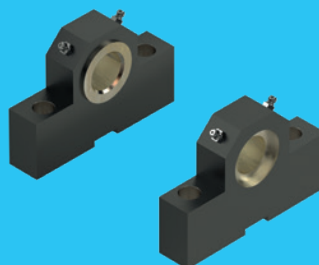
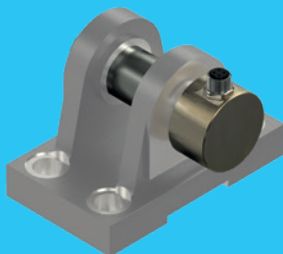


Electromechanical cylinder EMC-HP



Identification system for short product names

Short product name		Example: EMC - 130 - HP - 1			
System	=	<u>E</u> lectro <u>M</u> echanical <u>C</u> ylinder			
Size		115 / <u>130</u> / 160			
Version	=	<u>H</u> igh <u>P</u> ower			
Generation	=	Product generation 1			

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Product description

For positioning loads weighing tons with absolute precision on micrometers, powerful pressing, joining or closing and unrestricted motion sequence variation: The new electromechanical cylinders EMC Heavy Power (EMC-HP) from Rexroth exploit the advantages of modern control technology even at high forces.

The high rigidity of the units allows precise positioning in addition to high performance and dynamics. Users can seamlessly integrate the cylinders into intelligent energy management and in this way reduce power consumption and carbon emissions.

Parameters for force, position and travel speed can be set as required and flexibly adapted to new tasks at any time via the drive system. The electromechanical cylinders EMC-HP for heavy loads transmit the motor movement via ball or planetary screw assemblies depending on the dynamics and force requirements. Available in various sizes and leads, the highly precise Rexroth screw drives cover a wide range of needs in a cost-effectively manner. Rexroth offers the EMC-HP as ready-to-install, purely mechanical axes and as a complete system with a choice of precisely matched gear units, servo motors and drive controllers.

Structural design

The mechanical system in the electromechanical cylinder EMC-HP is based on proven planetary 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.

The piston rod-to-housing interface is optimally sealed to prevent dirt from working its way in.

The housing fulfills the requirements for protection class IP 65, the piston rod those for IP 54. The piston rod is protected against turning.

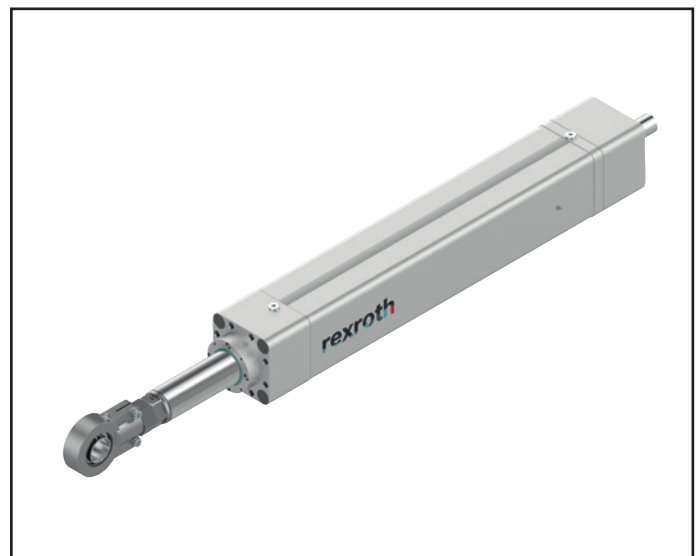
Integrated end position buffers protect the mechanical system during start-up. Switches are available as an option.

Limit switches prevent damage to the cylinder in operation. A reference point switch is available for the use of incremental encoder systems. A load measuring pin is available for the exact measurement of forces.

Electromechanical Cylinders EMC-HP require only minimum maintenance effort. The advantage of grease lubrication is that the screw drive can run long distances on one supply of grease. The oil bath lubrication entails the advantage of longer maintenance intervals.

Advantages

- ▶ High energy efficiency and low negative environmental impact (no risk of leaks)
- ▶ Straightforward, compact and robust structural design for space-saving integration in machine concepts and usage even in harsh environmental conditions
- ▶ Complete building system with great variability for high flexibility in a broad range of applications
- ▶ Precise positioning, high dynamics, powerful drive and a long service life thanks to precision Rexroth planetary screw assemblies
- ▶ Smart, service-oriented, 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)



Condition as delivered

- ▶ The electromechanical cylinder EMC-HP is delivered as a completely assembled unit. The only parts not pre-assembled are pillow blocks, clevis brackets and the switches.

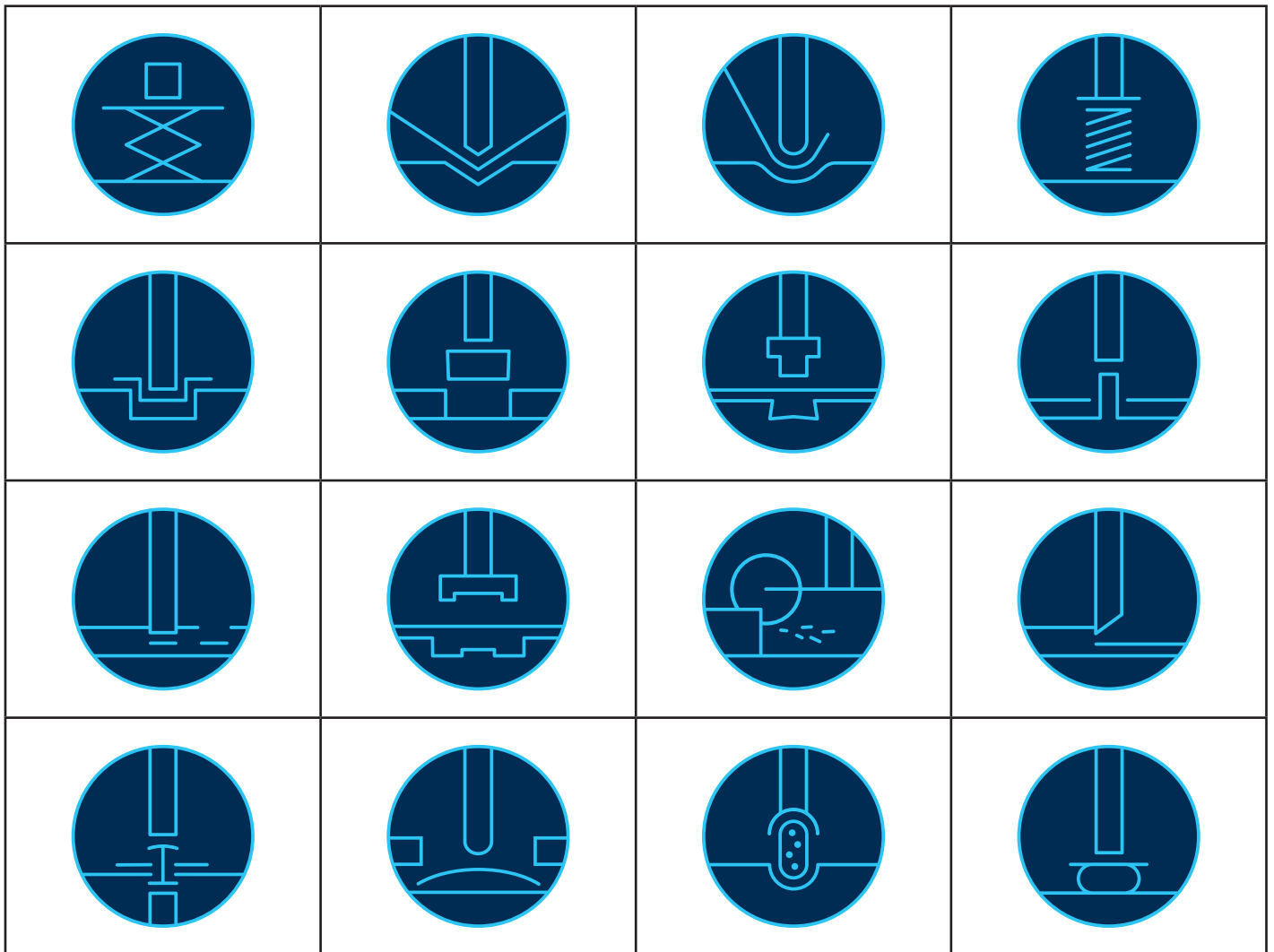
Application areas

Electromechanical cylinders EMC-HP 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 space-saving 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
- ▶ Machine tools
- ▶ Assembly and handling technology
- ▶ Packaging machines and conveyor systems
- ▶ Testing equipment and laboratory applications
- ▶ Simulators
- ▶ Special machines

Application examples: Bending, lifting, pressing, transporting, etc.



Structural design

- 1** Threaded bolt (galvanized steel)
- 2** Lock nut (galvanized steel)
- 3** Piston rod (stainless steel)
- 4** Thread (for mounting fastening elements)
- 5** Cover (aluminum, anodized)
- 6** Housing (aluminum, anodized)
- 7** Screw journal
- 8** Base (aluminum, anodized)
- 9** Lube connection (on two sides)
- 10** Cover for T-slot for switches
- 11** Service openings

Attachments

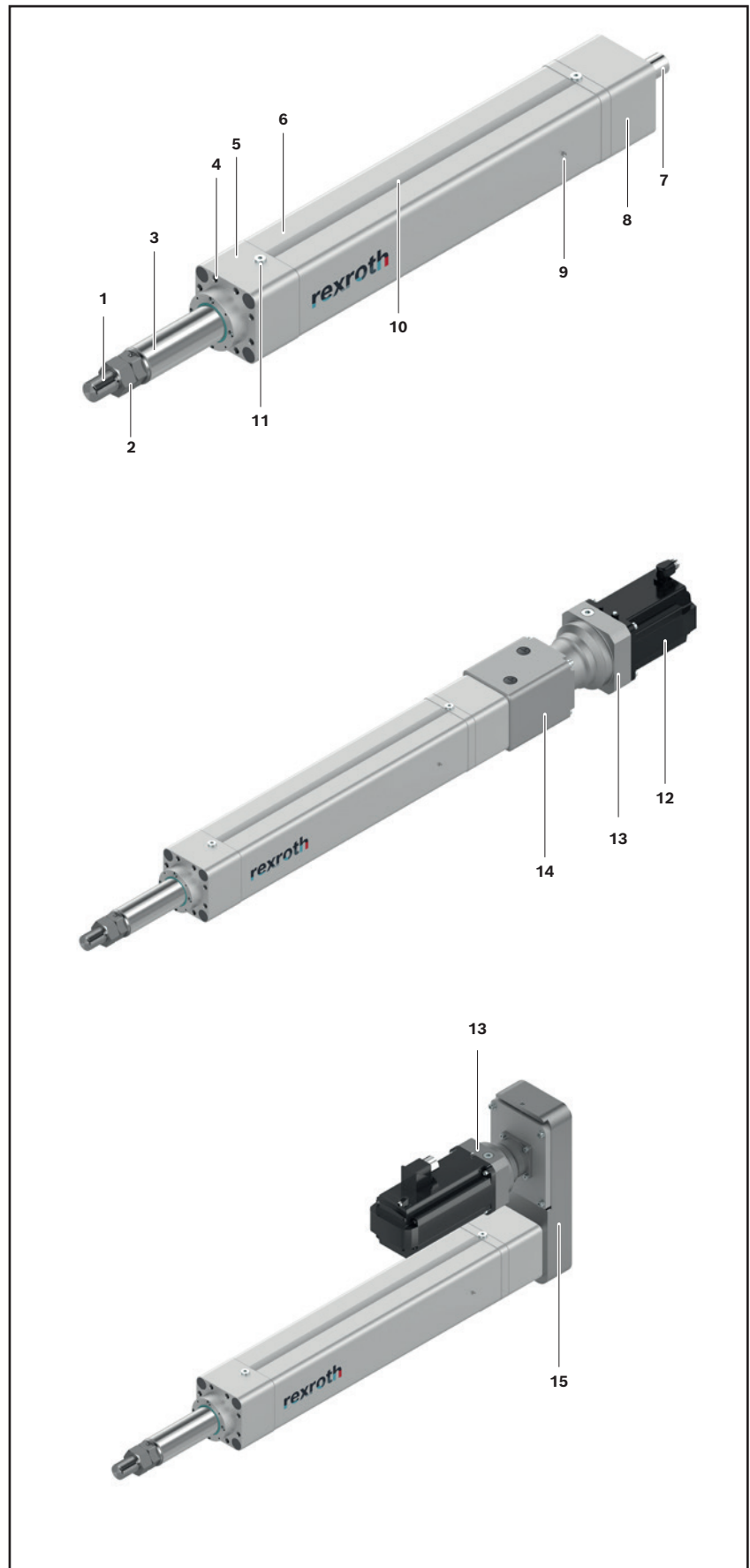
- 12** Motor
- 13** Gear (optional)
- 14** Flange (aluminum, anodized)
- 15** Belt side drive (aluminum, anodized)

Motor flange and coupling

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

Belt side drive

This configuration results in the shortest overall length of the EMC possible. The space-saving, closed housing serves as protection for the belt, motor bracket and to connect fastening elements. Gear ratio $i = 1 : 1.5$



Mounting examples



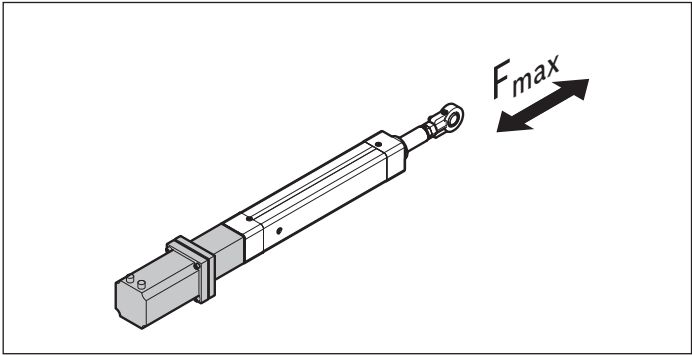
Technical data

Dimensions, load ratings, maximum forces and masses

EMC-HP	PLSA	C (N)	F _{max} (N)	M _p (Nm)	v _{max} (m/s)	a _{max} (m/s²)	s _{max} (mm)	s _{min} (mm)	L _{ad} (mm)		n _p (min ⁻¹)	
	d ₀ xP (mm)								Trunnion without	with		
115	30 x 5	82 000	44 000	43.8	0.42	30	1 200	85	332.0	374	5 000	
	30 x 10	82 000	41 000	81.6	0.83	30	1 200	85	332.0	374	5 000	
130	39 x 5	120 000	65 000	64.7	0.32	30	1 500	110	364.0	420	3 850	
	39 x 10	120 000	70 000	139.3	0.64	30	1 500	110	364.0	420	3 850	
160	48 x 5	179 000	95 000	94.5	0.26	30	1 500	130	418.5	482	3 125	
	48 x 10	179 000	100 000	198.9	0.52	30	1 500	130	418.5	482	3 125	

Note on dynamic load rating

In relation to the desired service life, an equivalent dynamic axial load of up to about 20% of the dynamic load rating (C) has generally proven effective. Do not exceed the technical data.



Mass of the EMC-HP

Weight calculation without motor and without motor attachment*)

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

Moved mass of system*)

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

*) When calculating the mass of the entire system, the masses of the attachments/fastening elements must also be taken into account.

The indicated values apply in case of compliance with the specified relubrication intervals and to standard operation. For short stroke operation (stroke < s_{min}), reduction factors must be taken into consideration. (see chapter "Operating conditions and application").

