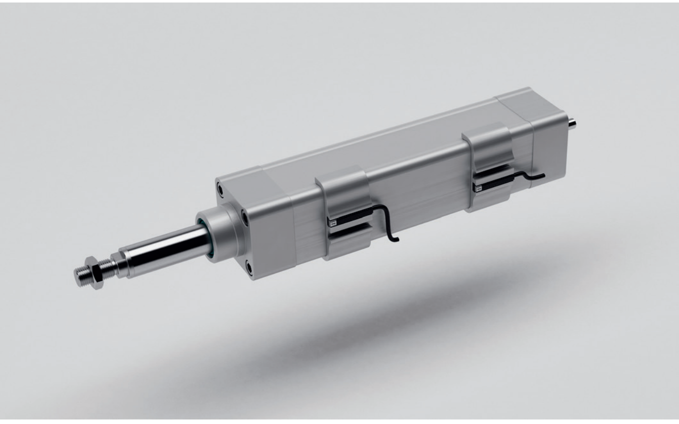
# CHARACTERISTICS

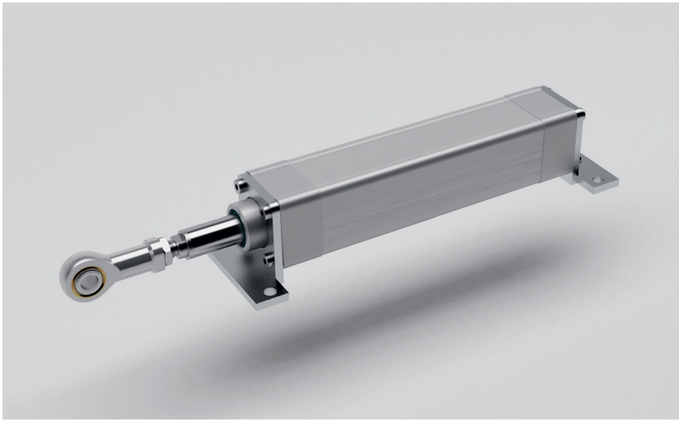
The PNCE are electric cylinders with a precision ball screw drive. The electric cylinder is based on the standard ISO 15552. Its outer design and dimensions are very similar to pneumatic cylinders. High performance features such as, high speeds, good positioning accuracy and high repeatability are ensured through a precision ball screw with reduced backlash (preload on request) of the ball nut and non-rotating piston rod. For a long service life the re-lubrication can be done through a lubrication nipple.
The design with its smooth surfaces enables easy cleaning of the cylinder. In combination with a lubricant class H1 it is also suitable for food & beverage applications. It can be additionaly equipped with switches and ISO standard accessories.

The excellent sealing of the components in the cylinder ensures an IP65 protection class and protects the interior of the cylinder from dust, water and other contaminants. Version IP65CR also offers a high corrosion resistance in harsh environments.

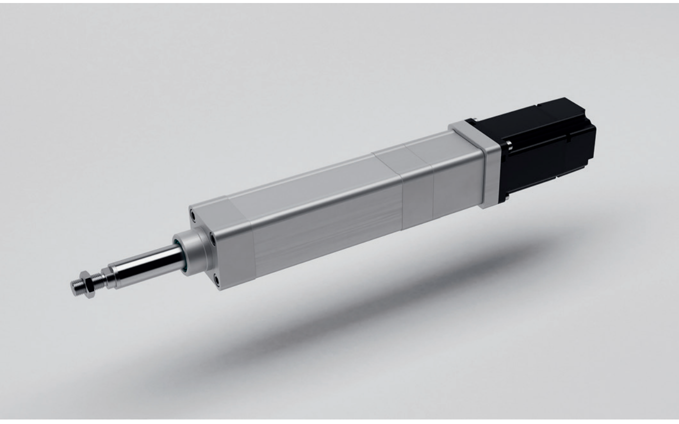
The aluminium profiles are manufactured according to the medium EN 12020-2 standard



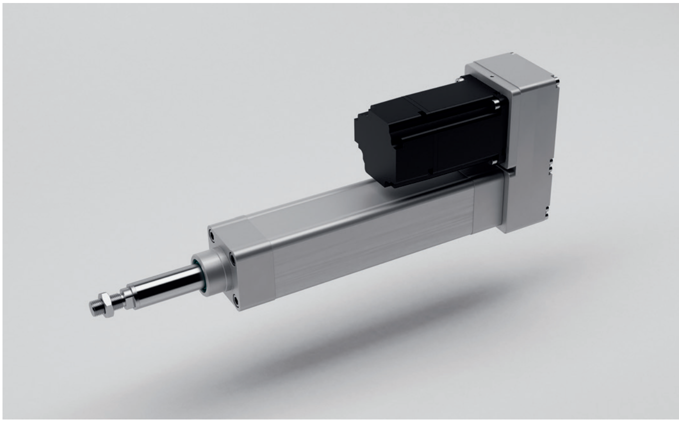
Sensor holder



ISO standard accessories



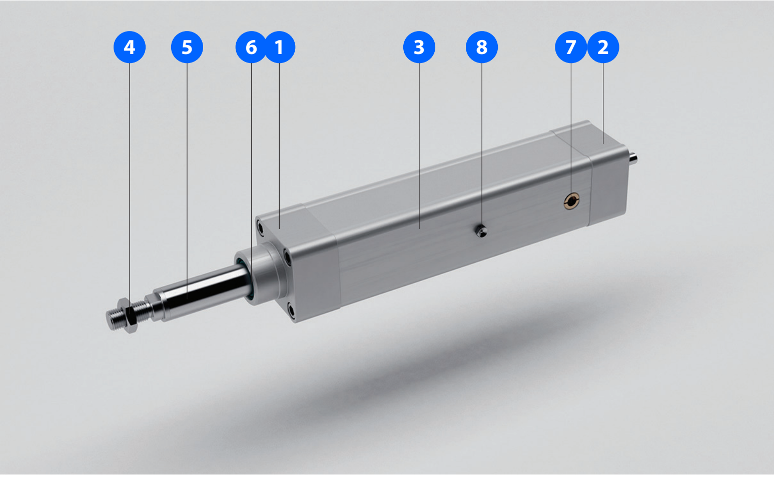
Motor adapter with coupling (IP65)



Motor side drive (IP65)

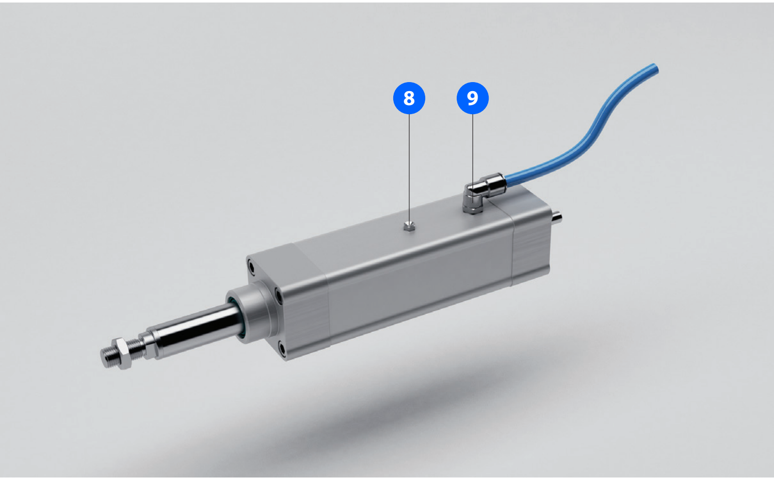
# STRUCTURAL DESIGN

## • Standard version (S)*




1 – Front cap
2 – Drive cap
3 – Smooth cylinder profile
4 – Hex nut
5 – Piston rod (stainless steel) with an anti-rotation device
6 – Piston rod seal
7 – Pressure compensation
8 – Lubrication nipple

* IP40 protection class




8 – Lubrication nipple
9 – Connection for pressure compensation

## • IP65 protection class (IP65)

The appropriate sealing of the external parts ensures the electric cylinder the IP65 protection class. The IP65 protection class of the electric cylinder fulfils the specifications to IEC 60 529. The connection for pressure compensation in the cylinder profile ensures the exchange of air between the interior of the cylinder and the environment. This prevents the occurence of excess pressure or negative pressure inside the electric cylinder. It also protects the interior of the cylinder from the external media like dust and water.

## • IP65 protection class with high corrosion resistance (IP65CR)

It offers high corrosion resistance in harsh environments.The version IP65CR includes all the features of the electric cylinder version IP65. In addition to ensuring high corrosion resistance all the external parts are corrosion resistant (e.g. the connection for pressure compensation, lubrication nipple, and the connection elements are made of stainless steel). More information about materials is available upon request in the extended material information list.

## • For applications in the food industry (FI)

The version FI includes all the features of the electric cylinder version IP65CR. It is upgraded by materials suitable for some applications in the food industry. The cylinder is greased with a lubricant class NSF H1. The design with the smooth surfaces of the aluminium profile enables its quick and effective cleaning. During the cleaning the sealing air can be applied to the connection for pressure compensation. The use for the food & beverage industry is limited by the materials of the electric cylinder. More information about materials is available upon request in the extended material information list.

