

PNCE
ELECTRIC CYLINDERS WITH A BALLSCREW DRIVE

CHARACTERISTICS

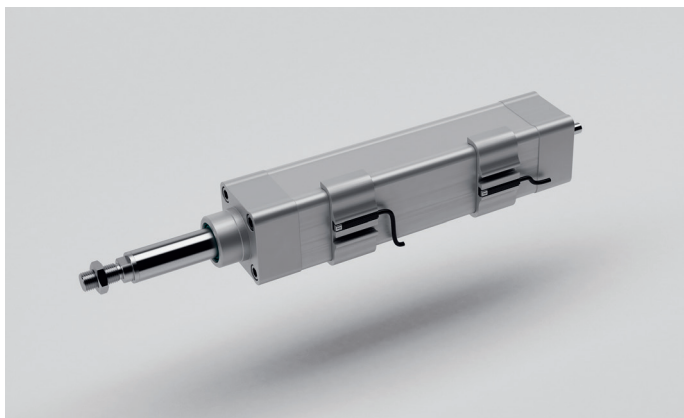
The PNCE are electric cylinders with a precision ball screw drive. The electric cylinder is based on the standard ISO 15552. Its outer design and dimensions are very similar to pneumatic cylinders. High performance features such as, high speeds, good positioning accuracy and high repeatability are ensured 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 additionally equipped with switches and ISO standard accessories.

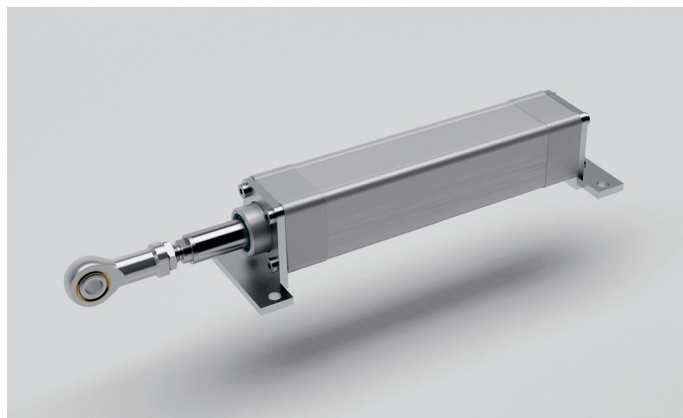
The excellent sealing of the components in the cylinder ensures an IP65 protection class and protects the interior of the cylinder from dust, water and other contaminants. Version IP65CR also offers a high corrosion resistance in harsh environments.



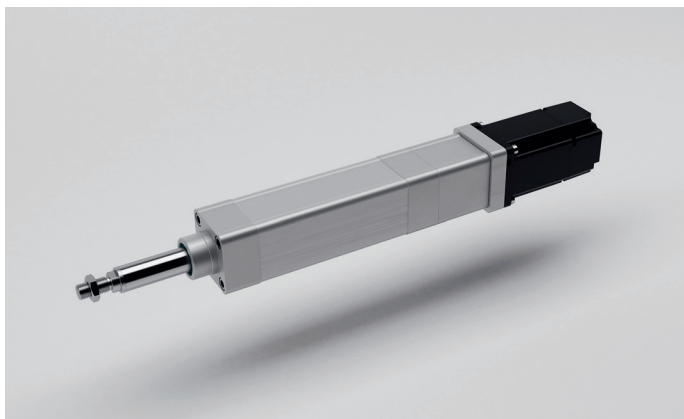
The aluminium profiles are manufactured according to the medium EN 12020-2 standard



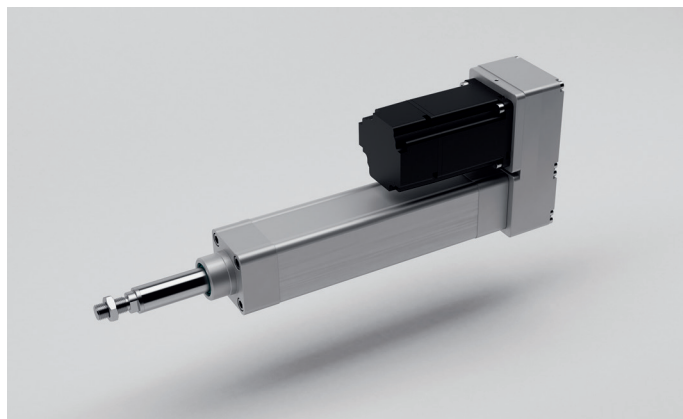
Sensor holder



ISO standard accessories



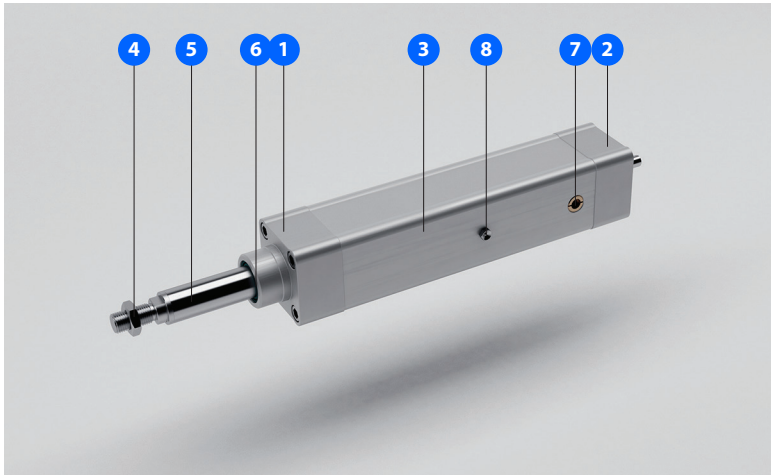
Motor adapter with coupling (IP65)



Motor side drive (IP65)

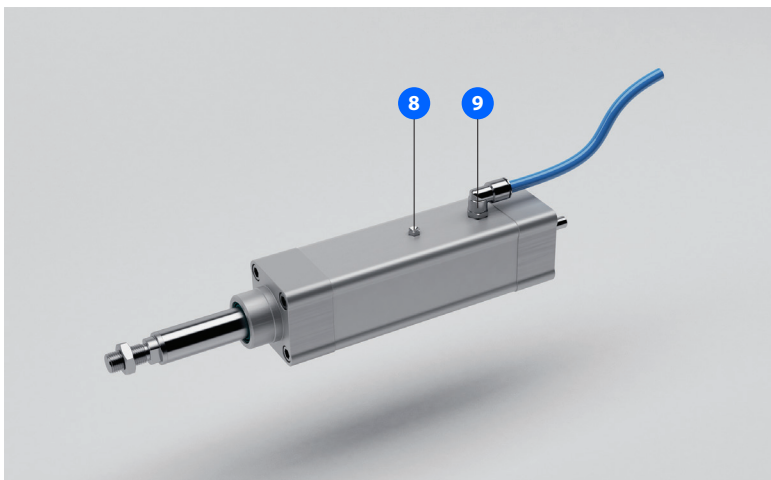
STRUCTURAL DESIGN

• 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 occurrence 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.

