rexroth
A Bosch Company

Electromechanical Cylinders EMC

Identification system for short product names

Short product name	Example: **EMC** – **063** – **NN** – **2**
System	**E**lectro**M**echanical **C**ylinder
Size	032 / 040 / 050 / **063** / 080 / 100
Version	**NN** Normal version
	XC Extra capacity
Generation	Product generation **2**

Changes/additions at a glance:

- New MS2N motors (MSK discontinued)

Contents

Product description

A variable and complete system: Hygienic, flexible, energy efficient
Its high variability makes the Electromechanical Cylinder so interesting for many industries and applications. By using the available configuration options, a cheaper, simpler base cylinder can be adjusted to virtually any customer requirement: chemical resistant, with perfect sealing and a high IP type of protection. All these properties ensure a long life – even under harsh industrial conditions. The powerful Electromechanical Cylinder always performs very efficiently. The resulting energy saving potential makes it an economical alternative to pneumatic systems.

Structural design
The mechanical system in the electromechanical cylinder is based on proven Rexroth Ball Screw Assemblies in a wide range of diameter and lead combinations. The Rexroth Ball Screw Assembly converts torque into linear motion with high mechanical efficiency. During this process, the piston rod fastened to the screw drive nut is extended and retracted. Both the Screw Drive nut and the piston rod are guided in the housing and cannot twist.
Optional limit switches prevent damage to the cylinder in operation. A reference point switch is available for the use of incremental encoder systems.
Thanks to grease lubrication, Electromechanical Cylinders EMC require only minimal maintenance at long intervals.

Advantages
- High-precision Rexroth Ball Screw Assemblies:
  For high performance with maximum cost-effectiveness
- Complete modular system with great variability:
  Can be adapted to a wide range of applications
- A ready to install and turn on system for low design and installation costs
- The smart, freely programmable drive system allows the realization of complex travel profiles (parameters for force, position and travel speed can be set as required over the complete working travel range)
- Optimized lubrication concept: optional connection to a central lubrication system reduces downtime
- Soundly sealed against dirt and water from the outside and lubrication leakage from the cylinder by selecting the IP65 type of protection option
- Hygienic design: High resistance to chemicals and cleaning agents by selecting the option IP65 + R (resistant)

Application areas

Electromechanical Cylinders EMC can be used in many application areas. Due to their specific characteristics, they offer advantages in terms of accuracy, dynamics and controllability, and can therefore not only help to shorten cycle times but also to increase flexibility and quality in the manufacturing process. Their compact design makes them ideal for use in tightly confined spaces.

Possible application areas are:

- Servo presses and forming technology
- Joining technology
- Thermoforming
- Injection molding and blow molding machines
- Woodworking machines
- Assembly and handling technology
- Packaging machines and conveyor systems
- Food processing machines
- Testing equipment and laboratory applications
- Special-purpose machines

Application examples

Joining and pressing

Transporting

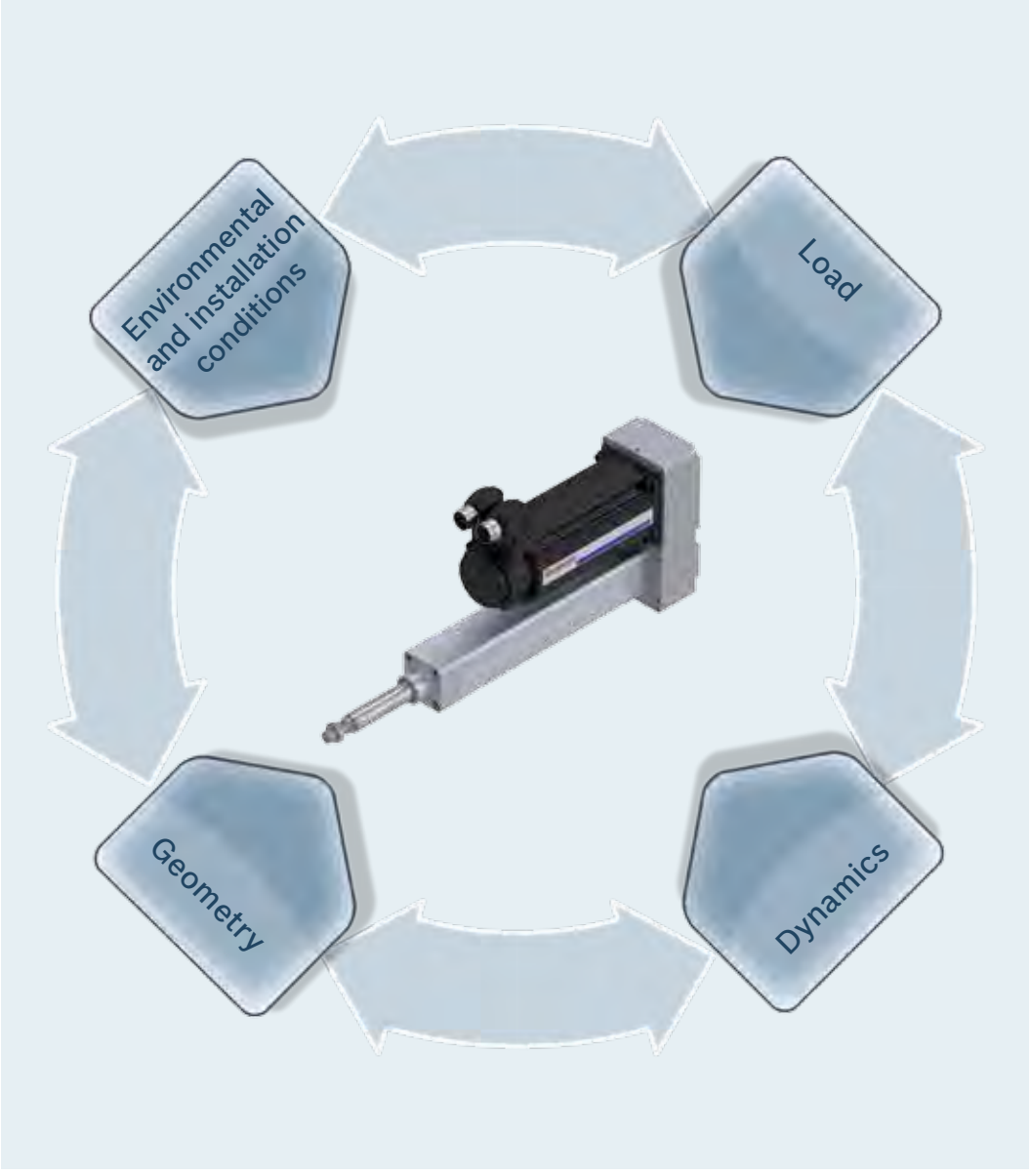
Forming / Thermoforming

Lifting

Selection guide

To make sure your electromechanical solution delivers optimal performance, both technically and economically, the right decisions have to be made as early as the planning phase. The following key parameters have a decisive influence on the choice of system and its structural design:

- Load
- Dynamics
- Geometry
- Environmental and installation conditions



Load
- Process force
- Masses
- Duty cycle
- Service life requirement
- etc.

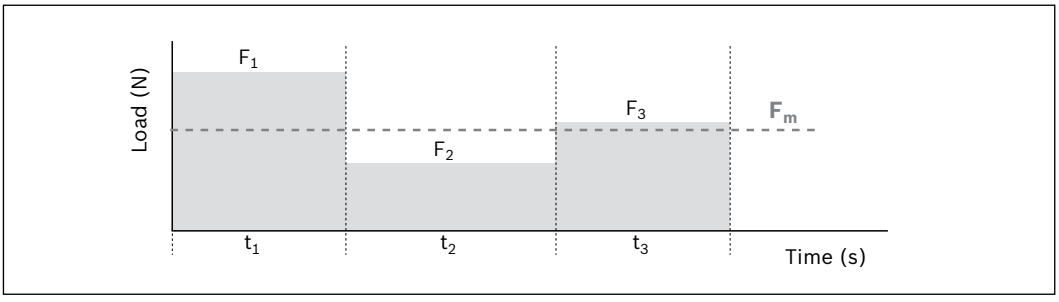
Dynamics
- Acceleration
- Travel speed
- Cycle time
- etc.

Geometry
- Work space
- Installation space
- Stroke length
- Interference contours
- etc.

Environmental and installation conditions
- Installation position
- Mounting options
- Degrees of freedom
- Temperature
- Humidity
- Contamination
- Vibration and shocks
- etc.

An Electromechanical Cylinder EMC that is optimal for your needs in just six steps
Electromechanical Cylinders EMC offer higher dynamics and precision, better controllability, and greater mechanical efficiency than the majority of fluid-power drives (e.g. hydraulic cylinders). It is particularly important to fully define application requirements in advance because of the special characteristics compared to fluid-driven technology. To find the most cost-efficient solution for your application, the following input parameters should be known:

1. Loads
An EMC solution that is both economical and reliable can be found when the loads (process forces and masses) are known as accurately as possible. Along with the maximum force in the application, it is important to also state changing forces over the stroke so that the average load over the entire cycle can be determined. This average load forms the basis for the life expectancy calculation.
Large safety factors for the force required, as are common in some fluid-power applications, should be avoided so that the axis is not over-sized. A differentiation also needs to be made between static load (cylinder at standstill) and dynamic load (during feed motion).



2. Duty cycle
The duty cycle is the percentage ratio of operating time to total cycle time. The duty cycle is an important input parameter for both the estimation of the total service life of the cylinder and for the thermal assessment of cylinder and motor. Pause times should always be stated in the calculation as well.

$$ED = \frac{t_B}{t_B + t_P} \cdot 100\%$$

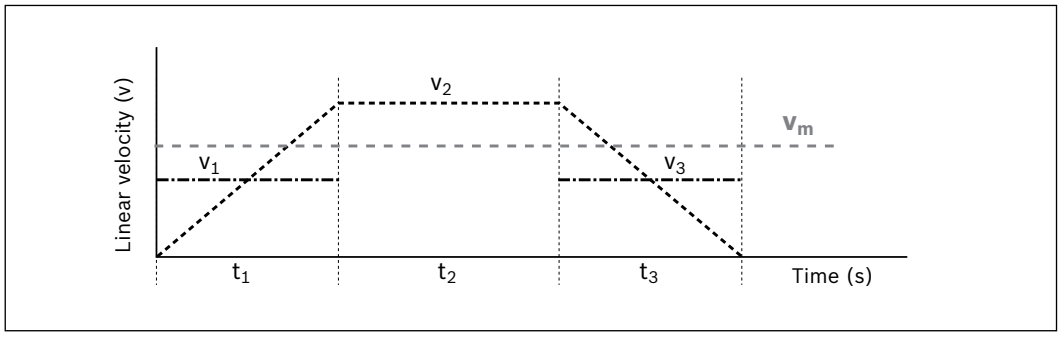
DC = duty cycle (%)
t_O = operating time (s)
t_P = pause time (s)

Selection guide

3. Total cycle

By stating the acceleration and linear speeds as accurately as possible or the necessary cycle time and the travel range, it is possible to adapt the complete drive train to maximize results for the application.

The EMC and drive can be selected so that requirements are met precisely and efficiently.



4. Integration in the machine

Transverse forces on the piston rod and alignment errors during installation can shorten the service life of the Electromechanical Cylinder EMC.

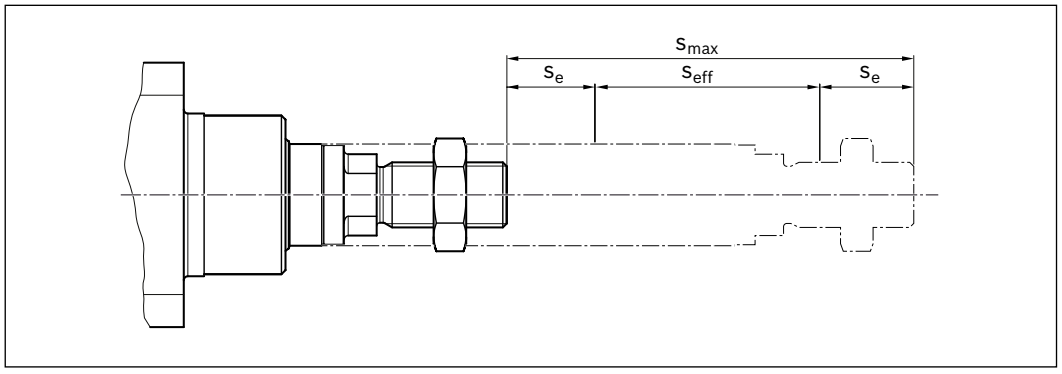
During mounting it must be ensured the cylinder is installed free of distortive stresses and heavy transverse loads are absorbed by an external guide.

In addition, the type of attachment and the EMC fastening element have an effect on the maximum permissible axial load. (see “Axial load” in the section on “Technical data”, see also “Fastening elements”).

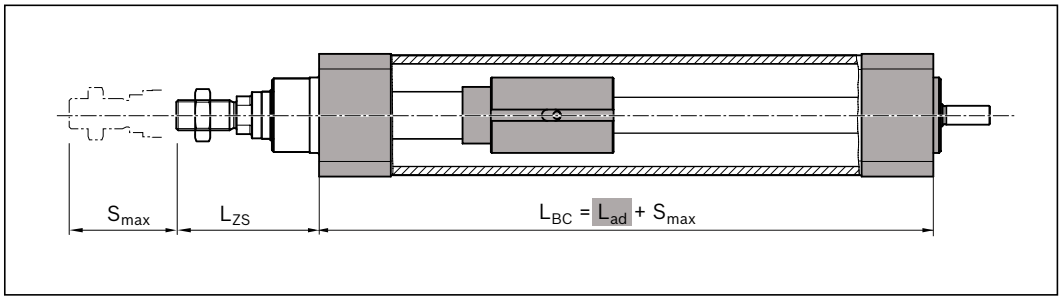
For an extensive and optimally balanced range of fastening elements, please refer to the section on “Attachments and accessories”.

5. Travel range and overall dimensions

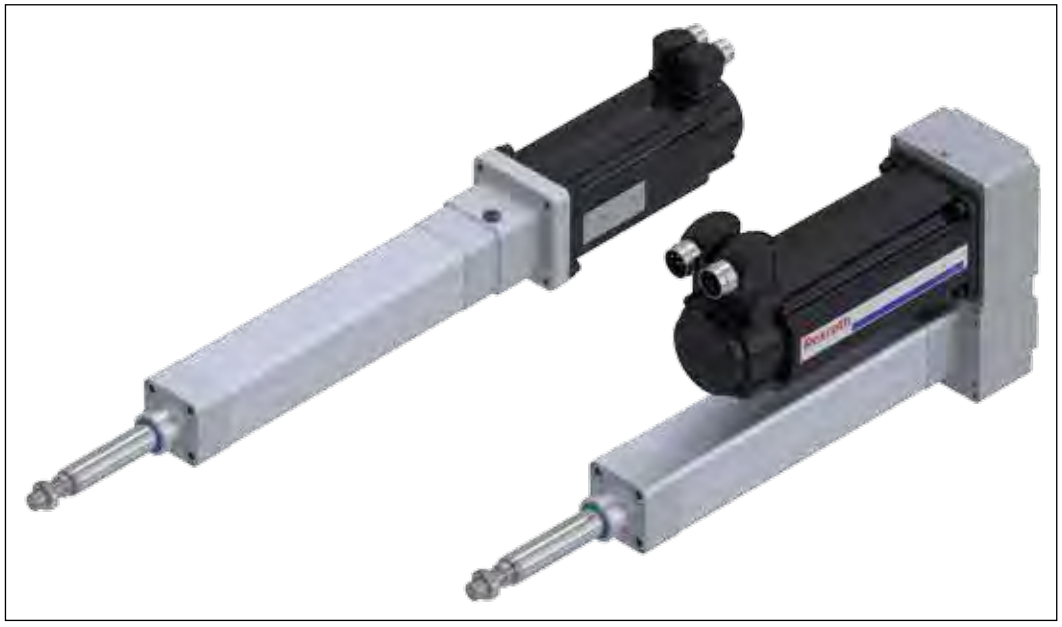
Determine the necessary operating stroke in your application. As Electromechanical Cylinders EMC must not be allowed to travel right up to the mechanical end stop, it is important to add excess travel (s_e) to both ends of the effective operating stroke (s_{eff}). This maximum travel range (s_{max}) is the parameter to be stated when ordering the cylinder.



For structural design reasons, the overall length of the cylinder is greater than the maximum travel range (s_{max}), as it includes the length of components such as the screw drive nut and the bearings (represented by L_{ad}), in addition to the travel range. The measurement L_{ZS} describes the position of the piston rod in the retracted position.



The cylinder can be adapted to the available installation space by mounting the motor as an extension to the axis (mount and coupling) or parallel to the axis (timing belt side drive). The type of motor attachment chosen also has an effect on the technical performance data and the selectable mounting methods.



6. Environmental conditions

The environment in which a cylinder is operated can have a significant effect on its service life. Both very high and very low temperatures can affect seals, lubrication and the performance of the motor. Abrasive dirt and chemicals can damage the seals and ultimately cause the screw drive to fail over the long term.

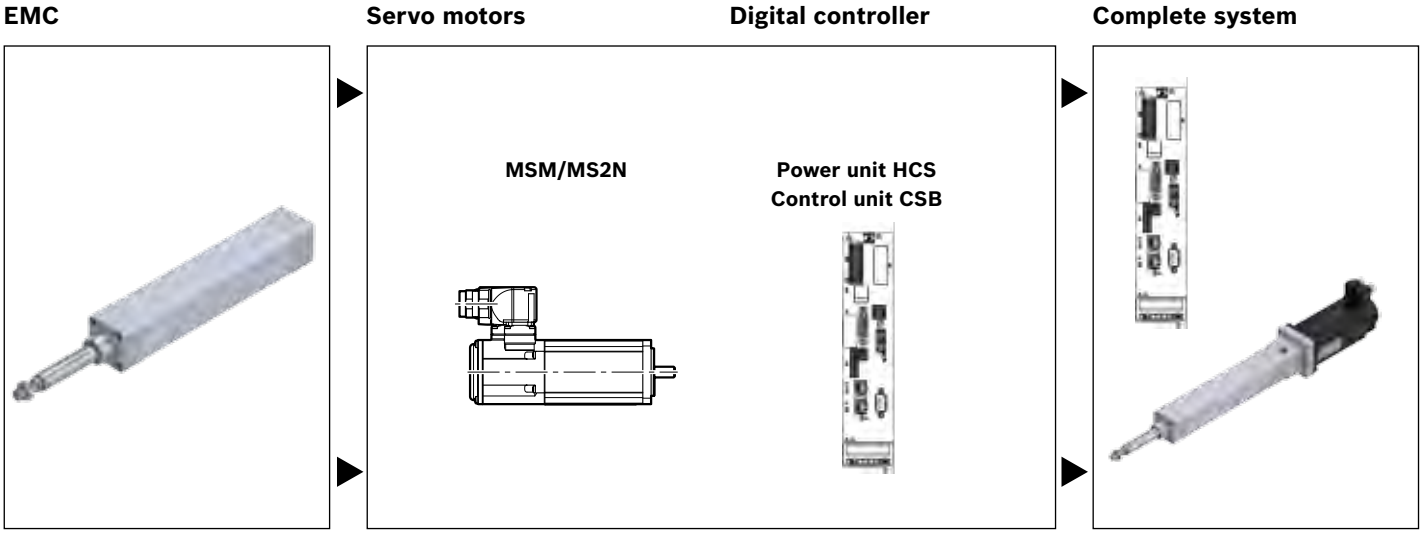
Please ask if your application involves special environmental conditions.

Motor-controller combination

Several motor-controller combinations are available in order to provide the most cost-effective solution for every customer application. When sizing the drive, always consider the motor-controller combination.

Notes on motors and controllers

- The motors are available complete with controllers and control systems
- For recommended motor-controller combinations, see the “Motors” section
- You can find more information on motors and control systems in the Rexroth catalogs on drive technology at www.boschrexroth.com/mediadirectory.

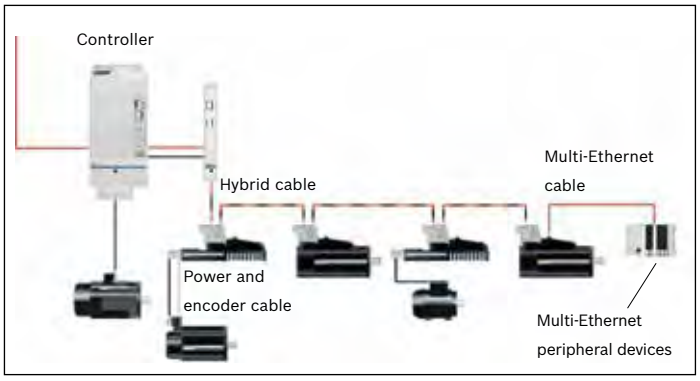


IndraDrive Mi distributed drive system

Control electronics and servo motor in one compact unit. The IndraDrive Mi is the ideal solution for applications that depend on minimum space yet require maximum flexibility and cost-effectiveness.

IndraDrive Mi – the new generation of cabinet-free drive technology from Rexroth.

For more information, see “Drive system Rexroth IndraDrive, R999000018”.

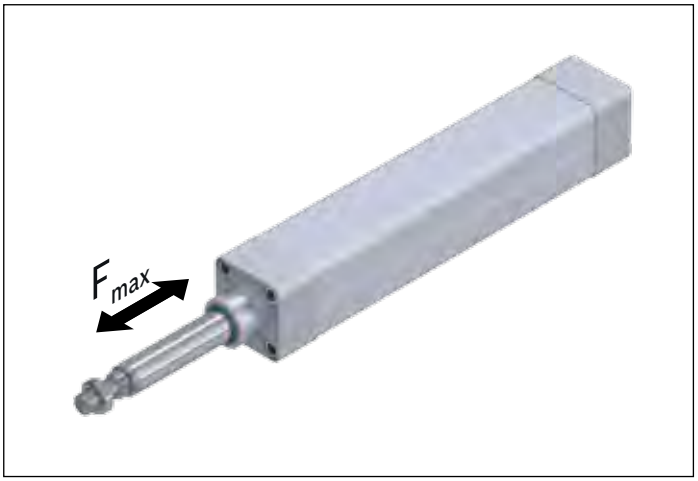


Up to 20 IndraDrive Mi in a string – these motor-integrated servo drives (KSM) and servo drives close to the motor (KMS) are freely combinable. Additional IndraDrive Mi-strands can be integrated via further KCU.

Product overview

Note on dynamic load capacities
In relation to the desired service life, generally speaking an equivalent dynamic axial load of up to about 20% of the dynamic load capacity (C) has proven effective
(see also service life graphs in the “Technical data” section.)

Do not exceed the technical data.



The size designation 32 to 100 is selected according to the piston diameter of an ISO 15552 standard cylinder.
The built-in Rexroth Ball Screw Assemblies have a diameter of 12 mm to 50 mm.

EMC	d_0 x P	C (N)	F_{max} (N)	$s_{max\ perm}$ (mm)	v_{max} (m/s)
32	12x5	4,100	1,200	750	0.57
	12x10	2,700	750		1.13
40	16x5	13,300	4,500	750	0.38
	16x10	10,400	3,000		0.77
	16x16	10,400	2,000		1.23
50	20x5	15,400	7,800	900	0.32
	20x10	15,200	5,500		0.63
	20x20	14,400	3,200		1.27
63	25x5	17,200	15,900	1,200	0.28
	25x10	17,000	14,800		0.55
	25x25	15,900	8,000		1.38
80	32x5	23,300	21,600	1,500	0.25
	32x10	26,000	22,000		0.50
	32x20	21,300	15,000		1.00
	32x32	21,100	10,400		1.60
100	40x5	31,400	29,000	1,500	0.18
	40x10	42,100	29,000		0.37
	40x20	40,900	29,000		0.73
	40x40	40,000	22,900		1.47
100XC	50x10	86,100	56,000	1,500	0.50
	50x20	104,900	50,000		1.00

For short product names, see the “Abbreviations” section.

Structural design

1 Hexagon nut
2 Piston rod (stainless steel)
3 Cylinder screw (for mounting fastening element and motor attachments)
4 Cover
5 Protective profile
6 Rear end cap
7 Screw journal
8 Slot for sensor profile (opposite the lube nipple)

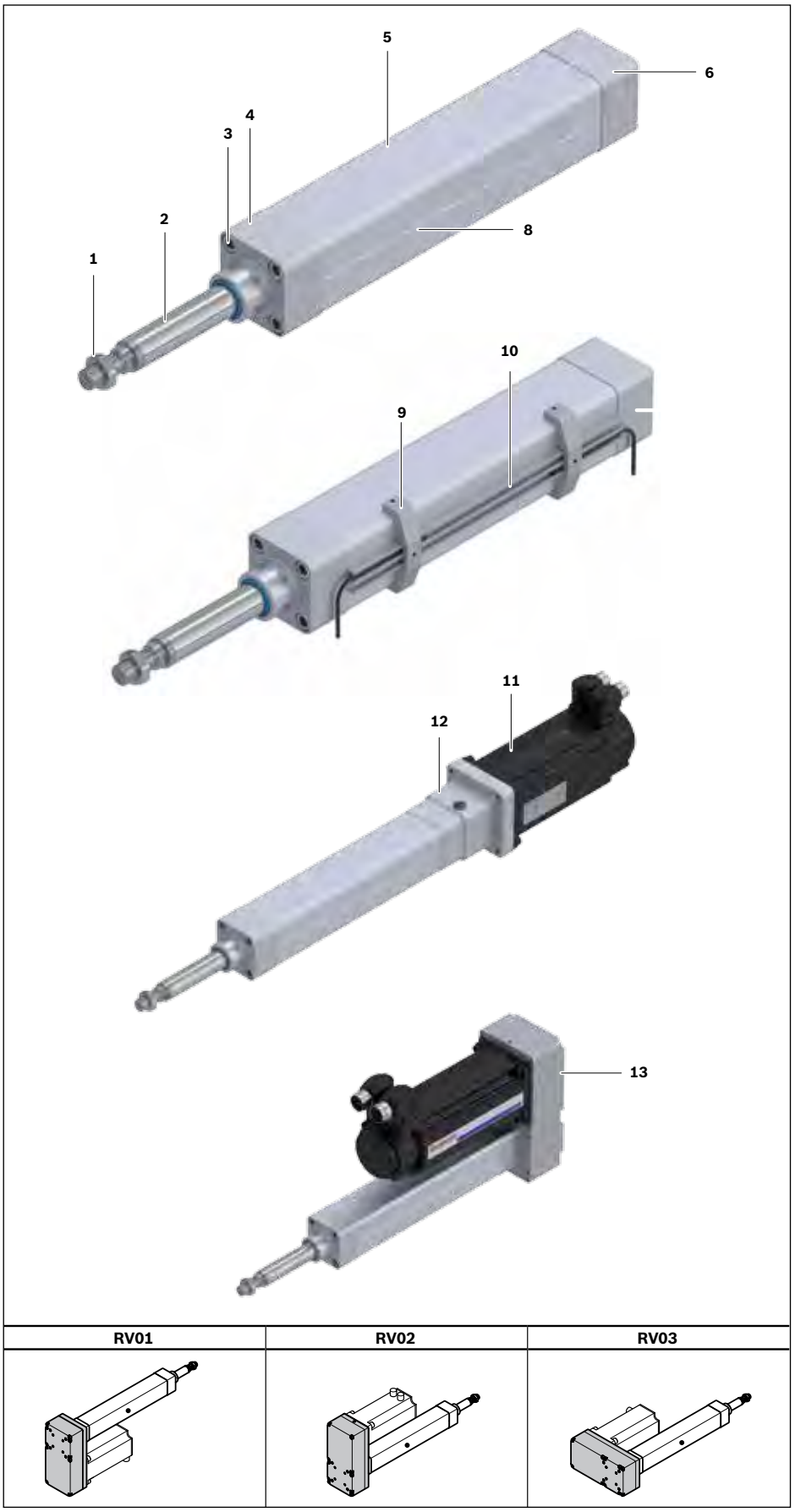
Attachments
9 Retaining bracket (for sensor profile)
10 Sensor profile
11 Motor
12 Mount and coupling
13 Timing belt side drive
14 Lube nipple
15 Port for pressure compensation

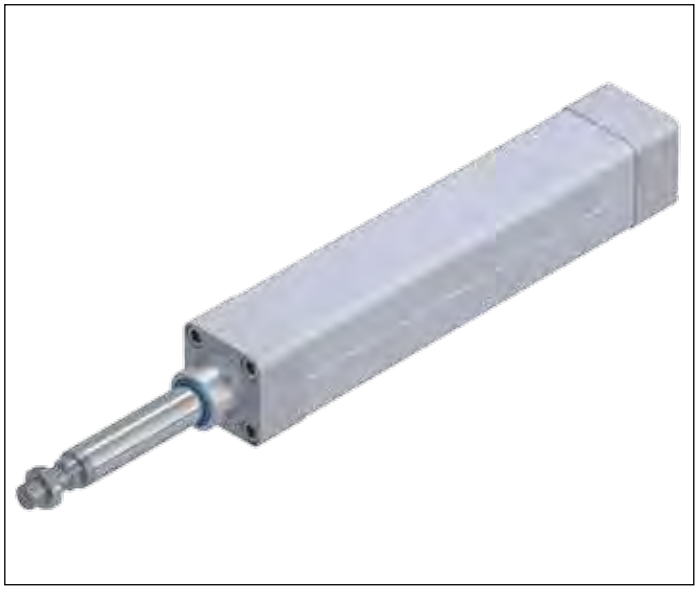
Motor mount and coupling
The motor flange is used to attach the motor to the EMC and as a closed housing unit for the coupling. With the coupling, the torque of the motor is transmitted free of distortive stresses on the screw journal of the EMC.

Timing belt side drive
This configuration results in the shortest possible length of the EMC. The space-saving, closed housing serves as protection for the belt, motor bracket and to connect fastening elements.

The following gear ratios are available:
i = 1 : 1
i = 1 : 1.5
i = 1 : 2

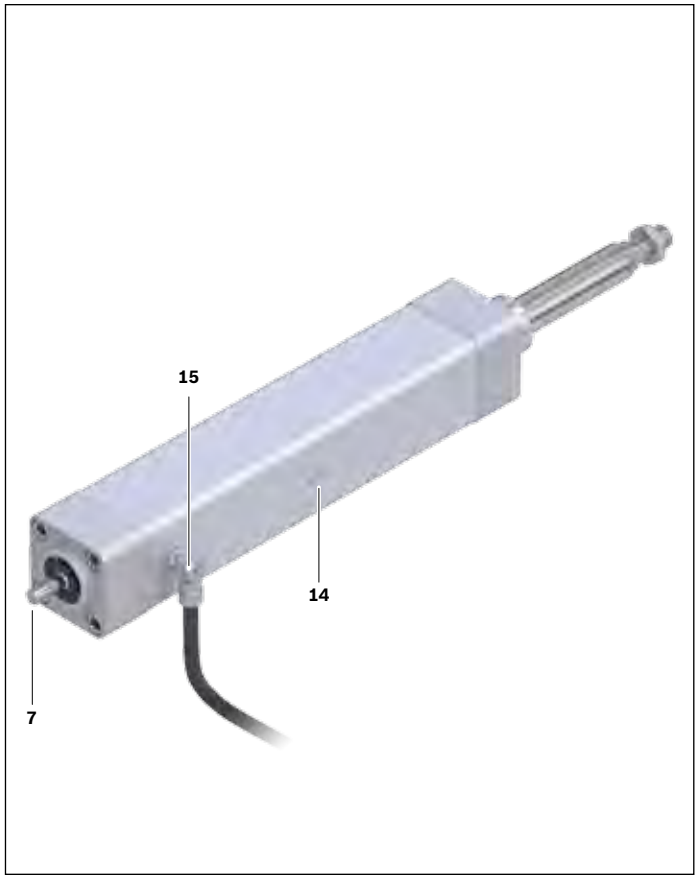
The timing belt side drive can be mounted in three directions (RV01 to RV03).





Features at a glance

- The hygienic design of the EMC with smooth surfaces prevents the formation of dirt and allows for easy cleaning of the cylinder. A sensor profile can be mounted to the aluminum profile to allow the use of limit and/or reference switches outside of the aluminum profile.
  The Electromechanical Cylinder is initially lubricated with standard grease or NSF-H1 grease and is therefore ready for immediate use. Alternatively, the built-in Rexroth Ball Screw Assembly can also be ordered only conserved for initial lubrication by the customer. The EMC can be connected to a central lubrication system with fluid grease. A lube fitting is included if the appropriate lubrication option has been selected.



IP65 rated version

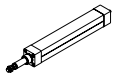
- Seals between the end caps and the aluminum profile and a reinforced seal on the piston rod ensure reliable protection against dust and water ingress. A connection for pressure compensation (15) in the housing prevents underpressure in the cylinder by allowing controlled air flow between interior and environment. Both the electric cylinder and the motor mountings with IP65 satisfy specifications in accordance with IEC 60 529.

IP65 rated version with +R (resistant) corrosion protection

- In addition to the benefits of the IP65 rating, this version provides chemical resistant seals between the end caps and the aluminum profile, as well as at the piston rod. The lube fitting (14), the port for pressure compensation (15) and the hexagon nut (1) are made from stainless steel.
  As additional accessories corrosion-resistant plug screws for the socket head screws in the front end cap are available.

Technical data

Drive data without motor attachment

EMC 	d_0xP	C	F_{max}	M_p	s_{min}	$s_{max\ perm}$	v_{max}	n_p	a_{max}	L_{ad}	M_{Rs}
	(mm)	(N)	(N)	(Nm)	(mm)	(mm)	(m/s)	(rpm)	(m/s^2)	(mm)	(Nm)
32	12x5	4,100	1,200	1.1	30	750	0.57	6,800	50.0	132.00	0.16
	12x10	2,700	750	1.3	40		1.13	6,800	50.0	136.00	0.20
40	16x5	13,300	4,500	4.0	35	750	0.38	4,600	50.0	134.00	0.28
	16x10	10,400	3,000	5.3	45		0.77	4,600	50.0	143.00	0.33
	16x16	10,400	2,000	5.7	65		1.23	4,600	50.0	159.00	0.40
50	20x5	15,400	7,800	6.9	40	900	0.32	3,800	39.8	142.00	0.50
	20x10	15,200	5,500	9.7	60		0.63	3,800	50.0	161.00	0.55
	20x20	14,400	3,200	11.3	80		1.27	3,800	50.0	180.00	0.65
63	25x5	17,200	15,900	14.1	45	1,200	0.28	3,300	28.9	148.00	0.75
	25x10	17,000	14,800	26.2	65		0.55	3,300	50.0	167.00	0.80
	25x25	15,900	8,000	35.4	95		1.38	3,300	50.0	199.00	1.00
80	32x5	23,300	21,600	19.1	50	1,500	0.25	3,000	17.9	163.00	1.20
	32x10	26,000	22,000	38.9	80		0.50	3,000	30.7	187.00	1.30
	32x20	21,300	15,000	53.1	85		1.00	3,000	50.0	195.00	1.40
	32x32	21,100	10,400	58.9	120		1.60	3,000	50.0	230.00	1.60
100	40x5	31,400	29,000	25.7	55	1,500	0.18	2,200	12.2	171.00	2.40
	40x10	42,100	29,000	51.3	70		0.37	2,200	16.8	185.00	2.50
	40x20	40,900	29,000	102.6	90		0.73	2,200	33.0	203.00	2.60
	40x40	40,000	22,900	162.0	145		1.47	2,200	50.0	258.00	2.80
100XC	50x10	86,100	56,000	99.0	90	1,500	0.50	3,000	12.1	316.00	4.00
	50x20	104,900	50,000	176.8	115		1.00	3,000	22.0	338.00	5.00

[1] Total axial clearance of the EMC when new
[2] Constants for calculating the mass moment of inertia. For formulas, see section “Drive dimensioning”

Note:
The travel range can be selected in mm steps between s_{min} and $s_{max\ perm.}$.

