

Design and installation guideline

TOX®-Powerpackage
Type T, RP

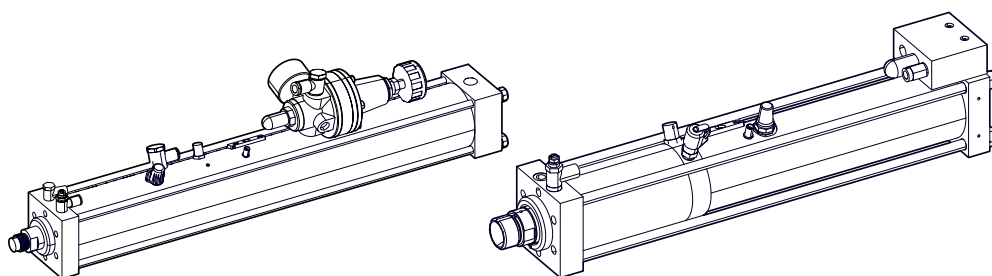


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1 Important information

1.1 Legal note

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Operating instructions, manuals, technical descriptions and software are originally compiled in German.

1.2 Exclusion of liability

TOX® PRESSOTECHNIK has checked the contents of this publication to ensure that it conforms to the technical properties and specifications of the products or plant and the description of the software. However, discrepancies may still be present, so we cannot guarantee complete accuracy. The supplier documentation included with the system documentation is an exception.

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 all sexes are normally only stated in the usual 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". This should in no way convey any gender discrimination or any violation of the principle of equality, however.

1.5 Contact and source of supply

Only use original spare parts or spare parts approved by TOX® PRESSOTECHNIK.

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For additional information and forms see www.tox-pressotechnik.com.

2 Product overview of Powerpackage Type T, RP

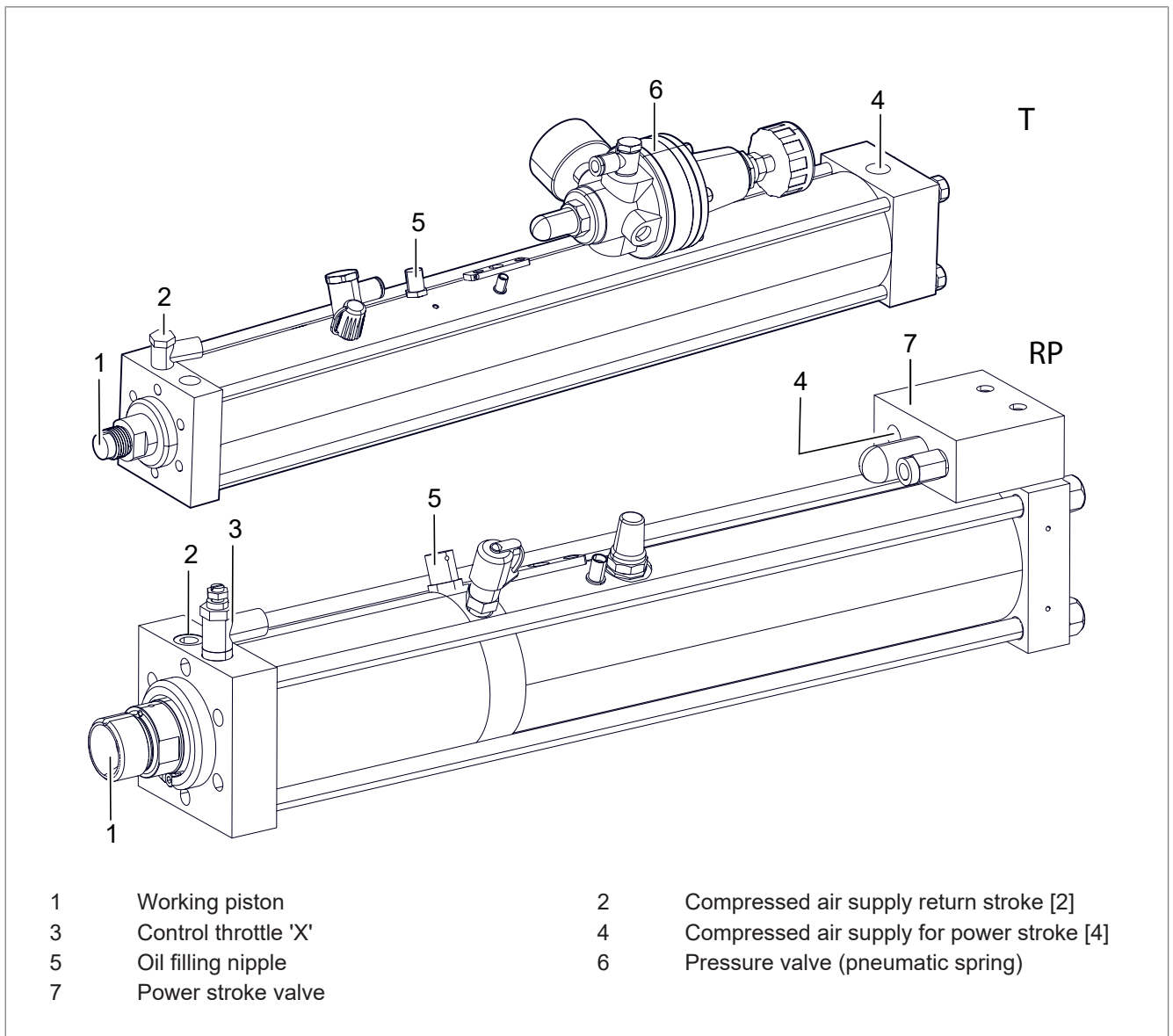


Fig. 1 Product overview Type T, Type RP

2.1 Product attributes of Powerpackage Type T, RP

Type	Product attributes
Type T	<ul style="list-style-type: none"> Fast running drive with up to 550 strokes per minute. Working process only with power stroke, no fast approach stroke. Including power bypass ZLB. Equipped with pressure control valve (pneumatic spring).
Type RP	<ul style="list-style-type: none"> For use with embossing tools. Including embossing cylinder with anti-rotation device and clamping tongs. Equipped with mechanical spring in fast approach stroke. Equipped with mechanical spring for return stroke of the intensifier piston.



3 Optional equipment

3.1 Additional optional equipment

Type	Product attributes
ZDK	Pressure regulation in power stroke line <ul style="list-style-type: none"> • Make possible the individual adjustment of the press force with a manual pressure valve or electrical proportional valve.
ZKHZ	External power stroke connection <ul style="list-style-type: none"> • Enables the connection of the power stroke valve with an electrically actuated 3/2-way valve.
ZWK	Tool coupling <ul style="list-style-type: none"> • Connects the drive and tool flexibly to prevent transverse forces from affecting the drive.
ZDO	Electronic pressure switch <ul style="list-style-type: none"> • Records the oil pressure in the high-pressure part as system pressure and visualizes it via a four-digit LED display. • The set switching function allows 2 output signals to be created.
ZHO	Stroke frequency optimization <ul style="list-style-type: none"> • Reduces the cycle time. • Replaces the existing power stroke valve with one of the next size.
ZPS	Pressing force sensor <ul style="list-style-type: none"> • Measures the press forces in the direction of the pressure.

Tab. 1 Optional equipment

For optional equipment, see data sheet and brochure TOX®-Powerpackage.