Load on the piston rod

Horizontal mounting	Vertical mounting
----------------------------	--------------------------

Loading the piston rod with transverse forces is not permissible

	η	M_{Rs} (Nm)	$k_J \text{ fix}$	$k_J \text{ var}$	k_{Jm}	m_s		m_{ca}	
						$k_g \text{ fix}$ (kg)	$k_g \text{ var}$ (kg/mm)	$m_{ca} \text{ fix}$ (kg)	$m_{ca} \text{ var}$ (kg/mm)
	0.80	6.00	811.00	0.625	0.633	11.2	0.019	4.0	0.0055
	0.80	6.00	819.00	0.629	2.533	11.2	0.019	4.0	0.0055
	0.80	7.00	1947.00	1.768	0.633	17.0	0.026	5.8	0.0068
	0.80	7.00	1958.00	1.781	2.533	17.0	0.026	5.8	0.0068
	0.80	8.00	5598.00	4.095	0.633	28.6	0.035	10.7	0.0115
	0.80	8.00	5618.00	4.091	2.533	28.6	0.035	10.7	0.0115

Length calculation

$$L = L_{ad} + S_{max}$$

For further calculations see configurators and tools

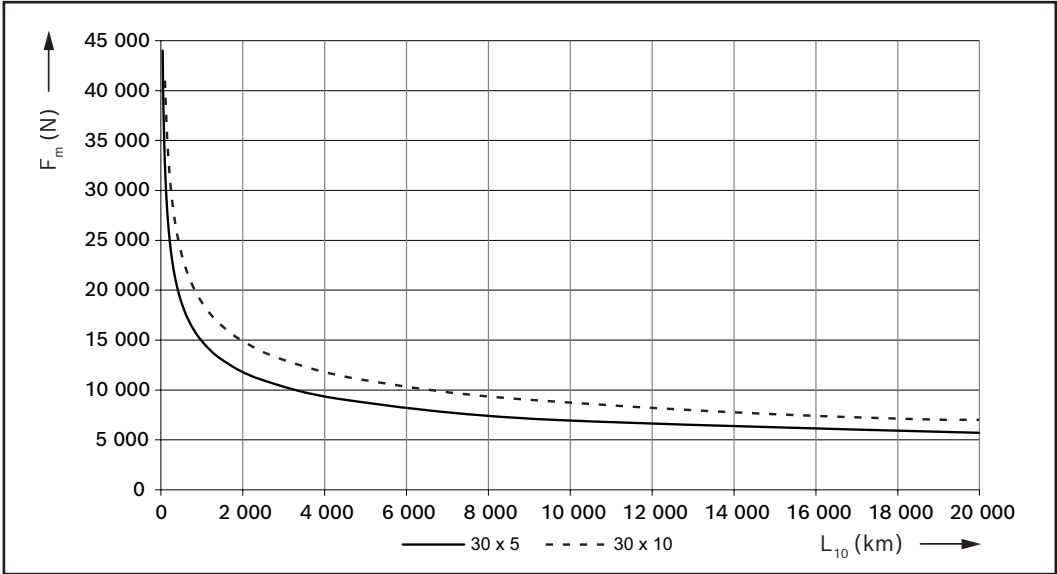
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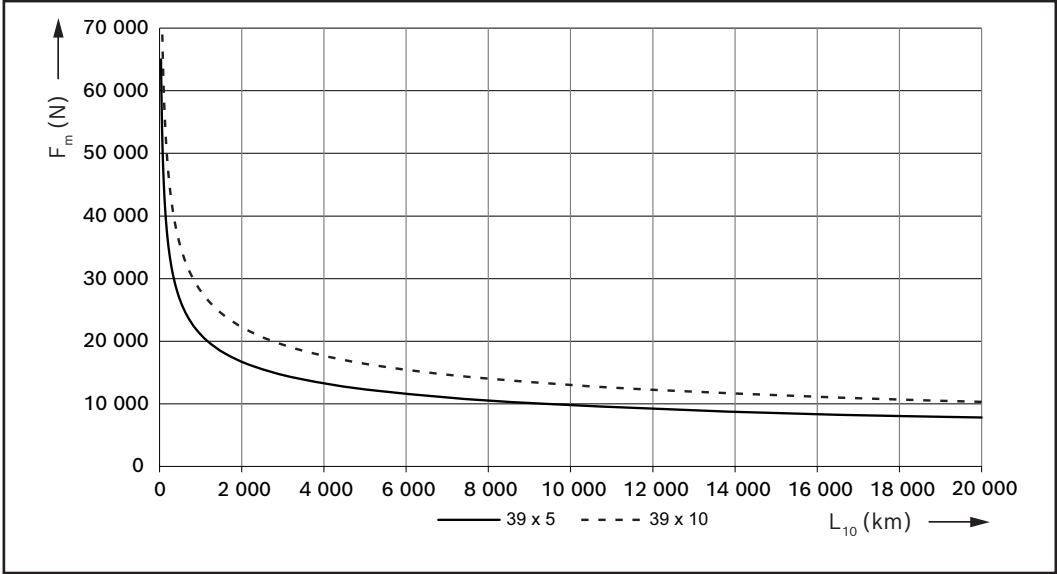
For abbreviations see chapter "Service and Information"

Service life

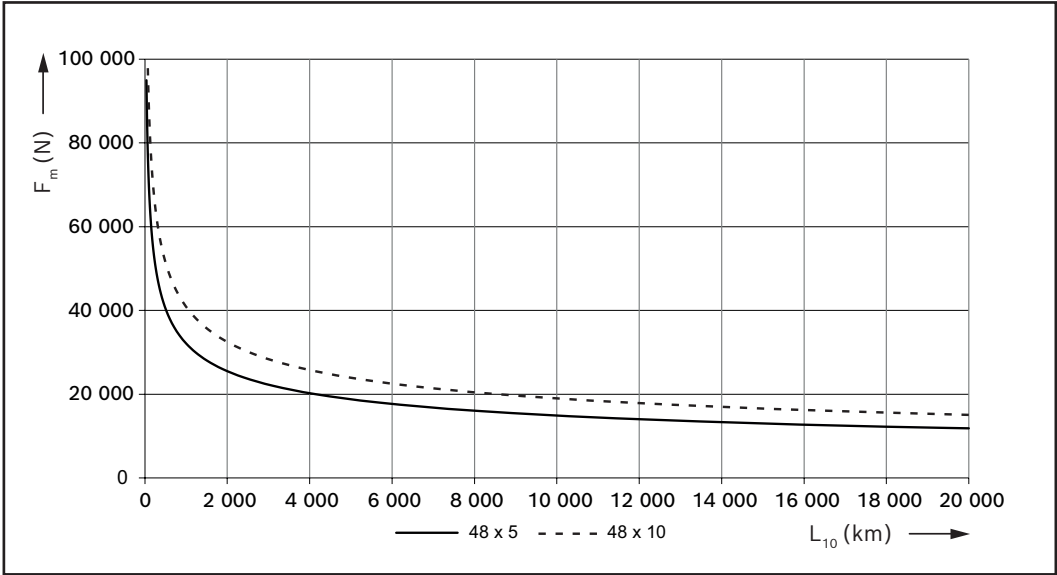
EMC-115-HP



EMC-130-HP

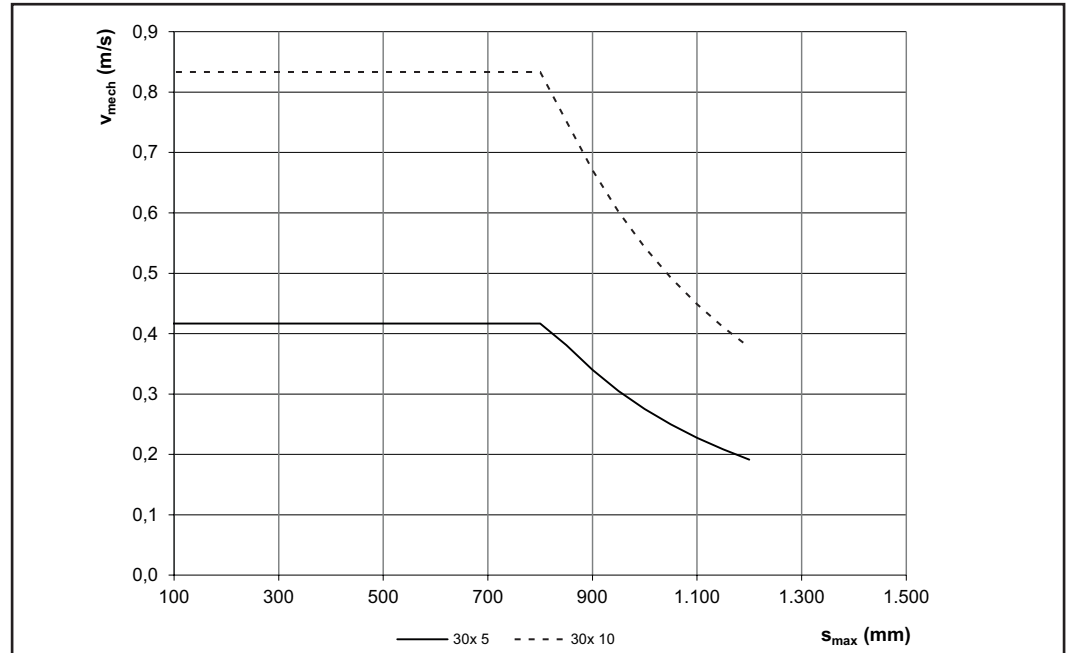


EMC-160-HP

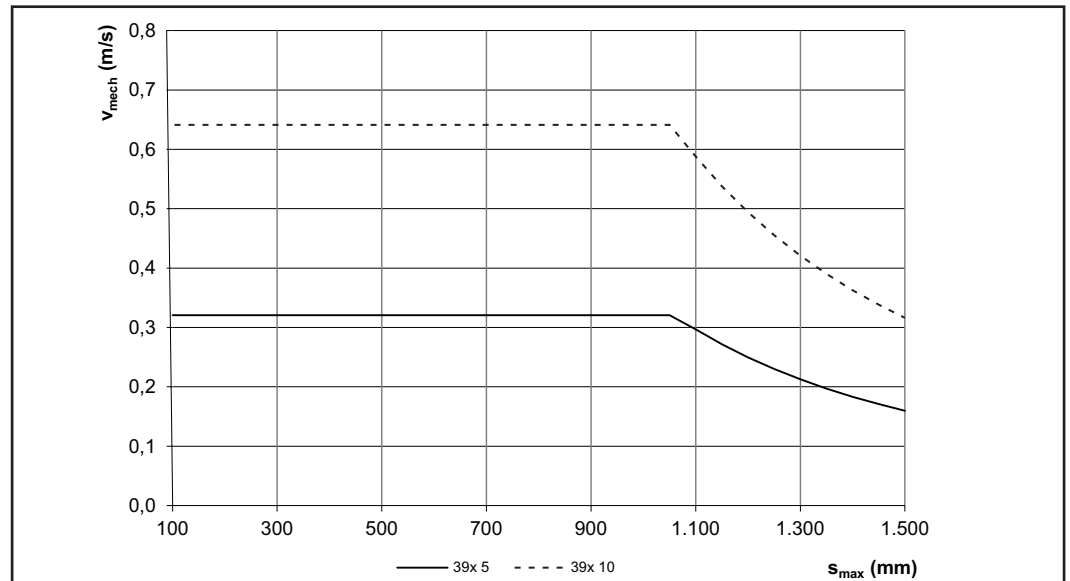


Travel speeds

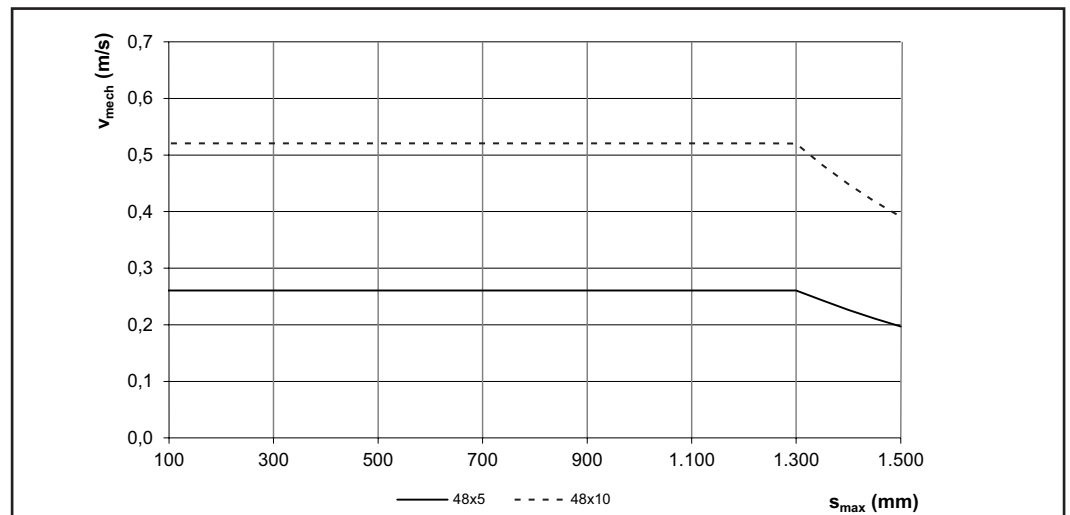
EMC-115-HP



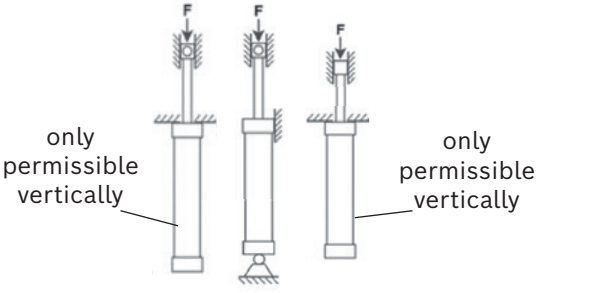
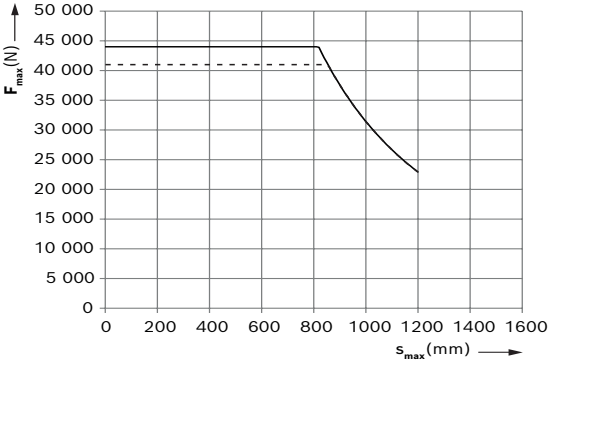
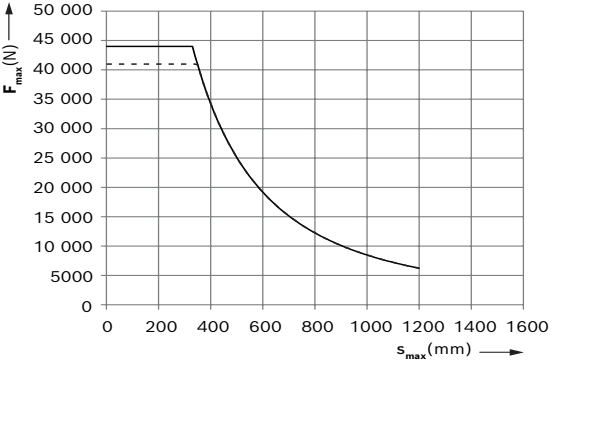
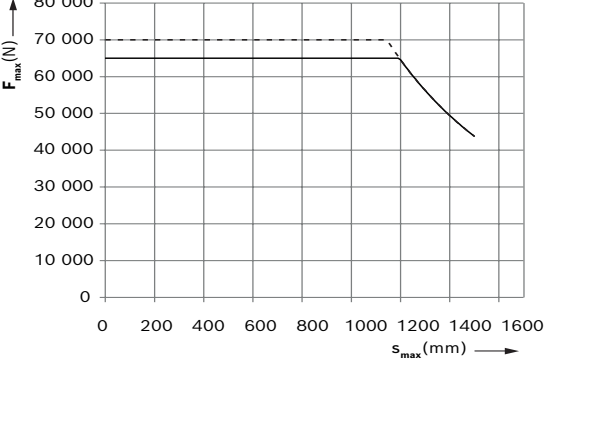
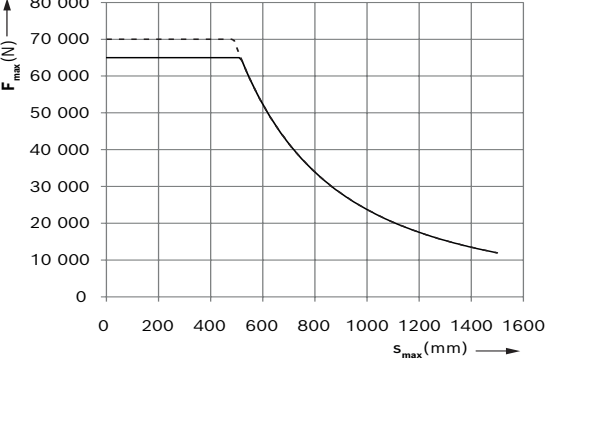
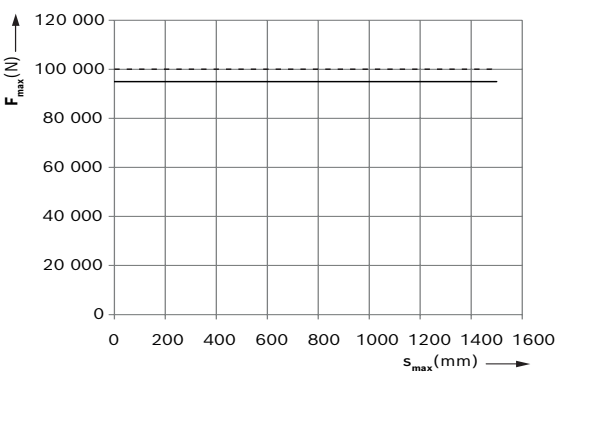
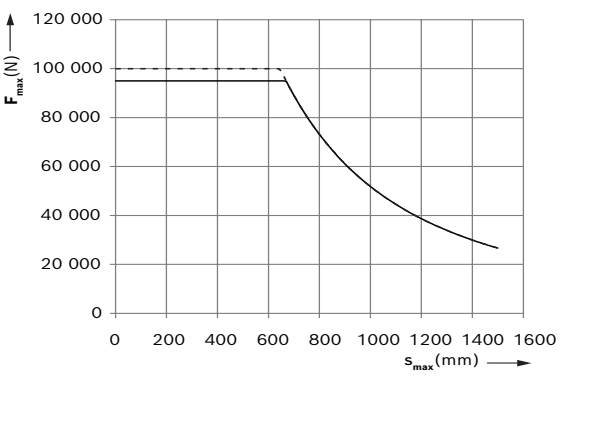
EMC-130-HP

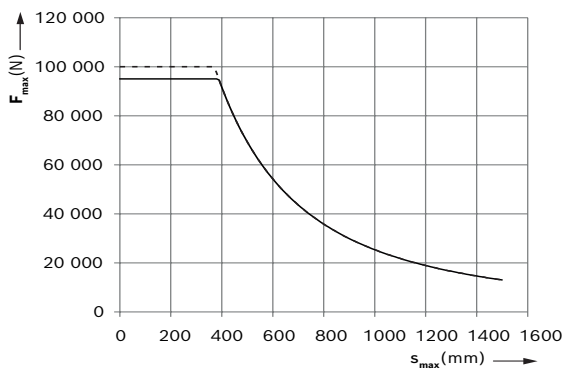
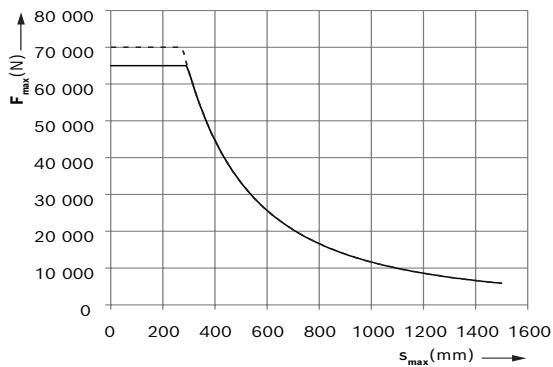
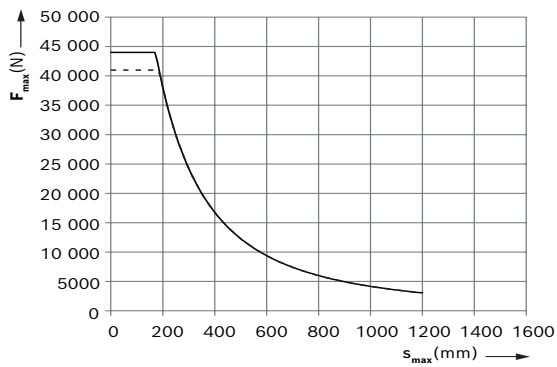
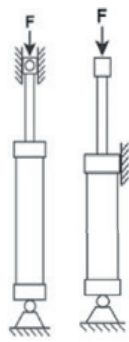
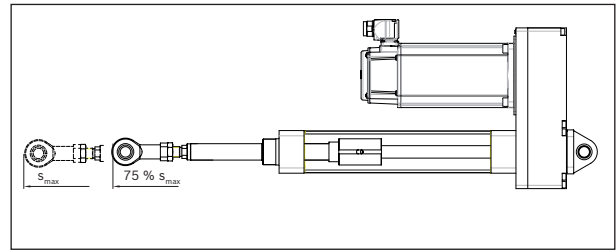


EMC-160-HP



Axial load on the cylinder mechanics

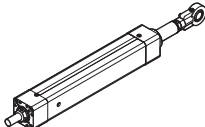
EMC-HP Size	Case I 	Case II 	
115 — 30x5 - - - 30x10			
130 — 39x5 - - - 39x10			
160 — 48x5 - - - 48x10			

Case III

Installation case III


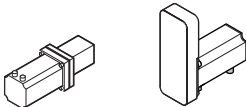
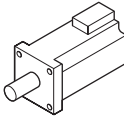
Note: In this installation case the cylinder mechanism of the EMC is loaded by its dead weight in a horizontal position.