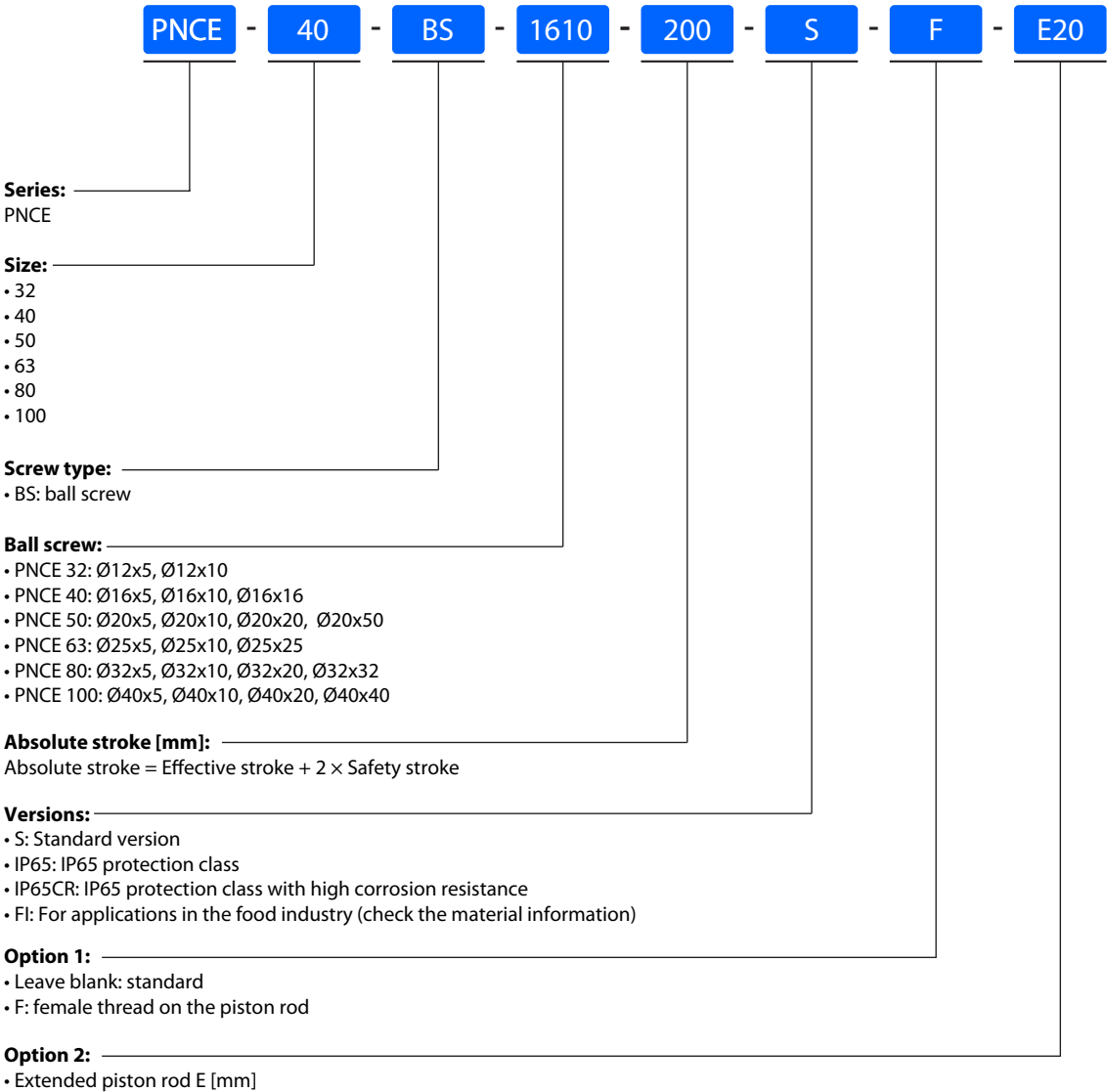
• For applications in the food industry (FI)



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.

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HOW TO ORDER



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/s ²]
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	3000	0,40	50			
	20×50	13000	1560		2,5		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	32×5	18850	18850	16,7	0,18	2150	0,65	60	1500	< 0,02	20
	32×10	37000	25000	44,2	0,50	3000	0,70	60			
	32×20	22950	17160	60,7	1,00		0,75	70			
	32×32	15500	10725	60,7	1,60		0,90	70			
100	40×5	23800	23800	21,0	0,18	2200	1,40	45	1500	< 0,02	20
	40×10	38000	29000	51,3	0,37		1,55	55			
	40×20	33300	29000	102,6	0,73		1,70	65			
	40×40	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.

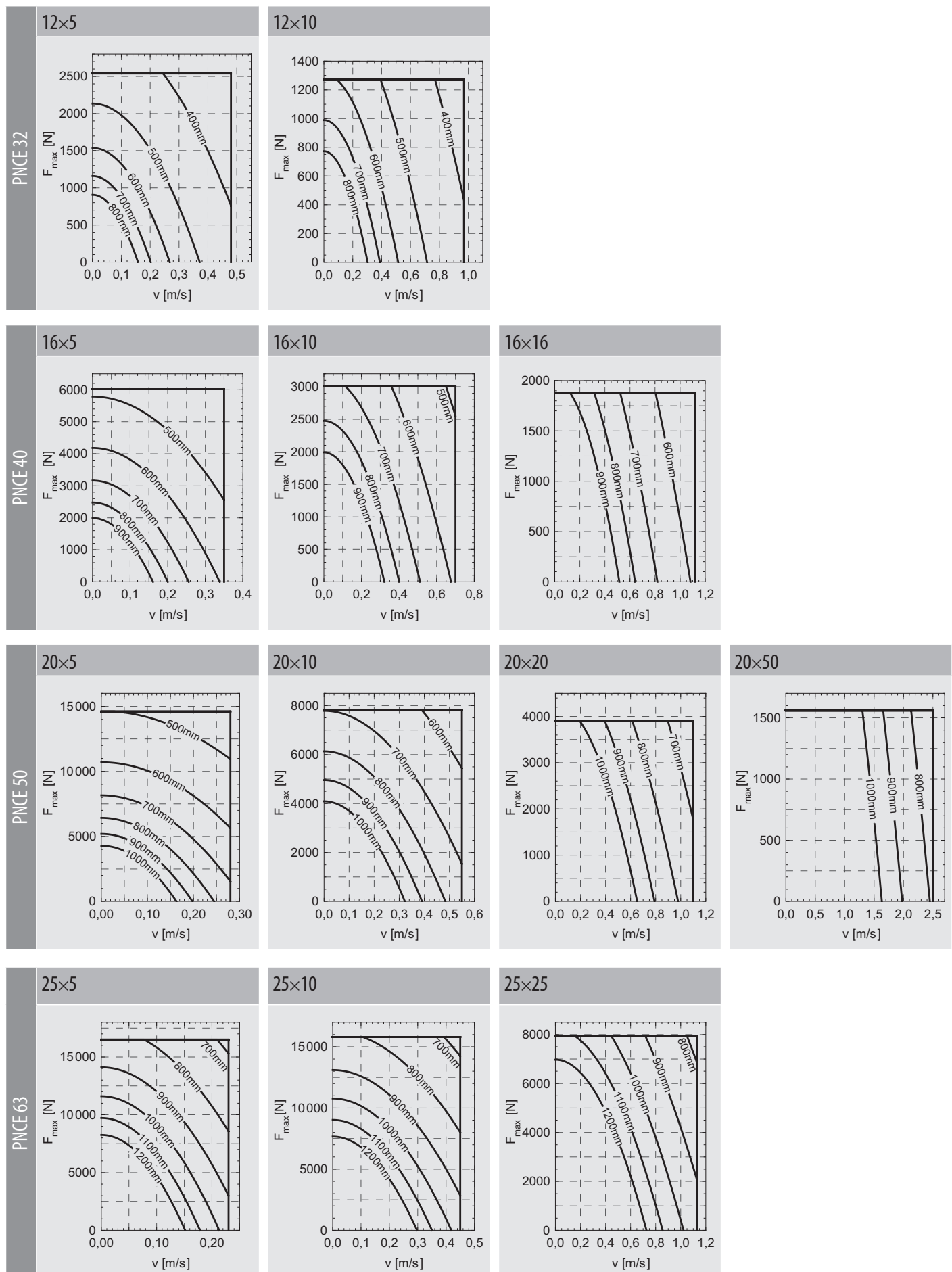
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Mass and mass moment of inertia

