BERGER LAHR

Catalogue of Twin Line Motors

Edition 11/2001

Twin Line

Motors

3-phase stepping motors

Size

VRDM 368 | VRDM 39X | VRDM 311X

Power class

3 A / 350 W / 1~
VRDM 368
VRDM 39X

7 A / 750 W / 1~
VRDM 311X

AC synchronous servomotors (standard)

SER 39X | SER 311X

3 A / 750 W / 1~
SER 397
SER 3910
SER 3913
SER 3916

3 A / 1,5 kW / 3~
SER 3913
SER 3916
SER 31112
SER 31117

6 A / 3 kW / 3~
SER 31117
SER 31122
SER 31127

Power electronics

for single-axis systems

TLD 011 | TLD 012 | TLD 132 | TLD 134 | TLD 136

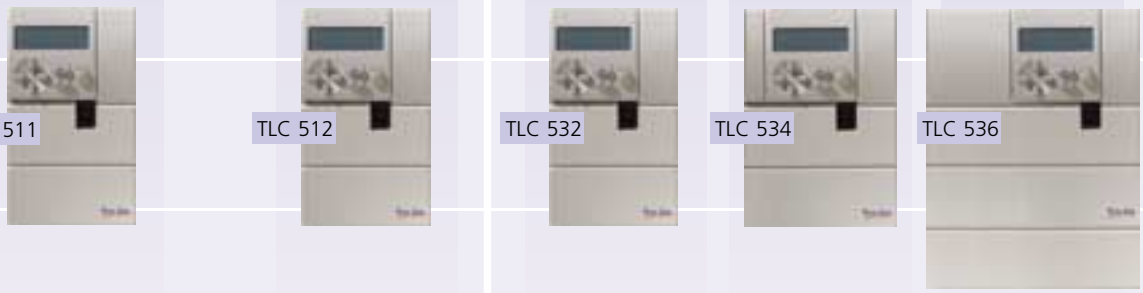
Positioning controllers

with data set processing

TLC 411 | TLC 412 | TLC 432 | TLC 434 | TLC 436

with field-bus interface

TLC 511 | TLC 512 | TLC 532 | TLC 534 | TLC 536



freely programmable according to IEC 1131-3

TLC 611 | TLC 612 | TLC 632 | TLC 634 | TLC 636

Robotics

Single-axis systems

Portal axis | Cantilever axis | Telescope axis

AC synchronous servomotors (high performance)

DSM 4-05.X
DSM 4-07.X

DSM 4-09.X

DSM 4-11.X

DSM 4-14.X

DSM 4-19.X

3 A / 750 W / 1~
DSM 4-05.1-.4
DSM 4-07.1-.2
DSM 4-09.1-.2

3 A / 1,5 kW / 3~
DSM 4-07.1-.3
DSM 4-09.1-.3

6 A / 3 kW / 3~
DSM 4-07.1-.3
DSM 4-09.1-.4
DSM 4-11.1-.2

16 A / 8 kW / 3~
DSM 4-11.1-.4
DSM 4-14.1-.4
DSM 4-19.1-.2

Catalogue includes

- General information
- 3-phase stepping motors
- AC synchronous servomotors (standard)
- AC synchronous servomotors (high performance)
- Accessories

TLD 132

TLD 134

TLD 136

TLD 138

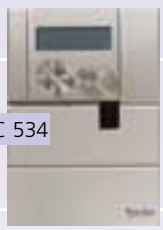
Catalogue of
Power electronics

TLC 432

TLC 532

TLC 632

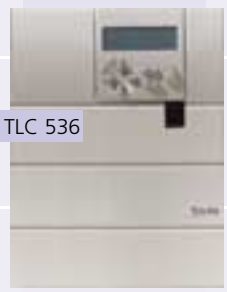
TLC 434



TLC 534

TLC 634

TLC 436



TLC 536

TLC 636

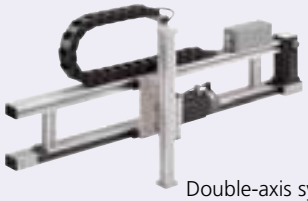
TLC 438

TLC 538

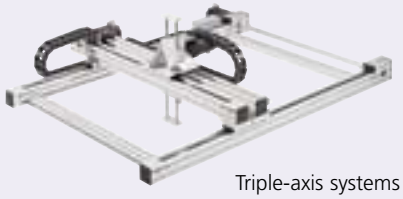
TLC 638

Catalogue of
Positioning
Controllers

Multi-axis systems



Double-axis systems



Triple-axis systems

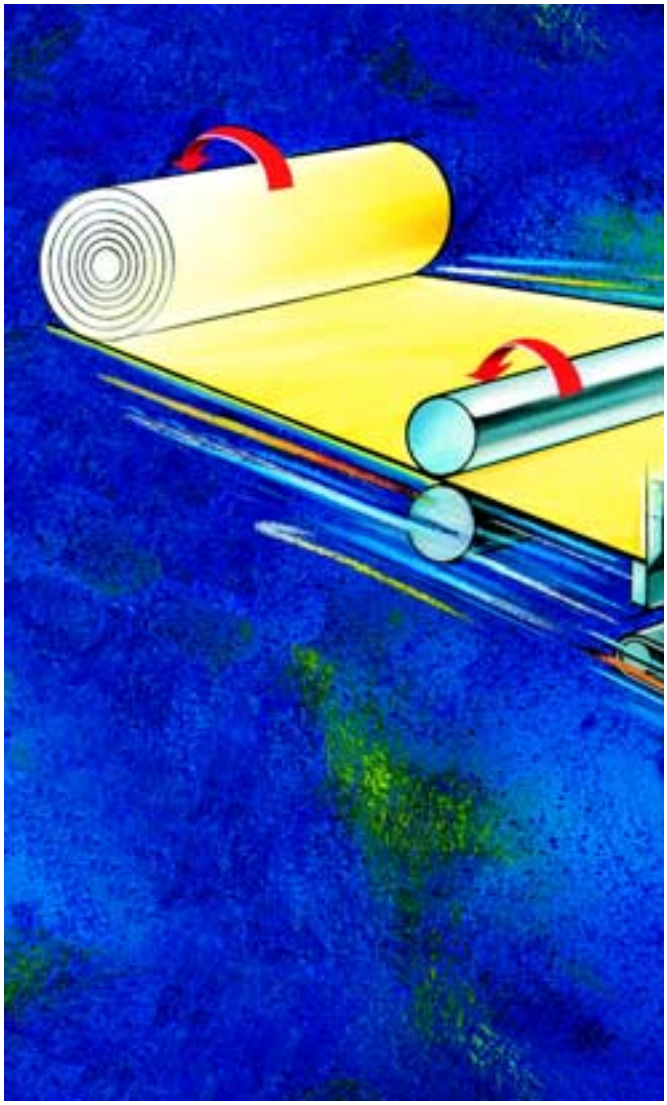
Low-mass systems

Catalogue of
Robotics

Positioning drives

Positioning drives enable the execution of accurate, precisely defined movements. The distances travelled may vary from a few µm to several metres. The digital positioning drives from Berger Lahr are especially well-suited to positioning tasks. They are maintenance-free, simple to control and the movement procedures are easy to program. They can be used to solve almost any task in production automation requiring up to 8 kW of power: from simple point-to-point movements all the way to multi-axis systems with varying travel patterns. Positioning drives from Berger Lahr may be

- operated as autonomous solutions
- controlled by a PLC
- integrated into various networks and standard field-bus systems



What would you like to position?

Below are some examples of possible positioning tasks. Many other applications are also conceivable.

Positioning parts

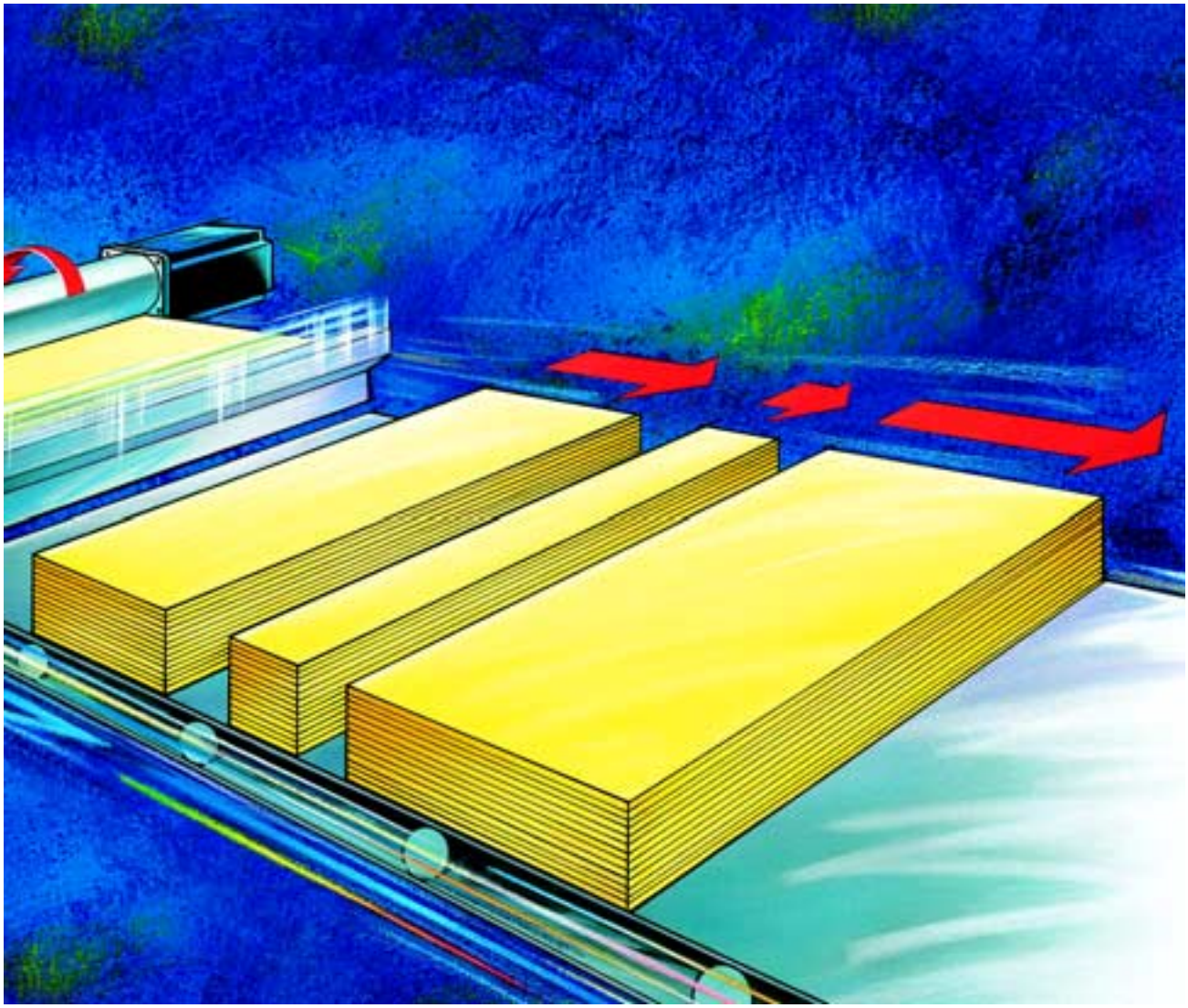
Positioning limit stops

Feed movements

Format setting/adjustment

Metering

Cutting to length



Toothed rod

Spindle

Toothed belt

Gearing

Chain

The mobility you need

Mechanical components precisely adjust the motor's rotary motion to the movement type for the positioning task required.

Berger Lahr positioning drives

Berger Lahr positioning drives

General information

The selection of positioning drives was previously limited to either a servomotor drive or a stepping-motor drive. Both of these distinct drive technologies have been combined in the Twin Line product family, enabling you to match the advantages of each system to your particular application.

Three different motor series are available for the Twin Line positioning drives:

3-phase stepping motors

Exceptionally robust, maintenance-free drives. They execute precise, step-by-step movements specified by a positioning controller.

The 3-phase stepping motors can be operated in conjunction with Twin Line power electronics (Power range from 350 W to 750 W) at resolutions from 200 to 1000 steps per revolution or, in micro-step mode, from 2000 to 10000 steps per revolution.

Options such as rotation monitoring, holding brake and rugged, low-backlash planetary gears expand the application possibilities.

AC synchronous servomotors - standard

Provide a very high power intensity, enabling highly dynamic positioning drives offering exceptional performance at a low price.

Power range from 750 W to 3 kW.

AC synchronous servomotors - high performance

Offer high impulse torques and a large power bandwidth, making them easy to adapt to your application.

Power range from 750 W to 8 kW.

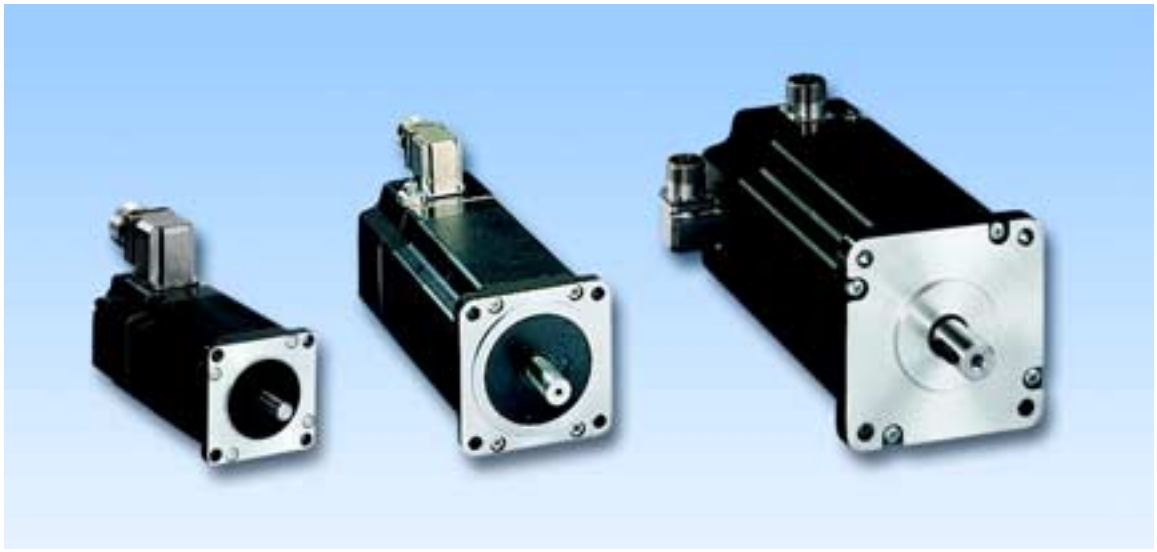
Berger Lahr servomotors are compatible with standard servo connection dimensions, providing flexible solutions to any problem. They all come equipped with an absolute measuring system, the SinCos® (SRS) Singleturn. This measuring system is designed to provide optimum performance with our Twin Line family of devices. You can use the HIPERFACE® interface between motor measuring system and device for a self-initialisation of the motor and current-regulator parameters, considerably simplifying the start-up process.

An AC synchronous servomotor module consists of the AC synchronous servomotor itself and the associated controller. Optimum performance is achieved only when motor and controller are perfectly in tune with each other.

Ever more exacting demands are being placed on the applications of modern drive technology, including:

- Positioning precision
- Rotary-speed precision
- Torque precision
- Regulation range
- Dynamics
- Overload compatibility
- Availability

These demands are fully satisfied by the Berger Lahr family of Twin Line products and by both AC synchronous servomotor programs: Standard and High Performance.



Series of 3-phase stepping motors

3-phase stepping motors

Features

3-phase stepping motors from Berger Lahr are:

- **Powerful** because the optimised internal geometry results in a high power intensity, meaning up to 50 % more torque than standard stepping motors of comparable size.
- **Quiet** due to the sinusoidal commutation of the Twin Line power electronics and the special mechanical construction - the stepping motor runs quietly and virtually resonance-free.
- **Economical** because of the high power intensity, simple wiring and compact Twin Line power electronics.

Characteristic curves

The measurements were performed at a step count of 1000 steps per revolution.

The following characteristic curves are depicted:

- Operating-limit torque curve
- Start-stop curve (start frequency depends on load torque)
- Load inertia curve for start-stop operation

The characteristic curves were generated at the following operating currents:

- VRDM 368 with TLD 011: 0.9 A
- VRDM 397 with TLD 011: 1.75 A
- VRDM 3910 with TLD 011: 2.0 A
- VRDM 3913 with TLD 011: 2.25 A
- VRDM 31117 with TLD 012: 4.0 A
- VRDM 31122 with TLD 012: 4.75 A

Technical specifications

- Testing voltage according to DIN VDE 0530
- Protection type:
  - Motor housing: IP 56
  - Shaft end, front: IP 41
- Insulation class F
- Motor with 90° mounting socket
- Size (flange)
  - VRDM 368 (57.2 x 57.2 mm^2)
  - VRDM 39x (85 x 85 mm^2)
  - VRDM 311x (110 x 110 mm^2)

Optional accessories

- Encoder (1000) for rotation monitoring, including integrated temperature sensor for monitoring the motor temperature
- Integrated holding brake
- Gearbox

Environmental influences

Ambient conditions (based on DIN 50019-R14):

- Temperature: –25 °C to +40 °C
- Humidity: ≤ 75 % R.H. yearly average, 95 % R.H. on 30 days, non-condensing

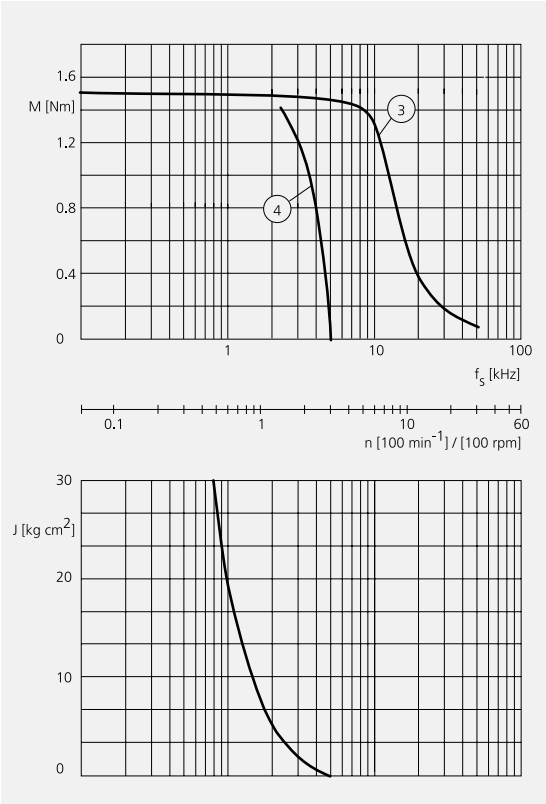
Storage and transport temperature:

- Temperature: –25 °C to +70 °C

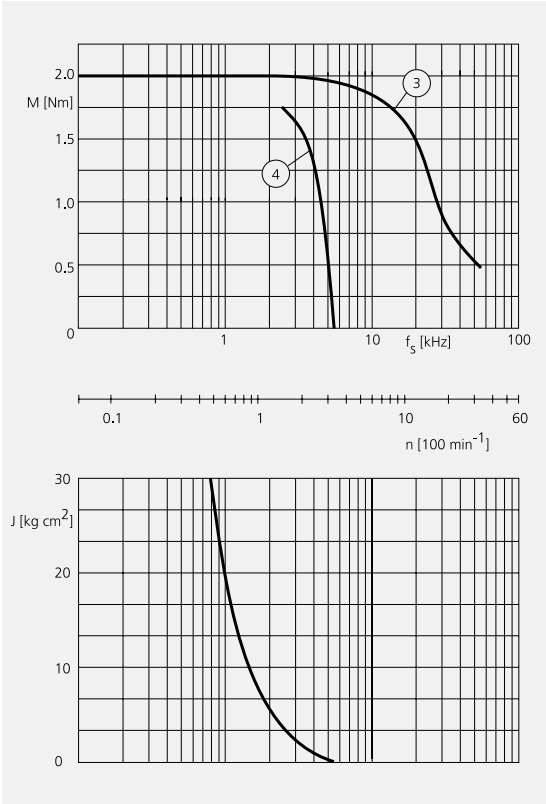
Technical data

		VRDM 368	VRDM 397	VRDM 3910	VRDM 3913	VRDM 31117	VRDM 31122
Max. torque	M_{max}	150 Ncm	200 Ncm	400 Ncm	600 Ncm	1200 Ncm	1650 Ncm
Holding torque	M_H	174 Ncm	226 Ncm	452 Ncm	678 Ncm	1392 Ncm	1914 Ncm
Rotor inertia	J_R	0.38 $kgcm^2$	1.1 $kgcm^2$	2.2 $kgcm^2$	3.3 $kgcm^2$	10.5 $kgcm^2$	16 $kgcm^2$
Max. start frequency	F_{Aom}	6 kHz	5.3 kHz	5.3 kHz	5.3 kHz	4.7 kHz	4.7 kHz
Rated current/ supply	Iω	0.9 A	1.8 A	2.0 A	2.3 A	4.1 A	4.8 A
Resistor/winding	Rω	25 Ω	6.5 Ω	5.8 Ω	6.5 Ω	1.8 Ω	1.9 Ω
Current rise-time constant	τ	4.6 ms	7 ms	9 ms	10 ms	22 ms	22 ms
Permissible dynamic shaft load, axial		8.4 N	60 N	60 N	60 N	60 N	60 N
Permissible dynamic shaft load, radial		50 N	100 N	100 N	110 N	300 N	300 N
Mass	G	1.1 kg	2.5 kg	3.1 kg	4.2 kg	8.0 kg	11 kg

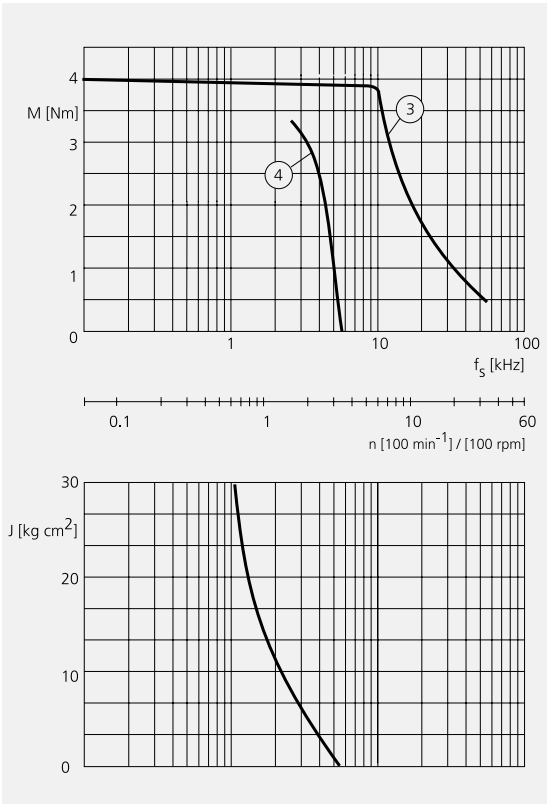
		VRDM 3x
Motor voltage	U	325 V
Step count	z	200/400/500/1000/2000/4000/5000/10000
Stepping angle per step	a	1.8/0.9/0.72/0.36/0.18/0.09/0.072/0.036 °
Encoder line count (optional)		1000



