

Technical Information TI-P12 SITEMA PowerStroke

Mold closing devices of FSKP series

- Powerful forces on a short stroke
- Working force of up to 3 metric tons
- Pneumatic actuation



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1 Function

The PowerStroke FSKP series clamps a rod and presses the attached machine part in one direction. The direction of this power stroke is usually the closing direction of the mold. The working force of the PowerStroke is proportional to the pressure applied.

The FSKP series is pneumatically operated.

Also observe the *Assembly Instructions MA-P12*.

2 Purpose

The PowerStroke FSKP is typically used in the following areas:

- Closing of molds
- Forming
- Die cutting
- Riveting
- Bending
- Metal forming
- Crushing
- Embossing
- Fixing

The PowerStroke is not a safety component. It must not be used to secure a load, for example.

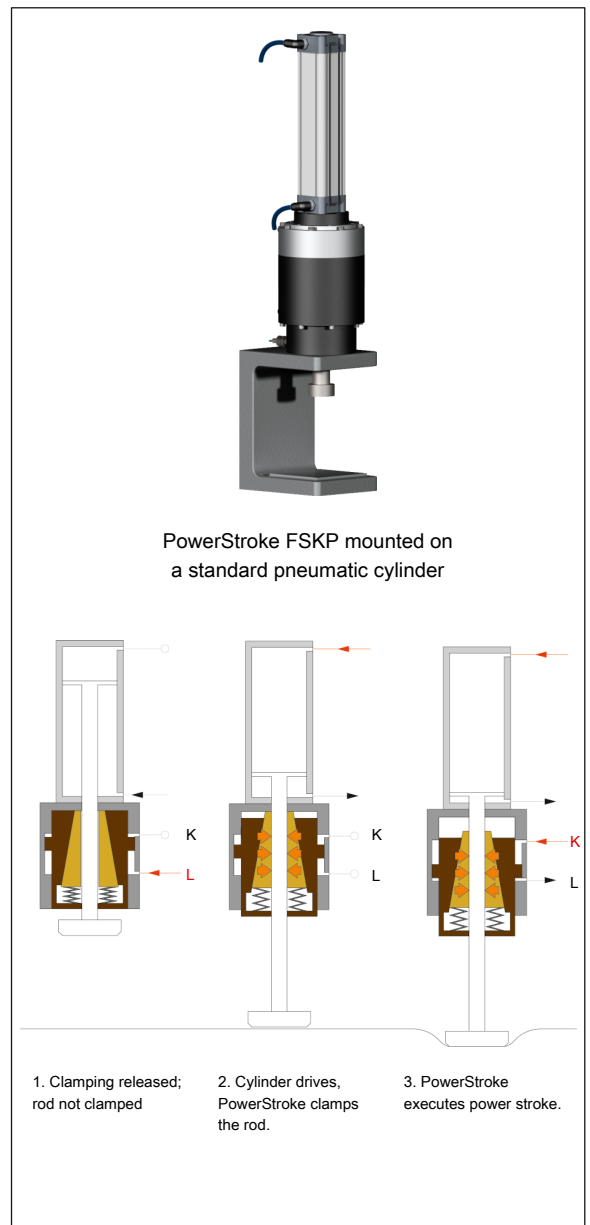


Fig. 1: Example: PowerStroke FSKP mounted on a pneumatic cylinder

3 Styles of FSKP series

Style	Rod diameter	Remarks
FSKP S	16/20/25	S – solo: for use with separate clamping rod
FSKP Z		Z - cylinder: for use with a standard pneumatic cylinder according to ISO 15552. Z styles usually need an extended, hardened piston rod.
FSKP-SVEF		SVEF – rod leaves unit: horizontal, fixed installation, no alignment compensation at PowerStroke
FSKP-SVEL		SVEL – rod leaves unit: vertical, loose installation (radially floating), with alignment compensation at PowerStroke

4 Function description

4.1 Direction of the power stroke

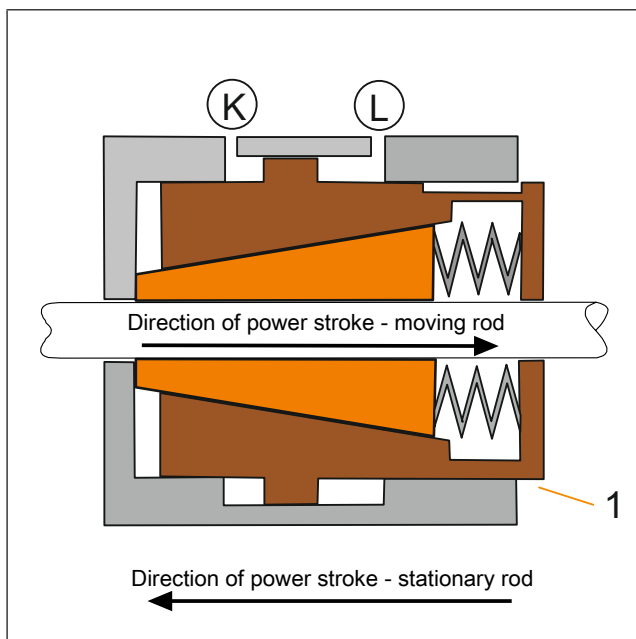


Fig. 2: Direction of the power stroke

The direction of the power stroke depends on how the PowerStroke is mounted on the machine.

Attachment to stationary machine part - rod is moving

If the PowerStroke is mounted on a stationary machine part, the rod is moving. In this case the power stroke pushes in the direction of the extending side (1).

Attachment to moving machine part - rod is stationary

If the PowerStroke is mounted on a moving machine part, the rod is stationary. In this case the power stroke pushes in the opposite direction of the extending side (1).

4.2 Releasing the clamping

In the following example the PowerStroke FSKP is mounted on a stationary machine element. The rod can move. The direction of the power stroke is displayed accordingly.

