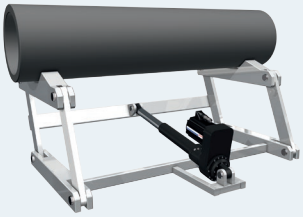
The Drive & Control Company

Rexroth
Bosch Group

Electromechanical Cylinder EMC-HD



Identification system for short product names

Short product name		Example: **EMC** – **085** – **HD** – **1**
System	=	**E**lectro**M**echanical **C**ylinder
Size		**085** / 125 / 180
Version	=	**H**eavy **D**uty
Generation	=	Product generation **1**

At the moment only available in PDF-Format
(After integration of the next sizes we will make a print version)

Contents

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 Duty (EMC-HD) 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-HD for heavy loads transmit the motor movement via ball or planetary screw assemblies depending on the requirements on dynamics and force. Available in various sizes and leads, the highly precise Rexroth screw drives cover a wide range of needs cost-effectively. Rexroth offers the EMC-HD 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 from the IndraDrive series.

Structural Design

The mechanical system in the Electromechanical Cylinders EMC-HD Heavy Duty 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.
The piston rod-to-housing interface is optimally sealed to prevent dirt from working its way in. The entire cylinder fulfills the requirements for protection class IP 65.
The EMC-HD is available with or without a piston rod anti-twist feature. The integrated anti-twist feature is realized by means of four guide surfaces on the piston rod and a sliding guide in the housing.
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.
Electromechanical Cylinders EMC-HD require only minimal maintenance effort. The advantage of grease lubrication is that the screw drive can run long distances on one supply of grease.

Advantages

- High energy efficiency and little pollution (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 multiple combination options for high flexibility to serve a broad range of applications
- Precise positioning, high dynamics, powerful drive and long service life due to the use of highly precise Rexroth planetary and ball screw assemblies
- Smart, freely programmable drive system allowing the realization of complex travel profiles (parameters for force, position and travel speed can be set as required over the complete working travel range)

Application areas

Electromechanical Cylinders EMC-HD 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
- Machine tools
- Assembly and handling technology
- Packaging machines and conveyor systems
- Testing equipment and laboratory applications
- Simulators
- Special-purpose machines

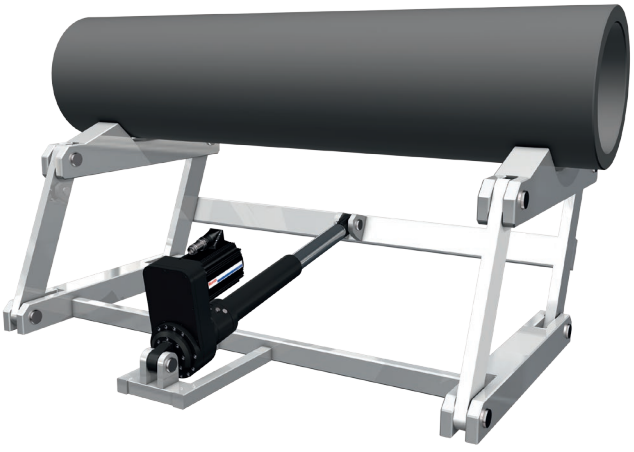
Application examples

Bending

Lifting

Pressing

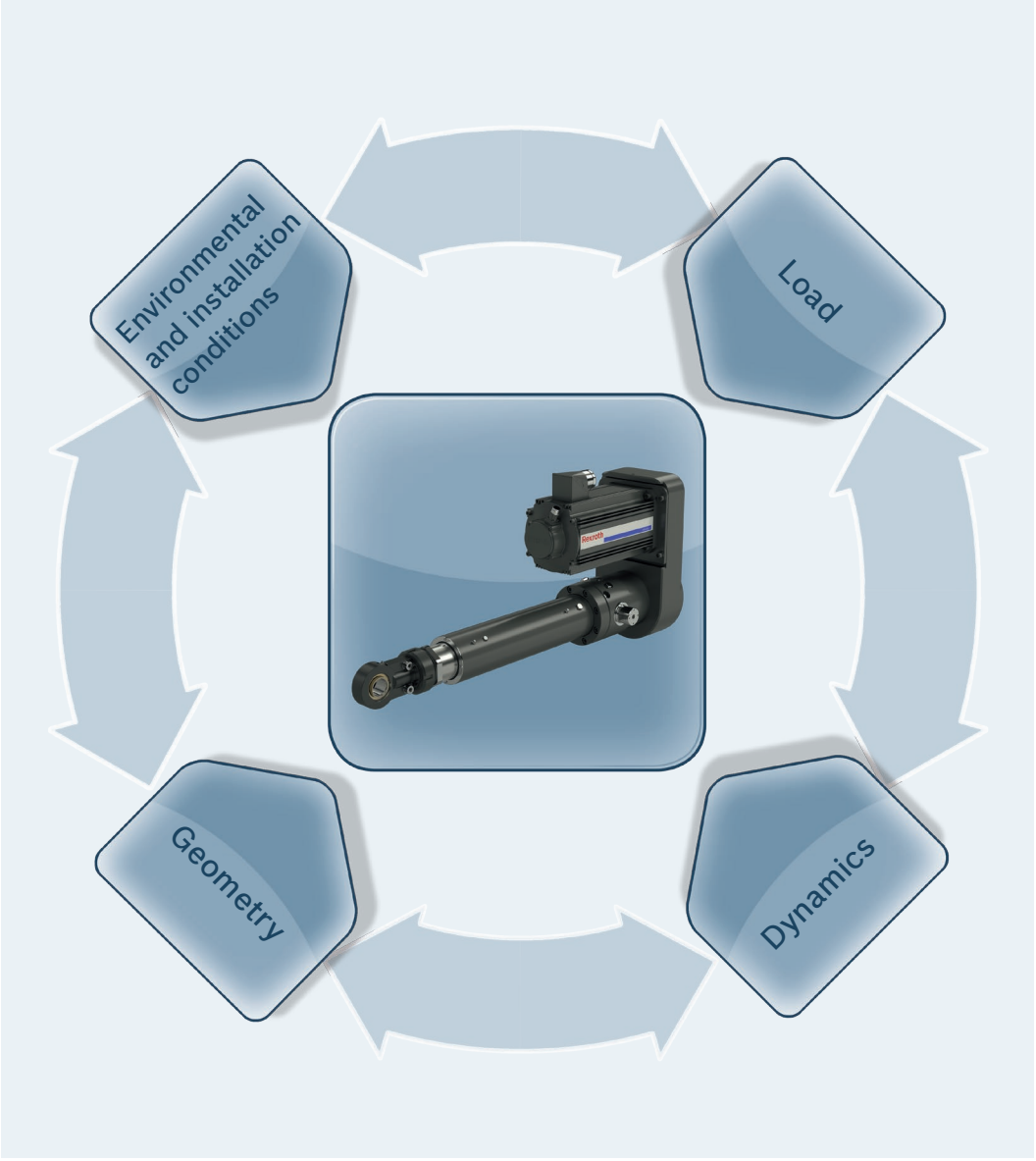
Transporting



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.

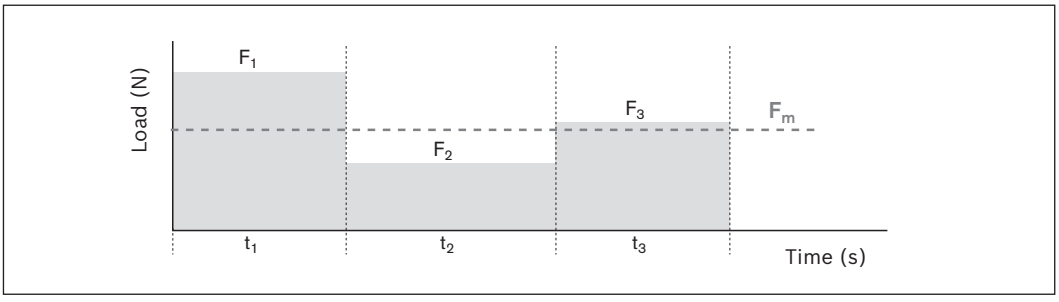
Dynamics
- Acceleration
- Linear speed
- Cycle time
- etc.

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

1. Loads
An EMC-HD 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 ratio of the operating time to the total cycle time expressed in percent. 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.

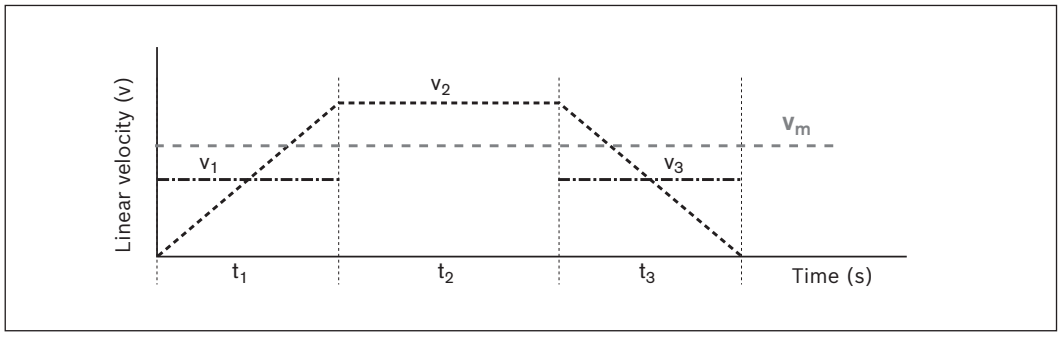
$$DC = \frac{t_O}{t_O + t_P} \cdot 100\%$$

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 type of screw drive, lead, gear reductions and drive can be selected such that the requirements are met precisely and efficiently.



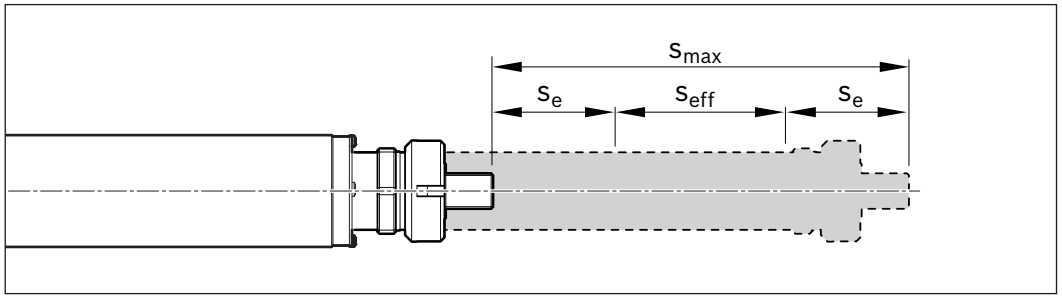
4. Integration in the machine

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

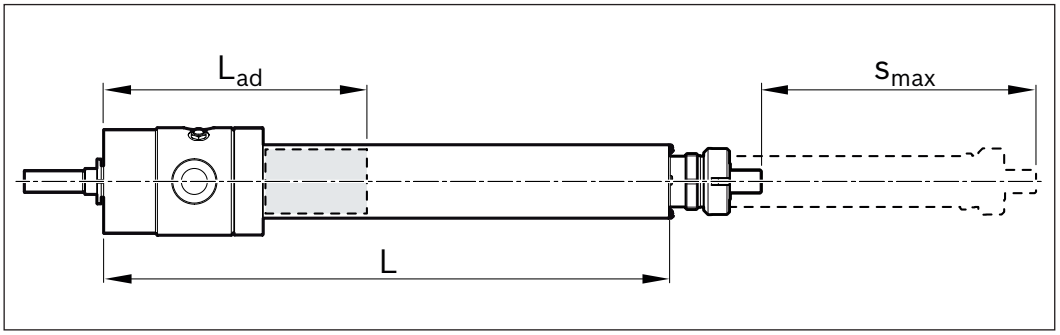
During mounting it must be ensured the cylinder is installed free of distortive stresses and any transverse loads are absorbed by an external guideway. Depending on whether the drive torque is to be absorbed in the cylinder or via an external guideway, the cylinder can be ordered with or without an integrated anti-twist feature. (For further information on the anti-twist feature see the “Structural design” section).

5. Travel range and overall dimensions

Determine the necessary operating stroke in your application. As Electromechanical Cylinders EMC HD 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 or the bearings, in addition to the travel.



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

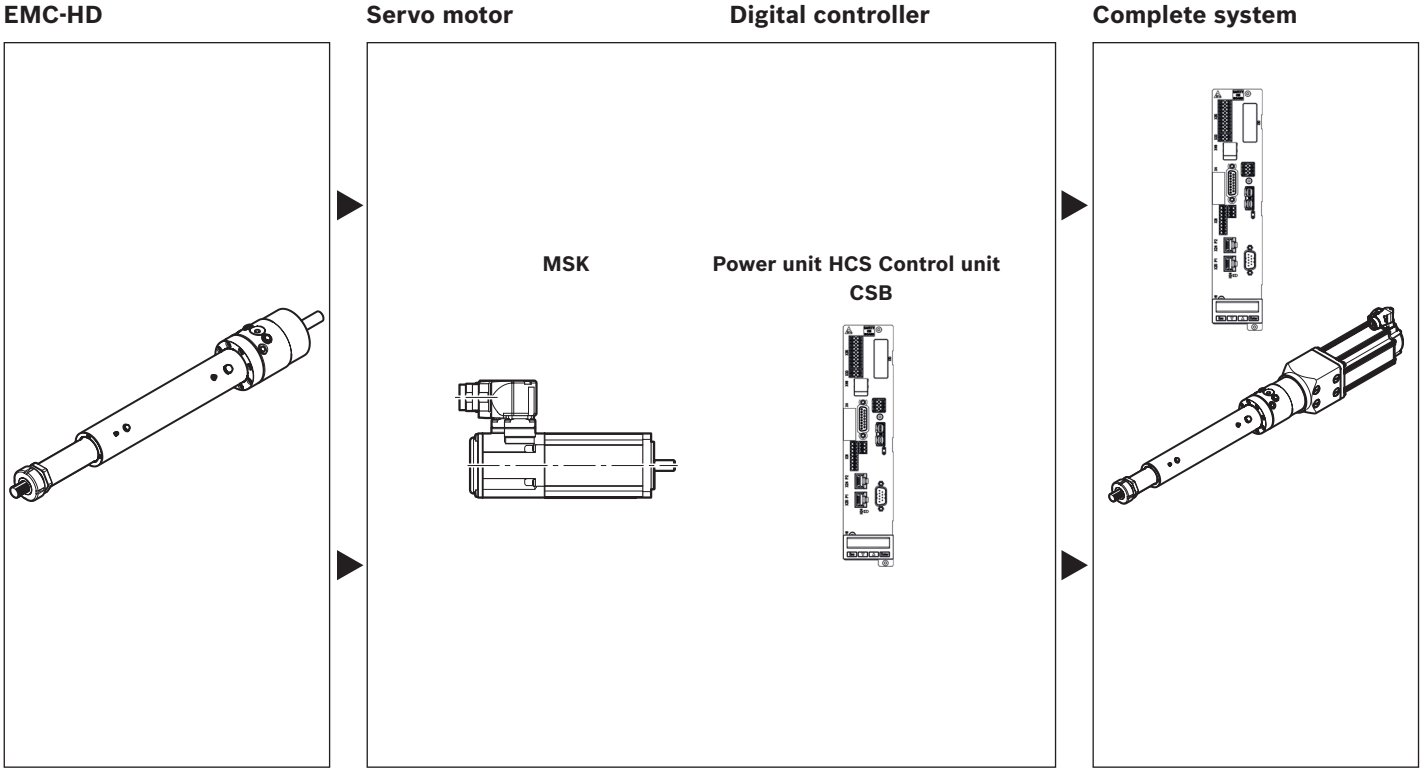
Several motor-controller combinations are available in order to provide the most cost-effective solution for every customer application. When sizing the drive, always consider the motor-controller combination.

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

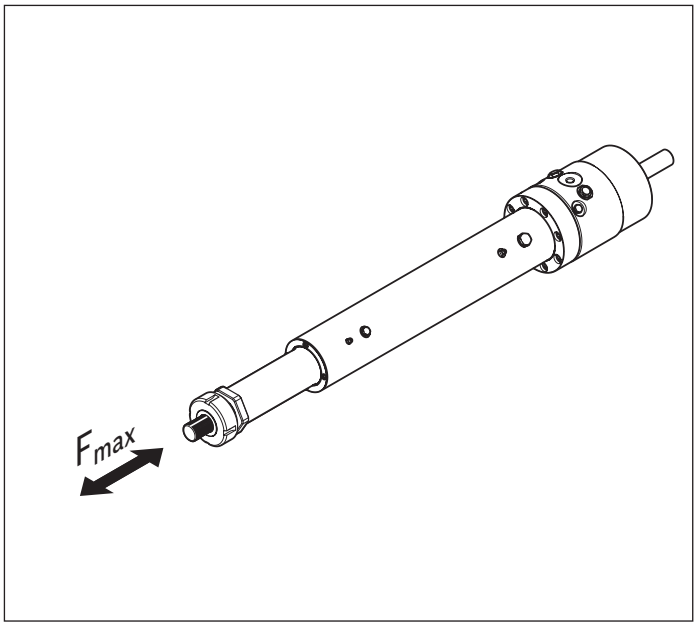
- Drive System Rexroth IndraDrive, R999000018
- Rexroth IndraDyn S Synchronous Motors MSK, R911296288
- Rexroth IndraDrive C Drive Controllers with HCS02 and HCS03, R911314904

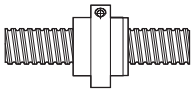
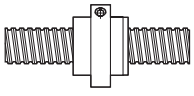
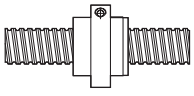


Load ratings and sizes

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



EMC-HD	Drive unit	d_0xP (mm)	C (N)	F_{max} (N)	$s_{max\ perm}$ (mm)	v_{max} (m/s)
085	**PLSA** 	30x5	87 000	44 000	700	0.42
		30x10	98 000	44 000		0.83
	Ball screw 	40x10	72 000	44 000		0.63
		40x20	95 000	38 000		1.00
125	**PLSA** 	48x5	188 000	95 000	1 200	0.26
		48x10	211 000	110 000		0.52
	Ball screw 	63x10	88 000	88 000		0.40
		63x20	130 000	85 000		0.80
180	**PLSA** 	75x10	470 000	250 000	1 700	0.33
		75x20	470 000	290 000		0.67

C = dynamic load rating
d_0 = diameter of screw drive
F_{max} = maximum permissible axial force
BS = Ball Screw Assembly
PLSA = Planetary Screw Assembly
P = screw drive lead
$s_{max\ perm}$ = maximum permissible linear travel
v_{max} = maximum linear speed

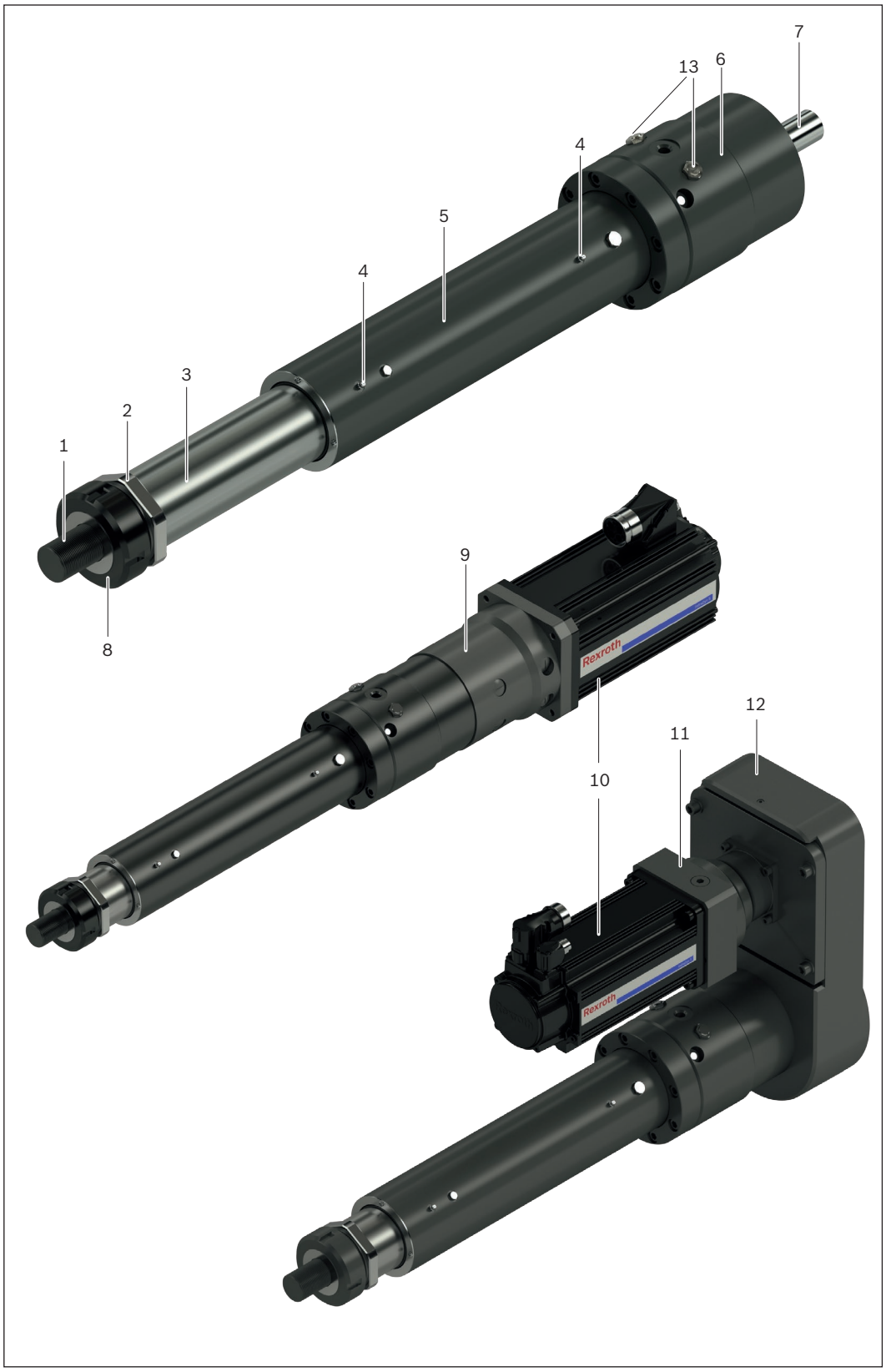
Structural Design

1 Threaded mounting interface[1)]
2 Wrench flats[3)]
3 Piston rod[2)]
4 Lube nipple
5 Housing[1)]
6 Bearing housing[1)]
7 Drive journal[4)]
8 Lock nut

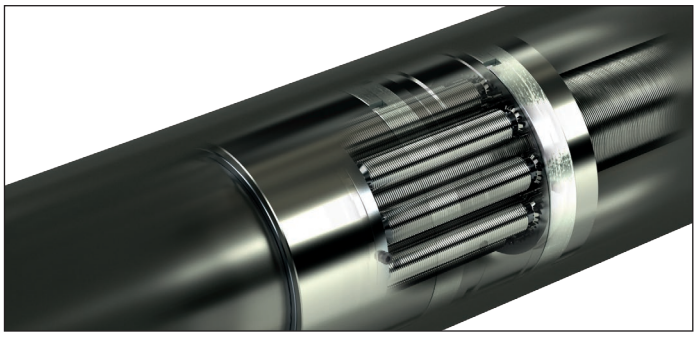
Attachments

9 Motor mount and coupling
10 Motor
11 Gear unit
12 Timing belt side drive
13 Air balance

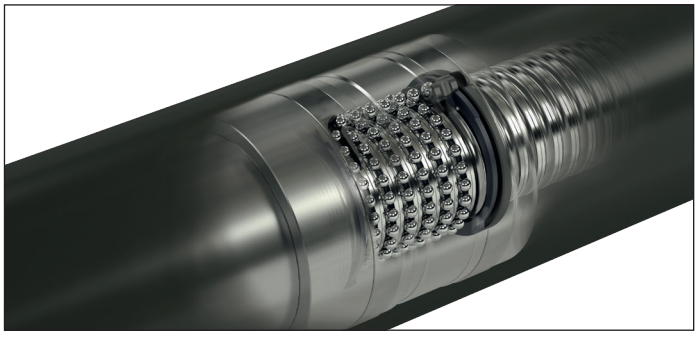
1) Steel, black galvanized, or black painted
2) Steel, chromium plated
3) Only on version “without anti-twist feature”
4) Steel



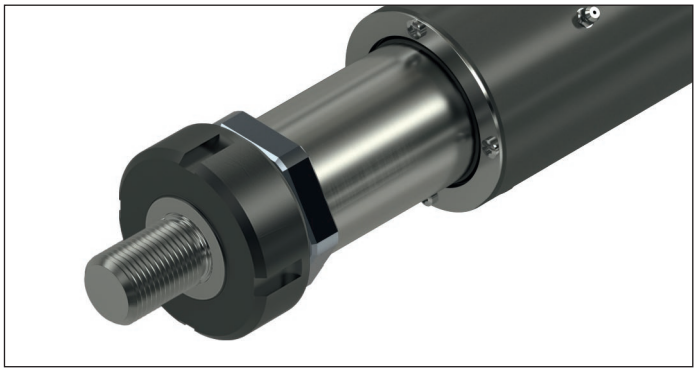
Version with Planetary Screw Assembly PLSA



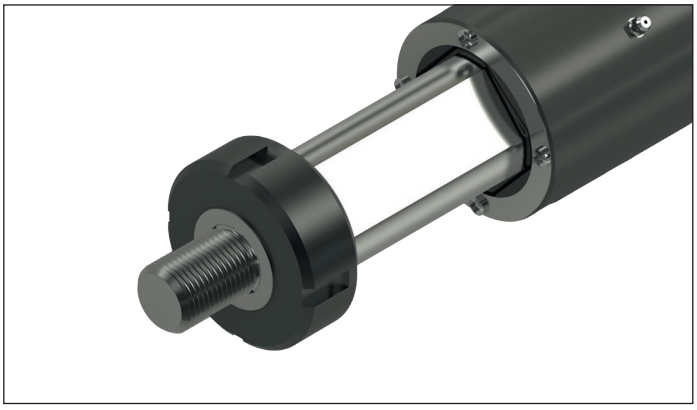
Version with Ball Screw Assembly BS



Guide without integrated anti-twist feature



Guide with integrated anti-twist feature



Screw drive

The EMC-HD is available with a planetary or ball screw assembly.

- In the case of planetary screw assemblies, several planets are positioned in a rotationally symmetrically manner inside a nut.
  They rotate parallel to the axis of a screw and generate linear motion. The numerous contact areas inherent in this system design result in high axial rigidity and load-bearing capacity and thus provide for a long service life. Planetary screw assemblies achieve very high positioning accuracy and repeatability even in case of minimal traversing movements.
- In ball screw assemblies, balls provide the rolling contact. The high leads allow for highly dynamic applications while assuring high mechanical efficiency so that little heat is generated. The low lubricant consumption ensures service intervals are long. The use of multi-start screws and a large number of ball track turns in the nut of the ball screw results in high load ratings and therefore a long service life.

