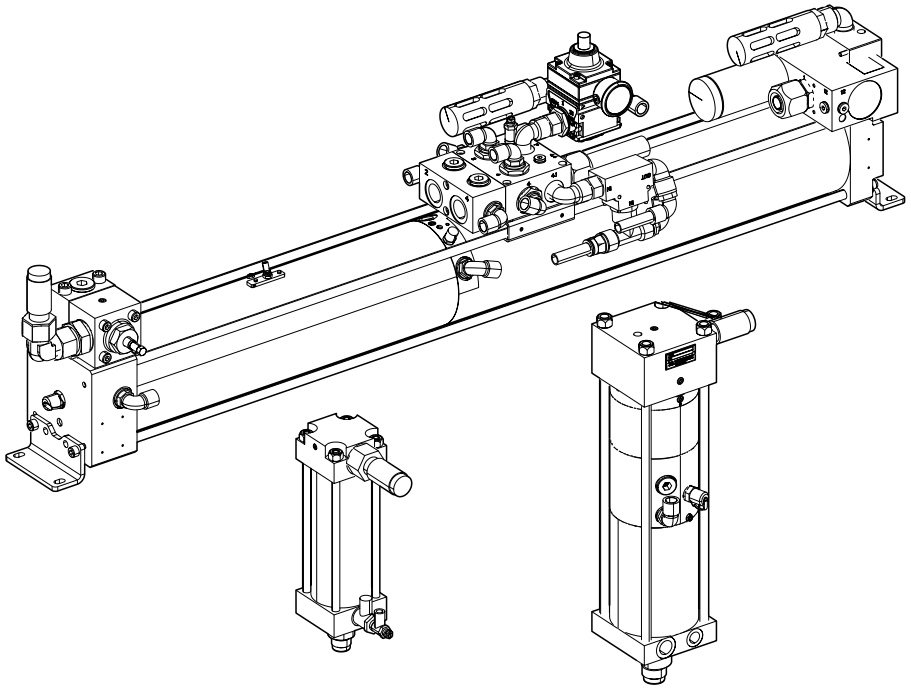
TOX® PRESSOTECHNIK

Design and installation guideline

TOX®-Powerpackage line-X
X-KT
.3030



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1 Important information

1.1 Legal note

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However, the information in this publication is checked regularly and any required corrections are included in subsequent editions. We are grateful for any corrections and suggestions for improvement. TOX® PRESSOTECHNIK reserves the right to revise the technical specifications of the products or plant and/or the software or documentation without prior notice.

1.3 Validity of the document

1.3.1 Content and target group

This design and installation guideline contains information and instructions for the design and installation of the product.

- All information in this design and installation guideline is up to date at the time of print. TOX® PRESSOTECHNIK reserves the right to make technical changes that improve the system or increase the standard of safety.
- The information is intended for the designer and operating company.

1.3.2 Other applicable documents

The following documents must also be observed in addition to the design and installation guideline:

- Data sheet TOX®-Powerpackage
- Data sheet TOX®-Powerpackage Control units
- Data sheet TOX®-Powerpackage Accessories
- Any supplier documentation

See http://www.tox-pressotechnik.de.

1.3.3 Contact and source of supply

Please send any questions on the technical documentation (e.g. missing documents, suggestions, corrections) by email to info@tox-de.com.

1.4 Gender note

In order to enhance readability, references to persons that also relate to women and men are normally only stated in the usual masculine or feminine form in German or in the corresponding translated language in this manual, thus e.g. "operator" (singular) for male or female, or "operators" (plural) for male or female".

2 Design data

2.1 Data sheet

For technical data and installation dimensions see data sheet.
(http://www.tox-pressotechnik.de)

3 Design guidelines

3.1 Design principles

- When fastening, note the following:
  - Installation dimensions
  - Weight, including weight of the accessories
  - Press force
  - Loads caused by the working process (dynamics and vibrations)
- No transverse forces may act on the piston rod.
  If necessary, use a linear guide for the working piston: either a ram plate and guiding columns or a guiding rail with guiding carriage.
- In the case of horizontal installation the connection side must face upwards.
- Elements requiring servicing maintenance, such as oil filling nipple, vent hole, high pressure measuring connection, control throttle‚X‘ and oil level indicator should be accessible.
- Make sure that the ventilation of the hydraulic system is always possible even when installed.
- The space requirement for supply lines must be taken into consideration.
- The length of the hose lines, the connection of an oil pressure switch or oil pressure monitor can significantly reduce the power stroke.

3.1.1 Air consumption

- For the air consumption, the fast and return stroke are calculated with the available air pressure.
- The air requirement in the power stroke is calculated depending on the required press force.
  For example, this depends on when the required oil pressure is reached.
- If the intensifier chamber is filled with complete air pressure, the air consumption can indeed be higher than the requirement that is actually needed and calculated.

In general, the specification for the air requirement includes all filling processes required for a stroke. The information only refers to the specific drive.

For hoses and valves - in particular for long hoses with large cross sections - which are filled and ventilated together with the drive, their consumption must also be considered when selecting a compressor.

The following applies here: Short lines from the valve to the drive mean economical energy.

When using pressure regulators (e.g. for the pneumatic spring), low internal air consumption cannot be avoided. This is usually in the range of a few liters per hour. Similarly, there might be air losses in the hose and valve connections. In order to avoid air losses, e.g. at night, the drive can be depressurized during this time.