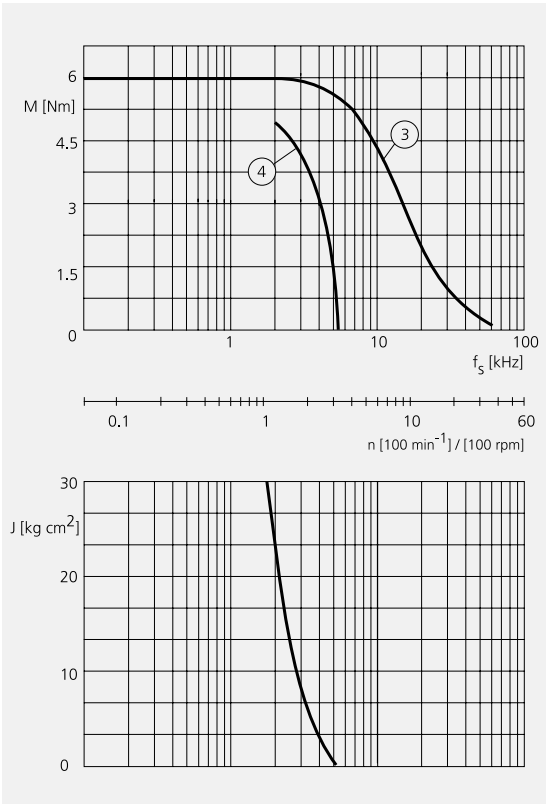
VRDM 368 with TLD 011



VRDM 397 with TLD 011

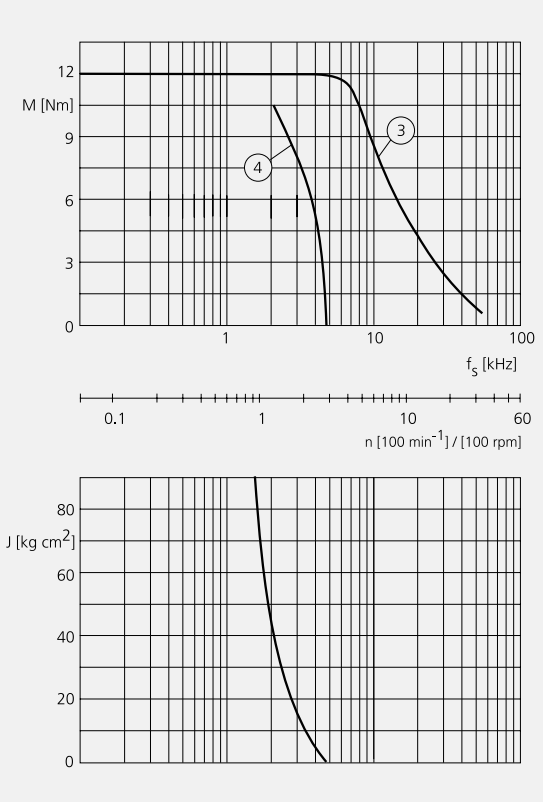


VRDM 3910 with TLD 011

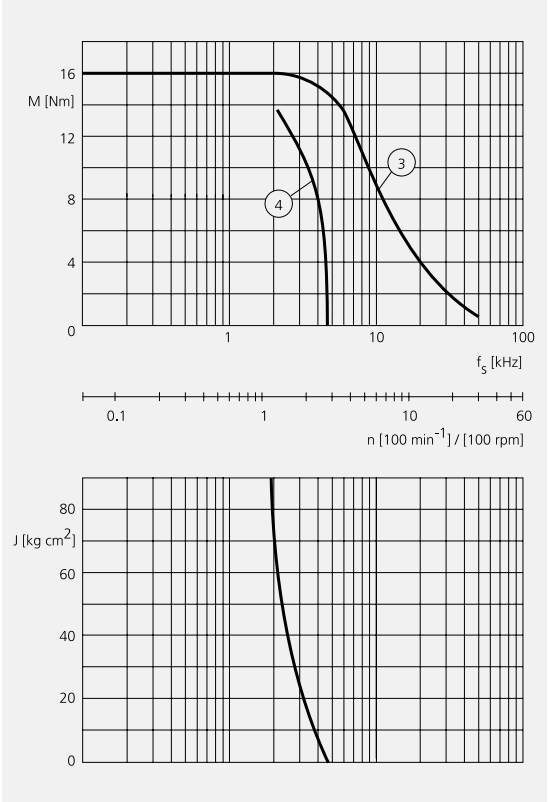


VRDM 3913 with TLD 011

3 Operating-limit torque
4 Start-stop curve

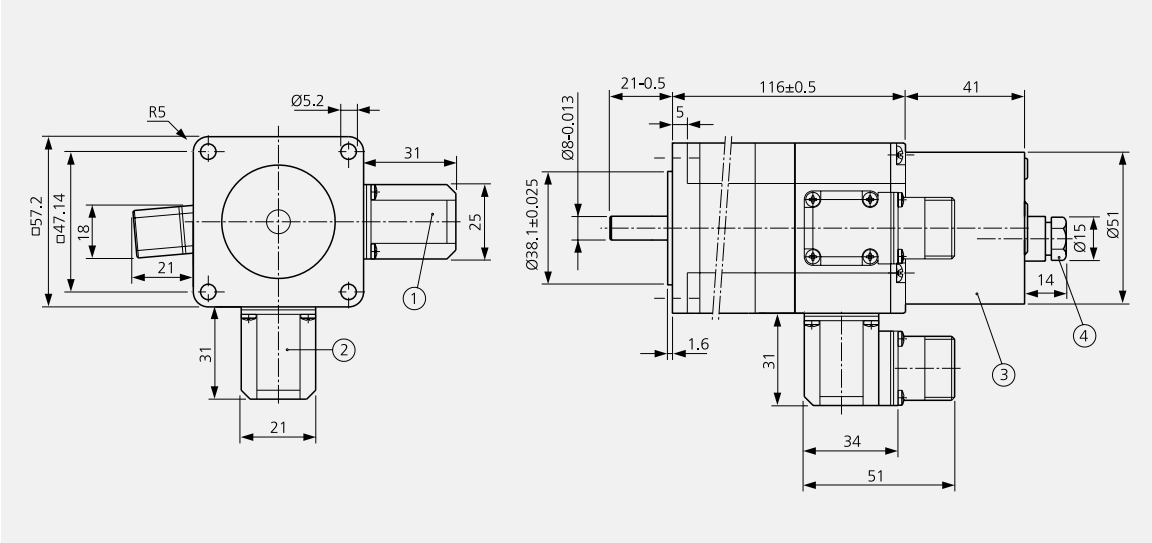


VRDM 31117 with TLD 012

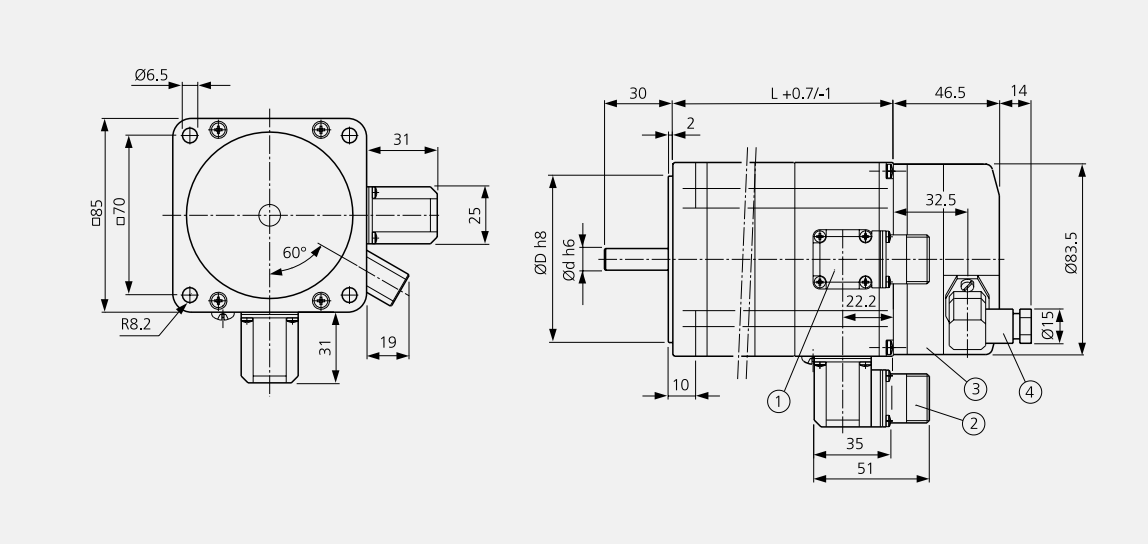


VRDM 31122 with TLD 012

3 Operating-limit torque
4 Start-stop curve

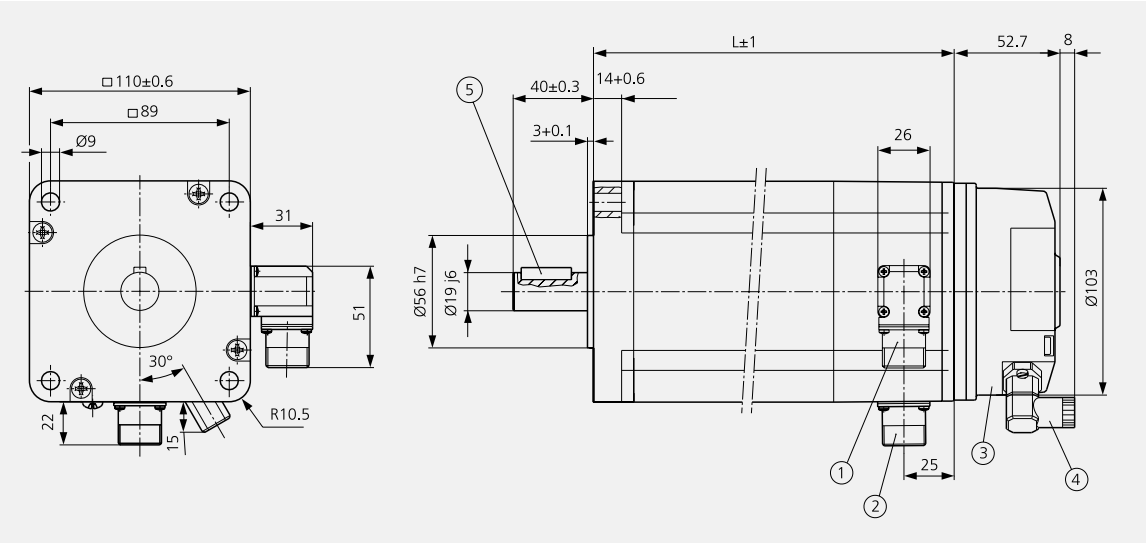


VRDM 368



VRDM 397, 3910, 3913

1 Encoder connector
2 Motor connector
3 Brake
4 Brake connector

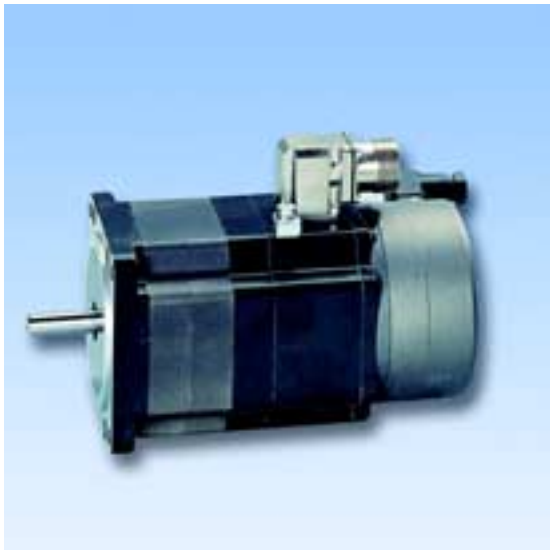


VRDM 31117, 31122

1 Encoder connector
2 Motor connector
3 Brake
4 Brake connector
5 Feather key

Dimensions

		VRDM 368	VRDM 397	VRDM 3910	VRDM 3913	VRDM 31117	VRDM 31122
Shaft diameter	d	8 mm	12 mm	12 mm	14 mm	19 mm	19 mm
Shaft construction		Smooth shaft	Smooth shaft	Smooth shaft	Smooth shaft	Washer/ featherkey A6 x 6 x 25 DIN 6885	Washer/ featherkey A6 x 6 x 25 DIN 6885
Length	L	116 mm	110 mm	140 mm	170 mm	180 mm	228 mm
Centering collar	D	38.1 mm	60 mm	60 mm	60 mm	56 mm	56 mm



3-phase stepping motor with holding brake

3-phase stepping motor with encoder (cover removed)

Holding brake

The holding brake is an electromagnetic spring-pressure brake for locking the motor axle after the motor current is shut off. In emergency situations, such as in a power failure or during an EMERGENCY STOP, it shuts down the drive, significantly contributing to overall safety. The motor axle must also be locked for weight-induced torque loads, e.g. in cases of vertical axes in manual mode.

Holding brake controller

The holding brake can be controlled either directly or via the **T**win **L**ine **H**olding **B**rake **C**ontroller, which is available as an accessory.

The TL HBC reduces heating of the brake by lowering the pickup voltage.

Caution! Overloading may damage the holding brake! Avoid stationary load torques greater than 25 % of the motor holding torque when using vertical axes with the holding brake.

Technical data of the holding brake

	VRDM 36x	VRDM 39x	VRDM 311x
Holding torque	1 Nm	6 Nm	16 Nm
Armature inertia	0.016 kgcm^2	0.2 kgcm^2	0.35 kgcm^2
Electrical pickup power	8 W	24 W	32 W
Energise time	58 ms	35 ms	65 ms
De-energise time	14 ms	15 ms	15 ms
Weight	0.5 kg	1.5 kg	2.0 kg

Encoder

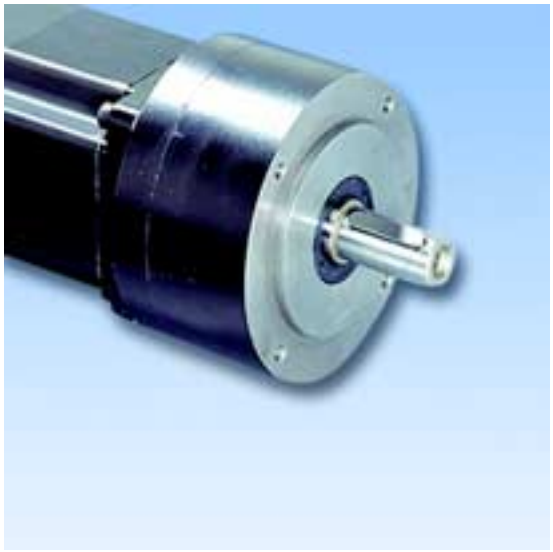
The encoder reports the actual motor position, provided the power controller is equipped with rotation monitoring electronics. The rotation monitoring system compares the set and actual positions of the motor and reports an error if the difference exceeds a limit (drag-error limit). One advantage of this system is that it can detect and prevent the motor from overloading.

The encoder is fitted in the connector housing – the motor length is unaffected.

The encoder option also includes integrated motor-temperature monitoring. The temperature is evaluated via the data-monitoring option of the Twin Line device.

	VRDM
Resolution	1000 incr./revolutions
Index pulse	1 pulse/revolution
Output	RS 422
Signals	A, B, $\overline{A}$, $\overline{B}$, 0, $\overline{0}$
Impulse form	Rectangular
Supply voltage	5 V ± 5 %
Supply current	0.15 A
Working temperature range	0 to 100 °C

PL 10 and PL 50 planetary gears



PL 100 planetary gear

Gearbox PL 10 ... PL 115

Gearbox data for all types

Gearbox type	Single-stage straight-toothed planetary gear
Nominal storage life*	L_{10h} = 20000 h
Torsional flank clearance	< 12', PL 115 < 3'
Housing material	Aluminium
Surface	Anodised black
Shaft material	C 45
Bearing	Roller bearing
Sealing at shaft end	IP 54
Lubrication	Grease-lubricated for entire service life
Temperature range	–20 °C to +80 °C

* Value in operating hours with a 10 % likelihood of failure; 100 % duty cycle at continuous output torque; operating mode S1 (continuous operation); storage temperature = 30 °C

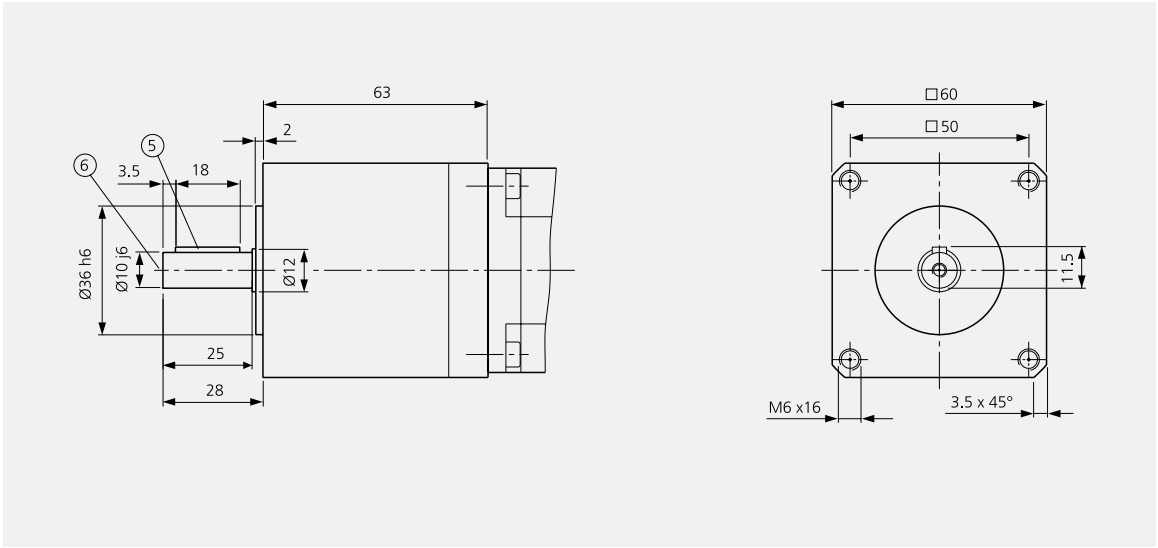
The PL 10 / 50 / 100 / 115 gearboxes are delivered already mounted to the motor. They can be ordered using the type key for the motor.

	1	2	3	4	5	J	M_{DG}	M_{max}
		kg	N	N		$kgcm^2$	Nm	Nm
VRDM 368 with PL 10	3:1 5:1 10:1	0.73	225	290	0.9	0.61 0.21 0.07	10 14 7.5	4.05 6.75 13.5
VRDM 397 with PL 50	3:1 5:1 10:1	2.3	550	580	0.9	0.63 0.14 0.07	38 50 41	5.4 9 18
VRDM 3910 with PL 50	3:1 5:1 10:1	2.3	550	580	0.9	0.63 0.14 0.07	38 50 41	10.8 18 36
VRDM 3913 with PL 50	3:1 5:1 10:1	2.3	550	580	0.9	0.63 0.14 0.07	38 50 41	16.2 27 54
VRDM 31117 with PL 100	3:1 5:1 10:1	8.75	760	760	0.9	1.5 0.7 0.5	100 100 80	32.4 54 108
VRDM 31122 with PL 100	3:1 5:1 10:1	8.75	760	760	0.9	1.5 0.7 0.5	100 100 80	44.55 74.25 148.5
VRDM 31122 with PL 115	10:1	9	3200	6500	0.98	1.0	125	148.5

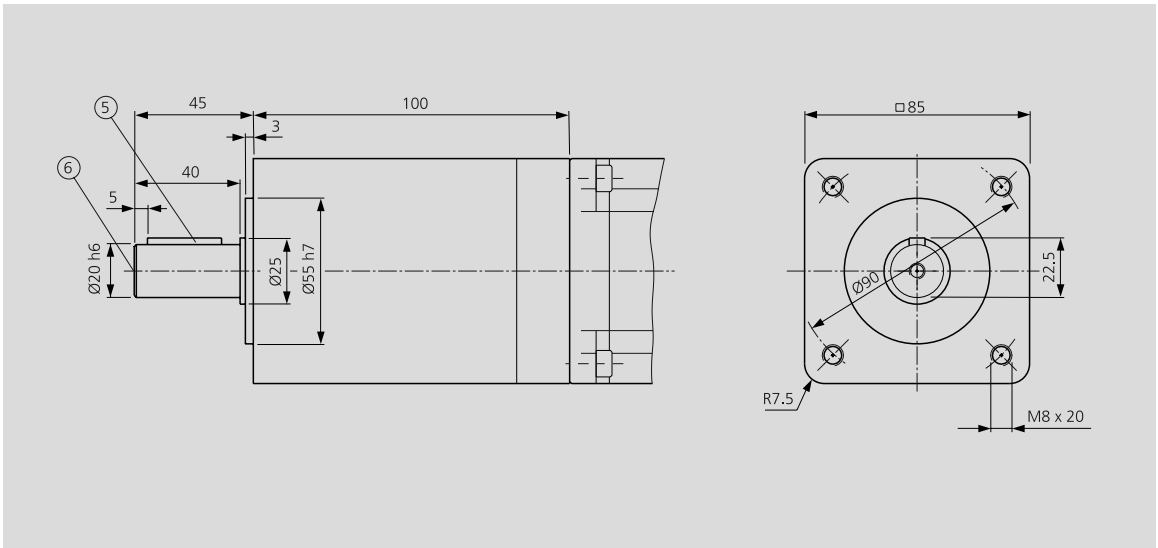
1	Reduction ratio	5	Efficiency
2	Gearbox mass	J	Gearing inertia
3	Max. permissible radial force at n2* = 400 min^{-1}	M_{DG}	Continuous output torque of the gearbox in the continuous endurance range of the toothed parts (motor not taken into account).
4	Max. permissible axial force at n2* = 400 min^{-1}	M_{max}	Max. torque at output (gearbox with motor, efficiency taken into account)
	*Gear output speed		

Note: M_{DG} may not be exceeded for a long period of time. Dual torque is possible for short periods, e. g. for EMERGENCY STOP situations.

Additional gearboxes are available upon request.



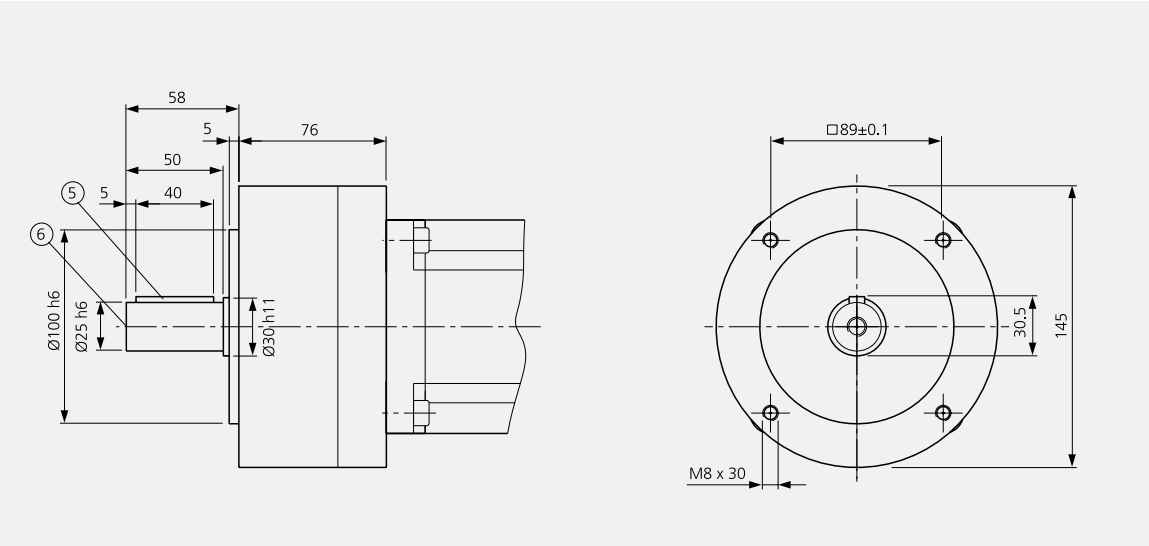
Dimensional drawing of 3-phase stepping motor, size 60, with PL 10 planetary gear



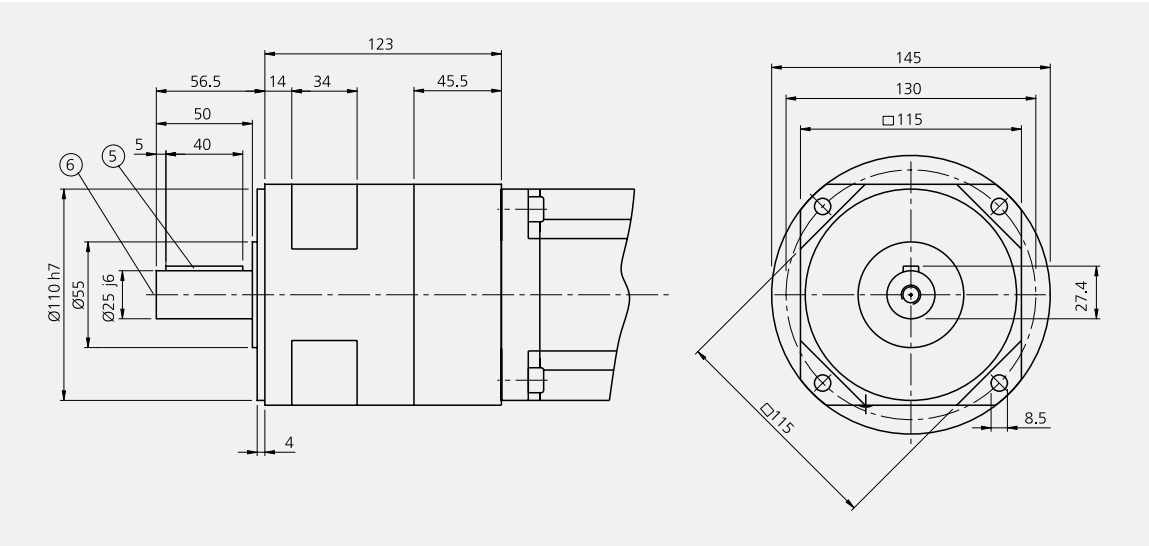
Dimensional drawing of 3-phase stepping motor, size 90, with PL 50 planetary gear

5 Featherkey
6 Centre hole

Gearbox	Featherkey	Centre hole
PL 10	DIN 6885 A4 x 4 x 18	DIN 332 DS M4
PL 50	DIN 6885 A6 x 6 x 28	DIN 332 DS M6



Dimensional drawing of 3-phase stepping motor, size 110, with PL 100 planetary gear



3-phase stepping motor, size 110, with PL 115 planetary gear

5 Featherkey
6 Centre hole

Gearbox	Featherkey	Centre hole
PL 100	DIN 6885 A8 x 7 x 40	DIN 332 DS M10
PL 115	DIN 6885 A8 x 7 x 40	DIN 332 DS M15

3-phase stepping motors

Type key

Example	VRDM	3	X	X	L	W	C	X	X	X	X

Number of phases
3

	VRDM	**3**	X	X	L	W	C	X	X	X	X

Size (flange)
6 (57,2 mm)
9 (85 mm)
11 (110 mm)

	VRDM	3	**X**	X	L	W	C	X	X	X	X

Length
7 8
10 13
17 22

	VRDM	3	X	**X**	L	W	C	X	X	X	X

Rotor
L = laminated rotor

	VRDM	3	X	X	**L**	W	C	X	X	X	X

Motor voltage
W = 325 V

	VRDM	3	X	X	L	**W**	C	X	X	X	X

Motor connection
C = with connector 90°

	VRDM	3	X	X	L	W	**C**	X	X	X	X

Holding brake
B = with brake
O = without brake

	VRDM	3	X	X	L	W	C	**X**	X	X	X

Encoder
E = with encoder
O = without encoder

	VRDM	3	X	X	L	W	C	X	**X**	X	X

Gearbox type
PL 10 PL 50
PL 100 PL 115

	VRDM	3	X	X	L	W	C	X	X	**X**	X

Gearbox ratios
I3 = 3:1
I5 = 5:1
I10 = 10:1

	VRDM	3	X	X	L	W	C	X	X	X	**X**

AC synchronous servomotors - Standard

Series of AC synchronous servomotors - Standard

AC synchronous servomotors - Standard

Features

- **High power intensity** by using the latest magnetic materials as well as the optimised motor design. Motors of a smaller size can thus produce comparable torque.
- **High impulse torque** up to five times the continuous stationary torque.
- **Economical** thanks to a streamlined Standard series of compact and powerful AC synchronous servomotors.

