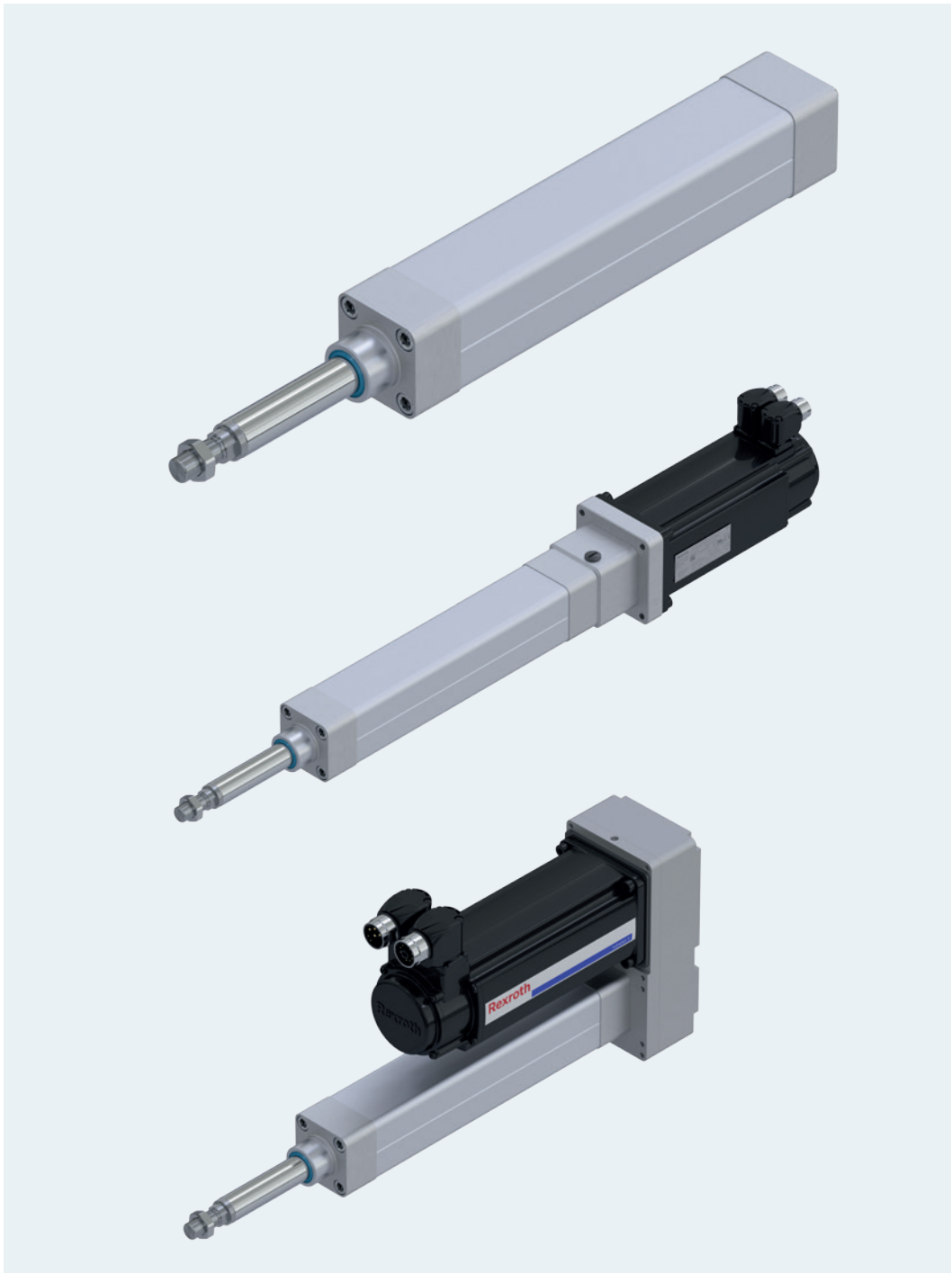
The Drive & Control Company

Rexroth
Bosch Group

Electromechanical Cylinder EMC



Identification system for short product names

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

Contents

Product description

In the new electromechanical cylinders EMC, you can see the high degree of systems expertise which Rexroth possesses in every detail. Thanks to the consistent integration of proven proprietary technologies, an actuator has been formed whose outer geometry and mode of operation is similar to a pneumatic cylinder, but which is considerably more versatile.

A variable and complete system: hygienic, flexible, energy-efficient
Its high variability makes the new EMC so interesting for many industries and applications. A cheaper, simpler base cylinder can be adjusted by using the available configuration options to virtually any customer requirement: chemical resistant, with perfect sealing and a high IP protection class. These properties also ensure a long life - even under harsh industrial conditions. Here as well, the powerful EMC always performs very efficiently. The resulting energy saving potential makes it a cost-cutting alternative to pneumatics.

Structural design
The mechanical system in the electromechanical cylinder is based on proven planetary or ball screw assemblies in a wide range of diameter and lead combinations. A screw drive 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 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 ball screw drives: for high performance with maximum cost-effectiveness
- Complete kit with great variability: can be adapted to a wide range of applications
- Complete ready-to-install and go system for simpler construction and assembly.
- 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 outside and lubrication leakage from the cylinder by selecting the option IP65.
- 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

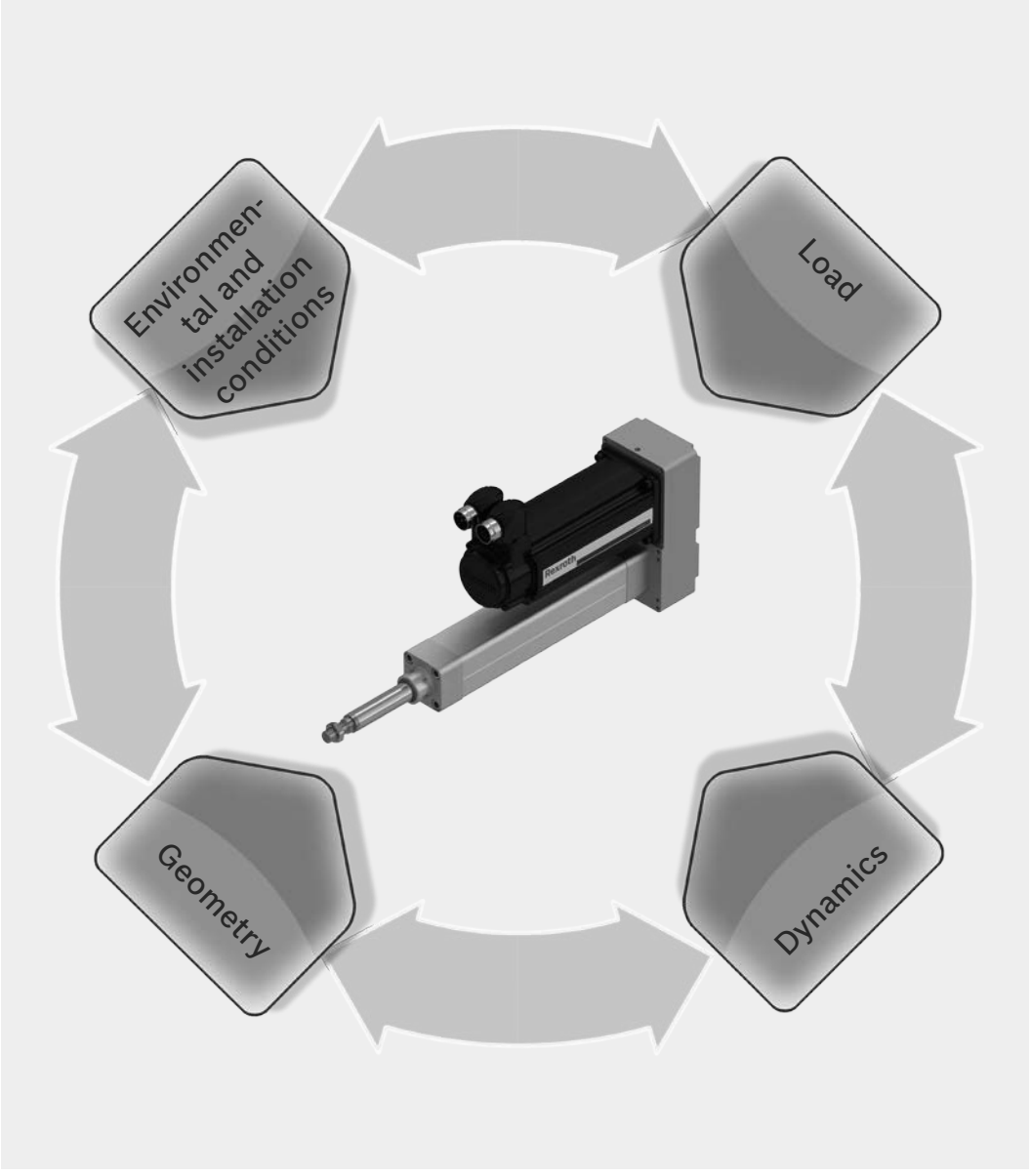
Forming / Thermoforming

Lifting

Product 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.

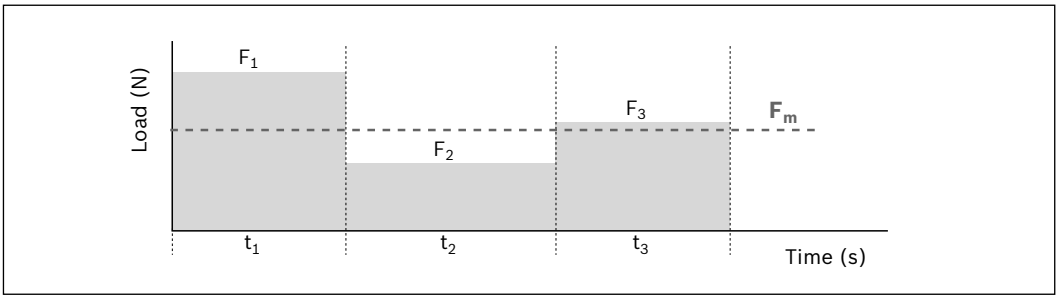
Dynamics
- Acceleration
- Linear speed
- Cycle time
- etc.

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

Environmental and installation conditions
- Mounting orientation
- 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 nominal life 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.

$$DC = \frac{t_O}{t_O + t_P} \cdot 100\ \%$$

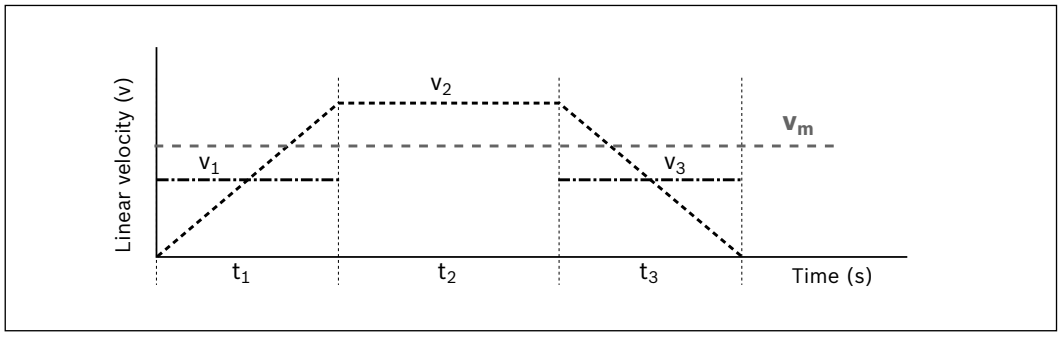
DC	=	duty cycle	(%)
t_O	=	operating time	(s)
t_P	=	pause time	(s)

Product 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.

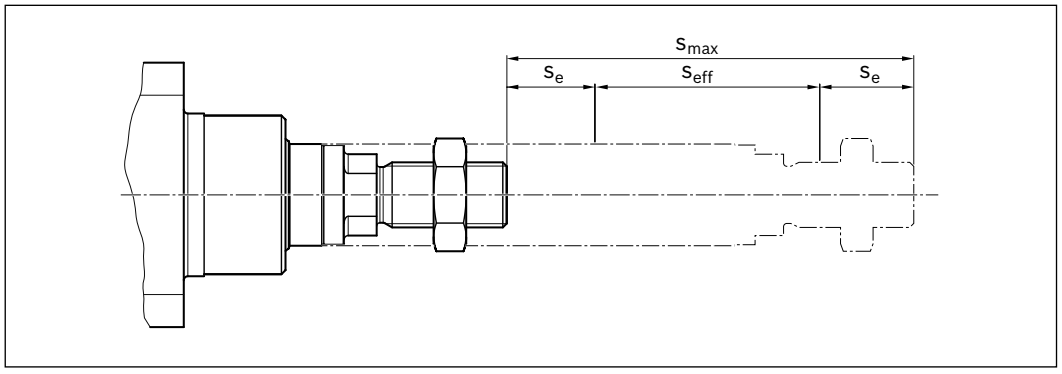
During mounting it must be ensured the cylinder is installed free of distortive stresses and heavy transverse loads are absorbed by an external guide.

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

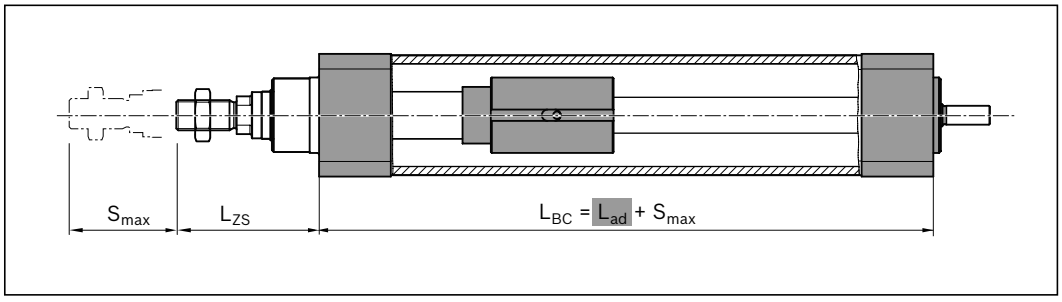
For an extensive and optimally balanced range of fasteners, please refer to the section on “Attachments and accessories”.

5. Travel range and overall dimensions

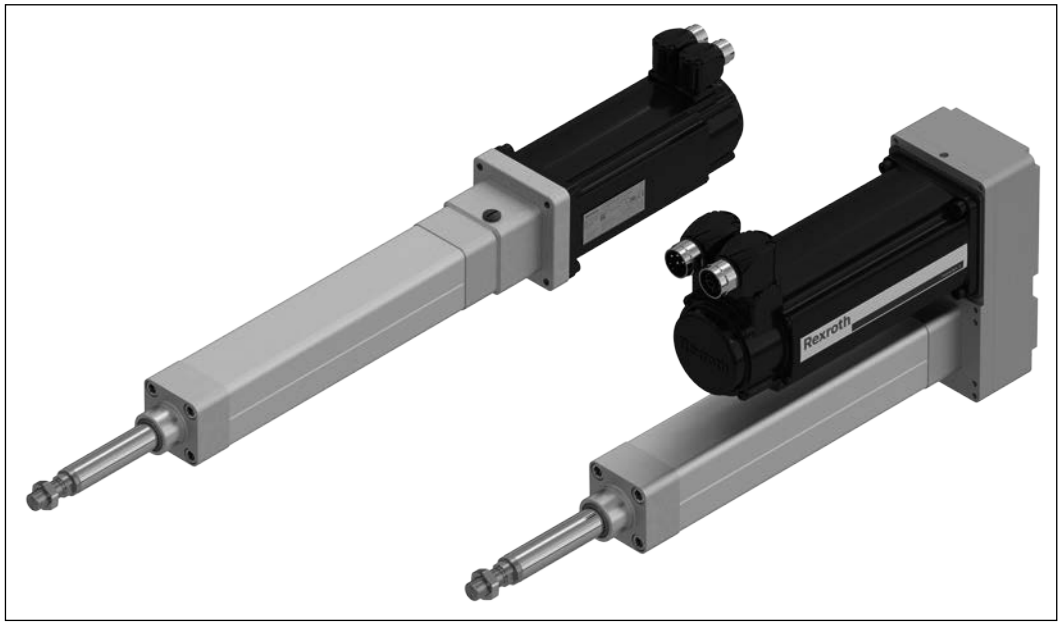
Determine the necessary operating stroke in your application. As Electromechanical Cylinders EMC must not be allowed to travel right up to the mechanical end stop, it is important to add excess travel (s_e) to both ends of the effective operating stroke (s_{eff}). This maximum travel range (s_{max})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

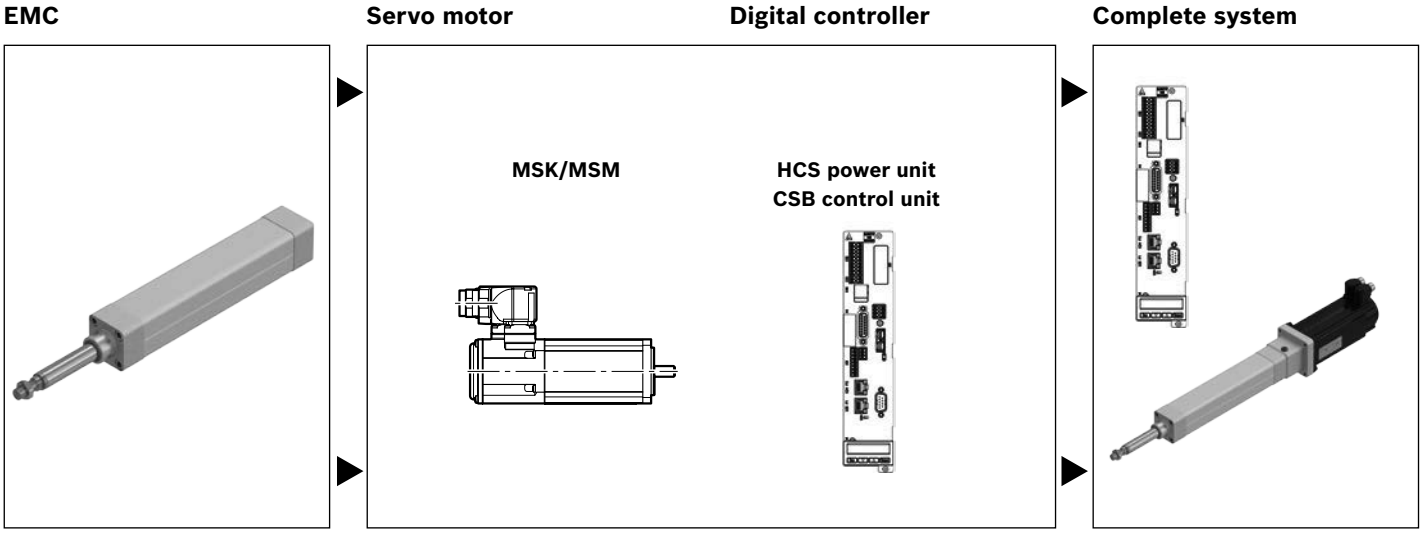
Several motor-controller combinations are available in order to provide the most cost-effective solution for every customer application. When sizing the drive, always consider the motor-controller combination.

Notes on motors and controllers

- The motors can be supplied complete with controllers and control systems
- For recommended motor-controller combinations, see the “Servo motors” section

Catalogs and information

- Drive System Rexroth IndraDrive, R999000018
- Rexroth IndraDyn S Synchronous Motors MSK, R911296288
- Rexroth IndraDrive C Drive Controller Devices HCS02.1, HCS03.1, R911314904
- Rexroth IndraDrive Cs Drive Systems with HCS01, R911322209.

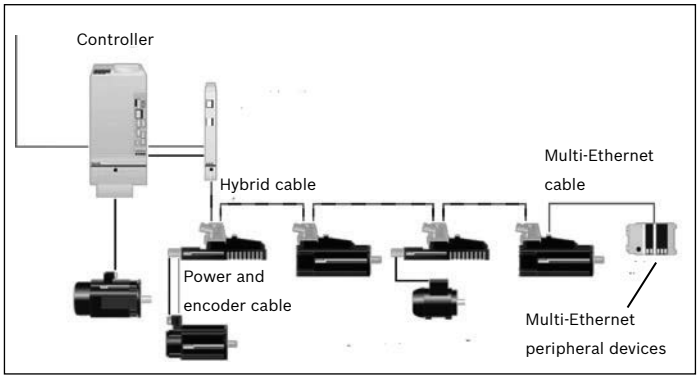


IndraDrive Mi distributed drive system

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”.

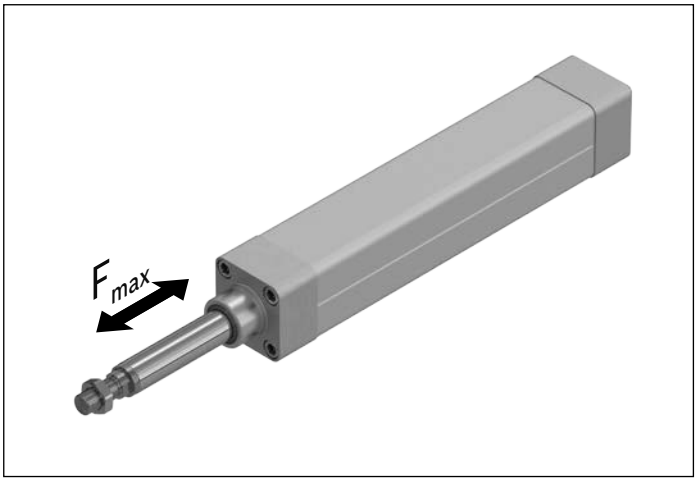


Up to 20 IndraDrive Mi in a string - these motor-integrated servo drives (KSM) and servo drives close to the motor (KMS) are freely combinable. Additional IndraDrive Mi-strands can be integrated via further KCU.

Load ratings and sizes

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

Here the following must not be exceeded:
- The maximum permissible drive torque
- The maximum permissible load
- The maximum permissible linear speed
- The maximum permissible acceleration



The size designation 32 to 100 is selected according to the piston diameter of an ISO 15552 standard cylinder.
The built-in ball screw drives 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	12 x 5	3800	1200	750	0.57
	12 x 10	2500	750		1.13
40	16 x 5	12300	4500	750	0.38
	16 x 10	9600	3000		0.77
	16 x 16	9600	2000		1.23
50	20 x 5	14300	7800	900	0.32
	20 x 10	14100	5500		0.63
	20 x 20	13300	3200		1.27
63	25 x 5	15900	15900	1200	0.28
	25 x 10	15700	14800		0.55
	25 x 25	14700	8000		1.38
80	32 x 5	21600	21600	1500	0.25
	32 x 10	26000	22000		0.50
	32 x 20	19700	15000		1.00
	32 x 32	19500	10400		1.60
100	40 x 5	29100	29100	1500	0.18
	40 x 10	42100	29000		0.37
	40 x 20	37900	29000		0.73
	40 x 40	37000	22900		1.47
100XC	50 x 10	79000	56000	1500	0.50
	50 x 20	93000	50000		1.00

C = Dynamic load rating of the EMC
d_0 = nominal diameter of ball screw
F_{max} = max. load
P = screw lead
$s_{max\ perm}$ = maximum permissible travel range
v_{max} = maximum permissible linear speed

Structural design

1 Hex nut
2 Piston rod (stainless steel)
3 Screw (for mounting elements and motor attachments)
4 Cover
5 Protective profile
6 Base
7 Drive journal
8 Slot for sensor profile

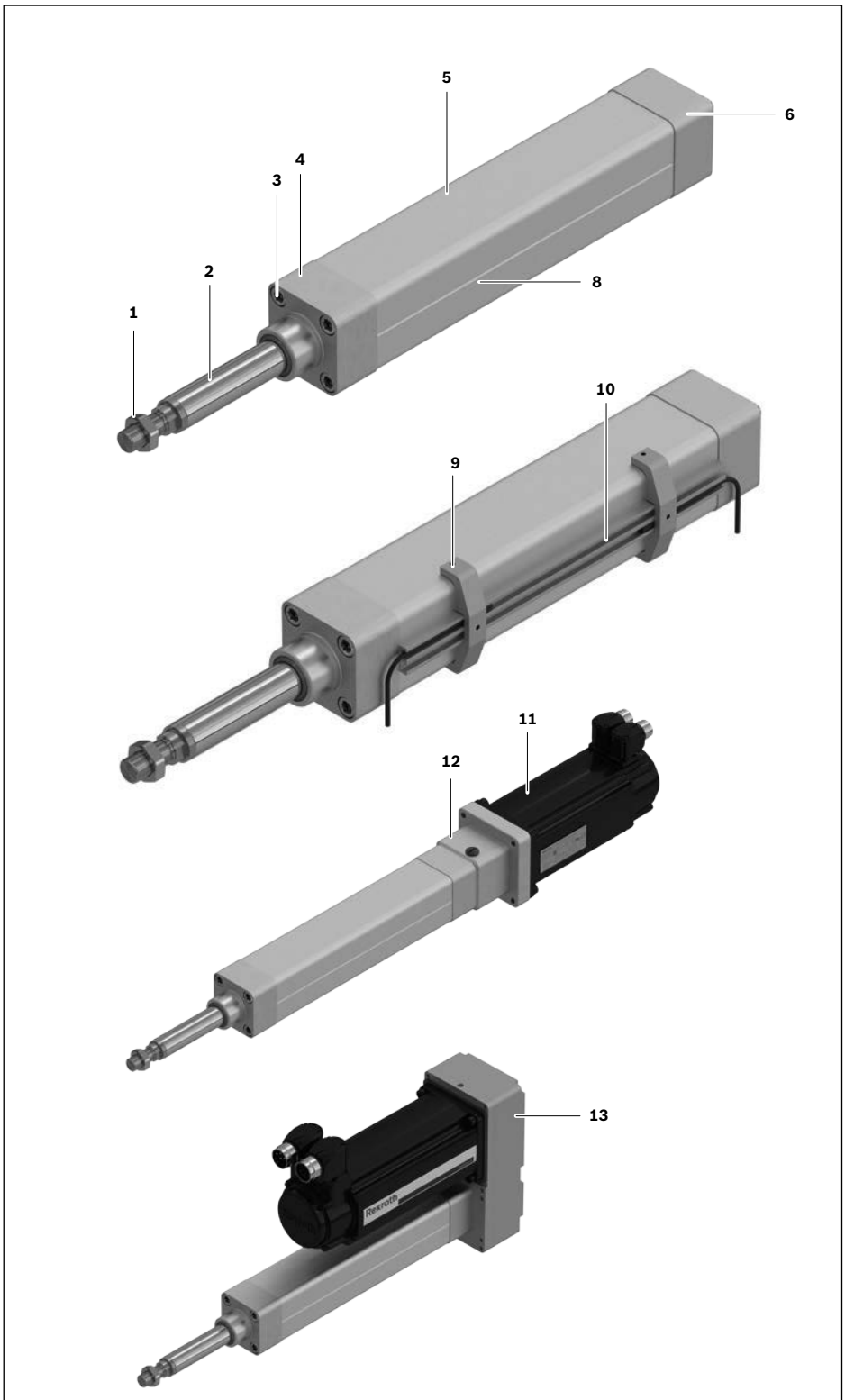
Attachments
9 Retaining bracket (for sensor profile)
10 Sensor profile
11 Motor
12 Motor flange with coupling
13 Timing belt side drive
14 Lube nipple
15 Port for pressure compensation

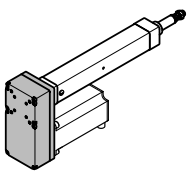
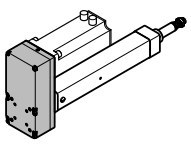
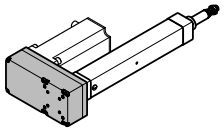
Motor flange and clutch
The motor flange is used to attach the motor to the EMC and as a closed housing unit for the clutch. With the clutch, the torque of the motor is transmitted without tension on the spindle pin of the EMC.

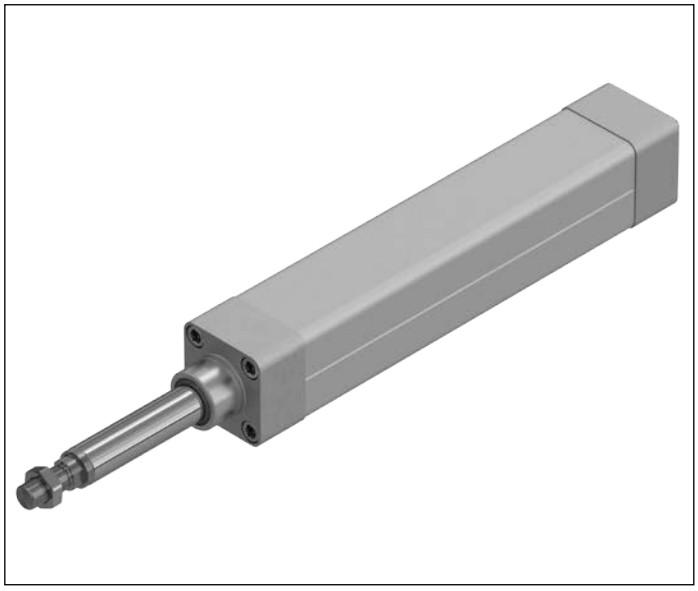
Timing belt side drive
This configuration results in the shortest possible length of the EMC. The compact, closed housing serves as a belt guard, motor mount and to connect fasteners.

There are different gear ratios 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).

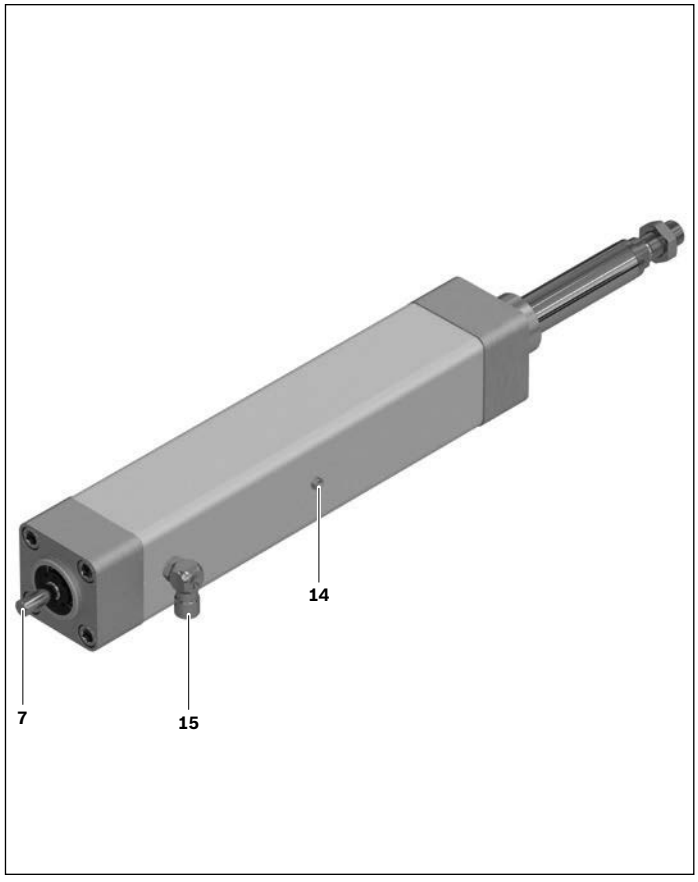


RV01	RV02	RV03
		



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 switch panel can be added for use of the limit and / or reference switches outside of the aluminum profile.
  The EMC is greased with Bosch Rexroth Dynalub and therefore ready for immediate use. Alternatively, the built-in ball screw drive can also be ordered only conserved to enable lubrication by the customer. The EMC can be connected to a central lubrication system with fluid grease. A corresponding lube port is available as an accessory.