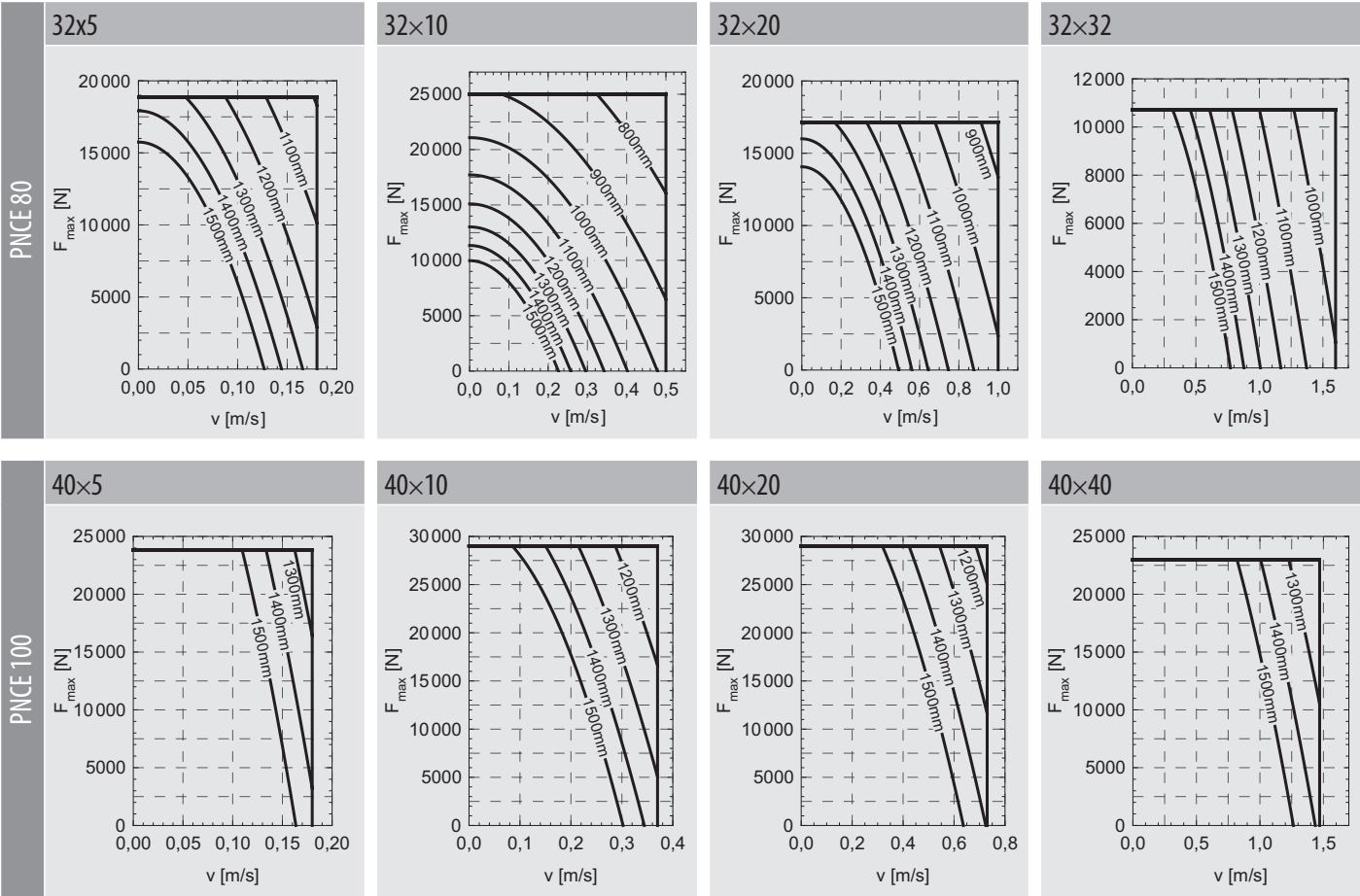
PNCE	Ball screw	Moved mass *	Mass of the electric cylinder	Mass moment of inertia
	d×l [mm]	m _m [kg]	m _{PNCE} [kg]	J _{PNCE} [10 ⁻⁶ kg m²]
32	12×5	0,32 + 0,0010 × (Absolute stroke + E)	1,10 + 0,0043 × Absolute stroke + 0,0010 × E	2,15 + 0,0128 × Absolute stroke + 0,0006 × E + 0,6333 × m _{load}
	12×10			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	32×5	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}
	32×10			122,23 + 0,6567 × Absolute stroke + 0,0071 × E + 2,5330 × m _{load}
	32×20			138,60 + 0,6781 × Absolute stroke + 0,0285 × E + 10,1321 × m _{load}
	32×32			172,65 + 0,7227 × Absolute stroke + 0,0731 × E + 25,9382 × m _{load}
100	40×5	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}
	40×10			348,27 + 1,6701 × Absolute stroke + 0,0118 × E + 2,5330 × m _{load}
	40×20			372,67 + 1,7056 × Absolute stroke + 0,0473 × E + 10,1321 × m _{load}
	40×40	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]

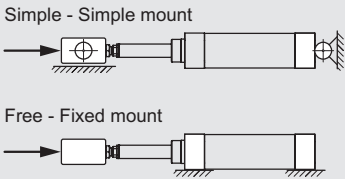
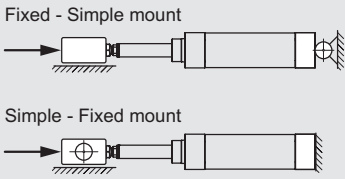
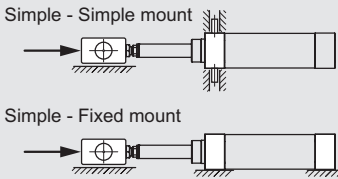
Maximum axial loading as a function of the travel speed for different values of absolute stroke**($F_{\max}$ - v curves)**

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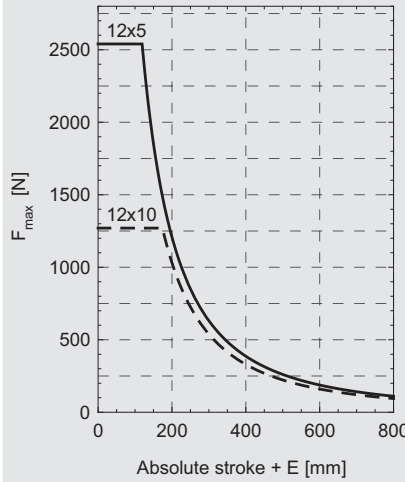
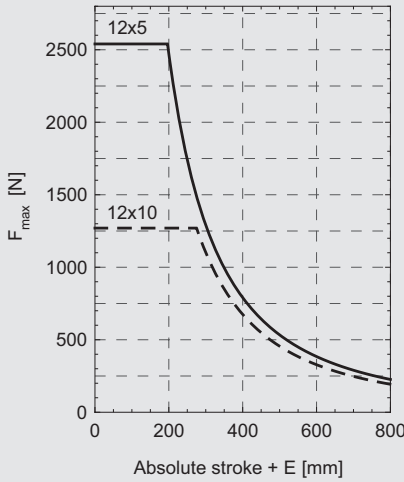
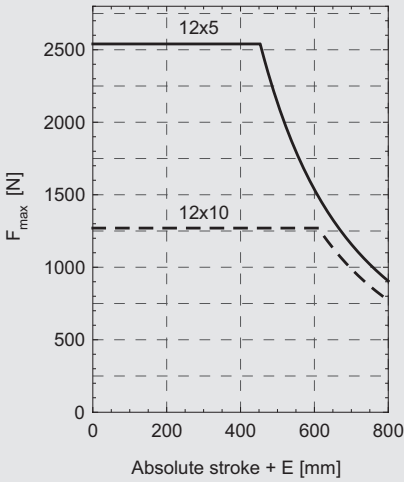


Maximum axial loading as a function of the absolute stroke (F_{max} - absolute stroke curves)

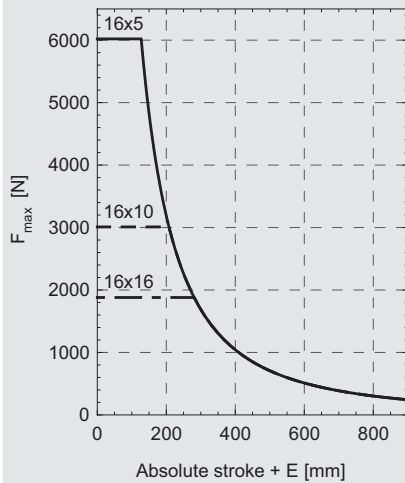
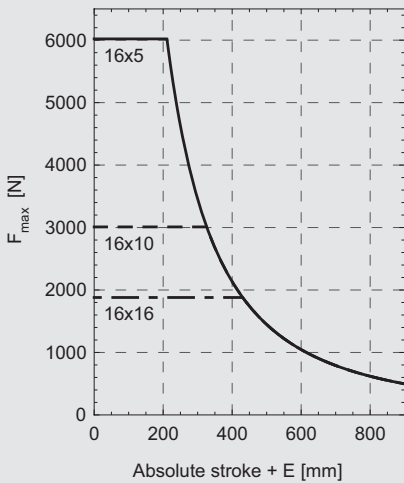
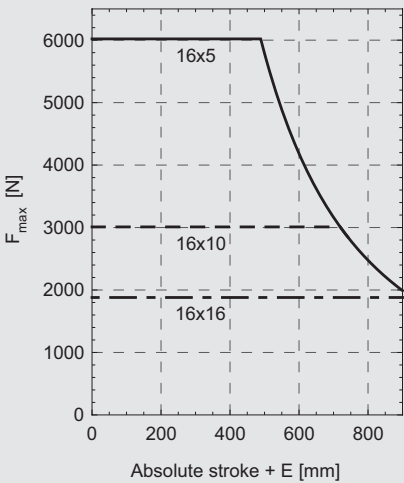
Schematically presented mounting cases



