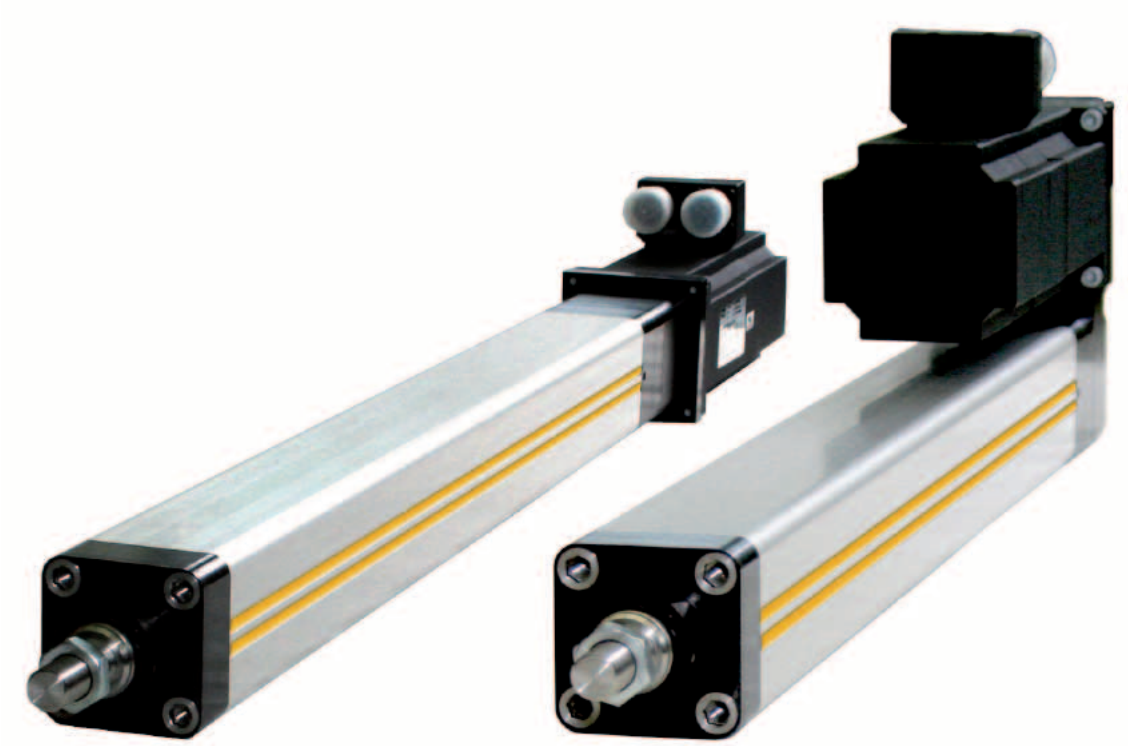
Mounting instructions

ET Manual - Installation, Commissioning, Maintenance and Repair

ETH - Electro Cylinder
Parker High Force Electro Thrust Cylinder



192-550002N2 ETH Mounting instructions

March 2011

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nonwarranty clause

Further information:

Our product on the Internet: http://www.parker-eme.com/eth

Inhalt Montageanleitung

Contents of catalog section:

Electro Cylinder ETH Series

1. Introduction

In this chapter you can read about:

1.1 Device assignment

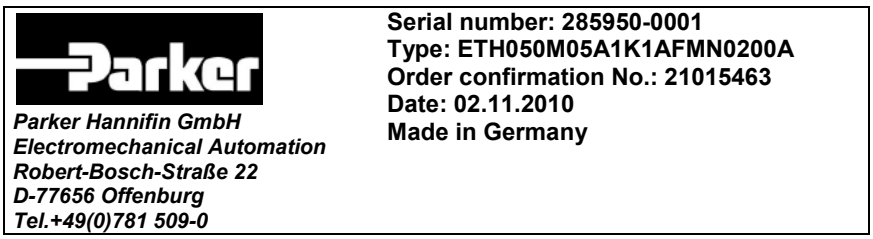
This manual is valid for the following devices:

Electro cylinder for motors and gearboxes:

- ETH032
- ETH050
- ETH080

1.2 Type specification plate

Type specification plate (example)



Type specification plate explanation

Left:		Manufacturer address
Right:	Serial number:	Unambiguous identification number
	Type:	Order code
	Order confirmation No.:	Customer Order No.:
	Date:	Delivery date

1.3 Mounting explanation

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EINBAUERKLÄRUNG

DECLARATION OF INCORPORATION

ACCORDING TO EC DIRECTIVE 2006/42/EC (ANNEX II, PART 1, SECTION B) FOR PARTLY COMPLETED MACHINERIES

Dokumenten Nr. *Declaration No.:*	**DoI001-R 1.0**
Firma / *Manufacturer:* Bevollmächtigter */ Authorized person:*	**Parker Hannifin GmbH** **Jürgen Killius**
Anschrift *Address:*	**Robert-Bosch-Straße 22** **77656 Offenburg** **Deutschland**
Produkt *Product:*	**ETH: Parker High Force Electro Thrust Cylinder**
Serien- / Typenbezeichnung *Model / Type:*	**ETH032; ETH050; ETH080**
Seriennummer *Serial No.:*	**Ab 284356-0001** ***From 284356-0001***
Baujahr *Year of manufature:*	**Ab November 2010** ***From November 2010***

Der oben genannte Hersteller / Bevollmächtigte erklärt, dass das Produkt den folgenden grundlegenden Anforderungen der Richtlinie Maschinen (2006/42/EG) entspricht:
The above mentioned Manufacturer / authorized person declare that the product is complying with the following essential requirements of the machinery directive 2006/42/EC:
Anhang I, Artikel */ Annex I, Article*: 1.1.1. 1.1.2, 1.1.3, 1.1.5, 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.7, 1.4.1, 1.5.4, 1.5.8 & 1.6.1.

Norm / *Standard*	Titel / *Title*	Ausgabe / *Edition*
EN ISO 12100-1	Sicherheit von Maschinen – Grundlegende, allgemeine Gestaltungsleitsätze Teil 1: Grundsätzliche Terminologie, Methodologie *Safety of Machinery – basic concepts. Part 1: fundamental terminology, methodology*	2003
EN ISO 12100-2	Sicherheit von Maschinen – Grundlegende, allgemeine Gestaltungsleitsätze Teil 2:Technische Leitsätze *Safety of Machinery – basic concepts, general design guideline, Part 2: Technical guidelines and specifications*	2003
EN ISO 14121-1	Sicherheit von Maschinen – Risikobeurteilung Teil 1: Leitsätze *Safety of Machinery – Risk assessment Part 1: Principle*	2007

Den im Produkthandbuch beschriebenen Sicherheits-, Installations- und Bedienungshinweisen muss Folge geleistet werden.
These products must be installed and operated with reference to the instructions in the Product Manual.
All instructions, warnings and safety information of the Product Manual must be adhered to.

Die unvollständige Maschine darf erst dann in Betrieb genommen werden, wenn festgestellt wurde, dass die Maschine, in die die unvollständige Maschine eingebaut werden soll, den Bestimmungen der Richtlinie Maschine 2006/42/EG entspricht.
The partly completed machinery must not be put into service until the final machinery, into which it is to be incorporated, has been declared in conformity with the provisions of directive 2006/42/EC on machinery.

Die zur Maschine gehörenden speziellen technischen Unterlagen nach Anhang VII Teil B wurden erstellt.
The machinery related special technical documentation according annex VII B has been created.

Der Hersteller verpflichtet sich, die speziellen Unterlagen zur unvollständigen Maschine einzelstaatlichen Stellen auf Verlangen elektronisch zu übermitteln. Die gewerblichen Schutzrechte des Herstellers der unvollständigen Maschine bleiben hiervon unberührt.
The manufacturer commits to transmit, in response to a reasoned request by the market surveillance authorities, relevant documents on the partly completed machinery electronically by our documentation department.
The intellectual rights of the manufacturer of the incomplete machine are not affected.

Offenburg, 28.10.2010
Jürgen Killius, *Operations Manager* ppa.

1.4 Safety instructions

1.4.1. General hazards

General Hazards on Non-Compliance with the Safety Instructions

The subsystem has been designed in accordance with state-of-the-art technical developments and is operationally reliable. If it is not operated by qualified or at least trained personnel or if it is operated improperly or not in accordance with the operating instructions, however, the unit may bear the risk of hazards.

Electronic, moving and rotating components can

- Danger for life and limb of the operator or third persons and / or
- cause material damage

If the linear actuator is installed in a machine plant, the safety requirements noted in the operating instructions for that machine must be combined with those described in this manual.

1.4.2. Intended use

The linear actuator has a number of uses including:

Positioning, transporting, feeding, removing, pallet handling, loading, unloading, processing and manipulating as well as testing work pieces or tools.

Since the component can be used in a very wide range of applications, the user is responsible for its use in specific applications.

Please make sure that the mounting of parts or tools will not pose a threat to persons or cause damages to any parts or devices. This also applies, for example, to the case of a broken toothed belt (if existing).

The linear actuator must only be used in areas that are not accessible to persons during operation.

If the linear actuator is used in areas accessible to people, it must be installed in such a manner that no one can be endangered during operation.

1.4.3. Identifying Residual Dangers and Hazardous Areas

If there are still residual dangers present to persons or property from the linear actuator in spite of operating it in a safe manner, the user must make reference to these residual dangers through signs and written rules requiring appropriate procedures.

The following safety signal words are used:

 **Danger!**	Indicates that an imminent hazardous situation may lead to death or serious bodily harm if not prevented using appropriate safety measures.
 **Warning!**	Indicates a potentially hazardous situation which, if not avoided using appropriate safety measures, could result in serious or minor injury.
 **Caution!**	Indicates a potentially hazardous situation which, if not avoided using appropriate safety measures, may result in minor injury or material damage.
 **Hint**	Provides important information about the product, how to handle the product or about the part of the manual to which particular attention must be paid.

1.4.4. Working safely

Heed the Instructions

The information (such as instructions and notes) contained in this manual must be heeded for all work involved in installing, commissioning, setting up, operating, changing operating conditions and modes, servicing, inspecting and repairing the unit.

The manual must be available close to the linear module during the performance of all tasks.

It is impermissible to operate the liner module if it is not in perfectly functional condition.

Operating personnel

The following jobs must only be performed by appropriately trained and authorized personnel:

- Installation and set-up tasks on the linear actuator
- Attaching safety limit switches (initiators)
- Connecting the drive and testing the motion direction

Instructions for Special Hazards

The linear module must be fixed or supported in accordance with the indications in this manual.

The operator must ensure that operation of the linear module does not cause any danger.

If the linear module moves in hazardous areas, these areas can be safeguarded with safety transmitter switches.

1.4.5. Safety Instructions for the Company Using the System

Supervisors must also become familiar with the entire chapter entitled "Safety" and handling required on the linear actuator.

Supervisors must ensure that installation and operating personnel have read and understand the chapter entitled "Safety" and the description of how to work with the machine, and that they observe the instructions.

The manual must be available close to the linear module during the performance of all tasks.

It is impermissible to operate the liner module if it is not in perfectly functional condition.

Depending on the application, the operating company must provide for a suitable separating safety fence. Access to the motion range during operation must be prevented.

The user must make sure that the work area is protected by appropriate safety devices.

1.4.6. Safety Instructions for Operating Personnel

Any work step that has a negative effect on the operating safety of the linear motor module must be omitted.

Operating and supervisory personnel are required to check the linear actuator or machine at least once per shift for externally visible damage or defects. Changes that have occurred (including the operating behavior) that could have a negative effect on the operating safety must be reported immediately.

Components and accessories are designed especially for this product. When purchasing spare and wearing parts, use only original Parker parts. We note here explicitly that we are unable to check or release spare parts or accessories that were not provided by us. Installing and/or using such products may cause negative

changes in the required design properties in some circumstances, which in turn could negatively effect the active and/or passive operating safety of the product.
The manufacturer is unable to accept any liability for damage caused by using non-original parts and accessories.
Safety and protection devices are strictly NOT to be removed or bypassed or set out of order.
Applicable requirements and national accident prevention regulations must always be observed when installing and operating our linear motor module.

1.5 Packaging, storage, transport

First check

- Check the packaging for damages.
- Remove the packaging.
  Do not discard the packaging; it is strongly recommended to use the original packaging material for return deliveries.
- Depending on the storage location, metal surfaces may have a temperature of 0 °C or below. Please provide appropriate worker protection (e.g. protective gloves).
- Please ensure that the consignment does correspond to your order.
- Check the product for damages. Do never use a device which seems damaged.
- Please read the installation manual carefully before installing or commissioning the device.

Packaging material

The packaging material is inflammable, if it is disposed of improperly by burning, lethal fumes may develop.

Transport

Make sure to transport the linear module always in a safe manner and with the aid of suitable lifting equipment (Means of transport).

Storage

The linear module must be stored evenly and without any mechanical load.
The stated storage temperature must be adhered to.

Disposal

We recommend to dispose of the respective materials in accordance with the respectively valid environmental laws. The following table states the materials suitable for recycling and the materials which have to be disposed of separately.

Material	suitable for recycling	Disposal
Metal	yes	no
Plastic materials	yes	no

1.5.1. Special notes on transport

Special notes on transport

Use only transport equipment with sufficient lifting capacity. When using ropes, make certain they are not twisted or knotted. If you are using more than one rope, all the ropes should be equally taut.

When transporting the ETH with a forklift, establish a condition of equilibrium and secure the load if necessary.

Never step under overhead loads - danger of being injured!
Moving parts must always be secured against slipping or moving.

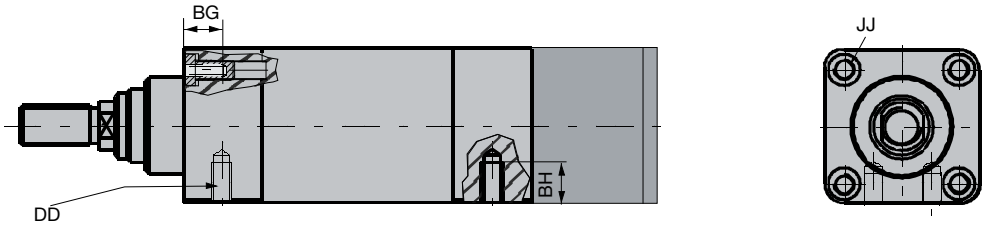
Required minimum load bearing capacity of the means of transport:

ETH032	ETH050	ETH080
130 kg	300 kg	750 kg

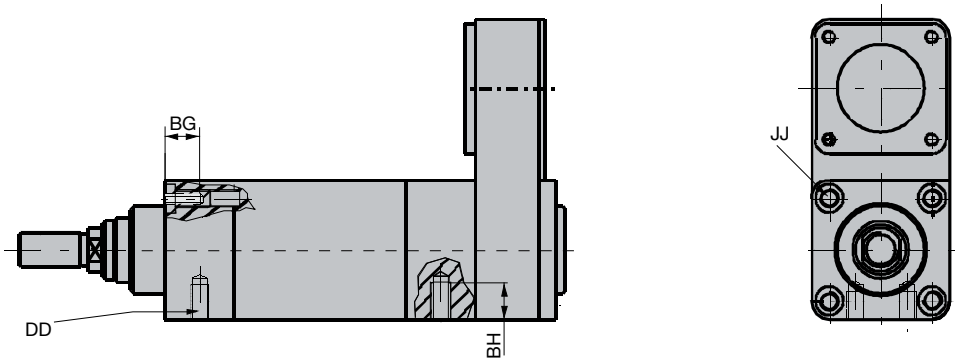
In these table values, a safety factor of S=8 is taken into consideration (motor and gearbox weight included). This means that it does **not** represent the cylinder weight.

The following threads on the cylinder can be used to mount transport or mounting equipment (for example eye bolts):

Motor inline:



Motor parallel



	ETH032	ETH050	ETH080
DD	M6x1.0	M8x1.25	M10x1.5
JJ*	M6x1.0	M8x1.25	M10x1.5
BH	9	12.7	17.5
BG	16	25	26

* screw “JJ” is not available in IP65 for the ETH32 and the ETH50!

1.6 Warranty conditions

User Conversions and Changes are Not Permitted

The linear actuator must not be changed in its design or in terms of safety without our approval. Any change as defined here made by the user excludes any liability on our part.

1.7 Conditions of utilization

General introductory notes

With the ETH electro cylinder you bought a product which was manufactured and tested before delivery with the utmost care.

Please take your time to read the following notes which you ought to follow closely during setup and operation.

The operation of the electro cylinder is only permitted within the limit values stated in this manual.

Unless, all claims under the warranty will become void and a reduced service life or even damages must be expected.

Please compare the operating data with the stated limit values especially with reference to:

- Stroke length and setting of the limit switches, those must be set so that there is a sufficient safety travel at both ends of the travel stroke

Even if the limit switches were already mounted at our premises, they must be adapted according to suitable values before operation!

- Thrust and traction force in the effective direction
- Lateral force (e.g. as a component of the effective force, but also due to own weight on horizontal mounting, especially with parallel motor mounting and long travel strokes)
- Speed
- Acceleration
- Environmental conditions (e.g. temperature, contamination)
- Please do take possible pulses caused by moved masses into consideration for the operating data. (Even small abrupt loads can cause damage, especially if they occur rather often at the same place.)

The limit values for the thrust and traction force, lateral force, speed and acceleration are partly influenced by several factors and can change depending on:

- the size of the electro cylinder
- Screw lead
- Direct or parallel drive via toothed belt transmission
- Mounting method
- Mounting orientation vertical or horizontal resp. inclined
- Travel Stroke

If the motor used with the electro cylinder should be able to exceed individual limit values of the cylinder, the respective values for the motor must be limited in the control by appropriate parameterization. The parameterization should even be reduced down to the values necessary for operation.
This would, for example provide a hint to a possible damage or to preventive maintenance if wear-induced extensive friction of the machine or cylinder would trigger an error message of the controller.

The internal end stops of the electro cylinder may under no circumstances be accessed during operation. The internal end positions may only be accessed by the cylinder in setup mode and only for determining the end positions with a low force of a few N (torque limitation if possible below 10%) and very slowly (max. 2% of the nominal speed).

The lifetime of the electro cylinder depends strongly on the degree of power exploitation and on impermissible operating states occurring - even if only for a short time.

2. Set-up

In this chapter you can read about:

The linear module is furnished completely mounted and mechanically ready-to-operate.

If no Parker drive is provided, attach your motor-gearbox combination according to the instructions of the respective supplier.

The technical data must be respected.

See from page 6 in the catalog section (following the mounting instructions).

2.1 Mounting

Caution!

Please use only the parts offered in the Parker ETH catalog for the following mounting components:

- Rear Eye Mounting (order code E)
- Rear Clevis (order code C) with bearing pedestal

Standard parts in accordance with the ISO flange standard cannot be used for these accessories, as they are not sufficiently stable.

Please Note:

- The cylinder housing must be mounted without tension or contorsion.
- The cylinder housing must be precisely aligned to the load direction of motion.
- Occurring lateral forces on the cylinder must be taken into consideration.

2.1.1. Mounting with mounting threads on the cylinder

The easiest and most economic method of mounting is using the available mounting threads on the cylinder body. Make sure that the mounting surface is level and that the cylinder is mounted without tension and contortion. This method of mounting is only possible, if the lower side of the mounting surface is accessible.

Dimensions: see in the catalog section (following the mounting instructions) on page 16.

2.1.2. Mounting with mounting accessories

Cylinder mounting with mounting plates or foot mounting brackets

If the underside of the mounting surface is not accessible, mounting plates or foot mounting brackets are available as accessories.

Mounting methods: see from page 19 in the catalog section (following the mounting instructions).

Dimensions: see in the catalog section (following the mounting instructions) on page 16.

The rear mounting plate cannot be fixed with inline motor configuration.

If you fix the cylinder only at the rear end (e.g. also with a rear clevis) please respect the effective direction of the known forces. Critical are above all lateral forces in horizontal or vertical direction.

Permissible side load: See from page 13 in the catalog section (following the mounting instructions).

2.1.3. Mounting notes

2.1.3.1 Side Load

Please respect the maximum permissible side loads depending on the vertical or horizontal mounting position.

Permissible side load: See from page 13 in the catalog section (following the mounting instructions).

2.1.3.2 Mounting of the payload

Connect the payload always with the end of the thrust rod so that occurring lateral forces are minimized. If the payload is separately guided, even minimal deviations between this guiding system and the cylinder length axis can generate high lateral forces and reduce the service life of the electro cylinder considerably.

There are two possibilities to avoid this problem:

- Use a flexible coupling at the thrust rod end.
  This coupling can compensate up to 3 mm axial offset and up to 10° angular offset.
- Use other thrust rod connection elements (accessories), which are able to compensate certain deviations such as for example rod clevis or spherical rod eye
- Use a flexible cylinder fixing device (accessories) such as for example rear clevis or center trunnion.

