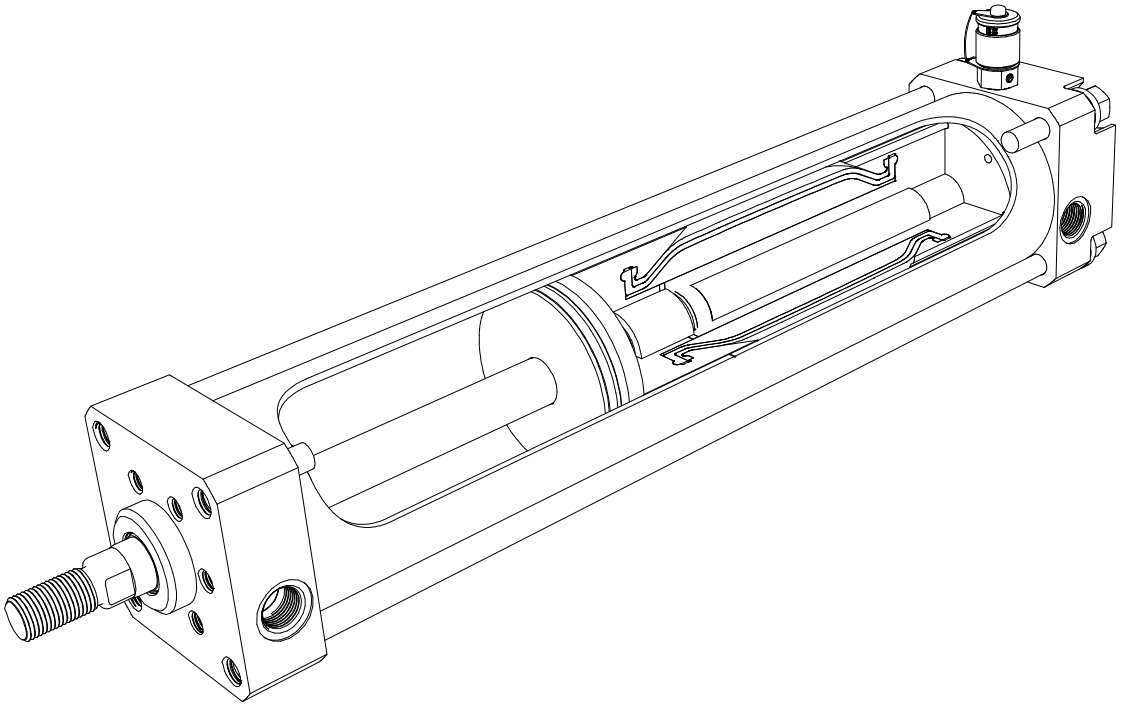
*speed**POWER***

Pressing cylinder



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Operating manual

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1 General instructions

1.1 Introduction

1.1.1 Warning notices and symbols

Hazard symbol 
This symbol is to be found adjacent to all work safety instructions in this user information, wherever there is a danger to the life and limb of persons. Pay attention to these instructions and exercise particular caution in these cases. Pass on all work safety instructions to other users also. In addition to these instructions in the user information, the general regulations for safety and the prevention of accidents must also be observed.

Attention symbol 
This symbol appears at points in the user information that require particular attention so that directives, regulations, instructions and the correct working sequence are complied with in order to prevent damage to or the destruction of the plant and/or other parts of the plant.

Information symbol 
This symbol identifies tips for use that ▪ are useful for the further understanding of this user information ▪ should facilitate the handling of the product or your work.

1.2 Important information

The legal 'regulations for safety and the prevention of accidents' apply independently of the instructions given in this operating manual. Each person who is assigned by the user to operate and maintain the pressing cylinder must have read and understood all instructions beforehand, in particular the chapter entitled 'Safety instructions'. Precise explanations of this are given in chapter 3.

Proper maintenance of the pressing cylinder requires appropriately trained and qualified staff. These persons are fundamentally responsible for this work themselves. It is the user's duty to provide appropriate training. Repairs may only be carried out by the manufacturer.

The warranty terms for the pressing cylinder are subject to our Terms of Sales and Delivery. These are rendered null and void if any damage that occurs is due to improper handling, failure to comply with the duty to instruct as specified in the operating manual and the regulations for the prevention of accidents, or handling and repair by unauthorised or untrained persons. Similarly, warranty claims will also be rejected if the product is modified after receipt, if the product is equipped with non-original spare parts, or if accessories are attached to the product that are not matched to it.

Amendments for the purpose of technical changes or improvements are reserved for the manufacturer alone.

1.3 Operating manual

This operating manual has been written with the intention of it being read and observed in all points by those persons who are responsible for the operation and maintenance of the product.

The entire operating manual must be kept safely in the vicinity of the product. This makes quick reference to the operating manual possible where necessary.

It is absolutely essential that this operating manual be read carefully before putting the equipment into operation. The manufacturer accepts no liability for damages and operating disruptions arising from failure to follow this operating manual.

This operating manual refers only to the scope of delivery for the pressing cylinder that the manufacturer must contractually provide.

The operating manual and the safety instructions must be read and followed before putting the equipment into operation.

This operating manual corresponds to the status as at the date of issue. Subsequent changes made to the contents by the user or technical changes to the product are not included.

2 Safety and hazards

2.1 General instructions

The legal regulations for safety and the prevention of accidents apply independently of this operating manual.

See chapter 1.1.1 'Warning notices and symbols' for the hazard symbols used in this operating manual.

Keep this operating manual in a safe place. The operating manual must be included with the equipment if it is resold.

Contact with hydraulic oils can lead to damage to health. Oils must not come into contact with mucous membranes in the eyes, mouth and nose. If this should occur, rinse out immediately with fresh water.

Medical assistance is to be obtained immediately in the event of skin irritations or allergic reactions as well as injuries caused by accidents.

2.2 Hazards arising from failure to observe safety instructions

The pressing cylinder has been designed and manufactured in accordance with the state of the art and recognised technical safety rules. Operating safety is guaranteed.

The pressing cylinder may be operated only if it is in perfect working order and only if the safety and hazard instructions and the user information are observed.

Malfunctions that impair the safety of the pressing cylinder must be rectified without delay by an authorised person.

All warranty and guarantee claims are rendered null and void if the instructions and/or regulations for safety and the prevention of accidents are not adhered to.

Nonetheless, dangers may arise from the improper operation and use of the pressing cylinder for a purpose other than that intended:

- Dangers to life and limb
- Dangers to the user's assets
- Dangers to the pressing cylinder and its efficient use

2.3 Use for the intended purpose

Intended purpose of use

The pressing cylinder serves the movement of masses and the transmission of forces. It is built exclusively for industrial use.

Any other use is construed as being inappropriate. The manufacturer accepts no liability for any damage resulting from this. The user bears the sole risk associated with inappropriate use!

Use for the intended purpose includes:

- observance of the user information, in particular the operating manual
- compliance with the intended operating and maintenance conditions as well as taking into account foreseeable malpractices
- compliance with legal regulations for the prevention of accidents as well as other generally recognised technical safety and occupational health rules for power-operated equipment
- compliance with the inspection and maintenance conditions
- use of operating materials in accordance with applicable safety regulations
- compliance with the highest permissible operating pressures
- use of equipment that allows safe operation at the respectively set operating pressure.

2.4 Safety

Design and factory acceptance are carried out on the basis of the Product Safety Act. The regulations for the prevention of accidents applicable to the respective country must be observed for the operation, service, maintenance and cleaning of the pressing cylinder.

2.5 Operating safety

The following basic rules apply: Persons may only be assigned to work on power-operated equipment

- if they are able to carry out the work independently and safely,
- if, following prior instruction, they are under the supervision of a person who is familiar with this work and
- if they are authorised to do so.

Persons who use power-operated equipment must ensure that they endanger neither other people nor themselves through dangerous movements.

Power-operated equipment may only be used if all necessary protective devices, interlocks and couplings are used and are effective. These devices must not be circumvented.

2.6 Instruction of staff

Each person who is assigned by the user to operate and maintain the pressing cylinder must have read and understood all instructions, in particular the chapter ‘Safety instructions’, beforehand.

