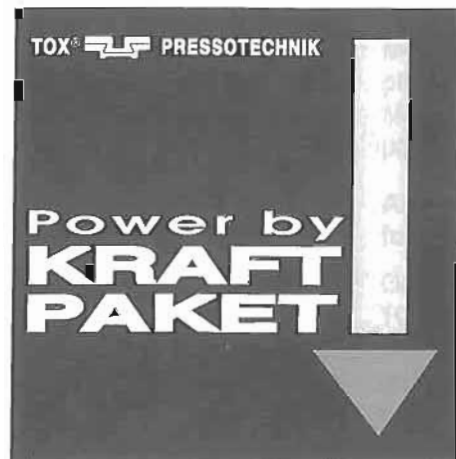


THE POWERPACKAGE OPERATING MANUAL



FOR TYPES S, K, RP and O

Instruction

The user of the Powerpackage hereby declares that all available instructions, e.g.:

- the operating manual of the Powerpackage, especially the "Safety" chapter,
- general product information,
- maintenance regulations etc.,
- applicable accident prevention regulations,

shall be made available for instruction purposes to all persons charged by the user with the operation, maintenance and repair of the Powerpackage.

The user promises to observe and execute all procedures specified under the applicable regulations concerning the duty to provide instruction.

Purchaser Place/date

User Place/date

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1 General

1.1. Important information

Besides the information given in this operating manual, the legal "safety and accident prevention regulations" also apply. All persons charged by the user with the operation, maintenance and repair of the Powerpackage must have read and understood the operating manual, and especially chapter 3 "Safety", before start-up. Detailed explanations can be found under "Information on obligatory instruction of operating personnel" in item 3.9 of the "Safety" chapter.

Staff engaged in repairing the Powerpackage are always responsible themselves for working safety.

All applicable safety regulations and legal conditions must be observed in order to avoid damage to persons and to the product during maintenance and repairs. Repair staff must have read and understood these regulations before beginning work.

TOX®-PRESSOTECHNIK products can only be professionally repaired by suitably trained specialist personnel. The responsibility for training lies with the user or repairer, who must ensure that the operators and future repair staff are properly trained for the product.

We guarantee the Powerpackage according to our conditions of sale and delivery. The guarantee shall not apply in the event of damage caused by improper handling. Repairs or interventions made by persons not authorized to do so will cause all guarantee claims to become invalid. This also applies to the use of accessories and spare parts for which our Powerpackage is not designed.

Report any failures as soon as they are detected. Repair any defects immediately in order to minimize the extent of the damage and avoid impairing the safety of the Powerpackage. Failure to observe these instructions will cause the guarantee claim to become invalid.

We reserve the right to make alterations with a view to technical improvements.

The following mandatory safety instructions are used in the operating manual:



is used to draw attention to special work procedures, methods, information and use of resources, etc.



Caution!

is used wherever divergent and unprofessional work procedures may cause damage to the product.



WARNING!

is used whenever a lack of caution can lead to personal injury or risk to life.

This operating manual is correct at the date of issue. Subsequent alterations or conversions to the Powerpackage performed by the user are not covered.

1.2 Copyright

TOX®-PRESSOTECHNIK GMBH holds the copyright to this operating manual and the operating documents. It is only sold to our customers and users of our products.

These documents may neither be copied nor made accessible to a third party, particularly our competitors, without our express permission.

2 Powerpackage characteristics



Type

S x.xx.xx

Serial number

Explanation of type no.:

- S1. = Powerpackage type S, pressing force approx. 10 kN
- 50. = 50 mm overall stroke
- 12 = 12 mm power stroke

Country of origin: made in Germany

Copyright: TOX® 1994

Please quote the following when ordering spare parts:

Serial no.:
Powerpackage type:
Description and order no. from spare parts list, chapter 13.
Required quantity.
The spare part order cannot be processed without this information.

The nameplate is located on the Powerpackage.

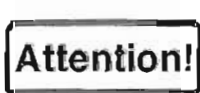
Note


Spare parts must comply with the technical requirements of the manufacturer! Only original spare parts from TOX®-PRESSOTECHNIK GMBH may be used, otherwise the guarantee claim will become invalid.

3 Safety


3.1 Risks arising from non-observance of safety information

The following mandatory safety instructions are used in the operating manual:

 *is used to draw attention to special work procedures, methods, information and use of resources, etc.*


 *is used wherever divergent and unprofessional work procedures may cause damage to the product.*

Caution!

 *is used whenever a lack of caution can lead to personal injury or risk to life.*

WARNING!


Besides the information given in this operating manual, the legal "safety and accident prevention regulations" also apply. All applicable safety regulations and legal conditions must be observed in order to avoid damage to persons and to the product during maintenance and repairs.

 *All persons charged by the user with the operation, maintenance and repair of the Powerpackage*

must have read and understood the operating manual, and particularly the chapter on safety, before start-up. Detailed explanations can be found under "Information on obligatory instruction of operating personnel".

Staff engaged in repairing the Powerpackage are always responsible themselves for working safety. The Powerpackage can only be professionally repaired by suitably trained specialist personnel. The responsibility for training lies with the user or repairer.


The Powerpackage is designed and manufactured according to the applicable German safety standards and the state of the art. Operating safety is guaranteed.

 The Powerpackage may only be operated, maintained or repaired by specially trained personnel.

Failure to use the Powerpackage for its intended purpose may lead to the following risks:

- *risks to life and limb*
- *risks to the Powerpackage and other assets of the user*
- *risks to the efficient operation of the Powerpackage.*

3.2 Area of application and intended use

 *The Powerpackage may only be used for its intended purpose: as a pneumatic-hydraulic power cylinder. Any other applications are regarded as inconsistent with the intended purpose and the manufacturer is not liable for any damage resulting therefrom, the risk being assumed in this case by the user. Arbitrary changes to the Powerpackage (mechanical, hydraulic or pneumatic alterations) exempt the manufacturer from liability for any damage resulting therefrom.*

Preconditions:

- The Powerpackage is built exclusively for industrial applications in which pressing forces are required.
- The Powerpackage may only be operated, used and maintained by authorized, trained and instructed specialist personnel.

Attention!

The intended purpose also includes observation of the start-up, operating and maintenance conditions stipulated by the manufacturer (operating manual) and anticipation of foreseeable malfunctions. Information signs are attached to the Powerpackage which must be observed.

The legal accident prevention regulations and other generally recognized rules of safety technology and industrial medicine, as well as the accident prevention regulations for power-driven equipment, must be observed. Any other use is regarded as inconsistent with the intended purpose and the manufacturer is not liable for any damage resulting therefrom. The operating manual is part of the delivery package and must be passed on to the new owner in the event of a resale of the Powerpackage.



The following must be observed:

- *the specified maximum permitted operating pressure*
- *the maintenance regulations.*

3.3 General safety

The Powerpackage is built according to the state of the art and is operationally safe. Owing to the nature of the operating cycles, however, the Powerpackage has parts and areas which cannot be protected without impairing its function and operation. For this reason, good personal safety procedures are required in order to protect personnel and the Powerpackage. Risks may arise from the Powerpackage if it is used by untrained personnel improperly or in any way which is inconsistent with the intended purpose.