Thrust rod version: see from page 23 in the catalog section (following the mounting instructions).

2.2 Electric installation

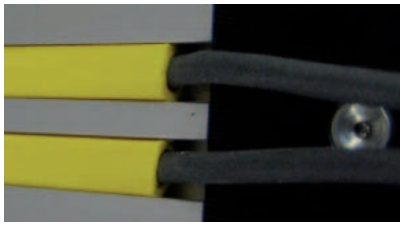
2.2.1. Sensors

All electro cylinders feature a permanent magnet in the spindle nut. It activates the limit switches which are mounted in the special mounting grooves on one side of the cylinder.

Sensors and limit switches: see from page 28 in the catalog section (following the mounting instructions).

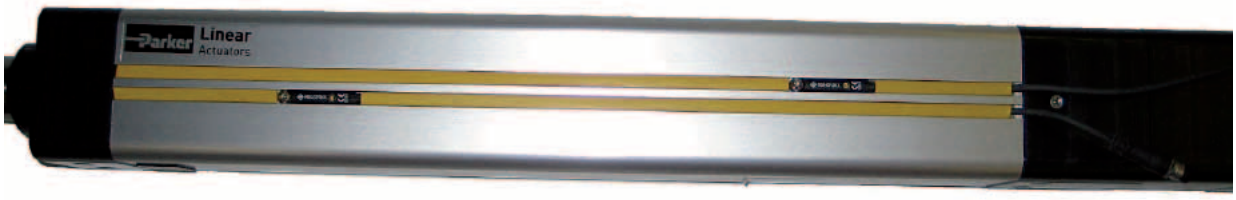
2.2.2. Sensor mounting

- Sensors can be inserted in all grooves on the ETH electro cylinder.
- If no sensors are mounted by the manufacturer (on customer request), please remove the groove protection covers. Use a pointed screwdriver to lever the ends of the covers off the grooves. Pull the entire covers out manually.
- Install the magnetic cylinder sensors. The sensors can be inserted into the grooves from above. The cable ends should lead into the drive direction. Push the sensors to their approximate positions in the grooves of the cylinder body. Tighten the fixing screws on the limit switches slightly and lead the cable along the profile groove.
- If **sensors are used as end limits** (see on page 16), do set them.
  - You can use the formerly removed protective covers in order to fix the sensor cables. Please cut the covers to the desired length with the aid of a pair of scissors. Please cut off an additional 5 to 10 mm, where the cables are to be lead out of the profile.

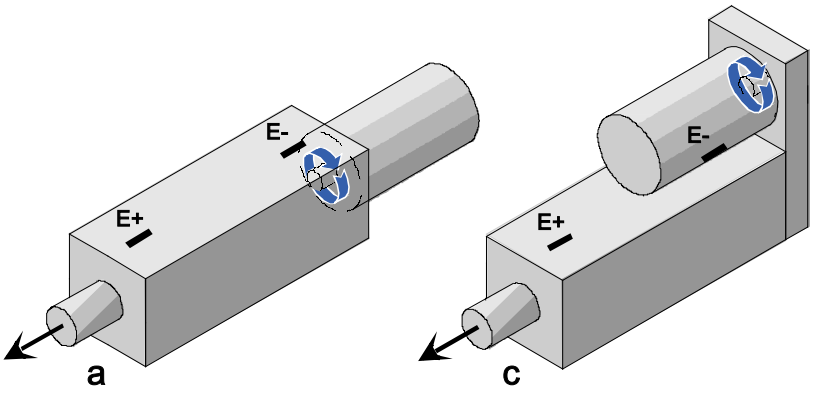


- Insert the cables into the grooves of the plastic covers and push the cover into the groove together with the cable.
- Connect the sensors to the controller.
  Sensors and limit switches: see from page 28 in the catalog section (following the mounting instructions).

Sensor mounting example: 2 end limits with machine zero



2.2.3. Direction of the motor during extension of the cylinder



With parallel drive (drawing c), the turning direction of the motor is reversed in comparison with the direct drive configuration!

2.2.4. Setting the end limits

The steps described below can be best executed with energized drive. Therefore, they may only be performed by trained and authorized personnel.

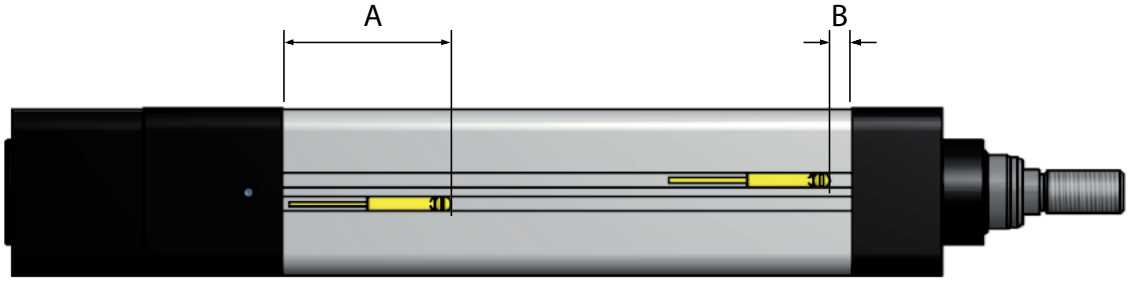
Do only travel at very low speed (<10 mm/s) and reduce the drive torque to a minimum.

Ensure that there are no persons in the hazardous area.

The setting of the end limits depends on the application.

No sensor is to be mounted in the area of the central lubrication port (option).

The following activation positions at the mechanical end limits result from the initiators recommended in the catalog.



ETH		A [mm]	B [mm]
032	M05	68	0
	M10	77	0
	M16	81	0
050	M05	71	0
	M10	77	0
	M20	89	0
080	M05	85	0
	M10	103	0
	M32	133	0

Caution!

Please add the respective safety travels to the values mentioned above”

Stroke, usable stroke and safety travel: see in the catalog section (following the mounting instructions) on page 14.

Sensors and limit switches: see from page 28 in the catalog section (following the mounting instructions).

Adjusting the machine zero proximity switch

The correct position for the home switch (machine zero switch) depends on the application

It is recommended to set the machine zero at or near the end of the travel - this saves time, as it minimizes the chance that the machine zero is searched for in the wrong direction. In some cases it is possible to use one of the limit switches as machine zero, this method provides however a reduced precision, as the resulting position can normally not be and-linked with the encoder index pulse.

2.3 Motor and feedback mounting

In this chapter you can read about:

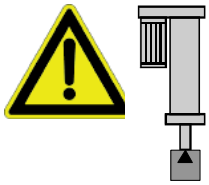
Notes on motor wiring

In order to adhere to the EMC directive, it is necessary to mount the motor if ever possible unchanged. If you require a longer cable, the entire line should be replaced with the same or a similar cable.

If you mount a connector on the new cable, please make sure that the 360 ° motor cable shielding is maintained and that there is no connection to earth via the connector housing.

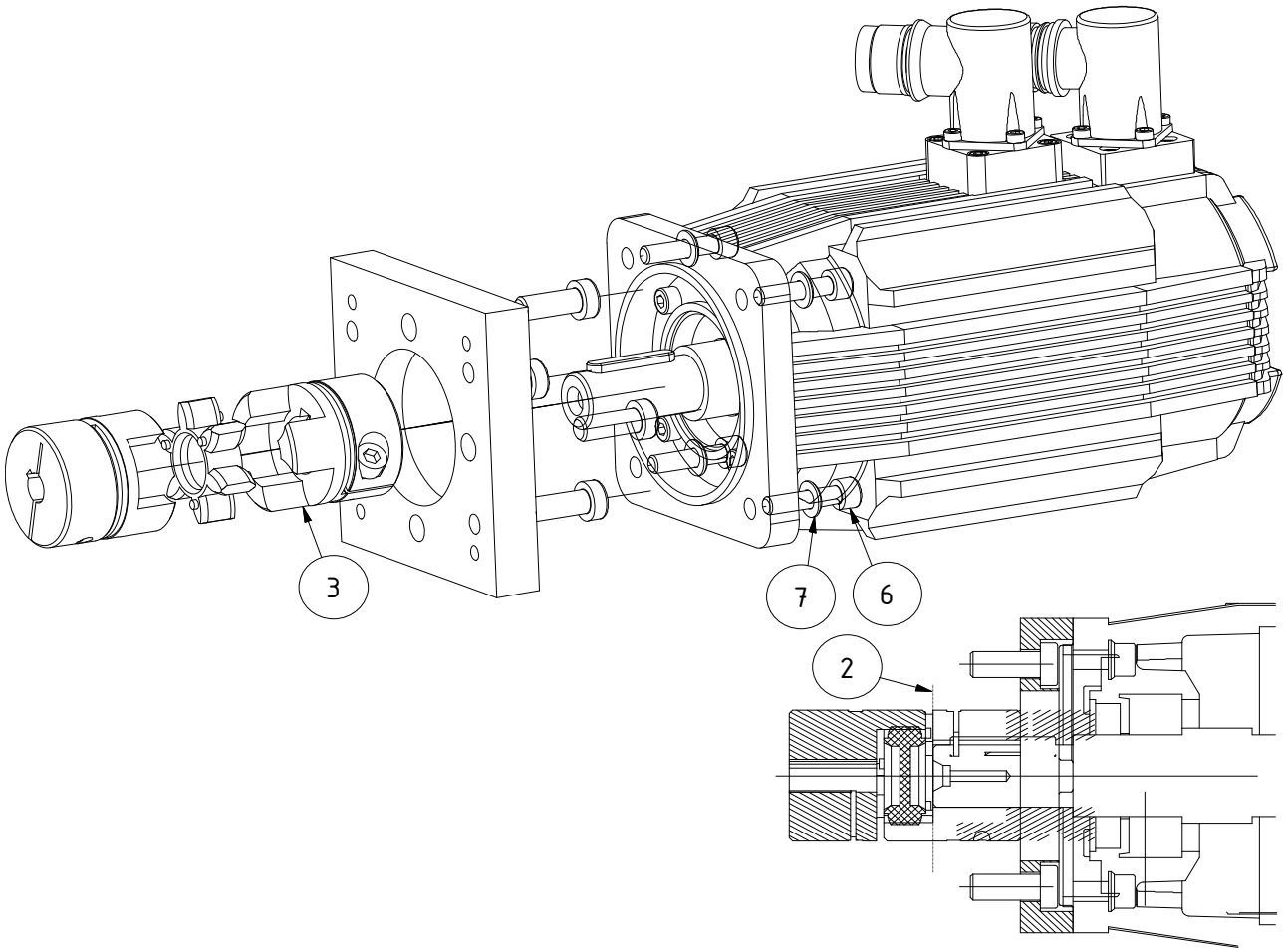
The motor must be grounded with a separate PE protective lead (green/yellow, cross-section at least 2.5 mm²).

This cable must be connected to the available motor-ground connector or - if there is non available - with a mounting screw. In the latter case, the coloring under the head of the screw must be removed.



If the axis is mounted upright, it must be secured against moving out!

2.3.1. Motor / gearbox mounting with inline motor configuration



Motor / gearbox dismantling

- Remove motor connector
  ATTENTION: Respect the safety instructions!
- If you use a gearbox, we recommend to dismount the motor from the gearbox first for reasons of weight.
- Loosen screws (Pos. 6).
- Remove motor / gearbox including mounted coupling half with caution.
- Loosen clamping screw of the coupling half (Pos. 3).
- Remove coupling half from the motor / gearbox shaft.

Mount motor / gearbox

- Loosen clamping screw of the coupling half (Pos. 3).
- Slip the coupling half onto the motor / gearbox shaft and align to be flush with the shaft if not stated otherwise by Parker (Pos. 2).
- Tighten clamping screw of the coupling half:

Coupling size	Tightening torque
GS12 (Outer diameter: 25 mm)	1.4 Nm
GS14 (Outer diameter: 30 mm)	1.4 Nm
GS19 (Outer diameter: 40 mm)	10.5 Nm

- Slip motor / gearbox onto the mounted flange.
  Attention: Slip on motor / gearbox with a slight pivoting movement, so that the coupling halves interlock.
- Arm screws (Pos. 6) with washers (Pos. 7) and tighten.

2.3.2. Motor / gearbox mounting with parallel motor configuration

In this chapter you can read about:

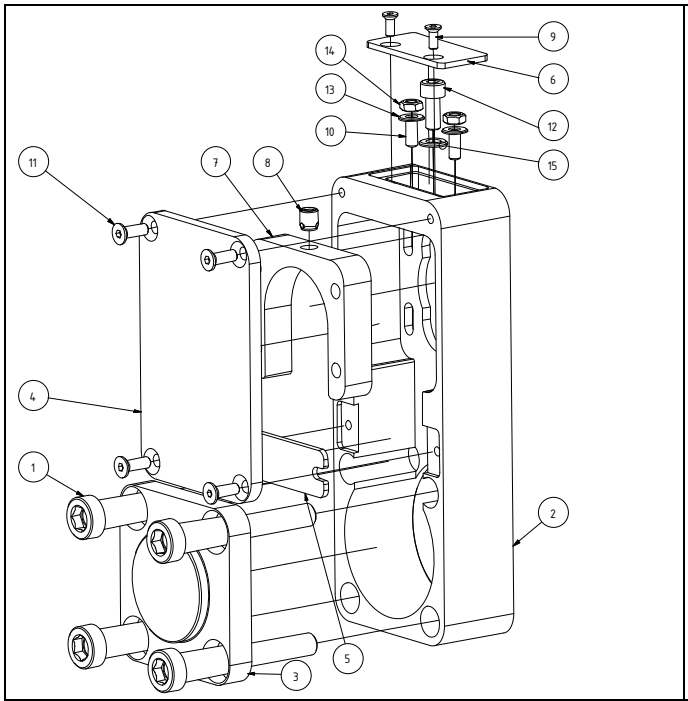


Figure 1: Parallel housing

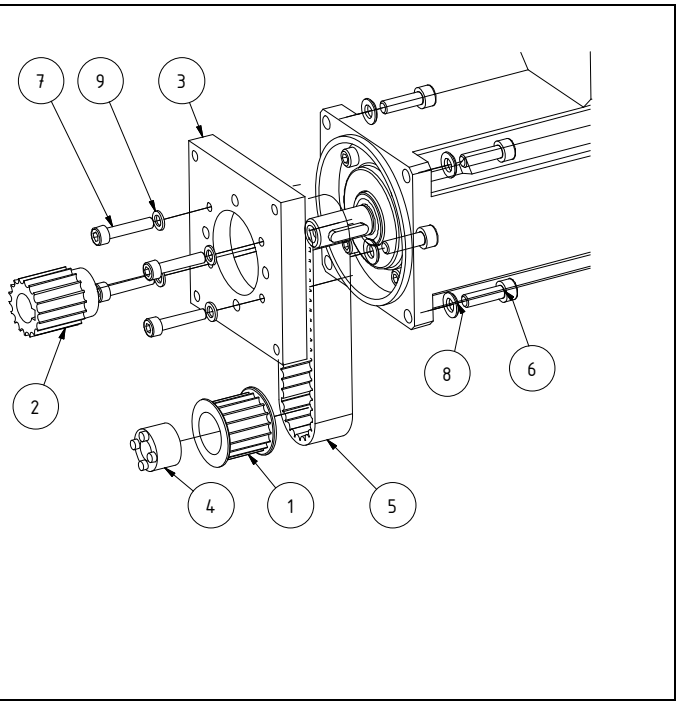


Figure 2: Parallel motor

Motor / gearbox dismantling

- Remove motor connector

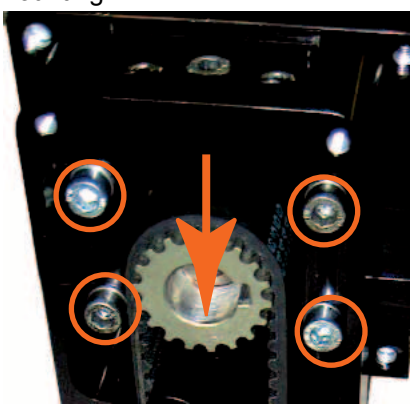
Caution!

Respect the safety instructions!

- Remove lid (Fig. 1 Pos. 6) and screws (Fig. 1 Pos. 9).
- Remove lid (Fig. 1 Pos. 4) and screws (Fig. 1 Pos. 11).

ATTENTION: Keep all screws and lids for later mounting.

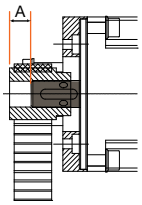
- Release toothed belt tension:
  - Slightly loosen 4 screws (Fig. 2 Pos. 7) by 1 or 2 turns (see figure on the right).
    ATTENTION: Do not remove the screws entirely!
  - Loosen central toothed belt tensioning screw (Fig. 1 Pos. 12).
    The drive unit must lower slightly when the tensioning screw is loosened.
  - Loosen tightening screw (Fig. 1 Pos. 12) until the drive unit is not lowered any further.



- Remove 4 screws (Fig. 2 Pos. 7) completely. First at the bottom, then at the top.

Caution!

Secure drive unit against dropping. We recommend to place a support pad between motor and cylinder profile.
Make sure not to insert your fingers between motor / gearbox and electro cylinder!



- Remove drive unit with mounted toothed pulley from the parallel housing with caution.
  ATTENTION: Make sure that the toothed belt is not stuck in the parallel housing.
- Dismount motor / gearbox flange (Fig. 2 Pos. 3) by loosening the screws (Fig. 2 Pos. 6).
- Measure and note depth “A” from toothed pulley to motor / gearbox shaft before dismounting the toothed pulley (see figure on the right).
- Remove threaded pin(s) from the toothed pulley.
- Pull off toothed pulley with the aid of a pull-off tool,

Motor / gearbox mounting

- Fit toothed pulley and set dimension “A”.
  Dimension “A” is provided by Parker. If the drive was exchanged, please set the dimension “A” noted before.
- Screw in the toothed pulley threaded pins.
- Mount motor / gearbox flange (Fig. 2 Pos. 3) with the screws (Fig. 2 Pos. 6 and Pos. 8).
- Insert drive unit with mounted toothed pulley into the parallel housing with caution. We recommend to place a support pad between motor and cylinder profile.
  ATTENTION: Please make sure that the toothed belt is correctly geared in the pulley toothing.
- Screw in 4 screws (Fig. 2 Pos. 7) until the motor flange fits. Do not yet tighten.

Caution!

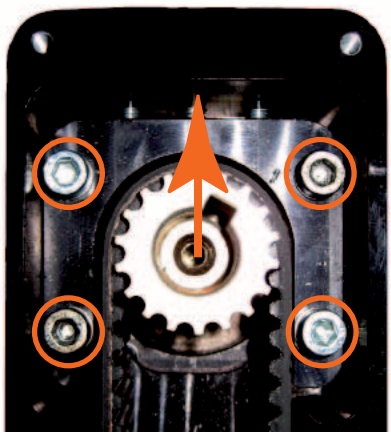
Make sure not to insert your fingers between motor /gearbox and electro thrust cylinder!

- Setting the toothed belt pre-tension:
  - For **the used toothed belt** (see on page 20).
  - For **a new toothed belt** (see on page 21).
- Mount lid (Fig. 1 Pos. 6) with screws (Fig. 1 Pos. 9).
- Mount lid (Fig. 1 Pos. 4) with screws (Fig.. 1 Pos. 11).

2.3.2.1 Re-apply toothed belt pre-tension (reinsert the same toothed belt)

If the motor / gearbox is exchanged and the toothed belt is still in good condition, the pre-tension can be reset without measuring device:

- First check, if the belt toothing is geared into the upper and lower toothed pulley.
- The screws (Fig. 2 Pos. 7) must be inserted (but not tightened), so that the drive unit can be lifted.
- Tighten central toothed belt tensioning screw (Fig. 1 Pos. 12).
  The drive unit must lift when tightening the screw. Lift the unit until it touches the 2 internal stops (fig. 1 Pos. 10). This is made by tightening the central tightening screw.



- Tighten 4 screws (Fig. 2 Pos. 7) with the given tightening torque.

ETH032	ETH050	ETH080
3 Nm	5 Nm	10 Nm

- Refix both lids (Fig. 1 Pos. 4 & 6) with the respective screws (Fig. 1 Pos. 11 & 9).

2.3.2.2 Resetting the toothed belt pre-tension (new toothed belt)

For a new toothed belt, we recommend to re-set the toothed belt pretension:

- Check, if the belt toothing is geared into the upper and lower toothed pulley.
- The screws (Fig. 2 Pos. 7) must be inserted (but not tightened), so that the drive unit can be lifted.
- Loosen both lock nuts (Fig. 1 Pos. 14) (do not remove entirely).
- Unscrew both threaded pins (Fig. 1 Pos. 10) until they are almost level with the inside of the parallel housing.
- Tighten central toothed belt tensioning screw (Fig. 1 Pos. 12) until the toothed belt is noticeably pretensioned.
- Measure toothed belt tension with a suitable device.
  We recommend: Gates: „Sonic 507c" or Hilger&Kern: „Trummeter"
- Tighten screw lightly and repeat measurement.
- Repeat this procedure until the required **toothed belt pretension** (see on page 21, see on page 23) is set.

