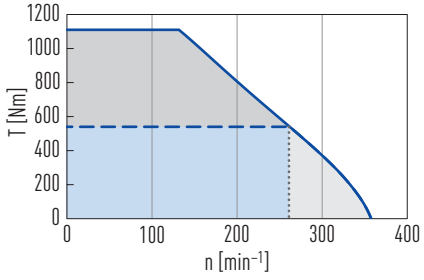
TM-2-77-SB0



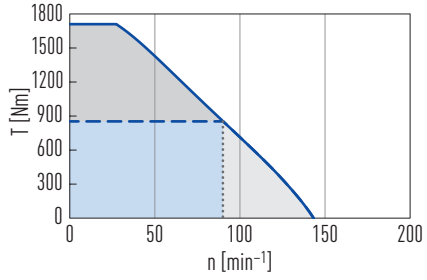
TM-2-7A-PB0



TM-2-7A-SB0



TM-2-7F-PB0



TM-2-7F-SB0

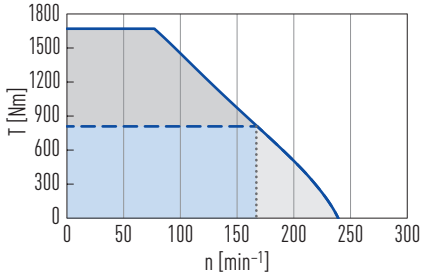
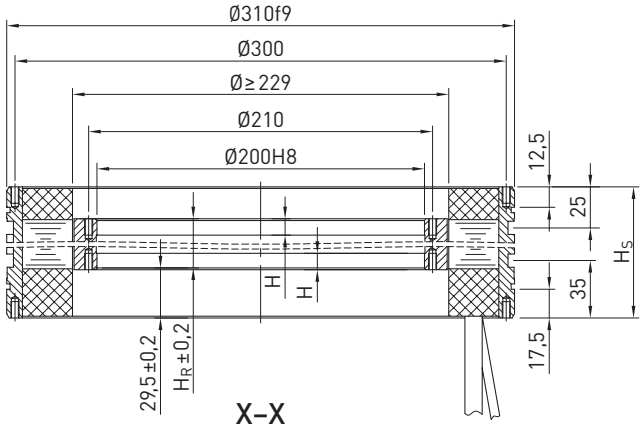


Table 4.4 **Technical data for TM-2-7**

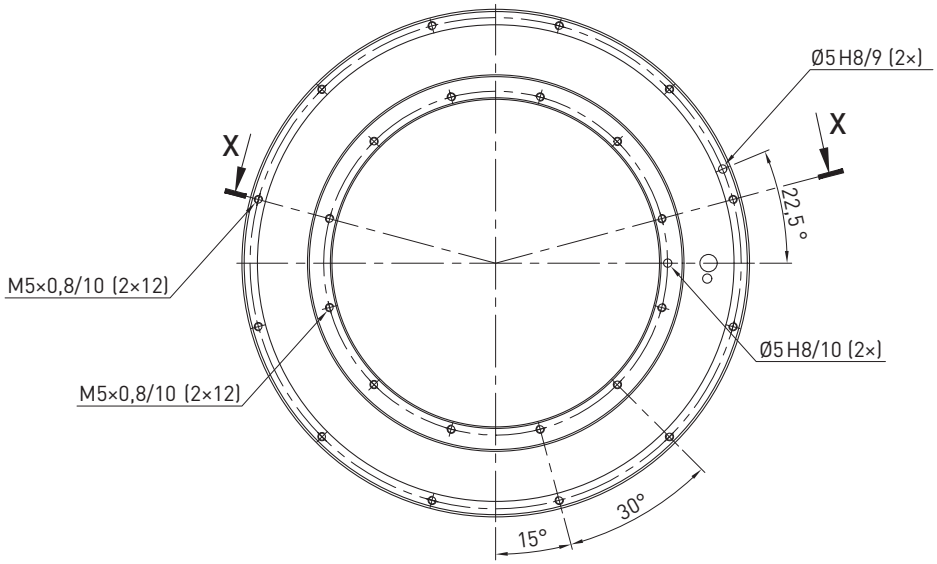
	Symbol	Unit	TM-2-73-LB0	TM-2-73-PB0	TM-2-75-PB0	TM-2-75-SB0	TM-2-77-PB0	TM-2-77-SB0	TM-2-7A-PB0	TM-2-7A-SB0	TM-2-7F-PB0	TM-2-7F-SB0
Torques and electrical parameters												
Peak torque (for 1 sec.)	T_p	Nm	345	340	570	545	800	760	1,140	1,110	1,710	1,670
Continuous torque (WC)	T_{c_WC}	Nm	175	171	284	270	400	378	569	540	853	809
Stall torque (WC)	T_{s_WC}	Nm	144	141	233	222	329	310	468	442	701	663
Peak current (for 1 sec.)	I_p	A	38.1	56.0	56.0	88.3	56.0	88.3	56.0	88.3	56.0	88.3
Continuous current (WC)	I_{c_WC}	A	14.0	20.5	20.5	32.3	20.5	32.3	20.5	32.3	20.5	32.3
Stall current (WC)	I_{s_WC}	A	11.2	16.4	16.4	25.8	16.4	25.8	16.4	25.8	16.4	25.8
Resistance [1]	R_{25}	Ω	3.5	1.7	2.5	1.0	3.3	1.3	4.5	1.8	6.5	2.6
Inductance [1]	L_{25}	mH	27.7	11.8	17.4	6.7	23.0	8.8	31.4	12.0	45.4	17.4
Motor constant	K_m	Nm/√W	5.82	5.58	7.63	7.26	9.33	8.89	11.42	10.79	14.24	13.48
Electrical time constant	K_e	ms	7.9	6.9	7.0	6.7	7.0	6.8	7.0	6.7	7.0	6.7
Torque constant	K_t	Nm/A	13.34	8.83	14.90	8.83	20.78	12.47	29.62	17.84	44.51	26.67
Back emf constant	K_u	V_{eff}/(rad/s)	7.7	5.1	8.6	5.1	12.0	7.2	17.1	10.3	25.7	15.4
Inertia of rotor	J	kgm²	0.025		0.041		0.057		0.081		0.121	
Thermal resistance (WC)	R_{th_WC}	°C/W	0.092	0.089	0.060	0.061	0.046	0.047	0.033	0.034	0.023	0.023
Max. DC bus voltage	U_{max}	VDC	750									
Max. speed at T_{c_WC}	n	min^{-1}	319	506	307	532	217	379	147	261	90	167
Max. speed at T_p	n	min^{-1}	148	246	152	271	104	195	64	131	27	77
Rated speed	n_N	min^{-1}	319	409	307	409	217	379	147	261	90	167
Mechanical parameters												
Number of poles	2p		44									
Thermal sensors			PTC SNM 100; PTC SNM 130; PT1000									
Stator height	H_S	mm	80		100		120		150		200	
Rotor height	H_R	mm	31		51		71		101		151	
Length of rotor centring fit	H	mm	10		15		15		15		15	
Rotor mass	M_r	kg	2.2		3.6		5.0		7.1		11.6	
Stator mass	M_s	kg	13.6		17.9		22.3		28.9		40.6	

All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature
WC: with water cooling
[1] Line to line

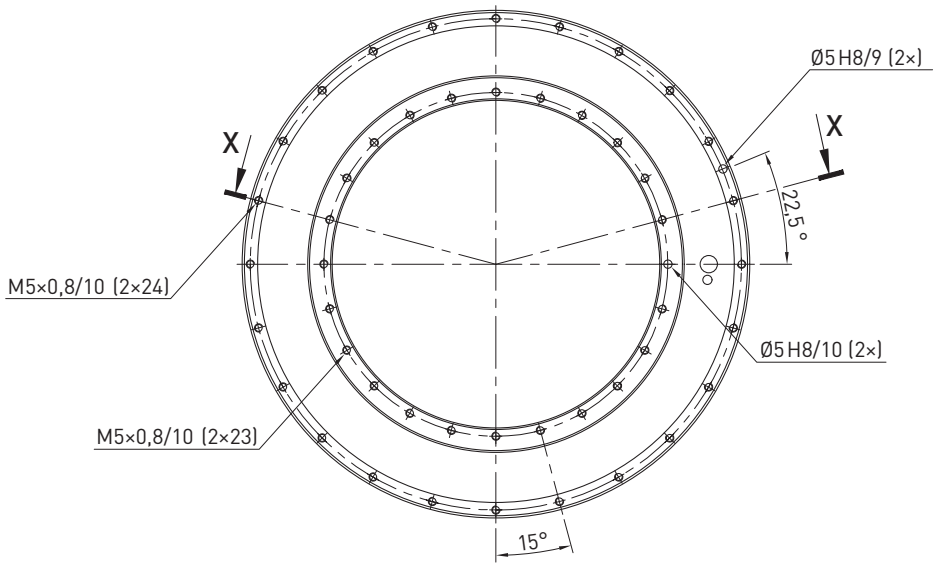
Dimensions TM-2-7



TM-2-73, TM-2-75, TM-2-77



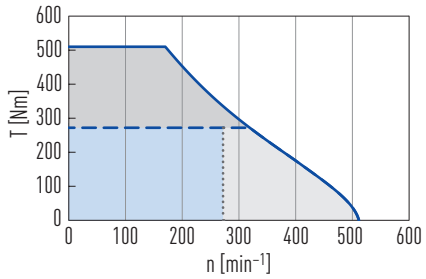
TM-2-7A, TM-2-7F



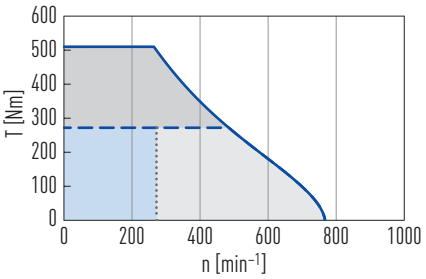
4.4.5 TM-2-A specifications

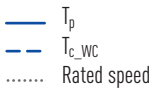
Torque-speed curves (DC bus voltage: 600 VDC)

TM-2-A3-PB0

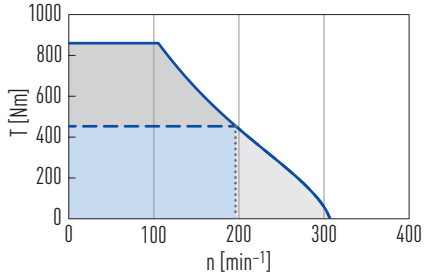


TM-2-A3-PC0

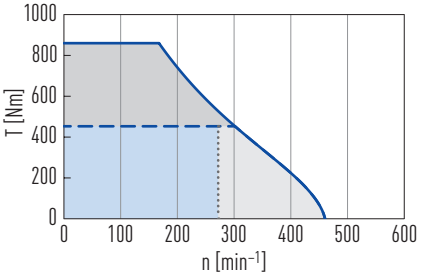




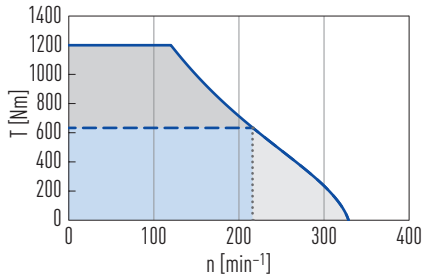
TM-2-A5-PB0



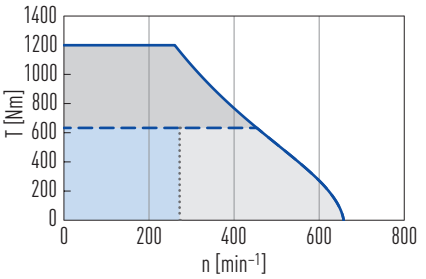
TM-2-A5-PC0



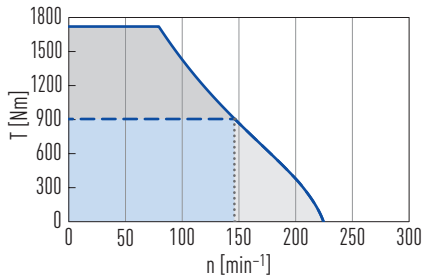
TM-2-A7-PC0



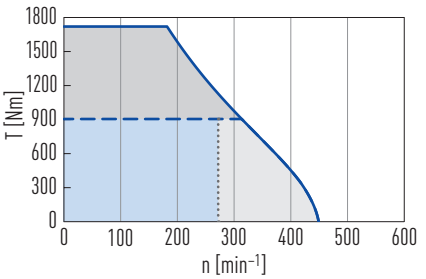
TM-2-A7-PF0



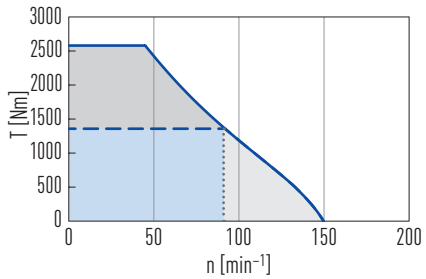
TM-2-AA-PC0



TM-2-AA-PF0



TM-2-AF-PC0



TM-2-AF-PF0

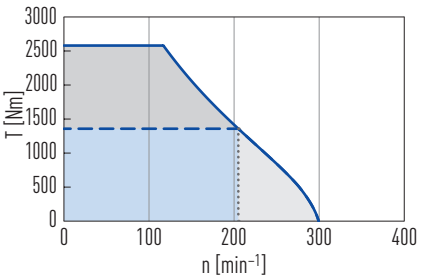
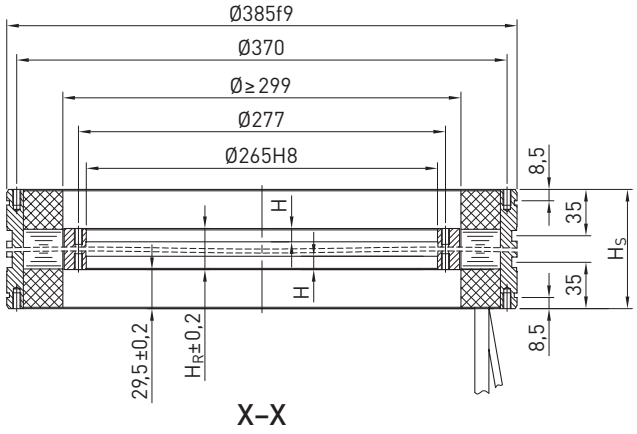