<http://tox-pressotechnik.com/>

4 Function description of Powerpackage with mechanical fast approach stroke spring

The drive works with a pneumatically operated cylinder with pneumohydraulic power stroke. At the same time, a closed oil cylinder and valve system is driven with compressed air, which is controlled in the same way as a double-acting pneumatic cylinder.

Compressed air is converted to oil pressure in the intensifier part to generate the necessary pressure for the power stroke. In the working part, the oil pressure acts on the working piston.

For the fast approach of the working piston to the working position (fast approach stroke) a mechanical spring is used.

Compressed air is used for the return to the home position (return stroke).

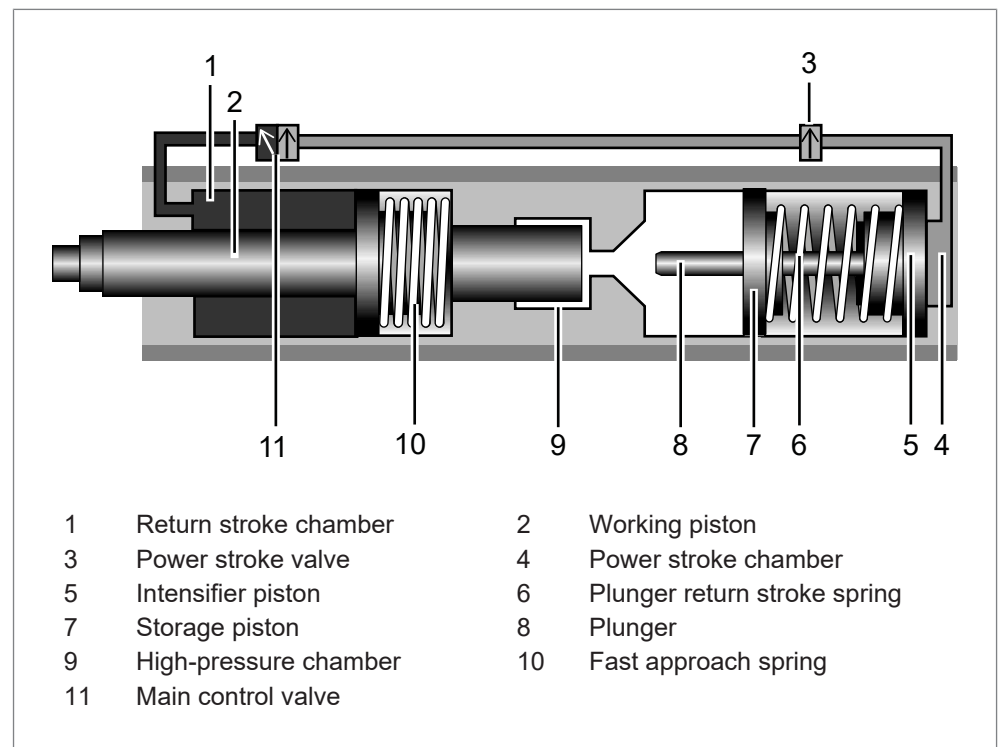


Fig. 2 Starting position of Powerpackage with mechanical fast approach stroke spring

- In home position, the drive is controlled via the main control valve in the return stroke.
- The working piston is retracted.

Mechanically operated fast approach stroke

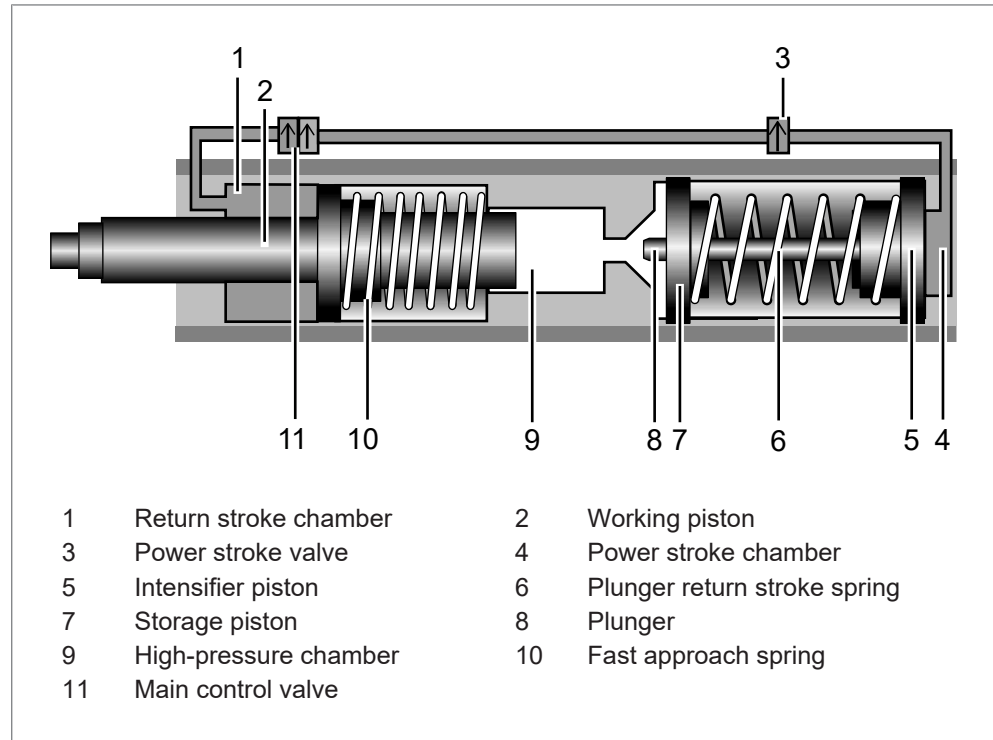


Fig. 3 Fast approach stroke Powerpackage with mechanical fast approach stroke spring

- After the switchover of the main control valve the power stroke chamber is vented.
- The power stroke valve is supplied with compressed air.
- The working piston extends in the fast approach stroke with the power generated by the mechanical spring.
- The feed piston pushes hydraulic oil from the reservoir into the high pressure chamber activated by the mechanical spring.
- As soon as the working piston meets any resistance, it stops.
- The power stroke valve switches over independently to power stroke after a delay, depending on the air volume flowing out of the control throttle 'X'.