3.1.2 Cycle times

The cycle time is calculated depending on the required press force. The following applies:

- The smaller the effective press force, the shorter the cycle time.
- An effective press force over 90 % should be avoided.
- The switching times of the valves and controls upstream of the drive must be taken into consideration for the specified cycle times.

Requirement for achieving the calculated times:

- **Air pressure**

  The required air pressure is the result of the desired effective press force. To achieve a short cycle time, an air pressure as high as possible is recommended for fast and return stroke. If the maximum press force of the cylinder is to be reduced, this can be realized with a pressure control ZDK (manual or electric) in the power stroke line.
- **Cross-section of hose**

  The line cross sections must at least match the connection sizes provided in order to achieve the calculated cycle time. This applies also to the regulation valves and maintenance units installed upstream of the drive.
  Reduced line cross sections can considerably reduce the cycle time.
- **Tube lengths**

  The length of the hoses should be kept to a minimum, since the air consumption as well as the cycle time are increased with the length.
- **Compressor performance**

  The compressor performance should always be sized with sufficient safety.
- **Speed setting**

  The speed can be regulated as required by installing throttle check valves in the fast approach stroke and return stroke lines. Furthermore, the speed of the power stroke can be adjusted by mounting a throttle in the power stroke line of the unit. The drive can thus also be used for special applications, such as pressing in bushes, projecting etc.
- **Stroke frequency optimization ZHO**

  The cycle time specifications correspond in general only to the entire drive under realistic conditions. If necessary, the cycle time can be further reduced using our optional accessory module ZHO.

3.2 Performance optimization

The ratio of the speed between the return stroke and the fast approach stroke must be set in order to ensure optimum performance.

- An optimum speed ratio between fast approach stroke and return stroke.
- A balanced power stroke speed.
- Adequately sized connection sizes (cross-section of hose, switching valves, maintenance unit) that prevent a reduction of the power stroke speed.

  For technical data and installation dimensions see data sheet. (http://www.tox-pressotechnik.de)

3.3 Limiting the travel of the power stroke

For applications where a fixed end stop is required, the total stroke of the Powerpackage can be limited.

In the case of punching applications, the travel of the power stroke can only be limited to a maximum of 80%.

In the case of punching applications, the travel can be limited by:

- Suitable tooling.
- Permanently adjusted total stroke (fast approach stroke and power stroke).
- Total stroke adjustment.

3.4 Power limit of the power stroke

It is possible to monitor the press force of the power stroke by connecting an oil pressure switch or an oil pressure monitor. Upon reaching the desired press force, the return stroke must be induced.

The press force can be reduced permanently by installing a pressure control in the power stroke line.

An oil pressure of at least 30 bar is necessary for pressure control in the power stroke line (ZDK).

3.5 Speed reduction of the power stroke

The speed of the power stroke can be reduced if a control throttle is installed in the supply line for the power stroke.

To prevent a dynamic oil leakage, an additional exhaust throttle must be installed in this case so that the speed ratio can be adjusted.

See Installing speed reduction for power stroke.

4 Activation and pressure control

4.1 Design principles of activation

A distance-dependent external power stroke switch is recommendable:

- In the case of an overhead piston rod.
- In the case of a heavy tool weight.
- In the case of fast approach stroke travel that is interrupted on account of the application (e.g. for fixing in place a spring-loaded holding-down clamp).
- If the control throttle 'X' cannot be adjusted for reasons of installation.

An external power stroke release with an electrical release signal is recommendable:

- If the power stroke release can accidentally be activated with the control throttle 'X' due to interference contours in the working area.

The following applies for the activation of the compressed air supply during venting:

- During venting, the return stroke and pressure valve (pneumatic spring) must be impinged with compressed air.
- It must not be possible to activate the fast approach stroke and the power stroke when doing so.
- Attach drop protection if necessary.

When depressurizing a pressure valve (pneumatic spring), the following applies:

- When the forward stroke connection and back stroke connection are switched, the compressed air supply of the pneumatic spring must also be turned off.

4.1.1 Measuring connection and control connection

The oil pressure proportional to the press force is present on the measuring connection and control connection.

This can be displayed, for example, by connecting a pressure gauge or used via transmission to a pressure switch for generating a switching pulse.

4.2 Activation according to dynamic pressure method (standard)

If the working piston meets a counterforce during the fast approach stroke, it stops and the dynamic pressure acting on the piston surface falls. The power stroke valve switches and the intensifier piston is impinged with compressed air.

The changeover time is controlled and adjusted with the control throttle X.

The drive is actuated like a double-acting pneumatic cylinder, via an electrical, pneumatic or mechanical 4/2 or 5/2 directional control valve or via a 4/3 or 5/3 directional control valve.

The drive must be switched to initial position before changing over to the fast approach stroke.