- Keep the operating manual in an accessible place.
- The Powerpackage may only be operated, used and maintained by authorized, trained and instructed specialist personnel.
- In the event of injuries, accidents, skin irritations or allergic reactions, consult a doctor immediately. Do not allow hydraulic oil to come into contact with mucous membrane in the eyes, mouth and nose. Should this happen, rinse out with clear water/see hydraulic oil manufacturer's specifications.

3.4 Operating safety

- Work on power-driven equipment may only be entrusted to persons who
 - are confidently able to carry out the work on their own,
 - are under the supervision of someone familiar with this work, after previous instruction or
 - are accordingly authorized.
- Persons operating power-driven equipment must make sure that neither they nor others are at risk due to potentially dangerous movements.
- Power-driven equipment may only be operated when the required safety devices, equipment with protective functions and locks and couplings are used and are effective. These devices may not be circumvented or rendered ineffective.

3.5 Safety regulations for pipelines and pressure vessels

The safety regulations for hydraulic hose-pipes prescribe that hose-pipes should be inspected for their working safety at least every six months. This inspection must be carried out by an expert.



Before beginning work, inspect the hydraulic pipes for damage to the outer liner, such as cracks, bends, cuts, peeling, chafe marks or embrittlement, etc. Also check for deformation of the tubes, both in the pressureless and pressurized states. Special attention should be paid to the connection between the pipe and fitting. If damage is discovered during the inspection, the pipe or hydraulic system must be relieved of pressure and replaced immediately by authorized specialist personnel.

Checking the pneumatic pipes

Before beginning work, the pneumatic pipes must be checked for blowing and whistling sounds. If any damage is visible or audible, the pneumatic pipe must be relieved of pressure and replaced immediately by authorized specialist personnel.

Attention!

Also applicable are the relevant safety regulations for:

pneumatics/pneumatic pipes/hydraulics/hydraulic pipes/pressure vessel regulation.

The applicable safety, noise, environmental protection and accident prevention regulations must be observed in all work procedures.

3.6 Information on special risks

Risk of cauterization/fire/explosion:

- in the vicinity of hydraulic pipes due to oil jet,
- by being hit if a pneumatic pipe should burst.



Even a small oil jet can penetrate the skin and cause serious injuries and infections. In such cases, consult a doctor immediately.

3.7 Safety in maintenance work

General safety information

Attention!

The maintenance and monitoring personnel must familiarize themselves with this chapter and the applicable safety regulations before carrying out any maintenance, repair and inspection work on the Powerpackage.



Maintenance and repair work may only be performed by trained, authorized specialist staff at the recommended intervals.



Do not start repair and maintenance work until it has been ensured that:

- potentially dangerous movements have come to a standstill
- an unexpected or accidental activation by non-authorized personnel and
- an accidental or unexpected activation of potentially dangerous movements due to stored energy has been prevented

Attention!

Damaged or missing notices and warning signs must be replaced immediately.

Replace all dismantled protective devices properly after maintenance work. The protective devices and their protective effect must be inspected by an expert before the Powerpackage is used for the first time. Arbitrary conversions or alterations endanger the safety of personnel and the Powerpackage.

Only use original TOX®-PRESSOTECHNIK spare parts.

3.8 Environmental protection regulations

Attention!

The applicable environmental protection regulations must be observed during all maintenance and repair work (e.g. changing the oil).

The most important regulations and laws concerning the use of cold cleaners are:

- Hazardous materials regulation
- Water resources law
- Waste materials law
- Waste certification regulation



The use of petroleum ether is prohibited, as it is highly inflammable, electrostatically chargeable and can form an explosive mixture of gas and air.

When selecting lubricants, lubrication oils, hydraulic oils and filter cartridges, consider the factors of environmental safety, health risks, disposal regulations and the availability of proper local disposal facilities.

Attention!

In the event of a hydraulic oil leak, cease operation immediately, repair the leak and soak up escaped oil with binding agent.

3.9 Information on obligatory instruction of the operating personnel

We advise the user of our Powerpackage to provide all those charged with its operation, maintenance and repair with a copy of the operating manual, especially the "Safety" chapter, in order for them to acquire the necessary specialist knowledge. We also advise the user to draw up internal "operating procedures",

taking into account the known qualifications of the personnel in question.

The user should obtain written confirmation of participation in introductory sessions, training, seminars, etc. for learning about the operation, maintenance and repair of the Powerpackage. We recommend that you copy and use the following form for this purpose.

3.10 Declaration of employed personnel

This is to confirm that the following member of staff

Mr. / Ms.

engaged by the manager/user, has read and understood the works-internal procedures and the operating manual of the Powerpackage, especially the "Safety" chapter.