Protection category IP65 version

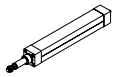
- Seals between the top or bottom and the aluminum profile and a reinforced seal on the piston rod to ensure a reliable seal against dust and water. A connection for pressure compensation (15) in the housing prevents the occurrence of underpressure in the cylinder by allowing controlled air cylinder balance between interior and environment. The electric cylinder and engine mountings with IP65 fulfill the requirements according to IEC 60 529.

Protection category IP65 +R (resistant) version

- In addition to the benefits of protection category IP65, this version provides chemical resistant seals between the top or bottom and the aluminum profile and the piston rod.
  The grease nipple (14) for manual lubrication and the connector for pressure compensation (15) are both stainless steel.
  For connection to a central lubrication system, a lubrication connector made of stainless steel is available as an accessory.
  Additional accessories include corrosion-resistant plug screws are available for the hex socket head cap screws in the cover and base.

Drive data

Drive data without motor attachment

EMC 	d_0 x P (mm)	C (N)	F_{max} (N)	M_p (Nm)	s_{min} (mm)	$s_{max\ perm}$ (mm)	v_{max} (m/s)	n_P (min^{-1})	a_{max} (m/s^2)	L_{ad} (mm)	M_{Rs} (Nm)
32	12 x 5	3800	1200	1.1	40	750	0.57	6800	50.0	132.00	0.16
	12 x 10	2500	750	1.3	40		1.13	6800	50.0	136.00	0.20
40	16 x 5	12300	4500	4.0	70	750	0.38	4600	50.0	134.00	0.28
	16 x 10	9600	3000	5.3	70		0.77	4600	50.0	143.00	0.33
	16 x 16	9600	2000	5.7	70		1.23	4600	50.0	159.00	0.40
50	20 x 5	14300	7800	6.9	90	900	0.32	3800	39.8	142.00	0.50
	20 x 10	14100	5500	9.7	90		0.63	3800	50.0	161.00	0.55
	20 x 20	13300	3200	11.3	90		1.27	3800	50.0	180.00	0.65
63	25 x 5	15900	15900	14.1	100	1200	0.28	3300	28.9	148.00	0.75
	25 x 10	15700	14800	26.2	100		0.55	3300	50.0	167.00	0.80
	25 x 25	14700	8000	35.4	100		1.38	3300	50.0	199.00	1.00
80	32 x 5	21600	21600	19.1	100	1500	0.25	3000	17.9	163.00	1.20
	32 x 10	26000	22000	38.9	100		0.50	3000	30.7	187.00	1.30
	32 x 20	19700	15000	53.1	100		1.00	3000	50.0	195.00	1.40
	32 x 32	19500	10400	58.9	130		1.60	3000	50.0	230.00	1.60
100	40 x 5	29100	29100	25.7	100	1500	0.18	2200	12.2	171.00	2.40
	40 x 10	42100	29000	51.3	100		0.37	2200	16.8	185.00	2.50
	40 x 20	37900	29000	102.6	100		0.73	2200	33.0	203.00	2.60
	40 x 40	37000	22900	162.0	150		1.47	2200	50.0	258.00	2.80
100XC	50 x 10	79000	56000	99.0	130	1500	0.50	3000	12.1	316.00	4.00
	50 x 20	93000	50000	176.8	130		1.00	3000	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”.

Mass of the EMC-
Weight calculation without 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 motor mount and coupling

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

Moved mass of system

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

Length calculation

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

	Total axial clearance cylinder[1] (µ)	$k_{J\ fix}$[2]	$k_{J\ var}$[2]	$k_{J\ m}$[2]	m_s		m_{ca}	
					$k_{g\ fix}$ (kg)	$k_{g\ var}$ (kg/mm)	$m_{ca\ fix}$ (kg)	$m_{ca\ var}$ (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	1080.741	3.588	2.533	16.828	0.031	5.292	0.007
	10	1184.852	3.519	10.132	18.020	0.031	5.994	0.007

Degree of efficiency η = 0.9 (for all sizes)

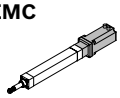
Note:

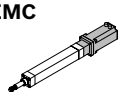
F_{max} and v_{max} depend on the selected drive range (s_{max}) of the EMC. See the following tables.

a_{max} = maximum permissible acceleration (m/s²)
C = dynamic load capacity (N)
d_0 = diameter of screw drive (mm)
F_{max} = maximum permissible axial force of EMC (N)
BS = ball screw assembly
i = speed reduction (–)
$k_{g\ fix}$ = constant for the fixed-length portion of the mass (kg)
$k_{g\ var}$ = constant for the variable-length portion of the mass (kg/mm)
$k_{J\ fix}$ = constant for fixed-length portion of mass moment of inertia (–)
$k_{J\ var}$ = constant for length-variable portion of mass moment of inertia (–)
$k_{J\ m}$ = constant for mass-specific portion of mass moment of inertia (–)
L_{BC} = overall length (without piston rod) (mm)
L_{ad} = additional length (mm)
M_p = maximum permissible drive torque (Nm)
M_{Rs} = frictional torque of EMC (Nm)
m_c = mass of motor mount and coupling (kg)
m_{ca} = moved mass of system (kg)
$m_{ca\ fix}$ = constant for the fixed-length portion of the moved mass of system (kg)
$m_{ca\ var}$ = constant of the variable-length portion of the moved mass of system (kg/mm)
m_s = mass of EMC (kg)
n_P = maximum permissible rotary speed of EMC (min^{-1})
m_{sd} = mass of timing belt side drive (kg)
P = screw drive lead (mm)
s_{min} = minimum travel range (mm)
s_{max} = maximum travel range (mm)
$s_{max\ per}$ = maximum permissible travel range (mm)
v_{max} = maximum permissible linear speed (m/s)
η = efficiency (–)

Drive data

Drive data for motor attachment via flange and coupling

EMC 	d_0 x P (mm)	Motor	Motor mount with coupling								
			F_{max} (N)	M_p (Nm)	v_{max} (m/s)	M_{Rs} (Nm)	$k_{J\ fix}$ [1)]	$k_{J\ var}$ [1)]	$k_{J\ m}$ [1)]	m_c (kg)	a_{max} (m/s²)
32	12 x 5	MSM019B MSM031B MSK030	1200	1.1	0.57	0.16	8.945	0.012	0.633	0.37	50.0
	12 x 10	MSM019B MSM031B MSK030	750	1.3	1.13	0.20	9.618	0.013	2.533	0.37	
40	16 x 5	MSM031C MSK030	4500	4.0	0.38	0.28	41.616	0.032	0.633	0.56	
		MSK040								0.68	
	16 x 10	MSM031C MSK030	3000	5.3	0.77	0.33	42.839	0.033	2.533	0.56	
		MSK040								0.68	
	16 x 16	MSM031C MSK030	2000	5.7	1.23	0.40	46.114	0.040	6.485	0.56	
		MSK040								0.68	
50	20 x 5	MSM031C MSM041B MSK040	7800	6.9	0.32	0.50	78.815	0.085	0.633	1.10	39.8
		MSK050								1.13	
	20 x 10	MSM031C MSM041B MSK040	5500	9.7	0.63	0.55	82.092	0.088	2.533	1.10	50.0
		MSK050								1.13	
	20 x 20	MSM031C MSM041B MSK040	3200	11.3	1.27	0.65	90.304	0.095	10.132	1.10	
		MSK050								1.13	
63	25 x 5	MSM041B MSK050	15900	14.1	0.28	0.75	249.693	0.223	0.633	1.77	28.9
		MSK040					103.693			1.28	
		MSK060					249.693			1.97	
	25 x 10	MSM041B MSK050	14800	26.2	0.55	0.80	258.227	0.243	2.533	1.77	50.0
		MSK040	10700	18.9			112.227			1.28	
		MSK060	14800	26.2			258.227			1.97	
	25 x 25	MSM041B MSK050	8000	35.4	1.38	1.00	286.002	0.242	15.831	1.77	
		MSK040	4300	19.0			140.002			1.28	
		MSK060	8000	35.4			286.002			1.97	

EMC 	d_0 x P (mm)	Motor	Motor mount with coupling								
			F_{max} (N)	M_p (Nm)	v_{max} (m/s)	M_{Rs} (Nm)	$k_{J\ fix}$[1)]	$k_{J\ var}$[1)]	$k_{J\ m}$[1)]	m_c (kg)	a_{max} (m/s^2)
80	32 x 5	MSK050	21600	19.1	0.25	1.20	302.538	0.607	0.633	2.29	17.9
		MSK060								2.49	
		MSK076								2.80	
	32 x 10	MSK050	22000	38.9	0.50	1.30	329.067	0.647	2.533	2.29	30.7
		MSK060								2.49	
		MSK076								2.80	
	32 x 20	MSK050	15000	53.1	1.00	1.40	355.503	0.665	10.132	2.29	50.0
		MSK060								2.49	
		MSK076								2.80	
	32 x 32	MSK050	10400	58.9	1.60	1.60	435.036	0.684	25.938	2.29	
		MSK060								2.49	
		MSK076								2.80	
100	40 x 5	MSK060	29100	25.7	0.18	2.40	686.160	1.568	0.633	3.77	12.2
		MSK071D								3.94	
		MSK076								4.13	
	40 x 10	MSK060	29000	51.3	0.37	2.50	701.780	1.369	2.533	3.77	16.8
		MSK071D								3.94	
		MSK076								4.13	
	40 x 20	MSK060	29000	102.6	0.73	2.60	759.478	1.408	10.132	3.77	33.0
		MSK071								3.94	
		MSK076								4.13	
	40 x 40	MSK060	21900	154.9	1.47	2.80	1038.583	1.567	40.528	3.77	50.0
		MSK071								3.94	
		MSK076								4.13	
100XC	50 x 10	MSK071	56000	99.0	0.50	4.00	1980.741	3.588	2.533	6.06	12.1
		MSK101								7.45	
	50 x 20	MSK071	50000	176.8	1.00	5.00	2084.852	3.519	10.132	6.06	22.0
		MSK101								7.45	

[1)] Constants for calculating the mass moment of inertia. For formulas, see section “Drive dimensioning”.

Degree of efficiency η = 0.9 (for all sizes)

Note:

All data is given for the complete mechanical drive chain (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.

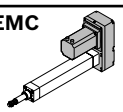
Actual results depend on the selected motor-controller combination.

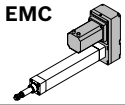
The engine torque might need to be limited.

Please refer to page 15 for short product names.

Drive data

Drive data for motor attachment via timing belt side drive

EMC 	d_0 x P (mm)	$i^{1)}$	Attachment for the motor	Timing belt side drive								
				F_{max} (N)	M_p (Nm)	v_{max} (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	0.26	12.2	0.012	0.633	0.6	50.0
			MSM031B	900	0.8		0.31	35.6	0.012		1.0	
			MSK030					34.0				
	12 x 10	1	MSM019	340	0.6	1.13	0.30	12.9	0.013	2.533	0.6	
			MSM031B	450	0.8		0.35	36.3			1.0	
			MSK030					34.7				
40	16 x 5	1	MSM031C	3200	2.8	0.38	0.43	42.6	0.032	0.633	0.9	50.0
			MSK030					37.5				
			MSK040	3800	3.4		0.68	224.7			2.0	
		1.5	MSM031C	3200	1.9		0.34	14.7	0.014	0.281	0.9	
			MSK030									
			MSK040	3800	2.2		0.59	76.0		0.281	1.9	
	16 x 10	1	MSM031C	1800	3.2	0.77	0.48	43.8	0.033	2.533	0.9	
			MSK030					38.7				
			MSK040	2300	4.1		0.73	225.9			2.0	
		1.5	MSM031C	1800	2.1		0.37	15.3	0.015	1.126	0.9	
			MSK030					15.0				
			MSK040	2300	2.7		0.62	76.5			1.9	
	16 x 16	1	MSM031C	1100	3.1	1.23	0.55	47.1	0.040	6.485	0.9	
			MSK030					42.0			0.9	
			MSK040	1500	4.2		0.80	229.2			2.0	
		1.5	MSM031C	1100	2.1		0.42	16.7	0.018	2.882	0.9	
			MSK030					16.4			0.9	
			MSK040	1500	2.8		0.67	78.0			1.9	
50	20 x 5	1	MSM031C	6200	5.7	0.32	0.90	234.4	0.085	0.633	1.9	39.8
			MSM041B					246.1			2.0	
			MSK040					234.4				
			MSK050	7100	6.3		0.95	1107.1	0.085	0.633	4.5	
		1.5	MSM031C	6500	3.8	0.32	0.73	80.3	0.038	0.281	1.8	
			MSM041B					83.1			1.9	
			MSK040					80.3				
	20 x 10	1	MSM031C	4100	7.3	0.63	0.95	237.7	0.088	2.533	1.9	50.0
			MSM041B					249.3			2.0	
			MSK040					237.7				
			MSK050	4800	8.5		1.00	1110.4			4.5	
		1.5	MSM031C	4100	4.8		0.77	81.7	0.039	1.126	1.8	
			MSM041B					84.6			1.9	
			MSK040					81.7				
	20 x 20	1	MSM031C	2200	7.8	1.27	1.05	245.9	0.095	10.132	1.9	
			MSM041B					257.5			2.0	
			MSK040					245.9				
			MSK050	2700	9.9		1.10	1118.6			4.5	
		1.5	MSM031C	2200	5.2		0.83	85.4	0.042	4.503	1.8	
			MSM041B					88.2			1.9	
			MSK040					85.4				

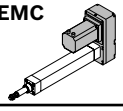
EMC 	d_0 x P (mm)	i[1]	Attachment for the motor	Timing belt side drive								
				F_{max} (N)	M_p (Nm)	v_{max} (m/s)	M_{Rs} (Nm)	$k_{J\ fix}$[2]	$k_{J\ var}$[2]	$k_{J\ m}$[2]	m_{sd} (kg)	a_{max} (m/s^2)
63	25 x 5	1	MSM041B	15900	14.1	0.28	1.20	1081.2	0.223	0.633	4.2	28.9
			MSK040					1082.9			4.6	
			MSK050				1.25	1350.2			4.5	
			MSK060					1359.7			4.7	
		2	MSM041B	15900	7.0		0.83	202.2	0.056	0.158	3.9	
			MSK040					188.2			4.2	
			MSK050				0.88	232.0			4.2	
	25 x 10	1	MSM041B	10500	18.6	0.55	1.25	1089.7	0.243	2.533	4.2	50.0
			MSK040					1091.5			4.6	
			MSK050	12000	21.6	0.55	1.30	1358.7			4.5	
			MSK060					1368.2			4.7	
		2	MSM041B	10500	9.3	0.55	0.85	204.3	0.061	0.633	3.9	
			MSK040					190.4			4.2	
			MSK050	12200	10.8		0.90	234.1			4.2	
	25 x 25	1	MSM041B	4200	18.6	1.38	1.45	1117.5	0.242	15.831	4.2	
			MSK040					1119.2			4.6	
			MSK050	5300	23.4		1.50	1386.5			4.5	
			MSK060					1396.0			4.7	
		2	MSM041B	4200	9.3		0.95	211.3	0.060	3.958	3.9	
			MSK040					197.3			4.2	
			MSK050	5300	11.7		1.00	241.0			4.2	
80	32 x 5	1	MSK050	21600	19.1	0.25	1.70	1469.0	0.607	0.633	4.3	17.9
			MSK060				1.75	5161.9			10.1	
			MSK076								10.4	
		2	MSK050		9.5		1.10	261.7	0.152	0.158	4.4	
			MSK060				1.15	861.3			9.2	
	32 x 10	1	MSK050	13900	24.6	0.50	1.80	1495.5	0.647	2.533	4.3	30.7
			MSK060	19700	34.8		1.85	5188.4			10.1	
			MSK076								10.4	
		2	MSK050	13900	12.3		1.15	268.3	0.162	0.633	4.4	
			MSK060	19700	17.4		1.20	867.9			9.2	
	32 x 20	1	MSK050	6900	24.4	1.00	1.90	1521.9	0.665	10.132	4.3	50.0
			MSK060	12800	45.3		1.95	5214.8			10.1	
			MSK076								10.4	
		2	MSK050	6900	12.2		1.20	274.9	0.166	2.533	4.4	
			MSK060	12800	22.6		1.25	874.5		2.533	9.2	
	32 x 32	1	MSK050	4300	24.3	1.60	2.10	1601.5	0.684	25.938	4.3	
			MSK060	8600	48.7		2.15	5294.4			10.1	
			MSK076				2.15	5294.4			10.4	
		2	MSK050	4300	12.3		1.30	294.8	0.171	6.485	4.4	
			MSK060	8600	24.3		1.35	894.4			9.2	

[1] Reduction of timing belt side drive.
[2] Constants for calculating the mass moment of inertia. For formulas, see section “Drive dimensioning”.

Please pay attention to the table at the end

Drive data

Drive data for motor attachment via timing belt side drive

EMC 	d_0 x P (mm)	$i^{1)}$	Attachment for the motor	Timing belt side drive								
				F_{max} (N)	M_p (Nm)	v_{max} (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	MSK060	29100	25.7	0.18	2.95	5466.6	1.568	0.633	10.2	12.2
			MSK076				3.00	7934.6			11.5	
			MSK071					7933.1			11.7	
		2	MSK060		12.9		1.75	937.5	0.392	0.158	9.3	
			MSK076				1.80	1331.6			10.4	
	40 x 10	1	MSK060	29000	51.3	0.37	3.05	5482.2	1.369	2.533	10.2	16.8
			MSK076				3.10	7950.2			11.5	
			MSK071					7948.7			11.7	
		2	MSK060		25.6		1.80	941.4	0.342	0.633	9.3	
			MSK076				1.85	1335.5			10.4	
	40 x 20	1	MSK060	19200	67.9	0.73	3.15	5539.9	1.408	10.132	10.2	33.0
			MSK076	29000	102.6		3.20	8007.9			11.5	
			MSK071					8006.4			11.7	
		2	MSK060	19200	34.0		1.85	955.8	0.352	2.533	9.3	
			MSK076	29000	51.3		1.90	1349.9		2.533	10.4	
	40 x 40	1	MSK060	9600	67.9	1.47	3.05	5819.0	1.567	40.528	10.2	50.0
			MSK076	15000	106.1		3.10	8287.0			11.5	
			MSK071					8285.5			11.7	
		2	MSK060	9600	34.0		1.80	1025.6	0.392	10.132	9.3	
			MSK076	15000	53.1		1.85	1419.7			10.4	
100XC	50 x 10	1	MSK071	56000	99.0	0.50	4.60	11127.9	3.588	2.533	16.9	12.1
			MSK101					10690.7			17.7	
		1.5	MSK071		66.0		3.27	3897.4	1.595	1.126	16.0	
			MSK101					3626.9			16.9	
	50 x 20	1	MSK071	37000	130.9	1.00	5.60	11232.0	3.519	10.132	16.9	22.0
			MSK101					10794.8			17.7	
		1.5	MSK071		87.2		3.93	3943.7	1.564	4.503	16.0	
			MSK101					3673.1			16.9	

1) Reduction of timing belt side drive.
2) Constants for calculating the mass moment of inertia. For formulas, see section “Drive dimensioning”.

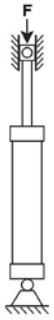
Degree of efficiency η = 0.9 (for all sizes)

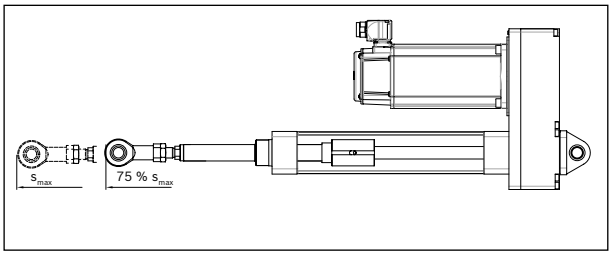
Note:
All data is given for the complete mechanical drive chain (EMC with timing belt side drive) at the motor shaft reference point.
F_{max} and v_{max} depend on the selected drive range (s_{max}) of the EMC. See the following tables.
Actual results depend on the selected motor-controller combination.
The engine torque might need to be limited.
Please refer to page 15 for short product names.

Axial load of the cylinder mechanism

Note on special installation and usage example

Installation - case III





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

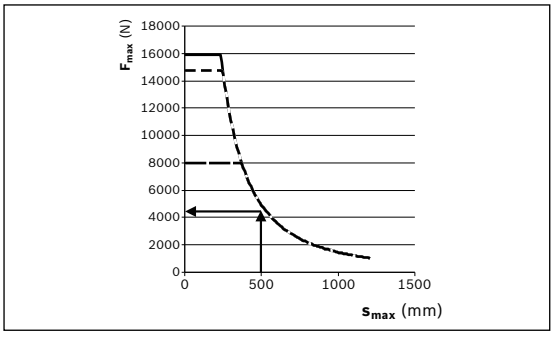
Application example:
Installation - case III Rotatable mount on the timing belt side drive, piston rod guided by means of rod end and fork clevis.

Example for determining the permissible axial load on the cylinder mechanism

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

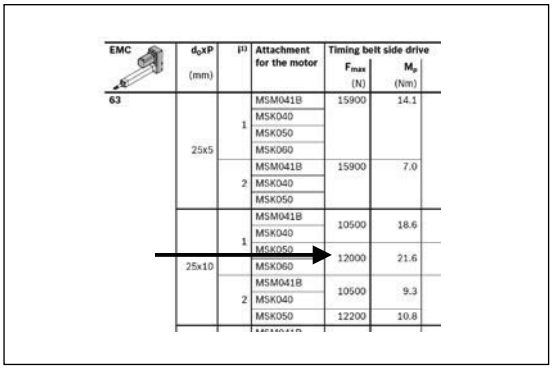
- EMC-063 with ball screw assembly 25 x 10
- Selected travel range s_{max} 500 mm
- with timing belt side drive i=1 for MSK50
- Mounting with clevis bracket and swivel mount.

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



F_{max} in Table “Drive data” with motor mounting via timing belt side drive:
F_{max} = 12 000 N

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

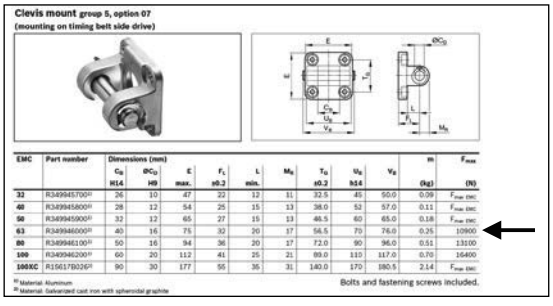


EMC	d_0xP (mm)	i[1]	Attachment for the motor	Timing belt side drive F_{max} (N)	Timing belt side drive M_p (Nm)
63	25x5	1	MSM041B	15900	14.1
			MSK040		
			MSK050		
			MSK060		
		2	MSM041B	15900	7.0
			MSK040		
			MSK050		
	25x10	1	MSM041B	10500	18.6
			MSK040		
			MSK050	12000	21.6
			MSK060		
		2	MSM041B	10500	9.3
			MSK040		
			MSK050	12200	10.8

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

The clevis mount and swivel mount size 63, the values for this example are => F_{max} 10 900 N.

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



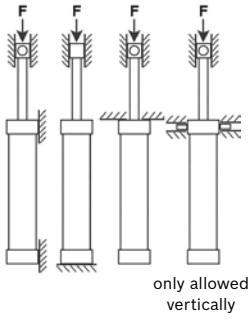
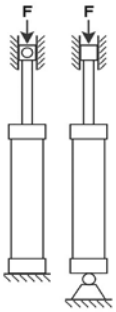
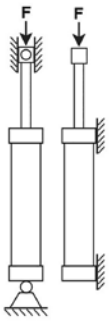
Clevis mount group 5, option 07
(mounting on timing belt side drive)

EMC	Part number	C_B H14	$\varnothing C_D$ H9	E max.	F_L ±0.3	L min.	M_R	T_D ±0.2	U_R h14	V_R	m (kg)	F_{max} (N)
32	R34994570[2]	26	10	47	22	12	11	32.5	45	50.0	0.09	F_{max} (EMC)
40	R34994580[2]	28	12	54	25	15	13	38.0	52	57.0	0.11	F_{max} (EMC)
50	R34994590[2]	32	12	65	27	15	13	46.5	60	65.0	0.18	F_{max} (EMC)
63	R34994600[2]	40	16	75	32	20	17	56.5	70	76.0	0.25	10900
80	R34994610[2]	50	16	94	36	20	17	72.0	90	96.0	0.51	13100
100	R34994620[2]	60	20	112	41	25	21	89.0	110	117.0	0.70	16400
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

Bolts and fastening screws included.

Axial load of the cylinder mechanism

<table>
<tr><th></th><th>Case I</th><th>Case II</th><th>Case III</th></tr>
<tr><td></td><td> 
</td><td> 
</td><td> 
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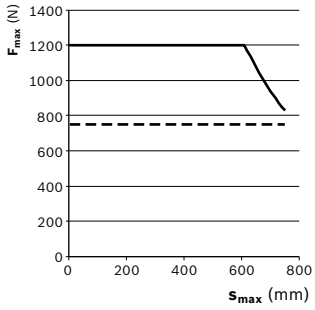
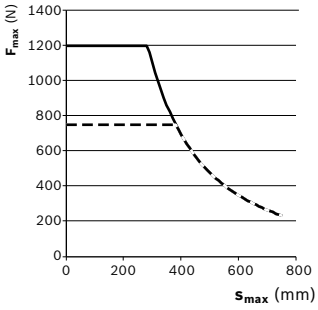
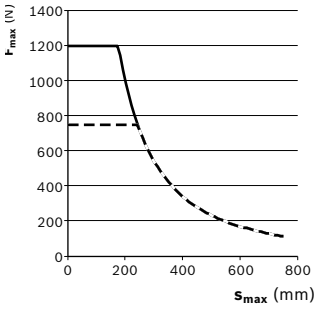
d_0 x P
12 x 5
12 x 10</td><td> 
</td><td> 
</td><td> 
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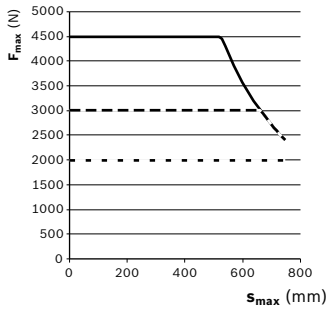
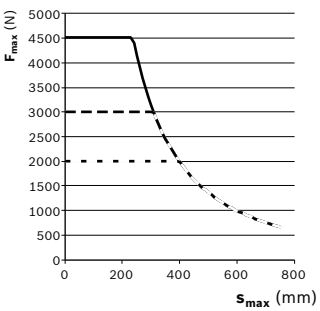
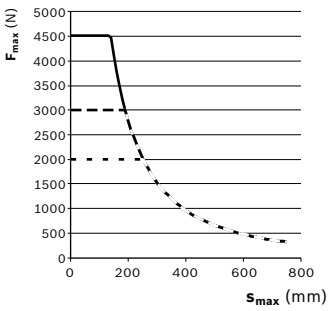
16 x 16</td><td> 
</td><td> 
</td><td> 
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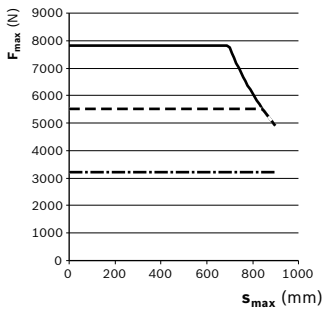
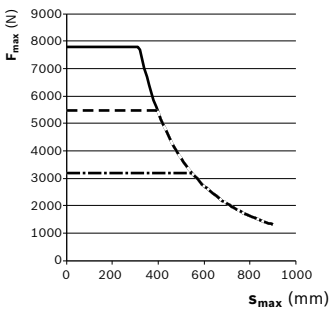
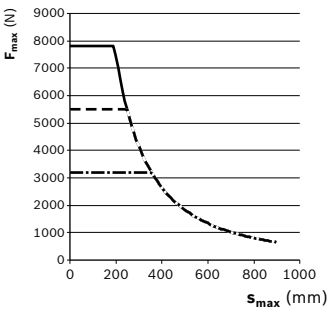
20 x 20</td><td> 
</td><td> 
</td><td> 
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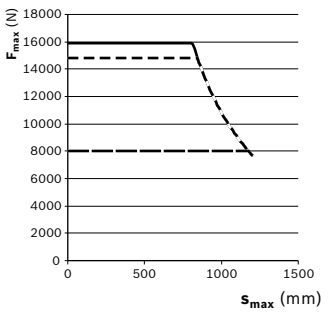
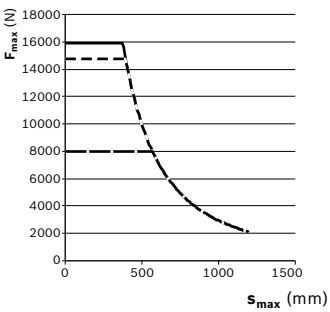
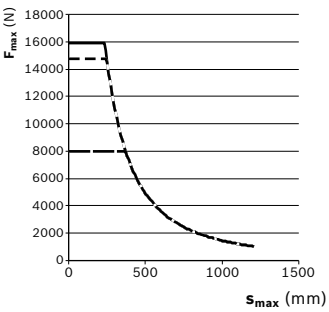
25 x 10
25 x 25</td><td> 
</td><td> 
</td><td> 
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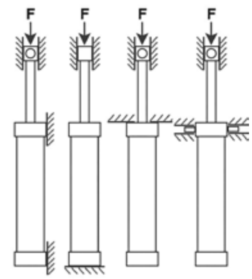
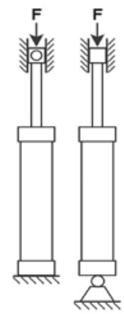
Case I

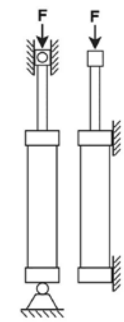


only allowed vertically

Case II



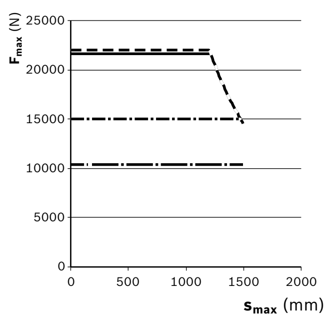
Case III



EMC-80

d_0 x P
- —— 32 x 5
- - - - 32 x 10
- ·-··-··- 32 x 20
- ·—·— 32 x 32

Case I:



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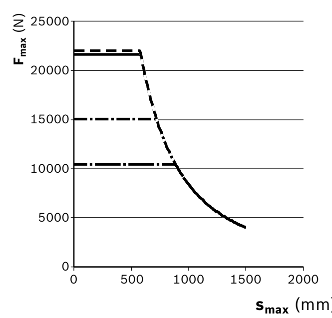

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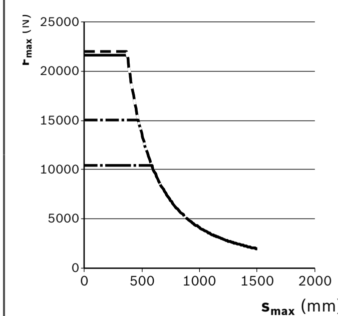