Pneumohydraulic power stroke

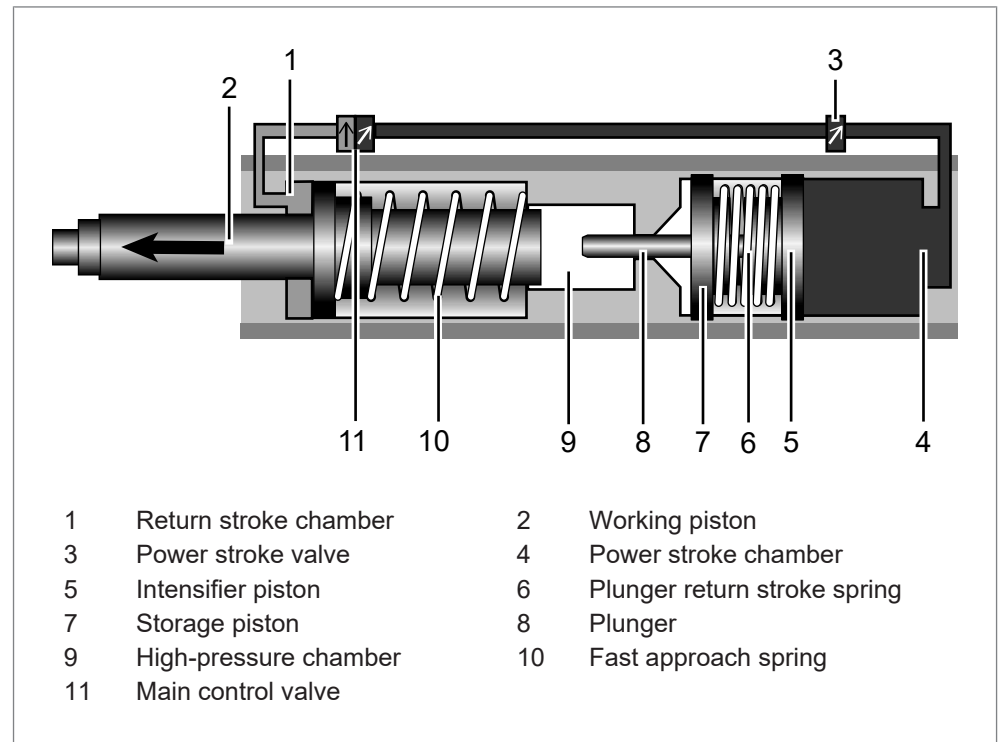


Fig. 4 Power stroke Powerpackage with mechanical fast approach stroke spring

- Compressed air from the forward stroke connection penetrates into the power stroke chamber of the intensifier piston via a connection line.
- The plunger passes through the high pressure seal and separates the oil chamber into a working area and an oil reservoir.
- A hydraulic pressure is generated in working area, which creates the power stroke via the working piston.

Back stroke

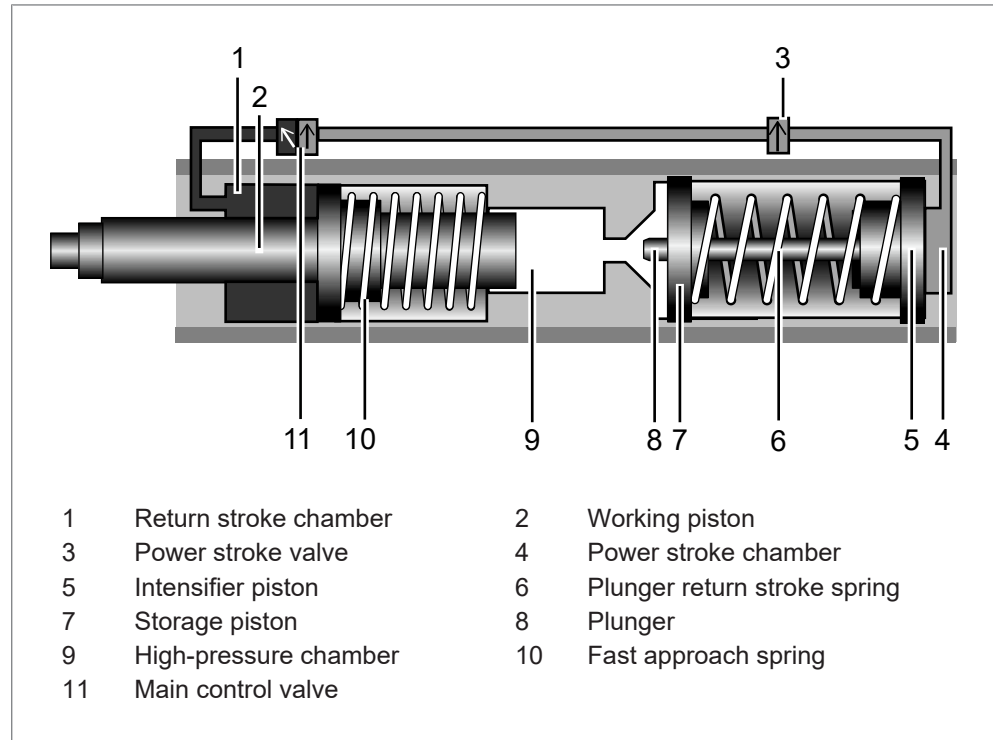


Fig. 5 Return stroke Powerpackage with mechanical fast approach stroke spring

- The main control valve is switched over to return stroke by a signal. The return stroke chamber is being filled with compressed air.
- As a result, the power stroke valve is vented and moved to the home position.
- The power stroke chamber of the intensifier piston is vented via the muffler and the return stroke is triggered.
- After the intensifier piston has released the high pressure seal, the working piston moves back to the home position.

5 Function description of Powerpackage without fast approach stroke

The drive works with a pneumatically operated cylinder with pneumohydraulic power stroke. At the same time, a closed oil cylinder and valve system is driven with compressed air, which is controlled in the same way as a double-acting pneumatic cylinder.

Compressed air is converted to oil pressure in the intensifier part to generate the necessary press force for the power stroke. In the working part, the oil pressure acts on the working piston.

Compressed air is used for the return to the home position (return stroke). The connections [2] (return stroke) and [8] (pressure valve/pneumatic spring) are continuously pressurized.

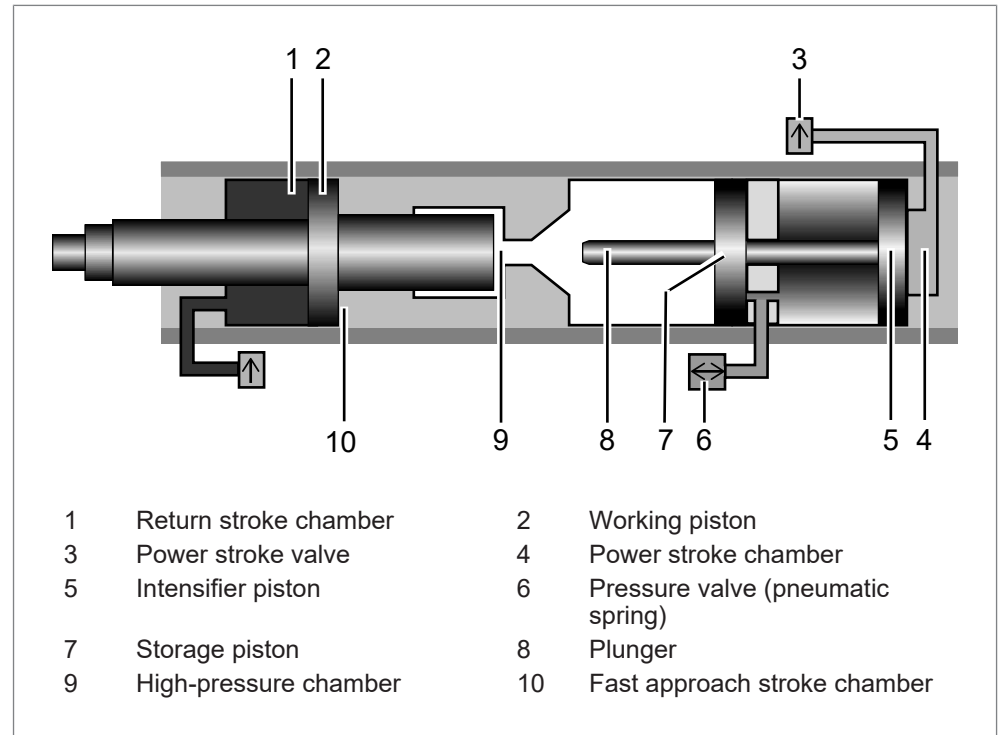


Fig. 6 Starting position of Powerpackage without fast approach stroke

- In the home position the drive is continuously pressurized.
- The working piston is retracted.