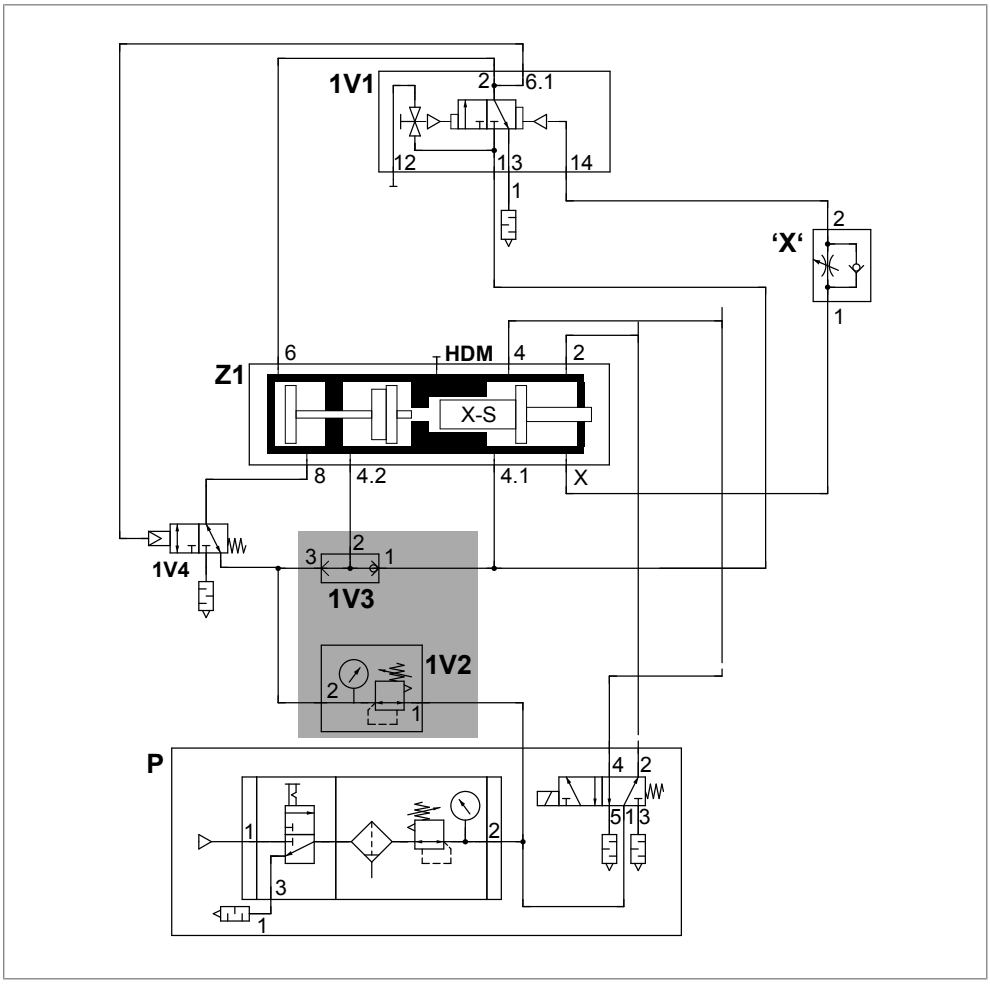

Fig. 1 Activation according to dynamic pressure method (standard) with pneumatic spring and fast stroke support

	Assembly	
1V1	Power stroke valve	
	2	Power stroke output
	6.1	Power stroke signal
	14	Control connection
	3	Muffler output
	1	Power stroke input
	12	Control connection
1V2	Pressure valve (pneumatic spring)	
1V3	Fast stroke support	
1V4	Pneumatic spring switch-off (type X-K 75/X-K 100 only)	
'X'	Control throttle 'X'	
Z1	Drive (example type X-S)	
	8	Plunger return stroke input
	4.2	Reservoir input
	4.1	Fast approach stroke output
	2.1	Return stroke output
	2	Return stroke input
	4	Fast approach stroke input
	HPM	High pressure measuring connection
	6	Power stroke input
P	**To be carried out by the customer: Compressed air supply and maintenance unit** (not included in delivery)	

Pneumatic spring switch-off (type X-K 75/X-K 100 only)

For the pneumatic spring switch-off, a valve is mounted between connection [8] of drive connection [3] of the fast stroke support and connection [2] of the fast stroke support. The valve is connected to connection [6.1] of the power stroke valve.

4.3 Pressure control in the power stroke line (assembly ZDK) (optional)

A pressure valve or electrical proportional valve in the power stroke line enables individual adaptation of the press force. No additional rapid vent valve is required. The required size depends on the size of the power stroke valve.