Anti-twist feature

The EMC-HD is available with or without a piston rod anti-twist feature.

- On the cost-optimized basic version without anti-twist feature, the piston rod can still be twisted during installation and as a result easily extended and retracted manually. To ensure correct linear motion in operation, the piston rod must be secured externally against twisting (e.g. by fastening it to a linear guide). The torque to be absorbed corresponds to the drive torque at the drive journal of the screw drive (see the “Design calculations” section).
- The integrated anti-twist feature is used if external absorption of the torque is not possible (e.g. when space is limited or if the piston rod extends freely into the working zone). The anti-twist feature is realized by means of four guide surfaces on the piston rod and a sliding guide at the head end of the housing.

Technical data

Dimensions, load capacities, maximum forces and masses

EMC-HD	PLSA	Ball screw						m_s		m_{ca}	
	d_0xP (mm)	d_0xP (mm)	C (N)	F_{max} (N)	s_{min} (mm)	$s_{max\ perm}$[1] (mm)	L_{ad} (mm)	$k_{g\ fix}$ (kg)	$k_{g\ var}$ (kg/mm)	$m_{ca\ fix}$ (kg)	$m_{ca\ var}$ (kg/mm)
085	30x5	–	87 000	44 000	85	700	352	30	0.030	6.2	0.011
	30x10	–	98 000	44 000	85	700	352	30	0.030	6.2	0.011
	–	40x10	72 000	44 000	110	700	352	30	0.033	6.2	0.011
	–	40x20	95 000	38 000	230	700	370	30	0.033	6.2	0.011
125	48x5	–	188 000	95 000	130	1 200	442	70	0.060	16.5	0.025
	48x10	–	211 000	110 000	130	1 200	442	70	0.060	16.5	0.025
	–	63x10	88 000	88 000	170	1 200	405	70	0.068	16.5	0.025
	–	63x20	130 000	85 000	230	1 200	427	70	0.068	16.5	0.025
180	75x10	–	470 000	250 000	190	1 700	677	206	0.135	53.0	0.058
	75x20	–	470 000	290 000	190	1 700	677	206	0.135	53.0	0.058

[1] For non-standard distances please contact Bosch Rexroth.

Mass of the EMC-HD

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 including gear unit (optional)*)

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

Weight calculation without motor with motor mount and coupling including gear unit (optional)*)

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

Moved mass of system*)

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

Length calculation

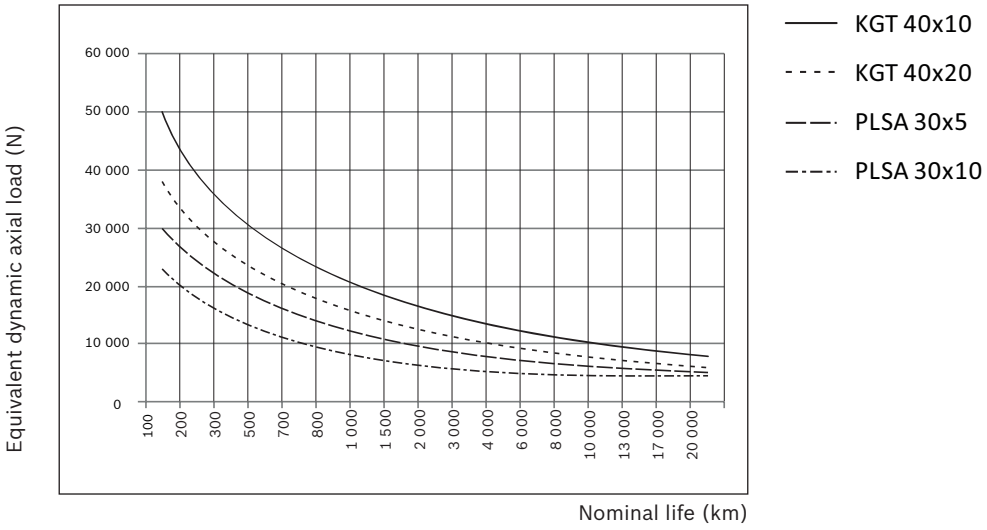
$$L = s_{max} + L_{ad}$$

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

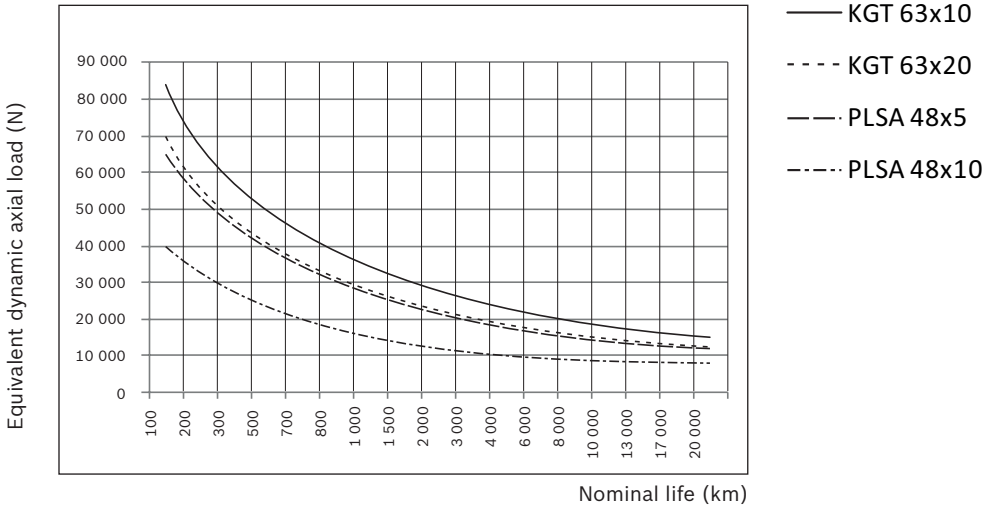
C	=	dynamic load capacity	(N)	$m_{ca\ fix}$	=	constant for the fixed-length portion of the moved mass of system	(kg)
d_0	=	diameter of screw drive	(mm)	$m_{ca\ var}$	=	constant of the variable-length portion of the moved mass of system	(kg/mm)
F_{max}	=	maximum permissible axial force	(N)	m_s	=	mass of EMC-HD	(kg)
BS	=	ball screw assembly		m_{sd}	=	mass of timing belt side drive	(kg)
$k_{g\ fix}$	=	constant for the fixed-length portion of the mass	(kg)	P	=	screw drive lead	(mm)
$k_{g\ var}$	=	constant for the variable-length portion of the mass	(kg/mm)	PLSA	=	Planetary Screw Assembly	
L	=	overall length (without piston rod)	(mm)	s_{min}	=	minimum travel range	(mm)
L_{ad}	=	additional length	(mm)	s_{max}	=	maximum travel range	(mm)
m_c	=	mass of motor mount and coupling	(kg)	$s_{max\ perm}$	=	maximum permissible travel	(mm)
m_{ca}	=	moved mass of system	(kg)				

Service life

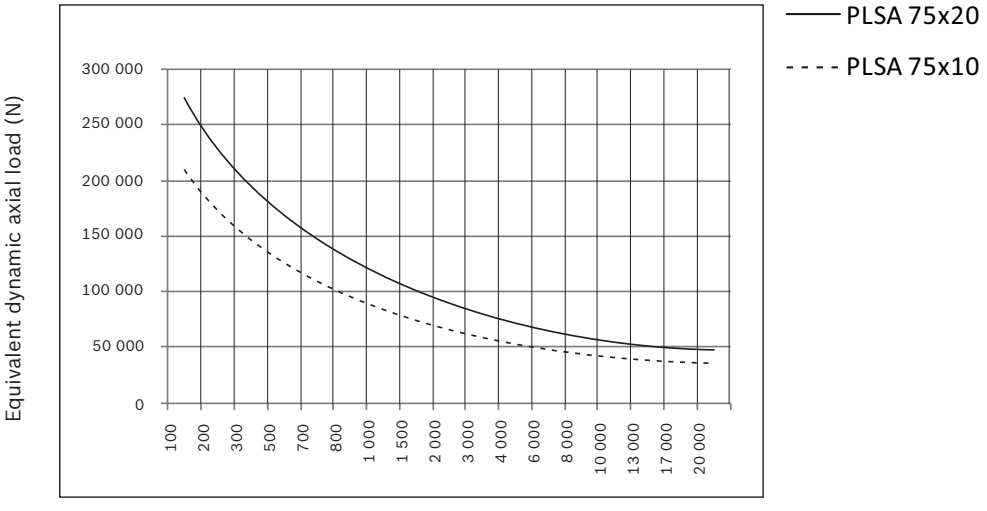
EMC-085-HD



EMC-125-HD



EMC-180-HD



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.

Technical data

Drive data

EMC-HD	PLSA	Ball screw						
	d_0xP	d_0xP	F_{max}	M_p	v_{max}	n_P	a_{max}	M_{Rs}
	(mm)	(mm)	(N)	(Nm)	(m/s)	(min^{-1})	(m/s^2)	(Nm)
085	30x5	–	44 000	44	0.42	5 040	30	3.5
	30x10	–	44 000	88	0.83	4 980	30	4.0
	–	40x10	44 000	78	0.63	3 780	8	4.0
	–	40x20	38 000	134	1.00	3 000	22	4.5
125	48x5	–	95 000	94	0.26	3 120	30	8.0
	48x10	–	110 000	219	0.52	3 120	30	8.0
	–	63x10	88 000	156	0.40	2 400	8	8.0
	–	63x20	85 000[1)]	301	0.80	2 400	13	9.0
180	75x10	–	250 000	497	0.33	2 000	30	17
	75x20	–	290 000	1 154	0.67	2 000	30	19

[1)] When using timing belt side drives only possible up to 62 000 N

EMC-HD	PLSA	Ball screw							η
	d_0xP	d_0xP	$k_{J\ fix}$	$k_{J\ var}$	$k_{J\ m}$	Backlash of screw drive	Max. perm. piston rod twist angle[1)]	Perm. transmitted power[2)]	
	(mm)	(mm)				(µm)	(°)	(W)	
085	30x5	–	206	0.628	0.633	30	±1.5	430	0.8
	30x10	–	216	0.643	2.533	30	±1.5	430	0.8
	–	40x10	456	1.383	2.533	0	±1.5	1 100	0.9
	–	40x20	527	1.463	10.132	0	±1.5	2 000	0.9
125	48x5	–	2 046	4.104	0.633	30	±1.5	460	0.8
	48x10	–	2 065	4.125	2.533	30	±1.5	540	0.8
	–	63x10	4 459	9.645	2.533	0	±1.5	1 100	0.9
	–	63x20	4 704	9.645	10.132	0	±1.5	2 000	0.9
180	75x10	–	16 529	24.436	2.533	30	±1.5	970	0.8
	75x20	–	16 550	24.527	10.132	30	±1.5	1 240	0.8

[1)] For version with anti-twist feature
[2)] Calculated for 25 ℃ ambient temperature

a_{max} = maximum permissible acceleration
d_0 = diameter of screw drive
F_{max} = maximum permissible axial force
$k_{J\ fix}$ = 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
i = gear ratio
m_c = mass of motor mount and coupling including gear unit
M_p = maximum permissible drive torque
M_{Rs} = frictional torque of EMC-HD
n_P = maximum permissible rotary speed of EMC-HD
P = screw drive lead
v_{max} = maximum permissible linear speed
η = mechanical efficiency

Drive data for motor attachment via flange and coupling

EMC-HD	d_0xP	Attachment for motor (optionally with gear unit)	i	Motor mount and coupling incl. gear unit										
	(mm)			F_{max} (N)	M_p[1] (Nm)	v_{max} (m/s)	n_p[2] (min^{-1})	η	M_{Rs} (Nm)	$k_{J\ fix}$	$k_{J\ var}$	$k_{J\ m}$	m_c (kg)	a_{max} (m/s^2)
085	30x5	MSK071	1	44 000	44.0	0.42	5 000	0.80	6.00	1 106.0	0.628	0.633	5.0	30
		MSK100/101	1	44 000	44.0	0.42	5 000	0.80	6.00	1 106.0	0.628	0.633	6.6	30
		MSK071/101 with gear unit	3	44 000	15.4	0.13	4 500	0.76	5.50	1 232.9	0.070	0.070	14.3	30
		MSK071 with gear unit	5	44 000	9.3	0.08	4 500	0.76	3.60	1 012.2	0.025	0.025	12.7	30
	30x10	MSK071	1	44 000	88.0	0.83	5 000	0.80	6.00	1 116.0	0.643	2.533	5.0	30
		MSK100/101	1	44 000	88.0	0.83	5 000	0.80	6.00	1 116.0	0.643	2.533	6.6	30
		MSK071/101 with gear unit	3	44 000	30.9	0.25	4 500	0.76	5.50	1 234.0	0.071	0.281	14.3	30
		MSK071 with gear unit	5	44 000	18.5	0.15	4 500	0.76	3.60	1 012.6	0.026	0.101	12.7	30
	40x10	MSK071	1	44 000	78.0	0.63	3 750	0.90	5.00	1 356.0	1.383	2.533	5.0	8
		MSK100/101	1	44 000	78.0	0.63	3 750	0.90	5.00	1 356.0	1.383	2.533	6.6	8
		MSK071/101 with gear unit	3	44 000	27.4	0.25	4 500	0.86	5.17	1 260.7	0.154	0.281	14.3	8
		MSK071 with gear unit	5	44 000	16.4	0.15	4 500	0.86	3.40	1 022.2	0.055	0.101	12.7	8
	40x20	MSK071	1	38 000	134.0	1.00	3 000	0.90	5.00	1 427.0	1.463	10.132	5.0	22
		MSK100/101	1	38 000	134.0	1.00	3 000	0.90	5.00	1 427.0	1.463	10.132	6.6	22
		MSK071/101 with gear unit	3	38 000	47.0	0.50	4 500	0.86	5.17	1 268.6	0.163	1.126	14.3	22
		MSK 071 with gear unit	5	38 000	28.2	0.30	4 500	0.86	3.40	1 025.1	0.059	0.405	12.7	22
125	48x5	MSK100	1	95 000	94.5	0.26	3 120	0.80	7.50	3 966.0	4.104	0.633	6.8	30
		MSK101	1	95 000	94.5	0.26	3 120	0.80	7.50	4 136.0	4.104	0.633	6.9	30
		MSK100 with gear unit	3	95 000	33.2	0.13	4 500	0.76	6.00	1 569.6	0.456	0.070	14.5	30
		MSK101 with gear unit	3	95 000	33.2	0.11	4 000	0.76	10.10	1 949.6	0.456	0.070	24.1	30
		MSK071 with gear unit	5	95 000	19.9	0.08	4 500	0.76	3.90	1 126.6	0.164	0.025	14.2	30
	48x10	MSK100	1	110 000	218.8	0.52	3 120	0.80	8.00	3 985.0	4.125	2.533	6.8	30
		MSK101	1	110 000	218.8	0.52	3 120	0.80	8.00	4 155.0	4.125	2.533	6.9	30
		MSK100 with gear unit	3	110 000	76.8	0.25	4 500	0.76	6.17	1 571.7	0.458	0.281	14.5	30
		MSK101 with gear unit	3	110 000	76.8	0.22	4 000	0.76	10.27	1 951.7	0.458	0.281	24.1	30
		MSK071 with gear unit	5	110 000	46.1	0.15	4 500	0.76	4.00	1 127.4	0.165	0.101	14.2	30
	63x10	MSK100	1	88 000	155.6	0.40	2 400	0.90	8.00	6 379.0	9.645	2.533	6.8	8
		MSK101	1	88 000	155.6	0.40	2 400	0.90	8.00	6 549.0	9.645	2.533	6.9	8
		MSK100 with gear unit	3	88 000	54.6	0.25	4 500	0.86	6.17	1 837.7	1.072	0.281	14.5	8
		MSK101 with gear unit	3	88 000	54.6	0.22	4 000	0.86	10.27	2 217.7	1.072	0.281	24.1	8
		MSK071 with gear unit	5	88 000	32.8	0.15	4 500	0.86	4.00	1 223.2	0.386	0.101	14.2	8
	63x20	MSK100	1	85 000	220.0	0.80	2 400	0.90	9.00	6 624.0	9.645	10.132	6.8	13
		MSK101	1	85 000	300.6	0.80	2 400	0.90	9.00	6 794.0	9.645	10.132	6.9	13
		MSK100 with gear unit	3	63 000	77.2	0.50	4 500	0.86	6.50	1 864.9	1.072	1.126	14.5	13
		MSK101 with gear unit	3	85 000	105.5	0.44	4 000	0.86	10.60	2 244.9	1.072	1.126	24.1	13
		MSK071 with gear unit	5	85 000	46.3	0.30	4 500	0.86	4.20	1 233.0	0.386	0.405	14.2	13

[1] Torque may be limited by the maximum torque of the motor.
[2] Rotary speed may be limited by the maximum speed of the motor.

Note:
All data is given for the complete mechanical drive chain (EMC-HD with motor mount coupling) at the reference point motor shaft.
Actual results depend on the selected motor-controller combination.
The engine torque might need to be limited.

Drive data for motor attachment via flange and coupling

EMC-HD	d_0xP	Attachment for motor (optionally with gear unit)	i	Motor mount and coupling incl. gear unit										
				F_{max}	M_p[1)]	v_{max}	n_p[2)]	η	M_{Rs}	$k_{J\ fix}$	$k_{J\ var}$	$k_{J\ m}$	m_c	a_{max}
	(mm)			(N)	(Nm)	(m/s)	(min^{-1})		(Nm)				(kg)	(m/s^2)
180	75x10	MSK101	1	250 000	497.4	0.33	2 000	0.80	17.00	59 610.4	24.4358	2.533	27.1	30
		MSK133	1	250 000	497.4	0.33	2 000	0.80	17.00	59 610.4	24.4358	2.533	28.3	30
		MSK101 with gear unit	3	250 000	174.5	0.19	3 500	0.76	19.67	11 703.4	2.7151	0.281	61.1	30
		MSK101 with gear unit	5	250 000	104.7	0.12	3 500	0.76	12.40	5 174.4	0.9774	0.101	61.1	30
		MSK101 with gear unit	7	250 000	74.8	0.08	3 500	0.76	9.23	3 436.5	0.4987	0.052	61.1	30
		MSK133 with gear unit	3	250 000	170.9	0.19	3 500	0.78	23.67	16 445.8	2.7151	0.281	69.1	30
		MSK133 with gear unit	5	250 000	102.5	0.12	3 500	0.78	12.90	7 346.9	0.9774	0.101	69.1	30
	75x20	MSK101	1	133 204	530.0	0.67	2 000	0.80	19.00	59 874.4	24.5272	10.132	27.1	30
		MSK133	1	136 363	650.0	0.67	2 000	0.80	19.00	59 874.4	24.5272	10.132	28.3	30
		MSK101 with gear unit	3	178 442	249.1	0.39	3 500	0.76	20.33	11 732.7	2.7252	1.126	61.1	30
		MSK101 with gear unit	5	178 442	149.5	0.23	3 500	0.76	12.80	5 185.0	0.9811	0.405	61.1	30
		MSK101 with gear unit	7	178 442	106.8	0.17	3 500	0.76	9.51	3 441.9	0.5006	0.207	61.1	30
		MSK133 with gear unit	3	290 000	396.5	0.39	3 500	0.78	24.33	16 475.1	2.7252	1.126	69.1	30
		MSK133 with gear unit	5	290 000	237.9	0.23	3 500	0.78	13.30	7 357.5	0.9811	0.405	69.1	30

[1)] Torque may be limited by the maximum torque of the motor.
[2)] Rotary speed may be limited by the maximum speed of the motor.

Note:
All data is given for the complete mechanical drive chain (EMC-HD with motor mount coupling) at the reference point motor shaft.
Actual results depend on the selected motor-controller combination.
The engine torque might need to be limited.

Drive data for motor attachment via timing belt side drive

EMC-HD	d_0xP (mm)	Attachment for motor (optionally with gear unit)	i[1]	Timing belt side drive incl. gear unit										
				F_{max} (N)	M_p[2] (Nm)	v_{max} (m/s)	n_p[3] (min^{-1})	η	M_{Rs} (Nm)	$k_{J\ fix}$	$k_{J\ var}$	$k_{J\ m}$	m_{sd} (kg)	a_{max} (m/s^2)
085	30x5	MSK071/100/101	1.5	44 000	30.1	0.42	7 560	0.78	5.33	3 621.6	0.2791	0.281	16.0	30
		MSK071 with gear unit	4.5	44 000	10.6	0.08	4 500	0.74	5.28	1 512.4	0.0310	0.031	23.7	30
		MSK071 with gear unit	7.5	44 000	6.3	0.05	4 500	0.74	3.47	1 112.9	0.0112	0.011	23.7	30
	30x10	MSK071/100/101	1.5	44 000	60.2	0.83	7 470	0.78	5.67	3 626.0	0.2858	1.126	16.0	30
		MSK071 with gear unit	4.5	44 000	21.1	0.17	4 500	0.74	5.39	1 512.9	0.0318	0.125	23.7	30
		MSK071 with gear unit	7.5	44 000	12.7	0.10	4 500	0.74	3.53	1 113.0	0.0114	0.045	23.7	30
	40x10	MSK071/100/101	1.5	44 000	53.5	0.63	5 670	0.87	5.67	3 732.7	0.6147	1.126	16.0	8
		MSK071 with gear unit	4.5	44 000	18.8	0.17	4 500	0.83	5.39	1 524.7	0.0683	0.125	23.7	8
		MSK071 with gear unit	7.5	44 000	11.3	0.10	4 500	0.83	3.53	1 117.3	0.0246	0.045	23.7	8
	40x20	MSK071/100/101	1.5	38 000	92.1	1.00	4 500	0.87	6.00	3 764.2	0.6502	4.503	16.0	22
		MSK071 with gear unit	4.5	38 000	32.3	0.33	4 500	0.83	5.50	1 528.2	0.0722	0.500	23.7	22
		MSK071 with gear unit	7.5	38 000	19.4	0.20	4 500	0.83	3.60	1 118.6	0.0260	0.180	23.7	22
125	48x5	MSK100/101	1.5	95 000	64.9	0.26	4 680	0.78	9.60	11 329.3	1.8240	0.281	27.1	30
		MSK100/101 with gear unit	4.5	95 000	22.8	0.08	4 500	0.74	6.70	2 368.8	0.2027	0.031	36.8	30
		MSK071 with gear unit	7.5	95 000	13.7	0.05	4 500	0.74	4.32	1 421.2	0.0730	0.011	36.8	30
	48x10	MSK100/101	1.5	110 000	150.4	0.52	4 680	0.78	9.93	11 337.8	1.8333	1.126	27.1	30
		MSK100/101 with gear unit	4.5	110 000	52.8	0.17	4 500	0.74	6.81	2 369.8	0.2037	0.125	34.8	30
		MSK071 with gear unit	7.5	110 000	31.7	0.10	4 500	0.74	4.39	1 421.5	0.0733	0.045	34.8	30
	63x10	MSK100/101	1.5	88 000	107.0	0.84	7 560	0.87	9.93	12 401.8	4.2867	1.126	27.1	8
		MSK100/101 with gear unit	4.5	88 000	37.5	0.17	4 500	0.83	6.81	2 488.0	0.4763	0.125	34.8	8
		MSK071 with gear unit	7.5	88 000	22.5	0.10	4 500	0.83	4.39	1 464.1	0.1715	0.045	34.8	8
	63x20	MSK100/101	1.5	62 000	164.9	0.80	3 600	0.87	10.60	12 510.7	4.2867	4.503	27.1	13
		MSK100/101 with gear unit	4.5	62 000	72.5	0.33	4 500	0.83	7.03	2 500.1	0.4763	0.500	34.8	13
		MSK071 with gear unit	7.5	62 000	43.5	0.20	4 500	0.83	4.52	1 468.4	0.1715	0.180	34.8	13
180	75x10	MSK101/133	1.5	201 052	274.9	0.33	3 000	0.78	26.33	65 566.4	10.8604	1.126	68.4	30
		MSK101 with gear unit SP140	4.5	250 000	119.9	0.15	4 000	0.74	16.38	8 775.2	1.2067	0.125	86.3	30
		MSK101 with gear unit SP140	7.5	250 000	72.0	0.09	4 000	0.74	9.97	3 722.7	0.4344	0.045	86.3	30
		MSK101 with gear unit SP180	4.5	250 000	119.9	0.13	3 500	0.74	22.78	12 365.2	1.2067	0.125	103.0	30
		MSK133 with gear unit	4.5	250 000	119.9	0.13	3 500	0.74	22.78	13 105.2	1.2067	0.125	103.0	30
		MSK101 with gear unit SP180	7.5	250 000	72.0	0.08	3 500	0.74	14.27	5 412.7	0.4344	0.045	103.0	30
	75x20	MSK101/133	1.5	100 526	274.9	0.67	3 000	0.78	27.67	65 575.6	10.9010	4.503	68.4	30
		MSK101 with gear unit SP140	4.5	135 485	130.0	0.30	4 000	0.74	16.82	8 776.2	1.2112	0.500	86.3	30
		MSK101 with gear unit SP140	7.5	229 282	132.0	0.18	4 000	0.74	10.23	3 723.0	0.4360	0.180	86.3	30
		MSK101 with gear unit SP180	4.5	290 000	278.3	0.26	3 500	0.74	23.22	12 366.2	1.2112	0.500	103.0	30
		MSK133 with gear unit	4.5	290 000	278.3	0.26	3 500	0.74	23.22	13 106.2	1.2112	0.500	103.0	30
		MSK101 with gear unit SP180	7.5	290 000	167.0	0.16	3 500	0.74	14.53	5 413.0	0.4360	0.180	103.0	30

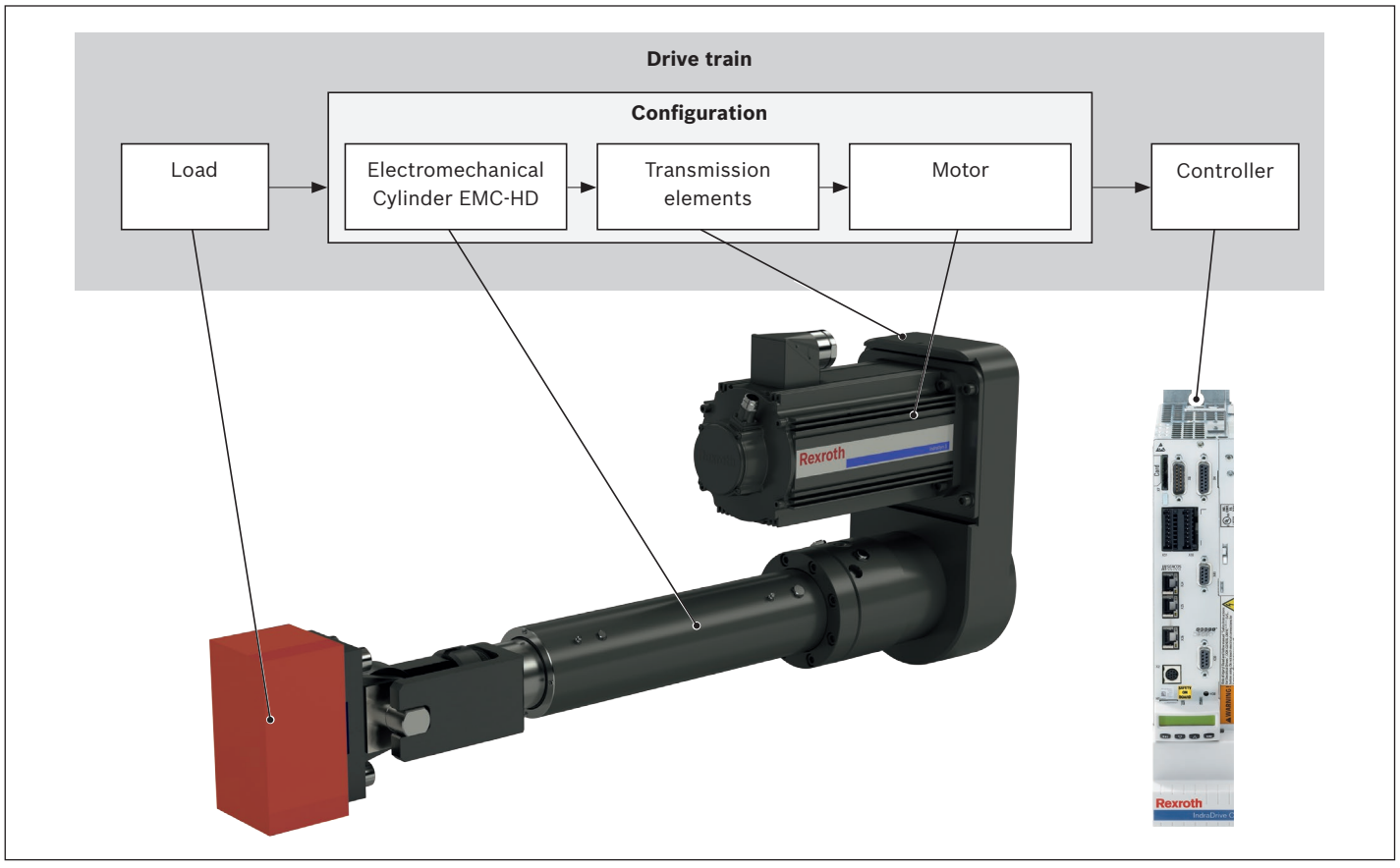
[1] Gear ratio of timing belt side drive and gear unit.
[2] Torque may be limited by the maximum torque of the motor.
[3] Rotary speed may be limited by the maximum speed of the motor.