Pneumohydraulic power stroke

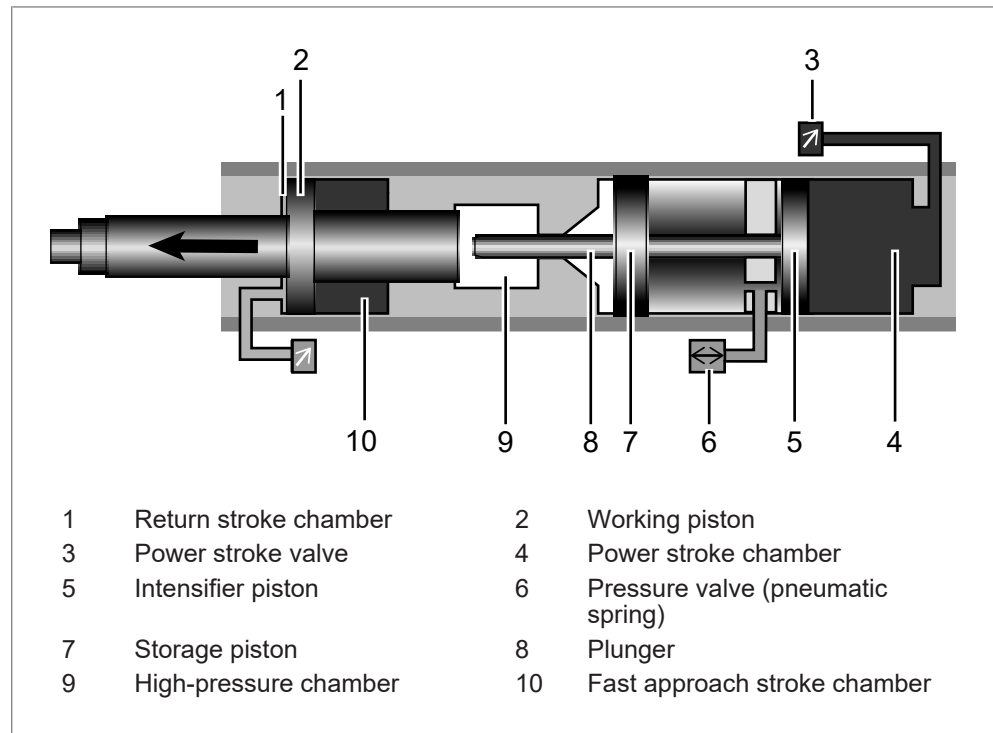


Fig. 7 Power stroke Powerpackage without fast approach stroke

- Compressed air penetrates into the power stroke chamber of the intensifier piston after the switchover of the power stroke valve.
- The plunger passes through the high pressure seal and separates the oil chamber into a working area and an oil reservoir.
- A hydraulic pressure is generated in working area, which creates the power stroke via the working piston.

Back stroke

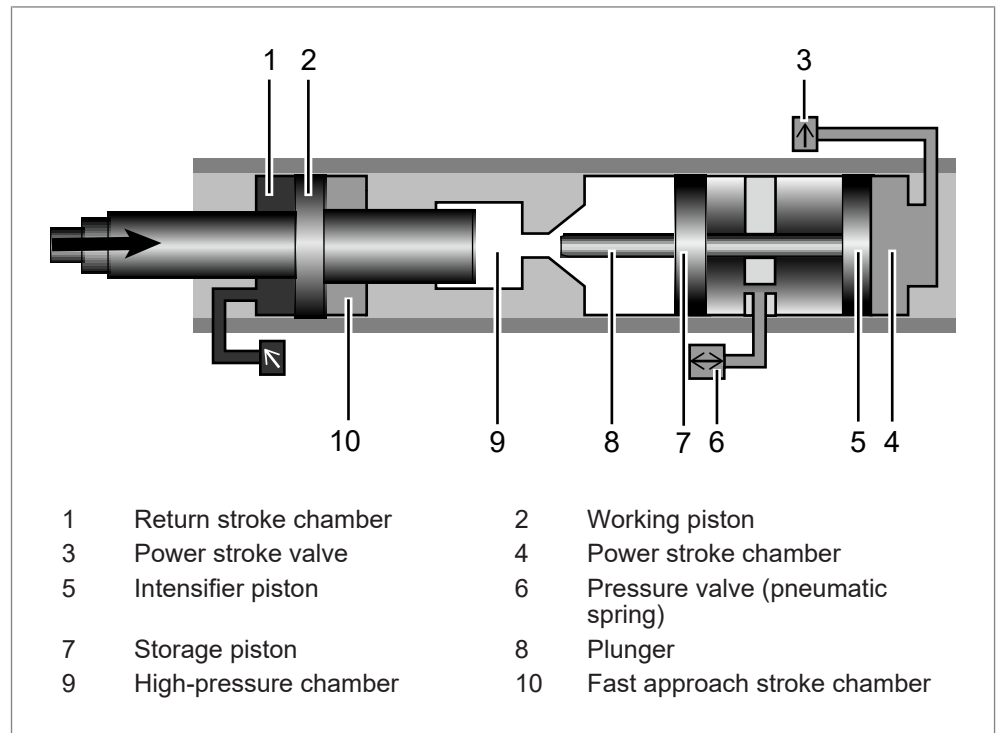


Fig. 8 Powerpackage return stroke without fast approach stroke

- The power stroke valve is switched over to return stroke by a signal.
- The power stroke chamber of the intensifier piston is vented via the muffler and the return stroke is triggered.
- After the intensifier piston has released the high pressure seal, the working piston moves back to the home position.



6 Technical data

6.1 Type sheet and data sheet

For technical data and installation dimensions see type sheet and data.
(<https://www.tox-pressotechnik.com>)

6.2 Specification for hydraulic oil

The following oils are approved for standard application:

- Hydraulic oil HLP32 (according to DIN 51524-2), filtered < 5µm, load rating > 30 N/mm²
- Food grade oil Klüber Summit HySyn FG 32

The following hydraulic oils are approved with limitations for standard application:

- Hydraulic oil UCON™ LB-165
- Synthetic oil ISOTEX 46
- Synthetic oil Envolubric PC 46 NWL
- The use of hydraulic oils that have not been approved as standard can lead to an increase of maintenance intervals due to an increased intake of air.
- The use of hydraulic oils that have not been approved as standard can reduce the lubrication capacity lower than for HLP32 hydraulic oils. This can lead to a shorter lifetime of seals.
- Some sealing materials in case of hydraulic oils not approved as standard tend towards increased swelling and therefore to a reduced lifetime of the seals.

NOTE

Loss of warranty in case of the use of non-approved hydraulic oils!

Due to the negative effects on maintenance intervals, swelling behavior and lifetime of the seals in case of the use of hydraulic oils that have not been approved as standard, the granted warranty becomes extinct.

- ➔ Use hydraulic oils that have been approved by TOX® PRESSOTECHNIK as standard.
 - ➔ Use other hydraulic oils only after the express approval of TOX® PRESSOTECHNIK.
 - ➔ Do not mix different hydraulic oils. Negative effects such as flocculation cannot be excluded.
-

7 Design data

7.1 Data sheet

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

8 Design guidelines

8.1 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.

8.1.1 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 de-pressurized during this time.

8.1.2 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 (except for type RP, T). 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.

- **Optimization of stroke frequency 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.

