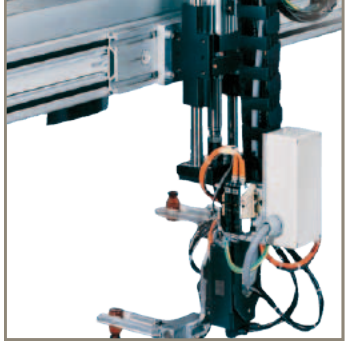

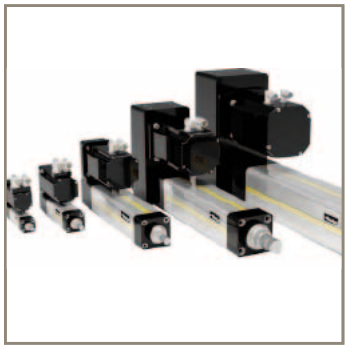

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filtration
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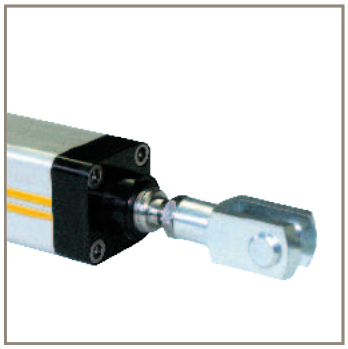
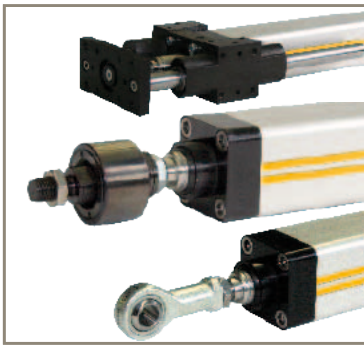
hydraulics
pneumatics
process control
sealing & shielding



ETH Electro Cylinder

Parker High Force Electro Thrust Cylinder



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- The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalog and in any other materials provided from Parker or its subsidiaries or authorized distributors.
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High Force Electro Thrust Cylinder - ETH

Overview 5

Technical Characteristics 8

Step by Step Selection Process 10

Calculating Required Axial Force 11

Selection of the Size and Screw Lead 12

Service Life 13

Permissible Axial Thrust Forces 15

Permissible Side Load 17

Stroke, Usable Stroke and Safety Travel 19

Relubrication 20

Dimensions 21

Motor Mounting Options 22

Motor and Gearbox Selection 25

Mounting Methods 26
- Standard 26
- Center Trunnion Mounting 26
- Rear Eye Mounting 27
- Rear Clevis 27
- Rear Plate 29
- Front Plate 29
- Front and Rear Plate 29
- Foot Mounting 30
- Mounting Flanges 30

Cylinder Rod Version 31
- External Thread 31
- Internal Thread 31
- Rod Clevis 32
- Spherical Rod Eye 32
- Alignment Coupler 33
- Outrigger Bearing 34

Accessories 38
- Force Sensors - Joint Head with Integrated Force Sensor 38
- Force Sensors - Rear Clevis with Force Sensor 40
- Initiators / Limit Switches 42

Drive Train Selection 43
- Example for Sizing with Predefined Drive Trains 43
- Predefined Motion Packages ETH032 44
- Predefined Motion Packages ETH050 46
- Predefined Motion Packages ETH080 48
- Predefined Motion Packages ETH100 50

Order Code 52

Parker Hannifin

The global leader in motion and control technologies

A world class player on a local stage

Global Product Design

Parker Hannifin has more than 40 years experience in the design and manufacturing of drives, controls, motors and mechanical products. With dedicated global product development teams, Parker draws on industry-leading technological leadership and experience from engineering teams in Europe, North America and Asia.

Local Application Expertise

Parker has local engineering resources committed to adapting and applying our current products and technologies to best fit our customers' needs.

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Parker is committed to meeting the increasing service demands that our customers require to succeed in the global industrial market. Parker's manufacturing teams seek continuous improvement through the implementation of lean manufacturing methods throughout the process. We measure ourselves on meeting our customers' expectations of quality and delivery, not just our own. In order to meet these expectations, Parker operates and continues to invest in our manufacturing facilities in Europe, North America and Asia.

Electromechanical Worldwide Manufacturing Locations

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Dijon, France
Offenburg, Germany
Filderstadt, Germany
Milan, Italy

Asia
Wuxi, China
Chennai, India

North America
Rohnert Park, California
Irwin, Pennsylvania
Charlotte, North Carolina
New Ulm, Minnesota

Offenburg, Germany

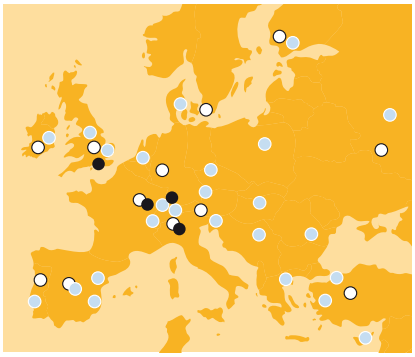
Local Manufacturing and Support in Europe

Parker provides sales assistance and local technical support through a network of dedicated sales teams and authorized technical distributors throughout Europe.

For contact information, please refer to the Sales Offices on the back cover of this document or visit www.parker.com

Milan, Italy

Littlehampton, UK



Electromechanical Manufacturing
Parker Sales Offices
Distributors

Dijon, France

High Force Electro Thrust Cylinder - ETH

Overview

Description

The ETH electro cylinder closes the gap between pneumatic and hydraulic actuators; it is suitable to replace those in many applications and simultaneously increase the reliability of the production process. Taking the costs for air and oil into consideration, you will find that in most cases an electromechanical system such as the ETH electro cylinder offers the more economical solution. Combined with a wide choice of accessories, it offers many possibilities in a wide variety of fields.

Typical areas of application

- Material handling and feed systems
  - Wood and plastic working industry
  - Vertical actuators for loading machine tools
  - In the textile industry for tensioning / gripping textile fabrics
  - In the automotive industry for transporting and feeding components
- Testing equipment and laboratory applications
- Valve and flap actuation
- Pressing
- Packaging machinery
- Process automation in the food and beverage industry

Features

- Unrivaled power density - high forces and small frame sizes
- Cabling can be concealed in the profile
- Accessories with integrated force sensors help to allot and even to control forces precisely.
- Optimized for safe handling and simple cleaning
- High service life
- Reduced maintenance costs thanks to lubricating access in the cylinder flange
- Easy replacement due to pneumatic ISO flange norm (DIN ISO 15552:2005-12) conformity
- Integrated anti-rotation device
- Reduced noise emission
- All from one source
  We offer the complete drive train: Drive controllers, motors and gearboxes to match the Electro Cylinder

Technical Characteristics - Overview

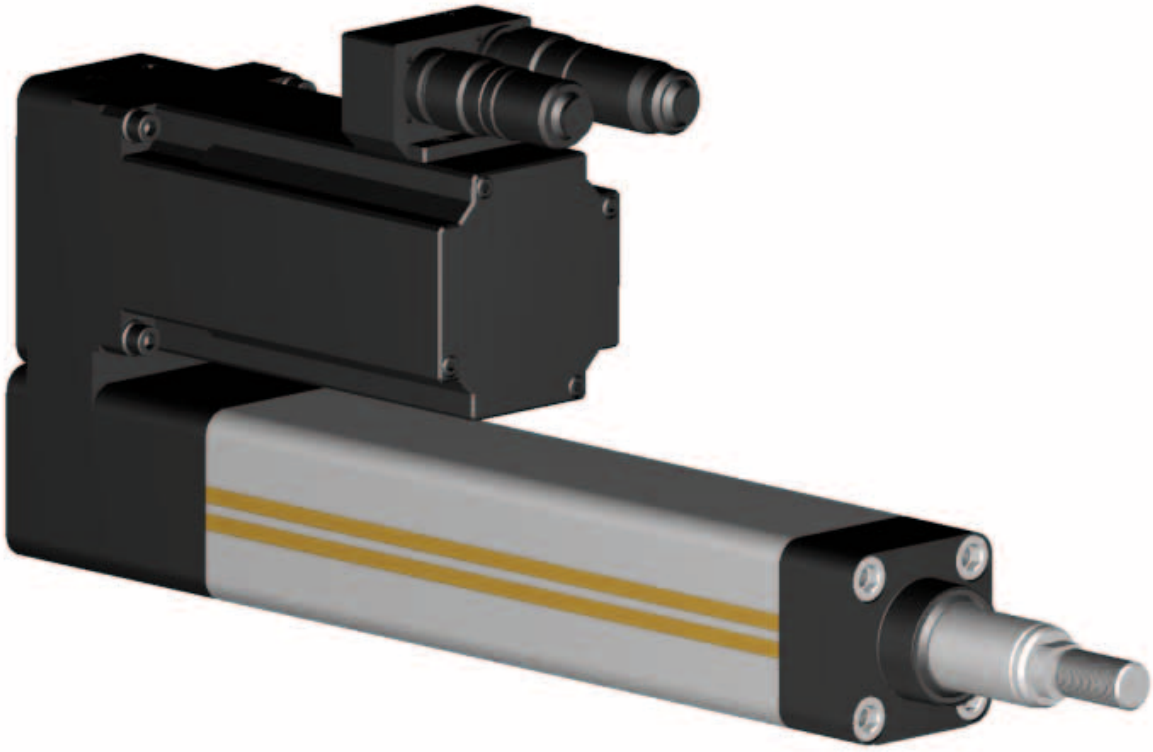
Type	ETH Electro Cylinder
Frame sizes	ETH032 / ETH050 / ETH080 / ETH100
Screw pitch	5, 10, 16, 20, 32 mm
Stroke	up to 2000 mm
Traction/thrust force	up to 56000 N
Speed	up to 1.7 m/s
Acceleration	up to 15 m/s²
Equivalent dynamic axial force at a lifetime of 2500 km	up to 24390 N
Efficiency	up to 90 %
Position Repeatability	up to ±0.03 mm
Protection classes	IP54 IP54 with stainless screws IP65
Drive	Inline: Axial drive or parallel drive with high performance toothed belt
Directives	2011/65/EC: Conform to RoHS On request: 94/9/EC: ATEX Equipment group II Category 2 Please contact Parker for details

We also Offer Customized Solutions:

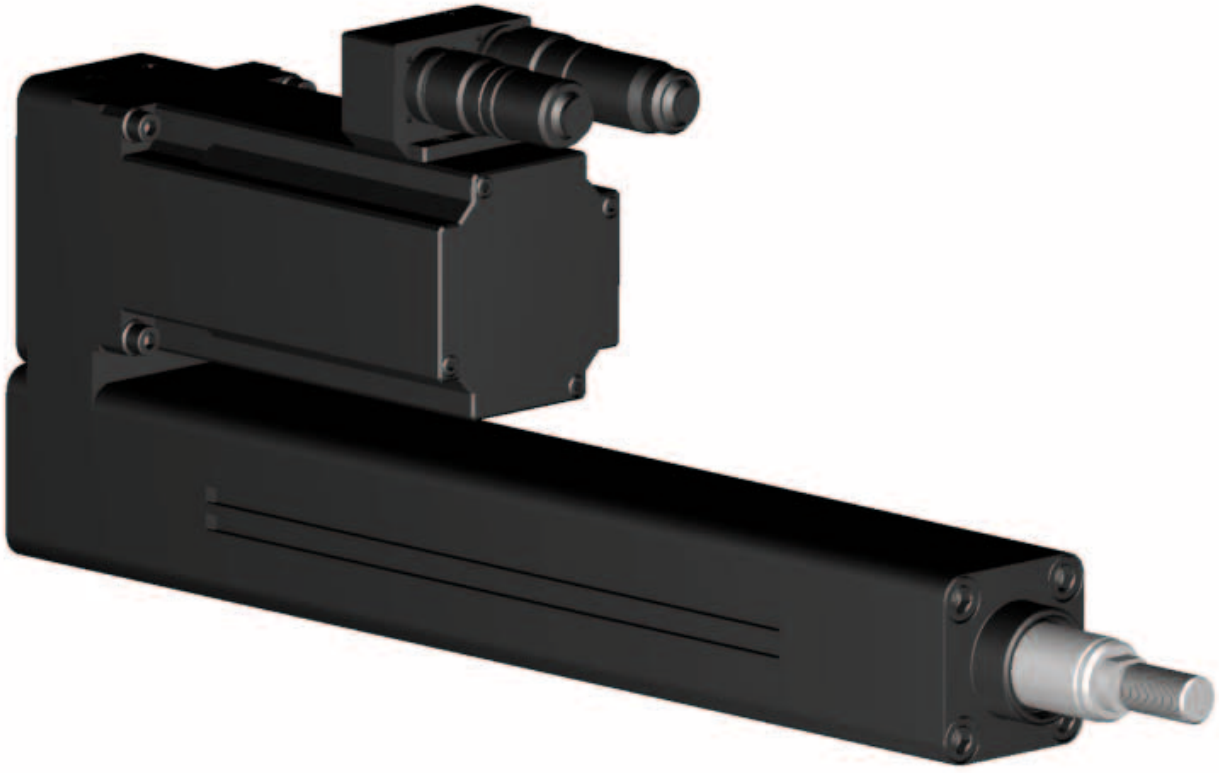
If your application requires a special version of the ETH cylinder, please contact your local Parker Sales Office.

- Oil splash lubrication
- Customized mountings and rod ends
- Mounting of customer motors
- Preparation of the cylinder for use under aggressive environmental conditions
- Overlong thrust rod
- Polished thrust rod
- Thrust rod hard-chrome plated
- .....

Parker High Force Electro Thrust Cylinder



ETH IP54 (Standard)



ETH IP65

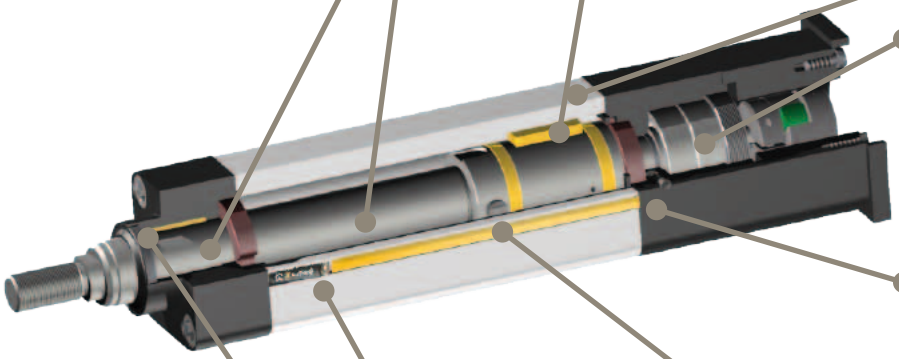
Product Design

Ballscrew
A high-quality precision class 7 ballscrew in accordance with ISO 3408 is used. The ball bearings between screw and nut ensure a low frictional resistance. This ensures an especially smooth operation over the entire speed range, high service life and excellent efficiency.

Screw support bearing (front end)
The front screw support bearing is supported by a polymer sliding bearing. This eliminates vibration and run-out. The result is quieter, smoother motion with better precision, longer screw life, and increased dynamic performance.

Piston Rod Anti-rotation Guidance
One of the unique design changes in the ETH is a new anti-rotation device. The high quality, maintenance free polymer bushing offers robust guidance preventing the piston rod from twisting as the rod extends and retracts.

Extruded cylinder body
The extrusion design reduces the number of slots or grooves for a cleaner overall design. The only slots are there for sensor mounting and are easily covered to eliminate any area for debris to be trapped. The result is a cleaner, more environmentally friendly design.



Screw Support Bearing (motor end)
A double stacked set of angular contact bearings allows for high thrust forces in both the extend and retract directions. The result is a design with high force density and minimal clearance when changing directions of motion.

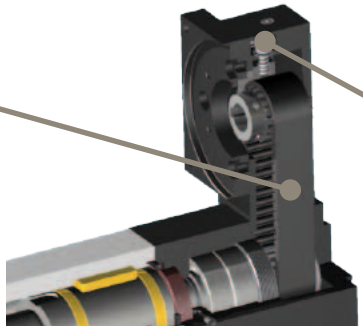
Easy Lubrication Port
The integrated lubrication fitting allows quick, simple and easy access to regrease the ball screw. In the event the rear is inaccessible the port can be located in the center of the extrusion (optional) The result is reduced down time for product maintenance yielding a higher ROI and a longer product life.

Piston Rod Support Bearing & Protection
The extra long cylinder rod bearing allows high lateral load forces. A wiper ring prevents the ingress of external contamination under normal conditions. In the event of fine dust, a high amount of dirt as well as muds and liquids, special sealing is required, which is available on request.

Sensors
The sensors are directly integrated into the profile; avoiding projecting edges. Cabling is neatly hidden under the yellow cover (fitting sensors available as accessories).

Permanent magnet
All electro cylinders are equipped with several permanent magnets integrated into the screw nut. The permanent magnets actuate the sensors, which can be mounted in the longitudinal grooves of the cylinder body.

Toothed belt transmission
The slip and wear free toothed belt transmission for parallel drive cylinders (motor mounted parallel to the cylinder) features a high efficiency and a transmission ratio of 1:1.



Belt tensioning device
A sophisticated belt tensioning device for parallel motor mounting allows the toothed belt to be pre tensioned precisely.

Technical Characteristics

Cylinder size / type		Unit	ETH032			ETH050			ETH080		
			M05	M10	M16	M05	M10	M20	M05	M10	M32
Screw pitch		[mm]	5	10	16	5	10	20	5	10	32
Screw diameter		[mm]		16			20			32	
Travels, speeds and accelerations											
Available strokes * [1)]		[mm]	continuous from 50-1000 & standard strokes			continuous from 50-1200 & standard strokes			continuous from 50-1600 & standard strokes		
Max. permissible speed at stroke =											
50-400 mm		[mm/s]	333	667	1067	333	667	1333	267	533	1707
600 mm		[mm/s]	286	540	855	333	666	1318	267	533	1707
800 mm		[mm/s]	196	373	592	238	462	917	267	533	1707
1000 mm		[mm/s]	146	277	440	177	345	684	264	501	1561
1200 mm		[mm/s]	-	-	-	139	270	536	207	394	1233
1400 mm		[mm/s]	-	-	-	-	-	-	168	320	1006
1600 mm		[mm/s]	-	-	-	-	-	-	140	267	841
Max. Acceleration		[m/s^2]	4	8	12	4	8	15	4	8	15
Forces											
Max. axial traction/thrust force motor inline		[N]	3600	3700	2400	9300	7000	4400	17 800	25 100	10 600
Max. axial traction/thrust force depending on the motor speed n Motor parallel	n < 100 min^{-1}	[N]		3280	2050		4920	2460		11 620	3630
	100 < n < 300 min^{-1}	[N]		2620	1640	7870	3930	1960			
	n > 300 min^{-1}	[N]		1820	1140	5480	2740	1370		10 720	3350
Equivalent dynamic axial force at a lifetime of 2500 km		[N]	1130	1700	1610	2910	3250	2740	3140	7500	6050
Max. transmissible torque / force constant											
Max. transmissible torque inline motor		[Nm]	3.2	6.5	6.8	8.2	12.4	15.6	15.7	44.4	60.0
Max. transmissible torque depending on the motor speed n Motor parallel	n < 100 min^{-1}	[Nm]	3.5	6.4		9.1	9.3		17.5	22.8	
	100 < n < 300 min^{-1}	[Nm]	3.5	5.2		7.7	7.7		17.5	22.8	
	n > 300 min^{-1}	[Nm]	3.5	3.6		5.4	5.4		17.5	21.1	
Force constant motor inline		[N/Nm]	1131	565	353	1131	565	283	1131	565	177
Force constant motor parallel		[N/Nm]	1018	509	318	1018	509	254	1018	509	159
Mass											
Mass of base unit with zero stroke (incl. Cylinder rod)		[kg]	1.2	1.2	1.3	2.2	2.3	2.5	6.9	7.6	8.7
Mass of additional stroke (incl. Cylinder rod)		[kg/m]		4.8			8.6			18.7	
Weight of cylinder rod with zero stroke		[kg]		0.06			0.15			0.59	
Weight of cylinder rod - additional length		[kg/m]		0.99			1.85			4.93	
Mass moments of inertia											
Motor parallel without stroke		[kgmm^2]	8.3	8.8	14.1	30.3	30.6	38.0	215.2	213.6	301.9
Motor inline without stroke		[kgmm^2]	7.1	7.6	12.9	25.3	25.7	33.1	166.2	164.5	252.9
Parallel/inline motor per meter		[kgmm^2/m]	41.3	37.6	41.5	97.7	92.4	106.4	527.7	470.0	585.4
Accuracy: Bidirectional Repeatability (ISO230-2)											
Motor inline		[mm]	±0.03								
Motor parallel		[mm]	±0.05								
Efficiency											
Motor inline	the efficiency includes all friction torques	[%]	90								
Motor parallel		[%]	81								
Ambient conditions											
Operating Temperature		[°C]	-10 ... +70								
Ambient temperature		[°C]	-10 ... +40								
Storage temperature		[°C]	-20 ... +40								
Humidity		[%]	0...95 % (non-condensing)								
Location height range		[m]	max. 3000								

* Intermediate stroke lengths may be interpolated.

[1)] "Order Code" (page 52)

Cylinder size type		Unit	ETH100		ETH125
			M10	M20	
Screw pitch		[mm]	10	20	
Screw diameter		[mm]	50		
Travels, speeds and accelerations					
Available strokes * [1]		[mm]	continuous from 100-2000 & standard strokes		
Max. permissible speed at stroke =					
100-500 mm		[mm/s]	333	667	
600 mm		[mm/s]	333	622	
800 mm		[mm/s]	241	457	
1000 mm		[mm/s]	185	354	
1200 mm		[mm/s]	148	284	
1400 mm		[mm/s]	122	235	
1600 mm		[mm/s]	102	198	
1800 mm		[mm/s]	88	170	
2000 mm		[mm/s]	76	148	
Max. Acceleration		[m/s²]	8	10	
Forces					
Max. axial traction/thrust force motor inline		[N]	54800	56000	max. 114000
Max. axial traction/thrust force depending on the motor speed n Motor parallel	n < 100 min⁻¹	[N]		50800	
	100 < n < 300 min⁻¹	[N]		43200	
	n > 300 min⁻¹	[N]		35600	
Equivalent dynamic axial force at a lifetime of 2500 km		[N]	16570	24390	
Max. transmissible torque / force constant					
Max. transmissible torque inline motor		[Nm]	100	200	
Max. transmissible torque depending on the motor speed n Motor parallel	n < 100 min⁻¹	[Nm]	100	200	
	100 < n < 300 min⁻¹	[Nm]	100	170	
	n > 300 min⁻¹	[Nm]	100	140	
Force constant motor inline		[N/Nm]	565	283	
Force constant motor parallel		[N/Nm]	509	254	
Mass					
Mass of base unit with zero stroke (incl. Cylinder rod)		[kg]	21	23	
Mass of additional stroke (incl. Cylinder rod)		[kg/m]	39		
Weight of cylinder rod with zero stroke		[kg]	1.2		
Weight of cylinder rod - additional length		[kg/m]	7.8		
Mass moments of inertia					
Motor parallel without stroke		[kgmm²]	5860	6240	
Motor inline without stroke		[kgmm²]	2240	2620	
Parallel/inline motor per meter		[kgmm²/m]	4270	4710	
Accuracy: Bidirectional Repeatability (ISO230-2)					
Motor inline		[mm]	±0.05		
Motor parallel		[mm]	±0.07		
Efficiency					
Motor inline	the efficiency includes all friction torques	[%]	90		
Motor parallel		[%]	81		
Ambient conditions					
Operating Temperature		[°C]	-10 ... +70		
Ambient temperature		[°C]	-10 ... +40		
Storage temperature		[°C]	-20 ... +40		
Humidity		[%]	0...95 % (non-condensing)		
Location height range		[m]	max. 3000		

in preparation

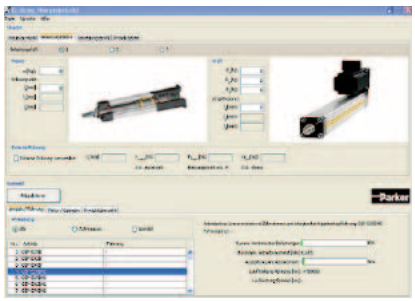
* Intermediate stroke lengths may be interpolated.