Technical specifications

- 8-pin synchronous motors
- SinCos absolute measuring system® (SRS) Singleturn as position and rotary-speed measuring system in Standard series
- Use of high-energy neodymium-iron-born magnets
- High power intensity in a compact package
- Integrated thermal coil monitoring (NTC)
- Vibration level R according to DIN EN 60034-14
- Protection type:
  - Motor housing: IP 56
  - Shaft end, front: IP 41
- Motor and measuring-system connection with mounting socket, straight exit
- Size (flange)
  - SER 39x (85 x 85 mm^2)
  - SER 311x (110 x 110 mm^2)
- Rated speeds depending on length, winding code and power output

Optional accessories

- Measuring system
  - SinCos® (SRM) Multiturn
  - Resolver upon request
- Integrated holding brake
- Gearbox
- Mounting sockets, 90°, can be rotated for:
  - Motor connection
  - Measuring system
- Protection type:
  - Shaft end, front: IP 56

Environmental influences

Ambient conditions (based on DIN 50019-R14):

- Temperature: –25 °C to +40 °C
- Humidity: 75 % R.H. yearly average, 95 % R.H. on 30 days, non-condensing

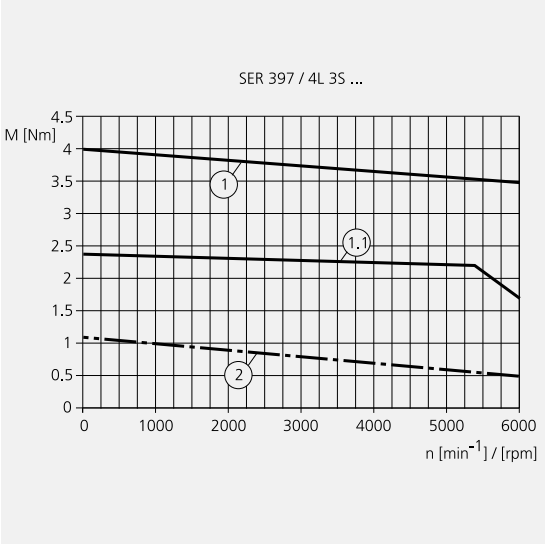
Storage and transport temperature:

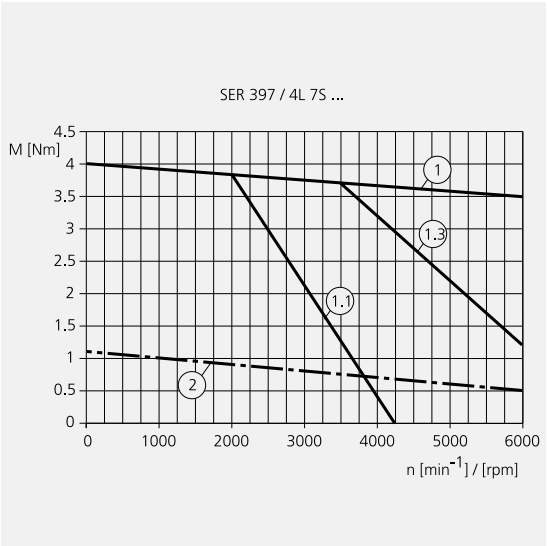
- Temperature: –25 °C to +70 °C

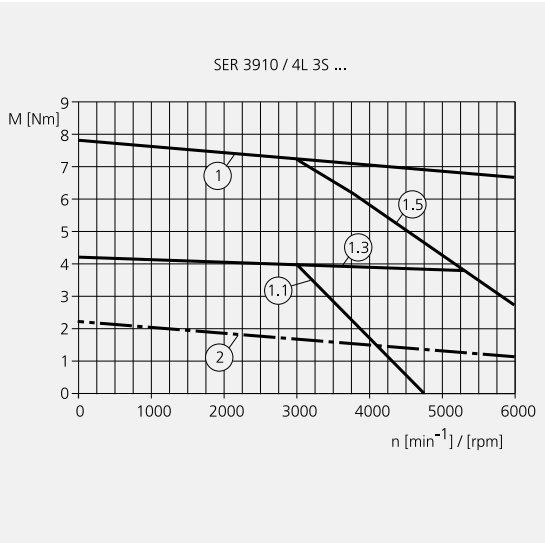
Technical data

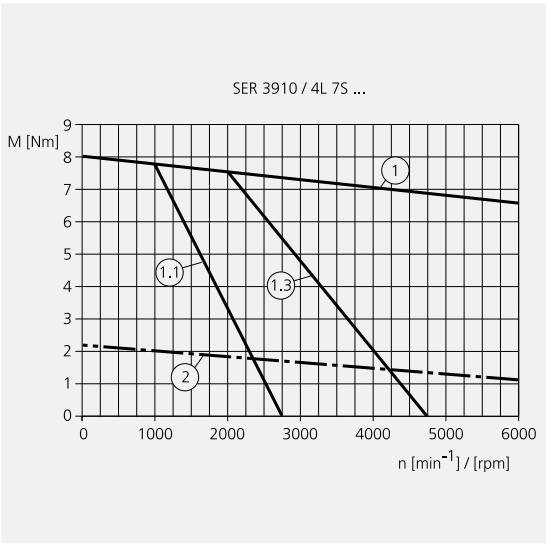
	U_{DC-Bus}	M_{dO}	I_{dO}	M_{dN}	I_{dN}	n_N	P_N	k_E	M_{max}	I_{max}	J_R	m
	V	Nm	A_{eff}	Nm	A_{eff}	min^{-1}	kW	V_{eff}	Nm	A_{eff}	$kgcm^2$	kg
SER 397 (3S)	325	1.1	2.6	0.6	1.5	6000	0.38	27.5	4.0	12.0	0.8	2.2
SER 397 (3S)	560	1.1	2.6	0.6	1.5	6000	0.38	27.5	4.0	12.0	0.8	2.2
SER 397 (7S)	325	1.1	1.3	0.8	1.0	3800	0.32	50.7	4.0	6.0	0.8	2.2
SER 397 (7S)	560	1.1	1.3	0.6	0.7	6000	0.38	50.7	4.0	6.0	0.8	2.2
SER 3910 (3S)	325	2.2	3.0	1.6	2.1	4000	0.67	47.2	8.0	12.0	1.6	3.3
SER 3910 (3S)	560	2.2	3.0	1.1	1.8	6000	0.69	47.2	8.0	12.0	1.6	3.3
SER 3910 (7S)	325	2.2	1.7	1.8	1.4	2200	0.42	83.2	8.0	6.0	1.6	3.3
SER 3910 (7S)	560	2.2	1.7	1.5	1.2	4000	0.63	83.2	8.0	6.0	1.6	3.3
SER 3913 (3S)	325	2.9	3.7	2.0	2.9	4000	0.84	49.5	11.5	18.0	2.4	4.4
SER 3913 (3S)	560	2.9	3.7	1.7	2.5	6000	1.06	49.5	11.5	18.0	2.4	4.4
SER 3913 (5S)	325	2.9	2.5	2.5	2.1	2500	0.65	72.3	11.5	12.0	2.4	4.4
SER 3913 (5S)	560	2.9	2.5	2.0	1.8	4500	0.94	72.3	11.5	12.0	2.4	4.4
SER 3913 (7S)	325	2.9	1.3	2.6	1.2	1250	0.34	141.6	11.5	6.0	2.4	4.4
SER 3913 (7S)	560	2.9	1.3	2.5	1.1	2300	0.60	141.6	11.5	6.0	2.4	4.4
SER 3916 (5S)	325	3.6	3.5	2.3	2.3	3000	0.72	65	14.5	17.5	3.2	6.1
SER 3916 (5S)	560	3.6	3.5	1.6	1.9	5000	0.84	65	14.5	17.5	3.2	6.1
SER 31112 (3S)	325	4.6	6.0	2.5	3.0	4000	1.05	44.6	18.0	30.0	4.0	5.0
SER 31112 (3S)	560	4.6	6.0	1.5	2.3	6000	0.94	44.6	18.0	30.0	4.0	5.0
SER 31112 (5S)	325	4.6	3.2	3.4	2.5	2200	0.78	77.6	18.0	16.0	4.0	5.0
SER 31112 (5S)	560	4.6	3.2	2.5	2.0	4000	1.05	77.6	18.0	16.0	4.0	5.0
SER 31112 (7S)	325	4.6	1.8	4.0	1.5	1000	0.42	140.0	18.0	9.0	4.0	5.0
SER 31112 (7S)	560	4.6	1.8	3.5	1.4	2000	0.73	140.0	18.0	9.0	4.0	5.0
SER 31117 (3S)	325	6.6	6.6	3.6	4.0	3300	1.24	58.4	25.0	32.0	8.0	8.0
SER 31117 (3S)	560	6.6	6.6	1.5	1.7	6000	0.94	58.4	25.0	32.0	8.0	8.0
SER 31117 (5S)	325	6.6	5.0	4.2	3.0	2400	1.06	82.0	25.0	24.0	8.0	8.0
SER 31117 (5S)	560	6.6	5.0	3.0	2.5	4000	1.26	82.0	25.0	24.0	8.0	8.0
SER 31117 (7S)	325	6.6	2.7	5.5	2.3	1250	0.72	148.4	25.0	12.5	8.0	8.0
SER 31117 (7S)	560	6.6	2.7	4.6	1.9	2250	1.05	148.4	25.0	12.5	8.0	8.0
SER 31122 (5S)	325	10.0	7.0	4.5	3.0	2250	1.06	90.9	38.0	32.0	11.3	11.0
SER 31122 (5S)	560	10.0	7.0	5.0	3.5	4000	2.09	90.9	38.0	32.0	11.3	11.0
SER 31122 (7S)	325	10.0	3.6	8.2	3.0	1000	0.86	176.0	38.0	16.5	11.3	11.0
SER 31122 (7S)	560	10.0	3.6	7.5	2.7	2000	1.57	176.0	38.0	16.5	11.3	11.0
SER 31127 (5D)	560	13.4	9.2	5.0	3.8	4000	2.2	88.2	48.0	45.0	15.5	13.0
SER 31127 (7S)	325	13.4	5.1	10.8	4.2	1100	1.25	160.0	48.0	25.0	15.5	13.0
SER 31127 (7S)	560	13.4	5.1	9.0	3.7	2000	1.88	160.0	48.0	25.0	15.5	13.0

U_{DC-Bus}	Intermediate-circuit direct voltage from Twin Line drive or controller	P_N	Rated power
		k_E	Voltage constant at 1000 min^{-1}
M_{dO}	Continuous stationary torque	M_{max}	Max. torque
I_{dO}	Continuous stationary current	I_{max}	Max. current
M_{dN}	Rated continuous torque	J_R	Rotor inertia
I_{dN}	Rated continuous current	m	Mass
n_N	Rated speed		

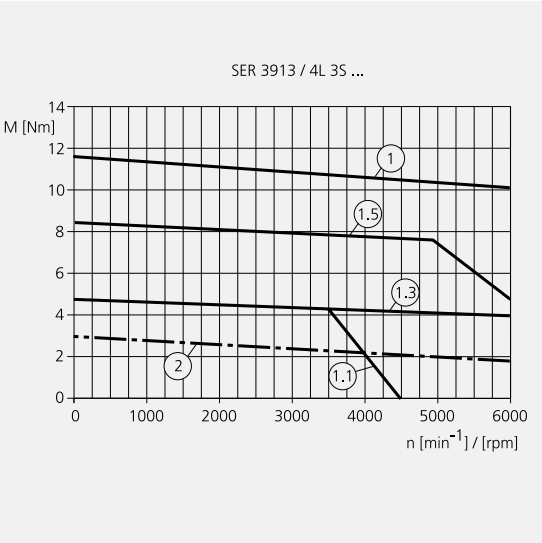


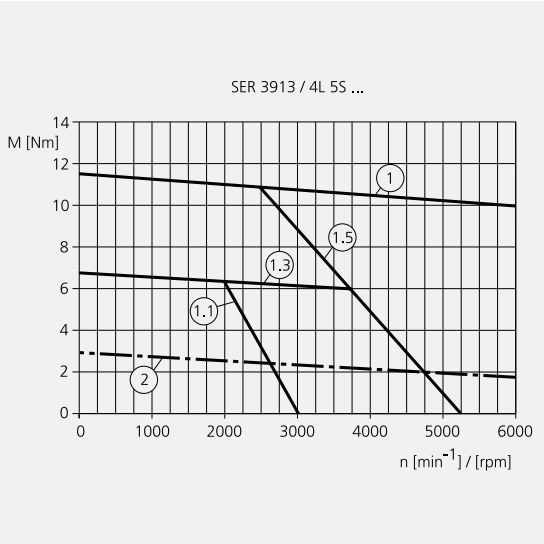


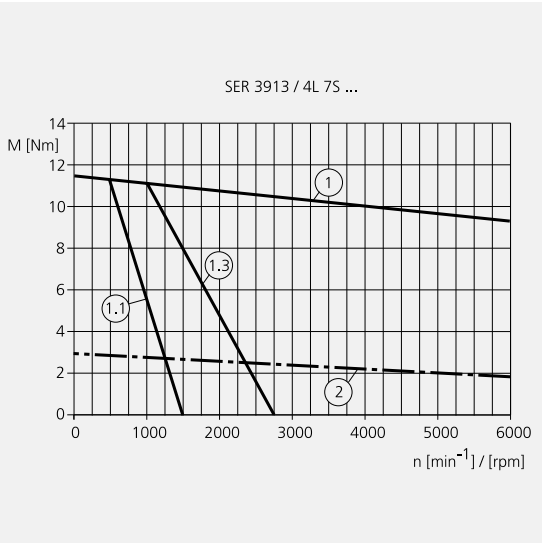


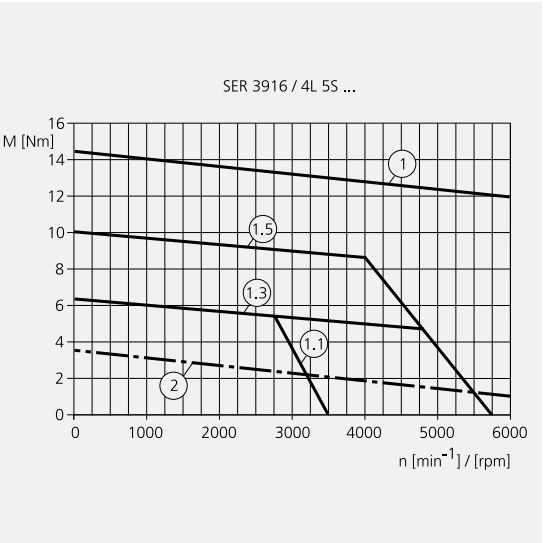


1 Motor peak torque
2 Continuous torque
1.1 Peak torque with TLX x32
1.3 Peak torque with TLX x34
1.5 Peak torque with TLX x36
1.7 Peak torque with TLX x38









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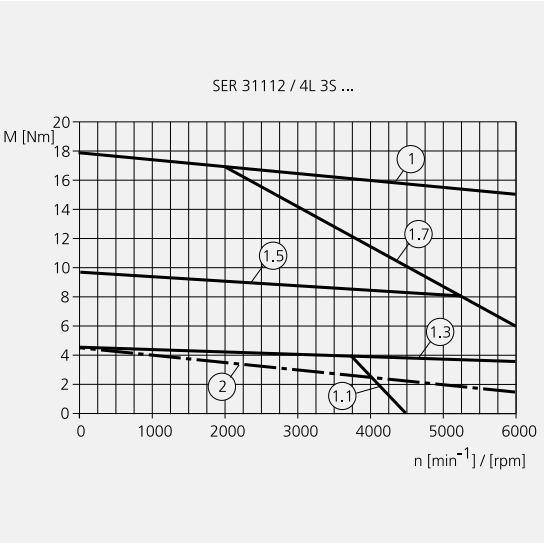
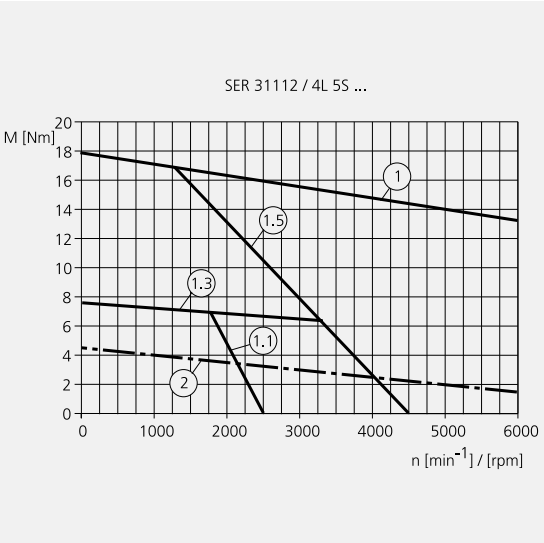
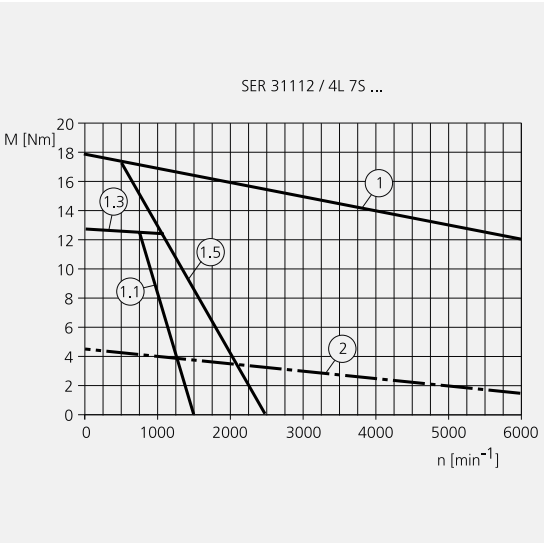
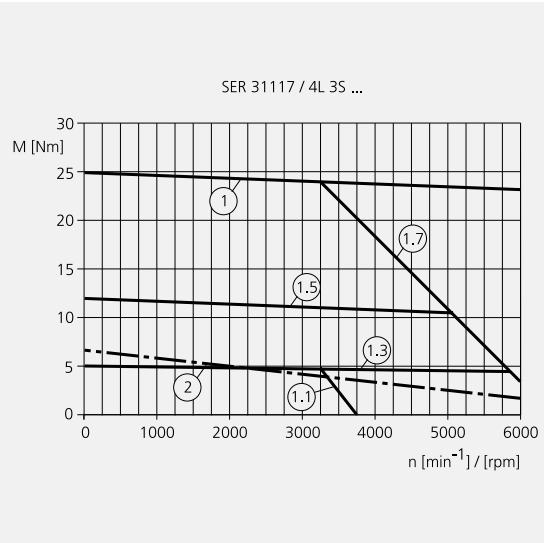
AC synchronous servomotors - Standard









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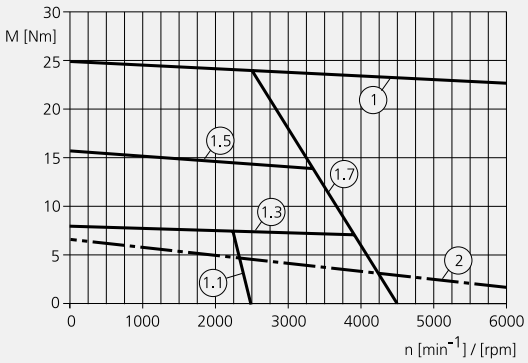
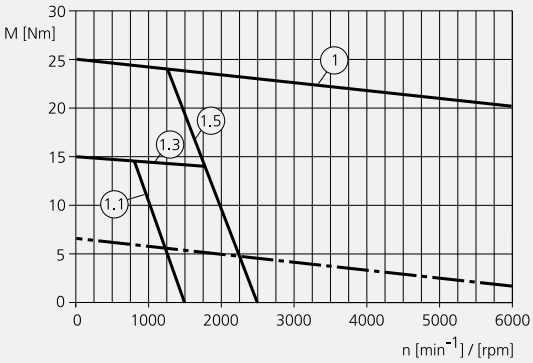
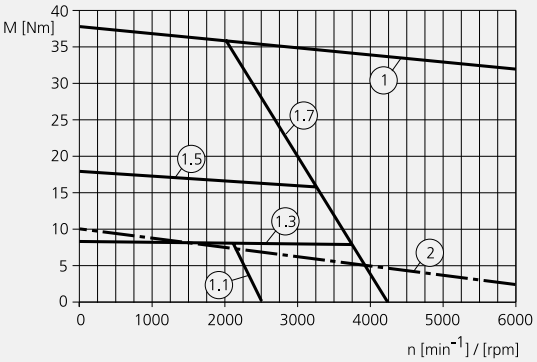
SER 31117 / 4L 5S ...



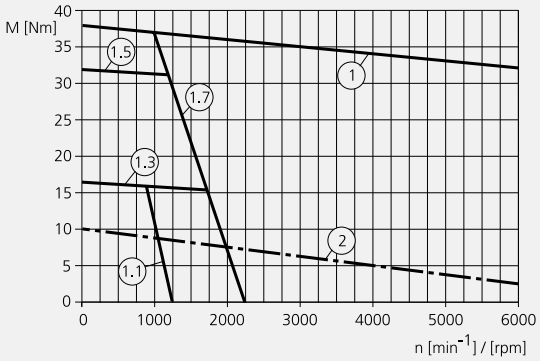
SER 31117 / 4L 7S ...



SER 31122 / 4L 5S ...



SER 31122 / 4L 7S ...



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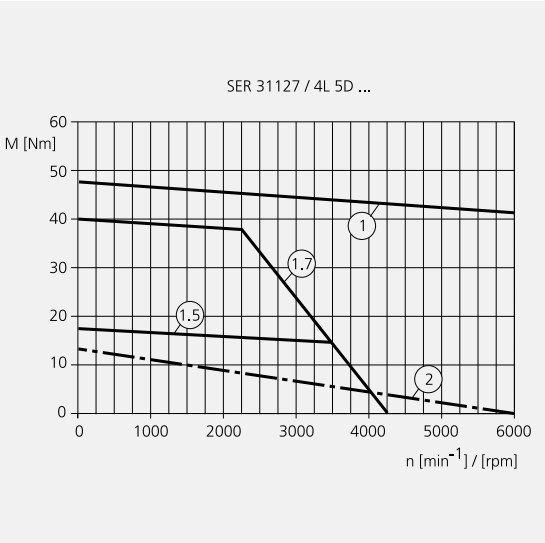
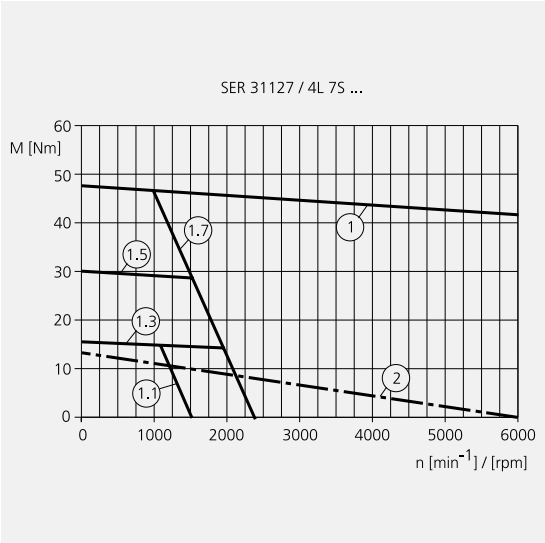
AC synchronous servomotors - Standard





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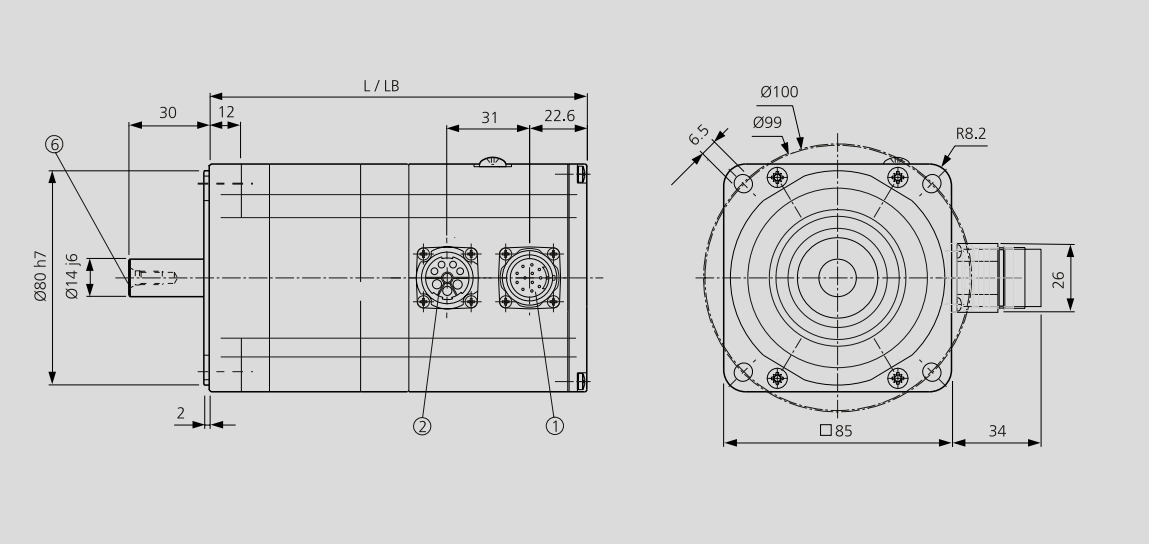
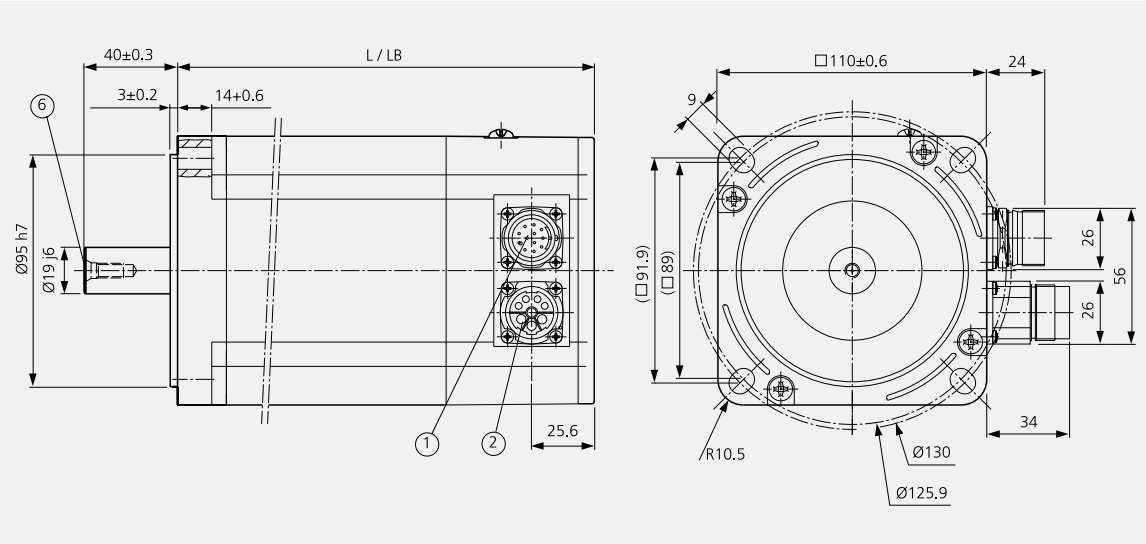


Standard AC synchronous servomotor, size 90



Standard AC synchronous servomotor, size 110

1 Encoder connector
2 Motor connector
6 Centre hole

Dimensions

		SER 397	SER 3910	SER 3913	SER 3916	SER 31112	SER 31117	SER 31122	SER 31127
Shaft diameter	ø	14 mm	14 mm	14 mm	14 mm	19 mm	19 mm	19 mm	19 mm
Centering collar	ø D	80 mm	80 mm	80 mm	80 mm	95 mm	95 mm	95 mm	95 mm
Total length without brake	L	141 mm	171 mm	201 mm	231 mm	132 mm	180 mm	228 mm	276 mm
Total length with brake	LB	186.5 mm	216.5 mm	246.5 mm	276.5 mm	198 mm	246 mm	294 mm	342 mm

Holding brake

The holding brake is an electromagnetic spring-pressure brake for locking the motor axle after the motor current is shut off. In emergency situations, such as in a power failure or during an EMERGENCY STOP, it shuts down the drive, significantly contributing to overall safety. The motor axle must also be locked for weight-induced torque loads, e.g. in cases of vertical axes in manual mode.

Holding brake controller

The holding brake is controlled via the **T**win **L**ine **H**olding **B**rake **C**ontroller, which is available as an accessory.

The TL HBC reduces heating of the brake by lowering the pickup voltage.

Caution! Overloading may damage the holding brake! Avoid stationary load torques greater than 25 % of the motor holding torque when using vertical axes with the holding brake.

Technical data

		SER 39x	SER 311x
Holding torque	M_{Br}	6 Nm	16 Nm
Armature inertia	J_{Br}	0.2 kgcm^2	0.35 kgcm^2
Electrical pickup power	P_{Br}	24 W	28 W
Energise time	t_E	40 ms	60 ms
De-energise time	t_A	20 ms	30 ms
Weight	m_{Br}	1.8 kg	3.0 kg

Measuring systems

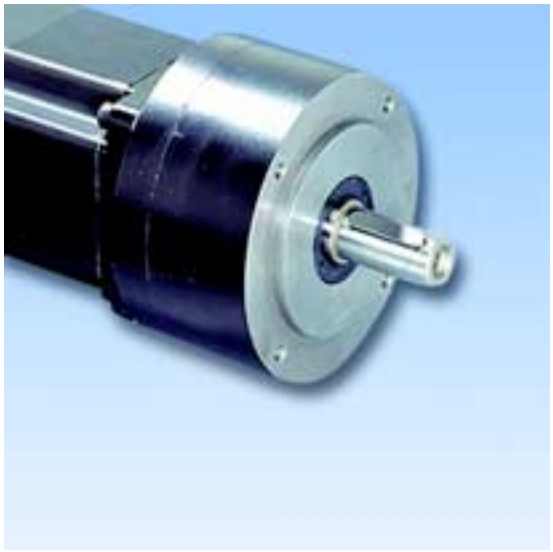
The standard measuring system is the SinCos® (SRS) Singleturn. This measuring system is designed to provide optimum performance with our Twin Line family of controllers. You can use the HIPERFACE® interface between motor-measuring system and device for a self-initialisation of the motor and current-regulator parameters, considerably simplifying the start-up process.

Another option is the SinCos® (SRM) Multiturn or Resolver, 2-pin, which is available as an accessory.