The works manager must instruct his staff on the basis of the user information. He must obligate all employees to adhere to all regulations and instructions. He must explain all of the safety facilities in an understandable manner and without exception.

2.7 Maintenance

Proper maintenance of the pressing cylinder requires appropriately trained technical staff. These persons are fundamentally responsible for this work themselves.

Work may only be carried out by qualified and trained staff in compliance with all safety precautions.

Maintenance intervals, if specified, must be adhered to. Failure to adhere to them voids any warranty claims.

Work may only be carried out on the pressing cylinder if it is certain that:

- the product is at a standstill,
- no dangerous movements take place,
- no unauthorised, unexpected or accidental start-up is possible,
- it is not possible for any dangerous movements to start up due to stored energy and
- all supply lines are depressurised.

If maintenance work or deinstallation is carried out immediately after operation, in particular after long running times, protective gloves must be worn or a cooling-down period must be maintained due to the development of heat in the pressing cylinder.

Only original operating materials in accordance with specifications are permissible.

Tightening torques must be adhered to.

2.8 Repair

Repairs may only be carried out by the manufacturer.

2.9 Unauthorised modifications

Technical changes are reserved for the manufacturer.

Changes to the product by the user by means of technical additions or modifications without the agreement of the manufacturer impair both the safety and function. These include:

- installation of parts not made by the manufacturer of the pressing cylinder
- operation with incorrect operating resources
- changing the functional sequence
- installation of components / accessories to which the pressing cylinder is not matched
- operation with incorrect operating pressures (see rating plate)
- influence of impermissible external forces (chapter 7.1).

2.10 Safety devices

All safety devices must be fitted, insofar as they exist. They may only be removed for the duration of maintenance. On account of the many possible applications of the pressing cylinder, the area around the working piston as it drives in and out cannot be secured. Observe the tool manufacturer's safety regulations during operation.

2.11 Safety regulations for supply, control and operating elements

Depending on the version, an oil pressure of up to 700 bar can build up during the power stroke. This must be borne in mind if a manometer is coupled to the measurement connection.

2.12 Technical data

The technical performance data must be adhered to as a matter of principle and must neither be exceeded nor undercut. No liability will be accepted for damage caused as a result of non-compliance with the technical performance data.

2.13 Particular hazards

Danger of injury in the area of the measurement connection due to oil jet:

On account of the high operating pressure, even the smallest oil jet can cause serious injuries and infections of the skin and eyes. Consult a doctor immediately in such a case.

2.14 Environmental regulations

The applicable environmental regulations must be adhered to during all maintenance work.

The most important regulations and laws pertaining to the use of cold-cleaning solvents are (in Germany):

- Hazardous Materials Ordinance (GefStoffV)
- Waste Act (AbfG)
- Waste Verification Ordinance (AbfNachwV)
- Water Resources Act (WHG)

The use of petroleum ether is forbidden. It is highly flammable, electrically chargeable and forms explosive gas/air mixtures.

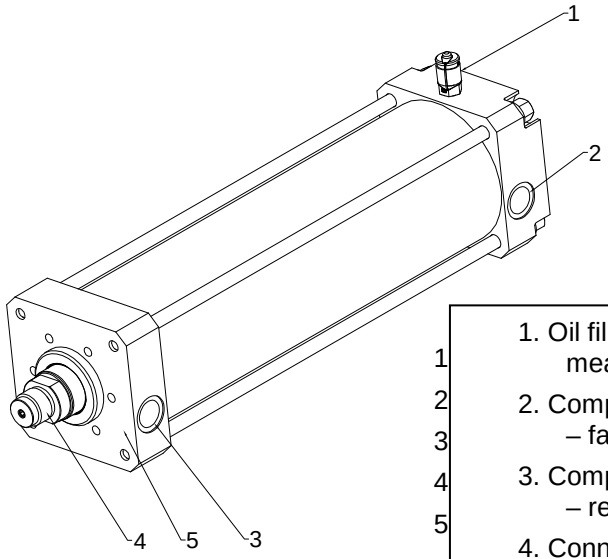
3 Transport and storage

The pressing cylinder must be transported such that it cannot be damaged by external influences. In particular the area around the working piston (thread) and the measurement connection must be protected. The pressing cylinder connections are provided with blanking plugs in the factory to protect against dirt. These blanking plugs must be used whenever transporting the cylinder.

If the pressing cylinder is to be stored, especially over a longer period of time, it is recommended to store it in an upright position in a dry, non-corrosive, clean environment that additionally offers protection against exterior damage.

4 General description

4.1 Operating elements and connections



1. Oil fill nipple and measurement connection
2. Compressed air connection – fast and power stroke
3. Compressed air connection – return stroke
4. Connecting thread
5.. Connecting flange

4.2 Function

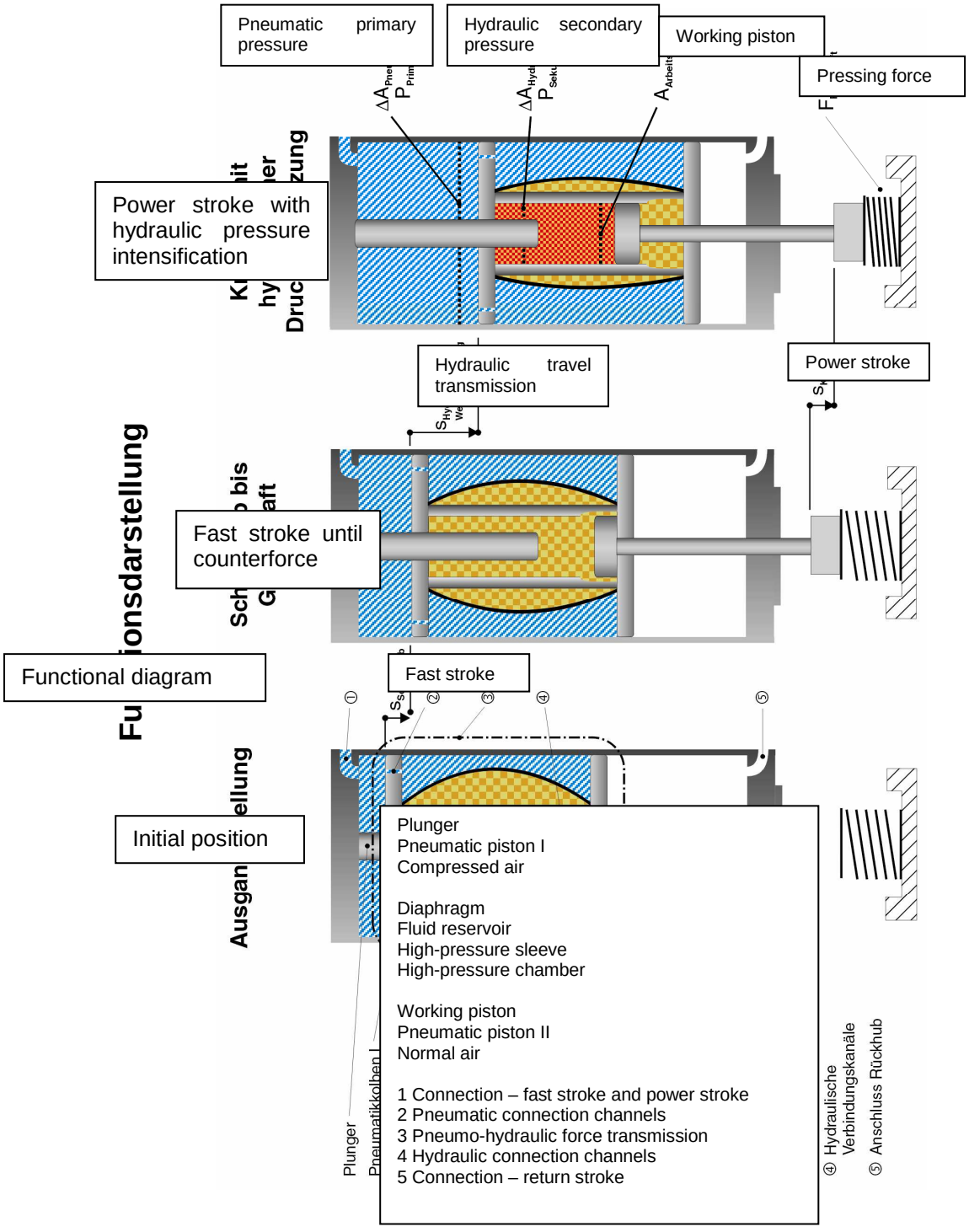
The hydro-pneumatic pressing cylinder is structured and actuated like a double-action pneumatic cylinder. Fast and power strokes are possible. In the fast stroke, the working piston and the tool are extended with a small amount of force, but at great speed. The power stroke is the positioning of the working piston with great force over a short distance. Switching from fast stroke to power stroke is initiated by the building up of a particular counterforce that is dependent on the installation size. Switching can take place at any position along the entire stroke, i.e. within the working range of a version. No additional valve is required for switching.