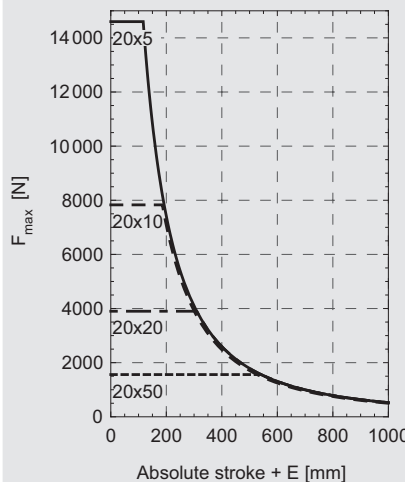
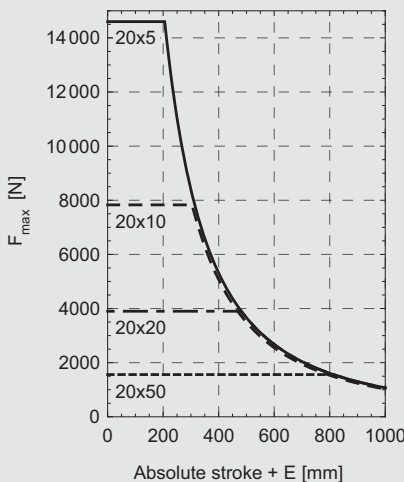
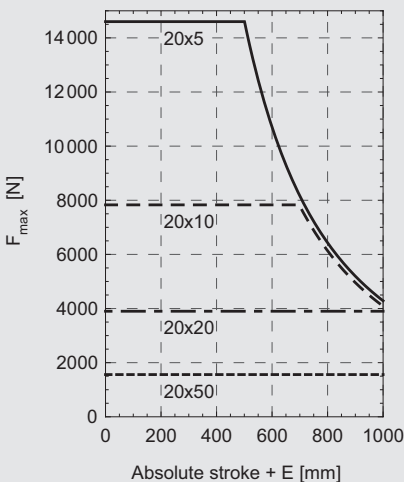
PNCE 32



PNCE 40



PNCE 50

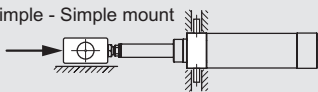


E Extended piston rod [mm]

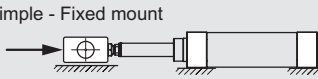
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Schematically presented mounting cases

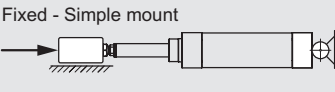
Simple - Simple mount



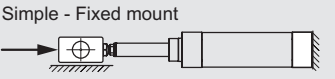
Simple - Fixed mount



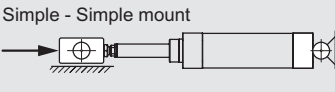
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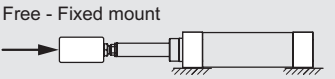
Simple - Fixed mount



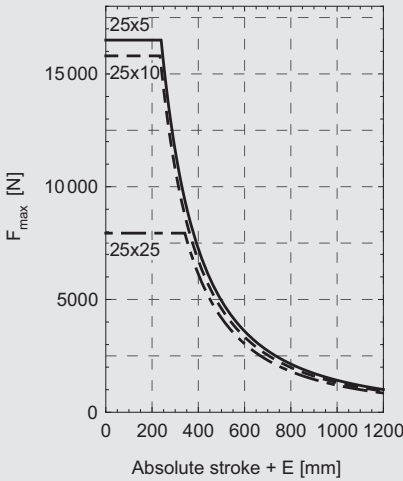
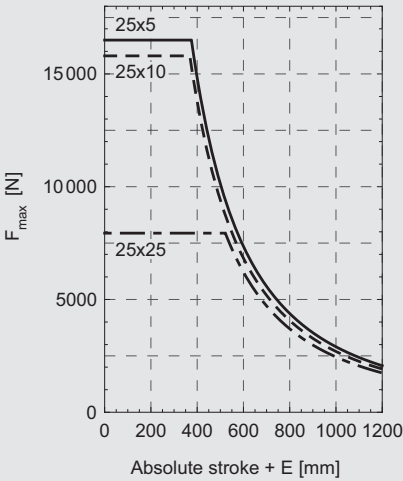
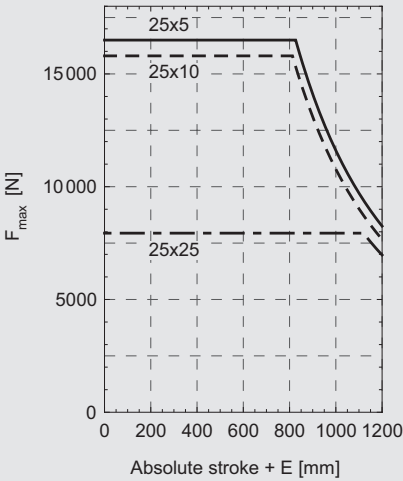
Simple - Simple mount



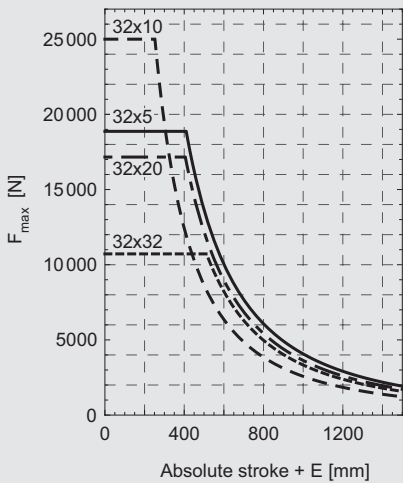
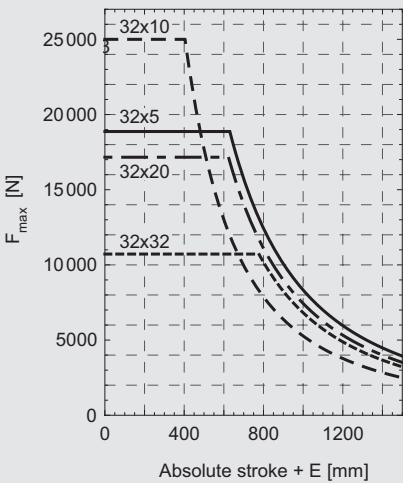
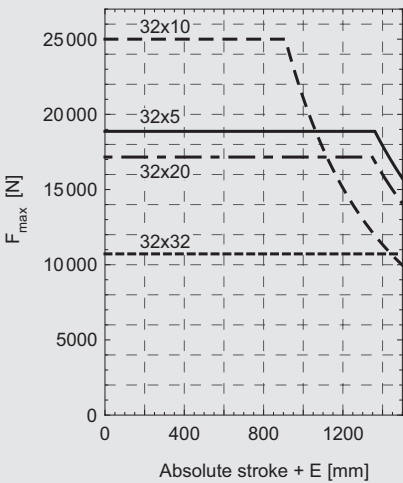
Free - Fixed mount



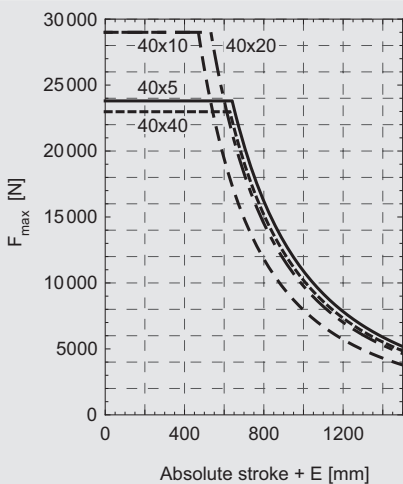
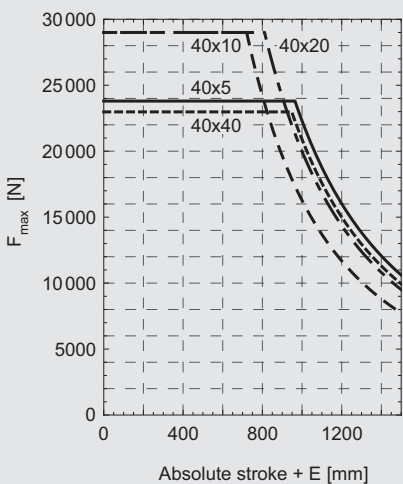
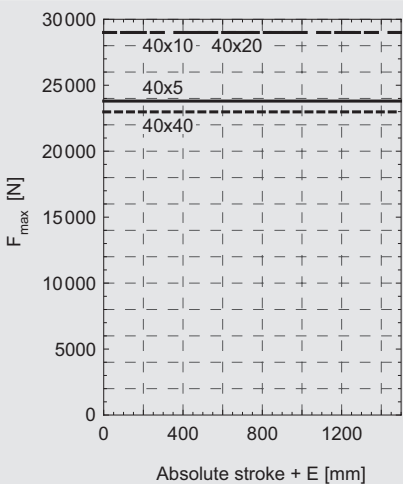
PNCE 63