Table 4.5 **Technical data for TM-2-A**

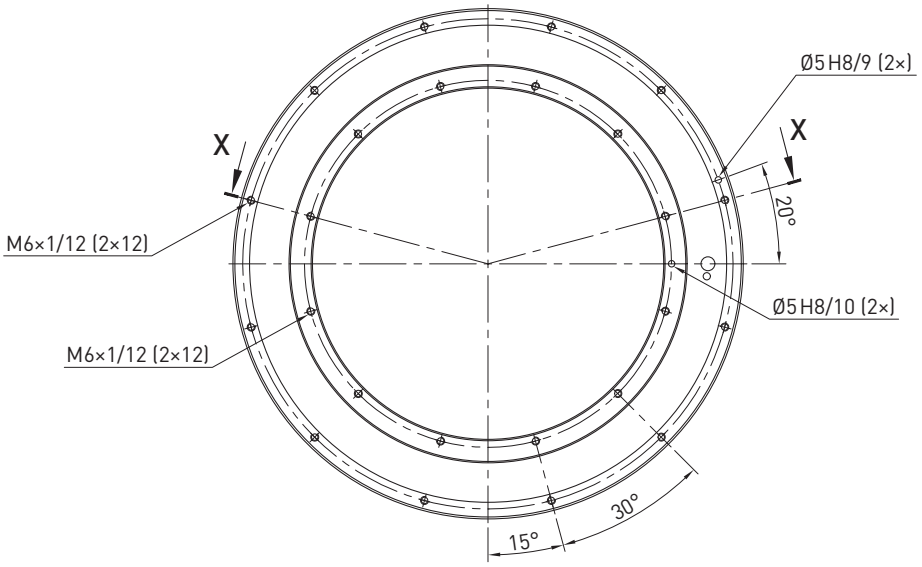
	Symbol	Unit	TM-2-A3-PB0	TM-2-A3-PC0	TM-2-A5-PB0	TM-2-A5-PC0	TM-2-A7-PC0	TM-2-A7-PF0	TM-2-AA-PC0	TM-2-AA-PF0	TM-2-AF-PC0	TM-2-AF-PF0
Torques and electrical parameters												
Peak torque (for 1 sec.)	T_p	Nm	510		860		1,200		1,720		2,580	
Continuous torque (WC)	T_{c_WC}	Nm	272		453		633		905		1,358	
Stall torque (WC)	T_{s_WC}	Nm	222		371		518		743		1,114	
Peak current (for 1 sec.)	I_p	A	52	78	52	78	78	156	78	156	78	156
Continuous current (WC)	I_{c_WC}	A	23	35	23	35	35	70	35	70	35	70
Stall current (WC)	I_{s_WC}	A	18.4	28.0	18.4	28.0	28.0	56.0	28.0	56.0	28.0	56.0
Resistance [1]	R_{25}	Ω	1.80	0.82	2.70	1.20	1.60	0.40	2.20	0.55	3.20	0.80
Inductance [1]	L_{25}	mH	12.4	5.5	18.3	8.2	10.8	2.7	14.8	3.7	21.6	5.4
Motor constant	K_m	Nm/√W	7.46	7.36	10.31	10.31	12.53	12.53	15.60	15.60	19.44	19.44
Electrical time constant	K_e	ms	6.9	6.7	6.8	6.8	6.8	6.8	6.7	6.7	6.8	6.8
Torque constant	K_t	Nm/A	12.47	8.31	20.78	13.86	19.40	9.70	28.41	14.20	42.61	21.30
Back emf constant	K_u	V_{eff}/(rad/s)	7.2	4.8	12.0	8.0	11.2	5.6	16.4	8.2	24.6	12.3
Inertia of rotor	J	kgm²	0.065		0.108		0.151		0.214		0.320	
Thermal resistance (WC)	R_{th_WC}	°C/W	0.074	0.070	0.049	0.048	0.036	0.036	0.026	0.026	0.018	0.018
Max. DC bus voltage	U_{max}	VDC	750									
Max. speed at T_{c_WC}	n	min^{-1}	319	484	196	301	216	453	146	313	91	205
Max. speed at T_p	n	min^{-1}	170	264	105	167	120	260	79	181	44	116
Rated speed	n_N	min^{-1}	272	272	196	272	216	272	146	272	91	205
Mechanical parameters												
Number of poles	2p		66									
Thermal sensors			PTC SNM 100; PTC SNM 130; PT1000									
Stator height	H_S	mm	90		110		130		160		210	
Rotor height	H_R	mm	31		51		71		101		151	
Length of rotor centring fit	H	mm	10		15		15		15		15	
Rotor mass	M_r	kg	3.3		5.5		7.6		10.8		16.2	
Stator mass	M_s	kg	20.1	20.1	26.8	26.8	34.5	34.5	44.9	44.9	63.1	63.1

All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature
WC: with water cooling
[1] Line to line

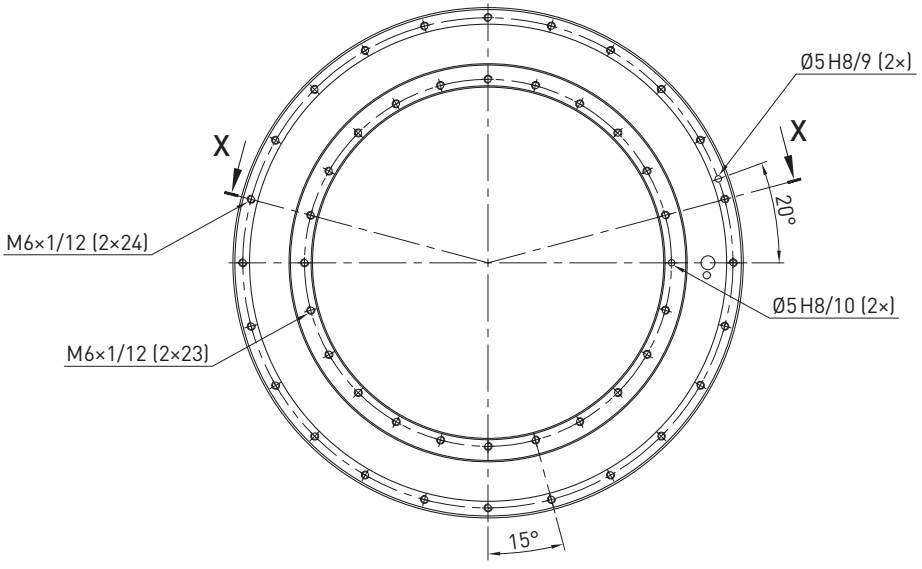
Dimensions TM-2-A



TM-2-A3, TM-2-A5, TM-2-A7



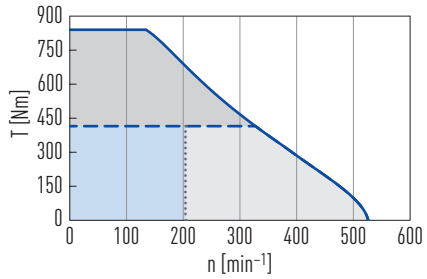
TM-2-AA, TM-2-AF



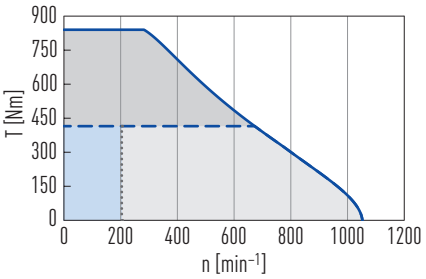
4.4.6 TM-2-D specifications

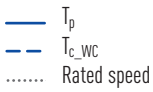
Torque-speed curves (DC bus voltage: 600 VDC)

TM-2-D3-SB0

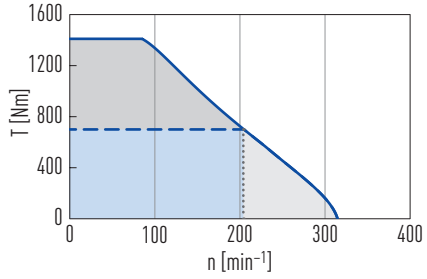


TM-2-D3-SD0

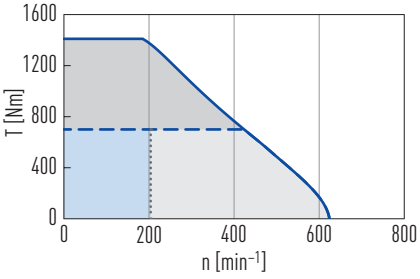




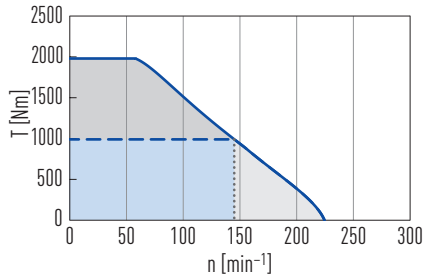
TM-2-D5-SB0



TM-2-D5-SD0



TM-2-D7-SB0



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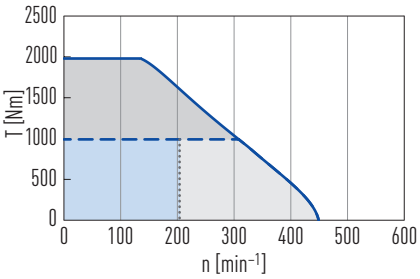
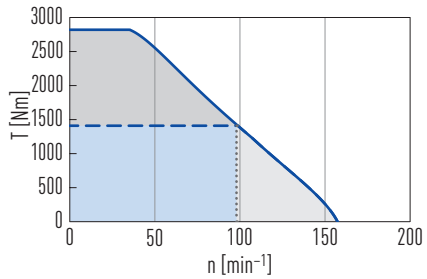
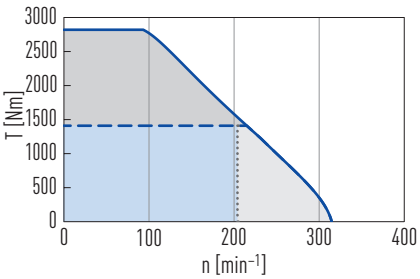


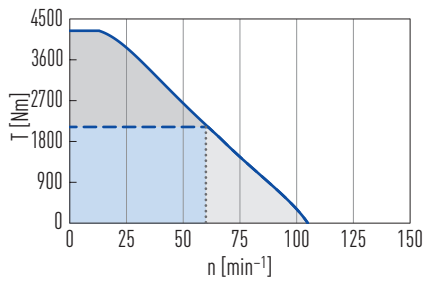
TM-2-DA-SB0



TM-2-DA-SD0



TM-2-DF-SB0



TM-2-DF-SD0

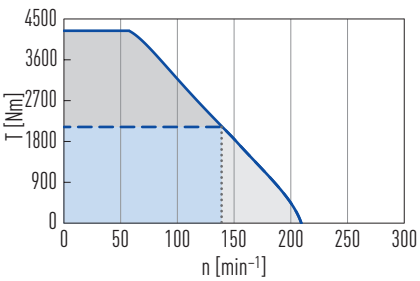
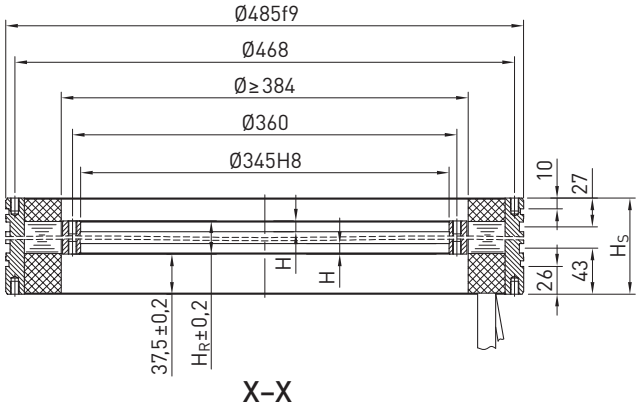


Table 4.6 **Technical data for TM-2-D**

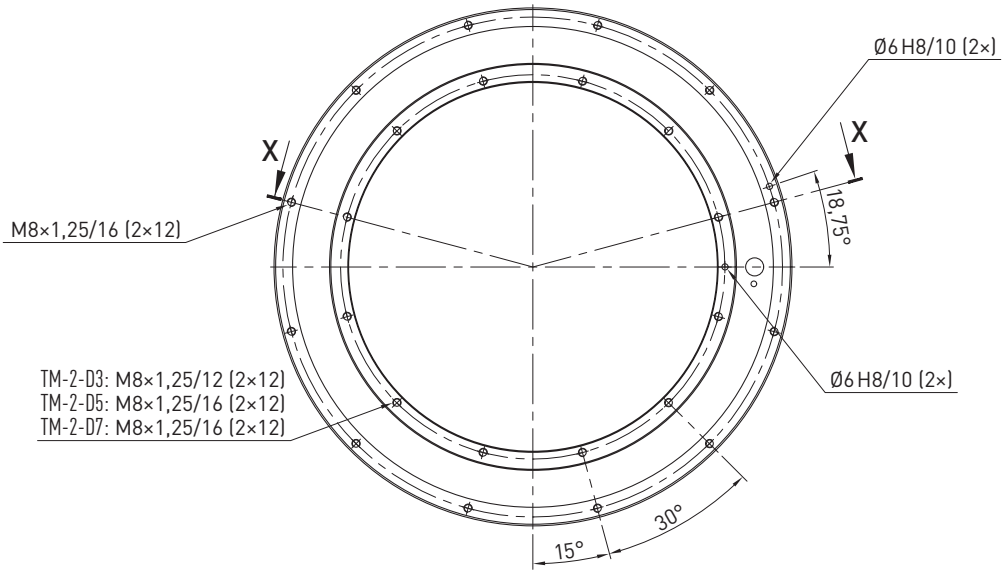
	Symbol	Unit	TM-2-D3-SB0	TM-2-D3-SD0	TM-2-D5-SB0	TM-2-D5-SD0	TM-2-D7-SB0	TM-2-D7-SD0	TM-2-DA-SB0	TM-2-DA-SD0	TM-2-DF-SB0	TM-2-DF-SD0
Torques and electrical parameters												
Peak torque (for 1 sec.)	T_p	Nm	840		1,410		1,980		2,820		4,240	
Continuous torque (WC)	T_{c_WC}	Nm	415		700		990		1,410		2,120	
Stall torque (WC)	T_{s_WC}	Nm	339		572		801		1,146		1,719	
Peak current (for 1 sec.)	I_p	A	106	212	106	212	106	212	106	212	106	212
Continuous current (WC)	I_{c_WC}	A	35.4	70.8	35.4	70.8	35.4	70.8	35.4	70.8	35.4	70.8
Stall current (WC)	I_{s_WC}	A	28.3	56.6	28.3	56.6	28.3	56.6	28.3	56.6	28.3	56.6
Resistance [1]	R_{25}	Ω	1.00	0.24	1.40	0.36	1.90	0.48	2.60	0.65	3.80	0.95
Inductance [1]	L_{25}	mH	6.0	1.5	8.8	2.2	11.7	2.9	16.0	4.0	23.2	5.8
Motor constant	K_m	Nm/√W	9.83	10.04	13.95	13.76	16.78	16.69	20.51	20.51	25.44	25.44
Electrical time constant	K_e	ms	6.0	6.3	6.3	6.1	6.2	6.0	6.2	6.2	6.1	6.1
Torque constant	K_t	Nm/A	12.12	6.06	20.26	10.22	28.41	14.20	40.53	20.26	60.79	30.48
Back emf constant	K_u	V_{eff}/(rad/s)	7.0	3.5	11.7	5.9	16.4	8.2	23.4	11.7	35.1	17.6
Inertia of rotor	J	kgm²	0.16		0.26		0.37		0.53		0.79	
Thermal resistance (WC)	R_{th_WC}	°C/W	0.056	0.058	0.040	0.039	0.029	0.029	0.021	0.021	0.015	0.015
Max. DC bus voltage	U_{max}	VDC	750									
Max. speed at T_{c_WC}	n	min^{-1}	327	672	204	423	145	308	98	214	60	139
Max. speed at T_p	n	min^{-1}	134	282	84	184	57	135	35	93	12	57
Rated speed	n_N	min^{-1}	204	204	204	204	145	204	98	204	60	139
Mechanical parameters												
Number of poles	2p		88									
Thermal sensors			PTC SNM 100; PTC SNM 130; PT1000									
Stator height	H_S	mm	90		110		130		160		210	
Rotor height	H_R	mm	31		51		71		101		151	
Length of rotor centring fit	H	mm	10		15		15		15		15	
Rotor mass	M_r	kg	4.8		7.9		11.0		15.8		23.6	
Stator mass	M_s	kg	20		35		50		73		87	