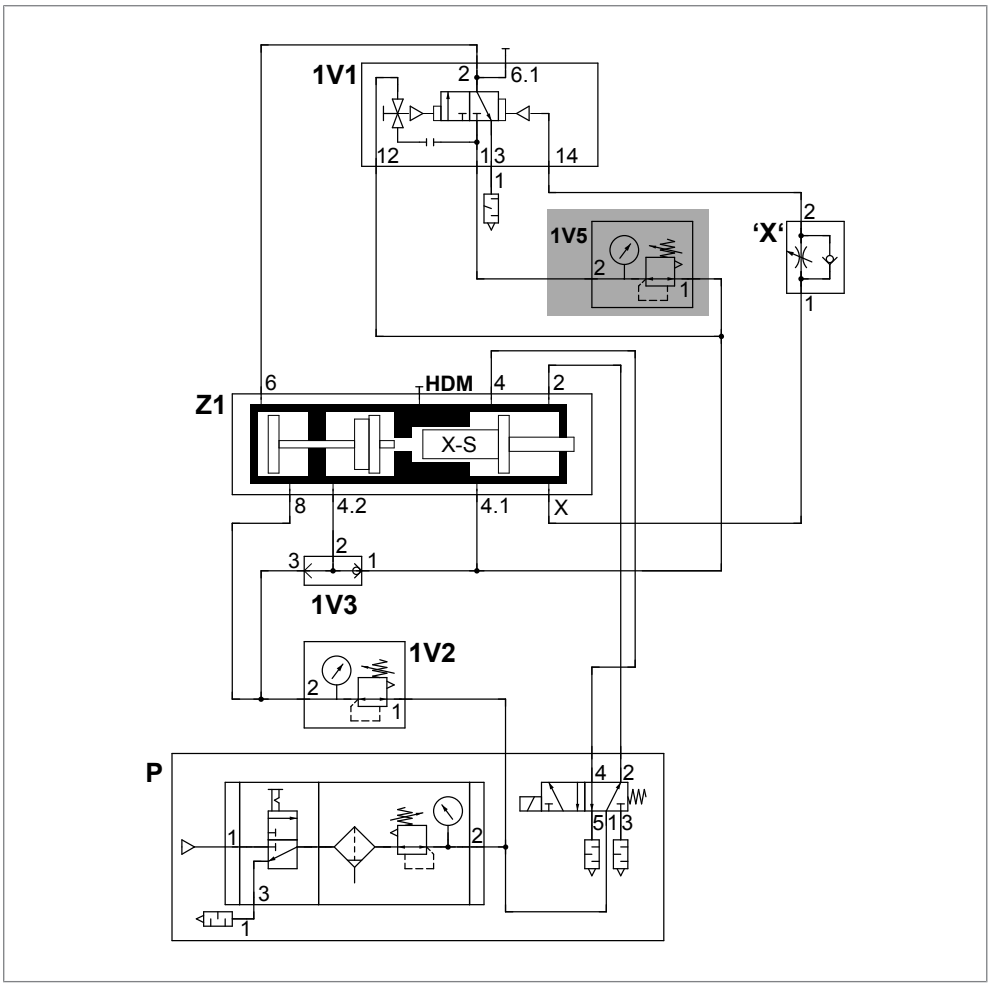

Fig. 2 Pressure control in the power stroke line (assembly ZDK)

	Assembly	
1V1	Power stroke valve	
	2	Power stroke output
	6.1	Power stroke signal
	14	Control connection
	3	Muffler output
	1	Power stroke input
	12	Control connection
1V2	Pressure valve (pneumatic spring)	
1V3	Fast stroke support	
1V5	Pressure regulator ZDK .2	
	1	Fast approach stroke input
	2	Power stroke output
'X'	Control throttle 'X'	
Z1	Drive (example type X-S)	
	8	Plunger return stroke input
	4.2	Reservoir input
	4.1	Fast approach stroke output
	2.1	Return stroke output
	2	Return stroke input
	4	Fast approach stroke input
	HPM	High pressure measuring connection
	6	Power stroke input
P	**To be carried out by the customer: Compressed air supply and maintenance unit** (not included in delivery)	

4.4 External power stroke switch (assembly ZKHZ) (optional)

In the case of the external power stroke switch, the power stroke is initiated after reaching a particular distance or after a certain period of time.

With the external power stroke switch option, the power stroke valve can be switched using an electrically actuated 3/2-way valve.