Note:
All data is given for the complete mechanical drive chain (EMC with timing belt side drive) at the motor shaft reference point.
Actual results depend on the selected motor-controller combination.
The engine torque might need to be limited.

a_{max} = maximum permissible acceleration
d_0 = diameter of screw drive
F_{max} = maximum permissible axial force
$k_{J\ fix}$ = 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
i = gear ratio
M_p = maximum permissible drive torque
M_{Rs} = frictional torque of EMC-HD
m_{sd} = mass of timing belt side drive including gear unit
n_P = maximum permissible rotary speed of EMC-HD
P = screw drive lead
v_{max} = maximum permissible linear speed
η = mechanical efficiency

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-HD, the transmission element (coupling or timing belt side drive) and the motor which can be ordered in that constellation as per the catalog.

Maximum permissible loads

When selecting of Electromechanical Cylinders EMC-HD, 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

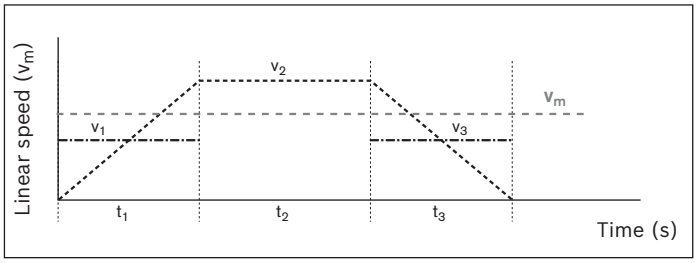
Useful power

To take into account the power loss in the EMC-HD, a permissible useful power is stated for each cylinder-screw drive combination, see “Technical Data”. This value applies at an ambient temperature of 25 ℃ and even distribution of the load over the stroke length. For applications in which the cylinder is permanently loaded over a small section of the total stroke length, please contact Bosch Rexroth.
Phases without load must be taken into account when calculating of the sum of the discrete time steps.

$$P_{app} = \frac{1}{t_{tot}} \cdot (|F_1| \cdot |v_1| \cdot t_1 + |F_2| \cdot |v_2| \cdot t_2 \ldots |F_n| \cdot |v_n| \cdot t_n)$$

Service life of Electromechanical Cylinder EMC-HD

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.

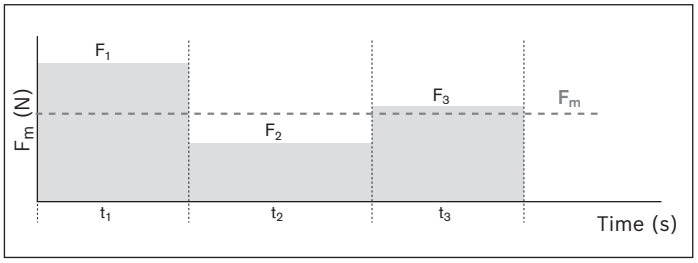


When the linear speed varies, the average speed v_m is calculated as follows:

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

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

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



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

Nominal life

– in revolutions L_{10}

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

– in hours L_{10h}

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

$$n_m = \frac{v_m \cdot 60\,000}{P}$$

Drive torque M_p:

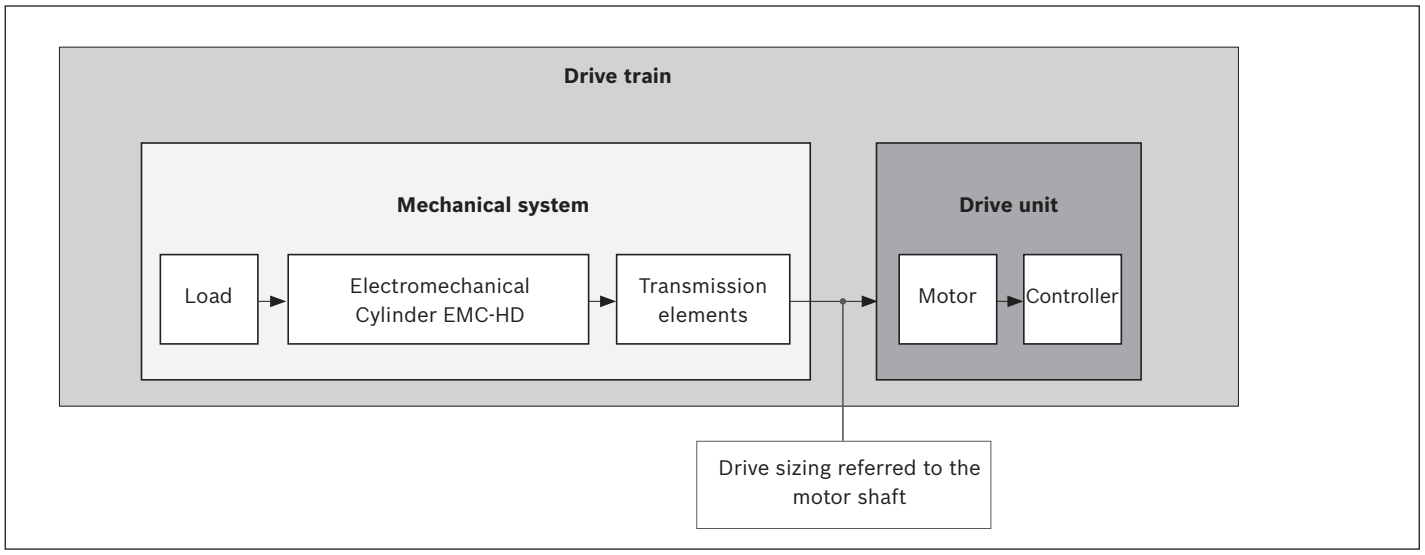
$$M_p = \frac{F \cdot P}{2000 \cdot \pi \cdot \eta}$$

C	=	dynamic load capacity	(N)	n_m	=	Mean speed	(rpm)
F	=	load	(N)	P	=	screw drive lead	(mm)
$F_1, F_2, \ldots F_n$	=	axial load in phase 1 ... n	(N)	P_{app}	=	useful power in the application	(W)
F_m	=	equivalent dynamic axial load	(N)	$t_1, t_2, \ldots t_n$	=	discrete time step for phases 1 ... n	(s)
L_{10}	=	nominal life in revolutions	(–)	t_{tot}	=	sum of discrete time step $t_1, t_2, \ldots t_n$	(s)
L_{10h}	=	nominal life in hours	(h)	$v_1, v_2, \ldots v_n$	=	linear speed in phase 1 ... n	(m/s)
M_P	=	drive torque	(Nm)	v_m	=	average linear speed	(m/s)
				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-HD (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 technical data for the Electromechanical Cylinder EMC-HD already include the relevant gear unit data and the gear ratio. This means that the relevant maximum permissible values for drive torque and linear speed as well as the basic values for frictional torque and mass moment of inertia referred 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-HD (incl. gear unit as transmission element)**
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

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

The value for the frictional torque of the EMC-HD already includes the friction for an appropriately configured gear unit and has been reduced with reference to the motor shaft.

For motor attachment via gear unit

$$M_R = M_{Rs}$$

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.

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

Determination of the mass moment of inertia of the EMC-HD components (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-HD 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-HD	(min^{-1})
v_{max}	=	maximum permissible linear speed of EMC-HD	(m/s)
v_{mech}	=	maximum permissible linear speed of mechanical system	(m/s)

Maximum permissible drive torque M_{mech}
The lowest (minimum) of all the values for permissible drive torque of all mechanical components contained in the drive train determines the maximum permissible drive torque of the mechanical system which has to be taken into consideration as the upper limit for the drive when sizing the motor. The value for the maximum permissible drive torque of the EMC-HD already includes the maximum permissible drive torque of any incorporated transmission elements.

$$M_{mech} = M_p$$

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.

Rough guide for 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 exceeding 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

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

When considering the torque ratio, the torque demand from the axial loads in the cycle must be included in the static load moment. 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 or PLSA.

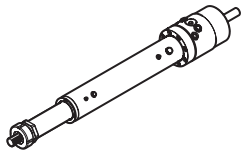
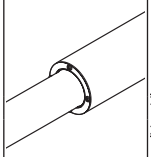
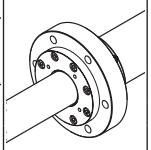
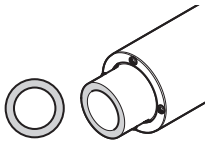
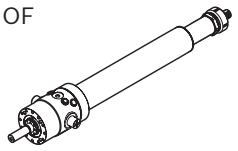
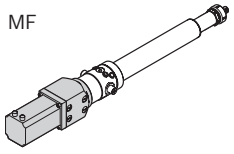
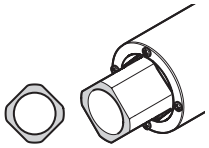
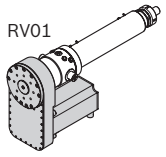
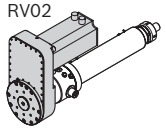
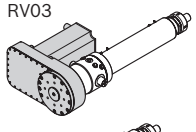
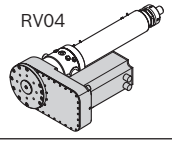
In the “Configuration and Ordering” section, users can put together standard configurations including gear unit and motor, for the various EMC-HD sizes by selecting the appropriate options. By checking the three conditions stated above, it is possible to see whether a standard motor selected in a particular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

Precise sizing of the drive

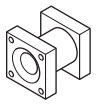
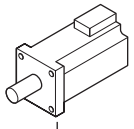
Pre-selecting the motor according to this rough guide is no substitute for the precise design calculations required for the drive, where all moments/torques and speed levels are taken into account. For precise calculation of the electric drive, including consideration of the specific motion profile, 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_m	=	equivalent dynamic torque	(Nm)
g	=	gravitational acceleration (= 9,81)	(m/s^2)	M_p	=	maximum permissible drive torque of EMC-HD	(Nm)
i	=	gear ratio of timing belt side drive/gear unit	(–)	M_0	=	continuous motor torque	(Nm)
J_{br}	=	mass moment of inertia of motor brake	(kgm^2)	M_R	=	frictional torque at motor journal	(Nm)
J_{ex}	=	mass moment of inertia of mechanical system	(kgm^2)	M_{stat}	=	static load moment	(Nm)
J_m	=	mass moment of inertia of motor	(kgm^2)	n_{mech}	=	maximum permissible rotary speed of mechanical system	(min^{-1})
m_{ca}	=	moved mass of carriage	(kg)	n_{max}	=	maximum speed of motor	(min^{-1})
m_{ex}	=	moved external load	(kg)	P	=	screw drive lead	(mm)
M_g	=	weight moment at motor journal	(Nm)	V	=	ratio of mass moments of inertia of drive train and motor	(–)
M_{mech}	=	maximum permissible drive torque of mechanical system	(Nm)	η	=	mechanical efficiency	(–)

EMC-085-HD – Configuration and Ordering

Short product name, s_{max} **EMC-085-HD-1, ... mm**	**Guideway**		**Drive units**				**Lubrication**			**Version**	
	 Without round flange	 With round flange[1]	PLSA d_0xP 30 x 5	PLSA d_0xP 30 x 10	Ball screw d_0xP 40 x 10	Ball screw d_0xP 40 x 20	With initial greasing	Prelubricated with low-temperature grease		Description	
Without anti-twist feature 	01	02	01	02	12	13	01	02[2]		Without motor mount OF 	
										With motor mount MF 	
With anti-twist feature 	11	12								With timing belt side drive RV01  RV02  RV03  RV04 	

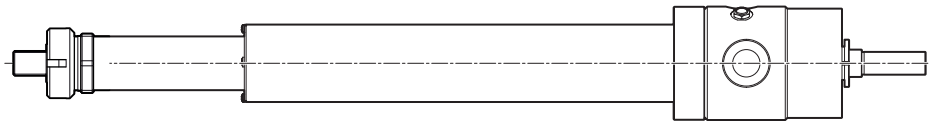
[1] For vertical installation only
[2] Only with PLSA drive

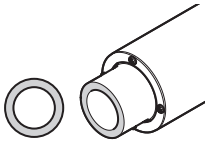
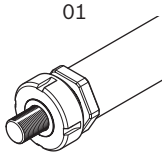
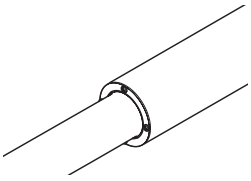
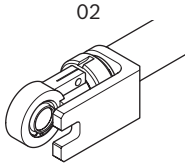
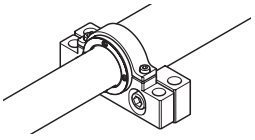
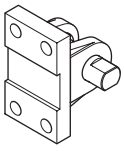
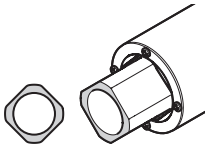
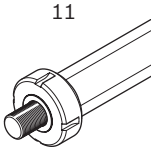
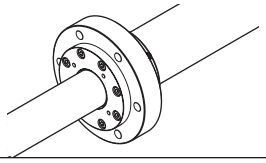
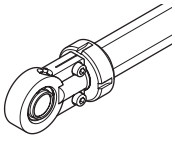
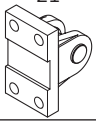
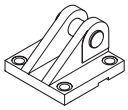
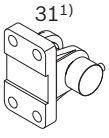
	Motor mounting			**Motor**			**Switches**				**Surface finish**		**Documentation**		
															
	Gear ratio	Description			Without brake	With brake	Without switch	1 reference switch	2 limit switches	2 limit switches and 1 reference switch	Standard	Black painted	Standard report	Measurement report	
		Without	00	Without	00	00	00	01	02	03	01	13	01	02[3]	03[4]
	i = 1	With motor mount	01	MSK071D	114	115									
			02	MSK100B	116	117									
			03	MSK101D	118	119									
				MSK101E	120	121									
	i = 3	With motor mount and gear unit	06	MSK071D	114	115									
			07	MSK101D	118	119									
	i = 5	With motor mount and gear unit	16	MSK071D	114	115									
	i = 1.5	Timing belt side drive	40	MSK071D	114	115									
			41	MSK100B	116	117									
			42	MSK101D	118	119									
				MSK101E	120	121									
	i = 4.5	RV (i = 1.5) and Gear unit (i = 3)	50	MSK071D	114	115									
	i = 7.5	RV (i = 1.5) and Gear unit (i = 5)	70	MSK071D	114	115									

[3] Frictional torque measurement
[4] Lead deviation

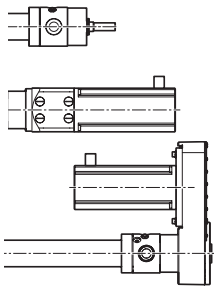
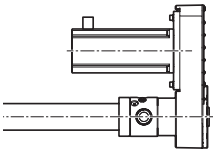
EMC-085-HD – Configuration and Ordering

Mounting Elements



Version	Group 1	Group 2	Version	Group 3
Without anti-twist feature 	00	01 	Without round flange 	00
	00	02 		11 
	11 			
With anti-twist feature 	00	11 	With round flange 	00
	00	12 		
	21 			
	22 			
	31[1] 			

1) With load measuring only on “With anti-twist feature” option (see “Attachments and Accessories” section)

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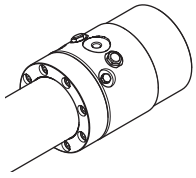
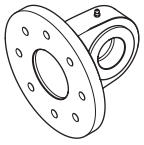
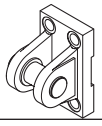
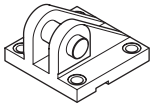
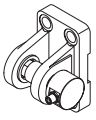
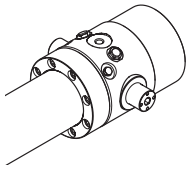
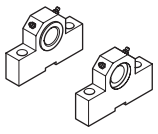
		01 	00	00	
			11 		00
					21 
					22 
					31[1] 
		02 	00	00	
				01 	
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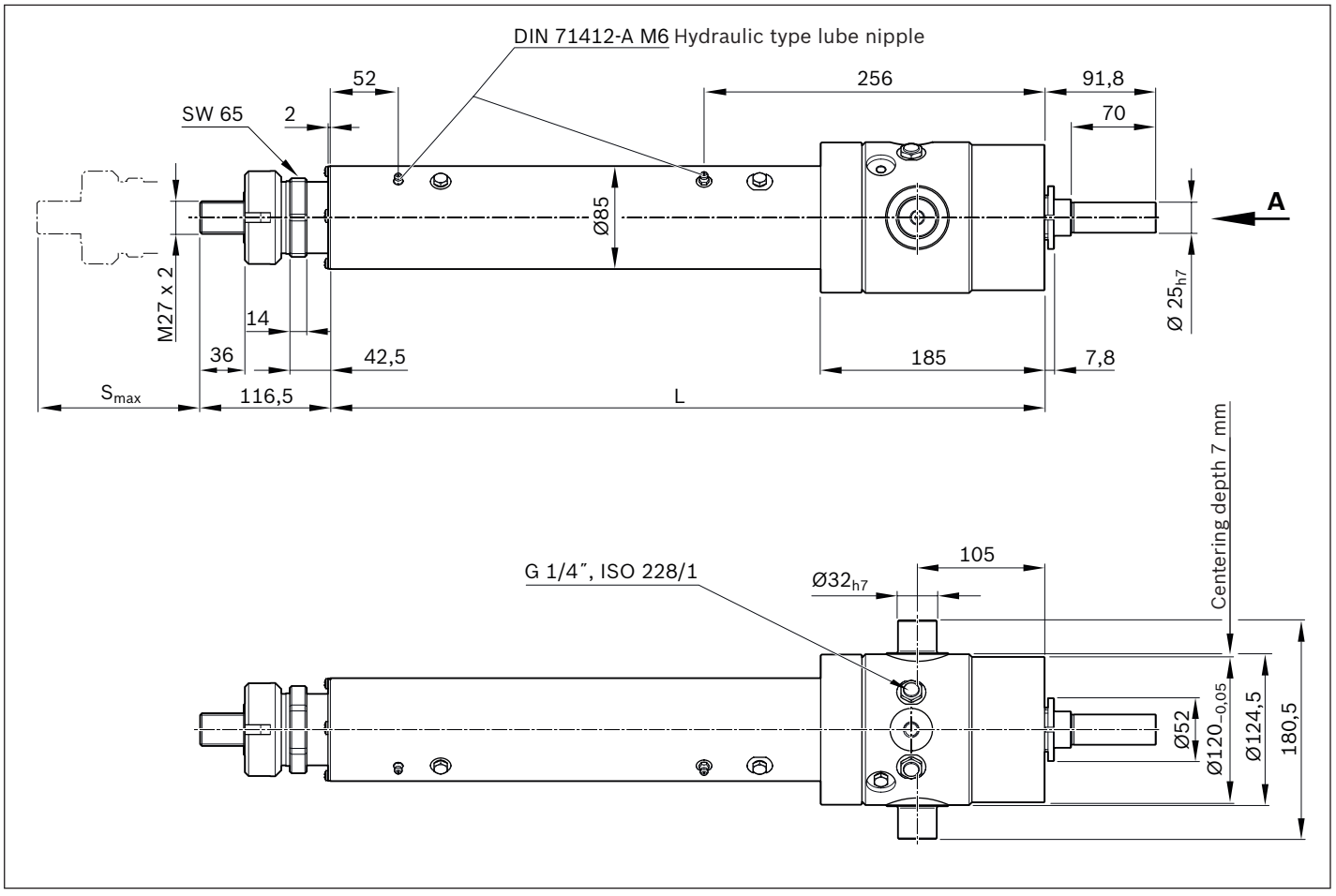
EMC-085-HD – Dimension Drawings

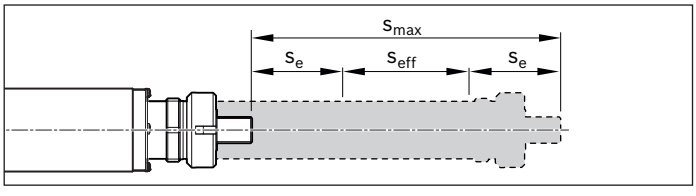


Effective stroke

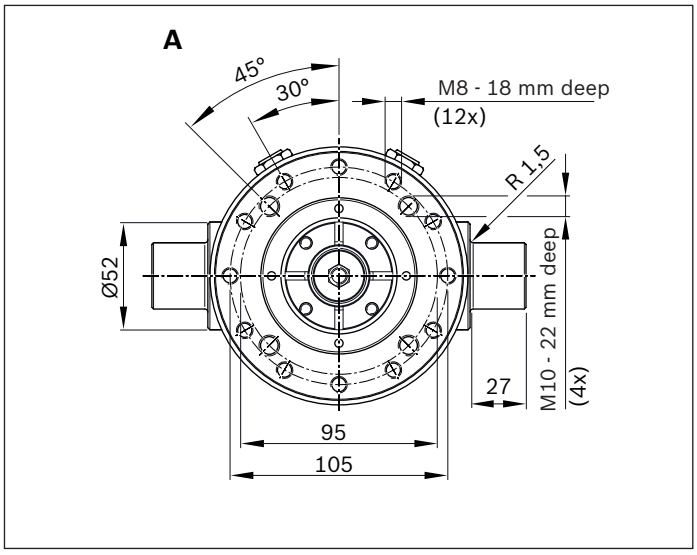
For safe operation the excess travel must be greater than the braking distance. The acceleration travel can be accepted as the guideline value for the braking distance. The following suffices in most cases:
Excess travel = 2 · screw lead (P)
Example: KGT (d_0 x P) 63x10:
Excess travel = 2 · 10 mm = 20 mm

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

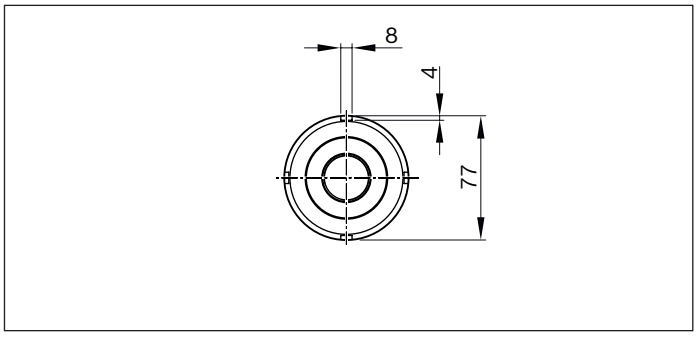
$$s_{eff} = s_{max} - 2 \cdot s_e$$



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



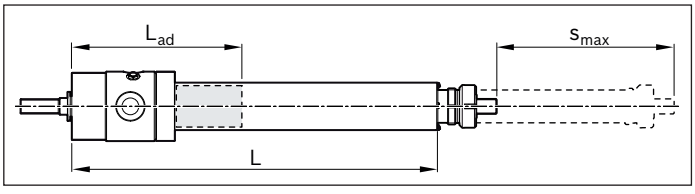
Lock nut on threaded mounting interface



Length calculation L

	d_0xP	L_{ad} (mm)
PLSA	30x5	352
	30x10	352
Ball screw	40x10	352
	40x20	370

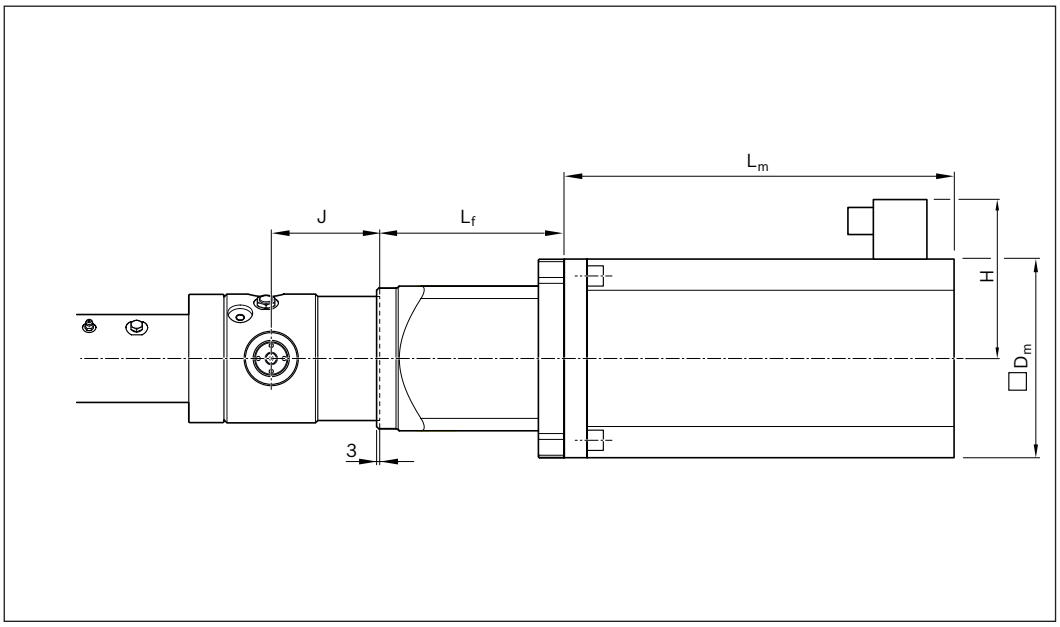
$$L = s_{max} + L_{ad}$$



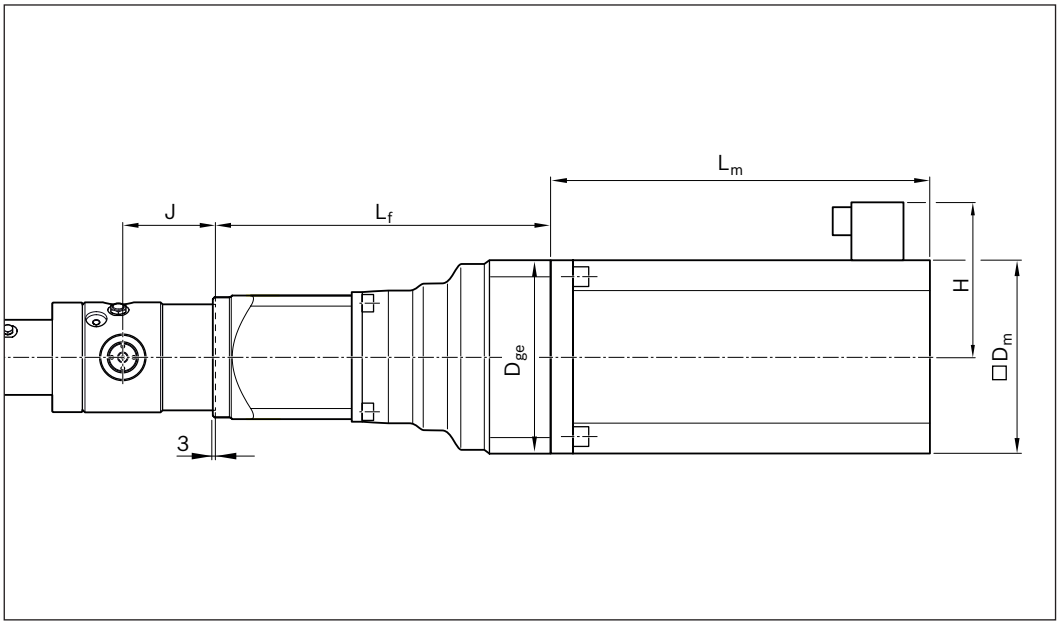
L	=	overall length (without piston rod)	(mm)
L_{ad}	=	additional length	(mm)
s_{max}	=	maximum travel range	(mm)