All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature
WC: with water cooling
[1] Line to line

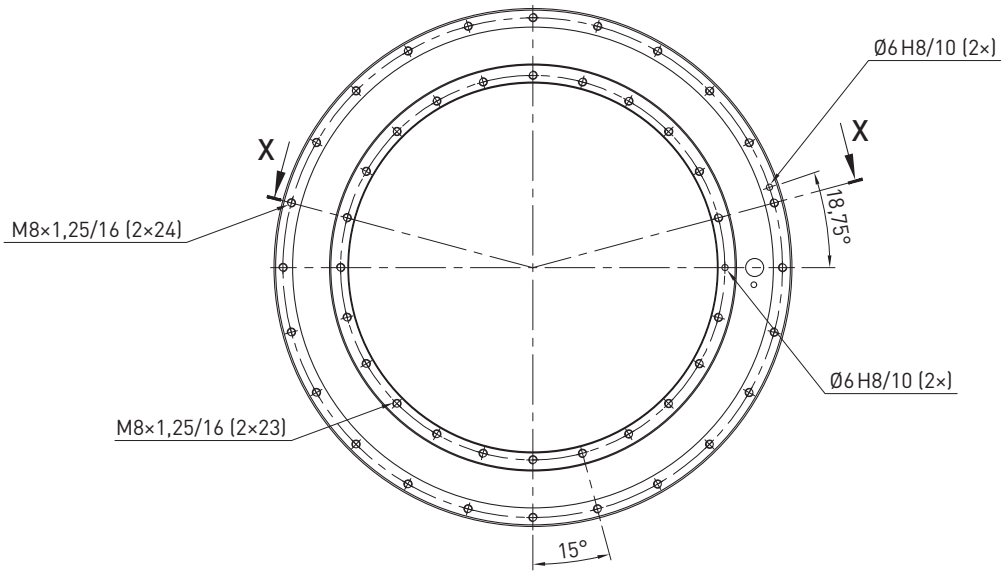
Dimensions TM-2-D



TM-2-D3, TM-2-D5, TM-2-D7



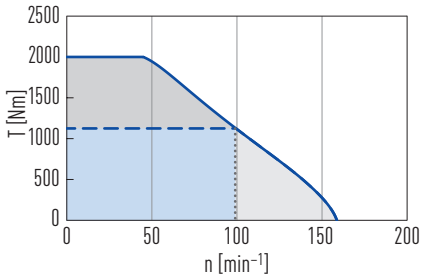
TM-2-DA, TM-2-DF



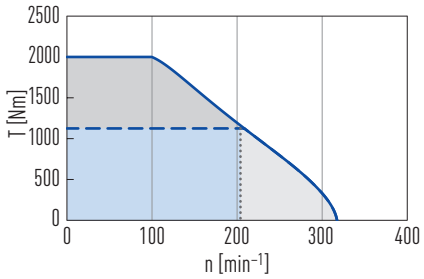
4.4.7 TM-2-G specifications

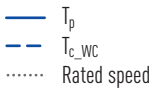
Torque-speed curves (DC bus voltage: 600 VDC)

TM-2-G5-SB0

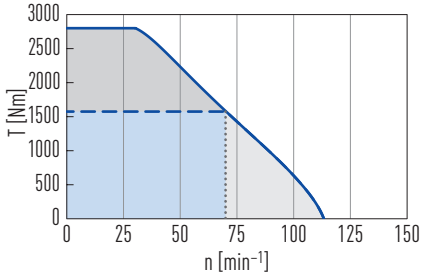


TM-2-G5-SD0

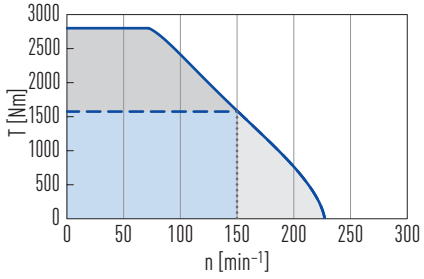




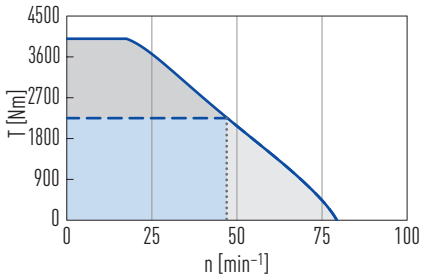
TM-2-G7-SB0



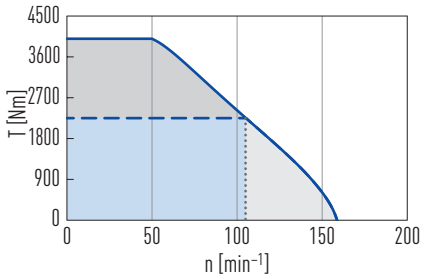
TM-2-G7-SD0



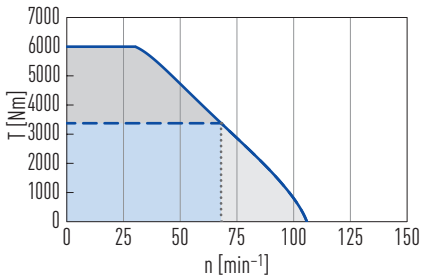
TM-2-GA-SB0



TM-2-GA-SD0



TM-2-GF-SD0



TM-2-GF-SH0

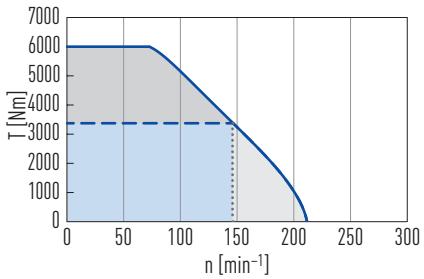
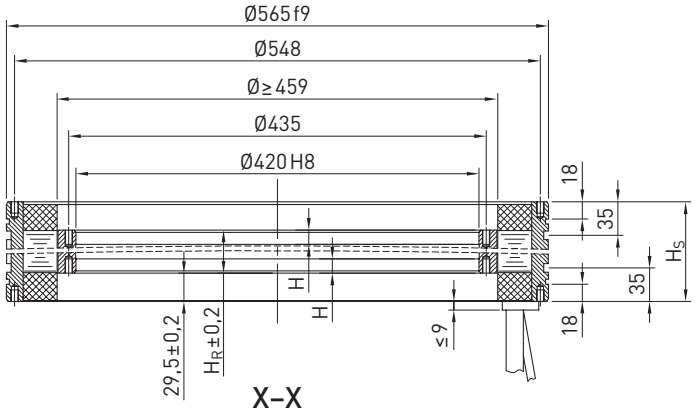


Table 4.7 **Technical data for TM-2-G**

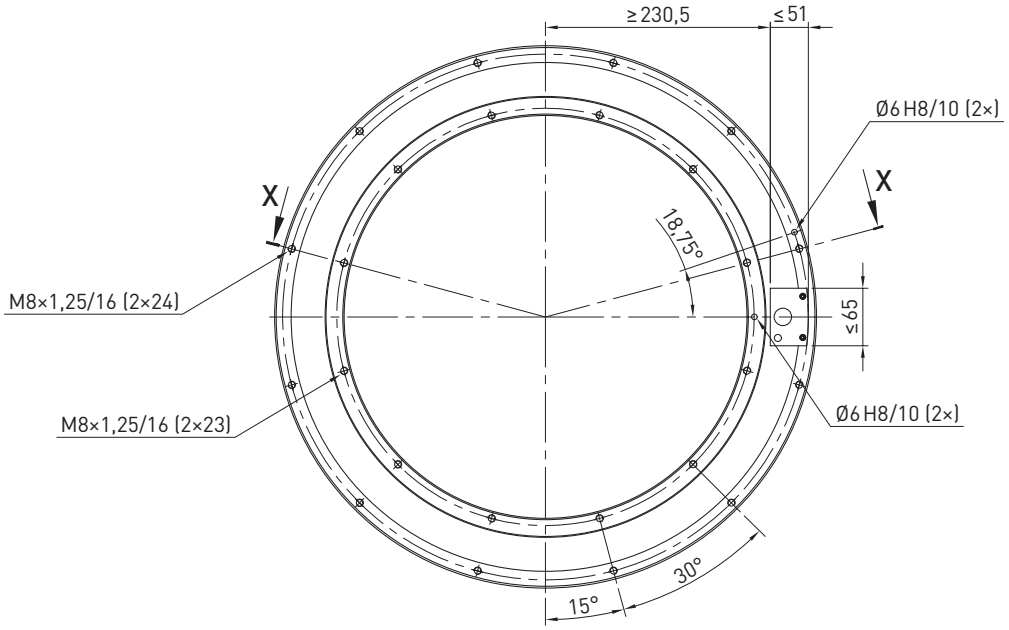
	Symbol	Unit	TM-2-G5-SB0	TM-2-G5-SD0	TM-2-G7-SB0	TM-2-G7-SD0	TM-2-GA-SB0	TM-2-GA-SD0	TM-2-GF-SD0	TM-2-GF-SH0
Torques and electrical parameters										
Peak torque (for 1 sec.)	T_p	Nm	2,000		2,800		4,000		6,000	
Continuous torque (WC)	T_{c_WC}	Nm	1,125		1,575		2,250		3,375	
Stall torque (WC)	T_{s_WC}	Nm	930	931	1,302	1,304	1,860	1,863	2,794	2,794
Peak current (for 1 sec.)	I_p	A	80	160	80	160	80	160	160	320
Continuous current (WC)	I_{c_WC}	A	30.3	60.6	30.3	60.6	30.3	60.6	60.6	121.2
Stall current (WC)	I_{s_WC}	A	24.2	48.5	24.2	48.5	24.2	48.5	48.5	97.0
Resistance [1]	R_{25}	Ω	2.10	0.52	2.76	0.70	3.76	0.94	1.36	0.34
Inductance [1]	L_{25}	mH	21.00	5.30	27.80	7.00	38.00	9.50	13.70	3.43
Motor constant	K_m	Nm/√W	22.59	22.70	27.65	27.45	33.81	33.81	42.08	42.08
Electrical time constant	K_e	ms	10.0	10.2	10.1	10.0	10.1	10.1	10.1	10.1
Torque constant	K_t	Nm/A	40.18	20.09	56.29	28.06	80.37	40.18	60.28	30.14
Back emf constant	K_u	V_{eff}/(rad/s)	23.2	11.6	32.5	16.2	46.4	23.2	34.8	17.4
Inertia of rotor	J	kgm²	0.452		0.619		0.904		1.380	
Thermal resistance (WC)	R_{th_WC}	°C/W	0.036	0.037	0.028	0.027	0.020	0.020	0.014	0.014
Max. DC bus voltage	U_{max}	VDC	750							
Max. speed at T_{c_WC}	n	min^{-1}	99	208	70	150	47	105	68	146
Max. speed at T_p	n	min^{-1}	44	99	30	72	17	49	30	72
Rated speed	n_N	min^{-1}	99	204	70	150	47	105	68	146
Mechanical parameters										
Number of poles	2p		88							
Thermal sensors			PTC SNM 100; PTC SNM 130; PT1000							
Stator height	H_S	mm	110		130		160		210	
Rotor height	H_R	mm	51		71		101		151	
Length of rotor centring fit	H	mm	15		15		15		15	
Rotor mass	M_r	kg	9.7		13.5		19.3		29.0	
Stator mass	M_s	kg	50.0		63.5		78.0		111.8	

All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature
WC: with water cooling
[1] Line to line

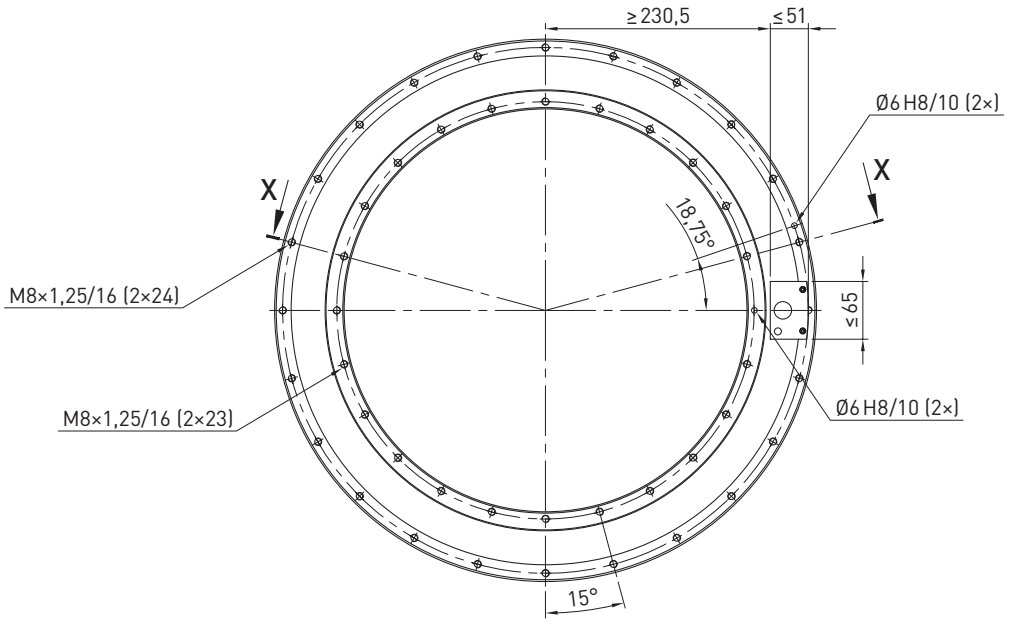
Dimensions TM-2-G



TM-2-G5, TM-2-G7



TM-2-GA, TM-2-GF



5. HIWIN torque motors IM-2

5.1 Special characteristics of the torque motors IM-2

IM-2 series torque motors are ready-to-install motor elements consisting of a stator and rotor, especially suitable for applications in machine tools.
Due to the integrated cooling channels, the torque motor can be operated with liquid cooling. No additional process heat is then introduced into the machine and higher continuous torques can be achieved.
The torque motors of the IM-2 series are constructed for field-weakening operation. They thus achieve a significantly broader speed spectrum and are therefore predestined for combined axes for turning and milling operations.