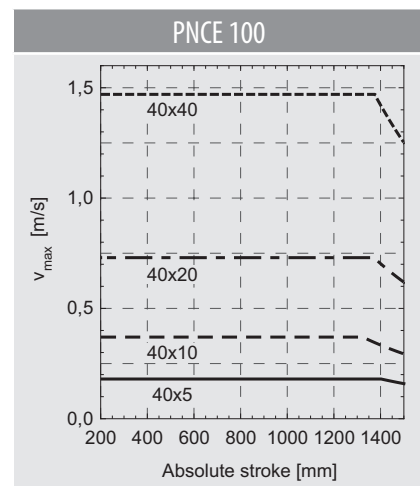
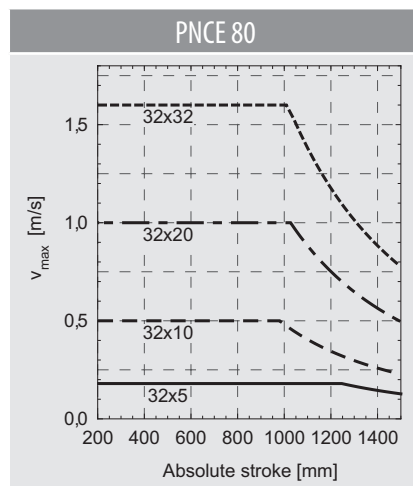
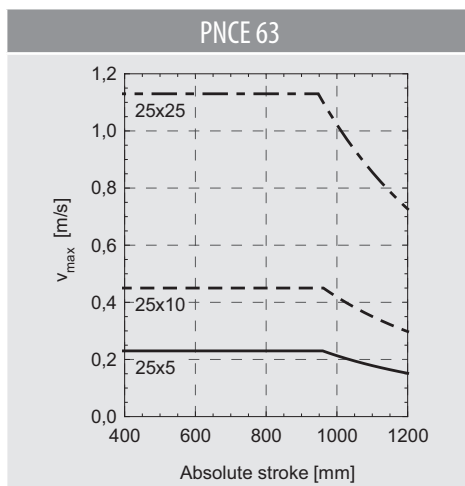
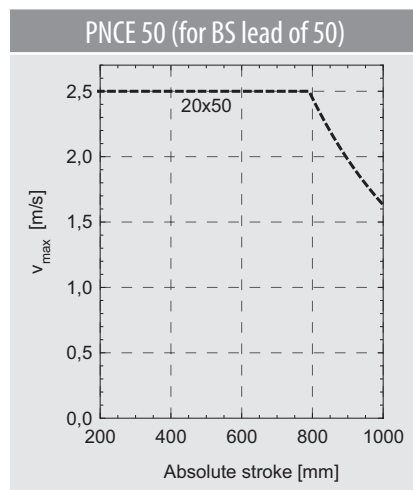
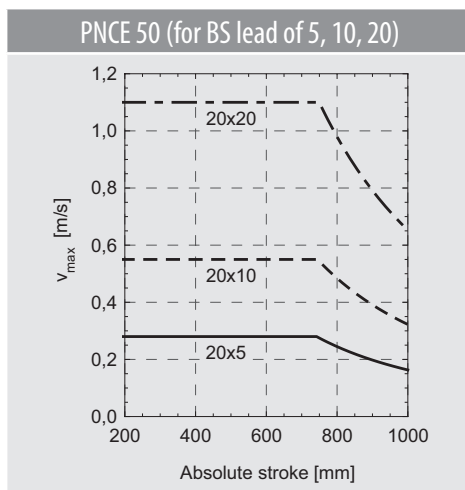
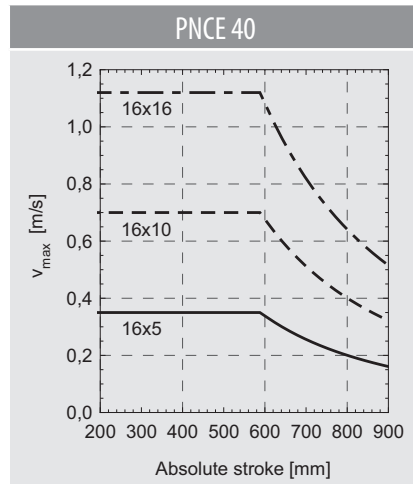
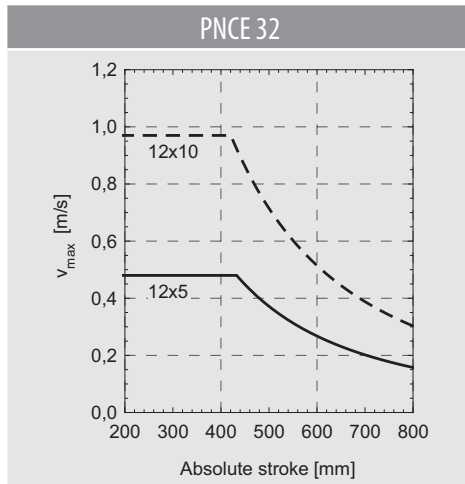
PNCE 80



PNCE 100



E Extended piston rod [mm]

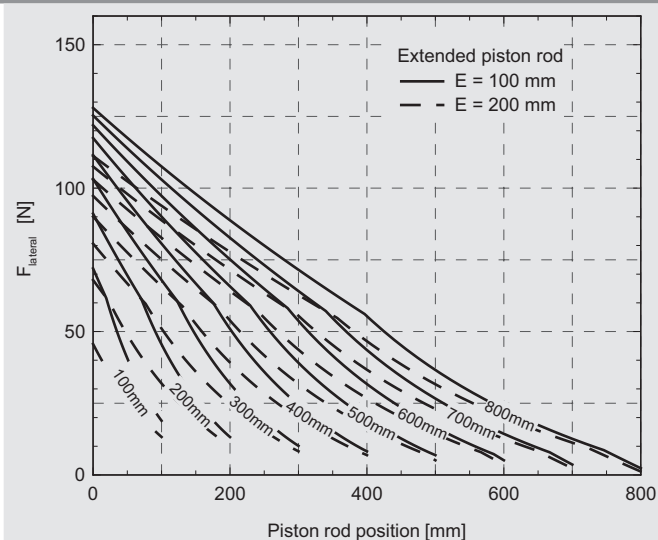
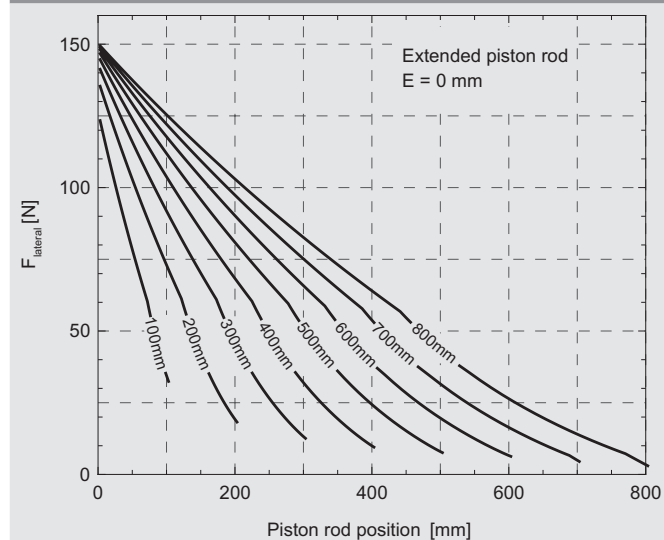
Maximum travel speed as a function of the absolute stroke ($v_{\max}$ - absolute stroke curves)

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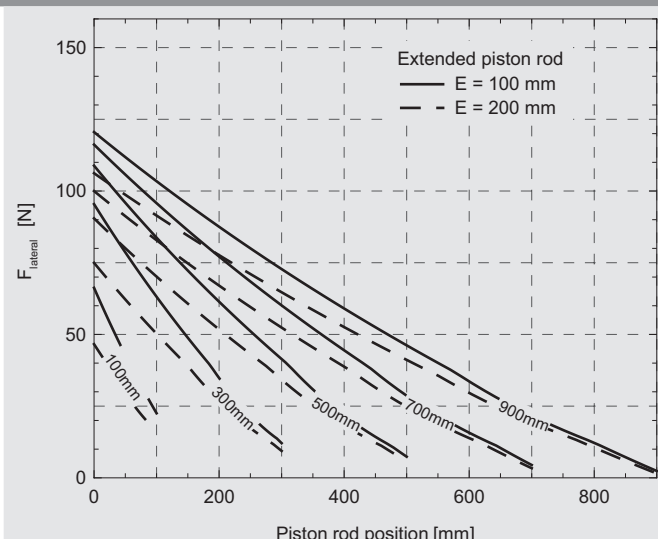
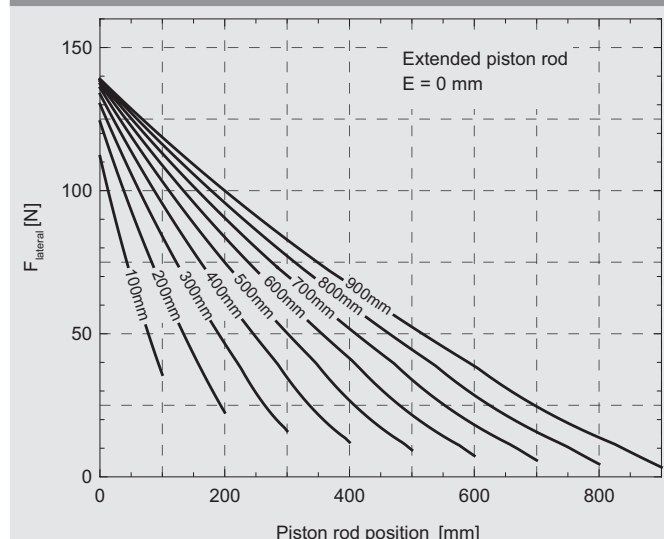
Maximum lateral loading as a function of the piston rod position for different values of the absolute stroke