8.2 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>

8.3 Stroke limitation of the power stroke

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

For punch applications a limiting the travel of the power stroke must take place. The travel of the power stroke must be limited to a maximum of 80%.

The travel of the power stroke can be limited by:

- Stroke limitation in the tool.
- Stroke limitation by a set total stroke (fast approach stroke and power stroke).
- Stroke limitation by setting the total stroke length and cutting impact damping (ZSD).

Stroke limitation of the power stroke in the tool

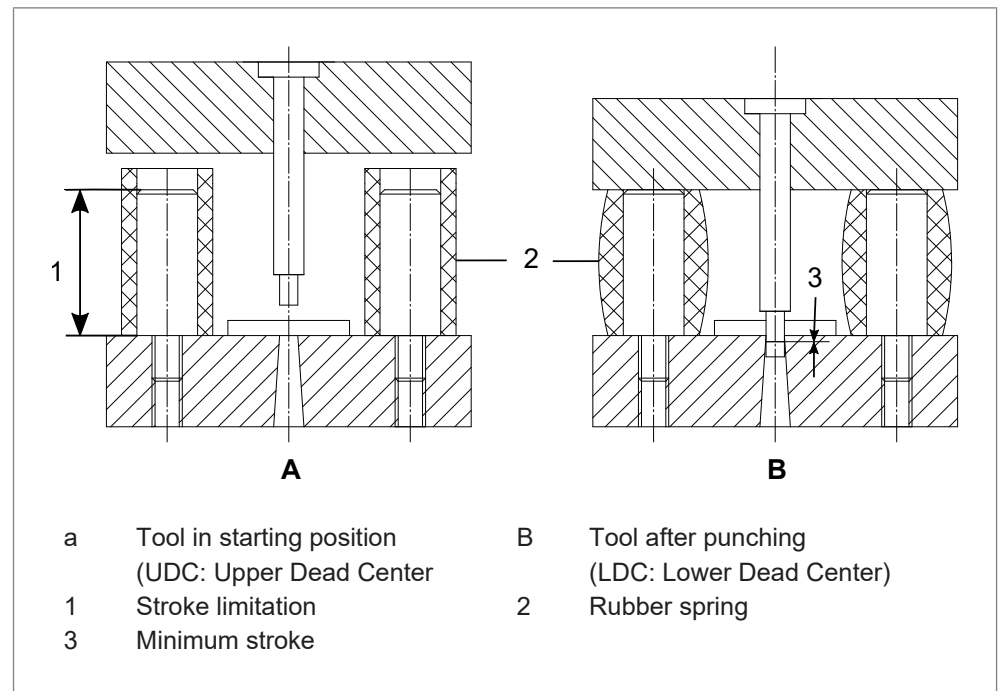


Fig. 9 Stroke limitation in the tool

After the punching process the tool limits the power stroke (LDC).

8.4 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).

8.5 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.

9 Activation and pressure control

9.1 Design principles of activation

A distance-dependent external power stroke switch is recommendable:

- For a piston rod working upwards.
- 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.

9.1.1 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.

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.

9.2 Activation according to dynamic pressure method for Powerpackage

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.

9.2.1 Powerpackage type T, RP

Powerpackage type RP with mechanical spring

Applicable for:

- Powerpackage type: RP

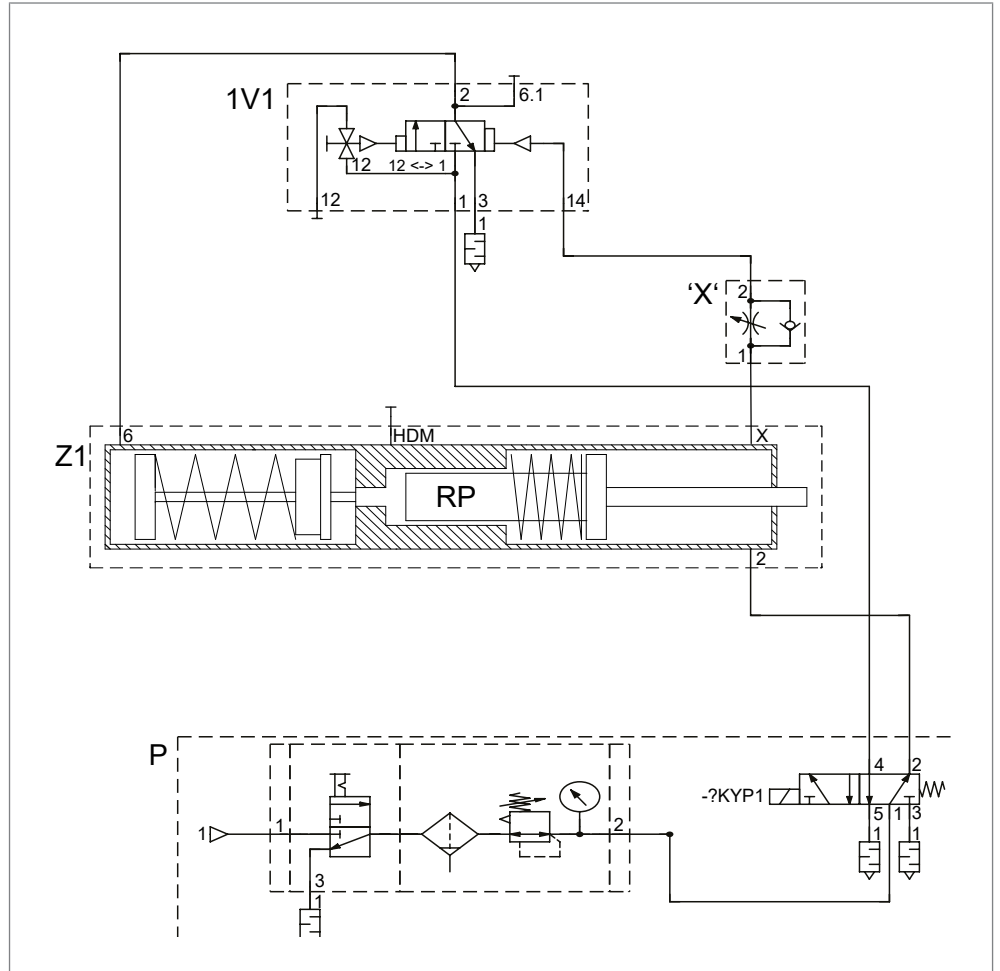


Fig. 10 Activation according to dynamic pressure method for Powerpackage with mechanical spring

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
'X'	Control throttle 'X'
Z1	Drive
2	Return 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)

Powerpackage type T with pressure valve (pneumatic spring)

Applicable for:

- Powerpackage type: T

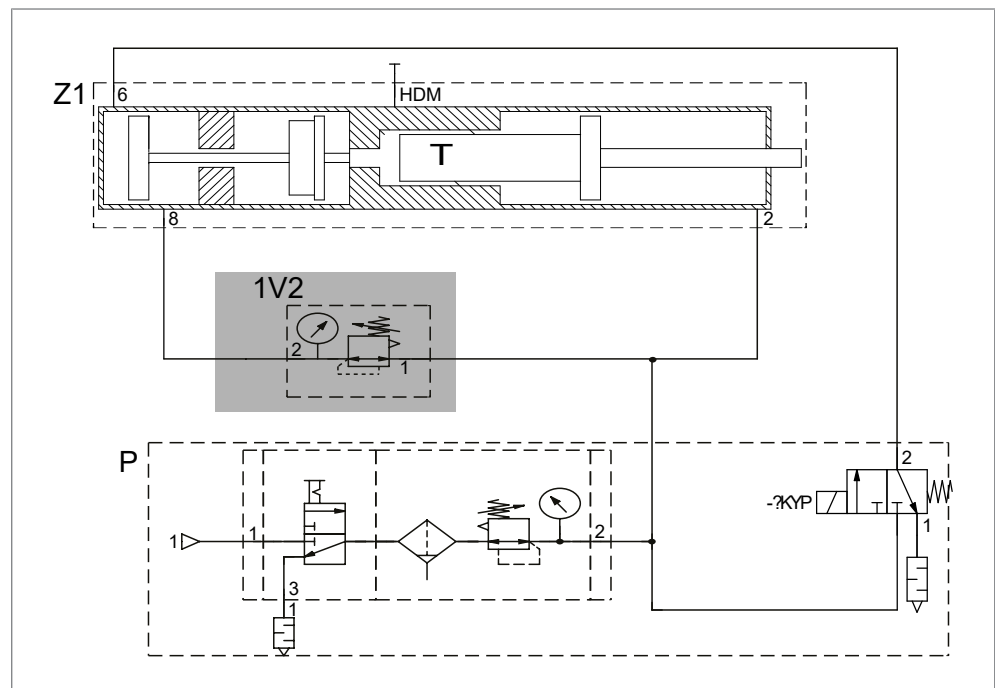


Fig. 11 Activation according to dynamic pressure method for Powerpackage pressure valve (pneumatic spring)

Assembly	
1V1	Power stroke valve
	2 Power stroke output
	6.1 Power stroke signal
	14 Control connection
	3 Muffler output
	1 Power stroke input
Z1	12 Control connection
	Drive
	2 Return stroke input
	8 Plunger return 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)

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

A pressure 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.

For installing the pressure regulation, see the operating manual, chapter Installation.

9.3.1 Powerpackage type T, RP

Powerpackage type RP with mechanical spring

Applicable for:

- Powerpackage type: RP

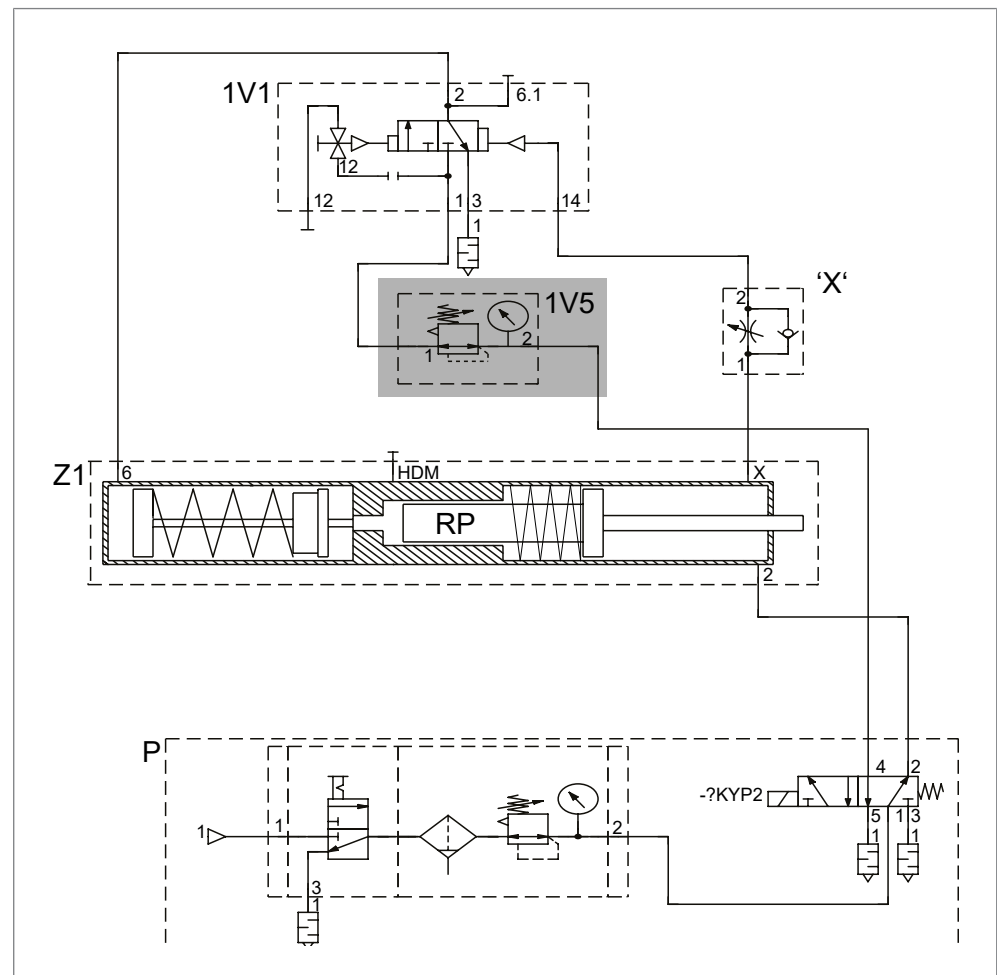


Fig. 12 Pressure control in the power stroke line (assembly ZDK)

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
'X'	Control throttle 'X'
Z1	Drive
	2 Return 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)

Powerpackage type T with pressure valve (pneumatic spring)

Applicable for:

- Powerpackage type: T

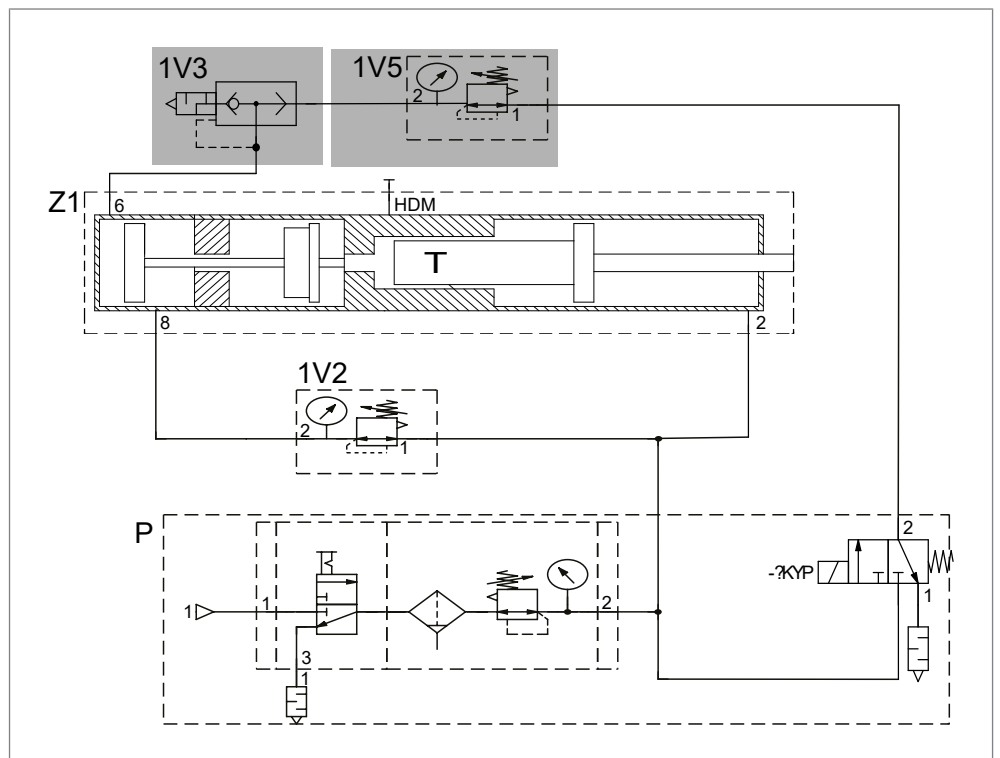


Fig. 13 Pressure control in the power stroke line (assembly ZDK)

	Assembly	
1V1	Power stroke valve	
	2	Power stroke output
	6.1	Power stroke signal
	14	Control connection
	3	Muffler output
	1	Power stroke input
Z1	12	Control connection
	Drive	
	2	Return stroke input
	8	Plunger return stroke input
	HPM	High pressure measuring connection
P	6	Power stroke input
	To be carried out by the customer: Compressed air supply and maintenance unit (not included in delivery)	

9.4 Pressure control in the power stroke line with proportional pressure control valve (optional)

The 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.