Key features of the torque motors IM-2:

- Optimised for a broad speed spectrum (field weakening operation)
- Wear- and maintenance-free direct drive
- Play-free and highly precise
- Prepared for liquid cooling
- UL-certified

Typical fields of application for the torque motors TMRI:

- Machine tools, especially combined turning and milling axes

5.2 Order code for torque motors IM-2

IM-2	D	7	PA0	0	10	V	00

Series:
IM-2

Outer diameter [mm]:
2: 198
4: 230
7: 310
A: 385
G: 565

Rotor height [mm]:
3: 30
5: 50
7: 70
A: 100
F: 150

Winding variant

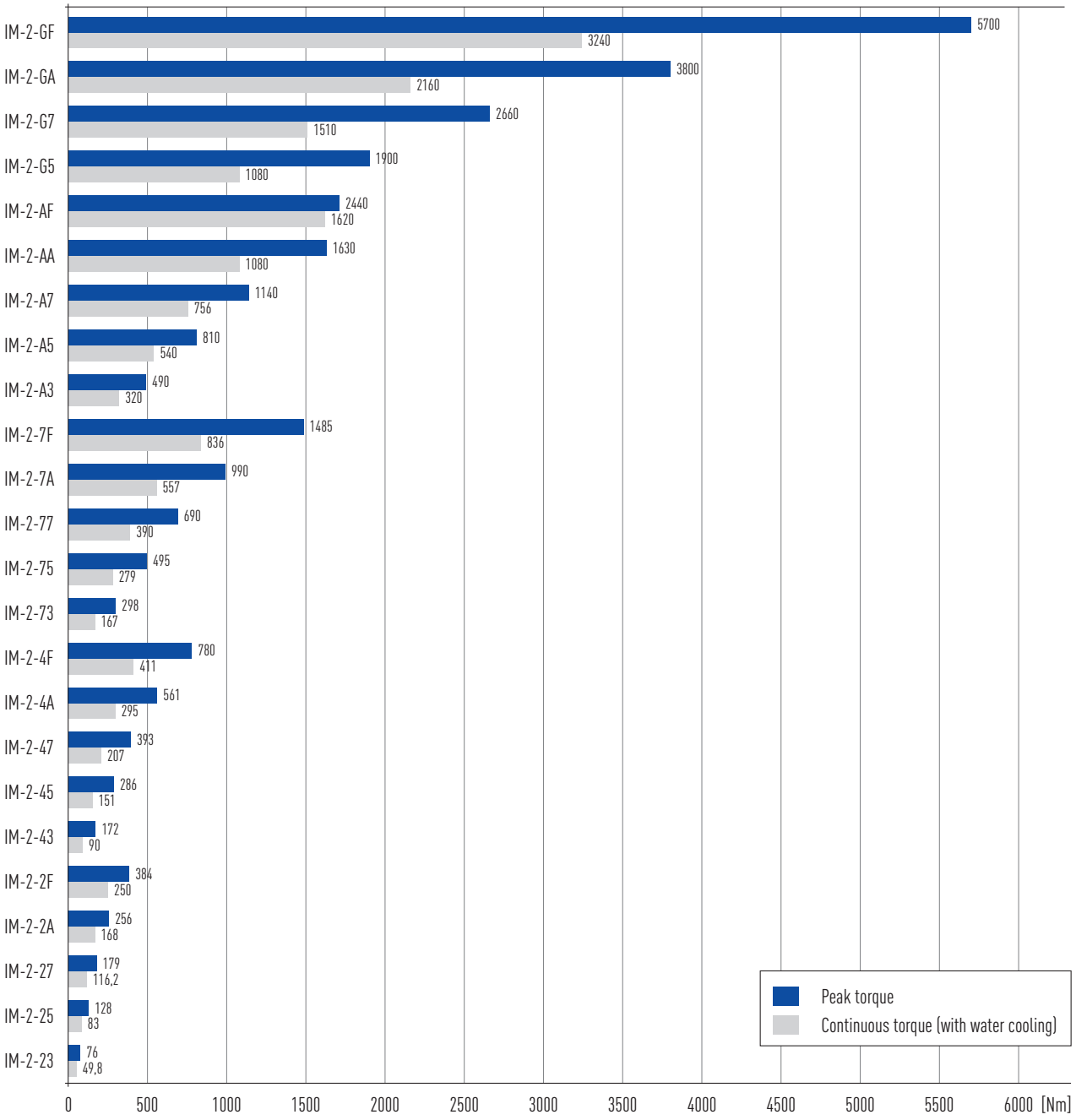
Special equipment:
00: Rotor and stator separately (standard)
03: Rotor and stator mounted with installation clamp

Cable outlet orientation:
S: Straight, potted in the stator
V: Straight, with strain relief plate
A: Straight, with PG screw connections
H: 90° motor cable outlet with strain relief plate

Cable length:
05: 500
10: 1,000
20: 2,000 (standard)

Thermal sensors:
0: 3 × PTC100, 3 × PTC130, 1 × PT1000 (Standard)
1: 3 × PTC100, 3 × PTC130, 3 × PT1000

5.3 IM-2 torques



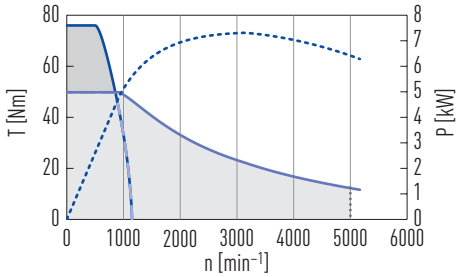
5.4 Torque motor IM-2 specifications

5.4.1 IM-2-2 specifications

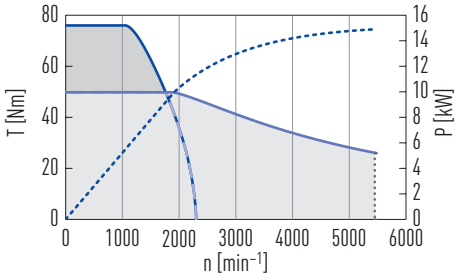
Torque-speed curves (DC bus voltage: 600 VDC)

- T_p
- T_{c_WC}
- T_{c_FW} (T_{c_WC} in field weakening mode)
- Power at T_{c_WC}
- Rated speed in field weakening mode

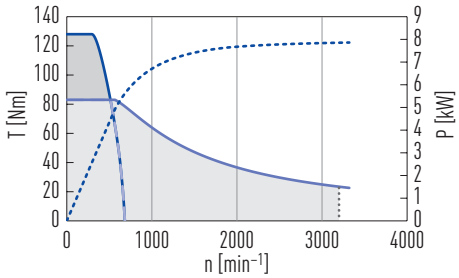
IM-2-23-PA0



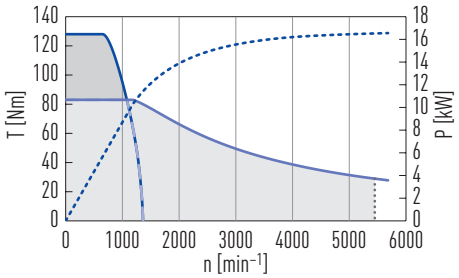
IM-2-23-PB0



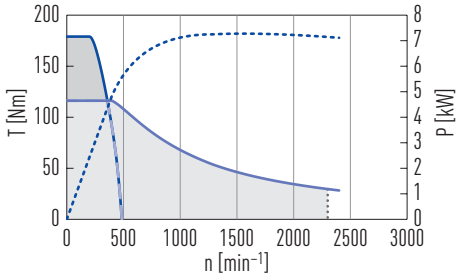
IM-2-25-PA0



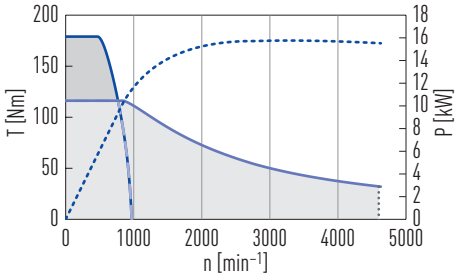
IM-2-25-PB0



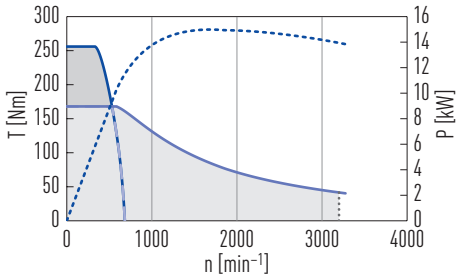
IM-2-27-PA0



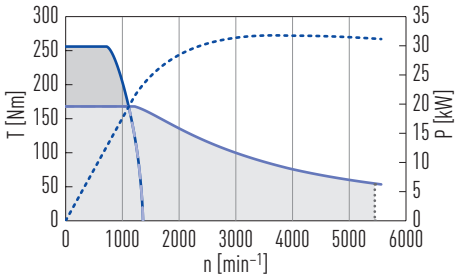
IM-2-27-PB0



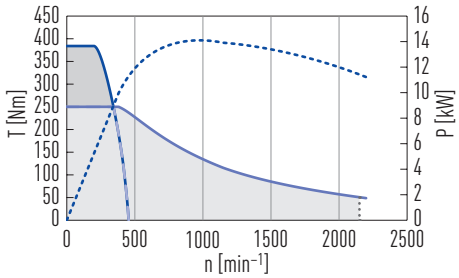
IM-2-2A-PB0



IM-2-2A-PD0



IM-2-2F-PB0



IM-2-2F-PD0

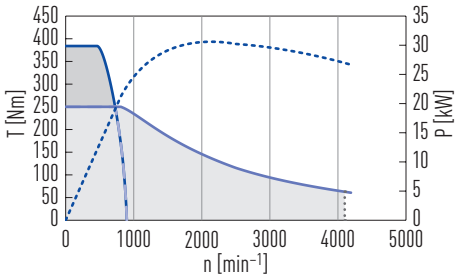
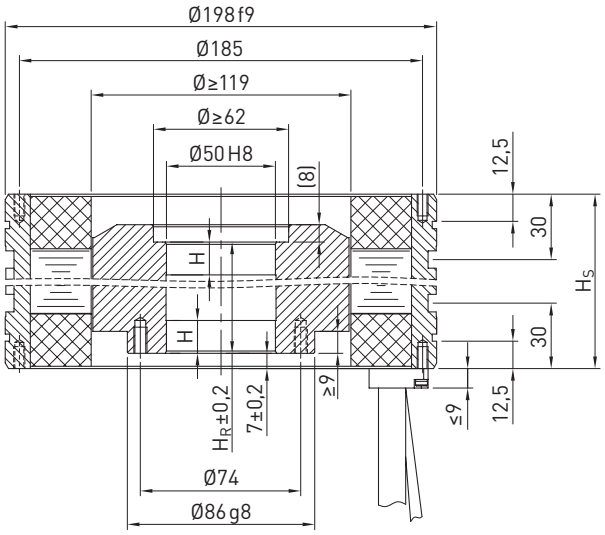


Table 5.1 **Technical data for IM-2-2**

	Symbol	Unit	IM-2-23-PA0	IM-2-23-PB0	IM-2-25-PA0	IM-2-25-PB0	IM-2-27-PA0	IM-2-27-PB0	IM-2-2A-PB0	IM-2-2A-PD0	IM-2-2F-PB0	IM-2-2F-PD0
Torques and electrical parameters												
Peak torque (for 1 sec.)	T_p	Nm	76		128		179		256		384	
Continuous torque (WC)	T_{c_WC}	Nm	49.8		83.0		116.2		168.0		250.0	
Stall torque (WC)	T_{s_WC}	Nm	42	42	70	70	98	98	141	141	210	210
Peak current (for 1 sec.)	I_p	A	25.5	51.0	25.5	51.0	25.5	51.0	51.0	102	51.0	102.0
Continuous current (WC)	I_{c_WC}	A	10.2	20.4	10.2	20.4	10.2	20.4	20.4	40.8	20.4	40.8
Stall current (WC)	I_{s_WC}	A	8.2	16.3	8.2	16.3	8.2	16.3	16.3	32.6	16.3	32.6
Resistance [1]	R_{25}	Ω	3.50	0.90	5.20	1.30	6.90	1.70	2.40	0.60	3.40	0.85
Inductance [1]	L_{25}	mH	25.5	6.4	37.6	9.4	49.7	12.4	17.0	4.3	24.6	6.2
Motor constant	K_m	Nm/√W	2.41	2.38	3.35	3.35	4.09	4.12	4.92	4.92	6.21	6.21
Electrical time constant	K_e	ms	7.3	7.1	7.2	7.2	7.2	7.3	7.1	7.2	7.2	7.3
Torque constant	K_t	Nm/A	5.54	2.77	9.35	4.68	13.16	6.58	9.35	4.68	14.03	7.10
Back emf constant	K_u	V_{eff}/(rad/s)	3.2	1.6	5.4	2.7	7.6	3.8	5.4	2.7	8.1	4.1
Inertia of rotor	J	kgm²	0.0051		0.0079		0.0107		0.0146		0.0215	
Thermal resistance (WC)	R_{th_WC}	°C/W	0.192	0.187	0.129	0.129	0.098	0.099	0.070	0.070	0.049	0.049
Max. DC bus voltage	U_{max}	VDC	750									
Max. speed at T_{c_WC}	n	min^{-1}	856	1,763	513	1,078	358	769	531	1,110	342	726
Max. speed at T_p	n	min^{-1}	477	1,004	289	641	196	462	313	686	193	449
Rated speed	n_N	min^{-1}	5,000	5,450	3,200	5,450	2,300	4,600	3,200	5,450	2,150	4,100
Mechanical parameters												
Number of poles	2p		22									
Thermal sensors			PTC SNM 100; PTC SNM 130; PT1000									
Stator height	H_S	mm	80		100		120		150		200	
Rotor height	H_R	mm	51		71		91		121		171	
Length of rotor centring fit	H	mm	15		20		20		20		20	
Rotor mass	M_r	kg	2.74		4.09		5.43		7.43		10.79	
Stator mass	M_s	kg	6.5		9.0		11.2		15.0		22.2	