(F_{lateral} - piston rod position curves)

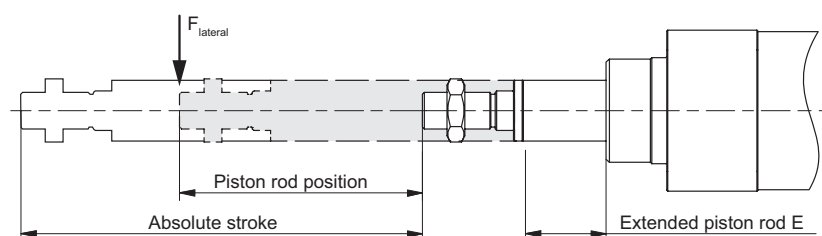
PNCE 32



PNCE 40

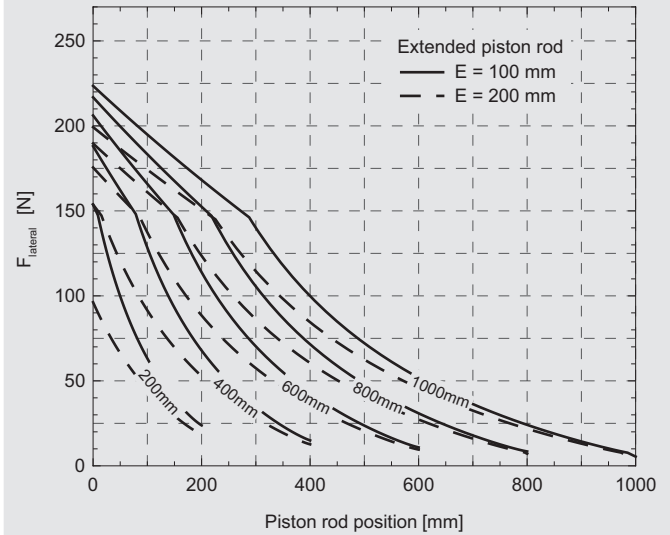
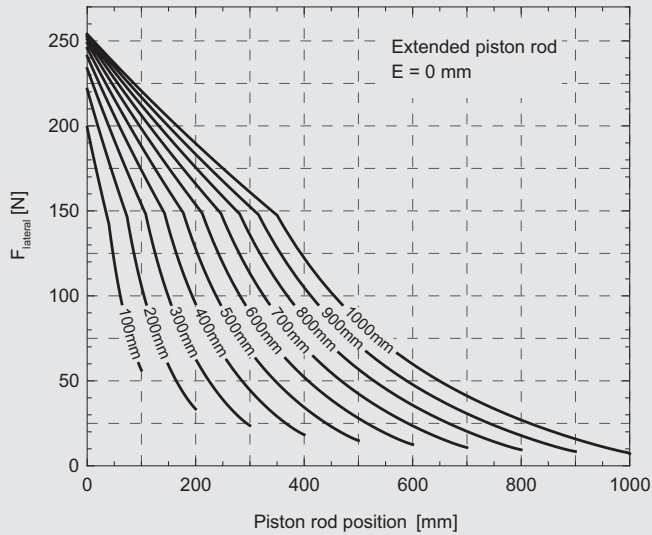


Values on the curves represent the absolute stroke

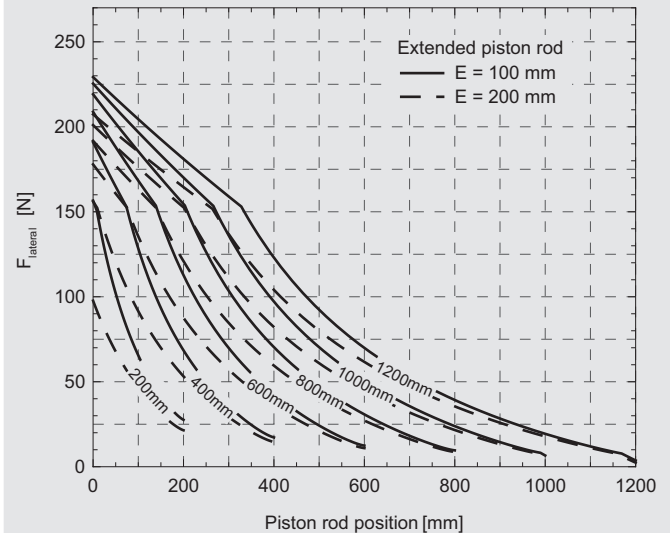
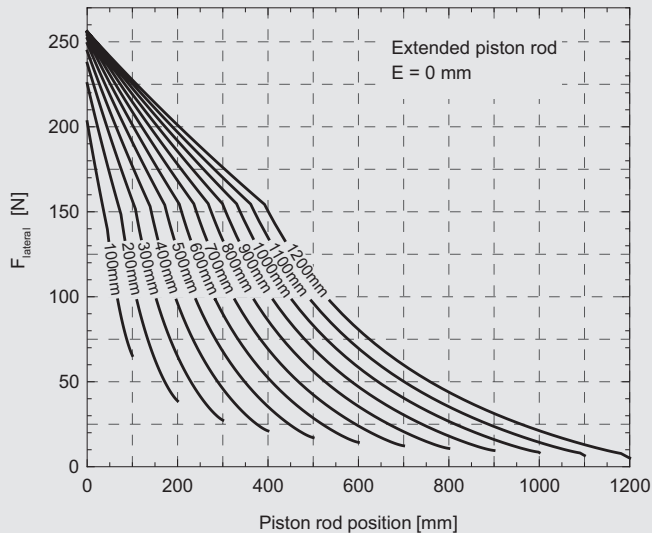


Diagrams taking into consideration
a travel speed of 0,5 m/s and an axial load of $F_{\text{max}}/4$.

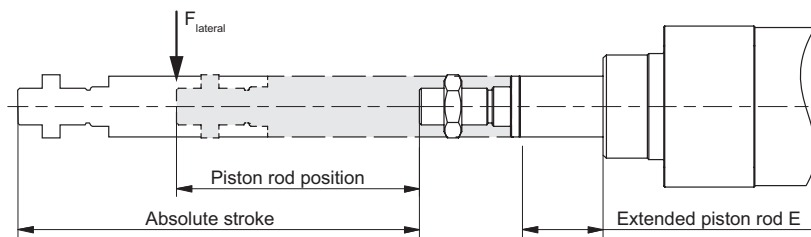
PNCE 50



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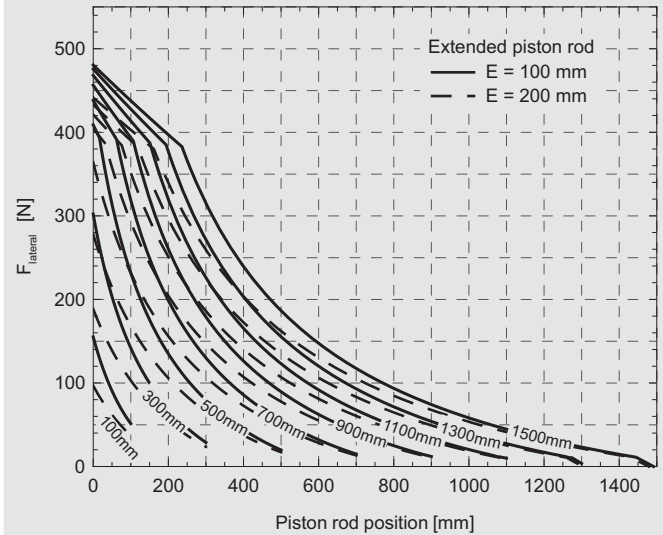
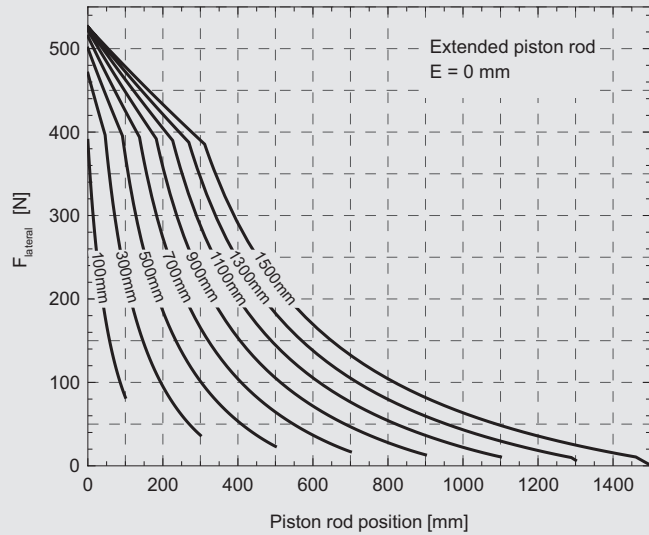
Values on the curves represent the absolute stroke