Mass of the EMC-
Weight calculation without the motor and without motor attachment

$$m_s = k_{g\ fix} + k_{g\ var} \cdot s_{max}$$

Weight calculation without motor with timing belt side drive

$$m_s = k_{g\ fix} + k_{g\ var} \cdot s_{max} + m_{sd}$$

Weight calculation without motor with mount and coupling

$$m_s = k_{g\ fix} + k_{g\ var} \cdot s_{max} + m_c$$

Moved system mass

$$m_{ca} = m_{ca\ fix} + m_{ca\ var} \cdot s_{max}$$

Length calculation

$$L_{BC} = s_{max} + L_{ad}$$

	Total axial clearance cylinder[1)]	$k_{J\ fix}$[2)]	$k_{J\ var}$[2)]	$k_{J\ m}$[2)]	m_s		m_{ca}	
					$k_{g\ fix}$	$k_{g\ var}$	$m_{ca\ fix}$	$m_{ca\ var}$
	(µm)				**(kg)**	**(kg/mm)**	**(kg)**	**(kg/mm)**
	10	1.945	0.012	0.633	0.885	0.004	0.311	0.001
	15	2.618	0.013	2.533	0.911	0.004	0.326	0.001
	10	6.616	0.032	0.633	1.255	0.005	0.432	0.001
	15	7.839	0.033	2.533	1.336	0.005	0.481	0.001
	20	11.114	0.040	6.485	1.487	0.005	0.567	0.001
	5	15.815	0.085	0.633	2.115	0.008	0.695	0.001
	10	19.092	0.088	2.533	2.382	0.008	0.838	0.001
	20	27.304	0.095	10.132	2.560	0.008	0.896	0.001
	5	39.693	0.223	0.633	3.018	0.010	1.059	0.002
	10	48.227	0.243	2.533	3.417	0.010	1.291	0.002
	20	76.002	0.242	15.831	4.047	0.010	1.679	0.002
	5	92.538	0.607	0.633	5.185	0.015	1.871	0.003
	10	119.067	0.647	2.533	6.182	0.015	2.495	0.003
	10	145.503	0.665	10.132	6.525	0.015	2.739	0.003
	20	225.036	0.684	25.938	7.610	0.015	3.404	0.003
	5	276.160	1.568	0.633	8.795	0.025	3.249	0.006
	5	291.780	1.369	2.533	9.684	0.025	3.829	0.006
	10	349.478	1.408	10.132	10.479	0.025	4.281	0.006
	20	628.583	1.567	40.528	13.410	0.025	6.166	0.006
	5	1,080.741	3.588	2.533	16.828	0.031	5.292	0.007
	10	1,184.852	3.519	10.132	18.020	0.031	5.994	0.007

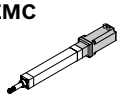
Degree of efficiency η = 0.9 (for all sizes)

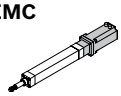
Note:

F_{max} and v_{max} depend on the selected drive range (s_{max}) of the EMC. See the following tables.

Technical data

Drive data for motor attachment via mount and coupling

EMC 	d_0 x P (mm)	for motor	Mount and coupling								
			F_{max} [2] (N)	M_p [2] (Nm)	v_{max} [2] (m/s)	M_{Rs} (Nm)	$k_{J\ fix}$ [1]	$k_{J\ var}$ [1]	$k_{J\ m}$ [1]	m_{fc} (kg)	a_{max} (m/s^2)
32	12 x 5	MSM019B MSM031B MS2N03B	1,200	1.1	0.57	0.16	8.945	0.012	0.633	0.37	50.0
	12 x 10	MSM019B MSM031B MS2N03B	750	1.3	1.13	0.20	9.618	0.013	2.533	0.37	
40	16 x 5	MSM031C MS2N03B MS2N03D	4,500	4.0	0.38	0.28	41.616	0.032	0.633	0.56	
		MS2N04								0.68	
	16 x 10	MSM031C MS2N03B MS2N03D	3,000	5.3	0.77	0.33	42.839	0.033	2.533	0.56	
		MS2N04								0.68	
	16 x 16	MSM031C MS2N03B MS2N03D	2,000	5.7	1.23	0.40	46.114	0.040	6.485	0.56	
		MS2N04								0.68	
50	20 x 5	MSM031C MSM041B MS2N04	7,800	6.9	0.32	0.50	78.815	0.085	0.633	1.10	39.8
		MS2N05								1.13	
	20 x 10	MSM031C MSM041B MS2N04	5,500	9.7	0.63	0.55	82.092	0.088	2.533	1.10	50.0
		MS2N05								1.13	
	20 x 20	MSM031C MSM041B MS2N04	3,200	11.3	1.27	0.65	90.304	0.095	10.132	1.10	
		MS2N05								1.13	
63	25 x 5	MSM041B MS2N05	15,900	14.1	0.28	0.75	249.693	0.223	0.633	1.77	28.9
		MS2N04					103.693			1.28	
		MS2N06					249.693			1.97	
	25 x 10	MSM041B MS2N05	14,800	26.2	0.55	0.80	258.227	0.243	2.533	1.77	50.0
		MS2N04	10,700	18.9			112.227			1.28	
		MS2N06	14,800	26.2			258.227			1.97	
	25 x 25	MSM041B MS2N05	8,000	35.4	1.38	1.00	286.002	0.242	15.831	1.77	
		MS2N04	4,300	19.0			140.002			1.28	
		MS2N06	8,000	35.4			286.002			1.97	

EMC 	d_0 x P (mm)	for motor	Mount and coupling								
			F_{max} [2] (N)	M_p [2] (Nm)	v_{max} [2] (m/s)	M_{Rs} (Nm)	$k_{J\ fix}$ [1]	$k_{J\ var}$ [1]	$k_{J\ m}$ [1]	m_{fc} (kg)	a_{max} (m/s^2)
80	32 x 5	MS2N05	21,600	19.1	0.25	1.20	302.538	0.607	0.633	2.29	17.9
		MS2N06								2.49	
		MS2N07								2.80	
	32 x 10	MS2N05	22,000	38.9	0.50	1.30	329.067	0.647	2.533	2.29	30.7
		MS2N06								2.49	
		MS2N07								2.80	
	32 x 20	MS2N05	15,000	53.1	1.00	1.40	355.503	0.665	10.132	2.29	50.0
		MS2N06								2.49	
		MS2N07								2.80	
	32 x 32	MS2N05	10,400	58.9	1.60	1.60	435.036	0.684	25.938	2.29	
		MS2N06								2.49	
		MS2N07								2.80	
100	40 x 5	MS2N06	29,000	25.7	0.18	2.40	686.160	1.568	0.633	3.77	12.2
		MS2N07								3.94	
	40 x 10	MS2N06	29,000	51.3	0.37	2.50	701.780	1.369	2.533	3.77	16.8
		MS2N07								3.94	
	40 x 20	MS2N06	29,000	102.6	0.73	2.60	759.478	1.408	10.132	3.77	33.0
		MS2N07								3.94	
	40 x 40	MS2N06	21,900	154.9	1.47	2.80	1,038.583	1.567	40.528	3.77	50.0
		MS2N07								3.94	
100XC	50 x 10	MS2N07	56,000	99.0	0.50	4.00	1,980.741	3.588	2.533	6.06	12.1
		MS2N010								7.45	
	50 x 20	MS2N07	50,000	176.8	1.00	5.00	2 084.852	3.519	10.132	6.06	22.0
		MS2N010								7.45	

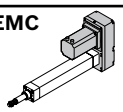
[1] Constants for calculating the mass moment of inertia. For formulas, see section “Drive dimensioning”
[2] Force or torque and speed can be limited by the motor

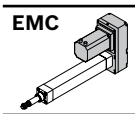
Degree of efficiency η = 0.9 (for all sizes)

Note:
All data is given for the complete mechanical drive train (EMC with coupling) at the reference point motor shaft.
F_{max} and v_{max} depend on the selected drive range (s_{max}) of the EMC. See the following tables.
Actual results depend on the selected motor-controller combination.
The motor torque might need to be limited.
For short product names, see the “Abbreviations” section.

Technical Data

Drive data for motor attachment via timing belt side drive

EMC 	d_0 x P (mm)	$i^{1)}$	for motor	Timing belt side drive								
				$F_{max}^{3)}$ (N)	$M_p^{3)}$ (Nm)	$v_{max}^{3)}$ (m/s)	M_{Rs} (Nm)	$k_{J\ fix}^{2)}$	$k_{J\ var}^{2)}$	$k_{J\ m}^{2)}$	m_{sd} (kg)	a_{max} (m/s^2)
32	12 x 5	1	MSM019	680	0.6	0.57	0.22	14.2	0.012	0.633	0.55	50.0
			MSM031B				0.31	45.6	0.012		0.95	
			MS2N03B					38.0			0.80	
	12 x 10	1	MSM019	450	0.8	1.13	0.26	14.9	0.013	2.533	0.55	
			MSM031B				0.35	46.3			0.95	
			MS2N03B					38.7			0.80	
40	16 x 5	1	MSM031C	3,100	2.8	0.38	0.43	47.6	0.032	0.633	0.80	50.0
			MS2N03B					43.5			0.75	
			MS2N04	3,400	3.0		0.68	247.7			1.70	
		1.5	MSM031C	3,100	1.9		0.34	15.4	0.014	0.281	0.75	
			MS2N03B					16.0			0.75	
			MS2N04	3,400	2.0		0.59	84.0		0.281	1.60	
	16 x 10	1	MSM031C	1,800	3.2	0.77	0.48	48.8	0.033	2.533	0.80	
			MS2N03B					44.7			0.75	
			MS2N04	2,200	4.0		0.73	248.9			1.70	
		1.5	MSM031C	1,800	2.1		0.37	16.0	0.015	1.126	0.75	
			MS2N03B					16.3			0.75	
			MS2N04	2,200	2.7		0.62	84.5			1.60	
	16 x 16	1	MSM031C	1,100	3.2	1.23	0.55	52.1	0.040	6.485	0.80	
			MS2N03B					48.0			0.75	
			MS2N04	1,400	4.0		0.80	252.2			1.70	
		1.5	MSM031C	1,100	2.1		0.42	17.4	0.018	2.882	0.75	
			MS2N03B					17.7			0.75	
			MS2N04	1,400	2.7		0.67	86.0			1.60	
50	20 x 5	1	MSM031C	6,200	5.5	0.32	0.90	256.4	0.085	0.633	1.70	39.8
			MSM041B					257.1			1.70	
			MS2N04					256.4			1.80	
			MS2N05	6,300	5.6		0.95	1 161.1	0.085	0.633	4.05	
		1.5	MSM031C	6,200	3.7	0.32	0.73	89.0	0.038	0.281	1.60	
			MSM041B					91.1			1.60	
			MS2N04					89.0			1.55	
	20 x 10	1	MSM031C	4,300	7.7	0.63	0.95	259.7	0.088	2.533	1.70	50.0
			MSM041B					260.3			1.70	
			MS2N04					259.7			1.80	
			MS2N05	4,400	7.9		1.00	1,164.4			4.05	
		1.5	MSM031C	4,300	5.1		0.77	90.4	0.039	1.126	1.60	
			MSM041B					92.6			1.60	
			MS2N04					90.4			1.55	
	20 x 20	1	MSM031C	2,300	8.2	1.27	1.05	267.9	0.095	10.132	1.70	
			MSM041B					268.5			1.70	
			MS2N04					267.9			1.80	
			MS2N05	2,400	8.5		1.10	1,172.5			4.05	
		1.5	MSM031C	2,300	5.5		0.83	94.1	0.042	4.503	1.60	
			MSM041B					96.2			1.60	
			MS2N04					94.1			1.55	

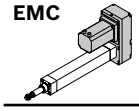
EMC 	d_0 x P (mm)	i[1]	for motor	Timing belt side drive								
				F_{max}[3] (N)	M_p[3] (Nm)	v_{max}[3] (m/s)	M_{Rs} (Nm)	$k_{J\ fix}$[2]	$k_{J\ var}$[2]	$k_{J\ m}$[2]	m_{sd} (kg)	a_{max} (m/s²)
63	25 x 5	1	MSM041B	15,900	14.1	0.28	1.20	1 081.2	0.223	0.633	4.2	28.9
			MS2N04					1,082.9			4.6	
			MS2N05				1.25	1,350.2			4.5	
			MS2N06					1,359.7			4.7	
		2	MSM041B	15,900	7.0		0.83	202.2	0.056	0.158	3.9	
			MS2N04					188.2			4.2	
			MS2N05				0.88	232.0			4.2	
	25 x 10	1	MSM041B	10,400	18.5	0.55	1.25	1,089.7	0.243	2.533	4.2	50.0
			MS2N04					1,091.5			4.6	
			MS2N05	11,400	20.2	0.55	1.30	1,358.7			4.5	
			MS2N06					1,368.2			4.7	
		2	MSM041B	10,400	9.3	0.55	0.85	204.3	0.061	0.633	3.9	
			MS2N04					190.4			4.2	
			MS2N05	11,400	10.1		0.90	234.1			4.2	
	25 x 25	1	MSM041B	4,200	18.6	1.38	1.45	1 117.5	0.242	15.831	4.2	
			MS2N04					1 119.2			4.6	
			MS2N05	5,200	23.1		1.50	1,386.5			4.5	
			MS2N06					1,396.0			4.7	
		2	MSM041B	4200	9.3		0.95	211.3	0.060	3.958	3.9	
			MS2N04					197.3			4.2	
			MS2N05	5200	11.6		1.00	241.0			4.2	
80	32 x 5	1	MS2N05	21600	19.1	0.25	1.70	1,469.0	0.607	0.633	4.3	17.9
			MS2N06				1.75	5,161.9			10.1	
			MS2N07								10.4	
		2	MS2N05		9.5		1.10	261.7	0.152	0.158	4.4	
			MS2N06				1.15	861.3			9.2	
	32 x 10	1	MS2N05	13,900	24.6	0.50	1.80	1,495.5	0.647	2.533	4.3	30.7
			MS2N06	18,400	32.6		1.85	5,188.4			10.1	
			MS2N07								10.4	
		2	MS2N05	13,900	12.3		1.15	268.3	0.162	0.633	4.4	
			MS2N06	18,400	16.3		1.20	867.9			9.2	
	32 x 20	1	MS2N05	6,900	24.6	1.00	1.90	1,521.9	0.665	10.132	4.3	50.0
			MS2N06	11,500	40.8		1.95	5,214.8			10.1	
			MS2N07								10.4	
		2	MS2N05	6,900	12.3		1.20	274.9	0.166	2.533	4.4	
			MS2N06	11,500	20.4		1.25	874.5		2.533	9.2	
	32 x 32	1	MS2N05	4,300	24.6	1.60	2.10	1,601.5	0.684	25.938	4.3	
			MS2N06	7,600	43.3		2.15	5,294.4			10.1	
			MS2N07				2.15	5,294.4			10.4	
		2	MS2N05	4,300	12.3		1.30	294.8	0.171	6.485	4.4	
			MS2N06	7,600	21.7		1.35	894.4			9.2	

[1] Gear ratio of the timing belt side drive.
[2] Constants for calculating the mass moment of inertia. For formulas, see section “Drive dimensioning”
[3] Force or torque and speed can be limited by the motor

Please pay attention to the note at the end of the table

Drive data

Drive data for motor attachment via timing belt side drive

EMC 	d_0 x P (mm)	i[1]	for motor	Timing belt side drive								
				F_{max}[3] (N)	M_p[3] (Nm)	v_{max}[3] (m/s)	M_{Rs} (Nm)	$k_{J\ fix}$[2]	$k_{J\ var}$[2]	$k_{J\ m}$[2]	m_{sd} (kg)	a_{max} (m/s^2)
100	40 x 5	1	MS2N06	29,000	25.6	0.18	2.95	5,466.6	1.568	0.633	10.2	12.2
			MS2N07				3.00	7,933.1			11.7	
		2	MS2N06		12.8		1.75	937.5	0.392	0.158	9.3	
			MS2N07				1.80	1,331.6			10.4	
	40 x 10	1	MS2N06	29,000	51.3	0.37	3.05	5,482.2	1.369	2.533	10.2	16.8
			MS2N07				3.10	7,948.7			11.7	
		2	MS2N06		25.6		1.80	941.4	0.342	0.633	9.3	
			MS2N07				1.85	1,335.5			10.4	
	40 x 20	1	MS2N06	19,200	68.1	0.73	3.15	5,539.9	1.408	10.132	10.2	33.0
			MS2N07	29,000	102.6		3.20	8,006.4			11.7	
		2	MS2N06	19,200	34.1		1.85	955.8	0.352	2.533	9.3	
			MS2N07	29,000	51.3		1.90	1,349.9		2.533	10.4	
	40 x 40	1	MS2N06	9,600	68.1	1.47	3.05	5 819.0	1.567	40.528	10.2	50.0
			MS2N07	15,000	106.4		3.10	8 285.5			11.7	
		2	MS2N06	9,600	34.1		1.80	1,025.6	0.392	10.132	9.3	
			MS2N07	15,000	53.2		1.85	1,419.7			10.4	
100XC	50 x 10	1	MS2N07	56,000	99.0	0.50	4.60	11,127.9	3.588	2.533	16.9	12.1
			MS2N010					10,690.7			17.7	
		1.5	MS2N07		66.0		3.27	3 897.4	1.595	1.126	16.0	
			MS2N010					3,626.9			16.9	
	50 x 20	1	MS2N07	37,400	132.4	1.00	5.60	11,232.0	3.519	10.132	16.9	22.0
			MS2N010					10,794.8			17.7	
		1.5	MS2N07		88.3		3.93	3,943.7	1.564	4.503	16.0	
			MS2N010					3,673.1			16.9	

[1] Gear ratio of the timing belt side drive.
[2] Constants for calculating the mass moment of inertia. For formulas, see section “Drive dimensioning”
[3] Force or torque and speed can be limited by the motor

Degree of efficiency η = 0.9 (for all sizes)

Note:

All data is given for the complete mechanical drive train (EMC with timing belt side drive) at the motor shaft reference point.

F_{max} and v_{max} depend on the selected drive range (s_{max}) of the EMC. See the following tables.

Actual results depend on the selected motor-controller combination.

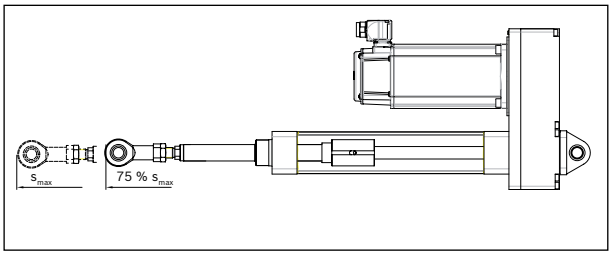
The motor torque might need to be limited.

For short product names, see the “Abbreviations” section.

Axial load on the cylinder mechanics

Note on special installation and usage example

Installation case III



Note: In this installation case, the cylinder is loaded by its own weight when mounted in a horizontal position.
Thus, the piston rod may be extended horizontally only up to 75% of s_{max}.

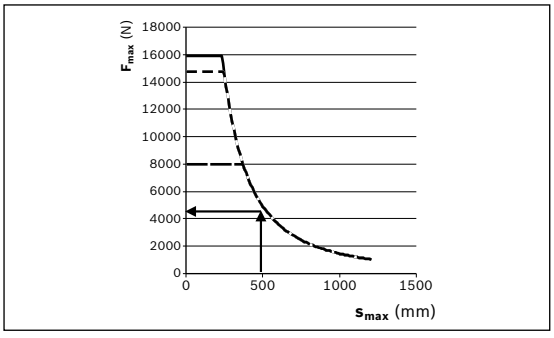
Application example:
Installation - case III: Swivel clevis mount on the timing belt side drive, piston rod guided by means of rod end bearing or fork clevis.

Example for determining the permissible axial load on the cylinder mechanics

Pre-selection for the above case as an application example:

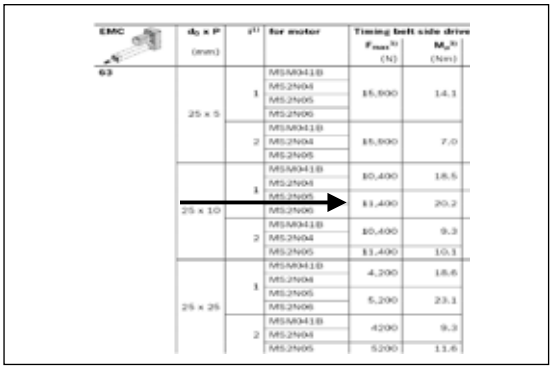
- EMC-063 with Rexroth Ball Screw Assembly 25 x 10
- selected travel range s_{max} 500 mm
- with timing belt side drive i=1 for MS2N05
- mounting with clevis mount and swivel mount

Max. permissible axial load according to the example in the diagram: approx. 4,200 N.



F_{max} in table “Drive data” with motor attachment via timing belt side drive: F_{max} = 11,400 N

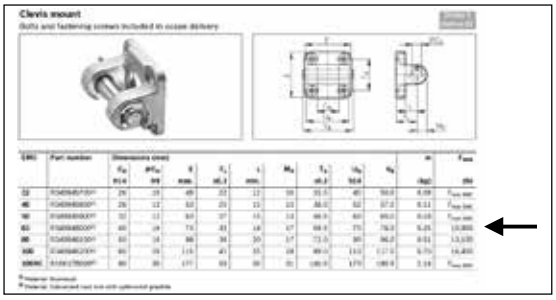
The actual achievable axial force of the system also depends on the selected motor / controller combination (see “Drive dimensioning” section).



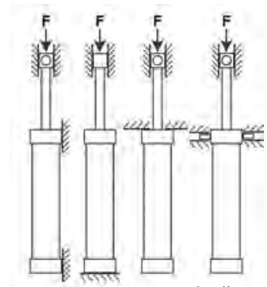
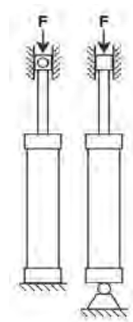
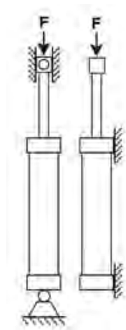
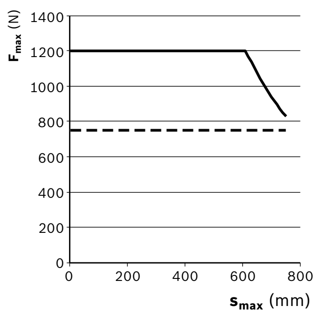
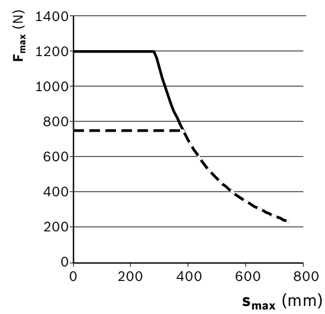
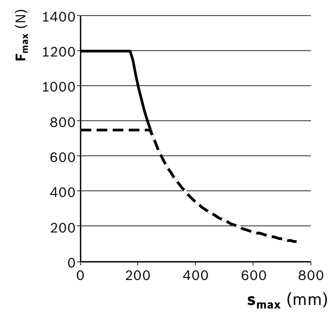
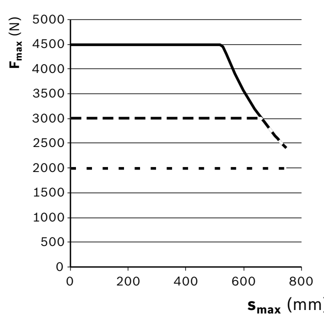
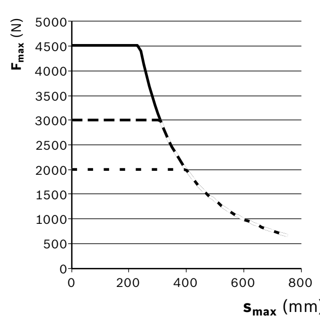
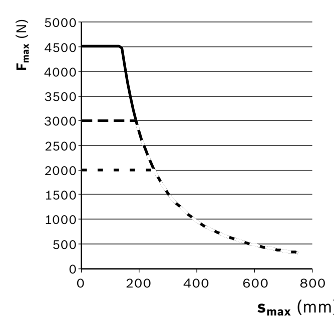
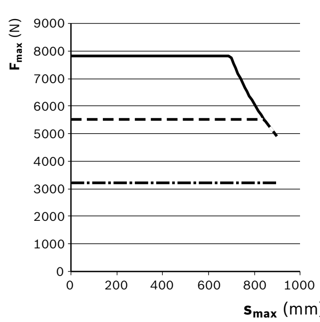
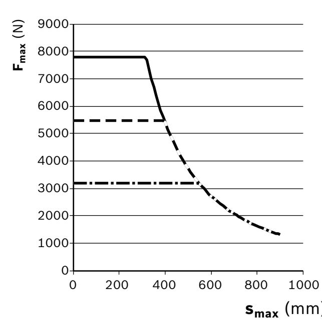
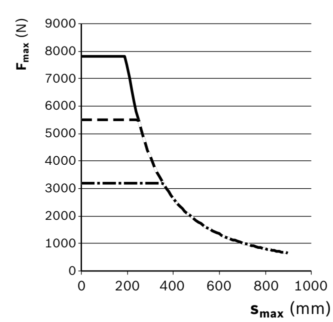
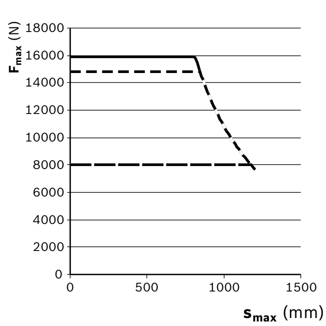
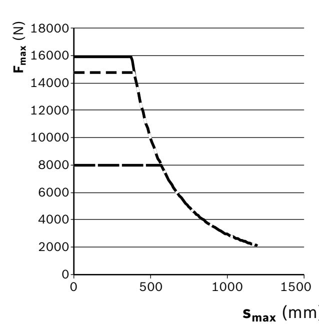
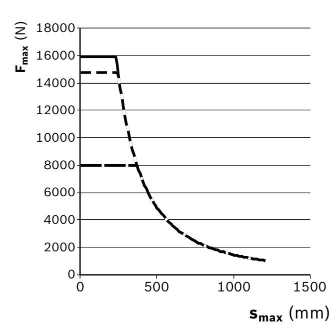
Note: Limitations caused by orderable fastening elements are not taken into account in the consideration of the drive train.

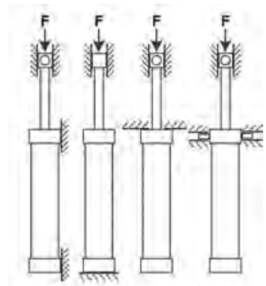
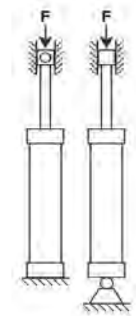
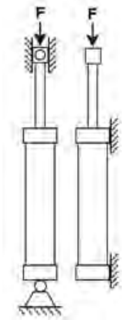
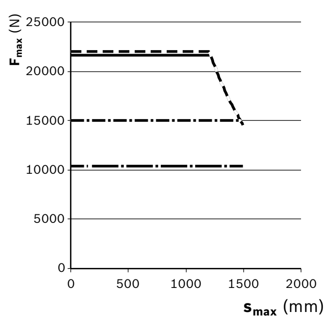
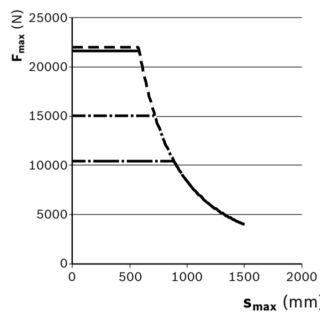
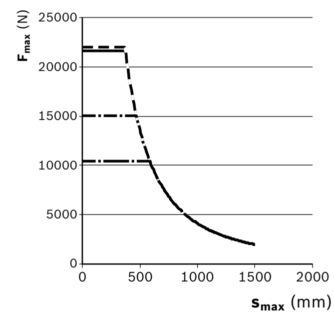
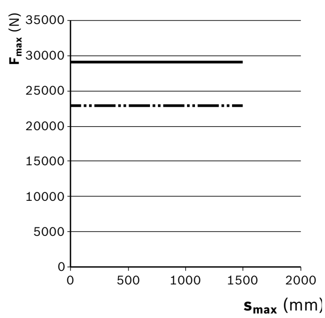
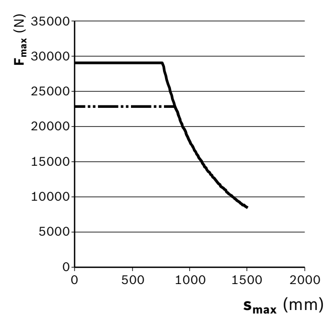
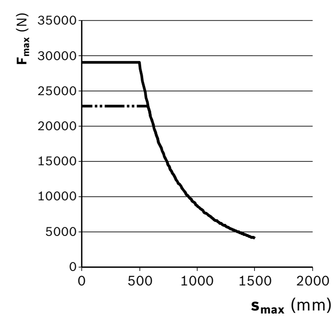
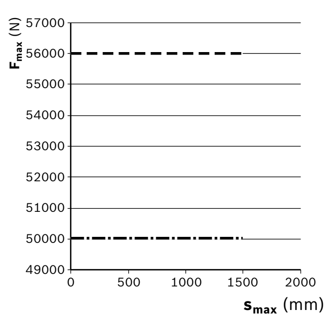
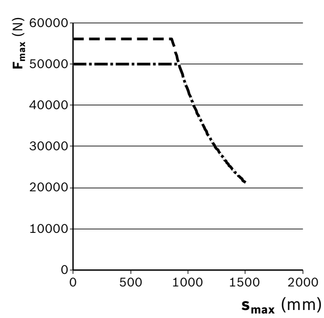
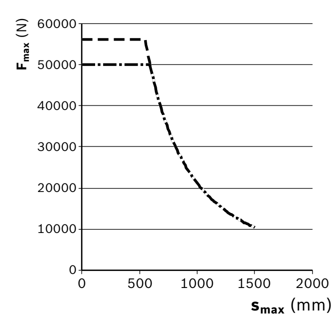
The F_{max} for the size 63 clevis mount, for example, is 10,900 N.

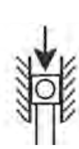
For F_{max} the smallest value is 4,200 N.



Axial load on the cylinder mechanics

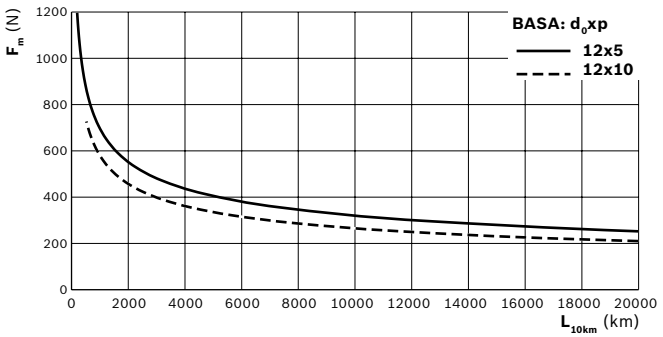
	Case I	Case II	Case III
	 only allowed vertically		
EMC-32 **d_0 x P** ——— 12 x 5 - - - - 12 x 10			
EMC-40 **d_0 x P** ——— 16 x 5 - - - - 16 x 10 · · · · · · 16 x 16			
EMC-50 **d_0 x P** ——— 20 x 5 - - - - 20 x 10 -·-·-·- 20 x 20			
EMC-63 **d_0 x P** ——— 25 x 5 - - - - 25 x 10 — — — 25 x 25			

	Case I	Case II	Case III
	 only allowed vertically		
EMC-80 **d_0 x P** ——— 32 x 5 - - - - - 32 x 10 -··-··- 32 x 20 -·-·- 32 x 32			
EMC-100 **d_0 x P** ——— 40 x 5/40 x 10 -··-··- 40 x 20/40 x 40			
EMC-100XC **d_0 x P** - - - - - 50 x 10 -·-·- 50 x 20			

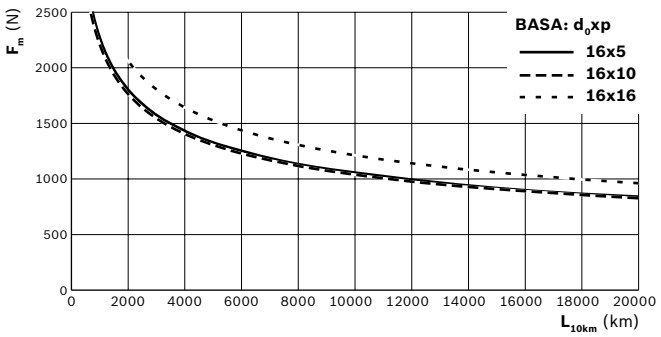
Piston rod in swivel bearings	Piston rod with linear travel range	Free piston rod	Swivel mount	Fixed mount
				

Life

EMC-32



EMC-40



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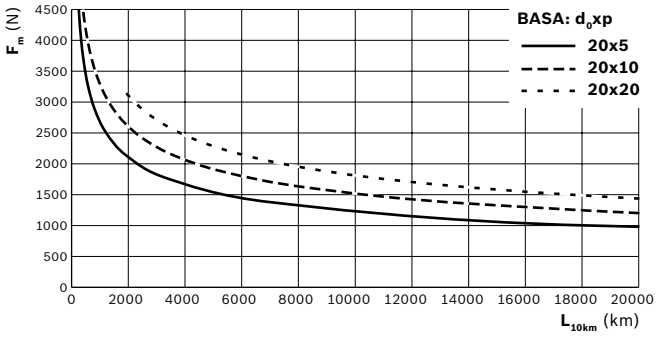
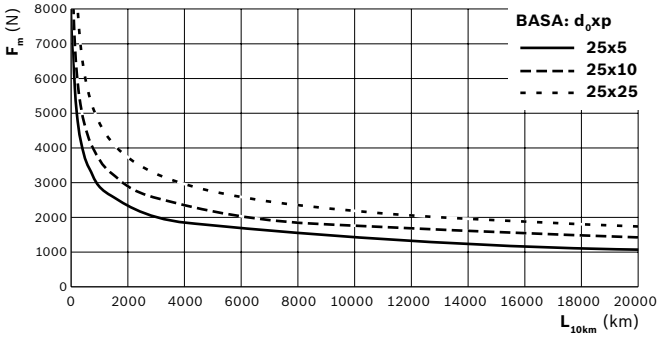
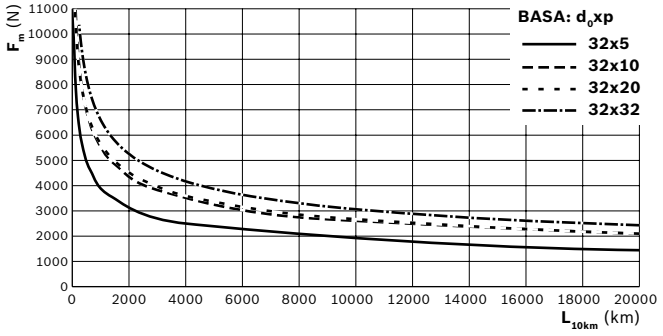


EMC-63



EMC-80



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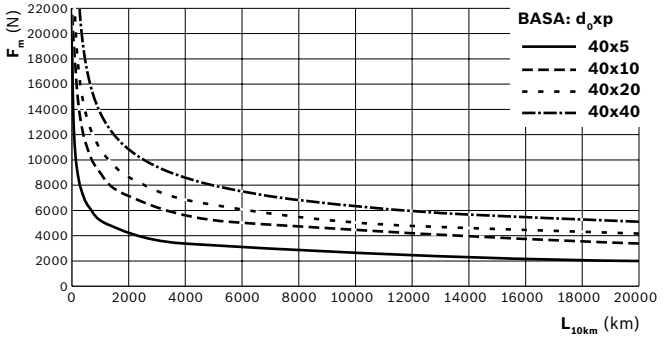
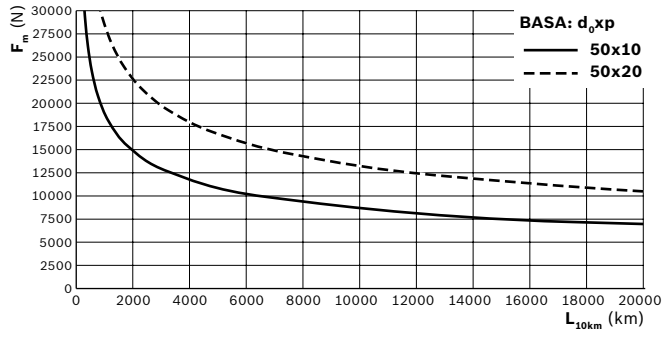


EMC-100XC

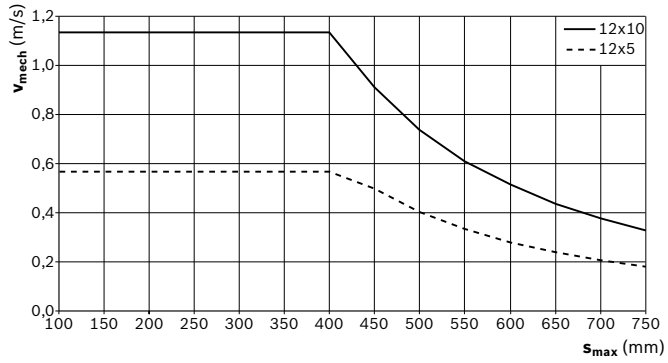


The stated values comply with the specified relubrication intervals (see the “Service and information” section).
For calculation of the equivalent dynamic axial load F_m see the “Calculation principles” section.