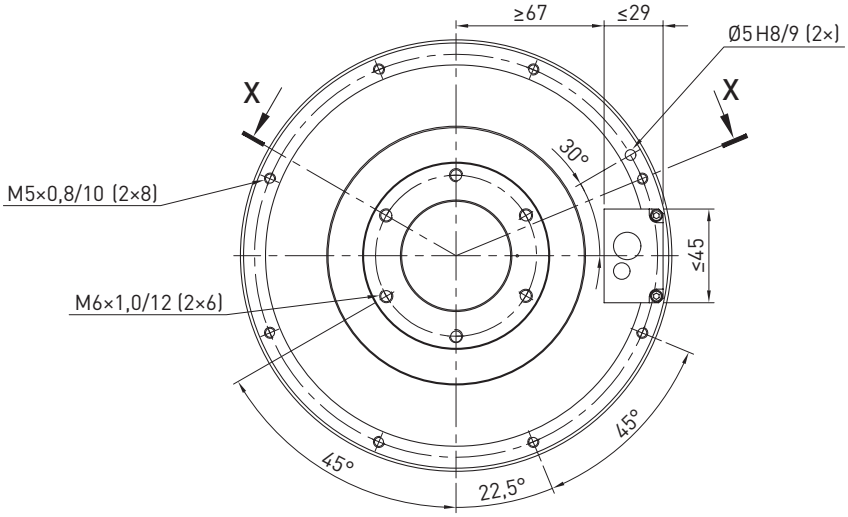
All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature
WC: with water cooling
[1] Line to line

Dimensions IM-2-2

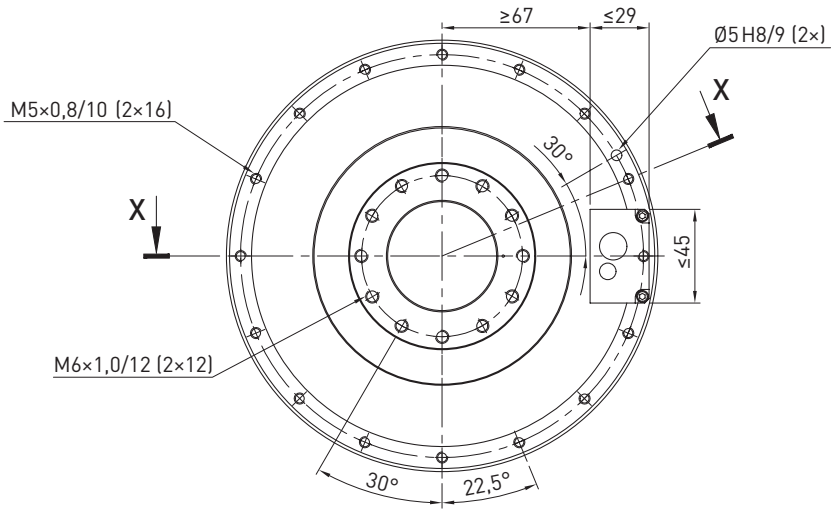


X–X

IM-2-23, IM-2-25, IM-2-27



IM-2-2A, IM-2-2F

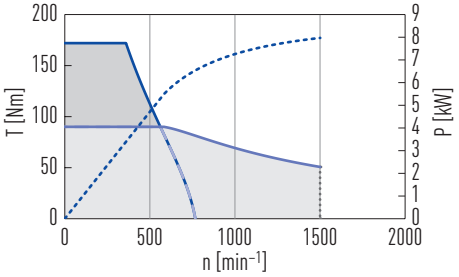


5.4.2 IM-2-4 specifications

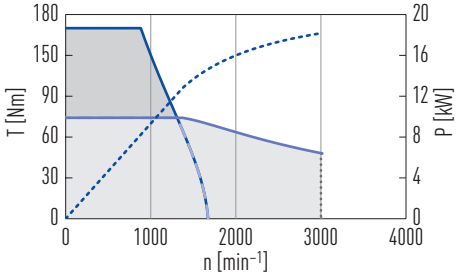
Torque-speed curves (DC bus voltage: 600 VDC)

- T_p
- T_{c_WC}
- T_{c_FW} (T_{c_WC} in field weakening mode)
- Power at T_{c_WC}
- Rated speed in field weakening mode

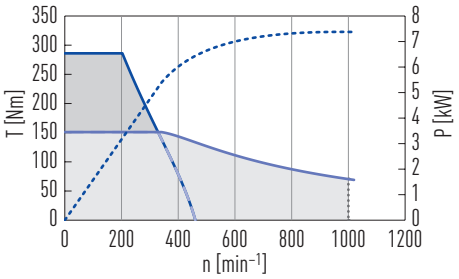
IM-2-43-LA0



IM-2-43-SA0



IM-2-45-LA0



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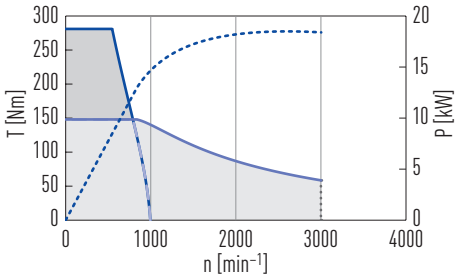
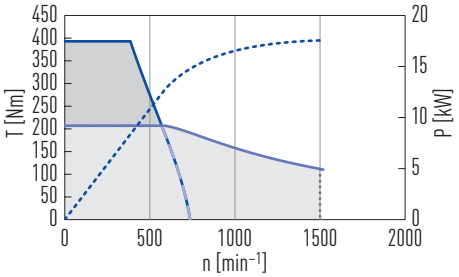
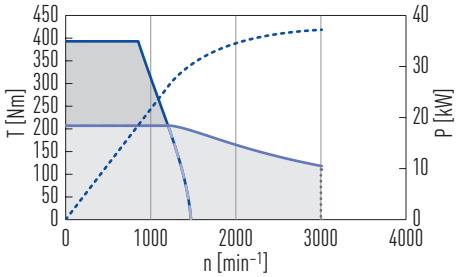


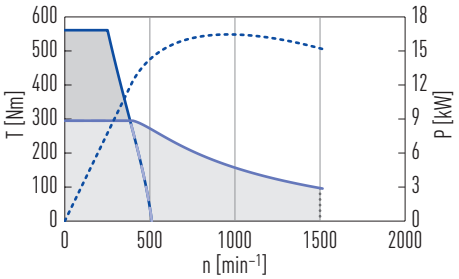
IM-2-47-SA0



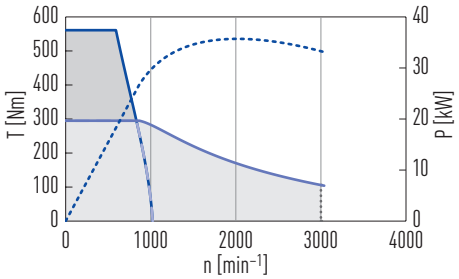
IM-2-47-SB0



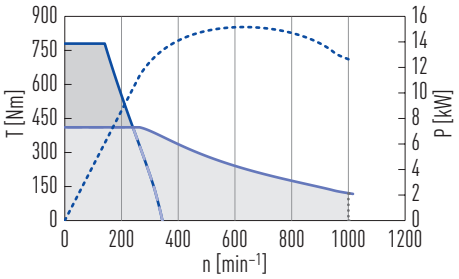
IM-2-4A-SA0



IM-2-4A-SB0



IM-2-4F-SA0



IM-2-4F-SB0

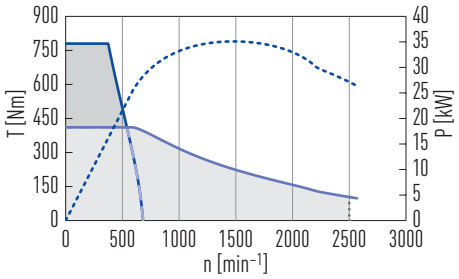
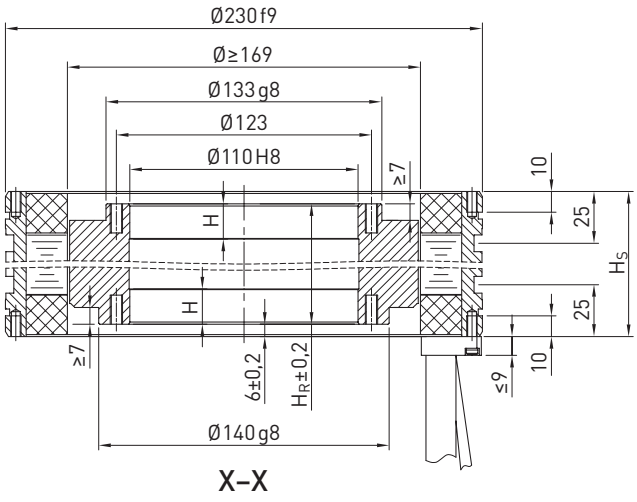


Table 5.2 **Technical data for IM-2-4**

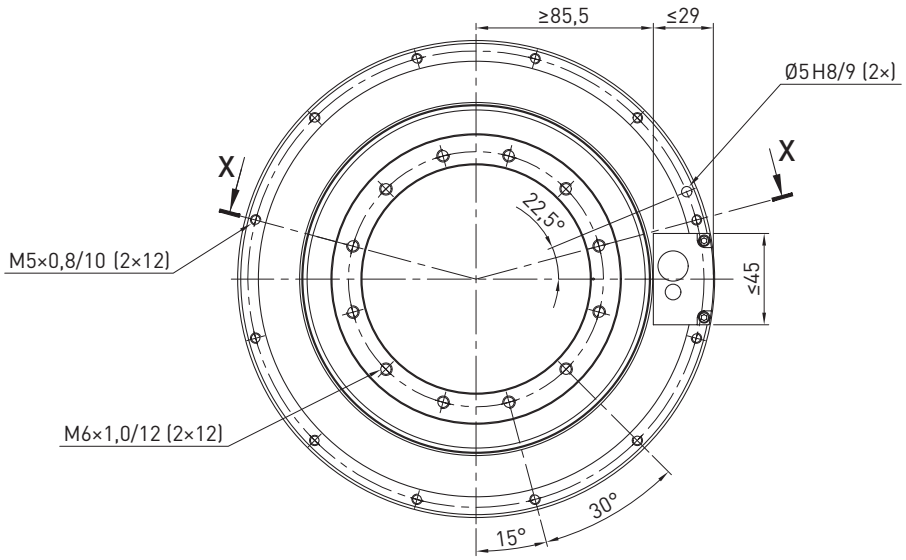
	Symbol	Unit	IM-2-43-LA0	IM-2-43-SA0	IM-2-45-LA0	IM-2-45-SA0	IM-2-47-SA0	IM-2-47-SB0	IM-2-4A-SA0	IM-2-4A-SB0	IM-2-4F-SA0	IM-2-4F-SB0
Torques and electrical parameters												
Peak torque (for 1 sec.)	T_p	Nm	172	168	286	281	393	393	561	561	780	780
Continuous torque (WC)	T_{c_WC}	Nm	90	89	151	148	207	207	295	295	411	411
Stall torque (WC)	T_{s_WC}	Nm	73	72	122	120	168	168	239	239	336	336
Peak current (for 1 sec.)	I_p	A	23.7	52.0	23.7	52.0	52.0	104.0	52.0	104.0	52.0	104.0
Continuous current (WC)	I_{c_WC}	A	11.4	24.9	11.4	24.9	24.9	49.8	24.9	49.8	24.9	49.8
Stall current (WC)	I_{s_WC}	A	9.1	19.9	9.1	19.9	19.9	39.8	19.9	39.8	19.9	39.8
Resistance [1]	R_{25}	Ω	5.6	1.2	8.3	1.72	2.3	0.6	3.1	0.8	4.5	1.1
Inductance [1]	L_{25}	mH	16.8	3.5	23.8	5.1	6.8	1.7	9.3	2.3	13.4	3.4
Motor constant	K_m	Nm/√W	2.86	2.84	3.89	3.93	4.60	4.51	5.74	5.65	7.09	7.17
Electrical time constant	K_e	ms	3.0	2.9	2.9	3.0	3.0	2.8	3.0	2.9	3.0	3.1
Torque constant	K_t	Nm/A	8.31	3.81	13.86	6.41	8.66	4.33	12.47	6.24	18.53	9.35
Back emf constant	K_u	V_{eff}/(rad/s)	4.8	2.2	8.0	3.7	5.0	2.5	7.2	3.6	10.7	5.4
Inertia of rotor	J	kgm²	0.018		0.027		0.036		0.049		0.071	
Thermal resistance (WC)	R_{th_WC}	°C/W	0.096	0.094	0.065	0.066	0.049	0.047	0.036	0.035	0.025	0.026
Max. DC bus voltage	U_{max}	VDC	750									
Max. speed at T_{c_WC}	n	min^{-1}	561	1,310	328	790	570	1,203	384	831	240	539
Max. speed at T_p	n	min^{-1}	359	883	203	546	385	852	251	590	140	374
Rated speed	n_N	min^{-1}	1,500	3,000	1,000	3,000	1,500	3,000	1,500	3,000	1,000	2,500
Mechanical parameters												
Number of poles	2p		40									
Thermal sensors			PTC SNM 100; PTC SNM 130; PT1000									
Stator height	H_S	mm	70		90		110		140		190	
Rotor height	H_R	mm	58		78		98		128		178	
Length of rotor centring fit	H	mm	17		17		17		17		17	
Rotor mass	M_r	kg	3.7		5.4		7.2		9.6		13.9	
Stator mass	M_s	kg	6.5		9.0		11.2		15.0		22.2	

All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature
WC: with water cooling
[1] Line to line