[1] "Order Code" (page 52)

Technical Data apply under normal conditions and only for the individual operating and load modes. In the case of compound loads, it is necessary to verify in accordance with normal physical laws and technical standards whether individual ratings should be reduced. In case of doubt please contact Parker.

Step by Step Selection Process

The following sizing steps help you to find the suitable electro cylinder.
Select an electro cylinder using estimated application data. Calculate the actually required application data following the dimensioning steps described below.
If your application's requirements exceed a maximum value, please choose a larger electro cylinder and recheck the maximum values. Perhaps, a smaller electro cylinder can also meet the requirements.

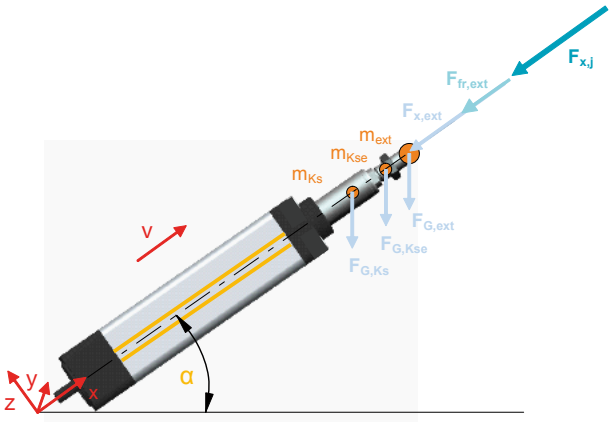


Automated dimensioning with the help of the "EL Sizing Tool"
A dimensioning tool simplifies the dimensioning process. Download under:
www.parker.com/eme/eth

Step	Application data	Selection	With the aid of ...
1	Accuracy, ambient conditions	Check the basic conditions for the use of the ETH in your application.	"Technical Characteristics" (page 8)
2	Required space	Check the space available in your application and choose the motor mounting option: inline or parallel.	"Dimensions" (page 21)
3	Axial forces	Calculation of the axial forces in the individual segments of the application cycle.	"Calculating Required Axial Force" (page 11)
4	Maximum force required	Determination of the maximum required axial force (traction and thrust force)	Determination of the maximum required axial force (page 12)
		Selection of the cylinder via the maximum axial traction/ thrust force (please use the characteristics of your desired motor mounting option: inline or parallel).	"Technical Characteristics" (page 8)
5	Maximum speed	Selection of the screw lead for the desired cylinder.	"Technical Characteristics" (page 8)
6	Maximum Acceleration	Please check if the maximum acceleration is sufficient.	"Technical Characteristics" (page 8)
7	Select stroke	Selection of the desired stroke: Determine required stroke from usable stroke and safety travels select the desired stroke from the list of standard strokes or, if the desired stroke is not listed: Define the length of the usable stroke in steps of one mm. Caution! Please respect the minimum and the maximum possible stroke	"Stroke, Usable Stroke and Safety Travel" (page 19) "Order Code" (page 52) "Technical Characteristics" (page 8)
8	Permissible thrust force taking the buckling risk into consideration	Check the maximum thrust force depending on the stroke and the mounting variant. Maybe your application can also be realized with a different mounting variant allowing to attain the maximum thrust force.	"Permissible Axial Thrust Forces" (page 15)
9	Service life	Determining the service life with the aid of an equivalent axial force, the operational environment (application factor) and the service life diagrams.	"Service Life" (page 13)
10	Permissible side load	Determine the lateral forces of your application and compare them to the permissible lateral forces (depending on the stroke).	Side load (page 17) Diagrams (page 17)
11	Relubricating cycle	Please check, if the required relubricating cycle is suitable for your production environment.	"Relubrication" (page 20)
12	Motor / gearbox	Calculation of the necessary torque to generate the required force at the ETH. Selection of a suitable motor.	"Motor and Gearbox Selection" (page 25)
13	Motor mounting flange	Selection of a suitable motor mounting flange.	"Motor Mounting Options" (page 22)
14	Mounting type	Selection of the electro cylinder mounting method.	"Mounting Methods" (page 26)
15	Cylinder rods	Selection of the cylinder rod end for load mounting.	"Cylinder Rod Version" (page 31)

Calculating Required Axial Force

Formulas 1 & 2 below give the mathematical equation for calculating the thrust required to extend or retract the piston rod.
With the aid of the axial forces, it is possible to check if the electro cylinder is able to provide the required forces and if the maximum buckling load is respected. The axial forces are also used as the calculation basis for the service life.



Service loading

Formula symbols (Formula 1-2)

$F_{x,a,j}$	=	Axial forces during extension in N
$F_{x,e,j}$	=	Axial forces during retraction in N
$F_{x,ext}$	=	External axial force in N
$F_{G,ext}$	=	Weight force caused by an additional mass in N
$F_{G,Kse}$	=	Weight force caused by the cylinder rod end in N
$F_{G,Ks}$	=	Weight force caused by the cylinder rod in N
m_{ext}	=	Additional mass in kg
m_{Kse}	=	Mass of the cylinder rod end in kg (see "Cylinder Rod Versions" page 31)
$m_{Ks,0}$	=	Mass of the cylinder rod at zero stroke in kg (see table "Technical Data" page 8)
$m_{Ks,Stroke}$	=	Mass of the cylinder rod per mm of stroke in kg (see table "Technical Data" page 8)
Stroke	=	Selected stroke in m
$a_{K,j}$	=	Acceleration at the cylinder rod in m/s²
α	=	Alignment angle in °
$F_{x,max}$	=	Maximum permissible axial force in N
$F_{fr,ext}$	=	External friction force in N

Index "j" for the individual segments of the application cycle

Calculation of axial forces

Determine the axial forces occurring during each individual segment of the application cycle.

Cylinder rod extending:

$$F_{x,a,j} = F_{x,ext} + F_{fr,ext} + (m_{ext} + m_{Kse} + m_{Ks,0} + m_{Ks,Stroke} \bullet Stroke) \bullet (a_{K,j} + \sin\alpha \bullet 9.81 \frac{m}{s^2})$$

Formula 1

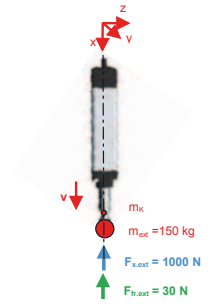
Cylinder rod retracting:

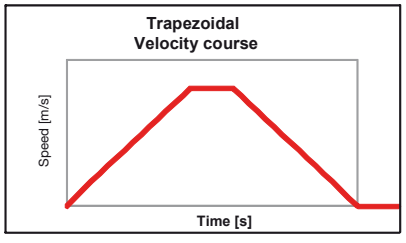
$$F_{x,e,j} = F_{x,ext} - F_{fr,ext} + (m_{ext} + m_{Kse} + m_{Ks,0} + m_{Ks,Stroke} \bullet Stroke) \bullet (-a_{K,j} + \sin\alpha \bullet 9.81 \frac{m}{s^2})$$

Formula 2

Sample calculation:

Vertical mounting
- ETH050
- Stroke = 500 mm = 0.5 m
- Pitch = 5 mm
- Rod End: External thread
- Trapezoidal velocity course
- Acceleration a_K = 4 m/s²
- m_{ext} = 150 kg
- $F_{x,ext}$ = 1000 N
- m_{Kse} = 0.15 kg
- $m_{Ks,0}$ = 0.15 kg
- $m_{Ks,Stroke}$ = 1.85 kg/m
- Alignment angle α = -90°
- External friction force = 30 N





Time [s]

Thrust rod moving forth: Mass is moved downwards

Load case: Acceleration

$$F_{x,a,1} = 1000N + 30N + \left(150kg + 0{,}15kg + 0{,}15kg + 1{,}85\frac{kg}{m} \cdot 0{,}5m\right) \cdot \left(4\frac{m}{s^2} + \sin(-90°) \cdot 9{,}81\frac{m}{s^2}\right) = 151N$$

Load case: Constant Velocity

$$F_{x,a,2} = 1000N + 30N + \left(150kg + 0{,}15kg + 0{,}15kg + 1{,}85\frac{kg}{m} \cdot 0{,}5m\right) \cdot \left(0\frac{m}{s^2} + \sin(-90°) \cdot 9{,}81\frac{m}{s^2}\right) = -454N$$

Load case: Deceleration

$$F_{x,a,3} = 1000N + 30N + \left(150kg + 0{,}15kg + 0{,}15kg + 1{,}85\frac{kg}{m} \cdot 0{,}5m\right) \cdot \left(-4\frac{m}{s^2} + \sin(-90°) \cdot 9{,}81\frac{m}{s^2}\right) = -1058N$$

Thrust rod moving back: Mass is moved upwards

Load case: Acceleration

$$F_{x,e,4} = 1000N - 30N + \left(150kg + 0{,}15kg + 0{,}15kg + 1{,}85\frac{kg}{m} \cdot 0{,}5m\right) \cdot \left(-4\frac{m}{s^2} + \sin(-90°) \cdot 9{,}81\frac{m}{s^2}\right) = -1118N$$

Load case: Constant Velocity

$$F_{x,e,5} = 1000N - 30N + \left(150kg + 0{,}15kg + 0{,}15kg + 1{,}85\frac{kg}{m} \cdot 0{,}5m\right) \cdot \left(0\frac{m}{s^2} + \sin(-90°) \cdot 9{,}81\frac{m}{s^2}\right) = -514N$$

Load case: Deceleration

$$F_{x,e,6} = 1000N - 30N + \left(150kg + 0{,}15kg + 0{,}15kg + 1{,}85\frac{kg}{m} \cdot 0{,}5m\right) \cdot \left(4\frac{m}{s^2} + \sin(-90°) \cdot 9{,}81\frac{m}{s^2}\right) = 91N$$

Selection of the Size and Screw Lead

Required Maximum Axial Force

Determine the maximum axial force (page 11) that the electro cylinder must provide.

Preselection of the electro cylinder

Using the calculated force required, compare the actual ETH specifications (page 8) to determine which profile size will produce enough force.
Once you have determined a profile size, determine that the unit will physically fit in the space allowed by the application (including parallel or in-line motor mounts).

Required Maximum Velocity

The maximum velocity of the electro cylinder depends on the stroke.
With the profile size selected, refer to the critical speed information (page 8) to determine which screw lead works best for the application at the needed stroke length.
When the precise stroke is defined, the velocity must again be verified.

Required Maximum Acceleration

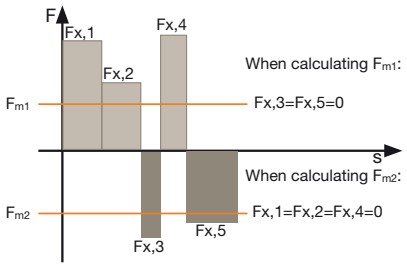
The maximum acceleration depends on the screw lead and serves as an additional selection criterion for the suitable electro cylinder. It is listed in the "Technical Data" (page 8).

Service Life

Nominal service life[1]

The nominal service life of the electro cylinder can be determined with the aid of the diagrams page 14.
The forces calculated for each individual segment of the application cycle must be summarized into an equivalent axial force Fm "Calculating Required Axial Force" (page 11). If axial forces with different signs apply, two equivalent axial forces must be calculated:

- F_{m1} for all positive forces. The negative forces will convert to zero.
- F_{m2} for all negative forces. The positive forces will convert to zero.



Calculation

$$F_{m1,2} = \sqrt[3]{\frac{1}{s_{total}} (F^3_{x,1} \bullet s_1 + F^3_{x,2} \bullet s_2 + F^3_{x,3} \bullet s_3 + ...)}$$

Formula 3

With the equivalent axial forces, the nominal service life L in km can be read off the diagrams on page 14.

With **load on both sides**, the nominal service life is:

$$L = (L_1^{-1.11} + L_2^{-1.11})^{-0.9}$$

Formula 3.1

Actual service life

The actual service life can only be approximated due to a variety of different effects. The nominal service life L calculation does, for instance, not take insufficient lubrication, impacts and vibrations into consideration. These effects can however be estimated with the aid of the application factor fw.

The actual service life is calculated as follows:

$$L_{fw} = \frac{L}{f_w^3}$$

Formula 4

Application factor f_w

Movement cycle	Shocks/vibrations			
	none	light	medium	heavy
More than 2.5 screw rotations	**1.0**	**1.2**	**1.4**	**1.7**
1.0 to 2.5 screw rotations* (short stroke applications)	1.8	2.1	2.5	3.0

* After max. 10000 movement cycles, a lubrication run must be performed (see lubrication run intervals).

Boundary conditions for application factor f_w:

- Externally guided electro cylinders
- Accelerations <10 m/s²

If your application factor is <1.5, please contact Parker.
The same applies for detailed calculations or for special boundary conditions.

Lubrication run lengths for short stroke applications

Lengths of lubrication runs [mm]	ETH032			ETH050			ETH080			ETH100	
	M05	M10	M16	M05	M10	M20	M05	M10	M32	M10	M20
	>45	>54	>58	>40	>46	>58	>47	>65	>95	>102	>140

Abbreviations used (formula 3-4)

F_m	=	Equivalent axial force in N
$F_{x,j}$	=	Resulting axial force in N see formula 1 & formula 2, page 11
s_j	=	Travel given a defined force $F_{x,a,j}$ in mm
s_{total}	=	Total travel in mm
L	=	Nominal service life in km see "Service Life" diagrams page 13
L_{fw}	=	Service life respecting the application factor in km
f_w	=	Application factor see table "Application Factor" page 13

Index "j" for the individual segments of the application cycle

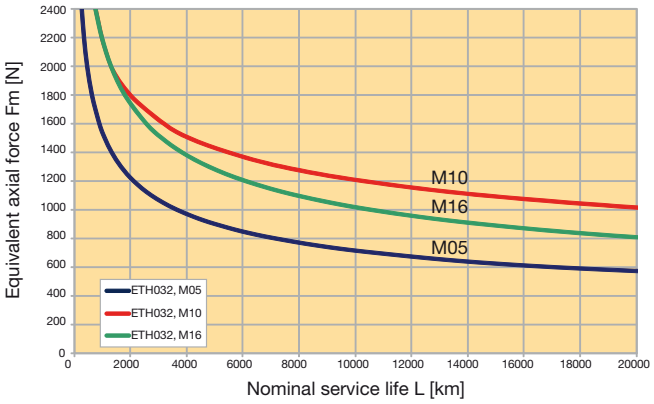
If you need the service life as the number of possible cycles, just divide the service life in kilometers by twice the stroke traveled. i.e. Standstill times are not taken into consideration when determining the equivalent axial force (F_m), as s_j=0. Caution, do always consider the stroke as well as the return stroke.

[1]The nominal service life is the service life reached by 90 % of a sufficient number of similar electro cylinders until the first signs of material fatigue occur.

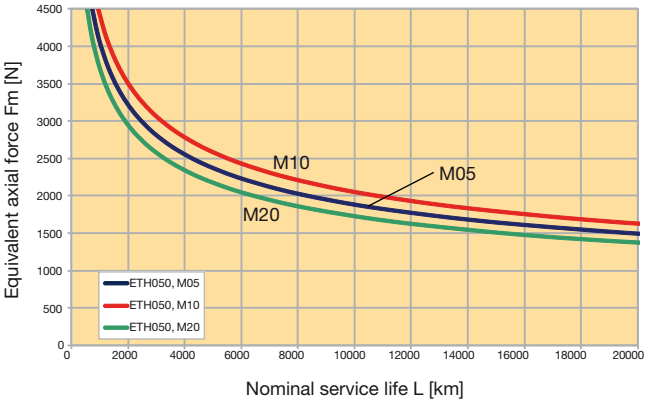
Diagrams

The given values apply when adhering to the recommended lubrication intervals (see relubrication). The diagrams were established in accordance with DIN ISO 3408-5

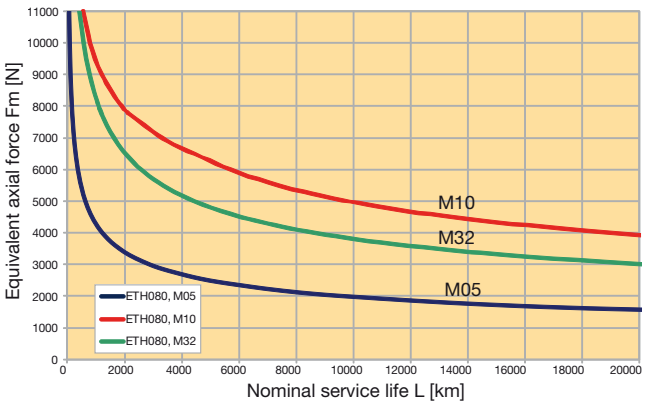
ETH032



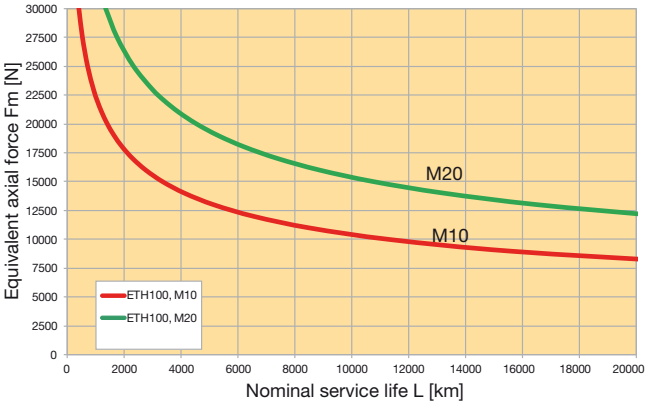
ETH050



ETH080



ETH100



Prerequisites for nominal service life

- Bearing and screw temperature between 20 °C and 40 °C.
- No impairment of the lubrication, for example by external particles.
- Relubrication in accordance with the specifications.
- The given values for thrust force, speed and acceleration must be adhered to at any rate.
- No approaching the mechanical end stops (external or internal), no other abrupt loads, as the given maximum force of the cylinder may never be exceeded.
- No external side loads
- Application factor fw = 1 In order to calculate the real service life and the corresponding application factor, please refer to chapter "Service Life" see page 13
- No high exploitation of several power features at a time (for example maximum speed or thrust force).
- No regulating oscillation at standstill.

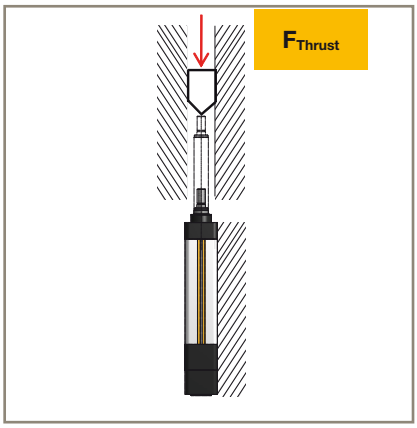
Permissible Axial Thrust Forces

Limited by the risk of buckling, depending on the stroke and the mounting method; traction forces do not pose any buckling risk.
Please check if the maximum axial force (page 11) is possible with the planned mounting method and for the desired stroke

Diagrams

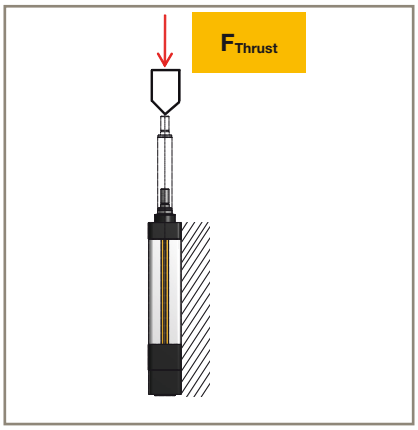
Case 1

Cylinders fixed with mounting flanges, foot mounting or mounting plates.
Cylinder always fixed at the front end as well.
Thrust rod with axial guiding



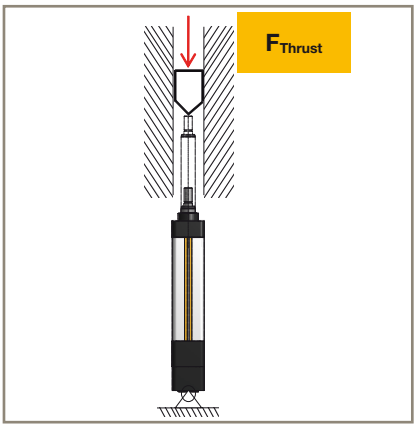
Case 2

Cylinders fixed with mounting flanges, foot mounting or mounting plates.
Cylinder always fixed at the front end as well. Thrust rod without axial guiding.
External force applied axially with respect to cylinder axis.

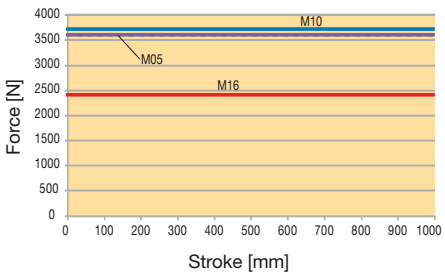


Case 3

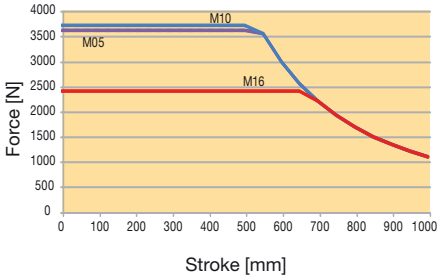
Cylinder mounted with center trunnion, rear clevis or any other rear fixing material (e.g. rear mounting plate).
Thrust rod with axial guiding



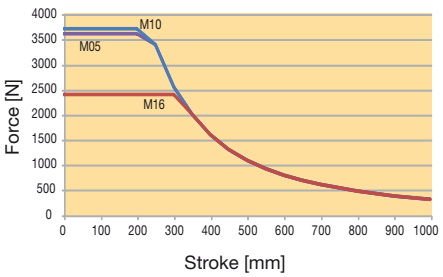
ETH032 - Case 1



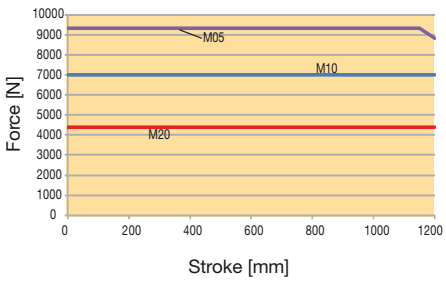
ETH032 - Case 2



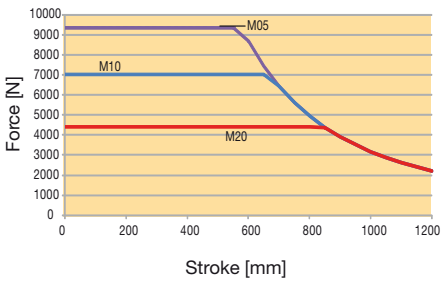
ETH032 - Case 3



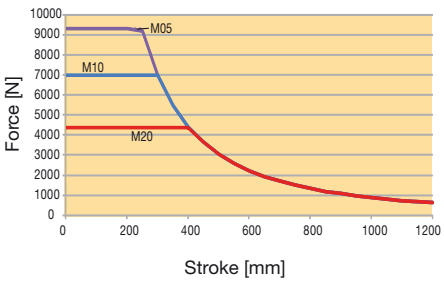
ETH050 - Case 1



ETH050 - Case 2

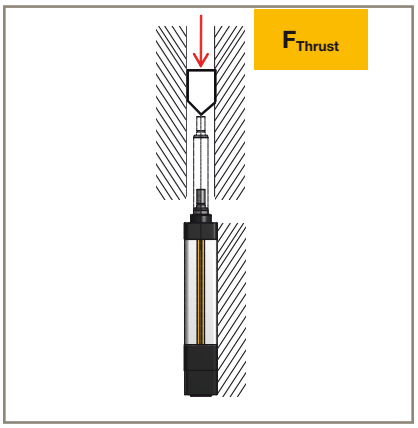


ETH050 - Case 3



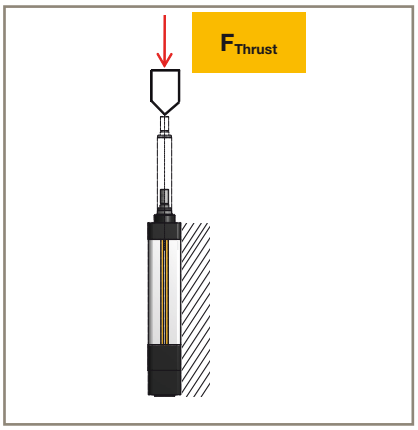
Case 1

Cylinders fixed with mounting flanges, foot mounting or mounting plates.
Cylinder always fixed at the front end as well.
Thrust rod with axial guiding



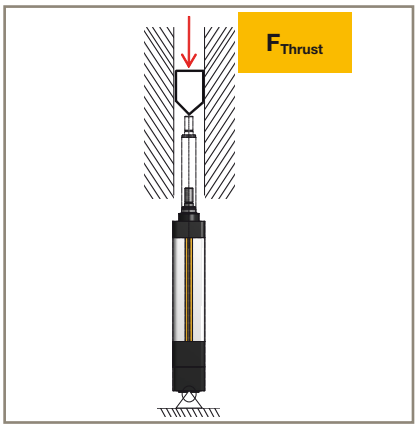
Case 2

Cylinders fixed with mounting flanges, foot mounting or mounting plates.
Cylinder always fixed at the front end as well. Thrust rod without axial guiding.
External force applied axially with respect to cylinder axis.