EMC-100

d_0 x P
- —— 40 x 5/40 x 10
- ·-··-··- 40 x 20/40 x 40

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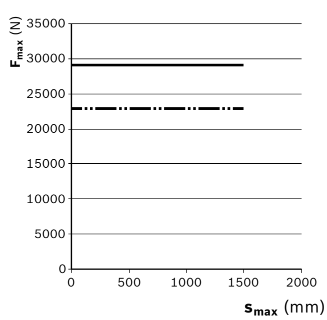

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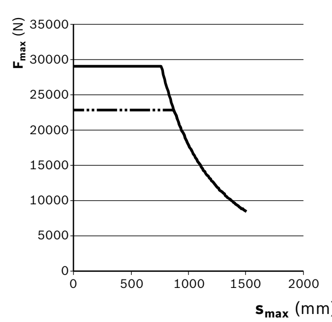

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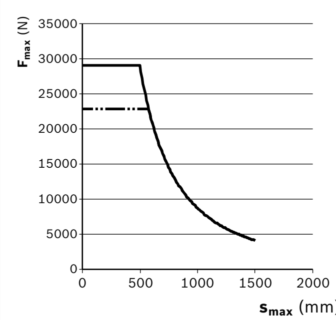
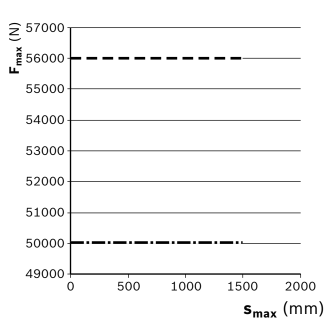


EMC-100XC

d_0 x P
- - - - 50 x 10
- ·—·— 50 x 20

Case I:



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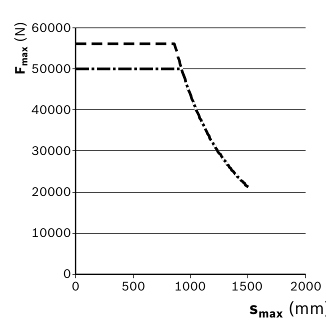

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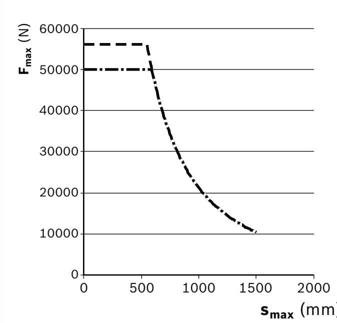


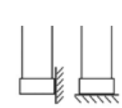
Piston rod in swivel bearings

Piston rod with linear travel range

Piston rod free

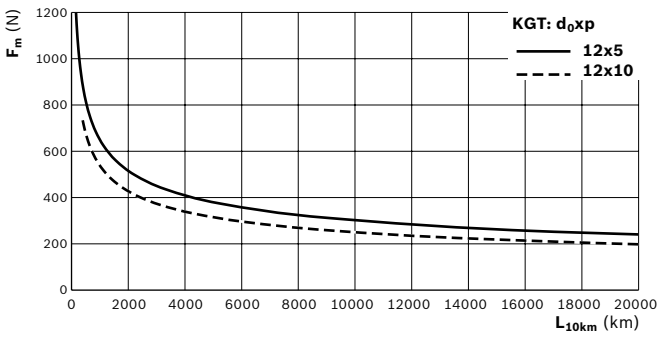
Swivel mount

Fixed mount

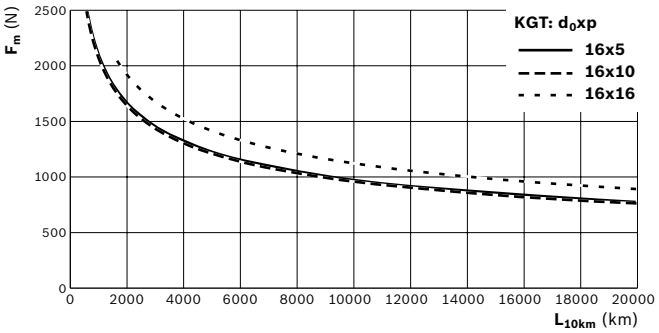


Service life

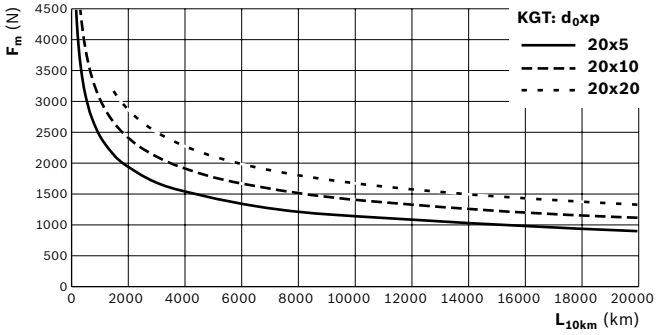
EMC-32



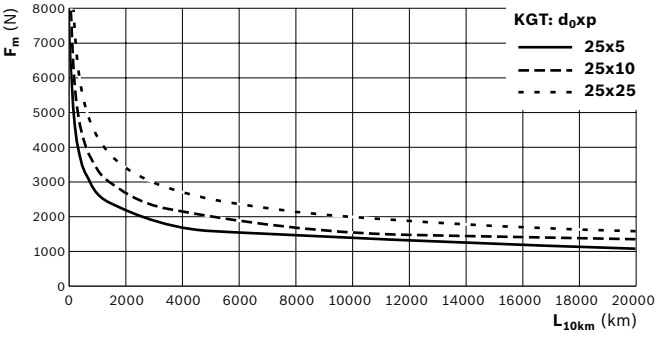
EMC-40



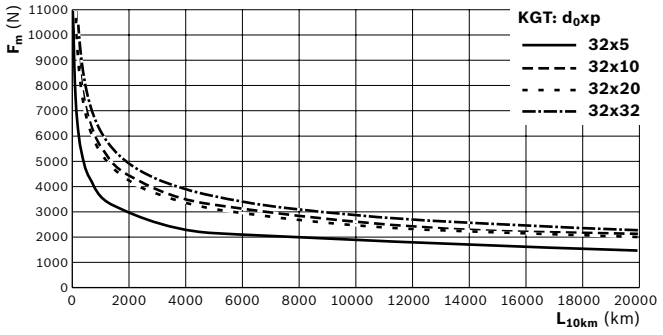
EMC-50



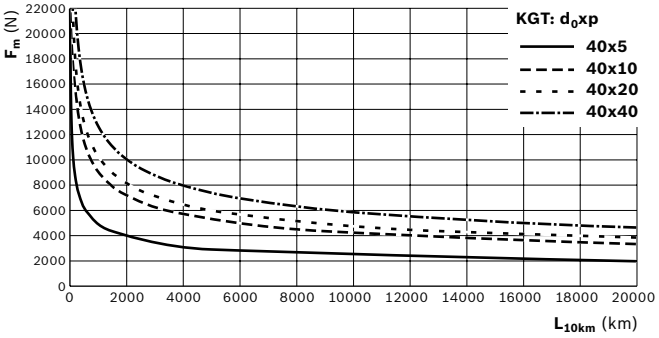
EMC-63



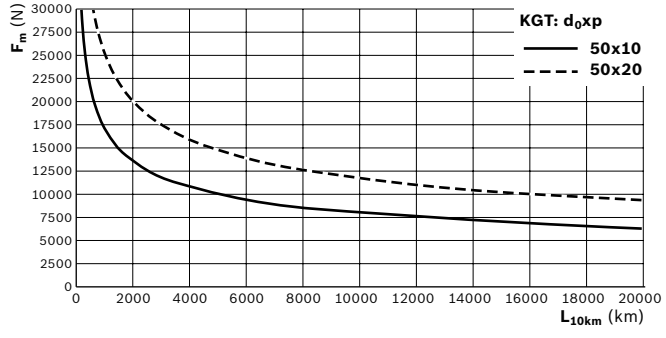
EMC-80



EMC-100



EMC-100XC



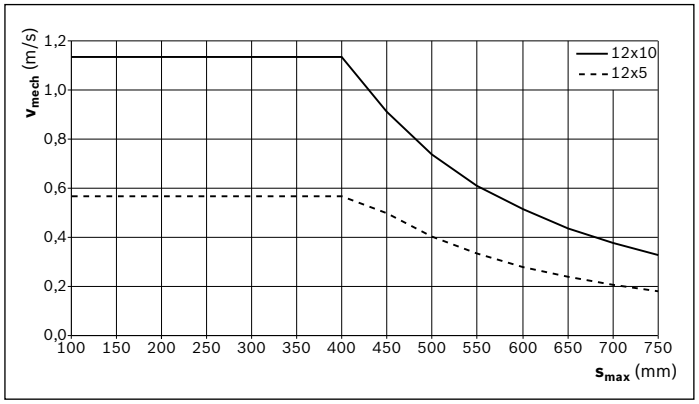
The stated values apply on compliance with the specified relubrication intervals (see the “Service and information” section).

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 travel speeds

EMC-32



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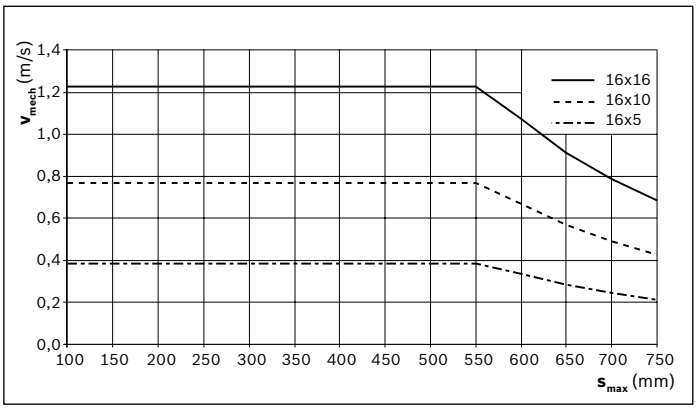
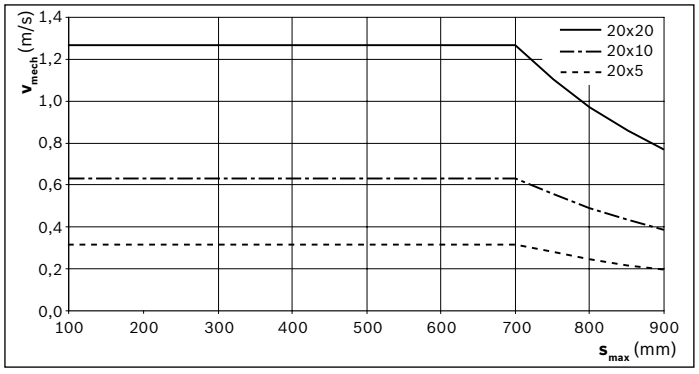


EMC-50



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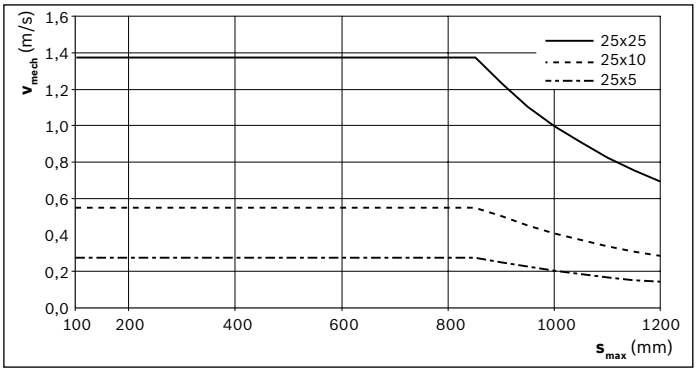

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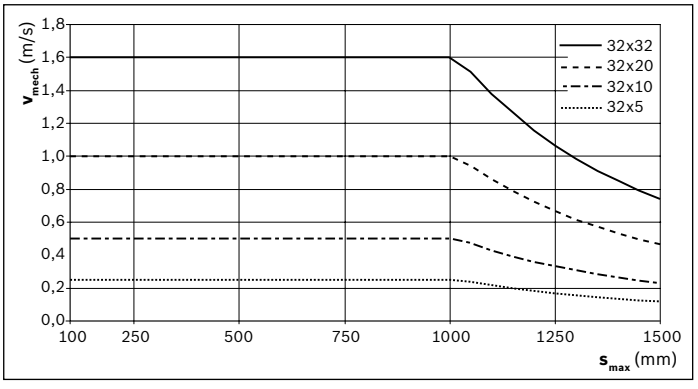

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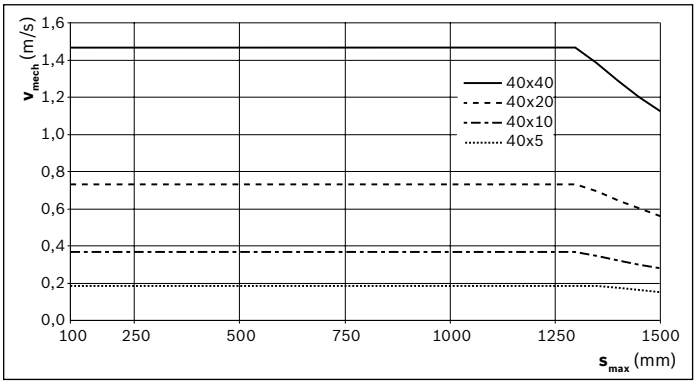
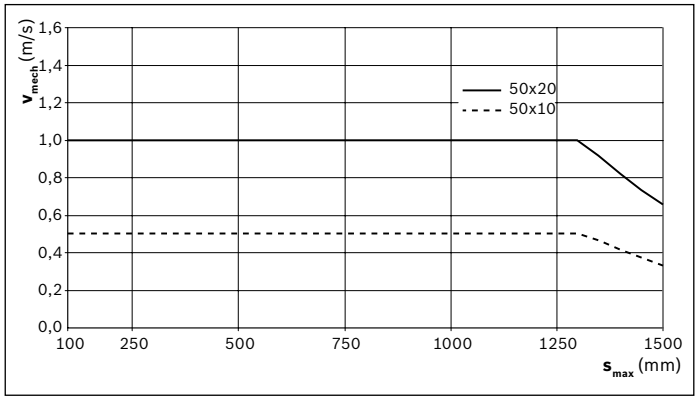
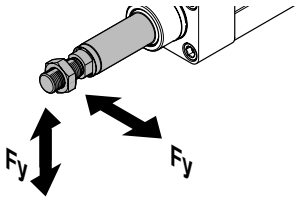


EMC-100XC

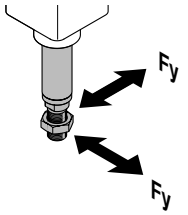


Load on the piston rod

Horizontal installation



Vertical installation



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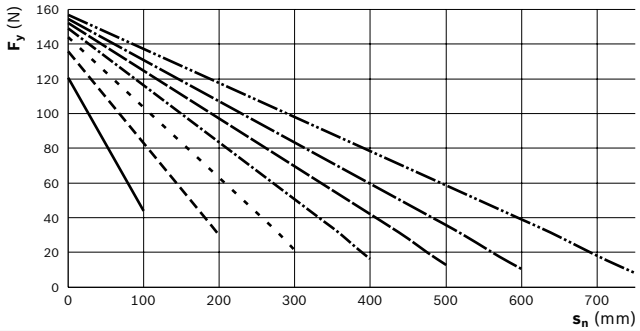

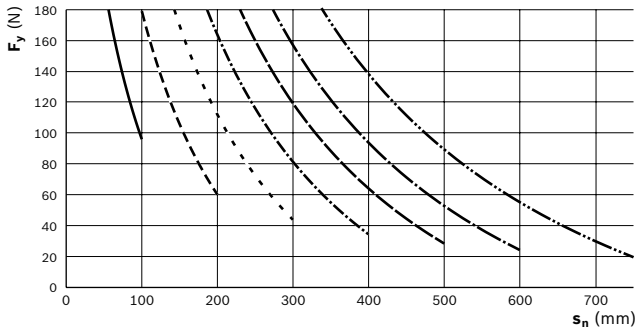

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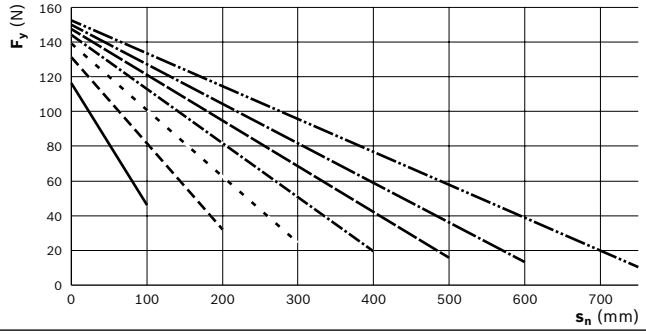

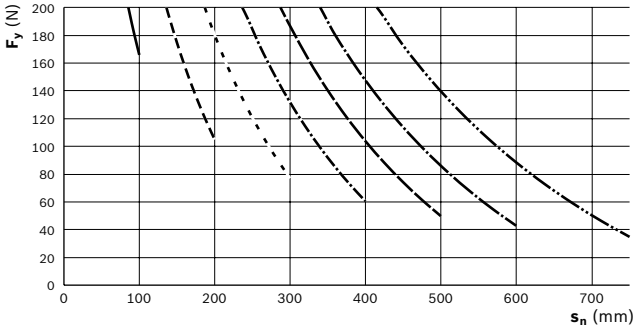

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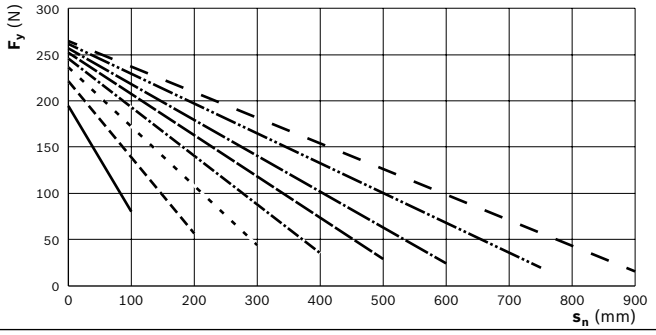

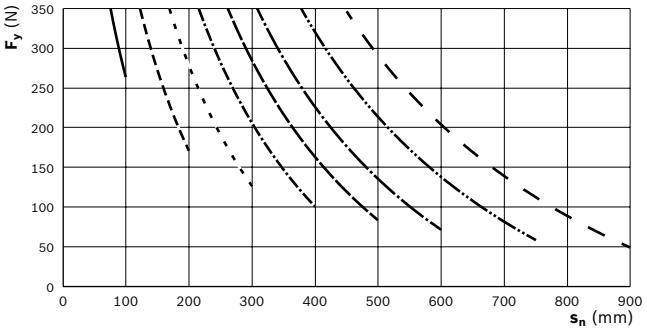

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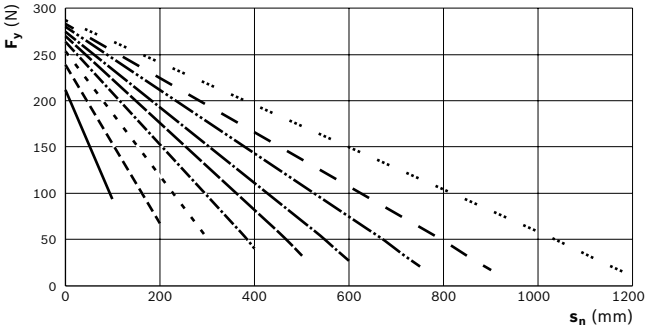
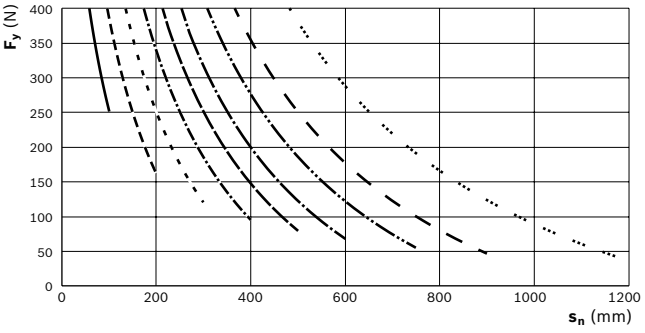
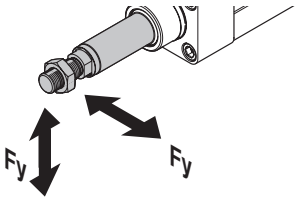
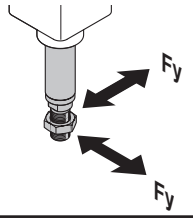




Horizontal installation



Vertical installation



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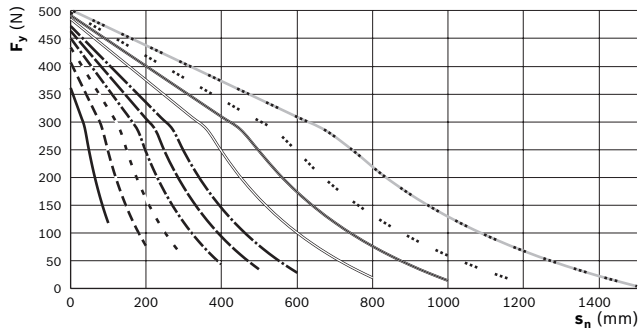

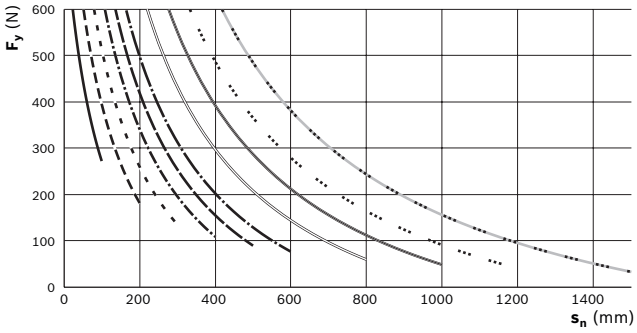

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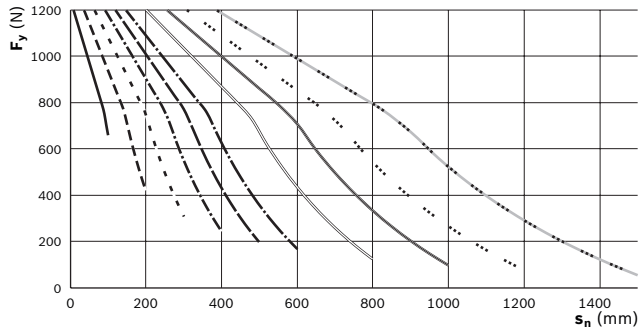
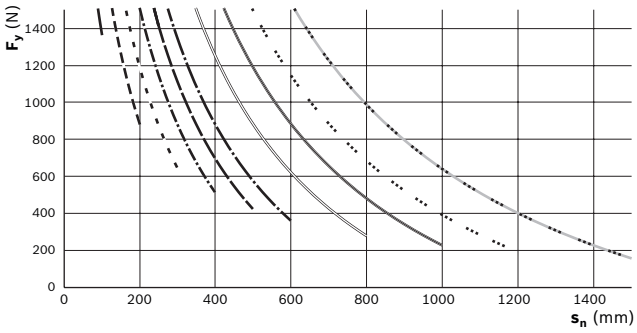
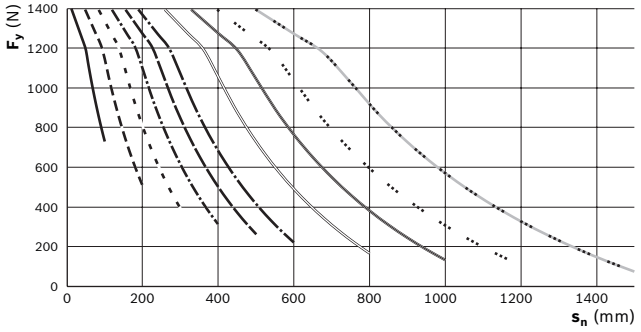
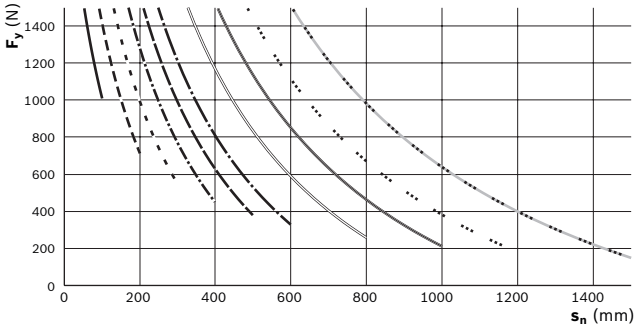




EMC-100XC





Characteristic curve for s_{max}

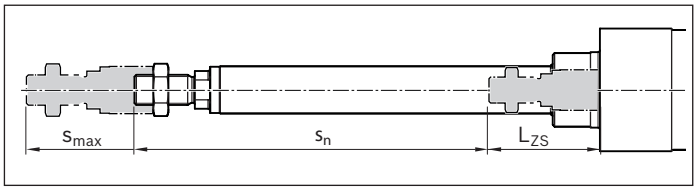
———	100 mm	—·—·—	750 mm
– – – – –	200 mm	═══	800 mm
· · · · · ·	300 mm	— — —	900 mm
—·—·—	400 mm	———	1000 mm
— — —	500 mm	··· ··· ···	1200 mm
—·—·—	600 mm	– – – – –	1500 mm

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:

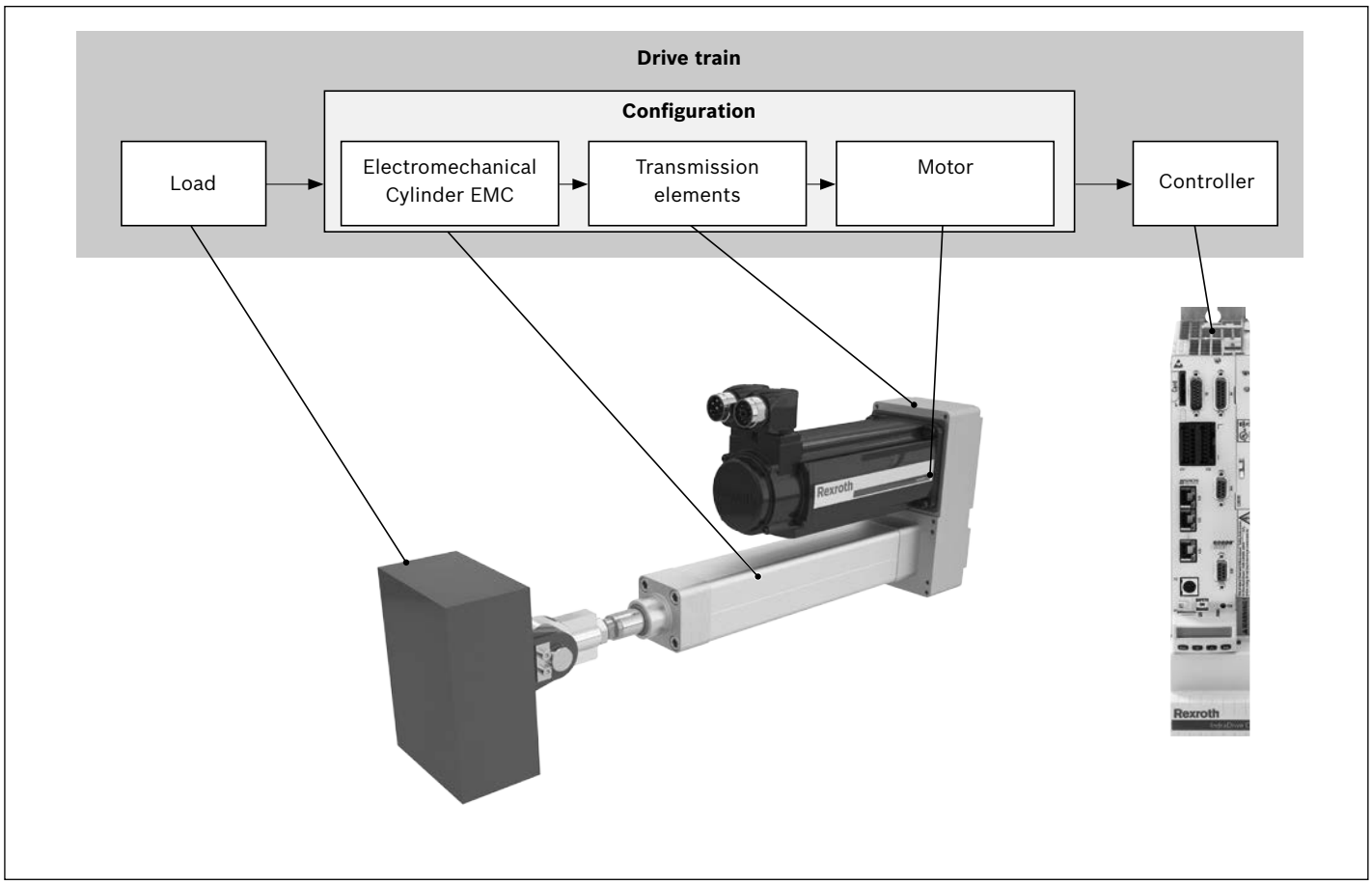
- 25 % of F_{max}
- a velocity of 0.5 m/s

Definition s_{max} /s_n



Calculation principles

Drive train



The correct dimensioning and assessment of an application requires a 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

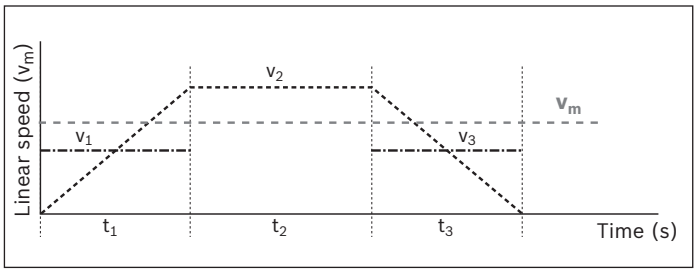
When selecting Electromechanical Cylinders EMC, maximum limits for permissible loads and forces must be taken into account. These limits can be found in the “Product description and technical data” section.

The values stated there are system-related. In other words, the upper limits are determined not only by the load ratings of the bearing points but also include structural design and material-related considerations.

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.