# HOW TO ORDER

PNCE - 40 - BS - 1610 - 200 - S - F - E20

**Series:**
PNCE

**Size:**
- 32
- 40
- 50
- 63
- 80
- 100

**Screw type:**
- BS: ball screw

**Ball screw:**
- PNCE 32: Ø12x5, Ø12x10
- PNCE 40: Ø16x5, Ø16x10, Ø16x16
- PNCE 50: Ø20x5, Ø20x10, Ø20x20, Ø20x50
- PNCE 63: Ø25x5, Ø25x10, Ø25x25
- PNCE 80: Ø32x5, Ø32x10, Ø32x20, Ø32x32
- PNCE 100: Ø40x5, Ø40x10, Ø40x20, Ø40x40

**Absolute stroke [mm]:**
Absolute stroke = Effective stroke + 2 × Safety stroke

**Versions:**
- S: Standard version
- IP65: IP65 protection class
- IP65CR: IP65 protection class with high corrosion resistance
- FI: For applications in the food industry (check the material information)

**Option 1:**
- Leave blank: standard
- F: female thread on the piston rod

**Option 2:**
- Extended piston rod E [mm]

# TECHNICAL DATA

## General technical data for the PNCE series

| PNCE | Ball screw | Dynamic * load capacity | Maximum axial load ** | Maximum drive torque | Maximum travel speed *** | Max. rotational speed | No load torque | Minimum stroke | Maximum stroke | Axial backlash (BS) | Maximum acceleration |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | d×l [mm] | C [N] | $F_{max}$ [N] | $M_p$ [Nm] | $v_{max}$ [m/s] | $n_{max}$ [$min^{-1}$] | $M_0$ [Nm] | $s_{min}$ [mm] | $s_{max}$ [mm] | [mm] | [m/s²] |
| **32** | 12×5 | 5000 | 2540 | 2,2 | 0,48 | 5800 | 0,10 | 30 | 800 | < 0,02 | 20 |
| | 12×10 | 3800 | 1270 | | 0,97 | | 0,15 | 30 | | | |
| **40** | 16×5 | 13150 | 6020 | 5,3 | 0,35 | 4200 | 0,15 | 40 | 900 | < 0,02 | 20 |
| | 16×10 | 11550 | 3010 | | 0,70 | | 0,20 | 35 | | | |
| | 16×16 | 8170 | 1880 | | 1,12 | | 0,25 | 35 | | | |
| **50** | 20×5 | 14800 | 14600 | 12,9 | 0,28 | 3300 | 0,30 | 50 | 1000 | < 0,02 | 20 |
| | 20×10 | 15900 | 7830 | 13,9 | 0,55 | | 0,35 | 55 | | | |
| | 20×20 | 16250 | 3900 | | 1,10 | | 0,40 | 50 | | | |
| | 20×50 | 13000 | 1560 | | 2,5 | 3000 | 0,50 | 30 | | | |
| **63** | 25×5 | 16700 | 16500 | 14,6 | 0,23 | 2700 | 0,50 | 40 | 1200 | < 0,02 | 20 |
| | 25×10 | 15800 | 15800 | 28,0 | 0,45 | | 0,55 | 40 | | | |
| | 25×25 | 16700 | 7940 | 35,1 | 1,13 | | 0,65 | 30 | | | |
| **80** | 32x5 | 18850 | 18850 | 16,7 | 0,18 | 2150 | 0,65 | 60 | 1500 | < 0,02 | 20 |
| | 32x10 | 37000 | 25000 | 44,2 | 0,50 | 3000 | 0,70 | 60 | | | |
| | 32x20 | 22950 | 17160 | 60,7 | 1,00 | | 0,75 | 70 | | | |
| | 32x32 | 15500 | 10725 | 60,7 | 1,60 | | 0,90 | 70 | | | |
| **100** | 40x5 | 23800 | 23800 | 21,0 | 0,18 | 2200 | 1,40 | 45 | 1500 | < 0,02 | 20 |
| | 40x10 | 38000 | 29000 | 51,3 | 0,37 | | 1,55 | 55 | | | |
| | 40x20 | 33300 | 29000 | 102,6 | 0,73 | | 1,70 | 65 | | | |
| | 40x40 | 35000 | 22980 | 162,6 | 1,47 | | 2,00 | 80 | | | |

* Dynamic load capacity of ball screw drive. This value is the basis for calculating the service life.
** When considering service life, see page 15. This value needs to be considered when using the piston rod or mounting attachments' accessories.
*** Maximum travel speed depends of the absolute stroke of the PNCE, see diagrams on page 11.

## Operating conditions

| | |
|---|---|
| Operating temperature | 0°C ~ +60°C |
| Protection class | IP40, IP65 |
| Duty cycle | 100 % |

Recommended values of loads:

All the data of the dynamic load capacities (ball screw drive) stated in the upper table are theoretical without considering any safety factor. The safety factor depends on the application and its requested safety and service life.

We recommend a minimum safety factor $f_s$ = 5,0, where $f_s$ is defined as $f_s = C / F_m$.

See page 15 for information on how the applied mean axial load $F_m$ affects the service life.

## Mass and mass moment of inertia

| PNCE | Ball screw | Moved mass * | Mass of the electric cylinder | Mass moment of inertia |
|---|---|---|---|---|
| | d×l [mm] | $m_m$ [kg] | $m_{PNCE}$ [kg] | $J_{PNCE}$ [$10^{-6}$ kg m$^2$] |
| 32 | 12×5 | 0,32 + 0,0010 × (Absolute stroke + E) | 1,10 + 0,0043 × Absolute stroke + 0,0010 × E | 2,15 + 0,0128 × Absolute stroke + 0,0006 × E + 0,6333 × $m_{load}$ |
| | 12×10 | | | 2,75 + 0,0147 × Absolute stroke + 0,0025 × E + 2,5330 × $m_{load}$ |
| 40 | 16×5 | 0,44 + 0,0007 × (Absolute stroke + E) | 1,45 + 0,0051 × Absolute stroke + 0,0007 × E | 4,50 + 0,0395 × Absolute stroke + 0,0004 × E + 0,6333 × $m_{load}$ |
| | 16×10 | | | 5,35 + 0,0408 × Absolute stroke + 0,0018 × E + 2,5330 × $m_{load}$ |
| | 16×16 | | | 7,10 + 0,0436 × Absolute stroke + 0,0046 × E + 6,4846 × $m_{load}$ |
| 50 | 20×5 | 0,95 + 0,0012 × (Absolute stroke + E) | 2,50+0,0073 × Absolute stroke + 0,0012 × E | 17,75 + 0,0817 × Absolute stroke + 0,0007 × E + 0,6333 × $m_{load}$ |
| | 20×10 | | | 19,55 + 0,0839 × Absolute stroke + 0,0030 × E + 2,5330 × $m_{load}$ |
| | 20×20 | | | 26,75 + 0,0928 × Absolute stroke + 0,0118 × E + 10,1321 × $m_{load}$ |
| | 20×50 | 0,88 + 0,0012 × (Absolute stroke + E) | 2,43 + 0,0073 × Absolute stroke + 0,0012 × E | 73,80 + 0,1549 × Absolute stroke + 0,0740 × E + 63,3257 × $m_{load}$ |
| 63 | 25×5 | 1,00 + 0,0011 × (Absolute stroke + E) | 3,05 + 0,0097 × Absolute stroke + 0,0011 × E | 32,55 + 0,2358 × Absolute stroke + 0,0007 × E + 0,6333 × $m_{load}$ |
| | 25×10 | | | 34,45 + 0,2378 × Absolute stroke + 0,0028 × E + 2,5330 × $m_{load}$ |
| | 25×25 | 0,98 + 0,0011 × (Absolute stroke + E) | 3,03 + 0,0097 × Absolute stroke + 0,0011 × E | 47,30 + 0,2523 × Absolute stroke + 0,0172 × E + 15,8314 × $m_{load}$ |
| 80 | 32x5 | 2,15 + 0,0028 × (Absolute stroke + E) | 6,48 + 0,0156 × Absolute stroke + 0,0028 × E | 118,14 + 0,6514 × Absolute stroke + 0,0018 × E + 0,6333 × $m_{load}$ |
| | 32x10 | | | 122,23 + 0,6567 × Absolute stroke + 0,0071 × E + 2,5330 × $m_{load}$ |
| | 32x20 | | | 138,60 + 0,6781 × Absolute stroke + 0,0285 × E + 10,1321 × $m_{load}$ |
| | 32x32 | | | 172,65 + 0,7227 × Absolute stroke + 0,0731 × E + 25,9382 × $m_{load}$ |
| 100 | 40x5 | 3,21 + 0,0047 × (Absolute stroke + E) | 10,12 + 0,0245 × Absolute stroke + 0,0047 × E | 342,17 + 1,6613 × Absolute stroke + 0,0030 × E + 0,6333 × $m_{load}$ |
| | 40x10 | | | 348,27 + 1,6701 × Absolute stroke + 0,0118 × E + 2,5330 × $m_{load}$ |
| | 40x20 | | | 372,67 + 1,7056 × Absolute stroke + 0,0473 × E + 10,1321 × $m_{load}$ |
| | 40x40 | 3,54 + 0,0047 × (Absolute stroke + E) | 10,61 + 0,0245 × Absolute stroke + 0,0047 × E | 483,41 + 1,8476 × Absolute stroke + 0,1893 × E + 40,5285 × $m_{load}$ |

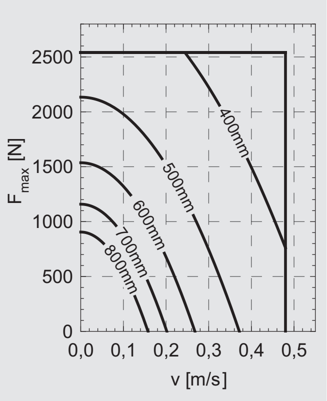
* The moved mass is already considered in the equation for calculating the mass of the electirc cylinder $m_{PNCE}$ and the mass moment of inertia $J_{PNCE}$. The moved mass includes the mass of the piston rod with the internal anti-rotation device and ball nut.

| | | |
|---|---|---|
| **$m_{load}$** | Applied mass to be moved | [kg] |
| **E** | Extended piston rod | [mm] |
| **Absolute stroke** | | [mm] |

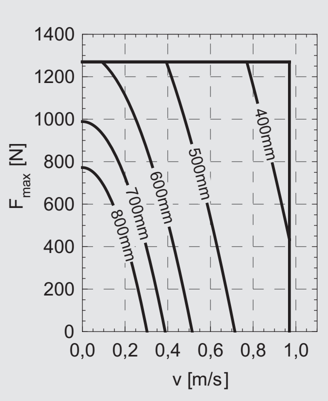
## Maximum axial loading as a function of the travel speed for different values of absolute stroke ($F_{max}$ - v curves)