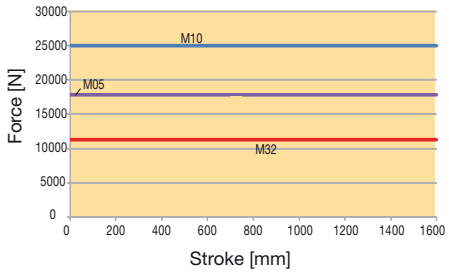


Case 3

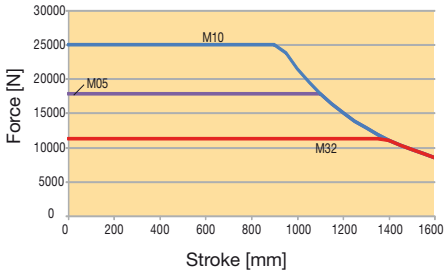
Cylinder mounted with center trunnion, rear clevis or any other rear fixing material (e.g. rear mounting plate).
Thrust rod with axial guiding



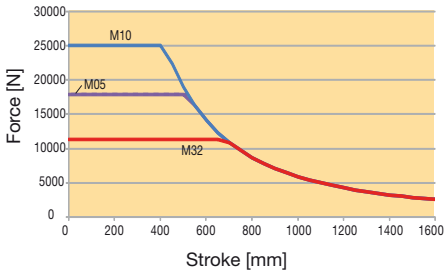
ETH080 - Case 1



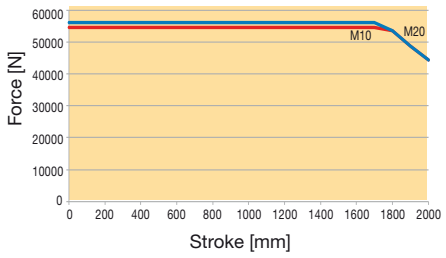
ETH080 - Case 2



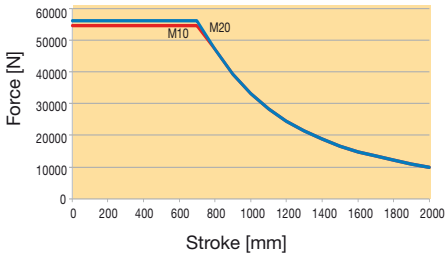
ETH080 - Case 3



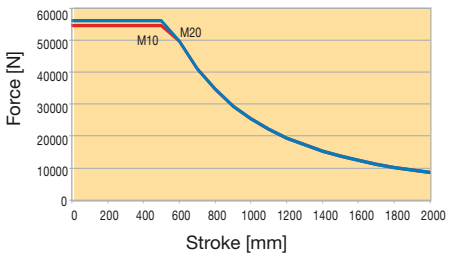
ETH100 - Case 1



ETH100 - Case 2



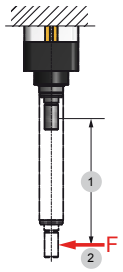
ETH100 - Case 3



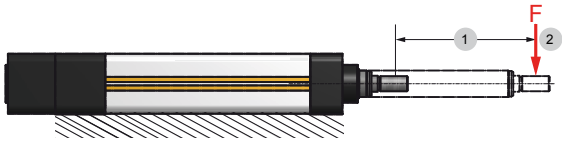
Permissible Side Load

The electro cylinder features a generously dimensioned cylinder rod and screw nut bearing in the form of high-quality plastic sliding elements to absorb the side load. Please note that electro cylinders with a longer stroke permit a higher lateral force at the same extension length. It may therefore be useful to choose a longer stroke than required for the application in order to increase the permissible lateral force.
If the permissible lateral forces are exceeded or if the maximum axial force occurs at the same time, the optional outrigger bearing (option R) must be used.

Permissible lateral forces in vertical mounting position

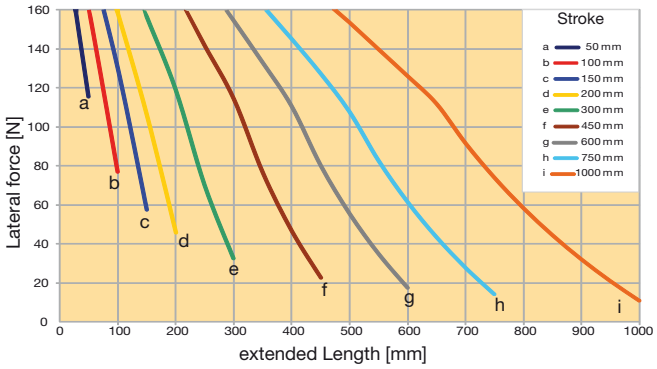


Permissible lateral forces in horizontal mounting position

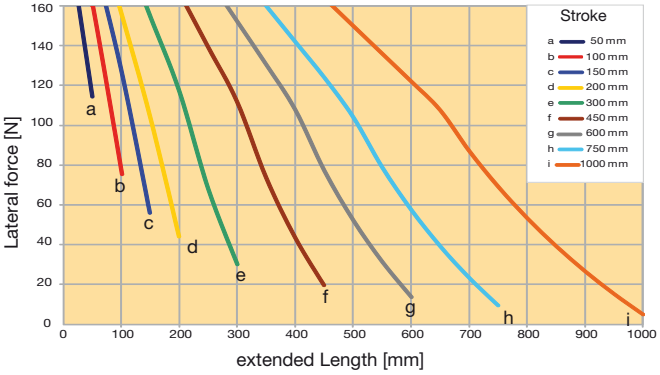


1: extended length
2: Force application - at the middle of the cylinder rod thread

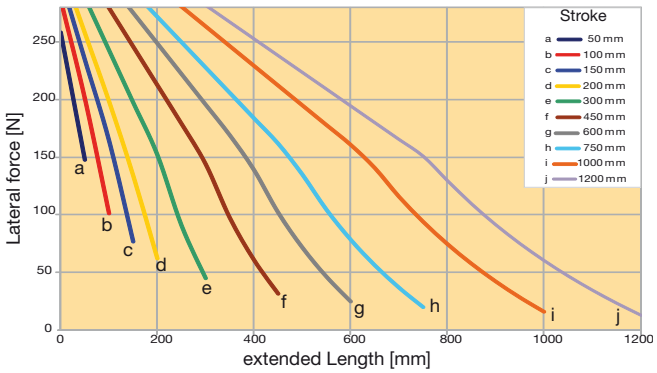
ETH032



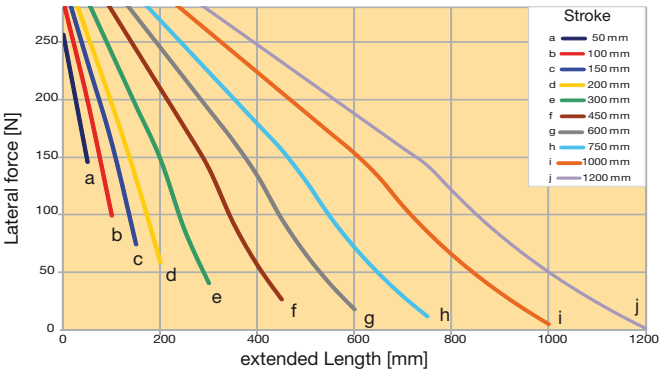
ETH032



ETH050

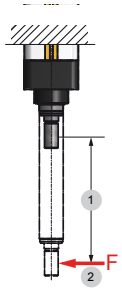


ETH050

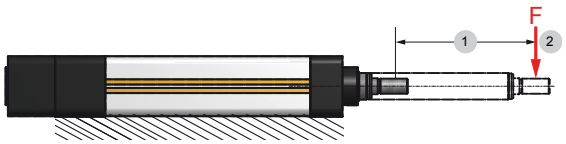


The diagrams apply for a medium travel speed of 0.5 m/s, an ambient temperature of 20 °C and all housing orientations.

Permissible lateral forces in vertical mounting position

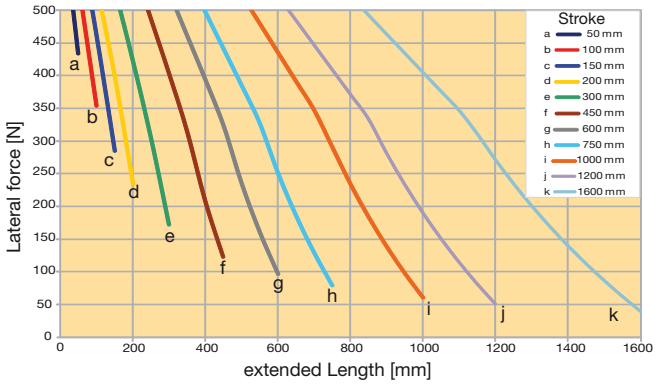


Permissible lateral forces in horizontal mounting position

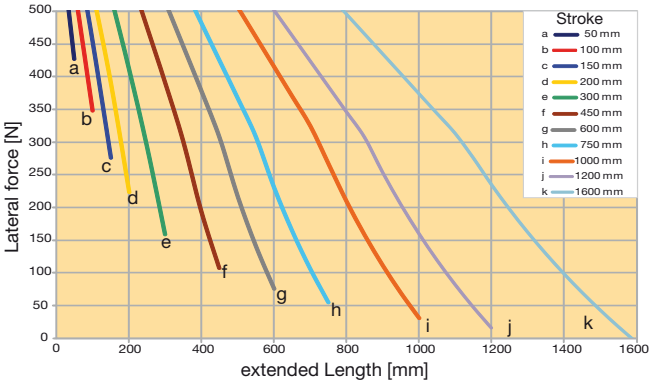


1: extended length
2: Force application - at the middle of the cylinder rod thread

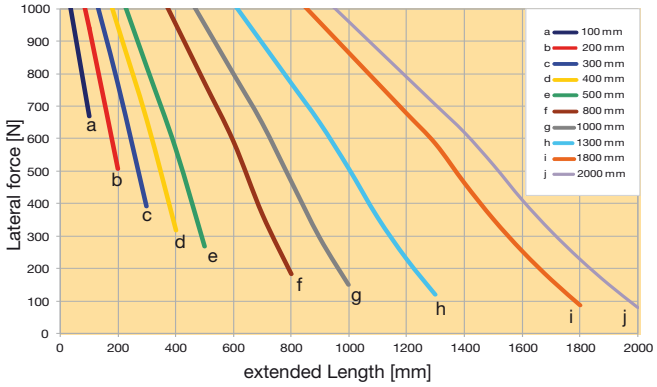
ETH080



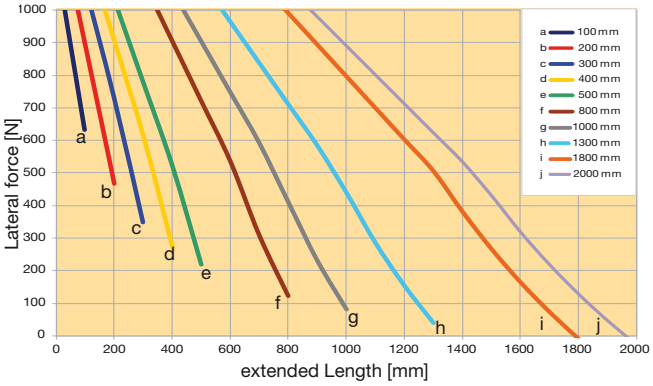
ETH080



ETH100



ETH100



The diagrams apply for a medium travel speed of 0.5 m/s, an ambient temperature of 20 °C and all housing orientations.

Stroke, Usable Stroke and Safety Travel

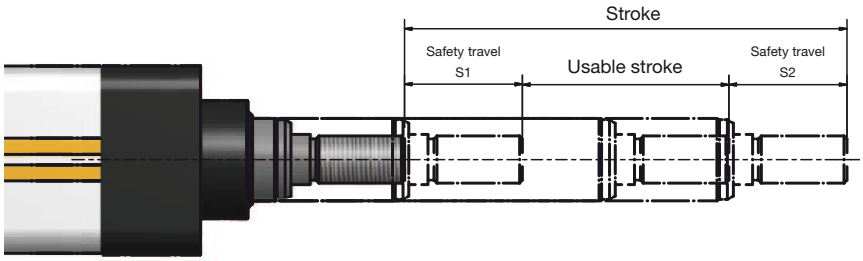
Calculation

Stroke:

The stroke to be indicated in the order code is the mechanically maximal possible stroke between the internal end stops.

Usable stroke:

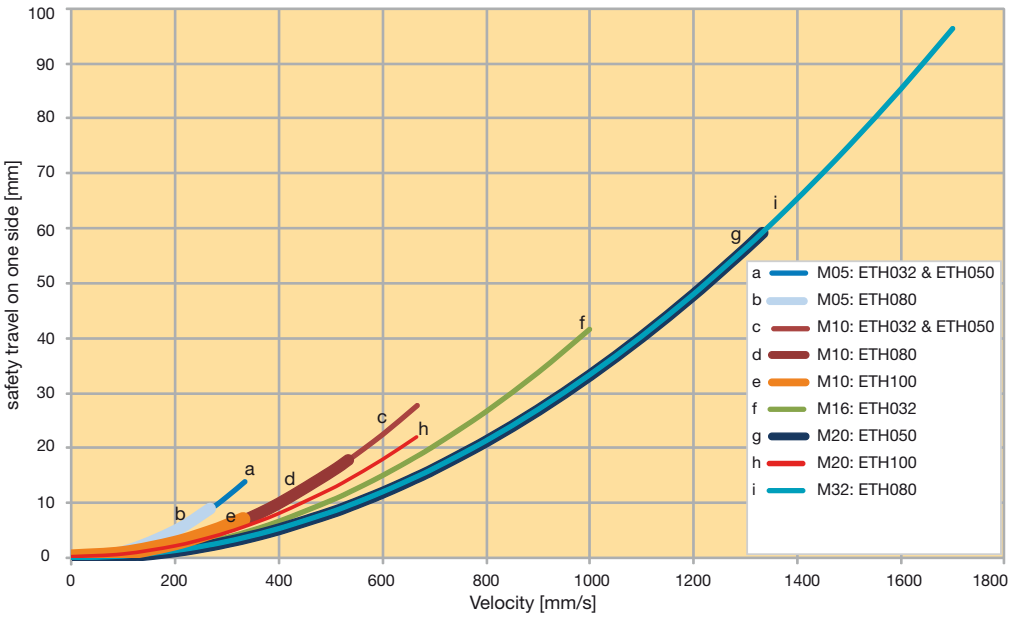
The usable stroke is the distance which you need to move in your application. It is always shorter than the stroke.



Safety travel (S1 & S2):

The safety travels are required to slow down the cylinder after it has passed a limit switch, Emergency stop in order to avoid contact with the mechanical limit stops.
Depending on the screw lead and the maximum speed, the following diagram recommends a minimum safety travel, which is sufficient for most applications according to experience.
With demanding applications (great masses and high dynamic), the safety travel has to be calculated and enlarged accordingly (dimensioning on demand).

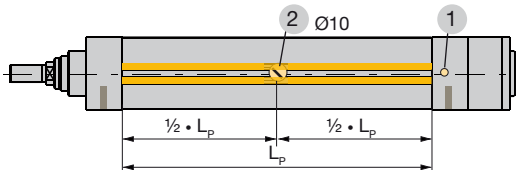
Diagram



Information: The safety travel taken from the diagram applies for one side. I.e. the diagram value must be multiplied by factor 2 in order to get the total safety travel. The diagram is based on the maximum screw acceleration / deceleration

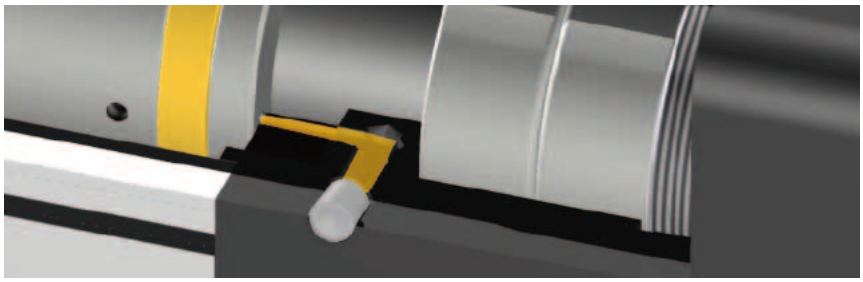
Relubrication

All frame sizes include a standard Easy lubrication port for lubricating the screw nut (designation "1" in the order code page 52).



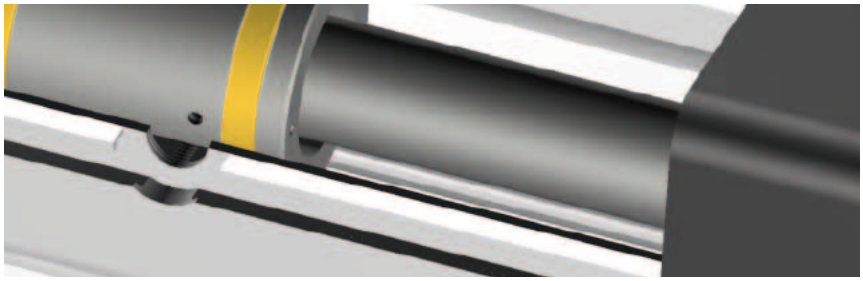
1: Central lubrication (standard)
2: Optional lubrication (possible on all 4 sides).
L_P: Length of profile

Option 1: Central lubrication (standard)



Relubrication is simple with the easy access port. Users simply perform a controlled retract of the cylinder approaching the end stop under slow speed and grease the cylinder. Central relubrication orientation is always envisaged in a 3 o'clock position.

Option 2...5: Middle lubrication via an opening in the profile



If a space constraint does not allow easy access to the standard lubrication port, other options in the part number configuration allow for a port at the center of the extrusion. Free access to this bore even after integration of the cylinder into a system can be ensured by choosing the corresponding profile orientation (see order code page 52). The bore is located exactly in the middle of the aluminum profile.

Lubrication intervals

The lubrication intervals depend on the operating conditions (nominal size, pitch, speed, acceleration, loads, etc.) and the ambient conditions (e.g. temperature). Ambient influences such as high loads, impacts and vibrations shorten the lubrication intervals. In the event of small loads and if the application is impact and vibration free, the lubrication intervals can be increased. Under normal operating conditions, the given lubrication intervals apply. If the total travel per year is shorter than the given intervals, the cylinder must be relubricated at least once per year.

Lubrication is always required if the cylinder will not be used for a longer period of time!
The lubricant used is supplied by Klüber; it is available worldwide.

Normal operating conditions:

- Medium speed: 0.5 x v_{max}
- Operating factor fw=1.0
- No impacts and vibrations
- Load ratio Fm/Fmax: 20 %

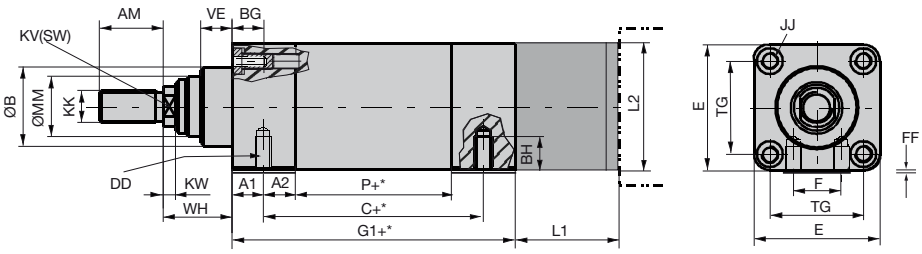
ETH032			ETH050			ETH080			ETH100	
M05	M10	M16	M05	M10	M20	M05	M10	M32	M10	M20
240 km	480 km	760 km	240 km	480 km	960 km	240 km	480 km	1530 km	240 km	480 km

Different operating conditions will shorten the lubrication intervals. Under normal operating conditions, the given lubrication intervals apply.

Dimensions

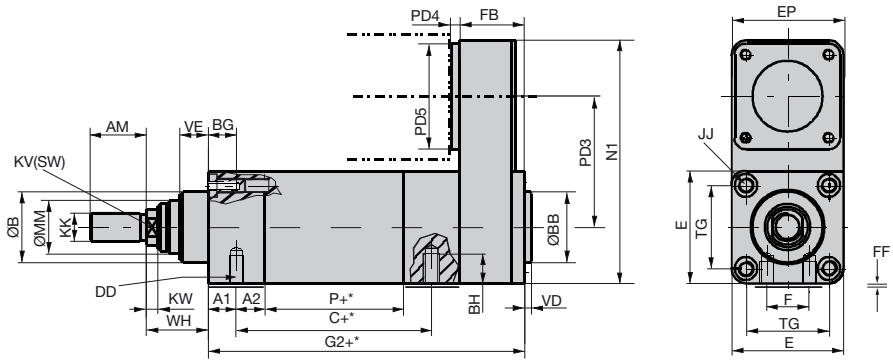
Electro Cylinder

prepared for inline motor mounting



Electro Cylinder

prepared for parallel motor mounting



+* =Measure + length of desired stroke.

Dimensions Standard (IP-Version)

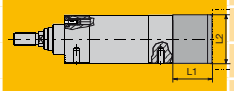
Cylinder size	Unit	ETH032			ETH050			ETH080			ETH100	
Screw pitch		M05	M10	M16	M05	M10	M20	M05	M10	M32	M10	M20
C	[mm]	93.6 (93.6)	102.6 (102.6)	106.6 (106.6)	99.5 (100.5)	105.5 (106.5)	117.5 (118.5)	141.5 (142.5)	159.5 (160.5)	189.5 (190.5)	- *	
G1	[mm]	133 (180.5)	142 (189.5)	146 (193.5)	154 (198.5)	160 (204.5)	172 (216.5)	197 (259.5)	215 (277.5)	245 (307.5)	323 (349.5)	361 (387.5)
G2	[mm]	180.5 (228.5)	189.5 (237.5)	193.5 (241.5)	194 (239)	200 (245)	212 (257)	257 (320)	275 (338)	305 (368)	451 (478.0)	489 (516.0)
P	[mm]	66	75	79	67	73	85	89	107	137	162	200
A1	[mm]	14 (60)			15.5 (58.5)			21 (82)			- *	
A2	[mm]	17			18.5			32			- *	
AM	[mm]	22			32			40			70	
BG (=BN+BS)	[mm]	16			25			26			32	
BN Usable length of thread	[mm]	11			20			20			22	
BS Depth of width across flat (without thread)	[mm]	5			5			6			10	
BH	[mm]	9			12.7			18.5			- *	
DD mounting thread[1]	[mm]	M6x1.0			M8x1.25			M12x1.75			- *	
E	[mm]	46.5			63.5			95			120	
EP		46.5			63.5			95			175	
F	[mm]	16			24			30			- *	
FF	[mm]	0.5			0.5			1.0			0	
JJ	[mm]	M6x1.0			M8x1.25			M10x1.5			M16x2	
KK	[mm]	M10x1.25			M16x1.5			M20x1.5			M42x2	
KV	[mm]	10			17			22			46	
ØMM h9	[mm]	22			28			45			70	
TG	[mm]	32.5			46.5			72			89	
KW	[mm]	5			6.5			10			10	
N1	[mm]	126			160			233.5			347	
FB	[mm]	47.5 (48)			40 (40.5)			60 (60.5)			128	
VD	[mm]	4			4			4			4	
ØBB	[mm]	30			40			45			90 d8	
VE	[mm]	12			16			20			20	
WH	[mm]	26			37			46			51	
ØB	[mm]	30 d11			40 d11			60 d11			90 d8	

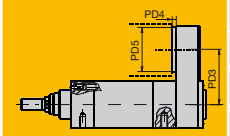
[1] Thread "DD" is only mandatory for mounting method "F".
* ETH100 does not have a mounting thread on the underside.