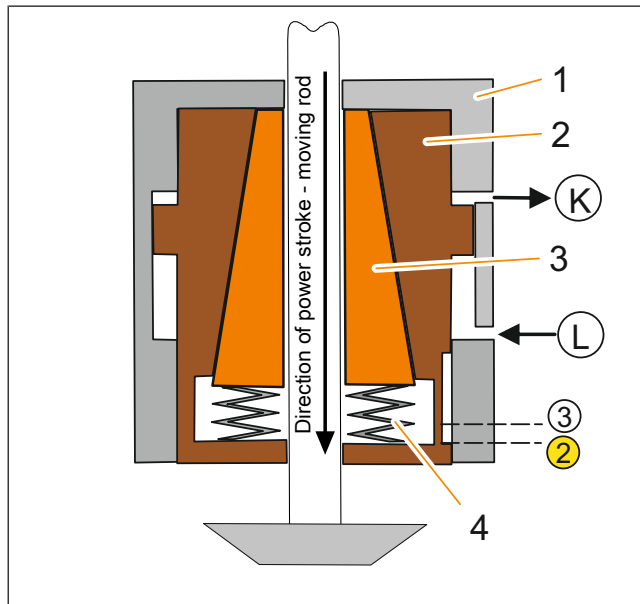


Fig. 3: Design of PowerStroke (clamping released)

The clamping system consists of the clamping sleeve (3) and the clamping ring (2) which are braced against each other by springs (4). The clamping ring is mounted movable within the housing (1) and can be moved pneumatically via the pressure ports L and K.

If the required minimum operating pressure is applied at pressure port L (pressure port K is not pressurized), the clamping ring moves into the opposite direction of the power stroke until it reaches the stop and opens the clamping system (see Fig. 3).

Proximity switch 2 is active: signal "clamping released".

4.3 Clamping the rod

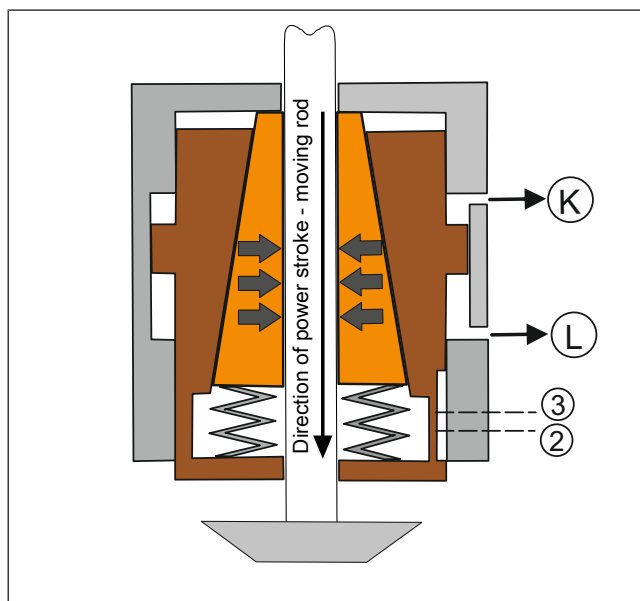


Fig. 4: Rod clamped

If pressure port L is depressurized, the PowerStroke clamps the rod. The unit is ready for the power stroke.

Proximity switch 2 is no longer active.

4.4 Executing the power stroke

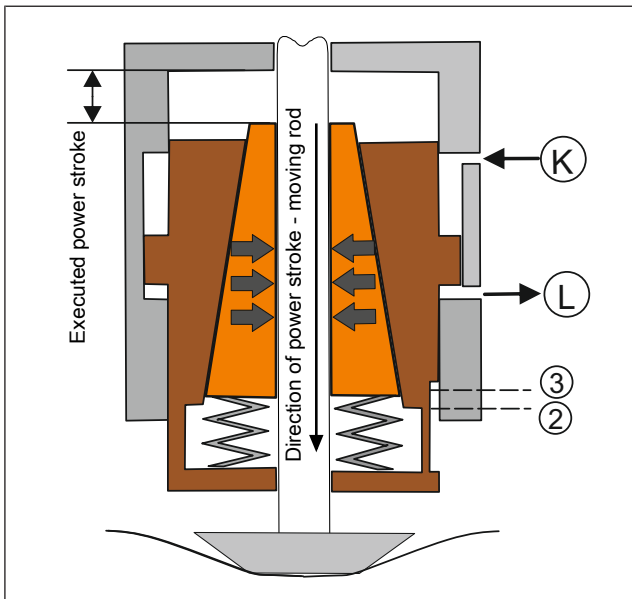


Fig. 5: Situation at the end of the power stroke

If the rod is clamped, pressure can be applied to pressure port K. The clamping force increases in a self-intensifying manner. The rod moves into the direction of the power stroke.

The power stroke ends when the force is reached which corresponds to the working pressure.

As with any pneumatic cylinder, the working force is proportional to the pressure applied. It is adjusted with the working pressure.

Stroke limit

If the PowerStroke travels the complete closing stroke and reaches the internal stop, proximity switch 3 sends the signal "stroke limit reached". This signal should not be displayed during normal operation. The proximity switches permanently monitor the proper functioning of the PowerStroke.

Releasing the clamping after power stroke

To release the clamping after a power stroke, port K is depressurized. Then pressure is applied to port L. The rod moves back the distance of the previously executed closing stroke. The clamping of the rod is released.

5 Requirements of the clamping rod

The PowerStroke only works correctly if it is used together with a clamping rod which fulfills all requirements mentioned here:

Requirement	Diameter	Value
ISO tolerance zone	all	f7 or h6
Induction hardened	all	min. HRC 56
Surface hardening depth	ø to 30 mm ø over 30 mm	min. 1 mm min. 1.5 mm
Surface roughness	all	Rz = 1 to 4 µm (Ra 0.15 to 0.3 µm)
Protection from corrosion	all	e.g. hard chromium plating: 20 ± 10 µm 800 - 1000 HV
FSKP: lead-in chamfer rounded	ø 18 to 25 mm	min. 4 x 30°
FSKP-SVEF/SVEL: lead-in chamfer rounded	ø 16 to 20 mm ø 25 mm	min. 6 x 10° min. 8 x 10°

Table 1: Requirements for the clamping rod

Make sure the base material of the rod is of adequate strength. In the case of compression-loaded rods, the buckling resistance must be observed.

i Manufacturers of piston rods for cylinders or rods for linear ball bearings usually offer suitable clamping rods.