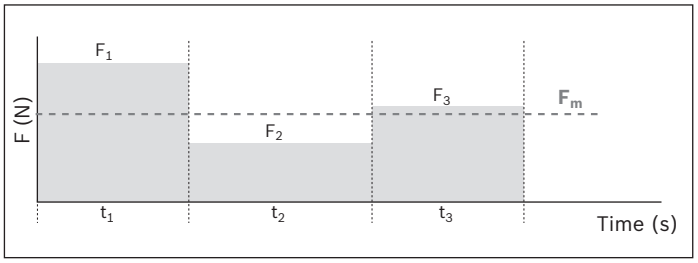


When the linear speed varies, the average speed v_m is calculated as follows:

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

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

When the load and rotary speed vary, the average load F_m is calculated as follows:



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

Nominal life

– in revolutions L_{10}

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

– in hours L_{10h}

$$L_{10h} = \frac{L_{10}}{n_m \cdot 60}$$

Driving torque M:

$$M = \frac{F \cdot P}{2000 \cdot \pi \cdot \eta}$$

C	=	dynamic load capacity	(N)	P	=	screw drive lead	
F	=	load	(N)	P_{app}	=	useful power in the application	(W)
$F_1, F_2, \ldots F_n$	=	axial load in phase 1 ... n	(N)	$t_1, t_2, \ldots t_n$	=	discrete time step for phases 1 ... n	(s)
F_m	=	equivalent dynamic axial load	(N)	t_{sum}	=	sum of discrete time steps $t_1, t_2, \ldots t_n$	(s)
L_{10}	=	nominal life in revolutions	(–)	$v_1, v_2, \ldots v_n$	=	linear speed in phase 1 ... n	(m/s)
L_{10h}	=	nominal life in hours	(h)	v_m	=	average linear speed	(m/s)
M	=	drive torque	(Nm)	η	=	mechanical efficiency	(–)

Sizing the drive

Principles

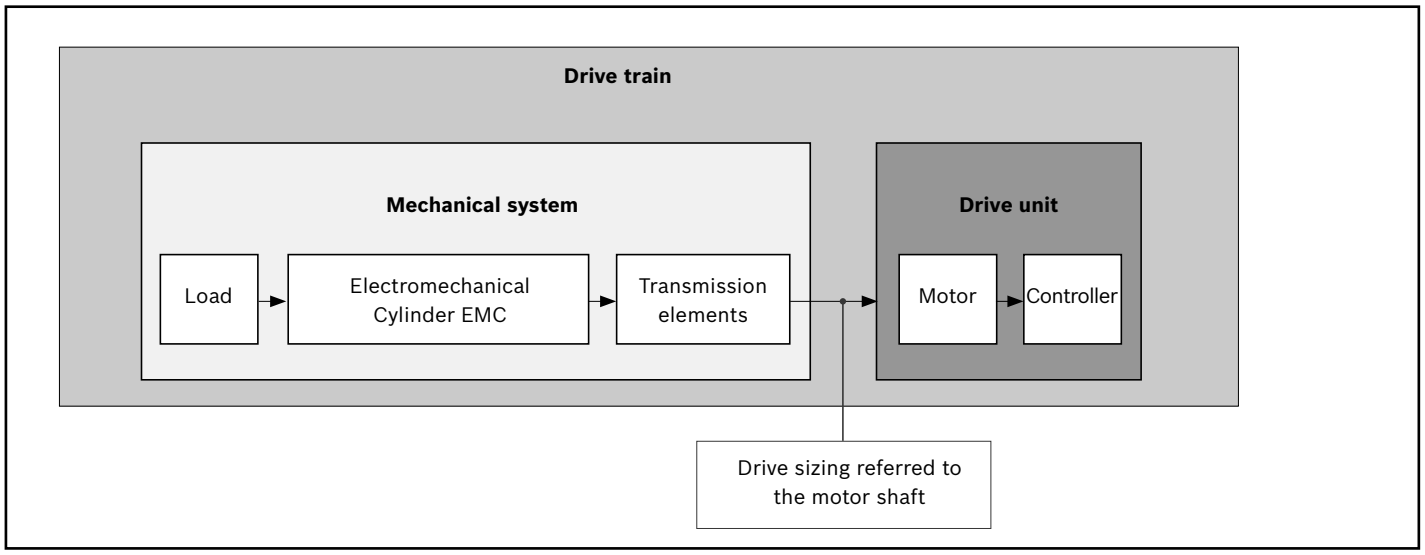
When calculating the required size of drive, the drive train can be subdivided into the **mechanical system** and the **drive itself**.

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 the appropriate performance data.

The electric drive is sized or dimensioned using the motor shaft as the reference point.

When sizing the drive, limit values must be taken into account as well as basic values. The limit (i.e. maximum) values must not be exceeded, in order to avoid damaging the mechanical components.



Technical data and 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 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 sizing the drive. 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	(min^{-1})		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] Value as per table
[4] For vertical mounting position: Determine the value using the appropriate formula

Drive sizing referred to the motor shaft

When sizing the drive, all the relevant design calculation values for the mechanical components contained in the drive train must be determined – and be expressed in terms of or 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}
- Max. permissible linear speed v_{mech} (max. permissible rotary speed n_{mech})
- Max. permissible drive torque M_{mech}

Determining the values for individual mechanical components in the drive train using the motor shaft as the 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 used in the formulas $k_{J\,fix}$, $k_{J\,var}$ and $k_{J\,m}$ already include the mass moment of inertia and gear ratios of the related transmission elements used 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 linear 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 linear 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.

J_{ex}	=	mass moment of inertia of mechanical system	(kgm^2)
J_s	=	mass moment of inertia of the linear motion system	(kgm^2)
J_t	=	translatory mass moment of inertia of external load based on the linear system drive journal	(kgm^2)
$k_{J\,fix}$	=	constant for fixed-length proportion of mass moment of inertia	(–)
$k_{J\,m}$	=	constant for mass-specific proportion of mass moment of inertia	(–)
$k_{J\,var}$	=	constant for variable-length proportion of mass moment of inertia	(–)
s_{max}	=	maximum travel range	(mm)
m_{ex}	=	moved external load	(kg)
M_R	=	frictional torque at motor journal	(Nm)
M_{Rs}	=	frictional torque of system	(Nm)
n_{mech}	=	maximum permissible rotary speed of mechanical system	(min^{-1})
n_P	=	maximum permissible rotary speed of EMC	(min^{-1})
v_{max}	=	maximum permissible linear speed of EMC	(m/s)
v_{mech}	=	maximum permissible linear speed of mechanical system	(m/s)

Sizing the drive

Maximum permissible drive torque M_p, M_{mech}

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

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.

$$M_{pl} = \frac{F_{max} \cdot P}{2000 \cdot \pi \cdot \eta}$$

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

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-selection of the motor

The following conditions can be used as a rough guide for pre-selecting the motor.

Condition 1:

The speed of the motor must be the same as or higher than the speed required for the mechanical system (but not exceed the maximum permissible 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 moments of inertia is used as an indicator for the quality of the control of a motor/controller combination.

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

Mass moment of inertia ratio

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

For pre-selection, experience has shown that the following ratios will result in a high level of 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 the empirical value of 0.6. This estimation roughly takes dynamic characteristics into account which still have to be determined by plotting an exact motion profile with the required motor torque levels.

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 flange and coupling: i = 1

$$M_g = \frac{P \cdot (m_{ex} + m_{ca}) \cdot g}{2000 \cdot \pi \cdot i \cdot \eta}$$

Equivalent dynamic torque

$$M_m = \frac{F_m \cdot P}{2000 \cdot \pi \cdot i \cdot \eta}$$

The equivalent dynamic torque can be calculated approximately via the average load F_m.
The value to be used for mechanical efficiency will depend on the drive element, ball screw.

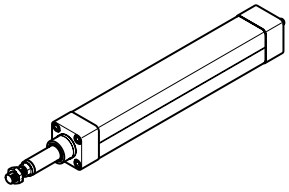
In the “Configuration and ordering” section, users can put together standard configurations including gear reducer and motor, for the various EMC sizes by selecting the appropriate options. By checking the three conditions stated above, it is possible to see whether a standard motor selected in a particular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

Precise sizing of the drive

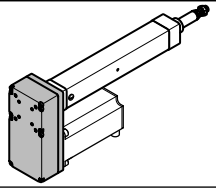
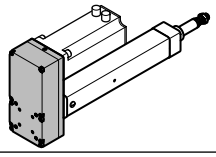
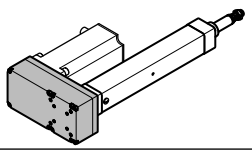
Pre-selecting the motor according to this rough guide is no substitute for the precise design calculations required for the drive, where all moments/torques and speed levels are taken into account. For precise calculation of the electric drive, including consideration of the specific motion profile, please refer to the performance data in the IndraDrive C catalog. When sizing 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!

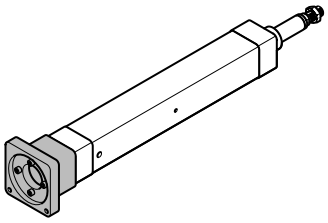
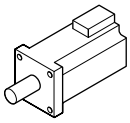
F_m	=	equivalent dynamic axial load	(N)	M_p	=	maximum permissible drive torque of EMC	(Nm)
F_{max}	=	maximum permissible axial force of EMC	(N)	M_{pl}	=	Maximum permissible drive torque of the EMC (from a maximum permissible axial load)	(Nm)
g	=	gravitational acceleration (= 9,81)	(m/s^2)	M_0	=	continuous motor torque	(Nm)
i	=	gear ratio of timing belt side drive	(–)	M_R	=	frictional torque at motor journal	(Nm)
J_{br}	=	mass moment of inertia of motor brake	(kgm^2)	M_{stat}	=	static load moment	(Nm)
J_{ex}	=	mass moment of inertia of mechanical system	(kgm^2)	n_{mech}	=	maximum permissible rotary speed of mechanical system	(min^{-1})
J_m	=	mass moment of inertia of motor	(kgm^2)	n_{max}	=	maximum speed of motor	(min^{-1})
m_{ca}	=	moved mass of carriage	(kg)	P	=	screw drive lead	(mm)
m_{ex}	=	moved external load	(kg)	V	=	ratio of mass moments of inertia of drive train and motor	(–)
M_g	=	weight moment at motor journal	(Nm)	η	=	mechanical efficiency	(–)
M_{mech}	=	maximum permissible drive torque of mechanical system	(Nm)				
M_m	=	equivalent dynamic torque	(Nm)				

EMC 32 – EMC 50

Size, Part number	Max. travel range (mm)	Housing			Drive unit		Lubrication			Switches			Version		
		Standard	Protection class IP65	Protection class IP65 + R	Ball screw d_0 x P (mm)		NLGI grade 02 (Dynalub 510)	NLGI grade 00 (Dynalub 520)[1]	Ball screw preserved only[2]	Without switch and sensor profile	Sensor profile	Switches 1, 2, 3, 4			
EMC-032-NN-2		01	02	03	12 x 5	01	-	02	03	00	80	PNP/normally closed (NC)	120	OF01	Without motor mount
														MF01	With motor mount
					12 x 10	02								RV01 RV02 RV03	With timing belt side drive
EMC-040-NN-2							01							OF01	Without motor mount
					16 x 5	01						NPN/normally closed (NC)	121	MF01	With motor mount
					16 x 10	02								RV01 RV02 RV03	With timing belt side drive
					16 x 16	03									
EMC-050-NN-2					20 x 5	01						PNP/normally open (NO)	122	OF01	Without motor mount
														MF01	With motor mount
					20 x 10	02							123	RV01 RV02 RV03	With timing belt side drive
					20 x 20	04						NPN/normally open (NO)			

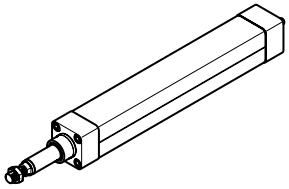
Timing belt side drive

RV01	RV02	RV03
		

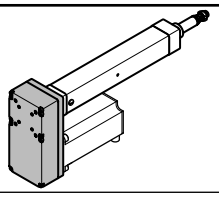
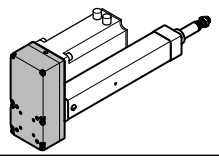
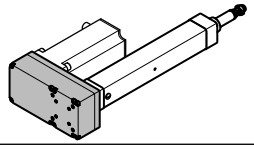
	Motor mounting			**Motor**		**Documentation**		
								
	Gear ratio	Mounting kit[3]	For motor[4]	Without brake	With brake	Standard report	Measurement report	
		00	Without	00		01	02[5]	03[6]
		01	MSM019B	104	105			
		02	MSM031B	106	107			
		03	MSK030	84	85			
	i = 1	41	MSM019B	104	105			
		42	MSM031B	106	107			
		43	MSK030	84	85			
		00	Without	00				
		05	MSM031C	108	109			
		06	MSK030	84	85			
		07	MSK040	86	87			
	i = 1	45	MSM031C	108	109			
		46	MSK030	84	85			
		47	MSK040	86	87			
	i = 1.5	49	MSM031C	108	109			
		50	MSK030	84	85			
		51	MSK040	86	87			
		00	Without	00				
		09	MSM031C	108	109			
		10	MSM041B	110	111			
		11	MSK040	86	87			
		12	MSK050	88	89			
	i = 1	53	MSM031C	108	109			
		54	MSM041B	110	111			
		55	MSK040	86	87			
		56	MSK050	88	89			
	i = 1.5	58	MSM031C	108	109			
		59	MSM041B	110	111			
		60	MSK040	86	87			

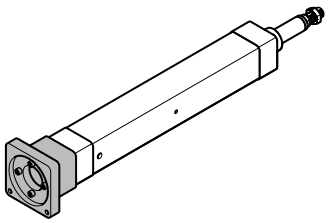
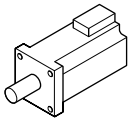
1) Recommended for one-point lubrication
2) Initial greasing required prior to initial operation
3) Attachment kit also available without motor (when ordering: enter “00” for motor); for motor mounting kit for customer motor see “Motor mounting” section.
4) For motor types see “IndraDyn S - servo motors” section
5) Frictional torque measurement
6) Lead deviation

EMC 63 – EMC 80

Size Part number	Max. travel range (mm)	Housing			Drive unit		Lubrication			Switches			Version		
		Standard	Protection class IP65	Protection class IP65 + R	Ball screw d_0 x P (mm)		NLGI grade 02 (Dynalub 510)	NLGI grade 00 (Dynalub 520)[1]	Ball screw preserved only[2]	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	00	80	PNP/normally closed (NC)	120	OF01	Without motor mount	
														MF01	With motor mount	
					25 x 10	02						NPN/normally closed (NC)	121	RV01 RV02 RV03	With timing belt side drive	
					25 x 25	05										
EMC-080-NN-2					32 x 5	01						PNP/normally open (NO)	122	OF01	Without motor mount	
														MF01	With motor mount	
					32 x 10	02										
					32 x 20	04						NPN/normally open (NO)	123	RV01 RV02 RV03	With timing belt side drive	
					32 x 32	06										

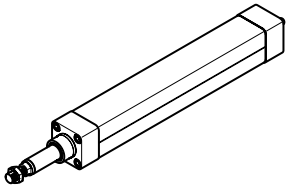
Timing belt side drive

RV01	RV02	RV03
		

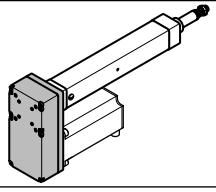
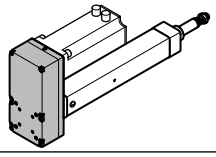
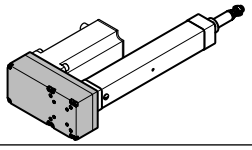
	Motor mounting			Motor		Documentation		
								
	Gear ratio	Mounting kit[3]	For motor[4]	Without brake	With brake	Standard report	Measurement report	
		00	Without	00				
		14	MSM041B	110	111			
		15	MSK040	86	87			
		16	MSK050	88	89			
		17	MSK060	90	91			
	i = 1	62	MSM041B	110	111			
		63	MSK040	86	87			
		64	MSK050	88	89			
		65	MSK060	90	91			
	i = 2	67	MSM041B	110	111			
		68	MSK040	86	87	01	02[5]	03[6]
		69	MSK050	88	89			
		00	Without	00				
		19	MSK050	88	89			
		20	MSK060	90	91			
		21	MSK076	92	93			
	i = 1	71	MSK050	88	89			
		72	MSK060	90	91			
		73	MSK076	92	93			
	i = 2	75	MSK050	88	89			
		76	MSK060	90	91			

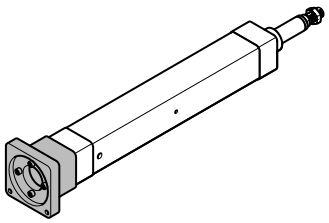
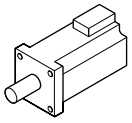
1) Recommended for one-point lubrication
2) Initial greasing required prior to initial operation
3) Attachment kit also available without motor (when ordering: enter “00” for motor); for motor mounting kit for customer motor see “Motor mounting” section.
4) For motor types see “IndraDyn S - servo motors” section
5) Frictional torque measurement
6) Lead deviation

EMC 100 – EMC 100XC

Size Part number	Max. travel range (mm)	Housing			Drive unit		Lubrication			Switches			Version		
		Standard	Protection class IP65	Protection class IP65 + R	Ball screw d_0 x P (mm)		NLGI grade 02 (Dynalub 510)	NLGI grade 00 (Dynalub 520)[1]	Ball screw preserved only[2]	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	00	80	PNP/normally closed (NC)	120	OF01	Without motor mount	
					40 x 10	02								MF01	With motor mount	
					40 x 20	04						NPN/normally closed (NC)	121	RV01 RV02 RV03	With timing belt side drive	
					40 x 40	07										
EMC-100-XC-2					50 x 10	02						PNP/normally open (NO)	122	OF01	Without motor mount	
														MF01	With motor mount	
					50 x 20	04						NPN/normally open (NO)	123	RV01 RV02 RV03	With timing belt side drive	

Timing belt side drive

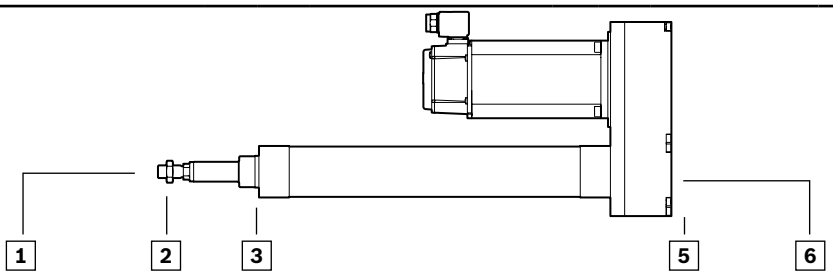
RV01	RV02	RV03
		

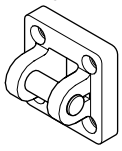
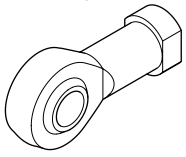
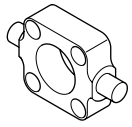
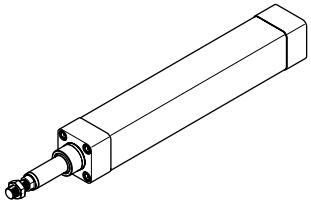
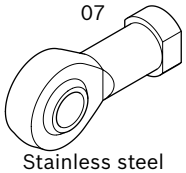
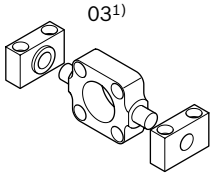
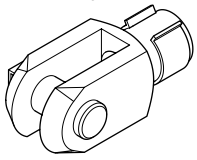
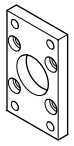
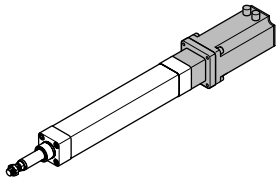
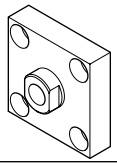
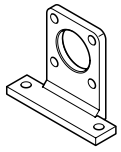
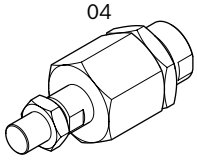
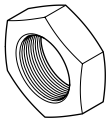
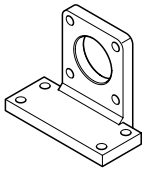
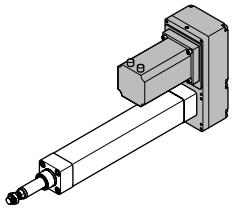
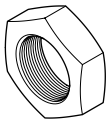
	Motor mounting			**Motor**		**Documentation**		
								
	Gear ratio	Mounting kit[3]	For motor[4]	Without brake	With brake	Standard report	Measurement report	
		00	Without	00		01	02[5]	03[6]
		23	MSK060	90	91			
		24	MSK071	114	115			
		25	MSK076	92	93			
	i = 1	78	MSK060	90	91			
		79	MSK071	114	115			
		80	MSK076	92	93			
	i = 2	82	MSK060	90	91			
		83	MSK076	92	93			
		00	Without	00				
		27	MSK071	122	123			
		28	MSK101	118	119			
	i = 1	85	MSK071	122	123			
		86	MSK101	118	119			
	i = 1.5	88	MSK071	122	123			
		89	MSK101	118	119			

1) Recommended for one-point lubrication
2) Initial greasing required prior to initial operation
3) Attachment kit also available without motor (when ordering: enter “00” for motor); for motor mounting kit for customer motor see “Motor mounting” section.
4) For motor types see “IndraDyn S - servo motors” section
5) Frictional torque measurement
6) Lead deviation

Mounting elements

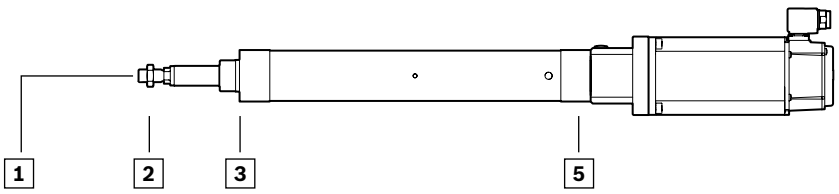
Mounting element

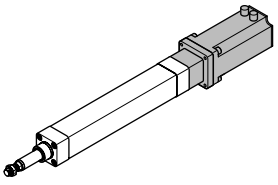
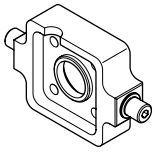
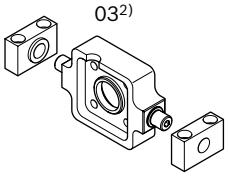
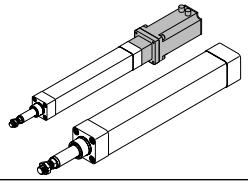
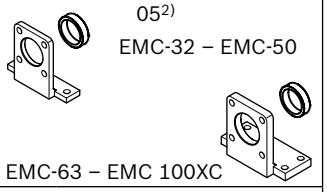
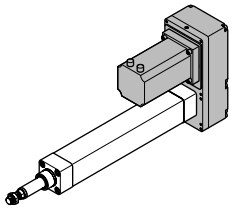
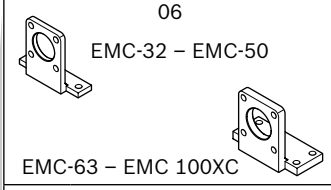
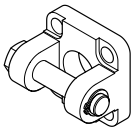
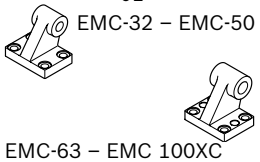
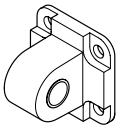
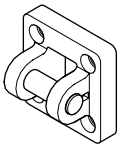
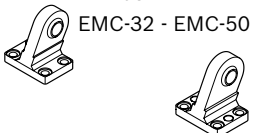
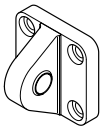
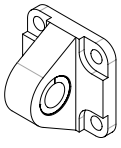


Version	Group 1	Group 2	Group 3	Group 4
	00 Without	00 Without	00 Without	00 Without
Without motor mount OF01	01 	01 	01[1] 	
	02  Clevis mount with force measuring bolts	07  Stainless steel	03[1] 	
With motor mount and coupling MF01		02 	04 	
		03 	06 EMC-32 – EMC-50 	
		04 		
With timing belt side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

[1] Only allowed vertically

[2] Mounting elements are already mounted for types with motor mount and coupling.

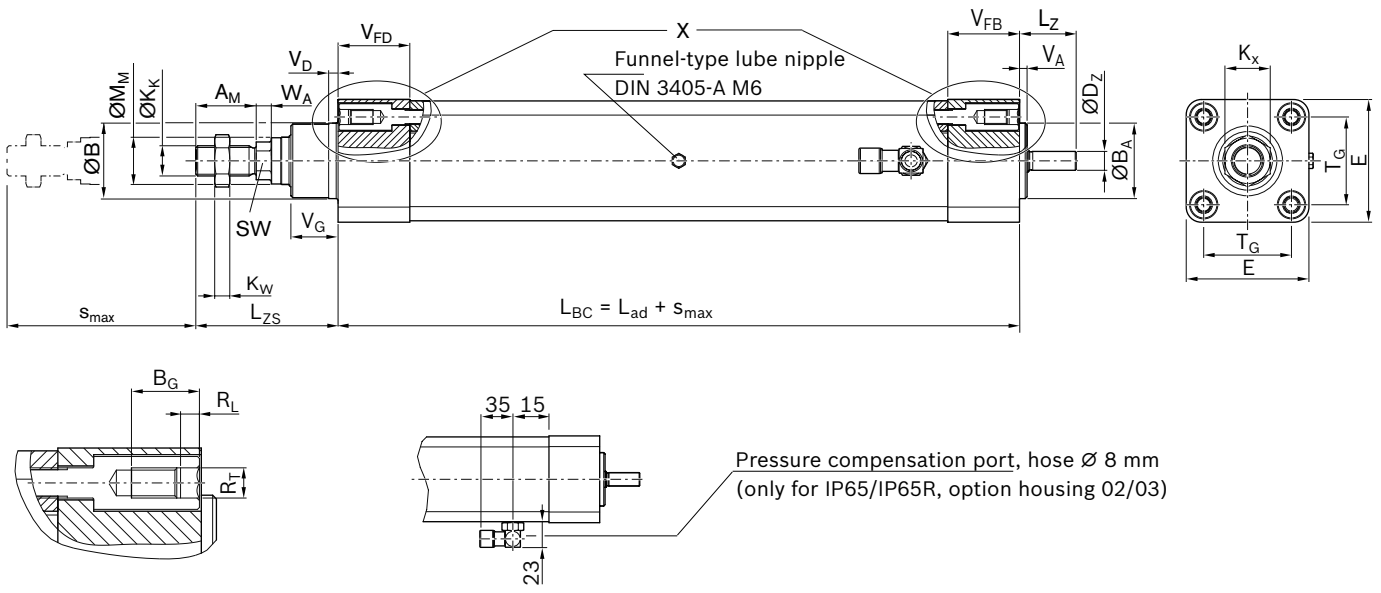


Version	Group 5		Group 6	
	00	Without	00	Without
With motor mount and coupling MF01 	01[2] 			
	03[2] 			
	05[2] EMC-32 – EMC-50  EMC-63 – EMC 100XC			
With timing belt side drive RV01 to RV03 	06 EMC-32 – EMC-50  EMC-63 – EMC 100XC			
	07 		01 EMC-32 – EMC-50  EMC-63 – EMC 100XC	02 
	08 		03 EMC-32 - EMC-50  EMC-63 – EMC 100XC	04 
	10  Clevis mount with force measuring bolts		05 	

Note: Mounting elements are included

Dimensional drawing of EMC

OF01



EMC	Ball screw	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

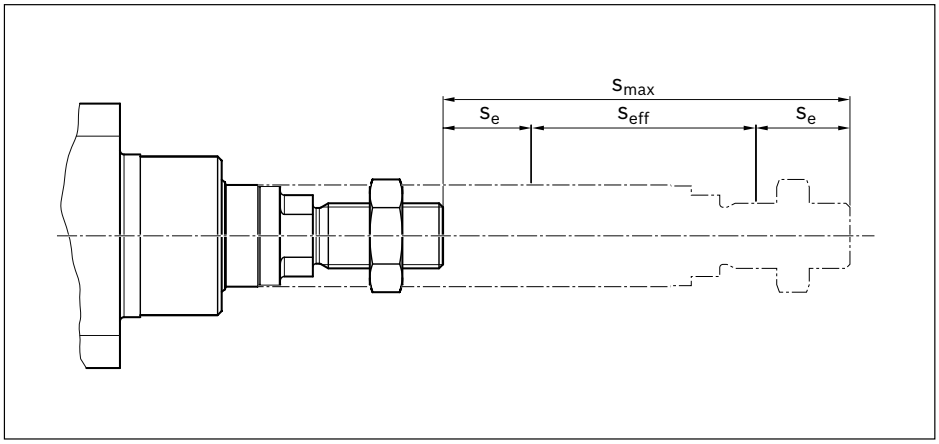
For safe operation, the excess travel must be longer than the braking distance. The acceleration travel can be taken as a guideline value for the braking distance. In most cases, this will be sufficient:

Excess travel = 2 · screw lead (P)

Example: Ball screw (d_0 x P) 12x5:

Excess travel = 2 · 5 mm = 10 mm

Maximum travel range s_{max} according to the customer specification.