Thus, the piston rod may be extended horizontally only up to 75% of $s_{\max}$.

EMC-115-HP -1 Configuration and ordering

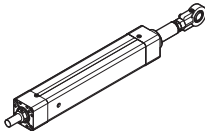
Short product name, s _{max} EMC-115-HP-1, ... mm	Housing	Drive PLSA d ₀ xP	Lubrication			Switches					Cable duct			
				LSS standard lubrication ¹⁾	LOB Oil bath lubrication	LLG low-temperature grease	Without sensor	PNP NC	NPN NC	PNP NO	NPN NO	Cover profile without		with
	Standard	30 x 5	Grease lubrication	001	-	006	000	120	121	122	123	000	081	
		30 x 10	Oil bath lubrication	-	011	-								

¹⁾ LSS: Standard lubrication with Dynalub 510 with manual grease gun
²⁾ Measurement of frictional torque without motor attachment

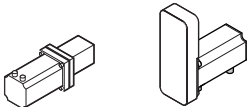
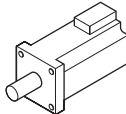
Version*				Mounting interface			Motor				Motor connector position*	Docu-mentation	
				Gear ratio			Motor code						
								Connection					
								1 cable		2 cables			
							without brake	with brake	without brake	with brake			
				Mechanical interface									
	F000	flangeless			without	000	without	000	000	000	000 090 180 270	Standard report 001 Measurement of frictional torque ²⁾ 002 Lead deviation 003	
	F001	with flange	i = 1	MS2N07	001	MS2N07-D1BNN	269	270	-	-			
						MS2N07-D0BHA	-	-	287	288			
				MS2N10	002	MS2N10-C0BNN	-	-	289	290			
						MS2N10-D0BHA	-	-	291	292			
	S000 S090 S180 S270	with belt side drive	i = 1.5	MS2N07	040	MS2N07-D1BNN	269	270	-	-			
						MS2N07-D0BHA	-	-	287	288			
				MS2N10	041	MS2N10-C0BNN	-	-	289	290			

* see page Configuration and ordering, comprehensive information

EMC-130-HP -1 Configuration and ordering

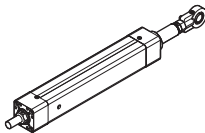
Short product name, s _{max} EMC-130-HP-1, ... mm	Housing	Drive PLSA d ₀ xP	Lubrication			Switches					Cable duct			
				LSS standard lubrication ¹⁾	LOB Oil bath lubrication	LLG low-temperature grease	Without sensor	PNP NC	NPN NC	PNP NO	NPN NO	Cover profile without with		
	Standard	39 x 5	Grease lubrication	001	-	006	000	120	121	122	123	000	081	
		39 x 10	Oil bath lubrication	-	011	-								

¹⁾ LSS: Standard lubrication with Dynalub 510 with manual grease gun
²⁾ Measurement of frictional torque without motor attachment

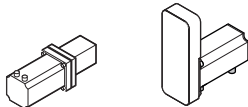
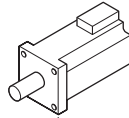
Version*			Mounting interface			Motor			Motor connector position*	Documentation
			Gear ratio				Connection 2 cables			
				without brake	with brake					
			Mechanical interface			Motor code				
	F000	flangeless		without	000	without	000	000	000 090 180 270	Standard report 001 Measurement of frictional torque ²⁾ 002 Lead deviation 003
	F001	with flange	i = 1	MS2N07	001	MS2N07-D0BHA	287	288		
				MS2N10	002	MS2N10-D0BHA	291	292		
						MS2N10-E0BHA	293	294		
	S000 S090 S180 S270	with belt side drive	i = 1.5	MS2N07	040	MS2N07-D0BHA	287	288		
				MS2N10	041	MS2N10-E0BHA	293	294		

* see page Configuration and ordering, comprehensive information

EMC-160-HP -1 Configuration and ordering

Short product name, s _{max} EMC-160-HP-1, ... mm	Housing	Drive PLSA d ₀ xP	Lubrication			Switches					Cable duct			
				LSS standard lubrication ¹⁾	LOB Oil bath lubrication	LLG low-temperature grease	Without sensor	PNP NC	NPN NC	PNP NO	NPN NO	without		with
	Standard	48 x 5	Grease lubrication	001	-	006	000	120	121	122	123	000	081	
		48 x 10	Oil bath lubrication	-	011	-								

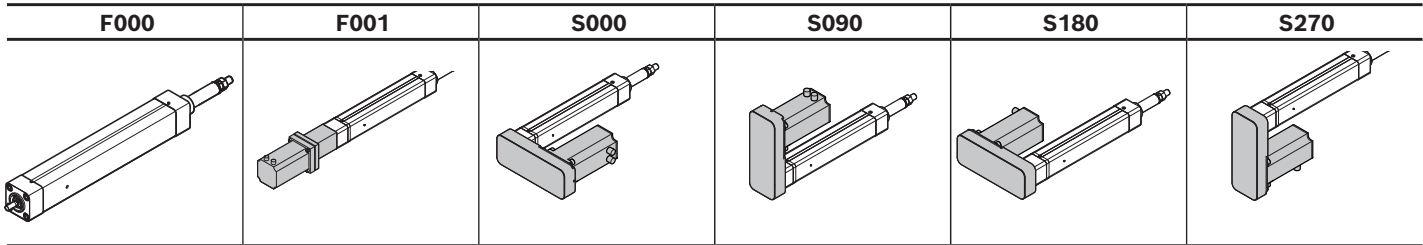
¹⁾ LSS: Standard lubrication with Dynalub 510 with manual grease gun
²⁾ Measurement of frictional torque without motor attachment

Version*			Mounting interface			Gearing	Motor			Motor connector position*	Docu-mentation
			Gear ratio			Gear ratio	 Connection 2 cables	Motor code	without brake	with brake	
				Mechanical interface							
	F000	flangeless		without	000		without	000	000	000 090 180 270	Standard report 001 Measurement of frictional torque ²⁾ 002 Lead deviation 003
	F001	with flange	i = 1	MS2N10	001	–	MS2N10-DOBHA	291	292		
			i = 1	MS2N10 with gear unit	006	i = 3	MS2N10-E0BHA	293	294		
	S000 S090 S180 S270	with belt side drive	i = 1.5	MS2N10	041	–	MS2N10-C0BNN	289	290		
							MS2N10-DOBHA	291	292		
							MS2N10-E0BHA	293	294		
					MS2N10 with gear unit	051	i = 3	MS2N10-C0BNN	289		

* see page Configuration and ordering, comprehensive information

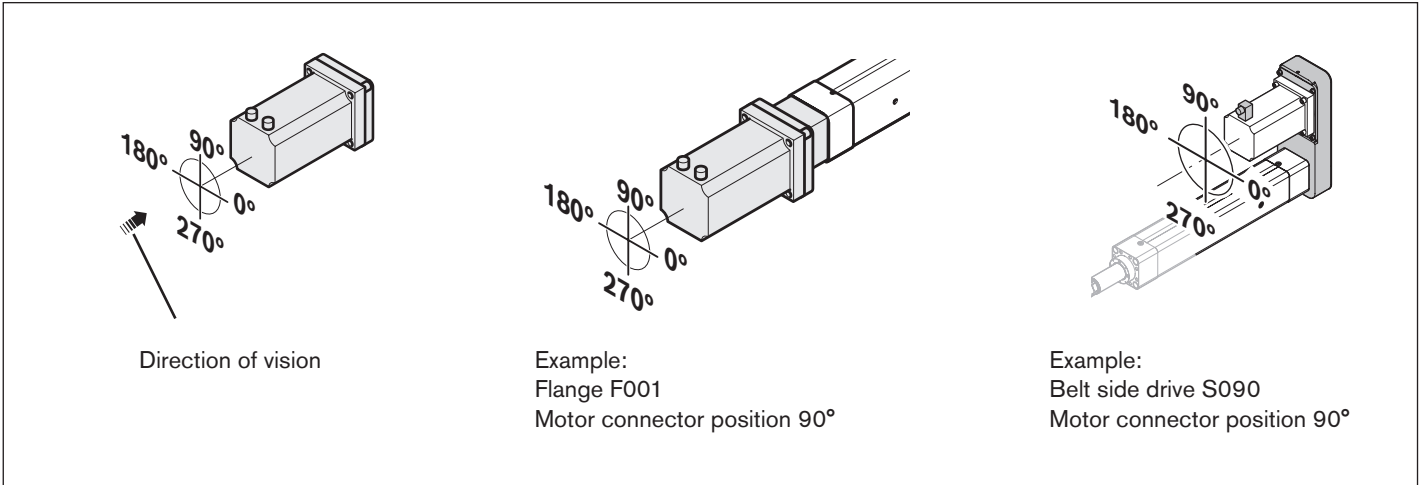
Configuration and ordering, comprehensive information

Motor attachment and motor connector position

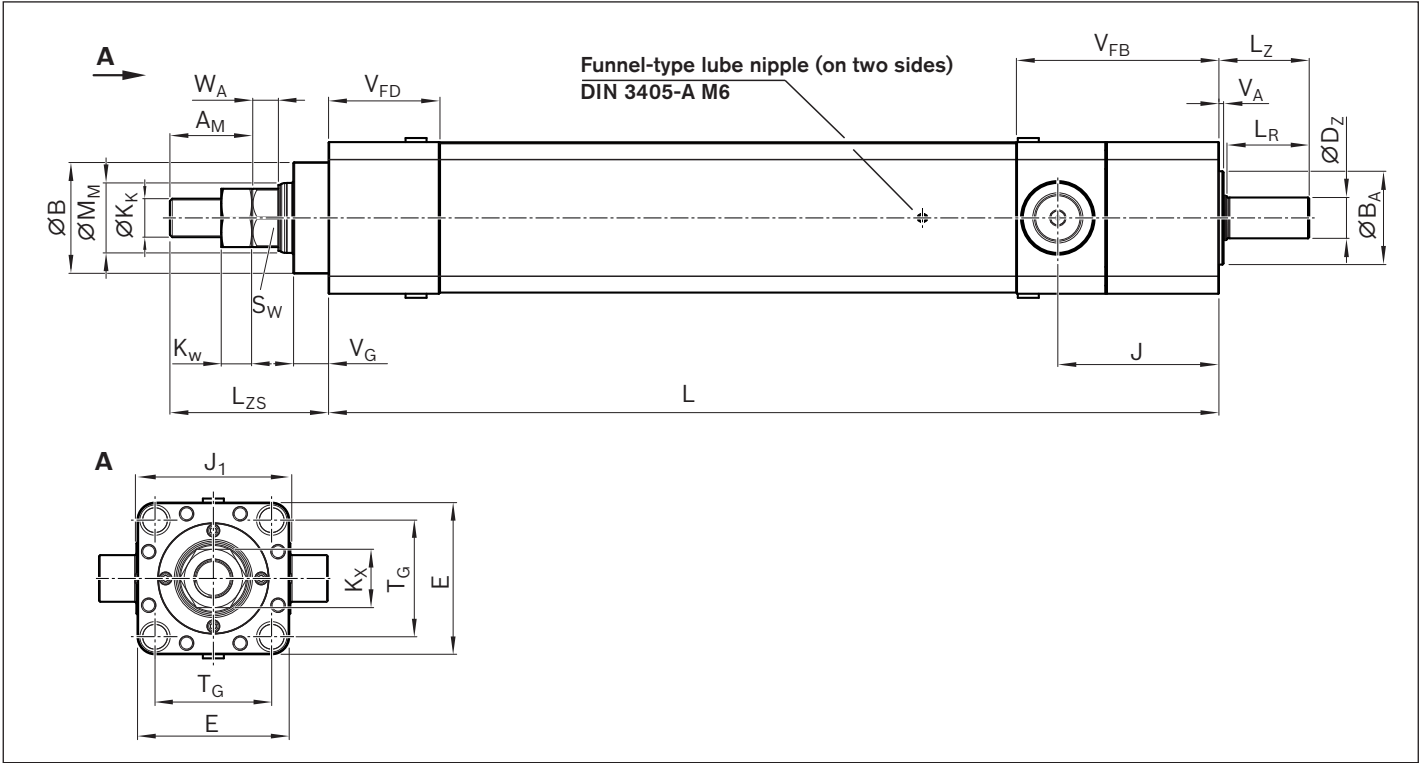


Version	Motor connector position			
	0 °	90 °	180 °	270 °
F001	000	090 ★	180	270
S000	–	090	180 ★	270
S090	000	090 ★	180	–
S180	000 ★	090	–	270
S270	000	–	180	270 ★

★ standard delivery



Dimension drawings for electromechanical cylinder

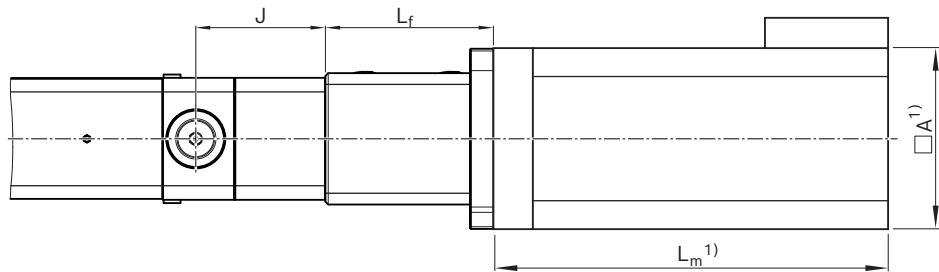


EMC-HP	Dimensions (mm)																				
	A _M	E	J	J ₁	K _W	K _X	L _Z	L _{ZS}	L _R	S _W	T _G	V _A	V _{FB}		V _{FD}	V _G	ØB	ØB _A	ØD _Z h7	ØM _M f8	ØK _K
													Trunnion without	with							
115	59	115	117	117	22	41	78	139	70.5	41	87	4	105.5	147.5	90.5	30	85	70	25	50	M27x2
130	71	130	138	132	26	50	78	155	70.5	50	100	4	117.5	173.5	95.5	30	95	80	35	60	M33x2
160	89	160	160	162	34	65	82	176	71.5	60	125	4	135.0	198.5	105.5	30	106	93	40	70	M42x2

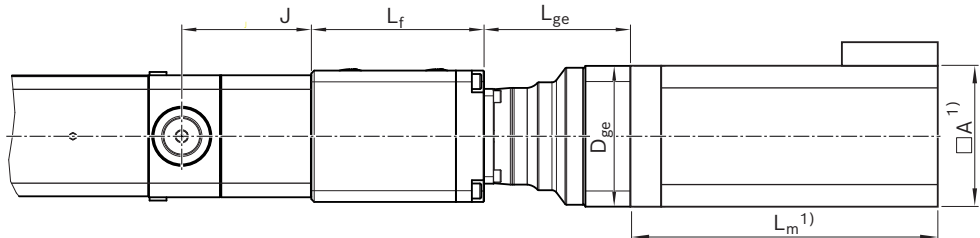
Length calculation L ➡ Technical data

Note: The presentations are schematic. Detailed contours can be found in the CAD model.