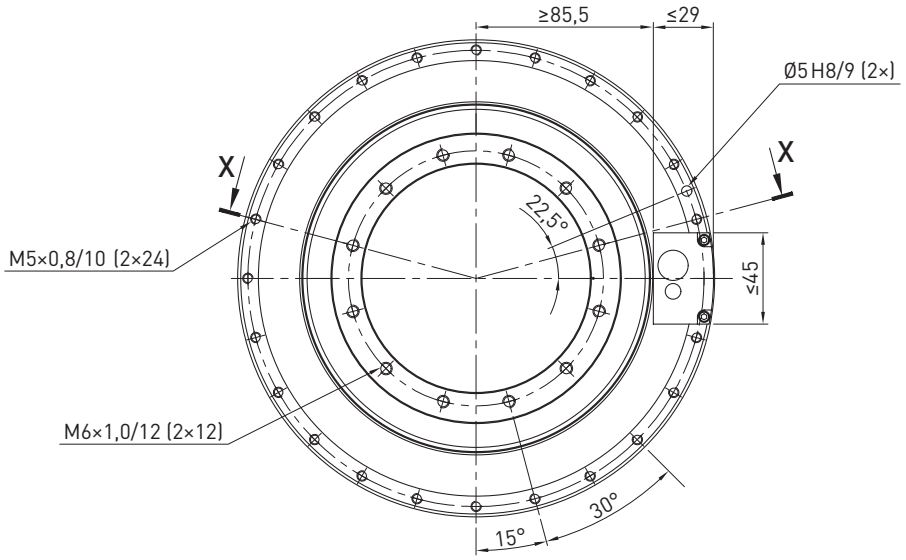
Dimensions IM-2-4



IM-2-43, IM-2-45, IM-2-47



IM-2-4A, IM-2-4F

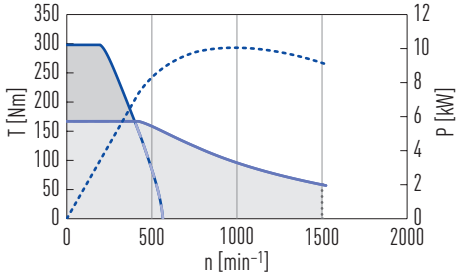


5.4.3 IM-2-7 specifications

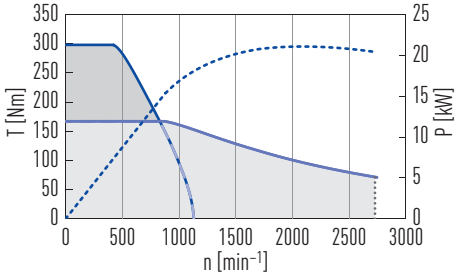
Torque-speed curves (DC bus voltage: 600 VDC)

- T_p
- T_{c_WC}
- T_{c_FW} (T_{c_WC} in field weakening mode)
- Power at T_{c_WC}
- Rated speed in field weakening mode

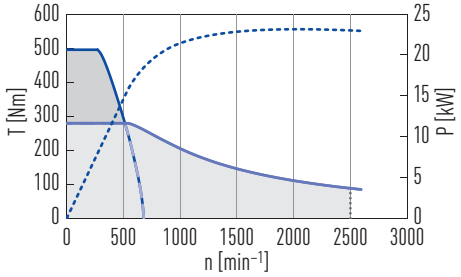
IM-2-73-SA0



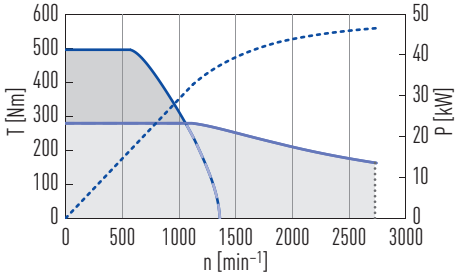
IM-2-73-SB0



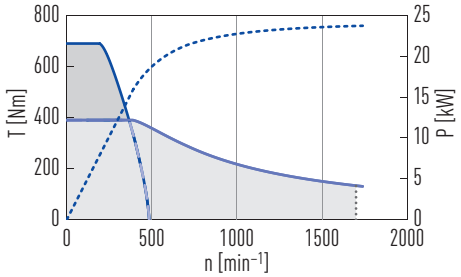
IM-2-75-SB0



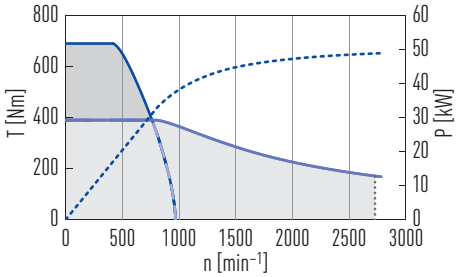
IM-2-75-SD0



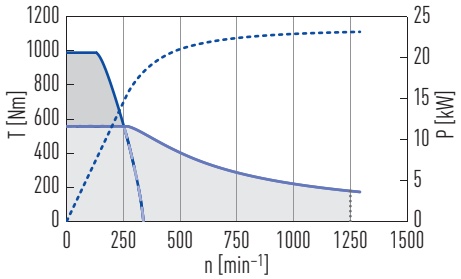
IM-2-77-SB0



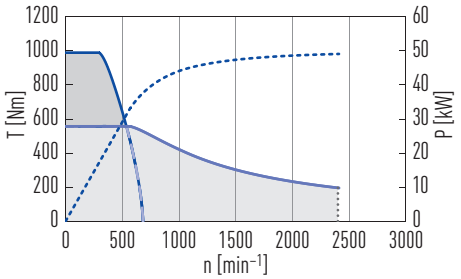
IM-2-77-SD0



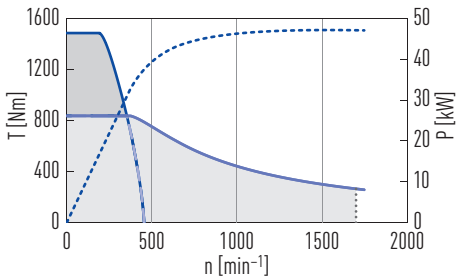
IM-2-7A-SB0



IM-2-7A-SD0



IM-2-7F-SD0



IM-2-7F-WD0

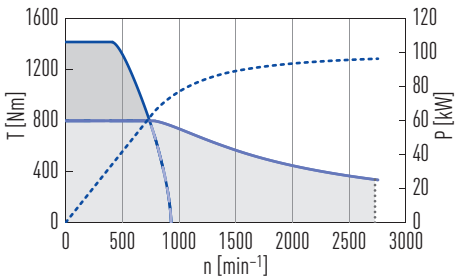
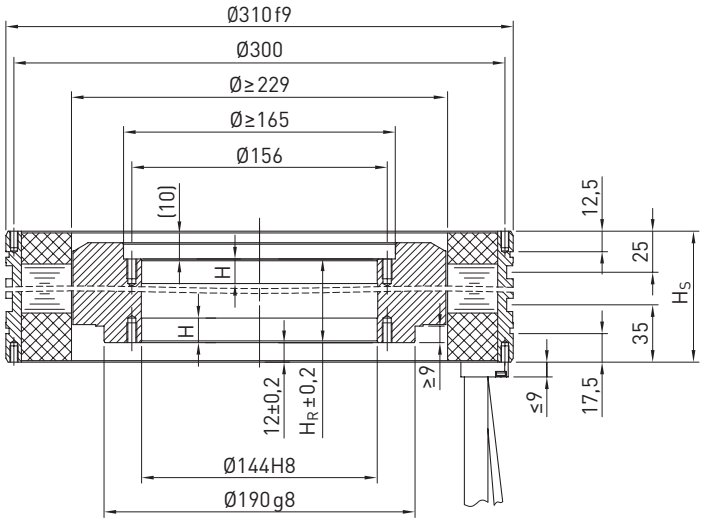


Table 5.3 **Technical data for IM-2-7**

	Symbol	Unit	IM-2-73-SA0	IM-2-73-SB0	IM-2-75-SB0	IM-2-75-SD0	IM-2-77-SB0	IM-2-77-SD0	IM-2-7A-SB0	IM-2-7A-SD0	IM-2-7F-SD0	IM-2-7F-WD0
Torques and electrical parameters												
Peak torque (for 1 sec.)	T_p	Nm	298		495		690		990		1,485	1,415
Continuous torque (WC)	T_{c_WC}	Nm	167		279		390		557		836	797
Stall torque (WC)	T_{s_WC}	Nm	138	137	229	229	321	321	458	458	688	656
Peak current (for 1 sec.)	I_p	A	44.2	88.3	88.3	176.6	88.3	176.6	88.3	176.6	176.6	344.0
Continuous current (WC)	I_{c_WC}	A	16.2	32.3	32.3	64.5	32.3	64.5	32.3	64.5	64.5	125.7
Stall current (WC)	I_{s_WC}	A	13.0	25.8	25.8	51.6	25.8	51.6	25.8	51.6	51.6	100.6
Resistance [1]	R_{25}	Ω	2.70	0.68	1.00	0.25	1.32	0.33	1.80	0.45	0.65	0.17
Inductance [1]	L_{25}	mH	18.10	4.52	6.65	1.66	8.80	2.20	12.00	3.00	4.30	1.13
Motor constant	K_m	Nm/√W	5.28	5.31	7.25	7.25	8.87	8.87	10.86	10.86	13.53	12.97
Electrical time constant	K_e	ms	6.7	6.6	6.7	6.6	6.7	6.7	6.7	6.7	6.6	6.6
Torque constant	K_t	Nm/A	11.29	5.65	9.41	4.69	13.16	6.58	18.88	9.35	14.03	6.86
Back emf constant	K_u	V_{eff}/(rad/s)	6.52	3.26	5.43	2.71	7.60	3.80	10.90	5.40	8.10	3.96
Inertia of rotor	J	kgm²	0.071		0.104		0.138		0.187		0.271	
Thermal resistance (WC)	R_{th_WC}	°C/W	0.099	0.099	0.067	0.067	0.051	0.051	0.037	0.037	0.026	0.026
Max. DC bus voltage	U_{max}	VDC	750									
Max. speed at T_{c_WC}	n	min^{-1}	399	829	512	1,057	366	761	251	535	353	740
Max. speed at T_p	n	min^{-1}	195	420	268	567	192	416	129	293	192	411
Rated speed	n_N	min^{-1}	1,500	2,730	2,500	2,730	1,700	2,730	1,250	2,400	1,700	2,730
Mechanical parameters												
Number of poles	2p		44									
Thermal sensors			PTC SNM 100; PTC SNM 130; PT1000									
Stator height	H_S	mm	80		100		120		150		200	
Rotor height	H_R	mm	51		71		91		121		171	
Length of rotor centring fit	H	mm	15		20		20		20		20	
Rotor mass	M_r	kg	8.2		11.8		15.5		21.0		30.2	
Stator mass	M_s	kg	13.6		17.9		22.3		28.9		40.6	

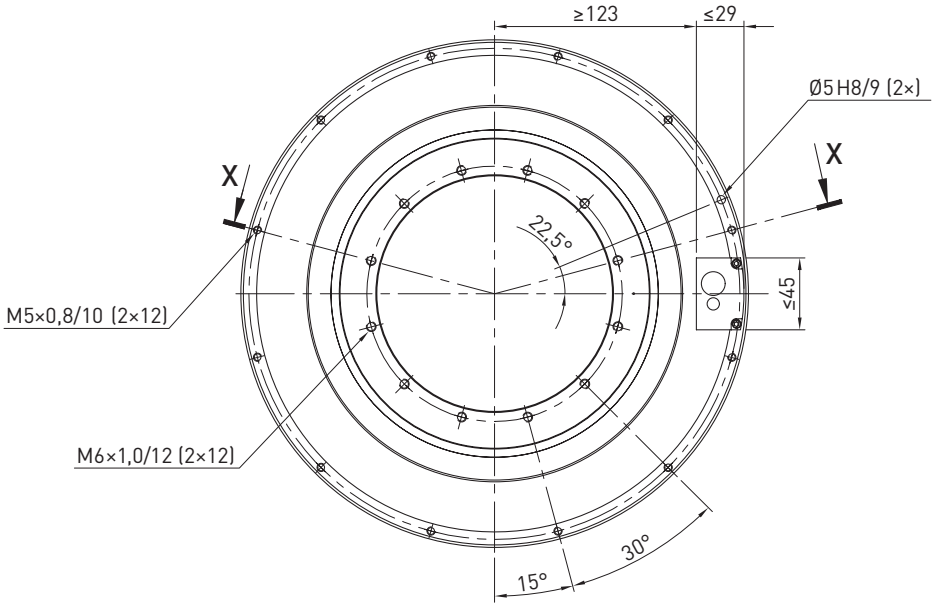
All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature
WC: with water cooling
[1] Line to line

Dimensions IM-2-7

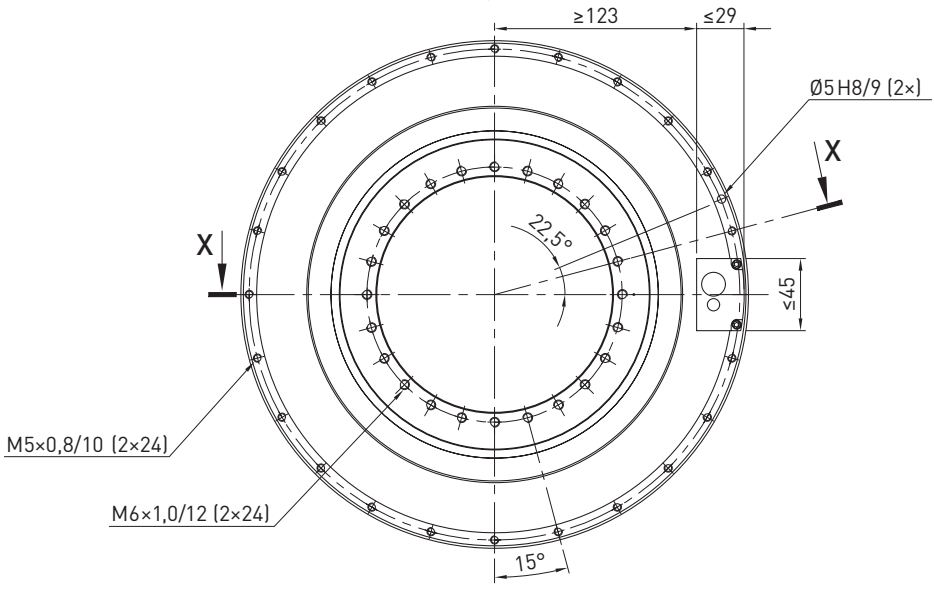


X–X

IM-2-73, IM-2-75, IM-2-77



IM-2-7A, IM-2-7F

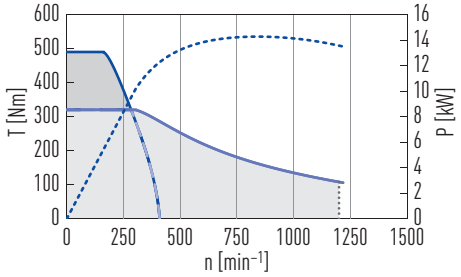


5.4.4 IM-2-A specifications

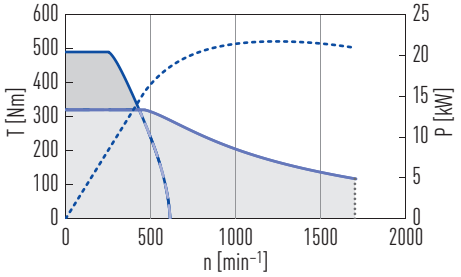
Torque-speed curves (DC bus voltage: 600 VDC)