Technical data

	SinCos® (SRS) Singleturn	SinCos® (SRM) Multiturn	Resolver, 2-pin
Resolution with TLx	16384 incr. min^{-1}	16384 incr. min^{-1}	4096 incr. min^{-1}
Precision, integral nonlinearity	± 45 angular seconds	± 45 angular seconds	± 360 angular seconds
Index pulse	–	–	–
Absolute position after activation within [min^{-1}], with the precision	1 ± 45 angular seconds	4096 ± 45 angular seconds	1 ± 360 angular seconds
Signal form	Sinusoidal/cosinusoidal 1024 cycles min^{-1}	Sinusoidal/cosinusoidal 1024 cycles min^{-1}	Sinusoidal/cosinusoidal 1 cycles min^{-1}
Measuring procedure	High-resolution, optical	High-resolution, optical	Inductive
Interface	HIPERFACE®	HIPERFACE®	–
Module required on slot 2, TLx	HIFA-C	HIFA-C	RESO-C
Working temperature range	–20 to +115 °C	–20 to +115 °C	–55 to +155 °C

PL 50 planetary gear



PL 100 planetary gear

Gearbox PL 50 / PL 100

Gearbox data for all types

Gearbox type	Single-stage straight-toothed planetary gear
Rated storage/service life*	L_{10h} = 20000 h
Torsional flank clearance	< 12'
Housing material	Aluminium
Surface	Anodised black
Shaft material	C 45
Bearing	Roller bearing
Sealing at shaft end	IP 54
Lubrication	Grease-lubricated for entire service life
Temperature range	–20 to +80 °C

* Value in operating hours with a 10 % likelihood of failure; 100 % duty cycle at continuous output torque; operating mode S1 (continuous operation); storage temperature = 30 °C

The PL 50 / 100 gearboxes are delivered already mounted to the motor. They can be ordered using the type key for the motor.

Additional gearboxes are available upon request.

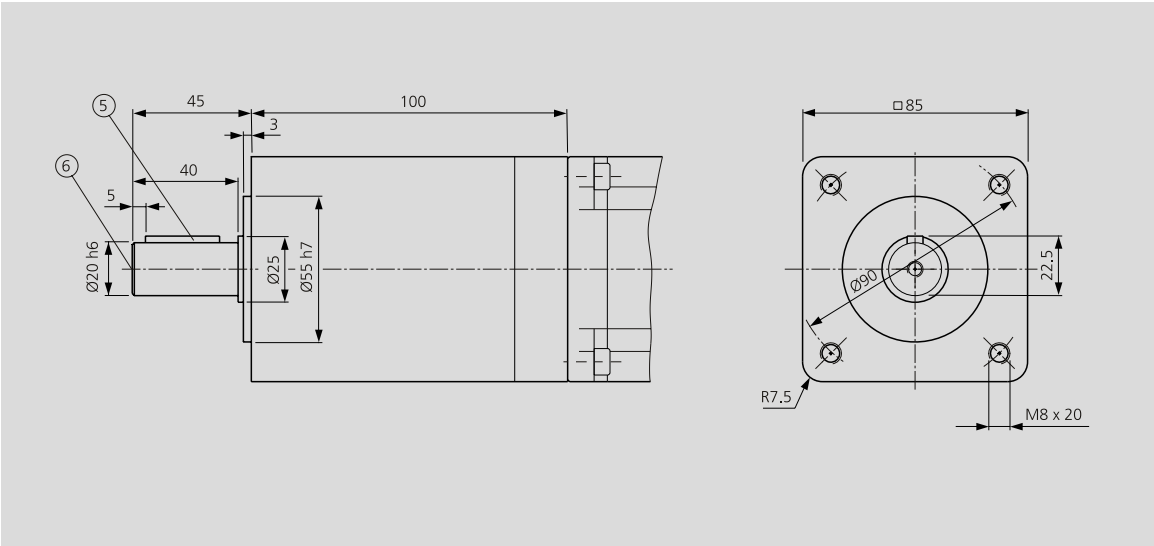
The technical data refers to a combination of motor and gearbox

	1	2	3	4	5	J	M_{DG}	M_{max}
		kg	N	N		$kgcm^2$	Nm	Nm
SER 397 with PL 50	3:1 5:1 10:1	2.3	550	580	0.9	0.63 0.14 0.07	38 50 41	10.8 18.0 36.0
SER 3910 with PL 50	3:1 5:1 10:1	2.3	550	580	0.9	0.63 0.14 0.07	38 50 41	21.6 36.0 72.0
SER 3913 with PL 50	3:1 5:1 10:1	2.3	550	580	0.9	0.63 0.14 0.07	38 50 41	31.05 51.75 103.50
SER 3916 with PL 50	3:1 5:1 10:1	2.3	550	580	0.9	0.63 0.14 0.07	38 50 41	39.15 62.25 130.50
SER 31112 with PL 100	3:1 5:1 10:1	8.75	760	760	0.9	1.5 0.7 0.5	100 100 80	48.6 81.0 162.0
SER 31117 with PL 100	3:1 5:1 10:1	8.75	760	760	0.9	1.5 0.7 0.5	100 100 80	67.5 112.5 225.0
SER 31122 with PL 100	3:1 5:1 10:1	8.75	760	760	0.9	1.5 0.7 0.5	100 100 80	102.6 171.0 342.0
SER 31127 with PL 100	3:1 5:1 10:1	8.75	760	760	0.9	1.5 0.7 0.5	100 100 80	129.6 216.0 432.0

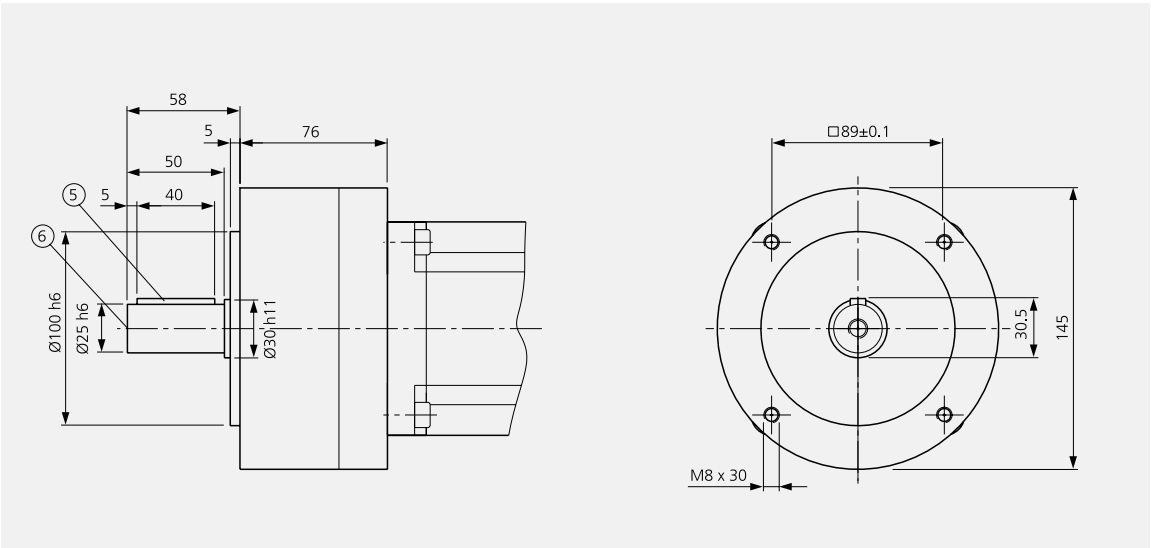
1	Reduction ratio	5	Efficiency
2	Gearbox mass	J	Gearing inertia
3	Max. permissible radial force at n2* = 400 min^{-1}	M_{DG}	Continuous output torque of the gearbox in the continuous endurance range of the toothed parts (motor not taken into account).
4	Max. permissible axial force at n2* = 400 min^{-1}	M_{max}	Max. torque at output (gearbox with motor, efficiency taken into account), at M_{max} of motor

*Gear output speed

Note: M_{DG} may not be exceeded for a long period of time. Dual torque is possible for short periods, e. g. for EMERGENCY STOP situations. The motor may need to be limited in order to preclude the risk of destroying the gearbox at peak torques.



PL 50 planetary gear for AC synchronous servomotors, size 90



PL 100 planetary gear for AC synchronous servomotors, size 110

5 Featherkey
6 Centre hole

Gearbox	Featherkey	Centre hole
PL 50	DIN 6885 A6 x 6 x 28	DIN 332 DS M6
PL 100	DIN 6885 A8 x 7 x 40	DIN 332 DS M10

AC synchronous servomotors - Standard

Example	SER	3	X	X	/	4	L	X	X	X	0	X	X	X	X
Number of phases 3	SER	**3**	X	X	/	4	L	X	X	X	0	X	X	X	X
Size (flange) 9 (85 mm) 11 (110 mm)	SER	3	**X**	X	/	4	L	X	X	X	0	X	X	X	X
Length 7 10 12 13 16 17 22 27	SER	3	X	**X**	/	4	L	X	X	X	0	X	X	X	X
Pole pair count 4	SER	3	X	X	/	**4**	L	X	X	X	0	X	X	X	X
Rotor inertia L = low inertia	SER	3	X	X	/	4	**L**	X	X	X	0	X	X	X	X
Winding code 3 5 7	SER	3	X	X	/	4	L	**X**	X	X	0	X	X	X	X
Winding circuit S = star D = triangle (only SER 31127)	SER	3	X	X	/	4	L	X	**X**	X	0	X	X	X	X
Measuring system S = SinCos® (SRS) Singleturn M = SinCos® (SRM) Multiturn R = resolver	SER	3	X	X	/	4	L	X	X	**X**	0	X	X	X	X
Resolution 0 = for measuring systems: S, M, R	SER	3	X	X	/	4	L	X	X	X	**0**	X	X	X	X
Motor connection C = with mounting sockets, straight exit T = with mounting sockets, 90°, rotating	SER	3	X	X	/	4	L	X	X	X	0	**X**	X	X	X
Holding brake B = with brake O = without brake	SER	3	X	X	/	4	L	X	X	X	0	X	**X**	X	X
Gearbox type PL 50 PL 100	SER	3	X	X	/	4	L	X	X	X	0	X	X	**X**	X
Gearbox reduction ratio I3 = 3:1 I5 = 5:1 I10 = 10:1	SER	3	X	X	/	4	L	X	X	X	0	X	X	X	**X**

Series of High Performance AC synchronous servomotors

AC synchronous servomotors - High Performance

Features

- **High impulse torque** up to five times the continuous stationary torque.
- **Large power bandwidth** encompassing a continuous stationary torque range from 0.34 to 50 Nm, in six model sizes.
- **High adaptability** to your application, because of the availability of individual sizes in several speed/torque variants.

Technical specifications

- 6-pin synchronous motors
- SinCos absolute measuring system® (SRS) Singleturn as standard position and rotary-speed measuring system, except for DSM 4-05.x, which only comes with the Resolver
- Use of high-energy neodymium-iron-boron magnets
- Integrated thermal efficiency monitoring (NTC)
- Vibration severity level R according to DIN ISO 2373
- Protection type:
  - Motor housing: IP 65
  - Shaft end, front: IP 64
- Motor and measuring-system connection with mounting sockets, straight exit, except DSM 4-19x, motor connection only via terminal box
- Size (flange)
  - DSM 4-05 (55 x 55 mm^2)
  - DSM 4-07 (70 x 70 mm^2)
  - DSM 4-09 (92 x 92 mm^2)
  - DSM 4-11 (110 x 110 mm^2)
  - DSM 4-14 (140 x 140 mm^2)
  - DSM 4-19 (190 x 190 mm^2)
- Rated speeds, depending on motor length
  - DSM 4-05: 6000 min^{-1}
  - DSM 4-07: 4000/6000 min^{-1}
  - DSM 4-09: 3000/4000/6000 min^{-1}
  - DSM 4-11: 3000/4000/6000 min^{-1}
  - DSM 4-14: 2000/3000/4000 min^{-1}
  - DSM 4-19: 1500/2000/3000/4000 min^{-1}

Optional accessories

- Measuring system
  - SinCos® (SRM) Multiturn
  - Resolver only for DSM 4-05.x
- Integrated holding brake
- Gearbox
- Mounting sockets, 90°, can be rotated for:
  - Motor (except DSM 4-19.x)
  - Measuring system
- Special shaft, special flange
- Vibration severity level S
- Level R flange precision
- Different colour scheme

Environmental influences

Ambient conditions (based on DIN 50019-R14):

- Temperature: –20 °C to +40 °C
- Humidity: 75 % R.H. yearly average, 95 % R.H. on 30 days, non-condensing

Storage and transport temperature:

- Temperature: –20 °C to +60 °C

AC synchronous servomotors - High Performance

Technical data for DSM 4-05

	U_{DC-Bus}	M_{dO}	I_{dO}	M_{dN}	I_{dN}	n_N	P_N	k_E	M_{max}	I_{max}	J_R	m
	V	Nm	A_{eff}	Nm	A_{eff}	min^{-1}	kW	V_{eff}	Nm	A_{eff}	$kgcm^2$	kg
DSM 4-05.1-1xx.x6	325	0.34	1.20	0.32	1.3	6000	0.20	20.0	1.7	7.07	0.17	1.0
DSM 4-05.1-2xx.x6	560	0.34	0.85	0.32	0.9	6000	0.20	27.6	1.7	5.02	0.17	1.0
DSM 4-05.2-1xx.x6	325	0.50	1.50	0.48	1.7	6000	0.30	20.0	2.5	9.05	0.24	1.2
DSM 4-05.2-2xx.x6	560	0.50	1.00	0.48	1.1	6000	0.30	32.8	2.5	6.01	0.24	1.2
DSM 4-05.3-1xx.x6	325	0.65	2.00	0.60	2.3	6000	0.375	20.0	3.2	10.80	0.31	1.4
DSM 4-05.3-2xx.x6	560	0.65	1.20	0.60	1.3	6000	0.375	35.2	3.2	6.51	0.31	1.4
DSM 4-05.4-1xx.x6	325	1.00	3.20	0.80	3.4	6000	0.500	20.0	5.0	16.97	0.45	1.8
DSM 4-05.4-2xx.x6	560	1.00	1.60	0.80	1.7	6000	0.500	40.0	5.0	8.49	0.45	1.8

Technical data for the DSM 4-07.x and its variations

	U_{DC-Bus}	M_{dO}	I_{dO}	M_{dN}	I_{dN}	n_N	P_N	k_E	M_{max}	I_{max}	J_R	m
	V	Nm	A_{eff}	Nm	A_{eff}	min^{-1}	kW	V_{eff}	Nm	A_{eff}	$kgcm^2$	kg
DSM 4-07.1-1xx.x4	325	0.65	1.9	0.6	2.0	4000	0.25	20.8	3.1	11.38	0.22	1.5
DSM 4-07.1-2xx.x4	560	0.65	0.9	0.6	0.9	4000	0.25	47.9	3.1	5.37	0.22	1.5
DSM 4-07.1-1xx.x6	325	0.65	2.6	0.5	2.5	6000	0.31	15.4	3.1	15.63	0.22	1.5
DSM 4-07.1-2xx.x6	560	0.65	1.3	0.5	1.2	6000	0.31	32.1	3.1	7.85	0.22	1.5
DSM 4-07.2-1xx.x4	325	1.50	3.2	1.3	2.9	4000	0.54	27.7	7.2	19.23	0.36	2.1
DSM 4-07.2-2xx.x4	560	1.50	1.6	1.3	1.4	4000	0.54	57.2	7.2	9.62	0.36	2.1
DSM 4-07.2-1xx.x6	325	1.50	5.0	1.0	4.4	6000	0.62	17.8	7.2	29.98	0.36	2.1
DSM 4-07.2-2xx.x6	560	1.50	2.4	1.0	2.1	6000	0.62	37.5	7.2	14.42	0.36	2.1
DSM 4-07.3-1xx.x4	325	2.30	5.5	2.0	4.7	4000	0.83	26.3	11.0	33.02	0.57	2.9
DSM 4-07.3-2xx.x4	560	2.30	2.4	2.0	2.0	4000	0.83	60.4	11.0	14.42	0.57	2.9
DSM 4-07.3-1xx.x6	325	2.30	7.7	1.5	6.6	6000	0.94	18.6	11.0	46.17	0.57	2.9
DSM 4-07.3-2xx.x6	560	2.30	3.5	1.5	3.0	6000	0.94	41.8	11.0	21.00	0.57	2.9

U_{DC-Bus}	Intermediate-circuit direct voltage from Twin Line drive or controller	P_N	Rated power
M_{dO}	Continuous stationary torque	k_E	Voltage constant at 1000 min^{-1}
I_{dO}	Continuous stationary current	M_{max}	Max. torque
M_{dN}	Rated continuous torque	I_{max}	Max. current
I_{dN}	Rated continuous current	J_R	Rotor inertia
n_N	Rated speed	m	Mass

Technical data for the DSM 4-09.x and its variations

	U_{DC-Bus}	M_{dO}	I_{dO}	M_{dN}	I_{dN}	n_N	P_N	k_E	M_{max}	I_{max}	J_R	m
	V	Nm	A_{eff}	Nm	A_{eff}	min^{-1}	kW	V_{eff}	Nm	A_{eff}	$kgcm^2$	kg
DSM 4-09.1-1xx.x3	325	0.95	1.5	0.8	1.3	3000	0.25	36.5	4.3	7.50	1.20	2.7
DSM 4-09.1-2xx.x3	560	0.95	0.8	0.8	0.72	3000	0.25	66.5	4.3	3.96	1.20	2.7
DSM 4-09.1-1xx.x4	325	0.95	2	0.75	1.8	4000	0.31	27.5	4.3	9.97	1.20	2.7
DSM 4-09.1-2xx.x4	560	0.95	1.1	0.75	0.9	4000	0.31	50.2	4.3	5.44	1.20	2.7
DSM 4-09.1-1xx.x6	325	0.95	3	0.7	2.4	6000	0.44	18.3	4.3	14.99	1.20	2.7
DSM 4-09.1-2xx.x6	560	0.95	1.6	0.7	1.3	6000	0.44	33.6	4.3	7.99	1.20	2.7
DSM 4-09.2-1xx.x3	325	2.70	3.2	2.4	2.7	3000	0.75	45.5	12.2	15.98	2.70	3.9
DSM 4-09.2-2xx.x3	560	2.70	1.9	2.4	1.6	3000	0.75	78.8	12.2	9.40	2.70	3.9
DSM 4-09.2-1xx.x4	325	2.70	4.3	2.2	3.6	4000	0.92	34.3	12.2	21.50	2.70	3.9
DSM 4-09.2-2xx.x4	560	2.70	2.5	2.2	2.1	4000	0.92	59	12.2	12.45	2.70	3.9
DSM 4-09.2-1xx.x6	325	2.70	6.5	2.0	5.3	6000	1.25	22.3	12.2	32.46	2.70	3.9
DSM 4-09.2-2xx.x6	560	2.70	3.7	2.0	3	6000	1.25	39.4	12.2	18.46	2.70	3.9
DSM 4-09.3-2xx.x3	560	4.50	2.9	3.9	2.4	3000	1.22	83.5	20.3	14.50	4.20	5.2
DSM 4-09.3-2xx.x4	560	4.50	3.8	3.5	3.1	4000	1.47	64.2	20.3	18.95	4.20	5.2
DSM 4-09.3-2xx.x6	560	4.50	5.6	2.8	3.8	6000	1.76	43.4	20.3	27.93	4.20	5.2
DSM 4-09.4-2xx.x3	560	6.00	4.2	5.0	3.4	3000	1.57	79.7	27.0	21.00	5.40	6.6
DSM 4-09.4-2xx.x4	560	6.00	5.5	4.5	4.4	4000	1.88	61.3	27.0	27.51	5.40	6.6
DSM 4-09.4-2xx.x6	560	6.00	7.8	3	4.5	6000	1.88	42.5	27.0	38.96	5.40	6.6

Technical data for the DSM 4-11.x and its variations

	U_{DC-Bus}	M_{dO}	I_{dO}	M_{dN}	I_{dN}	n_N	P_N	k_E	M_{max}	I_{max}	J_R	m
	V	Nm	A_{eff}	Nm	A_{eff}	min^{-1}	kW	V_{eff}	Nm	A_{eff}	$kgcm^2$	kg
DSM 4-11.1-2xx.x3	560	4.20	3	3.7	2.8	3000	1.2	82.7	18.9	10.18	4.80	6.3
DSM 4-11.1-2xx.x4	560	4.20	4	3.5	3.5	4000	1.5	62	18.9	13.58	4.80	6.3
DSM 4-11.1-2xx.x6	560	4.20	6	3	4.8	6000	1.9	41.3	18.9	20.36	4.80	6.3
DSM 4-11.2-2xx.x3	560	7.00	4.8	6.1	4.5	3000	1.9	84.7	31.5	16.26	7.40	7.9
DSM 4-11.2-2xx.x4	560	7.00	6.4	5.8	5.8	4000	2.4	62.9	31.5	21.71	7.40	7.9
DSM 4-11.2-2xx.x6	560	7.00	9.9	3.8	5.9	6000	2.4	40.9	31.5	33.59	7.40	7.9
DSM 4-11.3-2xx.x3	560	10	7.2	8.4	6.3	3000	2.6	84.7	45.0	24.40	9.80	9.6
DSM 4-11.3-2xx.x4	560	10	9.7	7.6	7.7	4000	3.2	62.4	45.0	32.88	9.80	9.6
DSM 4-11.3-2xx.x6	560	10	13.6	5	7.6	6000	3.1	44.6	45.0	46.17	9.80	9.6
DSM 4-11.4-2xx.x3	560	12	8.5	9.9	7.3	3000	3.1	85.9	54.0	28.84	12.70	11.2
DSM 4-11.4-2xx.x4	560	12	11.6	8.6	8.6	4000	3.6	63.1	54.0	39.39	12.70	11.2

U_{DC-Bus}	Intermediate-circuit direct voltage from Twin Line drive or controller	P_N	Rated power
M_{dO}	Continuous stationary torque	k_E	Voltage constant at 1000 min^{-1}
I_{dO}	Continuous stationary current	M_{max}	Max. torque
M_{dN}	Rated continuous torque	I_{max}	Max. current
I_{dN}	Rated continuous current	J_R	Rotor inertia
n_N	Rated speed	m	Mass

AC synchronous servomotors - High Performance

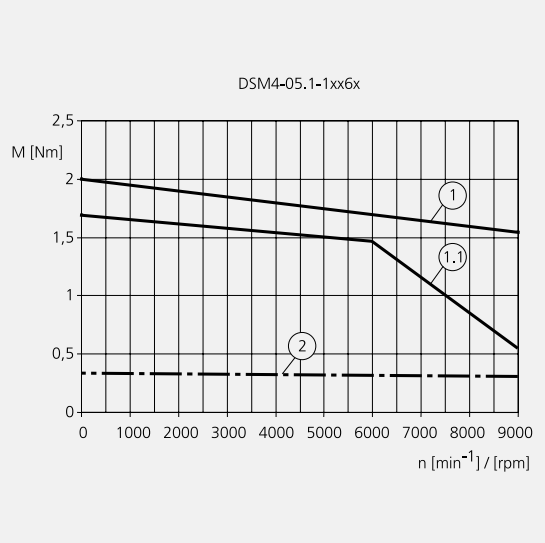
Technical data for the DSM 4-14.x and its variations

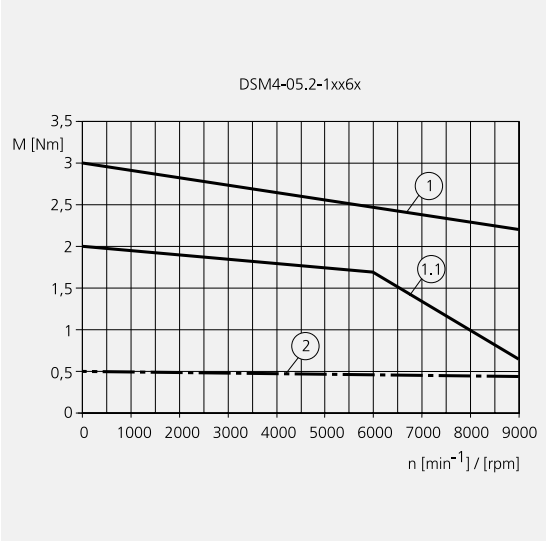
	U_{DC-Bus}	M_{dO}	I_{dO}	M_{dN}	I_{dN}	n_N	P_N	k_E	M_{max}	I_{max}	J_R	m
	V	Nm	A_{eff}	Nm	A_{eff}	min^{-1}	kW	V_{eff}	Nm	A_{eff}	$kgcm^2$	kg
DSM 4-14.1-2xx.x2	560	8.5	3.7	7	3.1	2000	1.5	142.3	42	19.80	12.3	10
DSM 4-14.1-2xx.x3	560	8.5	5.6	6.5	4.5	3000	2.0	94.0	42	29.70	12.3	10
DSM 4-14.1-2xx.x4	560	8.5	7.4	5.2	4.8	4000	2.2	71.0	42	39.60	12.3	10
DSM 4-14.2-2xx.x2	560	14.00	5.6	12.2	4.9	2000	2.6	145.4	70	29.70	19.50	12
DSM 4-14.2-2xx.x3	560	14.00	9.0	11.0	7	3000	3.5	96.3	70	48.08	19.50	12
DSM 4-14.2-2xx.x4	560	14.00	12.0	7.6	6.5	4000	3.2	73.1	70	63.64	19.50	12
DSM 4-14.3-2xx.x2	560	19.0	8.1	16.5	7.3	2000	3.5	141.1	85.0	38.89	26.70	16
DSM 4-14.3-2xx.x3	560	19.0	12.4	14.6	9.9	3000	4.6	92.5	85.0	59.40	26.70	16
DSM 4-14.3-2xx.x4	560	19.0	16.2	8.7	7.7	4000	3.6	70.7	85.0	77.78	26.70	16
DSM 4-14.4-2xx.x2	560	27.0	11.9	21.4	9.4	2000	4.5	148.0	121.0	56.57	36	20
DSM 4-14.4-2xx.x3	560	27.0	17.3	15.5	9.9	3000	4.9	101.0	121.0	82.73	36	20

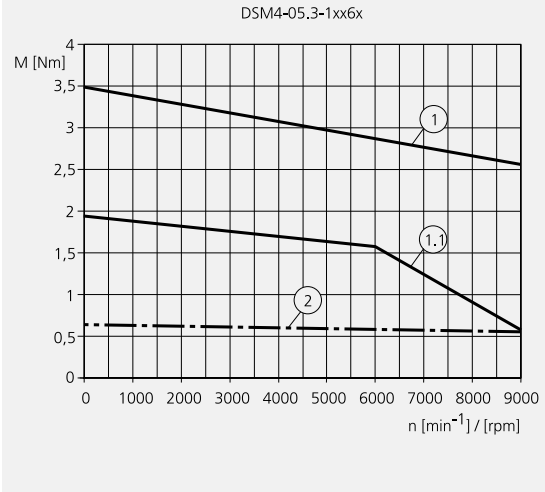
Technical data for the DSM 4-19.x and its variations