The rod may not be lubricated with grease.

5.1 Hints about the rod for Z styles

An extended piston rod is usually required for Z styles for mounting on a standard cylinder. This piston rod must be hardened.

5.2 Hints about the rod for SVEF/SVEL styles

If the rod leaves the unit (styles SVEF and SVEL), observe the following:

- The rod may move into or out of the PowerStroke on the end with the centering ring only when the clamping system is released.
- To start pre-loading and clamping, the rod must be inserted by the minimum insertion depth. You find the minimum insertion depth for standard designs in the data sheet, for special designs in the dimensional drawing.
- While releasing the clamping, the rod may not be exposed to any traction or compressive forces. Take this into consideration when designing the primary drive actuation.

6 Pressurizing medium

The compressed air must be dried and filtered. SITEMA recommends compressed air according to ISO 8573-1.

7 Actuation

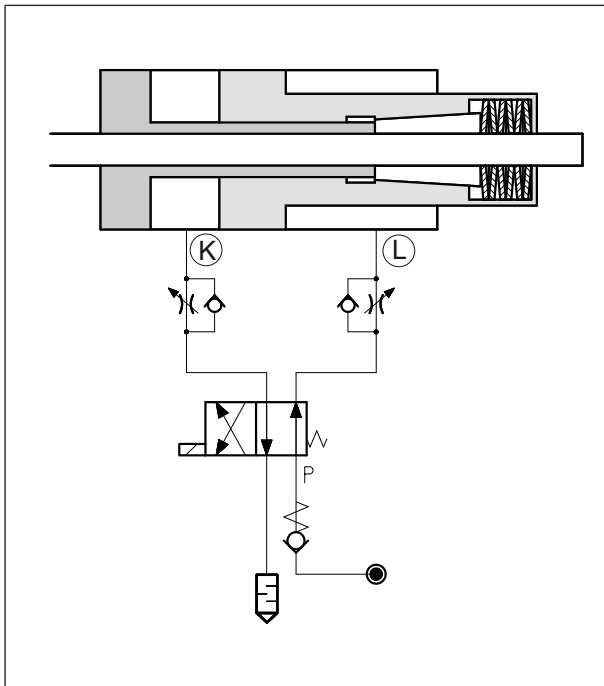


Fig. 6: Recommendation for pneumatic actuation

If you plan the pneumatic actuation, observe the displayed wiring diagram. It shows primarily the logical connections.

Additionally, the applicable safety regulations must be observed. The machinery manufacturer is responsible for adhering to the applicable regulations and also for carrying out the final check of all functions.

The PowerStroke may not be used to clamp the rod while the primary drive is moving it. This can create high dynamic braking forces. It may be necessary to take precautions against an unwanted pressure drop at port L.

While releasing the clamping, the rod may not be exposed to any traction or compressive forces. Take this into account when designing the actuation with the primary drive.

Hint for vertical applications

i *The primary drive must apply a force that can hold the weight of the rod and add-on parts (weight compensation) during the return stroke and release process. This prevents the rod from sinking after the clamping is released.*

The PowerStroke is not a safety component for securing vertical loads. For this purpose, SITEMA offers other specialized products.

Pressure port L: release clamping

Pressure port L must be pressurized with the minimum pressure when the rod is inserted and moving. This opens the clamping.

To carry out the power stroke, pressure port L must be depressurized. Then the clamping is ready for the power stroke.

Pressure port K: power stroke

When the rod is fully inserted and pressure port L is depressurized, pressure can be applied to pressure port K. By applying pressure to port K, the power stroke is carried out with the required working force.

i *Pressure ports L and K may never be pressurized at the same time.*

If a fast response time of the PowerStroke is required, the following conditions must be met:

- Short line distances
- Fast valve response times
- Suitable controller
- Installation of a dump valve

8 Status monitoring by proximity switches

Proximity switch 2 signals "clamping released". The signal is used to unlock the primary drive.

Proximity switch 3 signals "stroke limit reached"; this indicates that the maximum power stroke has been executed and the internal stop has been reached. The working force is not available in this case. For more information see Executing the power stroke.

9 Operating conditions

The immediate vicinity of the PowerStroke in its standard version must be dry and clean.

An environment with contamination such as grease, dirt, grinding dust or chips may require special protective measures. Liquids such as coolants, conservation agents and other liquids or chemicals inside the housing can reduce the holding force.

The machine manufacturer must take appropriate measures to ensure that contamination cannot enter the interior of the housing.

The rod may never be lubricated with grease as this reduces the clamping force.

The permitted surface temperature is 0 to 60 °C (32 to 140 °F).

In case of doubt, contact SITEMA.

10 CE marking

The PowerStroke is intended as a component (partly completed machinery) for installation in a machine or system and, as such, cannot be issued with the CE marking. The commissioner of the machine or system must provide information about the PowerStroke in the overall documentation and, if necessary, must obtain the CE marking of the overall machine or system.