- T_p
- T_{c_WC}
- T_{c_FW} (T_{c_WC} in field weakening mode)
- Power at T_{c_WC}
- Rated speed in field weakening mode

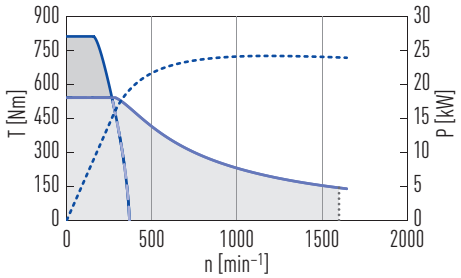
IM-2-A3-PB0



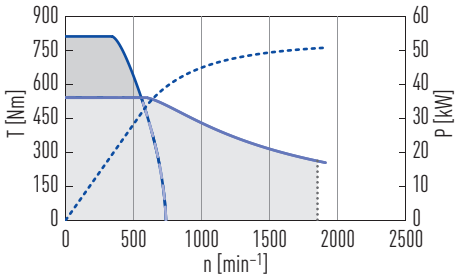
IM-2-A3-PC0



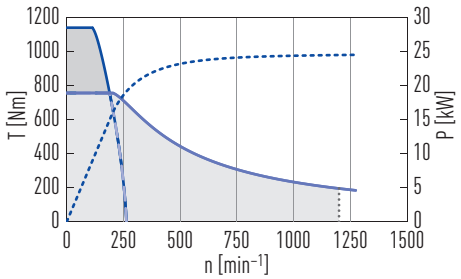
IM-2-A5-PC0



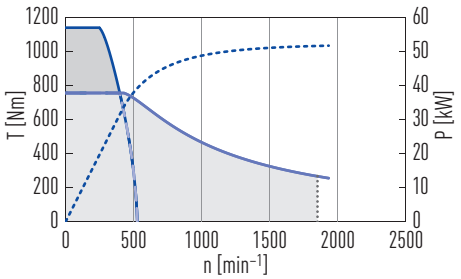
IM-2-A5-PF0



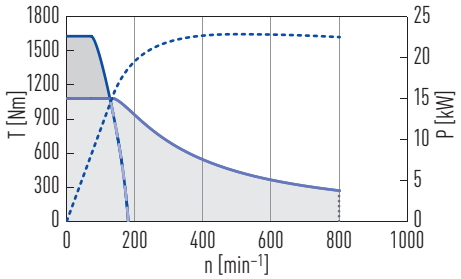
IM-2-A7-PC0



IM-2-A7-PF0



IM-2-AA-PC0



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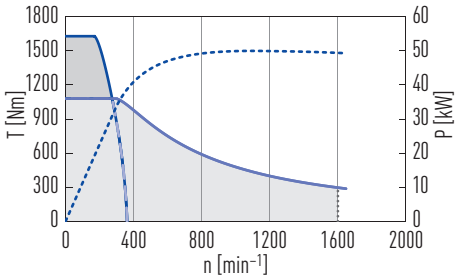

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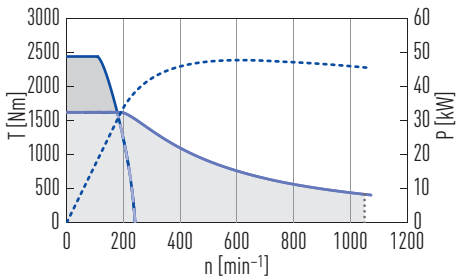

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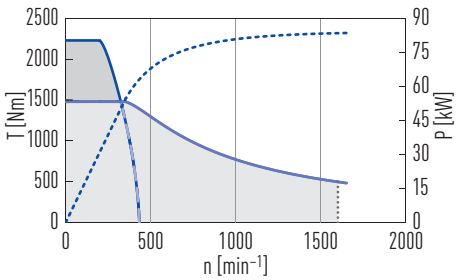
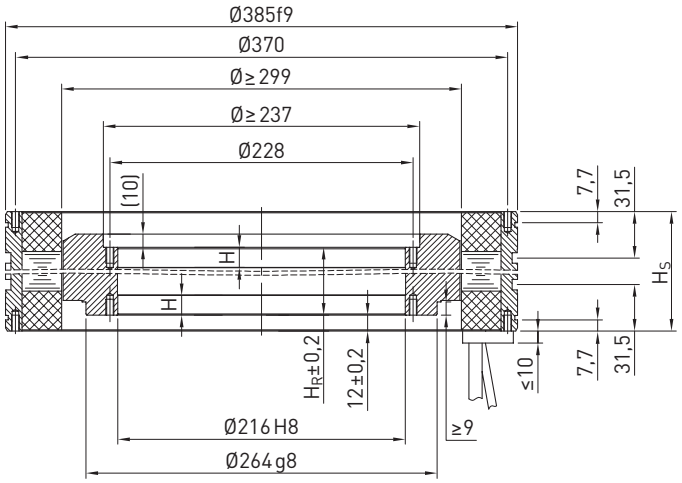


Table 5.4 **Technical data for IM-2-A**

	Symbol	Unit	IM-2-A3-PB0	IM-2-A3-PC0	IM-2-A5-PC0	IM-2-A5-PF0	IM-2-A7-PC0	IM-2-A7-PF0	IM-2-AA-PC0	IM-2-AA-PF0	IM-2-AF-PF0	IM-2-AF-SF0
Torques and electrical parameters												
Peak torque (for 1 sec.)	T_p	Nm	490		810		1,140		1,630		2,440	2,230
Continuous torque (WC)	T_{c_WC}	Nm	320		540		756		1,080		1,620	1,480
Stall torque (WC)	T_{s_WC}	Nm	268	268	453	453	634	634	907	907	1,361	1,242
Peak current (for 1 sec.)	I_p	A	52	78	78	156	78	156	78	156	156	255
Continuous current (WC)	I_{c_WC}	A	23.0	35.0	35.0	70.0	35.0	70.0	35.0	70.0	70.0	114.4
Stall current (WC)	I_{s_WC}	A	18.4	28.0	28.0	56.0	28.0	56.0	28.0	56.0	56.0	91.5
Resistance [1]	R_{25}	Ω	1.80	0.82	1.20	0.30	1.60	0.40	2.20	0.55	0.80	0.30
Inductance [1]	L_{25}	mH	12.4	5.5	8.2	2.0	10.8	2.7	14.8	3.7	5.4	2.0
Motor constant	K_m	Nm/√W	9.43	9.32	12.86	12.86	15.65	15.65	19.40	19.40	24.19	21.94
Electrical time constant	K_e	ms	6.9	6.7	6.8	6.7	6.8	6.8	6.7	6.7	6.8	6.7
Torque constant	K_t	Nm/A	15.59	10.39	17.32	8.66	24.25	12.12	35.33	17.67	26.50	14.72
Back emf constant	K_u	V_{eff}/(rad/s)	9.0	6.0	10.0	5.0	14.0	7.0	20.4	10.2	15.3	8.5
Inertia of rotor	J	kgm²	0.185		0.270		0.355		0.482		0.694	
Thermal resistance (WC)	R_{th_WC}	°C/W	0.074	0.070	0.048	0.048	0.036	0.036	0.026	0.026	0.018	0.018
Max. DC bus voltage	U_{max}	VDC	750									
Max. speed at T_{c_WC}	n	min^{-1}	283	432	265	555	188	397	126	273	177	324
Max. speed at T_p	n	min^{-1}	161	252	158	342	112	245	73	170	108	199
Rated speed	n_N	min^{-1}	1,200	1,700	1,600	1,850	1,200	1,850	800	1,600	1,050	1,600
Mechanical parameters												
Number of poles	2p		66									
Thermal sensors			PTC SNM 100; PTC SNM 130; PT1000									
Stator height	H_S	mm	90		110		130		160		210	
Rotor height	H_R	mm	51		71		91		121		171	
Length of rotor centring fit	H	mm	15		20		20		20		20	
Rotor mass	M_r	kg	11.3		16.3		21.3		28.7		41.2	
Stator mass	M_s	kg	20.1		26.8		34.5		44.9		63.1	

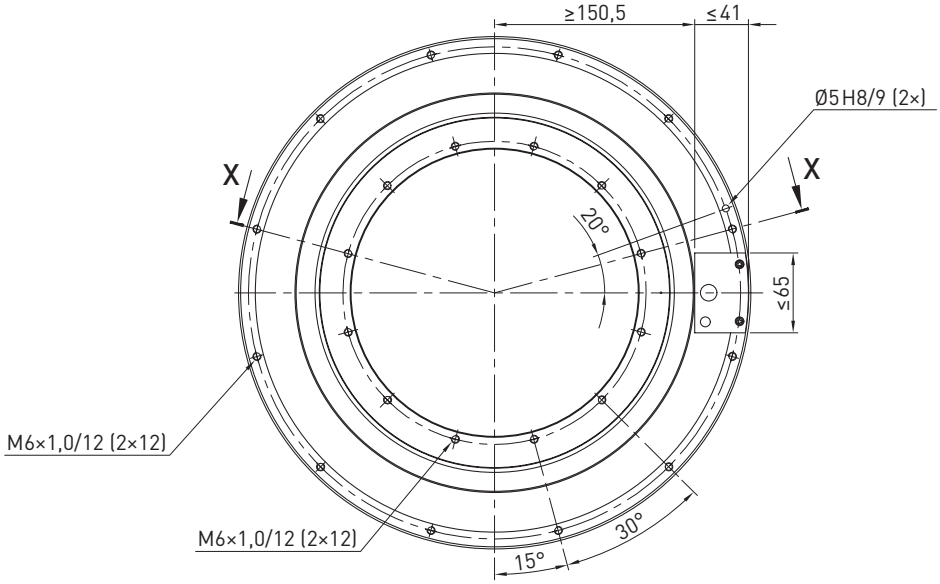
All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature
WC: with water cooling
[1] Line to line

Dimensions IM-2-A

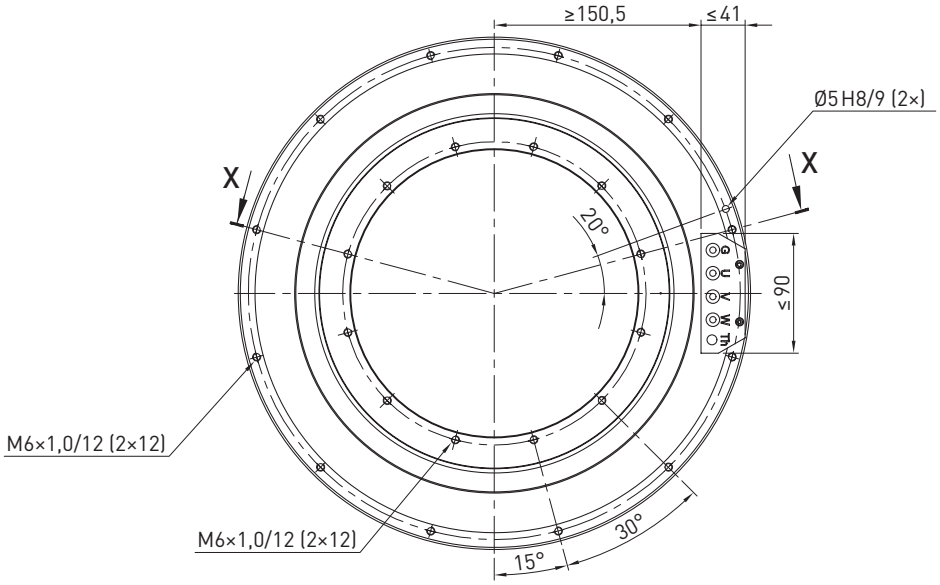


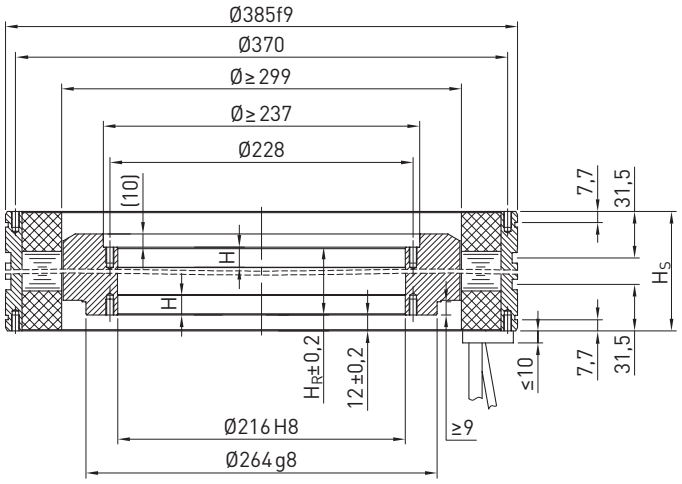
X–X

IM-2-A3



IM-2-A5, IM-2-A7





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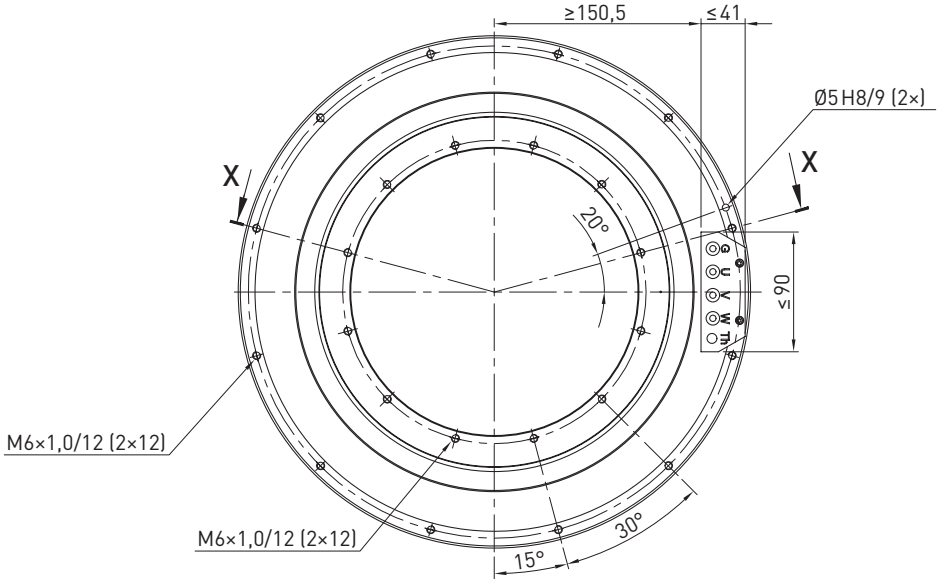
IM-2-A5, IM-2-A7