EMC-085-HD – Motor Attachments

MF01

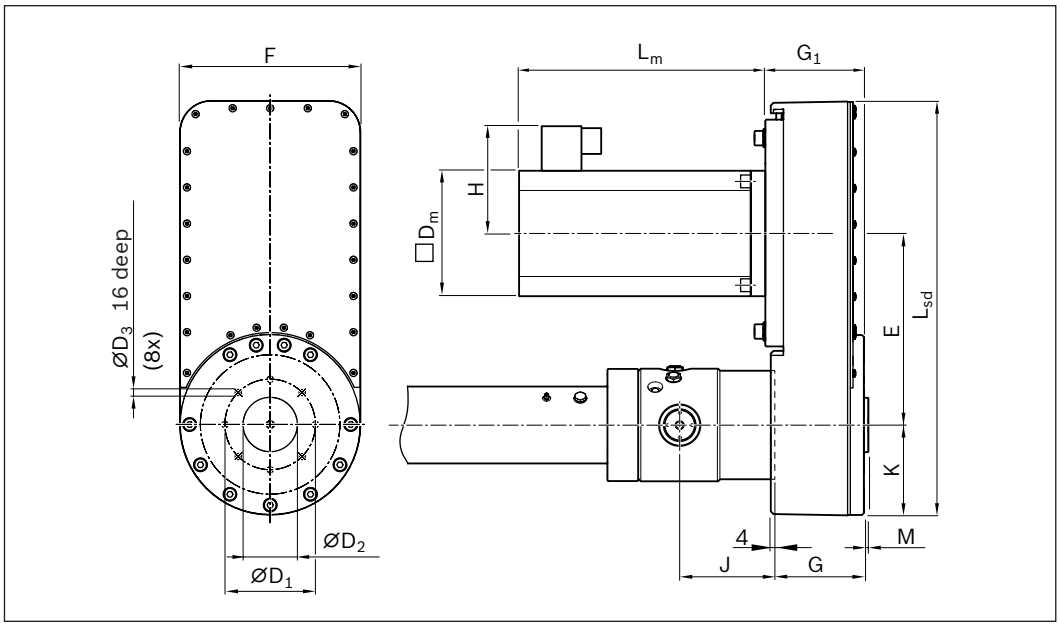


MF01 with gear unit

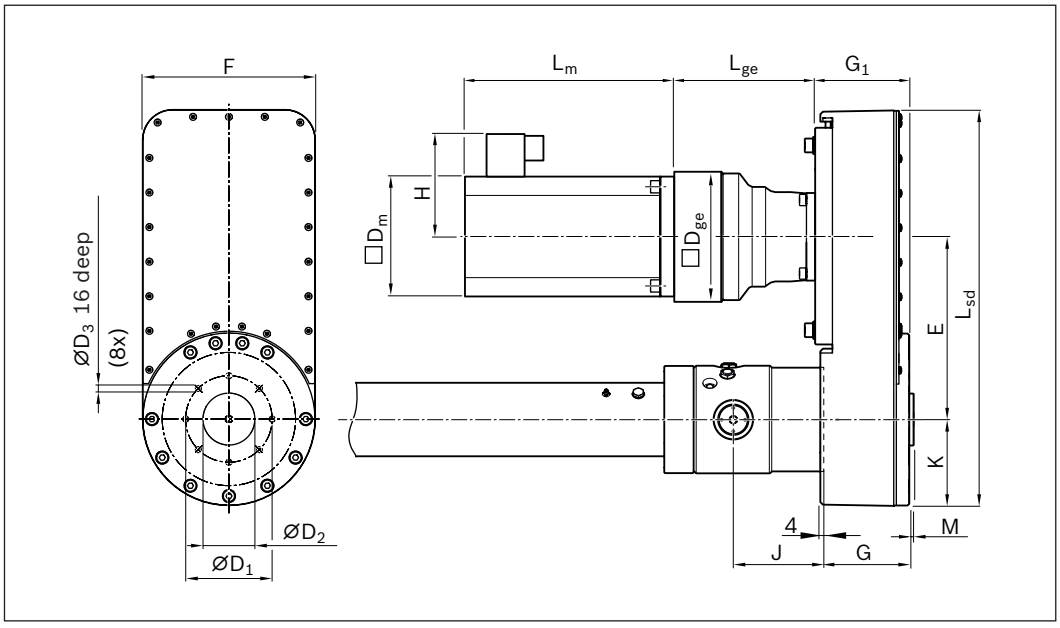


Motor	Option	i	Dimensions (mm)						
			L_m		D_m	D_{ge}	L_f	J	H
			With brake	Without brake					
MSK071D	01	–	347	312	140	–	153.5	105	132
	06	3	347	312	140	150	339.5	105	132
	16	5	347	312	140	150	339.5	105	132
MSK100B	02	–	368	368	192	–	178.5	105	166
MSK101D	03	–	410	410	192	–	178.5	105	166
	07	3	410	410	192	190	339.5	105	166
MSK101E	03	–	501	501	192	–	178.5	105	166

RV01, RV02, RV03, RV04

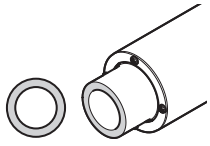
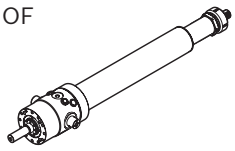
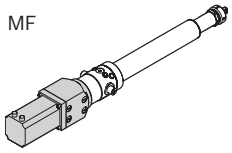
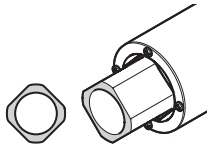
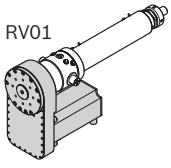
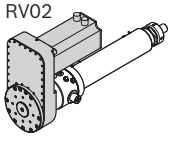
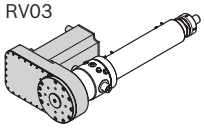
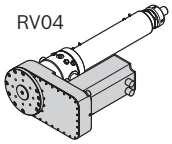


RV01, RV02, RV03, RV04 with gear unit



Motor	Option	i	Dimensions (mm)																
			L_{sd}	E	K	G	G_1	J	M	L_m With brake	L_m Without brake	L_{ge}	D_m	D_{ge}	H	F	$\varnothing D_1$	$\varnothing D_2$ -0.15	$\varnothing D_3$
MSK071D	40	1.5	458	211	100	99	99	105	5	347	312	–	140	–	132	200	100	60	M8
	50	4.5	458	211	100	99	99	105	5	347	312	156	140	150	132				
	70	7.5	458	211	100	99	99	105	5	347	312	156	140	150	132				
MSK100B	41	1.5	458	211	100	99	99	105	5	368	368	–	192	–	166				
MSK101D	42	1.5	458	211	100	99	99	105	5	410	410	–	192	–	166				
MSK101E	42	1.5	458	211	100	99	99	105	5	501	501	–	192	–	166				

EMC-125-HD – Configuration and Ordering

Short product name, s_{max} **EMC-125-HD-1, ... mm**	**Guideway**		**Drive units**				**Lubrication**			**Version**	
			PLSA d_0 x P		Ball screw d_0 x P						
	Without round flange	With round flange[1]	48 x 5	48 x 10	63 x 10	63 x 20	With initial greasing	Prelubricated with low-temperature grease		Description	
Without anti-twist feature 	01	02	01	02	12	13	01	02[2]		Without motor mount OF 	
										With motor mount MF 	
With anti-twist feature 	11	12								With timing belt side drive (SD) RV01  RV02  RV03  RV04 	

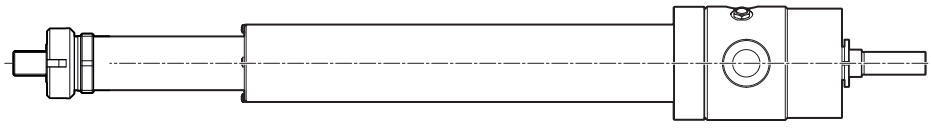
[1] For vertical installation only
[2] Only with PLSA drive

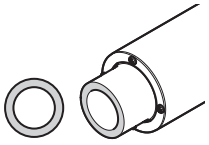
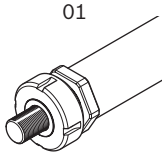
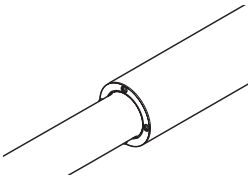
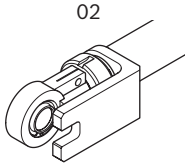
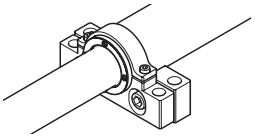
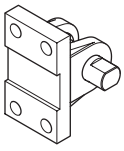
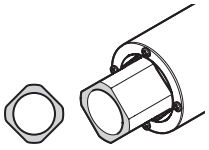
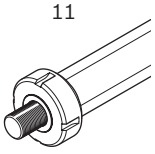
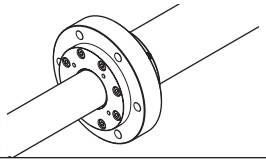
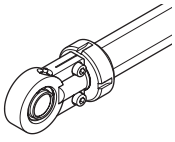
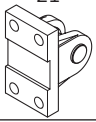
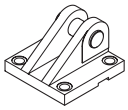
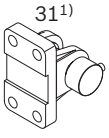
	Motor mounting			**Motor**			**Switches**				**Surface finish**		**Documentation**		
	Gear ratio	Description			Without brake	With brake	Without switch	1 reference switch	2 limit switches	2 limit switches and 1 reference switch	Standard	Black painted	Standard report	Measurement report	
		Without	00	Without	000	000	00	01	02	03	01	13	01	02[3]	03[4]
	i = 1	With motor mount	02	MSK100B	116	117									
			03	MSK101D	118	119									
				MSK101E	120	121									
	i = 3	With motor mount and gear unit	06	MSK100B	116	117									
			07	MSK101D	118	119									
	i = 5	With motor mount and gear unit	16	MSK071D	114	115									
	i = 1.5	Timing belt side drive	41	MSK100B	116	117									
			42	MSK101D	118	119									
				MSK101E	120	121									
	i = 4.5	RV (i = 1.5) and Gear unit (i = 3)	51	MSK100B	116	117									
			52	MSK101D	118	119									
	i = 7.5	RV (i = 1.5) and Gear unit (i = 5)	70	MSK071D	114	115									

[3] Frictional torque measurement
[4] Lead deviation

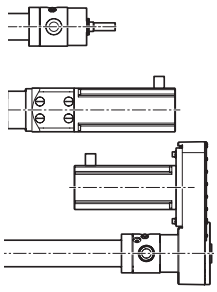
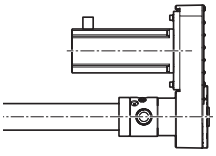
EMC-125-HD – Configuration and Ordering

Mounting Elements



Version	Group 1	Group 2	Version	Group 3
Without anti-twist feature 	00	01 	Without round flange 	00
	00	02 		11 
	11 			
With anti-twist feature 	00	11 	With round flange 	00
	00	12 		
	21 			
	22 			
	31[1] 			

1) With load measuring only on “With anti-twist feature” option (see “Attachments and Accessories” section)

		Group 4	Group 5	Group 6	
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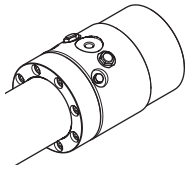
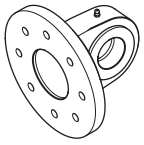
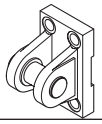
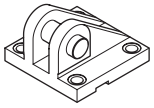
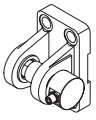
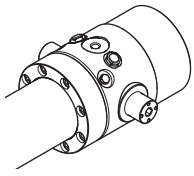
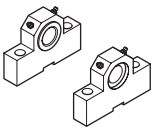
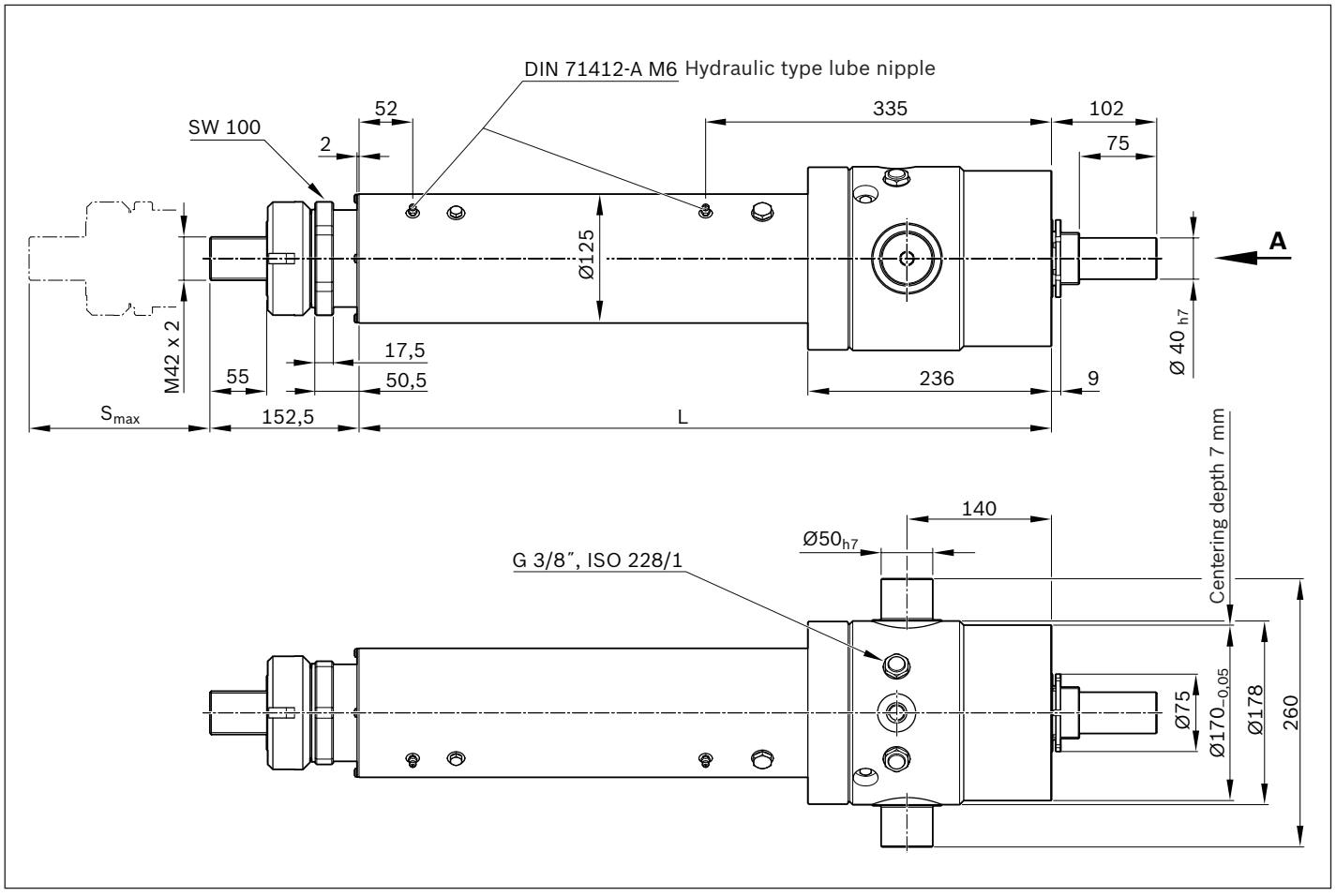
		01 	11 	00	
				21 	
				22 	
				31[1] 	
		02 	00	00	
				01 	
		01	00	00	

EMC-125-HD – Dimension Drawings

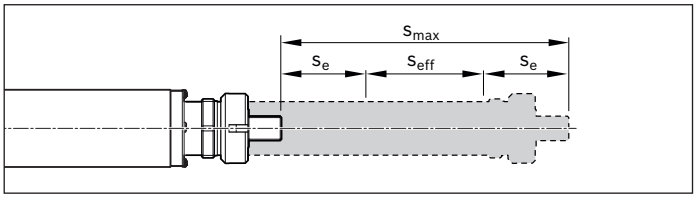


Effective stroke

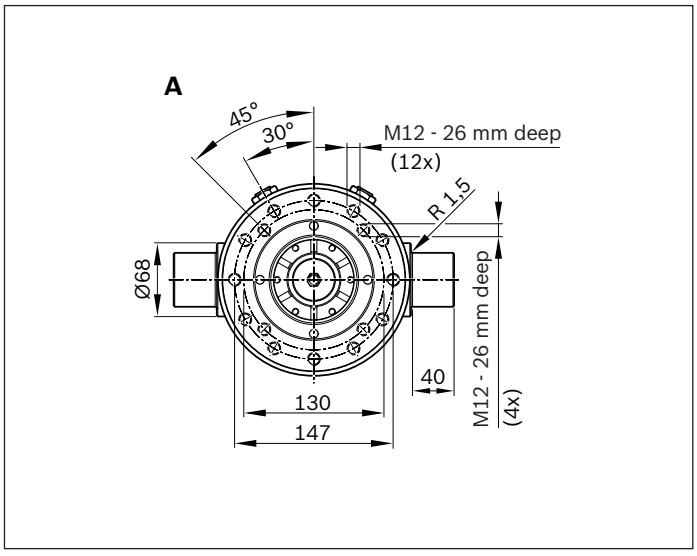
For safe operation the excess travel must be greater than the braking distance. The acceleration travel can be accepted as the guideline value for the braking distance. The following suffices in most cases:
Excess travel = 2 · screw lead (P)
Example: KGT (d_0 x P) 63x10:
Excess travel = 2 · 10 mm = 20 mm

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

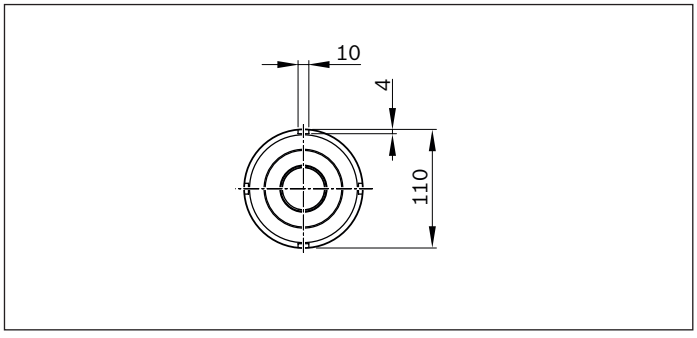
$$s_{eff} = s_{max} - 2 \cdot s_e$$



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



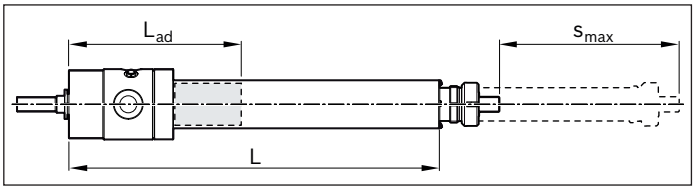
Slotted nut on threaded mounting interface



Length calculation L

	d_0xP	L_{ad} (mm)
PLSA	48x5	442
	48x10	442
Ball screw	63x10	405
	63x20	427

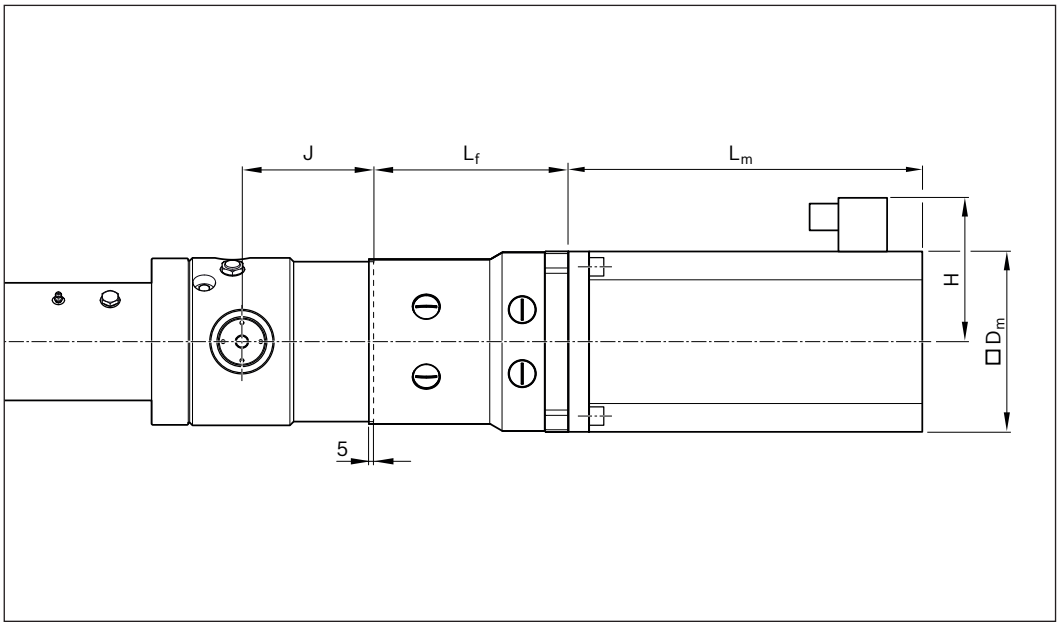
$$L = s_{max} + L_{ad}$$



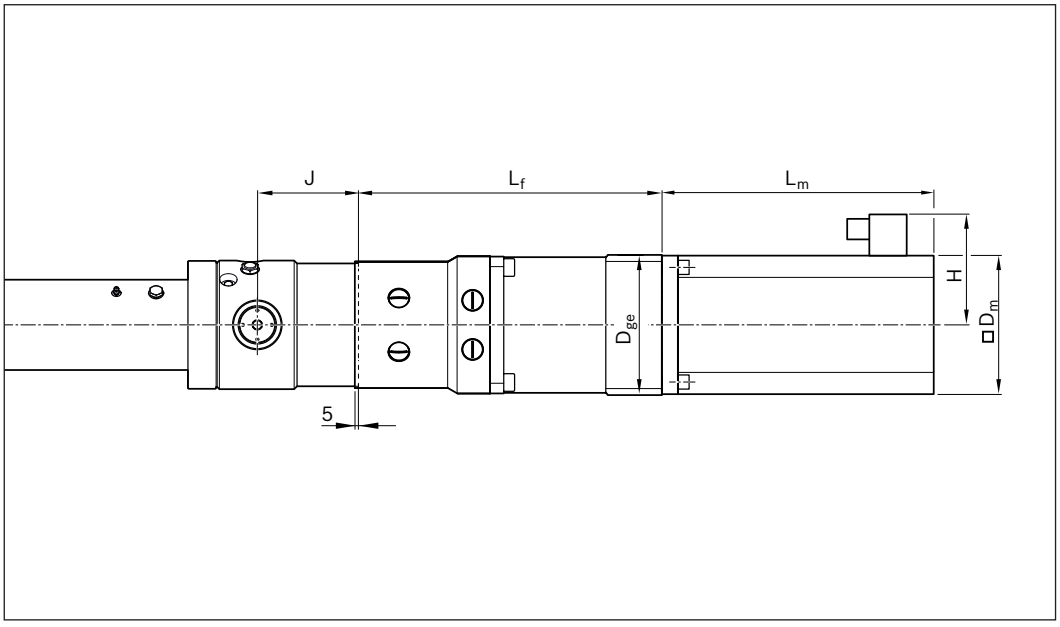
L	=	overall length (without piston rod)	(mm)
L_{ad}	=	additional length	(mm)
s_{max}	=	maximum travel range	(mm)