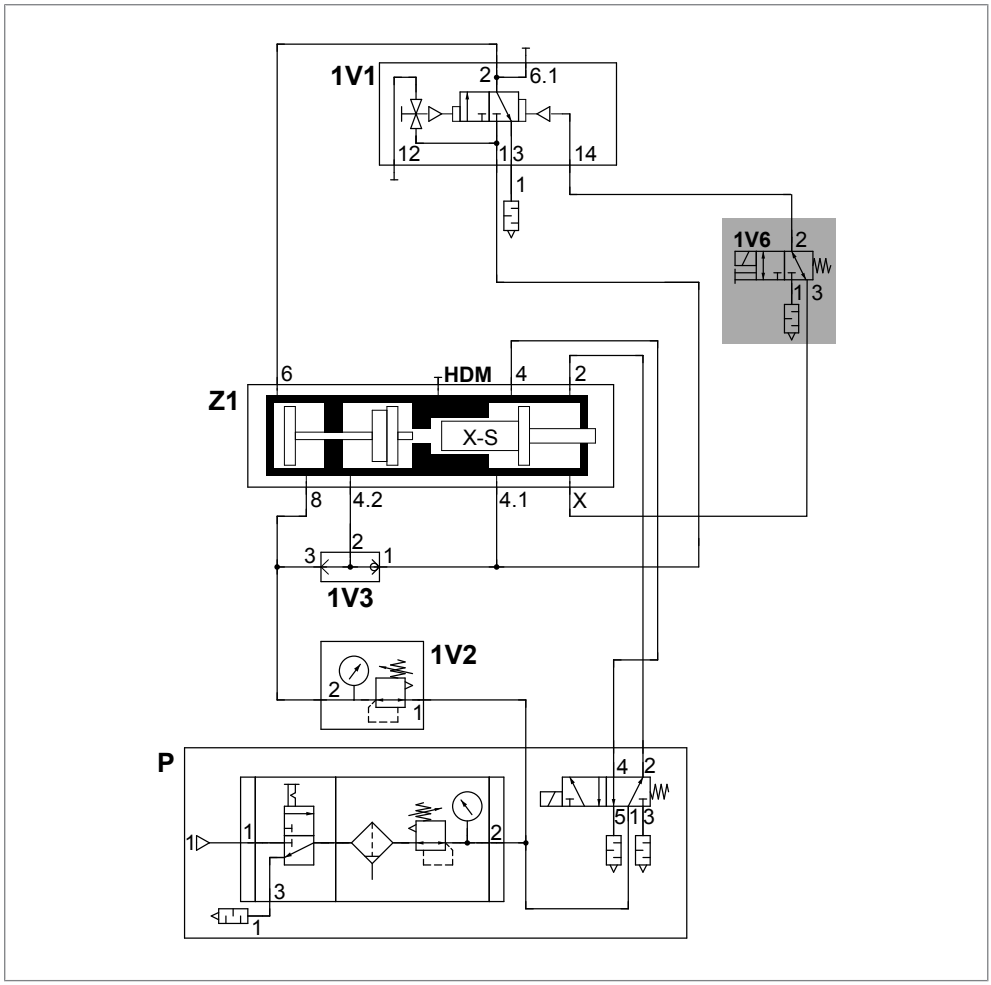

Fig. 3 External power stroke switch (subassembly ZKHZ)

	Assembly	
1V1	Power stroke valve	
	2	Power stroke output
	6.1	Power stroke signal
	14	Control connection
	3	Muffler output
	1	Power stroke input
	12	Control connection
1V2	Pressure valve (pneumatic spring)	
1V3	Fast stroke support	
1V6	Power stroke switch valve	
	1	Muffler output
	2	Output
	3	Input
Z1	Drive (example type X-S)	
	8	Plunger return stroke input
	4.2	Reservoir input
	4.1	Fast approach stroke output
	2.1	Return stroke output
	2	Return stroke input
	4	Fast approach stroke input
	HPM	High pressure measuring connection
	6	Power stroke input
P	**To be carried out by the customer: Compressed air supply and maintenance unit** (not included in delivery)	

An external power stroke switch can also be fitted retrospectively. The control system can be combined with a pressure regulator in the power stroke line.

The following is required:

- Permanent compressed air supply of the electrical 3/2-way valve with 3 to 6 bar (connection G 1/8").
- Electric switching signal (24 V) for switching the power stroke, e.g. a proximity switch ZHS 001 in combination with the stroke monitoring device ZHU, or output signal of a travel transducer ZKW/ZHW.
- Setting the position sensor of the stroke monitoring to the fast approach stroke end position to prevent an overload.

4.5 External power stroke deactivation (assembly ZKHD) (optional)

The power stroke can be deactivated with an electrical signal if necessary.

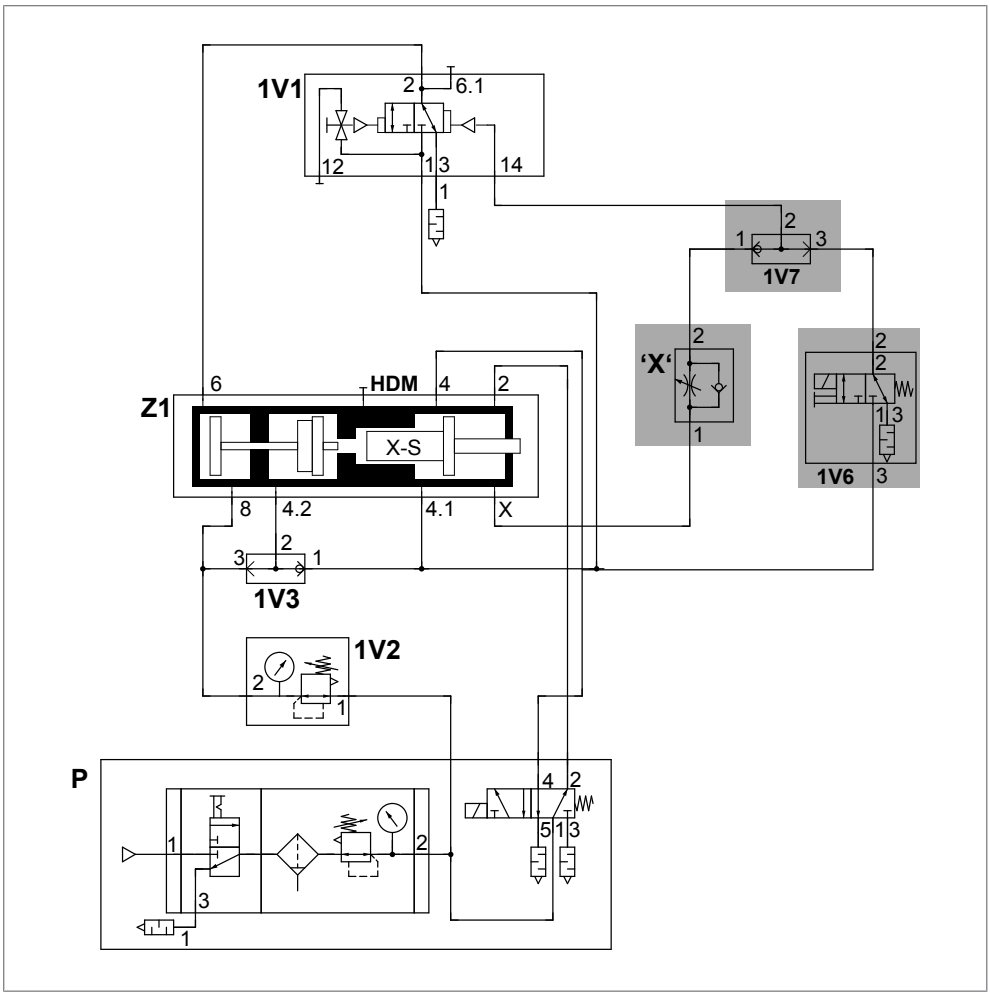

Fig. 4 External power stroke deactivation (assembly ZKHD)