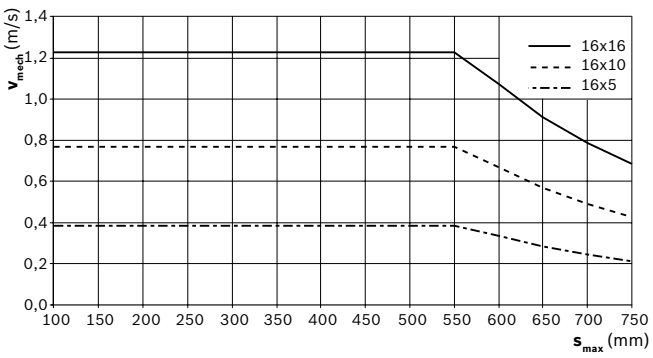
F_m = equivalent dynamic axial load (N)
L_{10km} = nominal service life (km)

Permissible speeds

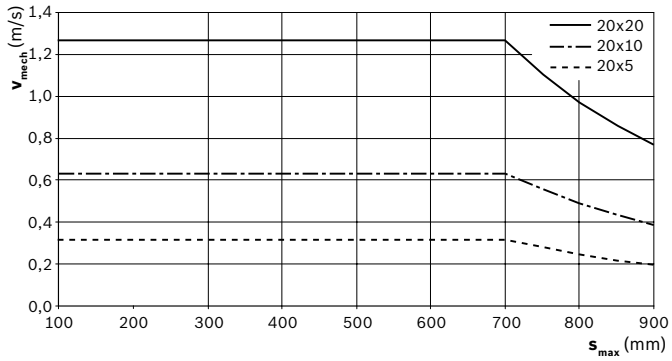
EMC-32



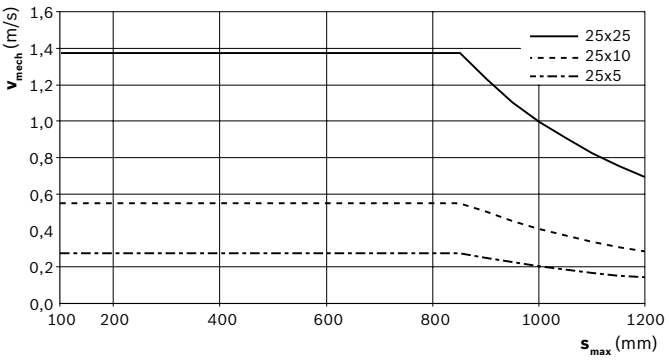
EMC-40



EMC-50



EMC-63



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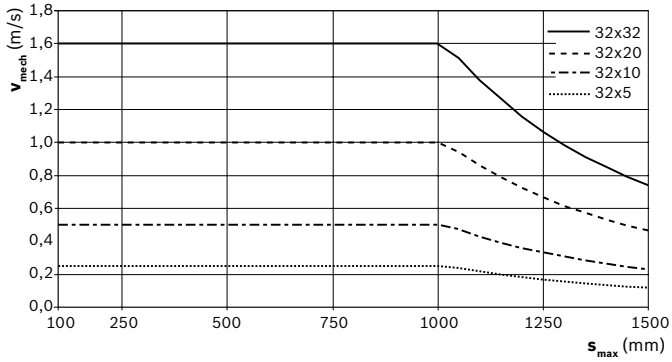
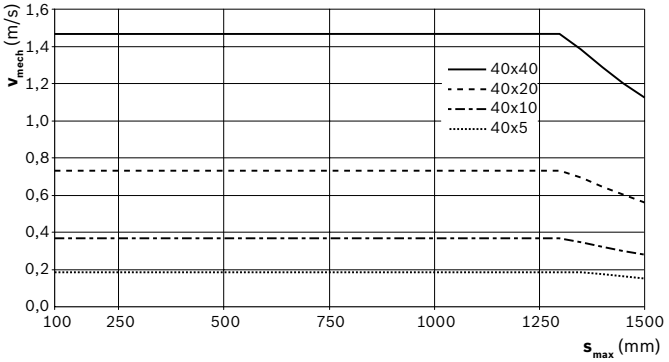
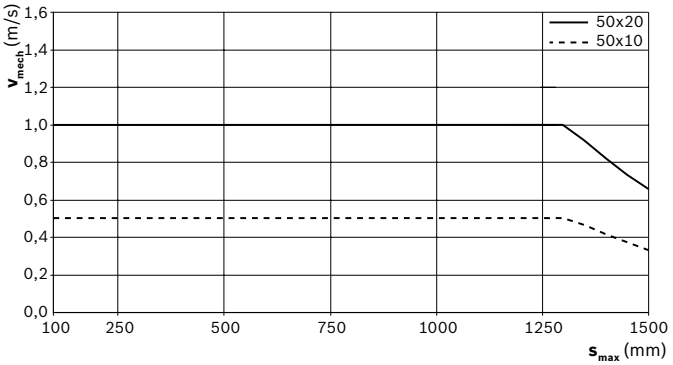


EMC-100

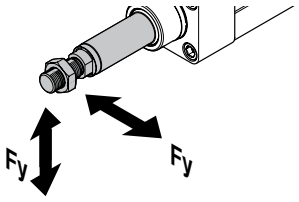


EMC-100XC

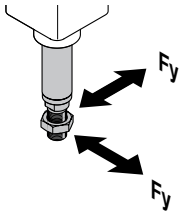


Load on the piston rod

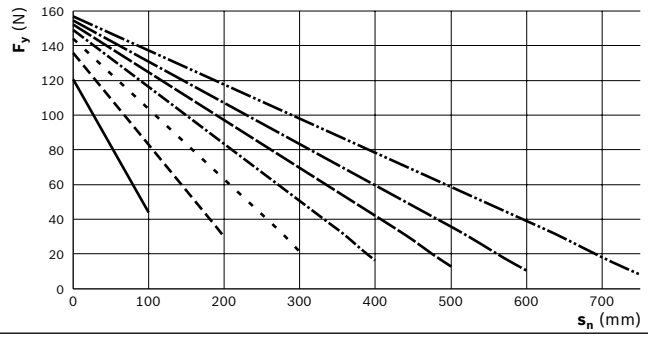
Horizontal installation

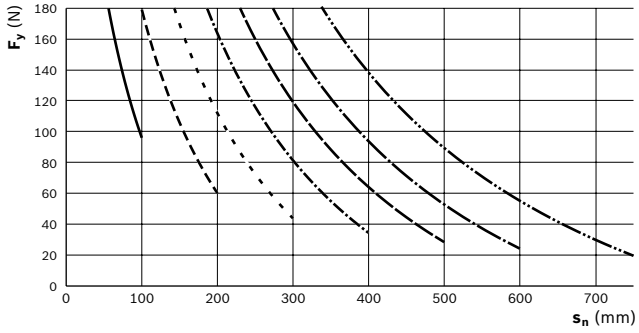


Vertical installation

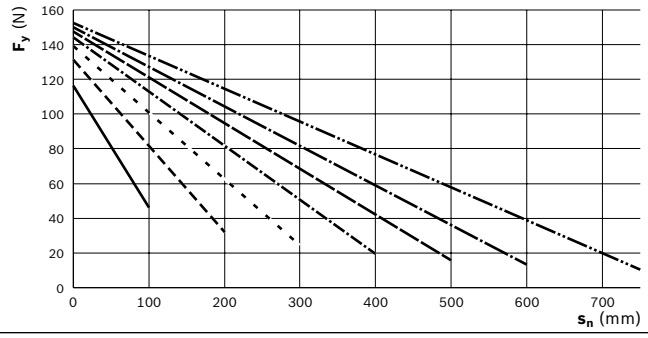


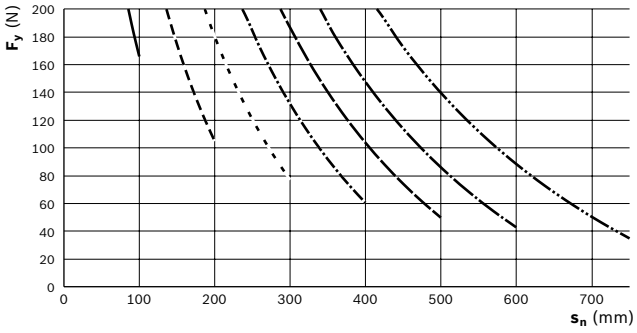
EMC-32



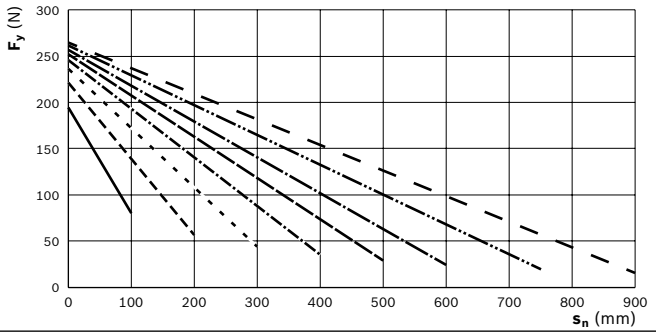


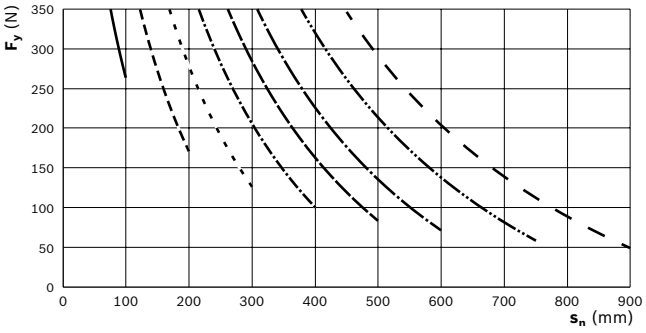
EMC-40



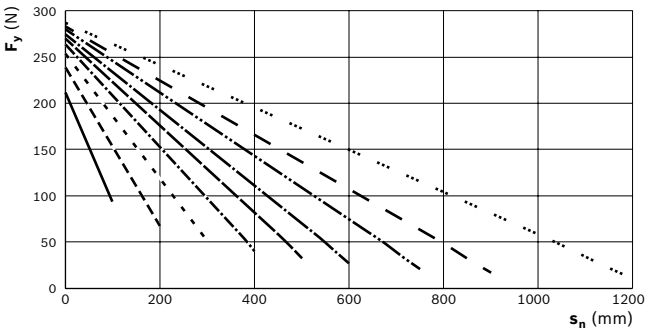


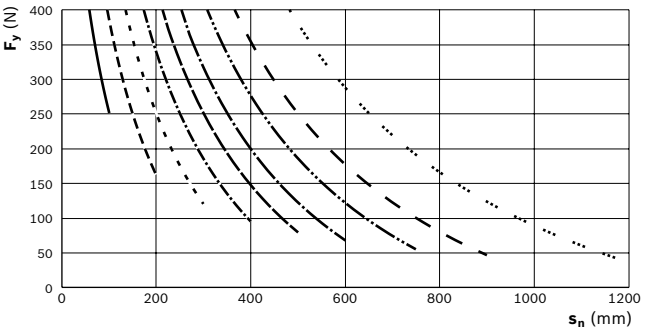
EMC-50



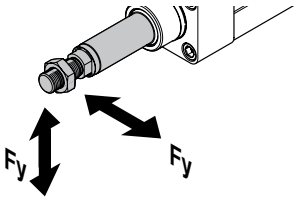


EMC-63

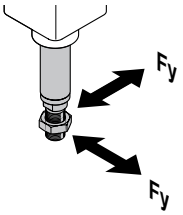




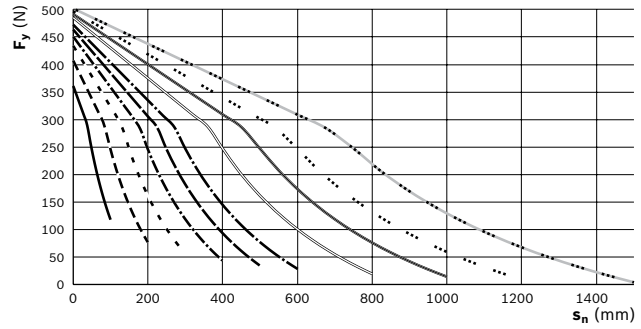
Horizontal installation

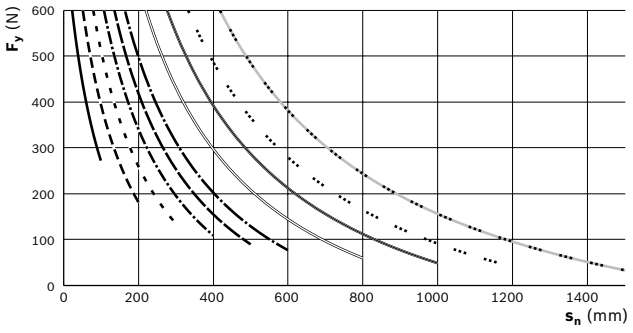


Vertical installation

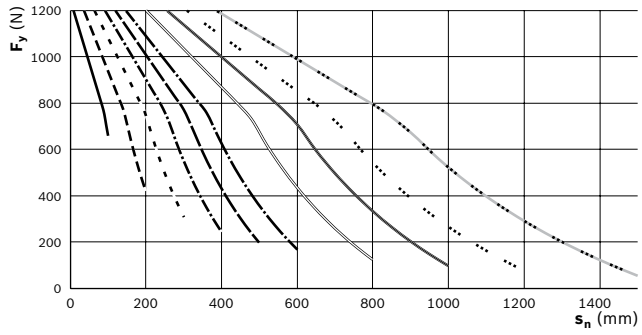


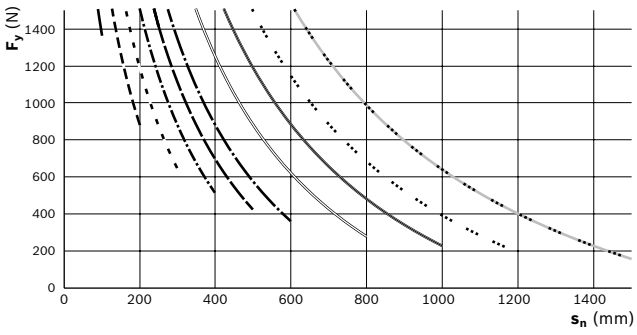
EMC-80



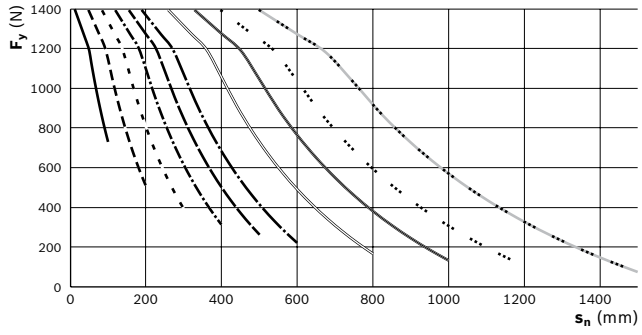


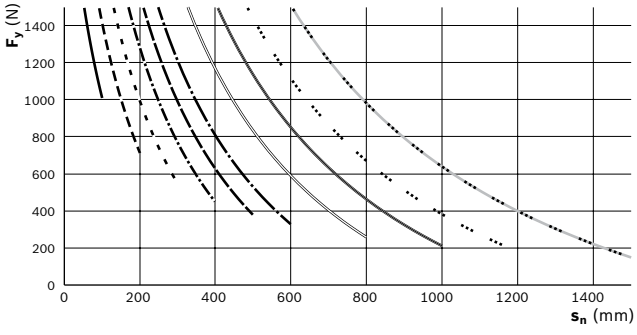
EMC-100





EMC-100XC





Characteristic curve for s_{max}

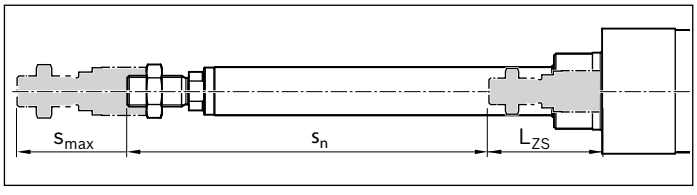
———	100 mm	-·-·-·-	750 mm
- - - - - -	200 mm	═══	800 mm
· · · · · ·	300 mm	— — —	900 mm
-·-·-·-	400 mm	———	1000 mm
— — — —	500 mm	··· ··· ···	1200 mm
-·-·-·-	600 mm	- - - - - -	1500 mm

F_y = lateral force (N)
s_n = position of the piston rod (mm)
s_{max} = maximum travel range (mm)
L_{ZS} = position of the retracted piston rod (mm)

Diagrams are valid for:

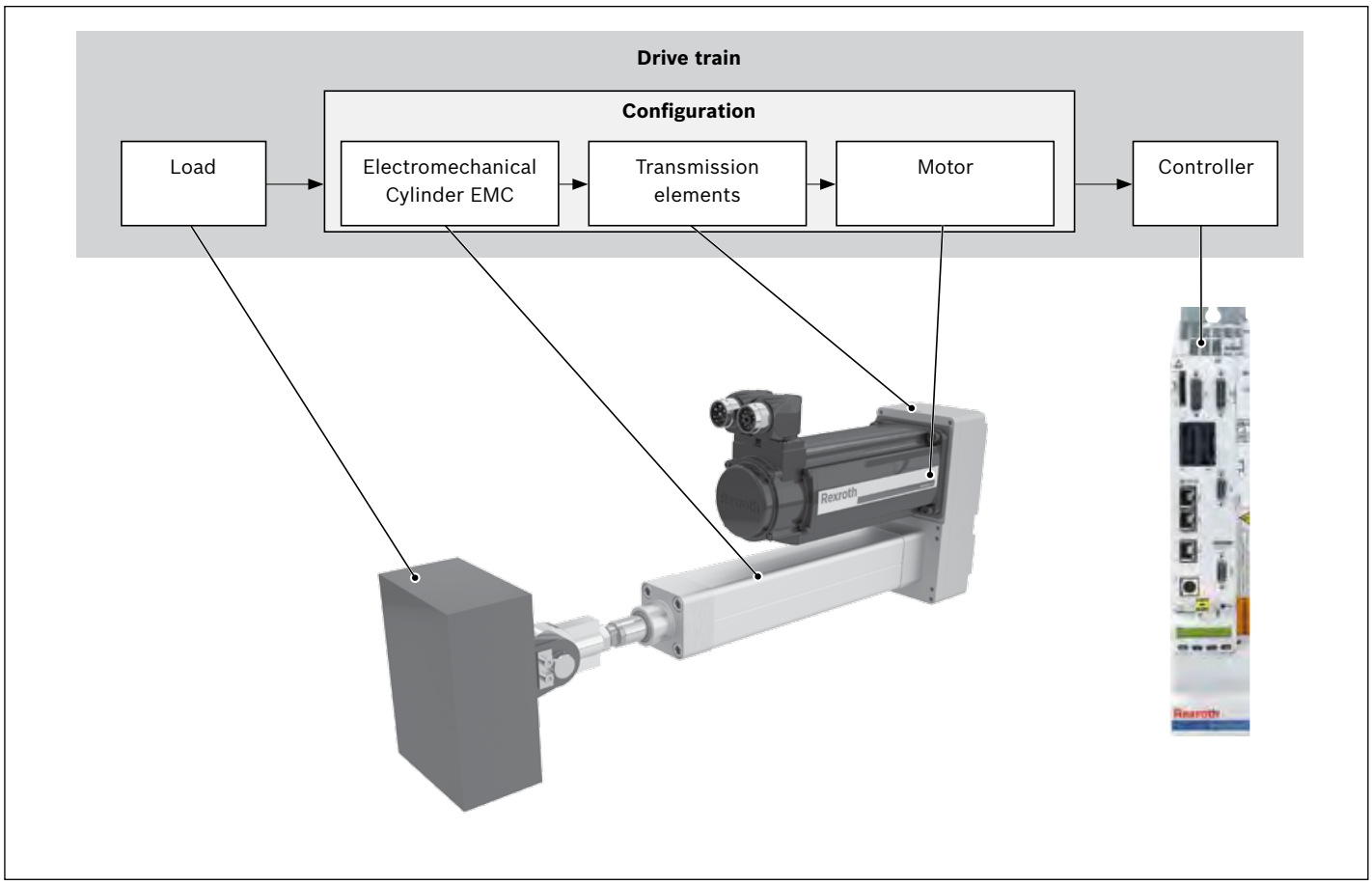
- 25% of F_{max}
- a velocity of 0.5 m/s

Definition s_{max} /s_n



Basis of calculations

Drive train



The correct dimensioning and assessment of an application requires structured consideration of the drive train as a whole. The basic element of the drive train is the configuration – comprising the Electromechanical Cylinder EMC, the transmission element (coupling or timing belt side drive) and the motor, which can be ordered in this constellation as per the catalog.

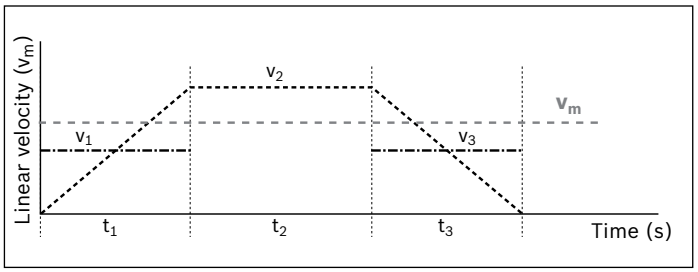
Maximum permissible loads

When selecting Electromechanical Cylinders EMC, maximum limits for permissible loads and forces must be taken into account. These limits can be found in the “Product description and technical data” section.

The values in this chapter are system-based, i.e. the limits are based not only on the load capacity of the bearings, but also on design/material limits.

Mechanical calculation

Service life of Electromechanical Cylinder EMC
Where the operating conditions vary (fluctuating linear speed and load), the service life must be calculated using the average values for F_m and v_m .

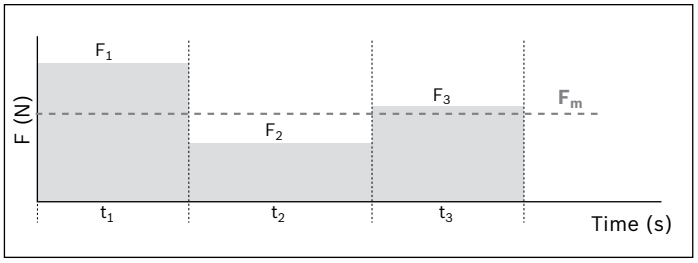


When the linear speed varies, the average speed v_m is calculated as follows:

$$v_m = \frac{1}{t_{total}} \cdot (|v_1| \cdot t_1 + |v_2| \cdot t_2 + \ldots + |v_n| \cdot t_n)$$

$$t_{total} = t_1 + t_2 + \ldots + t_n$$

When the load and rotary speed vary, the following applies for the average load F_m:



$$F_m = \sqrt[3]{|F_1|^3 \cdot \frac{|v_1|}{v_m} \cdot \frac{t_1}{t_{total}} + |F_2|^3 \cdot \frac{|v_2|}{v_m} \cdot \frac{t_2}{t_{total}} + \ldots + |F_n|^3 \cdot \frac{|v_n|}{v_m} \cdot \frac{t_n}{t_{total}}}$$

Nominal life

– in revolutions L

$$L = \left(\frac{C}{F_m}\right)^3 \cdot 10^6$$

– in hours L_h

$$L_h = \frac{L}{n_m \cdot 60}$$

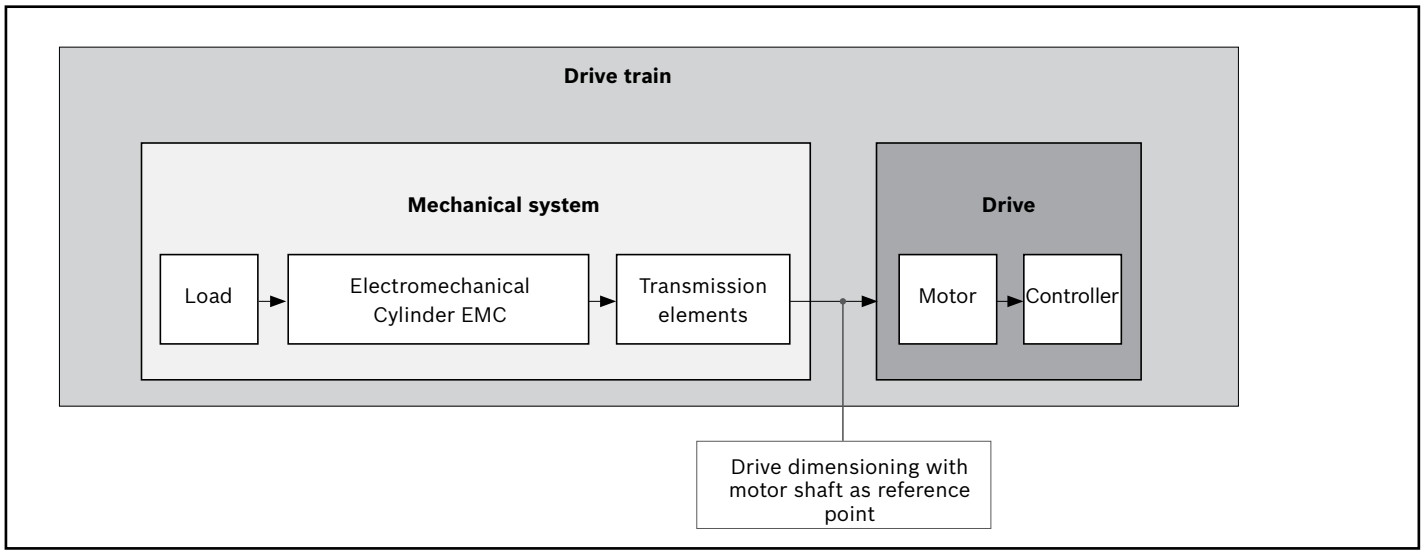
Drive torque M:

$$M = \frac{F \cdot P}{2{,}000 \cdot \pi \cdot \eta}$$

Drive dimensioning

Principles

For drive dimensioning, the drive train can be divided into the **mechanical system** and **drive system**.
The **mechanical system** includes the physical components – Electromechanical Cylinder EMC (including gear unit transmission element) – and the load to be carried.
The electric **drive** is a motor/controller combination with corresponding performance data.
The dimensioning of the electric drive is done taking the motor shaft as a reference point.
For drive dimensioning, limits must be taken into account as well as base values. The limits must not be exceeded in order to avoid damaging the mechanical components.



Technical data and formula symbols for the mechanical system

The relevant data for mount / coupling or timing belt drive side is already included in the specifications for the Electromechanical Cylinder EMC. In other words, the corresponding maximum permissible limits for torque and speed, as well as the underlying friction torque and mass moment of inertia with respect to the motor shaft are reduced, and can be taken directly from the tables (see “Drive data”).
The following technical data with the associated symbols are used when considering the basic mechanical system requirements in the design calculations for drive dimensioning. The data listed in the table below can be found in the “Technical data” section or they are determined using the formulas described on the following pages.

		Mechanical system	
		Load	**EMC**
Weight moment	(Nm)	M_g [4]	–
Equivalent dynamic torque	(Nm)	M_m [1]	–
Frictional torque	(Nm)	–	M_{Rs} [3]
Mass moment of inertia	(kgm^2)	J_t [1]	J_s [2]
Max. permissible linear speed	(m/s)	–	v_{max} [3]
Max. permissible rotary speed	(rpm)		n_P [3]
Max. permissible drive torque	(Nm)	–	M_p [3], M_{pl} [1]

[1] Determine the value using the appropriate formula
[2] Length-dependent value, determined using the appropriate formula
[3] Use the value from the table
[4] For vertical mounting position: Determine the value using the appropriate formula

Drive dimensioning with motor shaft as reference point

When dimensioning the drive, all relevant design calculation values for the mechanical components in the drive train have to be determined and be expressed/reduced to the motor shaft. In other words, for a combination of mechanical components within the drive train, this will result in one value for each of the following:

- Frictional torque M_R
- Mass moment of inertia J_{ex}
- Maximum permissible speed v_{mech} (maximum permissible rotary speed n_{mech})
- Max. permissible drive torque M_{mech}

Determination of the values for each mechanical component in the drive train based on the motor shaft as a reference point

Frictional torque M_R

With the value for frictional torque of the EMC, friction is already reduced to the motor shaft.

$$M_R = M_{Rs}$$

Mass moment of inertia J_{ex}

The constants $k_{J\,fix}$, $k_{J\,var}$ and $k_{J\,m}$ used in the formulas already contain the mass moment of inertia and gear ratios for any incorporated transmission elements, and can therefore be taken from the “Drive data” table.

$$J_{ex} = J_s + J_t$$

Determining the mass moment of inertia of the EMC component (including transmission elements, if used)

$$J_s = (k_{J\,fix} + k_{J\,var} \cdot s_{max}) \cdot 10^{-6}$$

Determination of the translatory mass moment of inertia of the external load (reduced to motor shaft)

$$J_t = m_{ex} \cdot k_{J\,m} \cdot 10^{-6}$$

Maximum permissible speed and maximum permissible rotary speed

The value for the maximum permissible linear speed of the EMC already includes the permissible rotary speed for any incorporated transmission elements.

Maximum permissible speed v_{mech}

$$v_{mech} = v_{max}$$

Maximum permissible rotary speed n_{mech}

$$n_{mech} = n_p$$

When considering the complete drive train (mechanical system + motor/controller) the rotary speed of the motor can lie below the maximum value for the mechanical system (M_{mech}) and thus limit the maximum permissible rotary speed of the overall drive train.

Drive dimensioning

Maximum permissible drive torque M_p, M_{mech}

The lower value of the permissible drive torque of all mechanical components contained in the drive train (M_p) and allowable axial load from the user-defined installation case determines the maximum permissible drive torque of the mechanical system which needs to be taken into account as a limitation in the drive dimensioning.

The smaller value from the drive data table or that calculated from the F_{max} value from the permissible axial load on the cylinder mechanism diagram is valid.

$$M_{pl} = \frac{F_{max} \cdot P}{2{,}000 \cdot \pi \cdot \eta}$$

$$M_{mech} = \text{Minimum } (M_{p;}\, M_{pl})$$

When considering the complete drive train (mechanical system + motor/controller) the maximum torque of the motor can lie below the maximum value for the mechanical system (M_{mech}) and thus limit the maximum permissible drive torque of the overall drive train.

If the maximum torque of the motor lies above the upper limit for the mechanical system (M_{mech}), the maximum motor torque must be limited to the permitted value for the mechanical system.

Pre-selecting the motor

The motor can be generally preselected using the following conditions.

Condition 1:

The rotary speed of the motor must be greater than or equal to the rotary speed required for the mechanical system (but not exceeding the maximum permissible limit value).

$$n_{max} \geq n_{mech}$$

Condition 2:

Consideration of the ratio of mass moments of inertia of the mechanical system and the motor. The ratio of the mass moments of inertia serves as an indicator for the control performance of a motor/controller combination.

The mass moment of inertia of the motor is directly related to the motor size.

Mass moment of inertia ratio

$$v = \frac{J_{ex}}{J_m + J_{br}}$$

For preselection, experience has shown that the following ratios will result in high control performance.

These are not rigid limits, but values exceeding them will require closer consideration of the specific application.

Application area	**V**
Handling	≤ 6.0
Processing	≤ 1.5

Condition 3:
Estimation of the ratio of the static load moment to the continuous torque of the motor. The torque ratio must be less than or equal to an empirical value of 0.6. This condition roughly factors in the missing dynamic characteristics of an exact motion profile with the required motor torques.