Flange coupling

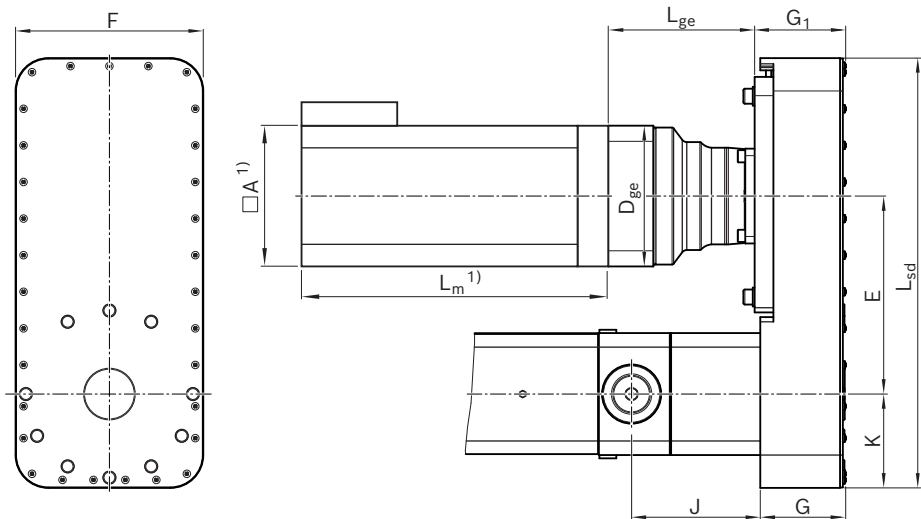


Gearing



EMC-HP				L _f	L _{ge}	D _{ge}	J
	Motor MS2N07	MS2N10	Gearing			Motor MS2N10	
115	154	179	—	—	—	—	117
130	154	179	—	—	—	—	138
160	—	188	193	156	190	—	160

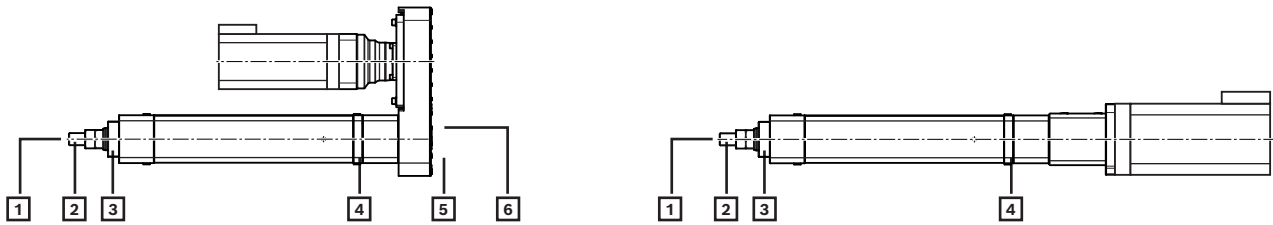
Belt side drive

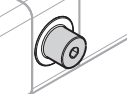
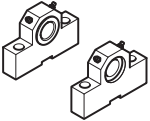
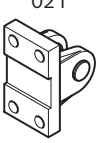
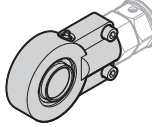
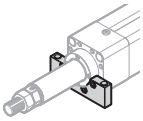
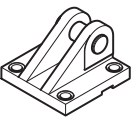
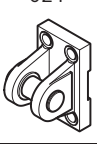
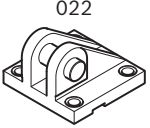
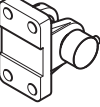
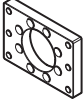
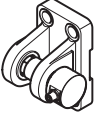


EMC-HP	E	F	G			G ₁	J	K	L _{sd}	L _{ge}	D _{ge}
				Motor	Gearing						Motor MS2N10
115	211	200	91	87	—	—	116	100.0	458	—	—
130	211	200	91	87	—	—	137	100.0	458	—	—
160	248	255	96	87	97	159	127.5	504	156	—	190

¹⁾ Dimensions see chapter Motors

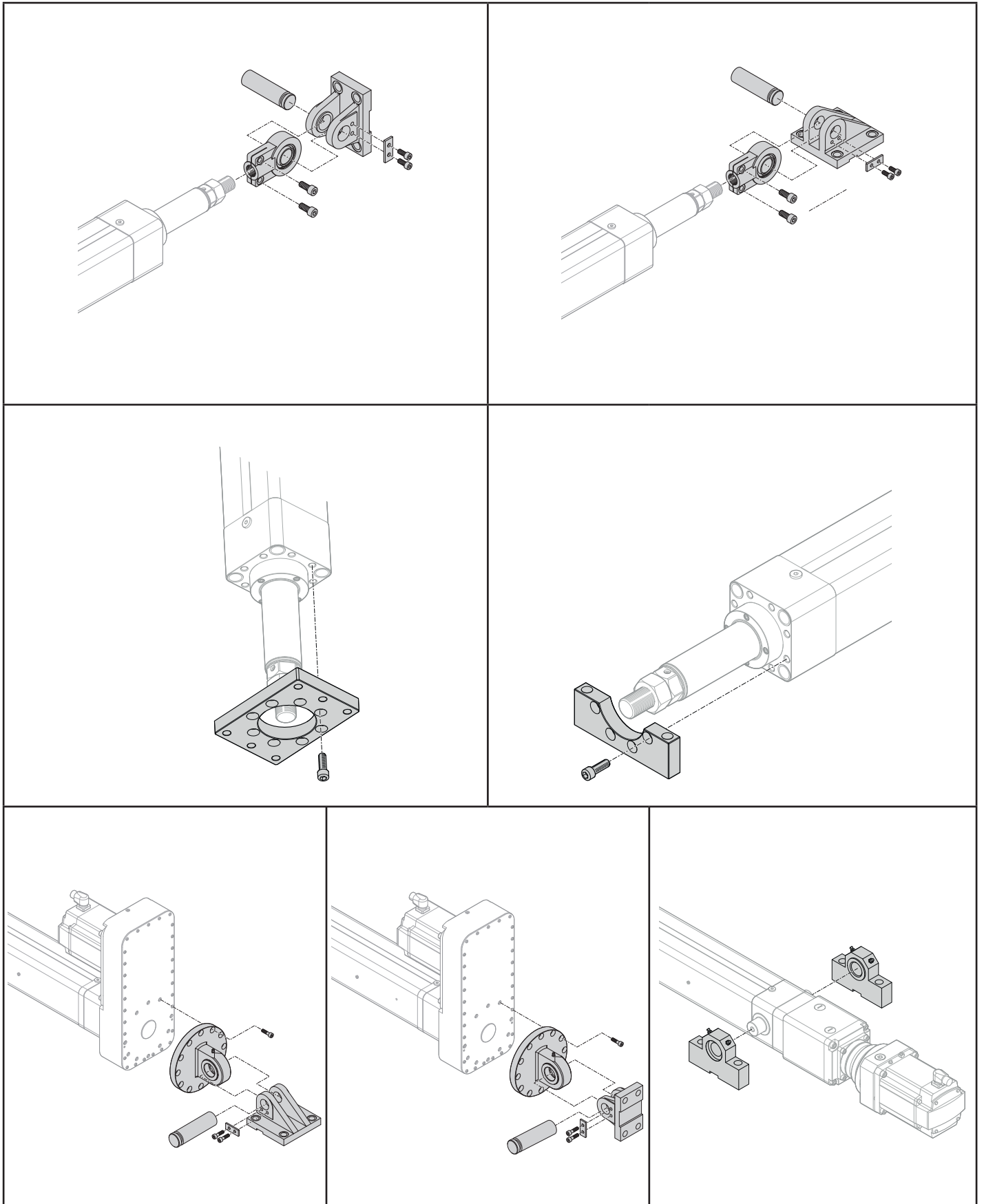
Fastening elements – Configuration and ordering



Group 1	Group 2		Group 3		Motor attachment	Group 4	Group 5	Group 6
000	011 		000		F000 without flange F001 with flange	002 with trunnion 	000	000
000						002 with trunnion 	000	001 
021 	012 		011 Foot mounting 		S000 S090 S180 S270 with belt side drive	000 without trunnion	000	000
022 							011 (not with screw cooling) 	021 
								022 
031 ¹⁾ 			014 with flange 		F000 without flange F001 with flange S000, S090 S180, S270 with belt side drive	000 without trunnion	000	031 ¹⁾ 

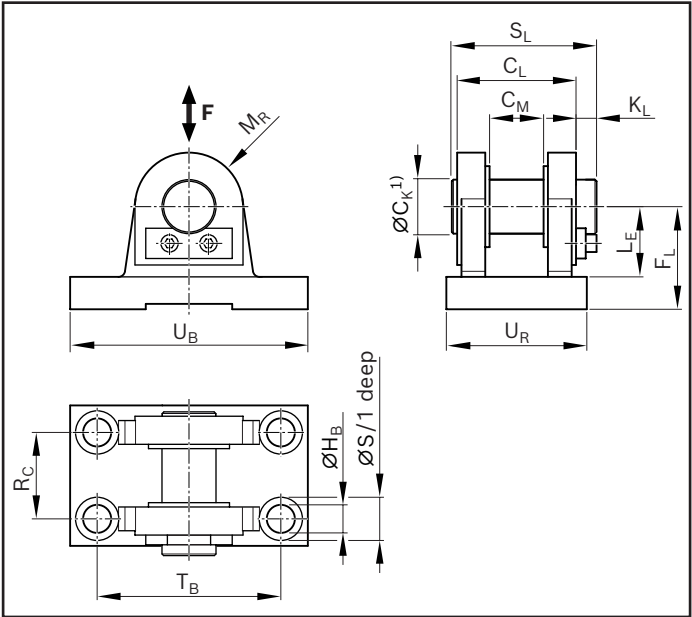
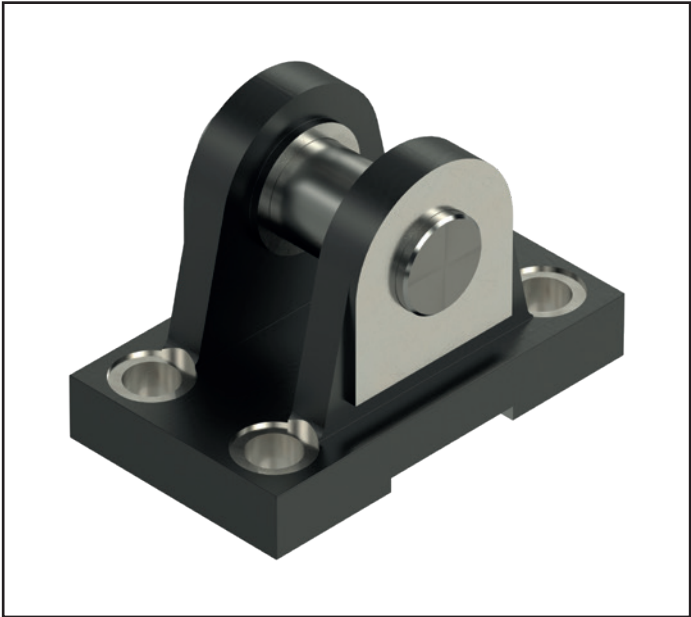
¹⁾ With load measuring pin

Examples



Fastening elements

Clevis bracket CLCD ISO 8132, form A
Group 1 / 6, option 021

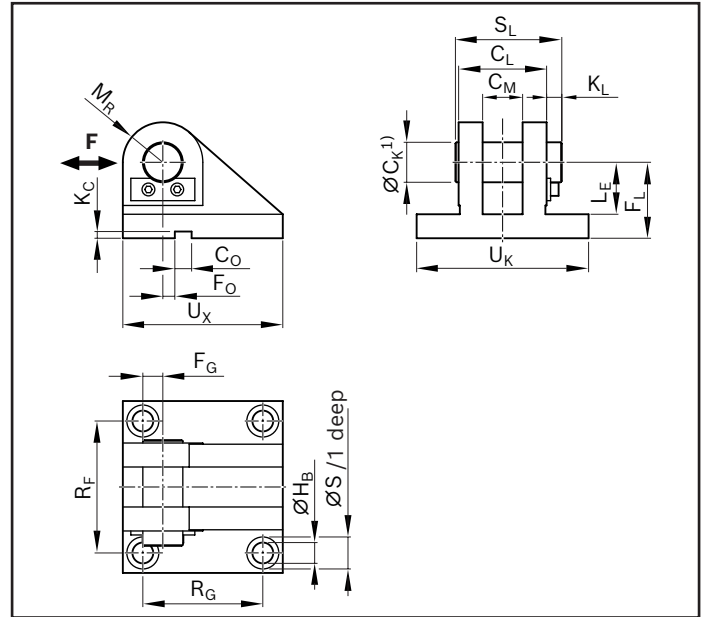


EMC-HP	Material number	Dimensions (mm)											T _B js14	U _R max.	U _H max.	m (kg)
		ØC _K ¹⁾	C _L	C _M	F _L	ØH _B	K _L	L _E	M _R	R _C	ØS	S _L				
		H9	h16	A12	js12	H13		min.	max.	js14						
115	R156330101	32	70	32	65	17.5	13	43	32	50	26	87	110	85	143	3.0
130	R156340101	40	90	40	76	22.0	16	52	40	65	33	110	130	108	170	5.5
160	R156350101	50	110	50	95	26.0	19	65	50	80	40	133	170	130	220	10.6

¹⁾ Matching bolt Ø m6 (bolt and bolt locking feature are included in the scope of supply and are not ready-mounted on delivery)

Material: Cast iron

Clevis bracket CLCA ISO 8132, form B **Group 1 / 6, option 022**



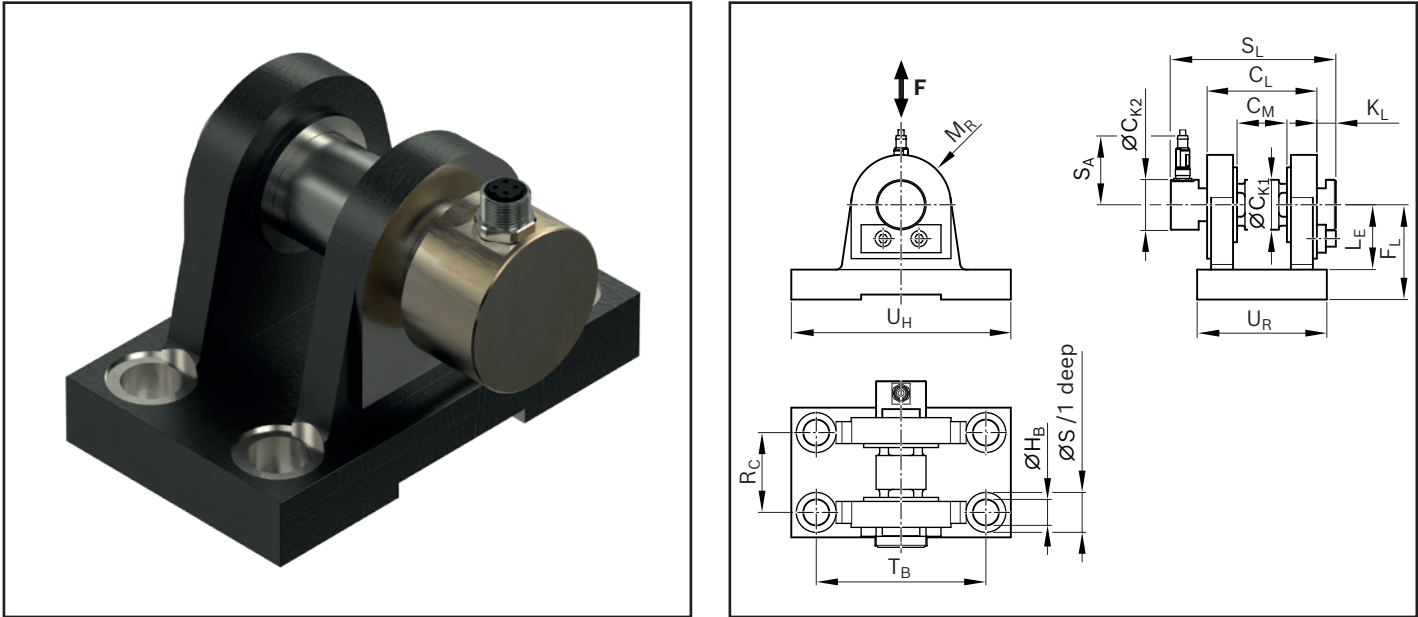
EMC-HP	Material number	Dimensions (mm)																	m	
		ØC _K ¹⁾	C _L	C _M	C _O	F _G	F _L	F _O	ØH _B	K _C	K _L	L _E	M _R	R _F	R _G	ØS	S _L	U _K		U _X
		H9	h16	A12	N9	js14	js12	js14	H13	+0.3		min.	max.	js14	js14			max.	max.	(kg)
115	R156330102	32	70	32	25	14.5	65	6	17.5	5.4	13	43	32	110	110	26	87	145	145	4.5
130	R156340102	40	90	40	36	17.5	76	6	22.0	8.4	16	52	40	140	125	33	110	185	170	8.5
160	R156350102	50	110	50	36	25.0	95	0	26.0	8.4	19	65	50	165	150	40	133	215	200	13.5

¹⁾ Matching bolt Ø m6 (bolt and bolt locking feature are included in the scope of supply and are not ready-mounted on delivery)

Material: Cast iron

Fastening elements

Clevis bracket CLCD (comparable with ISO 8132), form A, with load measuring pin
Group 1 / 6, option 031



EMC-HP	Material number	Dimensions (mm)																m
		ØC _{K1} ¹⁾	ØC _{K2}	C _L	C _M	F _L	ØH _B	K _L ²⁾	L _E	M _R	R _C	ØS	S _L ²⁾	T _B	U _R	U _H	S _A ²⁾	
		H9		h16	A12	js12	H13		min.	max.	js14			js14	max.	max.		
115	R156330103	32	50	70	32	65	17.5	12	43	32	50	26	117.0	110	85	143	69.5	3.5
130	R156340103	40	40	90	40	76	22.0	13	52	40	65	33	135.0	130	108	170	61.0	6.8
160	R156350103	50	50	110	50	95	26.0	20	65	50	80	40	166.5	170	130	220	69.5	11.0

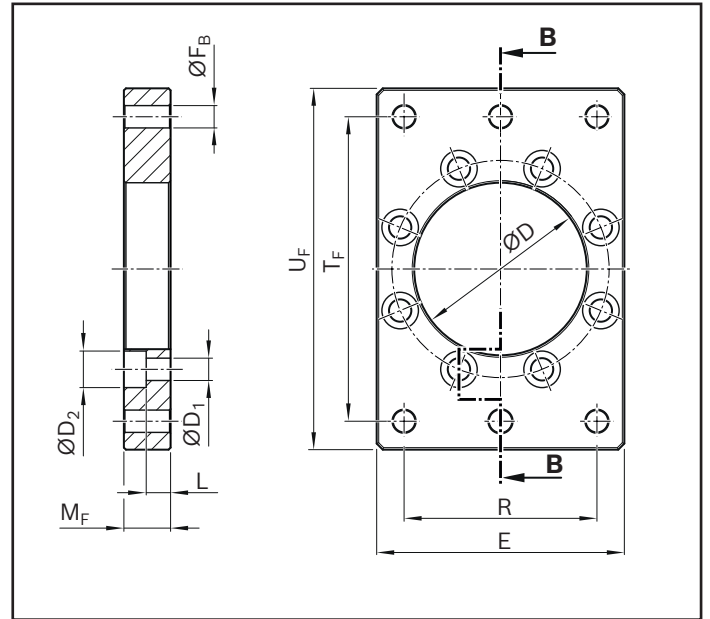
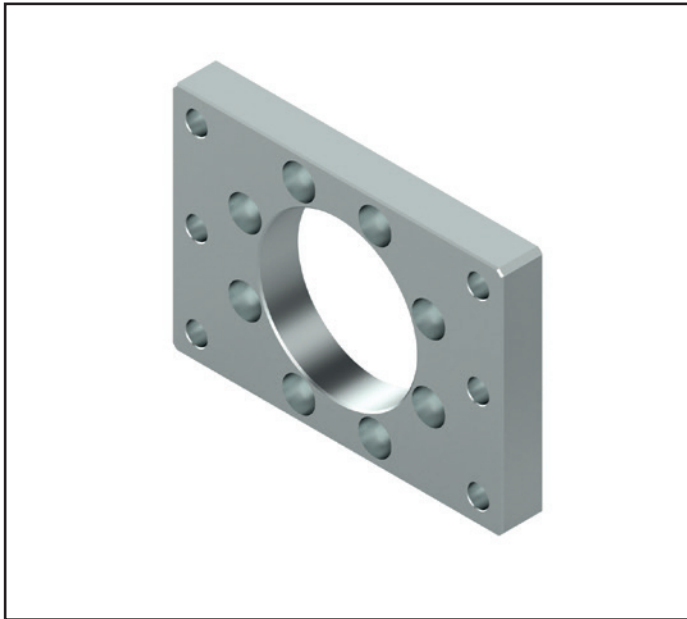
¹⁾ Matching bolt Ø f8. For detailed information on the load measuring pin see chapter "Force sensor".