	Assembly	
1V1	Power stroke valve	
	2	Power stroke output
	6.1	Power stroke signal
	14	Control connection
	3	Muffler output
	1	Power stroke input
	12	Control connection
1V2	Pressure valve (pneumatic spring)	
1V3	Fast stroke support	
1V6	Electrical switching valve	
	3	Input (release)
	2	Output
	1	Input (deactivation)
1V7	OR valve	
	3	Switching valve input
	1	Control throttle 'X' input
	2	Output
'X'	Control throttle 'X'	
Z1	Drive (example type X-S)	
	8	Plunger return stroke input
	4.2	Reservoir input
	4.1	Fast approach stroke output
	2.1	Return stroke output
	2	Return stroke input
	4	Fast approach stroke input
	HPM	High pressure measuring connection
	6	Power stroke input
P	**To be carried out by the customer: Compressed air supply and maintenance unit** (not included in delivery)	

An external power stroke deactivation can also be fitted retrospectively. The control system can be combined with a pressure regulator in the power stroke line.

The following is required:

- Permanent compressed air supply of the electrical 3/2-way valve with 3 to 6 bar (connection G 1/8").

4.6 External power stroke release (assembly ZKHF) (optional)

The power stroke can be released with an electrical signal if necessary.

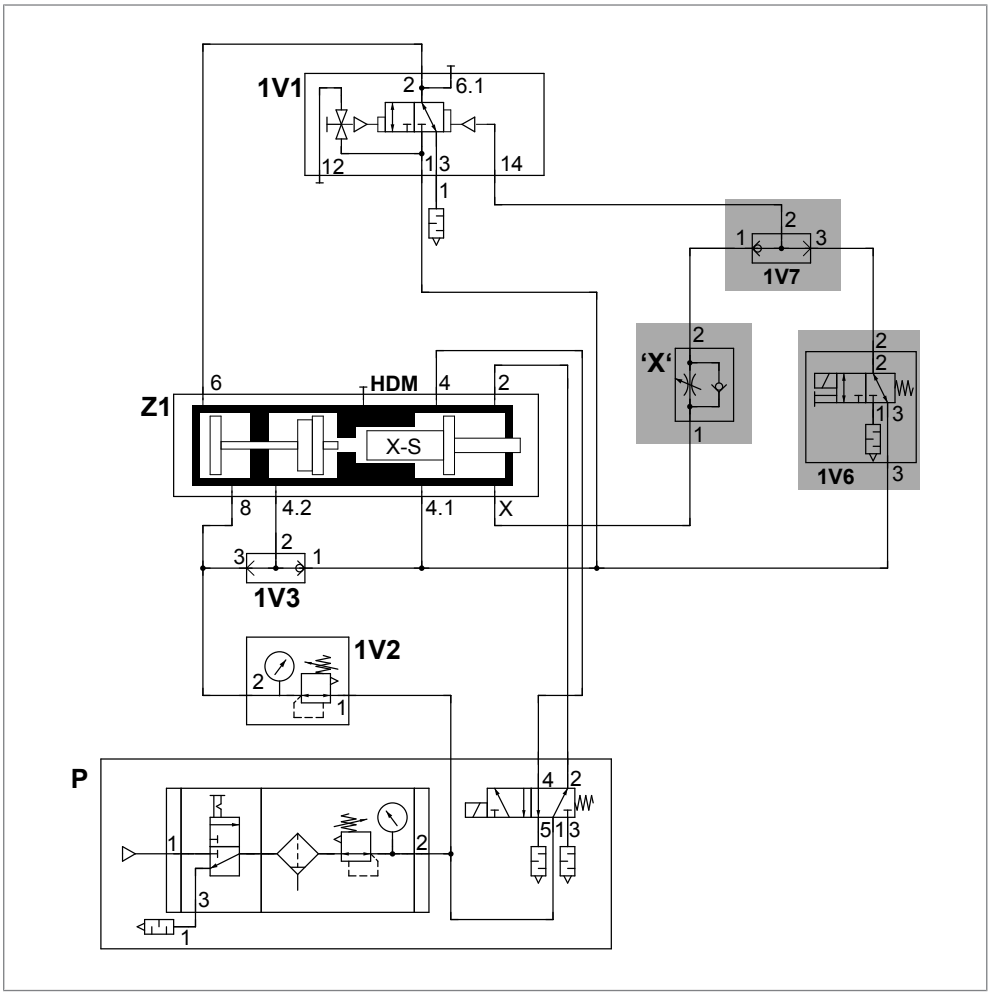

Fig. 5 External power stroke release (assembly ZKHF)

	Assembly	
1V1	Power stroke valve	
	2	Power stroke output
	6.1	Power stroke signal
	14	Control connection
	3	Muffler output
	1	Power stroke input
	12	Control connection
1V2	Pressure valve (pneumatic spring)	
1V3	Fast stroke support	
1V6	Electrical switching valve	
	3	Input (release)
	2	Output
	1	Input (deactivation)
1V7	OR valve	
	3	Switching valve input
	1	Control throttle 'X' input
	2	Output
'X'	Control throttle 'X'	
Z1	Drive (example type X-S)	
	8	Plunger return stroke input
	4.2	Reservoir input
	4.1	Fast approach stroke output
	2.1	Return stroke output
	2	Return stroke input
	4	Fast approach stroke input
	HPM	High pressure measuring connection
	6	Power stroke input
P	**To be carried out by the customer: Compressed air supply and maintenance unit** (not included in delivery)	

An external power stroke deactivation can also be fitted retrospectively. The control system can be combined with a pressure regulator in the power stroke line.