Caution! Only a correctly set toothed belt pretension ensures fail-safe operation of the cylinder.

- Screw in both threaded pins (Fig. 1 Pos. 10) until they touch the inner bracket. Tighten pins slightly.
- Retighten lock nuts (Fig. 1 Pos. 14).
- Tighten 4 screws (Fig. 2 Pos. 7) with the given tightening torque.

ETH032	ETH050	ETH080
3 Nm	5 Nm	10 Nm

- Refix both lids (Fig. 1 Pos. 4 & 6) with the respective screws (Fig. 1 Pos. 11 & 9).

2.4 Exchanging the toothed belt

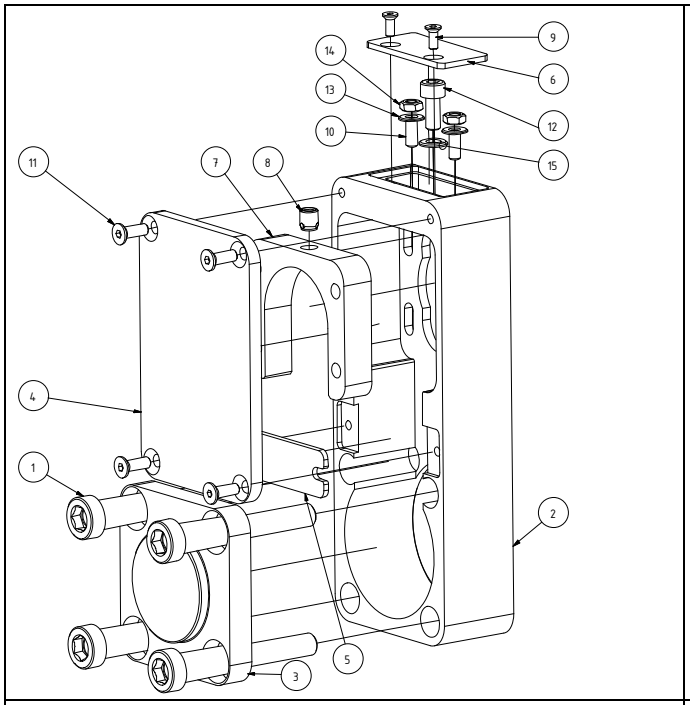


Figure 1: Parallel housing

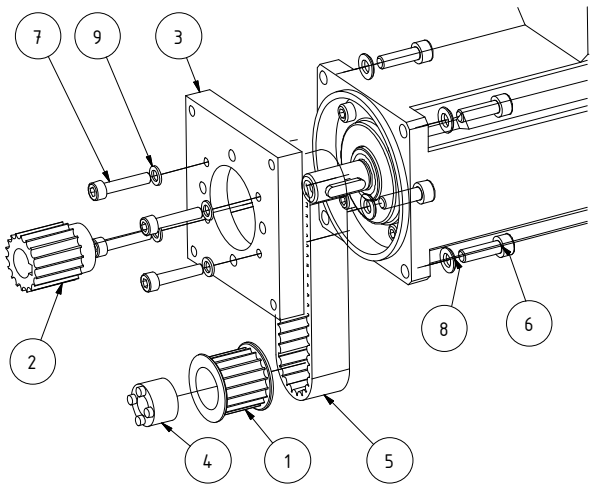


Figure 2: Parallel motor

Dismounting the motor (see on page 17)

- Loosen and remove 4 screws (Fig. 1 Pos. 1).
- Remove lid (Fig. 1 Pos. 3).
- Remove bar (Fig. 1 Pos. 5).
- Remove old toothed belt and insert new belt.
  ATTENTION: Please make sure that the toothed belt is correctly geared in the pulley toothing.
- Insert bar (Fig. 1 Pos. 5).
- Fit lid (Fig. 1 Pos. 3).
- Apply screw adhesive “Wiko 02K43 medium” to 4 screws (Fig. 1 Pos. 1) and tighten slightly.
- Align housing (Fig. 1 Pos. 2) with the electro cylinder.
- Tighten 4 screws (Fig. 1 Pos. 1) with the given tightening torque.

ETH032	ETH050	ETH080
9 Nm	20 Nm	40 Nm

- **Mounting the motor** (see on page 17)
- Setting the toothed belt pre-tension:
  - For **the used toothed belt** (see on page 20).
  - For **a new toothed belt** (see on page 21).
- Mount lid (Fig. 1 Pos. 6) with screws (Fig. 1 Pos. 9).
- Mount lid (Fig. 1 Pos. 4) with screws (Fig.. 1 Pos. 11).

2.5 Belt / belt tensions

	ETH032	ETH050	ETH080
Art. No. Belt	0111.013	0121.013	0131.013
Belt pre-tension	210 N ± 7 N	230 N ± 7 N	450 N ± 14 N
Trum Frequency*	438 Hz ± 14 Hz	306 Hz ± 10 Hz	236 Hz ± 8 Hz
Belt mass	0.060 kg/m	0.080 kg/m	0.120 kg/m
Center distance	67.5 mm	87.5 mm	130 mm

*Alternatively, the frequency for setting the pre-tension can be used.

3. Maintenance

In this chapter you can read about:

The ballscrew drive must be relubricated within given 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 short-stroke applications, a lubrication run must be performed after max. 10000 movement cycles.
Lifetime: see from page 10 in the catalog section (following the mounting instructions).

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**.

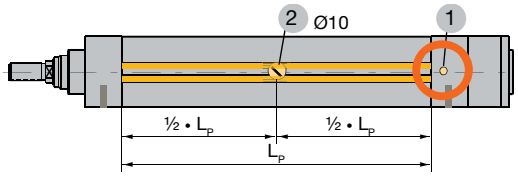
3.1 Lubricating intervals and amount of lubricant

	Screw	Interval	Amount of lubricant
ETH032	**M05**	300 km	1.3 cm^3
	M10	600 km	1.6 cm^3
	M16	960 km	2.1 cm^3
ETH050	**M05**	300 km	1.6 cm^3
	M10	600 km	1.9 cm^3
	M20	1200 km	2.7 cm^3
ETH080	**M05**	300 km	3.1 cm^3
	M10	600 km	4.4 cm^3
	M32	1500 km	7.8 cm^3

Lubricant

Do only use "Klüber NBU15" lubricating grease for standard cylinders!

3.2 Greasing via central lubrication port (standard)



1: Central lubrication (standard)

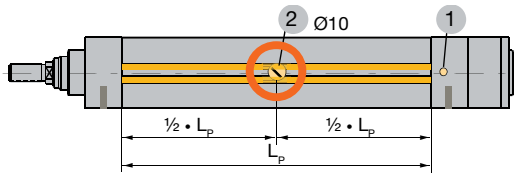
2: Central lubrication (Option)

- Make sure that all external stops are removed.
- Retreat thrust rod completely so that it touches the rear stop.
- Pass internal buffer by 0.5 mm.

ATTENTION!
Ensure by means of control, that the internal buffer is not passed by more than 0.5 mm!

- This is the lubricating position.
- Use a suitable pipe for the funnel type lubricating nipple, Type D1a4 DIN3405: Beaked nozzle.
- Place the pipe orthogonally onto the lubricating nipple.
- Use the **defined amount of lubricant** (see on page 24).
- The amount of lubricant applied can be defined by the number of pump strokes. Pump the stated amount of grease onto a balance, while counting the pump strokes.

3.3 Relubrication via central lubrication port (option)



1: Central lubrication (standard)

2: Central lubrication (Option)

- Loosen lubrication port screw.
- Move the cylinder slowly to the lubricating position until the lubricating port becomes visible.
- The lubricating ports have a diameter of 2.5 mm. Therefore you need a beaked nozzle insert for your lubricating gun.
- Use a stable pipe (no hose).
- Insert the nozzle into the hole in the cylinder profile and place it orthogonally onto the lubricating port.
- Use the **defined amount of lubricant** (see on page 24).
- The amount of lubricant applied can be defined by the number of pump strokes. Pump the stated amount of grease onto a balance, while counting the pump strokes.

4. Repair

In the event of a damage or a mechanical defect, the entire unit must be returned for repair (**Parker Hannifin** (see on page 2)). The repair must be made by trained Parker personnel.

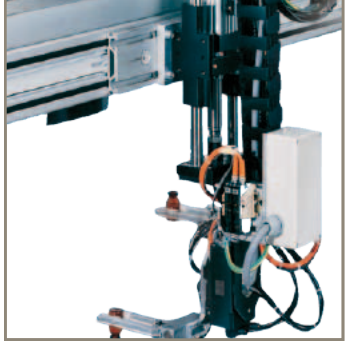
User Conversions and Changes are Not Permitted

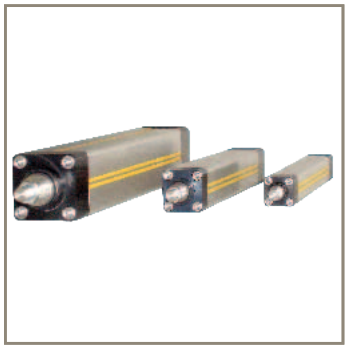
The linear actuator must not be changed in its design or in terms of safety without our approval. Any change as defined here made by the user excludes any liability on our part.

5. Index

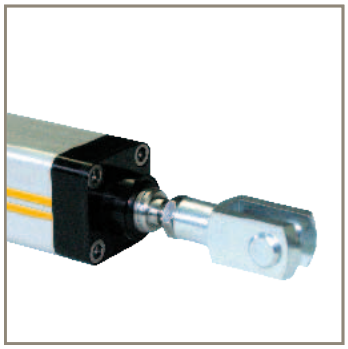
6. Further information

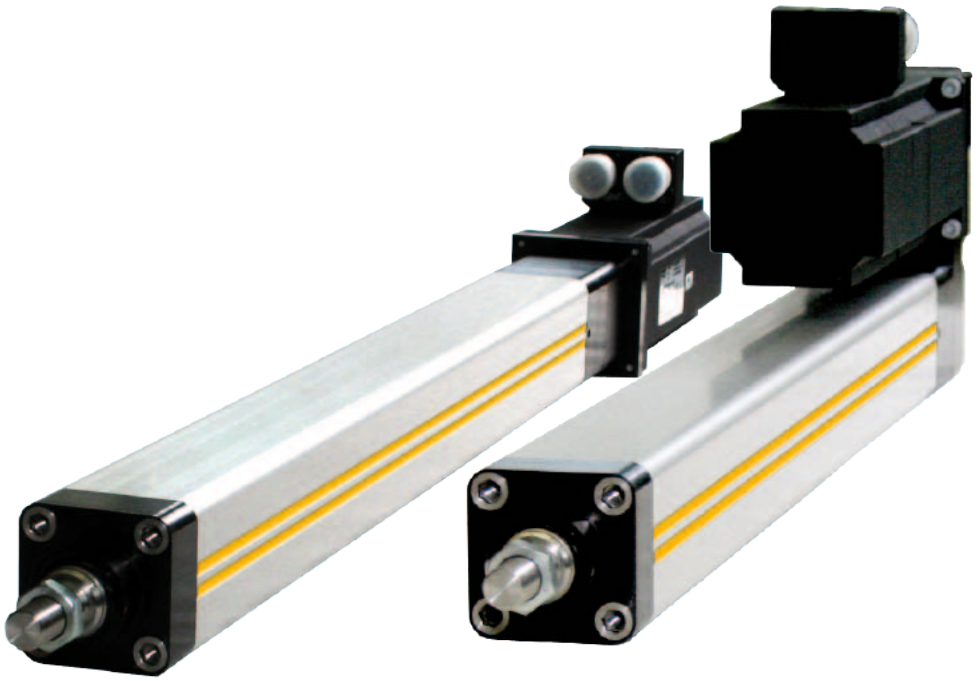
Our product on the Internet: http://www.parker-eme.com/eth





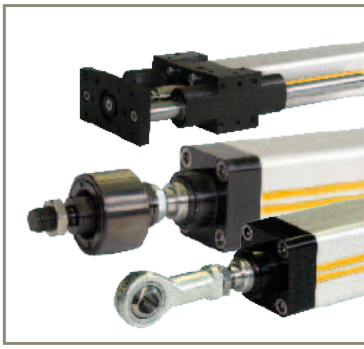
aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding





ETH Electro Cylinder

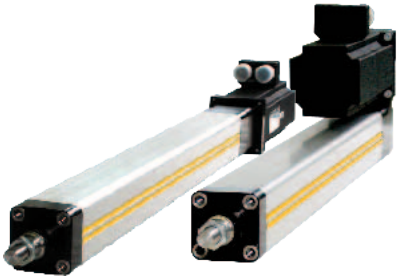
Parker High Force Electro Thrust Cylinder



Parker

ENGINEERING YOUR SUCCESS.

Electro Cylinder ETH Series

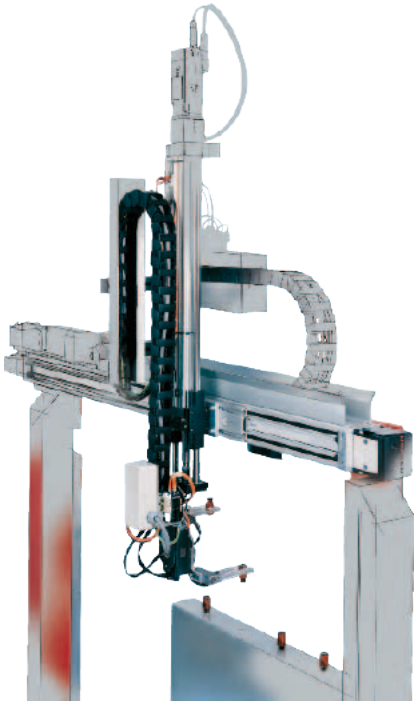


The ETH on the Internet:
www.parker-eme.com/eth

ETH Product Description

Advantages of the New Electro Cylinder:

- Unrivaled power density - high forces and small frame sizes
- Initiators / initiator cables can be concealed in the profile
- Optimized for safe handling and simple cleaning
- High service life
- Reduced maintenance costs thanks to lubricating hole in the cylinder flange
- Easy replacement due to pneumatic ISO flange norm (DIN ISO 15552:2005-12) conformity
- Anti-rotation device integrated
- Reduced noise emission
- All from one source
  We offer the complete drive train: Drive controllers, motors and gearboxes matching the Electro Cylinder



Typical Fields of Application:

The ETH electro cylinder closes the gap between pneumatic and hydraulic drives; 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 the following 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

Technical Characteristics:

For precise motion, positioning, setting and actuating, the electro cylinder offers:

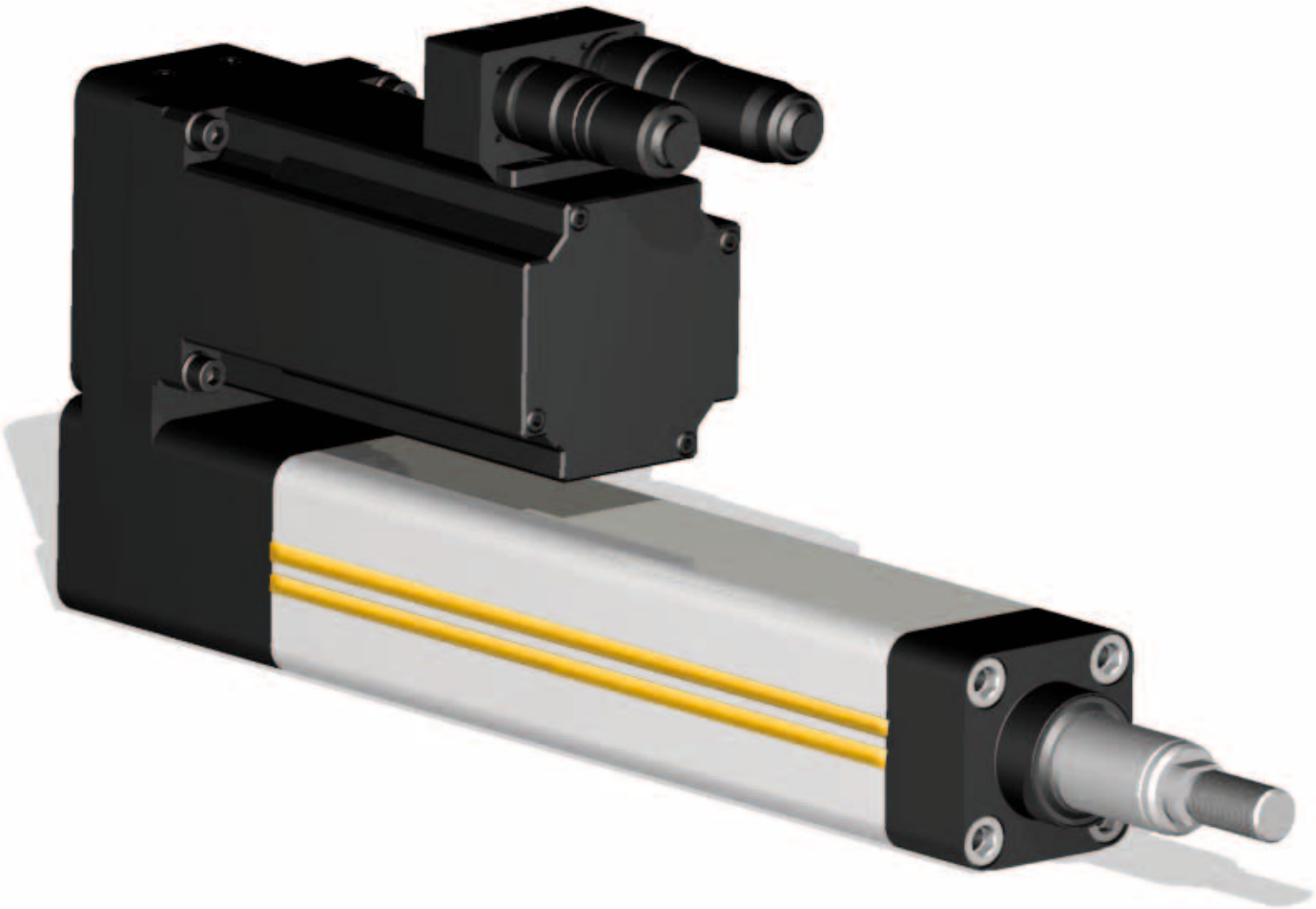
- High mechanical efficiency up to 90 %
- Strokes up to 1600 mm
- High traction/thrust force up to 25100 N
- Repeatability up to ±0.03 mm
- Speeds up to 1.7 m/s
- Toothed belt drive (for parallel motor mounting)
- Many different screw pitches for thrusts from 5 to 32 mm/rev.
- 3 different sizes (ETH032, ETH050, ETH080)
  additional sizes are planned
- Predefined standardized motor and gearbox flanges for simplified selection. The motors are available directly from Parker (all from one source).
- 3 different protection classes available:
  - IP54 with galvanized screws (standard)
  - IP54 with VA stainless screws
  - IP65

We also offer customized solutions:

If your application requires a special version of the ETH cylinder, please contact us, we shall be pleased to help you.

- 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



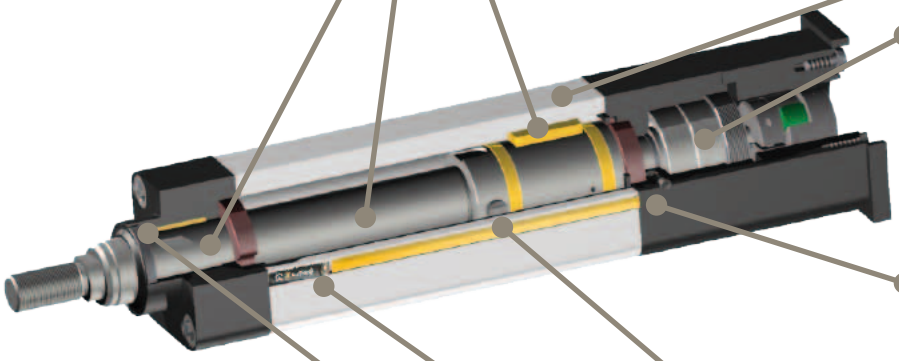
Product Design

Precision Ballscrew:
The drive train mechanism in the ETH is a class 7 ballscrew (ISO 3408). The ballscrew design also ensures low frictional resistance for smooth motion over the entire speed range, a longer life product with excellent efficiency, and lower dB ratings. The result is higher speeds and higher force capabilities per package size.

Screw support bearing (front end):
The non-motor end of the screw is supported by a hard durometer polymer bushing designed to eliminate vibration while also reducing noise. The result is a quieter, smoother motion with better precision, longer screw life, and increased dynamic behavior.