²⁾ Values deviate from ISO 8132 standard

Material: Cast iron

Flange fastening

Group 3, option 014

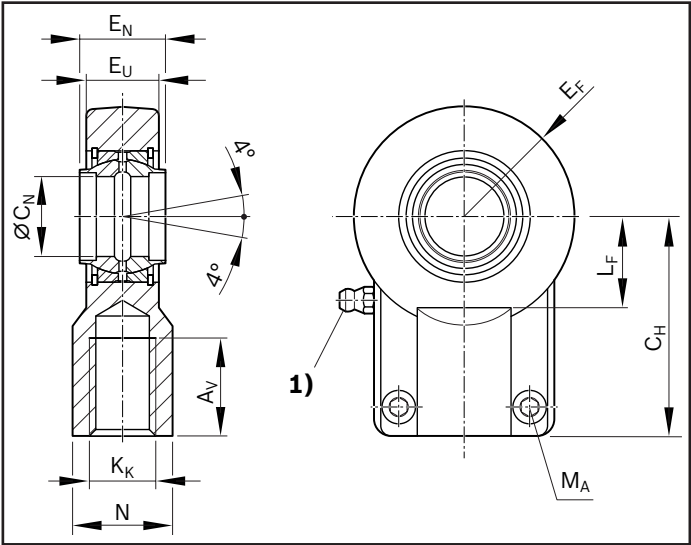


EMC-HP	Material number	Dimensions (mm)			E	ØF _B	L	M _F	R ±0.2	T _F ±0.2	U _F	m (kg)
		ØD H11	ØD1 H13	ØD2 H13								
115	R156530067	85	11	18	122	11	12	23	95	150	178	2.8
130	R156540067	96	13	20	140	13	12	25	110	170	200	4.0
160	R156550067	106	15	24	170	15	13	28	135	200	230	6.5

Material: Galvanized steel

Fastening elements

Spherical rod end bearing CGKD (clampable)
Group 2, option 012



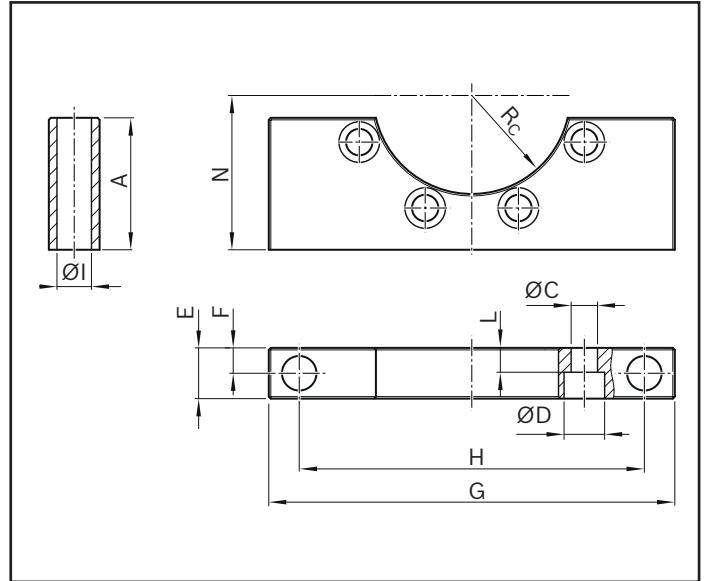
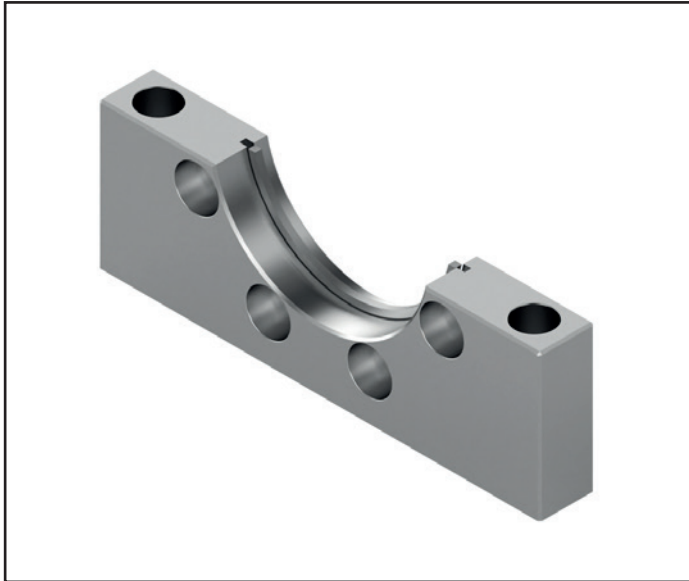
1) Lube nipple, hydraulic type A as per DIN 71412

EMC-HP	Material number	Dimensions (mm)									Clamping screw		m ³⁾
		A _V min.	N max.	C _H js13	E _F max.	∅C _N ²⁾ H7	E _N h12	E _U max.	K _K	L _F min.	ISO 4762-10.9	M _A (Nm)	
115	R900322049	37	38	80	40.0	32	32	28.0	M27x2	30	M10x25	59	1.15
130	R900322029	46	47	97	50.0	40	40	34.0	M33x2	39	M10x30	59	2.10
160	R900322719	57	58	120	63.0	50	50	42.0	M42x2	47	M12x35	100	4.00

2) Matching bolt ∅ m6
3) Add mass for basis cylinder weight

Foot mounting

Group 3, option 011

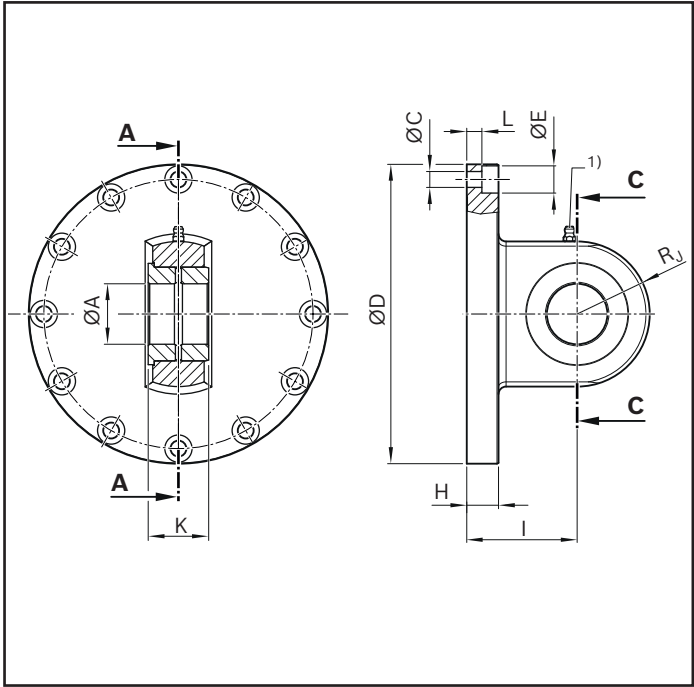
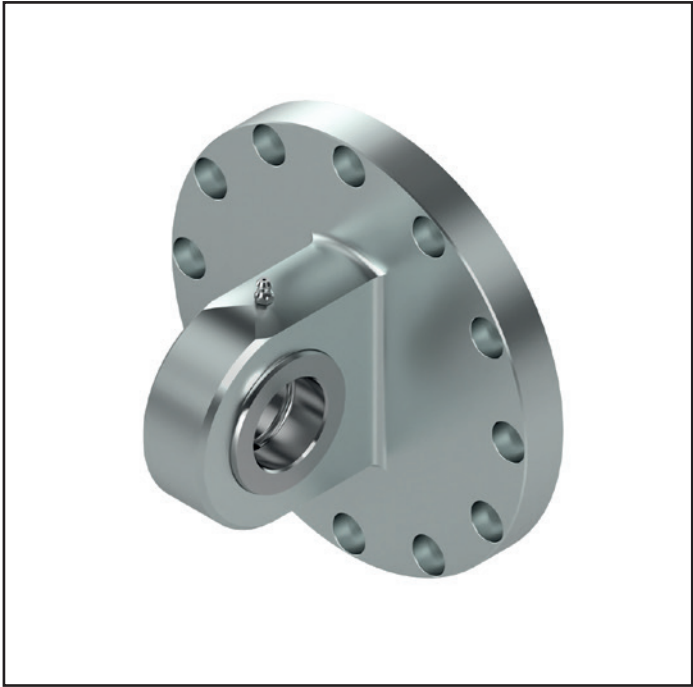


EMC-HP	Material number	Dimensions (mm)											m (kg)
		A	ØC H13	ØD H13	E	F ±0.1	G	H ±0.2	ØI H13	L	N	R _c	
115	R156530065	55	11	18	23	11.5	178	150	15	12	65	42.5	0.5
130	R156540065	65	13	20	25	12.5	200	170	17	12	76	48.0	0.8
160	R156550065	85	15	24	28	14.0	230	200	17	13	95	53.0	1.3

Material: Aluminum, anodized

Fastening elements

Swivel bearing
Group 5, option 011



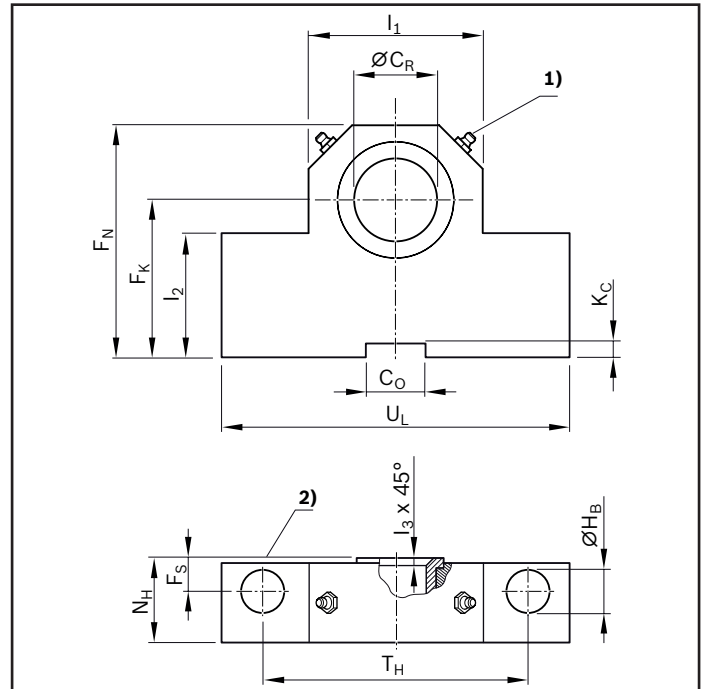
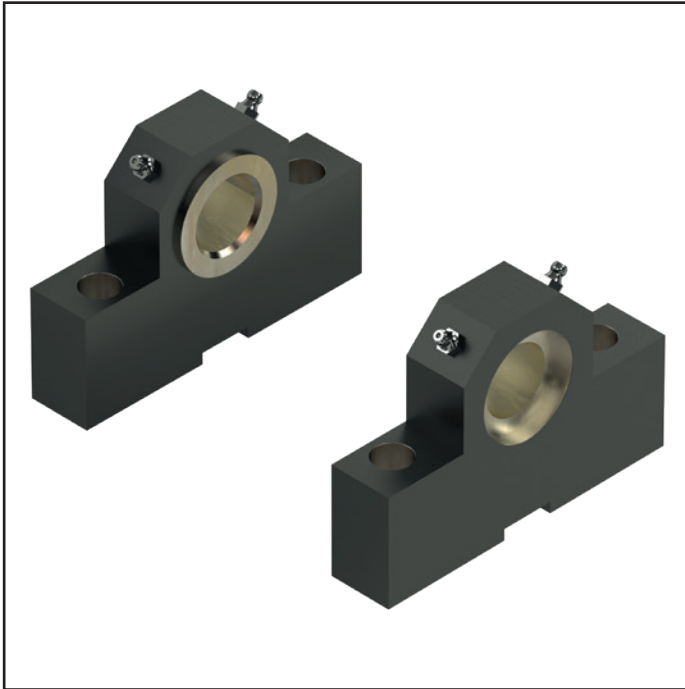
1) Lube nipple, hydraulic type A as per DIN 71412

EMC-HP	Material number	Dimensions (mm)									m (kg)
		ØA H9	ØC	ØD	ØE	H	I	K h12	L	R _J	
115	R156530068	32	10.5	198	18	21	65	32	10	40	6.1
130	R156540068	40	10.5	198	18	21	73	40	10	48	7.0
160	R156550068	50	12.5	253	20	23	88	50	10	58	12.6

Material: Galvanized steel

Trunnion bearing block CLTB

Group 6, option 001



1) Lube nipple, hydraulic type A as per DIN 71412

2) Trunnion location face (inside)

EMC-HP	Material number	Dimensions (mm)													m ³⁾
		ØCR H7	CO N9	FK js12	FN max.	FS js14	ØHB H13	KC +0.3	l1	l2	l3	NH max.	TH js14	UL max.	
115	R156330160	32	25	65	100	15	17.5	5.4	70	52	2.5	33	110	150	4.55
130	R156340160	40	36	76	120	16	22.0	8.4	88	60	2.5	41	125	170	7.30
160	R156350160	50	36	95	140	20	26.5	8.4	100	75	2.5	51	160	210	14.50

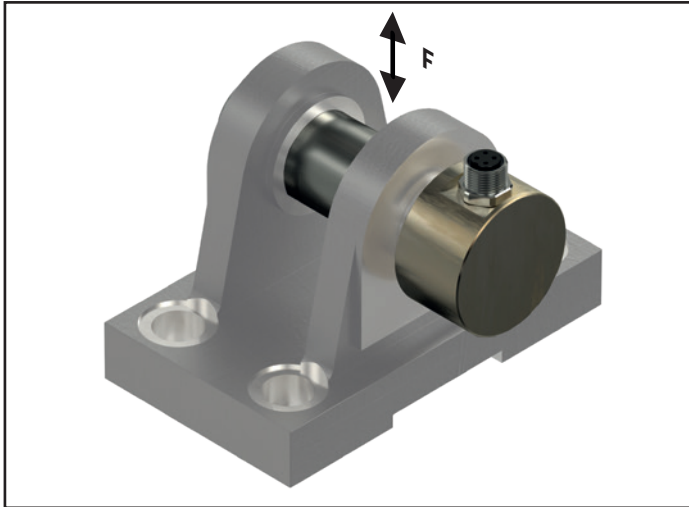
3) Add mass for basis cylinder weight, figure per pair

Note

Trunnion bearing blocks are always supplied in pairs.

Force sensor

Clevis bracket with load measuring pin



Technical data

Metrological specifications

Material	Stainless steel
Protection class	IP 65
Hardness (load range)	38 HRC
Mechanical system	
Operating load	150% of MB
Breaking load	300% of MB
Accuracy	
Non-linearity	±0.5% of MB
Repeatability	±0.25% of MB
Hysteresis	±0.2% of MB
Temperature drift at zero point	±0.05% of MB/K.
Temperature drift over measurement range	±0.05% of MB/K.
Compensated temperature	+10 ... +40 °C
Operating temperature	-20 ... +60 °C

MB = Measurement range
MB/K. = Measurement range per Kelvin

Electrical specifications

		EMC-HP
Output signal	0 kN	0 ±0.03 V
Output signal	MB	-10 ... 10 V ±0.2 V
Power supply voltage		24 ±2 V
Tare (zero setting function)		7.2 ... 24 V
Current consumption		max. 50 mA
Bandwidth		2.5 ±0.2 KHz
Connection		Connector M12x1

If your application requires precise load sensing, there is a clevis bearing block 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.

Note

The use of a hammer or press to fit the bolt is not permissible. It may only be inserted by hand.

The load measuring pin is not suitable for measuring torques and may therefore only be used with the cylinder option "Guideway with anti-twist feature".

It is secured axially and against rotation, like the standard bolt, on one side of the bearing block using the bolt locking feature included.

For force control at the controller level, a control component with an analog input is required.

Connection cable is included.