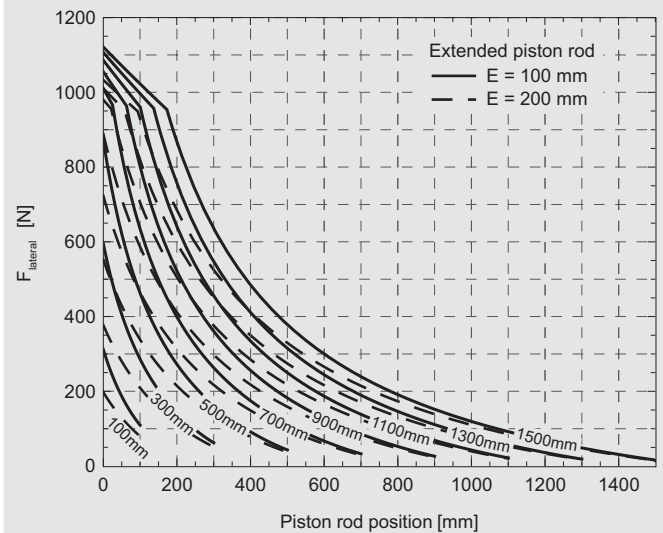
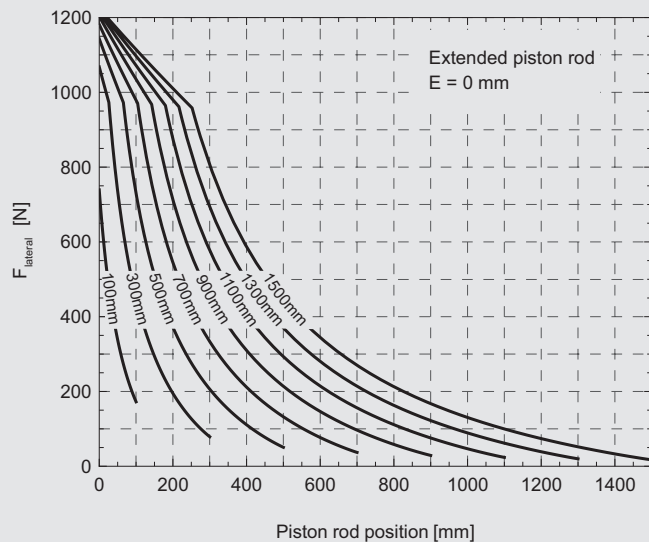
Diagrams taking into consideration
a travel speed of 0,5 m/s and an axial load of $F_{\text{max}}/4$.

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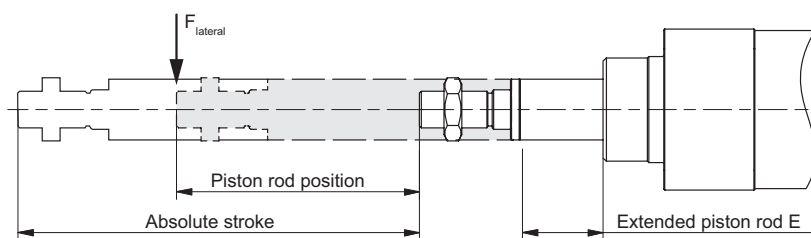
PNCE 80



PNCE 100



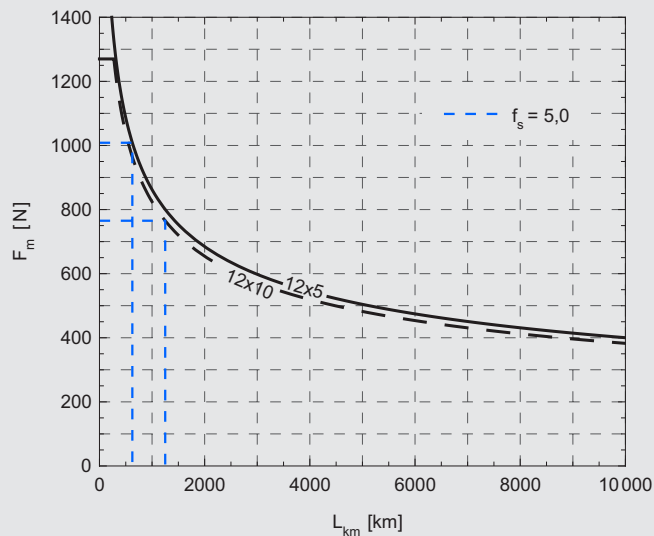
Values on the curves represent the absolute stroke



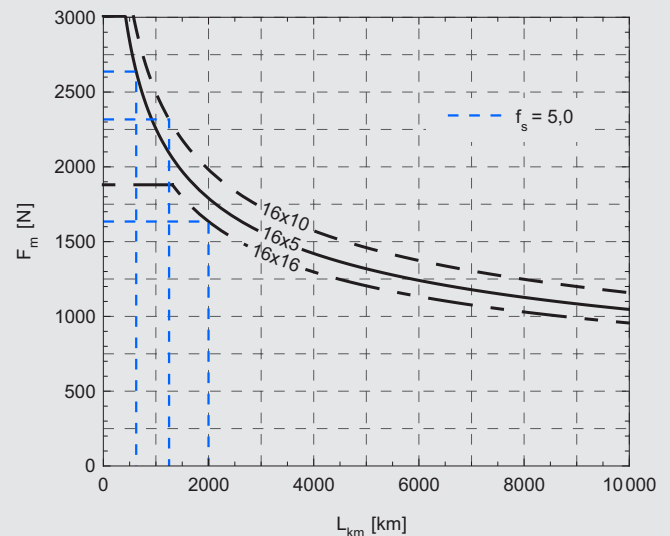
Diagrams taking into consideration
a travel speed of 0,5 m/s and an axial load of $F_{\text{max}}/4$.