Power stroke and fast stroke are dependent upon one another. The working range curve (see chapter 'Working range') illustrates the relationship. The possible power stroke is minimised by a long fast stroke.

The pressing cylinder operates within a compressed air range of 1 bar to maximum 10 bar. Please refer to the rating plate of your cylinder for the actual maximum permissible input pressure. This primary pressure is proportionally amplified in the pressure intensifier to the secondary pressure/oil pressure. The secondary pressure provides the force. Depending on the installation size, forces of 2 kN to 140 kN are possible. For each installation size there are versions with differing maximum possible power strokes and force ranges.

The pressing or working force is proportional to the nominal pressure of the compressed air supplied and can thus be regulated simply and very flexibly. The pressing cylinder can be used highly dynamically for stamping and punching work. With the appropriate drive, however, pure holding or slow pushing is also possible.

The performance capabilities, in particular the number of load changes and the stroke, are influenced by the choice of valves and the dimensioning and installation of the compressed air hoses.



4.2.1 Initial position (see functional diagram also)

Compressed air is applied to pneumatic piston I. The compressed air also flows into the membrane area through the pneumatic connection channels and acts externally on the elastic membrane and, hence, on the fluid reservoir. Pressure is thus applied to the fluid reservoir.

The compressed air flowing in pushes the entire pneumo-hydraulic pressure intensifier forwards. The pressure in the fluid reservoir presses the working piston against pneumatic piston II via its contact surface. The working piston with the tool is pushed forward.

4.2.2 Fast stroke until counterforce

The distance between the plunger and the working piston increases with the forward movement of the pneumo-hydraulic pressure intensifier during the fast stroke. The volume increases in this area of the high-pressure chamber. This increase in volume is compensated by oil flowing in via the hydraulic connection channels in the high-pressure sleeve. The elastic membrane lies closer to the high-pressure sleeve.

If the working piston with the tool reaches the workpiece, the forward movement of the working piston is stopped by the counterforce. The working piston and pressure intensifier can move freely with respect to one another. Despite the counterforce, the pressure intensifier initially continues its forward movement. As a result of this, the head of the working piston is pushed into the high-pressure sleeve, which becomes narrower at a certain point, and the high-pressure chamber closes. The movement of the pressure intensifier now also meets a counterforce. The secondary pressure/oil pressure builds up in the high-pressure chamber. The power stroke has now been initiated.

4.2.3 Power stroke with hydraulic pressure intensification

The compressed air introduced acts on the surface of pneumatic piston 1. The resulting force presses on the annular surface consisting of high-pressure sleeve and plunger. This substantially smaller surface generates a correspondingly high pressure in the oil in the high-pressure chamber. This high pressure acts in turn via the surface of the working piston on the piston rod and produces the ‘power force’ of the pressing cylinder.

The ratio of the piston surface area to the annular surface area is the power transmission ratio in the oil and is at the same time also a travel transmission ratio. This means that the pressure intensifier travels a greater distance than the piston rod.

Example: Power transmission 1:6.51 x piston rod stroke 2 mm = pressure intensifier stroke 13.02 mm.The respective power transmission is to be taken from the cylinder data sheet.

The fast stroke and power stroke share the total stroke of the cylinder. The ‘stroke consumption’ in the fast stroke is 1:1, whilst in the power stroke it is 1:power transmission.

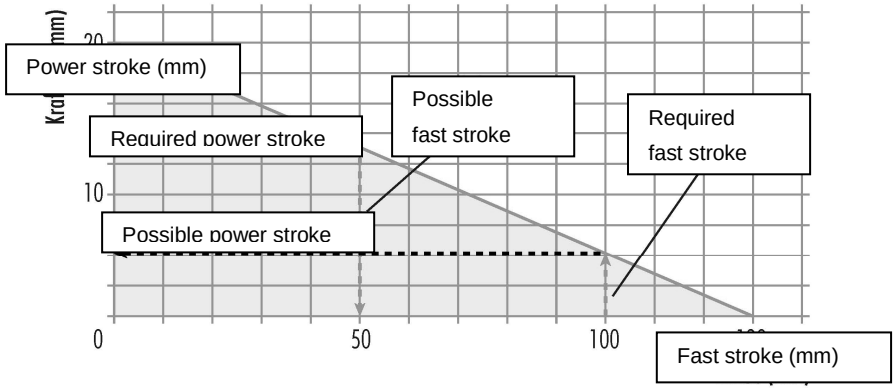
Example: Fast stroke 50 mm + (power stroke 2 mm x 6.51) = stroke consumption 63.02 mm. An individual, design-related stroke loss must be added to the theoretical stroke consumption.

4.2.4 Fast return stroke

The length of the power stroke is usually ‘time-controlled’. It can also be controlled by external displacement measuring systems. Once the cylinder has reached its position, it is driven back by the application of pressure to the front piston II and the simultaneous venting of the rear air chamber.

5 Working range

The interrelationship of fast stroke and power stroke is characteristic. The working range diagram below shows this interaction taking the SPK-B 080-20/130-17 as an example:



The number of load changes or the attainable cycle frequency, the possible power stroke, the fast stroke and the pressing force are affected by the design of the application (valves, pipes and vents). Optimum results are achieved if piping is selected that has the largest possible nominal width and the shortest possible length, and if the pneumatic valves have a sufficiently high nominal flow rate. An additional compressed air accumulator with a storage capacity of 10 l increases the dynamics during the fast stroke and facilitates the build-up of force.

The speed of the fast and power strokes can be regulated by means of throttle check valves.

6 Special features

When it contacts the workpiece, the working piston with the tool is pushed into the high-pressure sleeve, which becomes narrower. The contact is partly hydraulically damped and without jolts and thus extremely gentle on the tool. The size of the counterforce for switching from fast stroke to power stroke is determined by the diameter of the piston rod of the working piston and the internal pressure in the fluid reservoir.

The theoretical fast stroke forces are:

SPK-B 080: 190 N at 6 bar
SPK-B 125 and SPK-B 160: 900 N at 6 bar

This must be considered in particular in the operating mode ‘piston rod at top’ (see illustration). The device changes to power stroke in the case of a larger tool mass and/or tool acceleration.

This can be avoided by externally assisting the fast stroke, e.g. by means of springs or pneumatic cylinders.