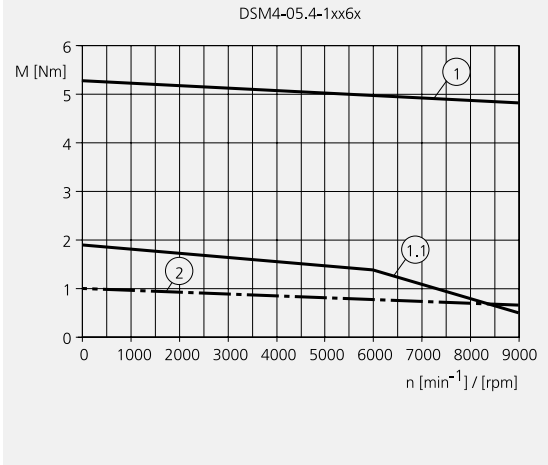
	U_{DC-Bus}	M_{dO}	I_{dO}	M_{dN}	I_{dN}	n_N	P_N	k_E	M_{max}	I_{max}	J_R	m
	V	Nm	A_{eff}	Nm	A_{eff}	min^{-1}	kW	V_{eff}	Nm	A_{eff}	$kgcm^2$	kg
DSM 4-19.1-2xx.x1	560	25	8.2	22.5	7.5	1500	3.5	189.2	88	28.99	84	31
DSM 4-19.1-2xx.x2	560	25	11.1	21.5	9.7	2000	4.5	140.6	88	38.89	84	31
DSM 4-19.1-2xx.x3	560	25	17.0	20.0	13.8	3000	6.3	91.9	88	60.10	84	31
DSM 4-19.1-2xx.x4	560	25	22.2	16.0	14.8	4000	6.7	70.3	88	77.78	84	31
DSM 4-19.2-2xx.x1	560	50	17.0	42.0	14.5	1500	6.6	179.6	175	60.1	147	44
DSM 4-19.2-2xx.x2	560	50	22.3	38.0	17.2	2000	7.9	137.3	175	78.5	147	44
DSM 4-19.2-2xx.x3	560	50	32.2	31.0	20.6	3000	9.7	95.1	175	113.1	147	44

U_{DC-Bus}	Intermediate-circuit direct voltage from Twin Line drive or controller	P_N	Rated power
M_{dO}	Continuous stationary torque	k_E	Voltage constant at 1000 min^{-1}
I_{dO}	Continuous stationary current	M_{max}	Max. torque
M_{dN}	Rated continuous torque	I_{max}	Max. current
I_{dN}	Rated continuous current	J_R	Rotor inertia
n_N	Rated speed	m	Mass

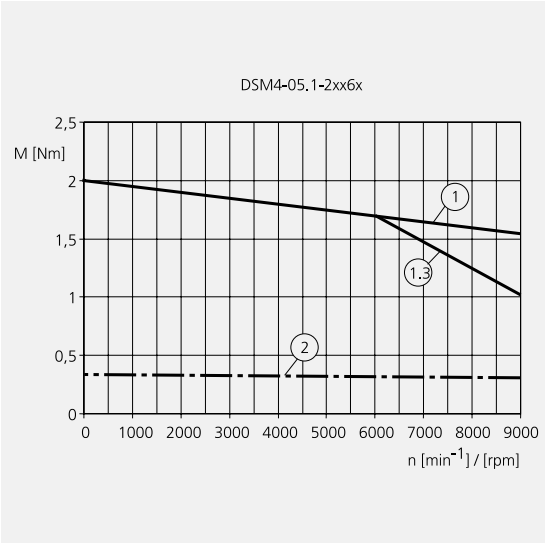


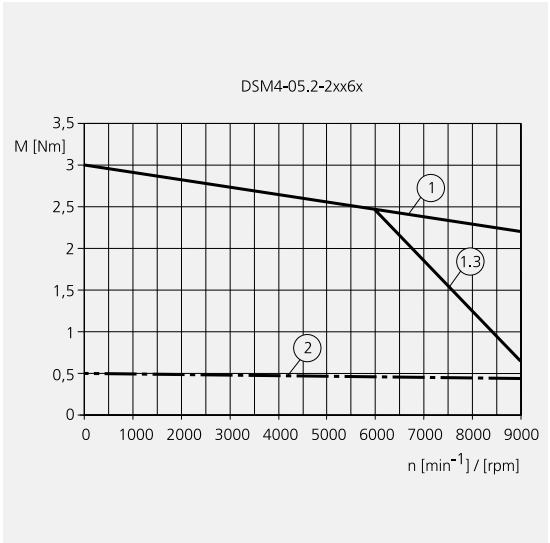


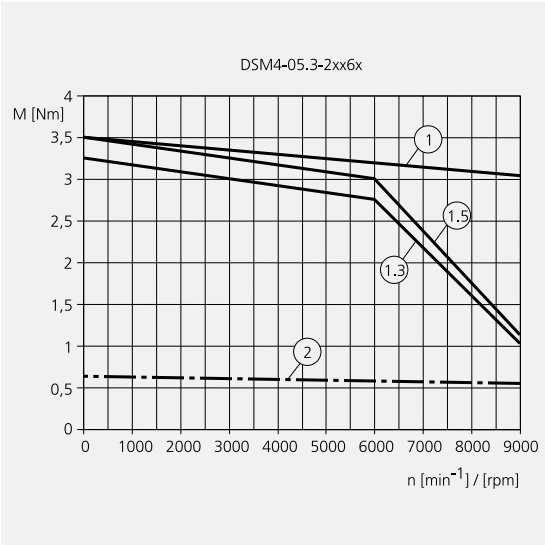


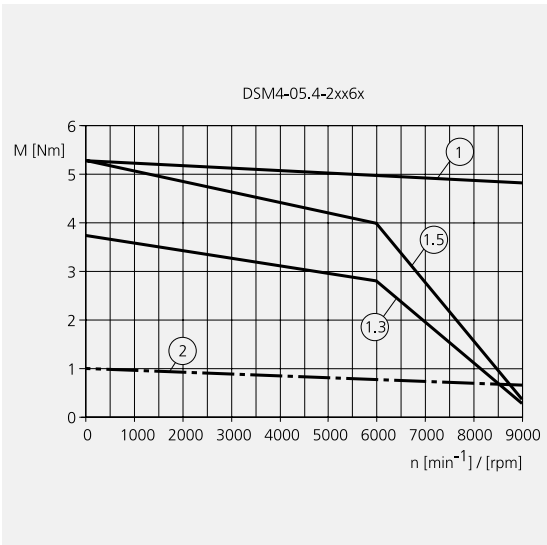


1 Motor peak torque
2 Continuous torque
1.1 Peak torque with TLX x32
1.3 Peak torque with TLX x34
1.5 Peak torque with TLX x36
1.7 Peak torque with TLX x38

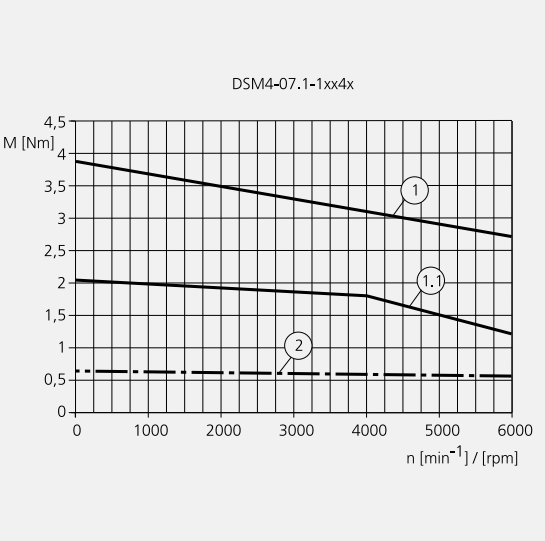


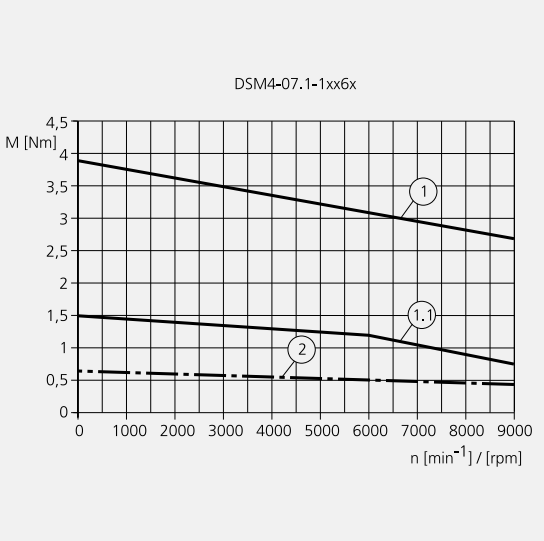


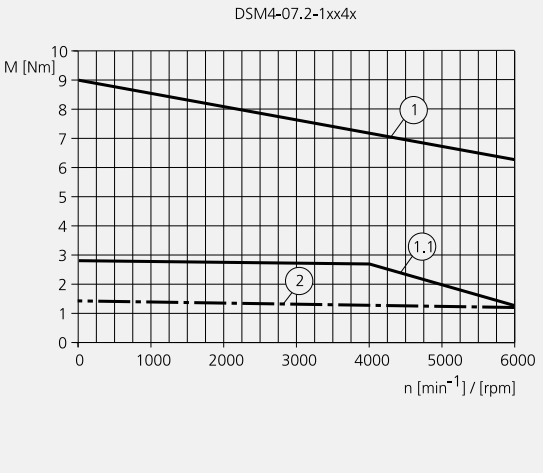


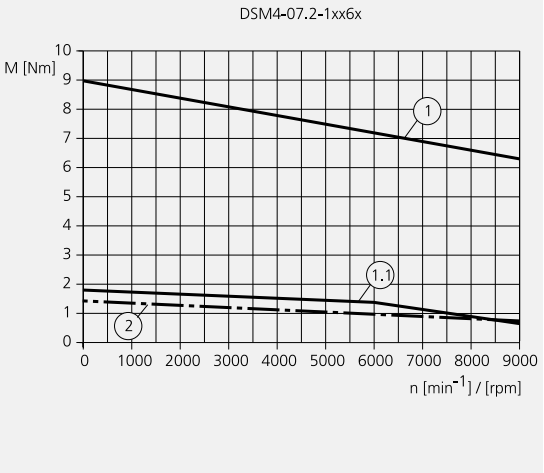


1 Motor peak torque
2 Continuous torque
1.1 Peak torque with TLX x32
1.3 Peak torque with TLX x34
1.5 Peak torque with TLX x36
1.7 Peak torque with TLX x38

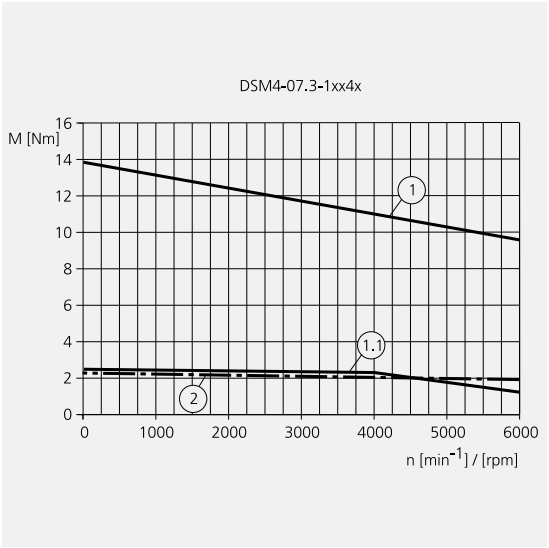


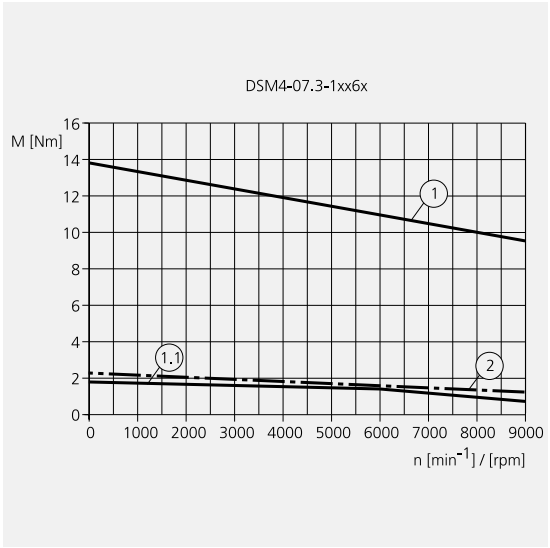


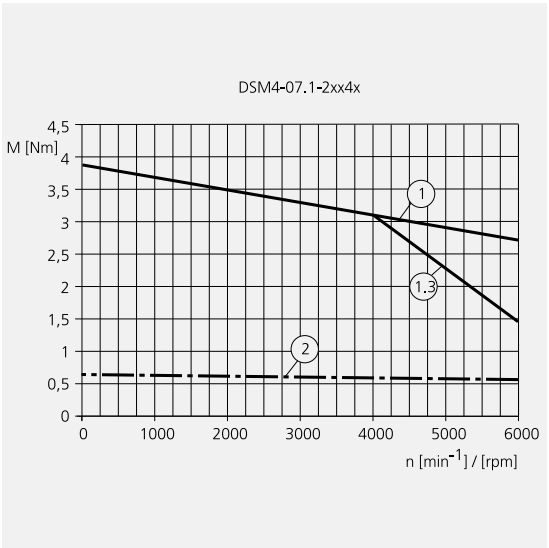


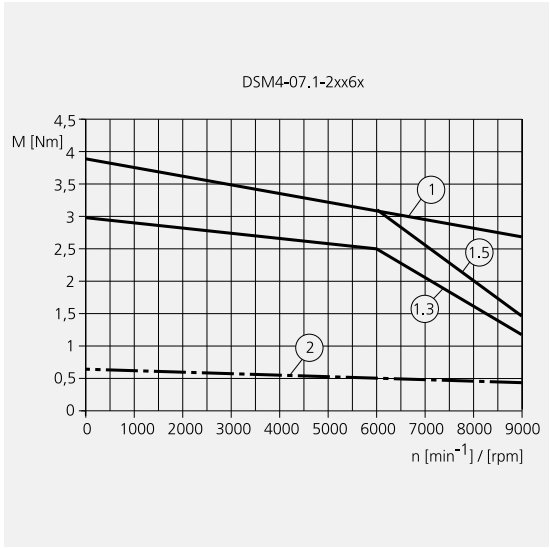


1 Motor peak torque
2 Continuous torque
1.1 Peak torque with TLX x32
1.3 Peak torque with TLX x34
1.5 Peak torque with TLX x36
1.7 Peak torque with TLX x38

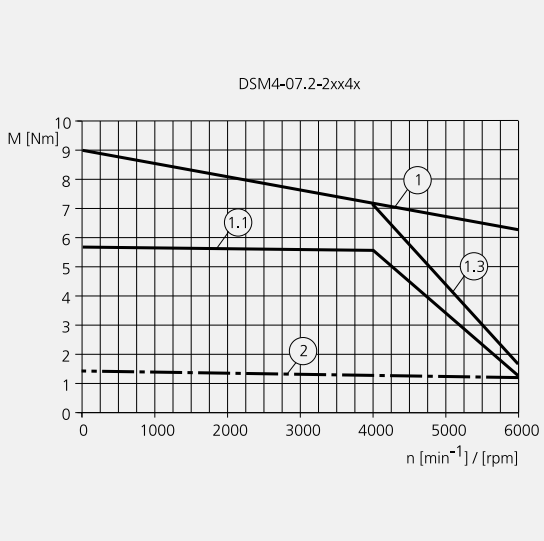


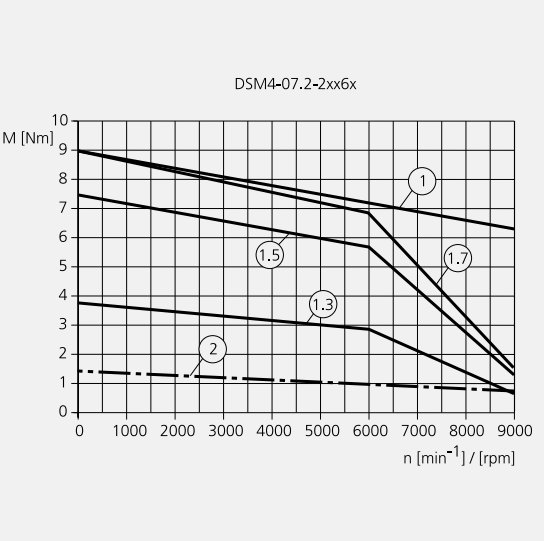


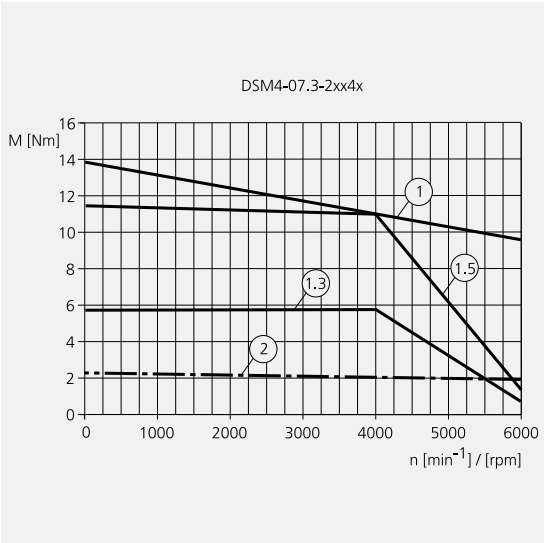


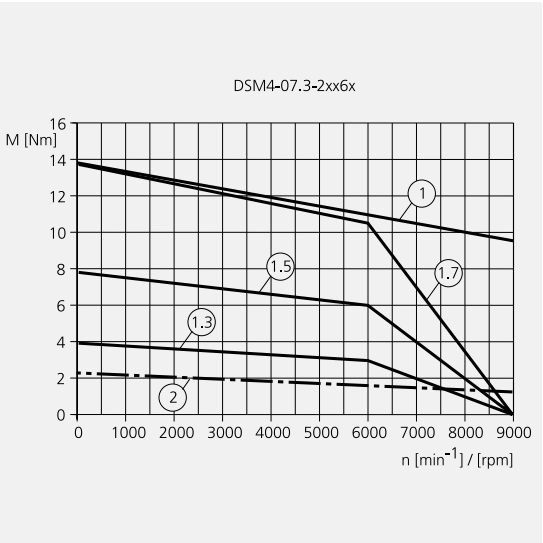


1 Motor peak torque
2 Continuous torque
1.1 Peak torque with TLX x32
1.3 Peak torque with TLX x34
1.5 Peak torque with TLX x36
1.7 Peak torque with TLX x38









1 Motor peak torque
2 Continuous torque
1.1 Peak torque with TLX x32
1.3 Peak torque with TLX x34
1.5 Peak torque with TLX x36
1.7 Peak torque with TLX x38

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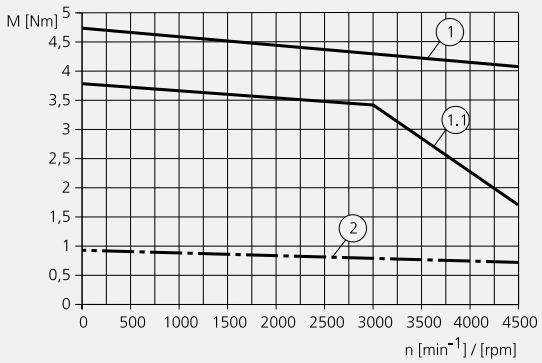
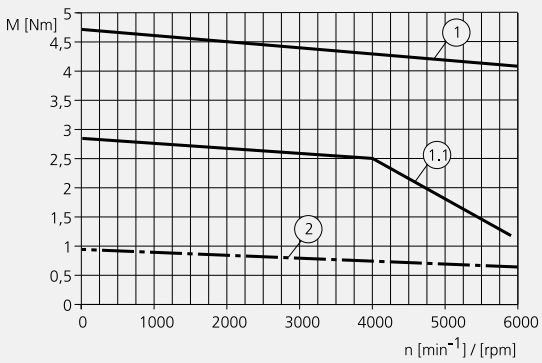
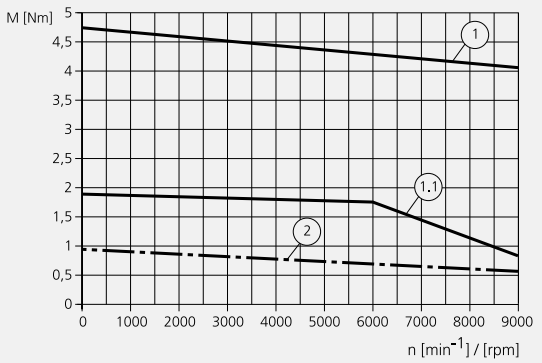
DSM4-09.1-1xx3x



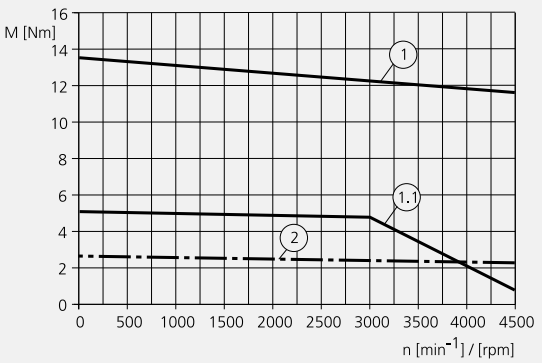
DSM4-09.1-1xx4x



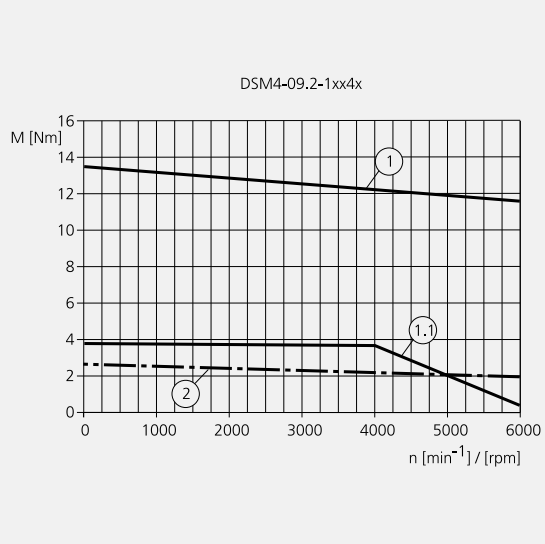
DSM4-09.1-1xx6x

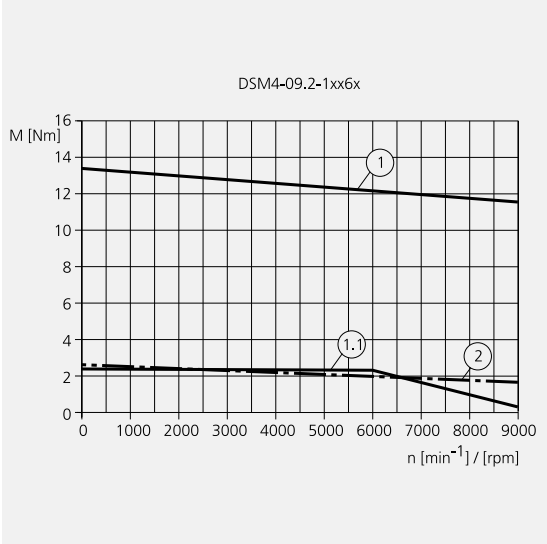


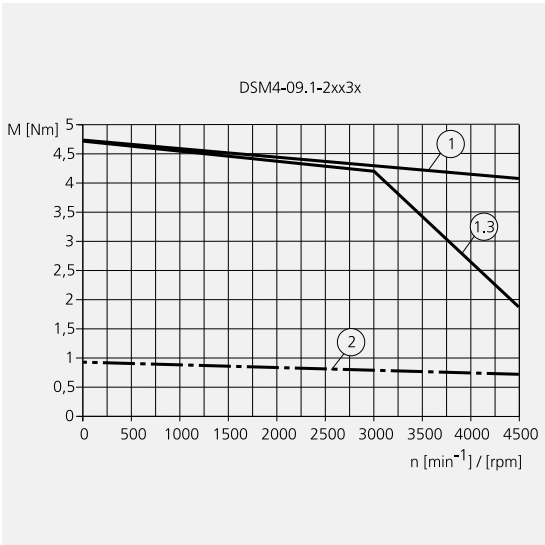
DSM4-09.2-1xx3x

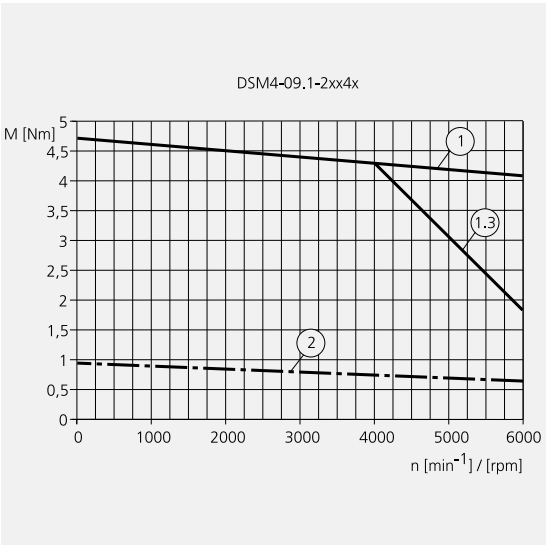


1 Motor peak torque
2 Continuous torque
1.1 Peak torque with TLX x32
1.3 Peak torque with TLX x34
1.5 Peak torque with TLX x36
1.7 Peak torque with TLX x38









1 Motor peak torque
2 Continuous torque
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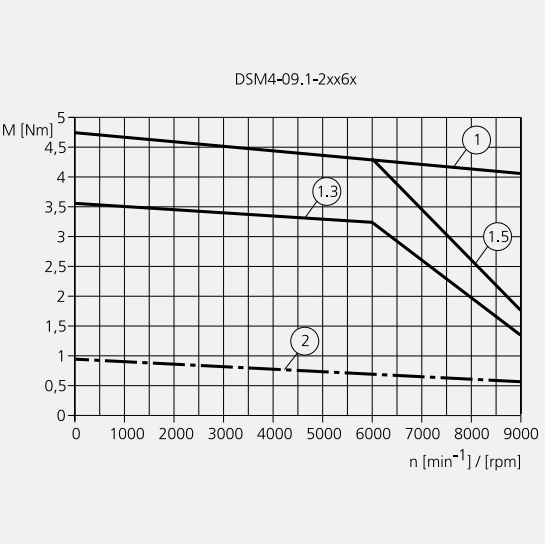
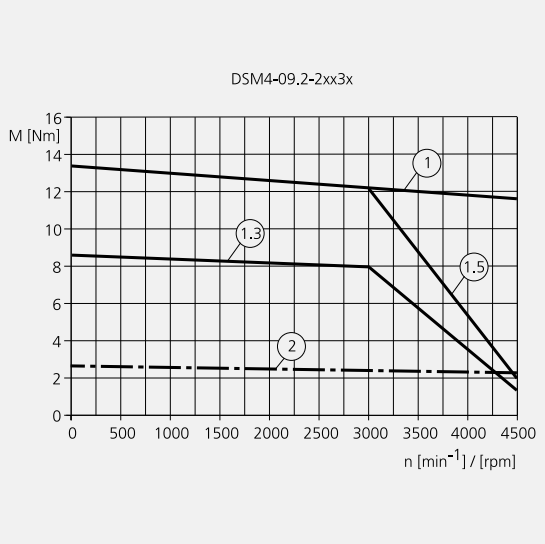
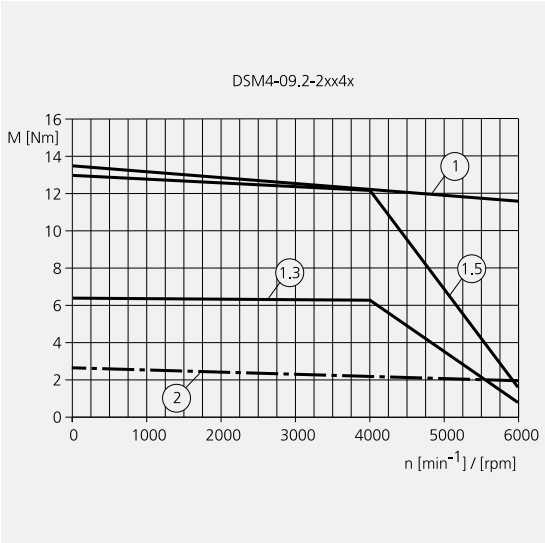
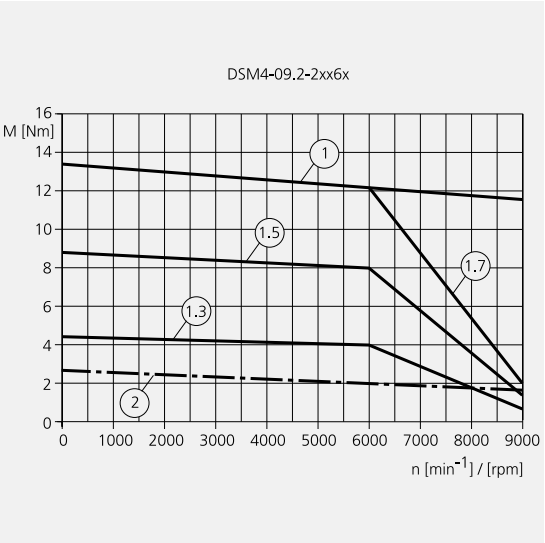
1.7 Peak torque with TLX x38