Member of staff

Date

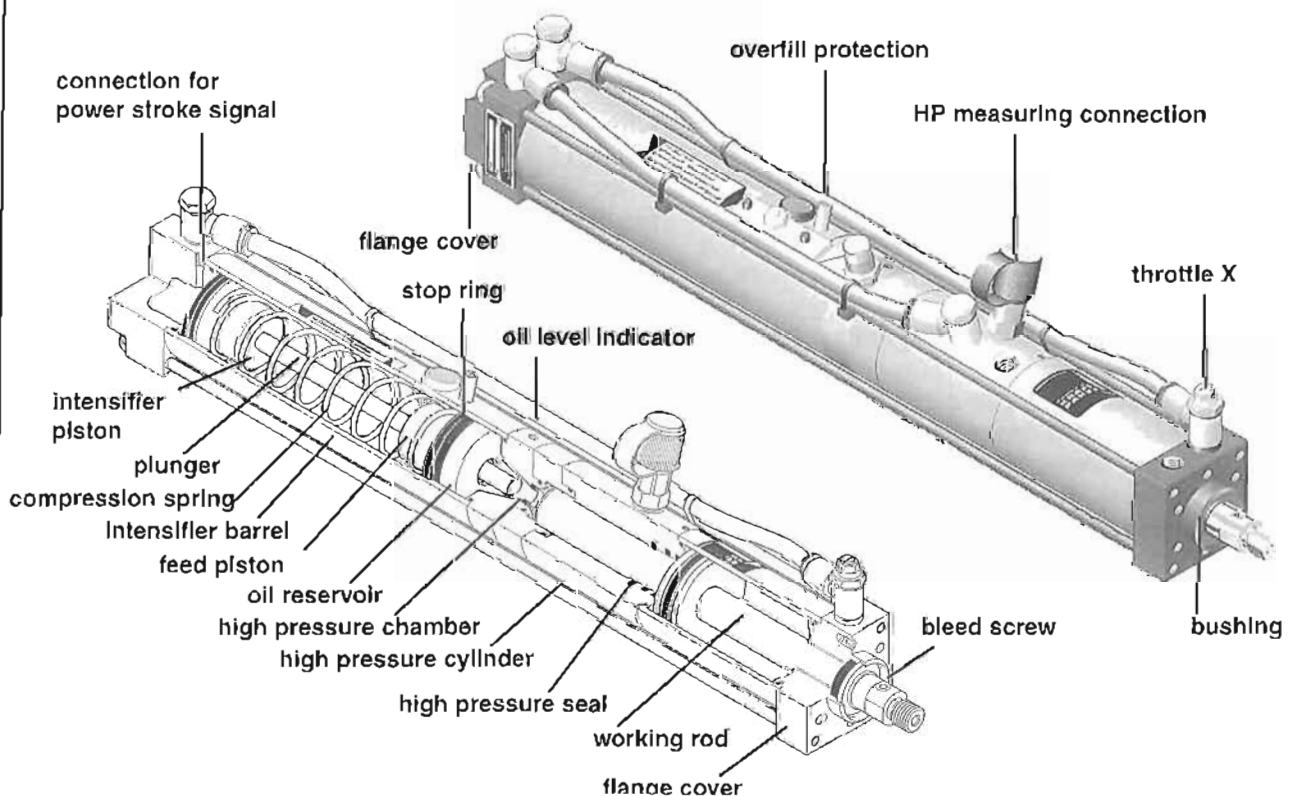
User/responsible official

Date

4 Description

The Powerpackage is a purely pneumatically driven cylinder with an automatically initiated pneumatic-hydraulic power stroke.

The Powerpackage is a sandwich construction joined together by means of four tie rods. All other parts are inserted. The changeover from fast approach to power stroke takes place automatically in response to an opposing force at any point along its travelling range. By adjusting the throttle X, the changeover time can be altered. When the throttle is closed, provided it is in working order, no power stroke takes place. The Powerpackage operates with compressed air from approx. 3 to 10 bar max. The forces generated range between 2 kN and 2000 kN, depending on the model.



5 Functional description

5.1 Types S and K

5.1.1 Neutral position

Compressed air is applied to piston area A. Other areas are vented.

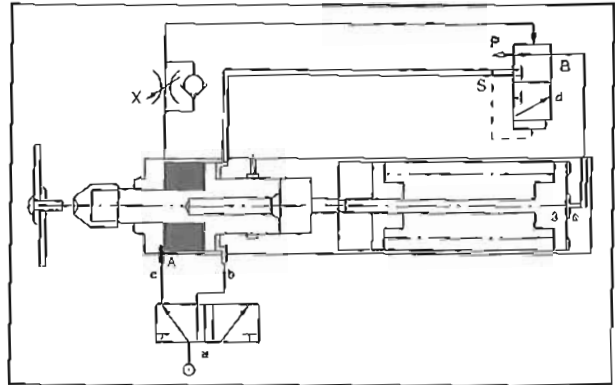


Fig. 5.1.1

5.1.2 Fast approach stroke

When main control valve "a" is switched on, compressed air enters piston chamber "b"; the air is evacuated from piston chamber "c". Working rod "1" extends with fast approach force and at high speed until it hits an opposing force at any point. This opposing force causes the built-in power stroke valve to switch (ram pressure is relieved). During the fast approach, feed piston "10", activated by spring "7", pushes hydraulic oil from reservoir "11" into HP chamber "5".

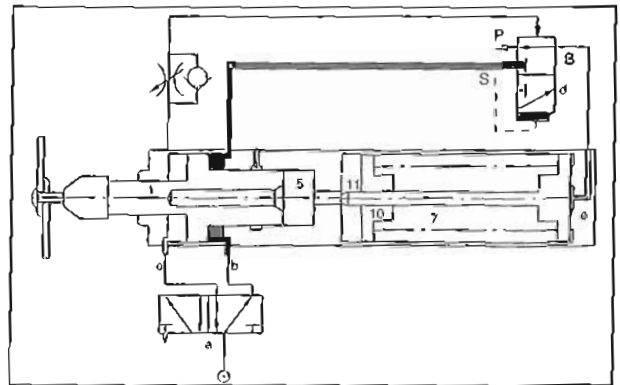


Fig. 5.1.2

5.1.3 Power stroke

Compressed air enters the chamber of the intensifier piston. Intensifier piston "3" passes through HP seal "4" and separates the oil chamber into working area "5" and oil reservoir "11". Here the hydraulic oil is compressed to approx. 400 bar. The displacement of the hydraulic oil by intensifier piston "3" brings about the power stroke of working rod "1". The power stroke of working rod "1" is proportional to the volume of displaced oil.

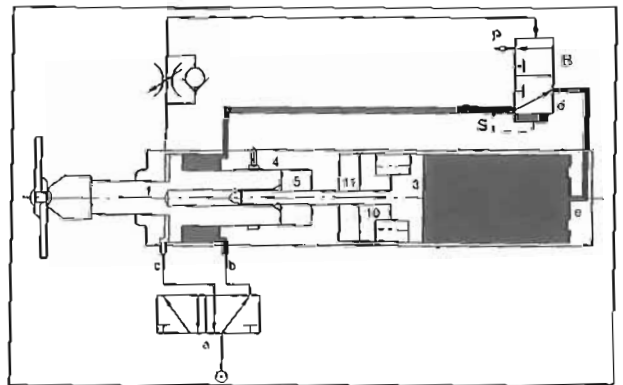


Fig. 5.1.3

5.1.4 Fast return stroke

When main control valve "a" is switched, power stroke valve "d" evacuates the air from chamber "e" into the open. Working rod "1" and intensifier piston "3" move to neutral position.

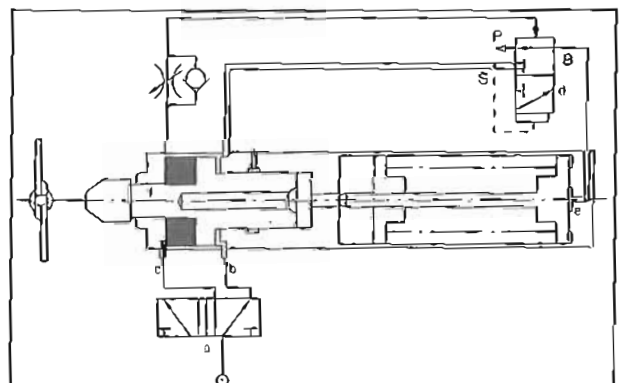


Fig. 5.1.4

5.2 Type RP

5.2.1 Neutral position

Compressed air is applied to piston area A. Other areas are vented.