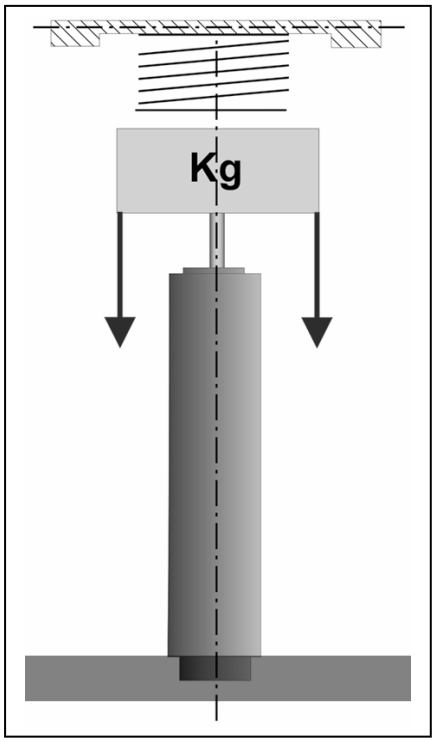


Fig.: Operating mode ‘Piston rod at top’

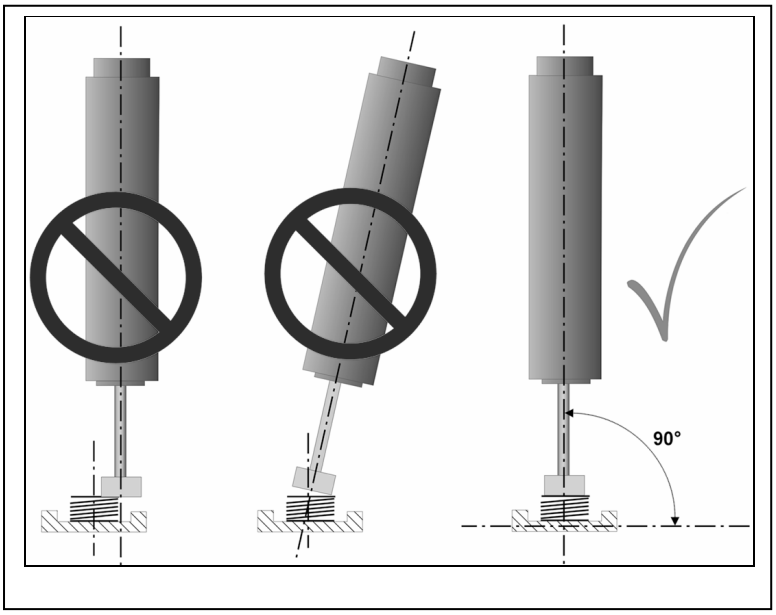
Power stroke/fast stroke repeats are possible within a complete stroke movement. For example, the sequence: power stroke, fast stroke and power stroke again is possible. Stroke limitation following a punching procedure is not necessary. The high pressure in the high-pressure chamber relaxes without a vacuum resulting. Due to the hydraulic pressure transmission ratio and the travel transmission ratio in the force stroke, no relaxation buffeting occurs at the piston rod.

7 Installation

7.1 Installation regulations

Care must be taken that no shear forces act on the piston rod during installation and operation.

The correct alignment of the piston rod and the associated components must be checked in both the extended and the retracted state. Incorrect alignment leads to rapid wearing of the functional parts, to oil leaks and to considerable damage for which the manufacturer accepts no liability.



7.2 Installation

As standard, the pressing cylinder is fastened at the cylinder head by means of bolts (see appendix). The installation orientation is arbitrary.

Caution: the length of the bolts depends on the dimensions of the fastening. The screw-in depth in the pressing cylinder must not exceed the given dimension. However, care must be taken that the entire available thread depth is used as far as possible.

Secure bolts against unintentional loosening.

Tighten bolts ‘diagonally’ (observe tightening torques).

If installed in the ‘piston rod at top’ position (see illustration on page 11), care must be taken that the tool weight + the weight of the piston rod as a weight force does not exceed the force of the fast stroke, as otherwise the cylinder will switch to power stroke.

See 12.4 for the dimensions of the respective types.

The measurement and filling connection should always be easily accessible for the purposes of maintenance.

Please refer to the rating plate of your cylinder for the maximum permissible input pressure.

The pressing cylinder may only be operated within an ambient temperature range of +10 °C to maximum +80 °C. Malfunctions may occur if it is operated outside this temperature range.

The pressing cylinder may be operated only with oiled or unoiled compressed air of the quality class 5 according to DIN ISO 8573-1. If unfiltered compressed air is used, premature damage to the seals may occur. In case of oiled compressed air the additional oiling must not exceed 25 mg/m³ (DIN ISO 8573-1 class 5). The compressed air conditioned after the compressor must correspond to the quality of unoiled compressed air.

7.3 Drive

The pressing cylinder is driven like a double-action pneumatic cylinder via pneumatically, mechanically or electrically-operated valves.

The compressed air supply must be equipped with a maintenance unit as a matter of principle. We recommend operation with exhaust throttles. Exhaust throttles may definitely be necessary depending on the application.

7.4 Switching from fast stroke to power stroke

If a certain counterforce, dependent on the installation size and primary pressure, i.e. dependent on force, is built up, the pressing cylinder switches from fast stroke to power stroke.

7.5 Measurement and filling connection

The measurement and filling connection on the cover of the cylinder can be used for measuring the high pressure. Using a suitable adaptor, pressure sensors, oil pressure switches and similar devices can be attached.

In the rear initial position the filling pressure of the fluid reservoir can be measured by means of a simple manometer (0 – 4 bar).

There are a great many possibilities for various control functions, for example:

- switching to return stroke if a certain oil pressure is reached
- monitoring of the required working force
- addition of external functions
- timing of the return stroke in the case of stamping or riveting work.

If a monitoring or measuring device is connected, care must be taken that the connection line is filled with oil and does not contain any air. The air will otherwise enter the high-pressure chamber and impair the work procedure.

7.6 Deinstallation

Before deinstalling the pressing cylinder, all compressed air lines must be depressurised or dismantled.

The pressing cylinder generates heat after a longer period of operation. Allow the cylinder to cool down sufficiently or wear protective gloves when deinstalling it.

8 Repair

Repairs may only be carried out by the manufacturer.

9 Maintenance

The fluid reservoir has an oil reserve whose size depends on the installation size and with which a service life of several million strokes is possible under normal operating conditions.

In the initial position, i.e. with the piston rod fully retracted, the fluid reservoir has an individual filling pressure that depends on the installation size. This pressure is achieved by the pre-tensioning of the elastic diaphragm. Over the course of the time this diaphragm loses a part of its tensioning capacity and leads to a lower filling pressure with the same stored quantity of oil. The compressed air supplied during operation acts on the exterior area of the diaphragm via the pneumatic connection channels, so that the interior pressure in the fluid reservoir increases by the nominal pressure of the compressed air during operation.

The individual filling pressure, which depends on the installation size, can be measured at the measurement connection with a manometer (0 – 4 bar). The pressing cylinder must be in the rear initial position and may not be pressurised for this measurement. If the interior pressure in the initial position lies below the specified minimum pressure (see data sheet in the appendix), the oil must be refilled (see chapter ‘Refilling the oil’).

If measurement of the internal pressure is not possible in the initial position, i.e. with the piston rod fully retracted, the following must be borne in mind: The specified optimum internal pressure for the initial position reduces by 0.1 bar per 30 mm of extended piston rod.

The manometer for measuring the filling pressure may not be connected during the operation of the pressing cylinder; it must be removed without fail before putting the cylinder into operation. Pressures of several hundred bar develop during the power stroke. A manometer with a low pressure range would burst at this pressure!

9.1 Refilling the oil

The pressing cylinder is filled with evacuated hydraulic oil type Unisyn OL 32 (viscosity: 32 mm²/sec at 40 °C). No other oil may be used for refilling.

The fluid reservoir has an oil reserve that is consumed due to leakage losses. The filling pressure should not fall below a minimum pressure (see 12.2) in the initial position without the application of compressed air. In this case, the oil must be refilled using an oil pump system.

Observe the filling instructions supplied with the filling pump when refilling the cylinder.

9.2 Manual refilling

Observe the filling instructions supplied with the filling pump when refilling the cylinder.

Caution in case of overfilling: The fluid reservoir is overfilled if the interior pressure lies above the specified optimum pressure range. Overfilling the fluid reservoir can damage it during operation. In particular when filling with the piston rod extended, it must be remembered that the optimum pressure range is reduced by 0.1 bar for every 30 mm that the piston rod extends.

In case of excessive overfilling the cylinder can no longer reach its rear initial position.

9.3 Venting

In order to vent the fluid reservoir, the pressing cylinder must be placed in the ‘piston rod at top’ position. Slightly open the plug screw with valve seat until no more air escapes and only a small amount of oil runs out.

9.4 Maintenance intervals

Daily:	Check for leaks (visual inspection)
Every six months or 1 million strokes:	Check the interior pressure (chap. 9)
	Check the tightness of the fixing bolts.

10 Cleaning

When cleaning the pressing cylinder, pay attention to the chapter on safety and environmental protection regulations.