Motor Mounting Options

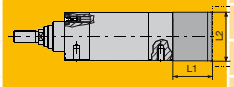
Dimensions [mm]

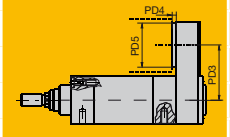
ETH032

inline	Code	Motor / gearbox	Motor Dimensions: Pilot	Bolt circle	∅ Shaft	Shaft length	Motor mounting options: L1	L2
	K1A	SMH60-B08/9	40	63	9	20	60.0	60.0
	K1A	MH56-B05/9	40	63	9	20		
	K1B	SMH60-B05/11	60	75	11	23	60.0	70.0
	K1B	MH70-B05/11	60	75	11	23		
	K1B	NX3	60	75	11	23		
	K1C	SMH82-B08/14	80	100	14	30	67.0	82.0
	P1A	PS60	50	70	16	40	77.0	63.5
	P1G	PE3	40	52	14	35	72.0	63.5

parallel	Code	Motor / gearbox	Pilot	Bolt circle	∅ Shaft	Shaft length	PD3	PD4	PD5
	K1A	SMH60-B08/9	40	63	9	20	67.5	9.0	60.0
	K1A	MH56-B05/9	40	63	9	20			
	K1B	SMH60-B05/11	60	75	11	23		9.0	70.0
	K1B	MH70-B05/11	60	75	11	23			
	K1B	NX3	60	75	11	23			
	K1C	SMH82-B08/14	80	100	14	30		14.0	82.0
	P1A	PS60	50	70	16	40		22.0	63.5
	P1G	PE3	40	52	14	35		16.0	63.5

ETH050

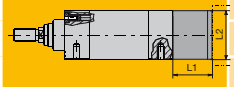
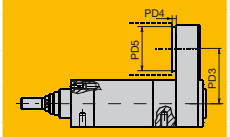
inline	Code	Motor / gearbox	Motor Dimensions: Pilot	Bolt circle	∅ Shaft	Shaft length	Motor mounting options: L1	L2
	K1B	SMH60-B05/11	60	75	11	23	59	70
	K1B	MH70-B05/11	60	75	11	23	59	70
	K1B	NX3	60	75	11	23	59	70
	K1C	SMH82-B08/14	80	100	14	30	63	82
	K1E	SMH82-B05/19	95	115	19	40	84	100
	K1E	SMH100-B5/19	95	115	19	40	84	100
	K1E	MH105-B5/19	95	115	19	40	84	105
	K1D	MH105-B9/19	80	100	19	40	84	105
	K1D	SMH82-B08/19	80	100	19	40	84	82
	K1D	NX4	80	100	19	40	84	82
	P1A	PS60	50	70	16	40	74	63.5
	P1G	PE3	40	52	14	35	69	63.5

parallel	Code	Motor / gearbox	Pilot	Bolt circle	∅ Shaft	Shaft length	PD3	PD4	PD5
	K1B	SMH60-B05/11	60	75	11	23	87.5	9	70
	K1B	MH70-B05/11	60	75	11	23		9	70
	K1B	NX3	60	75	11	23		9	70
	K1C	SMH82-B08/14	80	100	14	30		13	82
	K1F	SMH100-B5/14*	95	115	14	30		13	100
	P1A	PS60	50	70	16	40		24	63.5
	P1G	PE3	40	52	14	35		16	63.5

* Order Code SMH100-B5/14: " SMH100⌴⌴⌴ET... " (the motor shaft diameter is replaced by the term "ET")
(not in the motors catalog) only with feedback: Resolver, G5, A7

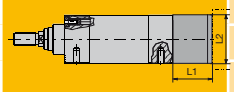
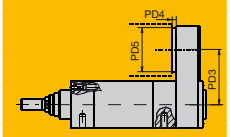
Motors always with key groove on the output shaft. Additional motor mounting options on request

Dimensions [mm]

				Motor Dimensions				Motor mounting options		
ETH080	inline	Code	Motor / gearbox	Pilot	Bolt circle	∅ Shaft	Shaft length	L1	L2	
		K1E	SMH82-B05/19	95	115	19	40	94.5	100	
		K1E	SMH100-B5/19	95	115	19	40	94.5	100	
		K1E	MH105-B5/19	95	115	19	40	94.5	100	
		K1D	MH105-B9/19	80	100	19	40	94.5	96	
		K1D	SMH82-B08/19	80	100	19	40	94.5	96	
		K1D	NX4	80	100	19	40	94.5	96	
		K1K	MH145-B5/24	130	165	24	50	104.5	145	
		K1K	SMH142-B5/24	130	165	24	50	104.5	145	
		K1J	MH105-B6/24	110	130	24	50	104.5	116	
		K1J	SMH115-B7/24	110	130	24	50	104.5	116	
		K1J	NX6	110	130	24	50	104.5	116	
		P1B	PS90	80	100	22	52	106.5	95	
		P1H	PE4	80	100	20	40	94.5	95	
	parallel	Code	Motor / gearbox	Pilot	Bolt circle	∅ Shaft	Shaft length	PD3	PD4	PD5
		K1E	SMH82-B05/19	95	115	19	40		15	100
		K1E	SMH100-B5/19	95	115	19	40		15	100
		K1E	MH105-B5/19	95	115	19	40		15	100
		K1D	MH105-B9/19	80	100	19	40		15	96
		K1D	SMH82-B08/19	80	100	19	40		15	96
		K1D	NX4	80	100	19	40		15	96
		K1K	MH145-B5/24	130	165	24	50	130	15	145
		K1K	SMH142-B5/24	130	165	24	50		15	145
		K1J	MH105-B6/24	110	130	24	50		15	116
		K1J	SMH115-B7/24	110	130	24	50		15	116
		K1J	NX6	110	130	24	50		15	116
		P1B	PS90	80	100	22	52		30	95
		P1H	PE4	80	100	20	40		12	95

Motors always with key groove on the output shaft. Additional motor mounting options on request

Dimensions [mm]

				Motor Dimensions				Motor mounting options		
ETH100	inline	Code	Motor / gearbox	Pilot	Bolt circle	∅ Shaft	Shaft length	L1	L2	
		K1H	SMH100-B05/24	95	115	24	50	155	140	
		K1H	MH105-B05/24	95	115	24	50	155	140	
		K1J	SMH115-B07/24	110	130	24	50	155	140	
		K1K	SMH142-B05/24	130	165	24	50	155	145	
		K1K	MH145-B05/24	130	165	24	50	155	145	
		K1L	MH205-B05/38	180	215	38	80	185	205	
		K1L	SMH170-B5/38	180	215	38	80	185	205	
		P1C	PS115	110	130	32	68	175	140	
		P1D	PS142	130	165	40	102	207	142	
	parallel	Code	Motor / gearbox	Pilot	Bolt circle	∅ Shaft	Shaft length	PD3	PD4	PD5
		K1H	SMH100-B05/24	95	115	24	50		23	155
		K1H	MH105-B05/24	95	115	24	50		23	155
		K1J	SMH115-B07/24	110	130	24	50		23	155
		K1K	SMH142-B05/24	130	165	24	50		22	155
		K1K	MH145-B05/24	130	165	24	50	176	22	155
		K1L	MH205-B05/38	180	215	38	80		27	205
		K1L	SMH170-B5/38	180	215	38	80		27	205
		P1C	PS115	110	130	32	68		38	155
		P1D	PS142	130	165	40	102		45	155

Motors always with key groove on the output shaft. Additional motor mounting options on request

Motor and Gearbox Selection

Drive torque calculation

The torques to be produced by the motor result from the acceleration, the load and the friction torque. The drive torques must be calculated for all segments of the application cycle (represented by index "j").

Calculation of the **acceleration torque** with respect to the rotary moments of inertia:

$$M_{B,j} = \left((J_{i/p,0} + J_{i/p,Stroke} \bullet \text{Stroke}) \bullet \frac{1}{\eta_{ETH}} \bullet \frac{1}{i_G^{\,2} \bullet \eta_G} + J_G + J_M \right) \bullet 10^{-3} \bullet \frac{6.28 \bullet a_{K,j}}{P_h}$$

only with gearbox

Formula 5

The acceleration forces due to the translatory moved masses are taken into consideration in the calculation of the axial forces on (page 11).

The **load torques** result from the occurring axial forces:

$$M_{L,j} = \frac{F_{x,a\,/\,e,j}}{\text{Thrust force factor}} \bullet \frac{1}{i_G \bullet \eta_G}$$

only with gearbox

Formula 6

The motor must therefore generate the following drive torques:

$$M_{M,j} = M_{B,j} + M_{L,j}$$

Formula 7

The **effective torque** can be deduced from the drive torques for all segments of the application cycle (formula 7):

$$M_{eff} = \sqrt[2]{\frac{1}{t_{total}} \bullet (M_{M1}^{\,2} \bullet t_1 + M_{M2}^{\,2} \bullet t_2 + \ldots)}$$

Formula 8

Motor dimensioning

- The nominal torque of the motor must exceed the calculated effective torque (formula 8).
- The peak torque of the motor must exceed the maximum occurring drive torque (formula 7).

With the aid of the "motor mounting options" chart you can check if the respective motor is mechanically compatible to the corresponding electro cylinder.

Abbreviations used (formula 5-8)

$M_{B,j}$	= Variable acceleration torque in Nm
$J_{i/p,0}$	= Red. rot. mass moment of inertia at zero stroke for inline/parallel motor configuration in kgmm² see "Technical Data" page 8
$J_{i/p,\,Stroke}$	= Red. rot. mass moment of inertia per mm of stroke for inline/parallel motor configuration in kgmm² see "Technical Data" page 8
Stroke	= Selected stroke in mm
η_{ETH}	= Efficiency of the electro cylinder 0.9 (inline drive configuration) 0.81 (parallel motor)
i_G	= Gearbox ratio
η_G	= Efficiency of the gearbox (see gearbox manufacturer specifications)
J_M	= Motor mass moment of inertia in kgmm² (see motor manufacturer specifications)
J_G	Gearbox mass moment of inertia in kgmm² (see gearbox manufacturer specifications)
$a_{K,j}$	= Acceleration at the cylinder rod in m/s²
P_h	= Screw pitch in mm
$M_{L,j}$	= Load torque in Nm
$F_{x,a/e,j}$	= Loads in x direction in N see page 11
$M_{M,j}$	= Drive torque in Nm
M_{eff}	= Effective value - motor in Nm
t_{total}	= Total cycle time in s
t_j	= Amount of time in the cycle in s

Force constant: "Technical Characteristics" see page 8.
Index "j" for the individual segments of the application cycle

Mounting Methods

Please respect the notes in the ETH Manual (19x-550002) on the permissible screws and tightening torques.

Standard

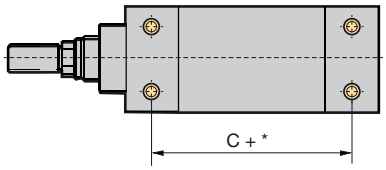
Order code **F**

ETH032-ETH100

Example for parallel motor configuration

Mounting via thread on the cylinder front or end side with parallel motor configuration (ETH032-ETH100).
("Dimensions" see page 21)

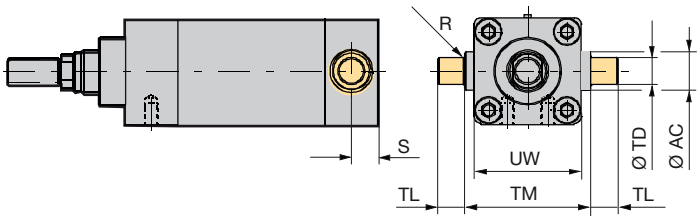
ETH032-ETH080



Mounting with 4 mounting threads on the underside of the profile.
(ETH032-ETH080).
("Dimensions" see page 21)

Center Trunnion Mounting

Order code **D**



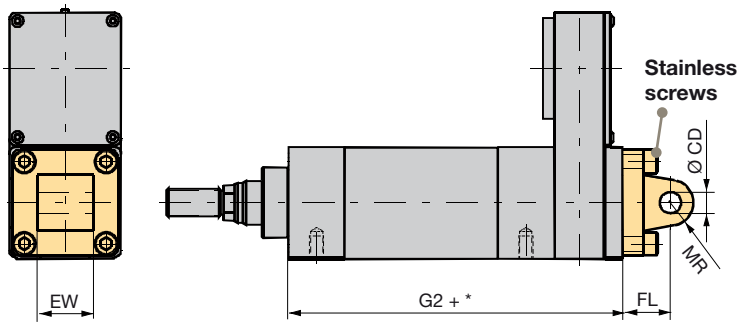
	UW	ØTD**	R	TL	TM	ØAC	S
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
ETH032	46.5	12	1	12	50	18	25.5
ETH050	63.5	16	1	16	75	25	39
ETH080	95.3	25	2	25	110	35	34.5
ETH100	120	70	4	40	140	40	57

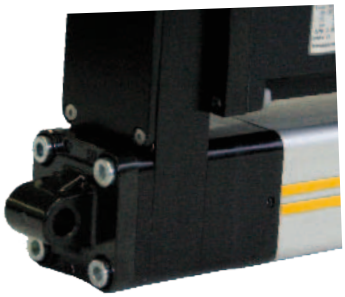
+* =Measure + length of desired stroke ("Dimensions" see page 21).
**: ØTD in accordance with ISO tolerance zone h8
Note: For relubrication option "1" (central lubrication port) please see mounting method with option "D" center trunnion always on 6 o'clock!

Rear Eye Mounting

Order code

E





	Order no.	EW	ØCD	MR (H9)	FL ±0.2
		[mm]	[mm]	[mm]	[mm]
ETH032	0112.033	26	10	11	22
ETH050	0122.033	32	12	13	27
ETH080	0132.033	50	16	17	36
ETH100	0142.033	60	30	35	80

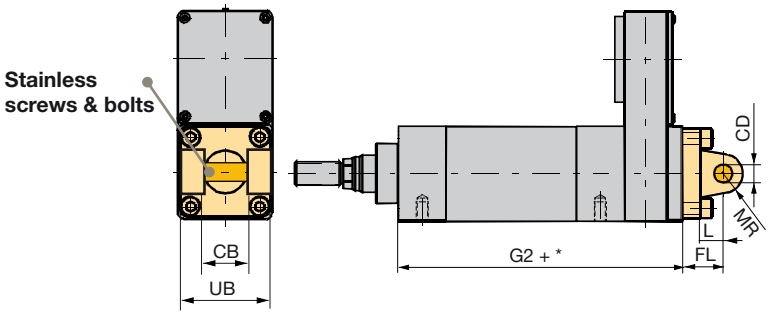
+* =Measure + length of desired stroke ("Dimensions" see page 21).
Listed in the order code of the cylinder; the order number applies only for ordering spare parts. Spare parts delivery is including screws for cylinder mounting.

Rear Clevis

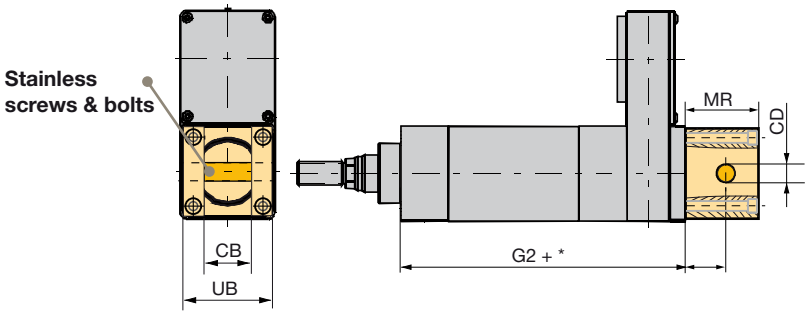
Order code

C

ETH032-ETH080



ETH100



	Order no.	UB (h13)	CB (H14)	ØCD (H9)	MR	L	FL ±0.2
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
ETH032	0112.031	46.5	26	10	9.5	13	22
ETH050	0122.031	63.5	32	12	12.5	16	27
ETH080	0132.031	95	50	16	17.5	22	36
ETH100	0142.031	120	60.5	30	100	40	65

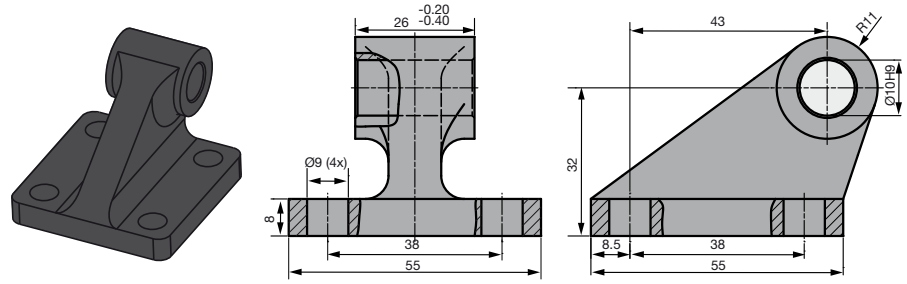
+* =Measure + length of desired stroke ("Dimensions" see page 21).
Listed in the order code of the cylinder; the order number applies only for ordering spare parts. Spare parts delivery is including screws for cylinder mounting.

Bearing Block

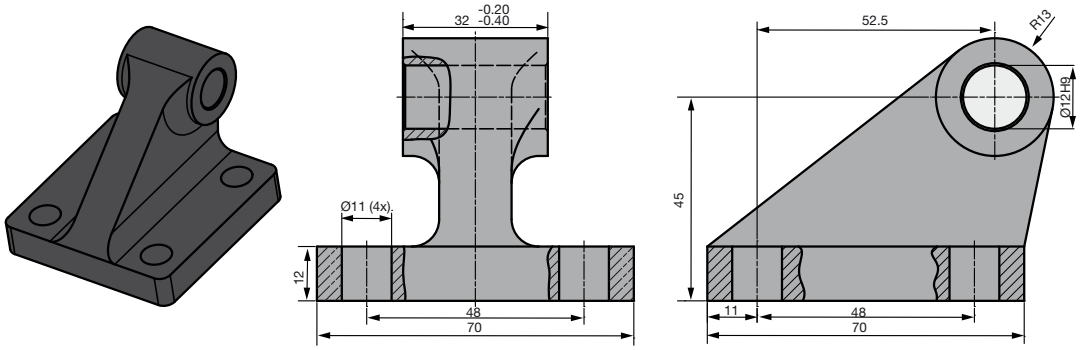
Counter piece of rear clevis
Please order separately with order no., if required

Dimensions [mm]

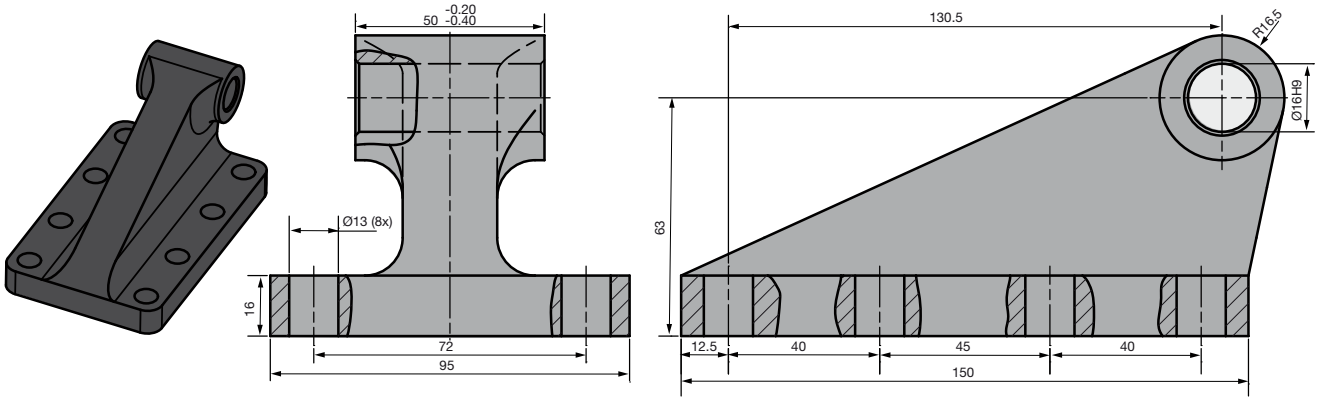
Bearing block for ETH032, Part No. 0112.039



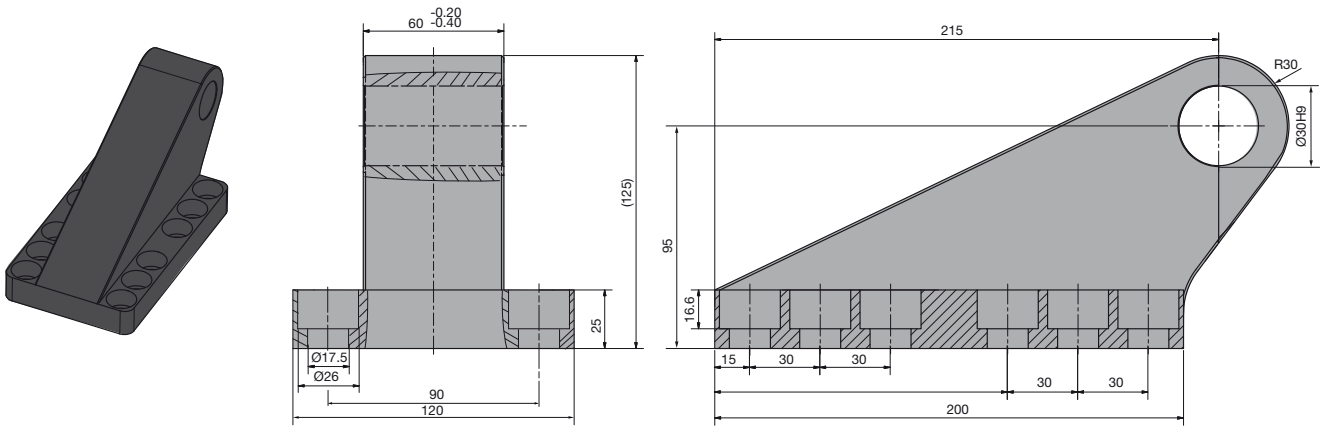
Bearing block for ETH050, Part No. 0122.039



Bearing block for ETH080, Part No. 0132.039

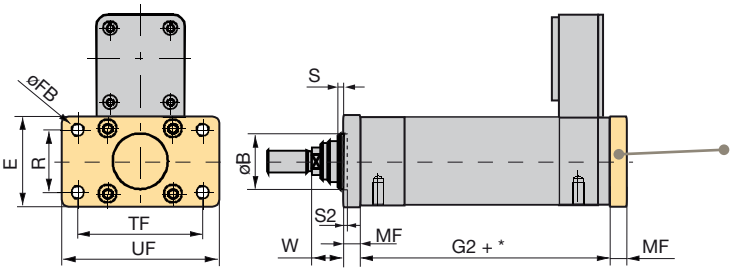


Bearing block for ETH100 Part No. 0142.039



Rear Plate

Order code **H**



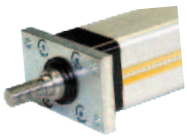
Rear plate dimensions

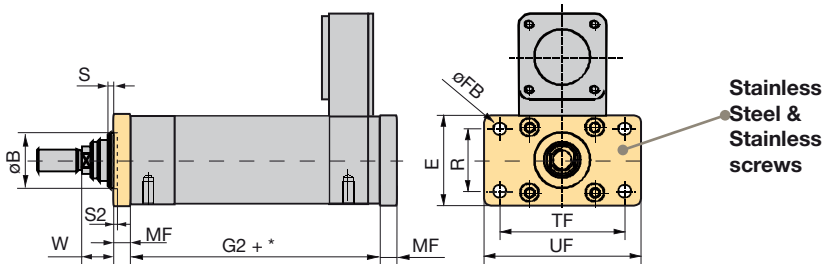
	Order no. (1 piece)	UF	E	TF	ØFB	R	W	MF	ØB	S	S2
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
ETH032	0112.918	80	48	64	7	32	16	10	30	2	-
ETH050	0122.918	110	65	90	9	45	25	12	40	4	-
ETH080	0132.918	150	95	126	12	63	30	16	45	4	-
ETH100	0142.918	258	120	220	17.5	80	26	25	90	-	5

+* =Measure + length of desired stroke ("Dimensions" see page 21).
Listed in the order code of the cylinder; the order number applies only for ordering spare parts. Spare parts delivery is including screws for cylinder mounting.