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 for quick, simple, easy access to re-grease ball screw. Optionally the part number allows the port to be located in the center of the extrusion in the event the rear is inaccessible in the machine. The result is reduced down time for product maintenance yielding a higher ROI and a longer product life.

Piston Rod Support Bearing & Protection:
The piston rod is supported by an extra long rod bushing. This bushing braces the rod in all directions allowing for smooth travel with high side loading capabilities. In front of the bearing, the rod wiper will keep the typical contamination out the ETH interior. Also available for more challenging environments is an IP65 version for better ingress protection. The result is a more robust design with high side loading capacities and longer contamination free life.

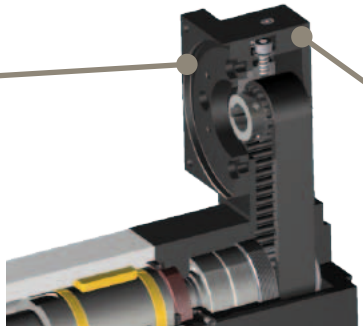
Home and End of Travel Sensors:
The extrusion is designed for flush mount sensors. The Parker global series limit sensors mount inside the groove and have no affect on the product overall width. Once mounted, the slot cover conceals any sensor cables for a clean, aesthetically appealing design with a minimized volumetric footprint. The a common sensor style across Parker's other series of actuation products (including pneumatics) reduces inventory and spare part complexity.

Permanent magnet:
All ETH 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.

Parallel Motor Options:

For applications where overall length requirements constrict the allowable space, the parallel motor mount is the answer. With flexibility in motor options, motor location, and motor orientation, the ETH is the most user friendly design allowing quick selection of the best solution for the application needs. The result is a smaller overall package with increased force density versus overall length.

High Force Parallel Timing Belt:
The robust toothed belt allows for slip free motion with minimal belt wear. The belt design offers a simple 1:1 ratio as a standard and many other ratios as needed by contacting our applications team. This design has maximized transmittable torque for previously un-attainable thrust forces at higher speeds. The result is a compact, robust, high force cylinder with a long life.



Parallel Belt Tension Design:
The new parallel belt tensioning method allows for precise, repeatable belt tensioning with a quick and easy process. The result is faster installation time and reduced down time.

Technical Data

Cylinder size type		Unit	ETH032			ETH050			ETH080		
			M05	M10	M16	M05	M10	M20	M05	M10	M32
Screw lead		[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/s²]	4	8	12	4	8	15	4	8	15
Forces											
Max. axial traction/thrust force motor inline		[N]	3600	3700	2400	9300	7000	4400	17800	25100	10600
Max. axial traction/ thrust force depending on the motor speed n of parallel motor	n < 100 rpm	[N]		3280	2050		4920	2460		11620	3630
	100 < n < 300 rpm	[N]		2620	1640	7870	3930	1960			
	n > 300 rpm	[N]		1820	1140	5480	2740	1370		10720	3350
Equivalent dynamic axial force at a service life of 2500 km		[N]	1130	1700	1610	2910	3250	2740	3140	7500	6050
Transmissible torque / thrust force factor											
Transmissible torque depending on the motor speed n of parallel motor	n < 100 rpm	[Nm]		6.5			9.7			22.8	
	100 < n < 300 rpm	[Nm]		5.2			7.7			22.8	
	n > 300 rpm	[Nm]		3.6			5.4			21.1	
Thrust force factor 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 basic unit with zero stroke (including cylinder rod)		[kg]	1.2	1.2	1.3	2.2	2.3	2.5	6.9	7.6	8.7
Weight of additional length (including 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		[kgmm²]	8.3	8.8	14.1	30.3	30.6	38.0	215.2	213.6	301.9
Motor inline without stroke		[kgmm²]	7.1	7.6	12.9	25.3	25.7	33.1	166.2	164.5	252.9
Parallel/inline motor per meter		[kgmm²/m]	41.3	37.6	41.5	97.7	92.4	106.4	527.7	470.0	585.4
Accuracy: 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								

[1] "Order code" (page 40)

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.

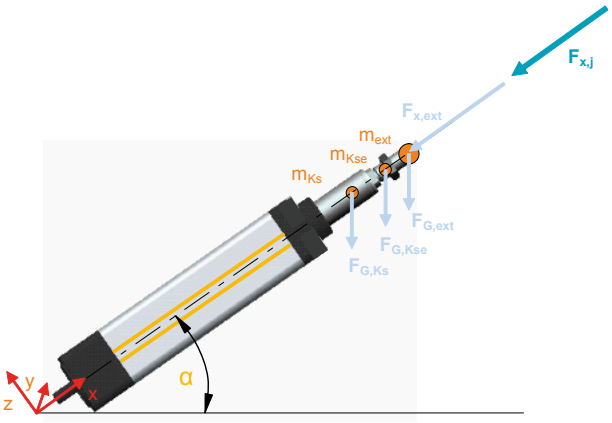
Step by Step Selection Process

The following dimensioning 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.

Step	Application data	Dimensioning	With the aid of ...
1	Accuracy, ambient conditions	Check the basic conditions for the use of the ETH in your application.	"Technical Data" (page 6)
2	Required space	Check the space available in your application and choose the motor mounting option: inline or parallel.	"Dimensions" (page 16)
3	Axial forces	Calculation of the axial forces in the individual segments of the application cycle.	"Calculating Required Axial Force" (page 8)
4	Maximum force required	Determination of the maximum required axial force (traction and thrust force)	"Required maximum axial force" (page 9)
		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 Data" (page 6)
5	Maximum velocity	Selection of the screw lead for the desired cylinder.	"Technical Data" (page 6)
6	Maximum acceleration	Verify maximum acceleration of the unit is not exceeeded.	"Technical Data" (page 6)
7	Select 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 14) "Order code" (page 40) "Technical Data" (page 6)
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 12)
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 10)
10	Permissible lateral force	Determine the lateral forces of your application and compare them to the permissible lateral forces (depending on the stroke).	Lateral force (page 13) Diagrams (page 13)
11	Relubricating cycle	Please check, if the required relubricating cycle is suitable for your production environment.	"Relubrication" (page 15)
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 18)
13	Motor mounting flange	Selection of a suitable motor mounting flange.	"Motor Mounting Options" (page 17)
14	Mounting type	Selection of the electro cylinder mounting method.	"Mounting Methods" (page 19)
15	Cylinder rods	Selection of the cylinder rod end for load mounting.	"Cylinder Rod Version" (page 23)

Calculating Required Axial Force

Formula 1 & 2 below give the mathematcial 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 23)
$m_{Ks,0}$	=	Mass of the cylinder rod at zero stroke in kg (see table “Technical Data” page 6)
$m_{Ks,stroke}$	=	Mass of the cylinder rod per mm of stroke in kg (see table “Technical Data” page 6)
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

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:

$$F_{x,a,j} = \left| F_{x,ext} + (m_{ext} + m_{Kse} + m_{Ks,0} + m_{Ks,Stroke} \bullet Stroke) \bullet (a_{K,j} + \sin\alpha \bullet 9{,}81 \tfrac{m}{s^2}) \right|$$

Formula 1

Cylinder rod retracting:

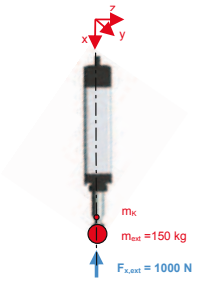
$$F_{x,e,j} = \left| - F_{x,ext} + (m_{ext} + m_{Kse} + m_{Ks,0} + m_{Ks,Stroke} \bullet Stroke) \bullet (a_{K,j} + \sin\alpha \bullet 9{,}81 \tfrac{m}{s^2}) \right|$$

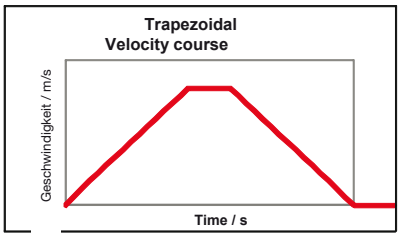
Formula 2

The values $F_{x,a,j}$ and $F_{x,e,j}$ are therefore always positive.

Sample calculation:

Vertical mounting
- ETH50
- 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 = α = -90°





Thrust rod moving forth: Mass is moved downwards

Load case: Acceleration

$$F_{x,1} = \left| 1000N + \left(150kg + 0{,}15kg + 0{,}15kg + 1{,}85\tfrac{kg}{m} \cdot 0{,}5m \right) \cdot \left(4\tfrac{m}{s^2} + \sin(-90°) \cdot 9{,}81\tfrac{m}{s^2} \right) \right| = 121N \quad L$$

Load case: Constant Velocity

$$F_{x,2} = \left| 1000N + \left(150kg + 0{,}15kg + 0{,}15kg + 1{,}85\tfrac{kg}{m} \cdot 0{,}5m \right) \cdot \left(0\tfrac{m}{s^2} + \sin(-90°) \cdot 9{,}81\tfrac{m}{s^2} \right) \right| = 484N$$

Load case: Deceleration

$$F_{x,3} = \left| 1000N + \left(150kg + 0{,}15kg + 0{,}15kg + 1{,}85\tfrac{kg}{m} \cdot 0{,}5m \right) \cdot \left(-4\tfrac{m}{s^2} + \sin(-90°) \cdot 9{,}81\tfrac{m}{s^2} \right) \right| = 1088N$$

Thrust rod moving back: Mass is moved upwards

Load case: Acceleration

$$F_{x,4} = \left| -1000N + \left(150kg + 0{,}15kg + 0{,}15kg + 1{,}85\tfrac{kg}{m} \cdot 0{,}5m \right) \cdot \left(4\tfrac{m}{s^2} - \sin(-90°) \cdot 9{,}81\tfrac{m}{s^2} \right) \right| = 1088N \quad L$$

Load case: Constant Velocity

$$F_{x,5} = \left| -1000N + \left(150kg + 0{,}15kg + 0{,}15kg + 1{,}85\tfrac{kg}{m} \cdot 0{,}5m \right) \cdot \left(0\tfrac{m}{s^2} - \sin(-90°) \cdot 9{,}81\tfrac{m}{s^2} \right) \right| = 484N$$

Load case: Deceleration

$$F_{x,6} = \left| -1000N + \left(150kg + 0{,}15kg + 0{,}15kg + 1{,}85\tfrac{kg}{m} \cdot 0{,}5m \right) \cdot \left(-4\tfrac{m}{s^2} - \sin(-90°) \cdot 9{,}81\tfrac{m}{s^2} \right) \right| = 121N$$

Selection of the Size and Screw Lead

Required maximum axial force

Determine the maximum axial force (page 8) that the electro cylinder must provide.

Preselection of the electro cylinder

Using the calculated force required from page 6, compare the actual ETH specifications 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 6) 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 6).

Service life

Nominal service life[1]

The nominal service life of the electro cylinder can be determined with the aid of the known forces.
The forces calculated for each individual segment of the application cycle must be summarized into an equivalent axial force F_m ("Calculating Required Axial Force" (page 8)).

Calculation

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

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.

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 table).

Boundary conditions for application factor f_w:

- Externally guided electro cylinders
- Accelerations <10 m/s^2
- Application factor <1.5

For other conditions, please contact Parker.

Lubrication run lengths for short stroke applications

Lubrication run lengths		ETH032			ETH050			ETH080		
		M05	M10	M16	M05	M10	M20	M05	M10	M32
	[mm]	>45	>54	>58	>40	>46	>58	>47	>65	>95

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.
- The given lateral forces applied to the cylinder rod must always be respected.
- No high exploitation of several power features at a time (for example maximum speed or thrust force).
- No regulating oscillation at standstill.

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 8)
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 11)
L_{fw}	=	Service life respecting the application factor in km
f_w	=	Application factor (see table “application factor” page 10)

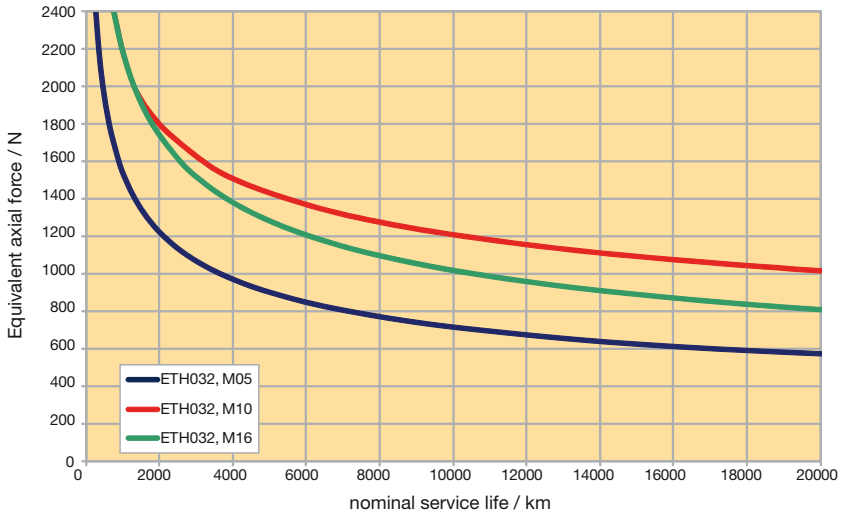
Index “j” for the individual segments of the application cycle

[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.

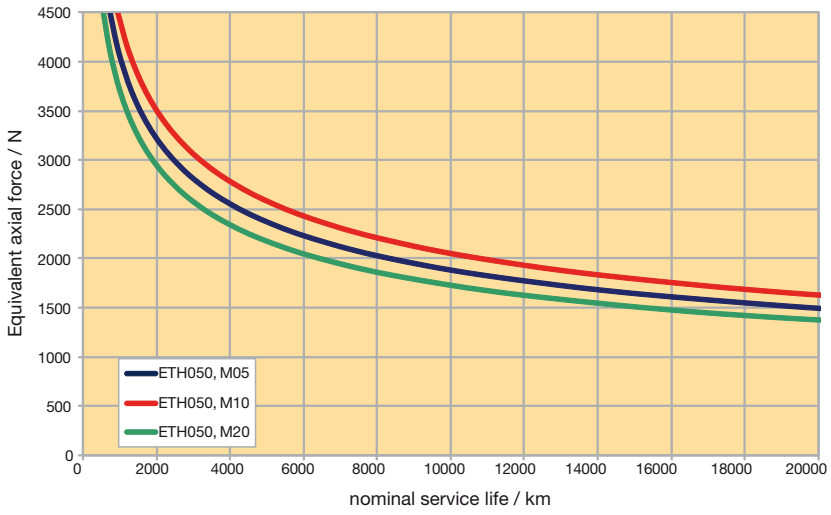
Diagrams

The given values apply when adhering to the recommended lubrication intervals (see relubrication)

ETH032



ETH050



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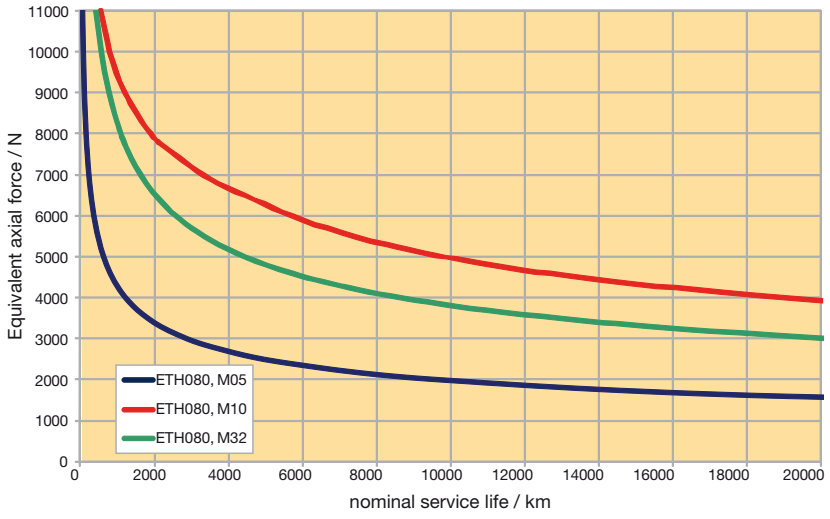


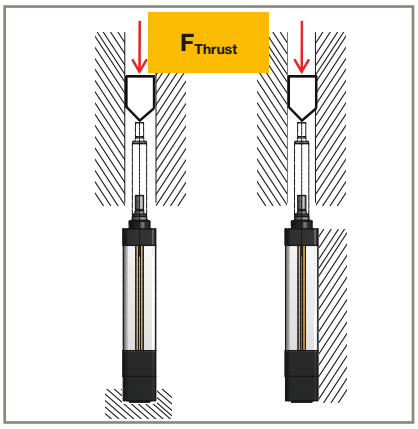
Permissible Axial Thrust Forces

Limited by buckling risk, depending on the stroke and the mounting method; traction forces do not pose any buckling risk. Please check if the maximum axial force (page 8) is possible with the planned mounting method and for the desired stroke.

Diagrams

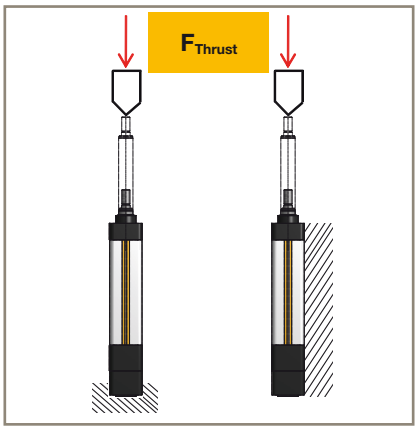
Case 1

Cylinders fixed with mounting flanges, foot mounting or mounting plates.
Thrust rod with axial guiding



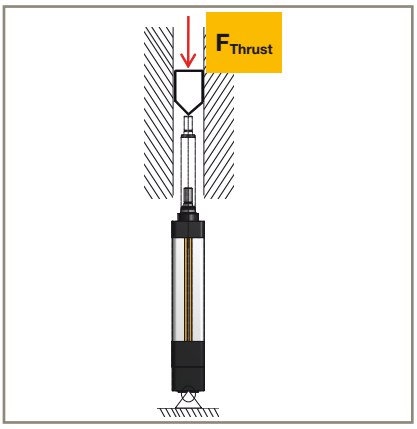
Case 2

Cylinders fixed with mounting flanges, foot mounting or mounting plates.
Thrust rod without axial guiding.