Technical Data Sheet for style S PowerStroke FSKP style S

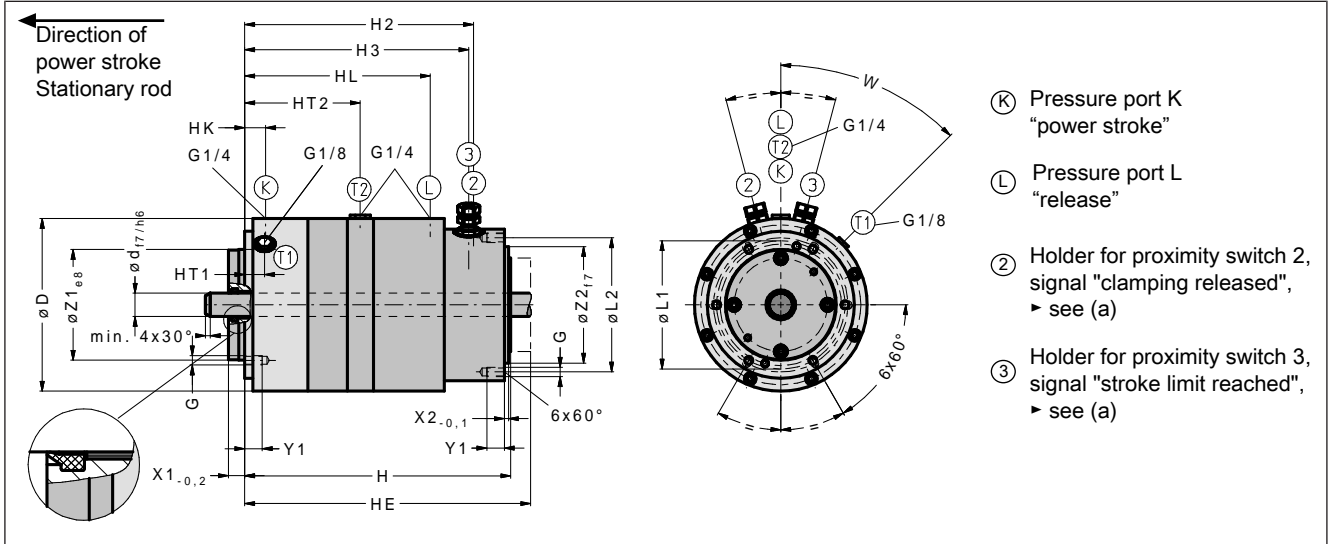


Fig. 7: Dimensions of PowerStroke FSKP style S for use with separate rod

Type		FSKP16-S	FSKP20-S	FSKP25-S	
ID no. (order number)		FSKP 016 01	FSKP 020 01	FSKP 025 01	
Working force at nominal pressure		kN	11.5	19	27.5
Working force at maximum working pressure		kN	12.4	20.5	29.7
Technical data					
d	Rod diameter	mm	16	20	25
D	External diameter	mm	126	148	177
H	Total length	mm	227	228	254
HE	Max. extended length	mm	244	245	271
	Power stroke	mm	12	12	12
	Weight approx.	kg	7.5	9.9	15.7
Pneumatics					
K	Nominal pressure for working force	bar	6	6	6
K, L	Max. working pressure/release pressure	bar	6.5	6.5	6.5
L	Min. release pressure	bar	5	5	5
K	Operating volume at complete stroke	cm ³	380	560	790
L	Operating volume at complete stroke	cm ³	120	180	240

Subject to modification without prior notice

(a) Proximity switch holders are provided for standard inductive proximity switches (M8 x 1, nominal switching distance 1.5 mm, flush mountable, NO (normally open)). For easier mounting, the proximity switch holders have a depth stop. They are preset to the correct depth. The proximity switches only need to be inserted to the stop and then clamped. The proximity switches are available as accessories.

Continued: PowerStroke FSKP style S

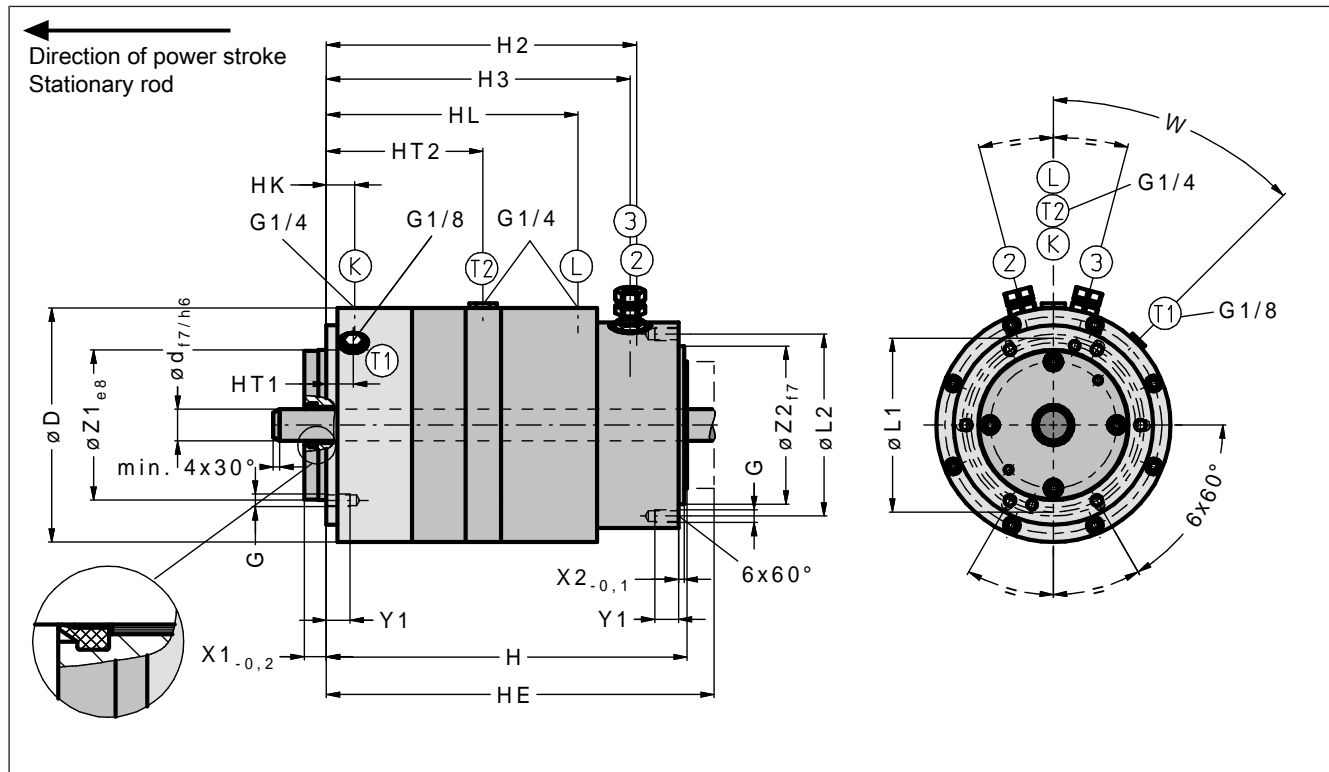


Fig. 8: Dimensions of PowerStroke FSKP style S

Type		FSKP16-S	FSKP20-S	FSKP25-S
ID no. (order number)		FSKP 016 01	FSKP 020 01	FSKP 025 01
Connection dimensions				
G		M6	M8	M8
H2	mm	195.5	196	214.5
H3	mm	191.5	192	210.5
HK	mm	18	18	21
HL	mm	160.5	159	171
HT1	mm	17	17	20
L1	mm	92	110	160
L2	mm	95	115	125
W	Degree	45	45	60
X1	mm	14	14	26.5
X2	mm	3	3.5	3.5
Y1	mm	12	15	18
Z1	mm	80	95	145
Z2	mm	85	100	110