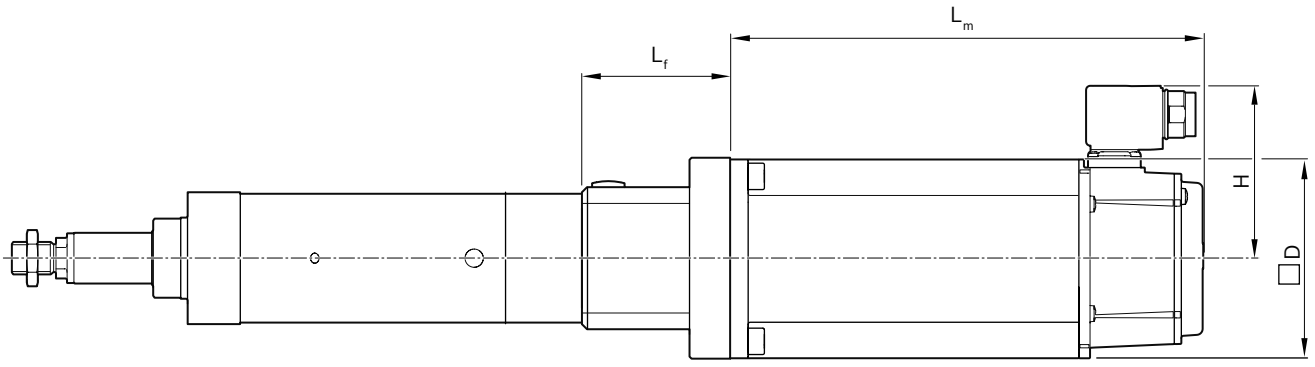
$$s_{eff} = s_{max} - 2 \cdot s_e$$

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

	L_{ad}	L_{ZS}	$M_{M\ f8}$	R_T	B_G	R_L	SW	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													

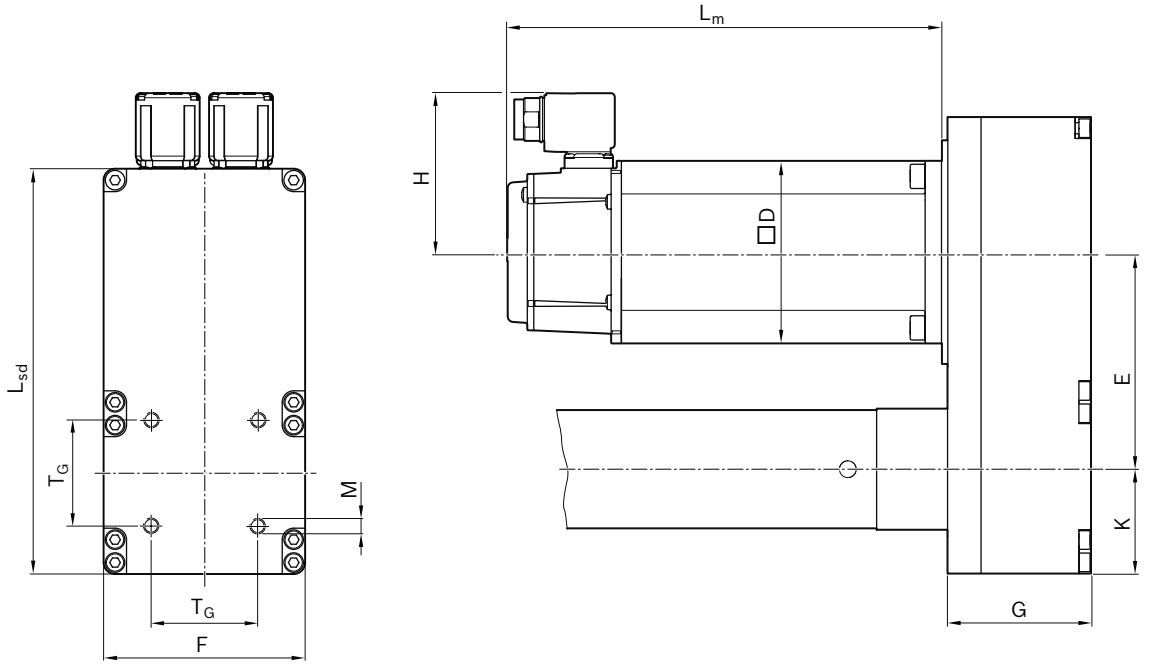
Dimensional drawing for motor mounting with flange and coupling

MF01



Dimensional drawing motor mounting with timing belt side drive

RV01, RV02, RV03



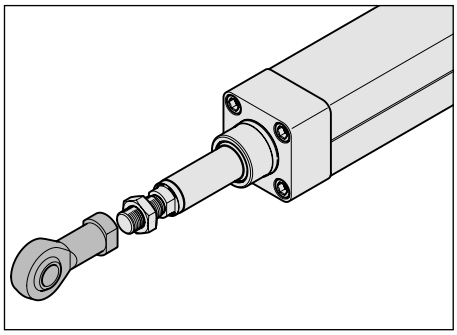
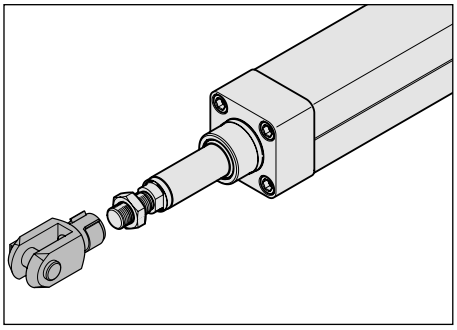
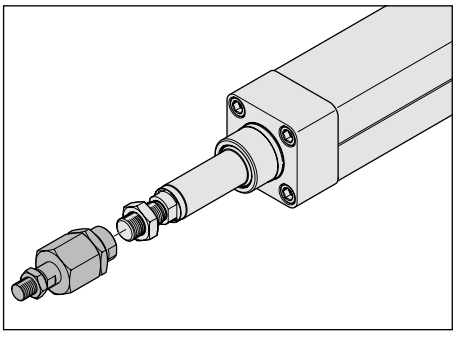
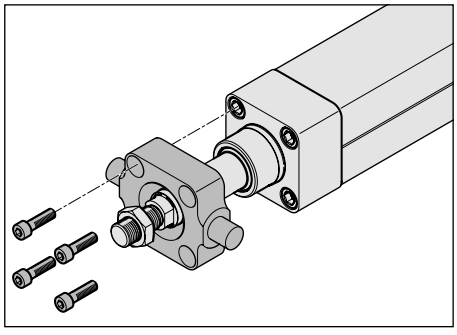
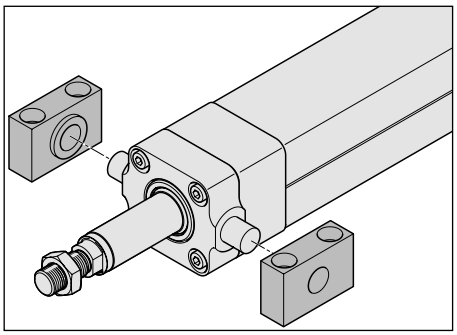
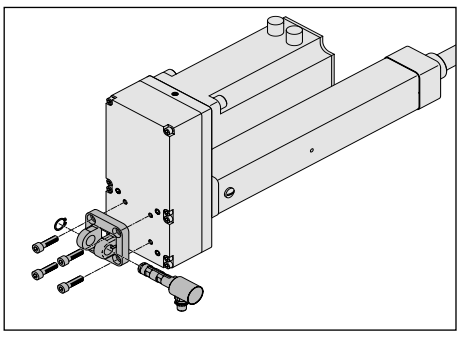
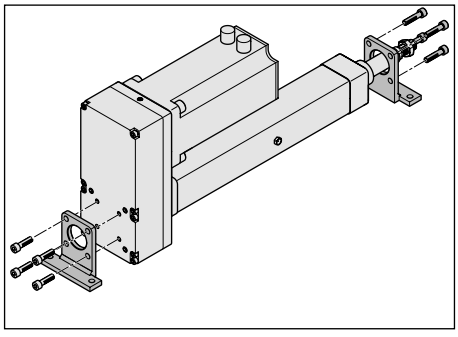
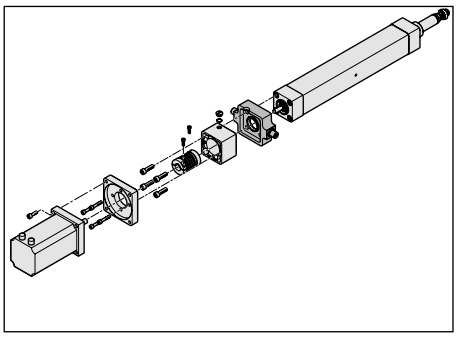
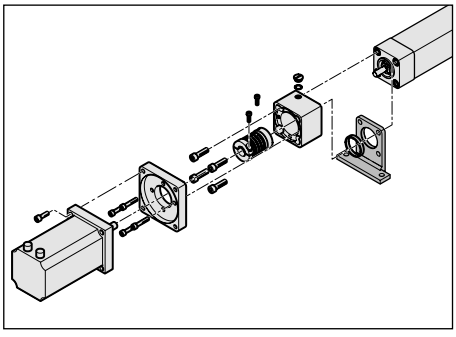
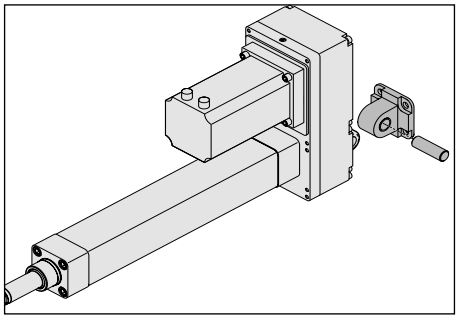
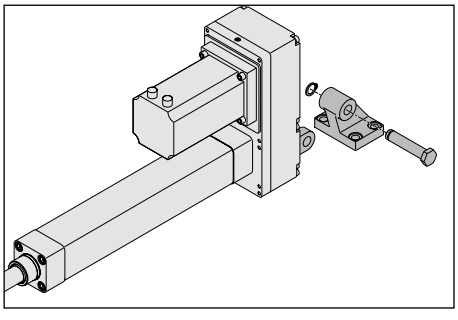
EMC	Motor	i	Dimensions (mm)											
			E	K	G	D	H	L_m Without brake	L_m With Brake	L_{sd}	L_f	F	T_G	M
32	MSM019B	1	67.3	30.5	37.0	38	32.0	92.0	122.0	130	55	54.0	32.5	M6
	MSM031B	1	62.8	33.0	45.5	60	43.0	79.0	115.5	138		64.5		
	MSK030C	1				54	71.5	188.0	213.0					
40	MSM031C	1	62.8	33.0	45.5	60	42.0	98.5	135.0	138	61	64.5	38.0	
		1.5	65.3											
	MSK030C	1	62.8			54	71.5	188.0	213.0					
		1.5	65.3											
	MSK040C	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
		1.5	81.5											
	MSM041B	1	82.2			80	53.0	112.0	149.0					
		1.5	81.5											
	MSK040C	1	82.2			82	83.5	185.5	215.5					
		1.5	81.5											
	MSK050C	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	
		2	116.2											
	MSK040C	1	117.2			82	83.5	185.5	215.5		88			
		2	116.2											
	MSK050C	1	117.2			98	85.5	203.0	233.0		95			
		2	116.2											
	MSK060C	1	117.2			116	98.5	226.0	259.0					
80	MSK050C	1	116.2	56.0	77.0	98	85.5	203.0	233.0	245	100	116.0	72.0	M10
		2	117.2											
	MSK060C	1	149.7	77.0	102.0	116	98.5	226.0	259.0	324		160.0		
		2	151.4											
	MSK076C	1	149.7			140	110.0	292.5	292.5					
100	MSK060C	1	149.7	77.0	102.0	116	98.5	226.0	259.0	324	119	160.0	89.0	
		2	151.4											
	MSK071D	1	149.7			140	132.0	312.0	347.0					
	MSK076C	1	149.7			140	110.0	292.5	292.5					
		2	151.4											
100XC	MSK071E	1	174.7	89.0	113.5	140	132.0	352.0	387.0	375	145	197.0	89.0	M12
		1.5	175.6											
	MSK101D	1	174.7			192	166.0	410.0	410.0		143			
		1.5	175.6											

Mounting

⚠ When you order an EMC with flange, motor and foot mounting, the unit is delivered fully assembled. When attaching the foot mounting retrospectively, the cylinder base flange first needs to be dismantled.

The fastening elements are mounted on the rear end of the timing belt side drive. The screws are included with the fasteners. Before installing the fasteners, remove the screws on the timing belt side drive.
For more information, see “Mounting Instructions for EMC”, R320103102.

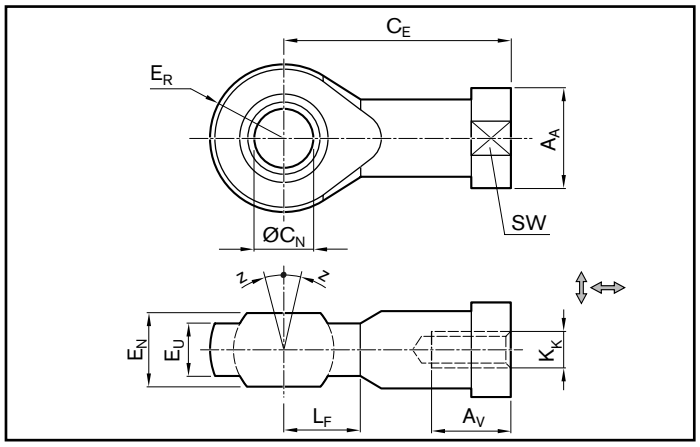
Examples

Mounting elements

Swivel head with interior thread

Group 2, option 01 (material: galvanized steel), option 07 (material: stainless steel)



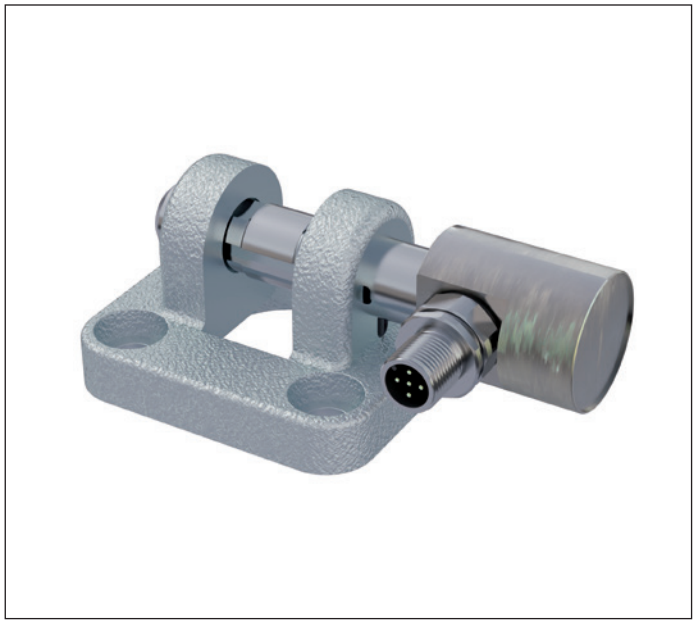
EMC	Part number		Dimensions (mm)											m
	Steel galvanized	Stainless steel	A_A	A_V min.	C_E	$ØC_N$ H7	E_N −0,1	E_R	E_U max.	K_K	L_F	SW	Z (°)	(kg)
32	R349938500	R349951600	19	15 (20)	43	10	14	14	11.5 (10.5)	M10x1.25	14	17	4 (7)	0.070 (0.10)
40	R349938600	R349951700	22	18 (22)	50	12	16	16	12.5 (12)	M12x1.25	16	19	4 (7)	0.105 (0.12)
50 / **63**	R349938700	R349951800	27	24 (28)	64	16	21	21	15.5 (15)	M16x1.5	21	22	4 (8)	0.210 (0.23)
80 / **100**	R349938900	R349951900	34	30 (33)	77	20	25	25	18.5 (18)	M20x1.5	25	30 (32)	4 (8)	0.380 (0.42)
100XC	R349951500	R349952000	60 (53)	56 (53)	125	35	43 (35)	40 (42)	32 (24)	M36x2	40 (37)	50 (–)	4 (6)	2.000 (1.40)

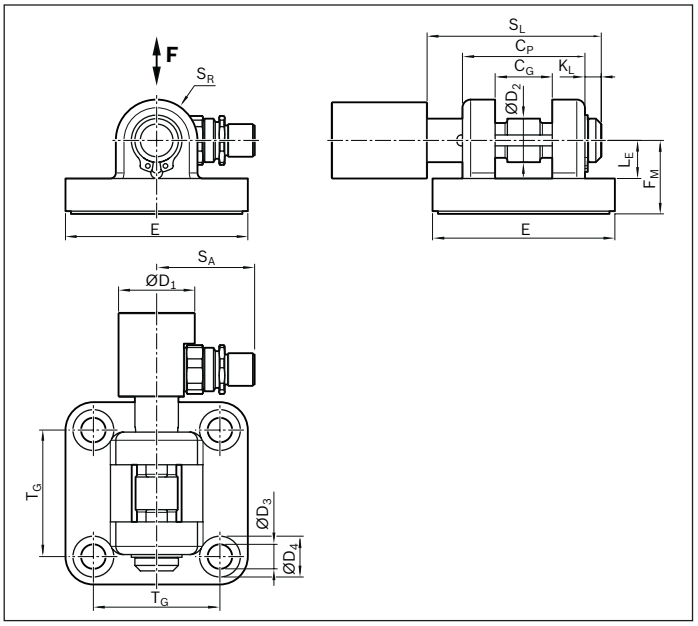
Bracketed values for type “stainless steel”

Mounting elements

Clevis mount with force measuring bolts

Group 1, option 02; group 5, option 10





EMC	Part number	Dimensions (mm)																m	F_{max}
		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)	(N)
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	$F_{max\ EMC}$
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	$F_{max\ EMC}$
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	$F_{max\ EMC}$
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	14500
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	17800
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	22900
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	$F_{max\ EMC}$

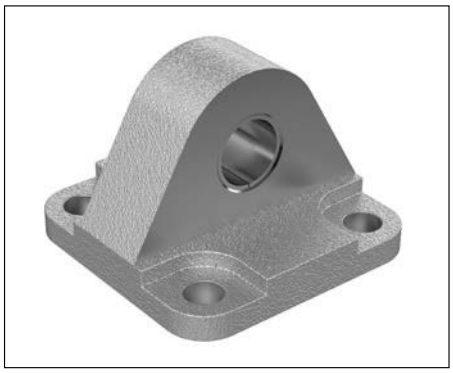
[1)] Material: Forged aluminum
[2)] Material: Galvanized spheroidal graphite iron

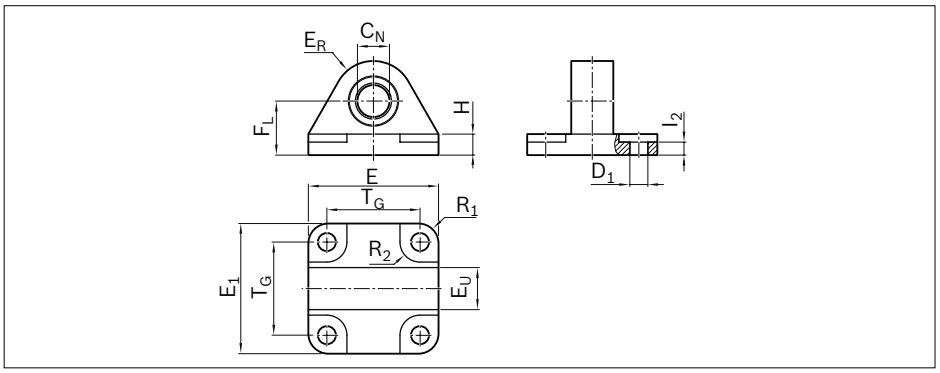
Mounting instruction

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

Swivel bearing

Group 6, option 05 (material: Aluminum; (counterpart to clevis bracket with force measuring bolts)



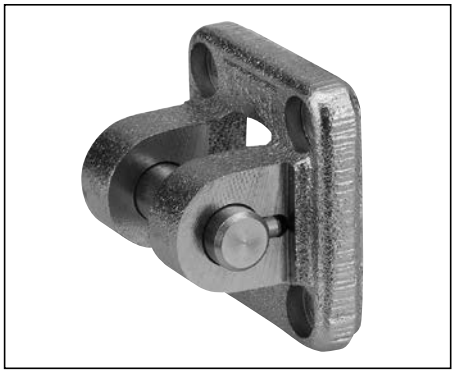


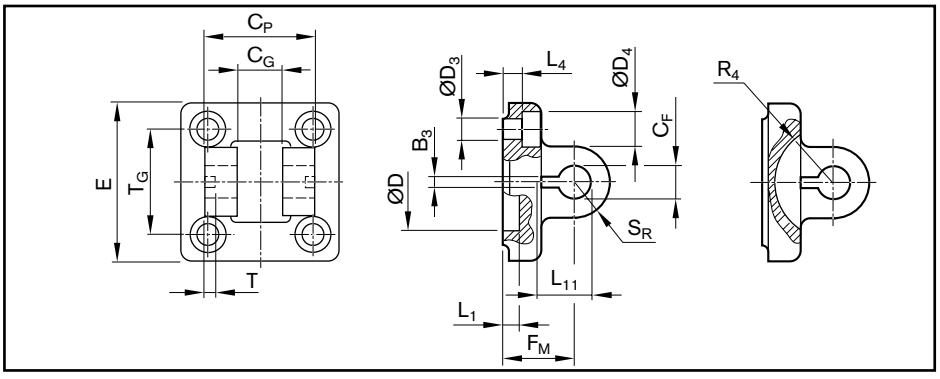
EMC	Part number	Dimensions (mm)											m
		ØC_N H7	ØD_1 H13	F_L ±0.2	H ±0.5	E_R ±0.2	E_U ±0.2	I_2 ±0.5	E/E_1 ±0.5	T_G	R_1/R_2	DIN 912	(kg)
32	R15611B025	10	6.6	22	9.0	15	14	5.5	47	32.5	8	M6x18	0.074
40	R15612B025	12	6.6	25	9.0	18	16	5.5	53	38.0	8	M6x18	0.109
50	R15613B025	16	9.0	27	10.5	20	21	6.5	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	13.5	55	17.0	44	43	10.0	176	140.0	20	M16x40	2.238

Clevis mount on the timing belt side drive

Group 1, option 01; group 5, option 08;

(for swivel bearing and counterpart for swivel head with internal thread)





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	14500
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	17800
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	22900
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

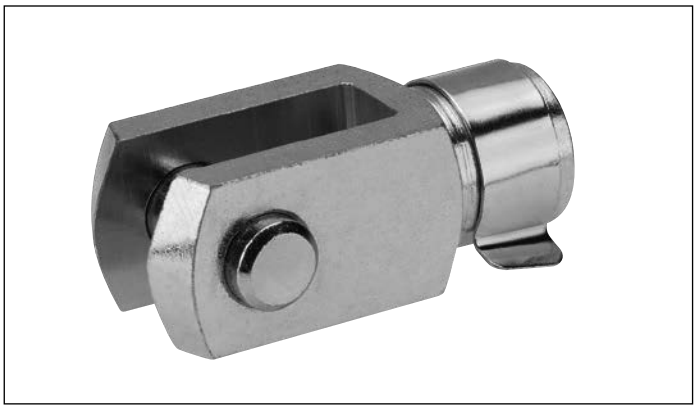
[2)] Material: Galvanized spheroidal graphite iron

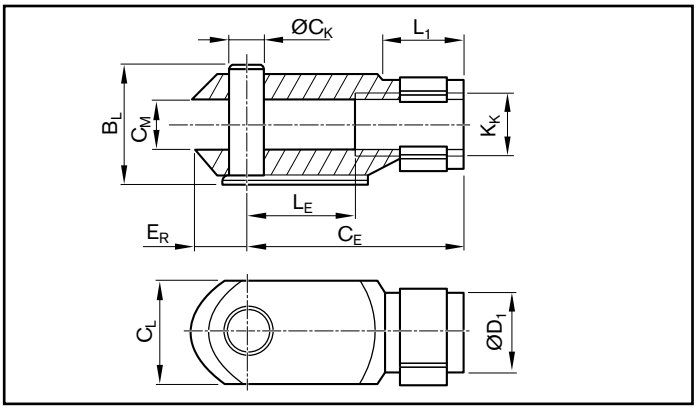
Bolts and fastening screws included.

Mounting elements

Fork clevis with internal thread

Group 2, option 02 (material: galvanized steel

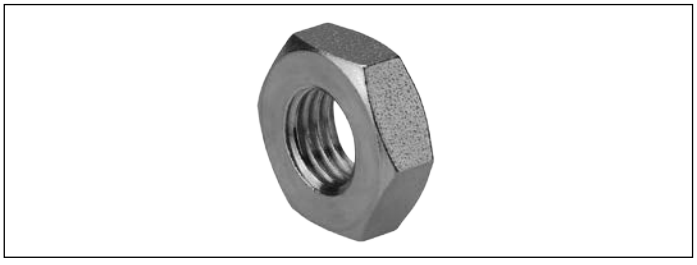


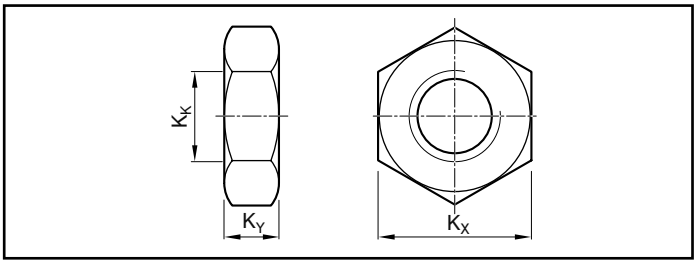


EMC	Part number	Dimensions (mm)										m
		B_L	C_E	ØCK e11	C_L	C_M	ØD1	E_R	K_K	L_1	L_E	(kg)
32	R349939100	26	40	10	20	10	18	12	M10x1.25	15.0	20	0.10
40	R349939200	31	48	12	24	12	20	14	M12x1.25	18.0	24	0.15
50 / **63**	R349939300	39	64	16	32	16	26	19	M16x1.5	24.0	32	0.35
80 / **100**	R349939500	50	80	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

Nut

Group 2, option 05 (material: galvanized steel), option 06 (material: stainless steel)





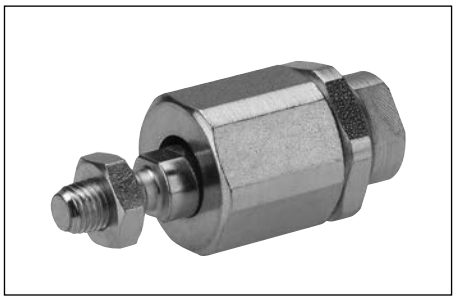
EMC	Part number		Dimensions (mm)			m
	Galvanized steel	Stainless steel	K_K	K_X	K_Y	(kg)
32	1823300020	2990600303	M10x1.25	17	6 (5)	0.010
40	1823300021	2990600304	M12x1.25	19	6	0.012
50 / **63**	1823300030	2990600305	M16x1.5	24	8	0.017
80 / **100**	1823300031	2990600308	M20x1.5	30	10	0.030
100XC	8103190414	2990600316	M36x2	55 (50)	18 (16)	0.175 (0.15)

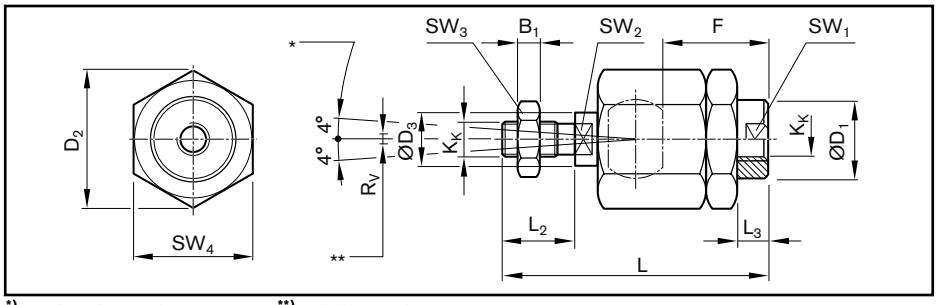
Supplied with the EMC

Bracketed values for type “stainless steel”

Flexible coupling

Group 2, option 04 (material: galvanized steel





*) Axial angle equalization **) Radial centerline movement

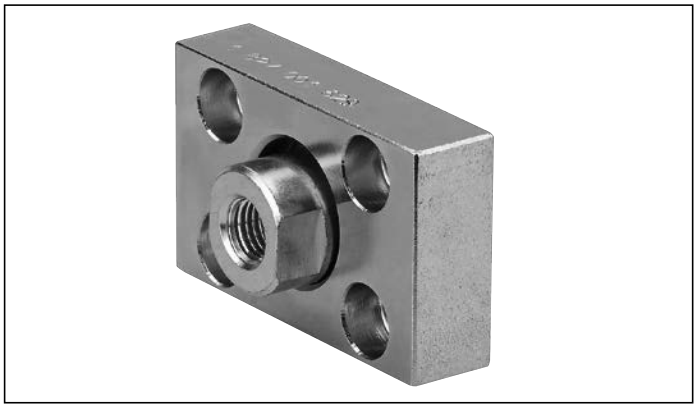
EMC	Part number	Dimensions (mm)														m	F_{max}
		B_1	$ØD_1$	D_2	$ØD_3$	F	K_K	L ±2	L_2	L_3 ±1	SW_1	SW_2	SW_3	SW_4	R_V	(kg)	(N)
32	R349937900	6	21.5	34	14	23	M10x1.25	73	20	7.5	19	12	17	30	0.7	0.21	$F_{max\ EMC}$
40	R349938000	7	21.5	34	14	28	M12x1.25	77	24	13.0	19	12	19	30	0.7	0.21	$F_{max\ EMC}$
50	R349938100	8	33.5	47	22	32	M16x1.5	108	32	9.0	30	19	24	41	1.0	0.65	$F_{max\ EMC}$
63																	10300
80	R349938300	10	33.5	47	22	42	M20x1.5	122	40	19.0	30	19	30	41	1.0	0.68	10300
100																	
100XC	R349950900	18	80.0	80	38	86	M36x2	241	72	18.2	50	36	55	75	1.5	5.40	15000

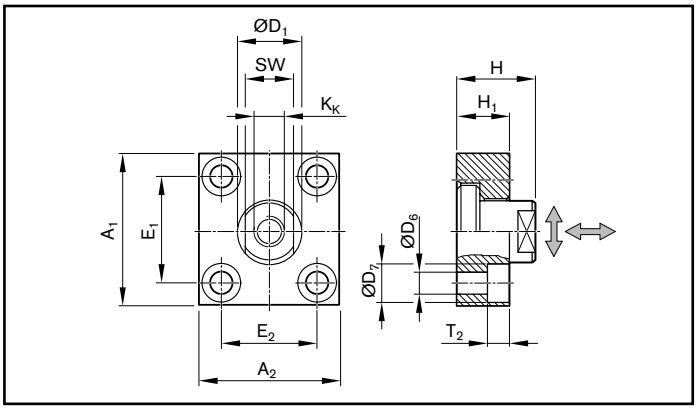
For mounting on the piston rod end:

- Compensates for misalignment
- Increases the assembly tolerance
- Simplifies cylinder installation

Flexible coupling with mounting plate

Group 2, option 03 (material: galvanized steel





EMC	Part number	Dimensions (mm)												m	F_{max}
		A_1	A_2	$ØD_1$ H11	$ØD_6$ H13	$ØD_7$ H13	E_1	E_2	H_1	H	K_K	SW	T_2	(kg)	(N)
32	R349939700	60	37	20	6.6	11	36±0.15	23±0.15	15	24	M10x1.25	17	7	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															28000
100XC	R349951100	125	125	60	18.0	26	90±0.30	90±0.30	30	55	M36x2	17	50	1.10	44000

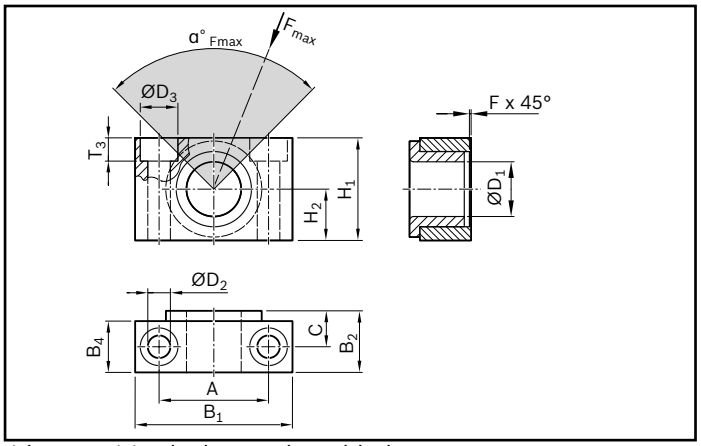
⇔ Axial clearance of 0.4 to 0.8 mm ⇕ Radial clearance 2 $^{\pm 0.13}$ mm

Mounting elements

Bearing for trunnion

are included in group 3, option 03; group 5, option 03; material: galvanized steel, with sockets made from sintered bronze

delivery in pairs

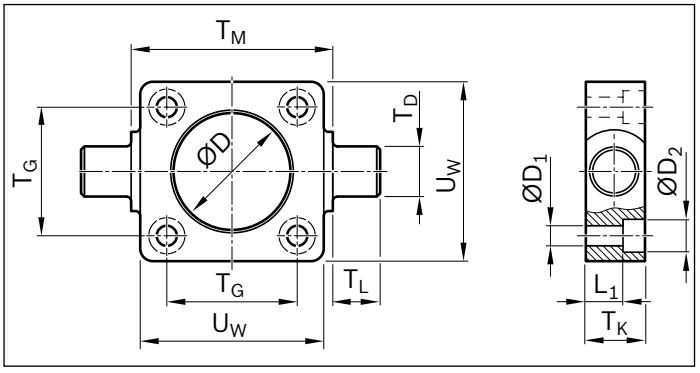


Note: Bearing pivots for vertical load; if α F_{max} is not complied with, a positive lock must be added.