Front Plate

Order code **J**





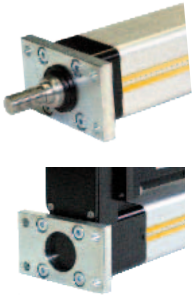
Front plate dimensions

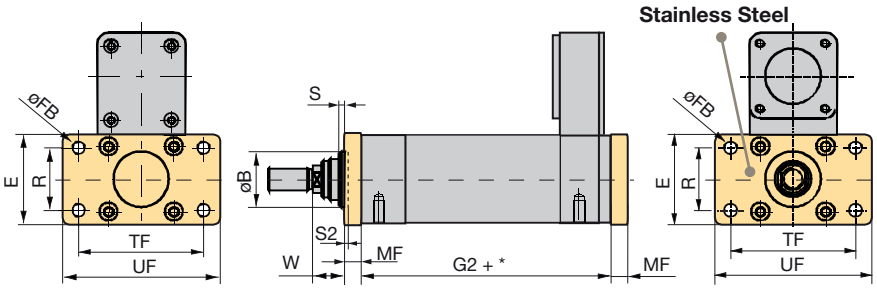
	Order no. (1 piece)	UF	E	TF	ØFB	R	W	MF	ØB	S	S2
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
ETH032	0112.918	80	48	64	7	32	16	10	30	2	-
ETH050	0122.918	110	65	90	9	45	25	12	40	4	-
ETH080	0132.919	150	95	126	12	63	30	16	60	4	-
ETH100	0142.918	258	120	220	17.5	80	26	25	90	-	5

+* =Measure + length of desired stroke ("Dimensions" see page 21).
Listed in the order code of the cylinder; the order number applies only for ordering spare parts.
Spare parts delivery is including screws for cylinder mounting.

Front and Rear Plate

Order code **N**





Listed in the cylinder order code.
Please note that front and rear plate as spare parts must be ordered separately.

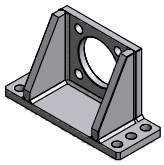
Foot Mounting

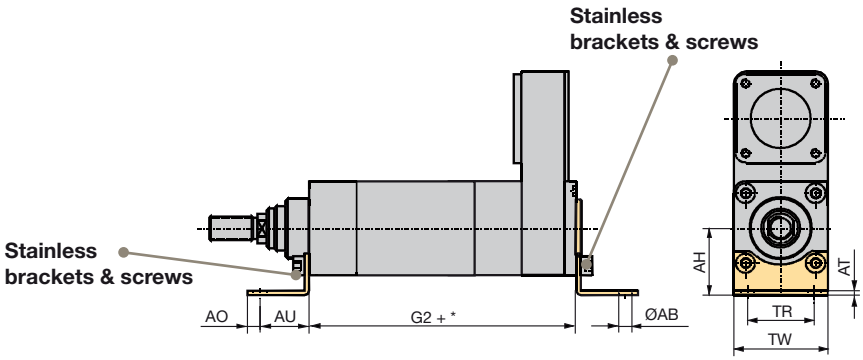
Order code

B

ETH032-ETH080
Front & Terminal bracket

ETH100
Mounting bracket





	Order no. Front & Terminal bracket	AH	AT	TR	ØAB (H14)	AO	AU	TW
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
ETH032	0112.916	32	4	32	7	8	24	48
ETH050	0122.916	45	4	45	9	12	32	65
ETH080	0132.916	63	6	63	13.5	15	41	95
ETH100	on request							

+* = Measure + length of desired stroke ("Dimensions" see page 21).
Listed in the order code of the cylinder; the order number applies only for ordering spare parts.
Spare parts delivery is including screws for cylinder mounting.
* For protection classes "B" and "C", we recommend GEOMET® coated screws (thin layer corrosion protection).

Mounting Flanges

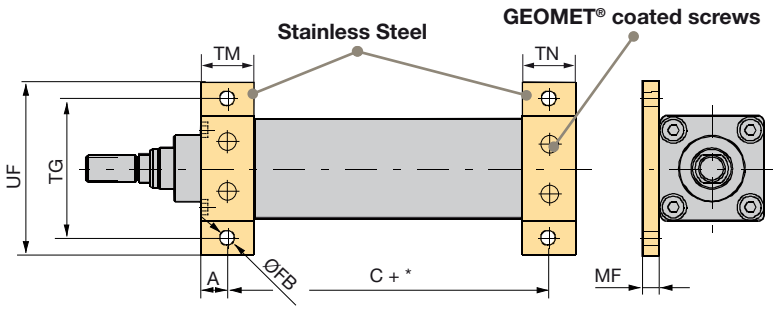
Order code

G

	Order no. (1 piece)	TG	UF	ØFB	TM	MF	A	AB	TN	B	BB	BC
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
ETH032	0112.917	62	78	6.6	25	8	12.5	-	25	-	-	-
ETH050	0122.917	84	104	9	30	10	15	-	30	-	-	-
ETH080	0132.917	120	144	13.5	40	12	20	-	40	-	-	-
ETH100	--	195	230	17.5	87	40	16	32	97	17.5	48.5	79.5

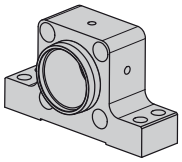
+* = Measure + length of desired stroke ("Dimensions" see page 21).
Listed in the order code of the cylinder; the order number applies only for ordering spare parts (of ETH032-ETH080 only). Spare parts delivery is including screws for cylinder mounting.
* For protection classes "B" and "C", we recommend GEOMET® coated screws (thin layer corrosion protection).

ETH032-ETH080
Mounting Flanges

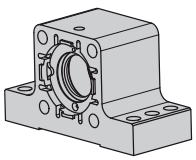


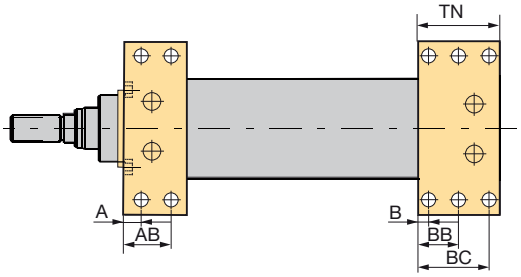
ETH100

Mounting cap (front)



Locating bearing (rear)



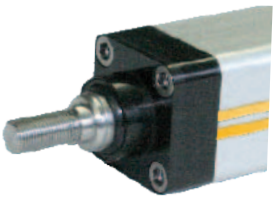


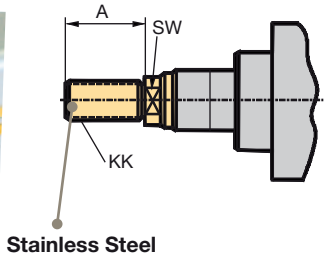
Cylinder Rod Version

External Thread

Order code

M





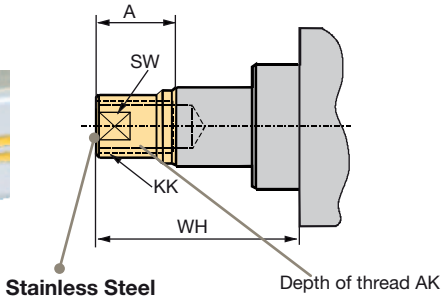
External Thread (upon delivery)				
	Mass	**A**	**KK**	**SW***
	[kg]	[mm]	[mm]	[mm]
ETH032	0.06	22	M10x1.25	10
ETH050	0.15	32	M16x1.5	17
ETH080	0.48	40	M20x1.5	22
ETH100	2.4	70	M42x2	46

* SW: Width across flat (position of the the flat is not fixed)

Internal Thread

Order code

F



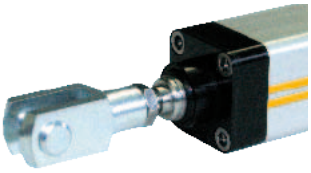
Internal Thread						
	Mass	**A**	**KK**	**AK**	**WH**	**SW***
	[kg]	[mm]	[mm]	[mm]	[mm]	[mm]
ETH032	0.04	14	M10x1.25	20	32	12
ETH050	0.14	24	M16x1.5	25	50	20
ETH080	0.42	29	M20x1.5	35	59	26
ETH100	2.2	60	M42x2	50	92	60

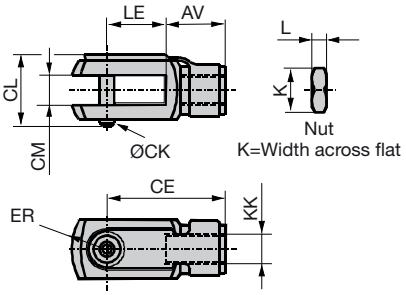
* SW: Width across flat (position of the the flat is not fixed)

Rod Clevis

Order code

C





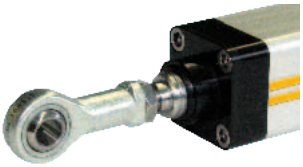
	Order no.		Mass	KK	CL	CM		LE	CE	AV	ER	ØCK (h11/E9)	K	L
	Standard	Stainless												
			[kg]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
ETH032	4309	P1S-4JRD	0.09	M10x1.25	26.0	10.2	+0.13 -0.05	20	40	20	14	10	17	5
ETH050	4312	P1S-4MRD	0.34	M16x1.5	39.0	16.2	+0.13 -0.05	32	64	32	22	16	24	8
ETH080	4314	P1S-4PRD	0.69	M20x1.5	52.5	20.1	+0.02 -0.0	40	80	40	30	20	30	10

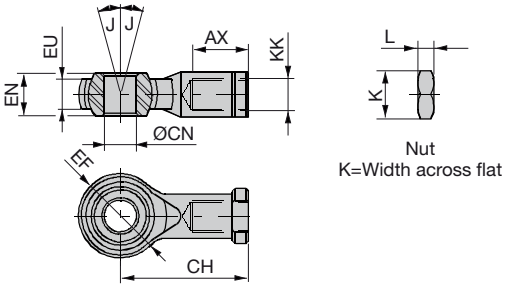
Listed in the order code of the cylinder; the order number applies only for ordering spare parts. Prerequisite is a cylinder rod with external thread.
Available for ETH032-ETH080.

Spherical Rod Eye

Order code

S





	Order no.		Mass	KK	ØCN	EN (h12)	EU	AX	CH	ØEF	J°	K	L
	Standard	Stainless											
			[kg]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
ETH032	4078-10	P1S-4JRT	0.07	M10x1.25	10 H9	14	10.5	20	43	28	13	17	5
ETH050	4078-16	P1S-4MRT	0.23	M16x1.5	16 H9	21	15.0	28	64	42	15	24	8
ETH080	4078-20	P1S-4PRT	0.41	M20x1.5	20 H9	25	18.0	33	77	50	14	30	10
ETH100	0142.920-01	0142.920-02	2.8	M42x2	40 H7	49	7	60	142	90	16	65	15

Listed in the order code of the cylinder; the order number applies only for ordering spare parts. Prerequisite is a cylinder rod with external thread.

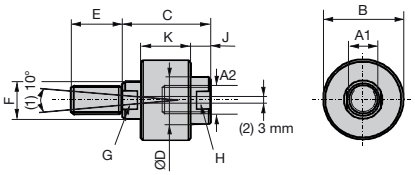
Alignment Coupler

Order code

L

For mounting at the extremity of the cylinder rod

- Balances misalignments
- Enlarges the mounting tolerance
- Simplifies the cylinder mounting
- Increases the service life of the cylinder guidings
- Compensates the offset between components and relieves the guiding from lateral force influences
- The traction/thrust force bearing capacity remains



(1): Angle offset
(2): Axial offset
A2: Thread depth=E

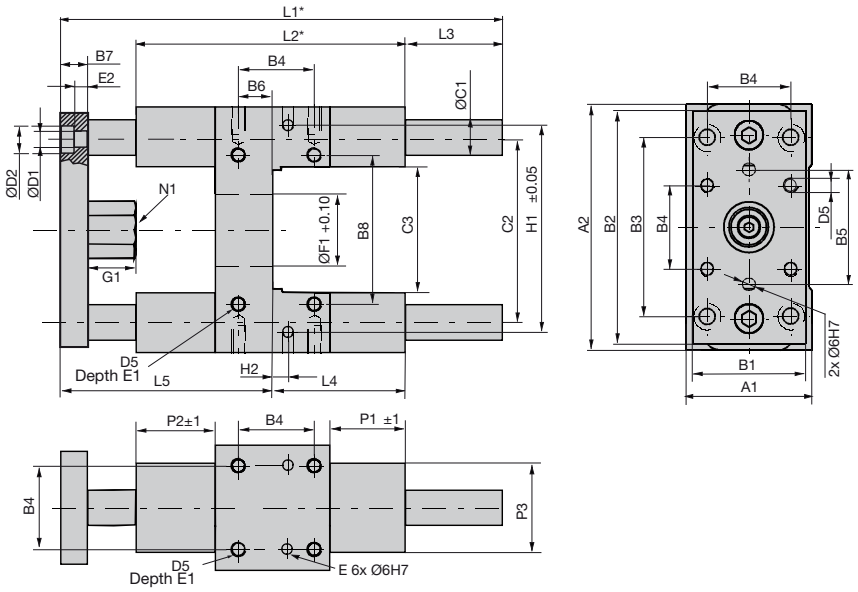
	Order no.	Mass	A1	A2	B	C	ØD	E	F	G	H	J	K
		[kg]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
ETH032	LC32-1010	0.26	M10x1.25	M10x1.25	40	51	19	19	16	13	16	13	26
ETH050	LC50-1616	0.64	M16x1.5	M16x1.5	54	59	32	29	25	22	29	14	33
ETH080	LC80-2020	1.30	M20x1.5	M20x1.5	54	59	32	29	25	22	29	14	33
ETH100	-*	4.5	M39x2*	M39x2	101.6	111.1	57.2	57.2	44.5	38	49	22.2	69.9

Listed in the order code of the cylinder; the order number applies only for ordering spare parts. Prerequisite is a cylinder rod with external thread.
Only available in protection option A (IP54 with galvanized screws).
* Note: Subsequent conversion from rod end M to L can only be made in our factory.

Outrigger Bearing

Order code **R**

Order code **T**



Function of outrigger bearing:

- Additional stability and precision
- Anti-rotation device for higher torques
- Absorption of lateral forces

Versions

Option R:
Outrigger bearing with ball bushings
(available only in protection class option A, "Order Code" see page 52)

- Main casting extruded aluminum
- 2 hardened steel guiding rods, surface hard-chrome plated
- Linear ball bearings

Option T:
Outrigger bearing with slide bushings
(for all protection options, standard with options B & C, "Order Code" see page 52)

- Main casting extruded aluminum
- 2 guiding rods stainless steel
- Sliding guides

When sizing the drive train of an ETH electro cylinder with outrigger bearing and sliding bushings, increased friction losses in the sliding bushings must be taken into consideration

+* = Measure + length of desired stroke ("Dimensions" see page 21).

For the ETH080, the standard pneumatic outrigger bearing modules cannot be used.

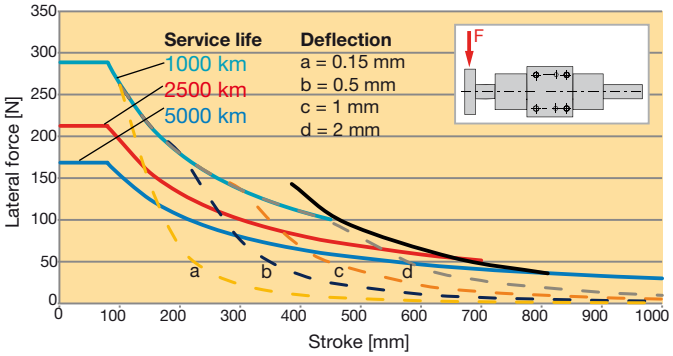
Available for ETH032-ETH080.

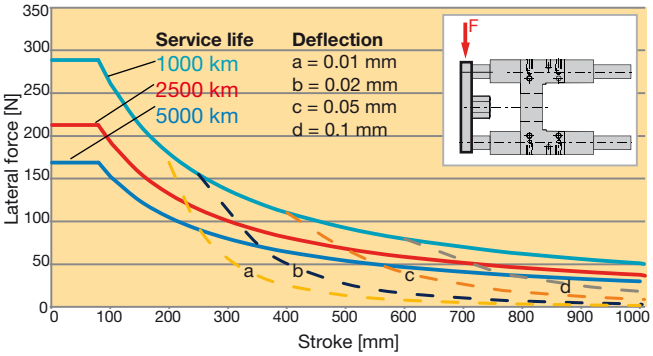
	Unit	ETH032	ETH050	ETH080
Part No.			on request	
A1	[mm]	50	70	105
A2	[mm]	97	137	189
B1	[mm]	45	63	100
B2	[mm]	90	130	180
B3	[mm]	78	100	130
B4	[mm]	32.5	46.5	72
B5	[mm]	50	72	106
B6	[mm]	4	19	21
B7	[mm]	12	15	20
B8	[mm]	61	85	130
ØC1	[mm]	12	20	25
C2	[mm]	73.5	103.5	147
C3	[mm]	50	70	105
ØD1	[mm]	6.6	9	11
ØD2	[mm]	11	14	17
D5	[mm]	M6	M8	M10
E (Depth)	[mm]	10	10	10
E1 (Depth)	[mm]	12	16	20
E2 (Depth)	[mm]	7	9	11
ØF1	[mm]	30	40	60
G1	[mm]	17	27	32
H1	[mm]	81	119	166
H2	[mm]	11.7	4.2	15
L1+*	[mm]	150	192	247
L2	[mm]	120	150	200
L3+*	[mm]	15	24	24
L4	[mm]	71	79	113
L5	[mm]	64	89	110
N1	[mm]	17	24	30
P1	[mm]	36	42	50
P2	[mm]	31	44	52
P3	[mm]	40	50	70
Total mass with zero stroke	[kg]	0.97	2.56	6.53
Moving mass zero stroke	[kg]	0.60	1.84	4.36
Additional mass	[kg/m]	1.78	4.93	7.71

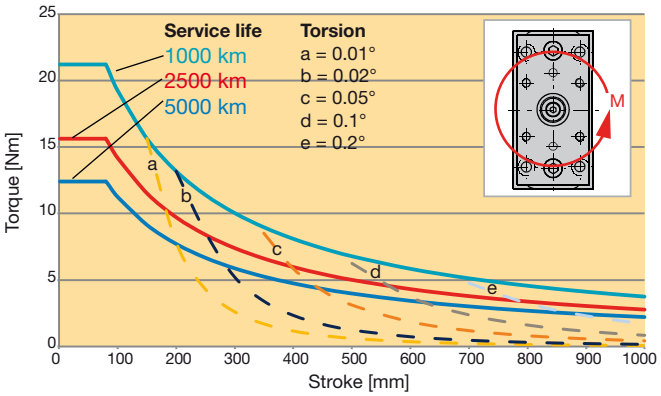
Permitted load / lifetime / deformation of the parallel guiding

Outrigger bearing with ball bushings (Option R)

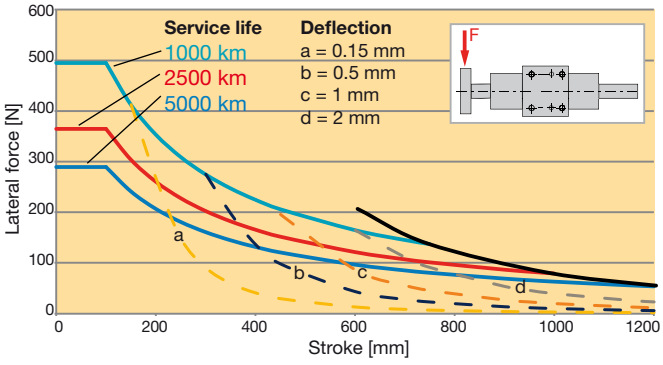
ETH032

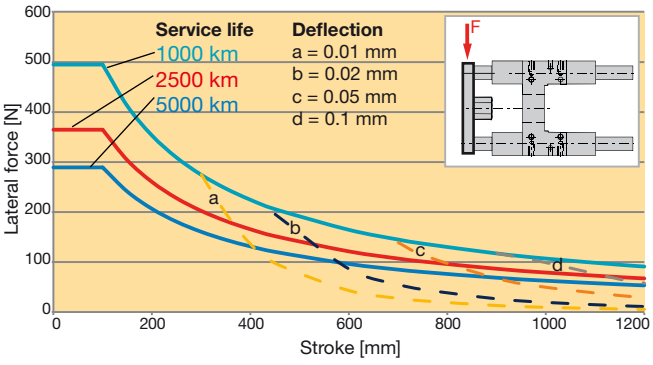


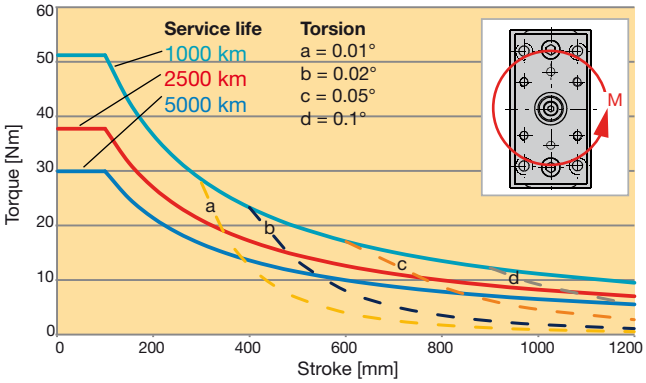




ETH050



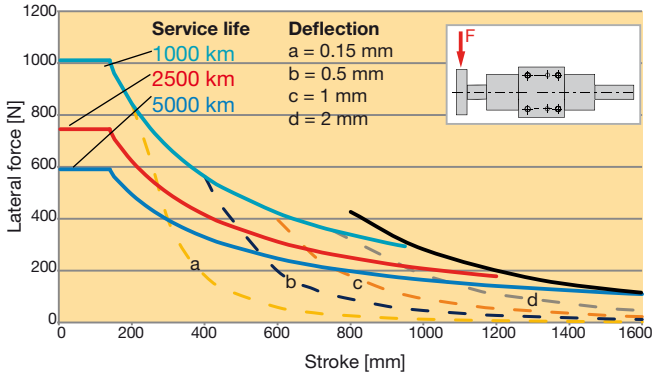


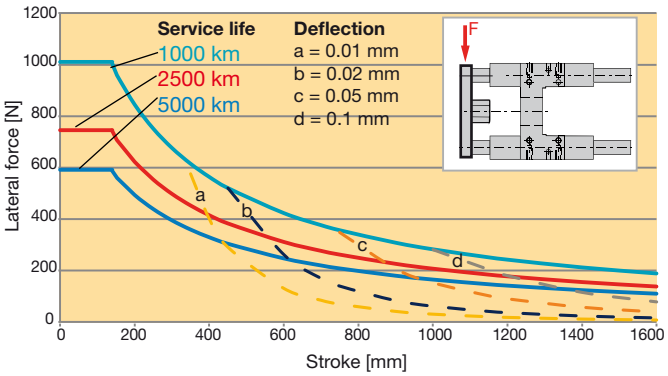


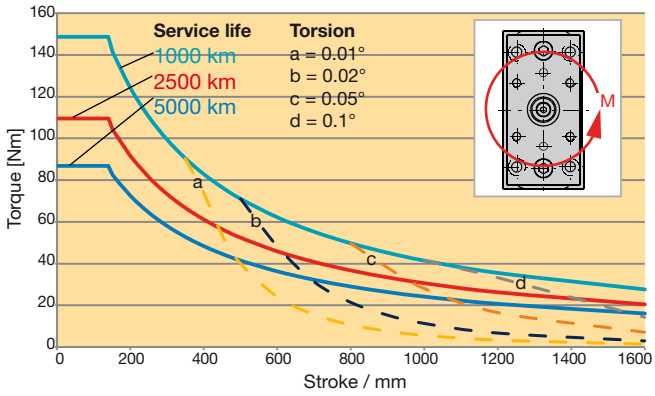
The diagrams apply for a medium travel speed of 0.5 m/s, an ambient temperature of 20 °C.