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Technical Data Sheet for style Z PowerStroke FSKP style Z (for standard cylinder)

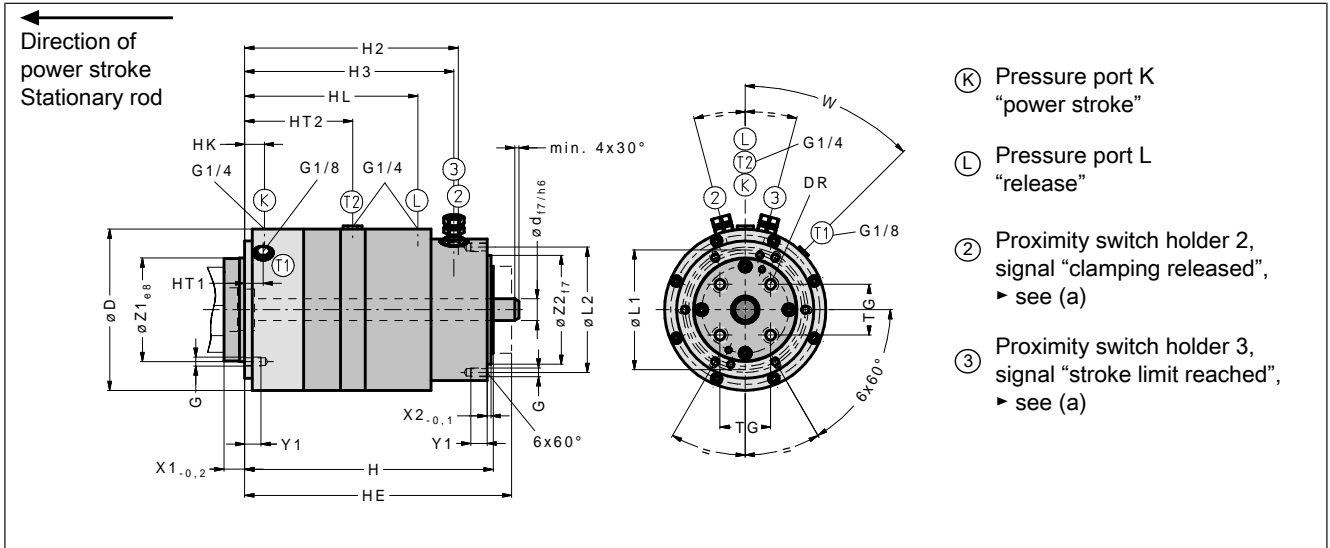


Fig. 9: Dimensions of PowerStroke FSKP style Z for use with standard cylinder ISO 15552

Type		FSKP16-Z	FSKP20-Z	FSKP25-Z	
ID no. (order number)		FSKP 016 11	FSKP 020 11	FSKP 025 11	
Working force at nominal pressure		kN	11.5	19	27.5
Working force at maximum working pressure		kN	12.4	20.5	29.7
Technical data					
d	Standard cylinder ISO 15552: \varnothing piston / \varnothing rod	mm	40 / 16	50 / 20	80 / 25
	Piston rod extension for standard cylinder ISO 15552	mm	225	225	250
D	External diameter	mm	126	148	177
H	Total length	mm	227	228	254
HE	Max. extended length	mm	244	245	271
	Power stroke	mm	12	12	12
	Weight approx.	kg	7.4	9.9	15.6
Pneumatics					
K	Nominal pressure for working force	bar	6	6	6
K/L	Max. working pressure/release pressure	bar	6.5	6.5	6.5
L	Min. release pressure	bar	5	5	5
K	Operating volume at complete stroke	cm ³	380	560	790
L	Operating volume at complete stroke	cm ³	120	180	240

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Continued: PowerStroke FSKP style Z