1 Motor peak torque
2 Continuous torque
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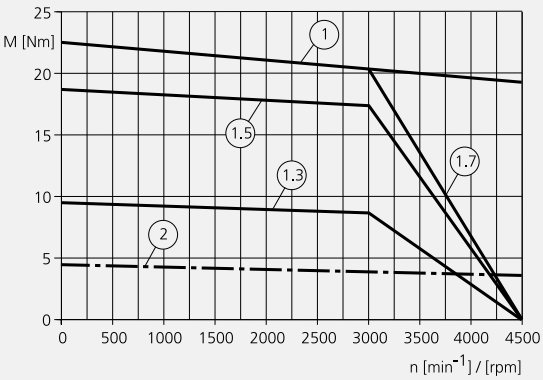
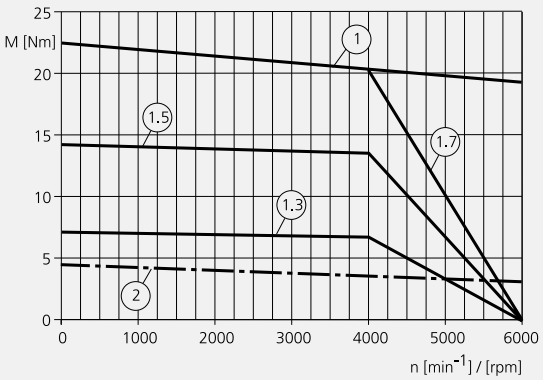
1.7 Peak torque with TLX x38

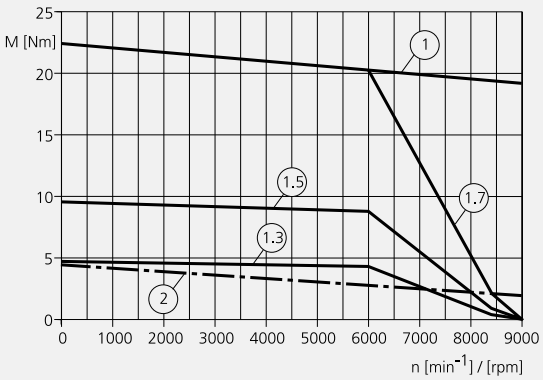
DSM4-09.3-2xx3x



DSM4-09.3-2xx4x



DSM4-09.3-2xx6x



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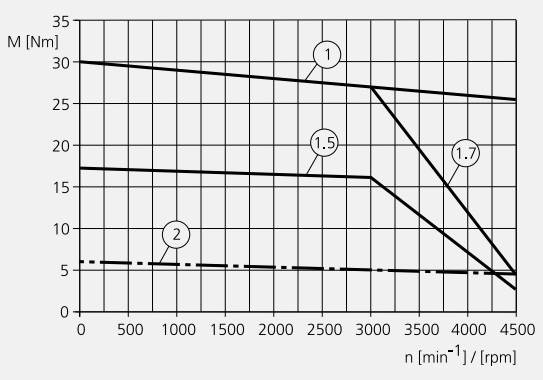

1 Motor peak torque
2 Continuous torque
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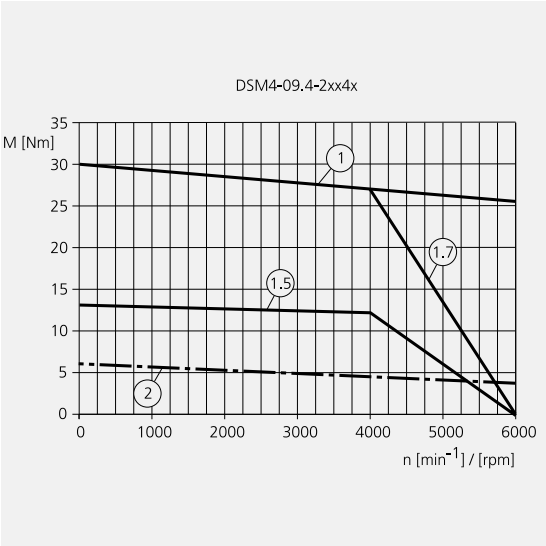
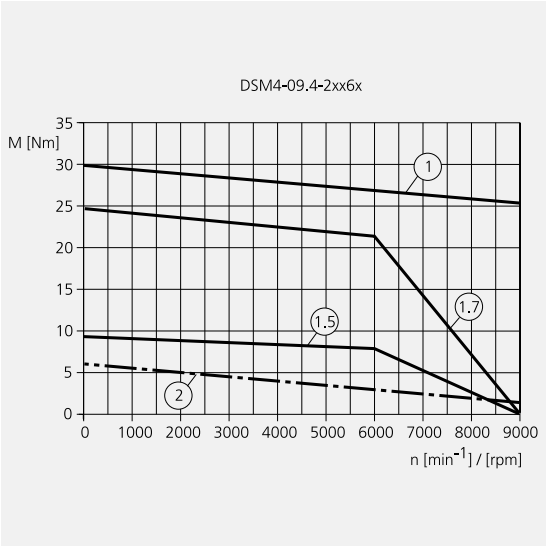
1.7 Peak torque with TLX x38





1 Motor peak torque
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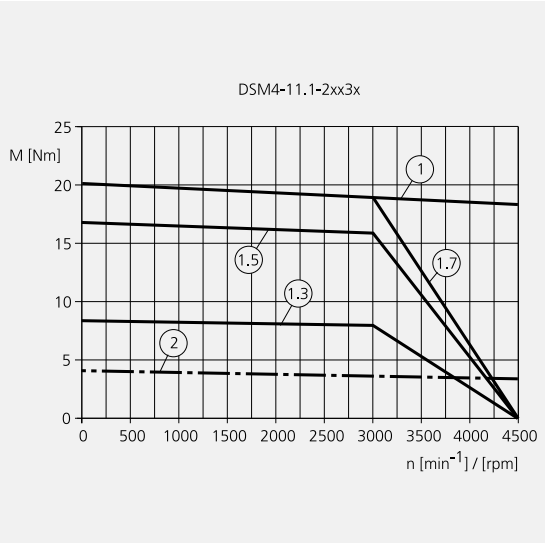

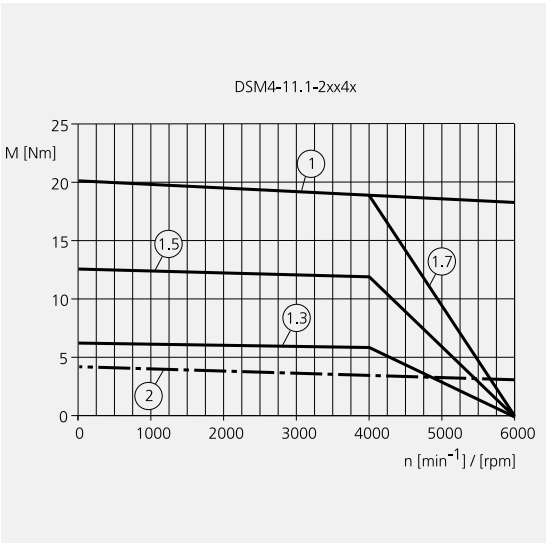

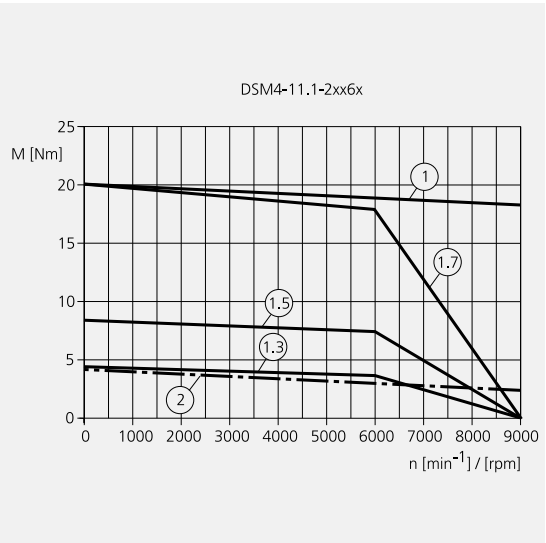

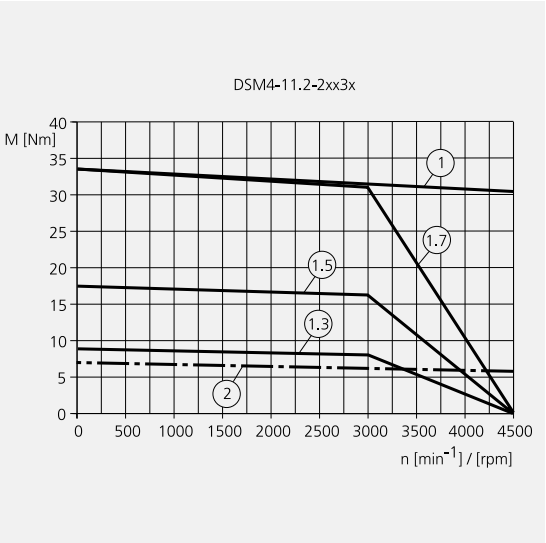

1 Motor peak torque
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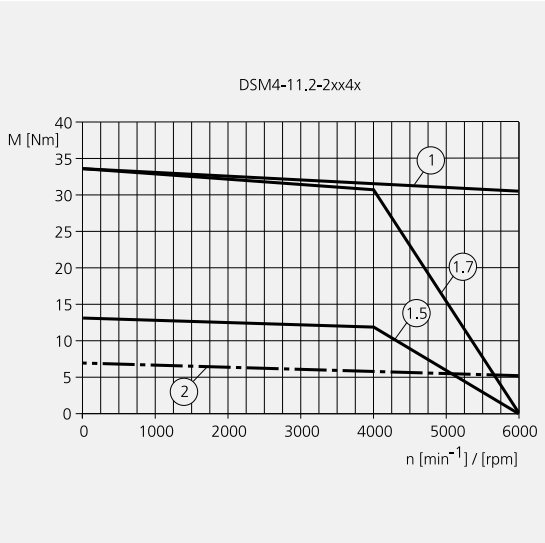

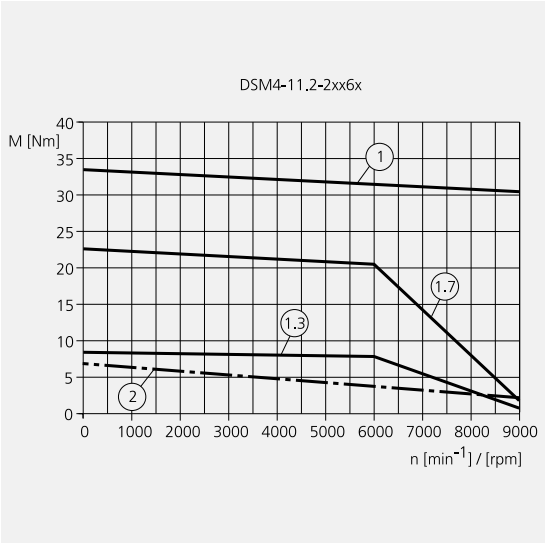

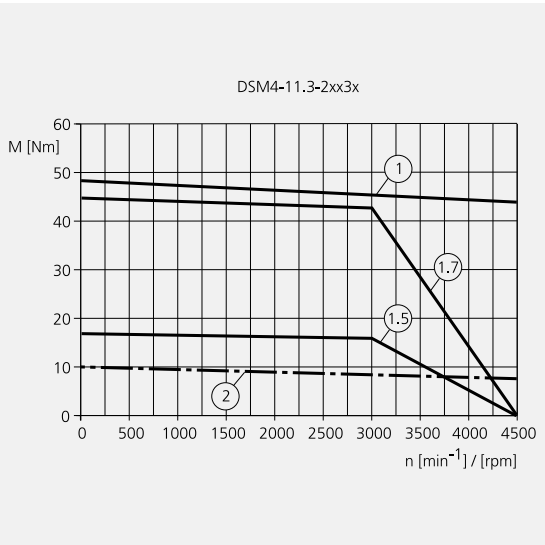

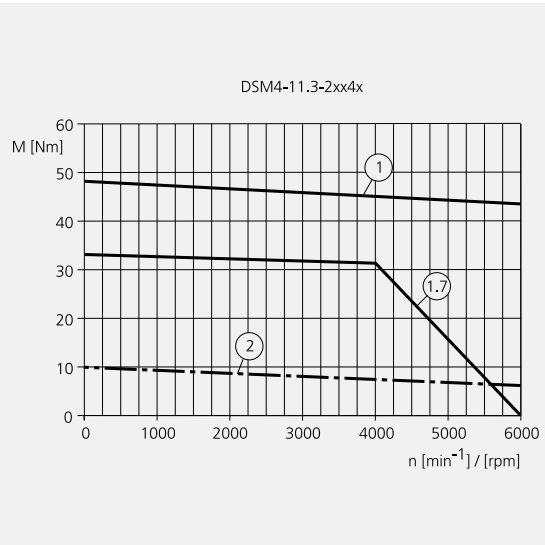

1 Motor peak torque
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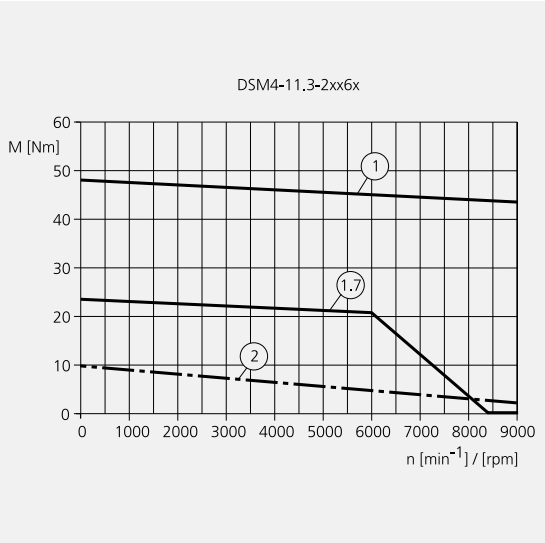

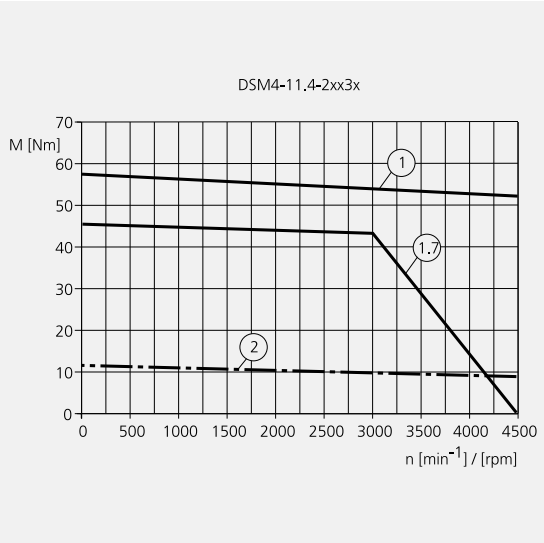

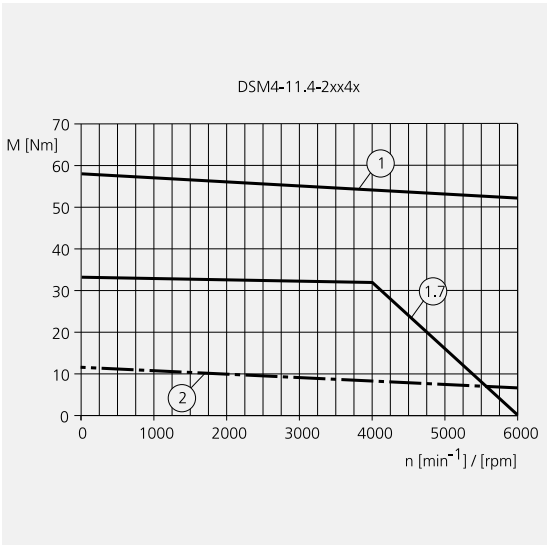

1 Motor peak torque
2 Continuous torque
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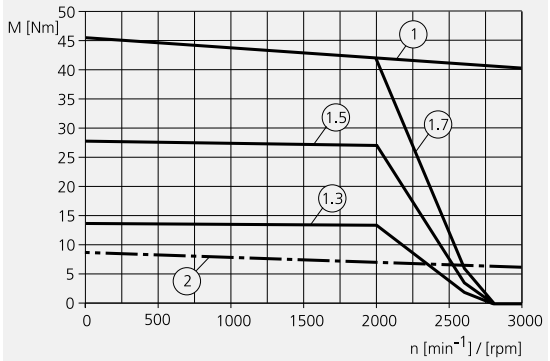
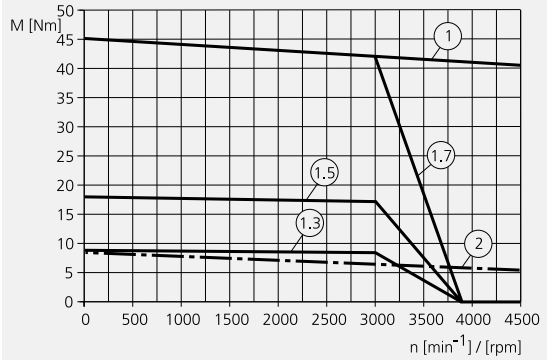
1.7 Peak torque with TLX x38

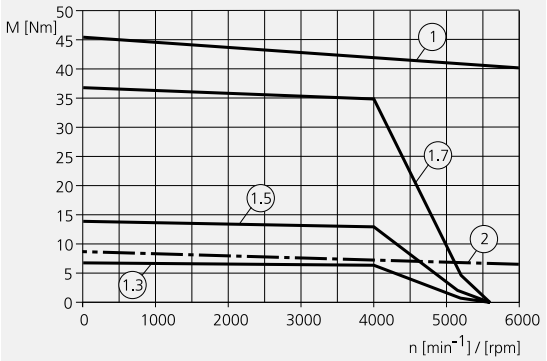
DSM4-14.1-2xx2x



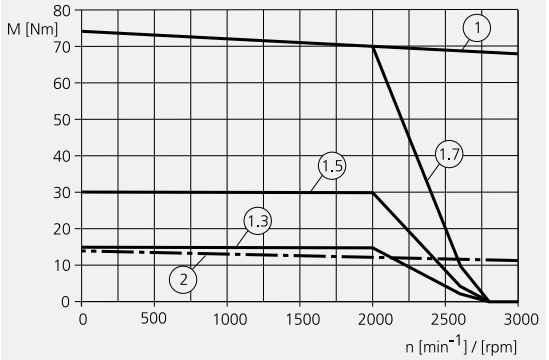
DSM4-14.1-2xx3x



DSM4-14.1-2xx4x



DSM4-14.2-2xx2x



1 Motor peak torque
2 Continuous torque
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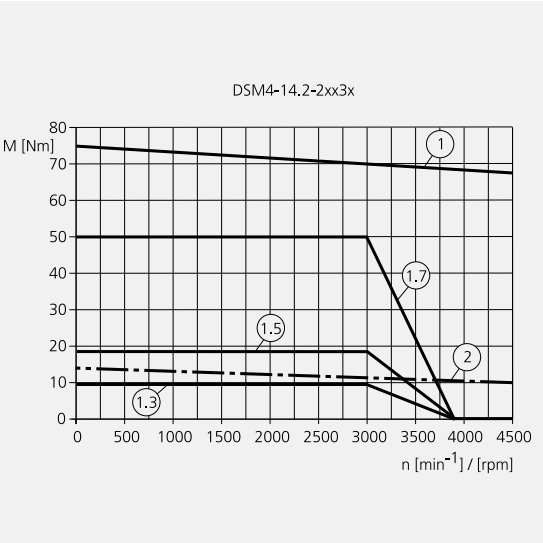

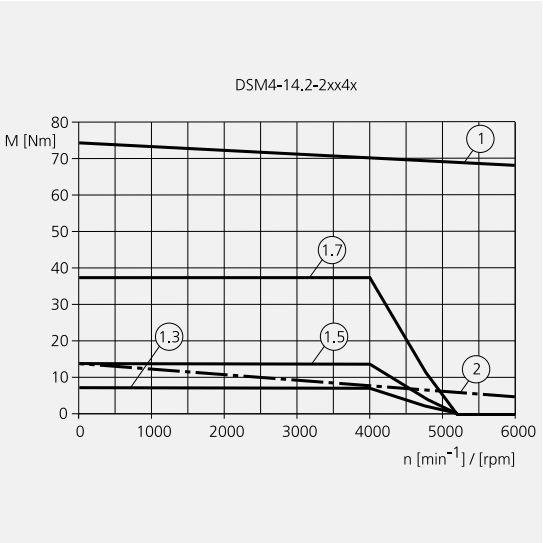

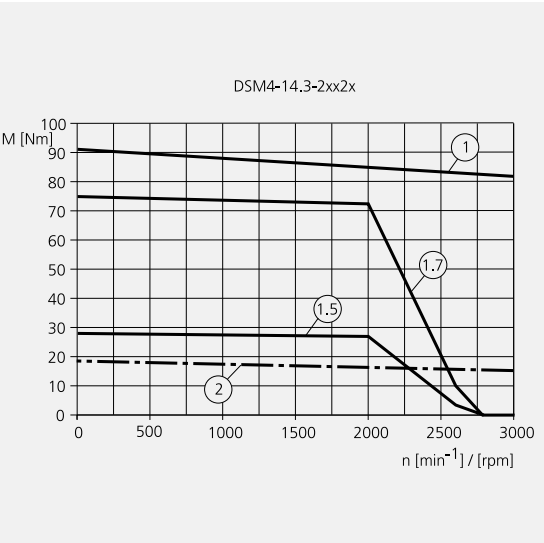

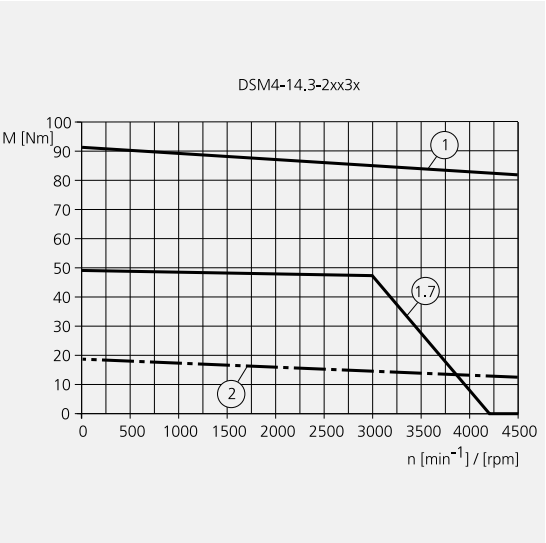

1 Motor peak torque
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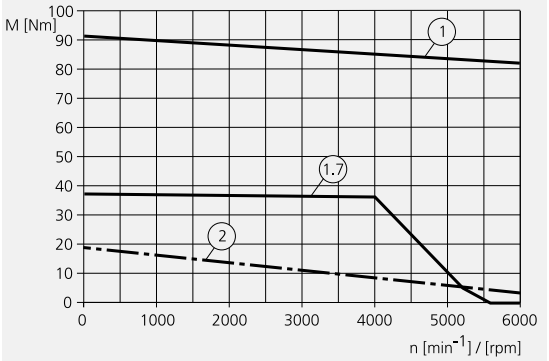
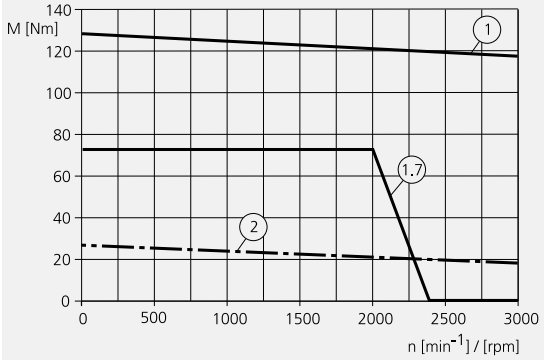
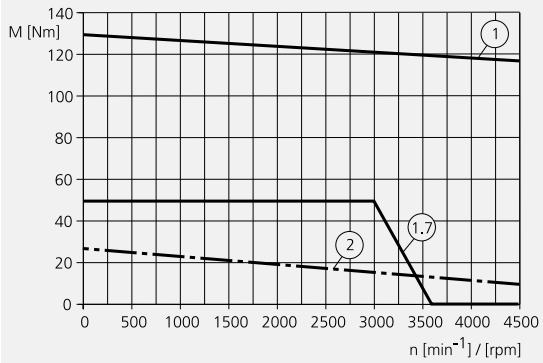
DSM4-14.3-2xx4x



DSM4-14.4-2xx2x



DSM4-14.4-2xx3x



1 Motor peak torque
2 Continuous torque
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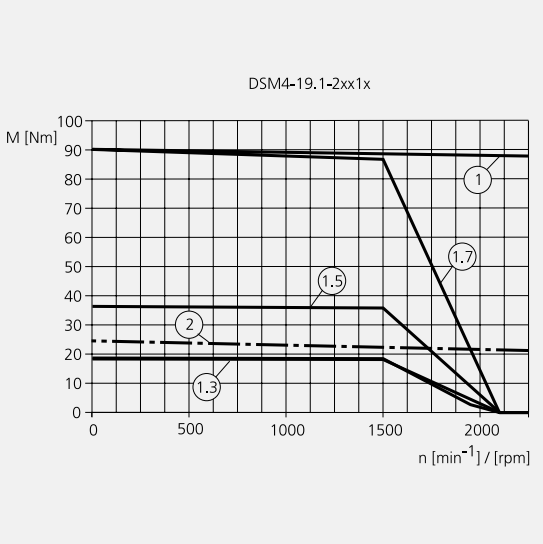