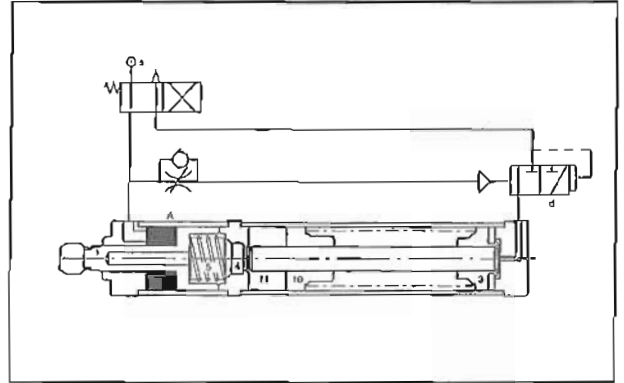


Fig. 5.2.1

5.2.2 Fast approach stroke

When main control valve "a" is switched on, the compressed air is evacuated from piston chamber "A". Working rod "1" extends by spring power until it hits an opposing force at any point. This opposing force causes the attached power stroke valve to switch (ram pressure is relieved). During the fast approach, feed piston "10", activated by spring "7", pushes hydraulic oil from reservoir "11" into HP chamber "5".

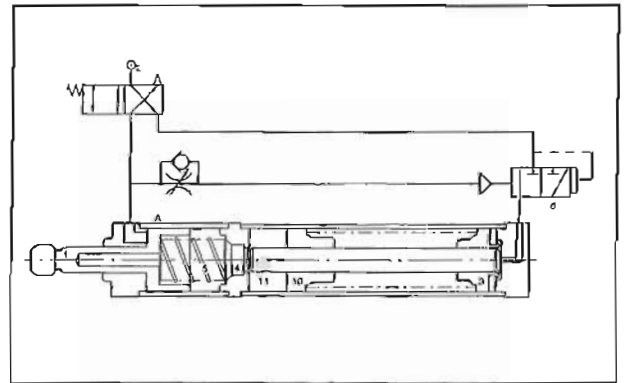


Fig. 5.2.2

5.2.3 Power stroke

Compressed air enters the chamber of the intensifier piston. Intensifier piston "3" passes through HP seal "4" and separates the oil chamber into working area "5" and oil reservoir "11". In working area "5" the hydraulic oil is compressed to approx. 400 bar. The displacement of the hydraulic oil by intensifier piston "3" brings about the power stroke of working rod "1". The power stroke of working rod "1" is proportional to the volume of displaced oil.

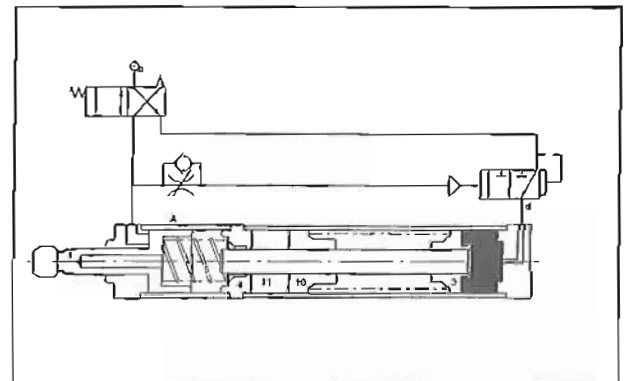


Fig. 5.2.3

5.2.4 Fast return stroke

When main control valve "a" is switched, power stroke valve "d" evacuates the air from chamber "e" into the open. Working rod "1" and intensifier piston "3" move to neutral position.

Attention! In the pressureless state, the piston rod extends automatically due to the fast approach spring power.

NOTE:

A pressure of at least 5 bar is necessary for the return stroke to neutral position.

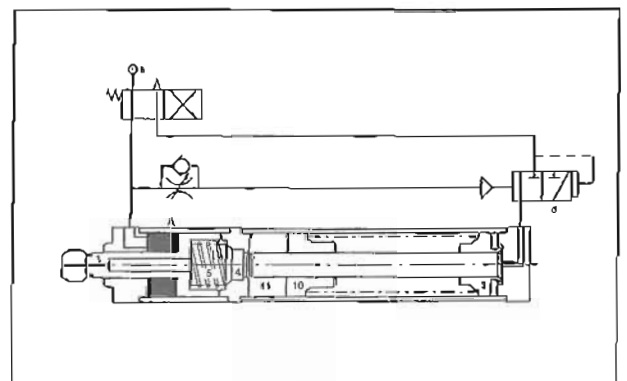


Fig. 5.2.4

5.3 Type O

5.3.1 Neutral position

Compressed air is applied to piston area A. Other areas are vented.

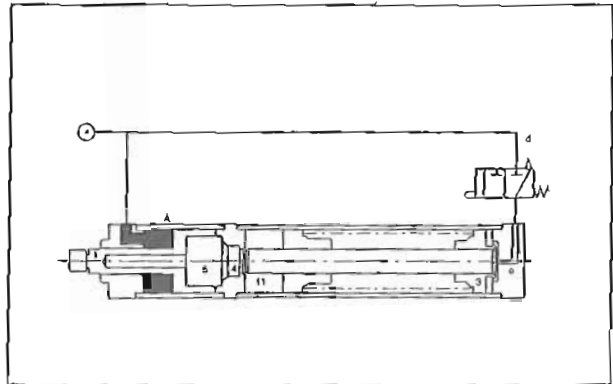


Fig. 5.3.1

5.3.2 Power stroke

When valve "d" is switched, compressed air enters the chamber of the intensifier piston. Intensifier piston "3" passes through HP seal "4" and separates the oil chamber into working area "5" and oil reservoir "11". In the working area, the hydraulic oil is compressed to approx. 400 bar. The displacement of the hydraulic oil by intensifier piston "3" brings about the power stroke of working rod "1". The power stroke of working rod "1" is proportional to the volume of displaced oil.

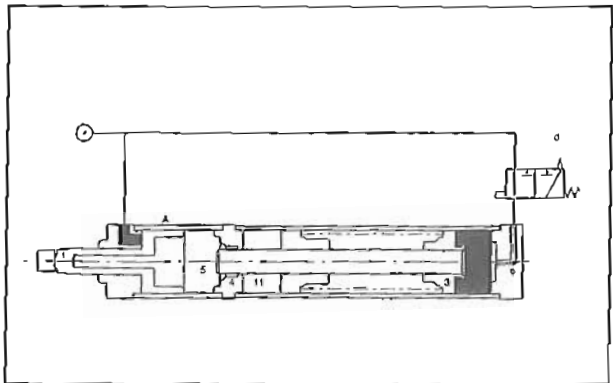


Fig. 5.3.2

5.3.3 Return stroke

When valve "d" is switched, air is evacuated from chamber "e" into the open. Working rod "1" and intensifier piston "3" move to neutral position.

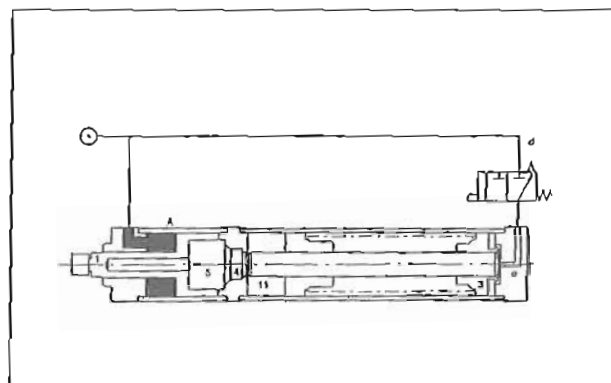


Fig. 5.3.3

6 Assembly instructions

6.1 Mounting specifications

The standard method of mounting the Powerpackage is by the front flange using high-grade screws. The assembly dimensions are listed in the Powerpackage catalogue. The design of the Powerpackage has been perfected so as to allow it to be mounted and operated in any position.