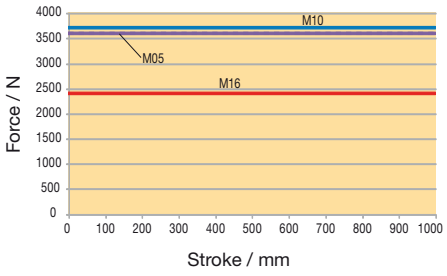


Case 3

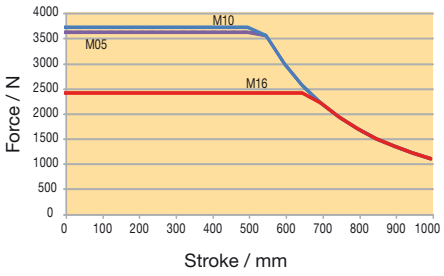
Cylinders mounted via centre trunnion mounting or rear clevis.
Thrust rod with axial guiding



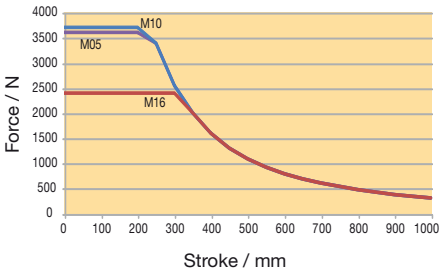
ETH032 - Case 1



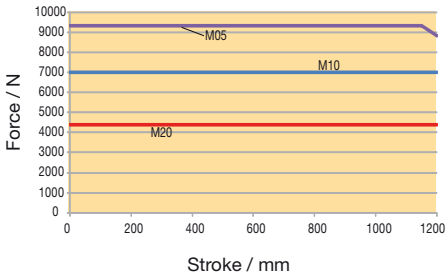
ETH032 - Case 2



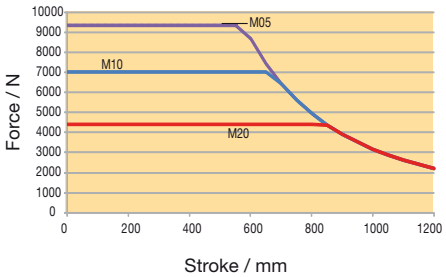
ETH032 - Case 3



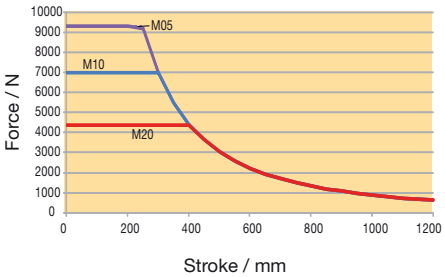
ETH050 - Case 1



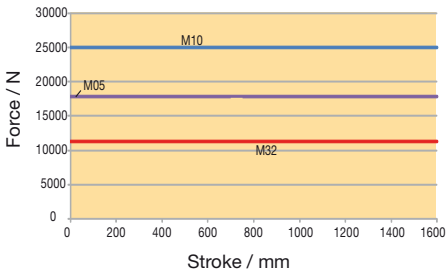
ETH050 - Case 2



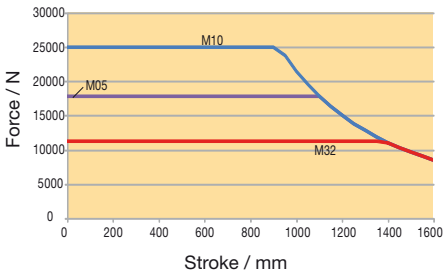
ETH050 - Case 3



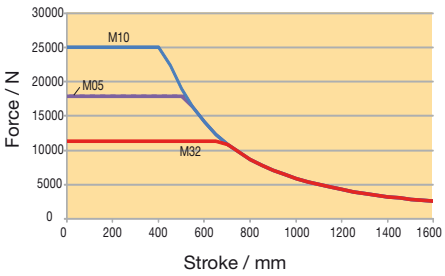
ETH080 - Case 1



ETH080 - Case 2



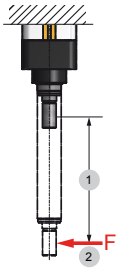
ETH080 - Case 3



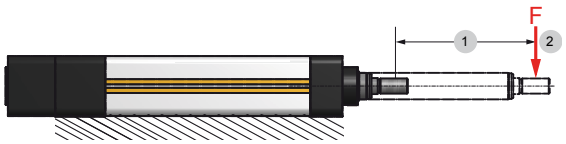
Permissible Side Load

The electro cylinder features a generously dimensioned cylinder rod and screw nut bearing in the form of high-quality plastic sliding bushings to absorb the lateral force.
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

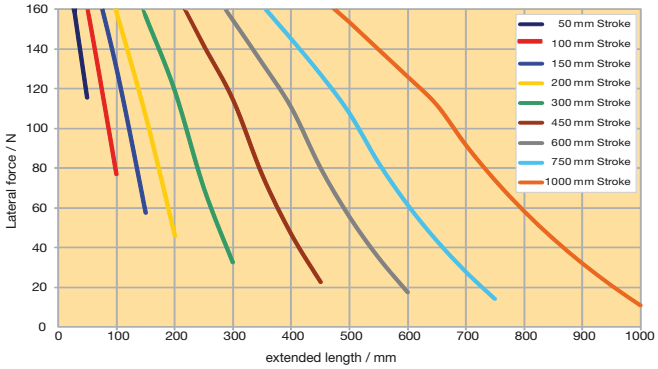


Permissible lateral forces in horizontal mounting position



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

ETH032



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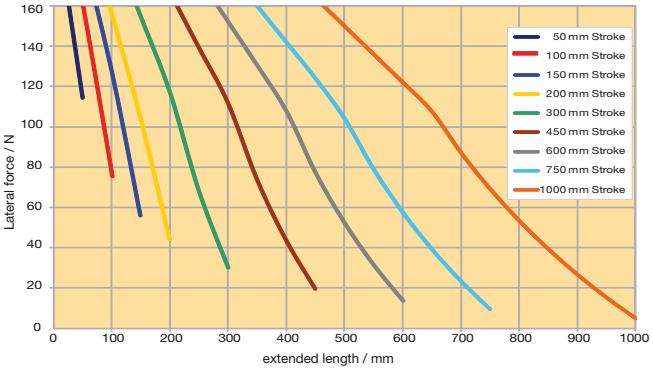

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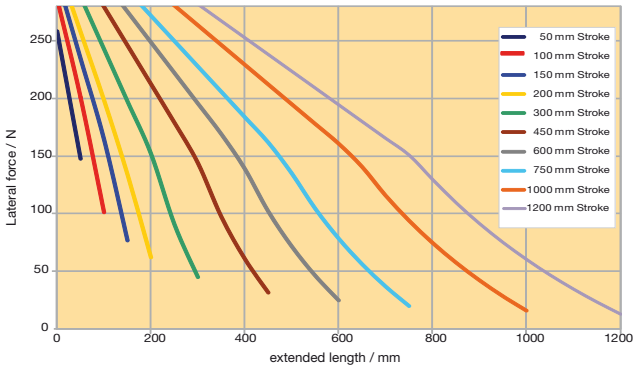

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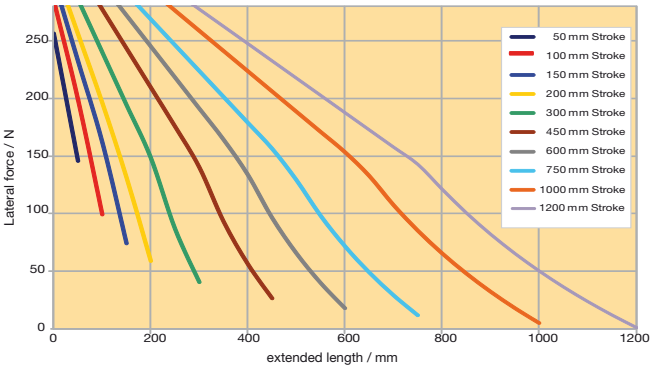

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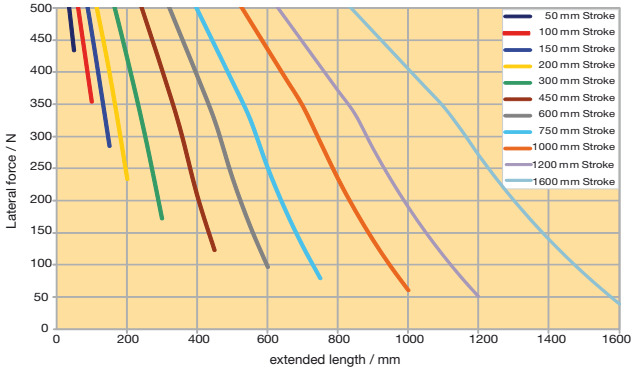

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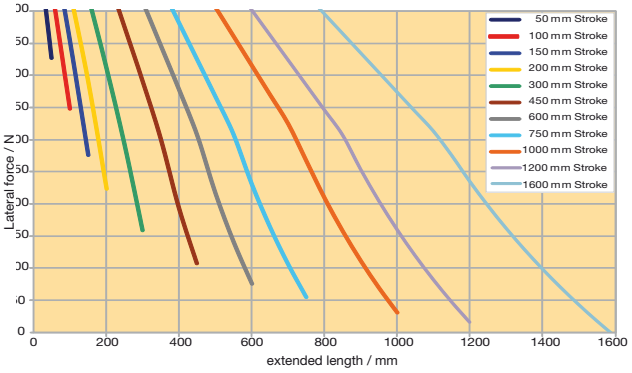


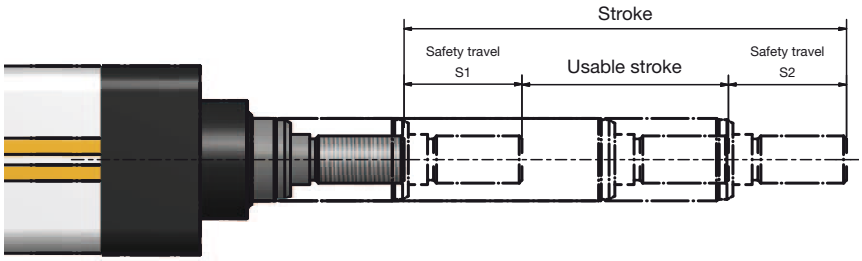
The diagrams apply for a medium travel speed of 0.5 m/s, an ambient temperature of 20 °C and all housing orientations.

Stroke, Usable Stroke and Safety Travel

Calculation

Stroke:

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



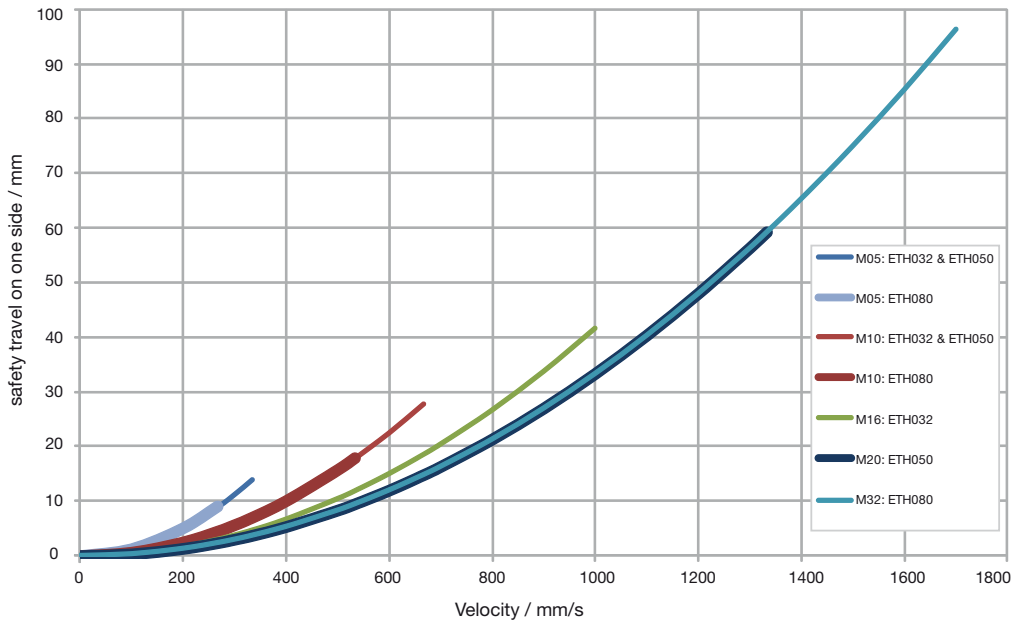
Usable stroke:

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

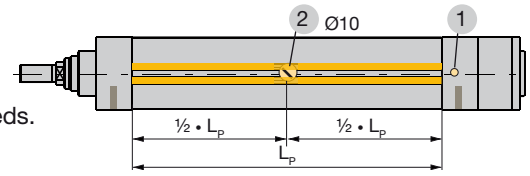


Info:
The safety travel taken from the diagram applies for one side. I.e. the diagram value must be multiplied by factor 2 in order to get the total safety travel.

Relubrication

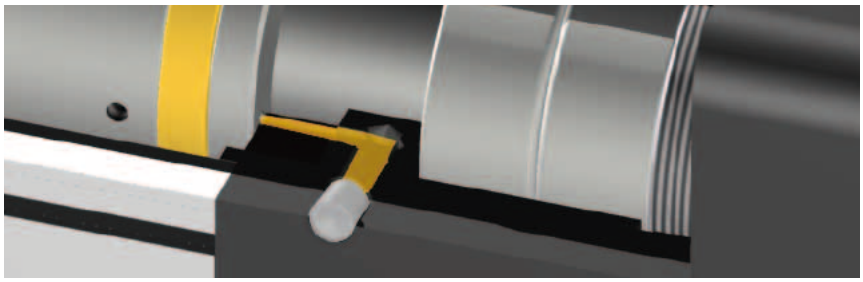
All frame sizes include a standard Easy lubrication port (designated by ordering code page 40).option 1), modifications for hole placement can easily be accommodated too.

Contact factory for special needs.



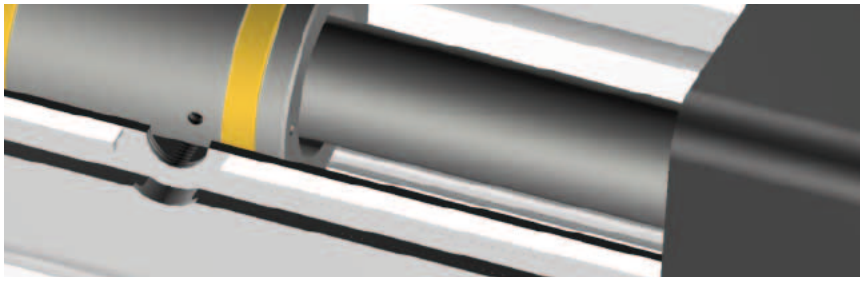
1: Central lubrication (standard)
2: Optional lubrication (possible on all 4 sides):
L_P: Length of profile

Option 1: Central lubrication (standard)



Relubrication is simple with the easy access port. Users simply perform a controlled retract of the cylinder approaching the endstop under slow speed and grease the cylinder.
The standard easy access port is always at the 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 40). 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. The lubricant used is supplied by Klüber; it is available worldwide.

Normal operating conditions:

- Medium screw velocity 2000 min^{-1}
- Operating factor fw=1.0
- No impacts and vibrations

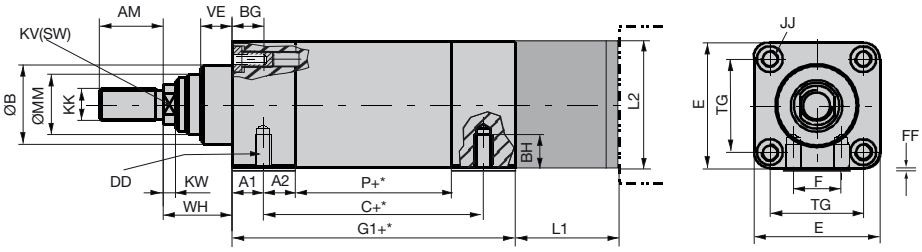
ETH032			ETH050			ETH080		
M05	M10	M16	M05	M10	M20	M05	M10	M32
300 km	600 km	960 km	300 km	600 km	1200 km	300 km	600 km	1500 km

Different operating conditions will 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.

Dimensions

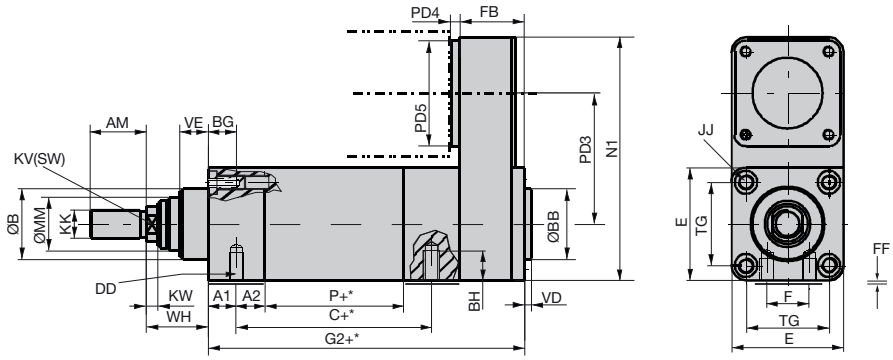
Electro Cylinder

prepared for inline motor mounting



Electro Cylinder

prepared for parallel motor mounting



+* =Measure + length of desired stroke.

Dimensions Standard / (IP-Version)

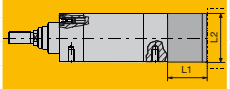
Cylinder size	Unit	ETH32			ETH50			ETH80		
Screw lead		M05	M10	M16	M05	M10	M20	M05	M10	M32
C	[mm]	93.5 (94.5)	103 (103.5)	106.5 (107.5)	99.5 (100.5)	105.5 (106.5)	117.5 (118.5)	141.5 (142.5)	159.5 (160.5)	189.5 (190.5)
G1	[mm]	133 (180.5)	142 (189.5)	146 (193.5)	154 (198.5)	160 (204.5)	172 (216.5)	197 (259.5)	215 (277.5)	245 (307.5)
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)
P	[mm]	66	75	79	67	73	85	89	107	137
A1	[mm]	14 (60)			15.5 (58.5)			21 (82)		
A2	[mm]	17			18.5			32		
AM	[mm]	22			32			40		
BG	[mm]	16			25			26		
BH	[mm]	9			12.7			17.5		
DDMounting thread	[mm]	M6x1.0 (1)			M8x1.25			M10x1.5		
E	[mm]	46.5			63.5			95		
F	[mm]	16			24			30		
FF	[mm]	0.5			0.5			1.0		
JJ	[mm]	M6x1.0			M8x1.25			M10x1.5		
KK	[mm]	M10x1.25			M16x1.5			M20x1.5		
KV	[mm]	10			17			22		
ØMM	[mm]	22			28			45		
TG	[mm]	32.5			46.5			72		
KW	[mm]	5			6.5			10		
N1	[mm]	126			160			233.5		
FB	[mm]	47.5 (48)			40 (40.5)			60 (60.5)		
VD	[mm]	4			4			4		
ØBB	[mm]	30			40			45		
VE	[mm]	12			16			20		
WH	[mm]	26			37			46		
ØB	[mm]	30			40			60		

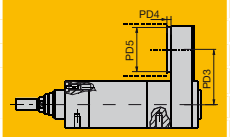
(1) Notwithstanding the current standards,
you should provide thru holes with a diameter of at least 7 mm in any component you wish to fix with the front screws (with JJ= M6x1 thread).

Motor Mounting Options

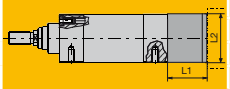
Dimensions [mm]

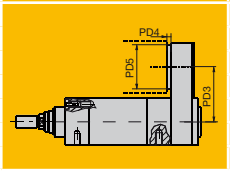
ETH032

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

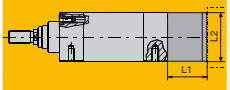
ETH050

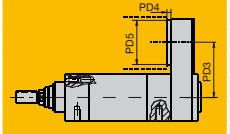
inline	Code	Motor / gearbox	Motor dimensions: Pilot	Bolt circle	∅ Shaft	Shaft length	Motor mounting options: L1	L2
	K1B	SMH60-B05/11	60	75	11	23	59	70
	K1B	MH70-B05/11	60	75	11	23	59	70
	K1B	NX3	60	75	11	23	59	70
	K1C	SMH82-B08/14	80	100	14	30	63	82
	K1E	SMH82-B05/19	95	115	19	40	84	100
	K1E	SMH100-B5/19	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

ETH080

inline	Code	Motor / gearbox	Motor dimensions: Pilot	Bolt circle	∅ Shaft	Shaft length	Motor mounting options: 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	130	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		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

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 8.

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

$$M_{L,j} = \frac{F_{x,a\,/\,e,j}}{\text{Thrust force factor}} \bullet \frac{1}{i_G^{\,2} \bullet \eta_G}$$

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)

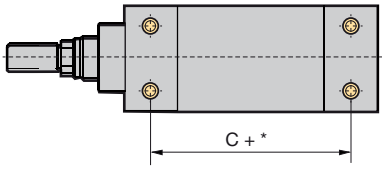
$M_{B,j}$	=	Variable acceleration torque in Nm
$J_{i/p,0}$	=	Red. rot. mass moment of inertia at zero stroke for inline/parallel motor configuration in kgmm² (see "Technical Data" page 6)
$J_{i/p,\,stroke}$	=	Red. rot. mass moment of inertia per mm of stroke for inline/parallel motor configuration in kgmm² (see "Technical Data" page 6)
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 8)
$M_{M,j}$	=	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 Data" see page 6.
Index “j” for the individual segments of the application cycle

Mounting Methods

Standard

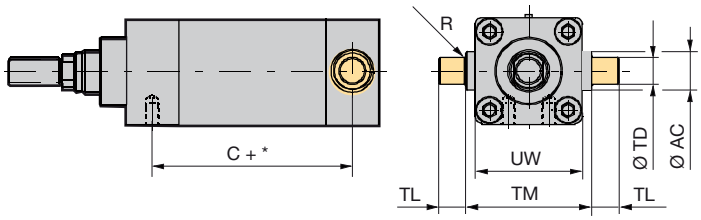
Order code
F



Mounting with 4 mounting threads on the cylinder ("Dimensions" see page 16)

Center Trunnion Mounting

Order code
D

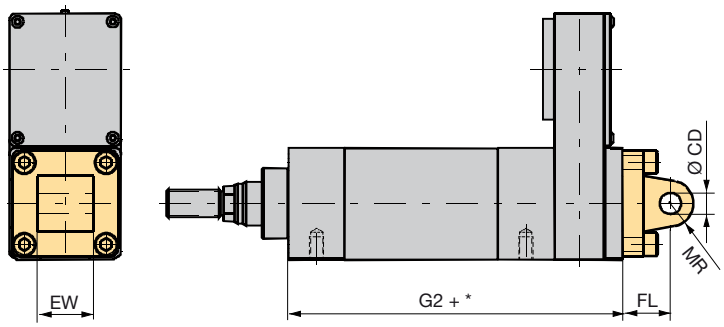


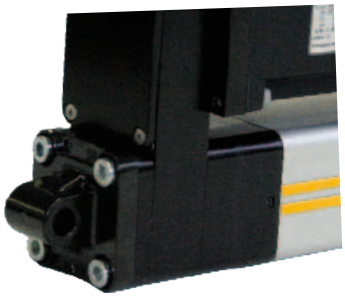
	UW	ØTD**	R	TL	TM	ØAC
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
ETH032	46.5	12	1	12	50	18
ETH050	63.5	16	1	16	75	25
ETH080	95.3	25	2	25	110	35

+* =Measure + length of desired stroke ("Dimensions" see page 16).
**: 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





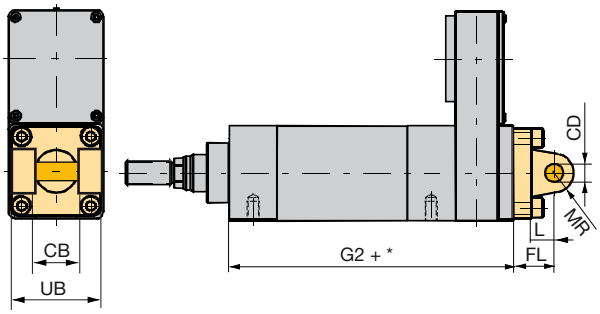
	Order no.	EW	ØCD	MR (H9)	FL ±0.2
		[mm]	[mm]	[mm]	[mm]
ETH032	0112.033	26	10	11	22
ETH050	0122.033	32	12	13	27
ETH080	0132.033	50	16	17	36

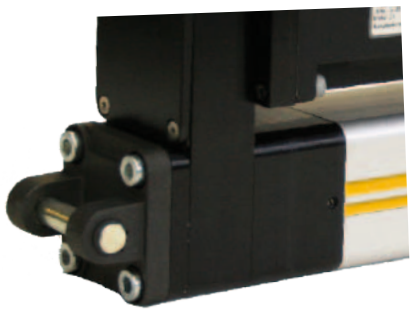
+* =Measure + length of desired stroke ("Dimensions" see page 16).
Listed in the order code of the cylinder; the order number applies only for ordering spare parts.