The following is required:

- Permanent compressed air supply of the electrical 3/2-way valve with 3 to 6 bar (connection G 1/8").

4.7 External power stroke supply (optional)

In the case of the external power supply, the power stroke valve is supplied with compressed air separately and independently from the fast approach stroke. The power stroke can be released by a dynamic pressure switch, an external power stroke switch (assembly ZKZ), or by an external power stroke release (ZKHZ).

If a power stroke deactivation (assembly ZKHD) is installed, the power stroke can be deactivated with an electrical signal if necessary.

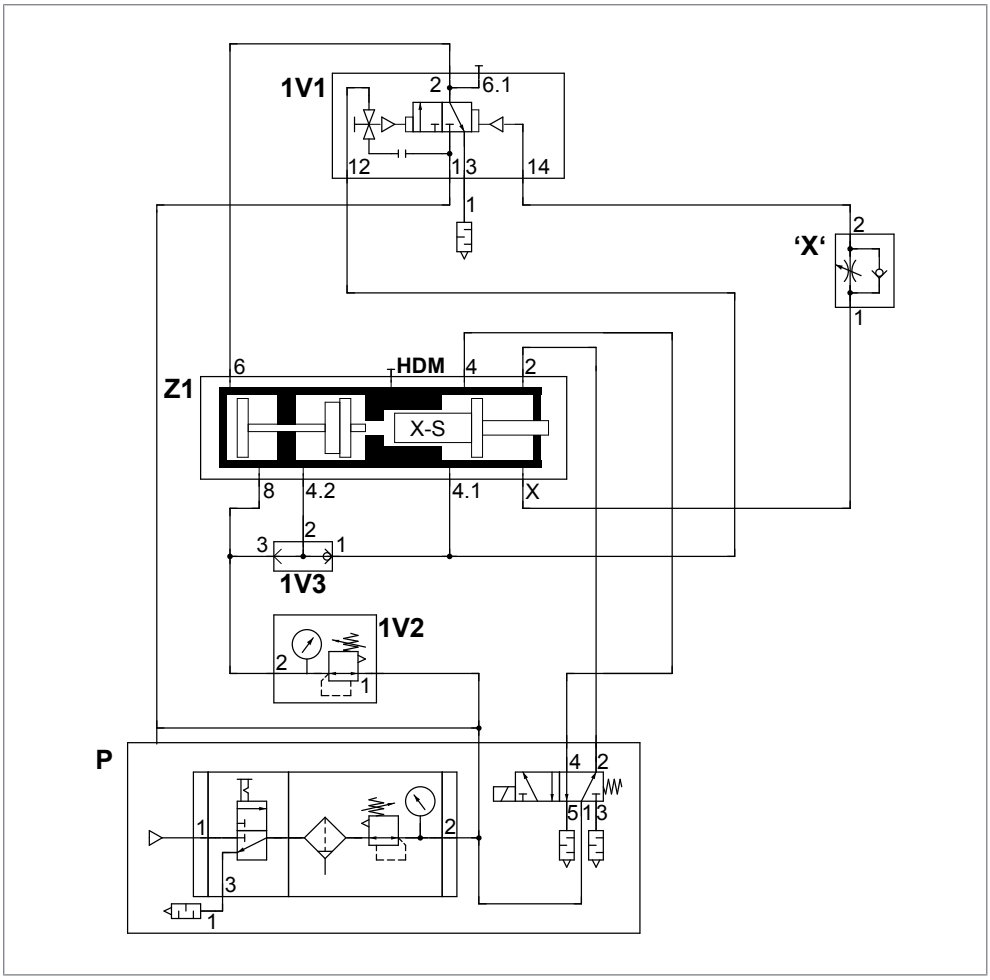

Fig. 6 External power stroke supply (optional)

	Assembly	
1V1	Power stroke valve	
	2	Power stroke output
	6.1	Power stroke signal
	14	Control connection
	3	Muffler output
	1	Power stroke input
	12	Control connection
1V2	Pressure valve (pneumatic spring)	
'X'	Control throttle 'X'	
Z1	Drive (example type X-S)	
	8	Plunger return stroke input
	4.2	Reservoir input
	4.1	Fast approach stroke output
	2.1	Return stroke output
	2	Return stroke input
	4	Fast approach stroke input
	HPM	High pressure measuring connection
	6	Power stroke input
P	**To be carried out by the customer: Compressed air supply and maintenance unit** (not included in delivery)	

The control system can be combined with a dynamic pressure switch, an external power stroke switch, an external power stroke release or a power stroke deactivation.

The following is required:

- External pressure supply at connection [1] of the power stroke valve.