For installing the pressure regulation, see the operating manual, chapter Installation.

9.4.1 Powerpackage type RP with mechanical spring

Applicable for:

- Powerpackage type: RP

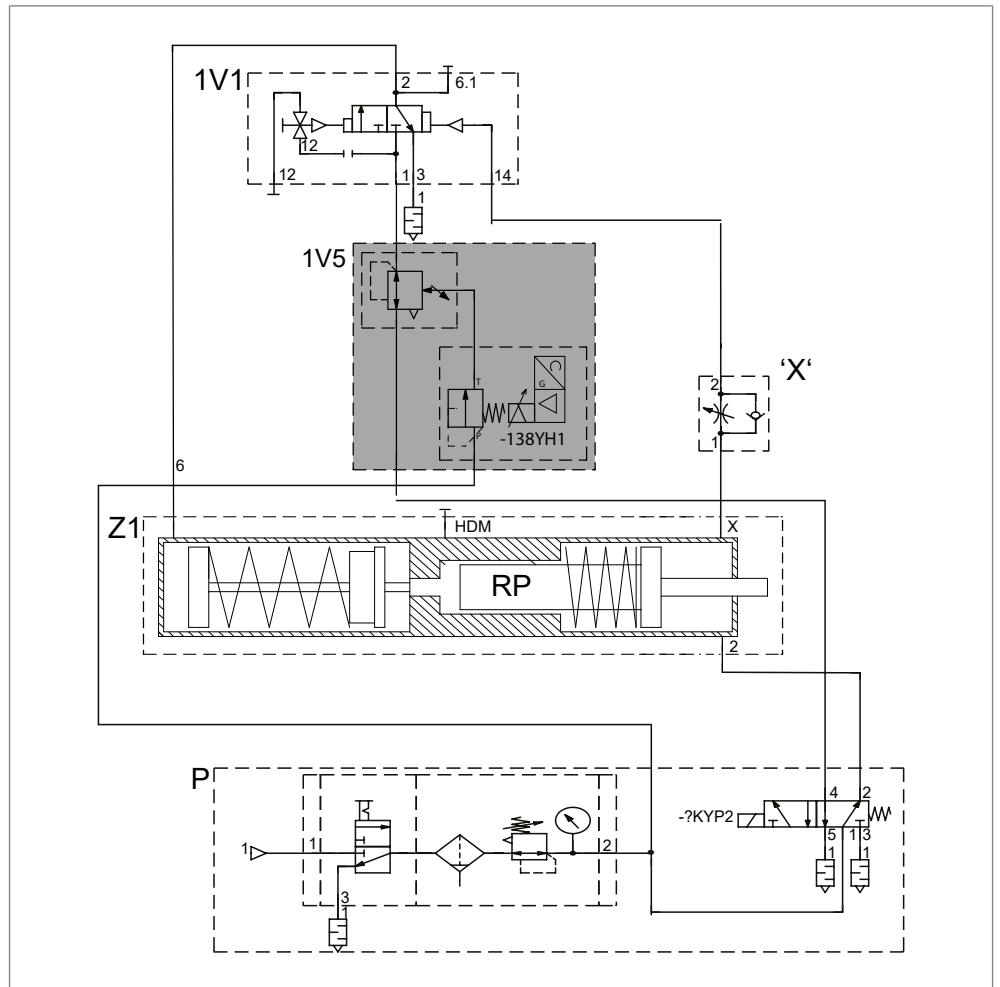


Fig. 14 Pressure control in the power stroke line with proportional pressure control valve

	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
'X'	Control throttle 'X'	
Z1	Drive	
	2	Return 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)	

9.5 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.

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.

9.5.1 Powerpackage type RP with mechanical spring

Applicable for:

- Powerpackage type: RP

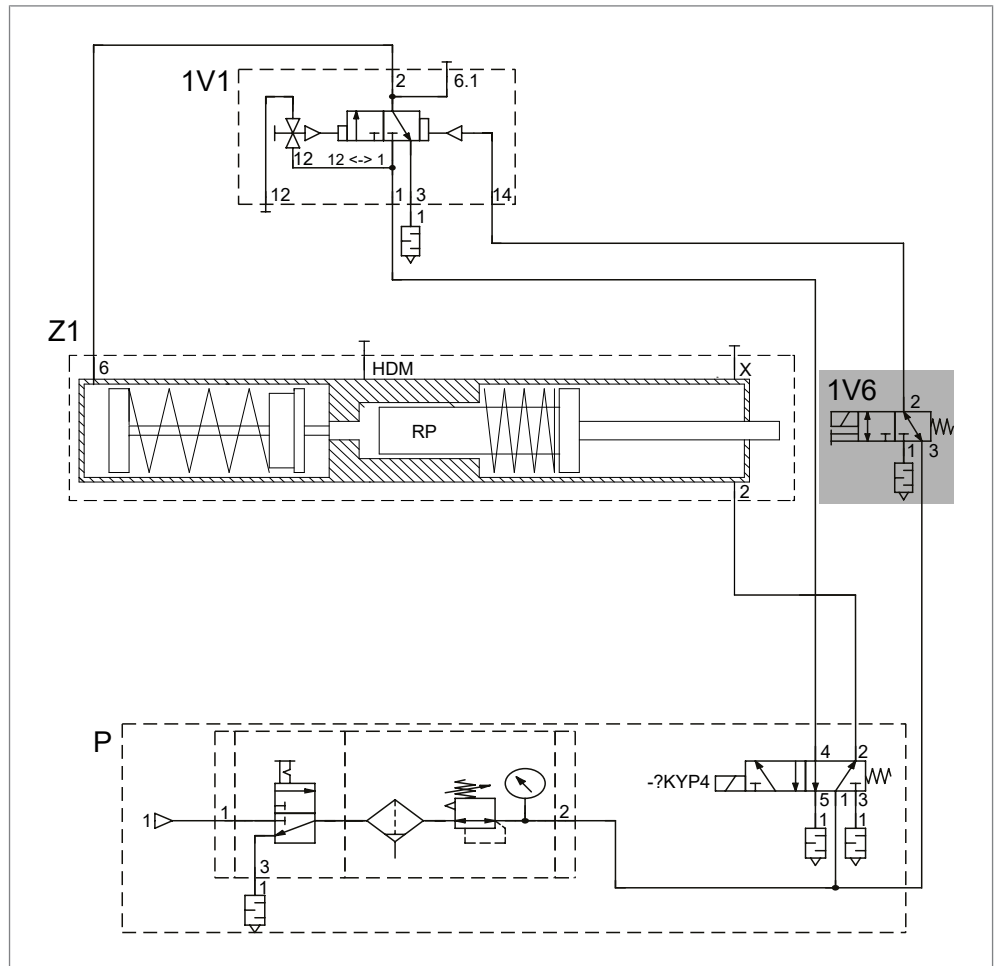


Fig. 15 External power stroke switch (subassembly ZKHZ)