Rear Clevis

Order code

C



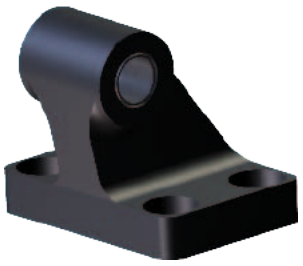


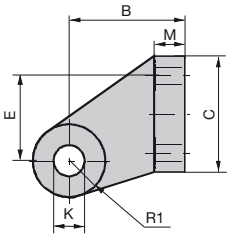
	Order no.	UB (h13)	CB (H14)	ØCD (H9)	MR	L	FL ±0.2
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
ETH032	0112.031	46.5	26	10	9.5	13	22
ETH050	0122.031	63.5	32	12	12.5	16	27
ETH080	0132.031	95	50	16	17.5	22	36

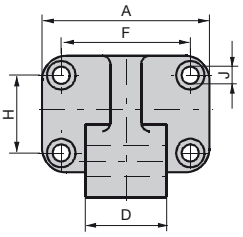
+* =Measure + length of desired stroke ("Dimensions" see page 16).
Listed in the order code of the cylinder; the order number applies only for ordering spare parts.

Bearing Block

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



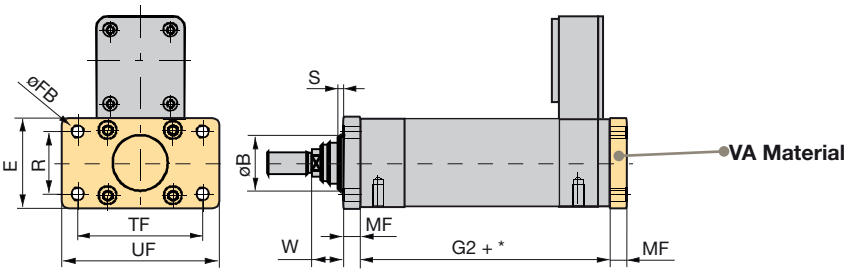




	Order no.	A	B	C	D	E	F	H	ØJ (H13)	ØK (H9)	M	R1
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
ETH032	0112.032	51	32	31	26	21	38	18	6.6	10	8	11
ETH050	0122.032	67	45	47	32	32	50	30	9.0	12	12	13
ETH080	0132.032	86	63	60	50	47	66	40	11.0	16	16	16.5

Rear Plate

Order code **H**



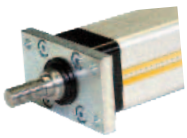
Front plate dimensions

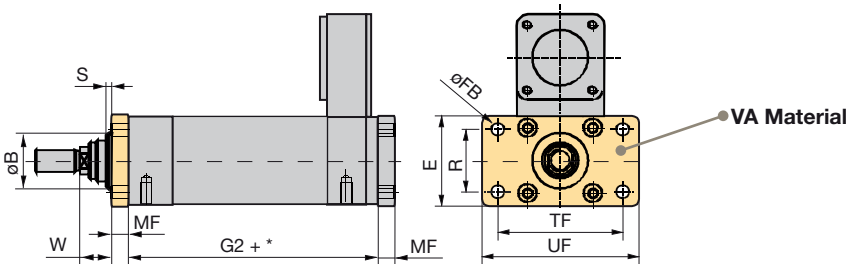
	Order no. (1 piece)	UF	E	TF	ØFB	R	W	MF	ØB	S
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
ETH032	0111.064	80	48	64	7	32	16	10	30	2
ETH050	0121.064	110	65	90	9	45	25	12	40	4
ETH080	0131.064-01	150	95	126	12	63	30	16	45	4

+* =Measure + length of desired stroke ("Dimensions" see page 16).
Listed in the order code of the cylinder; the order number applies only for ordering spare parts.

Front Plate

Order code **J**





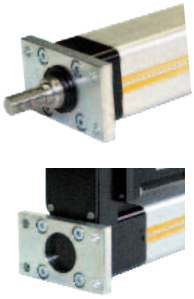
Front plate dimensions

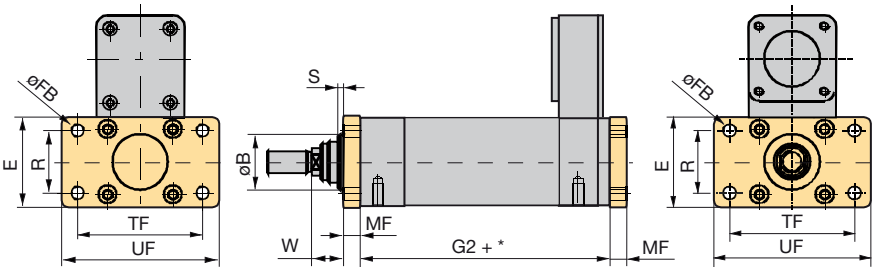
	Order no. (1 piece)	UF	E	TF	ØFB	R	W	MF	ØB	S
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
ETH032	0111.064	80	48	64	7	32	16	10	30	2
ETH050	0121.064	110	65	90	9	45	25	12	40	4
ETH080	0131.064-02	150	95	126	12	63	30	16	60	4

+* =Measure + length of desired stroke ("Dimensions" see page 16).
Listed in the order code of the cylinder; the order number applies only for ordering spare parts.

Front and Rear Plate

Order code **N**

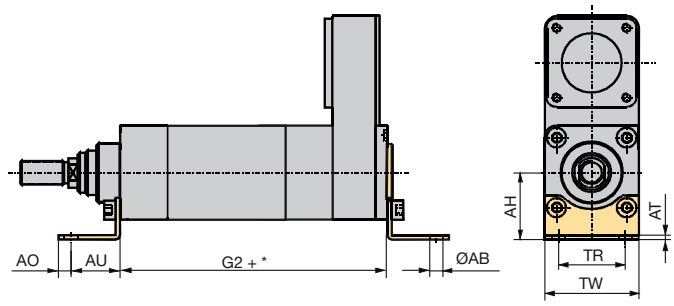




Listed in the cylinder order code.
Please note that front and rear plate as spare parts must be ordered separately.

Foot Mounting

Order code
B

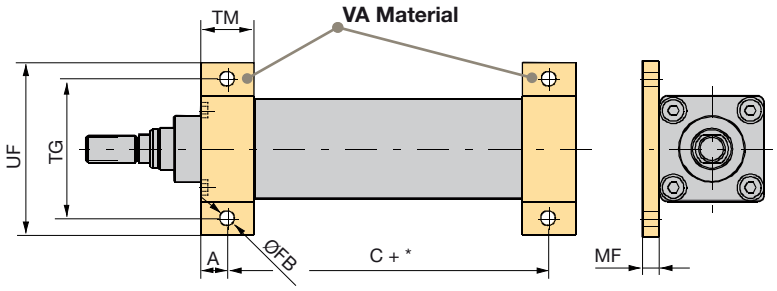


	Order no. (1 piece) Terminal bracket	Order no. (1 piece) Front bracket	AH	AT	TR	ØAB (H14)	AO	AU	TW
			[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
ETH032	0111.065		32	4	32	7	8	24	48
ETH050	0121.065		45	4	45	9	12	32	65
ETH080	0131.065-01	0131.065-02	63	6	63	11	15	41	95

+* =Measure + length of desired stroke ("Dimensions" see page 16).
Listed in the order code of the cylinder; the order number applies only for ordering spare parts.

Mounting Flanges

Order code
G



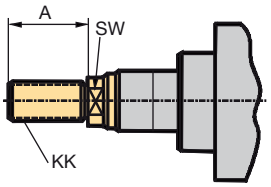
	Order no. (1 piece)	TG	UF	ØFB	TM	MF	A
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
ETH032	1440.079	62	78	6.6	25	8	14
ETH050	1441.093	84	104	9	30	10	16
ETH080	1442.081	120	144	11	40	12	21

+* =Measure + length of desired stroke ("Dimensions" see page 16).
Listed in the order code of the cylinder; the order number applies only for ordering spare parts.

Cylinder Rod Version

External Thread

Order code
M

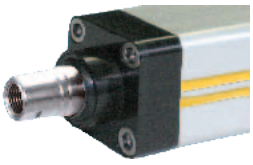


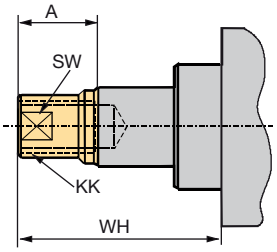
External Thread (upon delivery)					
	Order no.	Mass	A	KK	SW*
		[kg]	[mm]	[mm]	[mm]
ETH032	0111.028	0.06	22	M10x1.25	10
ETH050	0121.028	0.15	32	M16x1.5	17
ETH080	0131.028	0.48	40	M20x1.5	22

*SW: Width across flat

Internal Thread

Order code
F



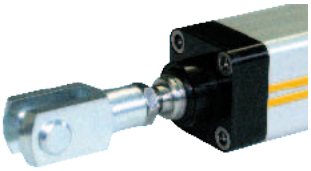


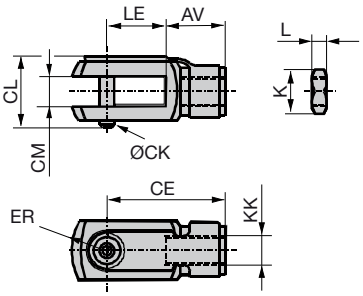
Internal Thread						
	Order no.	Mass	A	KK	WH	SW*
		[kg]	[mm]	[mm]	[mm]	[mm]
ETH032	0111.029	0.04	14	M10x1.25	32	12
ETH050	0121.029	0.14	24	M16x1.5	50	20
ETH080	0131.029	0.42	29	M20x1.5	59	26

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

Rod Clevis

Order code
C



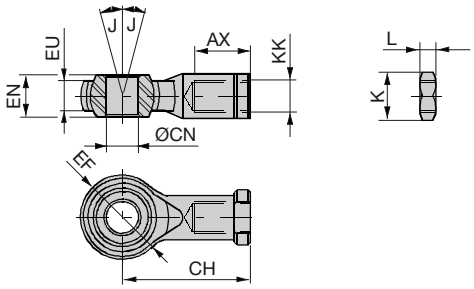


	Order no.	Mass	KK	CL	CM		LE	CE	AV	ER	ØCK (h11/E9)	K	L
		[kg]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
ETH032	4309	0.09	M10x1.25	26.0	10.2	+0.13 -0.05	20	40	20	14	10	17	5
ETH050	4312	0.34	M16x1.5	39.0	16.2	+0.13 -0.05	32	64	32	22	16	24	8
ETH080	4314	0.69	M20x1.5	52.5	20.1	+0.02 -0.0	40	80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

Spherical Rod Eye

Order code
S



	Order no.	Mass	KK	ØCN (H9)	EN (h12)	EU	AX	CH	ØEF	J°	K	L
		[kg]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
ETH032	4078-10	0.07	M10x1.25	10	14	10.5	20	43	28	13	17	5
ETH050	4078-16	0.23	M16x1.5	16	21	15.0	28	64	42	15	24	8
ETH080	4078-20	0.41	M20x1.5	20	25	18.0	33	77	50	14	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.

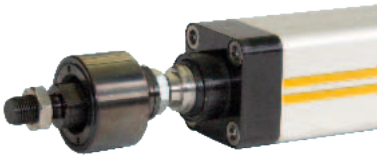
Alignment Coupler

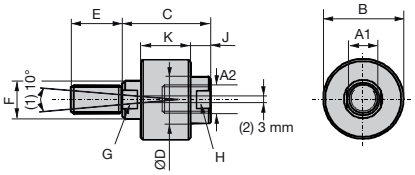
Order code

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

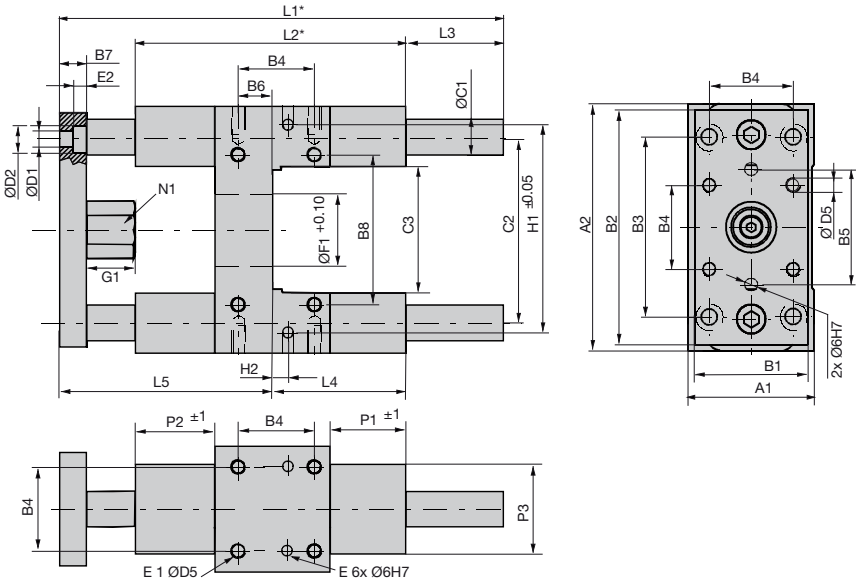
	Order no.	Mass	A1	A2	B	C	ØD	E	F	G	H	J	K
		[kg]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
ETH032	LC32-1010	0.26	M10x1.25	M10x1.25	40	51	19	19	16	13	16	13	26
ETH050	LC50-1616	0.64	M16x1.5	M16x1.5	54	59	32	29	25	22	29	14	33
ETH080	LC80-2020	1.30	M20x1.5	M20x1.5	54	59	32	29	25	22	29	14	33

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.

Outrigger Bearing

Order code

R



Function of outrigger bearing:

- Anti-rotation device for higher torques
- Absorption of lateral forces

The additional stability and precision is achieved by:

- 2 hardened steel guiding rods
- 4 linear ball bearings

Cannot be combined with IP65

+* =Measure + length of desired stroke ("Dimensions" see page 16).

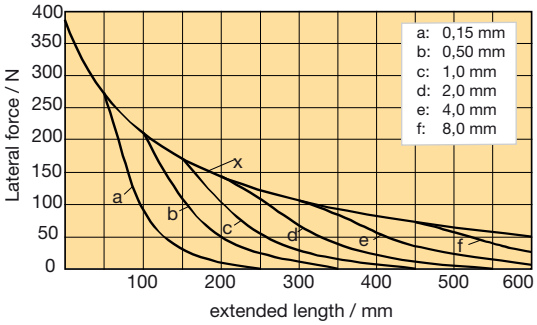
N1: Hexagon head,
outrigger bearing not possible with IP65 rating!

For the ETH080, the standard pneumatic outrigger bearing modules cannot be used, ØF1 must be bored up to 60 mm for ETH080 (from 45 mm).

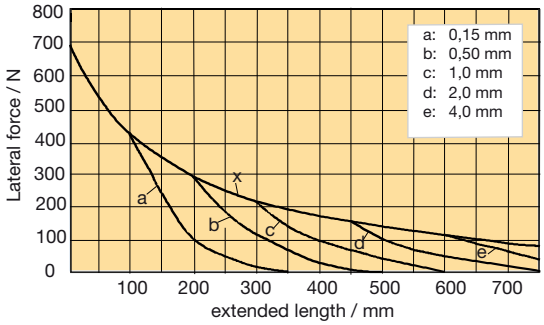
	Unit	ETH032	ETH050	ETH080
Model		32-2800R	50-2800R	80-2800R
A1	[mm]	50	70	105
A2	[mm]	97	137	189
B1	[mm]	45	63	100
B2	[mm]	90	130	180
B3	[mm]	78	100	130
B4	[mm]	32.5	46.5	72
B5	[mm]	50	72	106
B6	[mm]	4	19	21
B7	[mm]	12	15	20
B8	[mm]	61	85	130
ØC1	[mm]	12	20	25
C2	[mm]	73.5	103.5	147
C3	[mm]	50	70	105
ØD1	[mm]	6.6	9	11
ØD2	[mm]	11	14	17
ØD5	[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

Rigidity of the cylinder with outrigger bearing

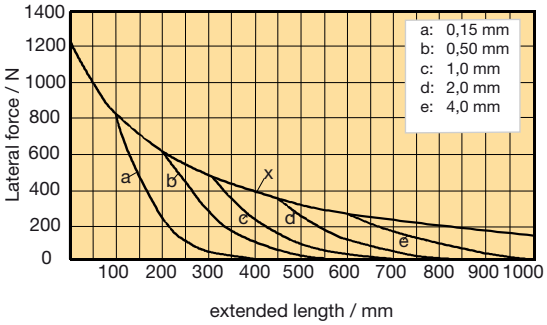
ETH032



ETH050

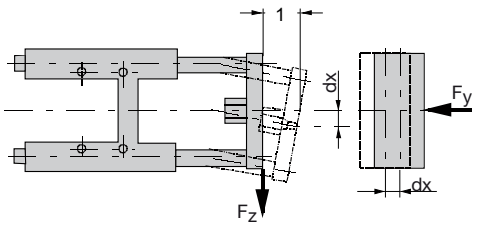


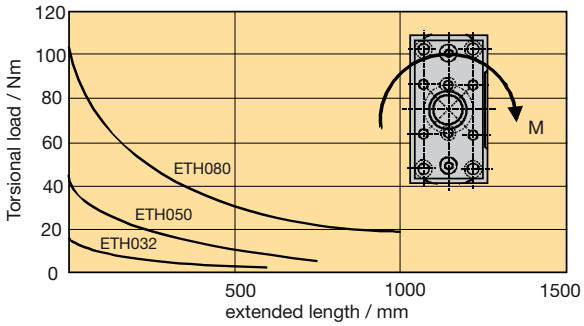
ETH080



a, b, ...: Deflection
x: Deflection with maximum load

Deflection



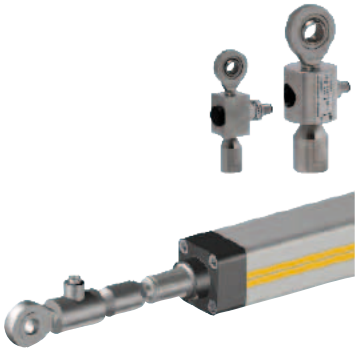


1: Stroke
dx: Deflection valid for Fz or Fy
M: Torsional load

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.