EMC-125-HD – Motor Attachments

MF01

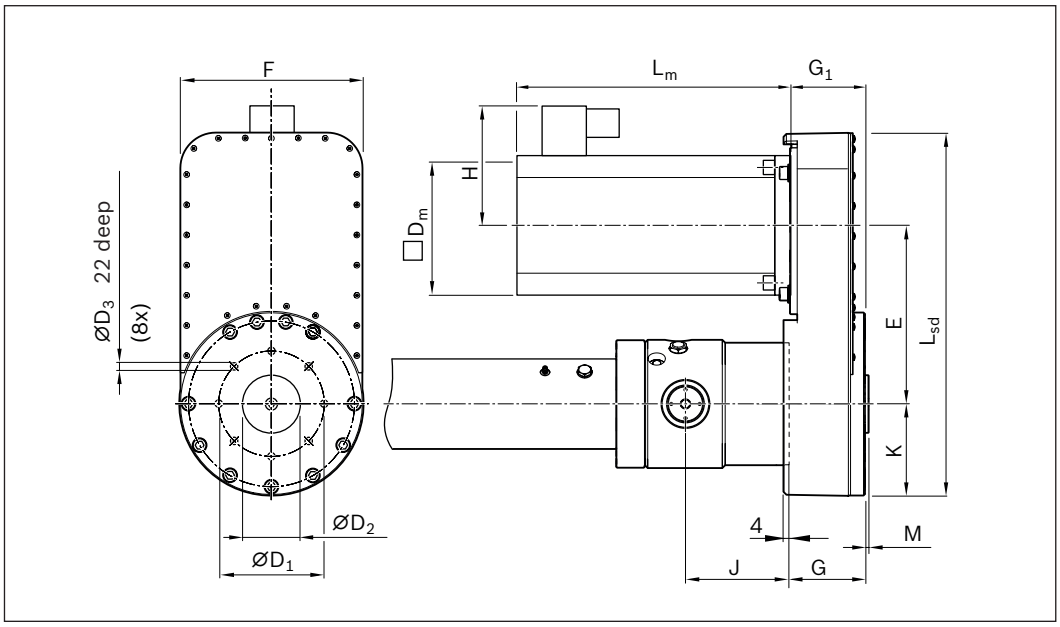


MF01 with gear unit

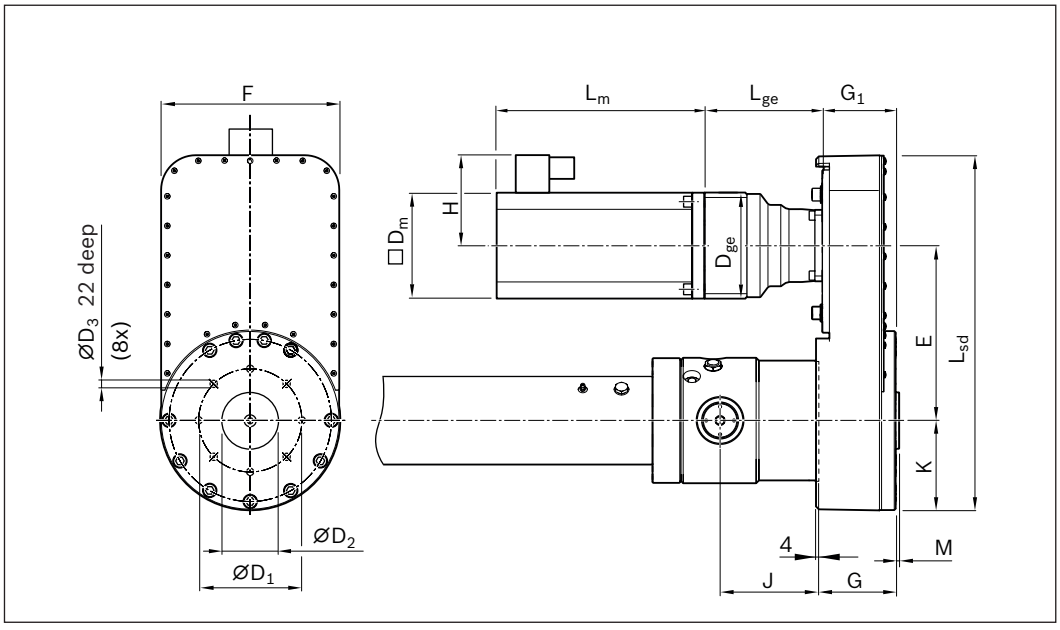


Motor	Option	i	Dimensions (mm)						
			L_m		D_m	D_{ge}	L_f	J	H
			With brake	Without brake					
MSK071D	16	5	347	312	140	150	388.3	140	132
MSK100B	02	–	368	368	192	–	207.0	140	166
	06	3	368	368	192	190	368.0	140	166
MSK101D	03	–	410	410	192	–	207.0	140	166
	07	3	410	410	192	190	388.3	140	166
MSK101E	03	–	501	501	192	–	207.0	140	166

RV01, RV02, RV03, RV04



RV01, RV02, RV03, RV04 with gear unit



Motor	Option	i	Dimensions (mm)																
			L_{sd}	E	K	G	G_1	J	M	L_m With brake	L_m Without brake	L_{ge}	D_m	D_{ge}	H	F	$ØD_1$	$ØD_2$ -0.15	$ØD_3$
MSK100B	41	1.5	504	248	128	109	104	140	5	368	368	–	192	–	166	255	145	80	M12
MSK101D	42	1.5	504	248	128	109	104	140	5	410	410	–	192	–	166				
MSK101E	42	1.5	504	248	128	109	104	140	5	501	501	–	192	–	166				
MSK100B	51	4.5	504	248	128	109	114	140	5	368	368	156	192	190	166				
MSK101D	52	4.5	504	248	128	109	114	140	5	410	410	156	192	190	166				
MSK071D	70	7.5	504	248	128	109	114	140	5	347	312	156	140	150	132				

EMC-180-HD – Configuration and Ordering

Short product name, s_{max} **EMC-180-HD-1, ... mm**	**Guideway**		**Drive units**		**Lubrication**			**Version**	
	Without round flange	With round flange[1]	PLSA d_0 x P 75 x 10	75 x 20	With initial greasing	Prelubricated with low-temperature grease		Description	
Without anti-twist feature	01	02	01	02	01	02[2]		Without motor mount	OF
								With motor mount	MF
With anti-twist feature	11	12						With timing belt side drive (SD)	RV01 RV02 RV03 RV04

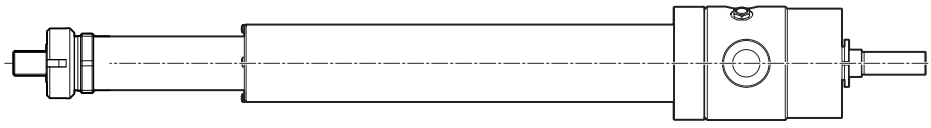
[1] For vertical installation only
[2] Only with PLSA drive

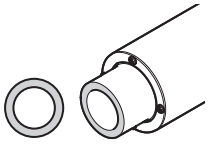
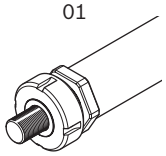
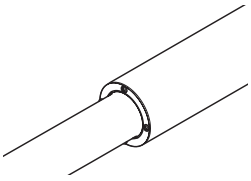
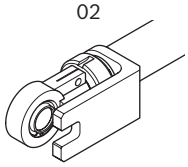
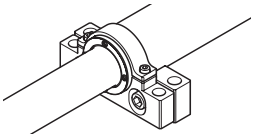
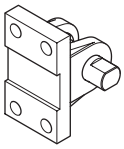
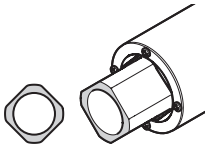
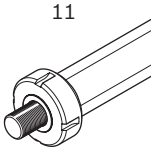
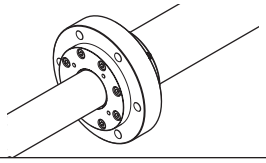
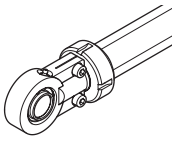
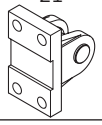
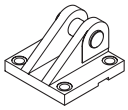
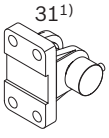
Motor mounting			Motor			Switches				Surface finish		Documentation		
Gear ratio	Description			Without brake	With brake	Without switch	1 reference switch	2 limit switches	2 limit switches and 1 reference switch	Standard	Black painted	Standard report	Measurement report	
	Without	00	Without	000	000	00	01	02	03	01	13	01	02[3]	03[4]
i = 1	With motor mount	03	MSK101D	118	119									
			MSK101E	120	121									
			MSK101E[5]	124	125									
		04	MSK133B[5]	126	127									
			MSK133D[5]	128	129									
i = 3	With motor mount and gear unit SP180	07	MSK101D	118	119									
			MSK101E	120	121									
			MSK101E[5]	124	125									
	With motor mount and gear unit XP050S	08	MSK133B[5]	126	127									
			MSK133D[5]	128	129									
i = 5	With motor mount and gear unit SP180	17	MSK101D	118	119									
			MSK101E	120	121									
			MSK101E[5]	124	125									
	With motor mount and gear unit XP050S	18	MSK133B[5]	126	127									
			MSK133D[5]	128	129									
	With motor mount and gear unit SP180	27	MSK101D	118	119									
			MSK101E	120	121									
			MSK101E[5]	124	125									
i = 1.5	Timing belt side drive	42	MSK101D	118	119									
			MSK101E	120	121									
			MSK101E[5]	124	125									
		43	MSK133B[5]	126	127									
			MSK133D[5]	128	129									
i = 4.5	RV (i = 1.5) and gear unit SP140 (i = 3)	51	MSK101D	118	119									
			MSK101E	120	121									
			MSK101E[5]	124	125									
	RV (i = 1.5) and gear unit SP180 (i = 3)	52	MSK101E	120	121									
			MSK101E[5]	124	125									
		53	MSK133B[5]	126	127									
i = 7.5	RV (i = 1.5) and gear unit SP140 (i = 5)	71	MSK101D	118	119									
			MSK101E	120	121									
			MSK101E[5]	124	125									
	RV (i = 1.5) and gear unit SP180 (i = 5)	72	MSK101E	120	121									
			MSK101E[5]	124	125									

[3] Frictional torque measurement
[4] Lead deviation
[5] With blower

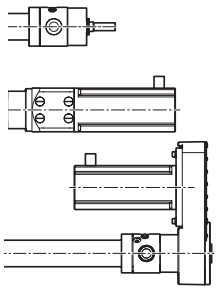
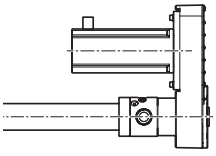
EMC-180-HD – Configuration and Ordering

Mounting Elements



Version	Group 1	Group 2	Version	Group 3
Without anti-twist feature 	00	01 	Without round flange 	00
	00	02 		11 
	11 			
With anti-twist feature 	00	11 	With round flange 	00
	00	12 		
	21 			
	22 			
	31[1] 			

1) With load measuring only on “With anti-twist feature” option (see “Attachments and Accessories” section)

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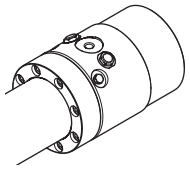
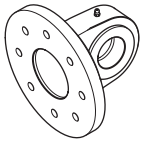
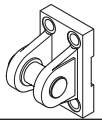
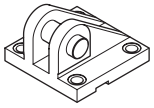
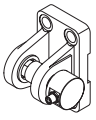
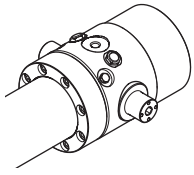
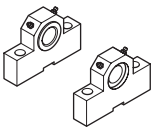
		01 	00	00	
			11 		00
					21 
					22 
					31[1)] 
		02 	00	00	
				01 	
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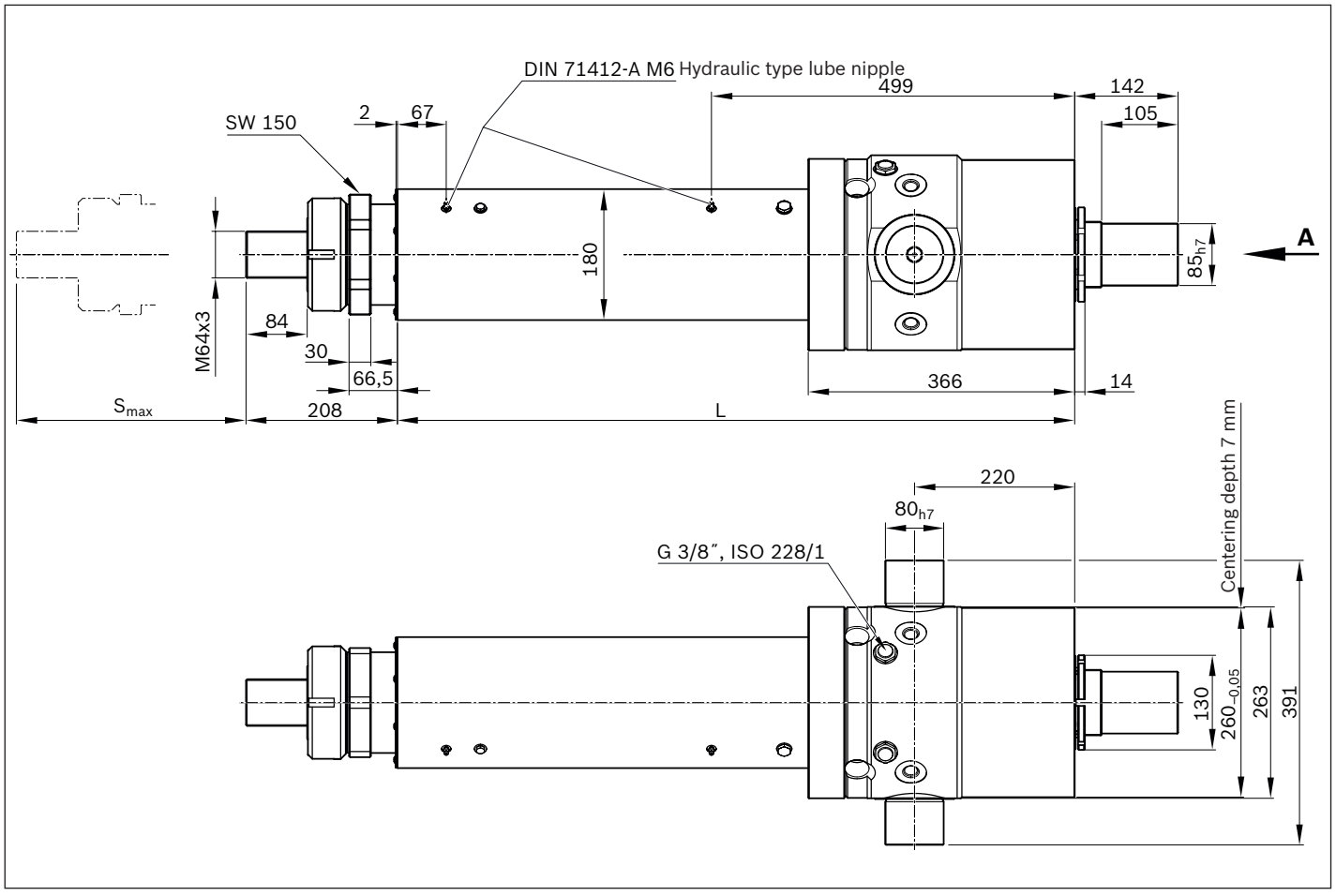
EMC-180-HD – Dimension Drawings

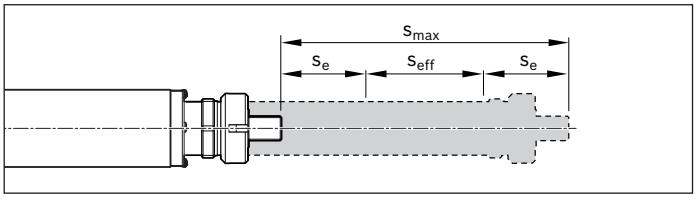


Effective stroke

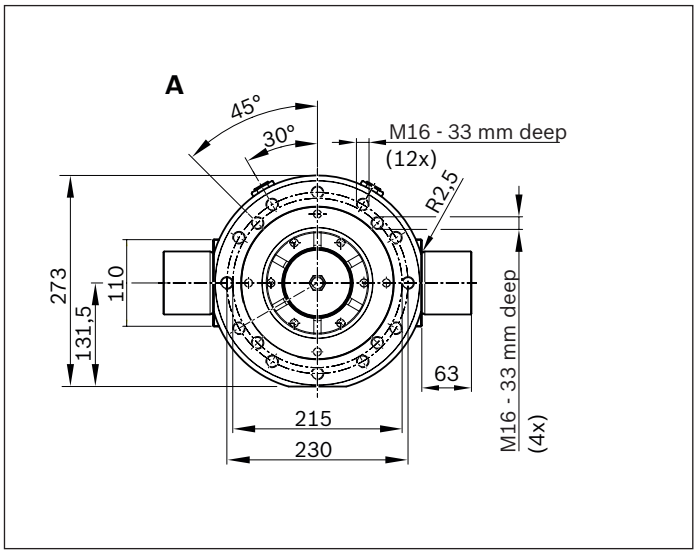
For safe operation the excess travel must be greater than the braking distance. The acceleration travel can be accepted as the guideline value for the braking distance. The following suffices in most cases:
Excess travel = 2 · screw lead (P)
Example: PLSA (d_0 x P) 75 x10:
Excess travel = 2 · 10 mm = 20 mm

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

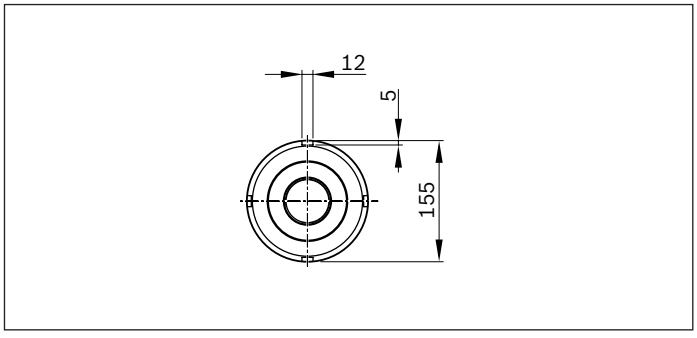
$$s_{eff} = s_{max} - 2 \cdot s_e$$



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



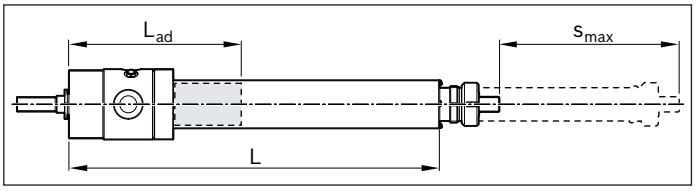
Slotted nut on threaded mounting interface



Length calculation L

	d_0xP	L_{ad} (mm)
PLSA	75x10	677
	75x20	677

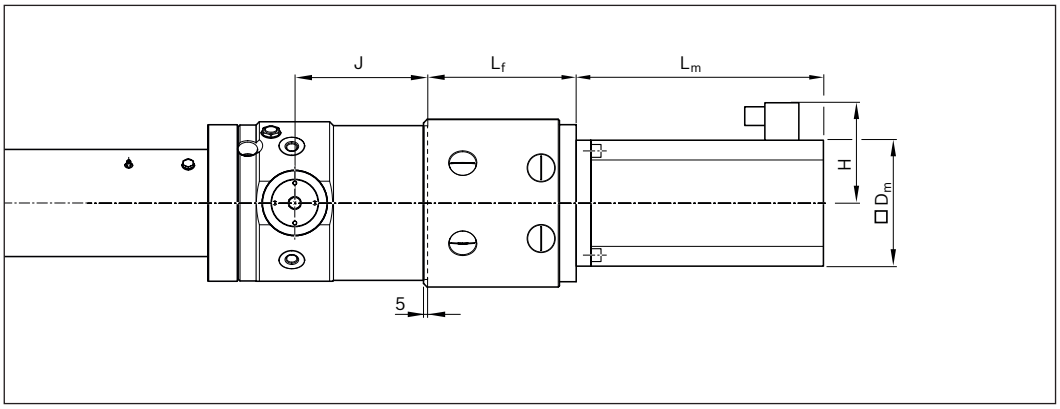
$$L = s_{max} + L_{ad}$$



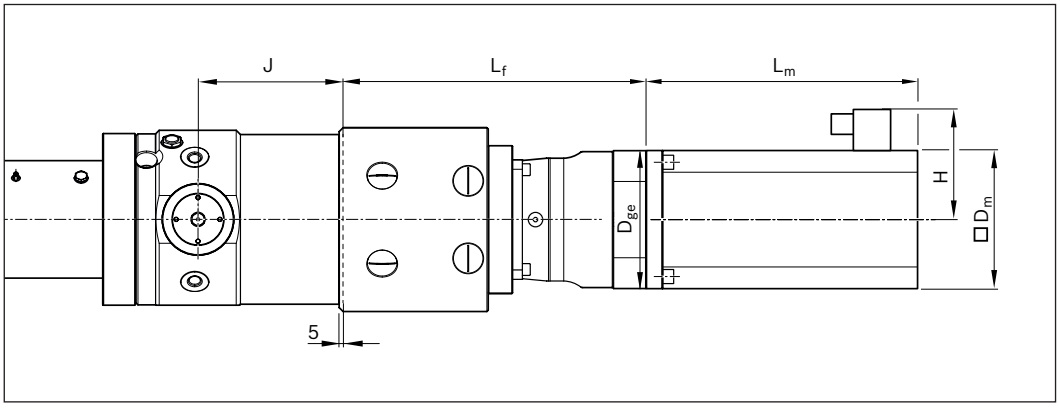
L	=	overall length (without piston rod)	(mm)
L_{ad}	=	additional length	(mm)
s_{max}	=	maximum travel range	(mm)

EMC-180-HD – Motor Attachments

MF01



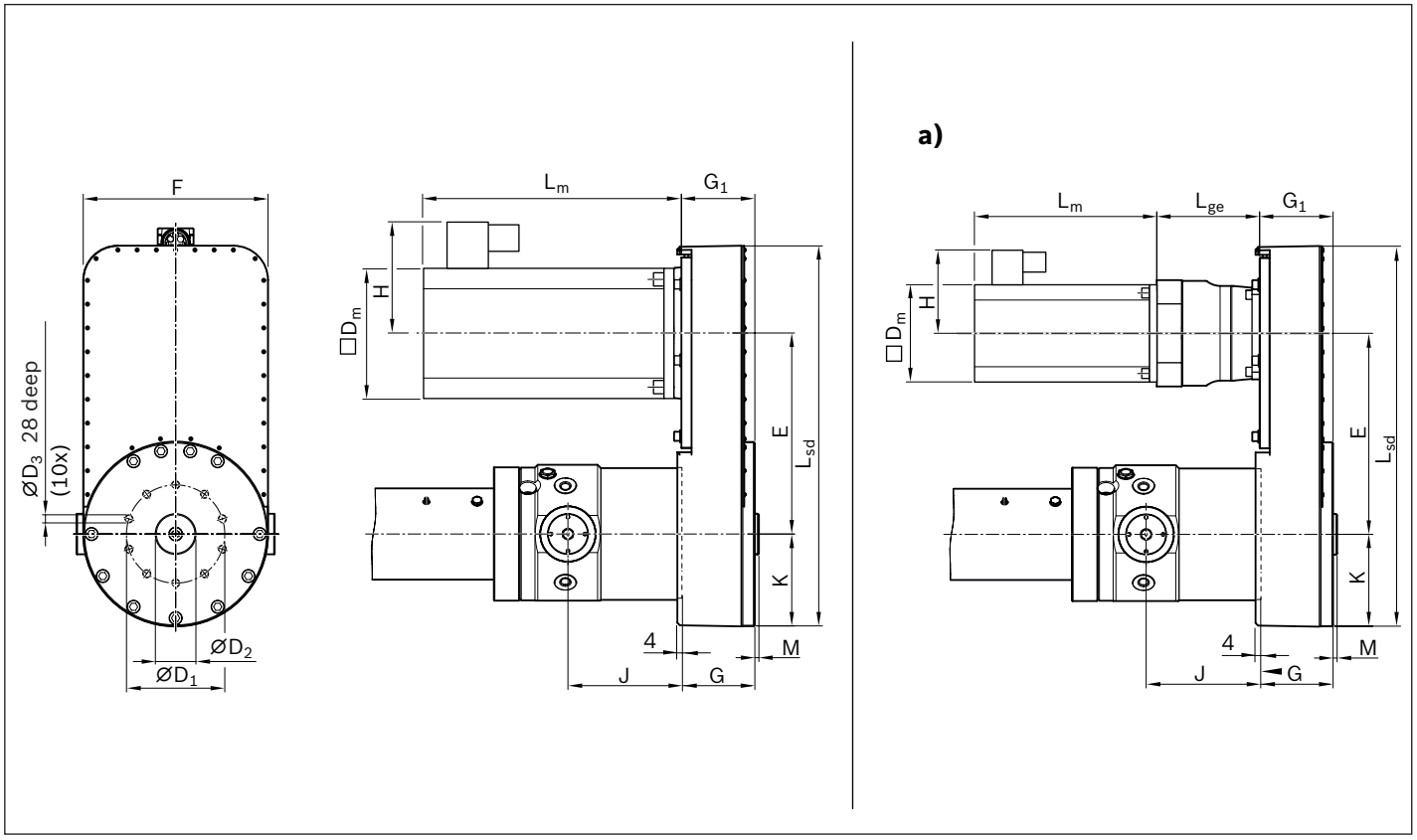
MF01 with gear unit



Motor	Option	i	Dimensions (mm)						
			L_m		D_m	D_{ge}	L_f	J	H
			With brake	Without brake					
MSK101D	03	1	410	410	192	–	259	220	166
MSK101E	03	1	501	501	192	–	259	220	166
MSK101E[1)]	04	1	672	672	208	–	259	220	166
MSK133B[1)]	04	1	807	622	260	–	255	220	214
MSK133D[1)]	04	1	907	722	260	–	255	220	238
MSK101D	07	3	410	410	192	210	462	220	166
MSK101E	07	3	501	501	192	210	462	220	166
MSK101E[1)]	07	3	672	672	208	210	462	220	166
MSK133B[1)]	08	3	807	622	260	260	490	220	214
MSK133D[1)]	08	3	907	722	260	260	490	220	238
MSK101D	17	5	410	410	192	210	462	220	166
MSK101E	17	5	501	501	192	210	462	220	166
MSK101E[1)]	17	5	672	672	208	210	462	220	166
MSK133B[1)]	18	5	807	622	260	260	490	220	214
MSK133D[1)]	18	5	907	722	260	260	490	220	238
MSK101D	27	7	410	410	192	210	462	220	166
MSK101E	27	7	501	501	192	210	462	220	166
MSK101E[1)]	27	7	672	672	208	210	462	220	166