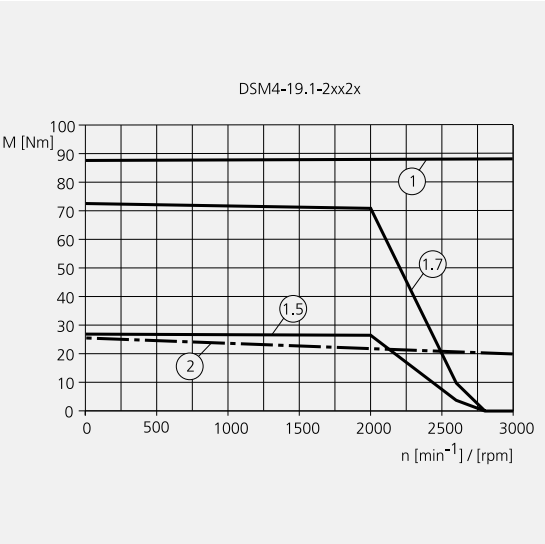

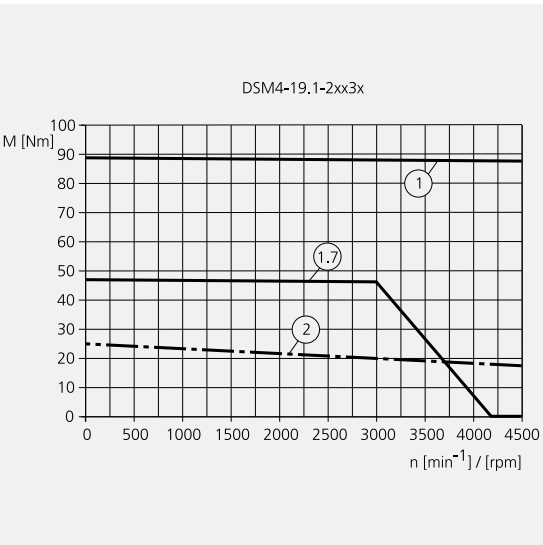

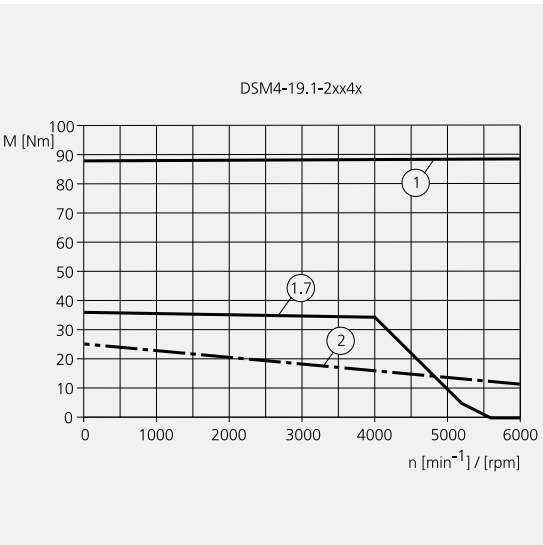

1 Motor peak torque
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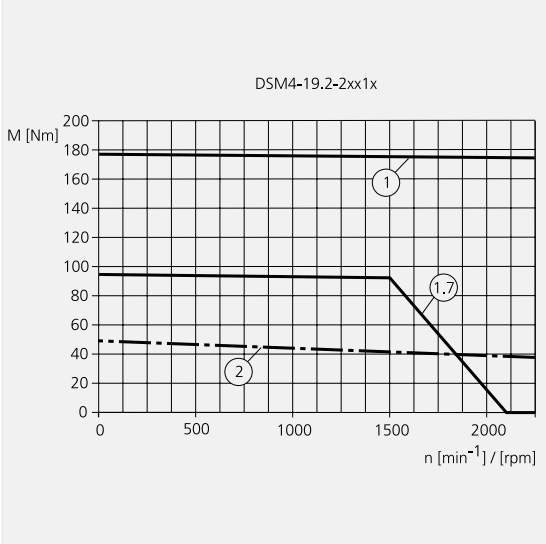
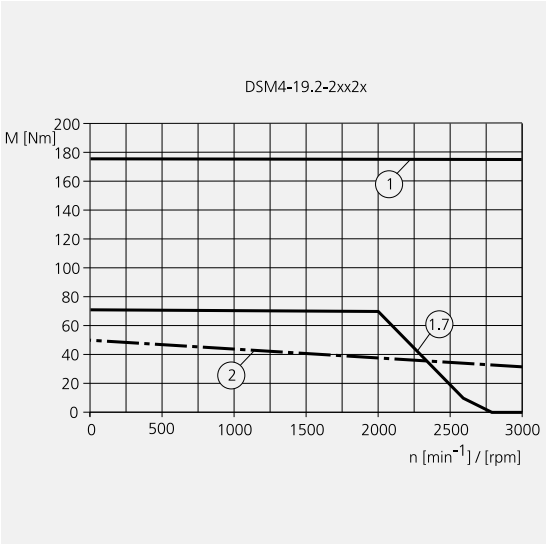
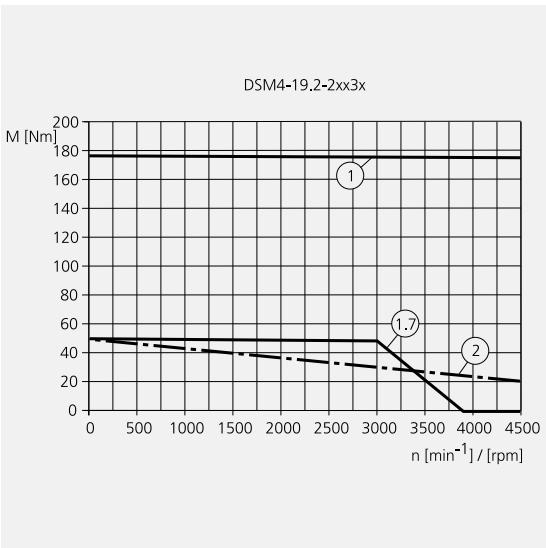
AC synchronous servomotors - High Performance







1 Motor peak torque
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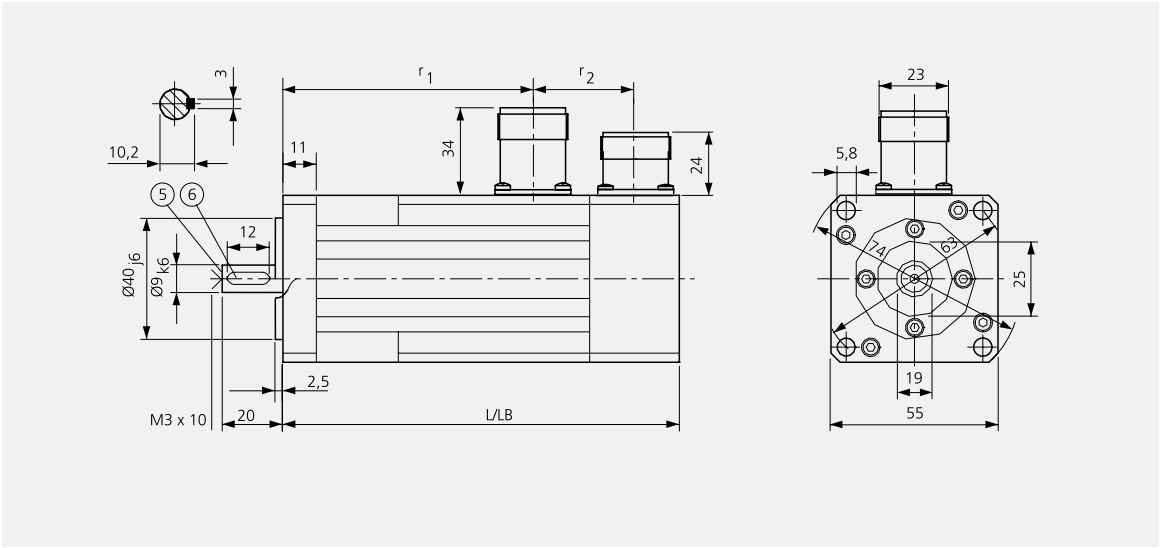
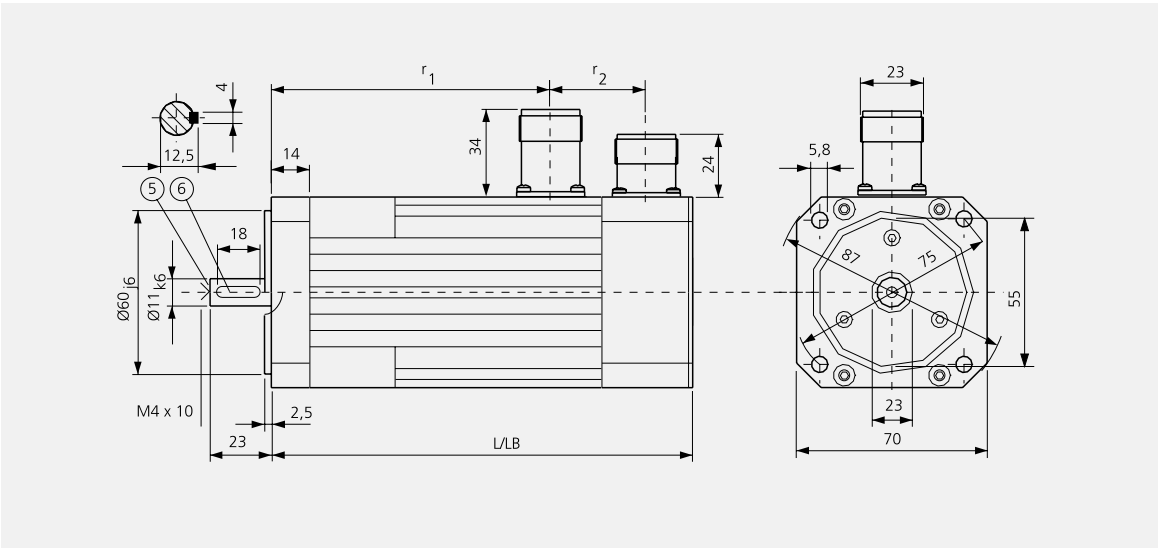
1.5 Peak torque with TLX x36
1.7 Peak torque with TLX x38



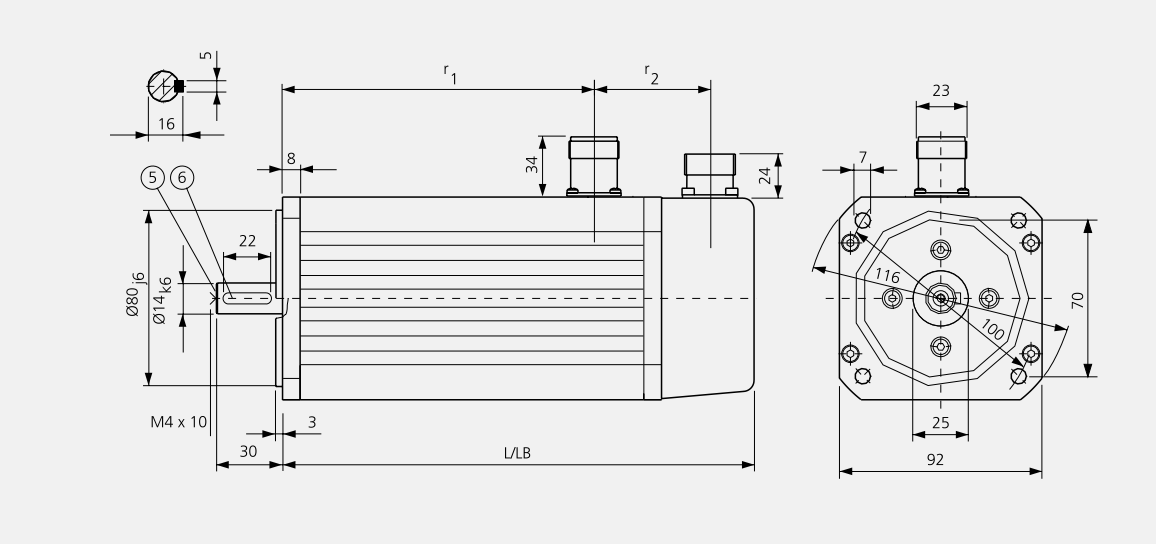
DSM 4-05 High Performance AC synchronous servomotor



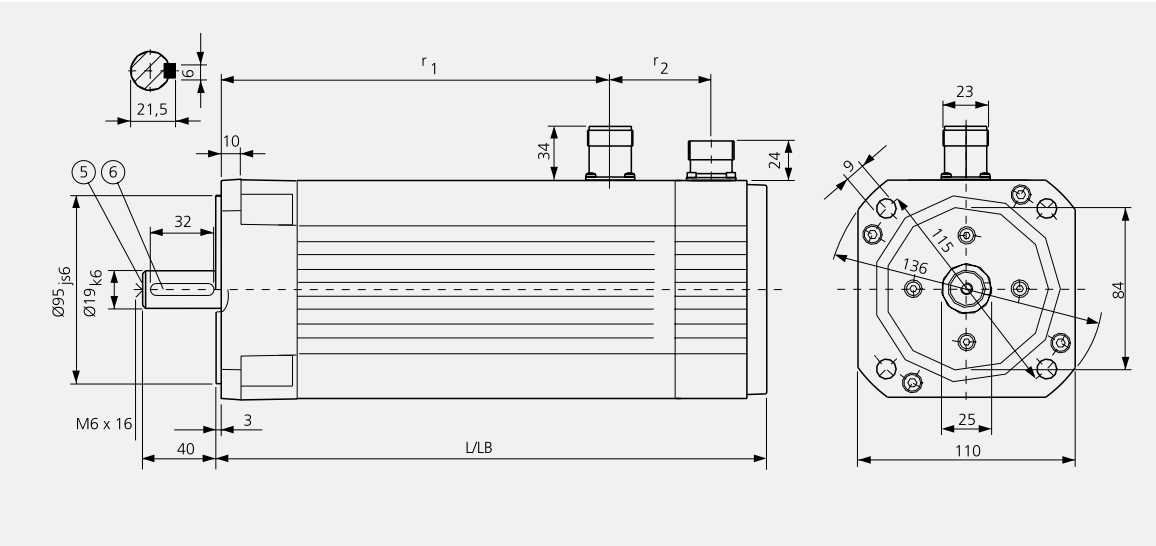
DSM 4-07 High Performance AC synchronous servomotor

5 Centre hole
6 Featherkey

	L = without brake (n. b.)		LB = with brake (w. b.)		r_1 (n. b.)	r_1 (w. b.)	r_2	
	Measuring system						Measuring system	
	SinCos®	Resolver	SinCos®	Resolver			SinCos®	Resolver
DSM 4-05.1	–	121 mm	–	145 mm	72 mm	97 mm	–	33 mm
DSM 4-05.2	–	133 mm	–	157 mm	85 mm	109 mm	–	33 mm
DSM 4-05.3	–	145 mm	–	169 mm	97 mm	121 mm	–	33 mm
DSM 4-05.4	–	170 mm	–	194 mm	121 mm	146 mm	–	33 mm
DSM 4-07.1	177 mm	136 mm	205 mm	164 mm	81 mm	109 mm	66 mm	33 mm
DSM 4-07.2	201 mm	160 mm	229 mm	188 mm	105 mm	133 mm	66 mm	33 mm
DSM 4-07.3	237 mm	196 mm	265 mm	224 mm	141 mm	169 mm	66 mm	33 mm



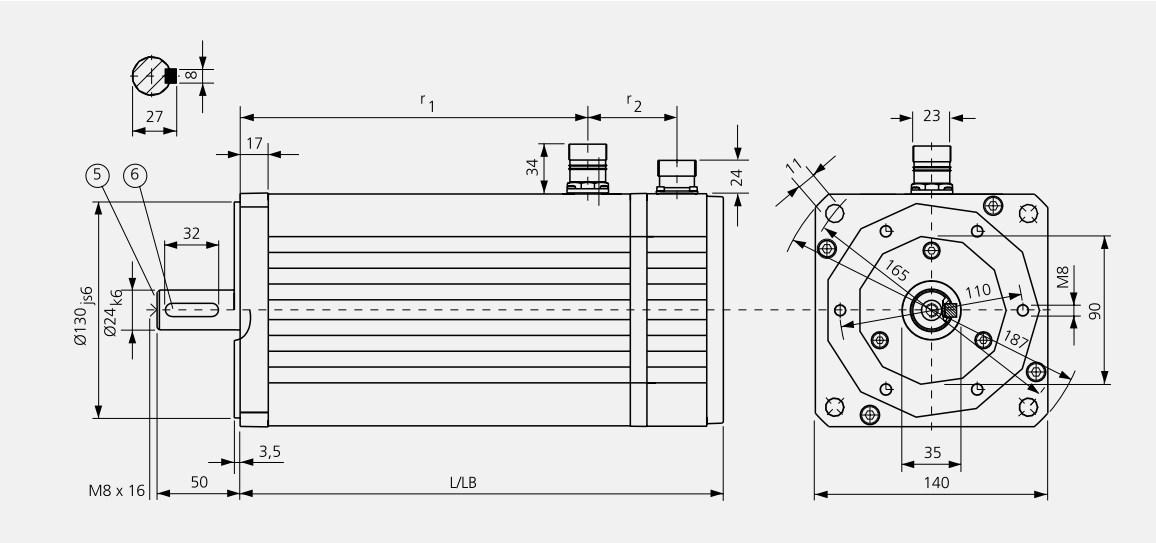
DSM 4-09 High Performance AC synchronous servomotor



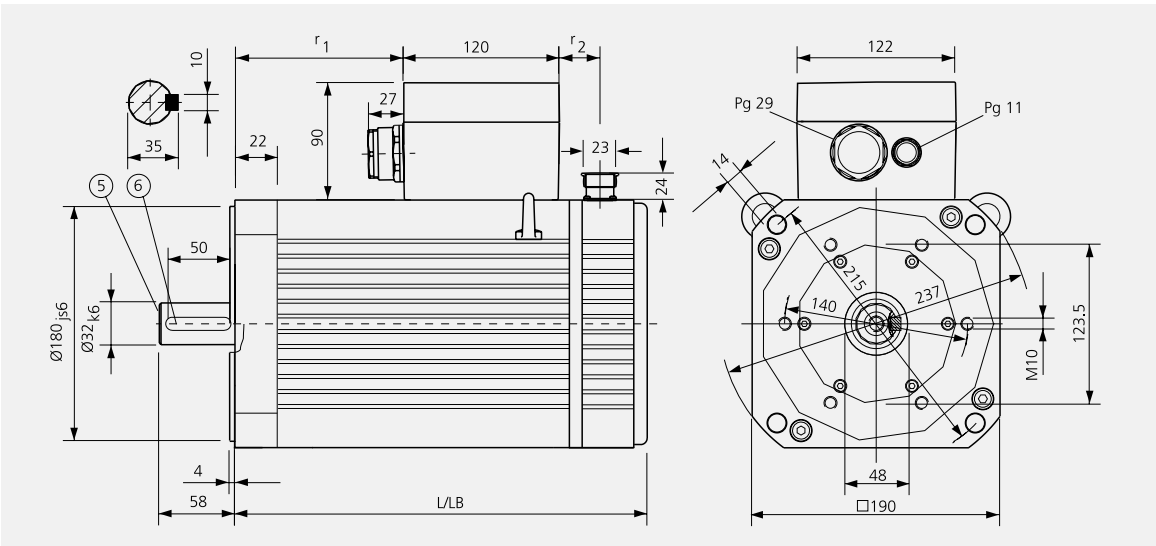
DSM 4-11 High Performance AC synchronous servomotor

5 Centre hole
6 Featherkey

	L = without brake (n. b.)		LB = with brake (w. b.)		r_1 (n. b.)	r_1 (w. b.)	r_2	
	Measuring system						Measuring system	
	SinCos®	Resolver	SinCos®	Resolver			SinCos®	Resolver
DSM 4-09.1	163 mm	156 mm	199 mm	192 mm	85 mm	121 mm	51 mm	51 mm
DSM 4-09.2	187 mm	180 mm	233 mm	226 mm	109 mm	155 mm	51 mm	51 mm
DSM 4-09.3	221 mm	214 mm	267 mm	260 mm	143 mm	189 mm	51 mm	51 mm
DSM 4-09.4	255 mm	248 mm	301 mm	294 mm	177 mm	223 mm	51 mm	51 mm
DSM 4-11.1	255 mm	218 mm	263 mm	226 mm	138 mm	145 mm	82 mm	52 mm
DSM 4-11.2	285 mm	248 mm	293 mm	256 mm	168 mm	175 mm	82 mm	52 mm
DSM 4-11.3	315 mm	278 mm	323 mm	286 mm	198 mm	205 mm	82 mm	52 mm
DSM 4-11.4	345 mm	308 mm	353 mm	316 mm	228 mm	235 mm	82 mm	52 mm



DSM 4-14 High Performance AC synchronous servomotor



DSM 4-19 High Performance AC synchronous servomotor

5 Centre hole
6 Featherkey

	L = without brake (n. b.)		LB = with brake (w. b.)		r_1 (n. b.)	r_1 (w. b.)	r_2	
	Measuring system						Measuring system	
	SinCos®	Resolver	SinCos®	Resolver			SinCos®	Resolver
DSM 4-14.1	238 mm	231 mm	283 mm	276 mm	150 mm	195 mm	54 mm	55 mm
DSM 4-14.2	268 mm	261 mm	313 mm	306 mm	180 mm	225 mm	54 mm	55 mm
DSM 4-14.3	298 mm	291 mm	343 mm	336 mm	210 mm	255 mm	54 mm	55 mm
DSM 4-14.4	343 mm	336 mm	388 mm	381 mm	255 mm	300 mm	54 mm	55 mm
DSM 4-19.1	355 mm	348 mm	355 mm	348 mm	163 mm	163 mm	31 mm	31 mm
DSM 4-19.2	435 mm	428 mm	435 mm	428 mm	243 mm	243 mm	31 mm	31 mm

Holding brake

The holding brake is an electromagnetic spring-pressure brake for locking the motor axle after the motor current is shut off. In emergency situations, such as in a power failure or during an EMERGENCY STOP, it shuts down the drive, significantly contributing to overall safety. The motor axle must also be locked for weight-induced torque loads, e.g. in cases of vertical axes in manual mode.

Holding brake controller

The holding brake is controlled via the **T**win **L**ine **H**olding **B**rake **C**ontroller, which is available as an accessory.

Caution! Overloading may damage the holding brake! Avoid stationary load torques greater than 25 % of the motor holding torque when using vertical axes with the holding brake.

Technical data of the holding brake for DSM motors

		DSM 4-05	DSM 4-07	DSM 4-09	DSM 4-11	DSM 4-14	DSM 4-19
Holding torque	M_{Br}	2.0 Nm	2.5 Nm	9.0 Nm	11.0 Nm	36.0 Nm	85.0 Nm
Armature inertia	J_{Br}	0.067 kgcm^2	0.380 kgcm^2	0.600 kgcm^2	2.300 kgcm^2	5.900 kgcm^2	17.600 kgcm^2
Electrical pickup power	P_{Br}	12 W	12 W	18 W	21 W	27 W	36 W
Energise time	t_E	25 ms	7 ms	15 ms	20 ms	35 ms	60 ms
De-energise time	t_A	15 ms	5 ms	7 ms	35 ms	50 ms	70 ms
Weight	m_{Br}	0.18 kg	0.30 kg	0.50 kg	0.78 kg	1.63 kg	3.80 kg

Measuring systems

The standard measuring system is the SinCos® (SRS) Singleturn. This measuring system is designed to provide optimum performance with our Twin Line family of controllers. You can use the HIPERFACE® interface between motor-measuring system and device for a self-initialisation of the motor and current-regulator parameters, considerably simplifying the start-up process.

The SinCos® (SRM) Multiturn and Resolver, 2-pin, are optionally available.

Technical data

	SinCos® (SRS) Singleturn	SinCos® (SRM) Multiturn	Resolver, 2-pin
Resolution with TLx	16384 incr. min^{-1}	16384 incr. min^{-1}	4096 incr. min^{-1}
Precision, integral nonlinearity	± 45 angular seconds	± 45 angular seconds	± 360 angular seconds
Index pulse	–	–	–
Absolute position after activation within [min^{-1}] with the precision	1 ± 45 angular seconds	4096 ± 45 angular seconds	1 ± 360 angular seconds
Signal form	Sinusoidal/cosinusoidal 1024 cycles min^{-1}	Sinusoidal/cosinusoidal 1024 cycles min^{-1}	Sinusoidal/cosinusoidal 1 cycles min^{-1}
Measuring procedure	High-resolution, optical	High-resolution, optical	Inductive
Interface	HIPERFACE®	HIPERFACE®	–
Module required on slot 2, TLx	HIFA-C	HIFA-C	RESO-C
Working temperature range	–20 to +115 °C	–20 to +115 °C	–55 to +155 °C

AC synchronous servomotors - High Performance

Type key

Example	**DSM 4 - X . X - X X X X - X X**

Mounting dimensions (flange)

DSM 4 - **X** . X - X X X X - X X

05 (55 mm) 07 (70 mm)
09 (90 mm) 11 (110 mm)
14 (140 mm) 19 (190 mm)

Length

DSM 4 - X . **X** - X X X X - X X

1, 2, 3 or 4

Voltage variant

DSM 4 - X . X - **X** X X X - X X

1 = U_N = 190 V, for amplifier with intermediate circuit voltage 270 to 350 VDC
2 = U_N = 330 V, for amplifier with intermediate circuit voltage 510 to 690 VDC

Holding brake

DSM 4 - X . X - X **X** X X - X X

0 = without holding brake
2 = with holding brake

Measuring system/interface

DSM 4 - X . X - X X **X** X - X X

IB = HIFA-C for SinCos®
R9 = RESO-C for resolver, only for DSM 4-05X

Rated speed

DSM 4 - X . X - X X X **X** - X X

1 = 1500 rpm, all lengths
2 = 2000 rpm, all lengths
3 = 3000 rpm, all lengths
4 = 4000 rpm, not available for all lengths
6 = 6000 rpm, not available for all lengths

Code for temperature sensors and mounting sockets

DSM 4 - X . X - X X X X - **X** X

NTC temperature sensor, connection via measuring-system connector, for devices of the Twin Line series
TA = for size/flange: 05/07/19* mounting sockets, straight exit
*except DSM4-19.x, motor connection only via terminal box
6N = for size/flange: 09/11/14 mounting sockets, straight exit
4E = for size/flange: 05/07/09/11/14 mounting sockets 90°, rotating

Measuring system (in conjunction with measuring system/interface)

DSM 4 - X . X - X X X X - X **X**

G = SinCos® (SRS) Singleturn
H = SinCos® (SRM) Multiturn
Z = resolver 2 pin

Gearbox options LP and SP

General information

Berger Lahr offers two gearbox series for the High Performance line of AC synchronous servomotors.

Gearbox series:
- LP – The economical solution
  - High reliability
  - Rugged design
  - Low price
- SP – Satisfies the highest expectations
  - High torques
  - Low distortion backlash
  - Smooth running

The gearboxes are normally delivered detached from the motor. You can, however, request to have the gearbox mounted to the order. Mounting the gearbox to the motor is simple and follows a patented procedure.

Additional gearboxes and gearbox variations are available upon request.