EMC	Part number	Dimensions (mm)												α°F_{max}
		A	B_1	B_2	B_4	C	ØD_1	ØD_2	ØD_3	F x 45°	H_1	H_2	T_3	
		±0.2	f8				H7	H12	H13			±0.1	−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 cover Group 3, option 01 (only for vertical installation of the EMC)

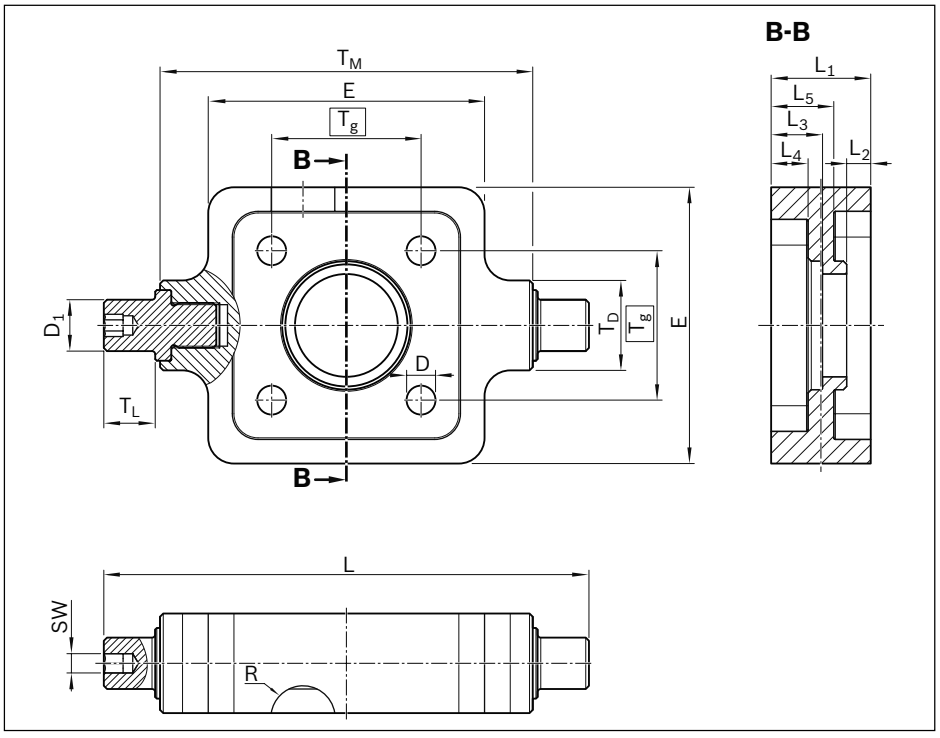
is included in group 3, option 03; material: galvanized cast iron with spheroidal graphite



EMC	Part number	Dimensions (mm)										m
		ØD	ØD_1	ØD_2	L_1	T_D	T_G	T_K	T_L	T_M	U_W	
		H11				e9	±0.2		h14	h14		(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 base group 5, option 01

is included in group 5, option 03; material: galvanized steel



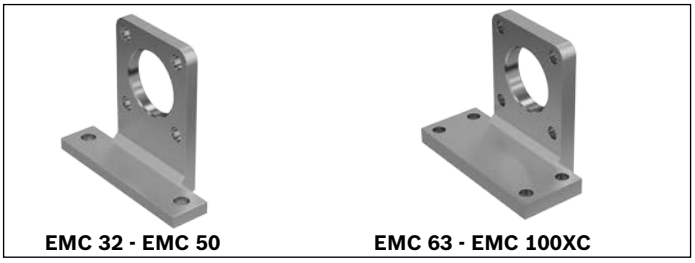
EMC	Part number	Dimensions (mm)															m
		ØD H13	$ØD_1$ H7	L	L_1 ±0.5	L_2 ±0.2	L_3 ±0.2	L_4 ±0.5	L_5 ±0.5	T_D ±0.5	T_g	T_L ±0.3	T_L ±0.2	E ±0.5	R	SW	(kg)
32	R15611B013	6.6	12	115	25	5.5	14.0	9.5	15.5	22	32.5	90	12	60	10	6	0.472
40	R15612B013	6.6	16	135	28	6.5	15.0	10.5	17.5	28	38.0	100	16	65	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

Mounting elements

Foot mounting for mounting on the cover or timing belt side drive

Group 3, option 06; / group 5, option 06

material: galvanized steel



EMC 32 - EMC 50 **EMC 63 - EMC 100XC**

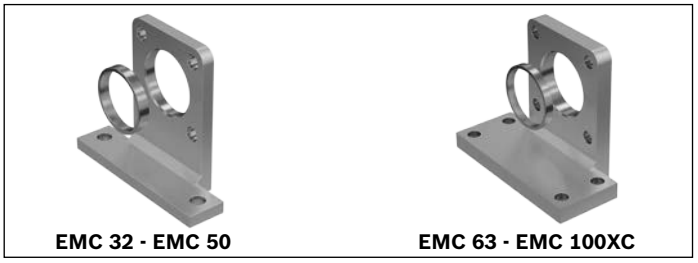
Fastening screws included.

EMC	Part number	m (kg)
32	R15611B013	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 mounting with centering ring for foot mounting

Group 5, option 05,

material: galvanized steel

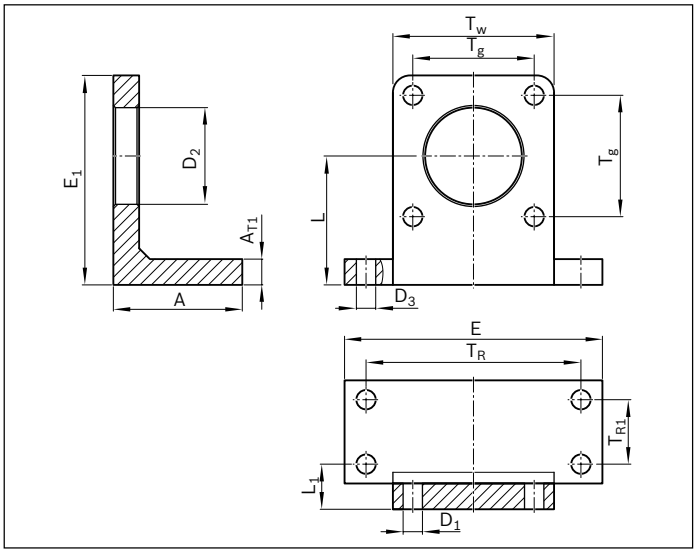


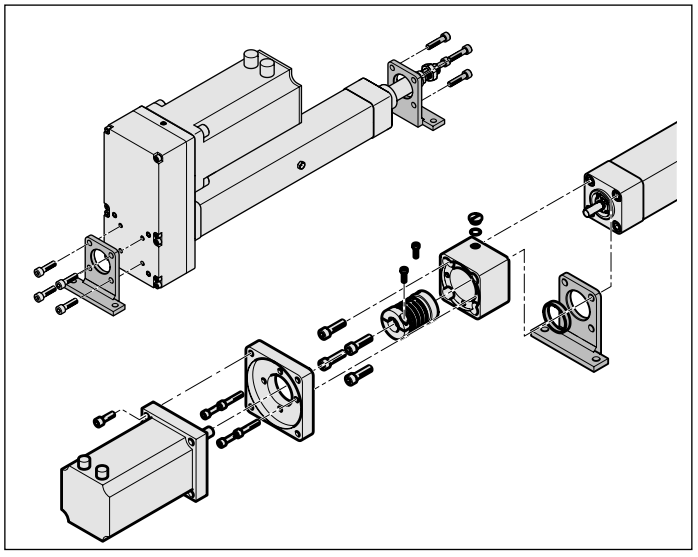
EMC 32 - EMC 50 **EMC 63 - EMC 100XC**

Fastening screws included.

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

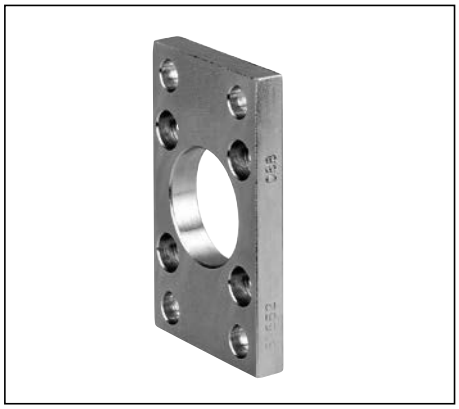


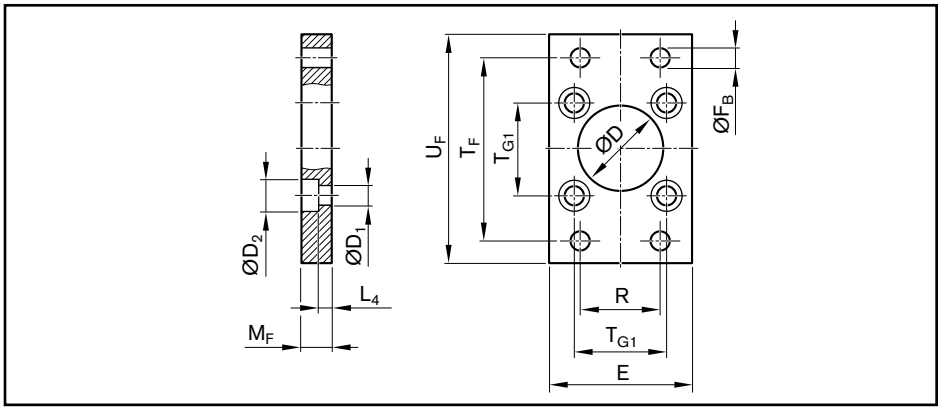


EMC	Dimensions (mm)												
	A ±0.5	A_{T1} ±0.5	ØD1 H13	ØD2 H7	ØD3 H13	E ±0.5	E_1 ±0.5	L ±0.1	L_1	T_R	T_{R1}	T_g	TW ±0.5
32	30	6	6.6	30	6.6	79	57.5	34	18	65	–	32.5	47
40	30	7	6.6	35	9.0	90	71.5	45	18	75	–	38.0	53
50	35	8	9.0	40	9.0	110	93.5	60	21	90	–	46.5	65
63	50	12	9.0	45	9.0	120	98.5	60	21	100	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

Flange mounting

Group 3, option 04, material: galvanized steel



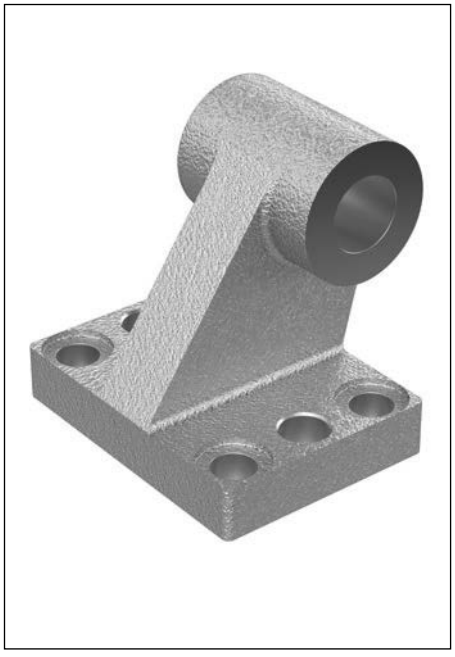


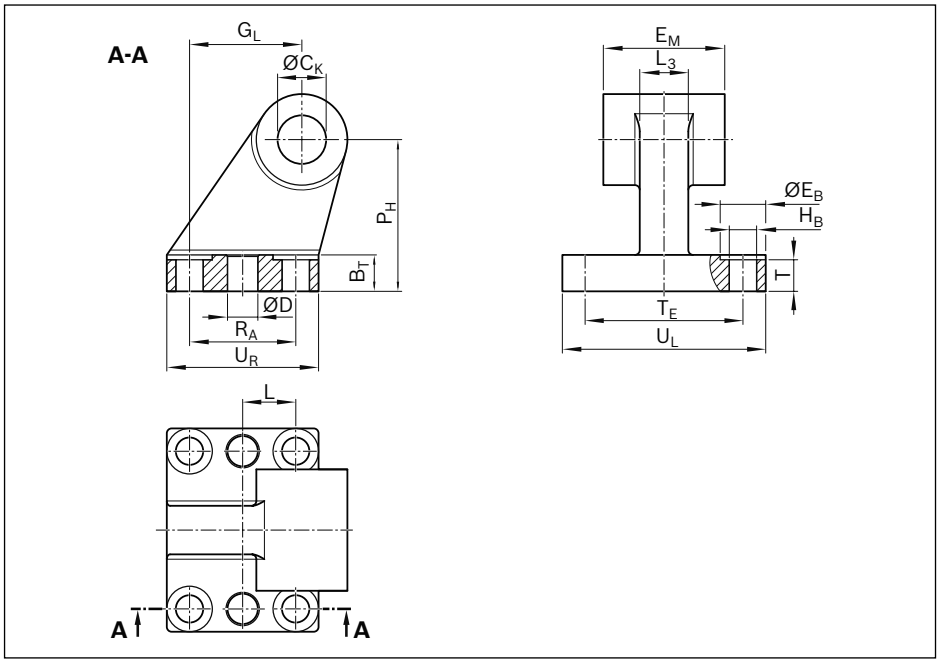
EMC	Part number	Dimensions (mm)											m
		ØD	$ØD_1$	$ØD_2$	E	$ØF_B$	L_4	M_F	R	T_F	T_{G1}	U_F	
		H11	H13	H13	max.			±0.1	±0.2	±0.2	±0.2	±0.2	(kg)
32	R349942100	30	6.6	11	50	7.0	4.5	10	32	64	32.5	80	0.3
40	R349942200	35	6.6	11	55	9.0	4.5	10	36	72	38.0	90	0.4
50	R349942300	40	9.0	15	65	9.0	6.0	12	45	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

Mounting elements

Bearing block group 6, option 01; material: galvanized cast iron with spheroidal graphite

(counterpart to clevis mount group 5, option 07)

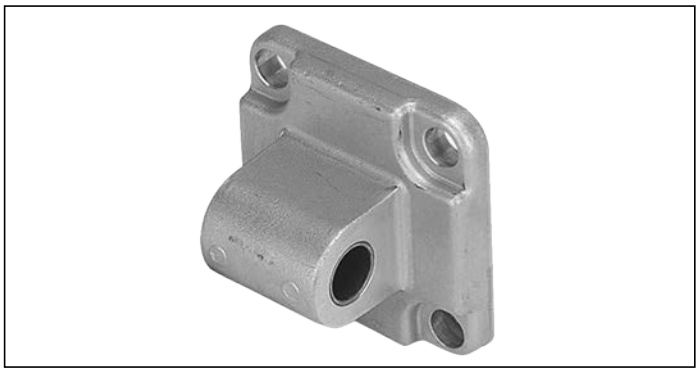


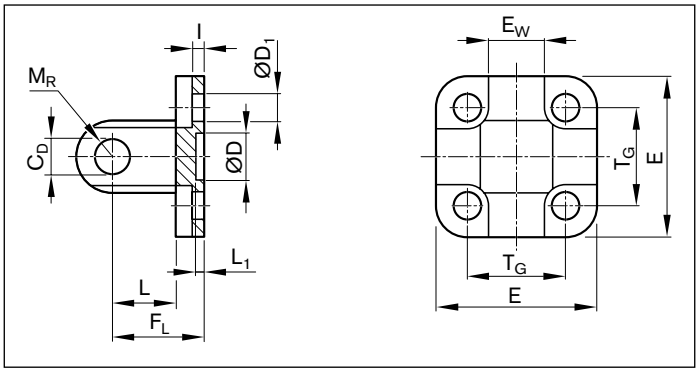


EMC	Part number	Dimensions (mm)																m
		B_R	B_T	$ØC_K$ H9	ØD H11	$ØE_B$ H13	E_M -0.2 -0.6	G_L	$ØH_B$ H13	L ±0.2	L_3	P_H JS15	R_A JS14	T	T_E JS14	U_L	U_R	(kg)
32	R349947500	10.0	8	10	–	10	26	21	6.6	–	10	32	18	4	38	51	31	0.20
40	R349947600	11.0	10	12	–	10	28	24	6.6	–	12	36	22	4	41	54	35	0.30
50	R349947700	13.0	12	12	–	11	32	33	9.0	–	16	45	30	6	50	65	45	0.29
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	17.5	25.0	20	71	50	6	76	96	70	1.90
100XC	R15617A017	31.5	25	25	12	26	90	97	17.5	44.0	36	115	88	17	118	156	126	1.90

without fastening screws

Swivel mount group 6, option 02
(counterpart to clevis mount group 5, option 07)



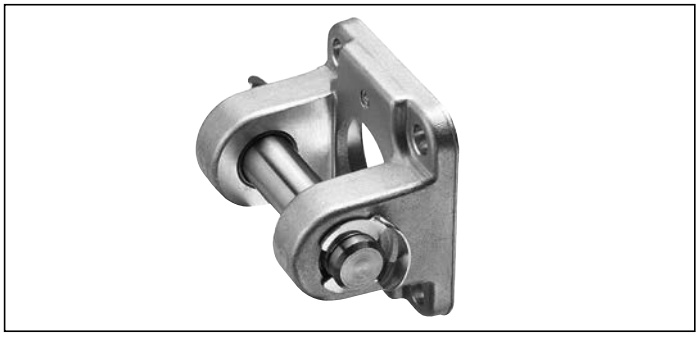


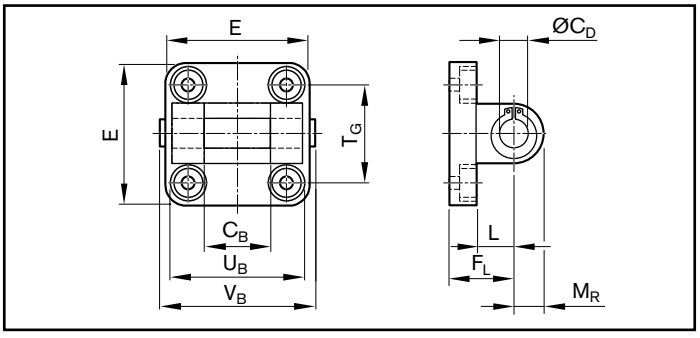
EMC	Part number	Dimensions (mm)												m	F_{max}
		C_D H9	ØD H11	D_1 H13	E	E_W −0.2/−0.6	F_L ±0.2	I ±0.5	L min.	L_1 min.	M_R max.	T_G ±0.2	DIN 912	(kg)	(N)
32	R349948100[1)]	10	30	6.6	48	26	22	5.5	12	4.5	10	32.5	M6x18	0.08	$F_{max\ EMC}$
40	R349948200[1)]	12	35	6.6	53	28	25	5.5	15	4.5	12	38.0	M6x18	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	10900
80	R349948500[1)]	16	45	11.0	98	50	36	10.0	20	4.5	16	72.0	M10x20	0.50	13100
100	R349948600[1)]	20	55	13.5	115	60	41	10.0	25	4.5	20	89.0	M10x20	0.77	16400
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

Fastening screws included.

Clevis mount group 5, option 07
(mounting on timing belt side drive)





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	47	22	12	11	32.5	45	50.0	0.09	$F_{max\ EMC}$
40	R349945800[1)]	28	12	54	25	15	13	38.0	52	57.0	0.11	$F_{max\ EMC}$
50	R349945900[1)]	32	12	65	27	15	13	46.5	60	65.0	0.18	$F_{max\ EMC}$
63	R349946000[1)]	40	16	75	32	20	17	56.5	70	76.0	0.25	10900
80	R349946100[1)]	50	16	94	36	20	17	72.0	90	96.0	0.51	13100
100	R349946200[1)]	60	20	112	41	25	21	89.0	110	117.0	0.70	16400
100XC	R15617B026[2)]	90	30	177	55	35	31	140.0	170	180.5	2.14	$F_{max\ EMC}$

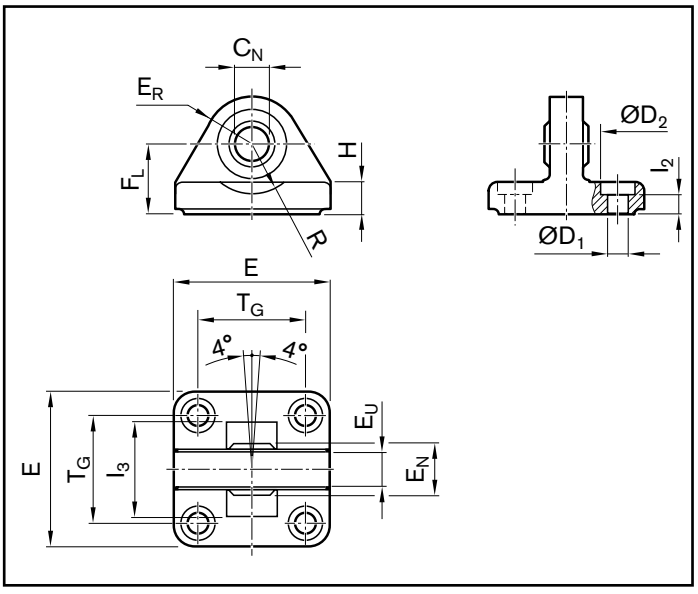
[1)] Material: Aluminum
[2)] Material: Galvanized cast iron with spheroidal graphite

Bolts and fastening screws included.

Mounting elements

Spherical bearing group 6, option 04

(counterpart to clevis mount group 5, option 08)



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	14500
80	R349947300[1)]	20	11.0	18	95	25	27	18.0	36	14.0	10.0	70	24	72.0	M10x20	1.21	17800
100	R349947400[1)]	20	11.0	18	115	25	30	18.0	41	15.0	10.0	80	25	89.0	M10x20	2.03	22900
100XC	1827001626[2)]	35	18.0	26	176	43	44	30.0	55	17.0	10.0	130	39	140.0	M16x20	6.10	$F_{max\ EMC}$

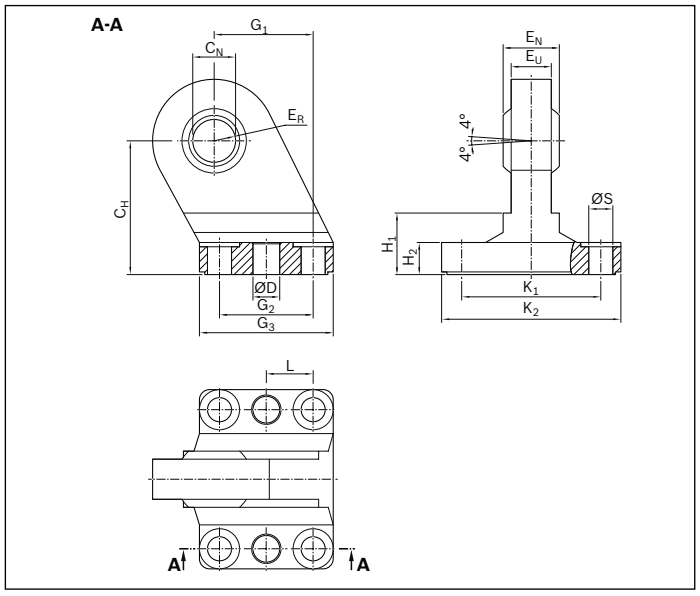
[1)] Material: Aluminum

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

Fastening screws included.

High spherical bearing group 6, option 03, material: galvanized cast iron with spheroidal graphite

(counterpart to clevis mount group 5, option 08)

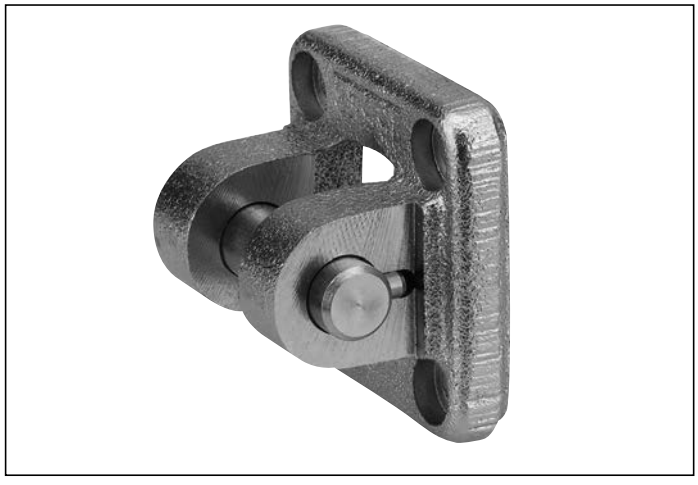


EMC	Part number	Dimensions (mm)															m
		C_H	C_N	ØD	E_N	E_R	E_U	G_1	G_2	G_3	H_1	H_2	K_1	K_2	L	ØS	
		JS15	H7	H11	-1.0	max.		JS14	JS14	max.			JS14	max.	±0.2	H13	(kg)
32	R349946300	32	10	–	14	16	10.5	21	18	31	16	$9^{\pm1,0}$	38	51	–	6.6	0.21
40	R349946400	36	12	–	16	18	12.0	24	22	35	16	$9^{\pm1,0}$	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	15617A018	115	35	12	43	44	28.0	97	88	126	70	$17^{\pm1,5}$	118	156	44.0	14.0	6.64

without fastening screws

Clevis mount on timing belt side drive group 5, option 08, material: Aluminum

(for spherical bearing and counterpart, for swivel head with internal thread see group 1, option 01)



Load sensor

Load measuring pin

Clevis mount with force measuring bolts

If your application requires precise load sensing, there is a clevis bracket version with load measuring pin 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 connected to the swivel bearing. 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.
A connection cable is included with each load measuring pin.

Note
The use of a hammer or press to fit the pin is not permitted. It may only be inserted by hand.
The pin is not suitable to handling torque. It is secured axially and against twisting, like the standard pin, on one side of the bracket using the pin-locking feature supplied.
For force control at the controller level, a control unit with an analog input is required.

Technical data, load measuring pin
Metrological specifications

Material	Stainless steel
Protection class	IP65
Hardness (load sensing range)	38 HRC
Mechanical system	
Operating load	150 % of MR
Load at fracture	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
Current consumption		25 mA (24 V)
Bandwidth		2.5 ±0.2 KHz

Technical data, connection cable

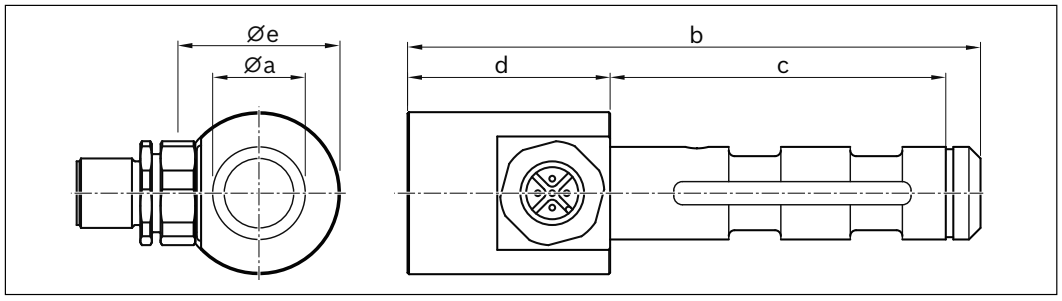
Length	5 m
Rated voltage	250 V
Rated current	4 A
Plug outlet	Angled
1. Connection type	Socket M12, 4-pin
2. Connection type	Flying leads
Type of cable	PUR black, shielded
Suitable for flexing installation	yes
Cable cross-section	4x0,34 mm^2
Cable diameter D	5.9 ±0.2 mm
Bending radius, stationary	> 10xD
Bending radius, flexing	> 5xD
Flexing cycles	> 2 mil
Ambient temperature, stationary	–25 ... +80 °C
Ambient temperature, in motion	–40 ... +80 °C
Protection class	IP65

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

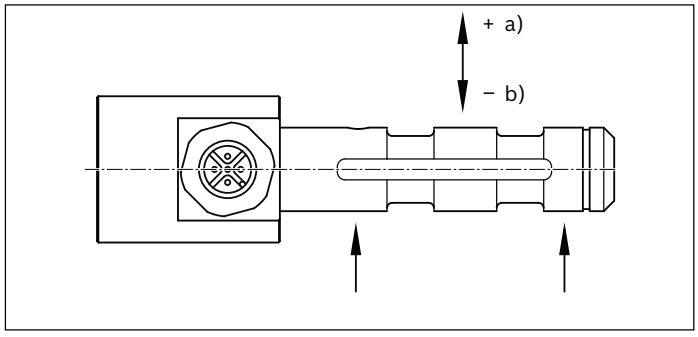


EMC	Part number (load measuring pin)	Dimensions (mm)					Measuring range
		Øa $_{f8}$	b	c	d	Øe	(kN)
32	R15611A007	10	83	43.5	35	28	1.3
40	R15612A007	12	89	49.5	35	28	5.0
50	R15613A007	16	99	58.0	35	28	8.0
63	R15614A007	16	107	66.0	35	28	16.0
80	R15615A007	20	109	67.5	35	28	22.0
100	R15616A007	20	119	77.5	35	28	45.0
100XC	R15617A007	35	170	124.5	35	35	56.0

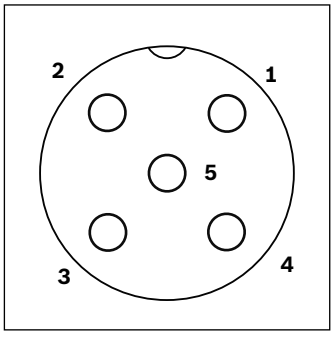
Connection type

Load measuring pin
1 Supply (+)
2 Tara
3 Mass
4 Output
5 Internal allocation

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



a) positive output
b) negative output

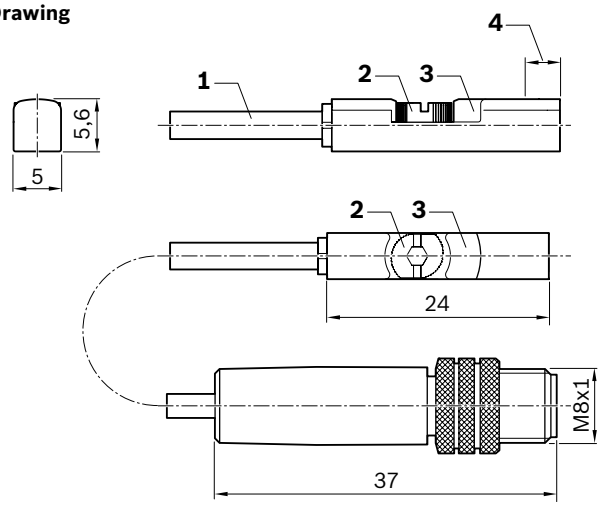


Connection diagram for load measuring pin

Switching system

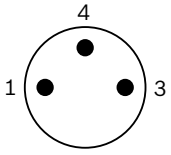
Magnetic switches

Drawing



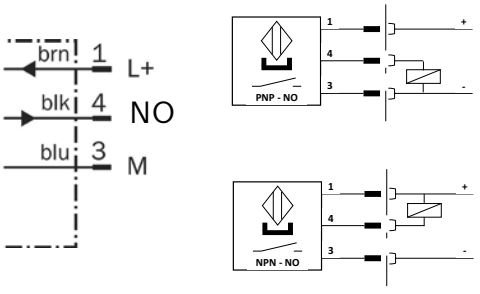
1) Connection
2) Fixing screw
3) LED display
4) Position of sensor element 2 mm

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

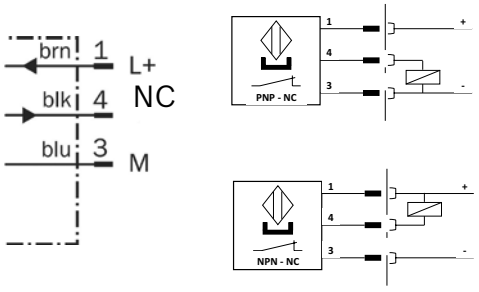


Connection scheme

R913037444
R913037446



R913037443
R913037445



Part number / 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
Function principle	Magnetic			
Operating voltage	10 - 30 VDC			
Load current	≦ 200 mA			
Switching function	PNP/normally closed (NC)	PNP/normally open (NO)	NPN/normally closed (NC)	NPN/normally open (NO)
Connection type	Cable 0.5 m and plug M8x1, 3-pin with knurled screws			
Function indication	✓			
Short-circuit protection	✓			
Polarity safe	✓			
Switch-on suppression	✓			
Switching frequency	3 kHz			
Off delay	20 ms			
Max. perm. approach speed	5 m/s			
Suitable for flexing installation*	✓			
Can withstand torsion*	✓			
Weld spark resistant*	--			
Cable cross-section	3x0.14 mm^2			
Cable diameter D*	2.9 ±0.15 mm			
Bending radius, stationary*	≧ 5xD			
Bending radius, flexing*	≧ 10xD			
Flexing cycles*	> 2 million			
Max. perm. travel speed*	5 m/s			
Max. perm. acceleration*	≦ 5 m/s^2			
Ambient temperature	–30 °C to +80 °C			
Protection class	IP68			
MTTFd (in accordance with EN ISO 13849-1)	MTTFd = 2339.0 years			
Certifications and approvals**	CE cULus LISTED RoHS			

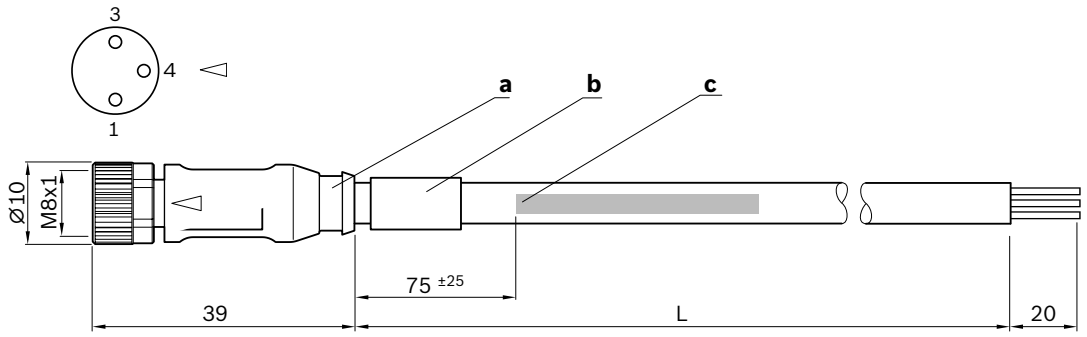
*) Technical data only for the cast-on connection line (0.5 m) at the magnetic sensor. Even more performance, e.g. extension cables are offered for use in a cable management chain (see following pages).