### PNCE 32

12×5

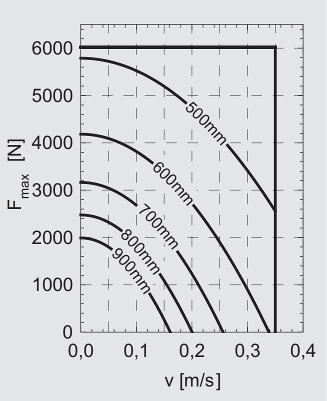



12×10

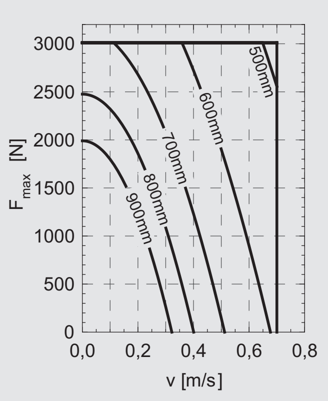



### PNCE 40

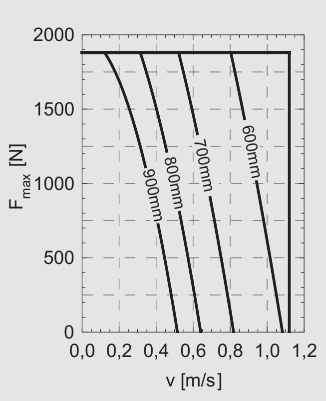
16×5




16×10

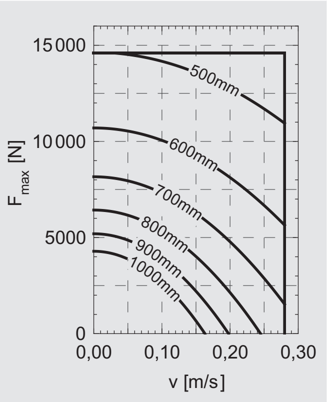



16×16

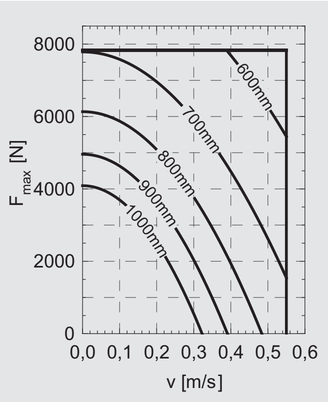



### PNCE 50

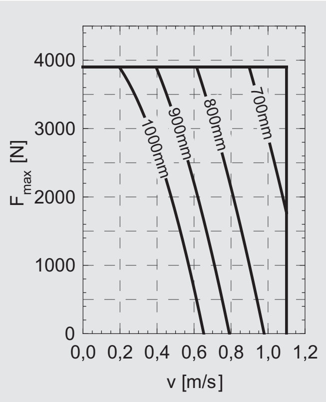
20×5



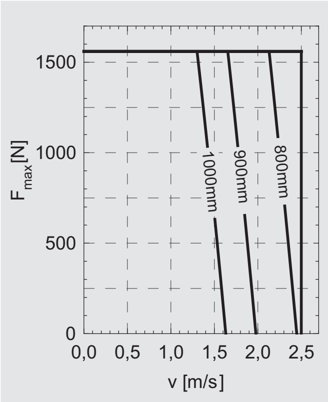

20×10




20×20

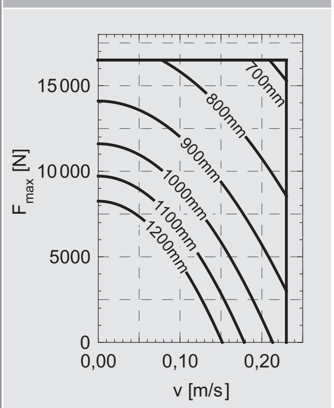



20×50

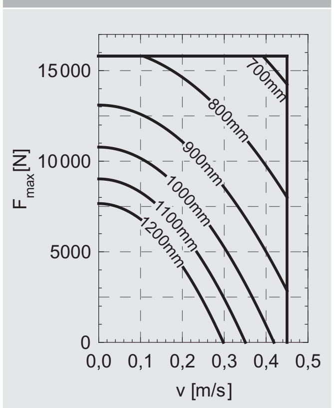



### PNCE 63

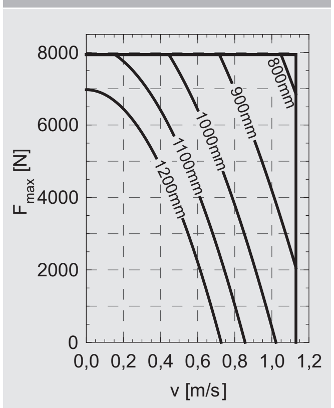
25×5




25×10

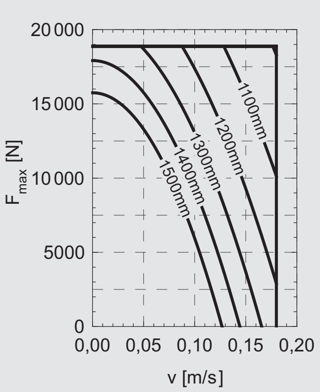



25×25

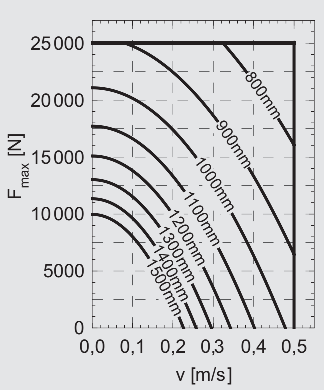


## PNCE 80

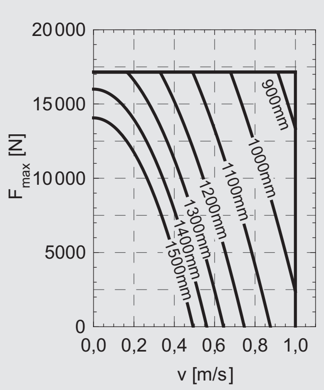
### 32x5



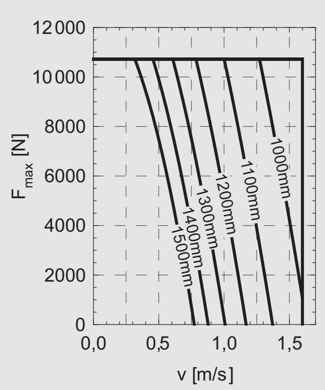

### 32×10




### 32×20

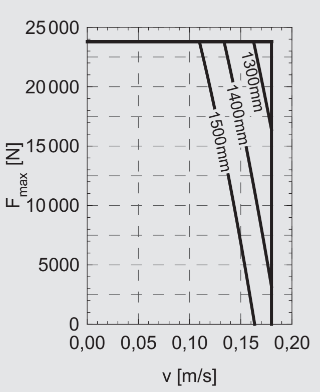



### 32×32

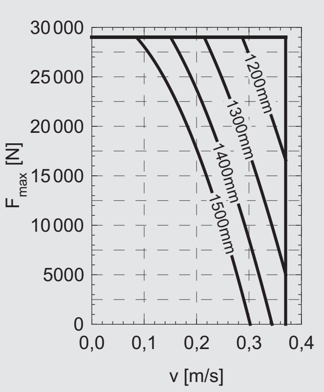



## PNCE 100

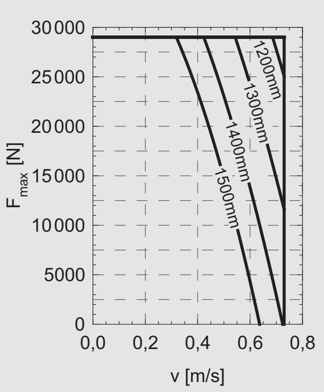
### 40×5



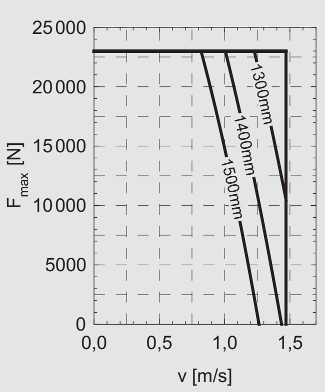

### 40×10




### 40×20



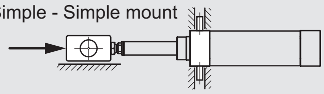

### 40×40



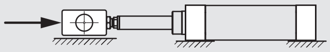
## Maximum axial loading as a function of the absolute stroke ($F_{max}$ - absolute stroke curves)