Torque ratio:

$$\frac{M_{stat}}{M_0} \leq 0.6$$

Static load moment:

$$M_{stat} = M_R + M_g + M_m$$

Weight moment:
For vertical mounting position only!
For motor attachment via mount and coupling: i = 1

$$M_g = \frac{P \cdot (m_{ex} + m_{ca}) \cdot g}{2{,}000 \cdot \pi \cdot i \cdot \eta}$$

Equivalent dynamic torque:

$$M_m = \frac{F_m \cdot P}{2{,}000 \cdot \pi \cdot i \cdot \eta}$$

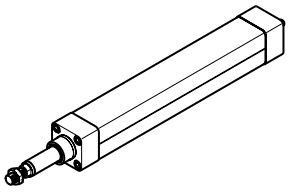
The equivalent dynamic torque can be calculated approximately via the average load F_m.
The appropriate mechanical efficiency must be used depending on the drive element for the Rexroth Ball Screw Assembly.

In the “Configuration and ordering” section, users can put together standard configurations including gear reducer and motor, for the various EMC sizes by selecting the appropriate options. By checking the three conditions stated above, it is possible to see whether a standard motor selected in a particular configuration will generally be of a suitable size for the specific application.

Precise drive dimensioning

Preselecting the motor according to this rough guide is no substitute for the required precise design calculations for the drive, taking all moments/torques and rotary speed levels into account. For precise calculation of the electric drive, including consideration of the specific motion profile, please refer to the performance data in the catalog “Rexroth drive technology”. When dimensioning the drive, the maximum permitted values for linear speed, drive torque and acceleration must not be exceeded, in order to avoid damaging the mechanical system!

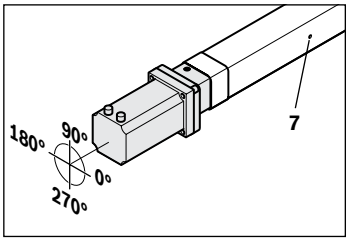
EMC 32 – EMC 50

Size Short product name	Max. travel range mm	Housing			Drive		Lubrication[1]				Switch[6]				Version	
		Standard	IP65 rating	IP65 rating with +R option	BASA d_0 x P (mm)		LSS	LCF	LPG	LHG	without switch and sensor profile	Sensor profile	Switches 1, 2, 3, 4			
EMC-032-NN-2		01	02	03	12 x 5	01	01	02	03	04	00	80	PNP NC	120	OF01	without motor attachment
															MF01	with mount
					12 x 10	02									RV01 RV02 RV03	with timing belt side drive
EMC-040-NN-2					16 x 5	01							NPN NC	121	OF01	without motor attachment
															MF01	with mount
					16 x 10	02							PNP NO		RV01 RV02 RV03	with Timing belt side drive
					16 x 16	03										
EMC-050-NN-2					20 x 5	01							NPN NO	122	OF01	without motor attachment
															MF01	with mount
					20 x 10	02									RV01 RV02 RV03	with timing belt side drive
					20 x 20	04								123		

[1] LSS: Standard lubrication
LCF: Prepared for central lubrication system for fluid grease
LPG: Preserved version
LHG: Initial lubrication with NSF-H1 grease
[2] Attachment kit also available without motor (when ordering: enter “00” for motor); for motor mounting kit for customer motor see “Motor attachment” section.
[3] For motor types see “IndraDyn S - servo motors” section
[4] Measurement of frictional torque
[5] Lead deviation
[6] Sensor profile and switch not possible in combination with version RV03
[7] Lube fitting

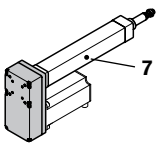
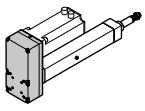
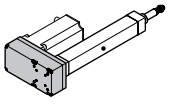
Mount	Motor connector position			
	0°	90°	180°	270°
MF01	000	090 ★	180	270

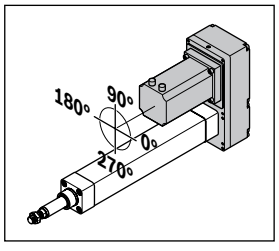
★ standard delivery



Example:
Mount MF01
Motor connector position 90°

Motor attachment		Motor					Documentation	
			Cable					
			2 cable		1 cable			
			Brake		Brake			
Gear ratio	Attachment kit[2]	Motor code[3]	without	with	without	with	Motor connector position	Standard report	Measurement report
	00	without	00						
	01	MSM019B-0300	134	135	–				
	02	MSM031B-0300	136	137	–				
	03	MS2N03-B0BYN	201	202	203	204	000		
i = 1	41	MSM019B-0300	134	135	–				
	42	MSM031B-0300	136	137	–				
	43	MS2N03-B0BYN	201	202	203	204			
	00	without	00						
	05	MSM031C-0300	138	139	–				
	06	MS2N03-B0BYN	201	202	203	204			
	200	MS2N03-D0BYN	205	206	207	208			
	07	MS2N04-B0BTN	209	210	211	212	090		
	45	MSM031C-0300	138	139	–				
i = 1	46	MS2N03-B0BYN	201	202	203	204			
	47	MS2N04-B0BTN	209	210	211	212			
		MS2N04-C0BTN	213	214	215	216			
	49	MSM031C-0300	138	139	–			01	02[4] 03[5]
i = 1.5	50	MS2N03-B0BYN	201	202	203	204			
	51	MS2N04-B0BTN	209	210	211	212			
	00	without	00				180		
	09	MSM031C-0300	138	139	–				
	10	MSM041B-0300	140	141	–				
	11	MS2N04-B0BTN	209	210	211	212			
		MS2N04-C0BTN	213	214	215	216			
	12	MS2N05-B0BTN	221	222	223	224			
	53	MSM031C-0300	138	139	–				
i = 1	54	MSM041B-0300	140	141	–				
	55	MS2N04-C0BTN	213	214	215	216	270		
	56	MS2N05-C0BTN	225	226	227	228			
	58	MSM031C-0300	138	139	–				
i = 1.5	59	MSM041B-0300	140	141	–				
	60	MS2N04-B0BTN	209	210	211	212			

RV01	RV02	RV03
		



Example:
Timing belt side drive RV02
Motor connector position 90°

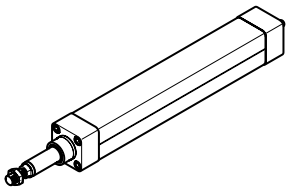
Timing belt side drive	Motor connector position 0°	90°	180°	270°
RV01	000	–	180	270 ★
RV02	000	090 ★	180	–
RV03	000 ★	090	–	270

★ standard delivery

Explanation of the order parameters and order example

➠ **“Order example” section.**

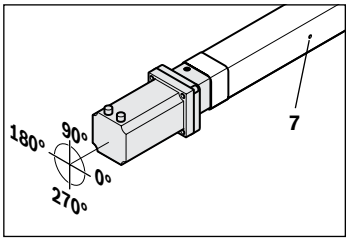
EMC 63 – EMC 80

Size Short product name	Max. travel range mm	Housing			Drive		Lubrication[1]				Switch[6]				Version	
		Standard	IP65 rating	IP65 rating with +R option	BASA d_0 x P (mm)		LSS	LCF	LPG	LHG	without switch and sensor profile	Sensor profile	Switches 1, 2, 3, 4			
EMC-063-NN-2		01	02	03	25 x 5	01	01	02	03	04	00	80	PNP NC	120	OF01	without motor attachment
															MF01	with mount
					25 x 10	02									RV01 RV02 RV03	with timing belt side drive
					25 x 25	05							NPN NC	121		
EMC-080-NN-2					32 x 5	01							PNP NO	122	OF01	without motor attachment
															MF01	with mount
					32 x 10	02										
					32 x 20	04							NPN NO	123	RV01 RV02 RV03	with timing belt side drive
					32 x 32	06										

[1] LSS: Standard lubrication
LCF: Prepared for central lubrication system for fluid grease
LPG: Preserved version
LHG: Initial lubrication with NSF-H1 grease
[2] Attachment kit also available without motor (when ordering: enter “00” for motor); for motor mounting kit for customer motor see “Motor attachment” section.
[3] For motor types see “IndraDyn S - servo motors” section
[4] Measurement of frictional torque
[5] Lead deviation
[6] Sensor profile and switch not possible in combination with version RV03
[7] Lube fitting

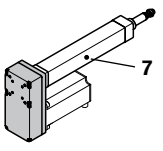
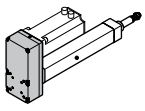
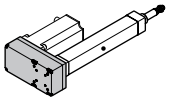
Mount	Motor connector position			
	0°	90°	180°	270°
MF01	000	090 ★	180	270

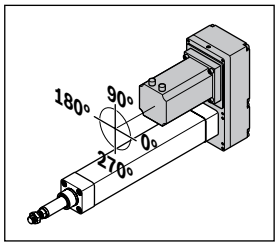
★ standard delivery



Example:
Mount MF01
Motor connector position 90°

Motor attachment		Motor					Documentation		
			Motor code[3]	Cable			Motor connector position	Standard report	Measurement report
				2 cable Brake		1 cable Brake			
Gear ratio	Attachment kit[2]			without	with	without	with			
	00	without		00						
	14	MSM041B-0300		140	141	–				
	15	MS2N04-D0BQN		217	218	219	220			
	16	MS2N05-D0BRN		229	230	231	232			
	17	MS2N06-C0BTN		237	238	239	240			
		MS2N06-D0BTN		241	242	243	244	00		
	62	MSM041B-0300		140	141	–				
	63	MS2N04-D0BQN		217	218	219	220			
i = 1	64	MS2N05-D0BRN		229	230	231	232			
	65	MS2N06-C0BTN		237	238	239	240			
		MS2N06-D1BNN		245	246	247	248			
	67	MSM041B-0300		140	141	–				
i = 2	68	MS2N04-C0BTN		213	214	215	216	090		
	69	MS2N05-B0BTN		221	222	223	224			
	00	without		00						
	19	MS2N05-D0BRN		229	230	231	232			
	20	MS2N06-C0BTN		237	238	239	240			
		MS2N06-D0BTN		241	242	243	244			
		MS2N06-E0BTN		249	250	251	252	180		
	201	MS2N07-C0BQN		257	258	259	260			
		MS2N07-D0BRN		265	266	–				
	71	MS2N05-D0BRN		229	230	231	232			
i = 1	72	MS2N06-D1BNN		245	246	247	248			
	202	MS2N07-B1BNN		253	254	255	256			
		MS2N07-C1BRN		261	262	263	264	270		
	75	MS2N05-B0BTN		221	222	223	224			
i = 2		MS2N05-C0BTN		225	226	227	228			
	76	MS2N06-C0BTN		237	238	239	240			
		MS2N06-D0BTN		241	242	243	244			
								01	02[4]	03[5]

RV01	RV02	RV03
		



Example:
Timing belt side drive RV02
Motor connector position 90°

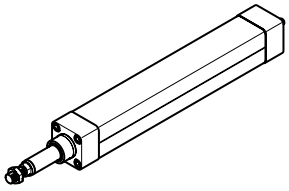
Timing belt side drive	Motor connector position			
	0°	90°	180°	270°
RV01	000	–	180	270 ★
RV02	000	090 ★	180	–
RV03	000 ★	090	–	270

★ standard delivery

Explanation of the order parameters and order example

➠ **“Order example” section.**

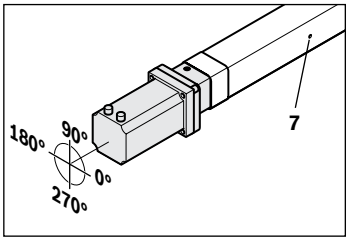
EMC 100 – EMC 100XC

Size Short product name	Max. travel range mm	Housing			Drive		Lubrication[1]				Switch[6]				Version	
		Standard	IP65 rating	IP65 rating with +R option	BASA d_0 x P (mm)		LSS	LCF	LPG	LHG	without switch and sensor profile	Sensor profile	Switches 1, 2, 3, 4			
EMC-100-NN-2		01	02	03	40 x 5	01	01	02	03	04	00	80	PNP NC	120	OF01	without motor attachment
					40 x 10	02									MF01	with mount
					40 x 20	04							NPN NC	121	RV01 RV02 RV03	with timing belt side drive
					40 x 40	07							PNP NO	122	OF01	without motor attachment
EMC-100-XC-2					50 x 10	02							NPN NO		MF01	with mount
					50 x 20	04								123	RV01 RV02 RV03	with timing belt side drive

[1] LSS: Standard lubrication
LCF: Prepared for central lubrication system for fluid grease
LPG: Preserved version
LHG: Initial lubrication with NSF-H1 grease
[2] Attachment kit also available without motor (when ordering: enter “00” for motor); for motor mounting kit for customer motor see “Motor attachment” section.
[3] For motor types see “IndraDyn S - servo motors” section
[4] Measurement of frictional torque
[5] Lead deviation
[6] Sensor profile and switch not possible in combination with version RV03
[7] Lube fitting

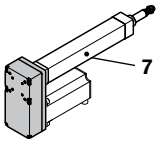
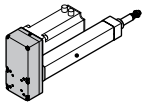
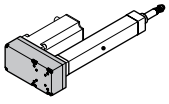
Mount	Motor connector position			
	0°	90°	180°	270°
MF01	000	090 ★	180	270

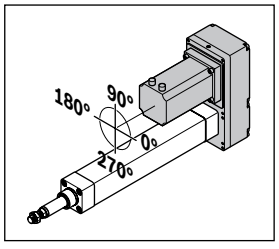
★ standard delivery



Example:
Mount MF01
Motor connector position 90°

Motor attachment		Motor					Documentation		
			Cable						
			2 cable		1 cable				
Gear ratio	Attachment kit[2]	Motor code[3]	without brake	with brake	without brake	with brake	Motor connector position	Standard report	Measurement report
	00	without	00				00 / 090 / 180 / 270	01	02[4] / 03[5]
	23	MS2N06-D0BRN	241	242	243	244			
		MS2N06-E0BRN	249	250	251	252			
	24	MS2N07-C0BQN	257	258	259	260			
		MS2N07-D0BRN	265	266	–				
		MS2N07-E0BQN	271	272					
i = 1	203	MS2N06-D1BNN	245	246	247	248			
	79	MS2N07-C1BRN	261	262	263	264			
		MS2N07-D0BRN	265	266	–				
		MS2N07-E0BQN	271	272					
i = 2	204	MS2N06-C0BTN	237	238	239	240			
		MS2N06-D0BRN	241	242	243	244			
		MS2N06-E0BRN	249	250	251	252			
	205	MS2N07-B1BNN	253	254	255	256			
		MS2N07-C0BQN	257	258	259	260			
		MS2N07-D0BRN	265	266	–				
	00	without	00						
	27	MS2N07-E0BQN	271	272					
	28	MS2N10-D0BNN	277	278					
		MS2N10-E0BNN	279	280	–				
i = 1	85	MS2N07-E1BNN	273	274					
	86	MS2N10-D0BNN	277	278					
i = 1.5	88	MS2N07-D1BNN	267	268	269	270			
		MS2N07-E1BNN	273	274	–				
	89	MS2N10-C0BNN	275	276	–				
		MS2N10-D0BNN	277	278					

RV01	RV02	RV03
		



Example:
Timing belt side drive RV02
Motor connector position 90°

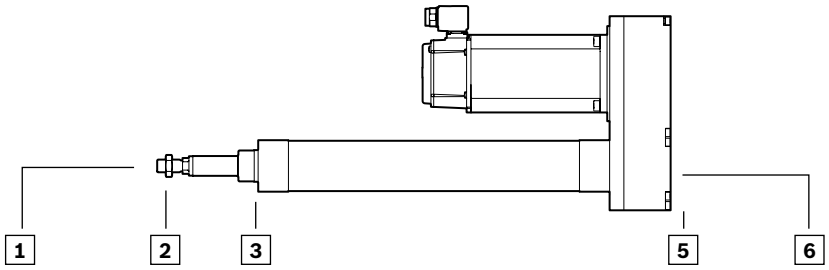
Timing belt side drive	Motor connector position 0°	90°	180°	270°
RV01	000	–	180	270 ★
RV02	000	090 ★	180	–
RV03	000 ★	090	–	270

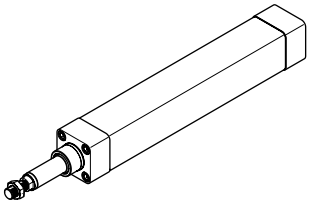
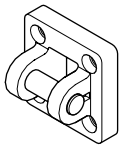
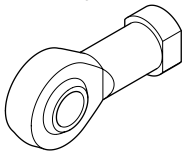
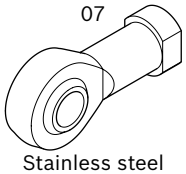
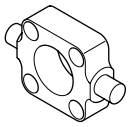
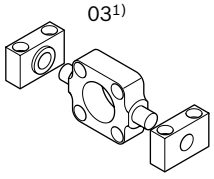
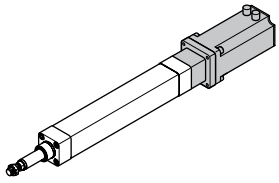
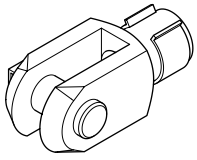
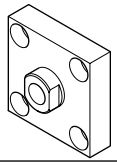
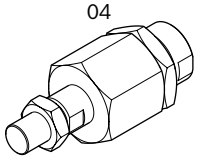
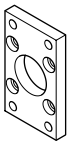
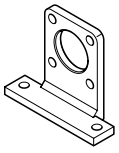
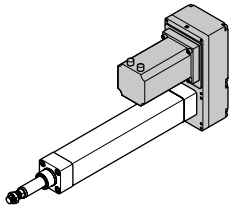
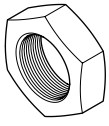
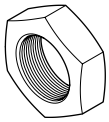
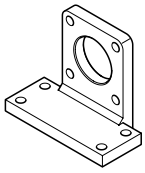
★ standard delivery

Explanation of the order parameters and order example
➠ **“Order example” section.**

Fastening elements

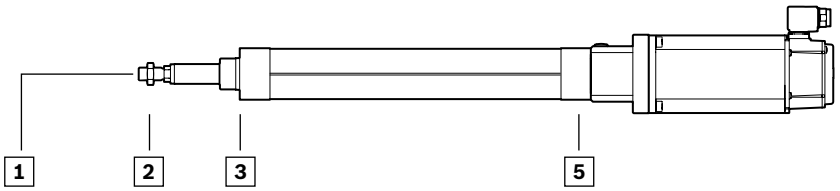
Fastening element

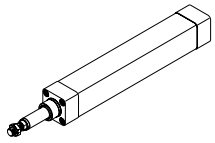
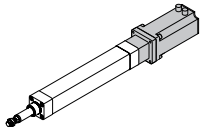
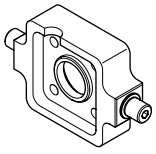
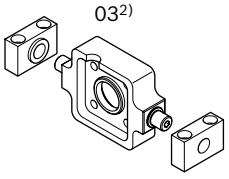
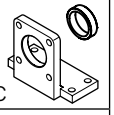
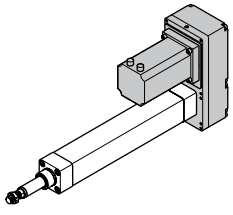
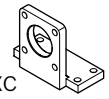
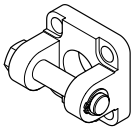
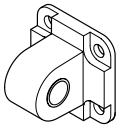
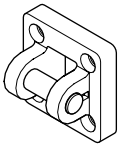
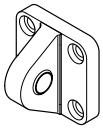
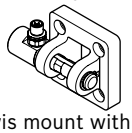
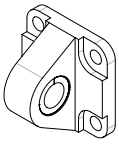


Version	**Group**			
	1	**2**	**3**	**4**
	00 without	00 without	00 without	00 without
without motor attachment OF01 	01  02  Clevis mount with load measuring pin	01  07  Stainless steel	01[1]  03[1] 	
with mount and coupling MF01 		02  03  04 	04  06 EMC-32 - EMC-50 	
with timing belt side drive RV01 to RV03 		05  06  Stainless steel	EMC-63 - EMC-100XC 	

[1] Only allowed vertically

[2] Fastening elements are supplied assembled when version with mount and coupling is selected

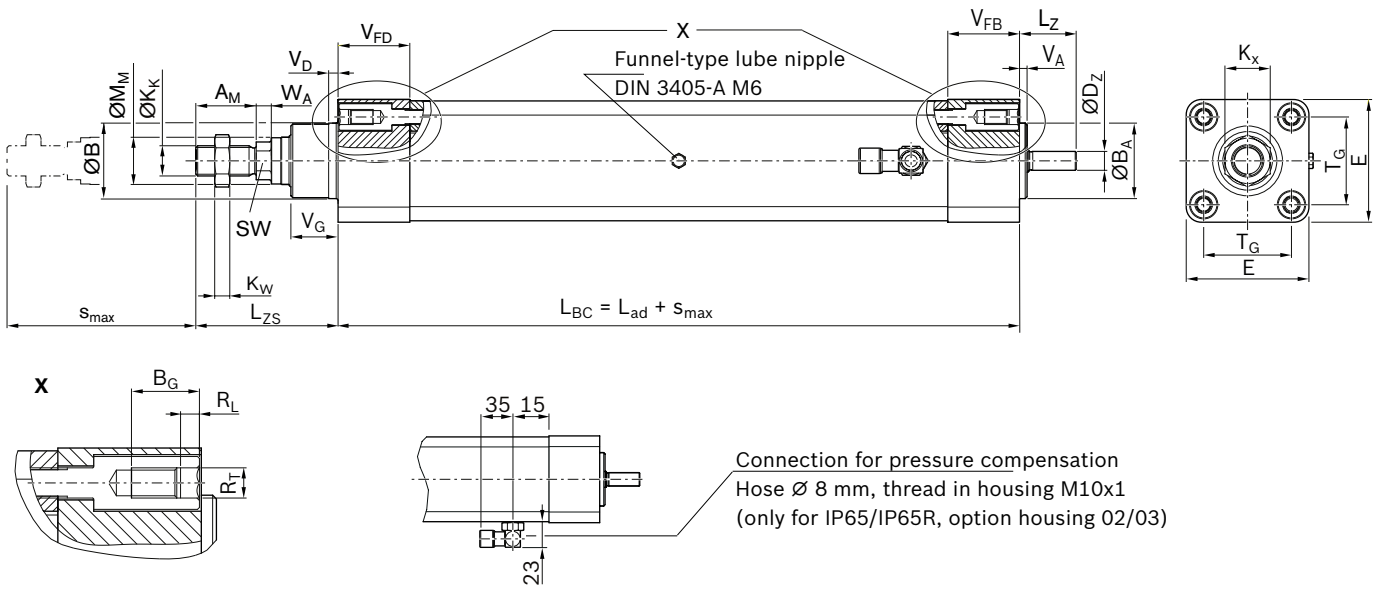


Version	Group			
	5		6	
	00	without	00	without
without motor attachment OF01  with mount and coupling MF01 	01[2)] 			
	03[2)] 			
	05[2)] EMC-32 - EMC-50   EMC-63 - EMC-100XC			
with timing belt side drive RV01 to RV03 	06 EMC-32 - EMC-50   EMC-63 - EMC-100XC			
	07 		01 EMC-32 - EMC-50   EMC-63 - EMC-100XC	02 
	08 		03 EMC-32 - EMC-50   EMC-63 - EMC-100XC	04 
	10  Clevis mount with load measuring pin		05 	

Note: Fastening elements are included

Dimensional drawing

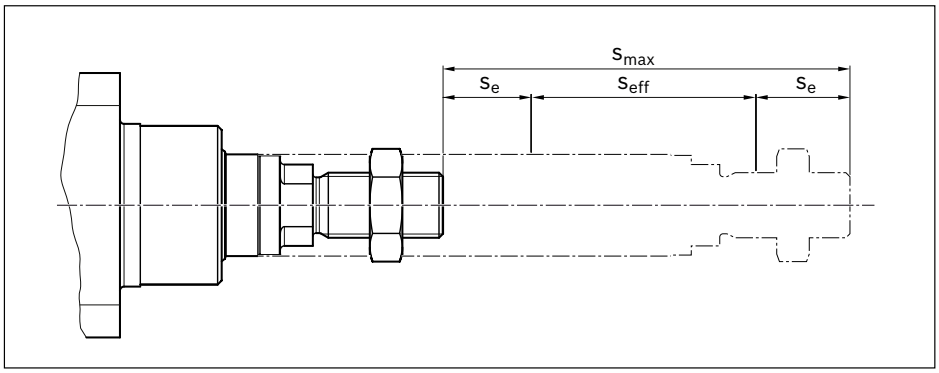
OF01



EMC	BASA	Dimensions (mm)							
	d_0 x P	A_M -0.1	B $_{d11}$ / $B_{A\ h7}$	$D^{Z\ h7}$	E ±0.1	K_K	K_W	K_X	L_{ZS}
32	12 x 5	22	30	5	47	M10x1.25	6	17	55.00
	12 x 10								
40	16 x 5	24	35	8	53	M12x1.25	7	19	61.50
	16 x 10								
	16 x 16								
50	20 x 5	32	40	10	65	M16x1.5	8	24	76.75
	20 x 10								
	20 x 20								
63	25 x 5	32	45	15	75	M16x1.5	8	24	76.50
	25 x 10								
	25 x 25								
80	32 x 5	40	55	18	95	M20x1.5	10	30	94.50
	32 x 10								
	32 x 20								
	32 x 32								
100	40 x 5	40	65	25	115	M20x1.5	10	30	99.25
	40 x 10								
	40 x 20								
	40 x 40								
100XC	50 x 10	72	75	32	115	M36x2	18	55	144.00
	50 x 20								

Effective stroke

Excess travel must be greater than braking distance. The acceleration travel can be adopted as the guideline value for the braking distance.



$$s_{eff} = s_{max} - 2 \cdot s_e$$

s_e	=	excess travel	(mm)
s_{eff}	=	effective stroke	(mm)
s_{max}	=	maximum travel range	(mm)

Length calculation:

Total length of EMC for motor attachment with mount and coupling = $L_{zs} + s_{max} + L_{ad} + L_f + L_m$

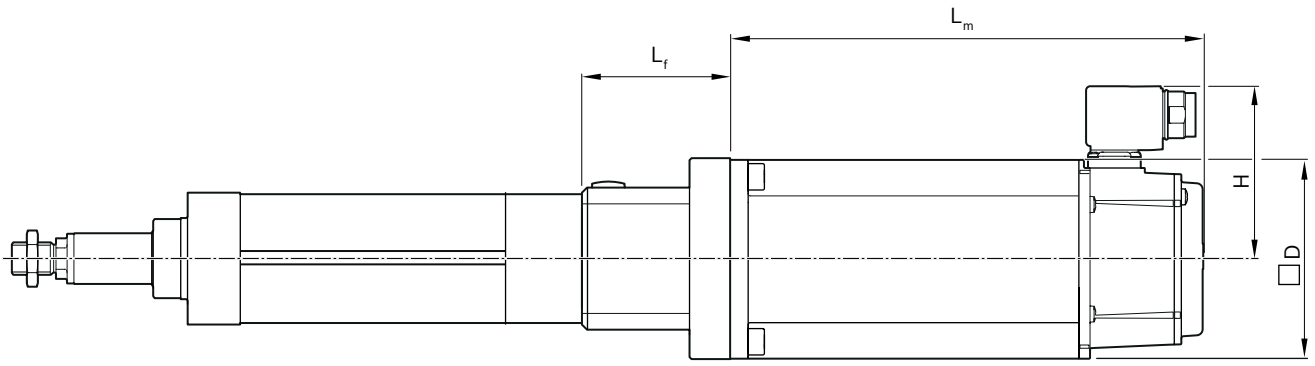
Total length of EMC for motor attachment with timing belt side drive = $L_{zs} + s_{max} + L_{ad} + G$

(for L_f, L_m and G, see following page)

L_{ad}	L_Z	$M_{M\,f8}$	R_T	B_G	R_L	A/F	T_G	V_A ±0.1	V_D	V_{FB}	V_{FD}	V_G ±0.1	W_A
132	18	18	M6	18	4	10	32.5	4	5	30	30	16	6
136													
134	25	20	M6		4	13	38.0			33		20	6
143													
159													
142	30	25	M8		5	17	46.5			38	38	25	8
161													
180													
148	35	30	M8		5	17	56.5			40			
167													
199													
163	46	38	M10	22	6	22	72.0			44	45	33	10
187													
195													
230													
171	57	50	M10		6	22	89.0			54		38	10
185													
203													
258													
316	62	60	M12	28	7	36	89.0			121	62	38	18
338													

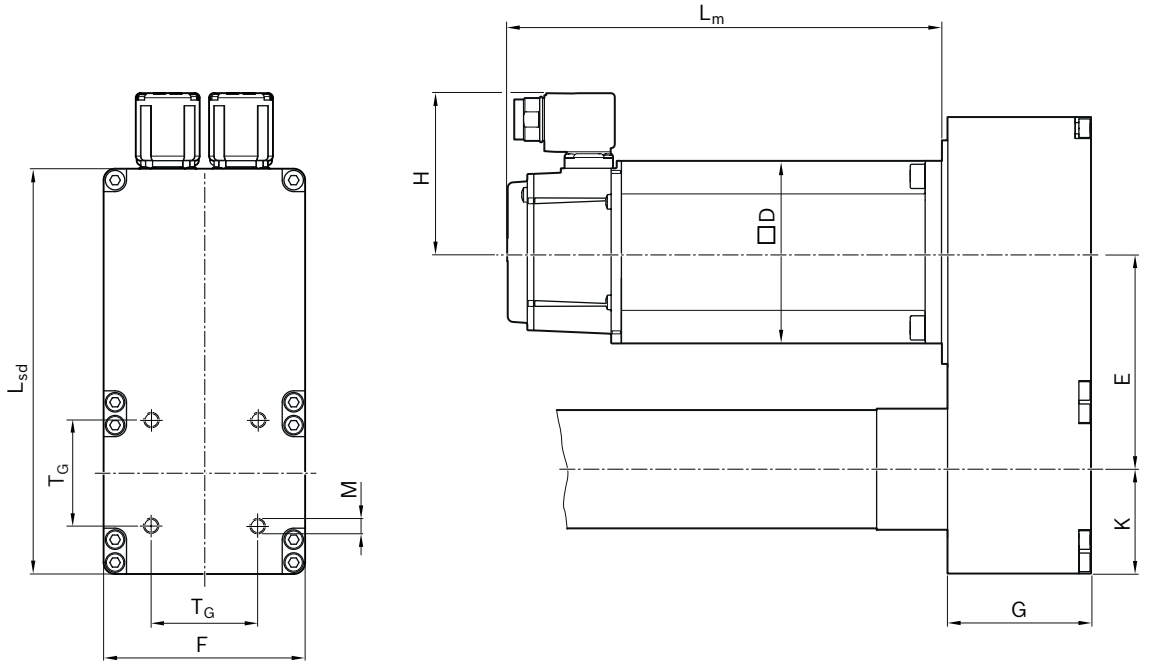
Dimension drawing for motor attachment with mount and coupling

MF01



Dimension drawing motor attachment with timing belt side drive

RV01, RV02, RV03



EMC	for motor	i	Dimensions (mm)													
			E	K	G	□D	H	L_m without brake	L_m with brake	L_{sd}	L_f	F	T_G	M	Max. permissible screw-in depth[1)]
32	MSM019B	1	67.3	30.5	37.0	38	32.0	92.0	122.0	130	55	54.0	32.5	M6	10.5
	MSM031B	1	62.8	33.0	45.5	60	43.0	79.0	115.5	138		64.5			16.0
	MS2N03B	1				54	71.5	188.0	213.0						
40	MSM031C	1	62.8	33.0	45.5	60	42.0	98.5	135.0	138	61	64.5	38.0	M6	16.0
		1.5	65.3												
	MS2N03B	1	62.8			54	71.5	188.0	213.0						
		1.5	65.3												
	MS2N04	1	82.2	44.0	55.5	82	83.5	185.5	215.5	177		88.0			
		1.5	81.5												
50	MSM031C	1	82.2	44.0	55.5	60	43.0	99.0	135.0	177	73	88.0	46.5	M8	16.0
		1.5	81.5												
	MSM041B	1	82.2			80	53.0	112.0	149.0						
		1.5	81.5												
	MS2N04	1	82.2			82	83.5	185.5	215.5						
		1.5	81.5												
	MS2N05	1	117.2	56.0	77.0	96	85.5	203.0	233.0	245		116.0			
63	MSM041B	1	117.2	56.0	77.0	80	53.0	112.0	149.0	245	95	116.0	56.5	M8	16.0
		2	116.2												
	MS2N03	1	117.2			82	83.5	185.5	215.5		88				
		2	116.2												
	MS2N05	1	117.2			98	85.5	203.0	233.0		95				
		2	116.2												
	MS2N06	1	117.2			116	98.5	226.0	259.0						
80	MS2N05	1	116.2	56.0	77.0	98	85.5	203.0	233.0	245	100	116.0	72.0	M10	16.0
		2	117.2												
	MS2N06	1	149.7	77.0	102.0	116	98.5	226.0	259.0	324		160.0			
		2	151.4												
	MS2N07	1	149.7			140	110.0	292.5	292.5						
100	MS2N06	1	149.7	77.0	102.0	116	98.5	226.0	259.0	324	119	160.0	89.0	M10	16.0
		2	151.4												
	MS2N07	1	149.7			140	110.0	292.5	292.5						
		2	151.4												
100XC	MS2N07	1	174.7	89.0	113.5	140	132.0	352.0	387.0	375	143	197.0	89.0/ 140.0	M12/ M16	24.0
		1.5	175.6												
	MS2N10	1	174.7			192	166.0	410.0	410.0		145				
		1.5	175.6												

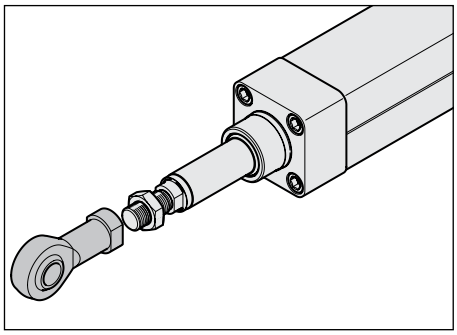
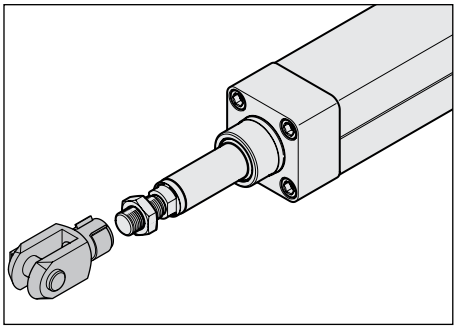
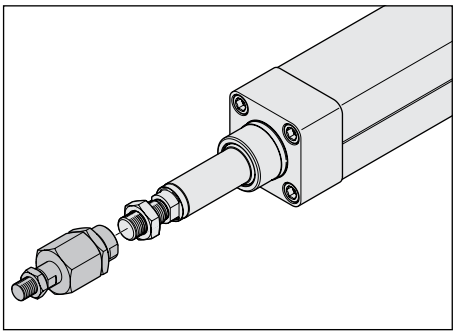
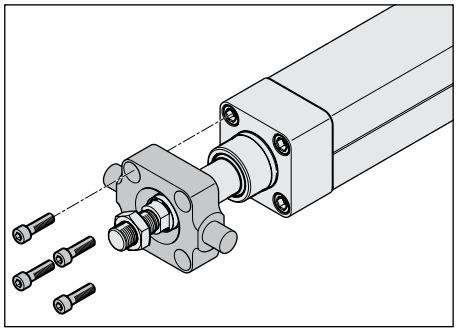
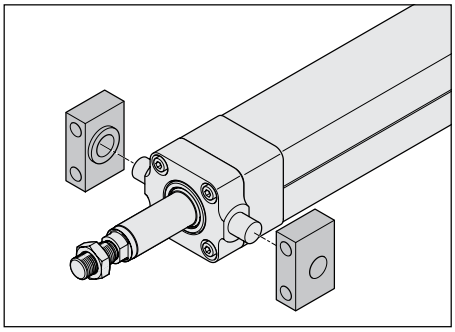
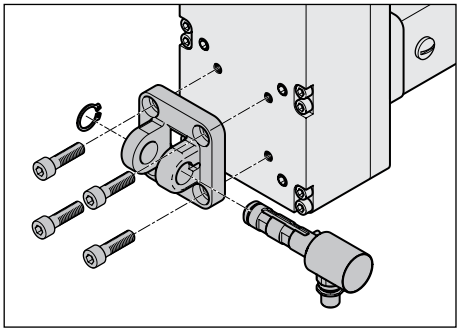
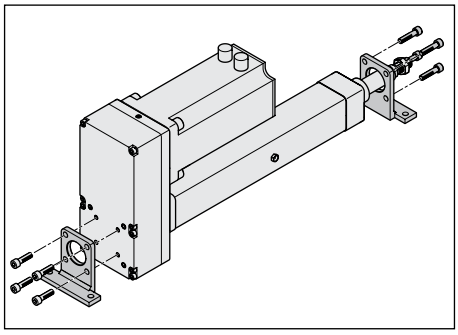
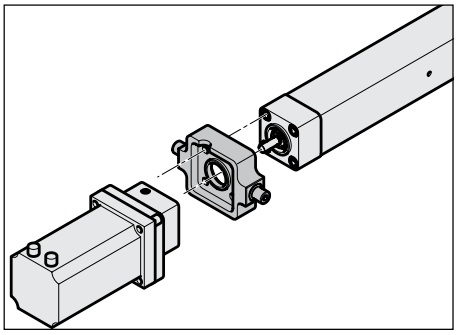
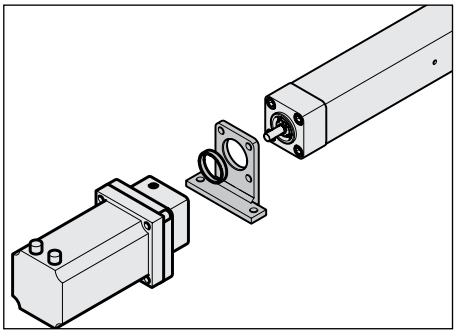
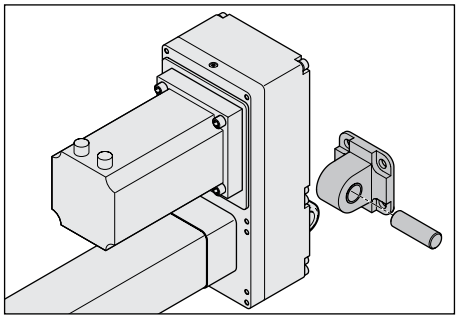
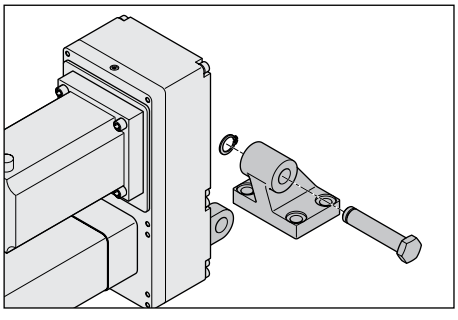
[1)] Do not exceed max. permissible screw-in depth for threads “M”

Mounting

⚠ When you order an EMC with mount, motor and foot mounting or trunnion on the bottom, the unit is delivered fully assembled. When attaching the fastening element retrospectively, the cylinder base mount first needs to be dismantled. See: “Instructions for EMC”, R320103102.