11 Malfunctions

Malfunctions	Cause	Remedial action
No build-up of force	▪ Oil reserve too low ▪ Air in the oil system ▪ Compressed air supply inadequate ▪ Fluid reservoir diaphragm defective ▪ Cylinder switches to the power stroke too early	▪ Refill the oil ▪ Vent the system ▪ Increase to working pressure ▪ Have repairs carried out ▪ Close the exhaust throttle on the cylinder head
Loss of oil, frequent refilling required	▪ Damaged seals ▪ Leakage from the filling and measurement connection	Have repairs carried out
High cycle frequencies are no longer achieved	▪ Oil reserve in fluid reservoir is insufficient	Refill the oil
No fast stroke (in installation position with piston rod at top and extending)	▪ Tool weight greater than fast stroke force	Reduce tool masses or provide additional assistance

12 Appendix

12.1 Type key

SPK-B 080-20/130-17

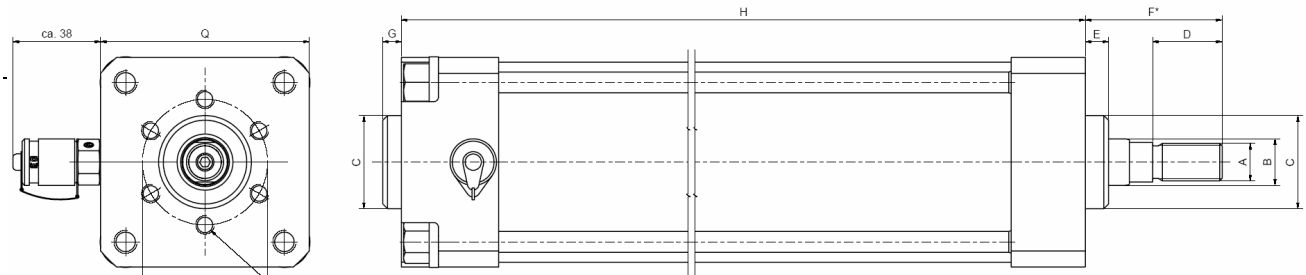
SPK-B	power-operated version, B version
080	Ø 80mm cylinder tube diameter
20	theoretical power stroke 20 mm without fast stroke
130	max. possible fast stroke 130 mm without power stroke
17	theoretical force during power stroke 17 kN at 6 bar compressed air supply pressure

12.2 Pressure transmission ratios, tightening torques, oil fill pressure in the initial position

Type of pressing cylinder	**Transmission ratios** Compressed air: oil high pressure Pressure areas (travel)	**Tightening torque for piston flange connecting bolt**	**Oil fill pressure in the initial position**
SPK-B 080-35/130-10 SPK-B 080-80/300-10	1 : 29 1 : 3.65	25 Nm	1.3 bar – 1.5 bar *(see chapter 9: Refilling the oil)*
SPK-B 080-20/130-17 SPK-B 080-45/300-17	1 : 61 1 : 6.51		
SPK-B 080-12/130-25	1 : 86 1 : 9.19		
SPK-B 125-39/130-20 SPK-B 125-90/300-20	1 : 12 1 : 3.27	35 Nm	0.8 bar – 1.2 bar *(see chapter 9: Refilling the oil)*
SPK-B 125-20/130-35 SPK-B 125-50/300-35	1 : 25 1 : 5.76		
SPK-B 125-12/130-57 SPK-B 125-30/300-57	1 : 40 1 : 9.42		
SPK-B 125-10/130-81 SPK-B 125-21/300-81	1 : 64 1 : 13.25		
SPK-B 160-39/130-29 SPK-B 160-90/300-29	1 : 21 1 : 3.27	35 Nm	0.8 bar – 1.2 bar *(see chapter 9: Refilling the oil)*
SPK-B 160-20/130-62 SPK-B 160-51/300-62	1 : 44 1 : 5.76		
SPK-B 160-12/130-100 SPK-B 160-30/300-100	1 : 71 1 : 9.42		
SPK-B 160-10/130-140 SPK-B 160-22/300-140	1 : 113 1 : 13.25		

12.3 Dimensional drawings

12.3.1 SPK-B 080



O x K deep
(quantity L)

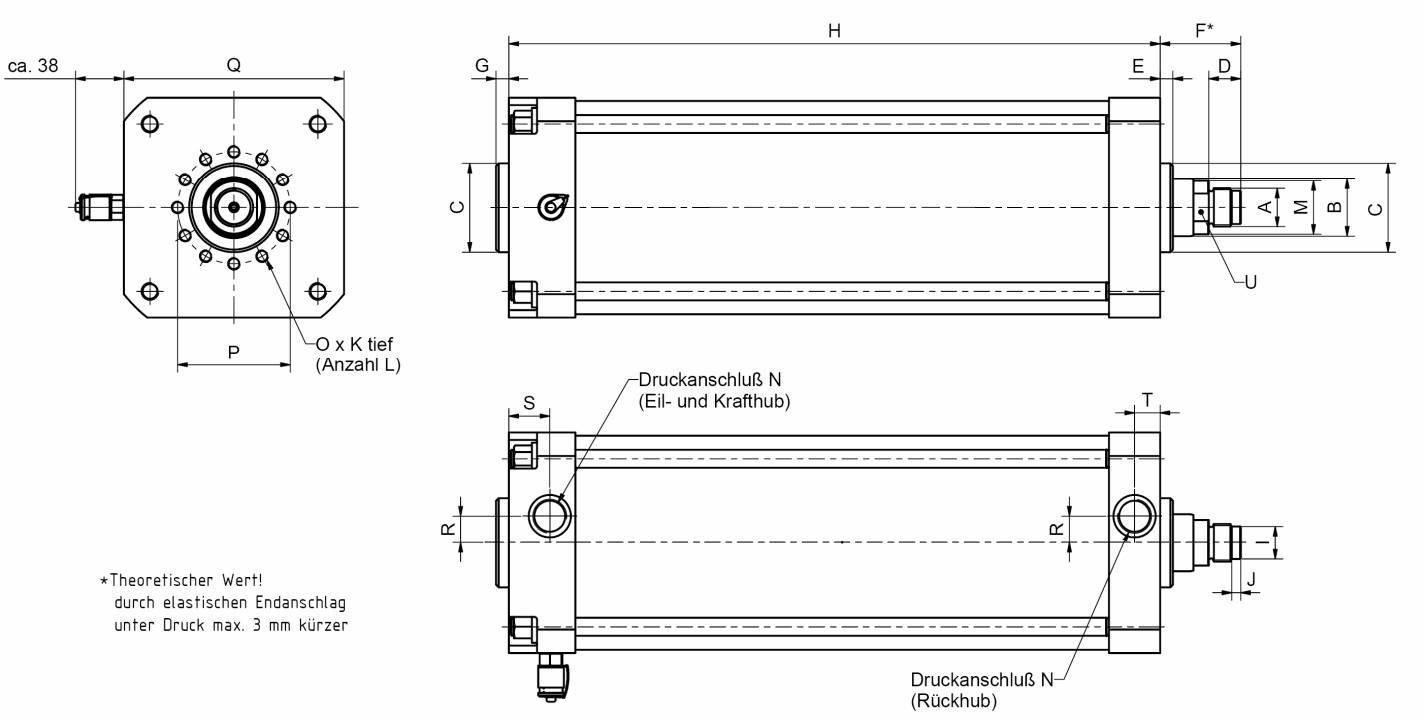
Pressure connection N
(fast and power stroke)

*Theoretical value!
Due to elastic end stop under pressure max. 3 mm shorter

Pressure connection N
(return stroke)

Dimension table SPK-B 080-																			
	A	$ØB_{f7}$	$ØC_{f7}$	D	E	F	G	H	K	L	N	ØM	O	ØP	□Q	R_{f7}	S	T	U
Standard	M16x1.5	20	40	30	10	59*	8	486	12	6	G3/8	19.2	M8	54	90	13	29	18.5	SW17
Long stroke	M16x1.5	20	40	30	10	59*	8	826	12	6	G3/8	19.2	M8	54	90	40	29	18.5	SW17