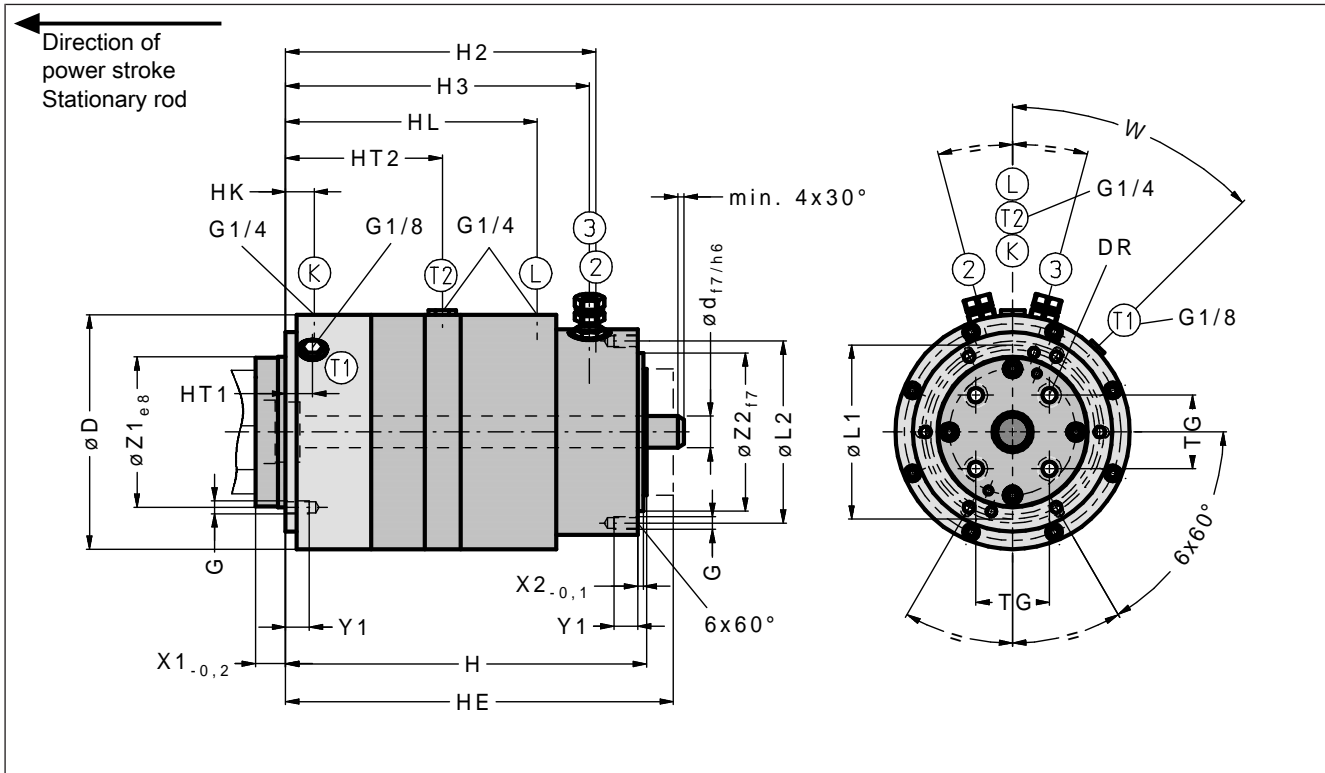


Fig. 10: Connection dimensions of PowerStroke FSKP style Z

Type		FSKP16-Z	FSKP20-Z	FSKP25-Z
ID no. (order number)		FSKP 016 11	FSKP 020 11	FSKP 025 11
Connection dimensions				
DR	mm	6.6	9	11
G		M6	M8	M8
H2	mm	195.5	196	214.5
H3	mm	191.5	192	210.5
HK	mm	18	18	21
HL	mm	160.5	159	171
HT1	mm	17	17	20
L1	mm	92	110	160
L2	mm	95	115	125
TG	mm	38	46.5	72
X1	mm	14	19	26.5
X2	mm	3	3.5	3.5
Y1	mm	12	15	18
Z1	mm	80	95	145
Z2	mm	85	100	110

Subject to modification without prior notice

Technical Data Sheet for style SVEF PowerStroke FSKP style SVEF (rod leaves unit)

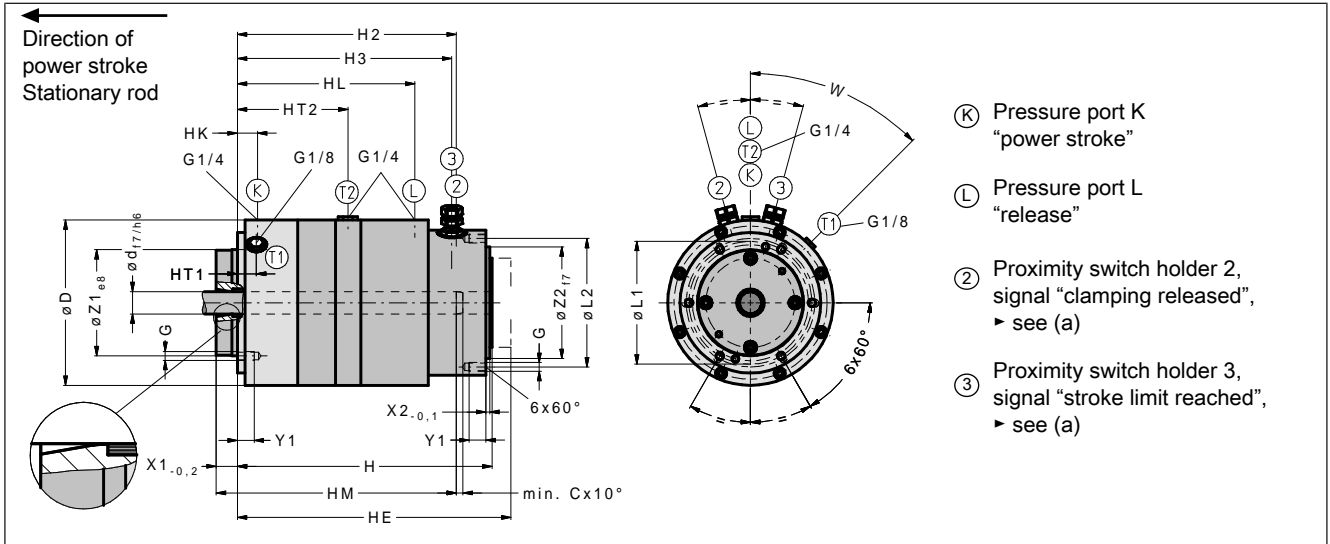


Fig. 11: Dimensions of PowerStroke FSKP style SVEF

Type		FSKP16-SVEF	FSKP20-SVEF	FSKP25-SVEF
ID no. (order number)		FSKP 016 02	FSKP 020 02	FSKP 025 02
Working force at nominal pressure		11.5	19	27.5
Working force at max. working pressure		12.4	20.5	29.7
Technical data				
d	Rod diameter	mm	16	20
C	Lead-in chamfer	mm	6	8
HM	Minimum insertion depth	mm	210	245
D	External diameter	mm	126	177
H	Total length	mm	227	254
HE	Max. extended length	mm	244	271
	Power stroke	mm	12	12
	Weight approx.	kg	8.0	18.4
Pneumatics				
K	Nominal pressure for working force	bar	6	6
K, L	Max. working pressure / release pressure	bar	6.5	6.5
L	Min. release pressure	bar	5	5
K	Operating volume at complete stroke	cm ³	380	790
L	Operating volume at complete stroke	cm ³	120	240

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(a) Proximity switch holders are provided for standard inductive proximity switches (M8 x 1, nominal switching distance 1.5 mm, flush mountable, NO (normally open)). For easier mounting, the proximity switch holders have a depth stop. They are preset to the correct depth. The proximity switches only need to be inserted to the stop and then clamped. The proximity switches are available as accessories.