**) For these products no CCC certificate is necessary for introduction into the Chinese market. “Sales Information CCC” document available on request.

Switching system

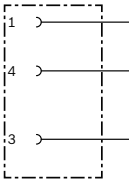
Extensions
Single-sided assembly

Drawing



Connection scheme

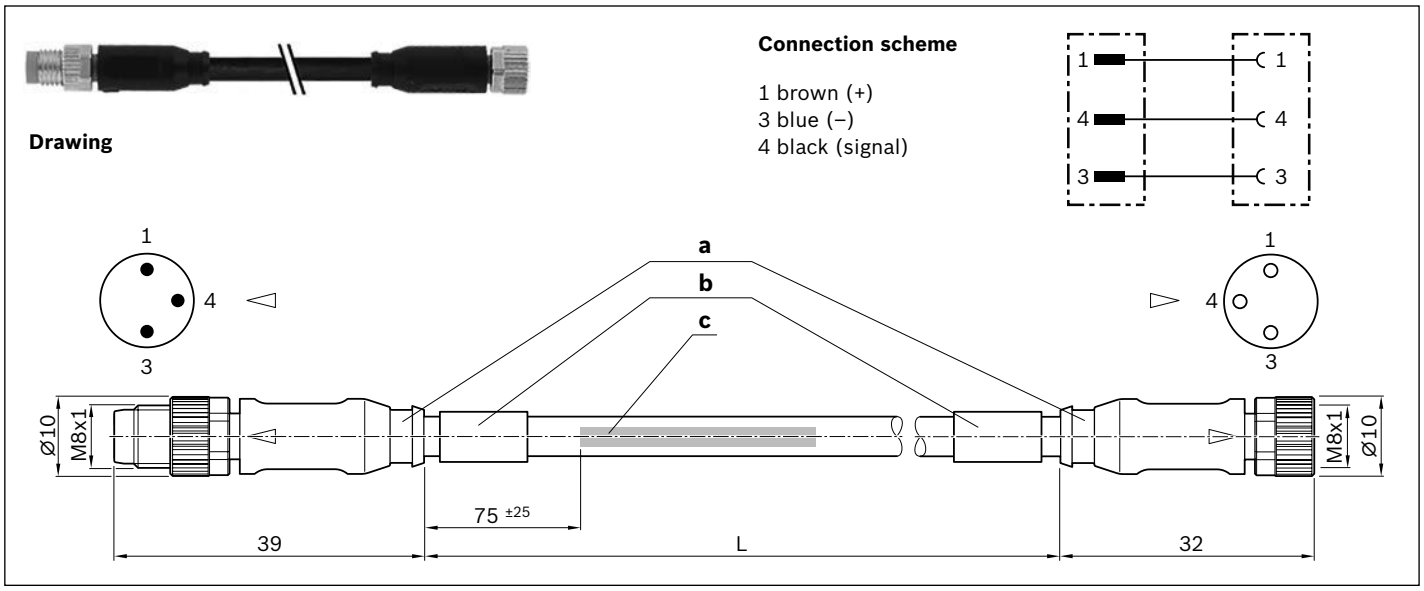
1 brown (+)
3 blue (–)
4 black (signal)



Part numbers

Use	Extension cables		
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	Straight socket, M8x1, 3-pin		
2. Connection type	Flying lead		

Double-sided assembly



Part numbers

Use	Extension cables				
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	Straight socket, M8x1, 3-pin				
2. Connection type	Female, M8x1, 3-pin				

Technical data for single and double-sided pre-assembled extensions

Function indication	–
Operating voltage indicator	–
Operating voltage	10 - 30 VDC
Type of cable	PUR black
Suitable for flexing installation	✓
Can withstand torsion	✓
Weld spark resistant	✓
Cable cross-section	3x0.25 mm^2
Cable diameter D	4.1 ±0.2 mm
Bending radius, stationary	≧ 5xD
Bending radius, flexing	≧ 10xD
Flexing cycles	> 10 million
Max. perm. travel speed	3.3 m/s - at 5 m travel range (typ.) to 5 m/s - at 0.9 m travel range
Max. perm. acceleration	≦ 30 m/s^2
Ambient temperature, fixed inst.	–40 °C to +85 °C
Ambient temperature, flexible inst.	-25 °C to +85 °C
Protection class	IP68
Certifications and approval	CE, cULus LISTED, CSA C US, PG, RoHS

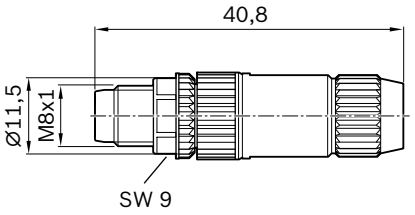
a) Contour for corrugated tube inner diameter 6.5 mm
b) Grommet
c) Cable label in accordance with labeling directive

Switching system

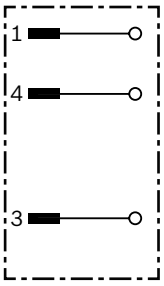
Plug

R901388333

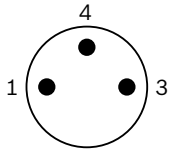
Drawing



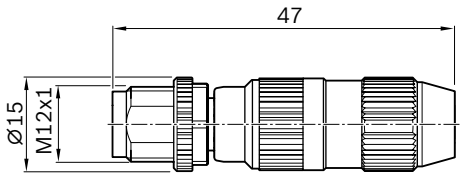
Connection scheme

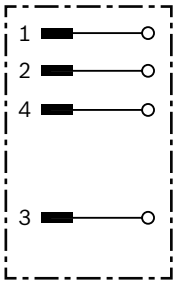


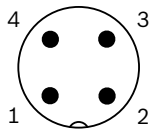
View connector side



R901388352







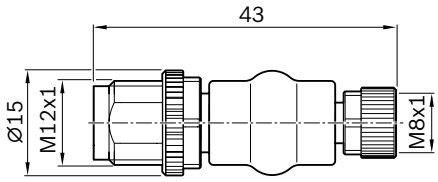
Part number / technical data

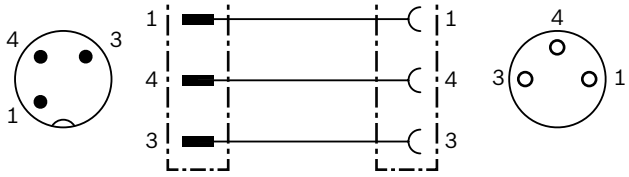
Use	Single plug	
Part number	R901388333	R901388352
Designation	7000-08331-0000000	7000-12491-0000000
Version	Straight	
Operating current per contact	Max. 4 A	
Operating voltage	Max. 32 V AC/DC	
Connection type	Straight plug, M8x1, 3-pin, IDC, self-locking screw	Straight plug, M12x1, 4-pin, IDC, self-locking screw
Function indication	-	
Operating voltage indicator	-	
Connection cross-section	0.14 ... 0.34 mm^2	
Ambient temperature	–25 °C to +85 °C	
Protection class	IP67 (plugged in & screwed down)	
Certifications and approvals		

Adapter

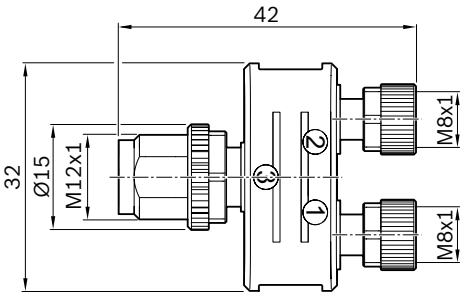
Drawing **Connection scheme**

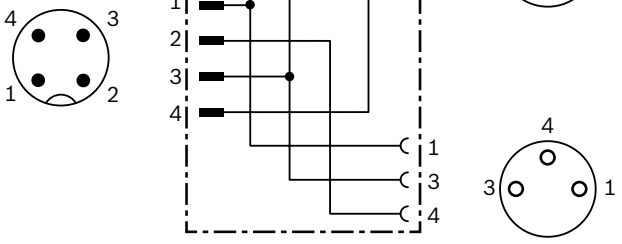
R911344591





R911344592





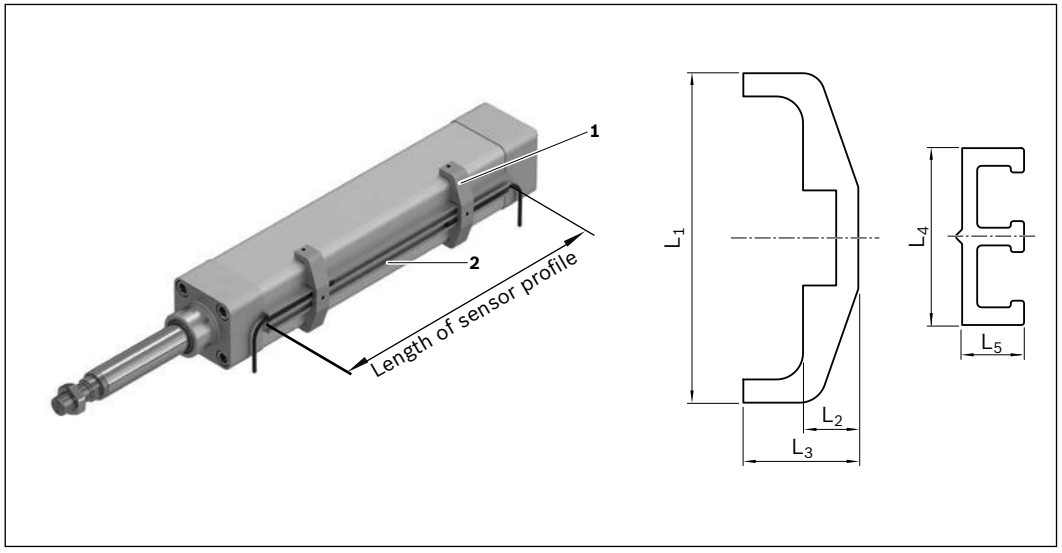
Part number / technical data

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 socket, M8x1, 3-pin, IDC, self-locking screw thread	2 X straight sockets, M8x1, 3-pin, IDC, 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 indication	–	
Operating voltage indicator	–	
Connection cross-section	–	
Ambient temperature	–25 °C to +85 °C	
Protection class	IP67 (plugged in & screwed down)	
Certifications and approvals	RoHS	c UL us LISTED, RoHS

Switching system

Sensor profile

1 Retaining bracket
2 Sensor profile



EMC	Part number		Ball screw size d_0 x P (mm)	Dimensions (mm)					
	Retaining bracket	Sensor profile		L_{SL}	L_1	L_2	L_3	L_4	L_5
32	R15611B022	R15610A009	12 x 5	68	56.5	12.5	25	20	7
			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

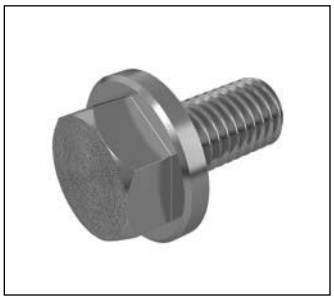
Length of sensor profile (mm)	Number of retaining brackets
≤ 500	2
≤ 900	3
≤ 1200	4
≤ 1500	5

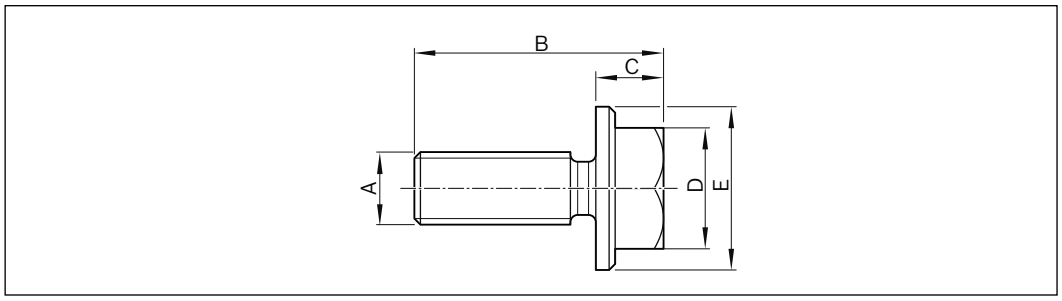
Length calculation of sensor profile

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

s_{max} = maximum travel range (mm)

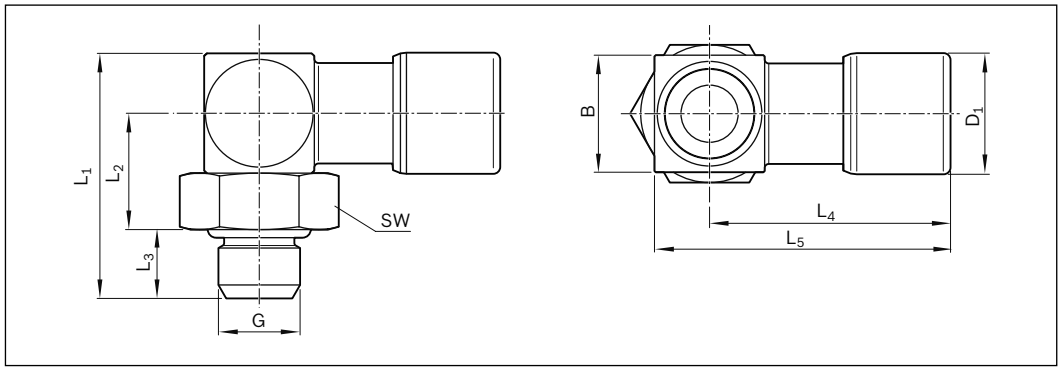
Plug screw for cover/base
Material: corrosion-resistant





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

Port for one-point lubrication



Part number	Material	G	For tubing	Dimensions (mm)								m
				SW	L_1	L_2	L_3	L_4	L_5	B	D_1	(g)
R913031697	Nickel-plated brass	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											

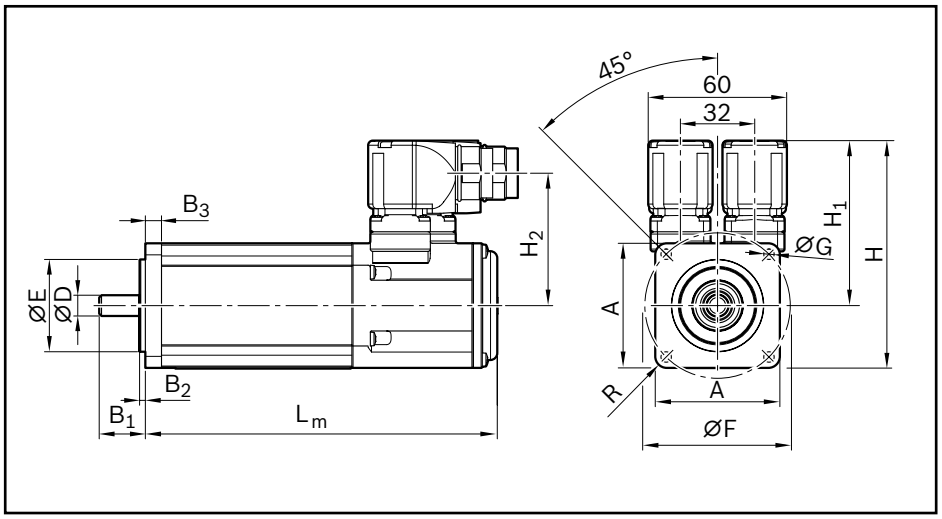
Properties

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

IndraDyn S – servo motors

AC servo motor MSK

Dimensions



Motor	Dimensions (mm)													
	A	B_1	B_2	B_3	ØD k6	ØE j6	ØF	ØG	H	H_1	H_2	L_m Without holding brake	L_m With holding brake	R
MSK 030C	54	20	2.5	7.0	9	40	63	4.5	98.5	71.5	57.4	188.0	213.0	R5
MSK 040C	82	30	2.5	8.0	14	50	95	6.6	124.5	83.5	69.0	185.5	215.5	R8
MSK 050C	98	40	3.0	9.0	19	95	115	9.0	134.5	85.5	71.0	203.0	233.0	R8
MSK 060C	116	50	3.0	9.5	24	95	130	9.0	156.5	98.5	84.0	226.0	259.0	R9
MSK 071D	140	58	4.0	16.5	32	130	165	11.0	202.0	132.0	110.0	312.0	347.0	R12
MSK 071E	140	58	4.0	16.5	32	130	165	11.0	202.0	132.0	110.0	352.0	387.0	R12
MSK 076C	140	50	4.0	14.0	24	110	165	11.0	180.0	110.0	95.6	292.5	292.5	R12
MSK 101D	192	80	4.0	17.5	38	180	215	14.0	262.0	166.0	137.5	410.0	430.0	R12

Motor data

Motor	n_{max} (min^{-1})	M_0 (Nm)	M_{max} (Nm)	M_{br} (Nm)	J_m (kgm^2)	J_{br} (kgm^2)	m_m (kg)	m_{br} (kg)
MSK 030C-0900	9 000	0.8	4.0	1	0.000030	0.000007	1.9	0.2
MSK 040C-0600	7 500	2.7	8.1	4	0.000140	0.000023	3.6	0.3
MSK 050C-0600	6 000	5.0	15.0	5	0.000330	0.000107	5.4	0.7
MSK 060C-0600	6 000	8.0	24.0	10	0.000800	0.000059	8.4	0.8
MSK 071D-0300	3 800	17.5	66.0	23	0.002300	0.000300	18.0	1.6
MSK 071E-0300	4 200	23.0	84.0	23	0.002900	0.000300	23.5	1.6
MSK 076C-0450	5 000	12.0	43.5	11	0.004300	0.000360	13.8	1.1
MSK 101D-0300	4 600	50.0	160.0	70	0.009320	0.000300	40.0	3.8

Motor data irrespective of EMC

J_{br} = mass moment of inertia of holding brake
J_m = mass moment of inertia of motor
L_m = length of motor
M_0 = standstill torque
M_{br} = holding torque of holding brake when switched off
M_{max} = maximum possible motor torque
m_m = mass of motor
m_{br} = mass of holding brake
n_{max} = maximum rotary speed

Option number[1)]	Motor	Part number	Version		Type designation
			Holding brake		
			Without	With	
84	MSK030C-0900	R911308683	X		MSK030C-0900-NN-M1-UG0-NNNN
85		R911308684		X	MSK030C-0900-NN-M1-UG1-NNNN
86	MSK040C-0600	R911306060	X		MSK040C-0600-NN-M1-UG0-NNNN
87		R911306061		X	MSK040C-0600-NN-M1-UG1-NNNN
88	MSK050C-0600	R911298354	X		MSK050C-0600-NN-M1-UG0-NNNN
89		R911298355		X	MSK050C-0600-NN-M1-UG1-NNNN
90	MSK060C-0600	R911306052	X		MSK060C-0600-NN-M1-UG0-NNNN
91		R911306053		X	MSK060C-0600-NN-M1-UG1-NNNN
114	MSK071D-0300	R911310539	X		MSK 071D-0300-NN-M1-UG0-NNNN
115		R911310168		X	MSK 071D-0300-NN-M1-UG1-NNNN
122	MSK071E-0300	R911310096	X		MSK071E-0300-NN-M1-UG0-NNNN
123		R911309394		X	MSK071E-0300-NN-M1-UG1-NNNN
92	MSK076C-0450	R911318098	X		MSK076C-0450-NN-M1-UG0-NNNN
93		R911315713		X	MSK076C-0450-NN-M1-UG1-NNNN
118	MSK101D-0300	R911315888	X		MSK 101D-0300-NN-M1-AG0-NNNN
119		R911310895		X	MSK 101D-0300-NN-M1-AG2-NNNN

[1)] From “Configuration and ordering” table

Version

- Plain shaft with shaft seal
- Multi-turn absolute encoder M1 (Hiperface)
- Cooling system: natural convection
- Protection class IP65 (housing)
- With or without holding brake

Note

The motors can be supplied complete with controllers and control systems For further motor types and more information on motors, controllers and control systems, please refer to the following Rexroth catalogs on drive technology:

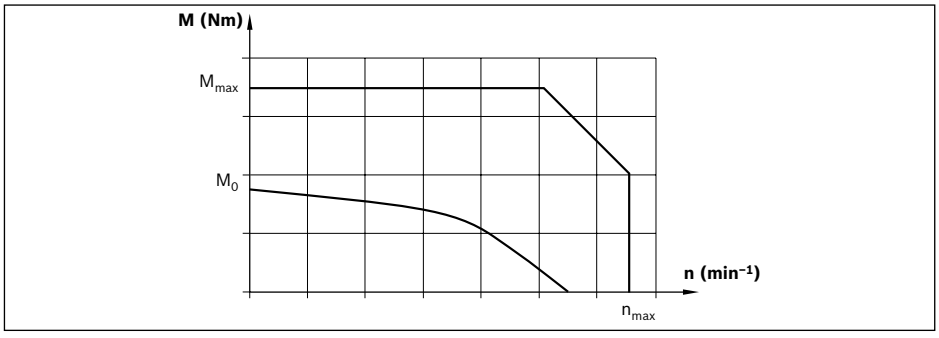
- Drive System Rexroth IndraDrive, R999000018
- Rexroth IndraDyn S Synchronous Motors MSK, R911296288
- Rexroth IndraDrive C Drive Controller Devices HCS02.1, HCS03.1, R911314904
- Rexroth IndraDrive Cs Drive Systems with HCS01, R911322209.

Recommended motor/controller combination

Motor	Controller
MSK 030C-0900	HCS 01.1E-W0005
MSK 030C-0900	HCS 01.1E-W0008
MSK 040C-0600	
MSK 040C-0600	HCS 01.1E-W0018
MSK 050C-0600	

Motor	Controller
MSK 050C-0600	HCS 01.1E-W0028
MSK 060C-0600	
MSK 071D-0300	HCS 02.1E-W0070
MSK 071E-0300	
MSK 076C-0450	HCS 01.1E-W0054
MSK 101D-0300	HCS 03.1E-W0100

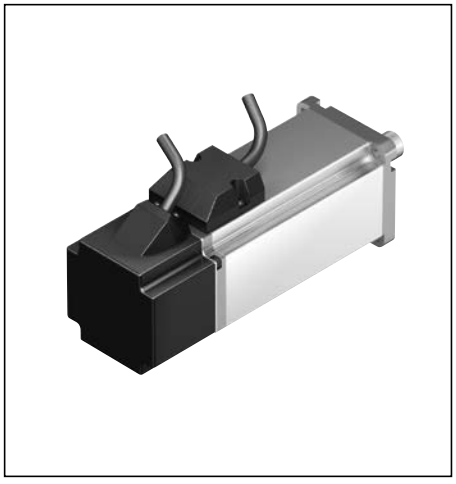
Motor torque speed curve
(schematic)

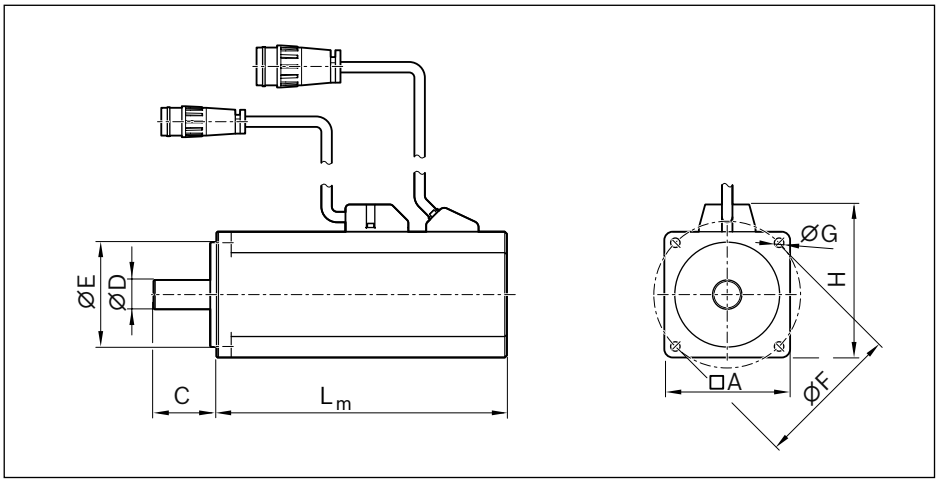


IndraDyn S – servo motors

AC servo motors MSM

Dimensions





Motor	Dimensions (mm)								
	A	C	ØD h6	ØE h7	ØF	ØG	H	L_m Without holding brake	L_m With holding brake
MSM 019B-0300	38	25	8	30	45	3.4	51	92.0	122.0
MSM 031B-0300	60	30	11	50	70	4.5	73	79.0	115.5
MSM 031C-0300	60	30	14	50	70	4.5	73	98.5	135.0
MSM 041B-0300	80	35	19	70	90	6.0	93	112.0	149.0

Motor data

Motor	n_{max} (min^{-1})	M_0 (Nm)	M_{max} (Nm)	M_{br} (Nm)	J_m (kgm^2)	J_{br} (kgm^2)	m_m (kg)	m_{br} (kg)
MSM 019B-0300	5 000	0.32	0.95	0.29	0.0000051	0.0000002	0.47	0.21
MSM 031B-0300	5 000	0.64	1.91	1.27	0.0000140	0.0000018	0.82	0.48
MSM 031C-0300	5 000	1.30	3.80	1.27	0.0000260	0.0000018	1.20	0.50
MSM 041B-0300	4 500	2.40	7.10	2.45	0.0000870	0.0000075	2.30	0.80

Motor data irrespective of EMC

J_{br} = mass moment of inertia of holding brake
J_m = mass moment of inertia of motor
L_m = length of motor
M_0 = standstill torque
M_{br} = holding torque of holding brake when switched off
M_{max} = maximum possible motor torque
m_m = mass of motor
m_{br} = mass of holding brake
n_{max} = maximum rotary speed

Option number[1)]	Motor	Part number	Version		Type designation
			Holding brake		
			Without	With	
104	MSM019B-0300	R911325131	X		MSM019B-0300-NN-M0-CH0
105		R911325132		X	MSM019B-0300-NN-M0-CH1
106	MSM 031B-0300	R911325135	X		MSM031B-0300-NN-M0-CH0
107		R911325136		X	MSM031B-0300-NN-M0-CH1
108	MSM 031C-0300	R911325139	X		MSM031C-0300-NN-M0-CH0
109		R911325140		X	MSM031C-0300-NN-M0-CH1
110	MSM 041B-0300	R911325143	X		MSM041B-0300-NN-M0-CH0
111		R911325144		X	MSM041B-0300-NN-M0-CH1

[1)] From “Configuration and ordering” table

Version:

- Plain shaft without shaft seal
- Mutiturn absolute encoder M0 (absolute encoder function only available with backup battery)
- Cooling system: natural convection
- Protection class IP54 (housing)
- With or without holding brake

Note

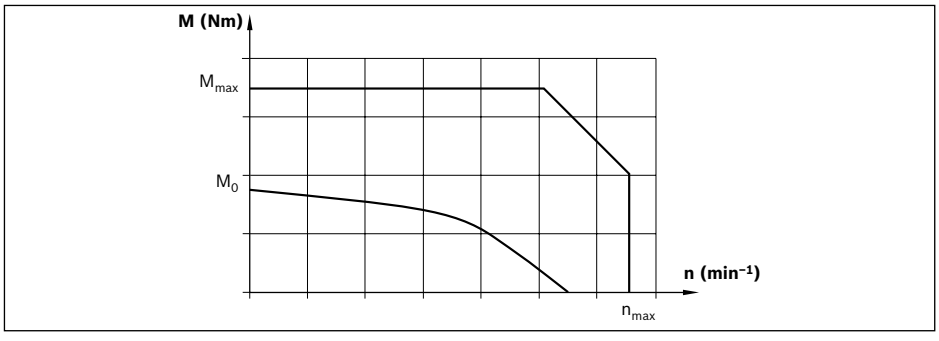
The motors can be supplied complete with controllers and control systems For further motor types and more information on motors, controllers and control systems, please refer to the following Rexroth catalogs:

- Drive System Rexroth IndraDrive, R999000018
- Rexroth IndraDyn S Synchronous Motors MSM, R911329337
- Rexroth IndraDrive C Drive Controller Devices HCS02.1, HCS03.1 R911314904
- Rexroth IndraDrive Cs Drive Systems with HCS01 R911322209.