12.3.2 SPK-B 125 or SPK-B 160



Dimension table SPK-B 125																				
	A	$ØB_{f7}$	$ØC_{f7}$	D	E	F	G	H	$Øl_{g6}$	J	K	L	ØM	N	O	ØP	□Q	R	S	T	U

Standard	M30x2	45	70	25	10	63*	10	509	26	7	16	6	42	G3/4	M10	88	136	18	32	20	SW36
Long stroke	M30x2	45	70	25	10	63*	10	849	26	7	16	6	42	G3/4	M10	88	136	18	32	20	SW36

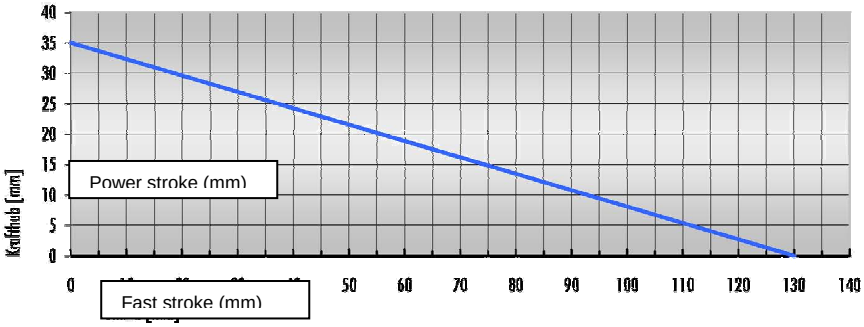
Dimension table SPK-B 160																					
	A	ØB$_{f7}$	ØC$_{f7}$	D	E	F	G	H	Øl$_{g6}$	J	K	L	ØM	N	O	ØP	□Q	R	S	T	U
Standard	M30x2	45	70	25	10	63*	10	509	26	7	16	12	42	G3/4	M10	88	172	21	32	20	SW36
Long stroke	M30x2	45	70	25	10	63*	10	849	26	7	16	12	42	G3/4	M10	88	172	21	32	20	SW36