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

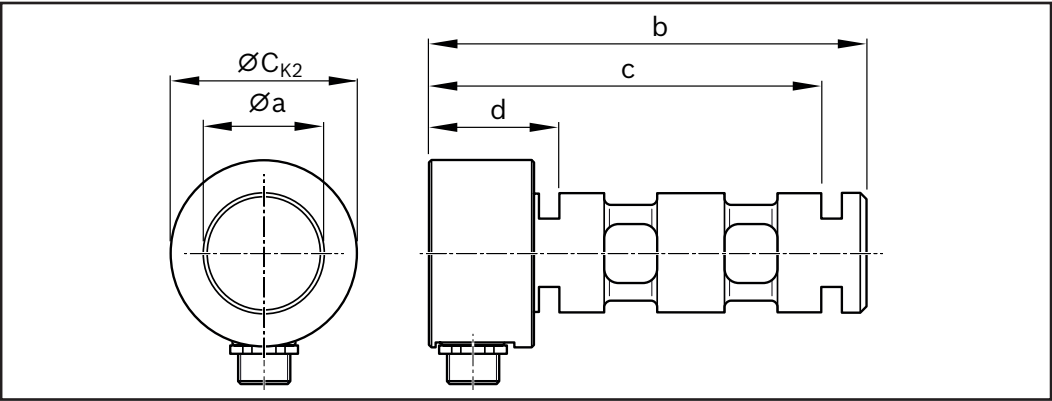
Technical data, connection cable

Length	5 m
Rated voltage	250 V
Rated current	4 A
Plug outlet	angled
Connection type 1	Female connector M12x1, 4-pin
Connection type 2	Flying leads
Type of cable	PUR black, shielded
Suitable for drag chains	ja
Cable cross-section	4x0,34 mm ²
Cable diameter D	5.9 ±0.2 mm
Static bending radius	>10 x D
Dynamic bending radius	>5 x D
Bending cycles	> 2 Mio
Ambient temperature, stationary	-25 ... +80 °C
Ambient temperature, in motion	-40 ... +80 °C
Protection class	IP 65

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

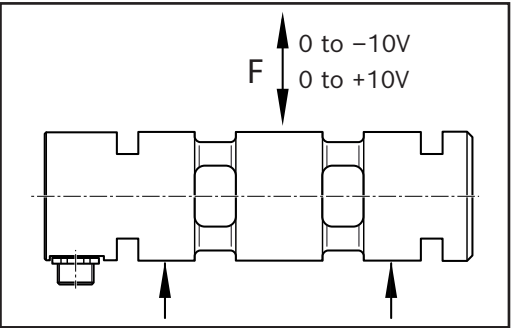


EMC-HP	Material number	Dimensions (mm)					Measurement range (kN)	Weight (kg)
		$\varnothing a$ f8	$\varnothing C_{K2}$	b	c	d		
115	R1563 370 80	32	32	131.0	119.0	49.0	50	0.9
130	R1563 470 80	40	40	135.0	122.0	32.0	80	1.3
160	R1563 570 80	50	50	166.5	146.5	36.5	110	2.2

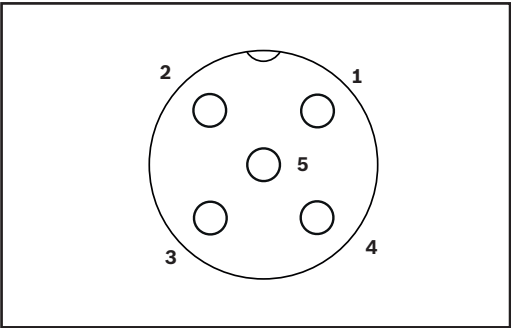
Connection diagram

- Load measuring pin
- 1 Supply (V+)
 - 2 Tare
 - 3 GND (0 V)
 - 4 Output
 - 5 Internal assignment

- Connection cable
- 1 brn = brown
Supply (V+)
 - 2 wht = white, tare
 - 3 blu = blue, GND (0 V)
 - 4 blk = black, output



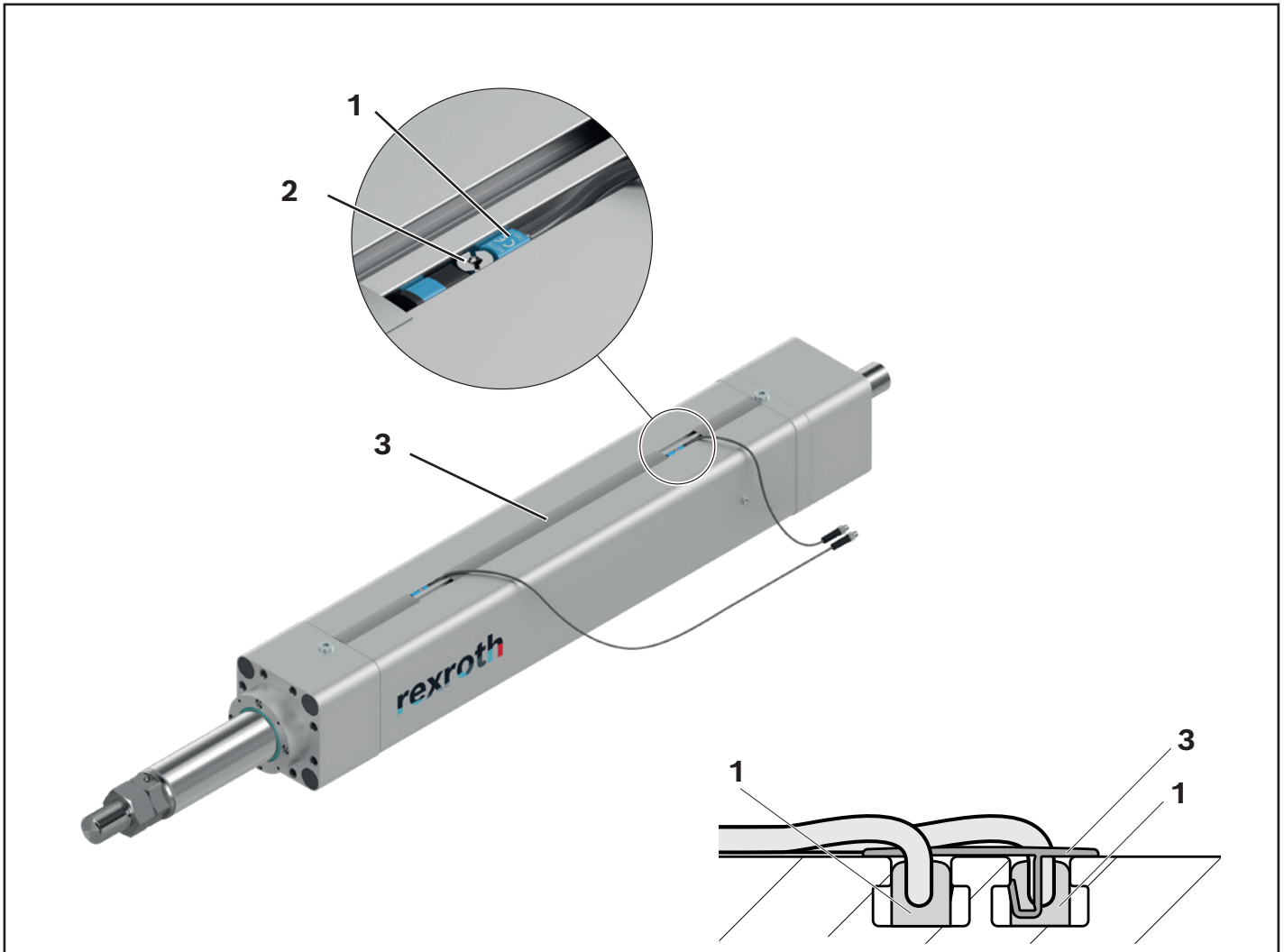
Output signal depending on direction of loading



Connection diagram for measuring pin

Switching system

Switching system



- ▶ The switches (magnetic field sensors (1)) can be used in both T-slots of the housing
- ▶ Insert the switch so that the clamping screw (2) shows outwards
- ▶ Cover profile (3) optionally available
- ▶ Further information see instructions EMC-HP R320103219

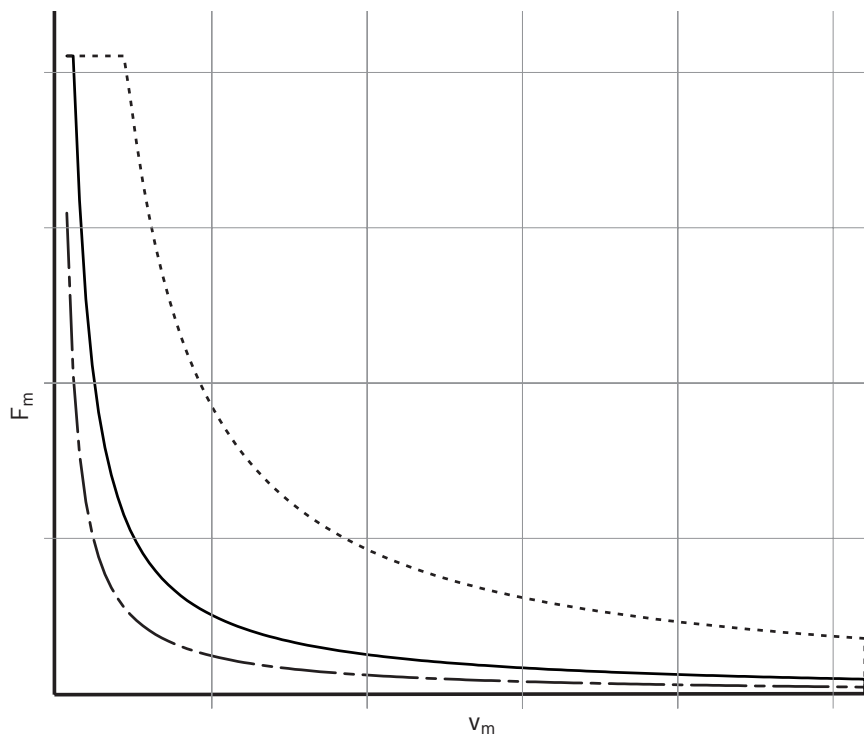
Cooling

The requirements of the application require an adaptation of the utility of the cylinder.
Various possibilities are offered for this purpose.

- ▶ The standard variant is the EMC-HP with grease lubrication. The cooling is carried out by the natural convection of the thermal energy to the environment. This inexpensive version covers the majority of applications. .
- ▶ Another variant is the EMC-HP with oil bath lubrication. This combination of a fluid inside and natural convection to the outside enables a more effective utilization of the cylinder.
- ▶ The most powerful option for demanding applications with high duty cycles or warm environments is spindle cooling. In this variant, a cooling medium is passed through the spindle. The resulting thermal energy is released into the environment through a separate cooler. For further details and support, please contact your local Bosch Rexroth sales office or your authorized dealer.

The selected option has an influence on the possible permanent power output of the cylinder.

Continuous power output
Performance curves



- LSW; screw cooling with grease lubrication
- LOB; Oil bath lubrication
- LSS; Grease lubrication

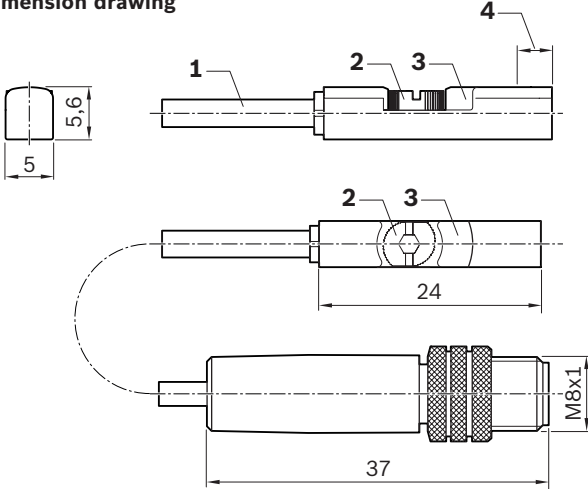
F_m = medium force
 v_m = medium velocity

Switching system

Magnetic switches

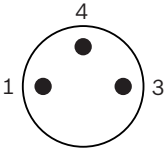


Dimension drawing



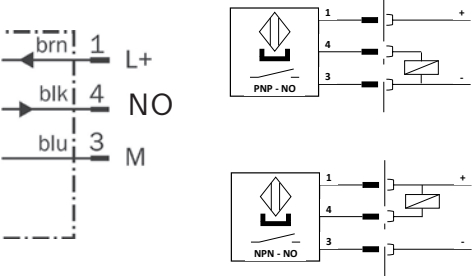
1) Connection
2) Fastening screw
3) LED display
4) Position of sensor element: 2 mm

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

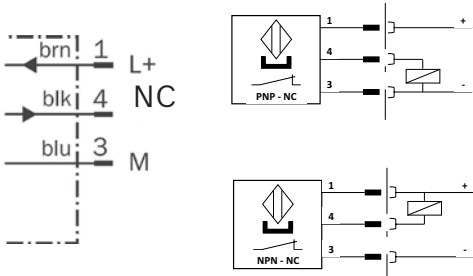


Connection diagram

R913037444
R913037446



R913037443
R913037445



Material numbers/technical data

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

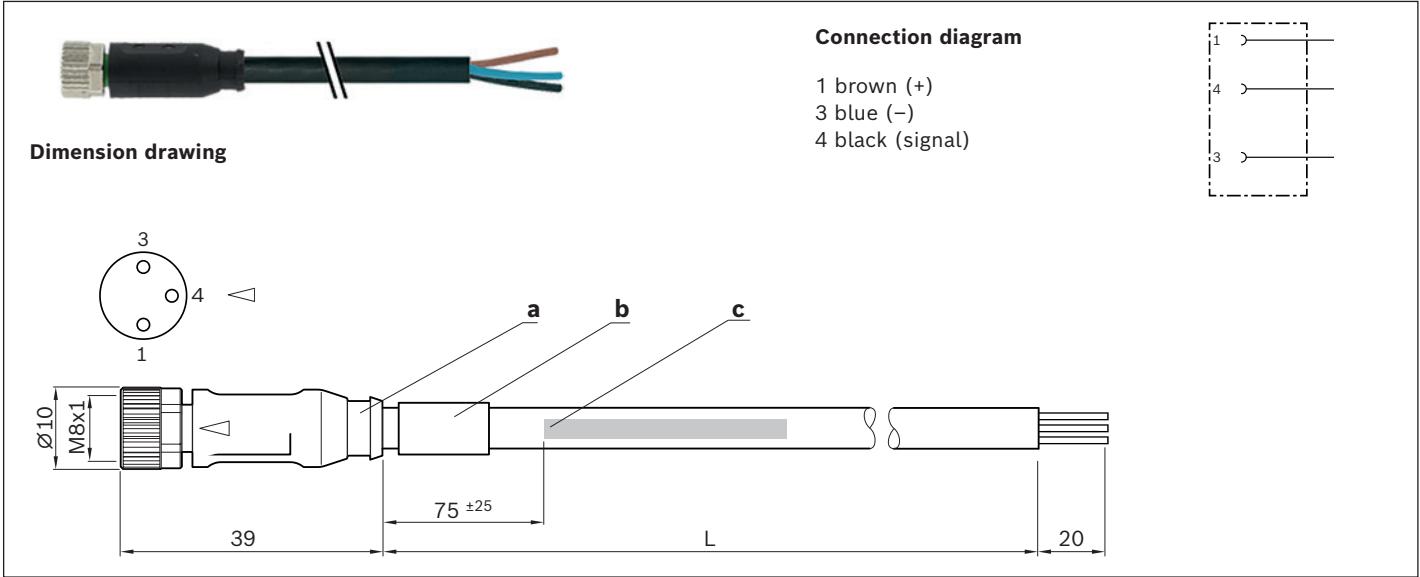
*) Technical data for connection line (0.5 m) cast on magnetic sensor only. Available extension cables offer even more performance, e.g. for use in a cable drag chain (see below).

**) No certificate for import to the  Chinese market required for these products. Document "Sales information CCC" available on request.

Switching system

Extensions

Assembled on one end

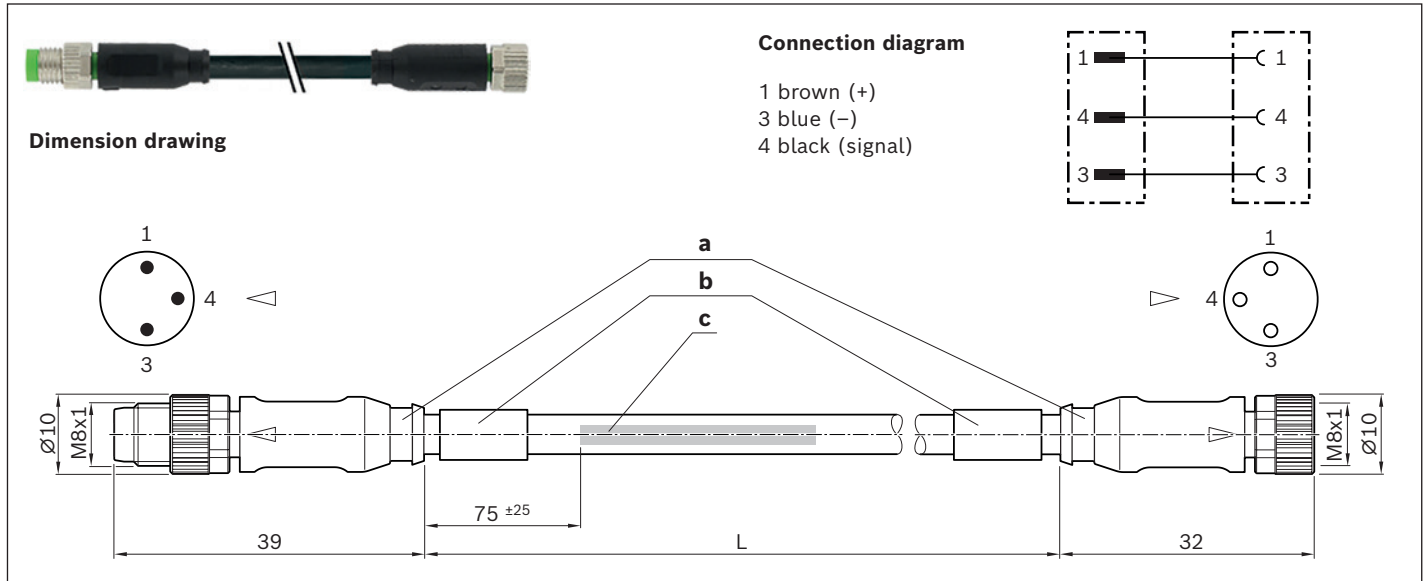


Material numbers

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

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

Assembled on two sides



Material numbers

Use	Extension cable				
Material number	R911344621	R911344622	R911344623	R911344624	R911344625
Name	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
Connection type 1	Female connector, straight, M8x1, 3-pin				
Connection type 2	Connector, straight, M8x1, 3-pin				