[1)] With blower

RV01, RV02, RV03, RV04



a) With gear unit

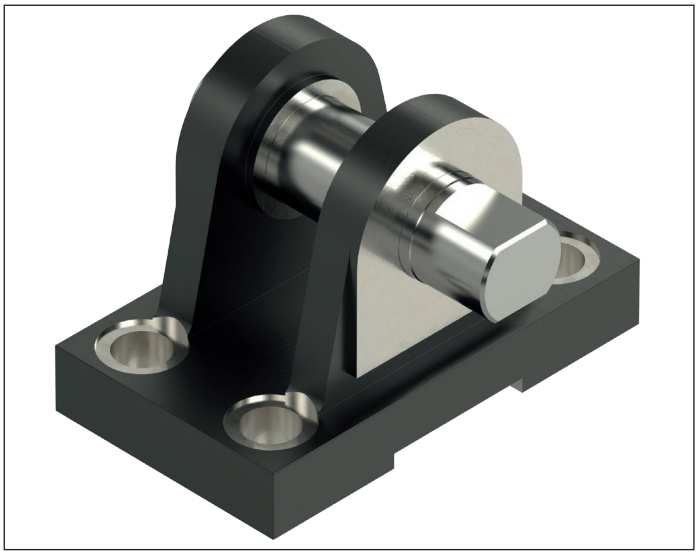
Motor	Option	i	Dimensions (mm)																
			L_{sd}	E	K	G	G_1	J	M	L_m With brake	L_m Without brake	L_{ge}	D_m	D_{ge}	H	F	$ØD_1$	$ØD_2$ -0.15	$ØD_3$
MSK101D	42	1.5	752	397.1	182.5	149	145	220	8	410	410	–	192	–	166	365	194	80	M16
MSK101E	42	1.5	752	397.1	182.5	149	145	220	8	501	501	–	192	–	166				
MSK101E[1)]	42	1.5	752	397.1	182.5	149	145	220	8	672	672	–	208	–	166				
MSK133B[1)]	43	1.5	752	397.1	182.5	149	145	220	8	807	622	–	260	–	214				
MSK133D[1)]	43	1.5	752	397.1	182.5	149	145	220	8	907	722	–	260	–	238				
MSK101D	51	4.5	752	397.1	182.5	149	145	220	8	410	410	171	192	190	166				
MSK101E	51	4.5	752	397.1	182.5	149	145	220	8	501	501	171	192	190	166				
MSK101E[1)]	51	4.5	752	397.1	182.5	149	145	220	8	672	672	171	208	190	166				
MSK101E	52	4.5	752	397.1	182.5	149	145	220	8	501	501	203	192	210	166				
MSK101E[1)]	52	4.5	752	397.1	182.5	149	145	220	8	672	672	203	208	210	166				
MSK133B[1)]	53	4.5	752	397.1	182.5	149	145	220	8	807	622	239	260	260	214				
MSK101D	71	7.5	752	397.1	182.5	149	145	220	8	410	410	171	192	190	166				
MSK101E	71	7.5	752	397.1	182.5	149	145	220	8	501	501	171	192	190	166				
MSK101E[1)]	71	7.5	752	397.1	182.5	149	145	220	8	672	672	171	208	190	166				
MSK101E	72	7.5	752	397.1	182.5	149	145	220	8	501	501	203	192	210	166				
MSK101E[1)]	72	7.5	752	397.1	182.5	149	145	220	8	672	672	203	208	210	166				

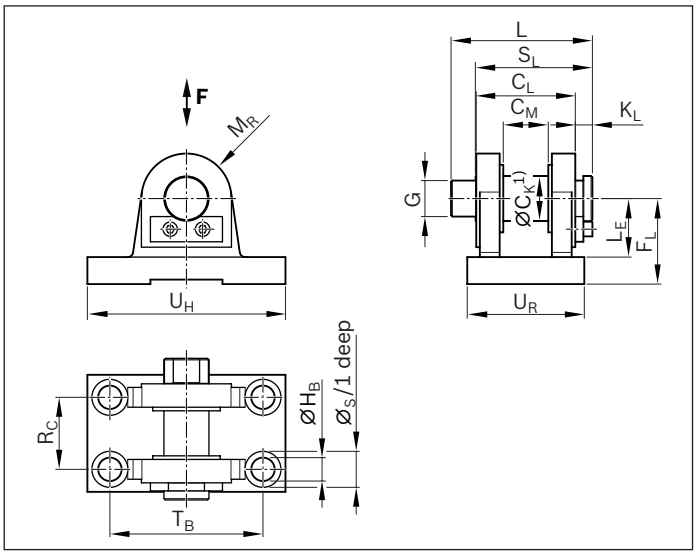
1) With blower

Mounting Elements

Clevis bracket CLCD (comparable with ISO 8132) for spherical rod end bearing with clevis, form A

Group 1, option 11





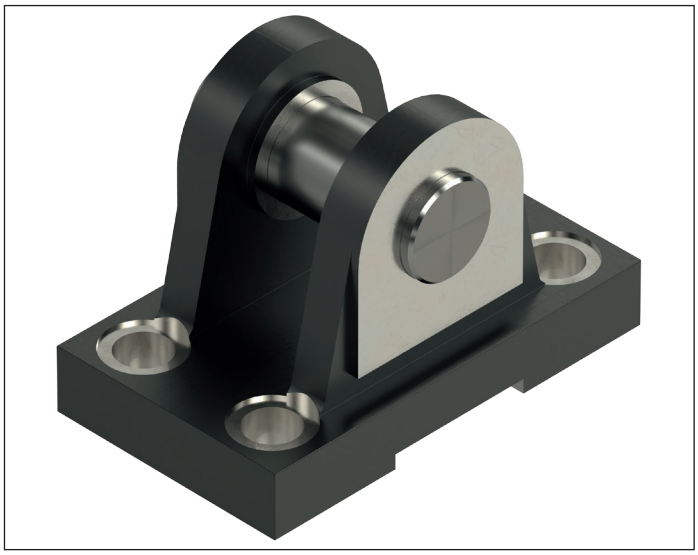
EMC-HD	Part number	Dimensions (mm)																
		$ØC_K$ 1) H9	C_L h16	C_M A12	F_L js12	$ØH_B$ H13	K_L	L_E min.	M_R max.	R_C js14	ØS	S_L 2)	L 2)	G 2) f7	T_B js14	U_R max.	U_H max.	m (kg)
085	R156330100	32	70	32	65	17.5	13	43	32	50	26	90.5	114.5	25	110	85	143	3.15
125	R156350100	50	110	50	95	26.0	19	65	50	80	40	130.0	157.0	40	170	130	220	10.95
180	R156370100	80	170	80	140	39.0	26	95	80	125	57	192.0	230.0	70	250	210	320	33.40

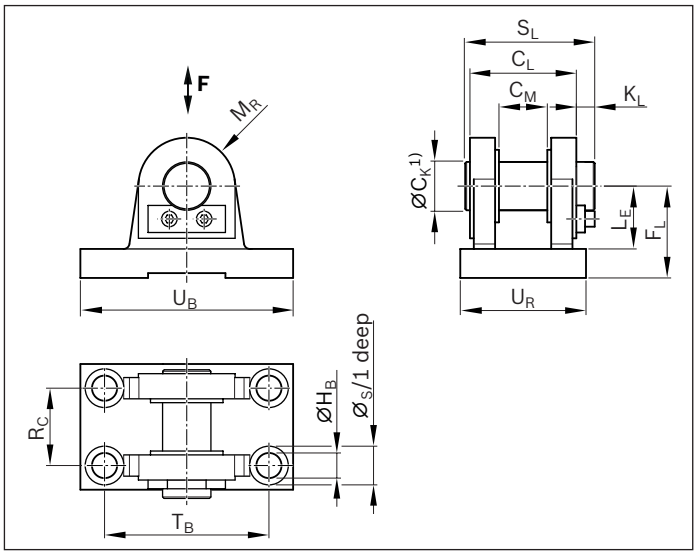
1) Matching pivot pin Ø f7 (pin and pin locking feature are included in the scope of supply and are not ready-mounted on delivery)
2) Values deviate from ISO 8132 standard

Note: Non-dimensioned contours may deviate from the illustration and/or from the CAD file.

Clevis bracket CLCD ISO 8132, form A

Group 1 / 6, option 21





EMC-HD	Part number	Dimensions (mm)															
		$ØC_K$ 1) H9	C_L h16	C_M A12	F_L js12	$ØH_B$ H13	K_L	L_E min.	M_R max.	R_C js14	ØS	S_L	T_B js14	U_R max.	U_H max.	m (kg)
085	R156330101	32	70	32	65	17.5	13	43	32	50	26	87	110	85	143	3.0
125	R156350101	50	110	50	95	26.0	19	65	50	80	40	133	170	130	220	10.6
180	R156370101	80	170	80	140	39.0	26	95	80	125	57	202	250	210	320	32.0

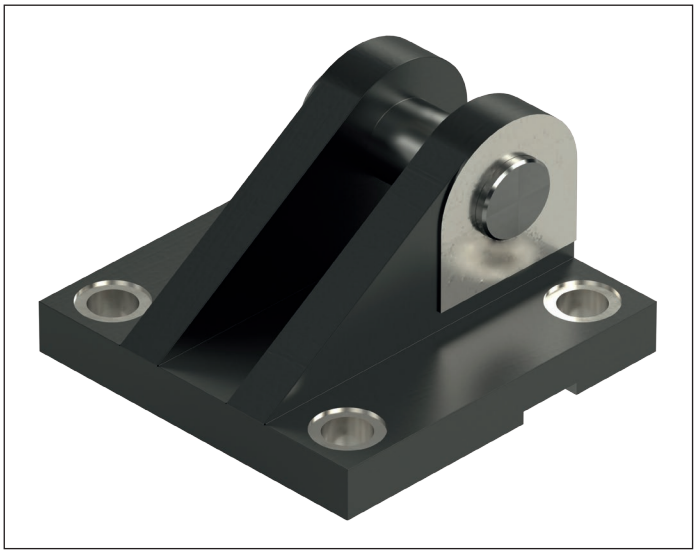
1) Matching pivot pin Ø m6 (pin and pin locking feature are included in the scope of supply and are not ready-mounted on delivery)

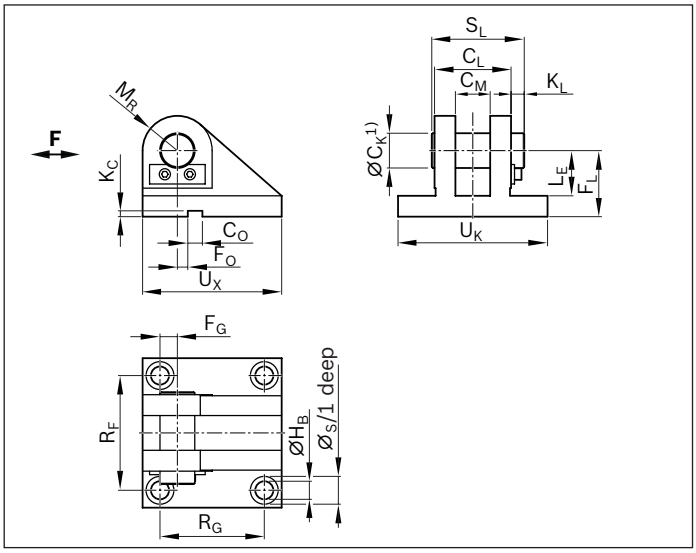
Note: Non-dimensioned contours may deviate from the illustration and/or from the CAD file.

Mounting Elements

Clevis bracket CLCA ISO 8132, form B

Group 1 / 6, option 22





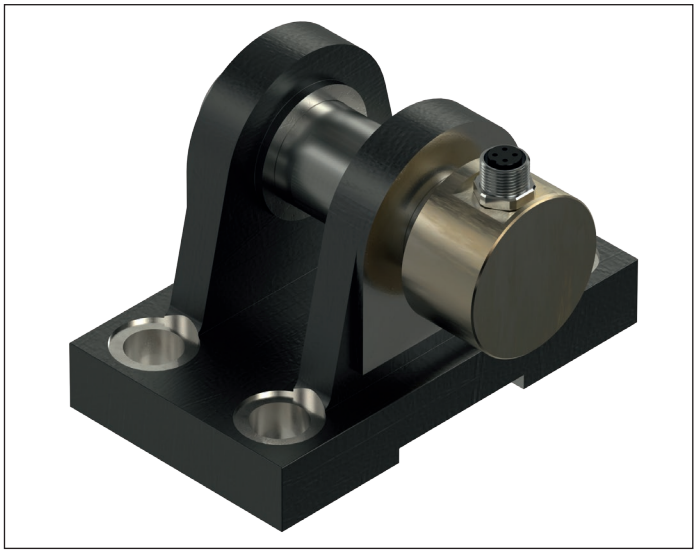
EMC-HD	Part number	Dimensions (mm)																			
		$ØC_K$[1] H9	C_L h16	C_M A12	C_O N9	F_G js14	F_L js12	F_O js14	$ØH_B$ H13	K_C +0.3	K_L	L_E min.	M_R max.	R_F js14	R_G js14	ØS	S_L	U_K max.	U_X max.	m (kg)
085	R156330102	32	70	32	25	14.5	65	6	17.5	5.4	13	43	32	110	110	26	87	145	145	4.5
125	R156350102	50	110	50	36	25.0	95	0	26 ,0	8.4	19	65	50	165	150	40	133	215	200	13.5
180	R156370102	80	170	80	50	45.0	140	0	39.0	11.4	26	95	80	250	210	57	202	320	280	38.5

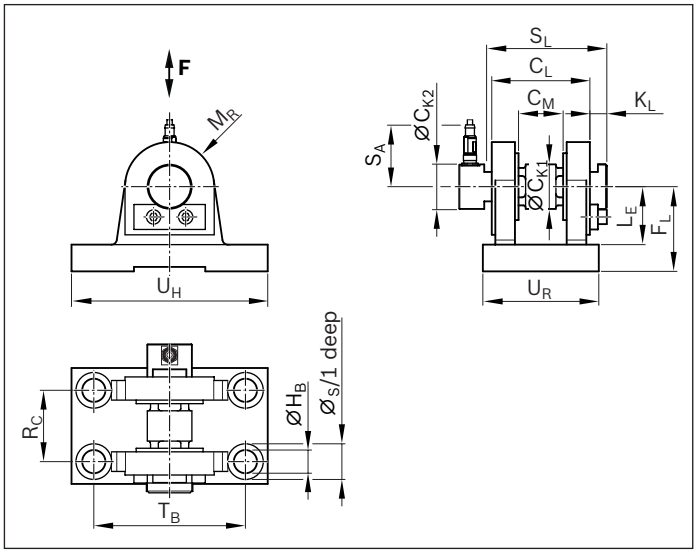
[1] Matching pivot pin Ø m6 (pin and pin locking feature are included in the scope of supply and are not ready-mounted on delivery)

Note: Non-dimensioned contours may deviate from the illustration and/or from the CAD file.

Clevis bracket CLCD (comparable with ISO 8132), form A, with load measuring pin

Group 1 / 6, option 31





EMC-HD	Part number	Dimensions (mm)																
		$ØC_{K1}$[1] H9	$ØC_{K2}$	C_L h16	C_M A12	F_L js12	$ØH_B$ H13	K_L[2]	L_E min.	M_R max.	R_C js14	ØS	S_L[2]	T_B js14	U_R max.	U_H max.	S_A[2]	m (kg)
085	R156330103	32	50	70	32	65	17.5	12	43	32	50	26	117.0	110	85	143	69.5	3.35
125	R156350103	50	50	110	50	95	26.0	20	65	50	80	40	166.5	170	130	220	69.5	11.05
180	R156370103	80	80	170	80	140	39.0	95	80	125	57	250	201.5	250	210	320	93.0	34.5

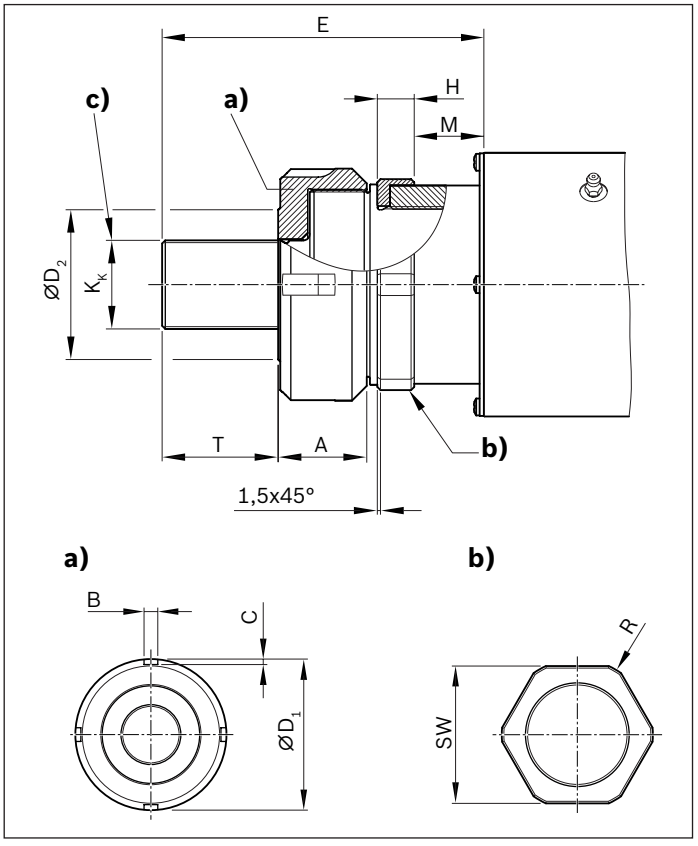
[1] Matching pivot pin Ø f8. For detailed information on the load measuring pin see “Load Sensor” section.
[2] Values deviate from ISO 8132 standard

Note: Non-dimensioned contours may deviate from the illustration and/or from the CAD file.

Mounting Elements

Threaded mounting interface for version without integrated anti-twist feature

Group 2, option 01



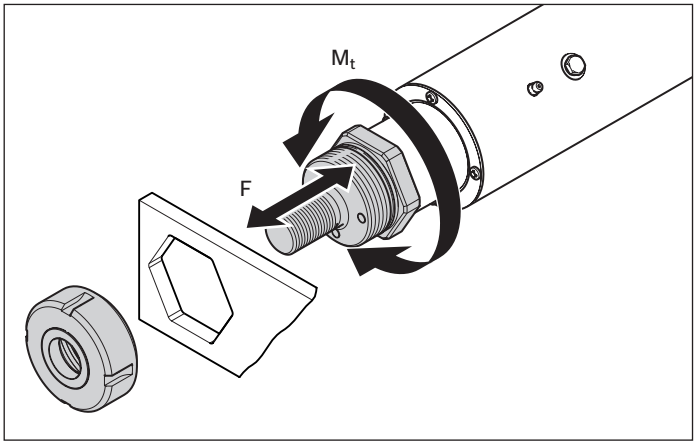
a) Lock nut on threaded mounting interface
b) Wrench flats for supporting the drive torque
c) Fastening thread for absorbing tensile/compressive forces

EMC-HD	Dimensions (mm)												
	A	B	C	ØD1	ØD2	E2)	H1)	Lock nut	KK	M	R	T max.	SW
085	31	8	4	77	41	116.5	14.0	M60x1.5	M27x2	28.5	R36	37	65
125	42	10	4	110	71	152.5	17.5	M90x2	M42x2	33.0	R55	56	100
180	53	12	5	155	100	225.0	28.5	M130x2	M64x3	36.5	R82.5	85	150

1) Maximum dimension of customer-built attachment
2) Dimensions E and F are shown in retracted state (stroke = 0 mm)!
The mass is included in the basis cylinder weight

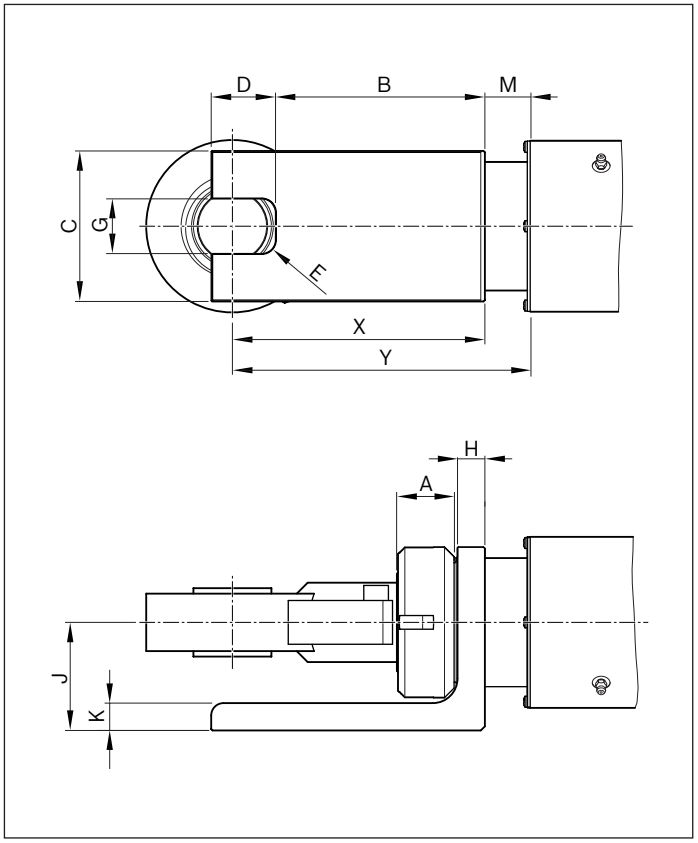
Notes for mounting

The wrench flats provide positive-locking support for the drive torque.
Tensile and compressive axial forces are absorbed via the fastening thread.
During installation, screw the lock nut all the way onto the threaded mounting interface.
After screwing on and radially aligning the connection element, screw back the lock nut against the connection element (maximum 1.5 turns).
The lock nut is not intended to fix the customer's attachment axially against at the wrench flats.



Spherical rod end bearing CGKD (clampable) with clevis

Group 2, option 02



EMC-HD	Dimensions (mm)													m[2)] (kg)
	A	B	C	D	E	G H7	H	J	K	M[1)]	X	Y[1)]		
085	31	114	75	34	R6	25	15	62	15	28.5	131-134	159.5-162.5		2.6
125	42	153	110	47	R10	40	20	79	15	33.0	183.5-186.5	216.5-219.5		7.8
180	53	215	160	80	R15	70	28.5	120	25	36.5	266.5-271.0	303.0-307.5		24.5

[1)] Dimensions M and Y are shown in retracted state (stroke = 0 mm)!
[2)] Add mass for basis cylinder weight

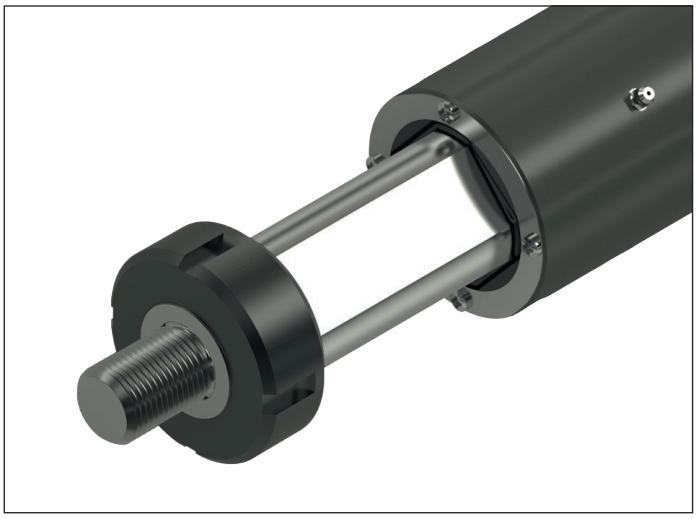
Note

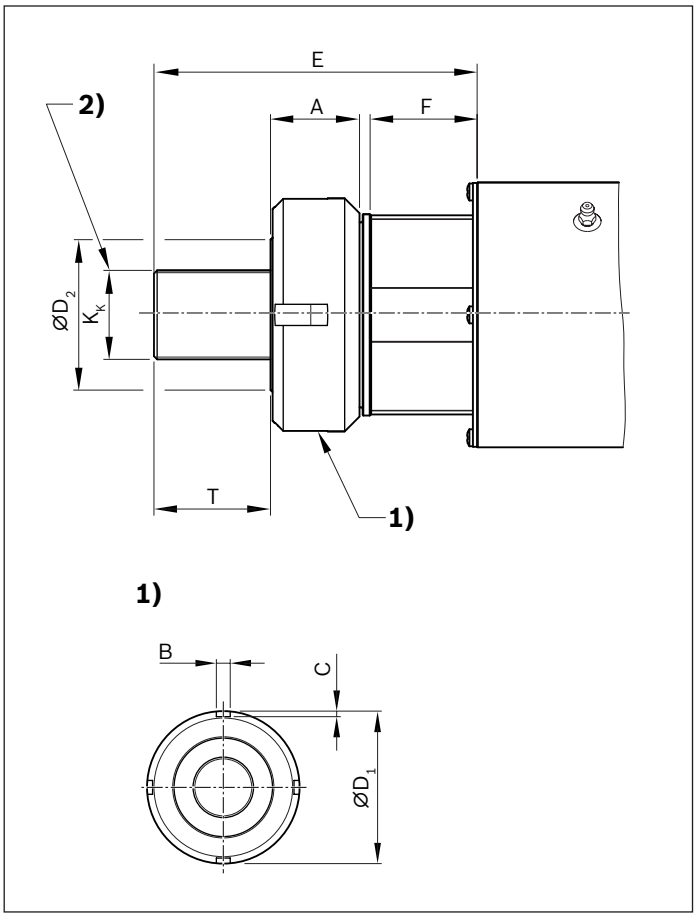
The matching pivot pin is included with the clevis bracket for spherical rod end bearing with clevis (group 1, option 11).
Customer-built connection elements dimensions analog to clevis brackets (group 1, option 11).

Mounting Elements

Threaded mounting interface for version with integrated anti-twist feature

Group 2, option 11





1) Lock nut on threaded mounting interface
2) Fastening thread for absorbing tensile/compressive forces

EMC-HD	Dimensions (mm)									
	A	B	C	ØD1	ØD2	E1)	F1)	Lock nut	KK	T max.
085	31	8	4	77	41	116.5	42.5	M60x1.5	M27x2	37
125	42	10	4	110	71	152.5	50.5	M90x2	M42x2	56
180	53	12	5	155	99	208.0	65.0	M130x2	M64x3	84

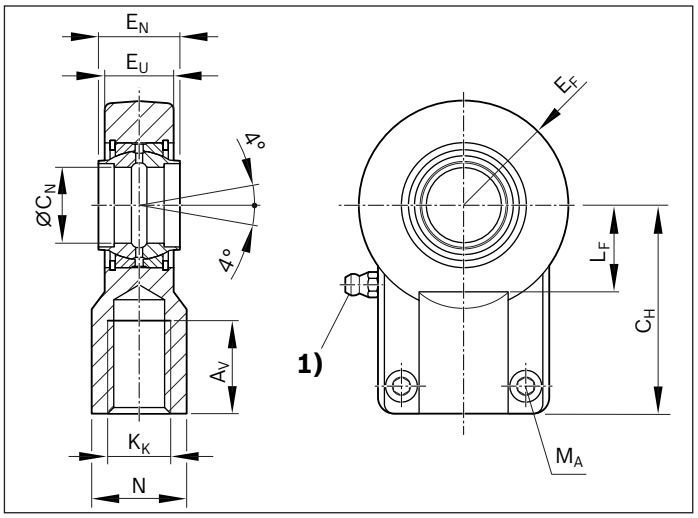
1) Dimensions E and F are shown in retracted state (stroke = 0 mm)!
The mass is included in the basis cylinder weight

Notes for mounting

The drive torque is absorbed via the integrated anti-twist feature.
Use with spherical rod only.
Tensile and compressive axial forces are absorbed via the fastening thread.
During installation, screw the lock nut all the way onto the threaded mounting interface.
After screwing on and radially aligning the connection element, screw back the lock nut against the connection element (maximum 1.5 turns).