The fastening elements are mounted on the rear of the timing belt side drive. The screws are included with the fastening elements.
Before installing the fastening elements, remove the set screws on the timing belt side drive.

Examples

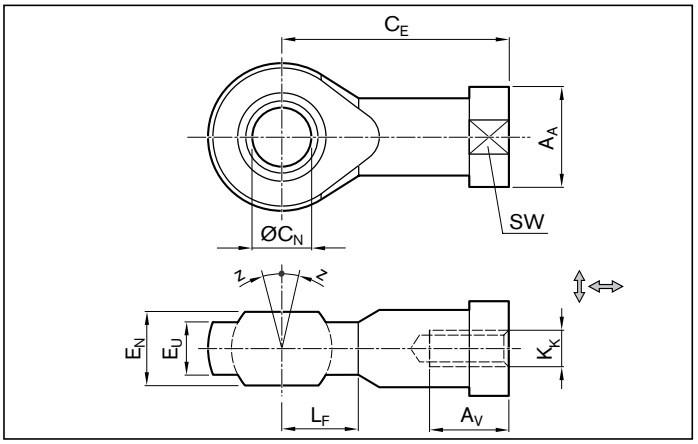












Fastening elements

Female spherical rod end bearing

Group 2 Option 01 Galvanized steel

Group 2 Option 07 Stainless steel



EMC	Part number		Dimensions (mm)										m
	Steel galvanized	Stainless steel	A_A	A_V min.	C_E	$ØC_N$ H7	E_N -0.1	E_U max.	K_K	L_F	A/F	Z (°)	(kg)
32	R349938500	R349951600	19	15	43	10	14	11.5 (10.5)	M10x1.25	14	17	4 (7)	0.070 (0.10)
40	R349938600	R349951700	22	18 (16)	50	12	16	12.5 (12)	M12x1.25	16	19	4 (7)	0.105 (0.12)
50	R349938700	R349951800	29	24	64	16	21	15.5 (15)	M16x1.5	21	24	4 (8)	0.210 (0.23)
63													
80	R349938900	R349951900	34	30 (33)	77	20	25	18.5 (18)	M20x1.5	25	30 (32)	4 (8)	0.380 (0.42)
100													
100XC	R349951500	R349952000	60 (53)	56 (53)	125	35	43 (35)	32 (24)	M36x2	40 (37)	50 (–)	4 (6)	2.000 (1.40)

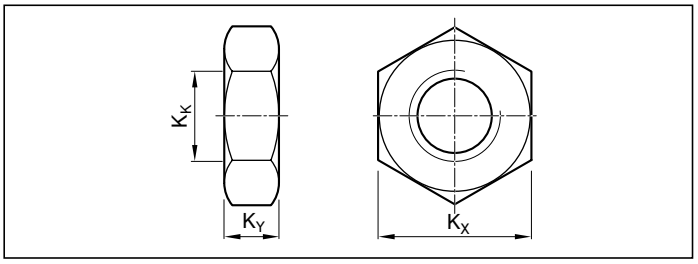
Bracketed values for “stainless steel” version

Fastening elements

Hexagon nut

Supplied with the EMC

Group 2 Option 05 Galvanized steel | **Group 2 Option 06 Stainless steel**



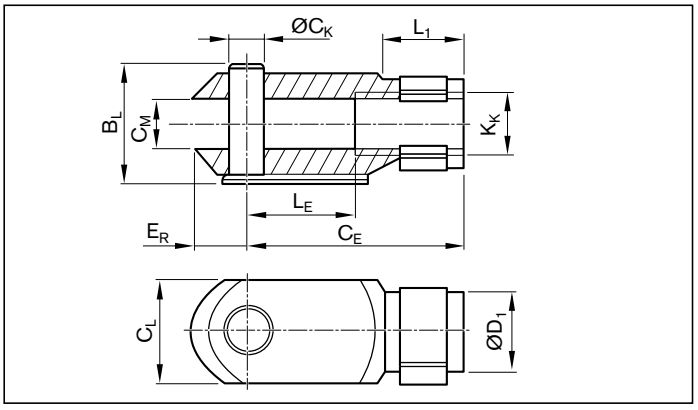
EMC	Part number		Dimensions (mm)			m
	Galvanized steel	Stainless steel	K_K	K_X	K_Y	(kg)
32	1823A00020	2990600303	M10x1.25	17	6 (5)	0.010
40	1823A00021	2990600304	M12x1.25	19	6	0.012
50 / **63**	1823300030	2990600305	M16x1.5	24	8	0.017
80 / **100**	1823300031	2990600308	M20x1.5	30	10	0.030
100XC	8103190414	2990600316	M36x2	55 (50)	18 (16)	0.175 (0.15)

Bracketed values for “stainless steel” version

Fork clevis with internal thread

Material: Galvanized steel

Group 2 Option 02

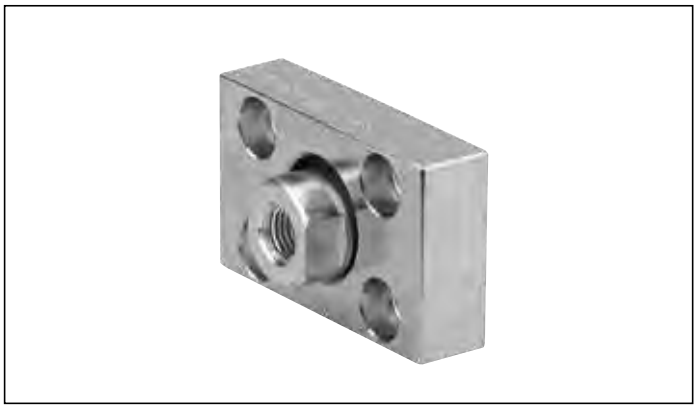


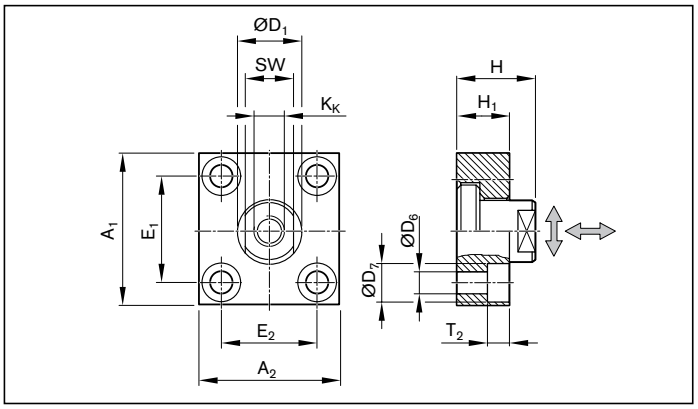
EMC	Part number	Dimensions (mm)									m
		B_L	C_E	$ØC_K$ e11	C_L	C_M	$ØD_1$	E_R	K_K	L_1	L_E	(kg)
32	R349939100	26	40	10	20	10	18	12	M10x1.25	15.0	20	0.10
40	R349939200	31	48	12	24	12	20	14	M12x1.25	18.0	24	0.15
50 / **63**	R349939300	39	64	16	32	16	26	19	M16x1.5	24.0	32	0.35
80 / **100**	R349939500	50	80	20	40	20	34	20	M20x1.5	30.0	40	0.70
100XC	R349951000	80	144	35	70	35	60	57	M36x2	54.5	72	1.40

Flexible coupling with mounting plate

Material: Galvanized steel

Group 2
Option 03



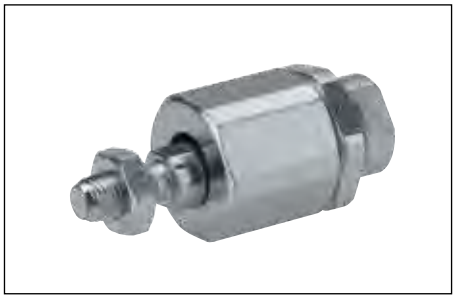


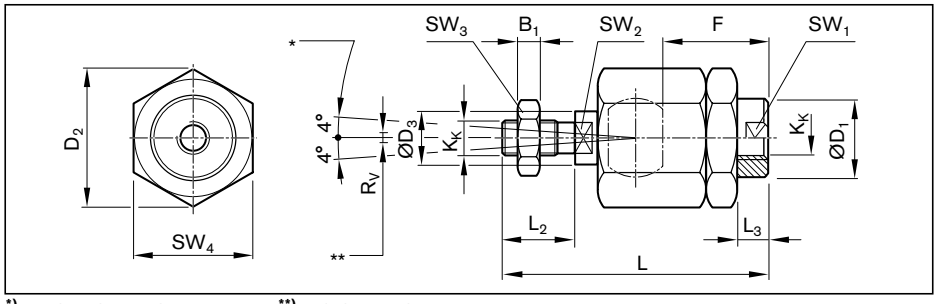
EMC	Part number	Dimensions (mm)													m	F_{max}
		A_1	A_2	ØD1 H11	ØD6 H13	ØD7 H13	E_1	E_2	H_1	H	K_K	A/F	T_2	Clearance (min./max) ⇔ axial	↕ radial	(kg)	(N)
32	R349939700	60	37	20	6.6	11	36±0.15	23±0.15	15	24	M10x1.25	17	7	0.4 – 0.8	1.9 – 2.3	0.30	$F_{max\ EMC}$
40	R349939800	60	56	25	9.0	15	42±0.20	38±0.20	20	30	M12x1.25	19	9			0.40	$F_{max\ EMC}$
50	R349939900	80	80	30	11.0	18	58±0.20	58±0.20	20	32	M16x1.5	24	11			0.90	$F_{max\ EMC}$
63																	$F_{max\ EMC}$
80	R349940100	90	90	40	14.0	20	65±0.30	65±0.30	20	35	M20x1.5	36	13			1.15	$F_{max\ EMC}$
100																	28,000
100XC	R349951100	125	125	60	18.0	26	90±0.30	90±0.30	30	55	M36x2	50	17	0.4 – 0.95	2.8 – 3.4	3.40	44,000

Flexible coupling

Material: Galvanized steel

Group 2
Option 04





*) Axial angle equalization **)Radial centerline movement

EMC	Part number	Dimensions (mm)																m	F_{max}
		B_1	ØD1	D_2	ØD3	F	K_K	L ±2	L_2	L_3 ±1	SW_1	SW_2	SW_3	SW_4	R_V	Axial clearance		(kg)	(N)
32	R349937900	6	22	32	14	23	M10x1.25	74.5	23	7.5	19	12	17	30	0.7	0.05 – 0.5		0.21	$F_{max\ EMC}$
40	R349938000	7	22	32	14	22	M12x1.25	75.0	24	13.0	19	12	19	30	0.7	0.05 – 0.5		0.21	$F_{max\ EMC}$
50	R349938100	8	32	45	22	30	M16x1.5	103.0	30	9.0	30	20	24	41	1.0	0.05 – 0.5		0.65	$F_{max\ EMC}$
63																			10,300
80	R349938300	10	32	45	22	40	M20x1.5	119.0	40	19.0	30	20	30	41	1.0	0.05 – 0.5		0.68	10,300
100																			
100XC	R349950900	18	80	80	38	86	M36x2	241	72	18.2	50	36	55	75	1.5	0.05 – 0.2		5.40	15,000

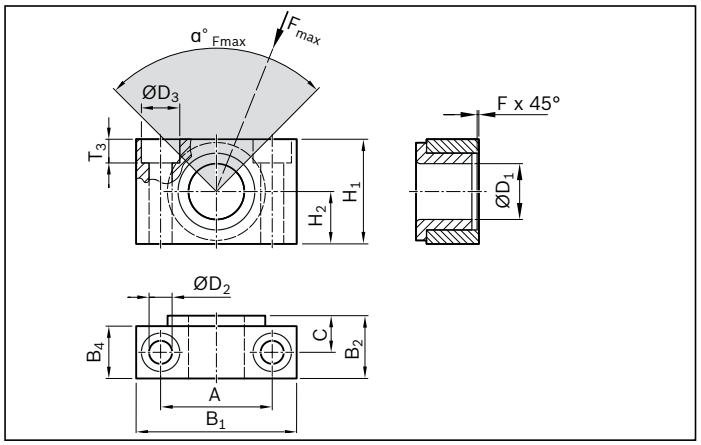
Radial clearance 0 – 2 mm

Fastening elements

Bearing for trunnion

Material: Galvanized steel, with female connectors made of sintered bronze. Delivered in pairs

Group 3 Option 03 | Group 5 Option 03



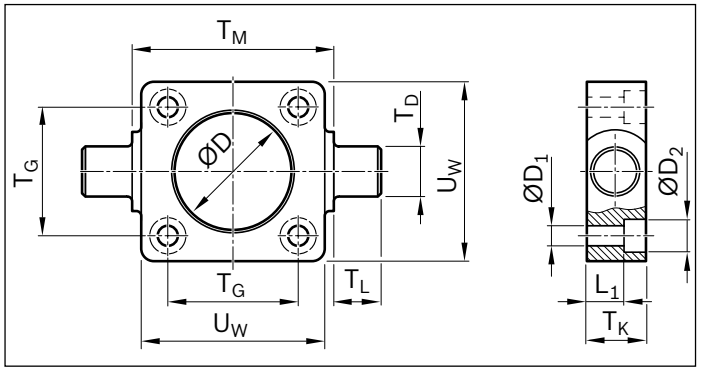
Note: Bearing for trunnion for vertical load; if α F_{max} is not complied with, a positive lock must be added

EMC	Part number	Dimensions (mm)												α°F_{max}
		A ±0.2	B_1 f8	B_2	B_4	C	ØD_1 H7	ØD_2 H12	ØD_3 H13	F x 45°	H_1	H_2 ±0.1	T_3 −0.4	
32	R349940900	32	46	18.0	15	10.5	12	6.6	11	1.0	30	15	6.8	180
40	R349941000	36	55	21.0	18	12.0	16	9.0	15	1.6	36	18	9.0	180
50														180
63	R349941200	42	65	23.0	20	13.0	20	11.0	18	1.6	40	20	11.0	110
80														70
100	R349941400	50	75	28.5	25	16.0	25	14.0	20	2.0	50	25	13.0	80
100XC														30

Trunnion for front end cap (only for vertical installation of EMC)

Material: Galvanized cast iron with spheroidal graphite. Fastening screws included in scope of delivery.

Group 3 Option 01 | Group 3 Option 03

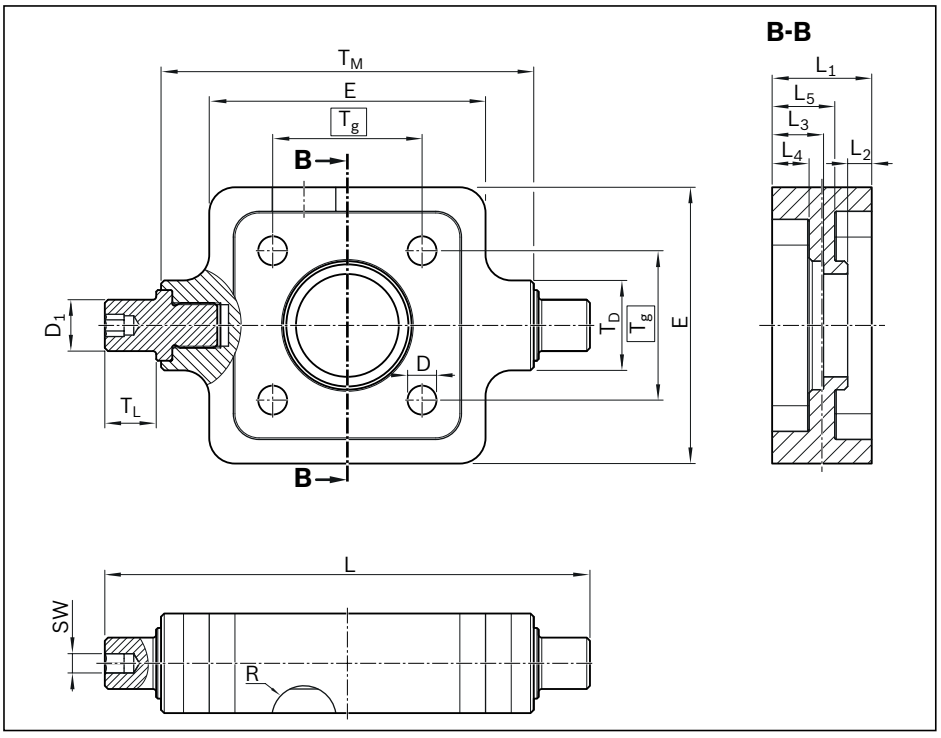


EMC	Part number	Dimensions (mm)										m
		ØD H11	ØD_1	ØD_2	L_1	T_D e9	T_G ±0.2	T_K	T_L h14	T_M h14	U_W	(kg)
32	R349940300	30	6.6	11	7.5	12	32.5	16	12	50	48	0.29
40	R349940400	35	6.6	11	7.5	16	38.0	20	16	63	56	0.50
50	R349940500	40	9.0	15	10.0	16	46.5	24	16	75	65	0.70
63	R349940600	45	9.0	15	10.0	20	56.5	24	20	90	75	1.10
80	R15615A001	55	11.0	18	16.0	20	72.0	28	20	110	100	1.50
100	R15616A001	65	11.0	18	25.5	25	89.0	38	25	132	120	2.70
100XC	R15617A001	75	13.5	20	25.5	25	89.0	38	25	132	120	3.88

Trunnion for rear end cap

Material: Galvanized steel. Fastening screws included in scope of delivery.

Group 5 Option 01 | Group 5 Option 03



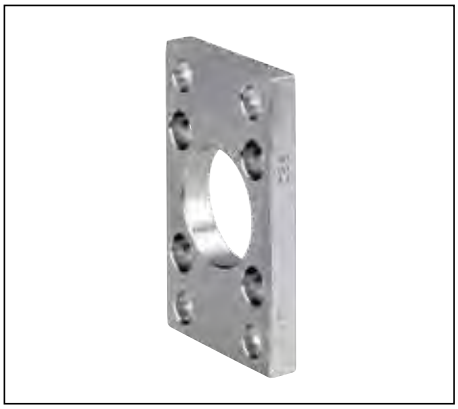
EMC	Part number	Dimensions (mm)															m
		ØD H13	$ØD_1$ h7	L	L_1 ±0.5	L_2 ±0.2	L_3 ±0.2	L_4 ±0.5	L_5 ±0.5	T_D ±0.5	T_g	T_M ±0.3	T_L ±0.2	E ±0.5	R	A/F	(kg)
32	R15611B013	6.6	12	115	25	5.5	14.0	9.5	15.5	22	32.5	90	12	60	10	6	0.472
40	R15612B013	6.6	16	135	28	6.5	15.0	10.5	17.5	28	38.0	100	16	65	10	6	0.657
50	R15613B013	9.0		151	31	7.5	16.0	11.5	19.5	28	46.5	116		86	10		1.141
63	R15614B013	9.0	20	173	35	7.5	16.5	11.5	23.5	35	56.5	130	20	90	10	8	1.468
80	R15615B013	11.0		193	36	7.5	16.5	11.5	24.5	38	72.0	150		105	10		2.079
100	R15616B013	11.0	25	233	38	7.5	16.5	11.5	26.5	38	89.0	180	25	125	10	12	2.725
100XC	R15617B013	13.5	25	253	44	7.5	16.5	11.5	32.5	45	89.0	200	25	140	11	12	4.480

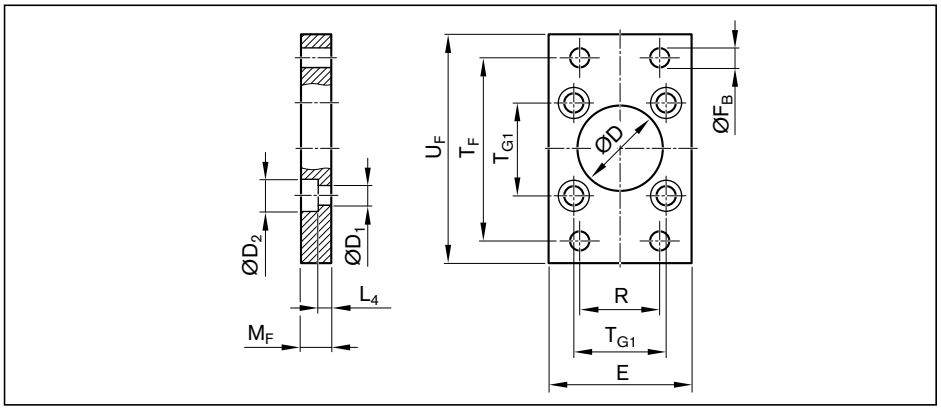
Fastening elements

Flange mounting

Material: Galvanized steel. Fastening screws included in scope of delivery.

Group 3
Option 04





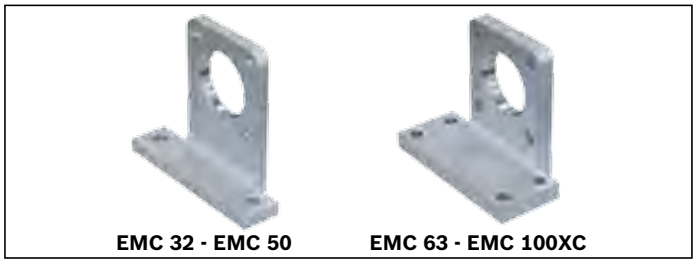
EMC	Part number	Dimensions (mm)											m
		ØD	$ØD_1$	$ØD_2$	E	$ØF_B$	L_4	M_F	R	T_F	T_{G1}	U_F	
		H11	H13	H13	max.			±0.1	±0.2	±0.2	±0.2	±0.2	(kg)
32	R349942100	30	6.6	11	50	7.0	4.5	10	32	64	32.5	80	0.3
40	R349942200	35	6.6	11	55	9.0	4.5	10	36	72	38.0	90	0.4
50	R349942300	40	9.0	15	65	9.0	6.0	12	45	90	46.5	110	0.8
63	R349942400	45	9.0	15	75	9.0	6.0	12	50	100	56.5	125	1.0
80	R15615A002	55	11.0	18	100	12.0	9.0	16	63	126	72.0	154	1.7
100	R15616A002	65	11.0	18	120	14.0	9.0	16	75	150	89.0	186	2.4
100XC	R15617A002	75	13.5	20	120	17.5	12.6	24	75	150	89.0	186	3.0

Foot mount for front end cap or timing belt side drive

Material: Galvanized steel

Fastening screws included in scope of delivery

Group 3 Option 06 | Group 5 Option 06



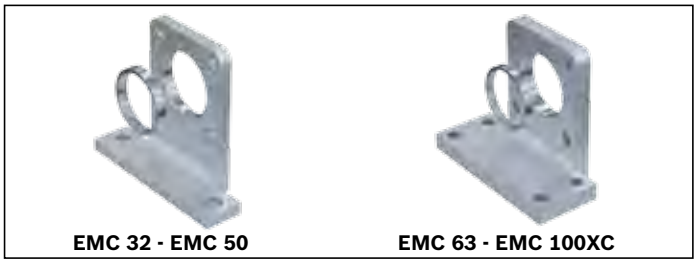
EMC	Part number	m (kg)
32	R15611B105	0.166
40	R15612B105	0.246
50	R15613B105	0.459
63	R15614B105	1.038
80	R15615B105	1.952
100	R15616B105	2.793
100XC	R15617B105	4.147

Foot mount with centering ring for rear end cap

Material: Galvanized steel

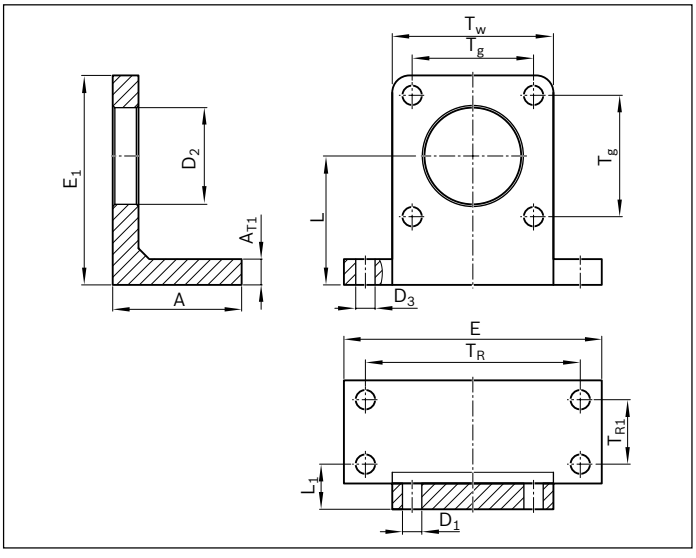
Fastening screws included in scope of delivery

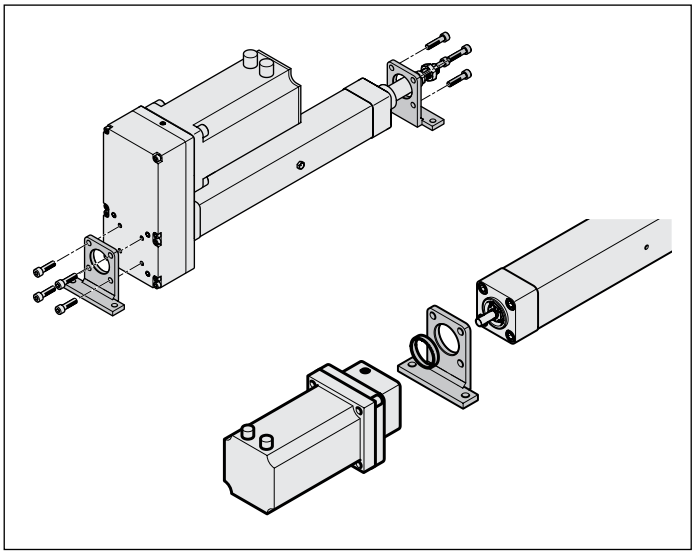
Group 5 Option 05



EMC	Part number	m[1] (kg)
32	R15611B104	0.172
40	R15612B104	0.252
50	R15613B104	0.465
63	R15614B104	1.047
80	R15615B104	1.962
100	R15616B104	2.805
100XC	R15617B104	4.165

[1] Including the weight of the centering ring





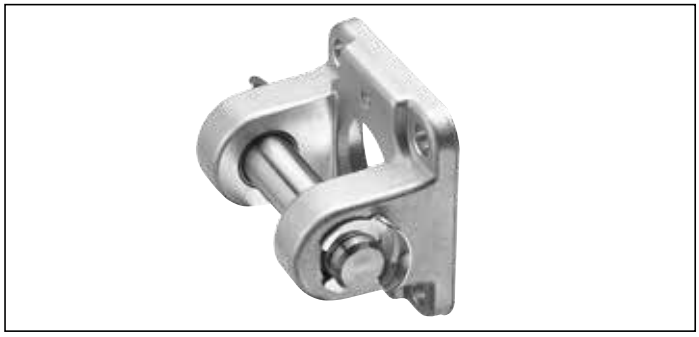
EMC	Dimensions (mm)												
	A ±0.5	A_{T1} ±0.5	ØD1 H13	ØD2 H7	ØD3 H13	E ±0.5	E_1 ±0.5	L ±0.1	L_1	T_R	T_{R1}	T_g	TW ±0.5
32	30	6	6.6	30	6.6	79	57.5	34	18	65	–	32.5	47
40	30	7	6.6	35	9.0	90	71.5	45	18	75	–	38.0	53
50	35	8	9.0	40	9.0	110	93.5	60	21	90	–	46.5	65
63	50	12	9.0	45	9.0	120	98.5	60	21	100	20	56.5	75
80	62	13	11.0	55	11.0	153	129.5	82	27	128	25	72.0	95
100	72	15	11.0	65	14.0	178	140.5	82	27	148	30	89.0	115
100XC	90	21	13.5	75	17.5	188	156.5	99	33	158	45	89.0	115

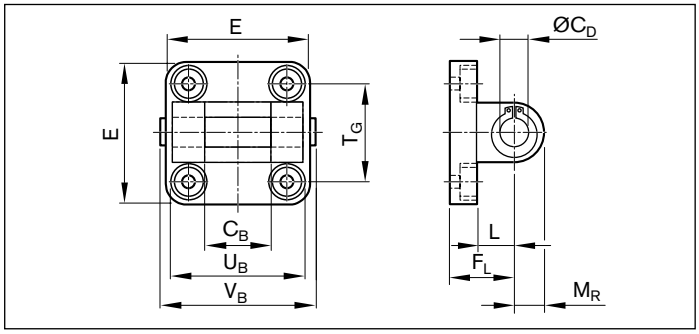
Fastening elements

Clevis mount

Bolts and fastening screws included in scope delivery

Group 5
Option 07





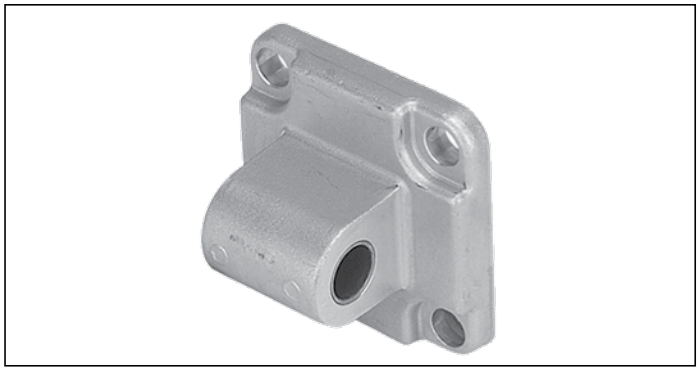
EMC	Part number	Dimensions (mm)									m	F_{max}
		C_B H14	ØC_D H9	E max.	F_L ±0.2	L min.	M_R	T_G ±0.2	U_B h14	V_B	(kg)	(N)
32	R349945700[1)]	26	10	49	22	12	10	32.5	45	50.0	0.09	$F_{max\ EMC}$
40	R349945800[1)]	28	12	53	25	15	13	38.0	52	57.0	0.11	$F_{max\ EMC}$
50	R349945900[1)]	32	12	63	27	15	13	46.5	60	65.0	0.18	$F_{max\ EMC}$
63	R349946000[1)]	40	16	73	32	18	17	56.5	70	76.0	0.25	10,900
80	R349946100[1)]	50	16	98	36	20	17	72.0	90	96.0	0.51	13,100
100	R349946200[1)]	60	20	115	41	25	18	89.0	110	117.0	0.70	16,400
100XC	R15617B026[2)]	90	30	177	55	35	31	140.0	170	180.5	2.14	$F_{max\ EMC}$