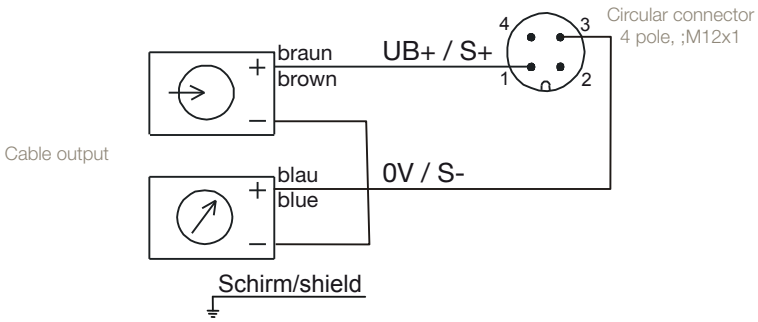
Technical Data

Joint head with integrated force sensor ETH...										
	Unit	ETH032			ETH050			ETH080		
		M05	M10	M16	M05	M10	M20	M05	M10	M32
Accuracy	[%]	0.2								
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)

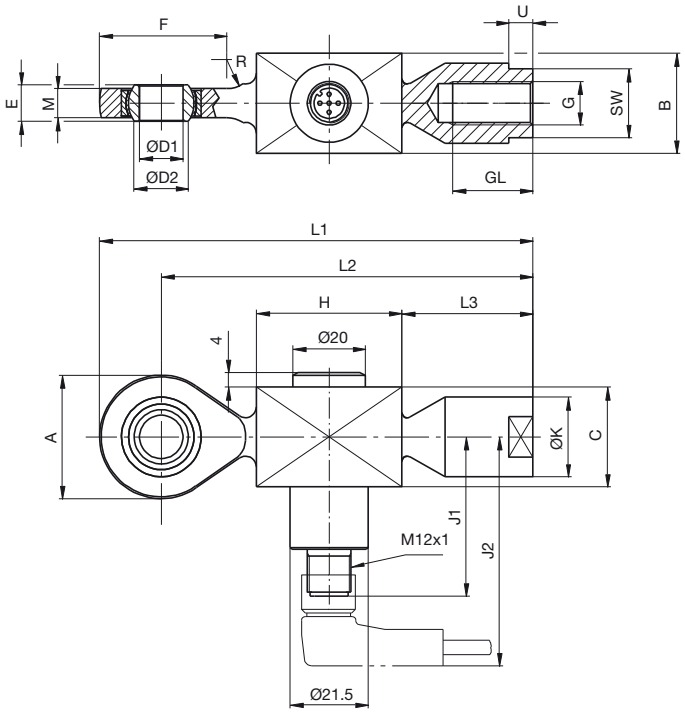
Electrical connection

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

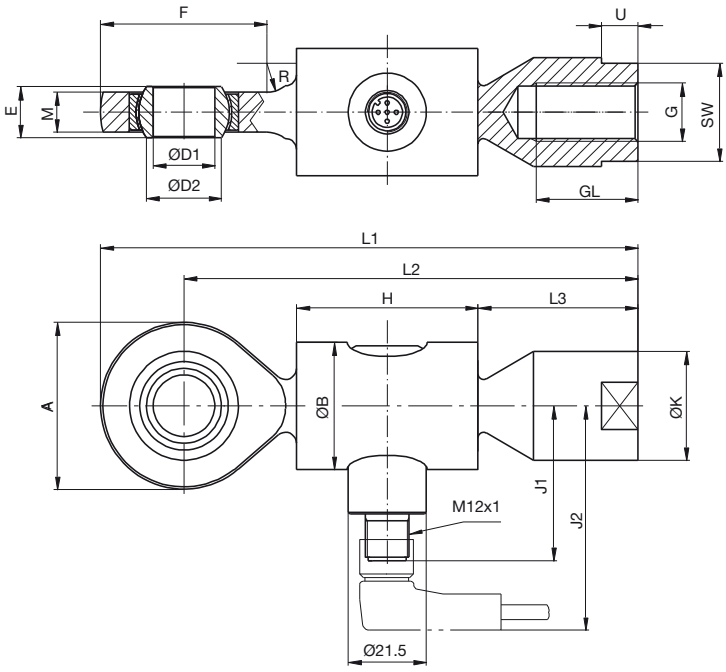


Order no.	Cable for force sensor
on request	Force sensor cable (PUR), straight connector, M12 with flying leads, 2 m
on request	Force sensor cable (PUR), straight connector, M12 with flying leads, 5 m
on request	Force sensor cable (PUR), angle connector, M12 with flying leads, 2 m
on request	Force sensor cable (PUR), angle connector, M12 with flying leads, 5 m

Version for ETH032



Version for ETH050 & ETH080



Dimensions [mm]

Dimensions

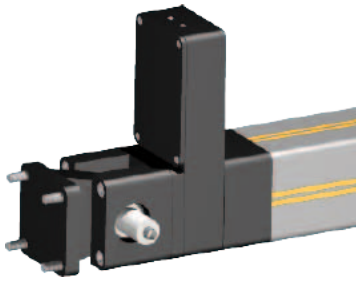
	A	B	ØB	C	ØD1	ØD2 0.008	E	F	G	GL	H	J1	J2	ØK	L1	L2	L3	M	SW*	U
for ETH032	34	27	-	27	12	15	10	35	M10x1.25	22	40	44	63	22	119	102	36	8	19	8
for ETH050	46	-	35	-	17	20.7	14	46	M16x1.5	28	50	43	62	30	148	125	44	11	27	12
for ETH080	53	-	54	-	20	24.2	16	54	M20x1.5	33	54	44	63	35	171	144.5	54	13	32	13

*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.

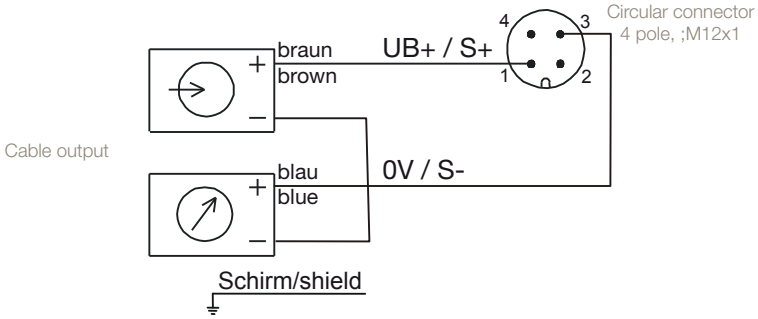
Technical Data

Rear clevis with force sensor for ETH...										
	Unit	ETH032			ETH050			ETH080		
		M05	M10	M16	M05	M10	M20	M05	M10	M32
Accuracy	[%]	1								
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)

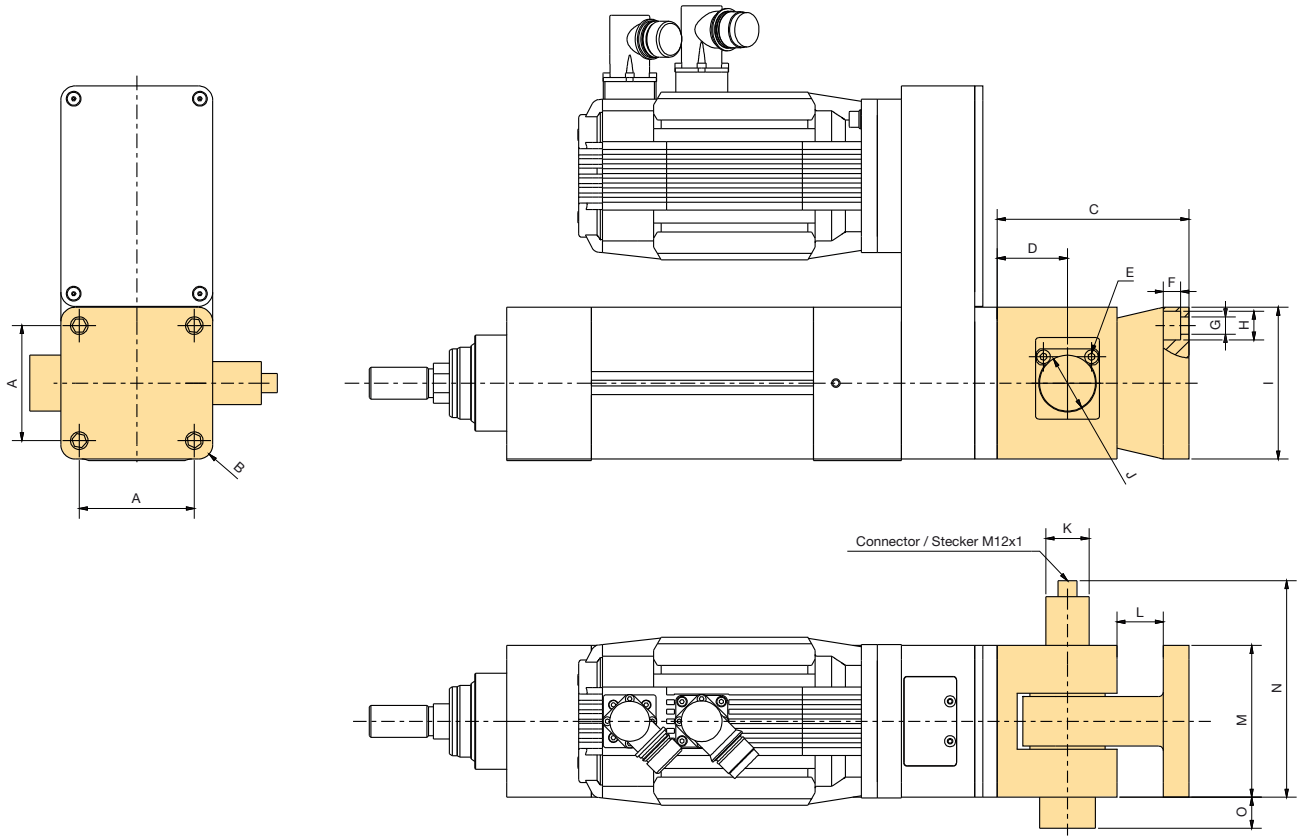
Electrical connection

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



Order no.	Cable for force sensor
on request	Force sensor cable (PUR), straight connector, M12 with flying leads, 2 m
on request	Force sensor cable (PUR), straight connector, M12 with flying leads, 5 m
on request	Force sensor cable (PUR), angle connector, M12 with flying leads, 2 m
on request	Force sensor cable (PUR), angle connector, M12 with flying leads, 5 m

Version with fixing flange for ETH cylinder



Dimensions [mm]

Dimensions

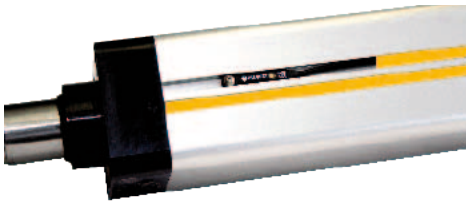
	A	B	C	D	E*	F	G	H	I	ØJ	ØK	L	M	N	O
for ETH032	32.5	R7	72	27	SW3	6.4	6.6	11	46.5	20	27	12	46.5	98.25	6.75
for ETH050	46.5	R8.5	89	32	SW3	8.8	9	15	63.5	25	27	17	63.5	111.75	3.25
for ETH080	72	R9	123	47	SW4	10.8	11	18	95	35	27	29	95	135.5	0

*SW: Width across flat

Initiators / Limit Switches

Sensors

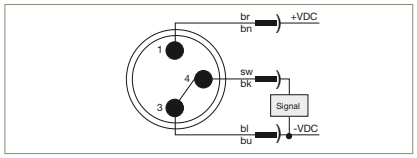
The position sensors can be mounted in the longitudinal grooves of the cylinder body and are directly immersible in the profile; projecting edges are thus avoided. The initiator cable is hidden under the yellow cover. The permanent magnet integrated into the screw nut actuates the sensors. Fitting sensors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



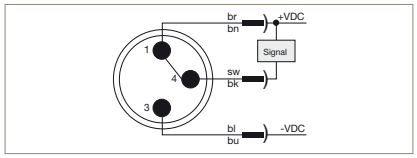
ETH032, ETH050 2 grooves each on 2 opposite sides.
ETH080 2 grooves each on all sides.

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

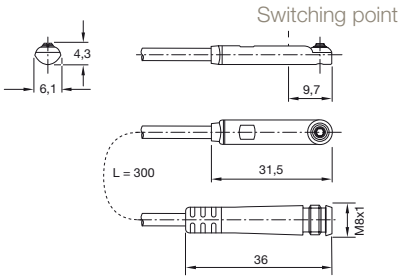
PNP Sensor (P8S-...)



NPN Sensor (P8S-...)



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



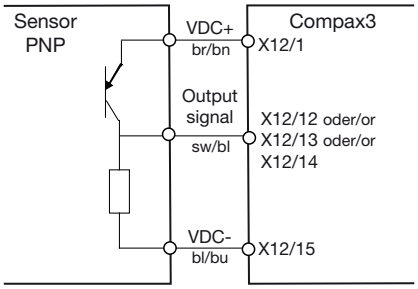
Dimensions [mm]

Magnetic cylinder sensors

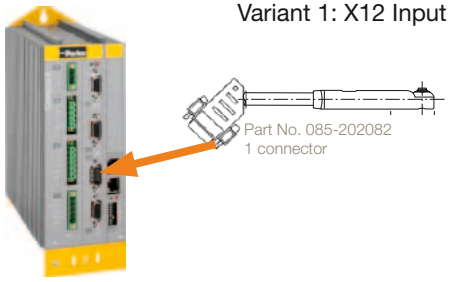
Type	Function	LED	Logic	Cable	Electric current drain	Switching current	Supply voltage	Switching Frequency	compatible with Compax3
P8S-GPFLX	N.O.	yes	PNP	3 m	max. 100 mA	max. 10 mA	10-30 VDC	5 kHz	yes
P8S-GNFLX			NPN						No
P8S-GPSHX			PNP	0.3 m cable with M8 connector					yes
P8S-GNSHX			NPN						No
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

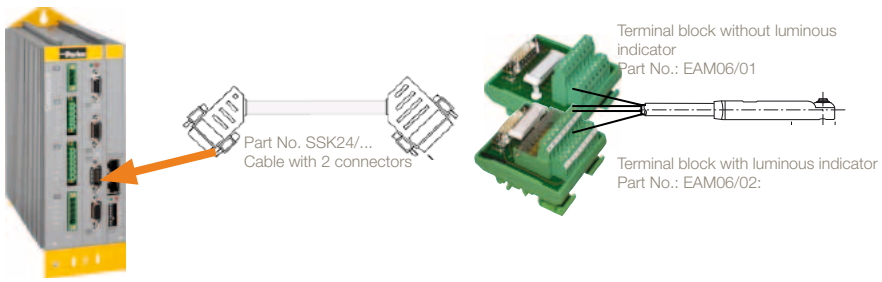
(do only use PNP types)



Variant 1: X12 Input - direct

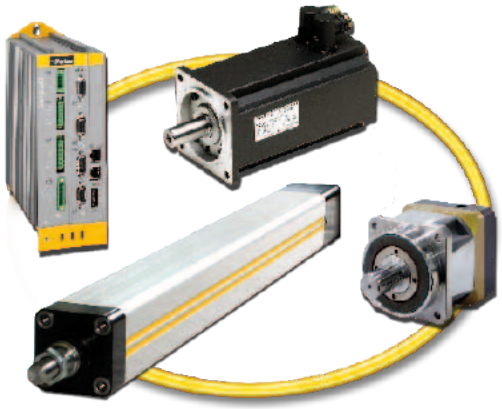


Variant 2: X12 Input - via digital I/Os



Drive Train Selection

Example for Dimensioning with Predefined Drive Trains



In order to simplify the dimensioning process for a complete drive train, we 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.
Please respect the boundary conditions!

The following application parameters are required:

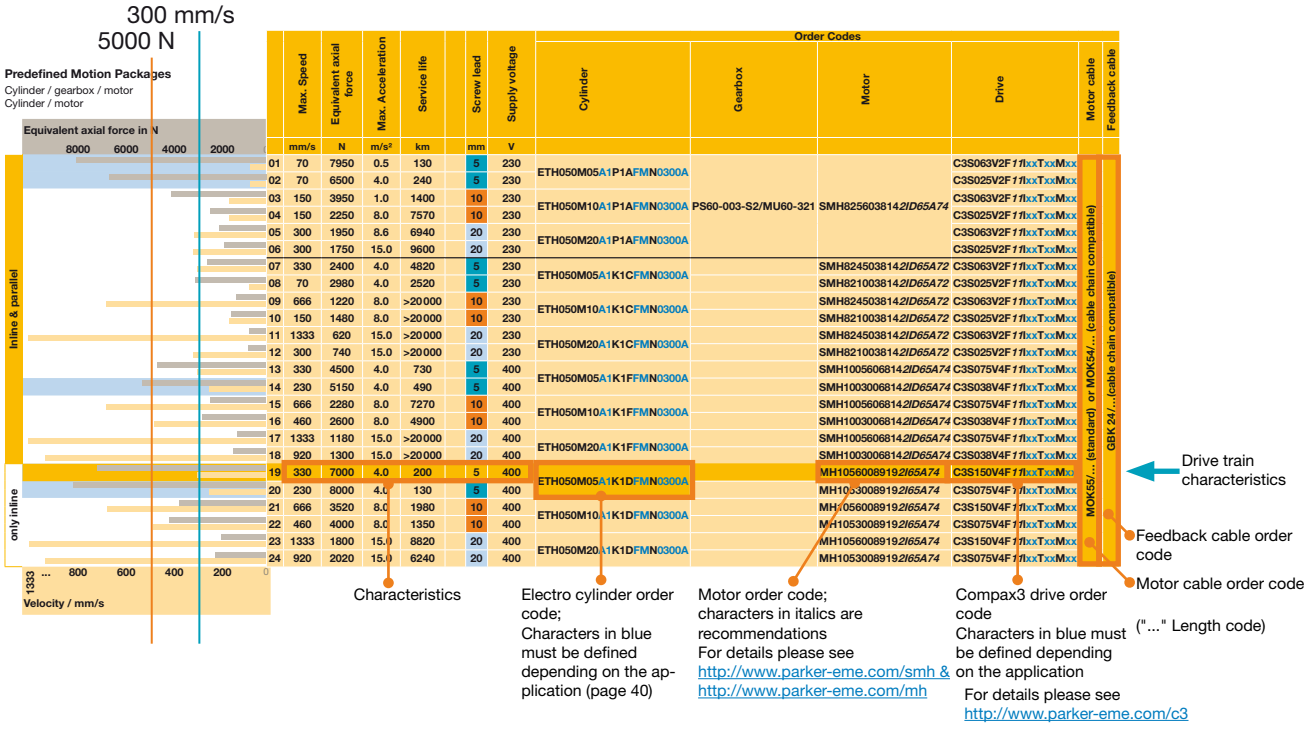
- The equivalent axial force.
  (Calculation page 10 formula 3 with the forces determined as described on page 8).
- The maximum speed.

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 for ETH032

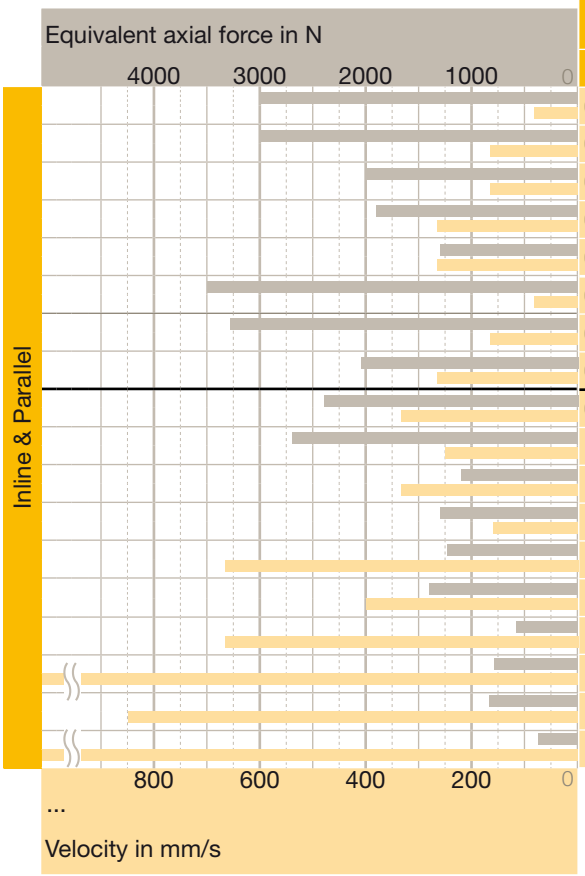
In order to simplify the representation, we assumed boundary conditions which must be adhered to without exception in your application, otherwise the product combinations suggested here might not work. In this case, the application must be dimensioned conventionally.