### Schematically presented mounting cases

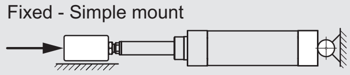
Simple - Simple mount



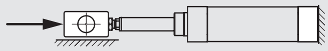
Simple - Fixed mount



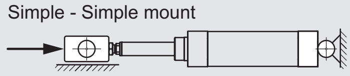
Fixed - Simple mount



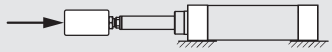
Simple - Fixed mount



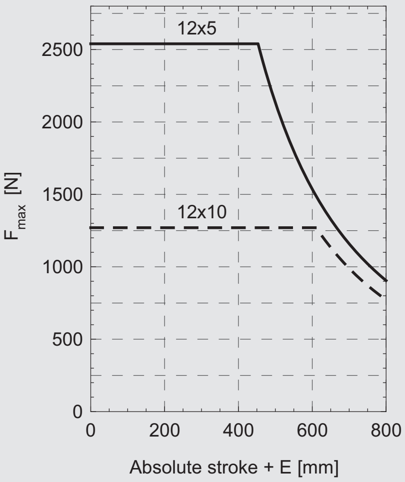
Simple - Simple mount

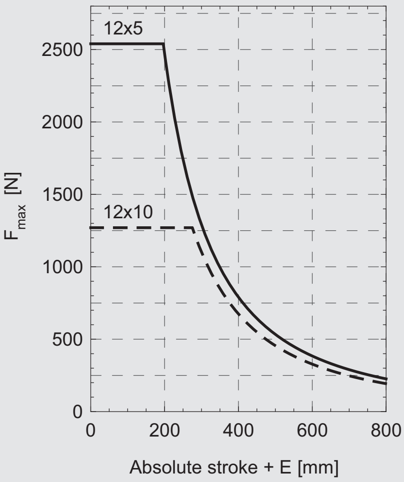


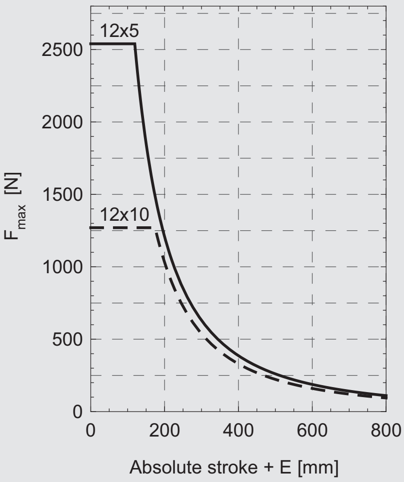
Free - Fixed mount



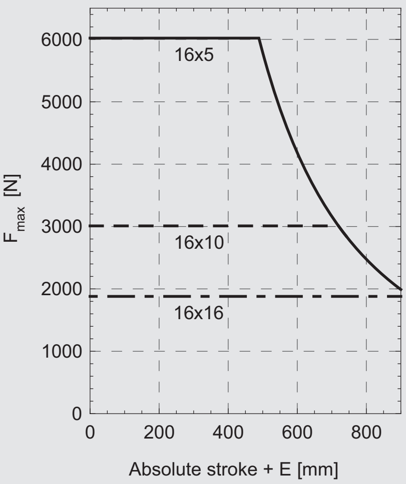
PNCE 32

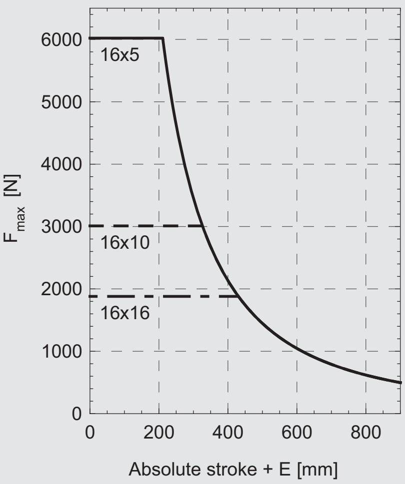


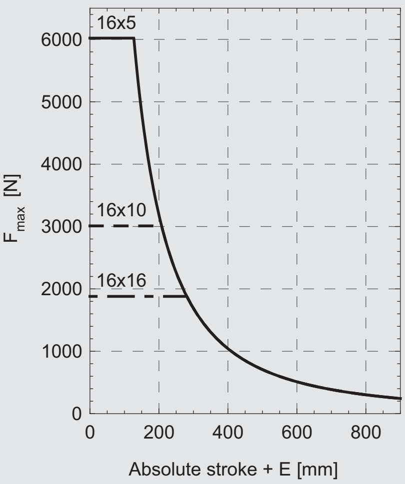



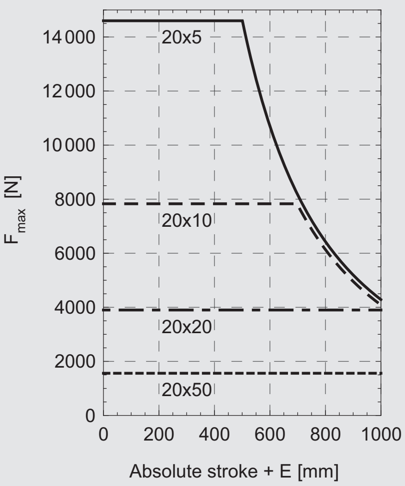

PNCE 40

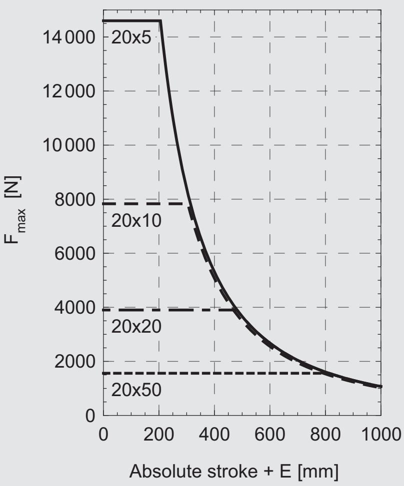


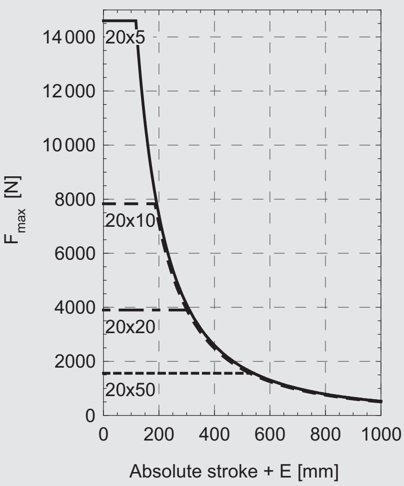




PNCE 50

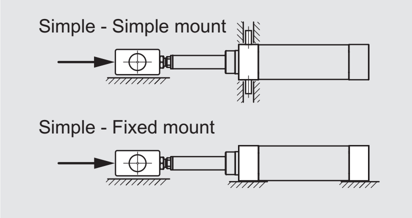


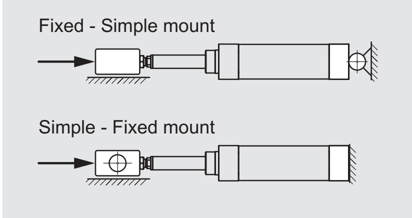



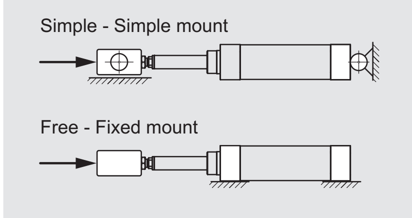




| | | |
|---|---|---|
| E | Extended piston rod | [mm] |

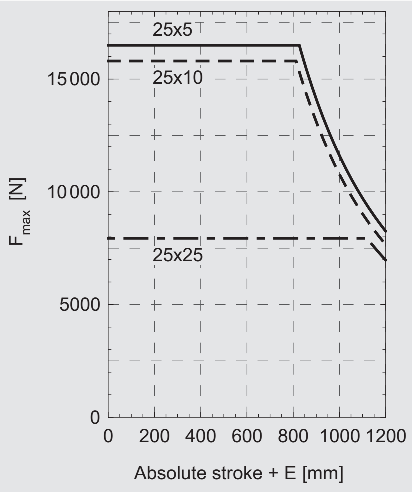
## Schematically presented mounting cases