The maintenance side of the Powerpackage should be easily accessible at all times. The bleed plate and oil refilling nipple should be at the top, in case the cylinder is installed horizontally.

Preparation of compressed air

The Powerpackage may only be used with filtered and dried compressed air. The maximum admissible particle size is 40 µm. To prolong the life of the Powerpackage, the compressed air should be slightly oiled.



The use of unfiltered compressed air can cause premature damage to the seals.

Caution!

Temperature limits

The Powerpackage may only be operated between $T_{min} = 0^{\circ}C$ and $T_{max} = 60^{\circ}C$.



Operation outside the temperature limits can cause malfunctions and damage to the seals.

Caution!

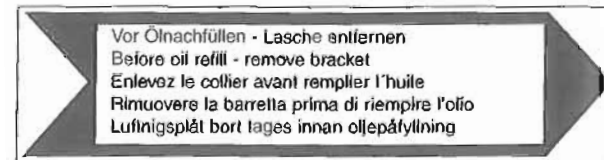
There are warning signs and notices attached to the Powerpackage.

6.2 Notices

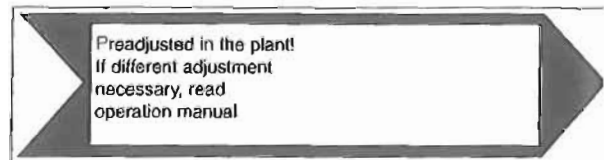
Trade mark, attached to the maintenance side.



Oil filling notice, next to the oil filling nipple.



Notice for throttle "X" setting (only in devices for export), attached at throttle "X".



6.3 Warning sign

Vorsicht

Maximaler Betriebsdruck beträgt 6 bar/90 p

Hersteller übernimmt keine Verantwortung, wenn Grenzwert überschritten wird.

Caution

Maximum operating pressure is 6 bar/90 p

Manufacturer assumes no responsibility if limits are exceeded.

This warning sign is only valid for 6 bar devices.



The specified operating pressure should not be exceeded under any circumstances, as the operating safety of the device cannot otherwise be guaranteed.

Stroke limitation

Once the power stroke has been travelled, the stroke of the working piston must be limited. In forming operations such as rivetting, stamping, stretching, etc., this is ensured by the nature of the application, where as in punching, the working piston can continue moving after the punching process.

This must be prevented by a stroke limiter in the tool. It can also be prevented by mounting the powerpackage so that the fast approach stroke together with the required power stroke is identical to the total stroke of the powerpackage e.g. S8.32.6: required power stroke 4 mm, total stroke of powerpackage 32 mm, gives a necessary fast approach of 28 mm. Fast approach 28 mm + power stroke 4 mm = total stroke 32 mm, which is then limited in the powerpackage.

In this case it is necessary to use an aluminium limit stop washer (please specify when ordering). If stroke limitation is not possible in the tool, the powerpackage K 51 with stroke adjustment can be used.

Generally it must be taken care that the power stroke of the powerpackage used for punching operations is only used to a maximum of 80%.

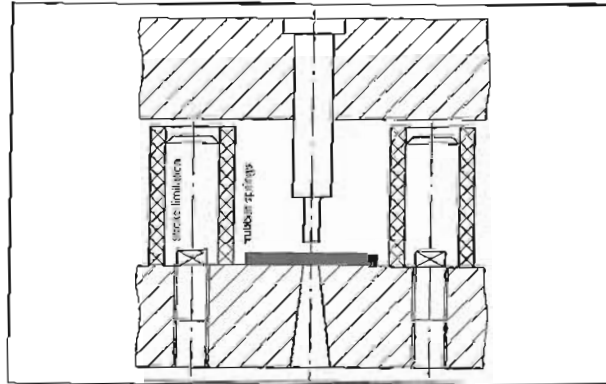
Example S 8.32.6 = power stroke 6 mm, useful power stroke 80% = 4.8 mm.

For punching operations there should also only be used powerpackages with integrated bypass ZLB.

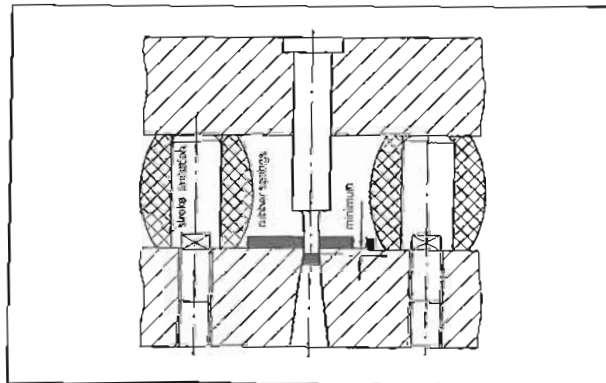
Mounting specifications

Mounting is possible in any position provided the following points are observed.

If mounting horizontally, the connecting side must point upwards, so that the device can still be bled in the mounted state. Make sure that the oil refill nipple, bleed hole, high-pressure measuring connection, throttle X and the oil level indicator are accessible. No shearing forces must be allowed to act on the piston rod!

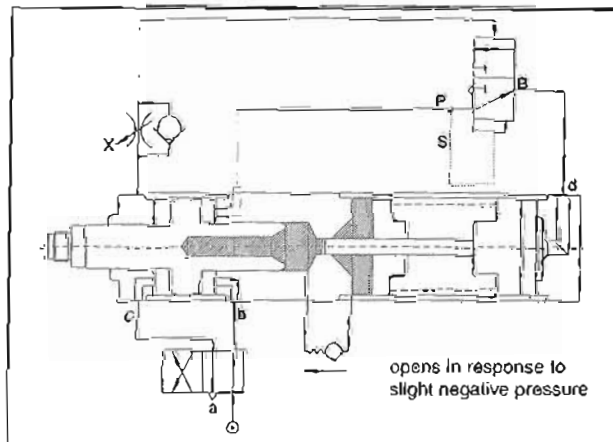


Punch in starting position (TDC)
(TDC - top dead center)



Punch in BDC
(BDC - bottom dead center)

The tension of the rubber springs must be adapted to the punching operation.



Powerpackage with bypass valve

6.5 Control systems

The Powerpackage is controlled, like any normal double-action pneumatic cylinder, via a mechanical, pneumatic or electric 4/2 or 5/2 way valve. The valve size must be adapted to connecting dimension "E" of the Powerpackage (see Powerpackage brochure). The compressed air supply must always be conducted via a maintenance unit. Please ensure that the air is dry, and if possible lightly oiled. This also allows optimal and energy-saving adjustments of the pressing force via the pressure.