Outrigger bearing with ball bushings (Option R)

ETH080

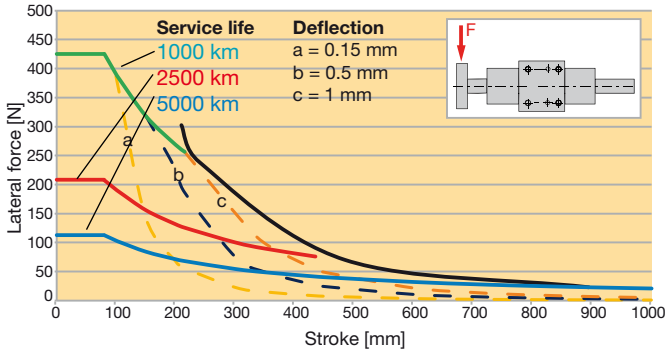


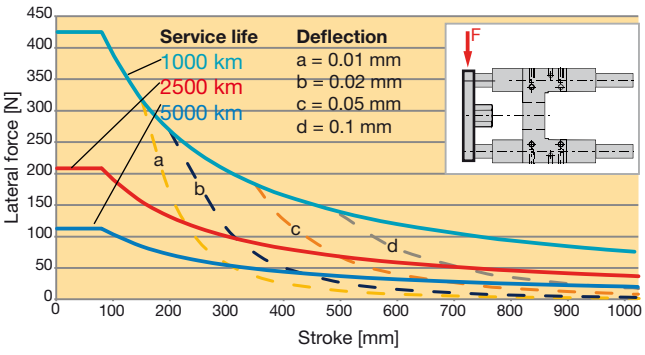


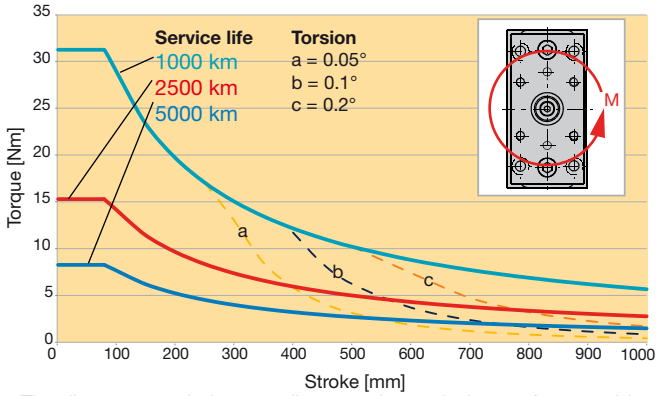


Outrigger Bearing with sliding guide (option T)

ETH032



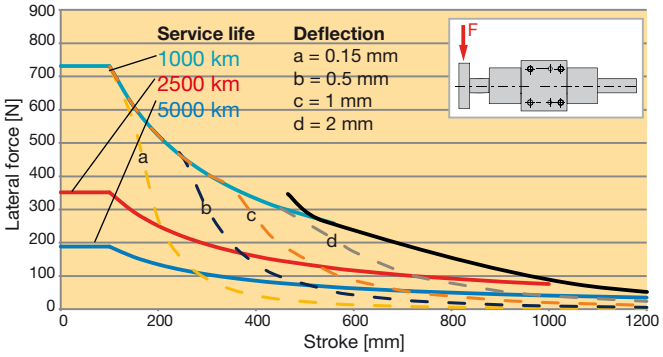


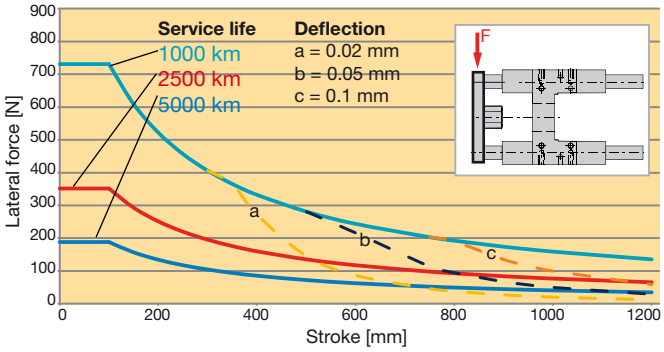


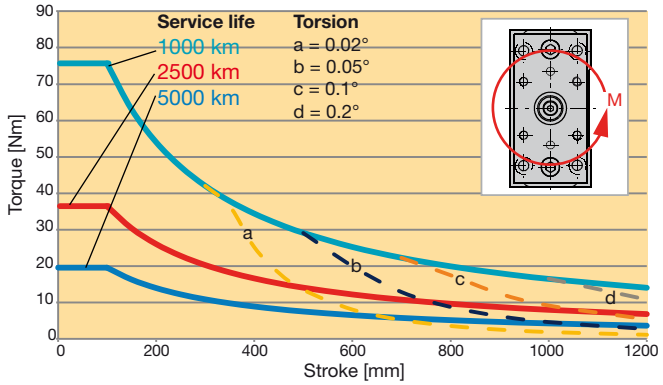
The diagrams apply for a medium travel speed of 0.5 m/s, an ambient temperature of 20 °C.

Outrigger Bearing with sliding guide (option T)

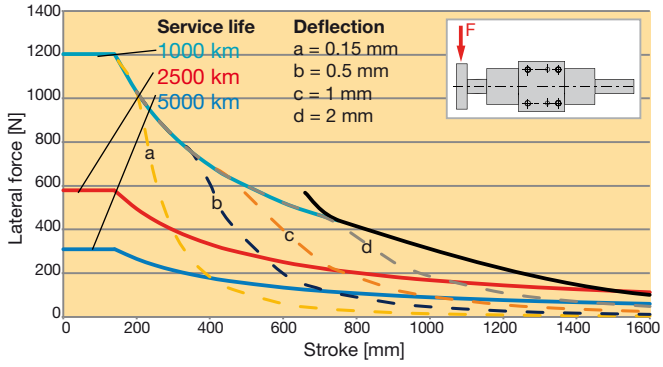
ETH050

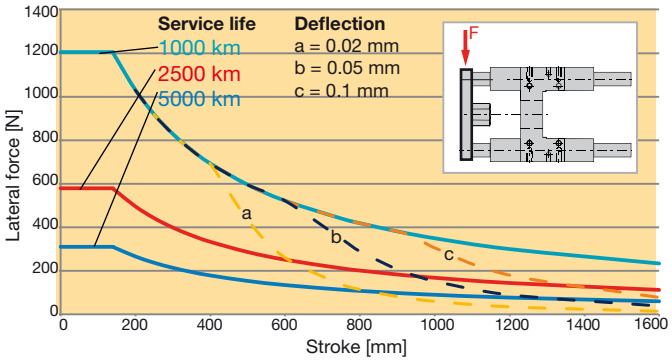


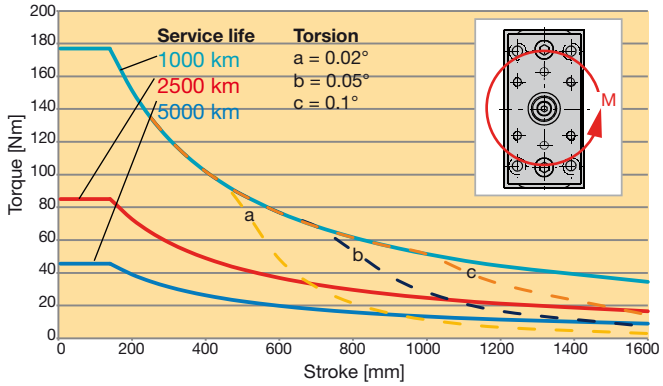




ETH080



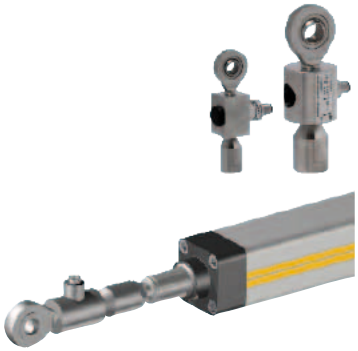




The diagrams apply for a medium travel speed of 0.5 m/s, an ambient temperature of 20 °C.

Accessories

Force Sensors - Joint Head with Integrated Force Sensor



Swivel heads are important construction components with respect to rotary, pivoting and tilting movements. Force measurements are more and more frequently required in those applications.
The force transducers are suitable for direct mounting on the cylinder rod. They can, for example, be used to measure contact forces or overloads. Thanks to the thin film technology, the swivel head force transducers are very robust and long time stable. An integrated amplifier emits an output signal of 4...20 mA.
The sensors correspond to the EN 61326 standard for electromagnetic compatibility (EMC) and are sized to pick up traction/ thrust forces.

Features

- Measuring range: Traction/thrust forces up to ±25 kN
- Thin film implants (instead of conventional bonded foil strain gauges)
- Corrosion resistant stainless steel version
- Integrated amplifier
- Small temperature drift
- High long term stability
- High shock and vibration resistance
- For dynamic or static measurements
- Good repeatability
- Simple mounting

Connection of the force sensors to Compax3 is possible on request

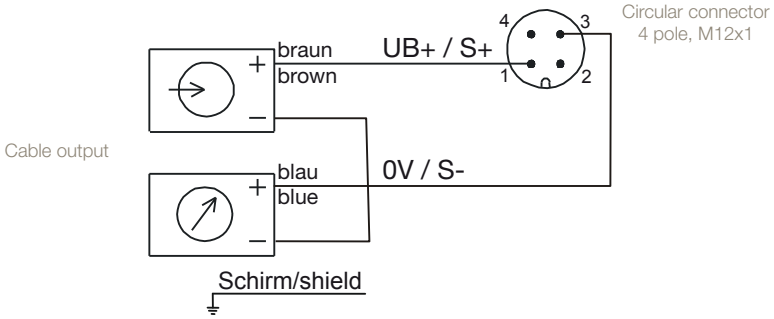
Technical data

Joint head with integrated force sensor ETH...											
	Unit	ETH032			ETH050			ETH080			ETH100
		M05	M10	M16	M05	M10	M20	M05	M10	M32	
Accuracy	[%]	0.2									in preparation
Material	-	Stainless steel									
Protection class	-	IP67									
Calibration to	[kN]	±3.7	±3.7	±2.4	±9.3	±7.0	±4.4	±17.8	±25.1	±10.6	
Accuracy	[N]	14.8	14.8	9.6	37.2	28.0	17.6	71.2	100.4	42.4	
Part No.	-	0111.916		0111.917	0121.916	0121.917	0121.918	0131.916	0131.917	0131.918	

Only possible with cylinder rod end "M" (external thread)

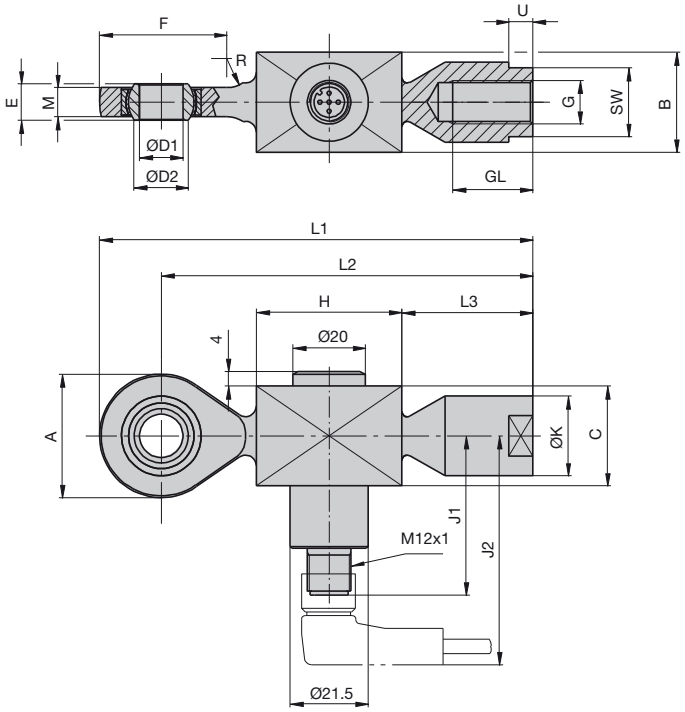
Electrical connection

Analog output 4...20 mA (two-wire technology)

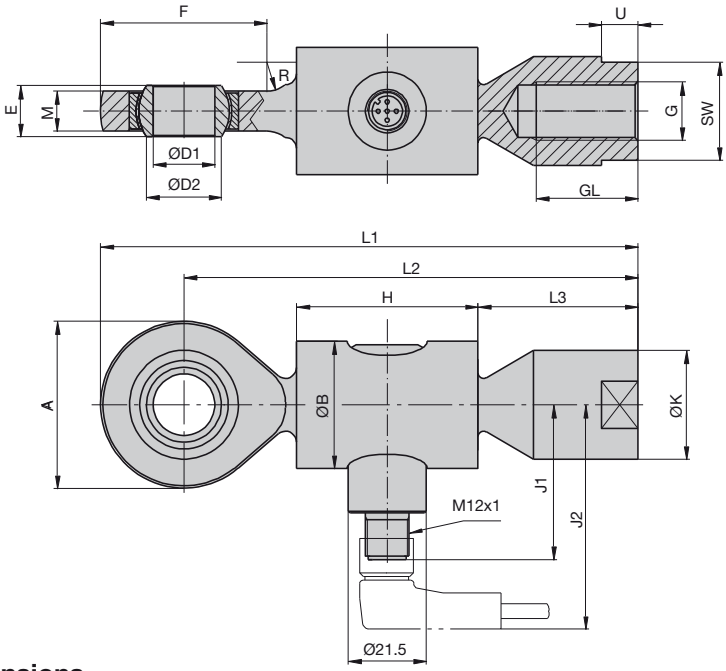


Order no.	Cable for force sensor
080-900446	Force sensor cable (PUR), straight connector, M12 with flying leads, 2 m
080-900447	Force sensor cable (PUR), straight connector, M12 with flying leads, 5 m
080-900456	Force sensor cable (PUR), angle connector, M12 with flying leads, 2 m
080-900457	Force sensor cable (PUR), angle connector, M12 with flying leads, 5 m

Version for ETH032



Version for ETH050 & ETH080



Dimensions [mm]

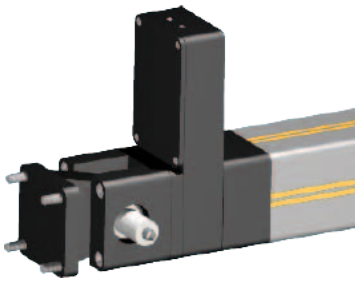
Dimensions

	A	B	ØB	C	ØD1	ØD2 0.008	E	F	G	GL	H	J1	J2	ØK	L1	L2	L3	M	SW*	U
for ETH032	34	27	-	27	12	15	10	35	M10x1.25	21	40	44	63	22	119	102	36	8	19	8
for ETH050	46	-	35	-	17	20.7	14	46	M16x1.5	28	50	43	62	30	148	125	44	11	27	12
for ETH080	53	-	54	-	20	24.2	16	54	M20x1.5	33	54	44	63	35	171	144.5	54	13	32	13
for ETH100	in preparation																			

*SW: Width across flat

Force Sensors - Rear Clevis with Force Sensor

In some force measurement applications, a force sensor on the cylinder rod is not possible or will affect the application's scope. For this case, we developed a special variant of the ETH cylinder, where the force sensor is integrated into the rear end of the cylinder. The advantage is that the sensor cable does not move with the rod.
All force sensors are configured as traction/thrust sensors.
Analog standard output signals 4...20 mA are available. The sensors correspond to the EN 61326 standard for electromagnetic compatibility (EMC).



Features

- Measuring range: Traction/thrust forces up to ±25 kN
- Thin film implants (instead of conventional bonded foil strain gauges)
- Corrosion resistant stainless steel version
- Integrated amplifier
- Small temperature drift
- High long term stability
- High shock and vibration resistance
- For dynamic or static measurements
- Good repeatability
- Simple mounting

Connection of the force sensors to Compax3 is possible on request.

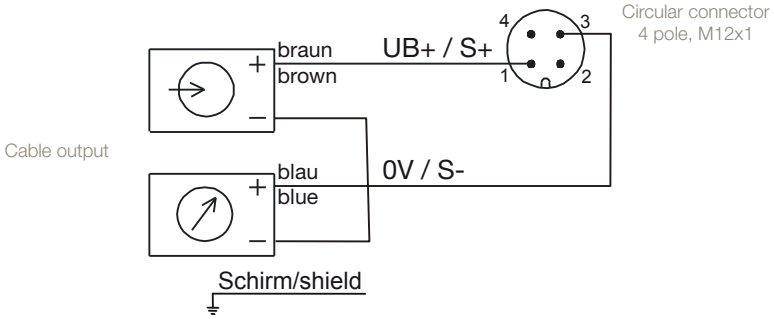
Technical data

Rear clevis with force sensor for ETH...											
	Unit	ETH032			ETH050			ETH080			ETH100
		M05	M10	M16	M05	M10	M20	M05	M10	M32	
Accuracy	[%]	1									in preparation
Material	-	Stainless steel									
Protection class	-	IP67									
Measuring range	[kN]	±3.7	±3.7	±2.4	±9.3	±7.0	±4.4	±17.8	±25.1	±10.6	
Accuracy	[N]	74.0	74.0	48.0	186.0	140.0	88.0	356.0	502.0	212.0	
Part No.	-	0112.034-01		0112.034-02	0122.034-01	0122.034-02	0122.034-03	0132.034-01	0132.034-02	0132.034-03	

Only for parallel configuration and cylinders with "F" mounting option (mounting thread on the cylinder body)

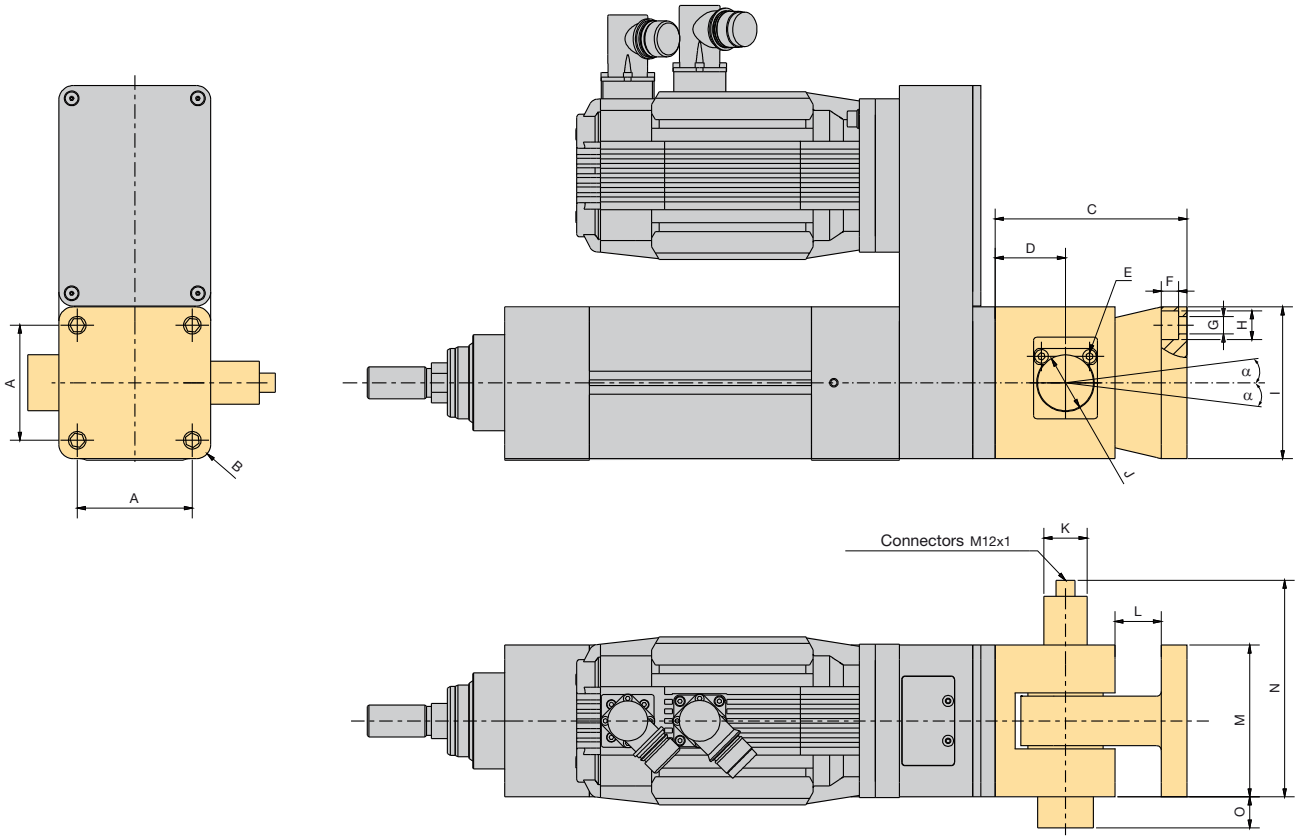
Electrical connection

Analog output 4...20 mA (two-wire technology)



Order no.	Cable for force sensor
080-900446	Force sensor cable (PUR), straight connector, M12 with flying leads, 2 m
080-900447	Force sensor cable (PUR), straight connector, M12 with flying leads, 5 m
080-900456	Force sensor cable (PUR), angle connector, M12 with flying leads, 2 m
080-900457	Force sensor cable (PUR), angle connector, M12 with flying leads, 5 m

Version with fixing flange for ETH cylinder



Dimensions [mm]

Dimensions

	A	B	C	D	E*	F	G	H	I	ØJ	ØK	L	M	N	O	α
for ETH032	32.5	R7	72	27	SW3	6.4	6.6	11	46.5	20	27	12	46.5	98.25	6.75	±3.5°
for ETH050	46.5	R8.5	89	32	SW3	8.8	9	15	63.5	25	27	17	63.5	111.75	3.25	±4°
for ETH080	72	R9	123	47	SW4	10.8	11	18	95	35	27	29	95	135.5	0	±4°
for ETH100	in preparation															

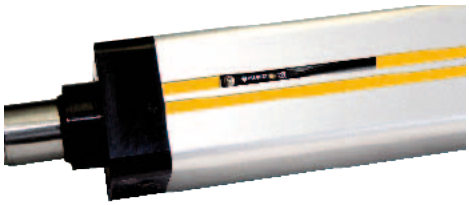
*SW: Width across flat
α: Max. permissible deflection angle with reference to center axis

Please respect the notes in the ETH Manual (19x-550002) on the permissible screws and tightening torques.

Initiators / Limit Switches

Sensors

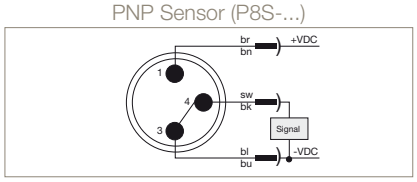
The position sensors can be mounted in the longitudinal grooves of the cylinder body and are directly immersible in the profile; projecting edges are thus avoided. The initiator cable is hidden under the yellow cover. The permanent magnet integrated into the screw nut actuates the initiators. Fitting sensors available as accessories.



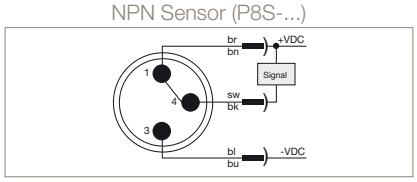
ETH032, ETH050 2 grooves each on 2 opposite sides.
ETH080, ETH100 2 grooves each on all sides.

The following initiator types are available for the ETH cylinder series:

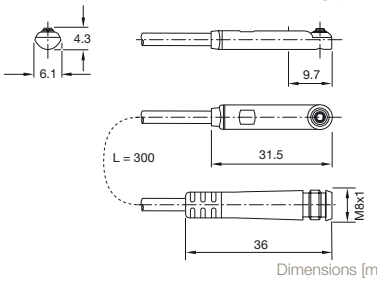
PNP Sensor (P8S-...)



NPN Sensor (P8S-...)



Switching point



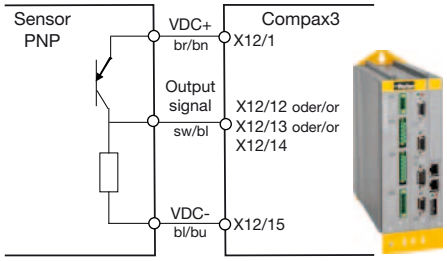
Dimensions [mm]

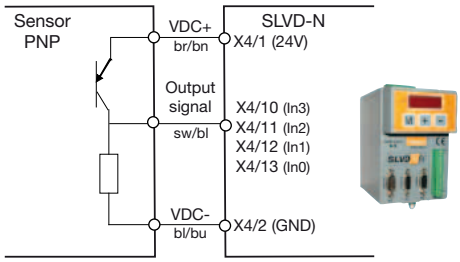
Info: Do only use PNP types for ETH with Compax3.