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

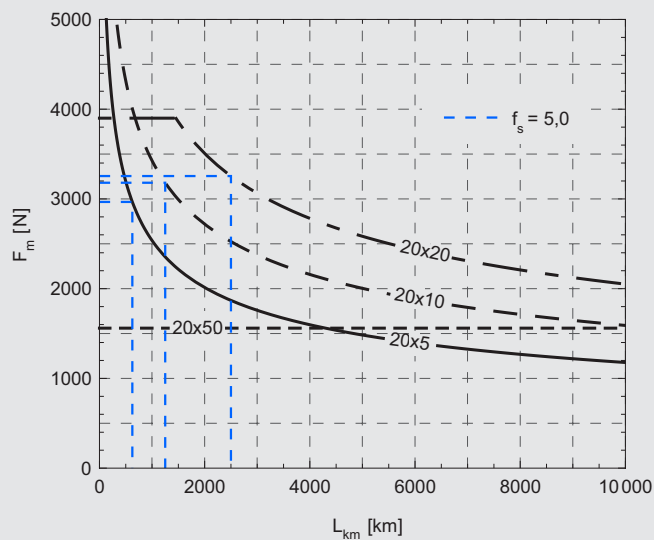
PNCE 32



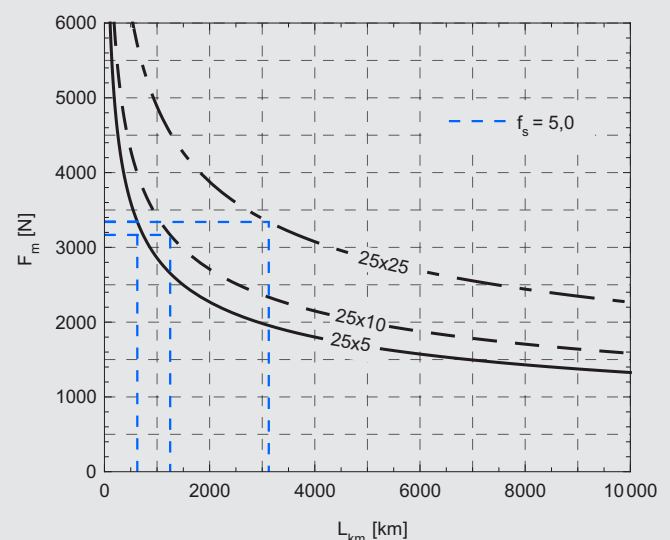
PNCE 40



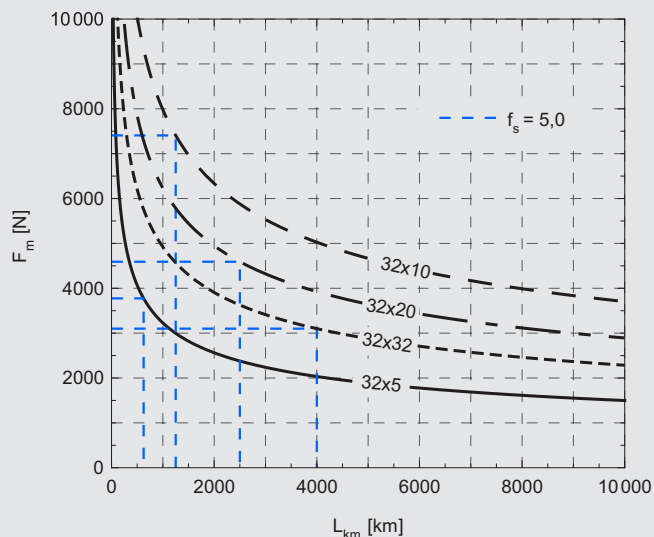
PNCE 50



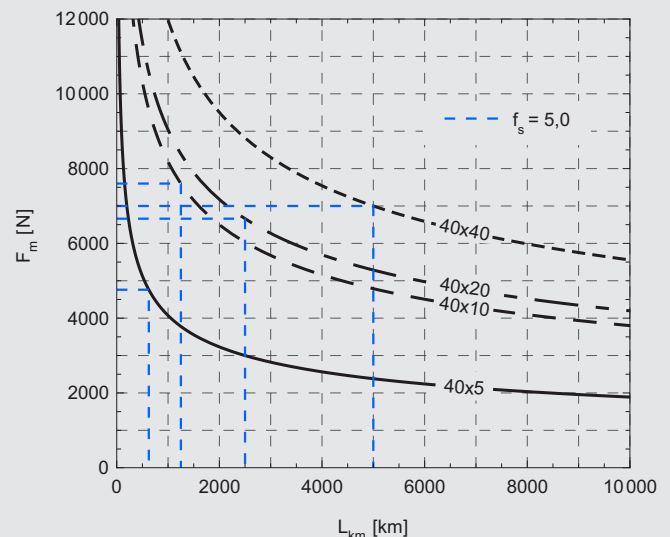
PNCE 63



PNCE 80



PNCE 100



PNCE
ELECTRIC CYLINDERS WITH A BALLSCREW DRIVE

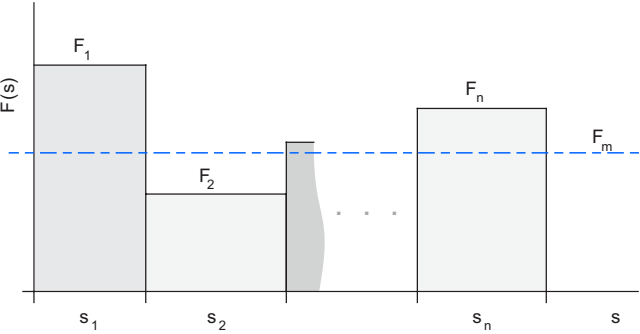
Mean axial load **F_m** calculation

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

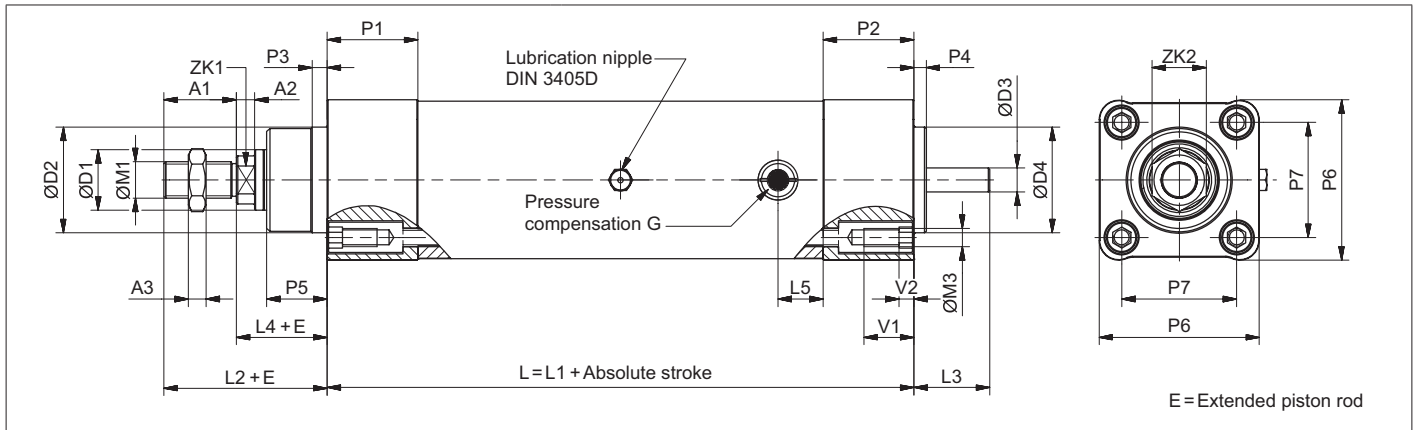
F_m	Mean axial load	[N]
F_i	i-th axial load of a given loading regime F(s), i∈{1,2,...,n}	[N]
s_i	i-th travel path of a given loading regime F(s), i∈{1,2,...,n}	[mm]

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.

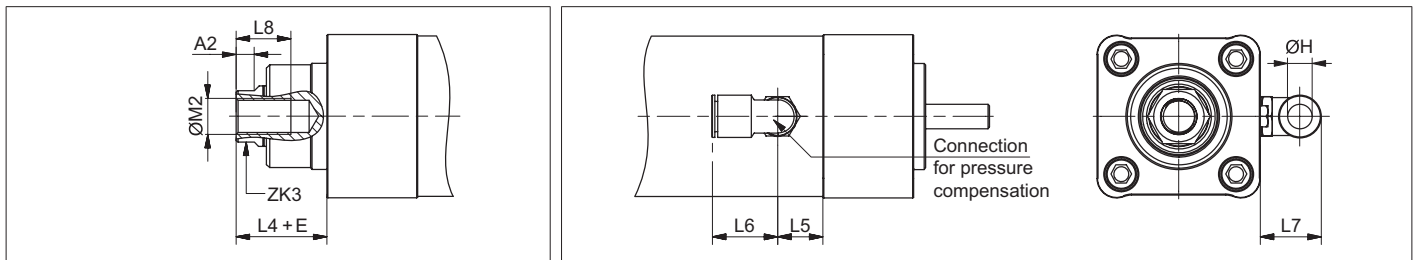


DIMENSIONS



Female thread

IP65, IP65CR, FI

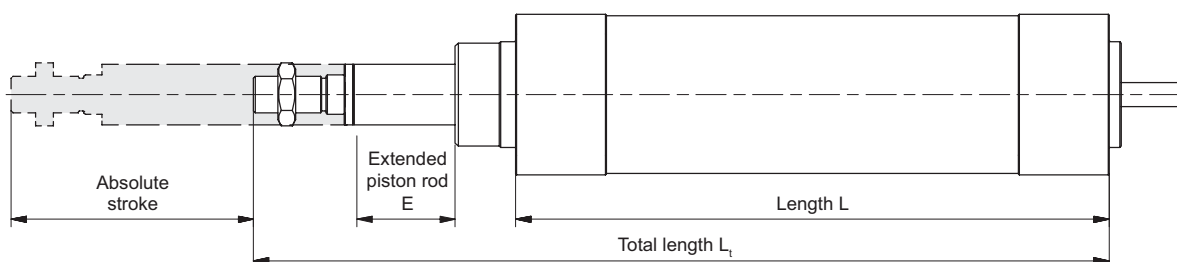


PNCE	L1 (+0,2 / -1,4)	L2	L3	L4 (+1,9 / -0,8)	L5	L6	L7	L8	P1	P2	P3	P4 (±0,1)	P5 (±0,1)	P6	P7	G
Size	[mm]															
32	136	48	21	26	15	22,5	20,0	15	30	30	5	4	18	47	32,5	G 1/8
40	144	54	25	30	15	22,5	20,0	18	30	30	5	4	20	54	38	G 1/8
50	180	69	32	37	15	22,5	20,0	25	36	37	5	4	25	65	46,5	G 1/8
63	171	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**

The electric cylinder does not include any safety stroke

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

Extended piston rod

[mm]