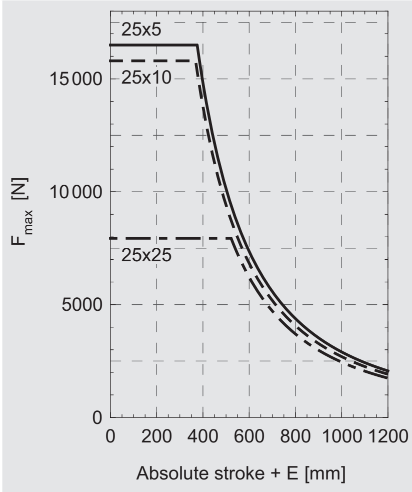


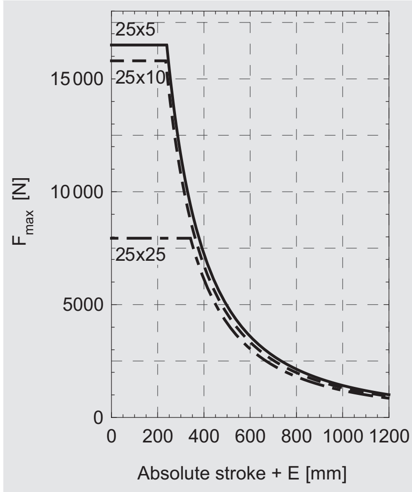



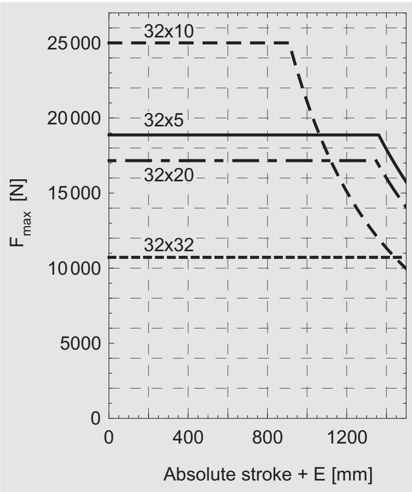

### PNCE 63

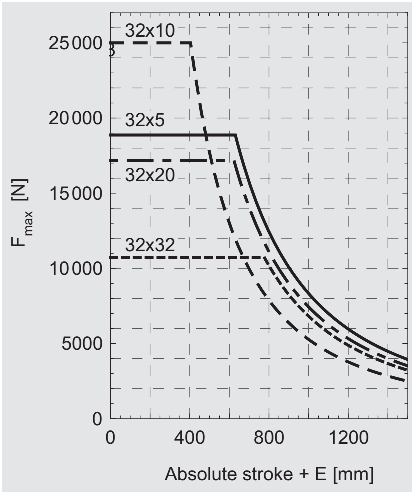


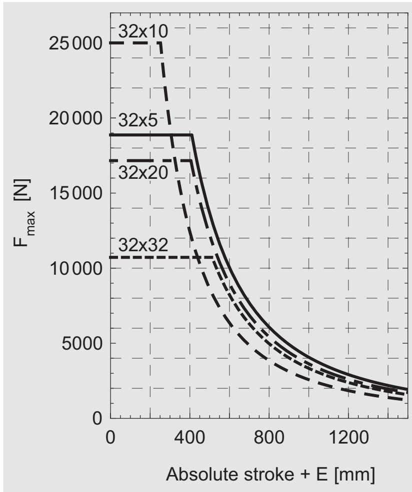



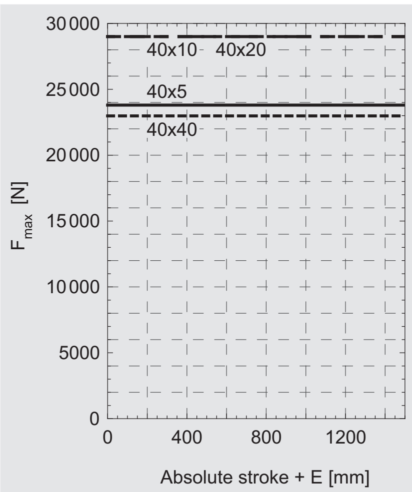

### PNCE 80

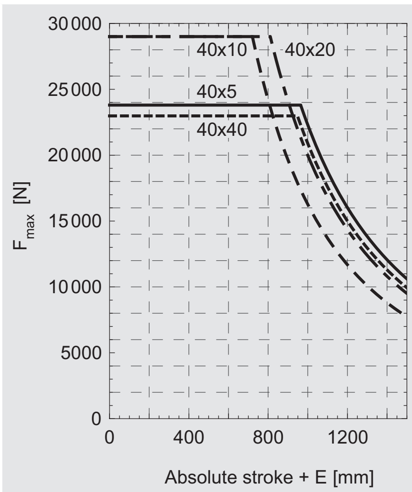


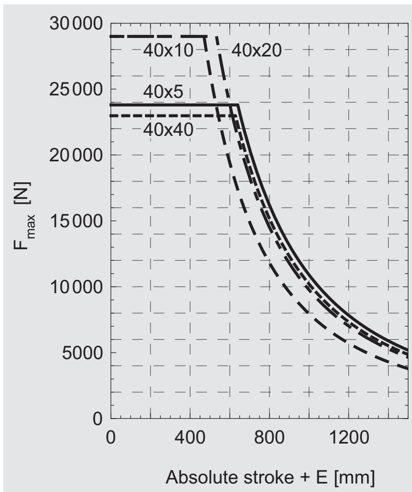




### PNCE 100



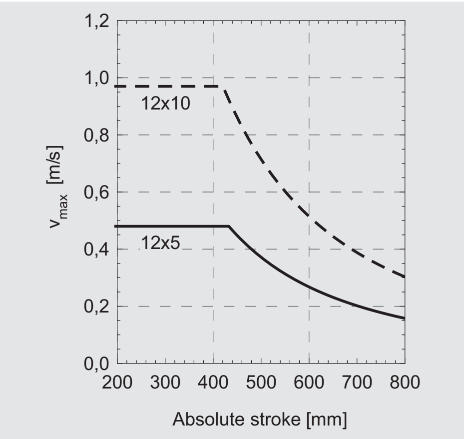



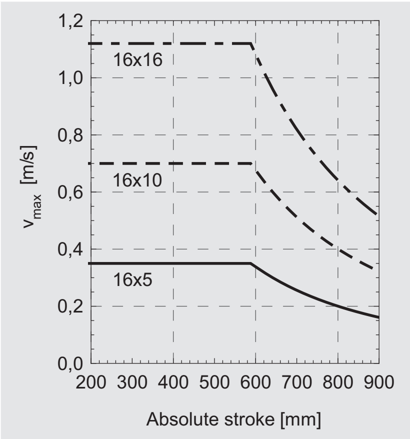

| | | |
|---|---|---|
| **E** | Extended piston rod | [mm] |

## Maximum travel speed as a function of the absolute stroke ($v_{max}$ - absolute stroke curves)

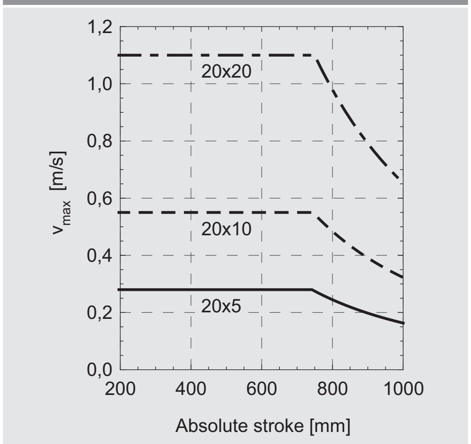
### PNCE 32



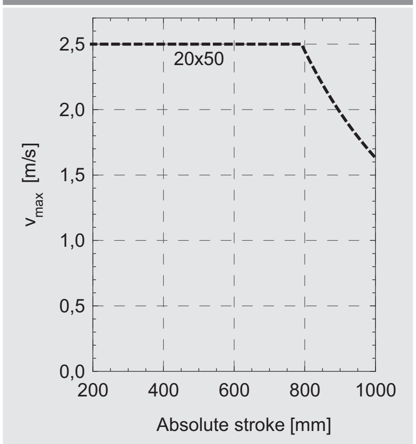

### PNCE 40



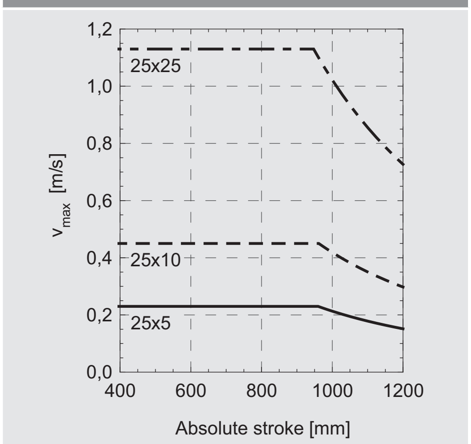

### PNCE 50 (for BS lead of 5, 10, 20)



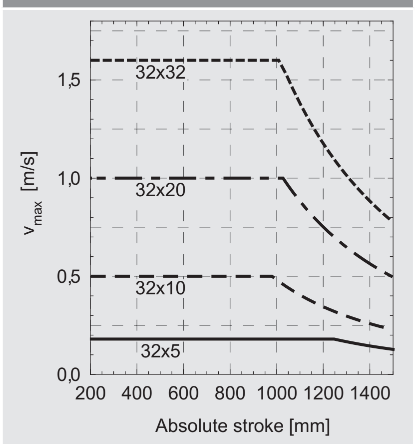

### PNCE 50 (for BS lead of 50)



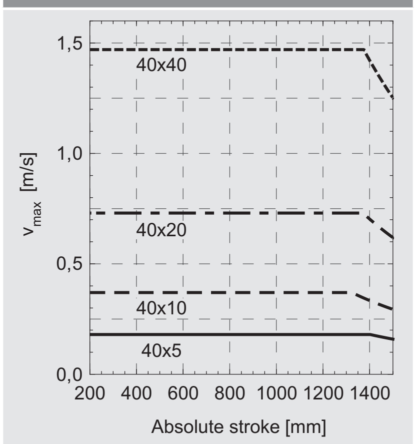

### PNCE 63




### PNCE 80

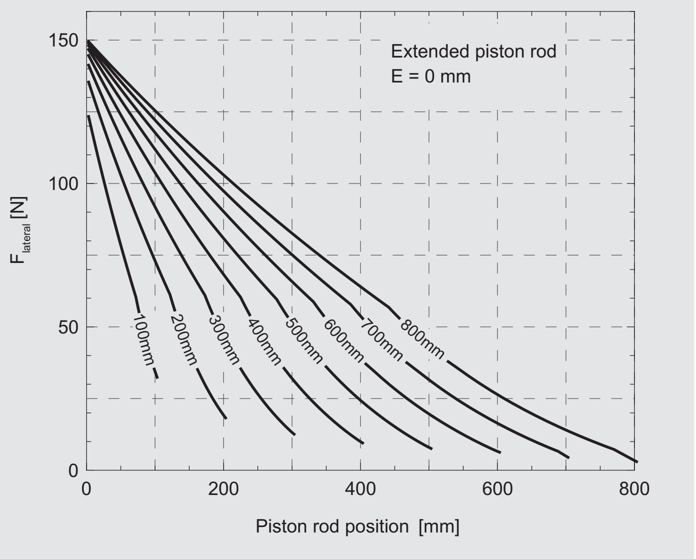


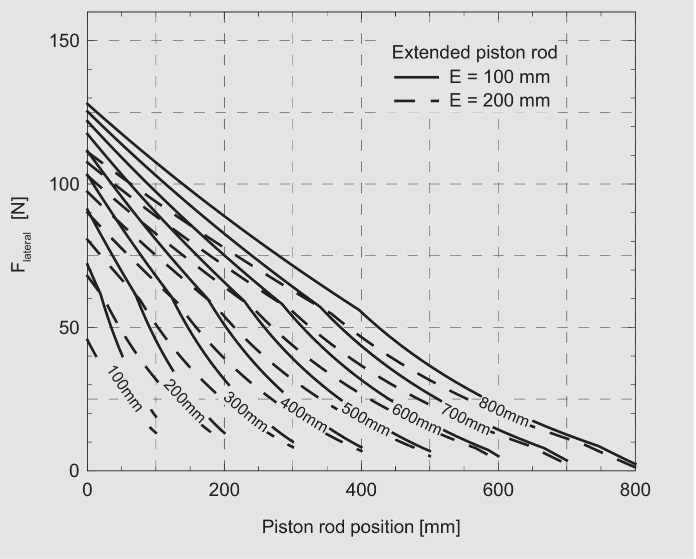

### PNCE 100



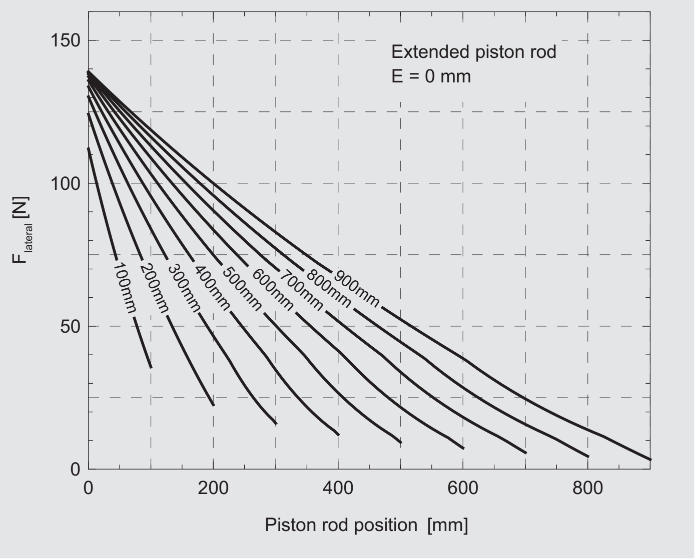
## Maximum lateral loading as a function of the piston rod position for different values of the absolute stroke ($F_{lateral}$ - piston rod position curves)