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

Motor torque speed curve
(schematic)



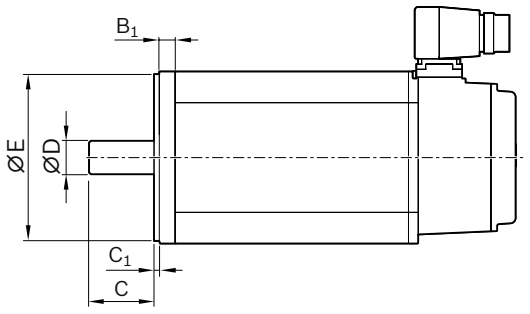
Motor mounting

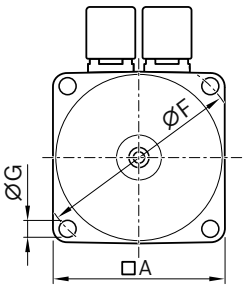
Motor mounting kits according to customer specification

The motor mounting for linear systems with ball screw drive consists of either a mounting kit with flange and coupling (MF) or a timing belt side drive (SD). The available combinations are shown in the “Components and ordering” selection tables for the respective size.

In addition to motor options for Rexroth motors, kits for motors can also be ordered according to customer specifications. In order to establish the appropriate mounting set, the connection geometry of the motor is crucial.

Characteristics required to uniquely determine the motor geometry are shown below.



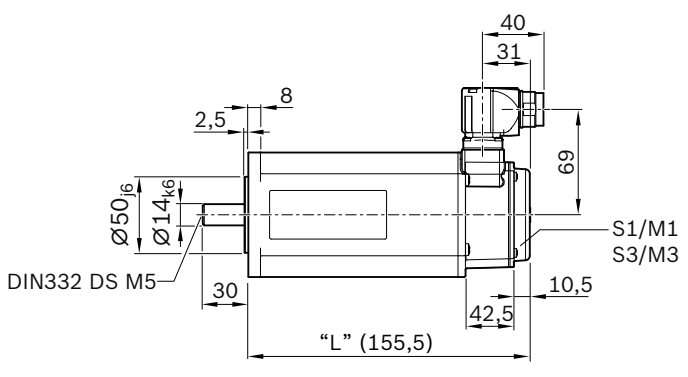


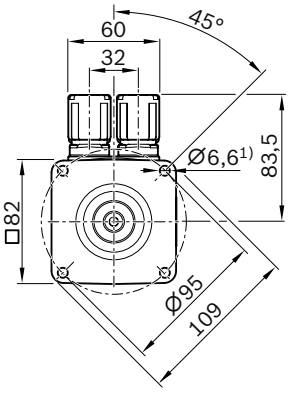
The dimensions queried result in a unique “motor geometry code”:

□□ – □□ – □□□ – □□□ – □□□ – **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	=	Flange thickness
A	=	Flange edge dimension

Example representation of servo motor IndraDyn S Type MSK040C



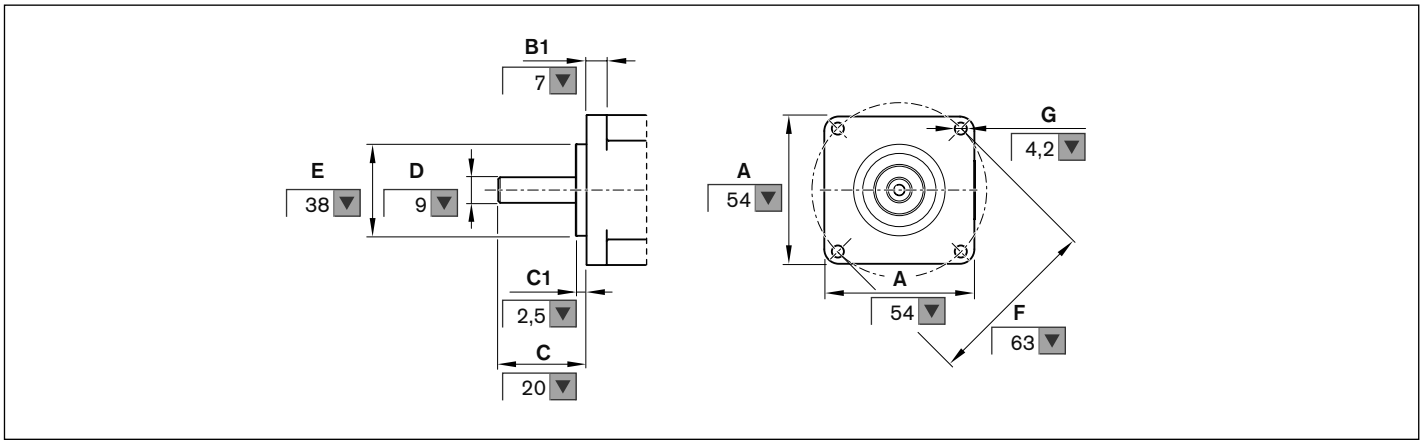


1 4 – 3 0 – 0 5 0 – 2 . 5 – 0 9 5 – M 0 6 – 0 0 8 – 0 8 2

[1)] The through hole Ø 6.6 mm results in the type designation M06 for the geometry motor code (nominal thread diameter mounting screw M6).

Motor mounting kits for motors according to customer specification can be configured using the online configurator in the eShop. The option “Motor mounting kits according to customer specification” needs to be selected for this.

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



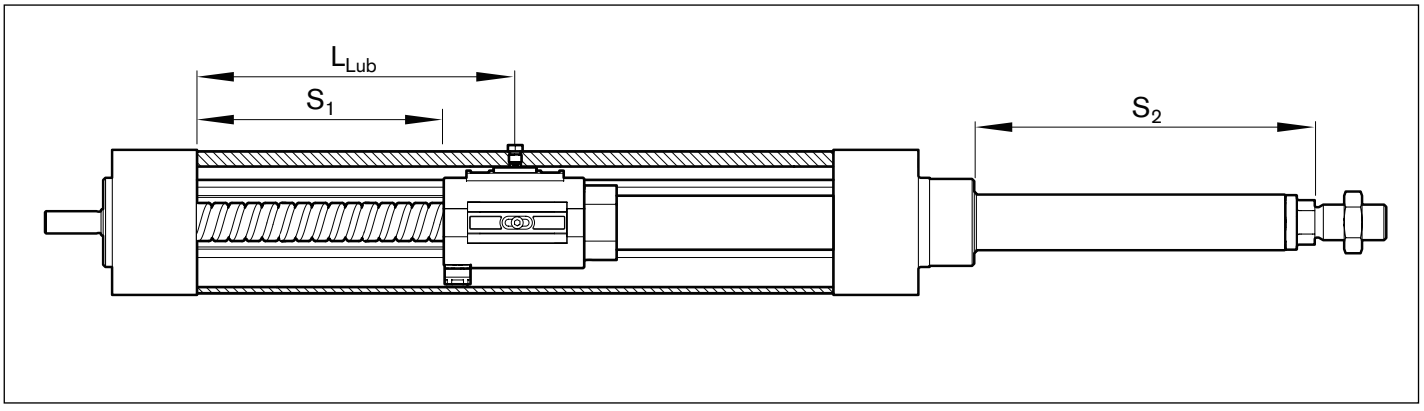
Lubrication and maintenance

Grease lubrication

The advantage of grease lubrication is that the ball or planetary screw assemblies can run for long distances on one supply of grease. As a result, a lubricating system is not required in many cases. All commercially available high-quality ball bearing lubricating greases may be used. Read the lubricant manufacturer's specifications carefully! Greases in accordance with DIN 51825-K2K and, for higher loads, KP2K of NLGI Class 2 in accordance with DIN 51818 are recommended for the longest possible lubrication intervals. Tests have shown that NLGI Class 00 greases achieve only about 75 % of the running performance of Class 2 at higher loads. The lubrication interval depends on many factors, such as degree of contamination, operating temperature, load, etc. Therefore, the following information is intended as a guide only.

Lubrication position and notes on lubrication

Basic lubrication is applied in-factory before shipment.
The electromechanical cylinders are designed for grease lubrication (via manual grease gun with lubricating mandrel).
Maintenance is limited to relubrication of the ball screw through the grease port.
In order to achieve the lubricating position L_{Lub} move the piston rod into stroke position S_2. For this procedure, move S_1 from the end position in accordance with the Table. For more information, see "Instructions for EMC, R320103102".



Recommended lubricants

Note

Do not use lubricants with solid particles (e.g. graphite or MoS_2 additives).
For one-point lubrication we recommend using Dynalub 520.

Grease	
Consistency class NLGI 2 as per DIN 51818 We recommend **Dynalub 510** (Bosch Rexroth) Cartridge (400 g) R341603700 Bucket (5 kg) R341603500	**Consistency class NLGI 00 as per DIN 51818** We recommend **Dynalub 520** (Bosch Rexroth) Cartridge (400 g) R341604300 Bucket (5 kg) R341604200
May also be used	**May also be used**
Elkalub GLS 135 / N2 (Chemie-Technik) Castrol Longtime PD2 (Castrol)	Elkalub GLS 135 / N00 (Chemie-Technik) Castrol Longtime PD 00 (Castrol)

Relubrication intervals

If the specified travel range is completed, or after no more than 2 years, whichever is reached first.
To ensure the lubricant is evenly distributed, the quantity of grease specified per lubrication interval is to be applied.

General conditions:	Load	=	≤ 0.2 C
	n_{min}	=	100 r.p.m.
Installation position:	any		
Operating mode:	no short stroke (> S_{min})		
Seals:	Standard		

Lubrication intervals, lubricant quantities, lubricating positions

For the option “ball screw preserved only”, double the relubrication amount is to be applied prior to initial operation.

EMC	P[1] (mm)	Rotations U (mil)		Travel range (km)		Grease relubrication amount (cm^3)	L_{Lub} (mm)	S_1 (mm)	S_2 (mm)
		Dynalub 510	Dynalub 520	Dynalub 510	Dynalub 520				
32	5	–	37.5	250	187.5	0.41	36.0 + $s_{max}/2$[2]	21,5 + $s_{max}/2$[2]	33,0 + $s_{max}/2$[2]
	10	–	37.5	500	375.0	0.41	38.0 + $s_{max}/2$[2]	18,5 + $s_{max}/2$[2]	30,0 + $s_{max}/2$[2]
40	5	50	37.5	250	187.5	0.83	35.5 + $s_{max}/2$[2]	16,1 + $s_{max}/2$[2]	28,1 + $s_{max}/2$[2]
	10	50	37.5	500	375.0	1.09	40.0 + $s_{max}/2$[2]	17,5 + $s_{max}/2$[2]	29,5 + $s_{max}/2$[2]
	16	50	37.5	800	600.0	1.50	48.0 + $s_{max}/2$[2]	15,0 + $s_{max}/2$[2]	27,0 + $s_{max}/2$[2]
50	5	50	37.5	250	187.5	1.24	33.0 + $s_{max}/2$[2]	10,0 + $s_{max}/2$[2]	24,0 + $s_{max}/2$[2]
	10	50	37.5	500	375.0	1.91	42.5 + $s_{max}/2$[2]	10,0 + $s_{max}/2$[2]	24,0 + $s_{max}/2$[2]
	20	50	37.5	1000	750.0	3.00	52.0 + $s_{max}/2$[2]	10,0 + $s_{max}/2$[2]	24,0 + $s_{max}/2$[2]
63	5	50	37.5	250	187.5	1.91	35.0 + $s_{max}/2$[2]	10,0 + $s_{max}/2$[2]	24,0 + $s_{max}/2$[2]
	10	50	37.5	500	375.0	2.33	44.5 + $s_{max}/2$[2]	10,0 + $s_{max}/2$[2]	24,0 + $s_{max}/2$[2]
	25	50	37.5	1250	937.5	4.24	60.5 + $s_{max}/2$[2]	10,0 + $s_{max}/2$[2]	24,0 + $s_{max}/2$[2]
80	5	50	37.5	250	187.5	2.74	37.0 + $s_{max}/2$[2]	10,0 + $s_{max}/2$[2]	26,0 + $s_{max}/2$[2]
	10	50	37.5	500	375.0	3.83	49.0 + $s_{max}/2$[2]	7,5 + $s_{max}/2$[2]	26,0 + $s_{max}/2$[2]
	20	50	37.5	1000	750.0	4.35	53.0 + $s_{max}/2$[2]	7,5 + $s_{max}/2$[2]	24,5 + $s_{max}/2$[2]
	32	50	37.5	1600	1200.0	6.68	70.5 + $s_{max}/2$[2]	7,5 + $s_{max}/2$[2]	24,5 + $s_{max}/2$[2]
100	5	50	37.5	250	187.5	3.68	36.0 + $s_{max}/2$[2]	7,9 + $s_{max}/2$[2]	23,9 + $s_{max}/2$[2]
	10	50	37.5	500	375.0	8.18	43.0 + $s_{max}/2$[2]	10,5 + $s_{max}/2$[2]	23,9 + $s_{max}/2$[2]
	20	50	37.5	1000	750.0	10.61	52.0 + $s_{max}/2$[2]	4,5 + $s_{max}/2$[2]	21,5 + $s_{max}/2$[2]
	40	50	37.5	2000	1500.0	17.55	79.5 + $s_{max}/2$[2]	4,5 + $s_{max}/2$[2]	21,5 + $s_{max}/2$[2]
100XC	10	10	7.5	100	75.0	13.20	66.5 + $s_{max}/2$[2]	15,3 + $s_{max}/2$[2]	43,4 + $s_{max}/2$[2]
	20	10	7.5	200	150.0	12.38	77.5 + $s_{max}/2$[2]	18,4 + $s_{max}/2$[2]	46,5 + $s_{max}/2$[2]

[1] Ball screw incline
[2] s_{max} maximum travel range of the EMC (see name plate)

Operating conditions and usage

Normal operating conditions

Ambient temperature, cylinder with Rexroth servo motor	0 °C ... 40 °C, above 40 °C loss of performance
Ambient temperature cylinder mechanical system	–10 °C ... +50 °C
Protection class	IP54, optional IP65
Duty cycle	100 %

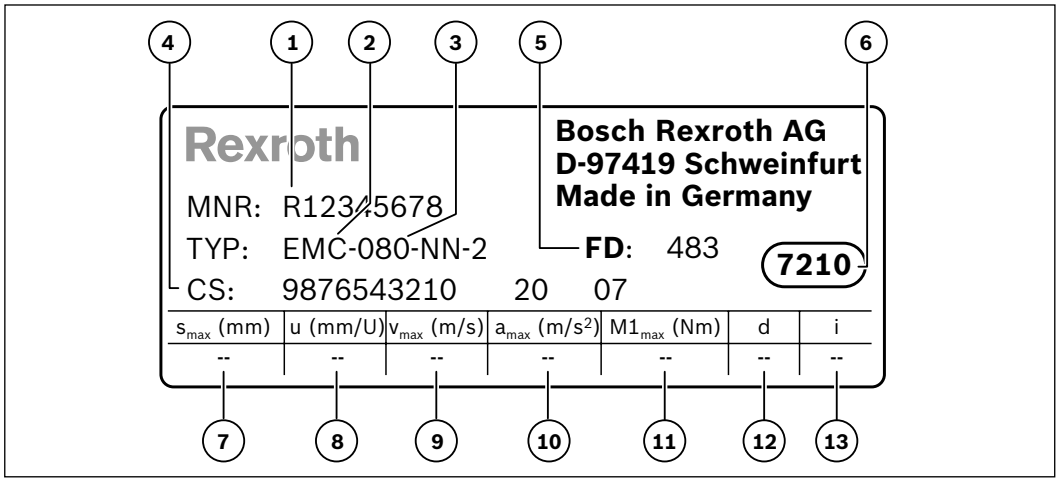
Important

For more information about Intended use and safety, see “Safety for linear systems R320103152”.

For more information on installation / initial operation see “Instructions EMC R320103102”.

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

Name plate



1	MNR	Part number
2	TYPE	Short product name
3	080	Size
4	CS	Customer information
5	FD	Date of manufacture
6	7210	Manufacturing location
7	s_{max}	Maximum travel range
8	u	Lead constant without motor attachment
9	v_{max}	Maximum linear speed
10	a_{max}	Maximum acceleration
11	$M1_{max}$	Maximum drive torque at motor journal
12	d	Direction of rotation of the motor for travel in positive (+) direction
13	i	Gear ratio

Note

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

Documentation

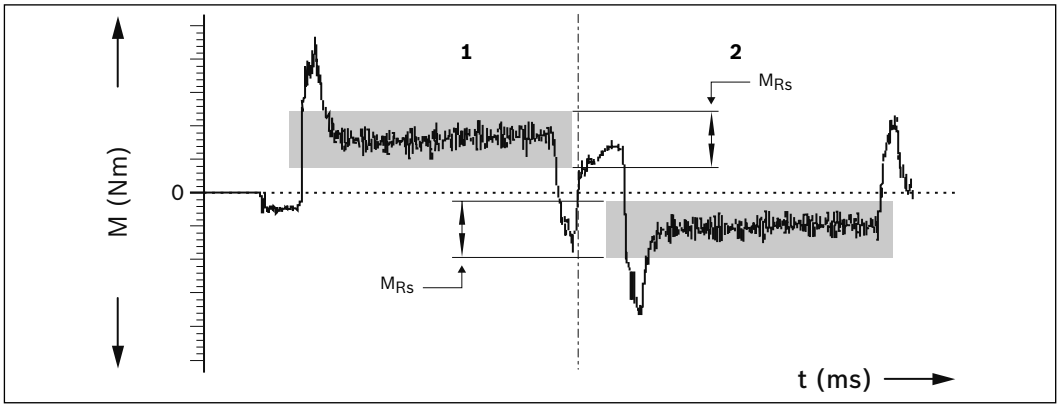
Standard report
Option 01

The standard report serves to confirm that the checks listed in the report have been carried out and that the measured values lie within the permissible tolerances.
Checks listed in the standard report

- Functional checks on mechanical components
- Functional checks on electrical components
- Design in accordance with order confirmation

Frictional torque of the complete system
Option 02
All items contained in the standard report.
The moment of friction M is measured over the entire travel range.

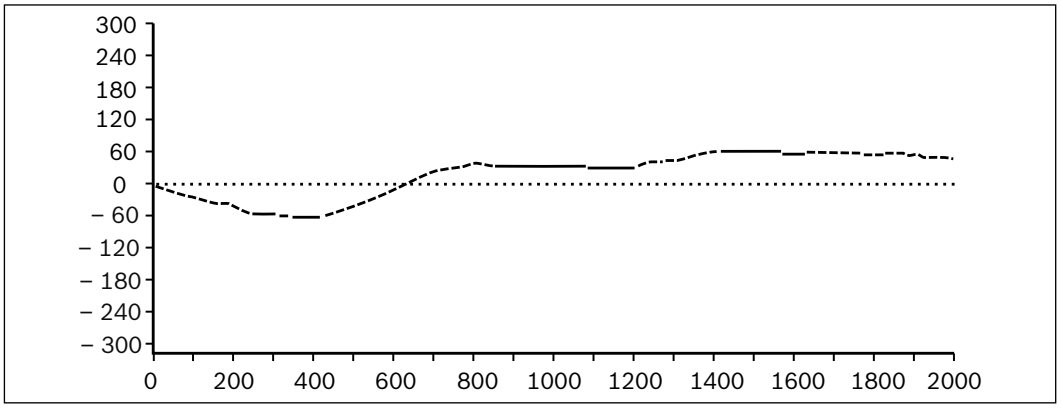
Example



1 Advance
2 Return

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

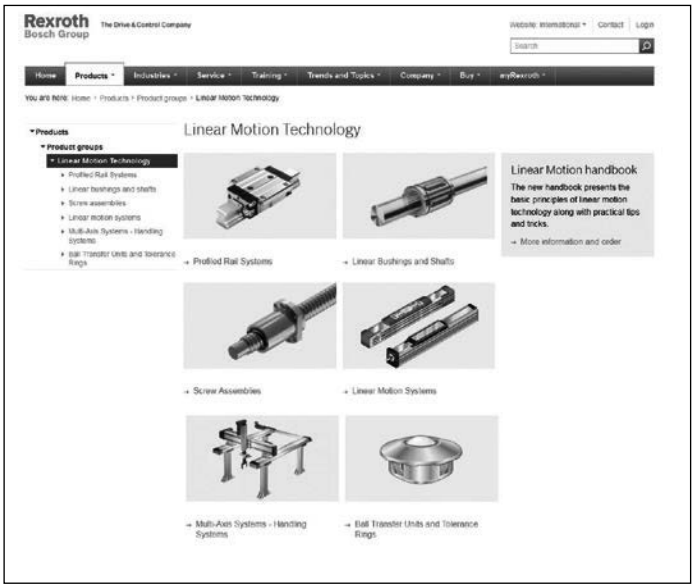
Lead deviation of screw drive
Option 03
All items contained in the standard report.
In addition to graphical representation (see illustration), a measurement report is supplied in tabular form.



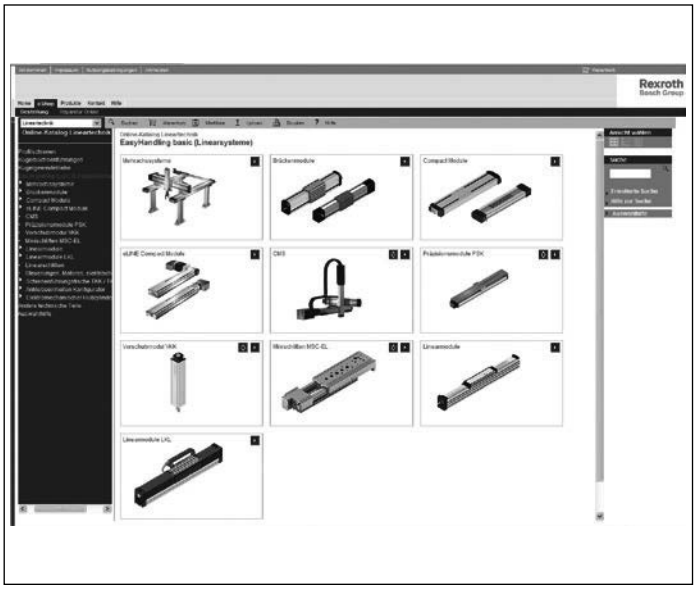
Further information

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

Product information:
http://www.boschrexroth.com/en/xc/products/product-groups/linear-motion-technology/index

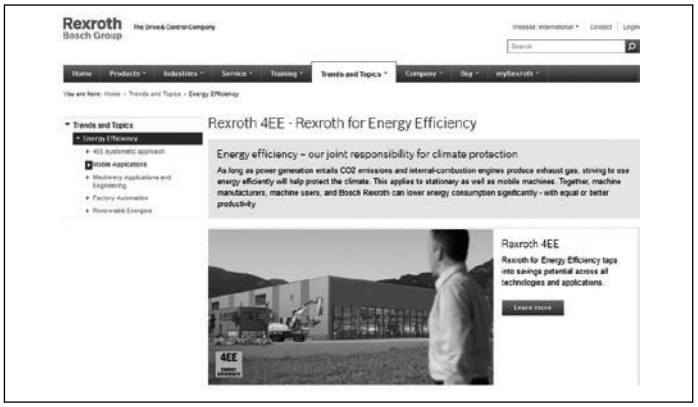


eShop:
http://www.boschrexroth.com/eshop



Rexroth 4EE - Rexroth for energy efficiency:

http://www.boschrexroth.com/4EE



Safety engineering:

http://www.boschrexroth.com/Maschinensicherheit

Training:

http://www.boschrexroth.com/training

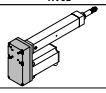
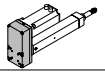
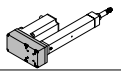
Service:

http://www.boschrexroth.com/service

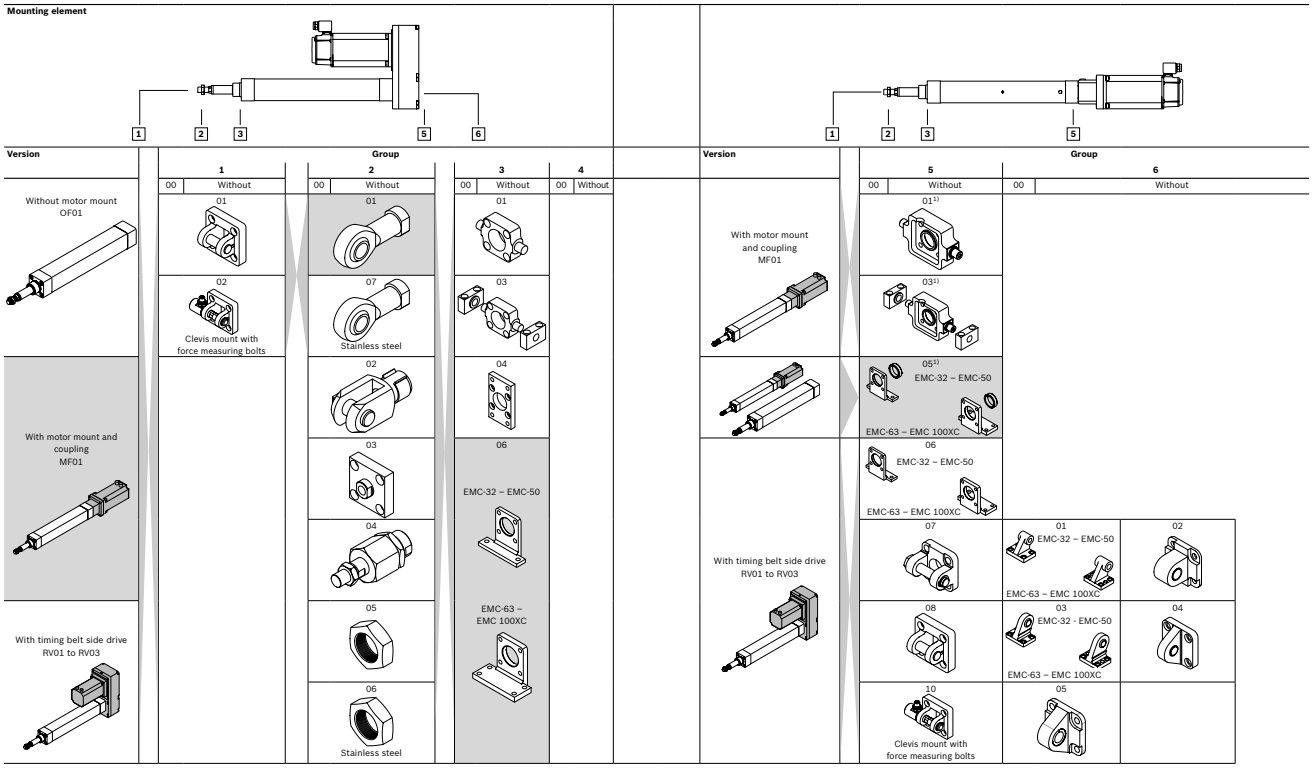
Ordering example

Size, Part number	Max. travel range (mm)	Housing: Standard	Housing: Protection class IP 65	Housing: Protection class IP 65 + R	Drive unit: Ball screw d_0 x P (mm)	Drive unit	Lubrication: NLGI grade 02 (Dynalub 510)	Lubrication: NLGI grade 00 (Dynalub 520)[1]	Lubrication: Ball screw preserved only[2]	Switches: Without switch and sensor profile	Switches: Sensor profile	Switches: Switches 1, 2, 3, 4		Version		Motor mounting: Gear ratio	Motor mounting: Mounting kit[3]	Motor mounting: For motor[4]	Motor: Without brake	Motor: With brake	Documentation: Standard report	Documentation: Measurement report	
EMC-032-NN-2		01	02	03	12 x 5	01	-	02	03	00	80	PNP/normally closed (NC)	120	OF01	Without motor mount		00	Without	00		01	02[5]	03[6]
														MF01	With motor mount		01	MSM 019B	104	105			
																	02	MSM 031B	106	107			
					12 x 10	02											03	MSM 030C	84	85			
														RV01 RV02 RV03	With timing belt side drive	i = 1	41	MSM 019B	104	105			
																	42	MSM 031B	106	107			
																	43	MSM 030C	84	85			
EMC-040-NN-2					16 x 5	01	01					NPN/normally closed (NC)	121	OF01	Without motor mount		00	Without	00				
														MF01	With motor mount		05	MSM031C	108	109			
																	06	MSK030C	84	85			
																	07	MSK040C	86	87			
					16 x 10	02								RV01 RV02 RV03	With timing belt side drive	i = 1	45	MSM031C	108	109			
																	46	MSK030	84	85			
																	47	MSK040	86	87			
					16 x 16	03										i = 1.5	49	MSM031C	108	109			
																	50	MSK030	84	85			
																	51	MSK040	86	87			
EMC-050-NN-2					20 x 5	01						PNP/normally open (NO)	122	OF01	Without motor mount		00	Without	00				
														MF01	With motor mount		09	MSM031C	108	109			
																	10	MSM041B	110	111			
																	11	MSK040	86	87			
																	12	MSK050	88	89			
					20 x 10	02								RV01 RV02 RV03	With timing belt side drive	i = 1	53	MSM031C	108	109			
																	54	MSM041B	110	111			
																	55	MSK040	86	87			
																	56	MSK050C	88	89			
					20 x 20	04						NPN/normally open (NO)	123			i = 1.5	58	MSM031C	108	109			
																	59	MSM041B	110	111			
																	60	MSK040	86	87			

Timing belt side drive

RV01	RV02	RV03
		

[1] Recommended for one-point lubrication
[2] Initial greasing required prior to initial operation
[3] Attachment kit also available without motor (when ordering: enter "00" for motor); for motor mounting kit for customer motor see "Motor mounting" section.
[4] For motor types see "IndraDyn S - servo motors" section
[5] Frictional torque measurement
[6] Lead deviation



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 unit		02	Planetary screw assembly 16 x 10
Lubrication		02	NLGI grade 00 (Dynalub 520)
Sensor profile		80	With sensor profile
Switch 1		122	122 PNP-NO contact
Version		MF01	With motor mount
Motor mounting		06	Mounting kit (motor mount and coupling) for MSK 030C
Motor		84	MSK 030C, without brake
Documentation		02	Frictional torque measurement
Mounting elements	**Group 1**	00	None
	Group 2	01	Female spherical rod end bearing
	Group 3	05	Foot mount
	Group 4	00	None
	Group 5	06	Foot mount
	Group 6	00	None

Inquiry or ordering

Bosch Rexroth AG
97419 Schweinfurt
Germany

Your local contact representative can be found at:
www.boschrexroth.com/adressen

To be completed by customer	Option
Inquiry	
Order	

Ordering data		Option
Short product name		E M C - _ _ _ - _ _ - 2
Max. travel range (mm)	=	
Housing	=	
Drive unit	=	
Lubrication	=	
Sensor profile	=	
Switch 1	=	
Switch 2	=	
Switch 3	=	
Switch 4	=	
Version	=	
Motor mounting	=	

		ØD	–	C	–	ØE	–	C_1	–	ØF	–	ØG	–	B_1	–	A
Motor geometry code	=											M				

Motor	=		
Documentation	=		
Mounting elements	=		Group 1
	=		Group 2
	=		Group 3
	=		Group 4
	=		Group 5
	=		Group 6

Order quantity	Quantity
One-off	
Monthly	
Annually	
Per order	
Comments	

Sender	
Company	
Address	
Name	
Department	
Fax	
Email	

Notes

Notes

The Drive & Control Company

Rexroth
Bosch Group

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R999000493 (2015-01)
replaces R310EN 3306 (2014-11)