6.5.1 Changeover from fast approach to power stroke

The changeover from fast approach to power stroke takes place automatically via the differential piston valve (2) attached to or integrated in the Powerpackage and the control throttle X (1). During the fast approach, compressed air is conducted into section (S) as well as onto the piston area (Y) of the differential piston valve (2). While the working rod (7) is extending, chamber (R) of the Powerpackage is vented. At the same time, counterpressure forms in conductor (b) with respect to the piston area (Z) of the differential piston valve (2). If the working rod (7) hits an opposing force during its fast approach, the counterpressure acting on piston area "Z" falls. The differential piston valve (2) switches and compressed air is applied to the intensifier piston.

The period of time until the changeover can be adjusted at throttle "X". Throttle "X", for adjusting the changeover point from fast approach to power stroke, must be adjusted for each particular application. For this purpose, it must be fully closed (by turning clockwise) while the piston is retracted and under pressure. Then extend the piston rod and open throttle "X" slowly by turning it counterclockwise, until the power stroke is perceptibly activated. Opening the valve further causes the power stroke to be activated more rapidly.



Opening throttle "X" too far causes a premature activation of the power stroke. The power stroke is activated before the piston rod hits a counterforce (device is oversteered)

Caution!

Attention: damage to sealing!



The return stroke speed of the working rod (7) must be greater than the approach stroke speed, as otherwise oil leakages will occur!

Caution!

- (1) Throttle "X"
- (2) Differential piston valve (2) for activating power stroke
- (3) Main control valve (not included in delivery)
- (4) Throttle valve in power stroke line (not included in delivery)

By installing a one-way restrictor "B" in the supply line for the power stroke, a slow power stroke can be obtained, e.g.:

- for press-fitting bushes,
- projections, etc.

- (5) Measuring and control connection (7, P, R, S, Y, Z).
- (6a) Approach stroke throttle (optional, not included in delivery)
- (6b) Return stroke throttle (optional, not included in delivery)

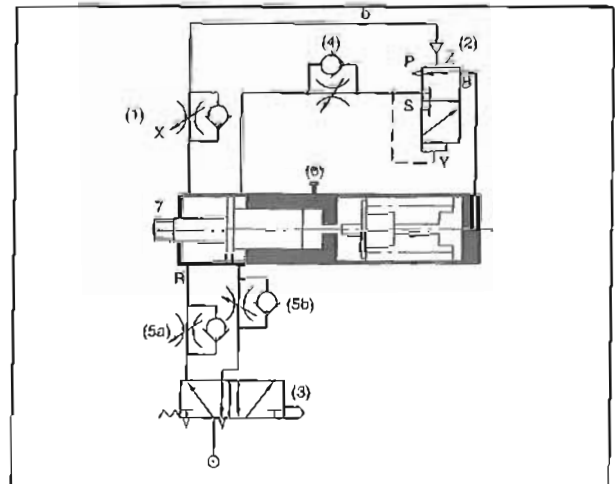


Fig. 6.5.1

6.5.2 Measuring and control connection

Fitted to the high-pressure section is a threaded terminal end (6) for monitoring the operation of the device. This allows connections for:

- oil pressure gauge,
- oil pressure switch or
- high-pressure measuring hose.

Attention! *If a monitoring instrument is connected, make sure that its connecting line is filled with oil and does not contain any air. Otherwise the air will get into the high pressure chamber and impair the working process. To be on the safe side, the Powerpackage should be bled after connection.*

Attention! *Connecting a pressure gauge, oil pressure switch or high-pressure measuring hose may reduce the power stroke of the Powerpackage considerably. Please consult us before using long hose-pipes.*

The oil pressure switch can be equipped with an electric or, alternatively, a pneumatic output contact. The oil pressure is infinitely adjustable within the range of the switch. The pressure switch switches when the oil pressure is reached. As a result, the following control functions can be obtained:

- changeover to return stroke when a certain oil pressure is reached (oil pressure proportional to pressing force),
- time lag for return stroke in the case of embossing or riveting operations,
- emergency stop if a certain pressure is not reached,
- activation of functions external to the cylinder, etc.

6.5.3 Changeover from fast to power stroke in type S75 and S100 Powerpackages

Since the flow volumes at the pressure intensifier are very large in the above devices, the differential piston valve can no longer be used as a power valve. It serves as a pilot valve for switching a 3/2-way power valve with the nominal ports G1.

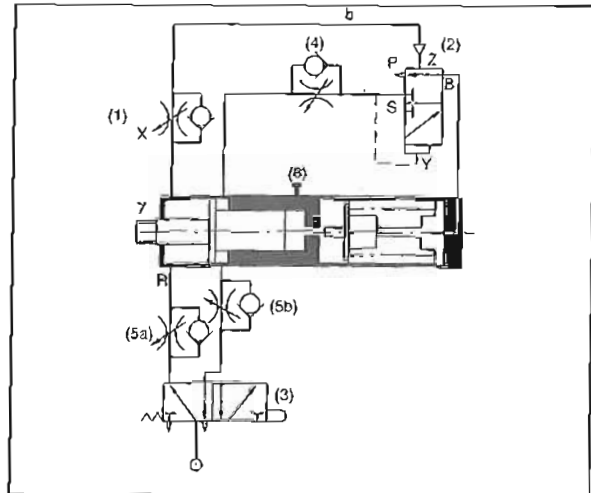


Fig. 6.5.2

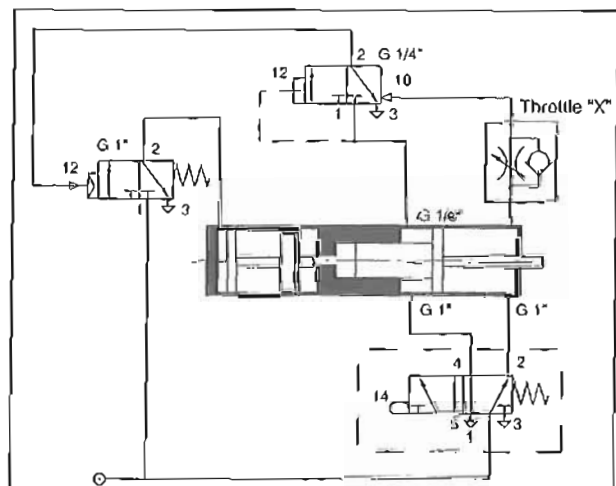


Fig. 6.5.3

6.6 Special changeover mechanisms

The standard dynamic pressure changeover mechanism can be replaced by various kinds of control systems.

6.6.1 Distance-dependent control system

This should be used if:

1. the Powerpackage is used with the piston rod pointing upwards and heavy tools,
2. the fast approach is interrupted by factors specific to the application,
 - e.g.: 30 mm fast approach without power,
 - 15 mm fast approach to press a spring-loaded hold-down device, etc.,
3. robots are used.