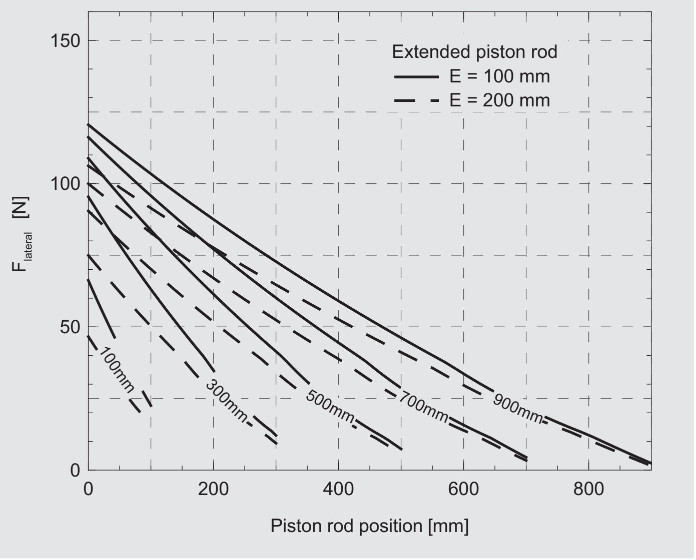
### PNCE 32



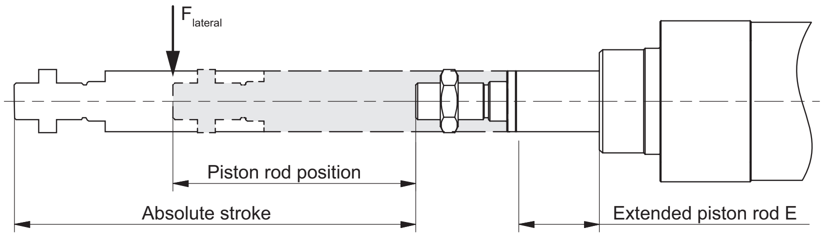




### PNCE 40



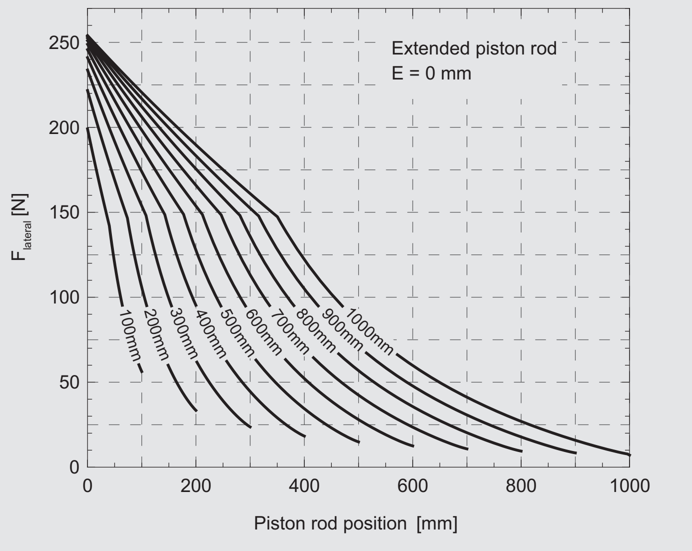



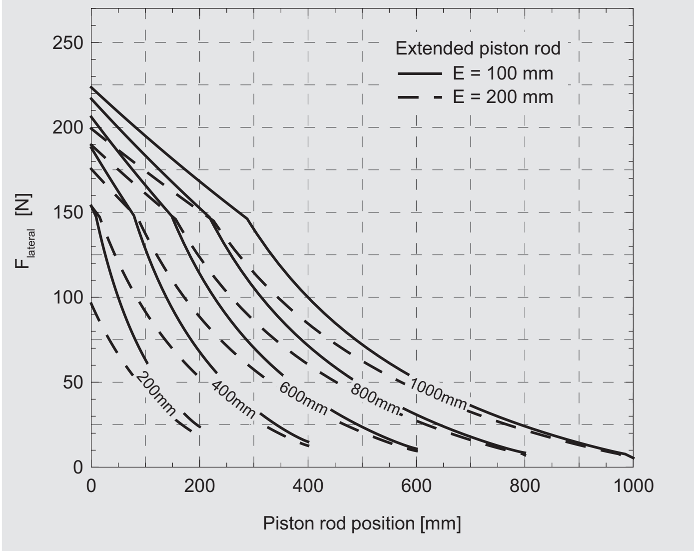

Values on the curves represent the absolute stroke



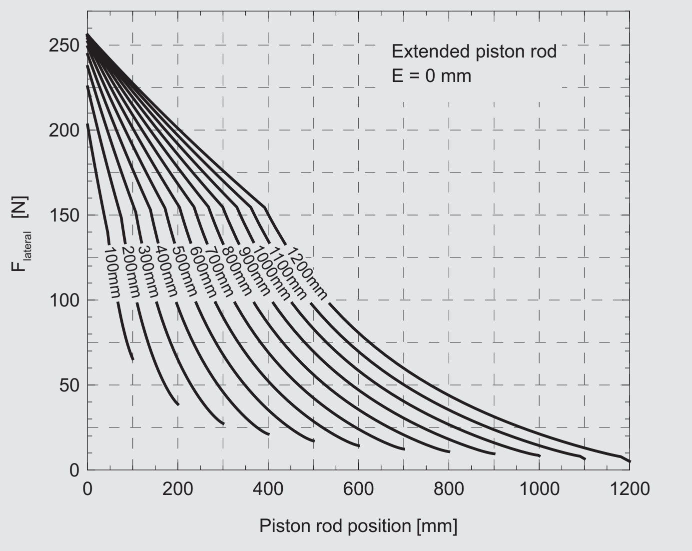

Diagrams taking into consideration
a travel speed of 0,5 m/s and an axial load of $F_{max}/4$.

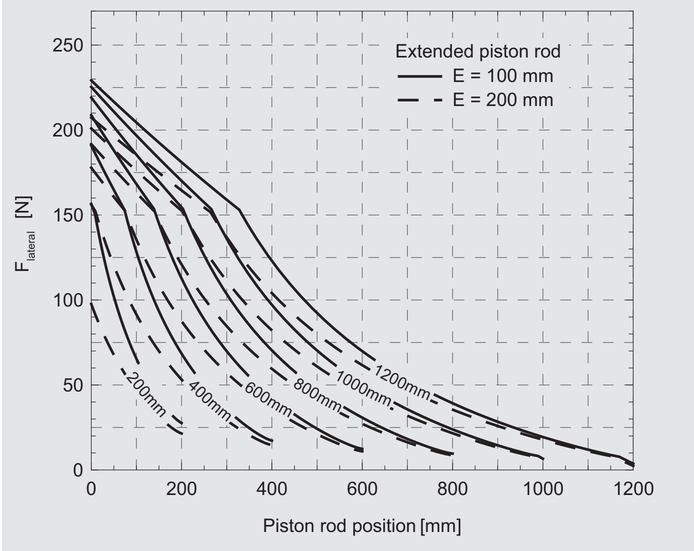
## PNCE 50



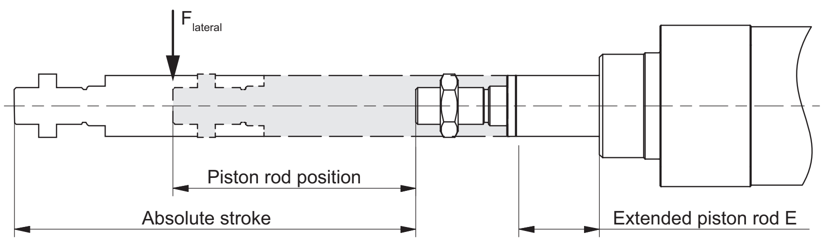




## PNCE 63



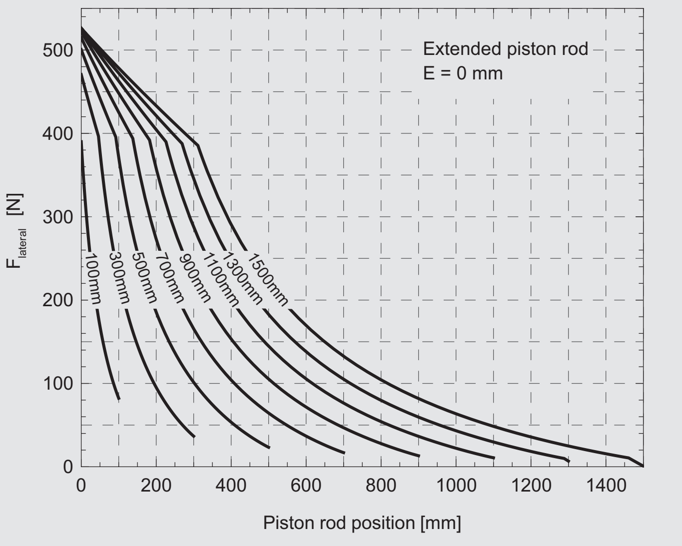



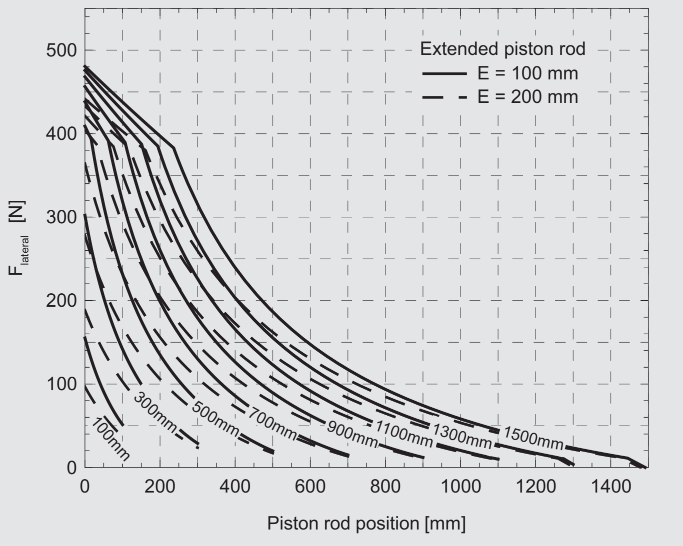

Values on the curves represent the absolute stroke



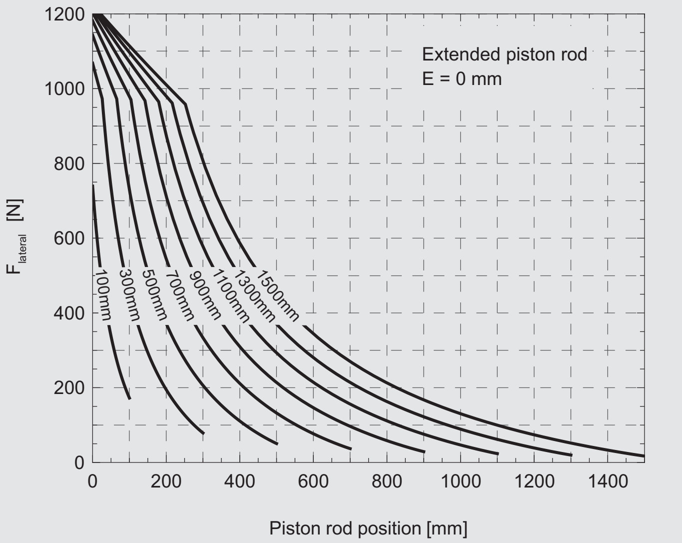

Diagrams taking into consideration
a travel speed of 0,5 m/s and an axial load of $F_{max}/4$.