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

Function indicator	—
Operating voltage indicator	—
Operating voltage	10 - 30 VDC
Type of cable	PUR black
Suitable for drag chains	✓
Torsion-resistant	✓
Weld spark-resistant	✓
Cable cross-section	3x0,25 mm ²
Cable diameter D	4.1 ±0.2 mm
Static bending radius	≥ 5xD
Dynamic bending radius	≥ 10xD
Bending cycles	> 10 Mio.
Max. permissible travel speed	3.3 m/s for 5 m travel range (typ.), up to 5 m/s for 0.9 m travel range
Max. permissible acceleration	≤ 30 m/s ²
Ambient temperature fixed ext.	-40 °C to +85 °C
Ambient temperature flexible ext.	-25 °C to +85 °C
Protection class	IP68
Certifications and approvals	    

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

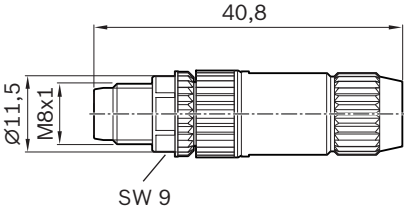
Switching system

Connectors

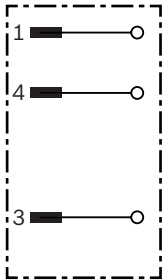


R901388333

Dimension drawing

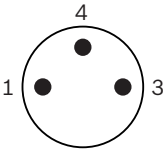


Connection diagram



View

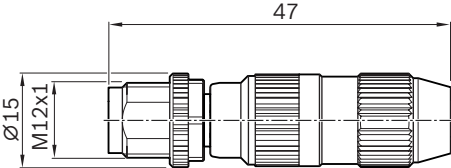
Connector side



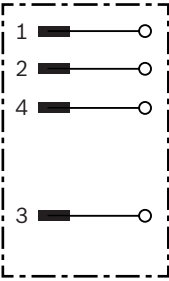


R901388352

Dimension drawing

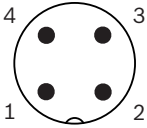


Connection diagram



View

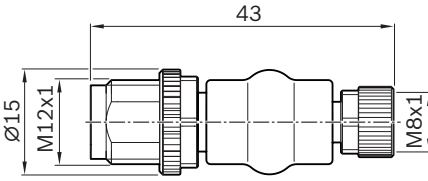
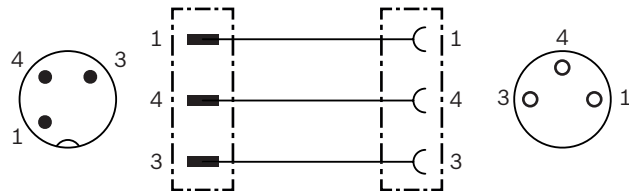
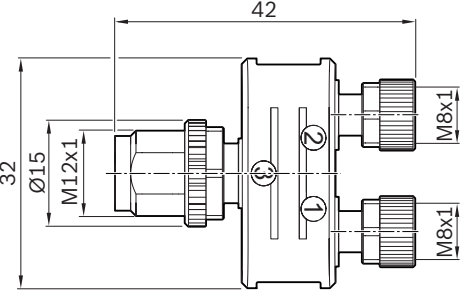
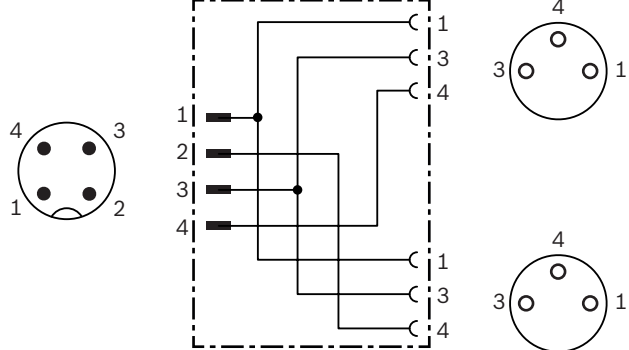
Connector side



Material numbers/technical data

Use	Connector, single	
Material number	R901388333	R901388352
Name	7000-08331-0000000	7000-12491-0000000
Version	straight	
Operating current per contact	max. 4 A	
Operating voltage	max. 32 V AC/DC	
Connection type	Connector, straight, M8x1, 3-pin Insulation displacement, self-locking screw thread	Connector, straight, M12x1, 4-pin Insulation displacement, self-locking screw thread
Function indicator	-	
Operating voltage indicator	-	
Connection cross-section	0.14...0.34 mm²	
Ambient temperature	-25 °C to +85 °C	
Protection class	IP67 (inserted and screwed down)	
Certifications and approvals	  	

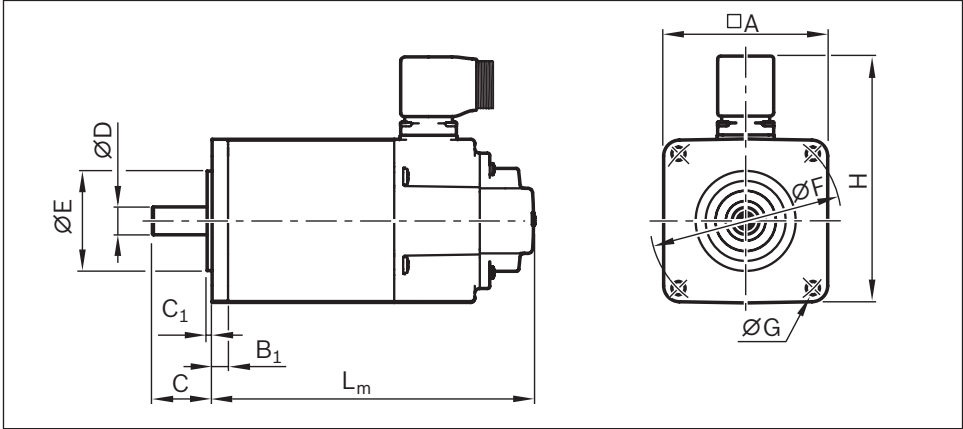
Adapters

	Dimension drawing	Connection diagram
 R911344591		
 R911344592		

Material numbers/technical data

Use	Adapters	
Material number	R911344591	R911344592
Name	7000-42201-0000000	7000-41211-0000000
Version	straight	
Operating current per contact	max. 4 A	
Operating voltage	max. 32 V AC/DC	
Connection type 1	Female connector, straight, M8x1, 3-pin self-locking screw thread	2 X Female connector, straight, M8x1, 3-pin self-locking screw thread
Connection type 2	Connector, straight, M12x1, 3-pin, self-locking screw thread	Connector, straight, M12x1, 4-pin self-locking screw thread
Function indicator	-	
Operating voltage indicator	-	
Connection cross-section	-	
Ambient temperature	-25 °C to +85 °C	
Protection class	IP67 (inserted and screwed down)	
Certifications and approvals		  

IndraDyn S – servo motors MS2N



Dimensions / motor data

	Dimensions (mm)										
	□ A	B ₁	C	C ₁	∅ D _{k6}	∅ E ₇	∅ F	∅ G	H	L _m	
										Brake 1 without	with
MS2N07-D1BNN	140	18	58	4	32	130	165	11	180	263	317
MS2N07-D0BHA	140	18	58	4	32	130	165	11	203	384	438
MS2N10-C0BNN	196	20	80	4	38	180	215	14	270	238	298
MS2N10-D0BHA	196	20	80	4	38	180	215	14	270	394	454
MS2N10-E0BHA	196	20	80	4	38	180	215	14	270	452	512

1) Self-cooling
2) External cooling 230V

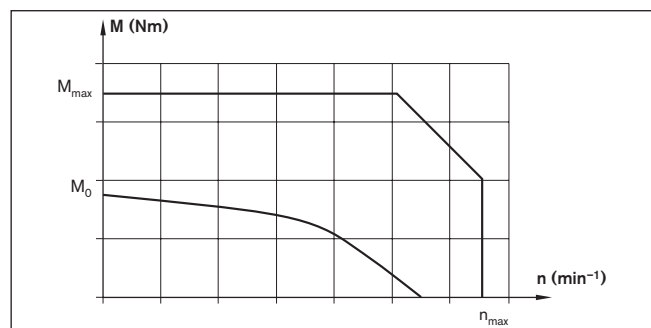
Version

- Plain shaft without shaft seal ring
- Multi-turn encoder
- Advanced encoder (C)
- Protection class IP64
- With or without holding brake
- Special ground connection terminal near motor flange (used as needed)

	Motor data								Motor connection	Holding brake	Type code	Material number
	$n_{\max}$ (min ⁻¹)	M_0 100K (Nm)	$M_{\max}$ (Nm)	M_{br} (Nm)	J_m (kgm ²)	J_{br} (kgm ²)	m_m (kg)	m_{br} (kg)				
	6000	24.0	84.4	36	0.0053	0.0004	17.5	2.5	1	N	MS2N07-D1BNN-CMSH0-NNNNE-NN	R911384965 ¹⁾
										Y	MS2N07-D1BNN-CMSH2-NNNNE-NN	R911384966 ¹⁾
	4000	35.5	73.2	36	0.0021	0.0004	20.0	2.5	2	N	MS2N07-D0BHA-CMVH0-NNNNE-NN	R914503253 ²⁾
										Y	MS2N07-D0BHA-CMVH2-NNNNE-NN	R914503254 ²⁾
	6000	34.0	70.5	53	0.0048	0.0015	23.5	5.0	2	N	MS2N10-C0BNN-CMVH0-NNNNE-NN	R914503255 ¹⁾
										Y	MS2N10-C0BNN-CMVH2-NNNNE-NN	R914503256 ¹⁾
	4000	82.0	142.0	53	0.0081	0.0015	35.0	5.0	2	N	MS2N10-D0BHA-CMVH0-NNNNE-NN	R914503257 ²⁾
										Y	MS2N10-D0BHA-CMVH2-NNNNE-NN	R914503258 ²⁾
	4000	119.0	214.0	90	0.0114	0.0027	46.0	7.0	2	N	MS2N10-E0BHA-CMAH0-NNNNE-NN	R914503270 ²⁾
										Y	MS2N10-E0BHA-CMAH3-NNNNE-NN	R914503271 ²⁾

For abbreviations see chapter "Service and Information"

Motor characteristic (schematic)



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.

You can find more information on motors and controllers in the Rexroth catalogs on drive technology at www.boschrexroth.com/mediadirectory.

IndraDrive drive family

The converters of the IndraDrive C series generate a DC link direct voltage from the mains voltage and from it a controlled AC output voltage with variable amplitude and frequency for operation of a servo motor.

The compact construction contains additional mains connection components, making it particularly suitable for single-axis applications.

Version

- ▶ Basic Universal or Basic Universal with Save Motion
- ▶ Multi-Ethernet for communication with a superior controller
- ▶ More interfaces or integrated controls available
- ▶ For the converter HCS01, a smart function kit for pressing and joining applications is available
- ▶ Brake resistor included
- ▶ Adapters included
- ▶ Separate mains filter included



IndraDrive Cs
HCS01.1E-W0054



IndraDrive C
HCS03.1E-W0100

Drive controller HSC

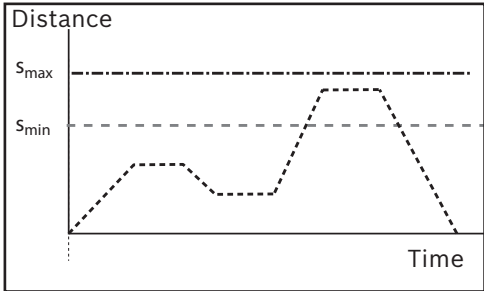
Motor	Controller Designation	Option		Cable management connection cable						
		BASIC UNIVERSAL-MultiEthernet (B-ET)	BASIC UNIVERSAL-MultiEthernet (B-ET) + S4 Safe Motion	without	1 cable Cable length			2 cables Cable length		
					5 m	10 m	15 m	5 m	10 m	15 m
EMC-HP-115										
without		000		000	--					
MS2N07-D1BNN	Indradrive HSC01-W054	500	501		105	110	115	--		
MS2N07-D0BHA					--			205	210	215
MS2N10-C0BNN										
MS2N10-D0BHA										
EMC-HP-130										
without		000			--					
MS2N07-D0BHA	Indradrive HSC01-W054	500	501		--			205	210	215
MS2N10-D0BHA										
MS2N10-E0BHA	Indradrive HSC03-W0100	700	701							
EMC-HP-160										
without		000			--					
MS2N10-C0BNN	Indradrive HSC01-W054	500	501		--			205	210	215
MS2N10-D0BHA										
MS2N10-E0BHA	Indradrive HSC03-W0100	700	701							

Operating conditions and usage

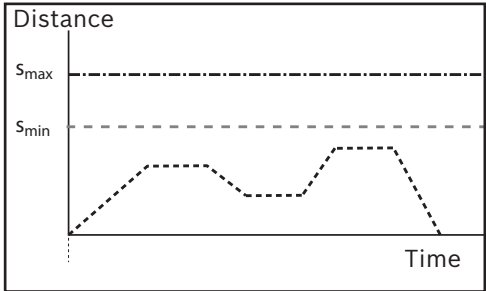
Normal operating conditions

Ambient temperature, cylinder with Rexroth servo motor	0 °C ... 40 °C, above 40 °C loss of performance
Ambient temperature Cylinder mechanics	−10 °C ... +50 °C (up to +70 °C with low duty cycle and power)
Ambient temperature Cylinder mechanics with PLSA and low-temperature grease	−30 °C ... +50 °C (up to +60 °C with low duty cycle and power)
Protection class	IP 54; housing IP 65
Duty cycle	100% (depending on power required, the permissible duty cycle may be limited due to heat generation)
Normal stroke	The distance traveled per cycle is $\geq s_{min}$ (see diagram)

Stroke definition



Normal stroke



Short stroke

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

Caution:

- Short stroke operation only permissible with regular lubrication strokes (larger s_{min})
- Perform service life expectancy calculation with reduction to the load rating
- Adapt maintenance interval

Contact Bosch Rexroth for further details.

Notes

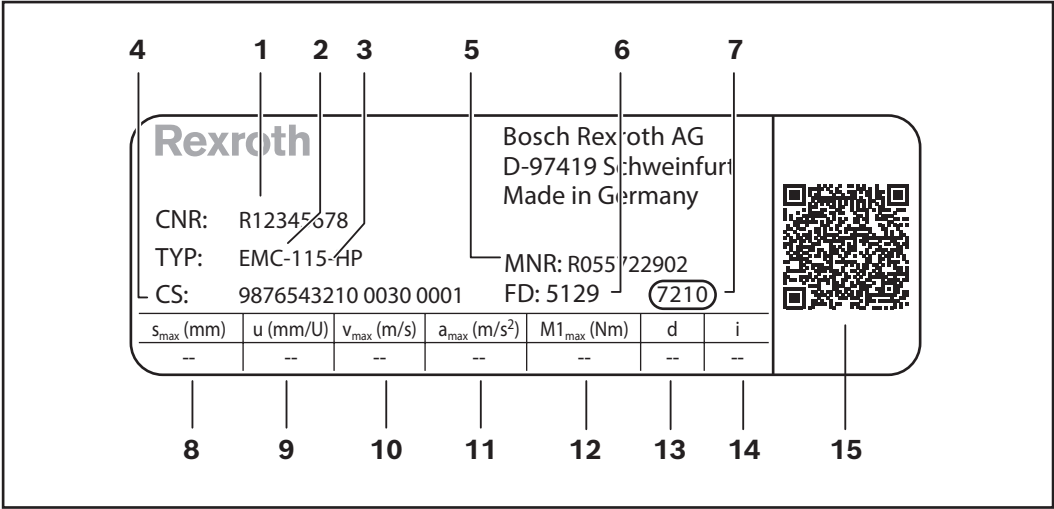
For more information about intended use and safety, see "Safety instructions for linear motion systems R320103152" and "Instructions EMC-HP R320103219".

For more information on assembly/start-up see "Instructions EMC-HP R320103219".

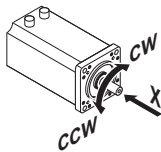
PDF files of these documents can be found on the Internet at:
www.boschrexroth.com/mediadirectory

Parameterization (start-up)

In addition to references for linear motion system production, the name plate contains technical parameters for start-up.



1	CNR	Customer's material number
2	TYP	Short product name
3	115	Size
4	CS	Customer information
5	MNR	Material number
6	FD	Date of manufacture
7	7210	Manufacturing location
8	s_{max}	Maximum travel range
9	u	Feed constant without motor attachment
10	v_{max}	Maximum speed
11	a_{max}	Maximum acceleration rate
12	$M1_{max}$	Maximum drive torque at motor journal
13	d	Direction of motor rotation to travel in positive (+) direction CW = clockwise CCW = counterclockwise



14	i	Gear ratio
15		QR code (for start-up)

Note

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

Lubrication and maintenance

Grease lubrication

The EMC-HP is designed for grease lubrication. Basic lubrication is applied in-factory before shipment.

The advantage of grease lubrication is that the planetary screw assembly can run long distances on one supply of grease.

Recommended lubricants

Do not use lubricants with solid particles (e.g. graphite or MoS₂ additives). Dynalub 520 is recommended for central lubrication systems. For lubrication quantities and lubrication intervals see "Instructions EMC-HP R320103219".