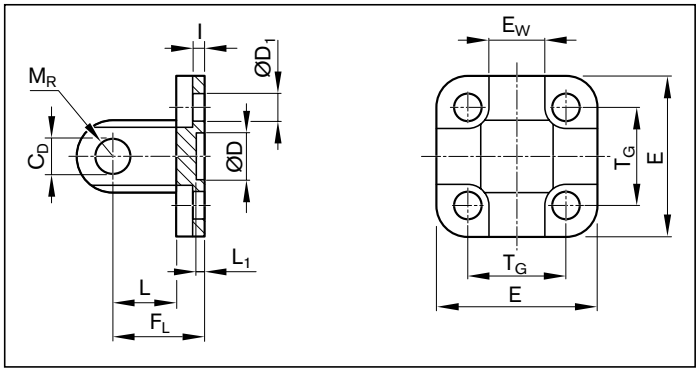
[1)] Material: Aluminum
[2)] Material: Galvanized cast iron with spheroidal graphite

Swivel mount

Fastening screws included in scope of delivery

Group 6
Option 02





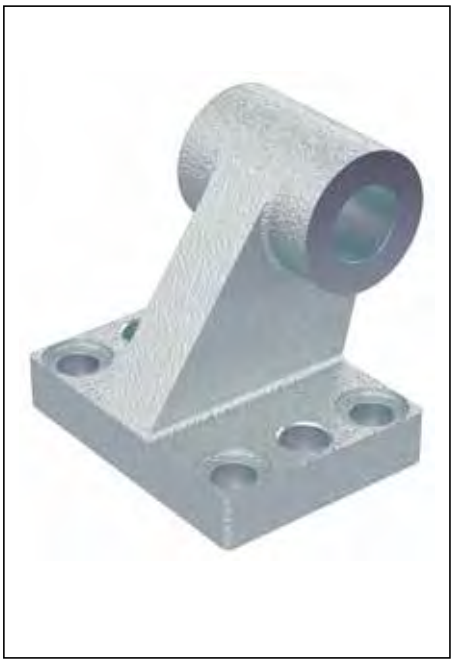
EMC	Part number	Dimensions (mm)												m	F_{max}
		C_D H9	ØD H11	D_1 H13	E	E_W −0.2/−0.6	F_L ±0.2	I ±0.5	L min.	L_1 min.	M_R max.	T_G ±0.2	DIN 912	(kg)	(N)
32	R349948100[1)]	10	30	6.6	48	26	22	5.5	12	4.5	10	32.5	M6x18	0.08	$F_{max\ EMC}$
40	R349948200[1)]	12	35	6.6	53	28	25	5.5	15	4.5	12	38.0	M6x18	0.11	$F_{max\ EMC}$
50	R349948300[1)]	12	40	9.0	63	32	27	6.5	15	4.5	12	46.5	M8x20	0.17	$F_{max\ EMC}$
63	R349948400[1)]	16	45	9.0	73	40	32	6.5	20	4.5	16	56.5	M8x20	0.27	10,900
80	R349948500[1)]	16	45	11.0	98	50	36	10.0	20	4.5	16	72.0	M10x20	0.50	13,100
100	R349948600[1)]	20	55	11.0	115	60	41	10.0	25	4.5	20	89.0	M10x20	0.77	16,400
100XC	1827004867[2)]	30	65	13.5	180	90	55	10.0	35	7.0	31	140±0.3	M16x50	2.60	$F_{max\ EMC}$

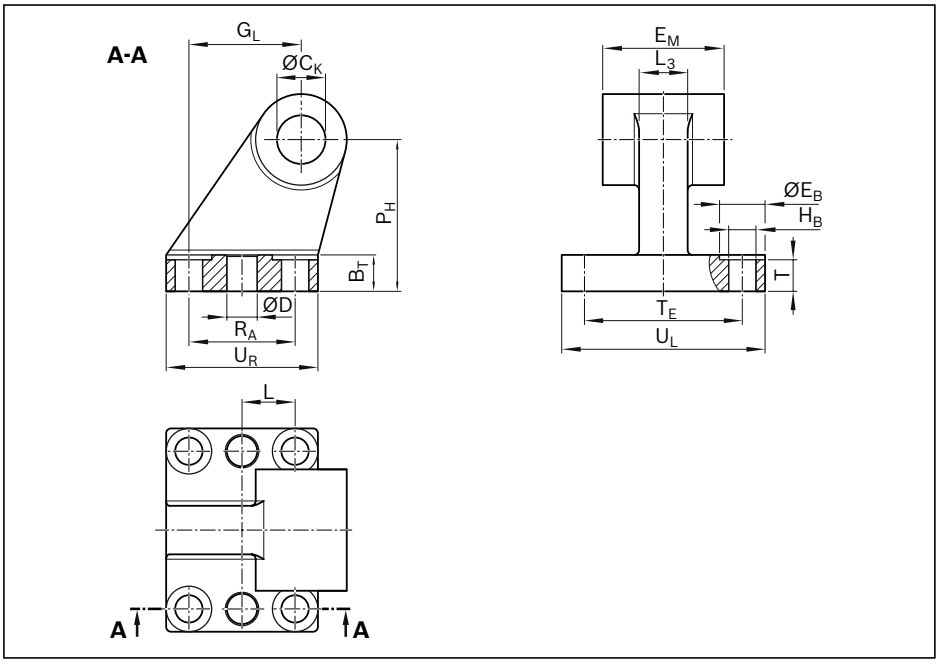
[1)] Material: Aluminum
[2)] Material: Galvanized cast iron with spheroidal graphite

Bearing block

Material: Galvanized cast iron with spheroidal graphite. Without fastening screws

Group 6
Option 01





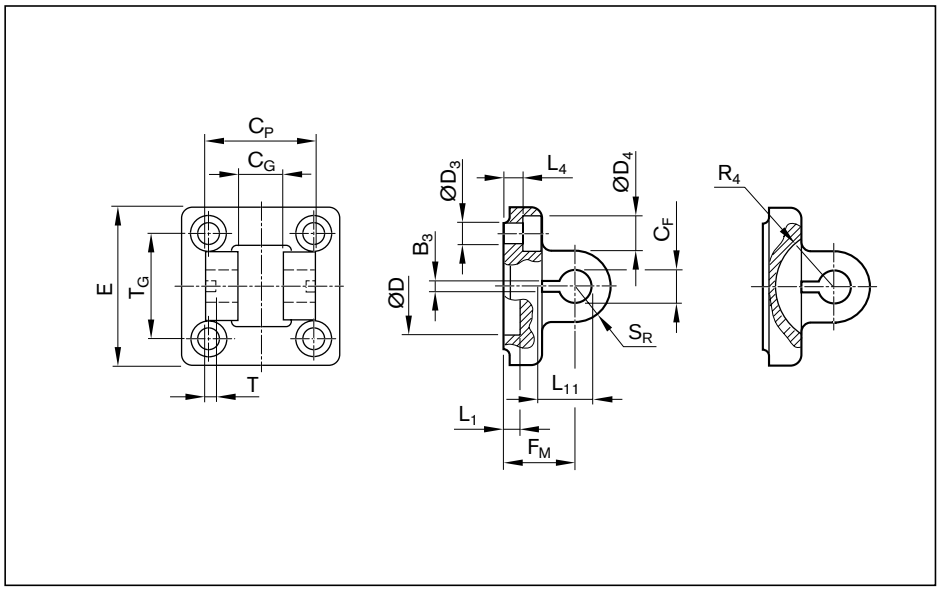
EMC	Part number	Dimensions (mm)																m
		B_R	B_T	$ØC_K$ H9	ØD H11	$ØE_B$ H13	E_M –0.2 –0.6	G_L	$ØH_B$ H13	L ±0.2	L_3	P_H JS15	R_A JS14	T	T_E JS14	U_L	U_R	(kg)
32	R349947500	10.0	8	10	–	10	26	21	6.6	–	10	32	18	4	38	51	31	0.20
40	R349947600	11.0	10	12	–	10	28	24	6.6	–	12	36	22	4	41	54	35	0.30
50	R349947700	13.0	12	12	–	11	32	33	9.0	–	16	45	30	6	50	65	45	0.50
63	R15614A017	15.0	12	16	10	11	40	37	9.0	17.5	16	50	35	6	52	67	50	0.85
80	R15615A017	15.0	14	16	10	15	50	47	9.0	20.0	20	63	40	6	66	86	60	1.40
100	R15616A017	19.0	15	20	10	15	60	55	11.0	25.0	20	71	50	6	76	96	70	1.90
100XC	R15617A017	31.5	25	25	12	26	90	97	14.0	44.0	36	115	88	17	118	156	126	1.90

Fastening elements

Clevis mount

Bolts and fastening screws included in scope delivery

Group 1 Option 01 | Group 5 Option 08



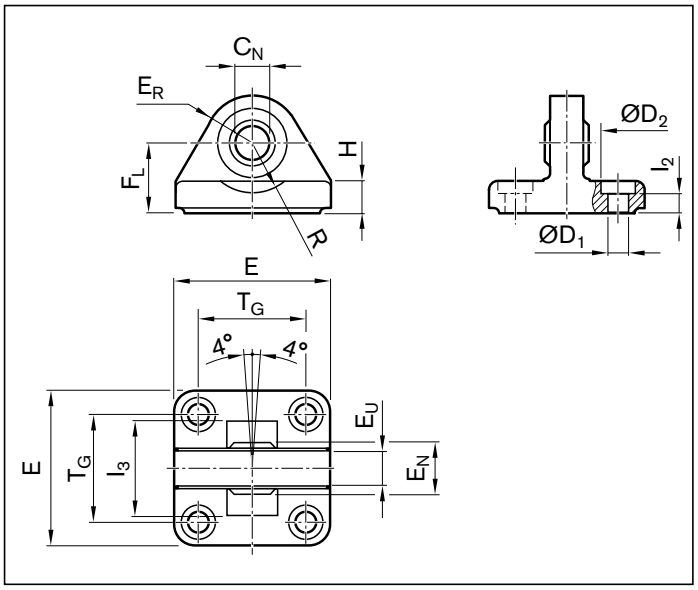
EMC	Part number	Dimensions (mm)																	m	F_{max}
		B_3 ±0.2	C_F F7	C_G D10	C_P d12	$ØD_3$	$ØD_4$	ØD	E	F_M ±0.2	L_1 ±0.5	L_4 ±0.5	L_{11} −0.5	R_4	S_R	T ±0.2	T_G ±0.2	DIN 912	(kg)	(N)
32	R349945100[1)]	3.3	10	14	34	6.6	11	30	49	22	4.5	5.5	16.5	17	11	3	32.5	M6x18	0.22	$F_{max\ EMC}$
40	R349945200[1)]	4.3	12	16	40	6.6	11	35	55	25	4.5	5.5	18.0	20	12	4	38.0	M6x18	0.29	$F_{max\ EMC}$
50	R349945300[1)]	4.3	16	21	45	9.0	15	40	67	27	4.5	6.5	23.0	22	15	4	46.5	M8x20	0.49	$F_{max\ EMC}$
63	R349945400[1)]	4.3	16	21	51	9.0	15	45	77	32	4.5	6.5	23.0	25	15	4	56.5	M8x20	0.68	14,500
80	R349945500[1)]	4.3	20	25	65	11.0	18	45	97	36	4.5	10.0	27.0	30	20	4	72.0	M10x20	1.39	17,800
100	R349945600[1)]	4.3	20	25	75	11.0	18	55	117	41	4.5	10.0	27.0	32	20	4	89.0	M10x20	2.04	22,900
100XC	1827001600[2)]	6.3	35	43	122	18.0	26	65	180	55	10.0	10.0	45.0	46	26	6	140.0	M16x50	2.13	$F_{max\ EMC}$

[1)] Material: Forged aluminum
[2)] Material: Galvanized spheroidal graphite iron

Swivel bearing

Fastening screws included in scope of delivery

Group 6
Option 04



EMC	Part number	Dimensions (mm)													DIN 912	m	F_{max}
		$ØC_N$ H7	$ØD_1$ H13	$ØD_2$ H13	E	E_N −0.1	E_R	E_U	F_L −0.2	H	l_2	l_3 min.	R	T_G ±0.2		(kg)	(N)
32	R349946900[1)]	10	6.6	11	47	14	15	10.5	22	9.0	5.5	36	12	32.5	M6x18	0.21	$F_{max\ EMC}$
40	R349947000[1)]	12	6.6	11	53	16	18	12.0	25	9.0	5.5	42	15	38.0	M6x18	0.28	$F_{max\ EMC}$
50	R349947100[1)]	16	9.0	15	65	21	20	15.0	27	10.5	6.5	48	19	46.5	M8x20	0.43	$F_{max\ EMC}$
63	R349947200[1)]	16	9.0	15	75	21	23	15.0	32	10.5	6.5	55	21	56.5	M8x20	0.68	14,500
80	R349947300[1)]	20	11.0	18	95	25	27	18.0	36	14.0	10.0	70	24	72.0	M10x20	1.21	17,800
100	R349947400[1)]	20	11.0	18	115	25	30	18.0	41	15.0	10.0	80	25	89.0	M10x20	2.03	22,900
100XC	1827001626[2)]	35	18.0	26	176	43	44	30.0	55	17.0	10.0	130	39	140.0	M16x30	6.10	$F_{max\ EMC}$

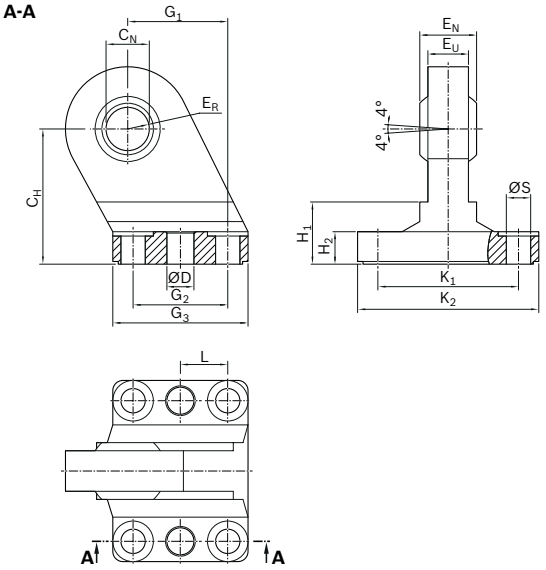
[1)] Material: Aluminum
[2)] Material: Galvanized cast iron with spheroidal graphite

Fastening elements

Swivel bearing up

Material: Galvanized cast iron with spheroidal graphite. Without fastening screws

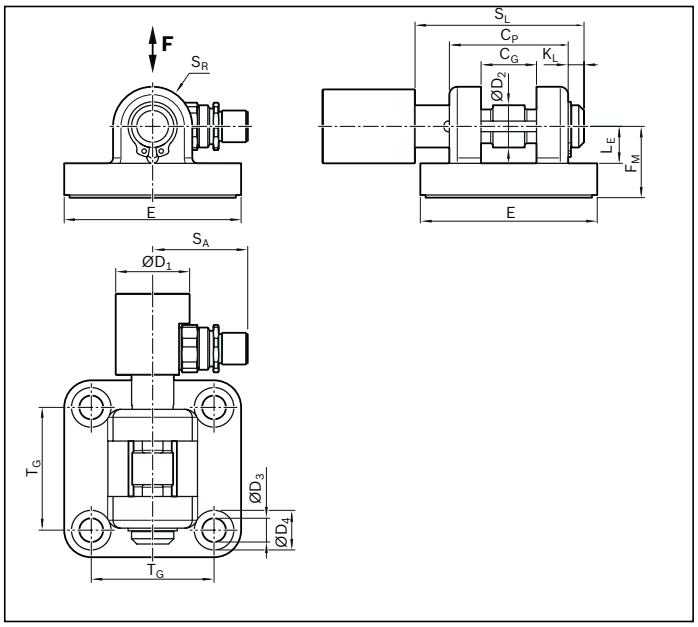
Group 6
Option 03



EMC	Part number	Dimensions (mm)															m
		C_H JS15	C_N H7	ØD H11	E_N –1.0	E_R max.	E_U	G_1 JS14	G_2 JS14	G_3 max.	H_1	H_2	K_1 JS14	K_2 max.	L ±0.2	ØS H13	(kg)
32	R349946300	32	10	–	14	16	10.5	21	18	31	16	$9^{\pm1.0}$	38	51	–	6.6	0.21
40	R349946400	36	12	–	16	18	12.0	24	22	35	16	$9^{\pm1.0}$	41	54	–	6.6	0.27
50	R349946500	45	16	–	21	21	15.0	33	30	45	23	$11^{\pm1.0}$	50	65	–	9.0	0.50
63	R15614A018	50	16	10	21	23	15.0	37	35	50	23	$11^{\pm1.0}$	52	67	17.5	9.0	0.61
80	R15615A018	63	20	10	25	28	18.0	47	40	60	32	$12^{\pm1.5}$	66	86	20.0	11.0	1.14
100	R15616A018	71	20	10	25	30	18.0	55	50	70	33	$13^{\pm1.5}$	76	96	25.0	11.0	1.56
100XC	R15617A018	115	35	12	43	44	28.0	97	88	126	70	$17^{\pm1.5}$	118	156	44.0	14.0	6.64

Clevis mount with load measuring pin

Group 1 Option 02 **Group 5 Option 10**



EMC	Part number	Dimensions (mm)																m
		C_G D10	C_P d12	$ØD_1$	$ØD_2$ f8	$ØD_3$	$ØD_4$	E	F_M ±0.2	K_L	L_E min.	S_A	S_L	S_R	T ±0.2	T_G ±0.2	DIN 912	(kg)
32	R15611B021[1)]	14	34	28	10	6.6	11	49	22	4.5	11.5	31.5	48	11	3	32.5	M6x18	0.372
40	R15612B021[1)]	16	40	28	12	6.6	11	55	25	4.5	12.0	31.5	54	12	4	38.0	M6x18	0.485
50	R15613B021[1)]	21	45	28	16	9.0	15	67	27	6.0	14.0	31.5	64	15	4	46.5	M8x20	0.721
63	R15614B021[1)]	21	51	28	16	9.0	15	77	32	6.0	14.0	31.5	72	15	4	56.5	M8x20	1.025
80	R15615B021[1)]	25	65	28	20	11.0	18	97	36	6.5	16.0	31.5	74	20	4	72.0	M10x20	1.829
100	R15616B021[1)]	25	75	28	20	11.0	18	117	41	6.5	16.0	31.5	84	20	4	89.0	M10x20	2.866
100XC	R15617B021[2)]	43	122	35	35	18.0	26	180	55	10.5	35.0	35.5	135	26	6	140.0	M16x50	2.994

[1)] Material: Aluminum (forged)
[2)] Material: Galvanized spheroidal graphite iron

Note for mounting

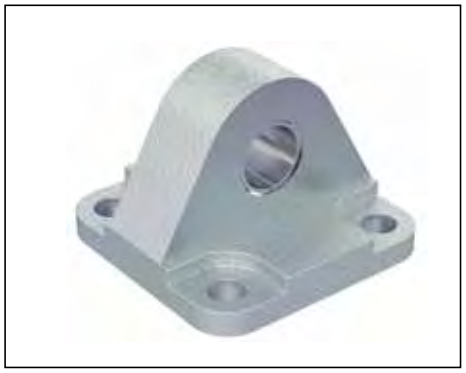
Pay attention to the direction of force, see also power sensor

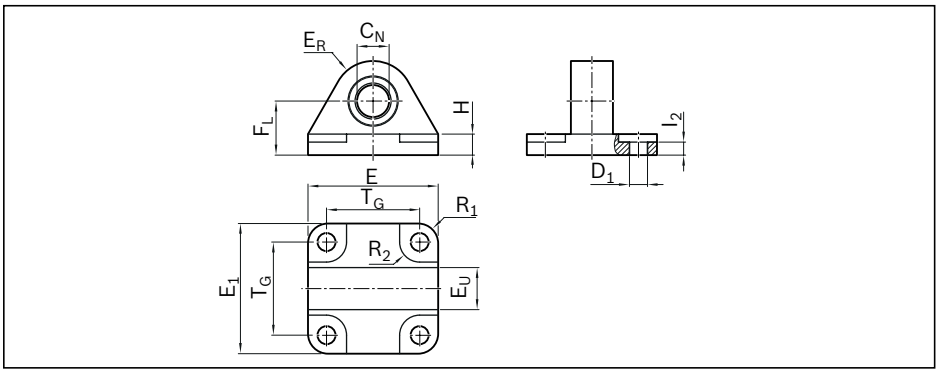
Fastening elements

Swivel mount for force measuring bolt

Material: Aluminum

Group 6
Option 05



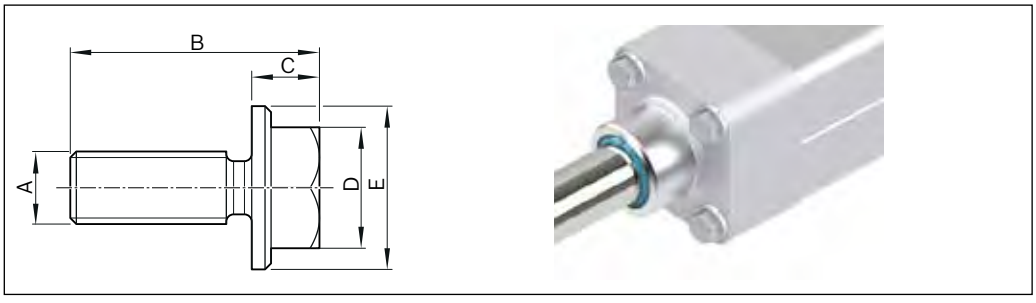


EMC	Part number	Dimensions (mm)											m
		ØC_N H7	ØD_1 H13	F_L ±0.2	H ±0.5	E_R ±0.2	E_U ±0.2	I_2 ±0.5	E/E_1 ±0.5	T_G	R_1/R_2	DIN 912	(kg)
32	R15611B025	10	6.6	22	9.0	15	14	5.5	47	32.5	8	M6x18	0.074
40	R15612B025	12	6.6	25	9.0	18	16	5.5	53	38.0	8	M6x18	0.109
50	R15613B025	16	9.0	27	10.5	20	21	6.5	65	46.5	10	M8x20	0.181
63	R15614B025	16	9.0	32	10.5	23	21	6.5	80	56.5	10	M8x20	0.257
80	R15615B025	20	11.0	36	14.0	27	25	10.0	95	72.0	13	M10x20	0.493
100	R15616B025	20	11.0	41	15.0	30	25	10.0	115	89.0	13	M10x20	0.747
100XC	R15617B025	35	18.0	55	17.0	44	43	10.0	176	140.0	20	M16x40	2.238

Accessories

Plug screw for the cover

Material: Corrosion-resistant

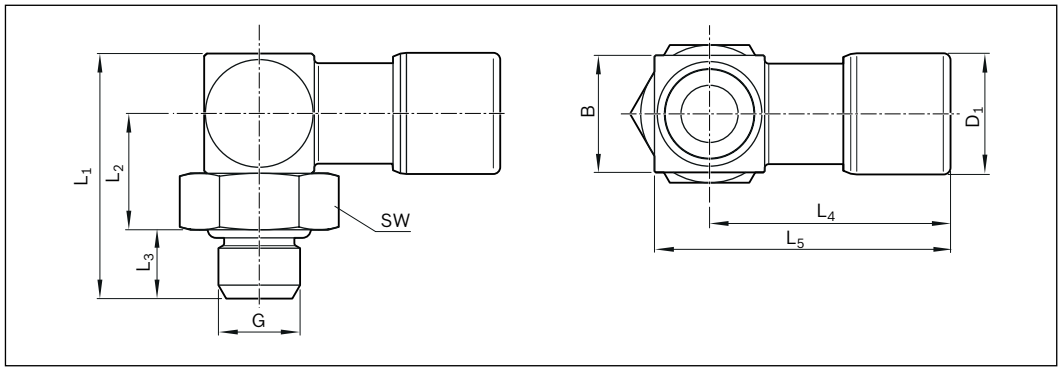


EMC	Part number	Dimensions (mm)				
		A	B	C	D	E
32/40	R15610A015	M6	20.6	5.6	SW 10	13.5
50/63	R15610A016	M8	24.0	8.0	SW 13	18.0
80/100	R15610A017	M10	29.0	8.5	SW 16	22.0
100XC	R15610A018	M12	36.0	10.0	SW 18	25.0

Accessories

Port for central lubrication system

Is supplied once as part of the delivery if the lubrication option LCF has been chosen (prepared for central lubrication system for liquid grease).



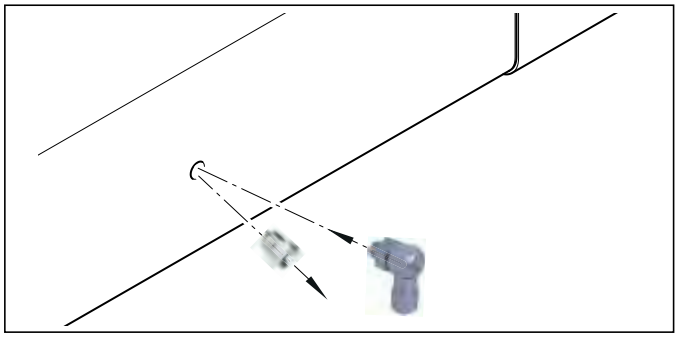
Part number	Material	G	For tubing	Dimensions (mm)								m
				A/F	L_1	L_2	L_3	L_4	L_5	B	D_1	(g)
R913031697	Chemically nickel-plated brass (for housing option standard and IP65)	M6	AD4(4/2)	10	17.8	8.5	5	17.5	21.5	8.5	8.8	10
R913031717	Corrosion resistant steel 1.430/1.4307 (for housing option IP65+R)											

Features

- Enclosed O-ring
- FPM seals
- Temperature range –20 to +120 °C
- Working pressure range –0.95 to 24 bar

Note for mounting

In order to connect the Electromechanical Cylinder to a central lubrication system, remove the standard lube nipple from the housing and replace it with the port for the central lubrication system.



Load sensor

Force measuring bolt

Clevis mount with load measuring pin

If your application requires precise load sensing, there is a clevis bearing block version with force measuring bolt available for this purpose. This option can be selected both at the piston rod end connected to the spherical rod end bearing, and at the timing belt side drive.
Thanks to the thin-film technology used, the load cells are very robust and stable over the long term. The load cells are compliant with the EN 61326 standard for electromagnetic compatibility (EMC) and are designed to sense both tensile and compressive forces.

Note
The use of a hammer or press to fit the pivot pin is not permitted. It may only be inserted by hand.
The pivot pin is not suitable to handling torque. It is secured axially and against rotation, like the standard pin, on one side of the clevis mount using the included retaining ring and clamping pin.
For force control at the controller level, a control component with an analog input is required.

Output signal 4 - 20 mA, reduced measurement range and test certificate on request.

Technical data, force measuring bolts
Metrological specifications

Material	Stainless steel
IP rating	IP65
Hardness (load range)	38 HRC
Mechanical system	
Operating load	150% of MR
Breaking load	300% of MR
Accuracy	
Non-linearity	±0.5% of MR
Repeatability	±0.25% of MR
Hysteresis	±0.2% of MR
Temperature drift at zero point	±0.05% of MR/K.
Temperature drift over measuring range	±0.05% of MR/K.
Compensated temperature	+10 ... +40 °C
Operating temperature	–20 ... +60 °C

Electrical specifications

Output signal	0kN	0±0.03 V
Output signal	MR	–10 ... 10 V ±0.2 V
Power supply		24 V ±2 V
Tare (zero setting function)		7.2 ... 24 V
Current consumption		25 mA (24 V)
Bandwidth		2.5 ±0.2 KHz
Connection		Plug M12x1

Technical data, connection cable

Length	5 m
Rated voltage	250 V
Rated current	4 A
Plug outlet	angled
1. Connection type	Female connector, M12, 4-pin
2. Connection type	Flying leads
Type of cable	PUR black, shielded
Suitable for drag chains	yes
Cable cross-section	4x0.34 mm²
Cable diameter D	5.9 ± 0.2 mm
Static bending radius	>10xD
Dynamic bending radius	>5xD
Bending cycles	> 2 mil
Ambient temperature, stationary	–25 ... +80 °C
Ambient temperature, in motion	–40 ... +80 °C
IP rating	IP65

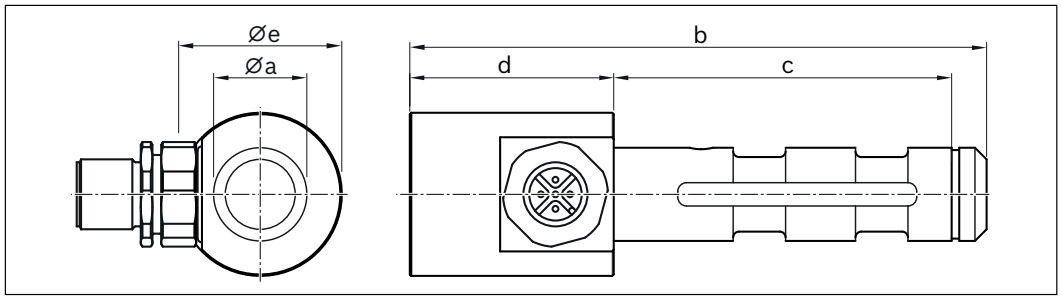
Connection cable in the scope of delivery

MR = measuring range
MR/K. = measuring range per Kelvin

Features

- For tensile and compressive forces
- Corrosion-resistant stainless steel version
- Integrated amplifier
- Low temperature coefficient
- High long term stability
- High shock and vibration resistance
- For dynamic or static measurements
- Good reproducibility
- Easy mounting

Dimensions/Part numbers



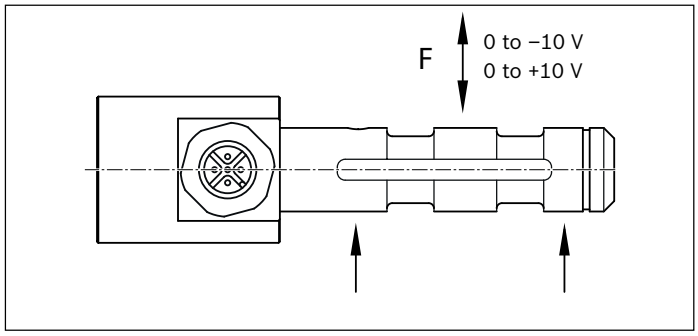
EMC	Part number (force measuring bolt)[1)]	Dimensions (mm)					Measuring range	Measurement inaccuracy
		Øa f8	b	c	d	Øe	(kN)	(kN)
32	R15611A007	10	83	43.5	35	28	1.3	± 0.007
40	R15612A007	12	89	49.5	35	28	5.0	± 0.025
50	R15613A007	16	99	58.0	35	28	8.0	± 0.04
63	R15614A007	16	107	66.0	35	28	16.0	± 0.08
80	R15615A007	20	109	67.5	35	28	22.0	± 0.11
100	R15616A007	20	119	77.5	35	28	45.0	± 0.23
100XC	R15617A007	35	170	124.5	35	35	56.0	± 0.28

[1)] with connection cable

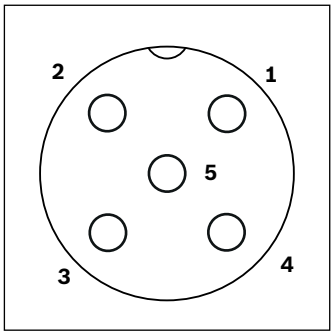
Connection diagram

Force measuring bolt
1 Supply (+)
2 Tare
3 GND
4 Output
5 Internal allocation

Connection cable
1 brn = brown, supply (+)
2 wht = white, Tara
3 blu = blue, GND
4 blk = black, output



Output signal depending on load direction

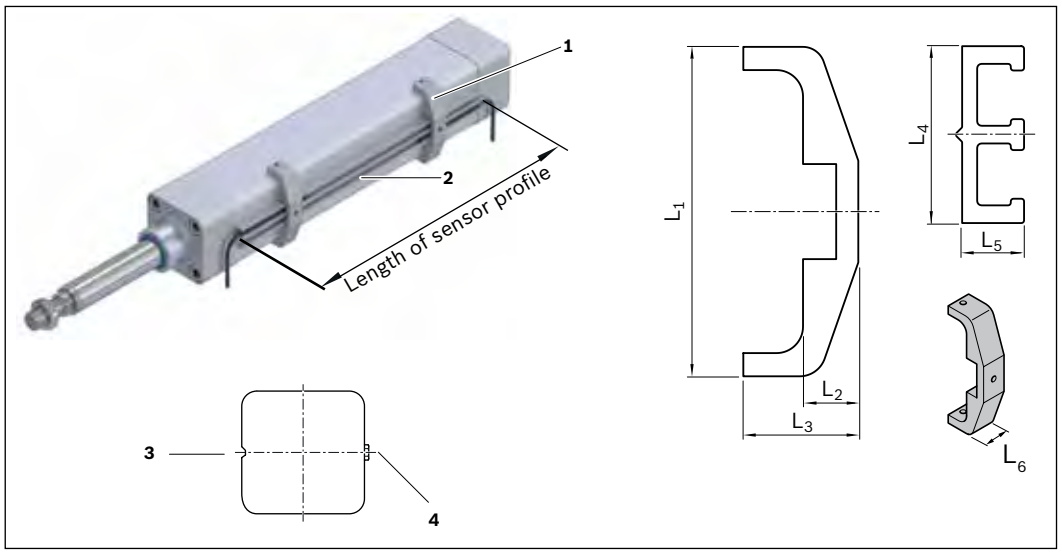


Connection diagram for force measuring bolt

Switching system

Sensor profile

1 Retaining bracket
2 Sensor profile
3 Slot for sensor profile (opposite the lube nipple)
4 Lube nipple



EMC	Part number		Ball Screw Assembly size d_0 x P (mm)	Dimensions (mm)						
	Retaining bracket	Sensor profile		L_{SL}	L_1	L_2	L_3	L_4	L_5	L_6
32	R15611B022	R15610A009	12 x 5	68	56.5	12.5	25	20	7	15
			12 x 10	72						
40	R15612B022		16 x 5	67	62.5	12.5	25			
			16 x 10	76						
			16 x 16	92						
50	R15613B022		20 x 5	62	74.5	12.5	26			
			20 x 10	81						
			20 x 20	100						
63	R15614B022		25 x 5	66	84.5	12.5	26			
			25 x 10	85						
			25 x 25	117						
80	R15615B022		32 x 5	70	104.5	12.5	26			
			32 x 10	94						
			32 x 20	102						
			32 x 32	137						
100	R15616B022		40 x 5	68	124.0	12.5	31			
			40 x 10	82						
			40 x 20	100						
			40 x 40	155						
100XC	R15616B022		50 x 10	129	124.0	12.5	31			
			50 x 20	151						

Number of retaining brackets

Length of sensor profile (mm)	Number of retaining brackets
≤ 500	2
≤ 900	3
≤ 1,200	4
≤ 1,500	5