12.4 Working range diagrams SPK-B 080/ SPK-B 125/ SPK-B 160

Type: SPK-B 080-35/130-10

Force during power stroke (theor.):
6 bar – 10 kN
10 bar – 16 kN

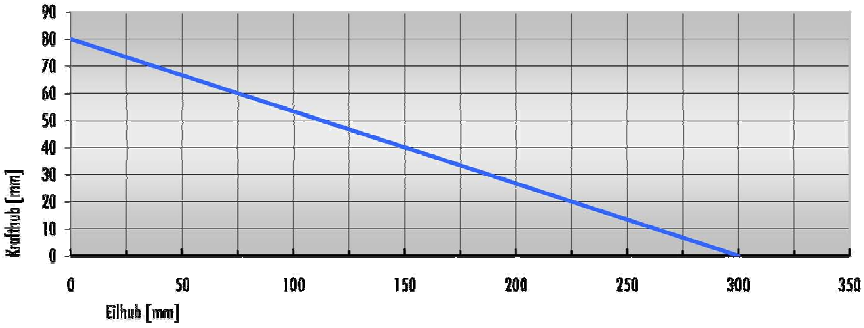
Force transmission ratio:
1 : 3.65



Type: SPK-B 080-80/300-10

Force during power stroke (theor.):
6 bar – 10 kN
10 bar – 16 kN

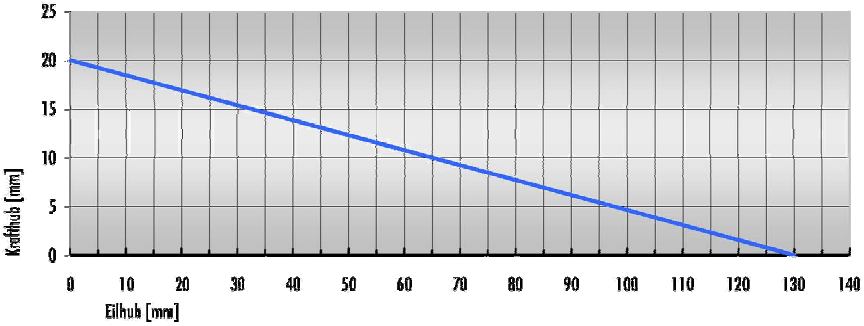
Force transmission ratio:
1 : 3.65



Type: SPK-B 080-20/130-17

Force during power stroke (theor.):
6 bar – 17 kN
10 bar – 29 kN

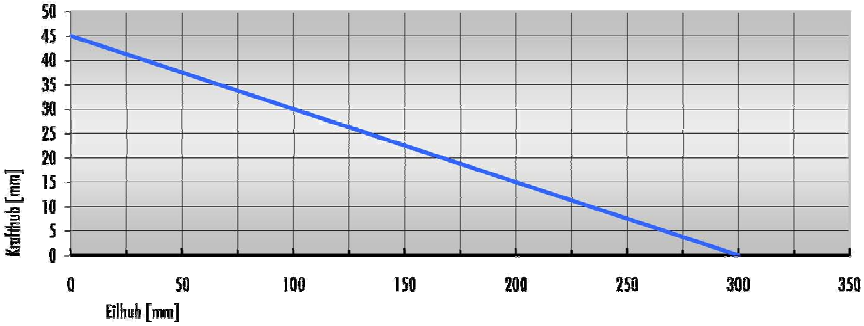
Force transmission ratio:
1 : 6.51



Type: SPK-B 080-45/300-17

Force during power stroke (theor.):
6 bar – 17 kN
10 bar – 29 kN

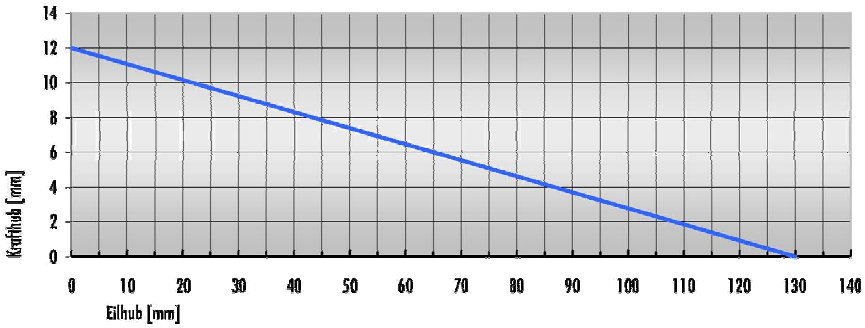
Force transmission ratio:
1 : 6.51



Type: SPK-B 080-12/130-25

Force during power stroke (theor.):
6 bar – 25 kN
max. 6 bar

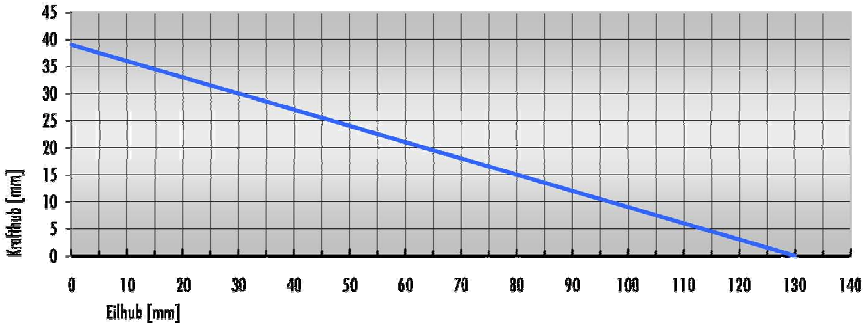
Force transmission ratio:
1 : 9.19



Type: SPK-B 125-39/130-20

Force during power stroke (theor.):
6 bar – 20 kN
10 bar – 33 kN

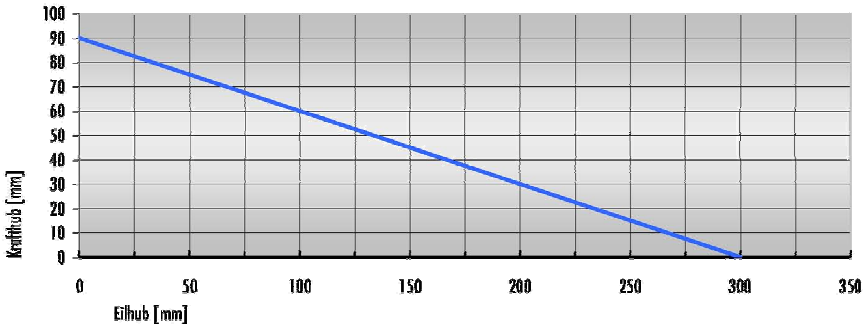
Force transmission ratio:
1 : 3.27



Type: SPK-B 125-90/300-20

Force during power stroke (theor.):
6 bar – 20 kN
10 bar – 33 kN

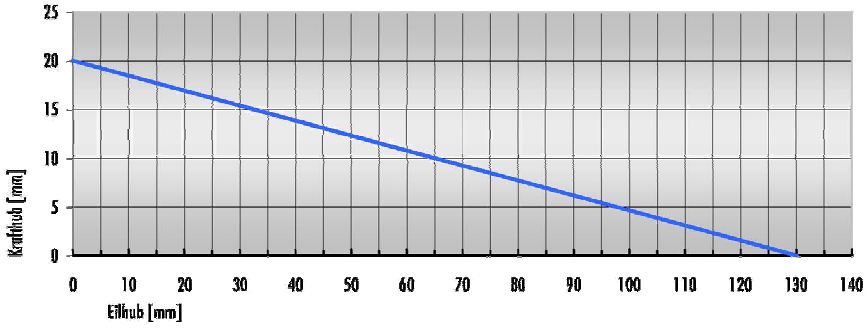
Force transmission ratio:
1 : 3.27



Type: SPK-B 125-20/130-35

Force during power stroke (theor.):
6 bar – 35 kN
10 bar – 59 kN

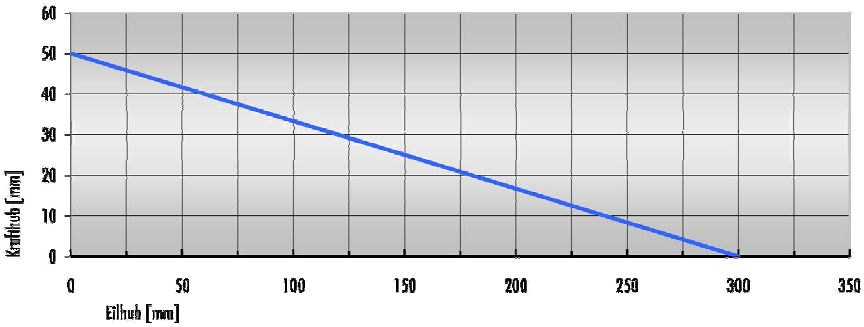
Force transmission ratio:
1 : 5.76



Type: SPK-B 125-50/300-35

Force during power stroke (theor.):
6 bar – 35 kN
10 bar – 59 kN

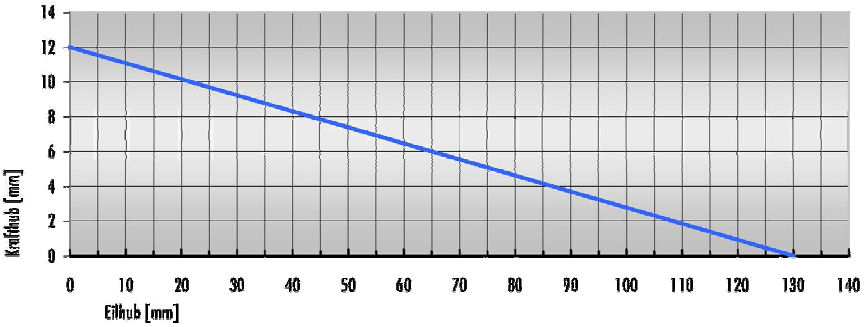
Force transmission ratio:
1 : 5.76



Type: SPK-B 125-12/130-57

Force during power stroke (theor.):
6 bar – 57 kN
10 bar – 95 kN

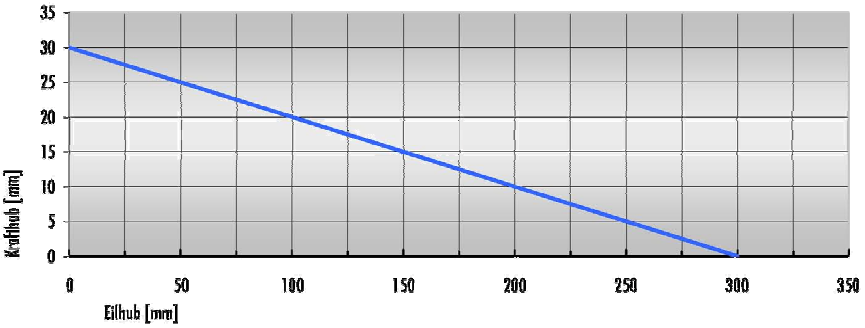
Force transmission ratio:
1 : 9.42



Type: SPK-B 125-30/300-57

Force during power stroke (theor.):
6 bar – 57 kN