Boundary conditions:

- Stroke from 50 to 400 mm
- Horizontal movement
- The characteristics of the individual components are not to be exceeded, e.g.
  - for parallel drive: transmissible torque depending on the motor speed n must be respected
  - 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

Predefined Motion Packages

Cylinder / gearbox / motor / drive controller / cable



	Max. Speed	Equivalent axial force	Max. Acceleration	Service life
	mm/s	N	m/s²	km
01	83	3000	1	135
02	165	3000	6	270
03	165	2000	8	1300
04	265	1900	8	1540
05	265	1300	12	4800
06	83	3500	4	75
07	165	3280	8	190
08	265	2050	12	1225
09	333	2400	4	265
10	250	2700	4	185
11	333	1100	4	2740
12	160	1300	4	1660
13	667	1230	8	9300
14	400	1400	8	5500
15	667	580	8	>20000
16	1067	790	12	>20000
17	850	840	12	17780
18	1067	370	12	>20000

Screw lead	Supply voltage	Order Codes					
		Cylinder	**Gearbox**	**Motor**	**Drive**	**Motor cable**	**Feedback cable**
mm	V						
5	230	**ETH032M05**A1**P1A**FM**N**0200A	**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)
10	230	**ETH032M10**A1**P1A**FM**N**0200A	**PS60-003-S2/MU60-321**	**SMH826003814***2ID65G54*	**C3S025V2F***11***I**xx**T**xx**M**xx		
10	230						
16	230	**ETH032M16**A1**P1A**FM**N**0200A					
16	230						
5	400	**ETH032M05**A1**P1A**FM**N**0200A	**PS60-003-S2/MU60-001**	**SMH60601,4511***2ID65G44*	**C3S015V4F***11***I**xx**T**xx**M**xx		
10	400	**ETH032M10**A1**P1A**FM**N**0200A	**PS60-003-S2/MU60-321**	**SMH826003814***2ID65G54*	**C3S038V4F***11***I**xx**T**xx**M**xx		
16	400	**ETH032M16**A1**P1A**FM**N**0200A					
5	230	**ETH032M05**A1**K1C**FM**N**0200A	without gearbox	**SMH824503814***2ID65G52*	**C3S063V2F***11***I**xx**T**xx**M**xx		
5	230			**SMH826003814***2ID65G54*			
5	230	**ETH032M05**A1**K1B**FM**N**0200A		**SMH60451,4511***2ID65G42*	**C3S025V2F***11***I**xx**T**xx**M**xx		
5	230			**SMH60601,4511***2ID65G44*			
10	230	**ETH032M10**A1**K1C**FM**N**0200A		**SMH824503814***2ID65G52*	**C3S063V2F***11***I**xx**T**xx**M**xx		
10	230			**SMH826003814***2ID65G54*			
10	230	**ETH032M10**A1**K1B**FM**N**0200A		**SMH60451,4511***2ID65G42*	**C3S025V2F***11***I**xx**T**xx**M**xx		
16	230	**ETH032M16**A1**K1C**FM**N**0200A		**SMH824503814***2ID65G52*	**C3S063V2F***11***I**xx**T**xx**M**xx		
16	230			**SMH826003814***2ID65G54*			
16	230	**ETH032M16**A1**K1B**FM**N**0200A		**SMH60451,4511***2ID65G42*	**C3S025V2F***11***I**xx**T**xx**M**xx		

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 for ETH050

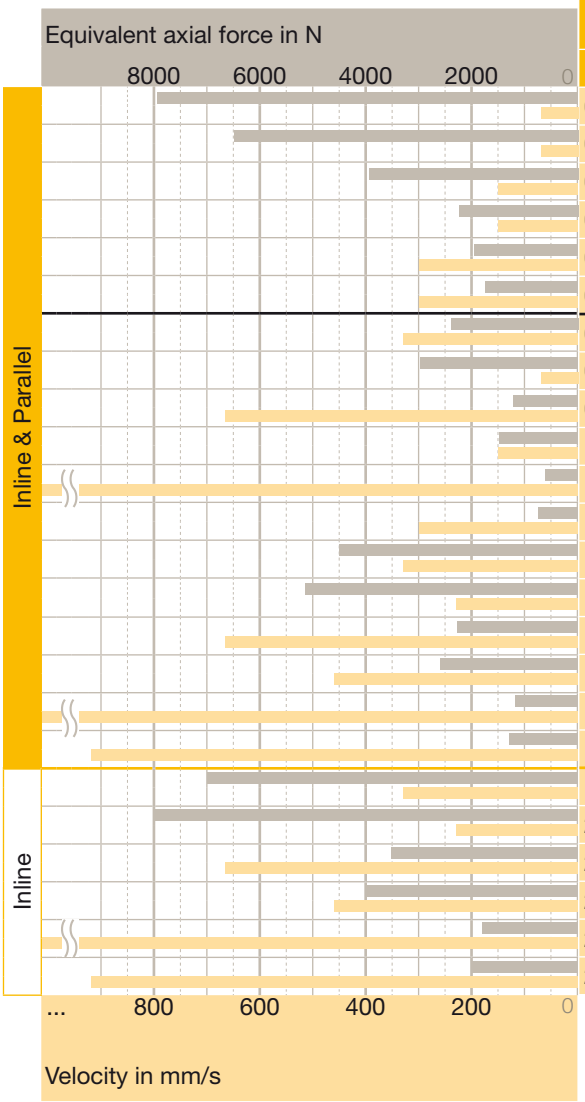
In order to simplify the representation, we assumed boundary conditions which must be adhered to without exception in your application, otherwise the product combinations suggested here might not work. In this case, the application must be dimensioned conventionally.

Boundary conditions:

- Stroke from 50 to 600 mm
- Horizontal movement
- The characteristics of the individual components are not to be exceeded, e.g.
  - for parallel drive: transmissible torque depending on the motor speed n must be respected
  - 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

Predefined Motion Packages

Cylinder / gearbox / motor / drive controller / cable



	Max. Speed	Equivalent axial force	Max. Acceleration	Service life
	mm/s	N	m/s²	km
01	70	7950	0.5	130
02	70	6500	4.0	240
03	150	3950	1.0	1400
04	150	2250	8.0	7570
05	300	1950	8.6	6940
06	300	1750	15.0	9600
07	330	2400	4.0	4820
08	70	2980	4.0	2520
09	666	1220	8.0	>20 000
10	150	1480	8.0	>20 000
11	1333	620	15.0	>20 000
12	300	740	15.0	>20 000
13	330	4500	4.0	730
14	230	5150	4.0	490
15	666	2280	8.0	7270
16	460	2600	8.0	4900
17	1333	1180	15.0	>20 000
18	920	1300	15.0	>20 000
19	330	7000	4.0	200
20	230	8000	4.0	130
21	666	3520	8.0	1980
22	460	4000	8.0	1350
23	1333	1800	15.0	8820
24	920	2020	15.0	6240

Screw lead	Supply voltage	Order Codes					
		Cylinder	**Gearbox**	**Motor**	**Drive**	**Motor cable**	**Feedback cable**
mm	V						
5	230	**ETH050M05**A1**P1A**FM**N**0300A	**PS60-003-S2/MU60-321**	**SMH825603814***2ID65G54*	**C3S063V2F***11***I**xx**T**xx**M**xx	**MOK55/...** (standard) **or MOK54/...** (cable chain compatible)	**GBK 24/...** (cable chain compatible)
5	230				**C3S025V2F***11***I**xx**T**xx**M**xx		
10	230	**ETH050M10**A1**P1A**FM**N**0300A			**C3S063V2F***11***I**xx**T**xx**M**xx		
10	230				**C3S025V2F***11***I**xx**T**xx**M**xx		
20	230	**ETH050M20**A1**P1A**FM**N**0300A			**C3S063V2F***11***I**xx**T**xx**M**xx		
20	230				**C3S025V2F***11***I**xx**T**xx**M**xx		
5	230	**ETH050M05**A1**K1C**FM**N**0300A	without gearbox	**SMH824503814***2ID65G52*	**C3S063V2F***11***I**xx**T**xx**M**xx		
5	230			**SMH821003814***2ID65G52*	**C3S025V2F***11***I**xx**T**xx**M**xx		
10	230	**ETH050M10**A1**K1C**FM**N**0300A		**SMH824503814***2ID65G52*	**C3S063V2F***11***I**xx**T**xx**M**xx		
10	230			**SMH821003814***2ID65G52*	**C3S025V2F***11***I**xx**T**xx**M**xx		
20	230	**ETH050M20**A1**K1C**FM**N**0300A		**SMH824503814***2ID65G52*	**C3S063V2F***11***I**xx**T**xx**M**xx		
20	230			**SMH821003814***2ID65G52*	**C3S025V2F***11***I**xx**T**xx**M**xx		
5	400	**ETH050M05**A1**K1F**FM**N**0300A		**SMH10056068ET***2ID65G54*	**C3S075V4F***11***I**xx**T**xx**M**xx		
5	400			**SMH10030068ET***2ID65G54*	**C3S038V4F***11***I**xx**T**xx**M**xx		
10	400	**ETH050M10**A1**K1F**FM**N**0300A		**SMH10056068ET***2ID65G54*	**C3S075V4F***11***I**xx**T**xx**M**xx		
10	400			**SMH10030068ET***2ID65G54*	**C3S038V4F***11***I**xx**T**xx**M**xx		
20	400	**ETH050M20**A1**K1F**FM**N**0300A		**SMH10056068ET***2ID65G54*	**C3S075V4F***11***I**xx**T**xx**M**xx		
20	400			**SMH10030068ET***2ID65G54*	**C3S038V4F***11***I**xx**T**xx**M**xx		
5	400	**ETH050M05**A1**K1D**FM**N**0300A	without gearbox	**MH1056008919***2I65A74*	**C3S150V4F***11***I**xx**T**xx**M**xx		
5	400			**MH1053008919***2I65A74*	**C3S075V4F***11***I**xx**T**xx**M**xx		
10	400	**ETH050M10**A1**K1D**FM**N**0300A		**MH1056008919***2I65A74*	**C3S150V4F***11***I**xx**T**xx**M**xx		
10	400			**MH1053008919***2I65A74*	**C3S075V4F***11***I**xx**T**xx**M**xx		
20	400	**ETH050M20**A1**K1D**FM**N**0300A		**MH1056008919***2I65A74*	**C3S150V4F***11***I**xx**T**xx**M**xx		
20	400			**MH1053008919***2I65A74*	**C3S075V4F***11***I**xx**T**xx**M**xx		

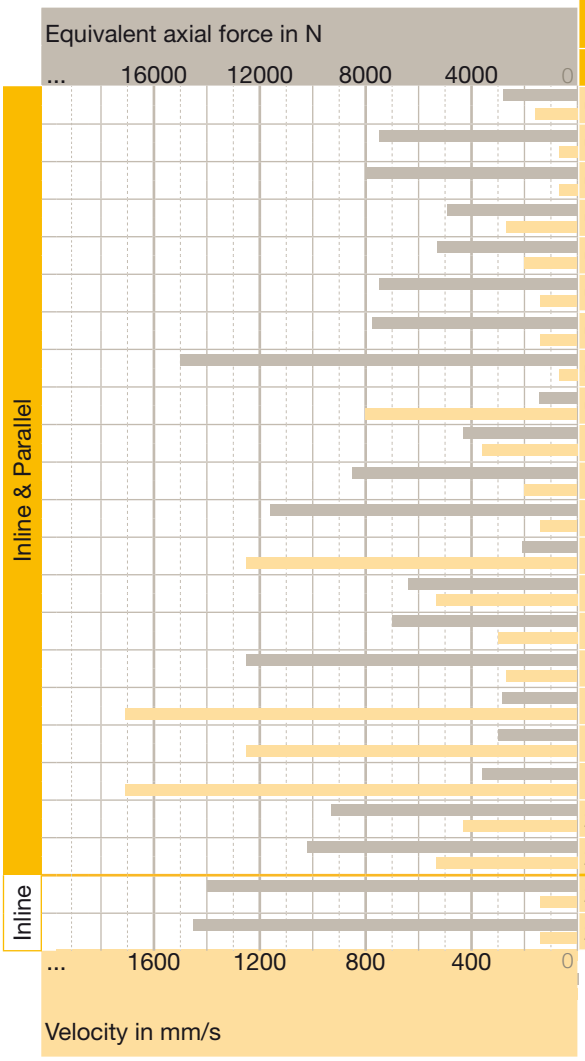
Order codes:
bold: **mandatory so that the package is combinable.**
italics: *recommended/standard*
blue: must be selected depending on the application.
Hint: The examples shown here are meant to help with the dimensioning process. As many parameters interact in this kind of drive package, the examples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

Predefined Motion Packages for ETH080

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
	mm/s	N	m/s²	km
01	160	2800	4	3560
02	70	7500	4	185
03	70	8000	0.5	155
04	267	4900	4	670
05	200	5300	4	530
06	139	7500	5	2200
07	139	7750	7.7	1950
08	70	15000	0.5	23
09	800	1450	15	>20000
10	360	4300	8	15540
11	200	8500	4	130
12	139	11620	4.6	400
13	1250	2100	15	>20000
14	533	6400	8	4710
15	300	7000	8	3100
16	267	12500	4	40
17	1707	2850	15	>20000
18	1250	3000	15	>20000
19	1707	3600	15	11920
20	430	9300	8	900
21	533	10200	8	630
22	139	14000	1	190
23	139	14500	7.7	160

Boundary conditions:

- Stroke from 50 to 800 mm
- Horizontal movement
- The characteristics of the individual components are not to be exceeded, e.g.
  - for parallel drive: transmissible torque depending on the motor speed n must be respected
  - 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

Screw lead	Supply voltage	Order Codes					
		Cylinder	**Gearbox**	**Motor**	**Drive**	**Motor cable**	**Feedback cable**
mm	V						
5	400	**ETH080M05**A1**K1E**FM**N**0400A	without gearbox	**SMH823003519***2ID65G54*	**C3S038V4F***11***I**xx**T**xx**M**xx	❶	**GBK 24/…** (cable chain compatible)
5	400	**ETH080M05**A1**P1B**FM**N**0400A	**PS90-003-S2/MU90-085**	**SMH825603819***2ID65G54*	**C3S038V4F***11***I**xx**T**xx**M**xx		
5	400			**SMH823003819***2ID65G54*	**C3S038V4F***11***I**xx**T**xx**M**xx		
5	400	**ETH080M05**A1**K1E**FM**N**0400A	without gearbox	**SMH1005606519***2ID65G54*	**C3S075V4F***11***I**xx**T**xx**M**xx		
5	400			**SMH1003006519***2ID65G54*	**C3S038V4F***11***I**xx**T**xx**M**xx		
10	400	**ETH080M10**A1**P1B**FM**N**0400A	**PS90-003-S2/MU90-088**	**SMH1003006519***2ID65G54*	**C3S038V4F***11***I**xx**T**xx**M**xx		
10	400			**SMH1005606519***2ID65G54*	**C3S075V4F***11***I**xx**T**xx**M**xx		
5	400	**ETH080M05**A1**P1B**FM**N**0400A		**SMH1003006519***2ID65G54*	**C3S038V4F***11***I**xx**T**xx**M**xx		
32	400	**ETH080M32**A1**K1J**FM**N**0400A	without gearbox	**SMH1153010724***2ID65G54*	**C3S075V4F***11***I**xx**T**xx**M**xx		
10	400	**ETH080M10**A1**K1J**FM**N**0400A			**C3S075V4F***11***I**xx**T**xx**M**xx		
5	400	**ETH080M05**A1**K1J**FM**N**0400A			**C3S075V4F***11***I**xx**T**xx**M**xx		
10	400	**ETH080M10**A1**P1B**FM**N**0400A	**PS90-003-S2/MU90-345**	**SMH1153010819***2ID65G54*	**C3S075V4F***11***I**xx**T**xx**M**xx		
32	400	**ETH080M32**A1**K1K**FM**N**0400A	without gearbox	**SMH1423015524***2ID65G54*	**C3S150V4F***11***I**xx**T**xx**M**xx	❷	
10	400	**ETH080M10**A1**K1K**FM**N**0400A		**SMH1425615524***2ID65G54*	**C3S150V4F***11***I**xx**T**xx**M**xx		
10	400	**ETH080M10**A1**K1K**FM**N**0400A		**SMH1423015524***2ID65G54*	**C3S150V4F***11***I**xx**T**xx**M**xx		
5	400	**ETH080M05**A1**K1K**FM**N**0400A		**SMH1425615524***2ID65G54*	**C3S150V4F***11***I**xx**T**xx**M**xx		
32	400	**ETH080M32**A1**K1K**FM**N**0400A		**MH1454522524***3I65A74*	**C3S300V4F***11***I**xx**T**xx**M**xx		
32	400	**ETH080M32**A1**K1K**FM**N**0400A		**MH1453022524***3I65A74*	**C3S150V4F***11***I**xx**T**xx**M**xx		
32	400	**ETH080M32**A1**K1K**FM**N**0400A		**MH1454528524***3I65A74*	**C3S300V4F***11***I**xx**T**xx**M**xx	❸	
10	400	**ETH080M10**A1**K1K**FM**N**0400A		**MH1453015524***2ID65G54*	**C3S150V4F***11***I**xx**T**xx**M**xx		
10	400	**ETH080M10**A1**K1K**FM**N**0400A		**MH1454528524***3I65A74*	**C3S300V4F***11***I**xx**T**xx**M**xx		
10	400	**ETH080M10**A1**P1B**FM**N**0400A	**PS90-003-S2/MU90-345**	**SMH1153010819***2ID65G54*	**C3S075V4F***11***I**xx**T**xx**M**xx	❶	
10	400			**SMH1155610819***2ID65G54*	**C3S150V4F***11***I**xx**T**xx**M**xx		

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.

Order code

ETH Series	Ordering example: ETH050M05A1K1AFMN0200A	ETH	050	M05	A	1	K1A

Frame size

ISO 32	032
ISO 50	050
ISO 80	080

Screw lead Mxx in mm

ETH032	ETH050	ETH080	
√	√	√	M05
√	√	√	M10
√			M16
	√		M20
		√	M32

Motor mounting position & profile orientation & groove orientation[1])

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

1) ETH080 features 2 grooves each on all 4 sides (i.e. Code B=A or D=C), therefore Codes A, C, E, G, J are possible for ETH080.

Relubrication option [2) & 3)]

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

2) With parallel configuration, the motor may block access to the sensors and the lubrication port. This depends on the motor mounting position.
3) When selecting the relubrication options 2-5, the standard lubrication port is without function.

Motor flange[4)]

		Pilot	Bolt circle	∅ Shaft	Shaft length	
With motor flange for Parker motor	SMH60-B08/9 or MH56-B05/9	40	63	9	20	K1A
	SMH60-B05/11 or MH70-B05/11 or NX3	60	75	11	23	K1B
	SMH82-B08/14	80	100	14	30	K1C
	SMH82-B08/19 or MH105-B9/19 (formerly HJ96 Motor) or NX4	80	100	19	40	K1D
	SMH82-B05/19 or SMH100-B5/19 or MH105-B5/19 or SMH100-B5/19 or MH105-B5/19	95	115	19	40	K1E
	SMH100-B5/14 ①	95	115	14	30	K1F
	SMH115-B7/24 or MH105-B6/24 or NX6	110	130	24	50	K1J
	SMH142-B5/24 or MH145-B5/24	130	165	24	50	K1K
With gearbox flange for Parker gearbox	PS60	50	70	16	40	P1A
	PS90	80	100	22	52	P1B
	PE3	40	52	14	35	P1G
	PE4	80	100	20	40	P1H
Special flange one-piece (customized)	if you need a flange for a third-party motor, please contact us					1xx
Special flange two-piece (customized)						2xx

4) Please check cylinder motor/gearbox combination with the aid of the table "Motor Mounting Options" see page 17).

F	M	N	0200	A		
						Here, a number for customized cylinders is assigned, please contact us — **Optional: only customized cylinder**
					Uxx	Unique Version
						Protection class
				A		IP54 with galvanized screws
				B		IP 54 stainless version with VA screws
				C		IP 65 like B + protective lacquer and specially sealed
						Stroke in mm

	ETH032	ETH050	ETH080	
0050	√	√		
0100	√	√	√	
0150	√	√	√	
0200	√	√	√	
0300	√	√	√	
0400			√	
0600			√	
1000	√			
1200		√		
1600			√	
XXXX	50...1000	50...1200	50...1600	customized in steps of 1 mm

			Option
	N	Standard	Place holder
			Thrust rod
M		External thread **(standard)**	
F		Internal Thread	
C		Rod Clevis	
S		Spherical Rod Eye	
R		Outrigger Bearing (not in IP65 rating) (not with motor mounting positions E, F, J, K)	
L		Alignment Coupler	
X		customized - please contact us	
			Mounting type
F		Thread on the cylinder body **(standard)**	
B		Foot Mounting ② ③	
C		Rear Clevis ②	
D		Center trunnion (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 ②	
G		Mounting Flanges ③	
H		Rear Plate ②	
J		Front Plate ③	
N		Rear Plate & Front Plate ② ③	
X		customized - please contact us	

① 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
② Not with motor mounting options A & B.
③ Not for thrust rod R

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-eme.com/eth
- Dimensioning tool “EL-Sizing”
  - A dimensioning tool simplifies the dimensioning process. www.parker-eme.com/eth

WARNING — USER RESPONSIBILITY

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

- This document and other information from Parker-Hannifin Corporation, its subsidiaries and authorized distributors provide product or system options for further investigation by users having technical expertise.
- 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.
- To the extent that Parker or its subsidiaries or authorized distributors provide component or system options based upon data or specifications provided by the user, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the components or systems.

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