Length calculation of sensor profile

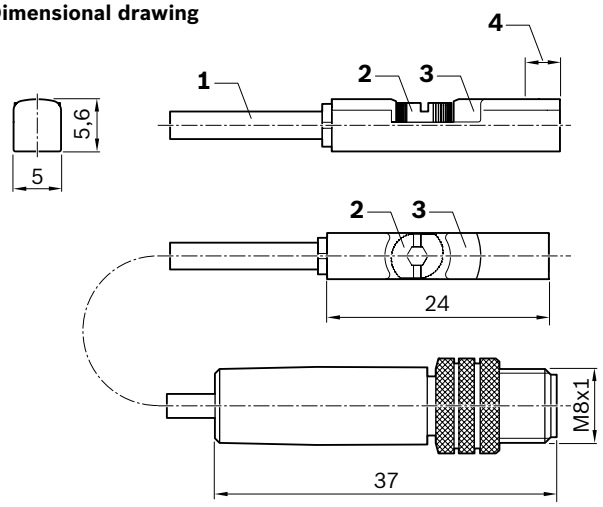
Length of sensor profile = $s_{max} + L_{SL}$

s_{max} = maximum travel range (mm)

Switching system

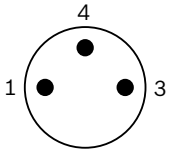
Magnetic switches

Dimensional drawing



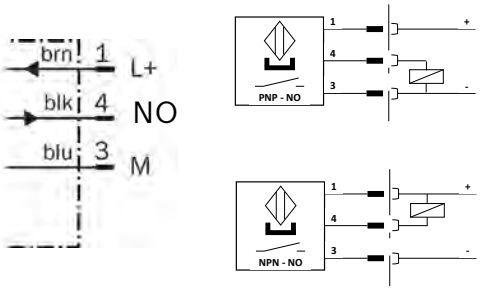
1) Connection
2) Fastening screw
3) LED display
4) Position of sensor element: 2 mm

1 brown (+)
3 blue (–)
4 black (signal)

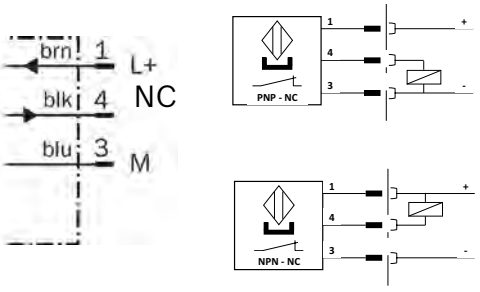


Connection diagram

R913037444
R913037446



R913037443
R913037445



Part numbers/technical data

Use	Limit switch	Reference switch	Limit switch	Reference switch
Part number	R913037445	R913037444	R913037443	R913037446
Designation	MZT8-03VPO-KRDS14	MZT8-03VPS-KRDS13	MZT8-03VNO-KRDS16	MZT8-03VNS-KRDS15
Functional principle	magnetic			
Operating voltage	10 - 30 VDC			
Load current	≦ 200 mA			
Switching function	PNP/NC	PNP/NO	NPN/NC	NPN/NO
Connection type	0.5 m cable and M8x1 connector, 3-pin with knurled screw connection			
Function indicator	✓			
Short-circuit protection	✓			
Reverse polarity protection	✓			
Switch-on suppression	✓			
Switching frequency	3 kHz			
Pulse elongation (off delay)	20 ms			
Max. permissible starting speed	5 m/s			
Suitable for drag chains	✓			
Twistable*	✓			
Welding spark-resistant*	–			
Cable cross-section*	3x0.14 mm^2			
Cable diameter D*	2.9 ± 0.15 mm			
Static bending radius*	≧ 5xD			
Dynamic bending radius*	≧ 10xD			
Bending cycles*	> 2 mil.			
Max. permissible travel velocity*	5 m/s			
Max. permissible acceleration*	≦ 5 m/s^2			
Ambient temperature	-30 °C to +80 °C			
IP rating	IP68			
MTTFd (per EN ISO 13849-1)	MTTFd = 2,339.0 years			
Certifications and Licenses**	CE cULus LISTED RoHS			

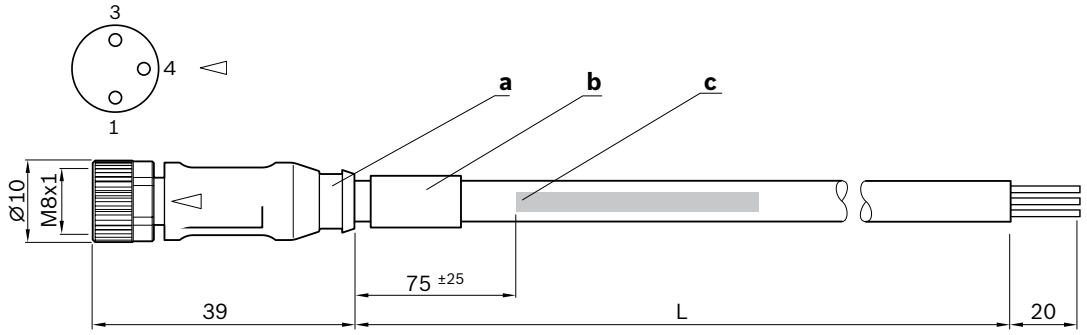
*) Technical data for connection cable (0.5 m) cast on magnetic sensor only. Available extension cables offer even more performance, e.g. for use in a cable drag chain (see below).

**) No CCC certificate for import to the Chinese market is required for these products. Document “CCC sales information” available on request.

Switching system

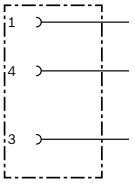
Extensions
Assembled on one end

Dimensional drawing



Connection diagram

1 brown (+)
3 blue (–)
4 black (signal)



Part numbers

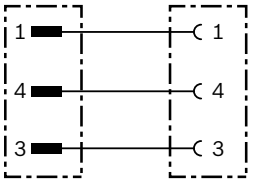
Use	Extension cable		
Part number	R911344602	R911344619	R911344620
Designation	7000-08041-6500500	7000-08041-6501000	7000-08041-6501500
Length (L)	5.0 m	10.0 m	15.0 m
1. Connection type	M8x1, 3-pin straight female connector		
2. Connection type	Unassembled cable end		

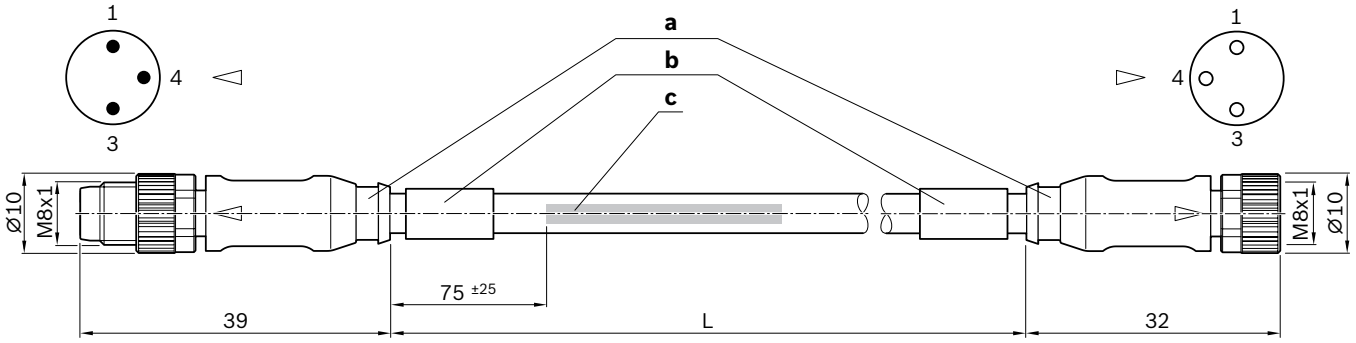
Assembled on both ends

Dimensional drawing

Connection diagram

1 brown (+)
3 blue (–)
4 black (signal)





Part numbers

Use	Extension cable				
Part number	R911344621	R911344622	R911344623	R911344624	R911344625
Designation	7000-88001-6500050	7000-88001-6500100	7000-88001-6500200	7000-88001-6500500	7000-88001-6501000
Length (L)	0.5 m	1.0 m	2.0 m	5.0	10.0
1. Connection type	M8x1, 3-pole straight female connector				
2. Connection type	Straight plug, M8x1, 3-pin				

Technical data for extensions pre-assembled on one or two sides

Function indicator	–
Operating voltage indicator	–
Operating voltage	10 - 30 VDC
Type of cable	PUR black
Suitable for drag chains	✓
Torsion-resistant	✓
Weld spark-resistant	✓
Cable cross-section	3x0.25 mm^2
Cable diameter D	4.1 ±0.2 mm
Static bending radius	≧ 5xD
Dynamic bending radius	≧ 10xD
Bending cycles	> 10 mil.
Max. permissible travel velocity	3.3 m/s for 5 m travel distance (typ.), up to 5 m/s for 0.9 m travel distance
Max. permissible acceleration	≦ 30 m/s^2
Ambient temperature fixed ext.	-40 °C to +85 °C
Ambient temperature flexible ext.	-25 °C to +85 °C
IP rating	IP68
Certifications and licenses	CE, cULus LISTED, CSA C US, PG, RoHS

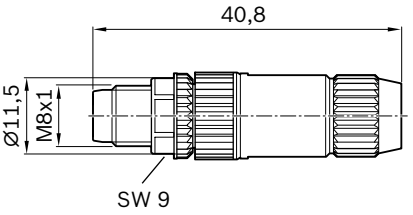
a) Contour for 6.5 mm corrugated tube (inner diameter)
b) Cable grommet
c) Cable printing per printing specification

Switching system

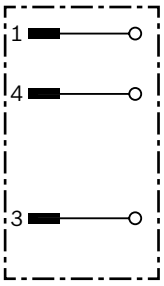
Connectors

R901388333

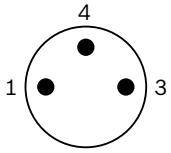
Dimensional drawing



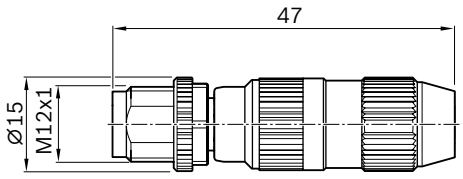
Connection diagram

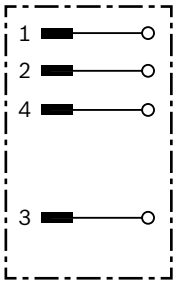


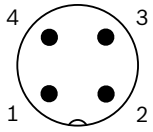
Connector side view



R901388352







Part numbers/technical data

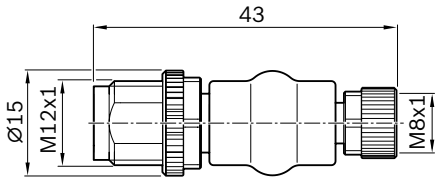
Use	Male connector, single	
Part number	R901388333	R901388352
Designation	7000-08331-0000000	7000-12491-0000000
Version	straight	
Operating current per contact	max. 4 A	
Operating voltage	max. 32 V AC/DC	
Connection type	Straight plug, M8x1, 3-pin, IDC, self-locking screw	Straight plug, M12x1, 4-pin, IDC, self-locking screw
Function indicator	-	
Operating voltage indicator	-	
Connection cross-section	0.14...0.34 mm^2	
Ambient temperature	–25 °C to +85 °C	
IP rating	IP67 (inserted and locked)	
Certifications and licenses		

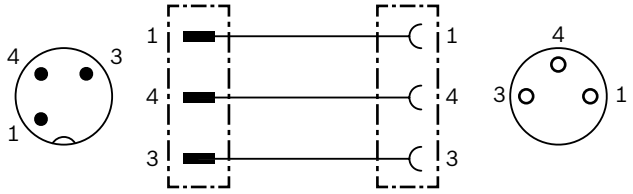
Adapter

Dimensional drawing

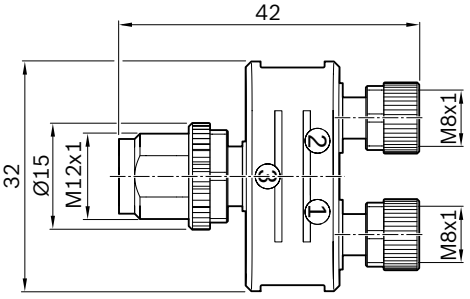
Connection diagram

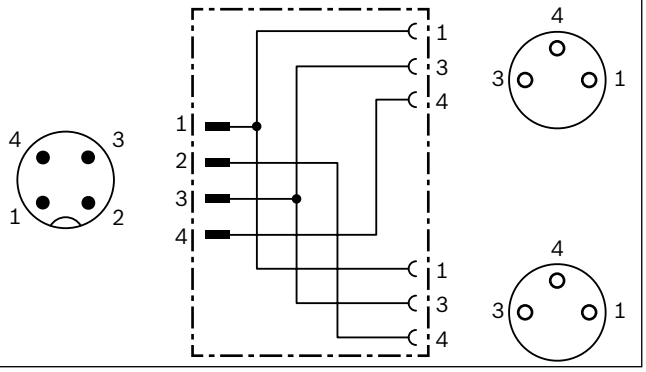
R911344591





R911344592

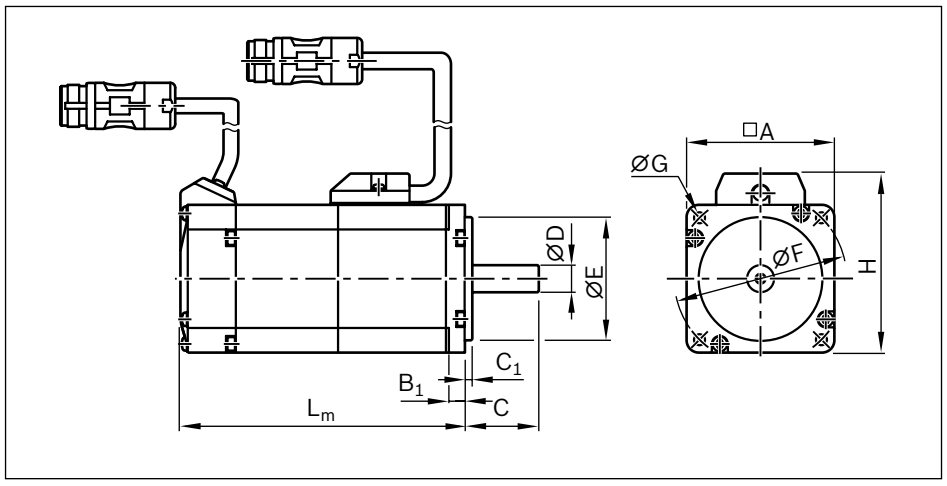




Part numbers/technical data

Use	Adapter	
Part number	R911344591	R911344592
Designation	7000-42201-0000000	7000-41211-0000000
Version	straight	
Operating current per contact	max. 4 A	
Operating voltage	max. 32 V AC/DC	
1. Connection type	Straight female connector, M8x1, 3-pin, self-locking screw thread	2 X straight female connectors, M8x1, 3-pin, self-locking screw thread
2. Connection type	Straight plug, M12x1, 3-pin, IDC, self-locking screw thread	Straight plug, M12x1, 4-pin, IDC, self-locking screw thread
Function indicator	–	
Operating voltage indicator	–	
Connection cross-section	–	
Ambient temperature	–25 °C to +85 °C	
IP rating	IP67 (inserted and locked)	
Certifications and licenses	RoHS	c UL us LISTED, RoHS

IndraDyn S – Servo Motors MSM



Motor schematic

Motor code	**Dimensions** (mm)									
	A	**B_1**	**C**	**C_1**	**Ø D h6**	**Ø E h7**	**Ø F**	**Ø G**	**L_m** Brake without	**L_m** Brake with
MSM 019B-0300	38	6.0	25	3	8	30	45	3.4	92.0	122.0
MSM 031B-0300	60	6.5	30	3	11	50	70	4.5	79.0	115.5
MSM 031C-0300	60	6.5	30	3	14	50	70	4.5	98.5	135.0
MSM 041B-0300	80	6.0	35	3	19	70	90	6.0	112.0	149.0

Versions:

- Plain shaft without shaft seal
- M5 multiturn absolute encoder (20-bit, absolute encoder function only available with backup battery)
- Cooling system: natural convection
- IP54 rating (shaft: IP40)
- With and without brake
- M17 metal round connector

Note

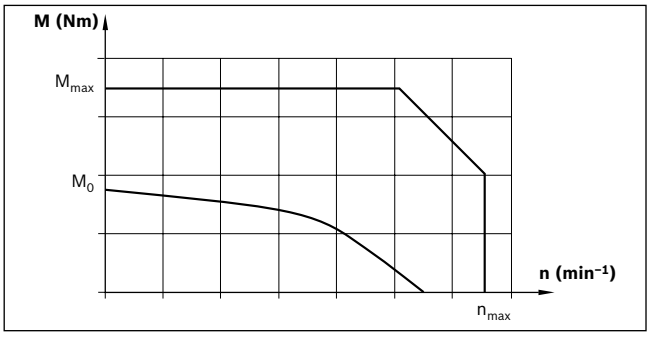
Motors are available with control units and controllers. You can find more information on motors and control systems in the Rexroth catalogs on drive technology at www.boschrexroth.com/mediadirectory.

Motor data										Type code	Part number
n_{max} (rpm)	M_0 (Nm)	M_{max} (Nm)	M_{br} (Nm)	J_m (kgm^2)	J_{br} (kgm^2)	m_m (kg)	m_{br} (kg)	Motor connection	Brake		
5,000	0.32	0.95	0.29	0.0000051	0.0000002	0.47	0.21	2	N	MSM 019B-0300-NN-M5-MH0	R911344211
									Y	MSM 019B-0300-NN-M5-MH1	R911344212
5,000	0.64	1.91	1.27	0.0000140	0.0000018	0.82	0.48	2	N	MSM 031B-0300-NN-M5-MH0	R911344213
									Y	MSM 031B-0300-NN-M5-MH1	R911344214
5,000	1.30	3.80	1.27	0.0000260	0.0000018	1.20	0.50	2	N	MSM 031C-0300-NN-M5-MH0	R911344215
									Y	MSM 031C-0300-NN-M5-MH1	R911344216
4,500	2.40	7.10	2.45	0.0000870	0.0000075	2.30	0.80	2	N	MSM 041B-0300-NN-M5-MH0	R911344217
									Y	MSM 041B-0300-NN-M5-MH1	R911344218

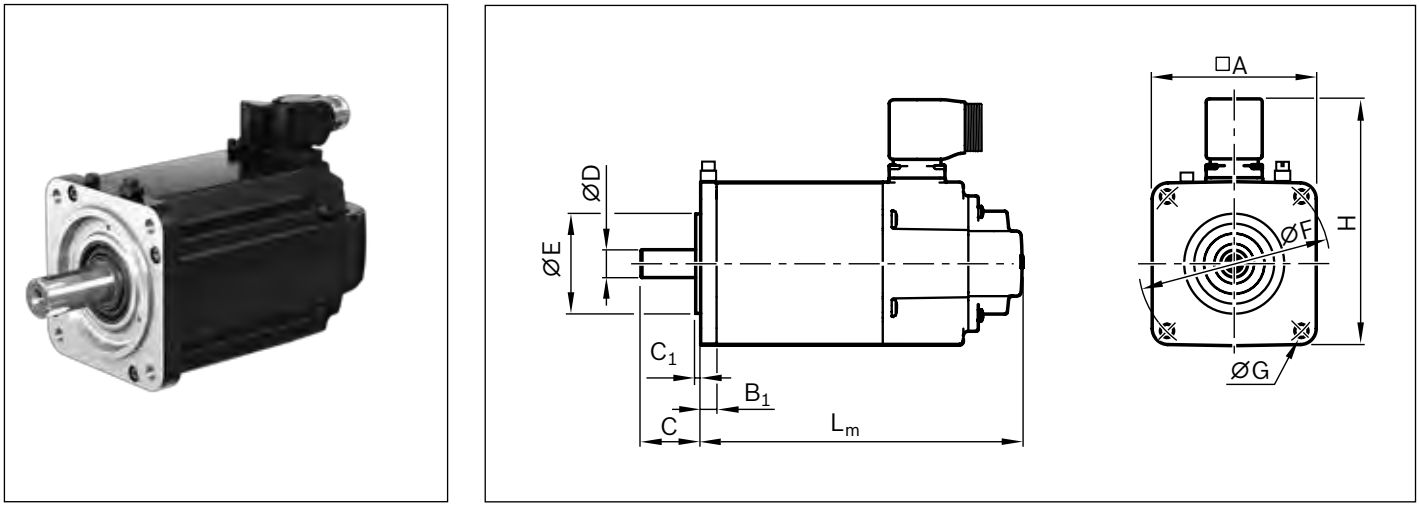
Recommended motor/controller combination

Motor	Controller
MSM 019B-0300	HCS 01.1E-W0003
MSM 031B-0300	HCS 01.1E-W0006
MSM 031C-0300	HCS 01.1E-W0009
MSM 041B-0300	HCS 01.1E-W0013

Torque/speed characteristic
(schematic)



IndraDyn S – Servo Motors MS2N



Motor schematic

Dimensions / Motor data

Motor code	Dimensions (mm)											
	□ A	B_1	C	C_1	ø D k6	ø E j7	ø F	ø G	H Cable 2	H Cable 1	L_m Brake without	L_m Brake with
MS2N03-B0BYN	58	7.5	23	2.5	11	40	63	4.5	84	99	163	192
MS2N03-D0BYN	58	7.5	23	2.5	11	40	63	4.5	84	99	203	232
MS2N04-B0BTN	82	8	30	2.5	14	50	95	6.6	108	123	162	194.5
MS2N04-C0BTN	82	8	30	2.5	14	50	95	6.6	108	123	194	226.5
MS2N04-D0BQN	82	8	30	2.5	14	50	95	6.6	108	123	226	258.5
MS2N05-B0BTN	98	9	40	3	19	95	115	9	124	139	188	218
MS2N05-C0BTN	98	9	40	3	19	95	115	9	124	139	224	254
MS2N05-D0BRN	98	9	40	3	19	95	115	9	124	139	260	290

Version

- Plain shaft without shaft seal ring
- Multiturn encoder
- Standard encoder (B) in conjunction with 2-cable connector (HIPERFACE interface)
- Advanced encoder (B) in conjunction with 1-cable connector (AcuroLink interface)
- IP64 rating
- With and without brake
- Special ground connection terminal near motor mount (used as needed)

Notes:

Motors are available with control units and controllers. You can find more information on motors and control systems in the Rexroth catalogs on drive technology at www.boschrexroth.com/mediadirectory.

Motor data										Type code	Part number
n_{max} (rpm)	M_0 (Nm)	M_{max} (Nm)	M_{br} (Nm)	J_m (kgm²)	J_{br} (kgm²)	m_m (kg)	m_{br} (kg)	Motor connection	Brake		
9,000	0.73	3.46	1.8	0.000023	0.000007	2.0	0.4	2	N	MS2N03-B0BYN-BMDH0-NNNNE-NN	R911384765
								2	Y	MS2N03-B0BYN-BMDH1-NNNNE-NN	R911384766
								1	N	MS2N03-B0BYN-CMSH0-NNNNE-NN	R911384767
								1	Y	MS2N03-B0BYN-CMSH1-NNNNE-NN	R911384769
9,000	1.15	6.8	1.8	0.000037	0.000007	2.0	0.4	2	N	MS2N03-D0BYN-BMDH0-NNNNE-NN	R911384770
								2	Y	MS2N03-D0BYN-BMDH1-NNNNE-NN	R911384771
								1	N	MS2N03-D0BYN-CMSH0-NNNNE-NN	R911384772
								1	Y	MS2N03-D0BYN-CMSH1-NNNNE-NN	R911384773
6,000	1.75	5.9	5.0	0.000070	0.000040	2.7	0.7	2	N	MS2N04-B0BTN-BMDH0-NNNNE-NN	R911384525
								2	Y	MS2N04-B0BTN-BMDH1-NNNNE-NN	R911384526
								1	N	MS2N04-B0BTN-CMSH0-NNNNE-NN	R911384527
								1	Y	MS2N04-B0BTN-CMSH1-NNNNE-NN	R911384528
6,000	2.80	12.0	5.0	0.000110	0.000050	3.7	0.7	2	N	MS2N04-C0BTN-BMDH0-NNNNE-NN	R911384529
								2	Y	MS2N04-C0BTN-BMDH1-NNNNE-NN	R911384530
								1	N	MS2N04-C0BTN-CMSH0-NNNNE-NN	R911384531
								1	Y	MS2N04-C0BTN-CMSH1-NNNNE-NN	R911384532
6,000	3.85	18.1	5.0	0.000160	0.000040	4.7	0.7	2	N	MS2N04-D0BQN-BMDH0-NNNNE-NN	R911384533
								2	Y	MS2N04-D0BQN-BMDH1-NNNNE-NN	R911384534
								1	N	MS2N04-D0BQN-CMSH0-NNNNE-NN	R911384535
								1	Y	MS2N04-D0BQN-CMSH1-NNNNE-NN	R911384536
6,000	3.75	10.6	10.0	0.000170	0.000110	4.0	1.1	2	N	MS2N05-B0BTN-BMDH0-NNNNE-NN	R911384539
								2	Y	MS2N05-B0BTN-BMDH1-NNNNE-NN	R911384540
								1	N	MS2N05-B0BTN-CMSH0-NNNNE-NN	R911384542
								1	Y	MS2N05-B0BTN-CMSH1-NNNNE-NN	R911384543
6,000	6.10	20.8	10.0	0.000290	0.000110	5.9	1.1	2	N	MS2N05-C0BTN-BMDH0-NNNNE-NN	R911384544
								2	Y	MS2N05-C0BTN-BMDH1-NNNNE-NN	R911384545
								1	N	MS2N05-C0BTN-CMSH0-NNNNE-NN	R911384546
								1	Y	MS2N05-C0BTN-CMSH1-NNNNE-NN	R911384547
6,000	7.90	31.3	10.0	0.000400	0.000110	7.3	1.1	2	N	MS2N05-D0BRN-BMDH0-NNNNE-NN	R911384548
								2	Y	MS2N05-D0BRN-BMDH1-NNNNE-NN	R911384549
								1	N	MS2N05-D0BRN-CMSH0-NNNNE-NN	R911384550
								1	Y	MS2N05-D0BRN-CMSH1-NNNNE-NN	R911384551

IndraDyn S – Servo Motors MS2N

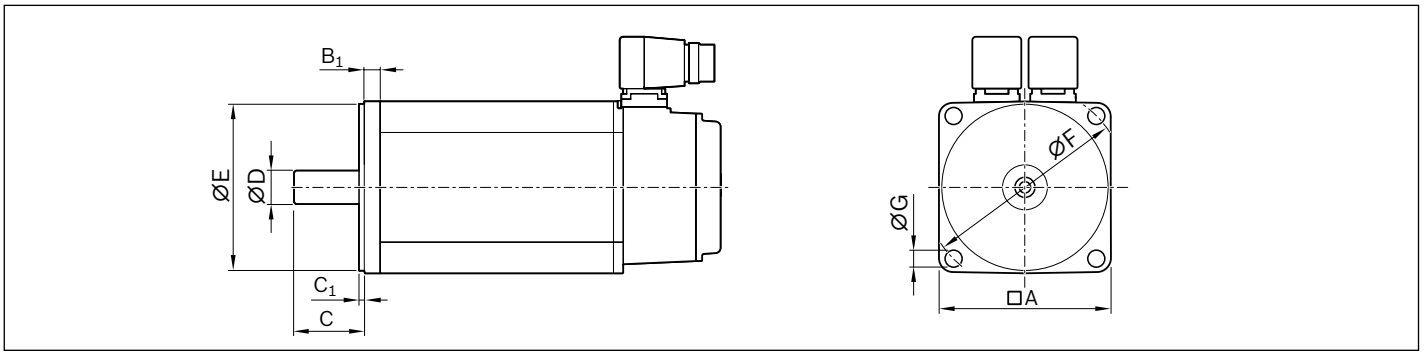
Dimensions / Motor data

Motor code	Dimensions (mm)											
	□ A	B_1	C	C_1	⌀ D k6	⌀ E j7	⌀ F	⌀ G	H Cable 2	H 1	L_m Brake without	L_m with
MS2N06-C0BTN	116	14	50	3	24	95	130	9	156	156	184	202
MS2N06-D0BRN	116	14	50	3	24	95	130	9	156	156	224	261
MS2N06-D1BNN	116	14	50	3	24	95	130	9	156	156	224	261
MS2N06-E0BRN	116	14	50	3	24	95	130	9	156	156	264	301
MS2N07-B1BNN	140	18	58	4	32	130	165	11	180	180	176	230
MS2N07-C0BQN	140	18	58	4	32	130	165	11	180	180	205	259
MS2N07-C1BRN	140	18	58	4	32	130	165	11	180	180	205	259
MS2N07-D0BRN	140	18	58	4	32	130	165	11	180	180	263	317
MS2N07-D1BNN	140	18	58	4	32	130	165	11	180	180	263	317
MS2N07-E0BQN	140	18	58	4	32	130	165	11	180	180	321	375
MS2N07-E1BNN	140	18	58	4	32	130	165	11	180	180	321	375
MS2N10-C0BNN	196	20	80	4	38	180	215	14	270	270	238	298
MS2N10-D0BNN	196	20	80	4	38	180	215	14	270	270	296	356
MS2N10-E0BNN	196	20	80	4	38	180	215	14	270	270	354	414

Motor data										Type code	Part number
n_{max} (rpm)	M_0 (Nm)	M_{max} (Nm)	M_{br} (Nm)	J_m (kgm²)	J_{br} (kgm²)	m_m (kg)	m_{br} (kg)	Motor connection	Brake		
6,000	6.00	16.0	10.0	0.000390	0.000110	6.4	1.0	2	N	MS2N06-C0BTN-BMUH0-NNNNE-NN	R911384931
								2	Y	MS2N06-C0BTN-BMUH1-NNNNE-NN	R911384932
								1	N	MS2N06-C0BTN-CMSH0-NNNNE-NN	R911384933
								1	Y	MS2N06-C0BTN-CMSH1-NNNNE-NN	R911384934
6,000	9.70	32.0	15.0	0.000650	0.000140	9.0	1.5	2	N	MS2N06-D0BRN-BMUH0-NNNNE-NN	R911384935
								2	Y	MS2N06-D0BRN-BMUH2-NNNNE-NN	R911384936
								1	N	MS2N06-D0BRN-CMSH0-NNNNE-NN	R911384937
								1	Y	MS2N06-D0BRN-CMSH2-NNNNE-NN	R911384938
6,000	9.00	38.4	15.0	0.001400	0.000140	9.0	1.5	2	N	MS2N06-D1BNN-BMUH0-NNNNE-NN	R911384939
								2	Y	MS2N06-D1BNN-BMUH2-NNNNE-NN	R911384940
								1	N	MS2N06-D1BNN-CMSH0-NNNNE-NN	R911384941
								1	Y	MS2N06-D1BNN-CMSH2-NNNNE-NN	R911384942
6,000	13.0	49.0	15.0	0.000890	0.000140	11.5	1.5	2	N	MS2N06-E0BRN-BMUH0-NNNNE-NN	R911384943
								2	Y	MS2N06-E0BRN-BMUH2-NNNNE-NN	R911384944
								1	N	MS2N06-E0BRN-CMSH0-NNNNE-NN	R911384945
								1	Y	MS2N06-E0BRN-CMSH2-NNNNE-NN	R911384946
6,000	7.40	21.0	20.0	0.001970	0.000260	9.5	2.0	2	N	MS2N07-B1BNN-BMUH0-NNNNE-NN	R911384949
								2	Y	MS2N07-B1BNN-BMUH1-NNNNE-NN	R911384950
								1	N	MS2N07-B1BNN-CMSH0-NNNNE-NN	R911384951
								1	Y	MS2N07-B1BNN-CMSH1-NNNNE-NN	R911384952
6,000	12.8	35.7	20.0	0.001200	0.000260	12.0	2.0	2	N	MS2N07-C0BQN-BMUH0-NNNNE-NN	R911384953
								2	Y	MS2N07-C0BQN-BMUH1-NNNNE-NN	R911384954
								1	N	MS2N07-C0BQN-CMSH0-NNNNE-NN	R911384955
								1	Y	MS2N07-C0BQN-CMSH1-NNNNE-NN	R911384956
6,000	11.50	42.2	20.0	0.003050	0.000260	12.0	2.0	2	N	MS2N07-C1BRN-BMUH0-NNNNE-NN	R911384957
								2	Y	MS2N07-C1BRN-BMUH1-NNNNE-NN	R911384958
								1	N	MS2N07-C1BRN-CMSH0-NNNNE-NN	R911384959
								1	Y	MS2N07-C1BRN-CMSH1-NNNNE-NN	R911384960
6,000	22.0	73.2	36.0	0.00210	0.000410	17.5	2.5	2	N	MS2N07-D0BRN-BMVH0-NNNNE-NN	R911384961
								2	Y	MS2N07-D0BRN-BMVH2-NNNNE-NN	R911384962
6,000	18.90	84.8	36.0	0.005290	0.000410	17.5	2.5	2	N	MS2N07-D1BNN-BMUH0-NNNNE-NN	R911384963
								2	Y	MS2N07-D1BNN-BMUH2-NNNNE-NN	R911384964
								1	N	MS2N07-D1BNN-CMSH0-NNNNE-NN	R911384965
								1	Y	MS2N07-D1BNN-CMSH2-NNNNE-NN	R911384966
6,000	29.2	109.5	36.0	0.00300	0.0000410	23.0	3.0	2	N	MS2N07-E0BQN-BMVH0-NNNNE-NN	R911384967
								2	Y	MS2N07-E0BQN-BMVH2-NNNNE-NN	R911384968
6,000	25.8	128.5	36.0	0.00752	0.0000410	23.0	3.0	2	N	MS2N07-E1BNN-BMVH0-NNNNE-NN	R911384969
								2	Y	MS2N07-E1BNN-BMVH2-NNNNE-NN	R911384970
6,000	30.2	70.5	53.0	0.00480	0.001470	23.5	5.0	2	N	MS2N10-C0BNN-BMVH0-NNNNE-NN	R911384875
								2	Y	MS2N10-C0BNN-BMVH2-NNNNE-NN	R911384876
6,000	51.0	142.0	53.0	0.00810	0.001470	34.0	5.0	2	N	MS2N10-D0BNN-BMVH0-NNNNE-NN	R911384877
								2	Y	MS2N10-D0BNN-BMVH2-NNNNE-NN	R911384878
6,000	67.7	214.0	90.0	0.01140	0.002700	45.0	7.0	2	N	MS2N10-E0BNA-BMAH0-NNNNE-NN	R911384881
								2	Y	MS2N10-E0BNA-BMAH3-NNNNE-NN	R911384882
								2	N	MS2N10-E0BNN-BMAH0-NNNNE-NN	R911384879
								2	Y	MS2N10-E0BNN-BMAH3-NNNNE-NN	R911384880

Motor mounting kits according to customer specification

The motor of a Linear Motion System with Rexroth Ball Screw Assembly is attached by either an attachment kit with mount and coupling (MF) or a timing belt side drive (RV).
The available combinations are shown in the “Configuration and ordering” selection tables for each size. In addition to attachment kits for Rexroth motors, attachment kits for motors according to customer specification are also available. In order to determine the appropriate attachment kit, the connection geometry of the motor is crucial. Characteristics required to clearly determine motor geometry are shown below.