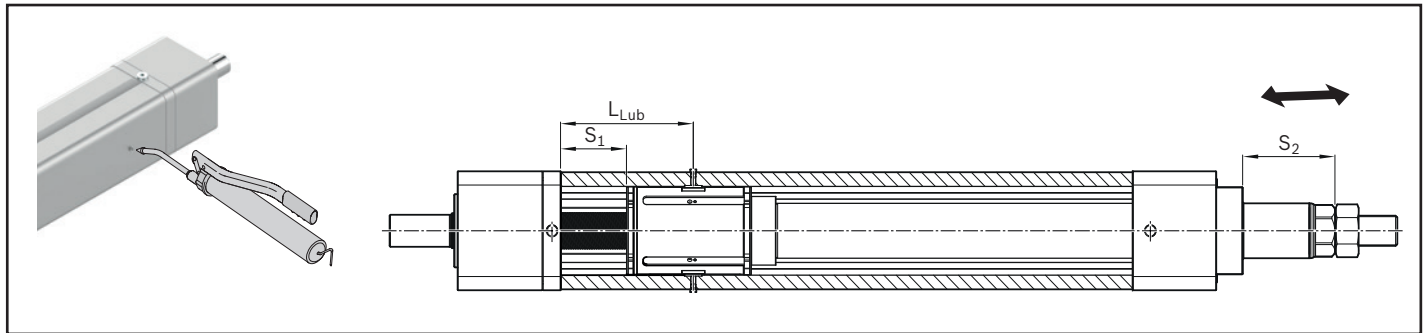
Grease		Low-temperature grease (-30 ... +60 °C)
Consistency class NLGI 2 in accordance with DIN 51818 We recommend Dynalub 510 (Bosch Rexroth) Cartridge (400 g) R341603700 Bucket (5 kg) R341603500	Consistency class NLGI 00 in accordance with DIN 51818 We recommend Dynalub 520 (Bosch Rexroth) Cartridge (400 g) R341604300 Bucket (5 kg) R341604200	Klüber BEM 34-132 R341603600
Can also be used	Can also be used	
Elkalub GLS 135 / N2 (Chemie-Technik) Tribol GR 100-2 PD (Castrol)	Elkalub GLS 135 / N00 (Chemie-Technik) Tribol GR 100-00 PD (Castrol)	

Lubrication position

a) Move the piston rod to stroke position S_2 (reference position) see figure

b) Without limit switch, extend from the rear end position by $S_1 + 5$ mm.

For more information, see "Instructions EMC-HP, R320103219".



EMC-HP	Dimensions (mm)			
	L_{Lub}	S_1	S_2	
115	143.5	75	101	
130	151.0	75	105	
160	164.5	75	108	

Oil bath lubrication

For maintenance-free operation a oil bath lubrication can optionally selected.

The prerequisites for this are:

- ▶ normal operating conditions (see chapter operating conditions)
- ▶ $F_m/C \leq 0,05$
- ▶ $V_m \geq 0,05$ m/s
- ▶ Trafel life L up to 15 000 km
- ▶ $T = -20$ °C up to 50 °C

An oil with a viscosity of 220 is used as standard (e.g. Shell Tonna 220)

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:

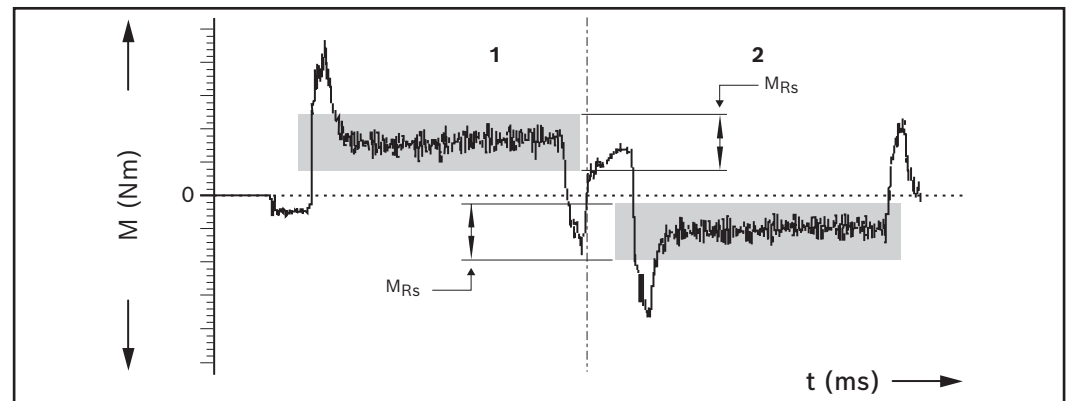
- Functional checks of mechanical components
- Functional checks of electrical components
- Design as per order confirmation

Measurement of frictional torque of complete system Option 02

All items as per the standard report.

The friction torque M is measured over the entire travel range.

Example diagram



- 1) Advance
2) Return

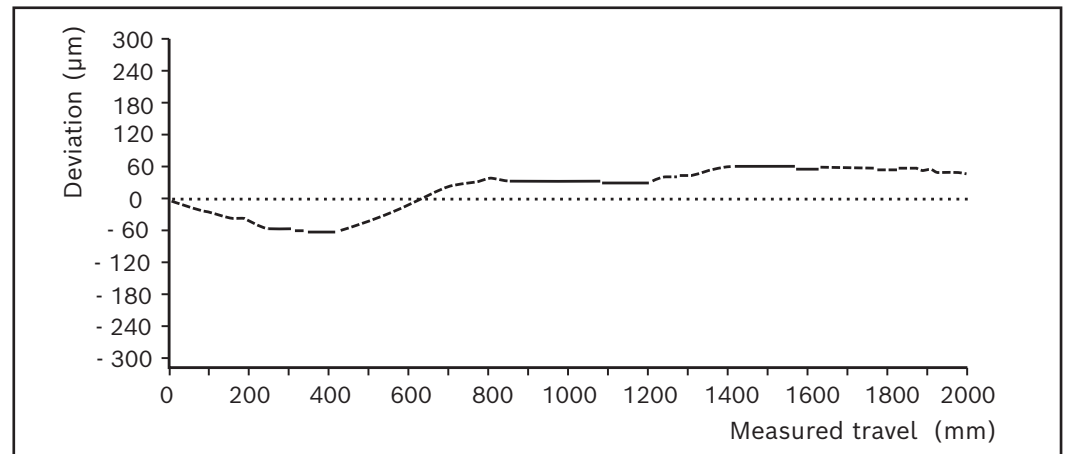
M_{Rs} = Frictional torque (N)
 t = Travel time (ms)

Lead deviation of screw drive Option 03

All items as per the standard report.

In addition to the graphical illustration (see figure), a measurement report is included in tabular form.

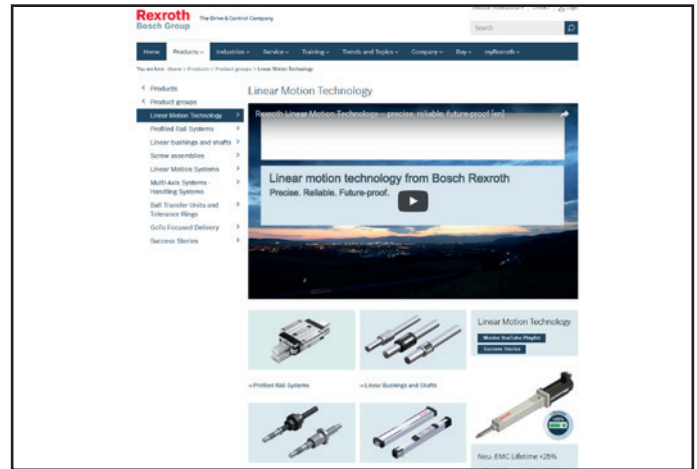
Example diagram



Inquiry / order / Related information

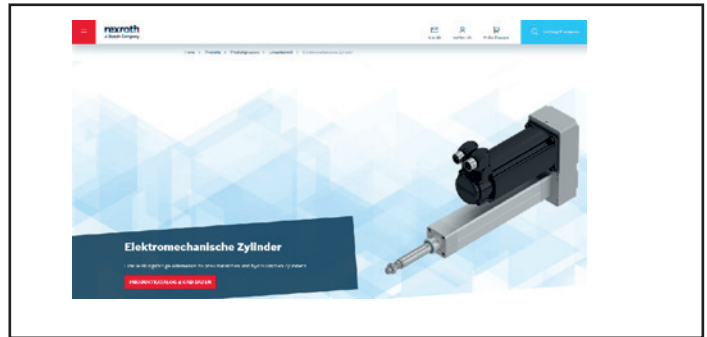
Bosch Rexroth Linear Motion Technology homepage

<https://www.boschrexroth.com/en/xc/products/product-groups/linear-motion-technology/index>



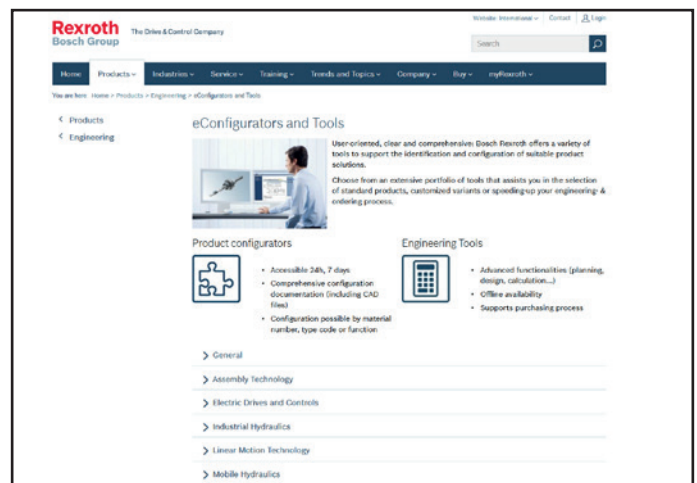
Product information electromechanical cylinders:

<https://www.boschrexroth.com/en/us/products/product-groups/linear-motion-technology/topics/linear-motion-systems/index>



Configurators and tools

<https://www.boschrexroth.com/en/us/products/direct-entry?cat=global-portfolio&language=&m=XC&u=im&o=portal&p=g317080>



Glossary (definitions)

Dynamic load capacity C:

Constant that is used to calculate the service life of a screw drive. The value for the dynamic load capacity C represents the load under which 90% of a sufficiently large number of identical screw drives can achieve a service life of one million revolutions.

Limit switch:

Limit switches are used to monitor the end position of moving parts. They emit a signal when the component reaches a certain position, usually the beginning or end of a stroke. The signal can be electrical, pneumatic or mechanical. Typical forms of limit switches with electrical signals are roller lever switches or non-contacting switches such as light barriers and proximity switches.

Service life:

The nominal life is expressed by the number of revolutions (or number of operating hours at constant rotary speed) that will be attained or exceeded by 90% of a sufficiently large number of identical screw drives before the first signs of material fatigue become evident.

Maximum force $F_{\max}$:

Maximum permissible mechanical load in axial direction.

Positioning accuracy:

The positioning accuracy is the maximum deviation between the actual position and the target position, as defined in VDI/DGQ 3441.

Reference switch:

Reference switches are used to detect the position of a moved component, e.g. screw drive nut in the cylinder. The switch emits a signal when the component reaches a defined position (reference mark). Reference switches are required for incremental measuring systems or motors with incremental encoders during start-up and after any interruption to the power supply.

Lead:

Relating to screws or threaded shafts, the lead is the linear distance traveled per revolution of the screw or shaft. In the case of a single thread (single-start screws), this is the distance between two thread crests or two grooves (running tracks).

Gear ratio:

This relates to the transmission and conversion of movements, linear and rotary speeds, forces and torques in a geared mechanism. The gear ratio (also known as reduction ratio) is the ratio between the drive variable and the output variable, e.g. the ratio of input speed to output speed.

Repeatability:

The repeatability indicates how precisely a linear system positions itself when approaching a position repeatedly from the same direction (unidirectional motion). It is stated as the deviation between the actual position and the target position.

Abbreviations

Abbreviation/ Index	Name	Unit
a	Acceleration	(m/s ²)
a_{max}	Maximum acceleration rate	(m/s ²)
BASA	Ball screw assembly	(–)
B_t	Belt type	(–)
c_{spe}	Specific spring rate	(N)
C_{gw}	Dynamic load capacity, guideway	(N)
C_{bs}	Dynamic load capacity for ball screw assembly	(N)
C_{fb}	Dynamic load capacity for fixed bearing	(N)
d₀	Nominal diameter of ball screw assembly	(mm)
d₃	Belt pulley diameter	(mm)
f_w	Load factor	(–)
F_n	Axial load of the ball screw assembly	(N)
F_{eff}	Effective equivalent axial load	(N)
F_{bp}	Max. belt drive transmission force	(N)
F_{comb}	Combined equivalent bearing load	(N)
F_{mbs}	Equivalent dynamic load on bearing of the ball screw assembly	(N)
F_{mgw}	Equivalent dynamic load on bearing of the guideway	(N)
F_n	Axial load of the ball screw assembly	(N)
F_{t zul}	Belt elasticity limit	(N)
F_y	Load due to a resulting force in the y-direction	(N)
F_{y max}	Maximum dynamic load in y-direction	(N)
F_z	Load due to a resulting force in the z-direction	(N)
F_{z max}	Maximum dynamic load in z-direction	(N)
g	Gravitational acceleration (= 9.81)	(m/s ²)
i	Gear ratio	(–)
I_y	Planar moment of inertia about the y-axis	(cm ⁴)
I_z	Planar moment of inertia about the z-axis	(cm ⁴)
J_{br}	Mass moment of inertia of the motor brake	(kgm ²)
J_c	Mass moment of inertia of coupling	(kgm ²)
J_{dc}	Mass moment of inertia of the drive train	(kgm ²)
J_{ex}	Mass moment of inertia of the mechanical system	(kgm ²)
J_{ge}	Mass moment of inertia of gear about the motor journal	(kgm ²)
J_m	Mass moment of inertia of motor	(kgm ²)
J_s	Mass moment of inertia of linear motion system	(kgm ²)
J_{sd}	Mass moment of inertia of belt side drive about the motor journal	(kgm ²)
J_t	Translative mass moment of inertia of external load based on the linear motion system screw journal	(kgm ²)
k_{g fix}	Constant for fixed portion of mass	(kg)
k_{g var}	Constant for variable-length portion of mass	(kg/mm)

Abbreviation/ Index	Name	Unit
k_{J fix}	Constant for fixed portion of mass moment of inertia	(kgmm ²)
k_{J m}	Constant for mass-specific portion of mass moment of inertia	(mm ²)
k_{J var}	Constant for variable-length portion of mass moment of inertia	(kgmm)
L	Length of the linear motion system	(mm)
L_{ad}	Additional length	(mm)
L_c	Length nut/length nut and housing	(mm)
L_{ca}	Carriage length	(mm)
L_{bs}	Nominal service life (Ball screw assembly, fixed bearing)	(min ⁻¹)
L_{hbs}	Nominal service life (Ball screw assembly, fixed bearing)	(h)
L_{gw}	Nominal life of the guideway	(m)
L_{hgw}	Nominal life of the guideway	(h)
L_w	Centerline-to-centerline distance between carriages	(mm)
m_{br}	Holding brake mass	(kg)
m_{ca}	Moved mass of system of carriage	(kg)
m_{ex}	Moved external load	(kg)
m_{fc}	Mass of flange and coupling	(kg)
m_m	Mass of the motor	(kg)
m_s	Mass of the linear system (without attachments)	(kg)
m_{sd}	Mass of the timing belt side drive	(kg)
M₀	Continuous motor torque	(Nm)
M_{cN}	Rated torque of coupling	(Nm)
M_g	Weight moment at motor journal	(Nm)
M_{ge}	Maximum permissible acceleration torque of the gear (on the output drive)	(Nm)
M_L	Dynamic longitudinal moment load capacity	(Nm)
M_m	Equivalent dynamic torque	(Nm)
M_{max}	Max. possible motor torque	(Nm)
M_{mech}	Maximum permissible drive torque for mechanical system	(Nm)
M_p	Maximum permissible drive torque (at drive journal)	(Nm)
M_R	Frictional torque at motor journal	(Nm)
M_{Rge}	Friction torque of gear at motor journal	(Nm)
M_{Rs}	Friction torque of system	(Nm)
M_{Rsd}	Friction torque of belt side drive at motor journal	(Nm)
M_{sd}	Maximum permissible drive torque of the belt side drive	(Nm)
M_{stat}	Static load moment	(Nm)
M_t	Dynamic torsional moment load capacity	(Nm)
M_x	Dynamic torsional moment around the X-axis	(Nm)
M_{x max}	Maximum permissible torsional moment around the x-axis	(Nm)

Abbreviation/ Index	Name	Unit
M_y	Dynamic torsional moment around the y-axis	(Nm)
M_{y max}	Maximum permissible torsional moment around the y-axis	(Nm)
M_z	Dynamic torsional moment around the z-axis	(Nm)
M_{z max}	Maximum permissible torsional moment around the z-axis	(Nm)
n	Rotary speed of the ball screw assembly	(min ⁻¹)
n₁, n₂, ... n_n	Rotary speed in acceleration and Bremsphasen	(min ⁻¹)
n_{A1 ... n}	Starting speed in phase 1 ... n	(min ⁻¹)
n_{E1 ... n}	Ending speed in Phase 1–n	(min ⁻¹)
n_{ge}	Maximum permissible rotary speed of the gear	(min ⁻¹)
n_m	Average rotary speed of the ball screw assembly	(min ⁻¹)
n_{mech}	Maximum permissible rotary speed for mechanical system	(min ⁻¹)
n_{max}	Max. motor speed	(min ⁻¹)
n_p	Maximum permissible rotary speed of the linear motion system	(min ⁻¹)
P	Screw lead/ball screw assembly	(mm)
P_{app}	Effective power in application	(W)
Keyway	Keyway	(–)
q_{t1..n}	Time step of the phases	(%)
s_a	Acceleration travel	(mm)
s_e	Excess travel	(mm)
s_{eff}	Effective stroke	(mm)
s_{min}	Min. travel range	(mm)
s_{max}	Maximum travel	(mm)
SPU	Screw support	(–)
TT	Carriage	(–)
t_a	Acceleration/braking time	(s)
t₁, t₂, ... t_n	Time for phases 1 ... n	(s)
t_{ges}	Sum of time steps	(s)
u	Feed constant	(mm/U)
v₁, v₂, ... v_n	Speed in phase 1 ... n	(m/s)
v_{max}	Maximum permissible speed	(m/s)
v_{mech}	Maximum permissible speed of mechanical system	(m/s)
v_{mgw}	Average linear speed of the guideway	(m/s)
V	Ratio of mass moments of inertia of drive chain and motor	(–)
z₁	Application point of the effective force	(mm)
π	Pi	(–)

Note:

This catalog may possibly not include all abbreviations listed here.

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