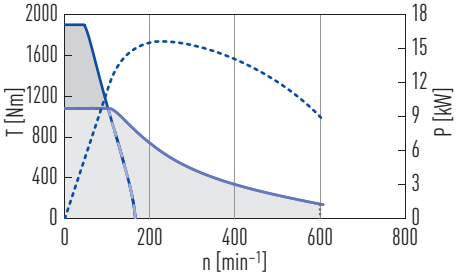


5.4.5 IM-2-G specifications

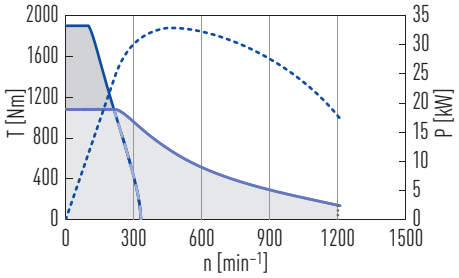
Torque-speed curves (DC bus voltage: 600 VDC)

- T_p
- T_{c_WC}
- T_{c_FW} (T_{c_WC} in field weakening mode)
- Power at T_{c_WC}
- Rated speed in field weakening mode

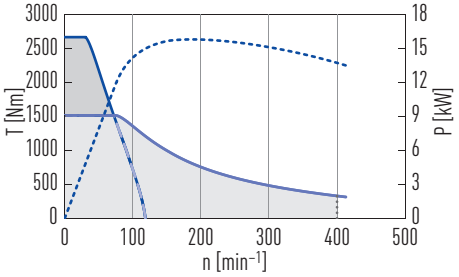
IM-2-G5-SB0



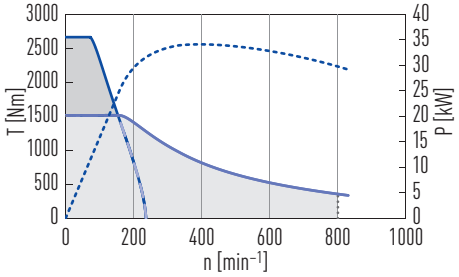
IM-2-G5-SD0



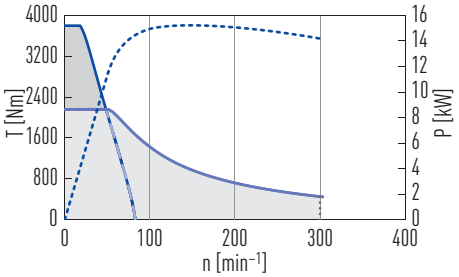
IM-2-G7-SB0



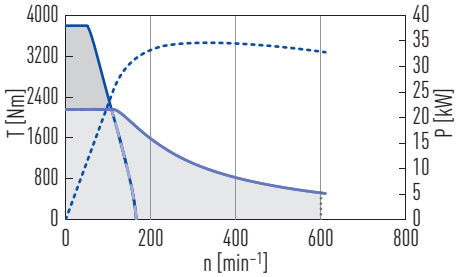
IM-2-G7-SD0



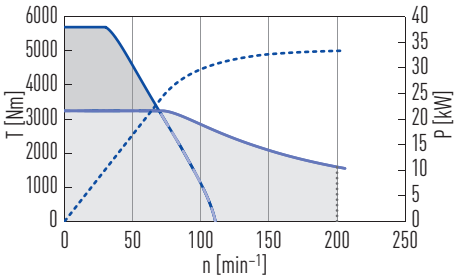
IM-2-GA-SB0



IM-2-GA-SD0



IM-2-GF-SD0



IM-2-GF-SH0

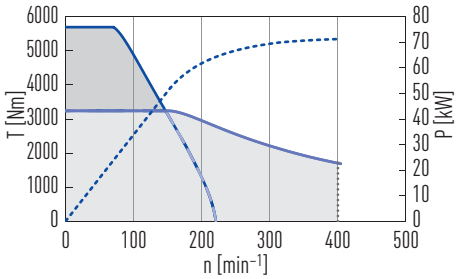
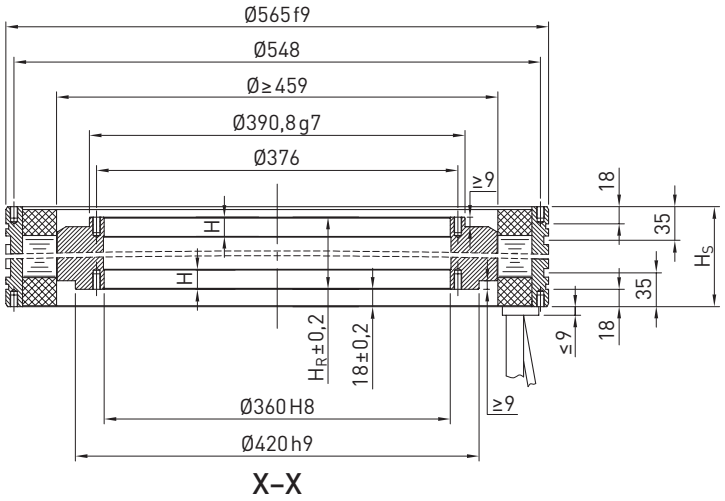


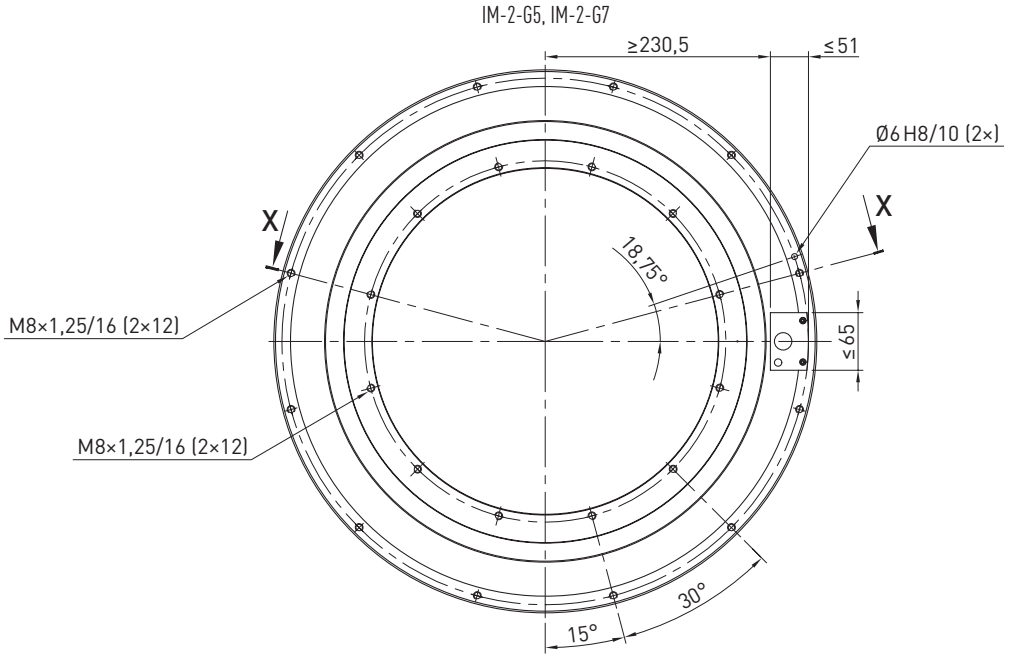
Table 5.5 **Technical data for IM-2-G**

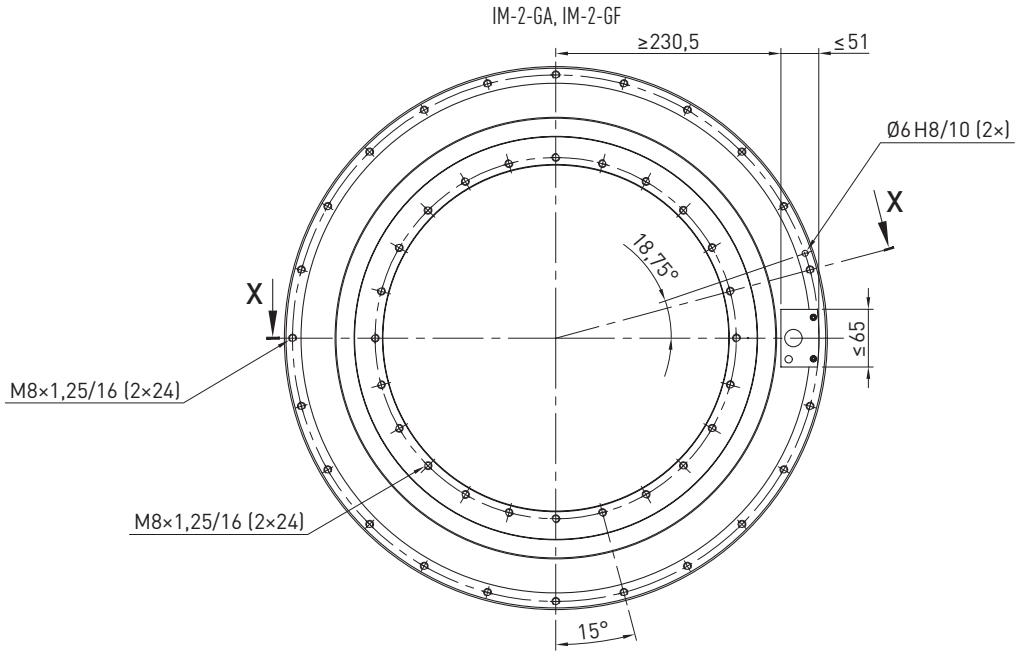
	Symbol	Unit	IM-2-G5-SB0	IM-2-G5-SD0	IM-2-G7-SB0	IM-2-G7-SD0	IM-2-GA-SB0	IM-2-GA-SD0	IM-2-GF-SD0	IM-2-GF-SH0
Torques and electrical parameters										
Peak torque (for 1 sec.)	T_p	Nm	1,900		2,660		3,800		5,700	
Continuous torque (WC)	T_{c_WC}	Nm	1,080		1,510		2,160		3,240	
Stall torque (WC)	T_{s_WC}	Nm	890	892	1.245	1.247	1.781	1.784	2.676	2.676
Peak current (for 1 sec.)	I_p	A	80	160	80	160	80	160	160	320
Continuous current (WC)	I_{c_WC}	A	30.3	60.6	30.3	60.6	30.3	60.6	60.6	121.2
Stall current (WC)	I_{s_WC}	A	24.2	48.5	24.2	48.5	24.2	48.5	48.5	97.0
Resistance [1]	R_{25}	Ω	2.10	0.53	2.75	0.70	3.76	0.94	1.40	0.40
Inductance [1]	L_{25}	mH	21.0	5.3	27.8	7.0	38.0	9.5	13.8	3.5
Motor constant	K_m	Nm/√W	21.13	21.03	25.85	25.62	31.58	31.58	38.82	36.31
Electrical time constant	K_e	ms	10.0	10.0	10.1	10.0	10.1	10.1	9.9	8.8
Torque constant	K_t	Nm/A	38.45	19.23	53.87	27.02	76.90	38.45	57.68	28.93
Back emf constant	K_u	V_{eff}/(rad/s)	22.2	11.1	31.1	15.6	44.4	22.2	33.3	16.7
Inertia of rotor	J	kgm²	1.14		1.60		2.28		3.42	
Thermal resistance (WC)	R_{th_WC}	°C/W	0.31	0.31	0.24	0.23	0.17	0.17	0.12	0.10
Max. DC bus voltage	U_{max}	VDC	750							
Max. speed at T_{c_WC}	n	min^{-1}	101	212	72	153	48	108	69	146
Max. speed at T_p	n	min^{-1}	45	100	30	72	17	50	29	70
Rated speed	n_N	min^{-1}	600	1,200	400	800	300	600	200	400
Mechanical parameters										
Number of poles	2p		88							
Thermal sensors			PTC SNM 100; PTC SNM 130; PT1000							
Stator height	H_S	mm	110		130		160		210	
Rotor height	H_R	mm	81		101		131		181	
Length of rotor centring fit	H	mm	20		20		20		20	
Rotor mass	M_r	kg	27.1		38.1		54.3		81.5	
Stator mass	M_s	kg	50.0		63.5		78.0		111.8	

All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature
WC: with water cooling
[1] Line to line

Dimensions IM-2-G







6. Options and accessories

6.1 Closed cooling jacket

For easy integration of our water-cooled torque motors, we also supply them in a closed version. The connection to the cooling unit is realised via 2 G⅛ threads in the stainless steel jacket. As in the version without a closed cooling jacket, the alignment of the motor is realised easily via the fit of the stator. Available for the series TMRW, TM-2 and IM-2G.

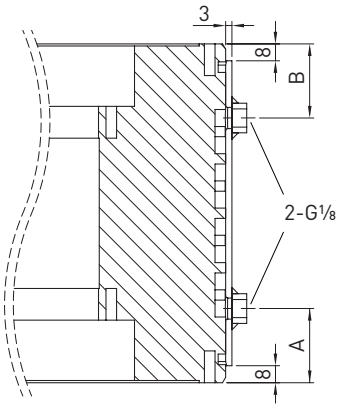


Table 6.1 **Dimensions of steel cooling jacket**

Torque motor [1]	Dimension A [mm]	Dimension B [mm]
TMRW7, TM-2-7, IM-2-7	35	25
TMRWA, TM-2-A, IM-2-A	35	35
TMRWG, TM-2-G, IM-2-G	35	35
TMRWD, TM-2-D	27	43

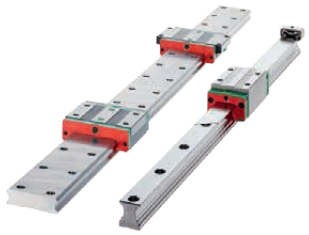
[1] All other sizes upon request

6.2 Cable outlet orientations of the torque motors

Table 6.2 **Cable outlet orientations of the torque motors**

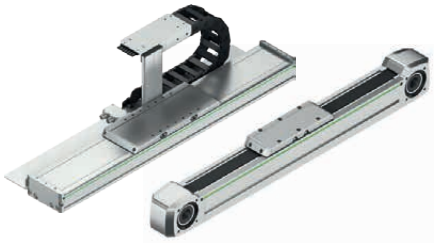
	**Type S** ○ Straight cable outlet ○ Cables potted in the stator
	**Type V** ○ Straight cable outlet ○ With strain relief plate
	**Type A** ○ Straight cable outlet ○ With strain relief plate ○ With PG screw connections
	**Type H** ○ 90° cable outlet of the motor cable ○ Straight cable outlet of the temperature cable ○ With strain relief plate

We live motion.

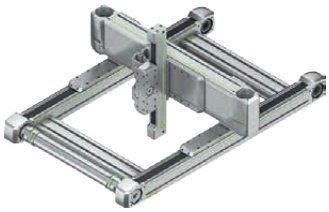


Linear Guideways

Ballscrews



Linear Axes



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Robots

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Rotary Tables

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