4.8 Adjustable damping (assembly ZED) (optional)

The integrated damping option allows an adjustable constant speed of the working piston during the approach stroke and power stroke, independent of the working forces.

Thus, the following can be compensated:

- When joining: stick-slip effect.
- When stamping: sudden acceleration of the working piston when the opposing force, the stamping impact, is removed.

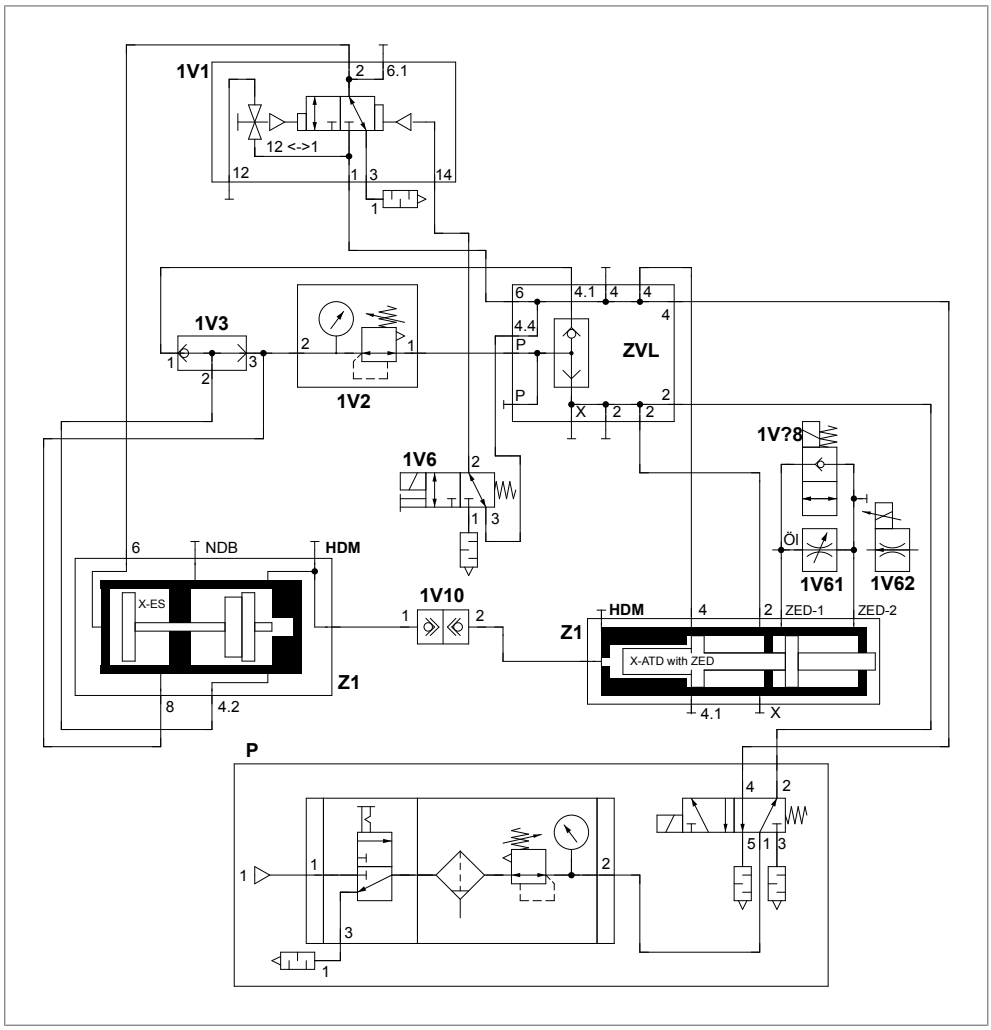

Fig. 7 Adjustable damping SED (optional)

	Assembly
1V1	Power stroke valve
1V2	Pressure valve (pneumatic spring)
1V3	Fast stroke support
1V6	Power stroke valve
1V61	Manual flow control valve
1V62	Electric proportional flow control valve (optional)
1V8	Damping On / Off
1V10	Hydrosplit coupling (ZHK)
Z1	Drive
P	**To be carried out by the customer: Compressed air supply and maintenance unit** (not included in delivery)

5 Technical data

For technical data and installation dimensions see data sheet and design and installation guideline.
(http://www.tox-pressotechnik.de)

5.1 Compressed air quality and pneumatic connection

The following is required:

- Filtered and dried compressed air

Lightly oiled compressed air is permitted.

Compressed air quality (according to DIN ISO 8573-1):

Solids		Water dew point		Maximum Oil content	
Class	[µm]	Class	[°C]	Class	[mg/m3]
5	40	4	3	3	1

5.1.1 Pneumatic connection, Hydrosplit couplings, air pressure, oil pressure

See data sheet.
(http://www.tox-pressotechnik.de).

No separate compressed air supply of the pressure valve (pneumatic spring) required.

5.2 Ambient temperature

Approved ambient temperature: 10 °C to 60 °C.

5.3 Torques for the installation

Prescribed tightening torques for fastening screws of property class ISO 4762-12.9:

Thread size	Torque
M 6	17 Nm
M 8	40 Nm
M 10	80 Nm
M 16	340 Nm
M 20	660 Nm
M 24	1,130 Nm

5.4 Press force table

The effective press force is the ratio of the available press force at the specified air pressure to the press force required for the pressing process.

5.4.1 Press force table X-KT system

See separate document Press force table.

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