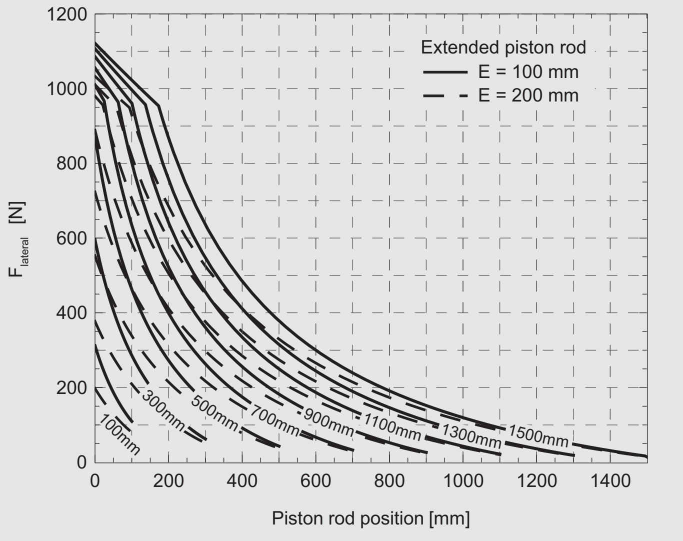
## PNCE 80



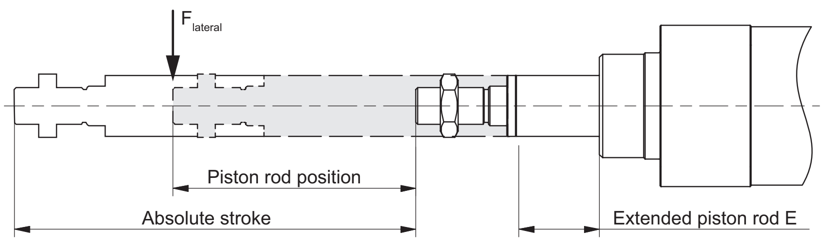




## PNCE 100



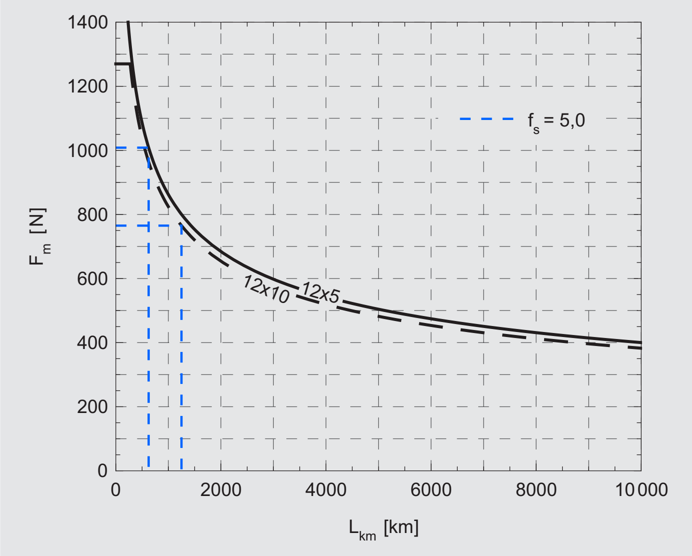

Values on the curves represent the absolute stroke



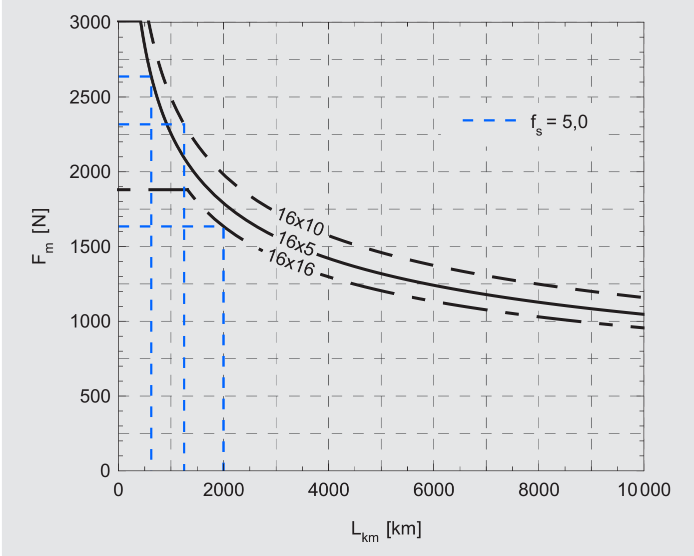

Diagrams taking into consideration
a travel speed of 0,5 m/s and an axial load of $F_{max}$/4.