LP – Value Line planetary gear

LP gearbox

The LP gearboxes come in five different sizes:
- LP 050
- LP 070
- LP 090
- LP 120
- LP 155

Features

- Max. acceleration torque T_{2B}: 10.5 Nm – 400 Nm
- Increasing ratios
  - 1-stage = 3*/5/10
  - 2-stage = 15*/25/30*/50/100
- High efficiency
  - 1-stage ≥ 97 %
  - 2-stage ≥ 95 %
- Integrated thermal linear compensation
- Low distortion backlash
- Simple, patented motor mounting
- Smooth running
- Suitable for cyclical and continuous operation
- High reliability
- Rugged design
- Low price

Technical data for the LP gearbox series

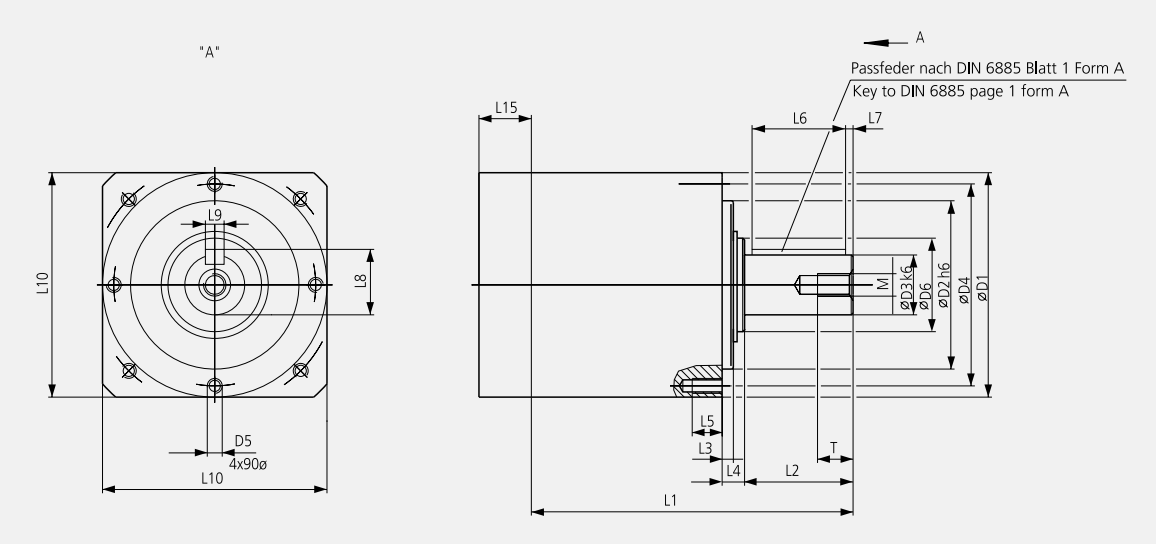
			LP 050	LP 070	LP 090
Max. acceleration torque for cyclical operation	T_{2B}	i = 5/25/50	11.5 Nm	32 Nm	80 Nm
	T_{2B}	i = 3*/10/15*/30*/100	10.5 Nm	29 Nm	72 Nm
EMERGENCY-STOP torque (max. 1000 times per service life)	T_{2Stop}		26 Nm	75 Nm	190 Nm
Rated torque at output	T_{2N}	i = 5/25/50	5.7 Nm	16 Nm	40 Nm
	T_{2N}	i = 3*/10/15*/30*/100	5.2 Nm	15 Nm	35 Nm
Ratio (i)	i	1-stage	3*/5/10	3*/5/10	3*/5/10
		2-stage	15*/25/30*/50/100	15*/25/30*/50/100	15*/25/30*/50/100
Max. radial force with respect to shaft centre at 100 min^{-1}	F_{2RMax}		650 N	1450 N	2400 N
Max. axial force with respect to shaft centre at 100 min^{-1}	F_{2AMax}		700 N	1550 N	1900 N
Distortion rigidity	C_{t21}	i = 5/25/50	0.9 Nm/arcmin	3.3 Nm/arcmin	9 Nm/arcmin
		i = 3*/10/15*/30*/100	0.75 Nm/arcmin	2.8 Nm/arcmin	7.5 Nm/arcmin
Distortion backlash	j_t	1-stage	≤ 12 arcmin	≤ 12 arcmin	≤ 12 arcmin
		2-stage	≤ 15 arcmin	≤ 15 arcmin	≤ 15 arcmin
Rated speed	n_{1N}		4000 min^{-1}	3700 min^{-1}	3400 min^{-1}
Max. drive rotary speed	n_{1Max}		8000 min^{-1}	6000 min^{-1}	6000 min^{-1}
Idling torque at rated speed	T_{012}		≤ 0.05 Nm	≤ 0.14 Nm	≤ 0.38 Nm
Service life	L_h		> 20000 h	> 20000 h	> 20000 h
Efficiency	η	1-stage	> 97 %	> 97 %	> 97 %
		2-stage	> 95 %	> 95 %	> 95 %
Mass inertia	J_1	1-stage	0.059 $kgcm^2$	0.280 $kgcm^2$	1.770 $kgcm^2$
		2-stage	0.055 $kgcm^2$	0.280 $kgcm^2$	1.770 $kgcm^2$
Weight	m	1-stage	0.770 kg	1.900 kg	4.100 kg
		2-stage	0.950 kg	2.200 kg	5.100 kg
Lubrication			Low-viscosity grease		
Primer			RAL 5002	RAL 5002	RAL 5002
Fitting positions			Variable	Variable	Variable
Protection type			IP 64	IP 64	IP 64
Running noise at 3000 min^{-1}	L_{PA}		≤ 68 dB (A)	≤ 70 dB (A)	≤ 72 dB (A)

*Ratio 3 or 15 and 30 only with LP 070/LP 090/LP 120

Technical data for the LP gearbox series

			LP 120	LP 155
Max. acceleration torque for cyclical operation	T_{2B}	i = 5/25/50	200 Nm	400 Nm
	T_{2B}	i = 3*/10/15*/30*/100	180 Nm	320 Nm
EMERGENCY-STOP torque (max. 1000 times per service life)	T_{2Stop}		480 Nm	1000 Nm
Rated torque at output	T_{2N}	i = 5/25/50	100 Nm	290 Nm
	T_{2N}	i = 3*/10/15*/30*/100	90 Nm	170 Nm
Ratio (i)	i	1-stage	3*/5/10	3*/5/10
		2-stage	15*/25/30*/50/100	15*/25/30*/50/100
Max. radial force with respect to shaft centre at 100 min^{-1}	F_{2RMax}		4600 N	7500 N
Max. axial force with respect to shaft centre at 100 min^{-1}	F_{2AMax}		4000 N	6000 N
Distortion rigidity	C_{t21}	i = 5/25/50	24 Nm/arcmin	55 Nm/arcmin
		i = 3*/10/15*/30*/100	20.5 Nm/arcmin	44 Nm/arcmin
Distortion backlash	j_t	1-stage	≤ 12 arcmin	≤ 12 arcmin
		2-stage	≤ 15 arcmin	≤ 15 arcmin
Rated speed	n_{1N}		2600 min^{-1}	2000 min^{-1}
Max. drive rotary speed	n_{1Max}		4800 min^{-1}	3600 min^{-1}
Idling torque at rated speed	T_{012}		≤ 0.8 Nm	≤ 2.50 Nm
Service life	L_h		> 20000 h	> 20000 h
Efficiency	η	1-stage	> 97 %	> 97 %
		2-stage	> 95 %	> 95 %
Mass inertia	J_1	1-stage	5.420 $kgcm^2$	25.73 $kgcm^2$
		2-stage	5.490 $kgcm^2$	5.33 $kgcm^2$
Weight	m	1-stage	9.000 kg	17.500 kg
		2-stage	11.200 kg	21.000 kg
Lubrication			Low-viscosity grease	
Primer			RAL 5002	RAL 5002
Fitting positions			Variable	Variable
Protection type			IP 64	IP 64
Running noise at 3000 min^{-1}	L_{PA}		≤ 74 dB (A)	≤ 75 dB (A)

*Ratio 3 or 15 and 30 only with LP 070/LP 090/LP 120



LP series gearbox

Dimensions

Size	Tolerances	LP 050		LP 070		LP 090		LP 120		LP 155	
Gearbox stages		1	2	1	2	1	2	1	2	1	2
D1		50		70		90		120		155	
D2	h6	35		52		68		90		120	
D3	k6	12		16		22		32		40	
D4		44		62		80		108		140	
D5		M4		M5		M6		M8		M10	
D6		17		25		40		50		65	
L1		75	91	104	124	126	152.5	172	204.5	219.5	250
L2		18		28		36		58		82	
L3		4		5		5		6		8	
L4		6.5		8		10		12		15	
L5		8		10		12		16		20	
L6		14		25		32		50		70	
L7		2		2		2		4		6	
L8		13.5		18		24.5		35		43	
L9	h9	4		5		6		10		12	
L10		See motor–gearbox compatibility									
L15		See motor–gearbox compatibility									
M		M4		M5		M8		M12		M16	
T		8		10		13		22		32	

All dimensions in mm

Motor–gearbox compatibility

Gearbox	DSM 4-05	DSM 4-07	DSM 4-09	DSM 4-11	DSM 4-14	DSM 4-19
LP 050-M01	L10 = 55 L15 = 14	L10 = 70 L15 = 24	–	–	–	–
LP 070-M01	L10 = 70 L15 = 15	L10 = 70 L15 = 15	L10 = 90 L15 = 22	–	–	–
LP 090-M01	–	L10 = 90 L15 = 22	L10 = 90 L15 = 22	L10 = 100 L15 = 32	L10 = 140 L15 = 42	–
LP 120-M01	–	–	L10 = 120 L15 = 28	L10 = 120 L15 = 28	L10 = 140 L15 = 38	L10 = 190 L15 = 48
LP 155-M01	–	–	–	L10 = 150 L15 = 36	L10 = 150 L15 = 46	L10 = 190 L15 = 46

All dimensions in mm

Gearbox options LP

Type key

Example	**LP X - M 0 X - X - 1 / Motor**
Gearbox type 050 070 090 120 155	LP **X** - M 0 X - X - 1 / Motor
Gearbox version M = motor-mounted gearbox	LP X - **M** 0 X - X - 1 / Motor
Gearbox model 0 = standard	LP X - M **0** X - X - 1 / Motor
Stage count 1 = 1-stage 2 = 2-stage	LP X - M 0 **X** - X - 1 / Motor
Reduction ratio 005/010 =1-stage 025/050/100 = 2-stage	LP X - M 0 X - **X** - 1 / Motor
Form of drive shaft 1 = shaft with featherkey DIN 6885 form A	LP X - M 0 X - X - **1** / Motor
Motor description see Motor type key or Motor–gearbox compatibility	LP X - M 0 X - X - 1 / **DSM 4-X**

SP – low-backlash planetary gear

SP gearbox

The SP gearboxes come in five different sizes:

- SP 060
- SP 075
- SP 100
- SP 140
- SP 180

Features

- Max. acceleration torque T_{2B}: 32 Nm – 1100 Nm
- Increasing ratios
  - 1-stage = 4/5/7/10
  - 2-stage = 16/20/28/40/50/70/100
- Low distortion backlash
  - 1-stage ≤ 4 arcmin / ≤ 2 arcmin
  - 2-stage ≤ 6 arcmin / ≤ 4 arcmin
- High efficiency
  - 1-stage ≥ 97 %
  - 2-stage ≥ 94 %
- Integrated thermal linear compensation
- Simple, patented motor mounting
- Smooth running
- Suitable for cyclical and continuous operation

Technical data for the SP gearbox series

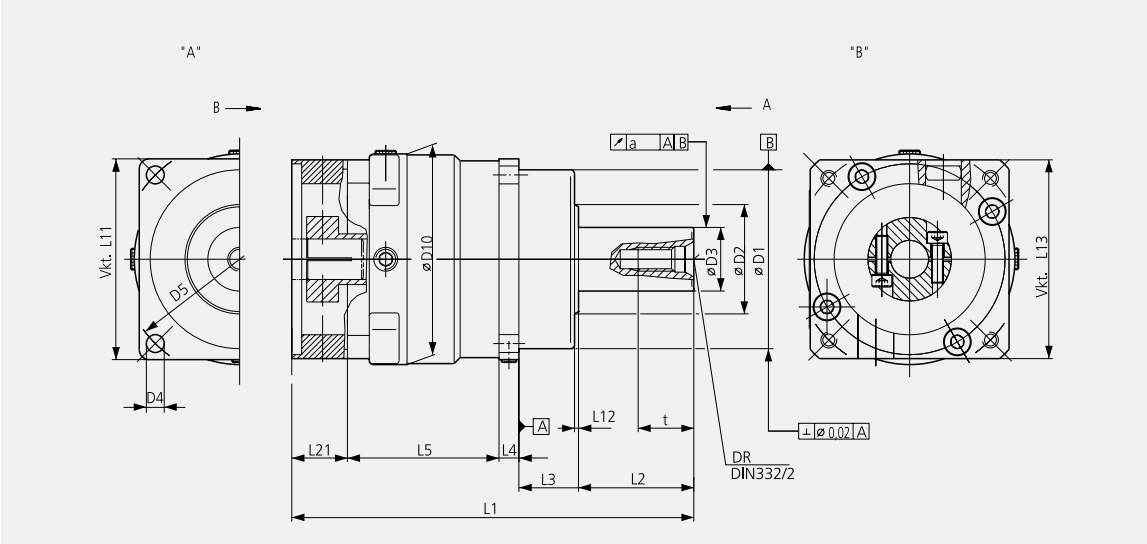
			SP 060	SP 075	SP 100
Max. acceleration torque for cyclical operation	T_{2B}	i = 4 – 7 / 16 – 70	40 Nm	100 Nm	250 Nm
		i = 10/100	32 Nm	80 Nm	200 Nm
EMERGENCY-STOP torque (max. 1000 times per service life)	T_{2Stop}	i = 4 – 7 / 16 – 70	100 Nm	250 Nm	625 Nm
		i = 10/100	80 Nm	200 Nm	500 Nm
Rated torque at output	T_{2N}	i = 4 – 7 / 16 – 70	25 Nm	70 Nm	170 Nm
		i = 10/100	15 Nm	45 Nm	110 Nm
Max. drive rotary speed	n_{1Max}	1-stage	6000 min^{-1}	6000 min^{-1}	4500 min^{-1}
		2-stage	6000 min^{-1}	6000 min^{-1}	4500 min^{-1}
Rated speed at drive	n_{1N}	i = 4/5	3300 min^{-1}	2900 min^{-1}	2500 min^{-1}
		i = 7/10	4000 min^{-1}	3100 min^{-1}	2800 min^{-1}
		i = 16	4400 min^{-1}	3500 min^{-1}	3100 min^{-1}
		i = 50	4800 min^{-1}	3800 min^{-1}	3500 min^{-1}
		i = 100	5500 min^{-1}	4500 min^{-1}	4200 min^{-1}
Ratio (i)	i	1-stage	4/5/7/10	4/5/7/10	4/5/7/10
		2-stage	16/20/28/40/ 50/70/100	16/20/28/40/ 50/70/100	16/20/28/40/ 50/70/100
Distortion backlash, standard	j_t	1-stage	≤ 6 arcmin	≤ 6 arcmin	≤ 4 arcmin
		2-stage	≤ 8 arcmin	≤ 8 arcmin	≤ 6 arcmin
Distortion backlash, reduced	j_t	1-stage	≤ 4 arcmin	≤ 4 arcmin	≤ 2 arcmin
		2-stage	≤ 6 arcmin	≤ 6 arcmin	≤ 4 arcmin
Distortion rigidity	C_{t21}		3 Nm/arcmin	8 Nm/arcmin	24 Nm/arcmin
Max. axial force with respect to shaft centre at output	F_{2AMax}		2300 N	3200 N	5400 N
Max. radial force with respect to shaft centre at output	F_{2RMax}		2600 N	3800 N	6000 N
Idling torque at 20 °C gearbox temperature and 3000 min^{-1}	T_{012}	i = 4	≤ 0.5 Nm	≤ 0.9 Nm	≤ 2.7 Nm
		i = 16	≤ 0.3 Nm	≤ 0.7 Nm	≤ 1.7 Nm
		i = 100	≤ 0.2 Nm	≤ 0.4 Nm	≤ 0.7 Nm
Max. pull-out torque	M_{2KMax}		133 Nm	225 Nm	464 Nm
Service life	L_h		> 20000 h	> 20000 h	> 20000 h
Efficiency at full load	η	1-stage	> 97 %	> 97 %	> 97 %
		2-stage	> 94 %	> 94 %	> 94 %
Weight	m	1-stage	1.500 kg	2.800 kg	6.200 kg
		2-stage	1.800 kg	3.100 kg	7.100 kg
Lubrication			Synth. gearbox oil, viscosity class ISO VG220	Synth. gearbox oil, viscosity class ISO VG220	Synth. gearbox oil, viscosity class ISO VG220
Paint			RAL 5002	RAL 5002	RAL 5002
Fitting positions			Variable	Variable	Variable
Permissible gearbox temperature			–10 to +90 °C	–10 to +90 °C	–10 to +90 °C
Direction of rotation			Motor and gearbox in same direction		
Protection type			IP 64	IP 64	IP 64
Running noise at 3000 min^{-1}	L_{PA}		≤ 68 dB (A)	≤ 68 dB (A)	≤ 70 dB (A)

Technical data for the SP gearbox series

			SP 140	SP 180
Max. acceleration torque for cyclical operation	T_{2B}	i = 4 – 7 / 16 – 70	500 Nm	1100 Nm
		i = 10/100	400 Nm	880 Nm
EMERGENCY-STOP torque (max. 1000 times per service life)	T_{2Stop}	i = 4 – 7 / 16 – 70	1250 Nm	2750 Nm
		i = 10/100	1000 Nm	2200 Nm
Rated torque at output	T_{2N}	i = 4 – 7 / 16 – 70	360 Nm	550 Nm
		i = 10/100	215 Nm	550 Nm
Max. drive rotary speed	n_{1Max}	1-stage	4000 min^{-1}	3500 min^{-1}
		2-stage	4000 min^{-1}	4000 min^{-1}
Rated speed at drive	n_{1N}	i = 4/5	2100 min^{-1}	1500 min^{-1}
		i = 7/10	2600 min^{-1}	2300 min^{-1}
		i = 16	2900 min^{-1}	2700 min^{-1}
		i = 50	3200 min^{-1}	2900 min^{-1}
		i = 100	3900 min^{-1}	3400 min^{-1}
Ratio (i)	i	1-stage	4/5/7/10	4/5/7/10
		2-stage	16/20/28/40/ 50/70/100	16/20/28/40/ 50/70/100
Distortion backlash, standard	j_t	1-stage	≤ 4 arcmin	≤ 4 arcmin
		2-stage	≤ 6 arcmin	≤ 6 arcmin
Distortion backlash, reduced	j_t	1-stage	≤ 2 arcmin	≤ 2 arcmin
		2-stage	≤ 4 arcmin	≤ 4 arcmin
Distortion rigidity	C_{t21}		45 Nm/arcmin	144 Nm/arcmin
Max. axial force with respect to shaft centre at output	F_{2AMax}		9400 N	13500 N
Max. radial force with respect to shaft centre at output	F_{2RMax}		9000 N	14000 N
Idling torque at 20 °C gearbox temperature and 3000 min^{-1}	T_{012}	i = 4	≤ 3.9 Nm	≤ 6.2 Nm
		i = 16	≤ 2.4 Nm	–
		i = 100	≤ 1.1 Nm	–
Max. pull-out torque	M_{2KMax}		907 Nm	1523 Nm
Service life	L_h		> 20000 h	> 20000 h
Efficiency at full load	η	1-stage	> 97 %	> 97 %
		2-stage	> 94 %	> 94 %
Weight	m	1-stage	11.500 kg	27.000 kg
		2-stage	14.500 kg	29.000 kg
Lubrication			Synth. gearbox oil, viscosity class ISO VG220	Synth. gearbox oil, viscosity class ISO VG220
Paint			RAL 5002	RAL 5002
Fitting positions			Variable	Variable
Permissible gearbox temperature			–10 to +90 °C	–10 to +90 °C
Direction of rotation			Motor and gearbox in same direction	
Protection type			IP 64	IP 64
Running noise at 3000 min^{-1}	L_{PA}		≤ 70 dB (A)	≤ 70 dB (A)

Mass inertia

J_1 in kgcm^2												
Gearbox size	**Shaft diameter [mm]**	**Increasing ratio**										
		single-stage				**double-stage**						
		4	**5**	**7**	**10**	**16**	**20**	**28**	**40**	**50**	**70**	**100**
SP 060	≤ 11	0.14	0.14	0.13	0.12	0.15	0.15	0.15	0.12	0.12	0.12	0.12
	> 11 to ≤ 14	0.17	0.17	0.16	0.15	0.19	0.19	0.19	0.15	0.15	0.15	0.15
SP 075	≤ 11	0.52	0.44	0.38	0.35	0.48	0.47	0.47	0.34	0.34	0.34	0.34
	> 11 to ≤ 14	0.57	0.49	0.43	0.40	0.53	0.52	0.52	0.39	0.39	0.39	0.39
	> 14 to ≤ 19	0.63	0.55	0.49	0.46	0.59	0.58	0.58	0.45	0.45	0.45	0.45
SP 100	≤ 14	1.9	1.6	1.3	1.2	1.7	1.7	1.7	1.1	1.1	1.1	1.1
	> 14 to ≤ 19	2.0	1.7	1.4	1.3	1.8	1.8	1.8	1.2	1.2	1.2	1.2
	> 19 to ≤ 24	2.7	2.4	2.1	2.0	2.5	2.5	2.5	1.9	1.9	1.9	1.9
	> 24 to ≤ 28	3.5	3.2	2.9	2.8	3.3	3.3	3.3	2.7	2.7	2.7	2.7
	> 28 to ≤ 32	4.6	4.3	4.0	3.9	4.4	4.4	4.4	3.8	3.8	3.8	3.8
SP 140	≤ 19	5.0	4.1	3.3	2.8	4.4	4.4	4.4	2.7	2.7	2.7	2.7
	> 19 to ≤ 24	5.7	4.8	4.0	3.5	5.1	5.1	5.1	3.4	3.4	3.4	3.4
	> 24 to ≤ 32	8.4	7.5	6.7	6.2	7.8	7.8	7.8	6.1	6.1	6.1	6.1
	> 32 to ≤ 35	8.2	7.3	6.5	6.0	7.6	7.6	7.6	5.9	5.9	5.9	5.9
	> 35 to ≤ 38	10.0	9.1	8.3	7.8	9.4	9.4	9.4	7.7	7.7	7.7	7.7
SP 180	≤ 19	–	–	–	–	5.0	4.8	4.6	2.8	2.8	2.7	2.7
	> 19 to ≤ 24	–	–	–	–	5.7	5.5	5.3	3.5	3.5	3.4	3.4
	> 24 to ≤ 32	–	–	–	–	8.4	8.2	8.0	6.2	6.2	6.1	6.1
	> 32 to ≤ 35	–	–	–	–	8.2	8.0	7.8	6.0	6.0	5.9	5.9
	> 35 to ≤ 38	–	–	–	–	10.0	9.8	9.6	7.8	7.8	7.7	7.7
	≤ 32	30.6	24.9	20.0	17.4	–	–	–	–	–	–	–
	> 32 to ≤ 38	31.7	26.0	21.1	18.5	–	–	–	–	–	–	–
	> 38 to ≤ 48	36.2	30.5	25.6	23.0	–	–	–	–	–	–	–



SP series gearbox

Dimensions

Size	Toler-ances	SP 060		SP 075		SP 100		SP 140		SP 180	
Gearbox stages		1	2	1	2	1	2	1	2	1	2
DR		M5		M8		M12		M16		M20	
D1	g6	60		70		90		130		160	
D2		30		38		55		70		90	
D3	k6	16		22		32		40		55	
D4		5.5		6.6		9		11		13	
D5		68		85		120		165		215	
D10	+ 1	61.5		82		106		140		193	
L1	± 2	129	149	156	182.5	202	234.5	256.5	296.5	297	315.5
L2		28		36		58		82		82	
L3		20		20		30		30		30	
L4		6		7		10		12		15	
L5		60	80	71	97.5	76	108.5	102	142	132.5	158
L11	± 2	62		76		101		141		182	
L12		2		2		2		3		3	
L13	+ 1	60		80		100		140		190	140
L21		15		22		28		30.5		37.5	30.5
t		12.5		19		28		36		42	

All dimensions in mm

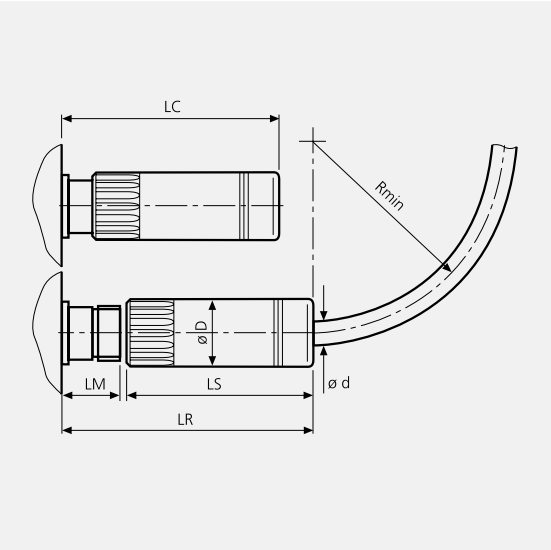
Motor–gearbox compatibility

Gearbox	DSM 4-05	DSM 4-07	DSM 4-09	DSM 4-11	DSM 4-14	DSM 4-19
SP 060-MF1	L13 = 60 L21 = 15	L13 = 70 L21 = 15	L13 = 90 L21 = 15	–	–	–
SP 075-MF1	–	L13 = 80 L21 = 22	L13 = 90 L21 = 22	L13 = 100 L21 = 22	–	–
SP 100-MF1	–	–	L13 = 100 L21 = 28	L13 = 100 L21 = 28	L13 = 140 L21 = 28	–
SP 140-MF1	–	–	L13 = 140 L21 = 30.5	L13 = 140 L21 = 30.5	L13 = 140 L21 = 30.5	–
SP 180-MF1	–	–	–	–	L13 = 190 L21 = 37.5	L13 = 190 L21 = 37.5
All dimensions in mm						

Gearbox options SP

Type key

Example	**SP X - M F X - X - X X X / Motor**
Gearbox type 060 075 100 140 180 210 240	SP **X** - M F X - X - X X X / Motor
Gearbox version M = motor-mounted gearbox	SP X - **M** F X - X - X X X / Motor
Gearbox model F = standard model FPM seals (Viton®)	SP X - M **F** X - X - X X X / Motor
Stage count 1 = 1-stage 2 = 2-stage	SP X - M F **X** - X - X X X / Motor
Reduction ratio 004/005/007/010 = 1-stage 016/020/028/040/050/070/100 = 2-stage	SP X - M F X - **X** - X X X / Motor
Form of drive shaft 0 = smooth shaft 1 = smooth shaft with featherkey, form A DIN 6885 2 = involute DIN 5480 4 = other	SP X - M F X - X - **X** X X / Motor
Drilling diameter of the clamping receiver prescribed by supplier based on motor description	SP X - M F X - X - X **X** X / Motor
Backlash level 1 = standard 0 = reduced	SP X - M F X - X - X X **X** / Motor
Motor description see Motor type key or Motor–gearbox compatibility	SP X - M F X - X - X X X / **DSM 4-X**



Schematic diagram of the connector fitting space

Connector fitting space

The rule of thumb for calculating the connector fitting space R_{min} is:

– Drag-chain lines (mobile): $R_{min} = 15 \times d$
– Stationary wiring: $R_{min} = 10 \times d$

The permissible temperature range depends on whether the cables are mobile or stationary:

– Stationary: –40 °C to +85 °C
– Mobile: –20 °C to +85 °C

The following data applies only to Berger Lahr motor and encoder cables or connectors:

Connector data

Dimensions	Servomotor connector	Servo-encoder connector	Stepping-motor connector (motor, encoder)
D	28	26	25
LS	79	54	65
LR	115	80	89
LC	95	65	75
LM	34	24	22

Cable data for motor connection

Cross section	d	Tolerance	Permissible voltage
1.5 mm^2	9.5 mm	± 0.3 mm	500 V (stepping motor)
1.5 mm^2	11.3 mm		800 V (servo)
2.5 mm^2	14.1 mm		800 V (servo)
4.0 mm^2	15.4 mm		800 V (servo)

Cable data for encoder connection

Cross section	d	Tolerance
–	8.8 mm	± 0.3 mm

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