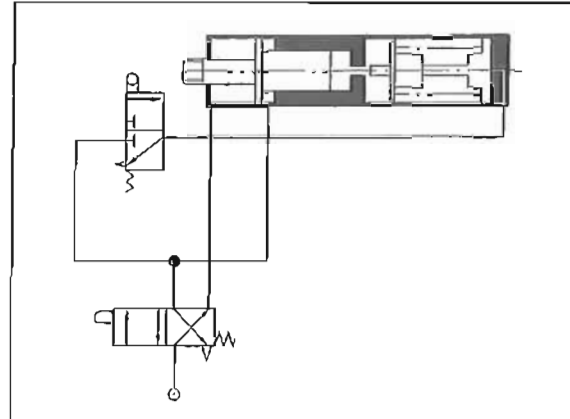


Fig. 6.6.1

6.6.2 Time-dependent changeover

With a time-dependent changeover, the same effect is obtained as with distance-dependent control except that no limit switch is set. The stroke speeds obtained are lower, however.

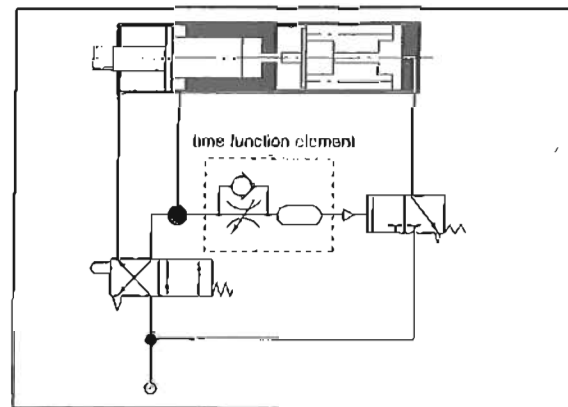


Fig. 6.6.2

7 Pneumatic spring

In the case of Powerpackages with integrated pneumatic springs, the conventional compression spring is replaced for technical reasons by the so-called "pneumatic spring". The oil pretension is obtained in this case by a prestressed volume of air in the intensifier chamber. Pressure controllers are included in delivery.

Operating pressure of pneumatic spring:

$P_{EL} = 0,5 - 1,5 \text{ bar}$.

Minimum supply pressure of pressure control valve:

$P_{min} = 2.5 \text{ bar}$

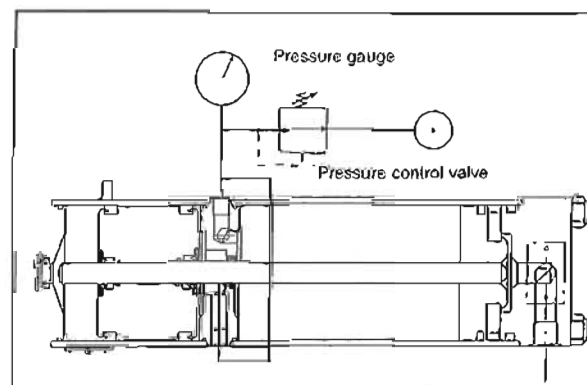


Fig. 7

Note on the pressure control valve

The pressure control valve has a low internal air consumption, and therefore a quiet but constant air evacuation noise. The internal air consumption depends on the supply pressure. As the supply pressure rises, so does the internal air consumption. It is advisable, but not obligatory, to operate the pressure valve slightly above the minimum supply pressure (2.5 bar). From the size S75/S100 upwards, and in the case of devices with larger power strokes (booster systems) in the S30 and S50 series, the design of the pneumatic spring changes. The spring and accumulator area are separated by an intermediate flange.

8 Powerpackage version 50

8.1 Power stroke setting

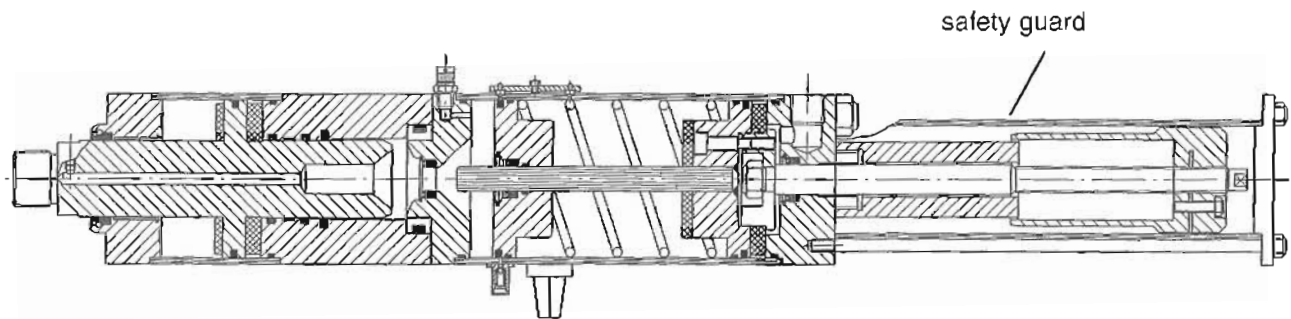


Fig. 8

8.1.1 Function

Attached to the intensifier piston of the Powerpackage is a spindle. On this spindle there is an adjusting nut which limits the stroke of the intensifier piston and hence the power stroke precisely. This does not impair the fast approach.

8.1.2 Adjustment of power stroke

To adjust the power stroke, the protective covering on the rear part of the Powerpackage has to be removed, in order to allow access to the adjusting nut.

- If the adjusting nut is turned to the extreme rear position, the entire power stroke is available.
- If the adjusting nut is turned to the extreme front position, the power stroke is set to zero.

The adjusting nut is altered and secured with the clamping device according to the power stroke required. After altering the adjusting nut, replace the safety guard.

8.1.3 Areas of application

Embossing, bending, compressing, clamping, coining, marking.

9 Oil refills

9.1 Type S, RP, O

The Powerpackage is supplied complete with an oil refill nipple, a bleed plate and an oil level indicator. During normal operation, the needle of the oil level indicator is flush with the surface of the cylinder. The oil indicator needle protrudes when the oil supply of the device is used up. To refill, please use only the TOX®-PRESSOTECHNIK oil pump, order no. ZP 1/100. Fill with hydraulic oil of type HL or HLP, viscosity 32 mm²/sec. at 40°C.



Caution!

Please follow the following refilling instructions carefully. Operating the Powerpackage after overfilling it with hydraulic oil can damage the cylinder!