	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
'X'	Control throttle 'X'	
Z1	Drive	
	2	Return 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)	

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

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

9.6.1 Powerpackage type RP with mechanical spring

Applicable for:

- Powerpackage type: RP

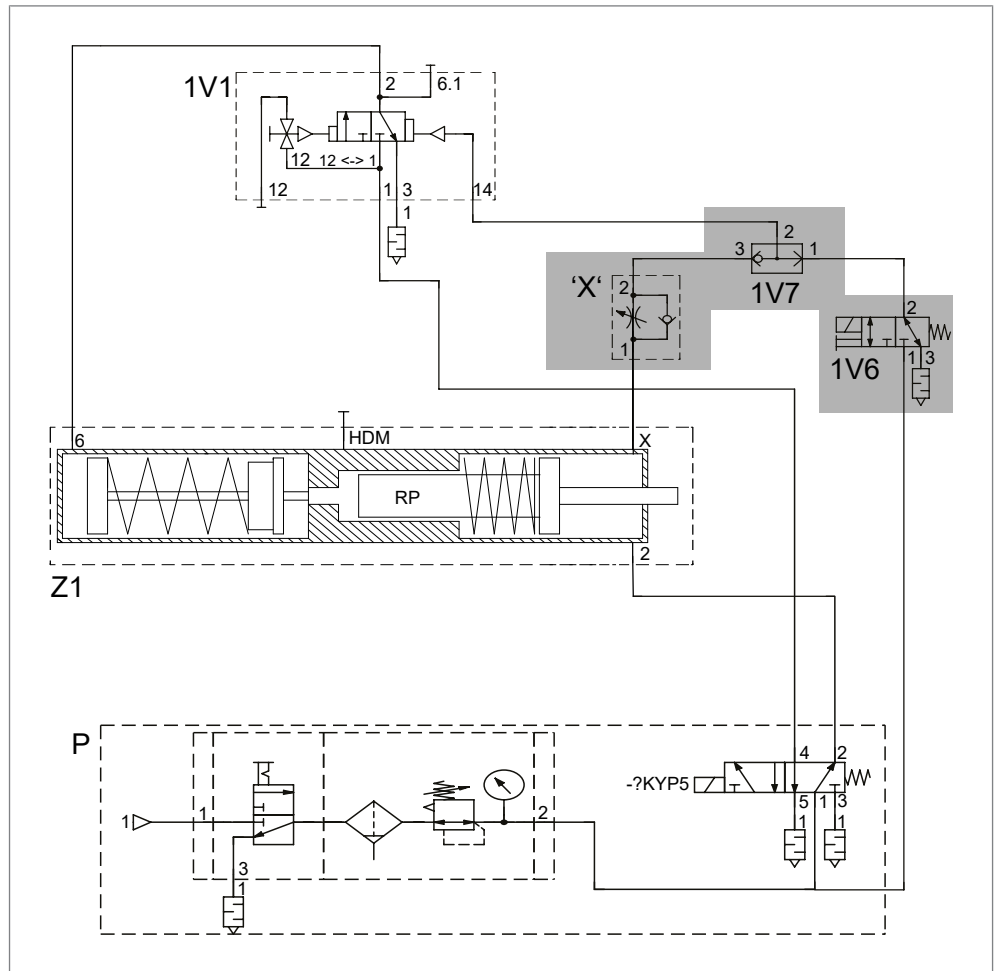


Fig. 16 External power stroke deactivation (assembly ZKHD)

	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
'X'	Control throttle 'X'	
Z1	Drive	
	2	Return 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)	

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

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

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").

9.7.1 Powerpackage type RP with mechanical spring

Applicable for:

- Powerpackage type: RP

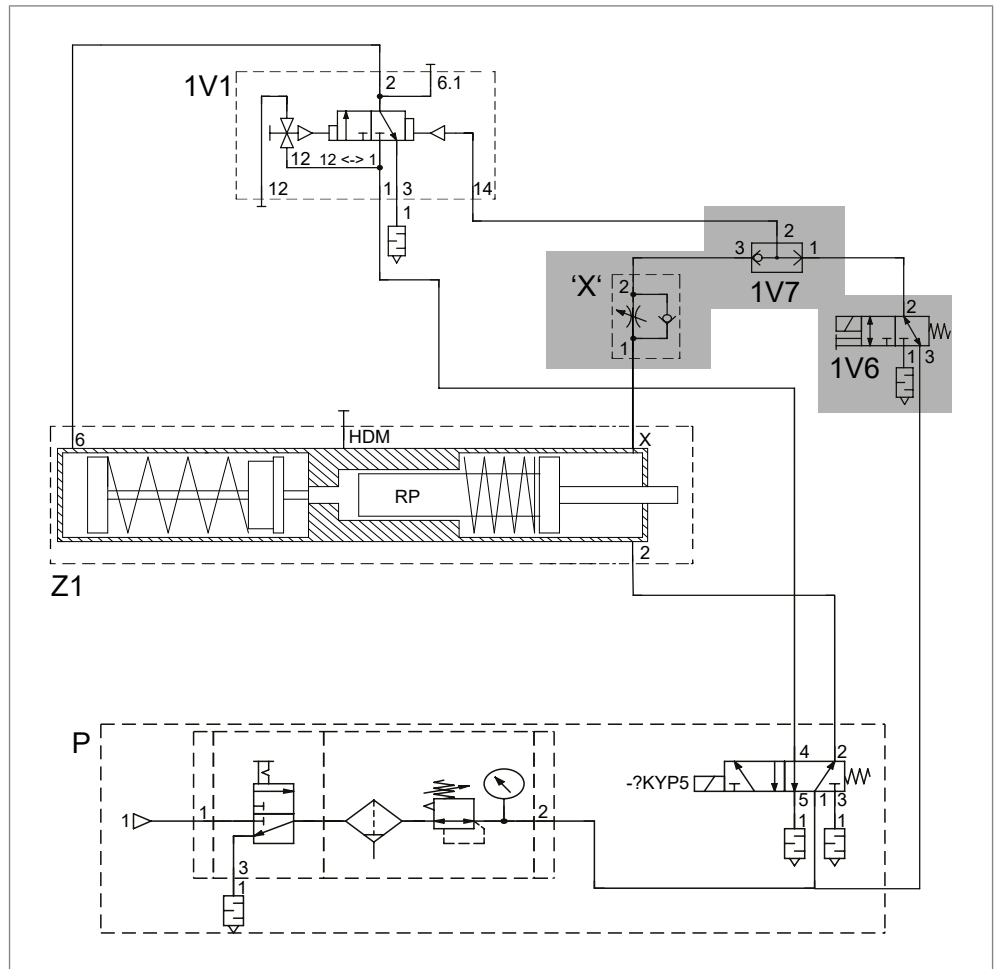


Fig. 17 External power stroke release (assembly ZKHF)

	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
'X'	Control throttle 'X'	
Z1	Drive	
	2	Return 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)	

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