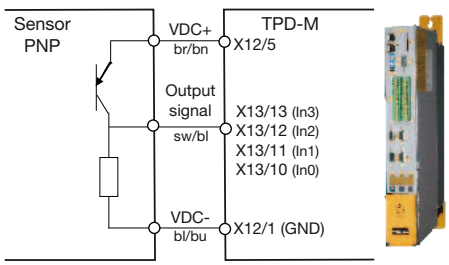
Magnetic cylinder sensors

Type	Function	LED	Logic	Cable	Continuous current	Current consumption	Supply voltage	Switching frequency	compatible with Compax3, SLVD-N, TPD-M
P8S-GPFLX	N.O.	yes	PNP	3 m	max. 100 mA	max. 10 mA	10-30 VDC	5 kHz	yes
P8S-GNFLX			NPN						no
P8S-GPSHX			PNP	0.3 m cable with M8 connector					yes
P8S-GNSHX			NPN						no
P8S-GQFLX	N.C.		PNP	3 m					yes
P8S-GMFLX			NPN						no
P8S-GQSHX			PNP	0.3 m cable with M8 connector					yes
P8S-GMSHX			NPN						no

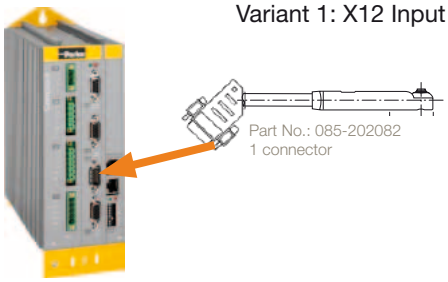
ETH with Compax3, SLVD-N, TPD-M



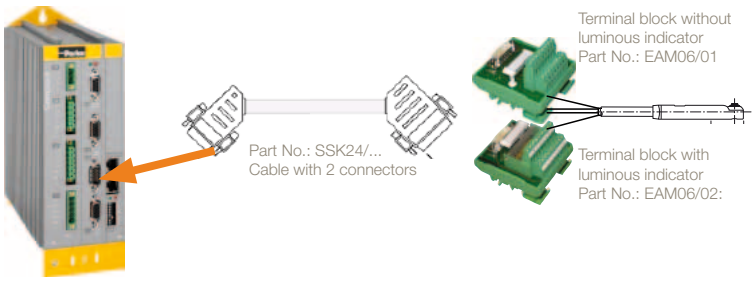




Variant 1: X12 Input - direct



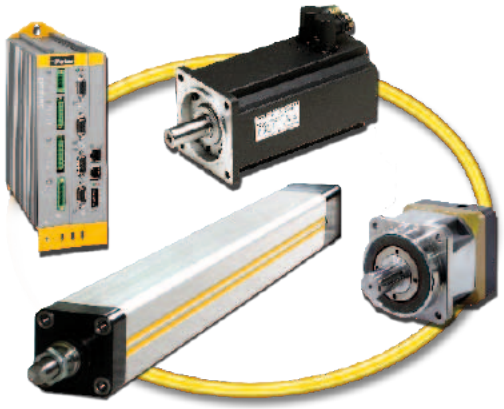
Variant 2: X12 Input - via digital I/Os



Drive Train Selection

Example for Sizing with Predefined Drive Trains

In order to simplify the dimensioning process for a complete drive train, we have prepared an overview of predefined electro cylinders, gearboxes, motors and servo drives, which can be found on the following pages.
With a few parameters, you can directly find the order code for the required components.
Note the boundary conditions!



The following application parameters are required:

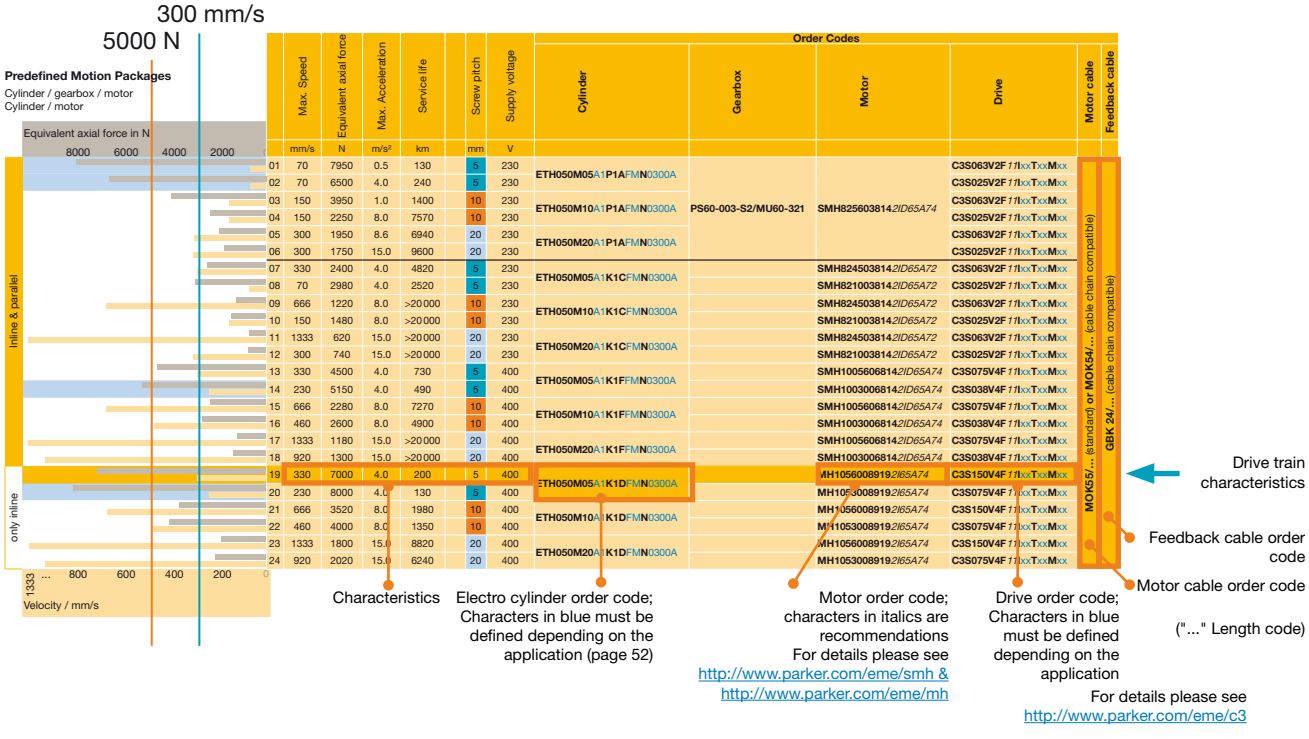
- The equivalent axial force.
  (Calculation page 13 formula 3 with the forces determined as described on page 11).
- The maximum speed.

Working with the drive train table

- Select the drive trains providing the required axial force (e.g. by drawing a vertical line).
- Then select from this choice the drive trains, that are able to travel at the required speed (e.g. by drawing a second vertical line).
- The suitable drive train can then be selected from the remaining range, if necessary by comparing additional characteristics.

Please check if all given characteristics (such as max. acceleration, supply voltage etc.) are suitable for your application.

Example:
Required data
Equivalent axial force: 5000 N
Speed: 300 mm/s



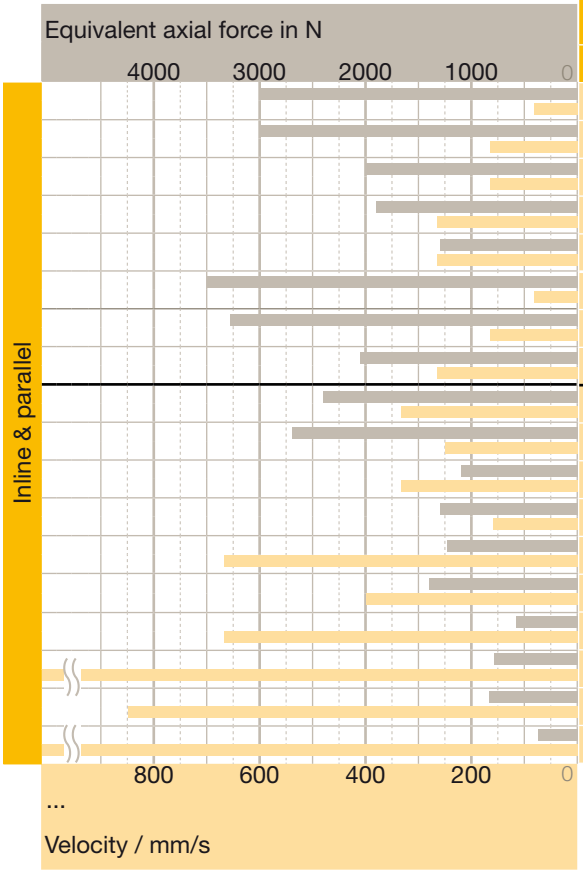
Predefined Motion Packages ETH032

with Compax3, SLVD-N, TPD-M

In order to simplify the representation, we assumed boundary conditions which must be adhered to without exception in your application, otherwise the product combinations suggested here might not work. In this case, the application must be dimensioned conventionally.

Predefined Motion Packages

Cylinder / gearbox / motor / drive controller / cable



	Max. Speed	Equivalent axial force	Max. Acceleration	Service life	Screw pitch	Supply voltage	Cylinder
	mm/s	N	m/s²	km	mm	V	
01	83	3000	1	135	5	230	**ETH032M05**A1**P1A**FM**N**0200A
02	165	3000	6	270	10	230	**ETH032M10**A1**P1A**FM**N**0200A
03	165	2000	8	1300	10	230	
04	265	1900	8	1540	16	230	**ETH032M16**A1**P1A**FM**N**0200A
05	265	1300	12	4800	16	230	
06	83	3500	4	75	5	400	**ETH032M05**A1**P1A**FM**N**0200A
07	165	3280	8	190	10	400	**ETH032M10**A1**P1A**FM**N**0200A
08	265	2050	12	1225	16	400	**ETH032M16**A1**P1A**FM**N**0200A
09	333	2400	4	265	5	230	**ETH032M05**A1**K1C**FM**N**0200A
10	250	2700	4	185	5	230	
11	333	1100	4	2740	5	230	**ETH032M05**A1**K1B**FM**N**0200A
12	160	1300	4	1660	5	230	
13	667	1230	8	9300	10	230	**ETH032M10**A1**K1C**FM**N**0200A
14	400	1400	8	5500	10	230	
15	667	580	8	>20 000	10	230	**ETH032M10**A1**K1B**FM**N**0200A
16	1067	790	12	>20 000	16	230	**ETH032M16**A1**K1C**FM**N**0200A
17	850	840	12	17 780	16	230	
18	1067	370	12	>20 000	16	230	**ETH032M16**A1**K1B**FM**N**0200A

Basic Application Assumptions:

- Stroke from 50 to 400 mm
- Horizontal movement
- The characteristics of the individual components are not to be exceeded
  - with parallel motor: respect transmissible torque depending on the motor speed n
  - permissible axial thrust forces must be respected
  - Ambient conditions
  - ...
- Linear acceleration
- Maximum acceleration given = deceleration times
- Application factor = 1.0
- The calculation is based on the assumption: without standstill time (i.e. if there are standstill times in the application, only the power reserve is increased)
- 40 °C ambient temperature, with gearbox 20 °C ambient temperature
- up to 1000 m above sea level

Order Codes								
Gearbox	Motor	Drive Compax3	Motor cable	Feedback cable	Drive SLVD-N / TPD-M	Motor cable	Feedback cable
PS60-003-S2/MU60-001	**SMH60601,4511***2ID65G44*	**C3S025V2F***11***I**xx**T**xx**M**xx	**MOK55/...** (standard) **or MOK54/...** (cable chain compatible)	**GBK 24/...** (cable chain compatible)	**SLVD2N...**	**CAVOMOT...**	**CAVORES...**
PS60-003-S2/MU60-321	**SMH826003814***2ID65G54*	**C3S025V2F***11***I**xx**T**xx**M**xx			**SLVD2N...**		
PS60-003-S2/MU60-001	**SMH60601,4511***2ID65G44*	**C3S015V4F***11***I**xx**T**xx**M**xx			**TPDM020202....**		
PS60-003-S2/MU60-321	**SMH826003814***2ID65G54*	**C3S038V4F***11***I**xx**T**xx**M**xx			**TPDM05...**		
without gearbox	**SMH824503814***2ID65G52*	**C3S063V2F***11***I**xx**T**xx**M**xx			**SLVD5N...**		
	SMH826003814*2ID65G54*						
	SMH60451,4511*2ID65G42*	**C3S025V2F***11***I**xx**T**xx**M**xx			**SLVD2N...**		
	SMH60601,4511*2ID65G44*						
	SMH824503814*2ID65G52*	**C3S063V2F***11***I**xx**T**xx**M**xx			**SLVD5N...**		
	SMH826003814*2ID65G54*						
	SMH60451,4511*2ID65G42*	**C3S025V2F***11***I**xx**T**xx**M**xx			**SLVD2N...**		
	SMH824503814*2ID65G52*	**C3S063V2F***11***I**xx**T**xx**M**xx			**SLVD5N...**		
	SMH826003814*2ID65G54*						
	SMH60451,4511*2ID65G42*	**C3S025V2F***11***I**xx**T**xx**M**xx			**SLVD2N...**		

Order codes:
bold: **mandatory so that the package is combinable.**
italics: *recommended/standard*
blue: must be selected depending on the application.
Hint: The examples shown here are meant to help with the dimensioning process. As many parameters interact in this kind of drive package, the examples make no claim to be complete.

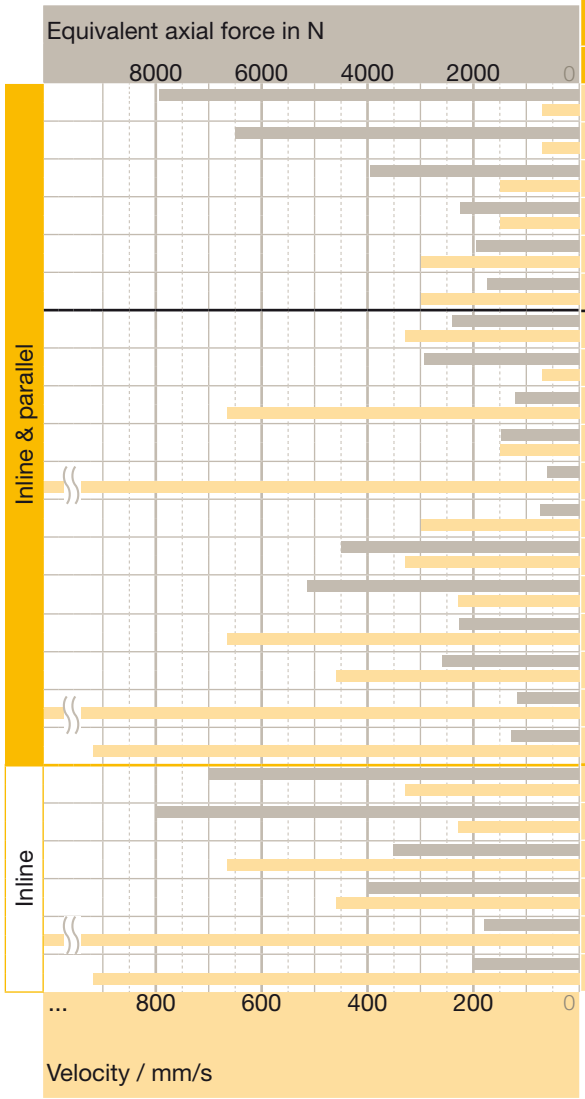
Predefined Motion Packages ETH050

with Compax3, SLVD-N, TPD-M

In order to simplify the representation, we assumed boundary conditions which must be adhered to without exception in your application, otherwise the product combinations suggested here might not work. In this case, the application must be dimensioned conventionally.

Predefined Motion Packages

Cylinder / gearbox / motor / drive controller / cable



	Max. Speed	Equivalent axial force	Max. Acceleration	Service life	Screw pitch	Supply voltage	Cylinder
	mm/s	N	m/s²	km	mm	V	
01	70	7950	0.5	130	5	230	**ETH050M05**A1**P1A**FM**N**0300A
02	70	6500	4.0	240	5	230	
03	150	3950	1.0	1400	10	230	**ETH050M10**A1**P1A**FM**N**0300A
04	150	2250	8.0	7570	10	230	
05	300	1950	8.6	6940	20	230	**ETH050M20**A1**P1A**FM**N**0300A
06	300	1750	15.0	9600	20	230	
07	330	2400	4.0	4820	5	230	**ETH050M05**A1**K1C**FM**N**0300A
08	70	2950	4.0	2520	5	230	
09	666	1220	8.0	>20000	10	230	**ETH050M10**A1**K1C**FM**N**0300A
10	150	1480	8.0	>20000	10	230	
11	1333	620	15.0	>20000	20	230	**ETH050M20**A1**K1C**FM**N**0300A
12	300	740	15.0	>20000	20	230	
13	330	4500	4.0	730	5	400	**ETH050M05**A1**K1F**FM**N**0300A
14	230	5150	4.0	490	5	400	
15	666	2280	8.0	7270	10	400	**ETH050M10**A1**K1F**FM**N**0300A
16	460	2600	8.0	4900	10	400	
17	1333	1180	15.0	>20000	20	400	**ETH050M20**A1**K1F**FM**N**0300A
18	920	1300	15.0	>20000	20	400	
19	330	7000	4.0	200	5	400	**ETH050M05**A1**K1D**FM**N**0300A
20	230	8000	4.0	130	5	400	
21	666	3520	8.0	1980	10	400	**ETH050M10**A1**K1D**FM**N**0300A
22	460	4000	8.0	1350	10	400	
23	1333	1800	15.0	8820	20	400	**ETH050M20**A1**K1D**FM**N**0300A
24	920	2020	15.0	6240	20	400	

Basic Application Assumptions:

- Stroke from 50 to 600 mm
- Horizontal movement
- The characteristics of the individual components are not to be exceeded
  - with parallel motor: respect transmissible torque depending on the motor speed n
  - permissible axial thrust forces must be respected
  - Ambient conditions
  - ...
- Linear acceleration
- Maximum acceleration given = deceleration times
- Application factor = 1.0
- The calculation is based on the assumption: without standstill time (i.e. if there are standstill times in the application, only the power reserve is increased)
- 40 °C ambient temperature, with gearbox 20 °C ambient temperature
- up to 1000 m above sea level

Order Codes

Gearbox	Motor	Drive Compax3	Motor cable	Feedback cable	Drive SLVD-N / TPD-M	Motor cable	Feedback cable
PS60-003-S2/MU60-321	**SMH825603814***2ID65G5***4**	**C3S063V2F***11***IxxTxxMxx**	**MOK55/...** (standard) or **MOK54/...** (cable chain compatible)	**GBK 24/...** (cable chain compatible)	**SLVD5N...**	**CAVOMOT...**	**CAVORES...**
		C3S025V2F*11***IxxTxxMxx**			**SLVD2N...**		
		C3S063V2F*11***IxxTxxMxx**			**SLVD5N...**		
		C3S025V2F*11***IxxTxxMxx**			**SLVD2N...**		
		C3S063V2F*11***IxxTxxMxx**			**SLVD5N...**		
		C3S025V2F*11***IxxTxxMxx**			**SLVD2N...**		
without gearbox	**SMH824503814***2ID65G5***2**	**C3S063V2F***11***IxxTxxMxx**			**SLVD5N...**		
	SMH821003814*2ID65G5***2**	**C3S025V2F***11***IxxTxxMxx**			**SLVD2N...**		
	SMH824503814*2ID65G5***2**	**C3S063V2F***11***IxxTxxMxx**			**SLVD5N...**		
	SMH821003814*2ID65G5***2**	**C3S025V2F***11***IxxTxxMxx**			**SLVD2N...**		
	SMH824503814*2ID65G5***2**	**C3S063V2F***11***IxxTxxMxx**			**SLVD5N...**		
	SMH821003814*2ID65G5***2**	**C3S025V2F***11***IxxTxxMxx**			**SLVD2N...**		
	SMH10056065ET*2ID65G5***4**	**C3S075V4F***11***IxxTxxMxx**			**TPDM05...**		
	SMH10030065ET*2ID65G5***4**	**C3S038V4F***11***IxxTxxMxx**			**TPDM05...**		
	SMH10056065ET*2ID65G5***4**	**C3S075V4F***11***IxxTxxMxx**			**TPDM05...**		
	SMH10030065ET*2ID65G5***4**	**C3S038V4F***11***IxxTxxMxx**			**TPDM05...**		
	SMH10056065ET*2ID65G5***4**	**C3S075V4F***11***IxxTxxMxx**			**TPDM05...**		
	SMH10030065ET*2ID65G5***4**	**C3S038V4F***11***IxxTxxMxx**			**TPDM05...**		
without gearbox	**MH1056008919***2I65A7***4**	**C3S150V4F***11***IxxTxxMxx**			**TPDM10...**		
	MH1053008919*2I65A7***4**	**C3S075V4F***11***IxxTxxMxx**			**TPDM05...**		
	MH1056008919*2I65A7***4**	**C3S150V4F***11***IxxTxxMxx**			**TPDM10...**		
	MH1053008919*2I65A7***4**	**C3S075V4F***11***IxxTxxMxx**			**TPDM05...**		
	MH1056008919*2I65A7***4**	**C3S150V4F***11***IxxTxxMxx**			**TPDM10...**		
	MH1053008919*2I65A7***4**	**C3S075V4F***11***IxxTxxMxx**			**TPDM05...**		

Order codes:
bold: **mandatory so that the package is combinable.**
italics: *recommended/standard*
blue: must be selected depending on the application.
Hint: The examples shown here are meant to help with the dimensioning process. As many parameters interact in this kind of drive package, the examples make no claim to be complete.

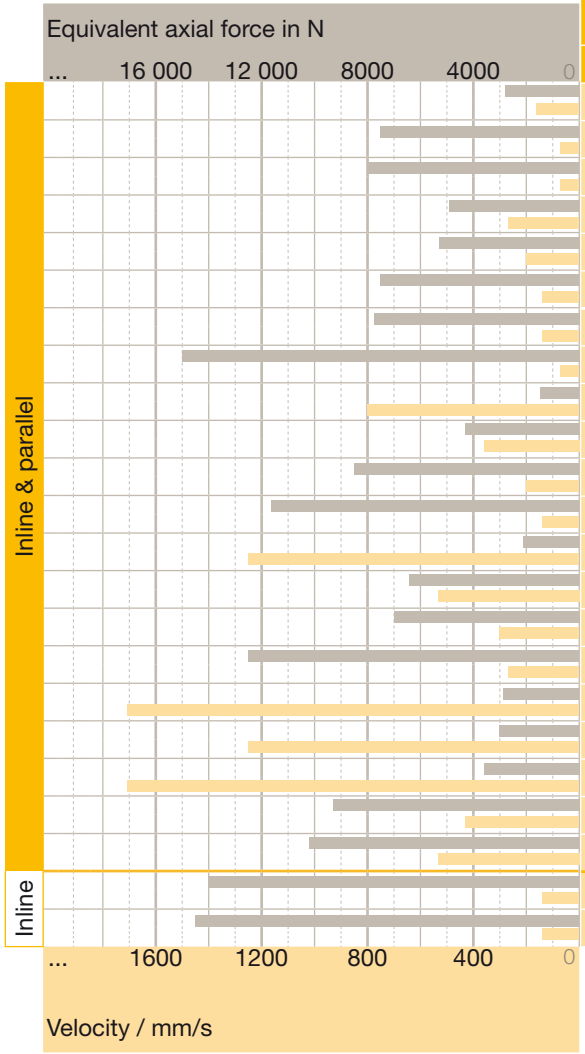
Predefined Motion Packages ETH080

with Compax3, TPD-M

In order to simplify the representation, we assumed boundary conditions which must be adhered to without exception in your application, otherwise the product combinations suggested here might not work. In this case, the application must be dimensioned conventionally.