Continued: PowerStroke FSKP style SVEF

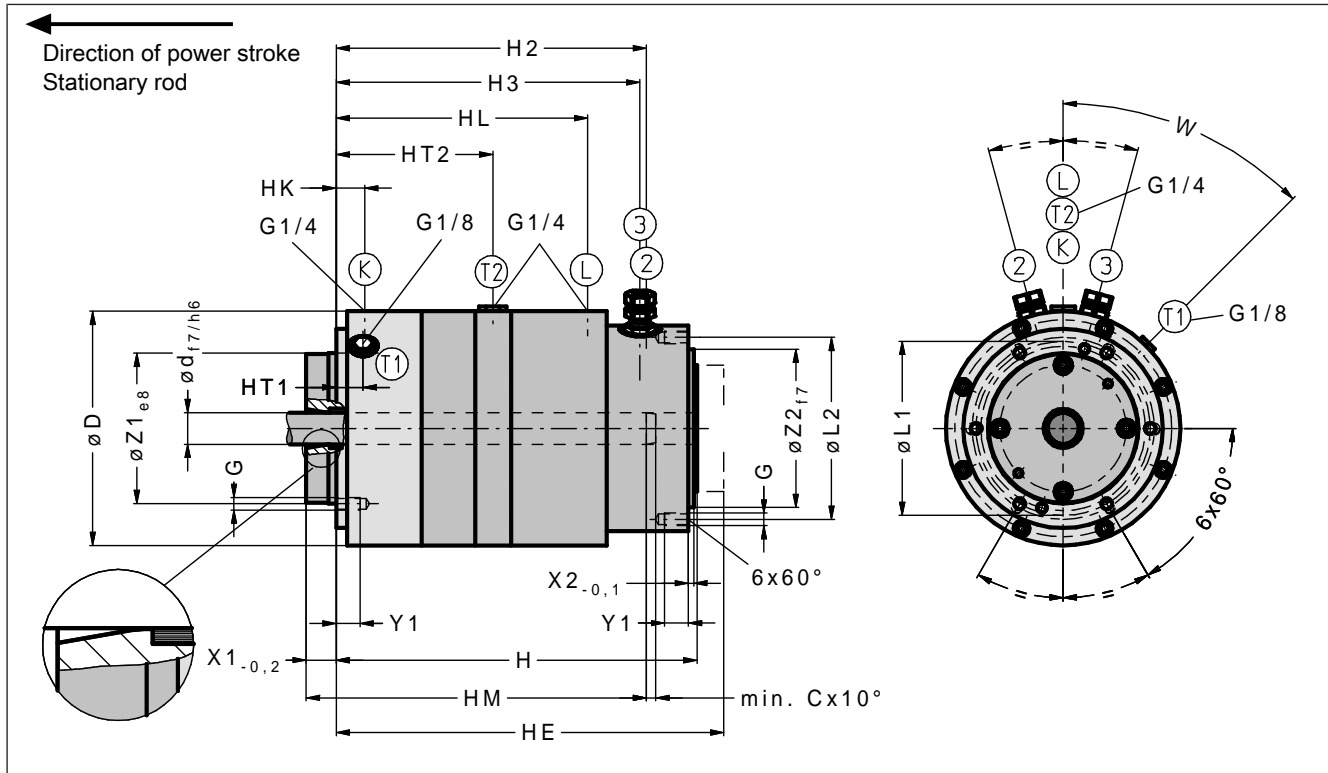


Fig. 12: Dimensions of PowerStroke FSKP style SVEF

Type		FSKP16-SVEF	FSKP20-SVEF	FSKP25-SVEF
ID no. (order number)		FSKP 016 02	FSKP 020 02	FSKP 025 02
Connection dimensions				
G		M6	M8	M8
H2	mm	195.5	196	214.5
H3	mm	191.5	192	210.5
HK	mm	18	18	21
HL	mm	160.5	159	171
HT1	mm	17	17	20
HT2	mm	100.5	99	111
L1	mm	92	110	160
L2	mm	95	115	125
W	Degree	45	45	60
X1	mm	19	19	30
X2	mm	3	3.5	3.5
Y1	mm	12	15	18
Z1	mm	80	95	145
Z2	mm	85	100	110

Subject to modification without prior notice

Technical Data Sheet for style SVEL

PowerStroke FSKP style SVEL (rod leaves unit)