Spherical rod end bearing CGKD (clampable)

Group 2, option 12



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

EMC-HD	Part number	Dimensions (mm)									Clamping screw	M_A	
		A_V min.	N max.	C_H js13	E_F max.	ØC_N[1] H7	E_N h12	E_U max.	K_K	L_F min.	ISO 4762-10.9	(Nm)	m[2] (kg)
085	R900322049	37	38	80	40	32	32	28	M27x2	30	M10x25	59	1.15
125	R900322719	57	58	120	63	50	50	42	M42x2	47	M12x35	100	4.00
180	R349952300	86	91	180	92	80	80	68	M64x3	74	M20x50	490	15.0

[1] Matching pivot pin Ø m6
[2] Add mass for basis cylinder weight

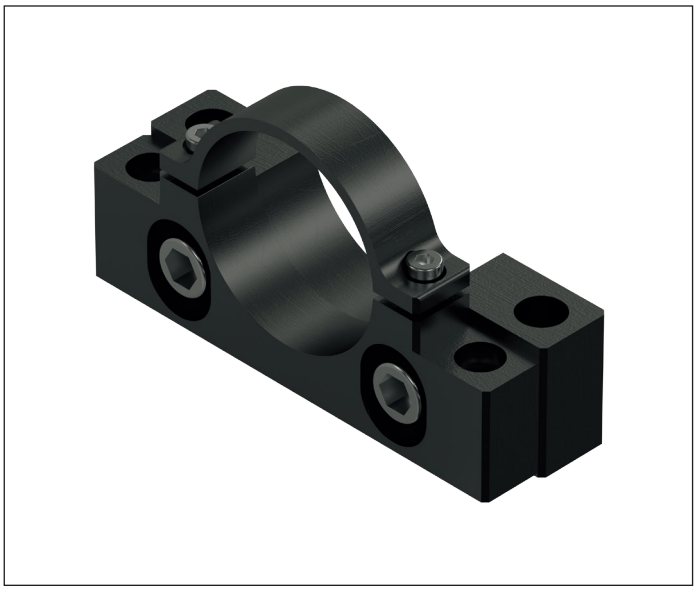
Notes for mounting

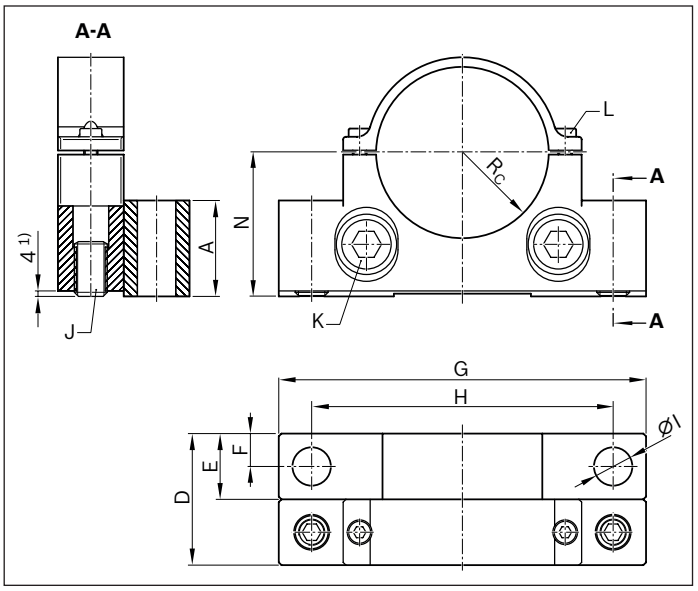
During installation, screw the lock nut all the way onto the threaded mounting interface.
After screwing on and radially aligning the connection element, screw back the lock nut against the connection element (maximum 1.5 turns).
Then tighten clamping screws to the stated tightening torque (M_A).

Mounting Elements

Foot mount

Group 3, option 11





EMC-HD	Part number	Dimensions (mm)								J	K	L	N	m 2)
		A	R_C	D	E	F	G	H	ØI	Set screw ISO 4026	Screw ISO 4762	Screw ISO 4762		(kg)
085	R156330130	55	43	60	32	16	195	162	19	M16X40	M16x40	M8x20	65	1.4
125	R156350130	70	63	96	48	24	268	220	28	M24X40	M24x70	M10x25	105	4.7
180	R156370130	106	91	118	70	35	400	327	39	M24X40	M24x70	M16x45	140	11.5

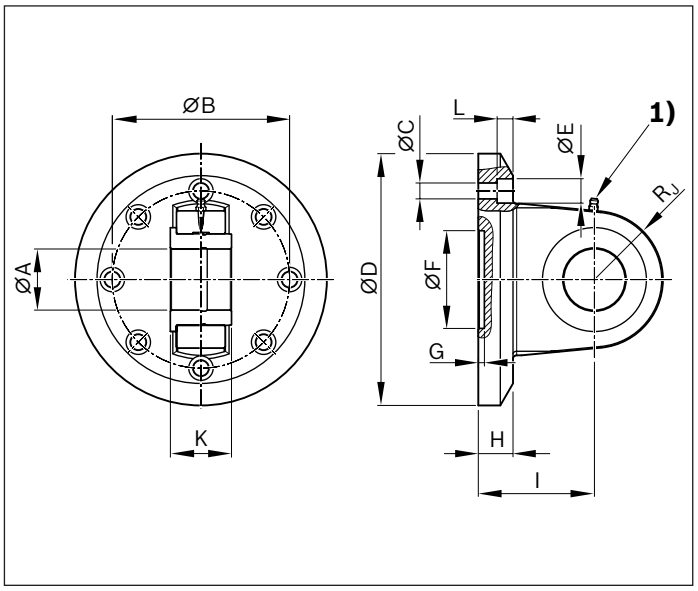
1) The foot mount can be adjusted for height in a range of +/- 4 mm

2) Add mass for basis cylinder weight

Note

This fastening element is only suitable for supporting the housing tube when the cylinder is installed horizontally. It is not designed to absorb axial forces!

Swivel bearing
Group 5, option 11



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

EMC-HD	Part number	Dimensions (mm)												m[1]
		ØA H9	ØB	ØC	ØD	ØE	ØF H7	G	H max.	I	R_J	K h12	L	(kg)
085	R156330150	32	100	9	162	15	60	5	22.7	65	39	32	9	4.1
125	R156350150	50	145	13	206	20	80	5	28.4	95	56	50	13	10.8
180	R156370150	80	197	18	250	26	80	9	27.0	122	82	80	16	20.0

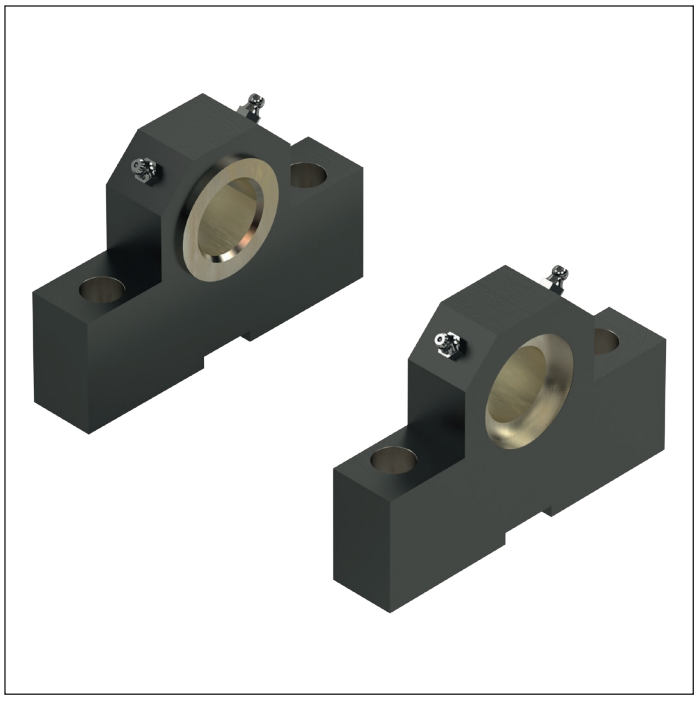
[1] Add mass for basis cylinder weight

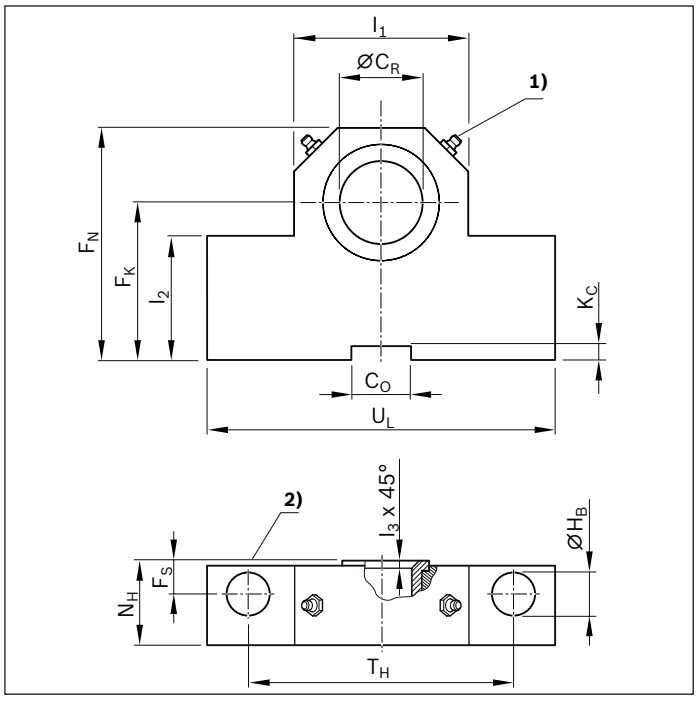
Note: If the swivel bearing installation position is horizontal, load the socket collar.

Mounting Elements

Trunnion bearing block CLTB

Group 6, option 01





1) Lube nipple, hydraulic type A as per DIN 71412
2) Trunnion location face (inside)

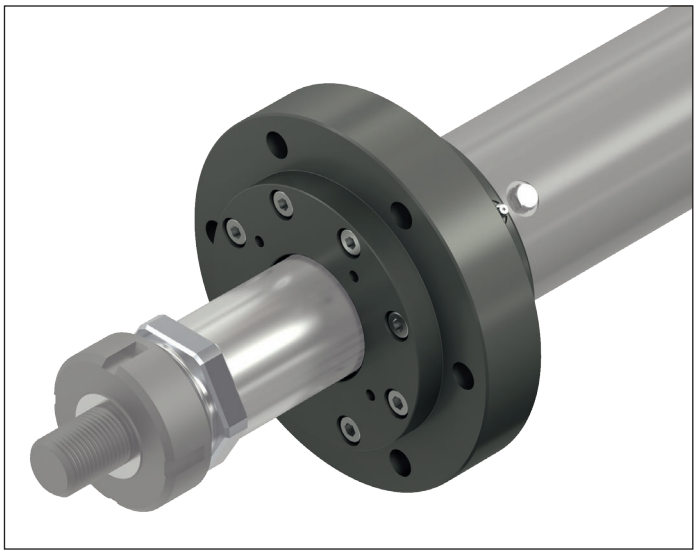
EMC-HD	Part number	Dimensions (mm)													m [1]
		$ØC_R$ H7	C_O N9	F_K js12	F_N max.	F_S js14	$ØH_B$ H13	K_C +0.3	l_1	l_2	l_3	N_H max.	T_H js14	U_L max.	(kg)
085	R156330160	32	25	65	100	15	17.5	5.4	70	52	2.5	33	110	150	4.55
125	R156350160	50	36	95	140	20	26.5	8.4	100	75	2.5	51	160	210	14.50
180	R156370160	80	50	140	220	31	39.0	11.4	160	112	3.5	81	250	325	52.30

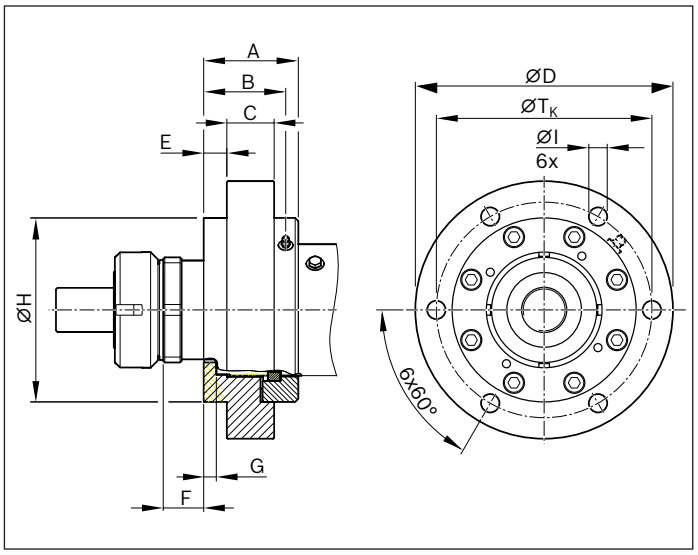
[1] Add mass for basis cylinder weight, figure per pair

Note

Trunnion bearing blocks are always supplied in pairs.
Non-dimensioned contours may deviate from the illustration and/or from the CAD file.

Round flange





EMC-HD	Dimensions (mm)										
	$ØT_K$	ØD	A	B	C	E	F	G	ØH ± 0.1	ØI	m [1] (kg)
085	155	185	76	66	35	15	32.5	10	130	13.5	8.2
125	205	245	90	78	45	22	38.5	12	175	17.5	15.8
180	290	335	116	95	55	20	50.0	15	245	26.0	35.8

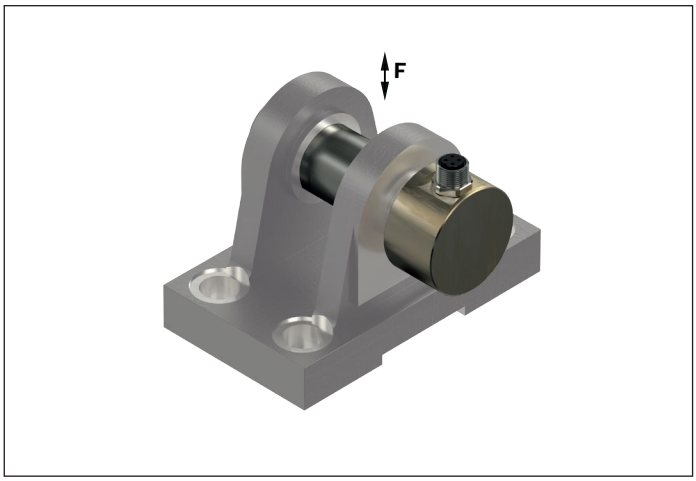
[1] Add mass for basis cylinder weight

Note

This type of mounting is only suitable for vertical installation.

Load sensor

Clevis bracket with load measuring pin



Load measuring pin for

Size	Measuring range (kN)
EMC-085-HD	50
EMC-125-HD	110
EMC-180-HD	300

Technical data
Metrological specifications

Material	Stainless steel
Protection class	IP 65
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

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

Electrical specifications

		EMC-085/125-HD	EMC-180-HD
Output signal	0kN	0 ± 0.03 V	0 ±0.03 V
Output signal	MR	–10 ... 10 V ± 0.2 V	–10 ... 10 V ± 0.2 V
Power supply		19 ... 28 V	24 ± 2 V
Current consumption		50 mA (24 V)	25 mA
Bandwidth		2.5 ± 0.2 KHz	2.5 ± 0.2 KHz

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.

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 for measuring torques and may therefore only be used with the cylinder option “Guideway with anti-twist feature”.
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.
Connection cable is supplied.

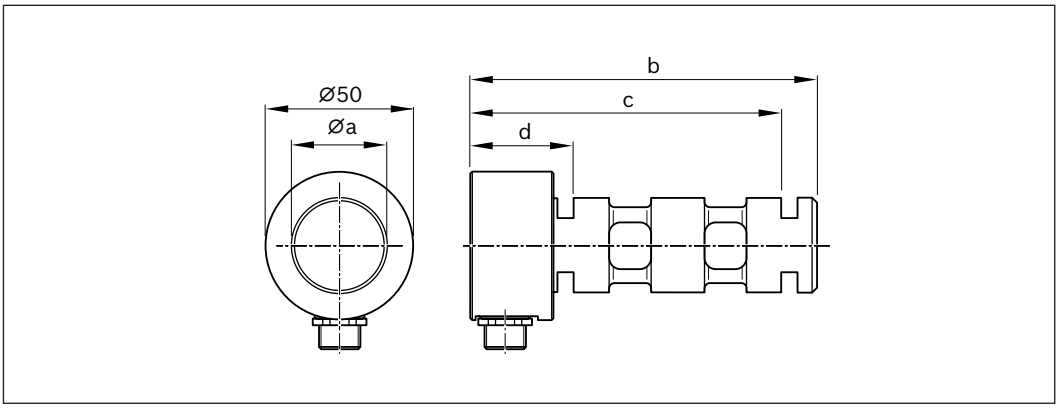
Technical data, connection cable

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	4 x 0.34 mm^2
Cable diameter D	5.9 ± 0.2 mm
Bending radius, stationary	> 10 x D
Bending radius, flexing	> 5 x D
Flexing cycles	> 2 mil
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

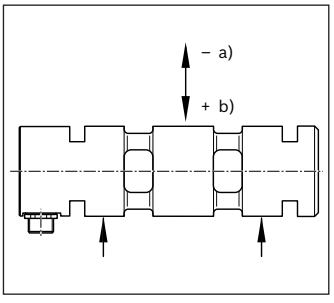


Size	Part number	Dimensions (mm)				Weight (kg)
		Øa f8	b	c	d	
EMC-085-HD	R1563 570 80	32	117.0	105.0	35.0	0.85
EMC-125-HD	R1563 570 80	50	166.5	146.5	36.5	2.20
EMC-180-HD	R1563 770 80	80	225.0	204.0	34.0	8.80

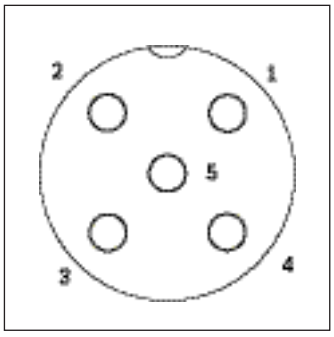
Connection type

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) - voltage output
b) + voltage output

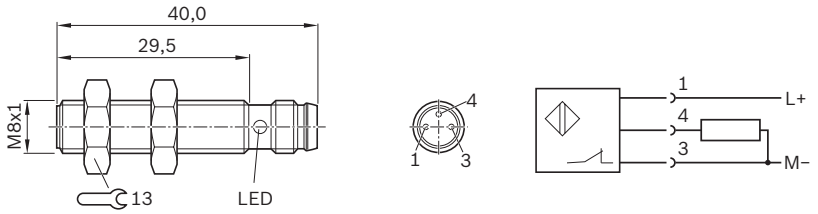


Connection diagram for load measuring pin

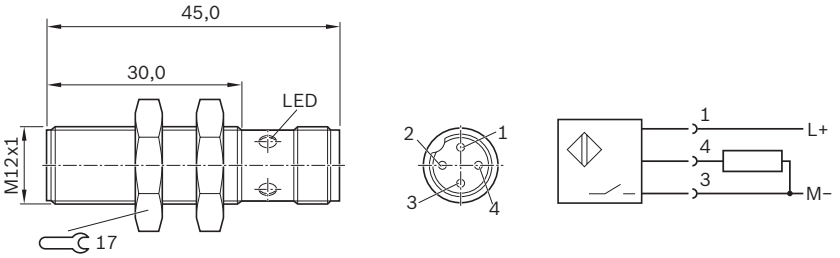
Switch Mounting Arrangements

Proximity switches

Limit switch



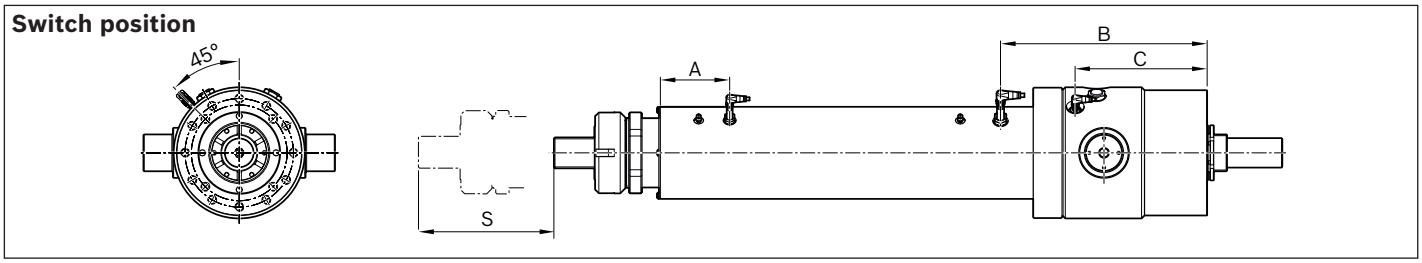
Reference switch



Technical data, proximity switches

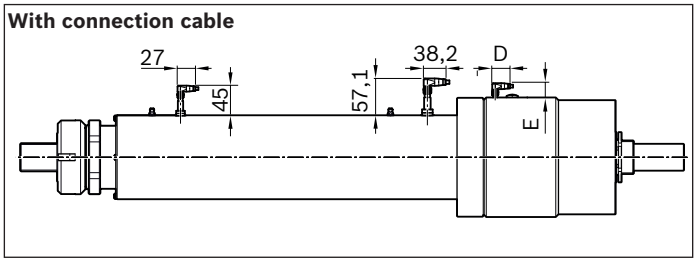
	Limit switch	Reference switch
Part number	R9130 307 57	R9130 307 58
		
Function principle	Proximity	Proximity
Operating voltage	10 ... 30 V DC	10 ... 30 V DC
Load current	< 200 mA	< 200 mA
Switching function	PNP/normally closed (NC)	PNP/normally open (NO)
Connection type	Plug connector, M8x1, 3-pin	Plug connector, M12x1, 4-pin
Function indication	✓	✓
Short-circuit protection	✓	✓
Polarity safe	✓	✓
Switching frequency	3 kHz	2 kHz
Reproducibility	< 0.05 mm	< 0.05 mm
Max. perm. approach speed	1 m/s	1 m/s
Ambient temperature	–25 ℃ to +70 ℃	–25 ℃ to +70 ℃
Protection class	IP 68	IP 68
MTTFd (as per EN 13849)	835 years at 40 ℃	835 years at 40 ℃
Certification and approval	CE c UL us LISTED	CE c UL us LISTED

Switch position

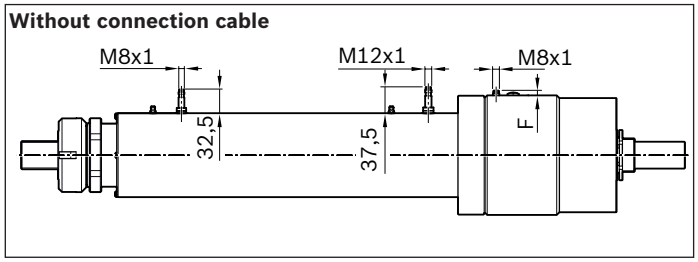


The limit switches are located outside the permissible travel.

With connection cable



Without connection cable

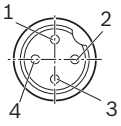


EMC-HD	Dimensions (mm)						
	A	B	C	D	E	F	S
085	91	210	135	27	18.5	6	75
125	94	280	180	27	18.5	6	100
180	114	399	299	0	17.0	-10*)	100

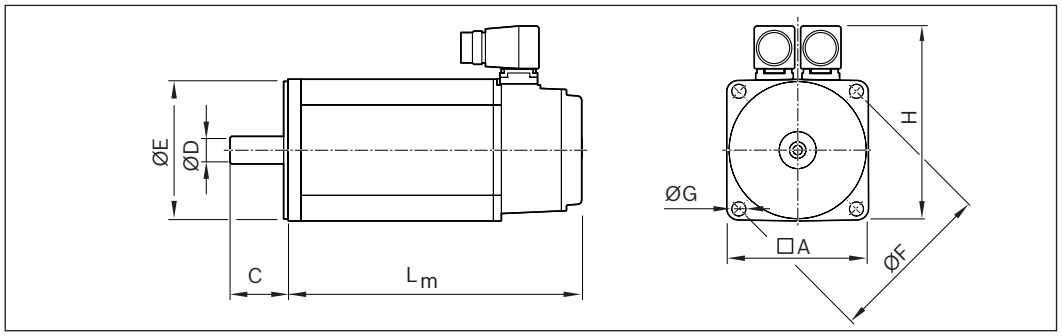
*) Countersunk to a depth of 10 mm in the bearing housing, therefore straight plugs are also used on the connection cable

S = reference position

Technical data, cables

	Limit switch cable		Reference switch cable
Part number	R9873 914 96	R9013 912 55	R9130 233 89
Pin assignment	 1 brown 3 blue 4 black		 1 brown 2 white 3 blue 4 black
Type of cable	PUR black	PUR black	PUR black
Length	5.0 m	5.0 m	5.0 m
Operating voltage	10 ... 30 V DC	10 ... 30 V DC	10 ... 30 V DC
1. Connection type	Angled female connector, M8x1, 3-pin	Socket, straight, M8x1, 3-ping	Angled female connector, M12x1, 5-pin
2. Connection type	Flying lead	Flying lead	Flying lead
Function indication	–	–	✓
Operating voltage indicator	✓	✓	✓
Suitable for flexing installation	✓	✓	✓
Cable cross-section	3 x 0.34 mm²	3 x 0.34 mm²	4 x 0.34 mm²
Cable diameter D	4.3 ± 0.2 mm	4.3 ± 0.2 mm	5.9 ± 0.2 mm
Bending radius, stationary	> 5 x D	> 5 x D	> 5 x D
Bending radius, flexing	> 10 x D	> 10 x D	> 10 x D
Flexing cycles	> 2 million	> 2 million	> 2 million
Max. perm. travel speed	3.3 m/s	3.3 m/s	3.3 m/s
Max. perm. acceleration	5 m/s²	5 m/s²	5 m/s²
Ambient temperature fixed & moving	–25 °C to +80 °C	–25 °C to +80 °C	–25 °C to +80 °C
Ambient temperature, flexing installation	–25 °C to +60 °C	–25 °C to +60 °C	–25 °C to +60 °C
Protection class	IP 68	IP 68	IP 68
Certification and approval	c UL us LISTED	c UL us LISTED	c UL us LISTED

IndraDyn S – Servo Motors MSK



Motor connector is orientated in direction of motor shaft

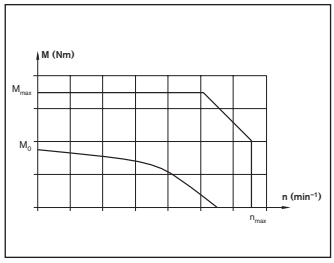
Motor	Dimensions (mm)								
	A	C	ØD	ØE	ØF	ØG	H	L_m Without holding brake	L_m With holding brake
MSK071D-0300	140	58	32	130	165	11	202	312	347
MSK100B-0300	192	60	32	130	215	14	262	368	368
MSK101D-0300	192	80	38	180	215	14	262	410	410
MSK101E-0300	192	80	38	180	215	14	262	501	501
MSK101E-0300[1)]	208	80	38	180	215	14	262	672	672
MSK133B-0300[1)]	260	110	48	250	300	18	368	622	807
MSK133D-0300[1)]	260	110	48	250	300	18	368	722	907