Predefined Motion Packages

Cylinder / gearbox / motor / drive controller / cable



	Max. Speed	Equivalent axial force	Max. Acceleration	Service life	Screw pitch	Supply voltage	Cylinder
	mm/s	N	m/s²	km	mm	V	
01	160	2800	4	3560	5	400	**ETH080M05**A1**K1E**FM**N**0400A
02	70	7500	4	185	5	400	**ETH080M05**A1**P1B**FM**N**0400A
03	70	8000	0.5	155	5	400	
04	267	4900	4	670	5	400	**ETH080M05**A1**K1E**FM**N**0400A
05	200	5300	4	530	5	400	
06	139	7500	5	2200	10	400	**ETH080M10**A1**P1B**FM**N**0400A
07	139	7750	7.7	1950	10	400	
08	70	15 000	0.5	23	5	400	**ETH080M05**A1**P1B**FM**N**0400A
09	800	1450	15	>20 000	32	400	**ETH080M32**A1**K1J**FM**N**0400A
10	360	4300	8	15 540	10	400	**ETH080M10**A1**K1J**FM**N**0400A
11	200	8500	4	130	5	400	**ETH080M05**A1**K1J**FM**N**0400A
12	139	11 620	4.6	400	10	400	**ETH080M10**A1**P1B**FM**N**0400A
13	1250	2100	15	>20 000	32	400	**ETH080M32**A1**K1K**FM**N**0400A
14	533	6400	8	4710	10	400	**ETH080M10**A1**K1K**FM**N**0400A
15	300	7000	8	3100	10	400	**ETH080M10**A1**K1K**FM**N**0400A
16	267	12 500	4	40	5	400	**ETH080M05**A1**K1K**FM**N**0400A
17	1707	2850	15	>20 000	32	400	**ETH080M32**A1**K1K**FM**N**0400A
18	1250	3000	15	>20 000	32	400	**ETH080M32**A1**K1K**FM**N**0400A
19	1707	3600	15	11 920	32	400	**ETH080M32**A1**K1K**FM**N**0400A
20	430	9300	8	900	10	400	**ETH080M10**A1**K1K**FM**N**0400A
21	533	10 200	8	630	10	400	**ETH080M10**A1**K1K**FM**N**0400A
22	139	14 000	1	190	10	400	**ETH080M10**A1**P1B**FM**N**0400A
23	139	14 500	7.7	160	10	400	

Basic Application Assumptions:

- Stroke from 50 to 800 mm
- Horizontal movement
- The characteristics of the individual components are not to be exceeded
  - with parallel motor: respect transmissible torque depending on the motor speed n
  - permissible axial thrust forces must be respected
  - Ambient conditions
  - ...
- Linear acceleration
- Maximum acceleration given = deceleration times
- Application factor = 1.0
- The calculation is based on the assumption: without standstill time (i.e. if there are standstill times in the application, only the power reserve is increased)
- 40 °C ambient temperature, with gearbox 20 °C ambient temperature
- up to 1000 m above sea level

Order Codes								
Gearbox	Motor	Drive Compax3	Motor cable	Feedback cable	Drive TPD-M	Motor cable	Feedback cable
without gearbox	**SMH8230035192ID65G54**	**C3S038V4F**11**I**xx**T**xx**M**xx	❶	GBK 24/... (cable chain compatible)	**TPDM05...**	CAVOMOT...	CAVORES...
PS90-003-S2/MU90-085	**SMH8256038192ID65G54**	**C3S038V4F**11**I**xx**T**xx**M**xx			**TPDM05...**		
	SMH8230038192ID65G54	**C3S038V4F**11**I**xx**T**xx**M**xx			**TPDM020202...**		
without gearbox	**SMH1005606519**2ID65G54	**C3S075V4F**11**I**xx**T**xx**M**xx			**TPDM0808...**		
	SMH10030065192ID65G54	**C3S038V4F**11**I**xx**T**xx**M**xx			**TPDM05...**		
PS90-003-S2/MU90-088	**SMH1003006519**2ID65G54	**C3S038V4F**11**I**xx**T**xx**M**xx			**TPDM05...**		
	SMH10056065192ID65G54	**C3S075V4F**11**I**xx**T**xx**M**xx			**TPDM0808...**		
	SMH10030065192ID65G54	**C3S038V4F**11**I**xx**T**xx**M**xx			**TPDM05...**		
without gearbox	**SMH1153010724**2ID65G54	**C3S075V4F**11**I**xx**T**xx**M**xx			**TPDM0808...**		
		C3S075V4F11**I**xx**T**xx**M**xx			**TPDM0808...**		
		C3S075V4F11**I**xx**T**xx**M**xx			**TPDM0808...**		
PS90-003-S2/MU90-345	**SMH1153010819**2ID65G54	**C3S075V4F**11**I**xx**T**xx**M**xx			**TPDM0808...**		
without gearbox	**SMH1423015524**2ID65G54	**C3S150V4F**11**I**xx**T**xx**M**xx	❷		**TPDM10...**		
	SMH14256155242ID65G54	**C3S150V4F**11**I**xx**T**xx**M**xx			**TPDM15...**		
	SMH14230155242ID65G54	**C3S150V4F**11**I**xx**T**xx**M**xx			**TPDM10...**		
	SMH14256155242ID65G54	**C3S150V4F**11**I**xx**T**xx**M**xx			**TPDM15...**		
	MH14545225243I65A74	**C3S300V4F**11**I**xx**T**xx**M**xx	❸		**TPDM30...**		
	MH14530225243I65A74	**C3S150V4F**11**I**xx**T**xx**M**xx			**TPDM10...**		
	MH14545285243I65A74	**C3S300V4F**11**I**xx**T**xx**M**xx			**TPDM30...**		
	MH14530225242ID65G54	**C3S150V4F**11**I**xx**T**xx**M**xx			**TPDM15...**		
	MH14545285243I65A74	**C3S300V4F**11**I**xx**T**xx**M**xx			**TPDM30...**		
PS90-003-S2/MU90-345	**SMH1153010819**2ID65G54	**C3S075V4F**11**I**xx**T**xx**M**xx	❶		**TPDM0808...**		
	SMH11556108192ID65G54	**C3S150V4F**11**I**xx**T**xx**M**xx			**TPDM15...**		

❶ **MOK55/... (standard) or MOK54/...** (cable chain compatible)
❷ **MOK56/... (standard) or MOK57/...** (cable chain compatible)
❸ **MOK59/... (standard) or MOK64/...** (cable chain compatible)

Order codes:
bold: **mandatory so that the package is combinable.**
italics: *recommended/standard*
blue: must be selected depending on the application.
Hint: The examples shown here are meant to help with the dimensioning process. As many parameters interact in this kind of drive package, the examples make no claim to be complete.

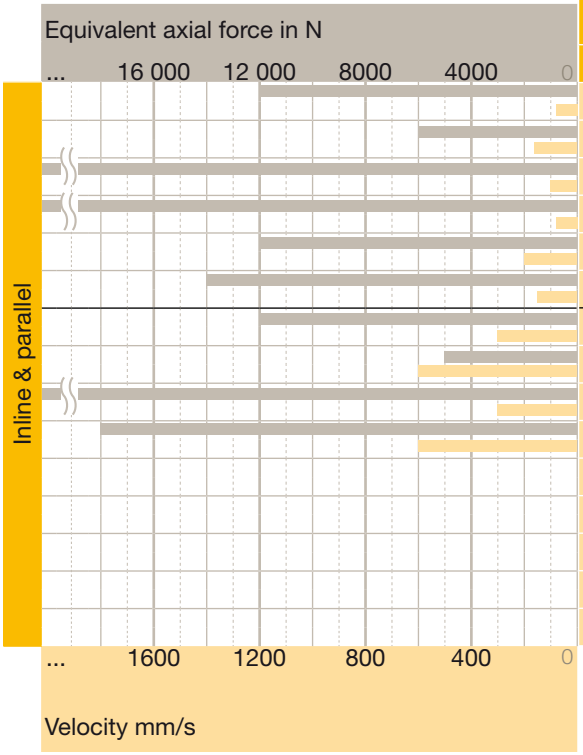
Predefined Motion Packages ETH100

with Compax3, TPD-M

In order to simplify the representation, we assumed boundary conditions which must be adhered to without exception in your application, otherwise the product combinations suggested here might not work. In this case, the application must be dimensioned conventionally.

Predefined Motion Packages

Cylinder / gearbox / motor / drive controller / cable



	Max. Speed	Equivalent axial force	Max. Acceleration	Service life	Screw pitch	Supply voltage	Cylinder
	mm/s	N	m/s²	km	mm	V	
01	80	12 000	4	6750	10	400	**ETH100M10**A1**P1C**FM**N**0600A
02	160	6000	4	>20 000	20	400	**ETH100M20**A1**P1C**FM**N**0600A
03	100	23 000	3	900	10	400	**ETH100M10**A1**P1C**FM**N**0600A
04	80	30 000	2	500	10	400	**ETH100M10**A1**P1C**FM**N**0600A
05	200	12 000	4	20 000	20	400	**ETH100M20**A1**P1C**FM**N**0600A
06	150	14 000	8	12500	20	400	**ETH100M20**A1**P1C**FM**N**0600A
07	300	12 000	5	20 000	10	400	**ETH100M10**A1**K1L**FM**N**0600A
08	600	5000	10	>20 000	20	400	**ETH100M20**A1**K1K**FM**N**0600A
09	300	30 000	4	500	10	400	**ETH100M10**A1**K1L**FM**N**0600A
10	600	18 000	4	6000	20	400	**ETH100M20**A1**K1L**FM**N**0600A

Basic Application Assumptions:

- Stroke from 100 to 600 mm
- Horizontal movement
- The characteristics of the individual components are not to be exceeded
  - with parallel motor: respect transmissible torque depending on the motor speed n
  - permissible axial thrust forces must be respected
  - Ambient conditions
  - ...
- Linear acceleration
- Maximum acceleration given = deceleration times
- Application factor = 1.0
- The calculation is based on the assumption: without standstill time (i.e. if there are standstill times in the application, only the power reserve is increased)
- 40 °C ambient temperature, with gearbox 20 °C ambient temperature
- up to 1000 m above sea level

Order Codes								
Gearbox	Motor	Drive Compax3	Motor cable	Feedback cable		Drive TPD-M	Motor cable	Feedback cable
PS115-005-S2/MU115-005	**SMH1005606524***2I65G5***4**	**C3S075V4F***11***IxxTxxMxx**	❶	GBK 24/... (cable chain compatible)		**TPDM0808...**	CAVOMOT...	CAVORES...
PS115-005-S2/MU115-005	**SMH1003006524***2I65G5***4**	**C3S038V4F***11***IxxTxxMxx**	❶			**TPDM05...**		
PS115-004-S2/MU115-026	**SMH1423015524***2I65G5***4**	**C3S150V4F***11***IxxTxxMxx**	❷			**TPDM15...**		
PS115-005-S2/MU115-026	**SMH1423015524***2I65G5***4**	**C3S150V4F***11***IxxTxxMxx**	❷			**TPDM15...**		
PS115-004-S2/MU115-026	**SMH1423015524***2I65G5***4**	**C3S150V4F***11***IxxTxxMxx**	❷			**TPDM15...**		
PS115-005-S2/MU115-026	**SMH1423015524***2I65G5***4**	**C3S150V4F***11***IxxTxxMxx**	❷			**TPDM15...**		
without gearbox	**SMH1703036538***2I65A7***4**	**C3S150V4F***11***IxxTxxMxx**	❷			**TPDM15...**		
	MH1454528524*2I65G5***4**	**C3S300V4F***11***IxxTxxMxx**	❸			**TPDM30...**		
	MH2053090538*2I65A7***4**	**C3H050V4F***11***IxxTxxMxx**	❹			--		
	MH2053090538*2I65A7***4**	**C3H050V4F***11***IxxTxxMxx**	❹			--		

❶ **MOK55/... (standard) or MOK54/...** (cable chain compatible)
❷ **MOK56/... (standard) or MOK57/...** (cable chain compatible)
❸ **MOK59/... (standard) or MOK64/...** (cable chain compatible)
❹ **MOK61/..., MOK62/...**

Order codes:
bold: **mandatory so that the package is combinable.**
italics: *recommended/standard*
blue: must be selected depending on the application.
Hint: The examples shown here are meant to help with the dimensioning process. As many parameters interact in this kind of drive package, the examples make no claim to be complete.

Order Code

	1	2	3	4	5	6	7	8	9	10	11	12
Example	**ETH**	**050**	**M05**	**A**	**1**	**1A**	**F**	**M**	**N**	**0200**	**A**	**Uxx**

1 Series

ETH	Electro Cylinder

2 Frame size

032	ISO 32
050	ISO 50
080	ISO 80
100	ISO 100

3 Screw lead Mxx in mm

M05	for ETH032, ETH050, ETH080
M10	for ETH032, ETH050, ETH080, ETH100
M16	for ETH032
M20	for ETH050, ETH100
M32	for ETH080

4 Motor mounting position, housing orientation, groove orientation [1]

A		Inline + groove for initiator 3 & 9 o'clock (standard)
B		Inline + groove for initiator 6 & 12 o'clock
C		Parallel 12 o'clock / groove for initiator 3 & 9 o'clock
D		Parallel 12 o'clock / groove for initiator 6 & 12 o'clock
E		Parallel 3 o'clock / groove for initiator 3 & 9 o'clock
F		Parallel 3 o'clock / groove for initiator 6 & 12 o'clock
G		Parallel 6 o'clock / groove for initiator 3 & 9 o'clock
H		Parallel 6 o'clock / groove for initiator 6 & 12 o'clock
J		Parallel 9 o'clock / groove for initiator 3 & 9 o'clock
K		Parallel 9 o'clock / groove for initiator 6 & 12 o'clock

5 Relubrication option [2, 3]

in combination with motor mounting position, housing orientation, groove orientation

1	No additional relubrication hole (standard) (not with 3 o'clock motor mounting)		
	ETH032	**ETH050**	**ETH080/ETH100**
	A, B, C, D, G, H, J, K	A, B, C, D, G, H, J, K	A, C, G, J
2	Relubricating hole centered in the profile 12 o'clock		
	ETH032	**ETH050**	**ETH080/ETH100**
	A, C, E, G, J	B, D, F, H, K	A, C, E, G, J
3	Relubricating hole centered in the profile 3 o'clock		
	ETH032	**ETH050**	**ETH080/ETH100**
	B, D, F, H, K	A, C, E, G, J	A, C, E, G, J
4	Relubricating hole centered in the profile 6 o'clock		
	ETH032	**ETH050**	**ETH080/ETH100**
	A, C, E, G, J	B, D, F, H, K	A, C, E, G, J
5	Relubricating hole centered in the profile 9 o'clock		
	ETH032	**ETH050**	**ETH080/ETH100**
	B, D, F, H, K	A, C, E, G, J	A, C, E, G, J

6 Motor flange [4]

Motors always with key groove on the output shaft

	ETH032	ETH050	ETH080	ETH100	With motor flange for Parker motor:
K1A	•				SMH60-B08/9, MH56-B05/9
K1B	•	•			SMH60-B05/11, MH70-B05/11 or NX3
K1C	•	•			SMH82-B08/14
K1D			•	•	SMH82-B08/19, MH105-B9/19 (formerly HJ96 Motor) or NX4
K1E			•	•	SMH82-B05/19, SMH100-B5/19, MH105-B5/19
K1F		•			SMH100-B5/14 [5]
K1H				•	SMH100-B05/24, MH105-B05/24
K1J			•	•	SMH115-B7/24, MH105-B6/24 or NX6
K1K			•	•	SMH142-B05/24, MH145-B05/24
K1L				•	MH205-B5/38, SMH170-B5/38
					With gearbox flange for Parker gearbox:
P1A	•	•			PS60
P1B			•		PS90
P1C				•	PS115
P1D				•	PS142
P1G	•	•			PE3
P1H			•		PE4
1xx					Special flange one-piece (customized)
2xx					Special flange two-piece (customized)

if you need a flange for a third-party motor, please contact us.

7	Mounting type	
	F	Thread on the cylinder body **(standard)** (ETH100 does not have a mounting thread on the underside)
	B	Foot mounting [6), 7)]
	C	Rear Clevis [6)]
	D	Centre trunnion mounting (not with motor mounting positions E, F, J, K), for lubricating option "1", the lubrication port is always in 6 o'clock position
	E	Rear Eye Mounting [6)]
	G	Mounting Flanges [7)]
	H	Rear plate [6)]
	J	Front plate [7)]
	N	Rear Plate & Front Plate [6), 7)]
	X	customized - please contact us

8	Thrust rod	
	M	External thread **(standard)**
	F	Internal Thread
	C	Rod clevis [8)] (stainless steel with protection class "B" and "C"; standard with protection class "A")
	S	Spherical Rod Eye (stainless steel with protection class "B" and "C"; standard with protection class "A")
	R	Parallel guiding with ball bushing [8)] (not with motor mounting positions E, F, J, K) (available only in protection class option A)
	T	Parallel guiding with sliding bushing [8)] (not with motor mounting positions E, F, J, K)
	L	Alignment Coupler (available only in protection class option A)
	X	customized - please contact us

9	Option (placeholder)	
	N	Standard

10	Stroke in mm	ETH032	ETH050	ETH080	ETH100
	0050	•	•		
	0100	•	•	•	•
	0150	•	•	•	•
	0200	•	•	•	•
	0300	•	•	•	•
	0400				•
	0600				•
	1000	•			•
	1200		•		
	1600			•	•
	XXXX	50...1000	50...1200	50...1600	100...2000
		customized in steps of 1 mm			

11	Protection class	
	A	IP54 with galvanized screws
	B	IP54 stainless version with VA screws
	C	IP65 like B + protective lacquer and specially sealed

12	Optional (only customized cylinders)	
	Uxx	Unique Version
		Here, a number for customized cylinders is assigned, please contact us

1) ETH080/ETH100 features 2 grooves each on all 4 sides (i.e. Code B=A or D=C, F=E, H=G, K=J), therefore Codes A, C, E, G, J are possible for ETH080/ETH100.
2) With parallel configuration, the motor may block access to the sensors and the lubrication port.
3) When selecting the relubrication options 2-5, the standard lubrication port is without function.
4) Please check cylinder motor/gearbox combination with the aid of the table ("Motor Mounting Options" see page 22).
Order Code SMH100-B5/14: " SMH100␣␣␣␣ET..." (the motor shaft diameter is replaced by the term "ET")(not in the motors catalog) only with feedback: Resolver, G5, A7
6) Not with motor mounting options A & B.
7) Not for thrust rod R, T
8) Not for ETH100

Software & Tools

- Actuator database
  - A special actuator database is available in the Compax3 ServoManager. You can simply enter the ETH type code for automatic controller parameterization.
- CAD-Configurator
  - Configure your electro cylinder CAD data online.
    www.parker.com/eme/eth
- Dimensioning tool "EL-Sizing"
  - A dimensioning tool simplifies the dimensioning process.
    www.parker.com/eme/eth

Parker's Motion & Control Technologies

At Parker, we're guided by a relentless drive to help our customers become more productive and achieve higher levels of profitability by engineering the best systems for their requirements. It means looking at customer applications from many angles to find new ways to create value. Whatever the motion and control technology need, Parker has the experience, breadth of product and global reach to consistently deliver. No company knows more about motion and control technology than Parker. For further info call 00800 27 27 5374

Aerospace

Key Markets

Aftermarket services
Commercial transports
Engines
General & business aviation
Helicopters
Launch vehicles
Military aircraft
Missiles
Power generation
Regional transports
Unmanned aerial vehicles

Key Products

Control systems & actuation products
Engine systems & components
Fluid conveyance systems & components
Fluid metering, delivery & atomization devices
Fuel systems & components
Fuel tank inerting systems
Hydraulic systems & components
Thermal management
Wheels & brakes

Climate Control

Key Markets

Agriculture
Air conditioning
Construction Machinery
Food & beverage
Industrial machinery
Life sciences
Oil & gas
Precision cooling
Process
Refrigeration
Transportation

Key Products

Accumulators
Advanced actuators
CO_2 controls
Electronic controllers
Filter driers
Hand shut-off valves
Heat exchangers
Hose & fittings
Pressure regulating valves
Refrigerant distributors
Safety relief valves
Smart pumps
Solenoid valves
Thermostatic expansion valves

Electromechanical

Key Markets

Aerospace
Factory automation
Life science & medical
Machine tools
Packaging machinery
Paper machinery
Plastics machinery & converting
Primary metals
Semiconductor & electronics
Textile
Wire & cable

Key Products

AC/DC drives & systems
Electric actuators, gantry robots & slides
Electrohydrostatic actuation systems
Electromechanical actuation systems
Human machine interface
Linear motors
Stepper motors, servo motors, drives & controls
Structural extrusions

Filtration

Key Markets

Aerospace
Food & beverage
Industrial plant & equipment
Life sciences
Marine
Mobile equipment
Oil & gas
Power generation & renewable energy
Process
Transportation
Water Purification

Key Products

Analytical gas generators
Compressed air filters & dryers
Engine air, coolant, fuel & oil filtration systems
Fluid condition monitoring systems
Hydraulic & lubrication filters
Hydrogen, nitrogen & zero air generators
Instrumentation filters
Membrane & fiber filters
Microfiltration
Sterile air filtration
Water desalination & purification filters & systems

Fluid & Gas Handling

Key Markets

Aerial lift
Agriculture
Bulk chemical handling
Construction machinery
Food & beverage
Fuel & gas delivery
Industrial machinery
Life sciences
Marine
Mining
Mobile
Oil & gas
Renewable energy
Transportation

Key Products

Check valves
Connectors for low pressure fluid conveyance
Deep sea umbilicals
Diagnostic equipment
Hose couplings
Industrial hose
Mooring systems & power cables
PTFE hose & tubing
Quick couplings
Rubber & thermoplastic hose
Tube fittings & adapters
Tubing & plastic fittings

Hydraulics

Key Markets

Aerial lift
Agriculture
Alternative energy
Construction machinery
Forestry
Industrial machinery
Machine tools
Marine
Material handling
Mining
Oil & gas
Power generation
Refuse vehicles
Renewable energy
Truck hydraulics
Turf equipment

Key Products

Accumulators
Cartridge valves
Electrohydraulic actuators
Human machine interfaces
Hybrid drives
Hydraulic cylinders
Hydraulic motors & pumps
Hydraulic systems
Hydraulic valves & controls
Hydrostatic steering
Integrated hydraulic circuits
Power take-offs
Power units
Rotary actuators
Sensors

Pneumatics

Key Markets

Aerospace
Conveyor & material handling
Factory automation
Life science & medical
Machine tools
Packaging machinery
Transportation & automotive

Key Products

Air preparation
Brass fittings & valves
Manifolds
Pneumatic accessories
Pneumatic actuators & grippers
Pneumatic valves & controls
Quick disconnects
Rotary actuators
Rubber & thermoplastic hose & couplings
Structural extrusions
Thermoplastic tubing & fittings
Vacuum generators, cups & sensors

Process Control

Key Markets

Alternative fuels
Biopharmaceuticals
Chemical & refining
Food & beverage
Marine & shipbuilding
Medical & dental
Microelectronics
Nuclear Power
Offshore oil exploration
Oil & gas
Pharmaceuticals
Power generation
Pulp & paper
Steel
Water/wastewater

Key Products

Analytical Instruments
Analytical sample conditioning products & systems
Chemical injection fittings & valves
Fluoropolymer chemical delivery fittings, valves & pumps
High purity gas delivery fittings, valves, regulators & digital flow controllers
Industrial mass flow meters/ controllers
Permanent no-weld tube fittings
Precision industrial regulators & flow controllers
Process control double block & bleeds
Process control fittings, valves, regulators & manifold valves

Sealing & Shielding

Key Markets

Aerospace
Chemical processing
Consumer
Fluid power
General industrial
Information technology
Life sciences
Microelectronics
Military
Oil & gas
Power generation
Renewable energy
Telecommunications
Transportation

Key Products

Dynamic seals
Elastomeric o-rings
Electro-medical instrument design & assembly
EMI shielding
Extruded & precision-cut, fabricated elastomeric seals
High temperature metal seals
Homogeneous & inserted elastomeric shapes
Medical device fabrication & assembly
Metal & plastic retained composite seals
Shielded optical windows
Silicone tubing & extrusions
Thermal management
Vibration dampening

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