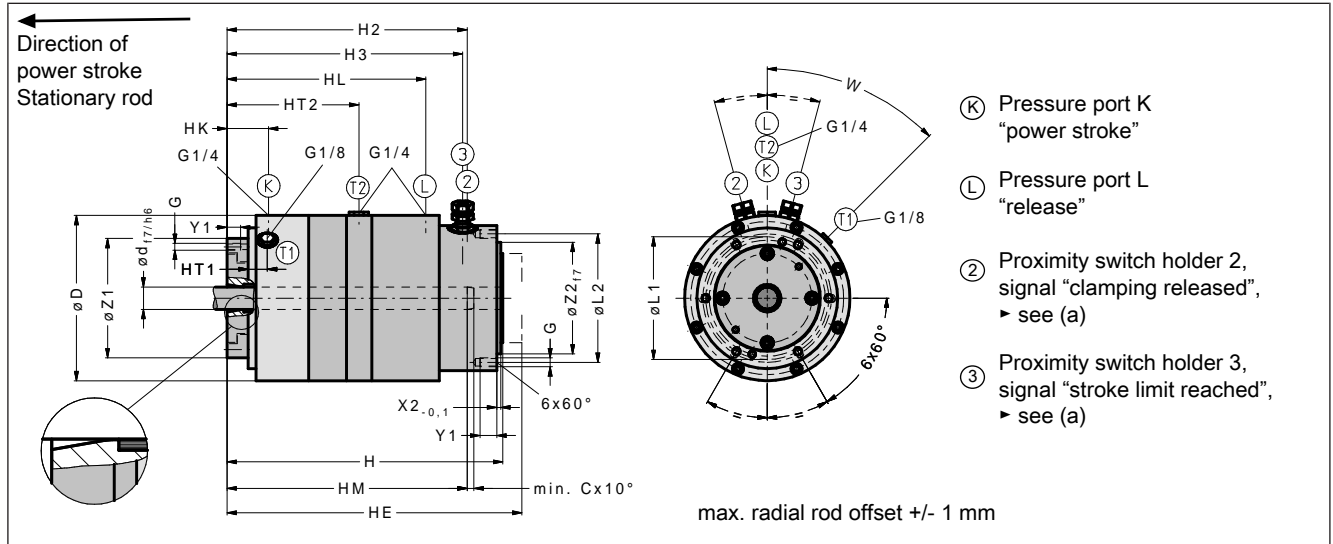


Fig. 13: Dimensions of PowerStroke FSKP style SVEL

Type		FSKP16-SVEL	FSKP20-SVEL	FSKP25-SVEL	
ID no. (order number)		FSKP 016 03	FSKP 020 03	FSKP 025 03	
Working force at nominal pressure		11.5	19	27.5	
Working force at maximum working pressure		12.4	20.5	29.7	
Technical data					
d	Rod diameter	mm	16	20	25
C	Lead-in chamfer of the rod	mm	6	6	8
HM	Minimum insertion depth of rod	mm	210	215	245
D	External diameter	mm	126	148	177
H	Total length	mm	246	247	284
HE	Max. extended length	mm	263	264	301
	Power stroke	mm	12	12	12
	Weight approx.	kg	8.1	10.8	17.8
Pneumatics					
K	Nominal pressure for working force	bar	6	6	6
K / L	Max. working pressure / release pressure	bar	6.5	6.5	6.5
L	Min. release pressure	bar	5	5	5
K	Operating volume at complete stroke	cm ³	380	560	790
L	Operating volume at complete stroke	cm ³	120	180	240

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Continued: PowerStroke FSKP style SVEL

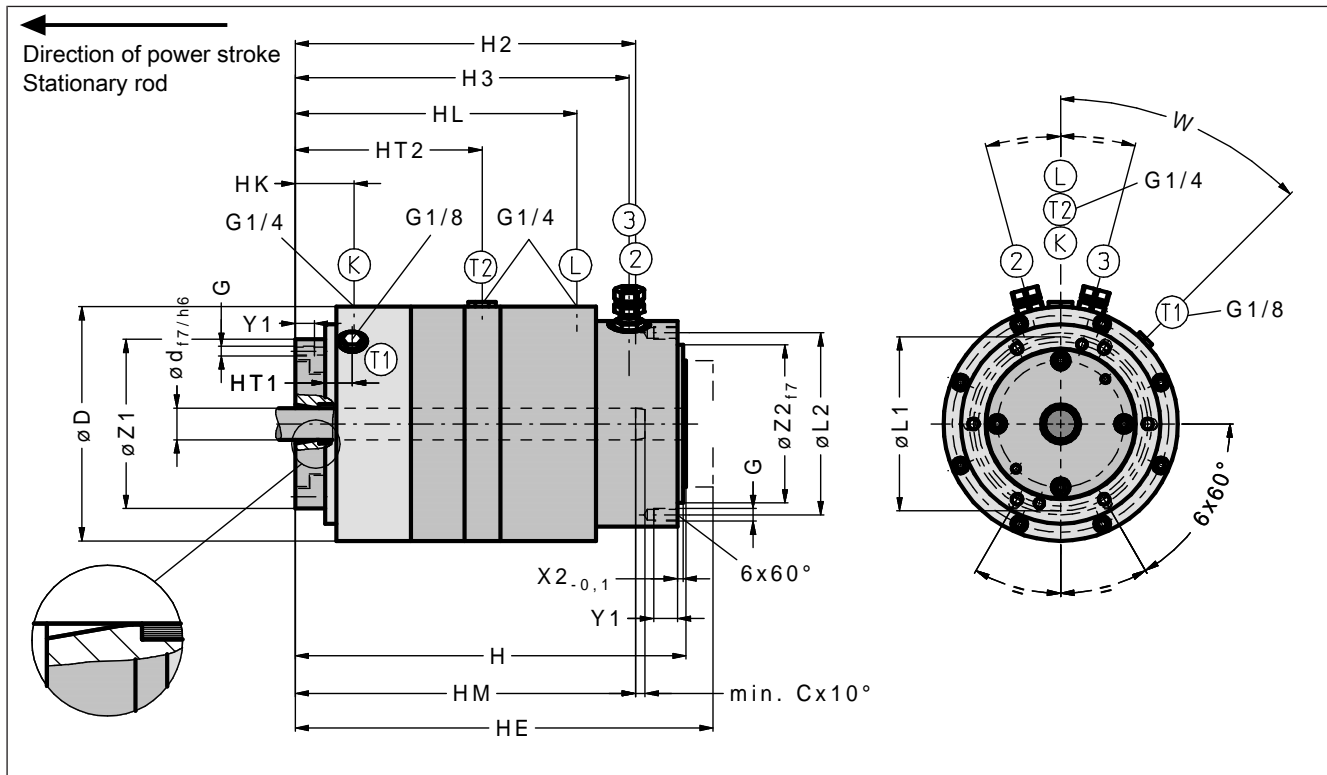


Fig. 14: Dimensions of PowerStroke FSKP style SVEL

Type		FSKP16-SVEL	FSKP20-SVEL	FSKP25-SVEL
ID no. (order number)		FSKP 016 03	FSKP 020 03	FSKP 025 03
Connection dimensions				
G		M6	M8	M8
H2	mm	214.5	215	244.5
H3	mm	210.5	211	240.5
HK	mm	37	37	51
HL	mm	179.5	178	201
HT1	mm	36	36	50
L1	mm	92	110	160
L2	mm	95	115	125
X2	mm	3	3.5	3.5
Y1	mm	12	15	18
Z1	mm	107	125	177
Z2	mm	85	100	110

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