10 bar – 95 kN

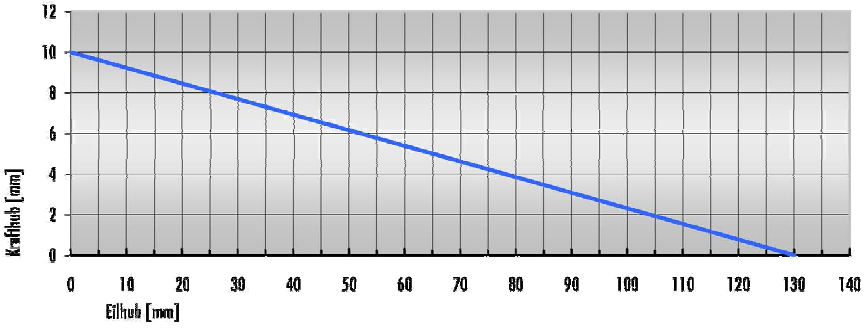
Force transmission ratio:
1 : 9.42



Type: SPK-B 125-10/130-81

Force during power stroke (theor.):
6 bar – 81 kN
10 bar – 130 kN

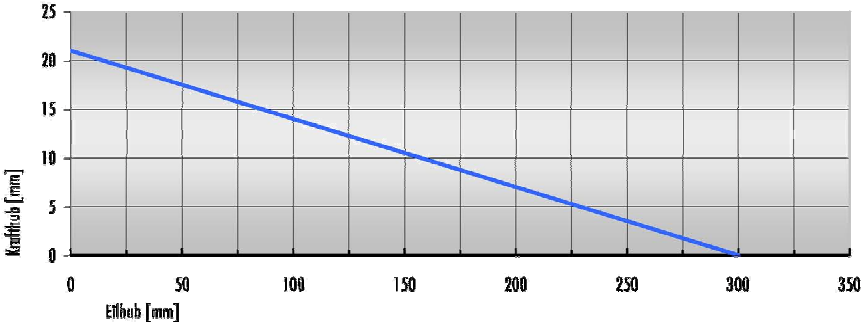
Force transmission ratio:
1 : 13.25



Type: SPK-B 125-21/300-81

Force during power stroke (theor.):
6 bar – 81 kN
10 bar – 130 kN

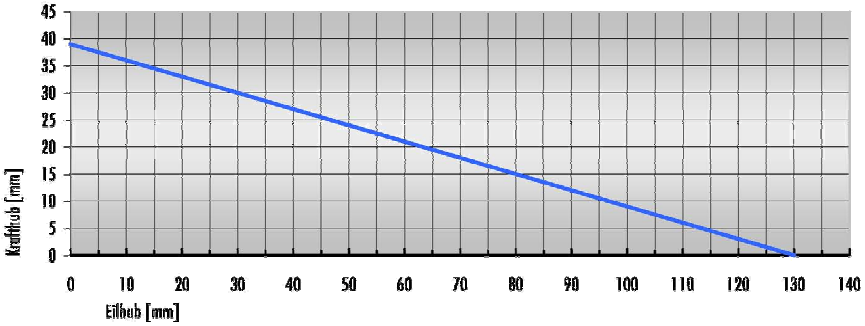
Force transmission ratio:
1 : 13.25



Type: SPK-B 160-39/130-29

Force during power stroke (theor.):
6 bar – 29 kN
10 bar – 49 kN

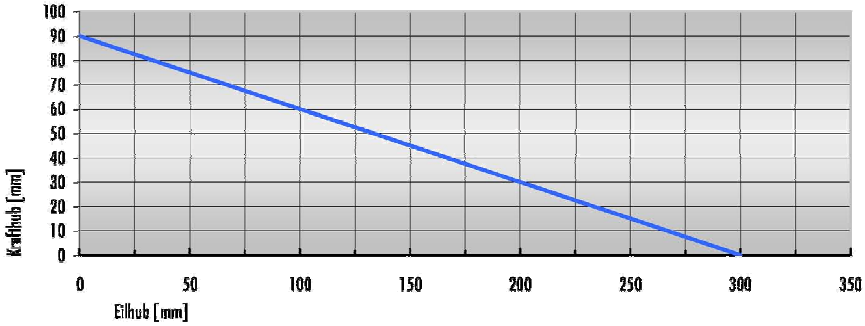
Force transmission ratio:
1 : 3.27



Type: SPK-B 160-90/300-29

Force during power stroke (theor.):
6 bar – 29 kN
10 bar – 49 kN

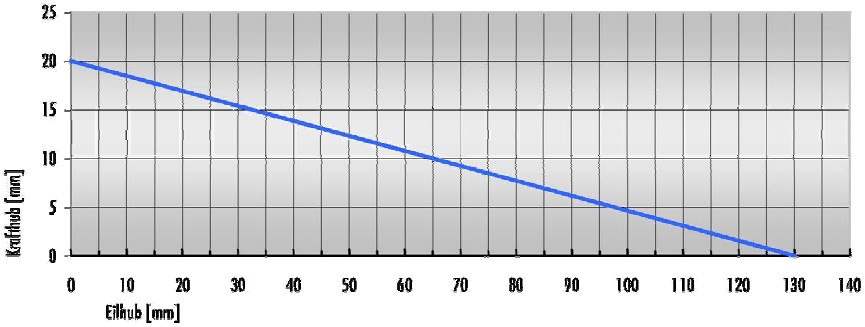
Force transmission ratio:
1 : 3.27



Type: SPK-B 160-20/130-62

Force during power stroke (theor.):
6 bar – 62 kN
10 bar – 103 kN

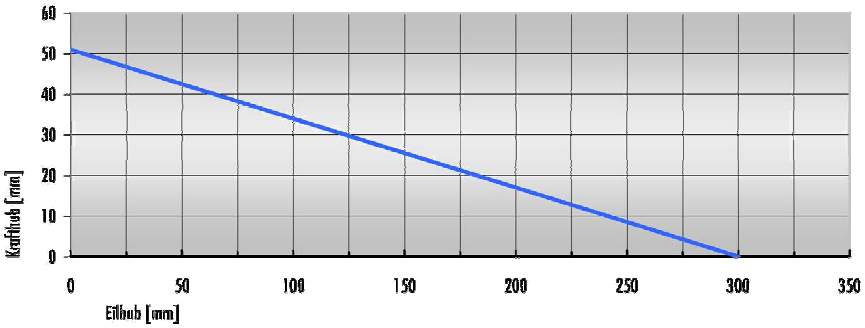
Force transmission ratio:
1 : 5.67



Type: SPK-B 160-51/300-62

Force during power stroke (theor.):
6 bar – 62 kN
10 bar – 103 kN

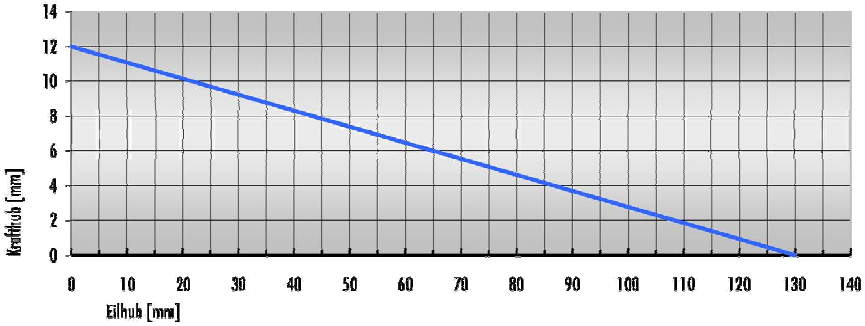
Force transmission ratio:
1 : 5.67



Type: SPK-B 160-12/130-100

Force during power stroke (theor.):
6 bar – 100 kN
8 bar – 135 kN
max. 8 bar

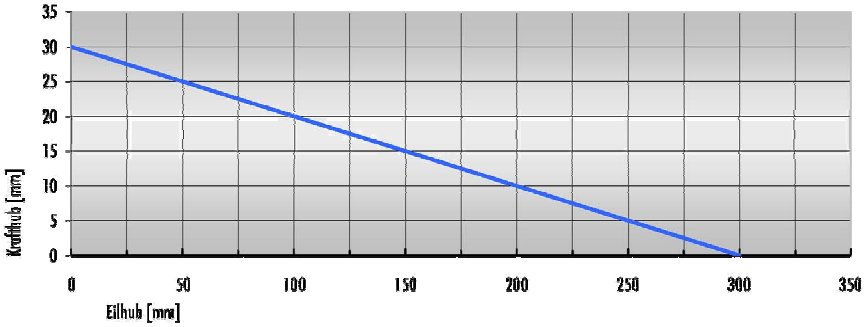
Force transmission ratio:
1 : 9.42



Type: SPK-B 160-30/300-100

Force during power stroke (theor.):
6 bar – 100 kN
8 bar – 135 kN
max. 8 bar

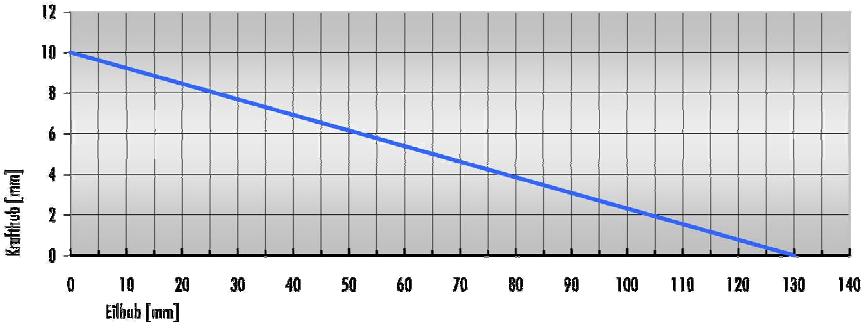
Force transmission ratio:
1 : 9.42



Type: SPK-B 160-10/130-140

Force during power stroke (theor.):
6 bar – 140 kN
max. 6 bar

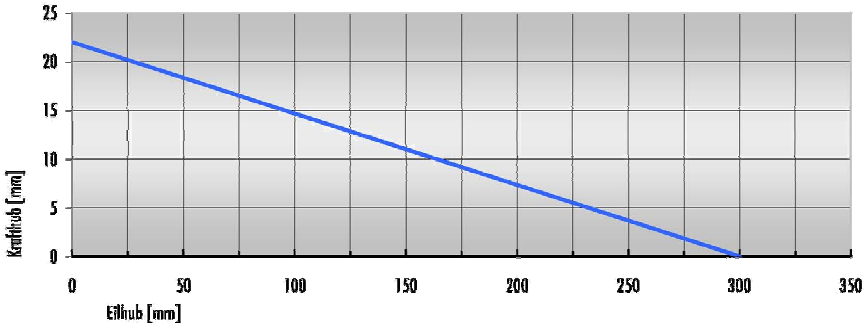
Force transmission ratio:
1 : 13.25



Type: SPK-B 160-22/300-140

Force during power stroke (theor.):
6 bar – 140 kN
max. 6 bar

Force transmission ratio:
1 : 13.25



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