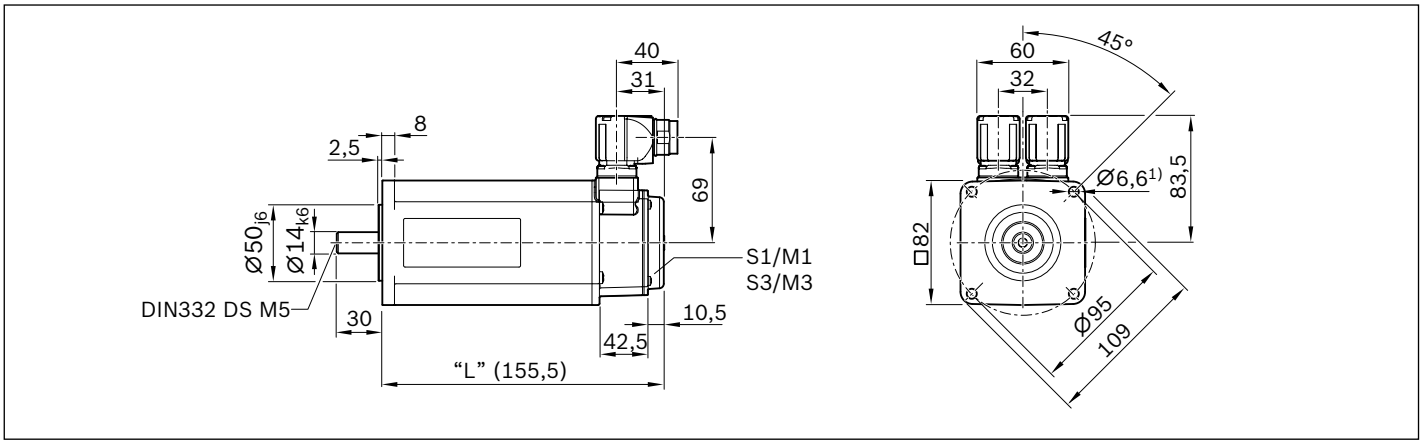


The dimensions queried result in a unique “motor geometry code”:

□□ – □□ – □□□ – □□□ – □□□ – **M**□□ – □□□ – □□□

ØD	=	Shaft diameter
C	=	Shaft length
ØE	=	Centering diameter
C_1	=	Centering depth
ØF	=	Pitch diameter
ØG	=	Through-hole for mounting screw (specify thread diameter)
B_1	=	Mount thickness
A	=	Mount edge dimension

Example illustration of servo motor IndraDyn S Type MS2N04

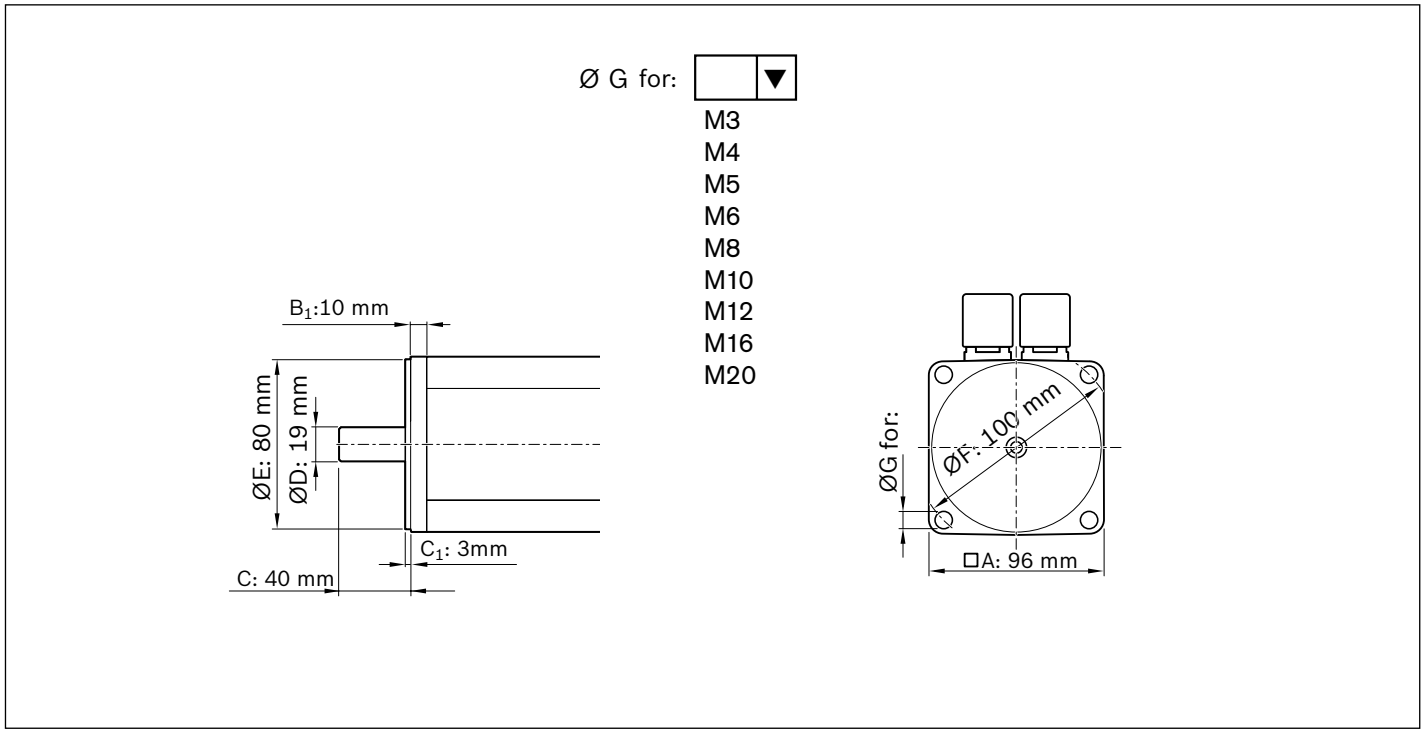


1 4 – 3 0 – 0 5 0 – 2 . 5 – 0 9 5 – M 0 6 – 0 0 8 – 0 8 2

[1)] With a through-hole Ø of 6.6 mm, this produces a type designation of M06 for the motor geometry code (nominal thread diameter of fastening screw M6).

Motor attachment kits for motors according to customer specification can be configured using the online configurator in the eShop. To do this, select the “Attachment kits for motors according to customer specification” option.

Enter motor geometry in the input dialog box. The dimensions can either be entered by being input directly or via a drop-down menu.

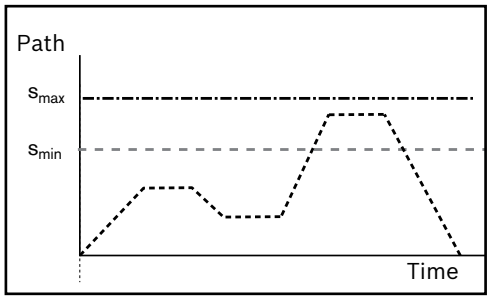


Operating conditions and usage

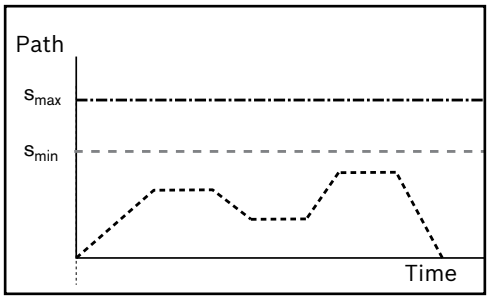
Normal operating conditions

Ambient temperature with Bosch Rexroth servo motor	0 °C ... 40 °C, above 40 °C loss of performance
Ambient temperature for mechanical system (without dropping below dew point)	-10 °C ... 50 °C
IP rating	IP54, IP65 as an option
Duty cycle	100%
Normal stroke	The distance traveled per cycle is ≥ s_{min} (see diagram)

Stroke definition



Normal stroke



Short stroke

Short stroke: The distance traveled per cycle is **<** s_{min} (see diagram).

Short-stroke case 1:
Distance traveled in the cycle < s_{min} and > 2 x screw lead:
- Perform the life expectancy calculation with 69% of the dyn. load capacity
- Halve the maintenance interval (see “Instructions EMC R320103102”)

Short-stroke case 2:
Distance traveled in the cycle < s_{min} and ≤ 2 x screw lead:
- Only permitted with regular lubricating strokes
- Perform service life expectancy calculation with reduction to the dyn. load capacity
- Adapt maintenance interval

Contact Bosch Rexroth for further details.

Notes

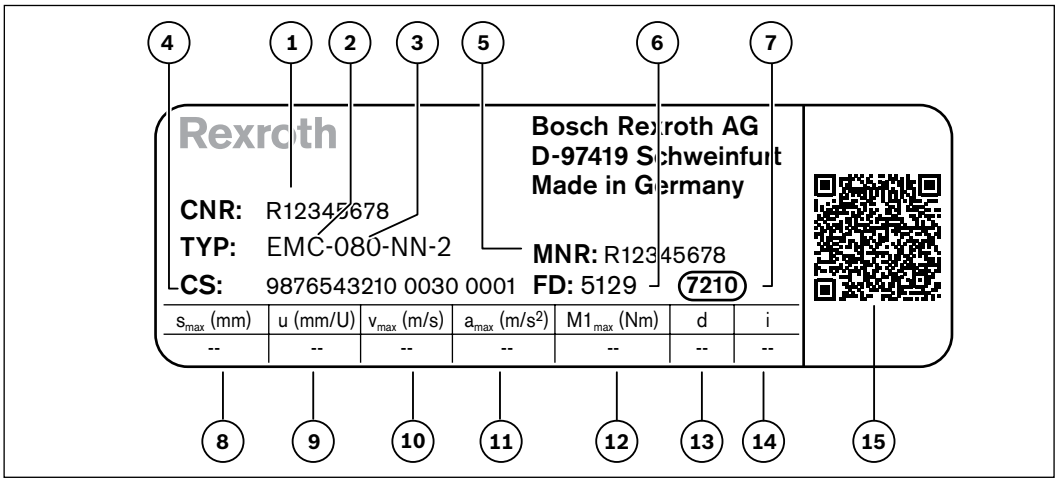
For more information about Intended use and safety, see “Safety for Linear Motion Systems R320103152”.

For more information on installation/start-up see “Instructions EMC R320103102”.

PDF files of these documents can be found on the Internet at:
www.boschrexroth.com/mediadirectory

Parameterization (start-up)

The nameplate contains reference information on the production of the Linear Motion System as well as technical start-up parameters.



1	CNR	Customer's part number
2	TYP	Short product name
3	080	Size
4	CS	Customer information
5	MNR	Part number
6	FD	Date of manufacture
7	7210	Manufacturing location
8	s_{max}	Maximum travel range
9	u	Lead constant without motor attachment
10	v_{max}	Maximum speed
11	a_{max}	Maximum acceleration
12	$M1_{max}$	Maximum drive torque at motor journal
13	d	Direction of motor rotation to move in positive (+) direction CW = clockwise CCW = counterclockwise
14	i	Gear ratio
15		QR code

Note

The values given describe the mechanical limit values of the axle.
Limits for the supplied fastening elements and application-related installation cases are not taken into account here.

Lubrication and maintenance

Grease lubrication

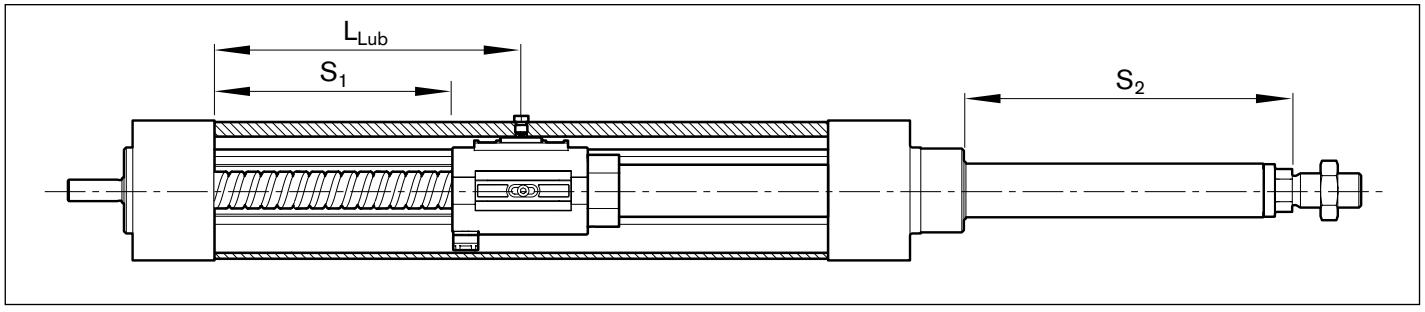
The advantage of grease lubrication is that Rexroth Ball Screw Assemblies can run for prolonged periods without needing relubrication.

All high-quality ball bearing lubricating greases can be used. Follow the lubricant manufacturer's instructions! Greases in accordance with DIN 51825 K2K and, for higher loads, KP2K of NLGI grade 2 in accordance with DIN 51818 are recommended for the longest possible lubrication intervals. Tests have shown that greases of NLGI grade 00 achieve only about 75% of the running performance of Class 2 at higher loads.

Lubrication position and notes on lubrication

Basic lubrication is applied in-factory before shipment. When selecting the LPG option (preserved version), initial lubrication by the customer is necessary prior to start-up.

The electromechanical cylinders are designed for grease lubrication using a manual grease gun with a lubricating pin, or for connecting to a central lubrication system (with fluid grease). Maintenance is limited to re-lubrication of the Rexroth Ball Screw Assembly. In order to reach lubrication position L_{Lub}, move the piston rod to stroke position S_2. For this purpose, move S_1 from the rear end position according to the table. For more information, see "Instructions for EMC, R320103102".



EMC	P[1] (mm)	L_{Lub} (mm)	S_1 (mm)	S_2 (mm)
32	5	36.0 + $s_{max}/2$[2]	21.5 + $s_{max}/2$[2]	33.0 + $s_{max}/2$[2]
	10	38.0 + $s_{max}/2$[2]	18.5 + $s_{max}/2$[2]	30.0 + $s_{max}/2$[2]
40	5	35.5 + $s_{max}/2$[2]	16.1 + $s_{max}/2$[2]	28.1 + $s_{max}/2$[2]
	10	40.0 + $s_{max}/2$[2]	17.5 + $s_{max}/2$[2]	29.5 + $s_{max}/2$[2]
	16	48.0 + $s_{max}/2$[2]	15.0 + $s_{max}/2$[2]	27.0 + $s_{max}/2$[2]
50	5	33.0 + $s_{max}/2$[2]	10.0 + $s_{max}/2$[2]	24.0 + $s_{max}/2$[2]
	10	42.5 + $s_{max}/2$[2]	10.0 + $s_{max}/2$[2]	24.0 + $s_{max}/2$[2]
	20	52.0 + $s_{max}/2$[2]	10.0 + $s_{max}/2$[2]	24.0 + $s_{max}/2$[2]
63	5	35.0 + $s_{max}/2$[2]	10.0 + $s_{max}/2$[2]	24.0 + $s_{max}/2$[2]
	10	44.5 + $s_{max}/2$[2]	10.0 + $s_{max}/2$[2]	24.0 + $s_{max}/2$[2]
	25	60.5 + $s_{max}/2$[2]	10.0 + $s_{max}/2$[2]	24.0 + $s_{max}/2$[2]
80	5	37.0 + $s_{max}/2$[2]	10.0 + $s_{max}/2$[2]	26.0 + $s_{max}/2$[2]
	10	49.0 + $s_{max}/2$[2]	7.5 + $s_{max}/2$[2]	24.5 + $s_{max}/2$[2]
	20	53.0 + $s_{max}/2$[2]	7.5 + $s_{max}/2$[2]	24.5 + $s_{max}/2$[2]
	32	70.5 + $s_{max}/2$[2]	7.5 + $s_{max}/2$[2]	24.5 + $s_{max}/2$[2]
100	5	36.0 + $s_{max}/2$[2]	7.9 + $s_{max}/2$[2]	23.9 + $s_{max}/2$[2]
	10	43.0 + $s_{max}/2$[2]	10.5 + $s_{max}/2$[2]	27.5 + $s_{max}/2$[2]
	20	52.0 + $s_{max}/2$[2]	4.5 + $s_{max}/2$[2]	21.5 + $s_{max}/2$[2]
	40	79.5 + $s_{max}/2$[2]	4.5 + $s_{max}/2$[2]	21.5 + $s_{max}/2$[2]
100XC	10	66.5 + $s_{max}/2$[2]	15.3 + $s_{max}/2$[2]	43.4 + $s_{max}/2$[2]
	20	77.5 + $s_{max}/2$[2]	18.4 + $s_{max}/2$[2]	46.5 + $s_{max}/2$[2]

[1] Rexroth Ball Screw Assembly lead

[2] s_{max}: maximum travel range of the EMC (see nameplate)

Note on recommended lubricants
Do not use greases with solid lubricant components (e.g., graphite or MoS_2 additives). Dynalub 520 is recommended for central lubrication systems.

Grease	
Consistency class NLGI 2 as per DIN 51818	**Consistency class NLGI 00 as per DIN 51818**
- **Dynalub 510** (Bosch Rexroth) Cartridge (400 g) R341603700 Bucket (5 kg) R341603500 - **Berulub FG H2 SL** (Bechem) NSF-H1 grease Cartridge (400g) R341604600	- **Dynalub 520** (Bosch Rexroth) Cartridge (400 g) R341604300 Bucket (5 kg) R341604200
Can still be used	**Can still be used**
Elkalub GLS 135 / N2 (Chemie-Technik) Tribol GR 100-2 PD (Castrol)	Elkalub GLS 135 / N00 (Chemie-Technik) Tribol GR 100-00 PD (Castrol)

Initial lubrication with NSF-H1 lubricant:
Ball Screw Assembly and other components are initially lubricated with NSF-H1 lubricant.

Even when using an H1 lubricant, the EMC is suitable to only a limited extent for use in the foodstuff industry.

H1 lubricants or separating agents (preserving agents) only then have H1 approval if they are available with grade purity in an unmixed state. A blend of two H1 approval lubricants or separating agents does not have H1 approval. Owing to the preservation used for the Ball Screw Assembly, the H1 lubricant in the EMC does not have grade purity.

Information on the materials used is available upon request.
In case of any doubt, please consult Bosch Rexroth.

Port for central lubrication system
For additional information, please refer to the “Attachments and accessories” section.

Documentation

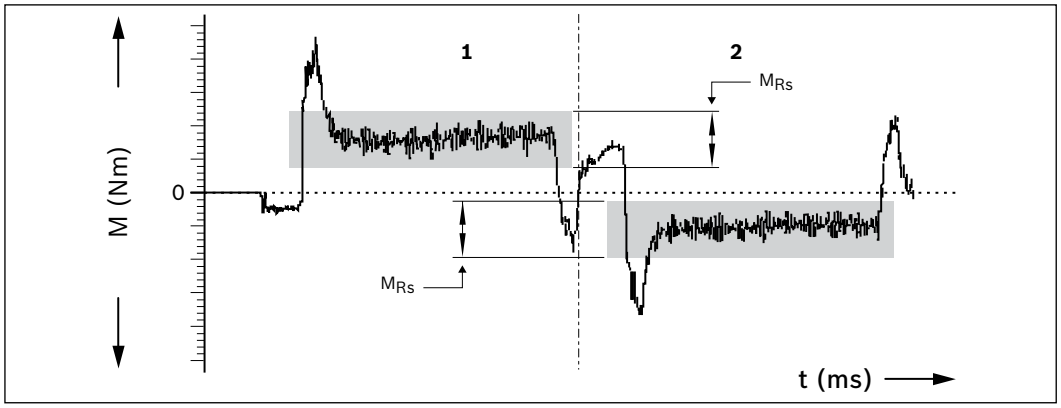
Standard report
Option 01

The standard report is used as confirmation that the listed checks have been carried out, and the measured values are within the permissible tolerances. The checks listed in the standard report

- Functional checks of mechanical components
- Functional checks of electrical components
- Design as per order confirmation

Measurement of frictional torque of complete system
Option 02
All items as per the standard report.
The moment of friction M is measured over the entire travel range.

Example diagram

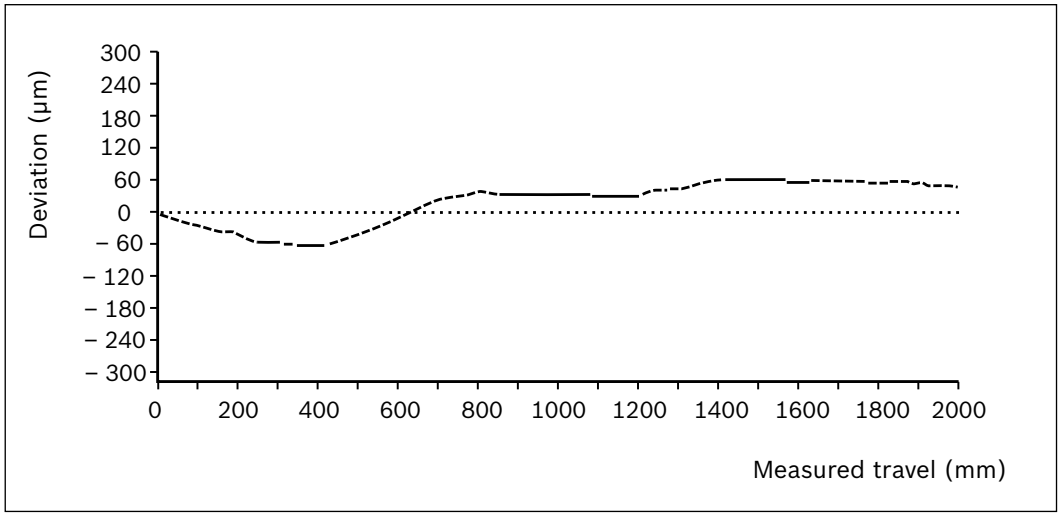


1 Advance
2 Return

M_{Rs} = frictional torque (N)
t = travel time (ms)

Lead deviation of screw drive
Option 03
All items as per the standard report.
In addition to the graphical illustration (see figure), a measurement report is supplied in tabular form.

Example diagram

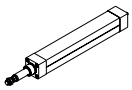


Abbreviations

Abbreviation/index	Designation	Unit
a	Acceleration	(m/s^2)
a_{max}	Maximum acceleration	(m/s^2)
BASA	Ball Screw Assembly	(–)
C	Dynamic load capacity, guideway	(N)
d_0	Nominal diameter of Ball Screw Assembly	(mm)
F_1, F_2, ... F_n	Axial load during phases 1 ... n	(N)
F_m	Equivalent dynamic axial load	(N)
i	Gear ratio	(–)
J_{br}	Mass moment of inertia of the motor brake	(kgm^2)
J_{ex}	Mass moment of inertia of the mechanical system	(kgm^2)
J_{ge}	Mass moment of inertia of gear about the motor journal	(kgm^2)
J_m	Mass moment of inertia of motor	(kgm^2)
J_s	Mass moment of inertia	(kgm^2)
J_t	Translatory mass moment of inertia of external load based on the Linear Motion System screw journal	(kgm^2)
$k_{g\ fix}$	Constant for fixed portion of mass	(kg)
$k_{g\ var}$	Constant for variable-length portion of mass	(kg/mm)
$k_{J\ fix}$	Constant for fixed portion of mass moment of inertia	($kgmm^2$)
$k_{J\ m}$	Constant for mass-specific portion of mass moment of inertia	(mm^2)
$k_{J\ var}$	Constant for variable-length portion of mass moment of inertia	(kgmm)
L	Nominal life – in revolutions – in meters	 (rpm) (m)
L_{ad}	Additional length	(mm)
L_h	Nominal life	(h)
L_m	Motor length	(mm)
m_{br}	Mass of the brake	(kg)
m_{ex}	Moved external mass	(kg)
m_{fc}	Mass of mount and coupling	(kg)
m_m	Motor mass	(kg)
m_s	Mass of Linear Motion System (without attachments)	(kg)
m_{sd}	Mass of timing belt side drive	(kg)
M_0	Continuous motor torque	(Nm)
M_m	Equivalent dynamic torque	(Nm)
M_{max}	Max. possible motor torque	(Nm)
M_{mech}	Max. permissible drive torque for the mechanical system	(Nm)
M_p	Max. permissible drive torque (at the drive journal)	(Nm)
M_R	Frictional torque at motor journal	(Nm)
M_{Rs}	Frictional torque of system	(Nm)

Abbreviation/index	Designation	Unit
M_{stat}	Static load moment	(Nm)
n_1, n_2, ... n_n	Rotary speed in acceleration and braking phases	(rpm)
n_{mech}	Maximum permissible speed of mechanical system	(rpm)
n_{max}	Max. motor speed	(rpm)
n_p	Maximum permissible rotary speed	(rpm)
P	Screw lead	(mm)
s_e	Excess travel (excess travel s_e should be greater than breaking distance. The acceleration travel can be used as a guideline for braking distance.)	(mm)
s_{eff}	Effective stroke	(mm)
s_{min}	Min. travel range	(mm)
s_{max}	Max. travel distance	(mm)
t_1, t_2, ... t_n	Time for phase 1 ... n	(s)
u	Lead constant	(mm/rev)
v_1, v_2, ... v_n	Speed in phase 1 ... n	(m/s)
v_{max}	Maximum permissible speed	(m/s)
v_{mech}	Maximum permissible speed for mechanical system	(m/s)
v_m	Mean speed	(m/s)
V	Ratio of mass moments of inertia of drive train and motor	(–)
π	Pi	(–)

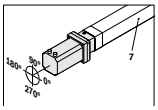
Order example

Size Short product name	Max. travel range mm	Housing: Standard	Housing: IP65 rating	Housing: IP65 rating with +R option	Drive: BASA d_0 x P (mm)	Drive	Lubrication[1]: LSS	Lubrication[1]: LCF	Lubrication[1]: LPG	Lubrication[1]: LHG	Switch[6]: without switch and sensor profile	Switch[6]: Sensor profile	Switch[6]: Switches 1, 2, 3, 4		Version			Motor attachment: Gear ratio	Motor attachment: Attachment kit[2]	Motor code[3]	Motor: Cable 2 cable Brake without	Motor: Cable 2 cable Brake with	Motor: Cable 1 cable Brake without	Motor: Cable 1 cable Brake with	Motor connector position	Documentation: Standard report	Documentation: Measurement report
																											
EMC-032-NN-2		01	02	03	12 x 5	01	01	02	03	04	00	80	PNP NC	120	OF01	without motor attachment			00	without		00					
															MF01	with mount			01	MSM019B-0300	134	135		–			
																			02	MSM031B-0300	136	137		–			
																			03	MS2N03-B0BYN	201	202	203	204	000		
					12 x 10	02									RV01 RV02 RV03	with timing belt side drive		i = 1	41	MSM019B-0300	134	135		–			
																			42	MSM031B-0300	136	137		–			
																			43	MS2N03-B0BYN	201	202	203	204			
															OF01	without motor attachment			00	without		00					
EMC-040-NN-2					16 x 5	01							NPN NC	121	MF01	with mount			05	MSM031C-0300	138	139		–			
																			06	MS2N03-B0BYN	201	202	203	204			
																			200	MS2N03-D0BYN	205	206	207	208			
																			07	MS2N04-B0BTN	209	210	211	212	090		
					16 x 10	02									RV01 RV02 RV03	with Timing belt side drive		i = 1	45	MSM031C-0300	138	139		–			
																			46	MS2N03-B0BYN	201	202	203	204			
																			47	MS2N04-B0BTN	209	210	211	212			
																				MS2N04-C0BTN	213	214	215	216			
					16 x 16	03												i = 1.5	49	MSM031C-0300	138	139		–			
																			50	MS2N03-B0BYN	201	202	203	204			
													PNP NO						51	MS2N04-B0BTN	209	210	211	212			
															OF01	without motor attachment			00	without		00			180		
EMC-050-NN-2					20 x 5	01								122	MF01	with mount			09	MSM031C-0300	138	139		–			
																			10	MSM041B-0300	140	141		–			
																			11	MS2N04-B0BTN	209	210	211	212			
																				MS2N04-C0BTN	213	214	215	216			
																			12	MS2N05-B0BTN	221	222	223	224			
					20 x 10	02									RV01 RV02 RV03	with timing belt side drive		i = 1	53	MSM031C-0300	138	139		–			
																			54	MSM041B-0300	140	141		–			
																			55	MS2N04-C0BTN	213	214	215	216	270		
																			56	MS2N05-C0BTN	225	226	227	228			
													NPN NO						58	MSM031C-0300	138	139		–			
																		i = 1.5	59	MSM041B-0300	140	141		–			
					20 x 20	04								123					60	MS2N04-B0BTN	209	210	211	212			

[1] LSS: Standard lubrication
LCF: Prepared for central lubrication system for fluid grease
LPG: Preserved version
LHG: Initial lubrication with NSF-H1 grease
[2] Attachment kit also available without motor (when ordering: enter "00" for motor); for motor mounting kit for customer motor see "Motor attachment" section.
[3] For motor types see "IndraDyn S - servo motors" section
[4] Measurement of frictional torque
[5] Lead deviation
[6] Sensor profile and switch not possible in combination with version RV03
[7] Lube fitting

Mount	Motor connector position 0°	90°	180°	270°
MF01	000	090 ★	180	270

★ standard delivery

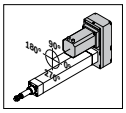


Example:
Mount MF01
Motor connector position 90°

RV01	RV02	RV03
		

Timing belt side drive	Motor connector position 0°	90°	180°	270°
RV01	000	–	180	270 ★
RV02	000	090 ★	180	–
RV03	000 ★	090	–	270

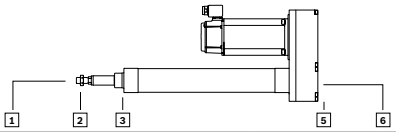
★ standard delivery

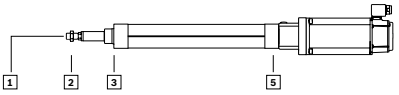


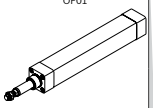
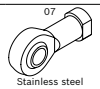
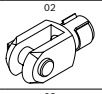
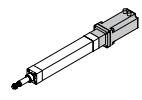
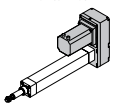
Example:
Timing belt side drive RV02
Motor connector position 90°

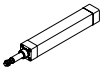
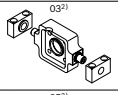
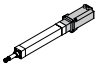
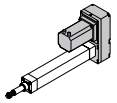
Explanation of the order parameters and order example
➠ **"Order example" section.**

Fastening element





Version	Group 1	2	3	4
without motor attachment OF01	00 without	00 without	00 without	00 without
	01 	01 	01[1] 	
	02  Clevis mount with load measuring pin	07  Stainless steel	03[1] 	
with mount and coupling MF01		02 	04 	
		03 	06 EMC-32 - EMC-50 	
		04 		
with timing belt side drive RV01 to RV03		05 	EMC-63 - EMC-100XC 	
		06  Stainless steel		

Version	Group 5	6
without motor attachment OF01	00 without	00 without
	01[2] 	
with mount and coupling MF01	03[2] 	
	05[2] EMC-32 - EMC-50  EMC-63 - EMC-100XC	
	06 EMC-32 - EMC-50  EMC-63 - EMC-100XC	
with timing belt side drive RV01 to RV03	07 	01 EMC-32 - EMC-50  EMC-63 - EMC-100XC; 02 
	08 	03 EMC-32 - EMC-50  EMC-63 - EMC-100XC; 04 
	10  Clevis mount with load measuring pin	05 

[1] Only allowed vertically
[2] Fastening elements are supplied assembled when version with mount and coupling is selected

Note: Fastening elements are included

Electromechanical Cylinder EMC-040-NN-2

Ordering data		Option	Description
Short product name		EMC-040-NN-2	
Max. travel range		580	580 mm
Housing		01	Standard
Drive		02	Rexroth Ball Screw Assembly 16 x 10
Lubrication		02	LCF
Sensor profile		80	With sensor profile
Switch 1		122	PNP NO
Version		MF01	With mount
Motor attachment		06	Attachment kit (mount and coupling) for MS2N03
Motor		203	MS2N03, without brake, 1 cable
Documentation		01	Standard
Fastening elements	**Group 1**	00	None
	Group 2	01	Female spherical rod end bearing
	Group 3	06	Foot mount
	Group 4	00	None
	Group 5	05	Foot mount
	Group 6	00	None

Inquiry or ordering

Bosch Rexroth AG
97419 Schweinfurt
Germany

Find your local contact person here:
www.boschrexroth.com/addressen

To be completed by customer	Option
Inquiry	
Order	

Ordering data		Option											
Short product name		E	M	C	-				-			-	2
Max. travel range (mm)	=												
Housing	=												
Drive	=												
Lubrication	=												
Sensor profile	=												
Switch 1	=												
Switch 2	=												
Switch 3	=												
Switch 4	=												
Version	=												
Motor attachment	=			**ØD**	–	**C**	–	**ØE**	–	**C_1**	–	**ØF**	–
Motor geometry code	=												
Motor	=												
Documentation	=												
Fastening elements	=			Group 1									
	=			Group 2									
	=			Group 3									
	=			Group 4									
	=			Group 5									
	=			Group 6									

Motor attachment	=			**ØG**	–	**B_1**	–	**A**					
Motor geometry code	=	**M**											

Order quantity	Quantity		
one-off			
monthly			
annually			
per order			

Comments

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Further information

Here you will find extensive information on products, eShop, safety engineering, as well as training and services offered.

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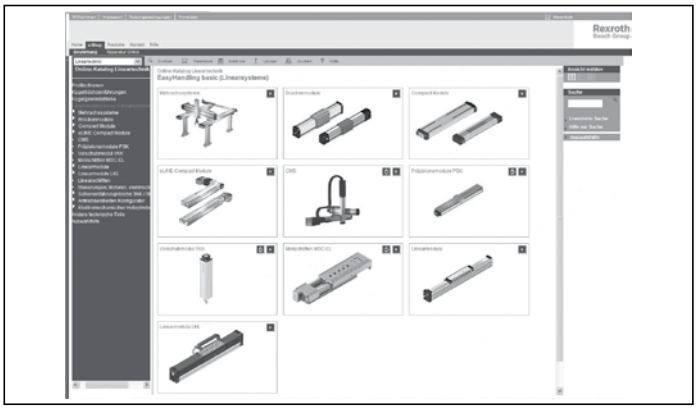

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