## Service life - applied mean axial load $F_m$ as a function of the service life $L_{km}$

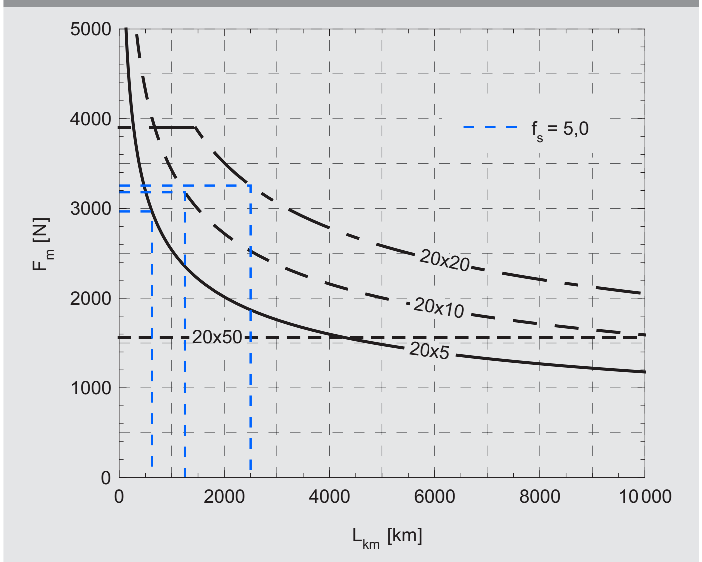
### PNCE 32



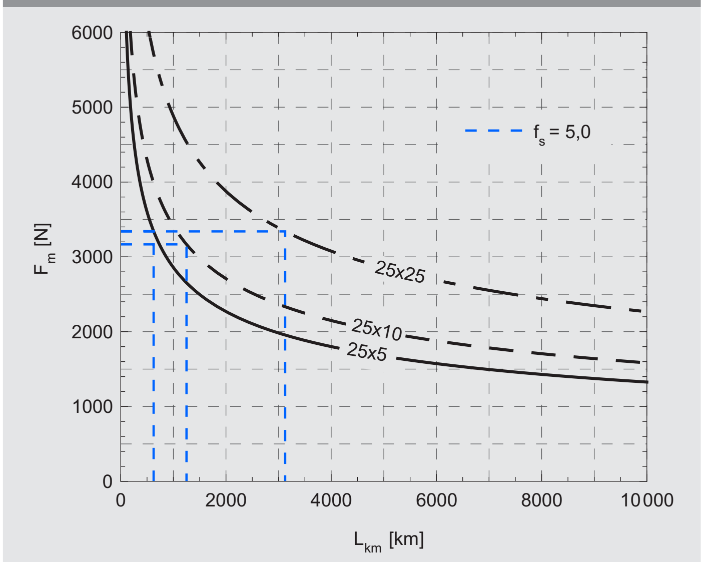

### PNCE 40



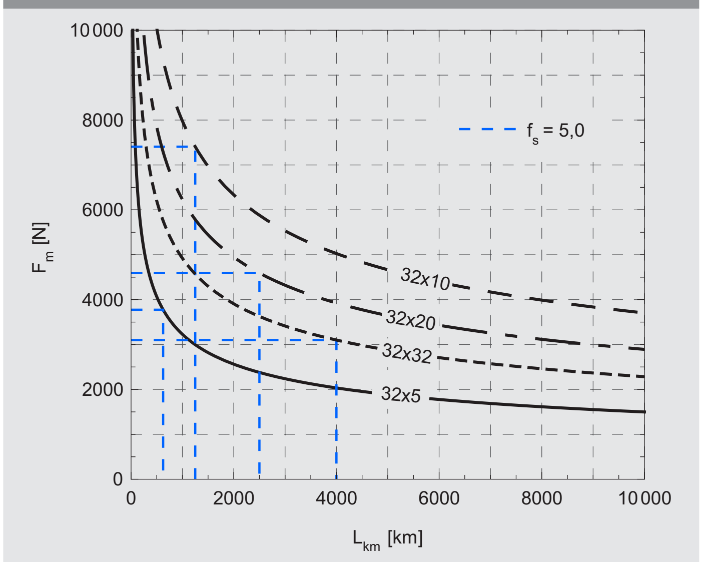

### PNCE 50



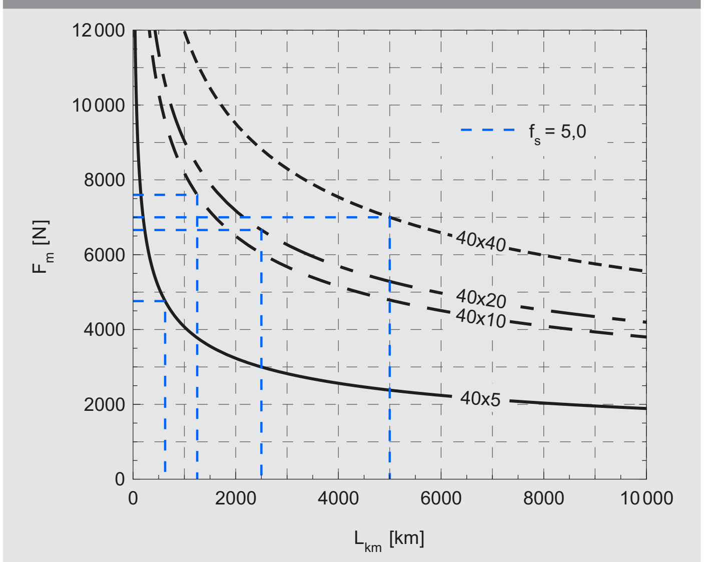

### PNCE 63




### PNCE 80

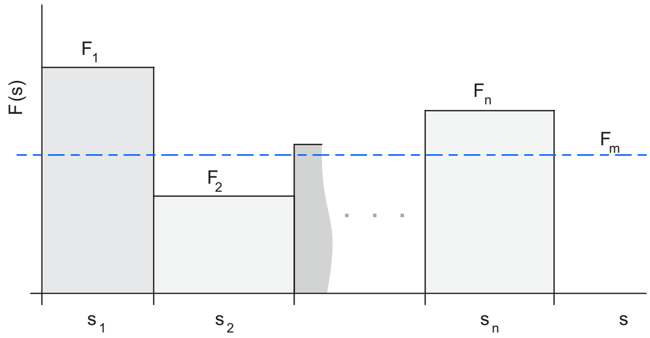



### PNCE 100



## Mean axial load $F_m$ calculation

$$F_m = \sqrt[3]{\frac{|F_1|^3 \times s_1 + |F_2|^3 \times s_2 + \ldots + |F_n|^3 \times s_n}{s_1 + s_2 + \ldots + s_n}}$$

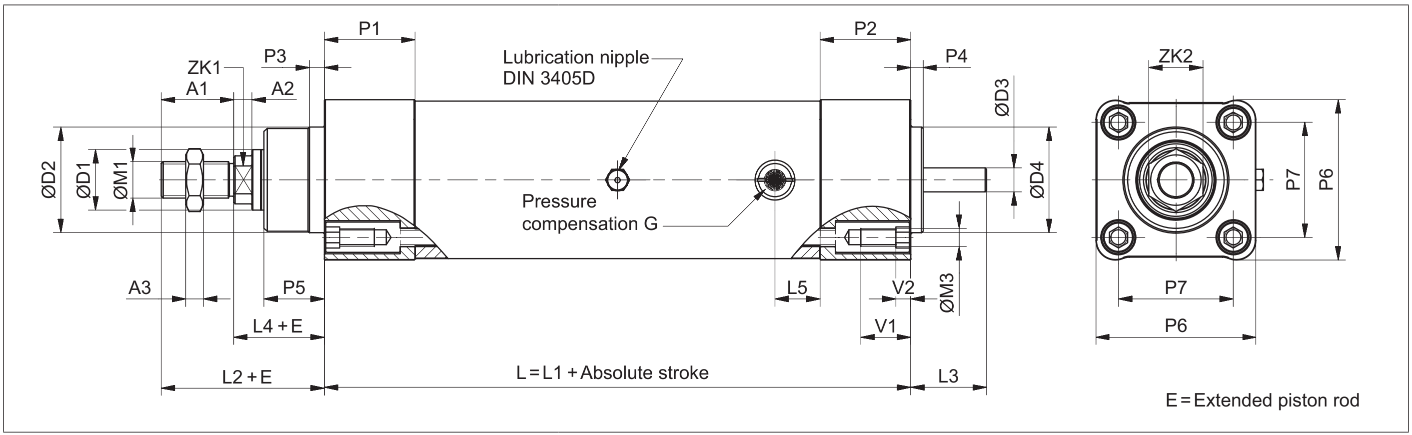



| | | |
|---|---|---|
| **$F_m$** | Mean axial load | [N] |
| **$F_i$** | i-th axial load of a given loading regime F(s), i∈{1,2,...,n} | [N] |
| **$s_i$** | i-th travel path of a given loading regime F(s), i∈{1,2,...,n} | [mm] |

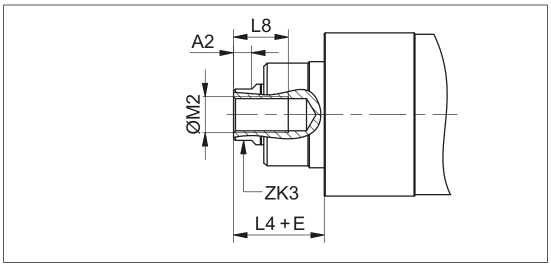
Diagrams presented on the page 15 are showing the theoretically determined service life of the ball screw drive when the mean axial load $F_m$ at room temperature is taken into consideration.

It should be noted that application conditions may have a significant effect on the service life.

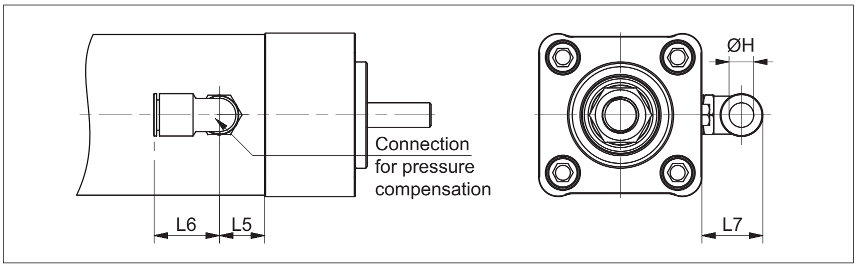
# DIMENSIONS




## Female thread




## IP65, IP65CR, FI

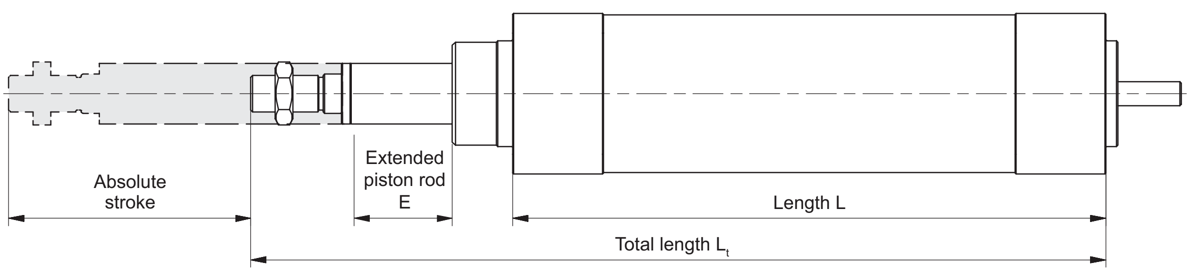



| PNCE | L1 (+0,2 / -1,4) | L2 | L3 | L4 (+1,9 / -0,8) | L5 | L6 | L7 | L8 | P1 | P2 | P3 | P4 (±0,1) | P5 (±0,1) | P6 | P7 | G |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | [mm] | | | | | | | | | | | | | | | |
| **32** | 136 | 48 | 21 | 26 | 15 | 22,5 | 20,0 | 15 | 30 | 30 | 5 | 4 | 18 | 47 | 32,5 | G 1/8 |
| **40** | 144 | 54 | 25 | 30 | 15 | 22,5 | 20,0 | 18 | 30 | 30 | 5 | 4 | 20 | 54 | 38 | G 1/8 |
| **50** | 180 | 69 | 32 | 37 | 15 | 22,5 | 20,0 | 25 | 36 | 37 | 5 | 4 | 25 | 65 | 46,5 | G 1/8 |
| **63** | 171 | 69 | 38 | 37 | 15 | 22,5 | 20,0 | 25 | 38 | 38 | 5 | 4 | 25 | 75 | 56,5 | G 1/8 |
| **80** | 204 | 86 | 40 | 46 | 15 | 22,5 | 20,0 | 30 | 40 | 40 | 18 | 14 | 31 | 93 | 72 | G 1/8 |
| **100** | 224 [239] | 91 | 50 | 51 | 25 | 28,5 | 28,0 | 30 | 42 | 42 | 20 | 18 | 34 | 110 | 89 | G 3/8 |

| PNCE | ØD1 (f8) | ØD2 (d11) | ØD3 (h7) | ØD4 (g7) | ØM1 | ØM2 | ØM3 | ØH | A1 | A2 | A3 | ZK1 | ZK2 | ZK3 | V1 | V2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | [mm] | | | | | | | | | | | | | | | |
| **32** | 18 | 30 | 6 | 30 | M10×1,25 | | M6 | 8 | 22 | 5 | 5 | 10 | 17 | 16 | 16 | 4,5 |
| **40** | 20 | 35 | 8 | 35 | M12×1,25 | | M6 | 8 | 24 | 6 | 6 | 13 | 19 | 17 | 16 | 4,5 |
| **50** | 25 | 40 | 11 | 40 | M16×1,5 | | M8 | 8 | 32 | 8 | 8 | 17 | 24 | 22 | 18 | 4,5 |
| **63** | 30 | 45 | 15 | 45 | M16×1,5 | | M8 | 8 | 32 | 8 | 8 | 17 | 24 | 27 | 18 | 4,5 |
| **80** | 40 | 60 | 18 | 60 | M20×1,5 | M12 | M10 | 8 | 40 | 8 | 10 | 22 | 30 | 32 | 17 | / |
| **100** | 50 | 70 | 25 | 70 | M20×1,5 | M12 | M10 | 12 | 40 | 6 | 10 | 22 | 30 | 40 | 17 | / |

Bracketed values for ball screw 40x40

## Absolute stroke and length of the PNCE definition




**Absolute stroke = Effective stroke + 2 × Safety stroke**

**L = L1 + Absolute stroke**

**$L_t$ = L + L2 + E** **$E_{max}$ = 200 mm**

**Female thread:** **$E_{max}$ = 200 mm**
**$L_t$ = L + L4 + E**

The electric cylinder does not include any safety stroke

| | | |
|---|---|---|
| **E** | Extended piston rod | [mm] |