Motor data

Motor	n_{max} (min⁻¹)	M_0 (Nm)	M_{max} (Nm)	M_{br} (Nm)	J_m (kgm²)	J_{Br} (kgm²)	m_m (kg)	m_{br} (kg)
MSK071D-0300	3 800	17.5	66.0	Without	0.00230	–	18.0	–
MSK071D-0300		17.5	66.0	23	0.00230	0.00030	18.0	1.6
MSK100B-0300	4 500	28.0	102.0	Without	0.01920	–	34.0	–
MSK100B-0300		28.0	102.0	32	0.01920	0.00124	34.0	2.5
MSK101D-0300	4 600	50.0	160.0	Without	0.00932	–	40.0	–
MSK101D-0300		50.0	160.0	70	0.00932	0.00300	40.0	3.8
MSK101E-0300		70.0	231.0	Without	0.0138	–	53.5	–
MSK101E-0300		70.0	231.0	70	0.0138	0.00300	53.5	3.8
MSK101E-0300[1)]	4 600	105	231	Without	0.0138	–	57.8	–
MSK101E-0300[1)]		105	231	70	0.0138	0.00300	57.8	3.8
MSK133B-0300[1)]	3 300	152	320	Without	0.0476	–	91.6	–
MSK133B-0300[1)]	3 000	152	320	200 +40% -20%	0.0476	0.02500	91.6	60.0
MSK133D-0300[1)]	3 300	250	520	Without	0.0780	–	127.0	–
MSK133D-0300[1)]	3 000	250	520	224 +40% -20%	0.0780	0.02500	127.0	60.0

[1)] With blower

Motor torque speed curve
(schematic)



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	Motor part number	External holding brake part number	Fan part number	Version Holding brake		Type designation
					Without	With	
114	MSK071D-0300	**R911310539**	**–**		X		MSK071D-0300-NN-M1-UG0-NNNN
115		**R911310168**	**–**			X	MSK071D-0300-NN-M1-UG1-NNNN
116	MSK100B-0300	**R911315705**	**–**		X		MSK100B-0300-NN-M1-AG0-NNNN
117		**R911310478**	**–**			X	MSK100B-0300-NN-M1-AG1-NNNN
118	MSK101D-0300	**R911315888**	**–**		X		MSK101D-0300-NN-M1-AG0-NNNN
119		**R911310895**	**–**			X	MSK101D-0300-NN-M1-AG2-NNNN
120	MSK101E-0300	**R911317226**	**–**		X		MSK101E-0300-NN-M1-AG0-NNNN
121		**R911310891**	**–**			X	MSK101E-0300-NN-M1-AG2-NNNN
124	MSK101E-0300[2]	**R911317226**	**–**	**R911325863**	X		MSK101E-0300-NN-M1-AG0-NNNN
125		**R911310891**	**–**	**R911325863**		X	MSK101E-0300-NN-M1-AG2-NNNN
126	MSK133B-0202[2]	**R911344559**	**–**	**– [4]**	X		MSK133B-0202-SA-M1-EG0-NPNN
127		**R911344559**	**R039612359[3]**	**– [4]**		X	MSK133B-0202-SA-M1-EG0-NPNN
128	MSK133D-0202[2]	**R911344560**	**–**	**– [4]**	X		MSK133D-0202-SA-M1-EG0-NPNN
129		**R911344560**	**R039612359[3]**	**– [4]**		X	MSK133D-0202-SA-M1-EG0-NPNN

[1] From “Configuration and ordering” tables on pages 28, 36 and 44
[2] With blower
[3] Motors MSK133B/ MSK133D do not have their own holding brakes
[4] The fan is integrated in the motor part number

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 Controllers with HCS02 and HCS03, R911314904
- HCS03 (see “General product description; motor-controller combination”)

Recommended motor/ controller combinations

Motor	Controller [1]	Controller [2]
MSK 071D	HCS02.1E-W0070	HCS02.1E-W0028
MSK 100B	HCS03.1E-W0100	HCS02.1E-W0054
MSK 101D	HCS03.1E-W0150	HCS03.1E-W0100
MSK 101E	HCS03.1E-W0210	HCS03.1E-W0100
MSK133B	HCS03.1E-W0210	HCS03.1E-W0100
MSK133D	HCS04.2E-W0350	HCS03.1E-W0210

[1] Design for maximum current / maximum torque of the motor
If the acceleration torque is not required, a drive controller 1-2 power ratings lower may also be adequate.
[2] Design for continuous current at standstill / continuous torque at standstill of the motor
The relevant DC bus continuous power and increased current demand on acceleration are to be taken into account!

Due to the need to take into account the drive controller’s power and the effect of accessories (mains choke), detail design is essential in any case.

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 (up to +60 °C with low duty cycle and power)
Ambient temperature cylinder mechanical system with PLSA and low-temperature grease	-30 °C ... +50 °C (up to +60 °C with low duty cycle and power)
Protection class	IP 65
Duty cycle	100% (depending on power required, the permissible duty cycle may be limited due to heat generation)

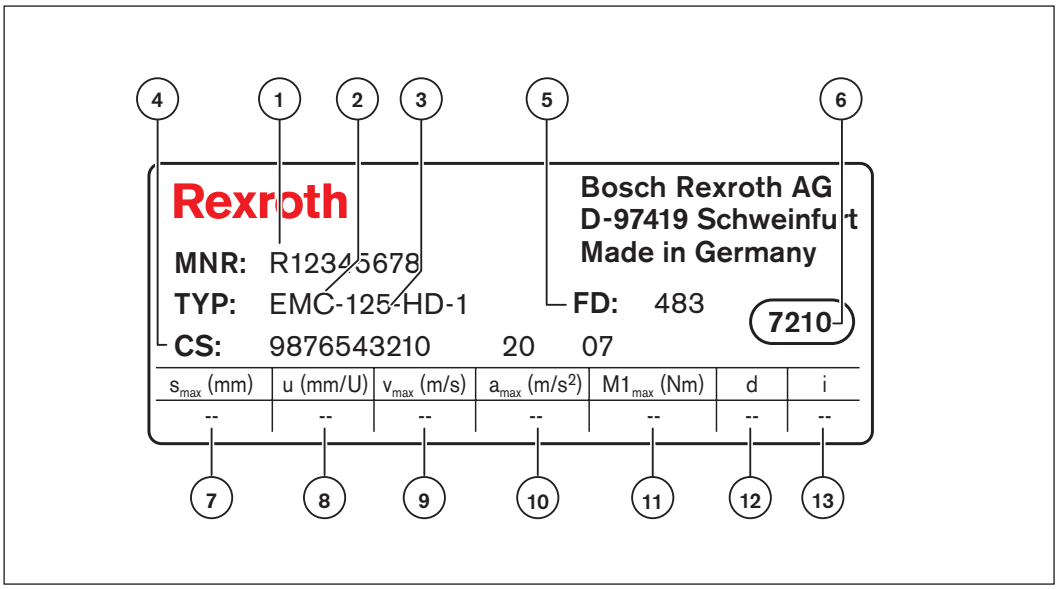
Important

For more information about Intended use and safety, see “Safety for linear systems R320103152” and “Instructions EMC-HD R320103139”.

For more information on installation / initial operation see “Instructions EMC-HD R320103139”.

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	125	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.

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 greases of NLGI Class 00 achieve only about 50% 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.

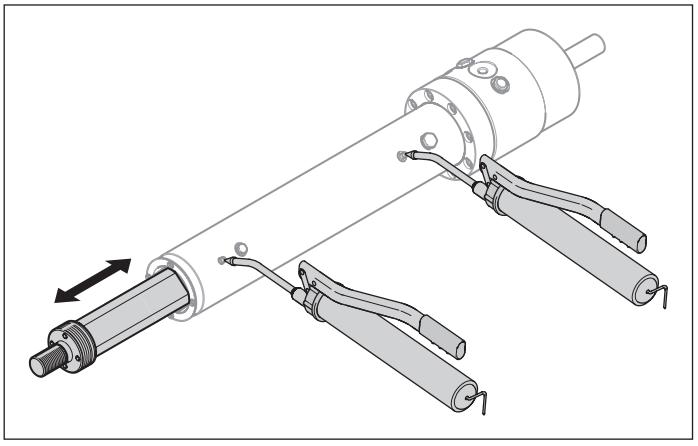
The electromechanical cylinders are designed for grease lubrication. Screw drives and guideway must be relubricated. During this process lubricant must be applied to all lubrication points. There are 3 ways to reach the lubrication position:

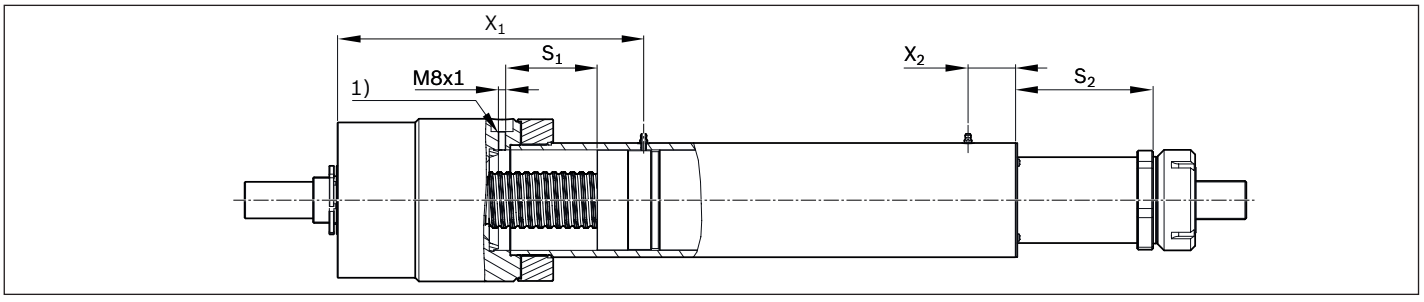
a) move the piston rod to stroke position S2 (reference position) see figure

b) with limit switch fitted, extend by S1.

c) without limit switch, extend from the rear end position by S1 + 8 mm.

*) with the round flange option, X2 deviates from the specified value; see round flange option catalog. For more information, see "Instructions for EMC-HD, R320103139".





1) Limit switch bore

Size	X_1 (mm)	X_2*) (mm)	S_1 (mm)	S_2 (mm)
EMC-085-HD	256	52	75	117
EMC-125-HD	335	52	100	150
EMC-180-HD	499	67	100	183

*) Deviate with the round flange option. Please take note of the appropriate dimensional drawings.

Recommended lubricants

Note

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

Grease		**Low-temperature grease** (–30 ... +60 °C)
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	Klüber BEM 34-132 R341603600
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)	

Documentation

Standard report
Option 01

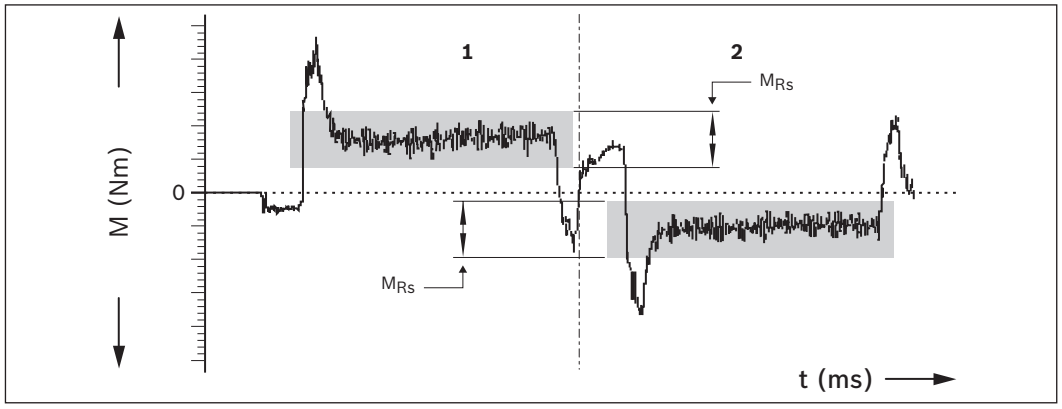
The standard report serves to confirm that the checks listed in the report have been carried out and that the measured values lie within the permissible tolerances. Checks listed in the standard report:

- 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

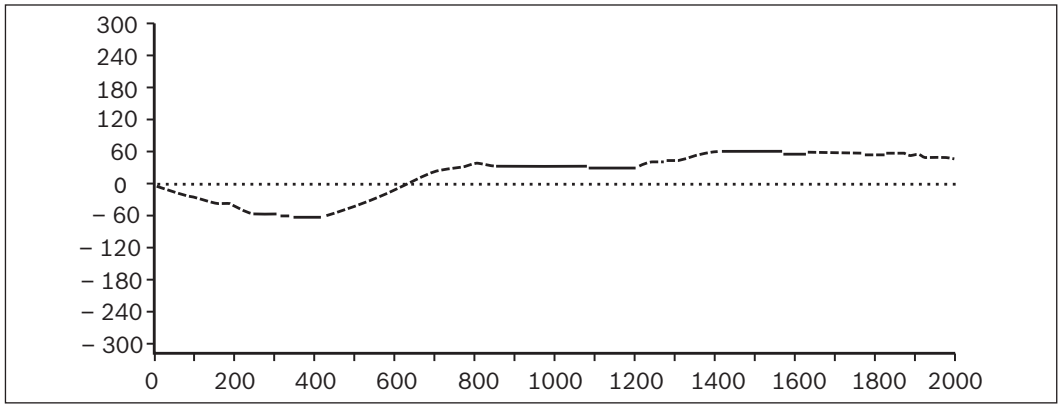


1) Advance
2) Return

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

Lead deviation of screw drive
Option 03

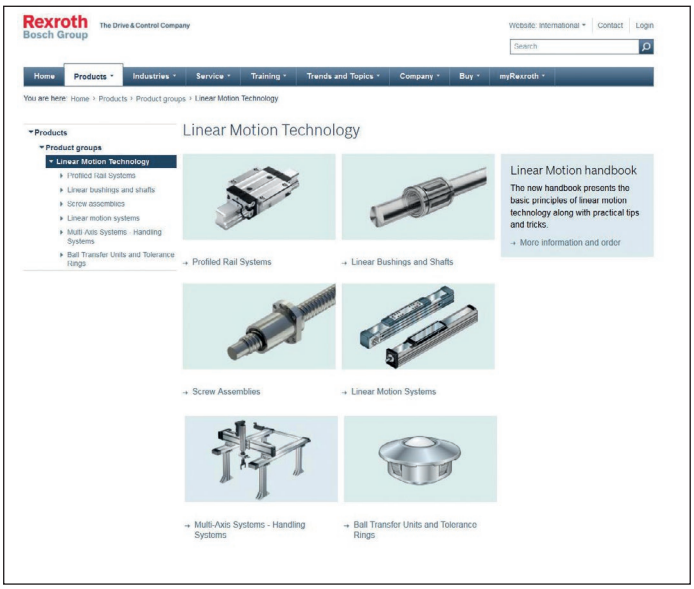
All items contained in the standard report.
In addition to graphical representation (see illustration), a measurement report is supplied in tabular form.



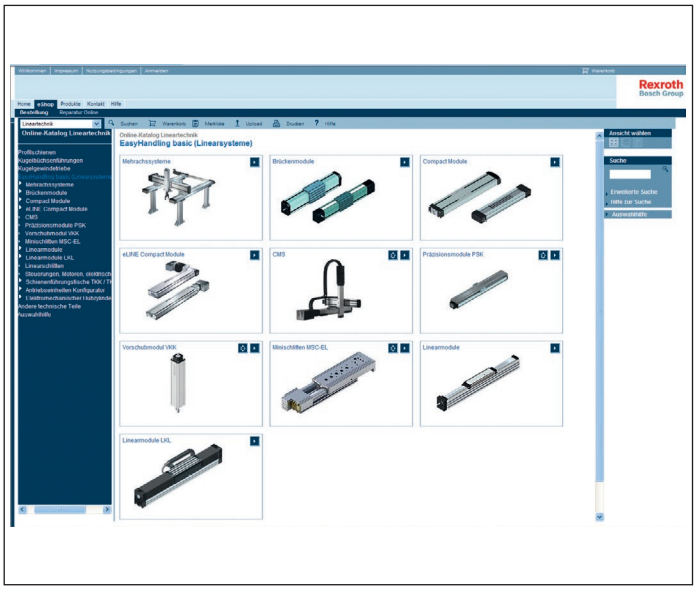
Further information

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

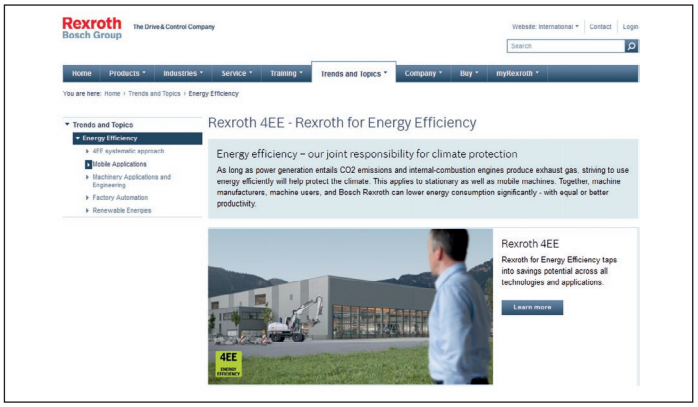
Product information:
http://www.boschrexroth.com/en/xc/products/productgroups/linear-motion-technology/index



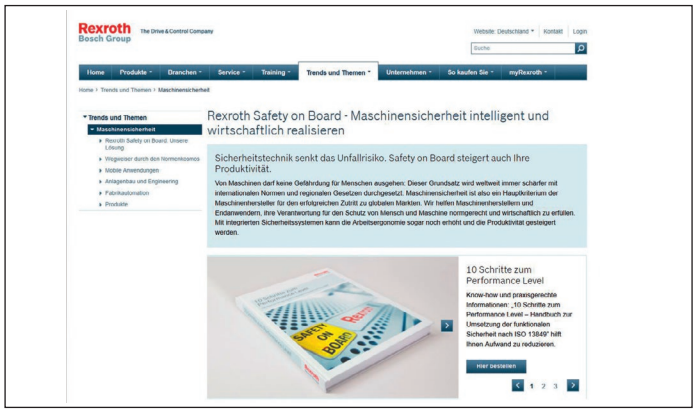
eShop:
http://www.boschrexroth.com/eshop



Rexroth 4EE - Rexroth for energy efficiency:
http://www.boschrexroth.com/4EE

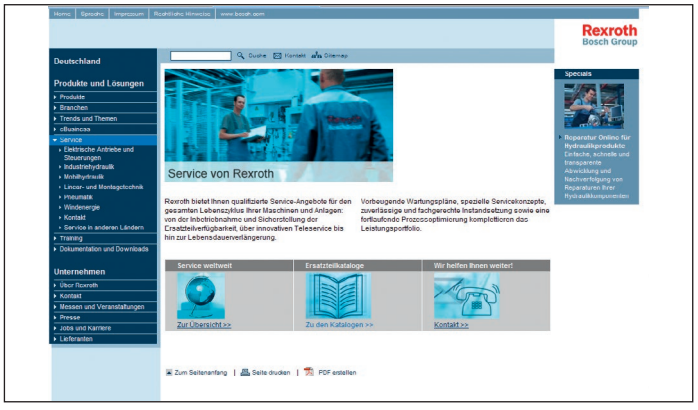


Safety engineering:
http://www.boschrexroth.com/Maschinensicherheit

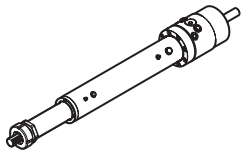
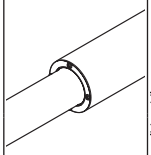
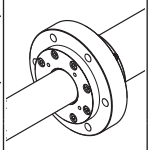
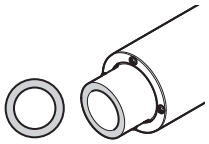
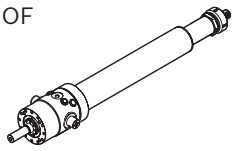
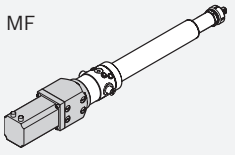
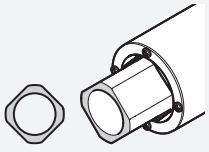
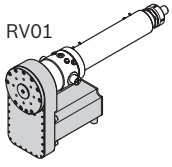
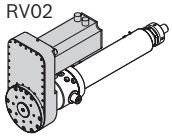
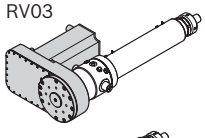
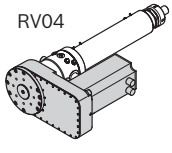


Training:
http://www.boschrexroth.com/training

Service:
http://www.boschrexroth.com/service



Ordering Example EMC-125-HD

Short product name, s_{max} **EMC-125-HD-1, ... mm**	**Guideway**		**Drive units**				**Lubrication**			**Version**	
	 Without round flange	 With round flange	PLSA d_0 x P		Ball screw d_0 x P		With initial greasing	Prelubricated with low-temperature grease		Description	
			48 x 5	48 x 10	63 x 10	63 x 20					
Without anti-twist feature 	01	02	01	02	12	13	01	02[1)]		Without motor mount	OF 
										With motor mount	MF 
With anti-twist feature 	11	12								With timing belt side drive (SD)	RV01  RV02  RV03  RV04 

1) Only with PLSA drive

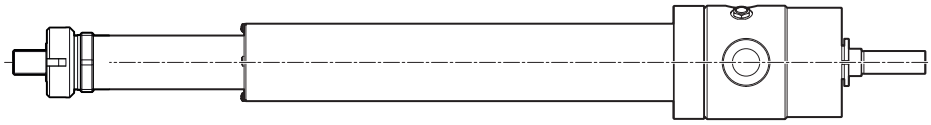
Motor mounting			**Motor**			**Switches**				**Surface finish**		**Documentation**		
Gear ratio	Description			Without brake	With brake	Without switch	1 reference switch	2 limit switches	2 limit switches and 1 reference switch	Standard	Black painted	Standard report	Measurement report	
	Without	00	Without	000	000	00	01	02	03	01	13	01	02[2]	03[3]
i = 1	With motor mount	02	MSK 100B	116	117									
		03	MSK 101D	118	119									
			MSK 101E	120	121									
i = 3	With motor mount and gear unit	06	MSK 100B	116	117									
		07	MSK 101D	118	119									
			MSK 101E	120	121									
i = 5	With motor mount and gear unit	16	MSK 071D	114	115									
i = 1.5	Timing belt side drive	41	MSK 100B	116	117									
		42	MSK 101D	118	119									
			MSK 101E	120	121									
i = 4.5	RV (i = 1.5) and Gear unit (i = 3)	51	MSK 100B	116	117									
		52	MSK 101D	118	119									
i = 7.5	RV (i = 1.5) and Gear unit (i = 5)	70	MSK 071D	114	115									

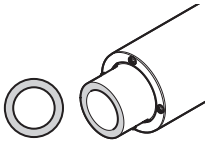
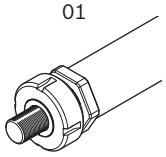
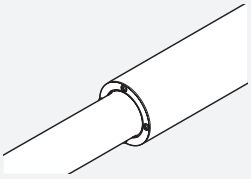
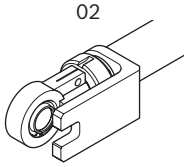
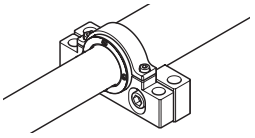
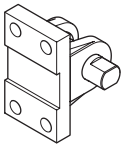
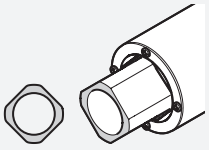
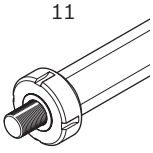
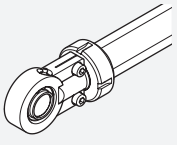
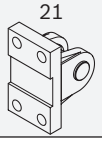
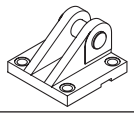
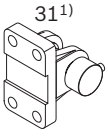
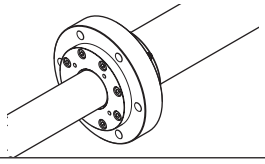
2) Frictional torque measurement

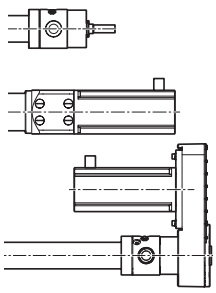
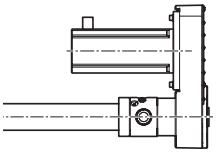
3) Lead deviation

Ordering Example EMC-125-HD

Mounting Elements



Version	Group 1	Group 2		Version	Group 3
Without anti-twist feature 	00	01 		Without round flange 	00
	00	02 			11 
	11 				
With anti-twist feature 	00	11 			
	00	12 			
	21 				
	22 				
	31[1)] 			With round flange 	00

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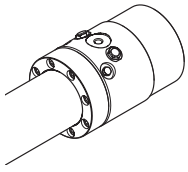
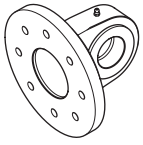
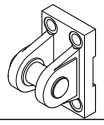
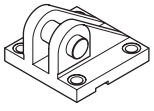
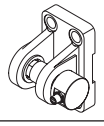
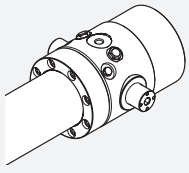
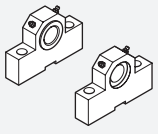
		01 	00	00	
			11 		00
					21 
					22 
					31[1)] 
		02 	00	00	
				01 	
		01	00	00	

Ordering example

Elektromechanischer Zylinder EMC-125-HD-1

Ordering data	Option	Description
Short product name	EMC-125-HD-1	
Max. travel range	580	580 mm
Guideway	11	Without round flange
Drive unit	02	Planetary screw assembly 48 x 10
Lubrication	01	With initial greasing
Version	MF	With motor mount
Motor mounting	03	Motor mount and coupling for MSK 101D
Motor	118	MSK 101D, without brake
Switches	02	Two limit switches
Surface finish	01	Standard
Documentation	01	Frictional torque
Mounting Elements	21	Clevis bracket
	12	Spherical rod end bearing CGKD
	00	Without
	02	Trunnion mount
	00	Without
	01	Trunnion bearing block CLTB

Inquiry or ordering

To be completed by customer	Option
Inquiry	
Order	

Bosch Rexroth AG
97419 Schweinfurt
Germany

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

Ordering data		Option												
Short product name		E	M	C	-				-	H	D	-	1	
Max. travel range (mm)	=													
Guideway	=													
Drive unit	=													
Lubrication	=													
Version	=													
Motor mounting	=													
Motor	=													
Switches	=													
Surface finish	=													
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	

Glossary (definitions)

Dynamic load rating C:
Constant that is used to calculate the service life of a screw drive. The value for the dynamic load rating 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 photoelectric sensors 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.

The Drive & Control Company

Rexroth
Bosch Group

Bosch Rexroth AG
Ernst-Sachs-Straße 100
97424 Schweinfurt, Deutschland
Tel. +49 9721 937-0
Fax +49 9721 937-275
www.boschrexroth.com

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

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