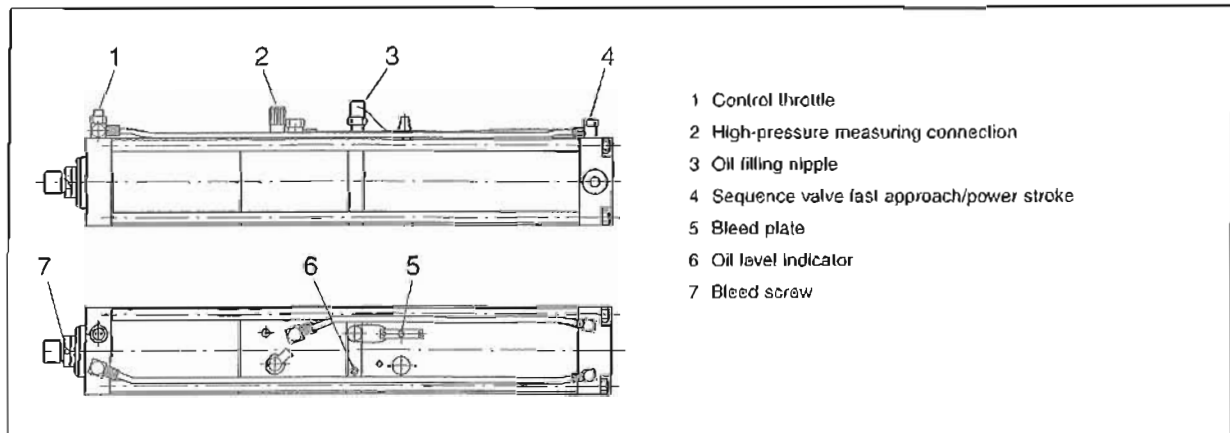


Fig. 9.1

9.1.1 Mounting position with piston rod pointing downwards

1. Powerpackage in neutral position, return stroke line and, if applicable, pneumatic spring, under pressure.
2. Remove bleed plate 5 (Fig. 9) with locking wire and knurled cap of oil filling nipple (3). The 0.6 mm diameter hole "U" is now visible.
3. Loosely connect filling hose of oil pump to the refill nipple. Operate oil pump in order to pump air out of the filling hose. Connect threaded piece of filling hose hand-tight.
4. Pump in oil slowly until it emerges free of bubbles from hole "U".
5. Stop pumping and replace bleed plate, pump in oil again (max. 2 - 3 pump lifts).
6. After a rest period of at least 30 minutes, repeat the bleeding process.
7. When no more oil emerges from hole "U", reassemble knurled cap and bleed plate. Put oil level indicator needle back into place.

9.1.2 Mounting position with horizontal piston rod

1. Powerpackage in neutral position, return stroke line and, if applicable, pneumatic spring, under pressure.
2. Remove bleed plate 5 (Fig. 9.1) with locking wire and knurled cap of oil filling nipple (3). The 0.6 mm diameter hole "U" is now visible.
3. Loosely connect filling hose of oil pump to the refill nipple. Operate oil pump in order to pump air out of the filling hose. Connect threaded piece of filling hose hand-tight.
4. Pump in oil slowly until it emerges free of bubbles from hole "U".
5. Push in a 2 mm diameter pin at high pressure measuring connection 2 (Fig. 9.1) until oil emerges free of bubbles.
6. Withdraw pin.
7. Loosen bleed screw 7 (Fig. 9.1) on piston rod slightly. Allow oil to continue flowing until it emerges free of bubbles. Re-tighten bleed screw 7 (Fig. 9.1). Pump in oil again (max. 2 - 3 pump lifts).
8. Continue pumping oil until it emerges free of bubbles from hole "U". Stop pumping and replace bleed plate.
9. After a rest period of at least 30 minutes, repeat the bleeding process.
10. When no more oil emerges from hole "U", reassemble knurled cap and bleed plate. Push oil level indicator needle back into place.

9.1.3 Mounting position with piston rod pointing upwards

1. Powerpackage in neutral position, return stroke line and, if applicable, pneumatic spring, under pressure.
2. Remove bleed plate 5 (Fig. 9.1) with locking wire and knurled cap of oil filling nipple (3). The 0.6 mm diameter hole "U" is now visible.
3. Loosely connect filling hose of oil pump to the refill nipple. Operate oil pump in order to pump air out of the filling hose. Connect threaded piece of filling hose hand-tight.
4. Continue pumping oil until it emerges free of bubbles from hole "U".
5. Loosen bleed screw 7 (Fig. 9.1) on piston rod slightly. Allow oil to continue flowing until it emerges free of bubbles. Re-tighten bleed screw 7 (Fig. 9.1).
6. Continue pumping oil until it emerges free of bubbles from hole "U". Stop pumping and replace bleed plate. Pump in oil again (max. 2 - 3 pump lifts).
7. After a rest period of at least 30 minutes, repeat the bleeding process.
8. When no more oil emerges from hole "U", reassemble knurled cap and bleed plate. Push oil level indicator needle back into place.

9.2 Type K

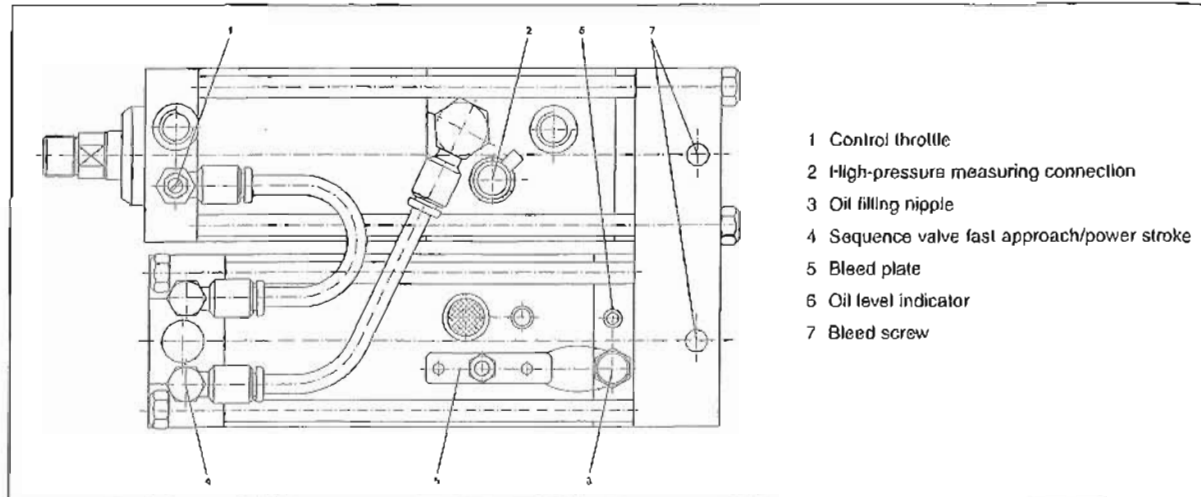


Fig. 9.2

9.2.1 Mounting position with piston rod pointing downwards

1. Powerpackage in neutral position, return stroke line and, if appropriate, pneumatic spring, under pressure.
2. Dismount vent plate (5) (Fig. 9.2) together with locking wire and knurled cap of oil filling nipple (3). Borehole "U" (0.6 diameter) becomes visible.
3. Connect filling hose of oil pump loosely to refill nipple. Actuate oil pump in order to pump air out of filling hose. Screw threaded fitting of hose hand tight.
4. Continue pumping oil until it emerges free of bubbles from borehole "U".
5. Stop pumping and mount vent plate.
6. Loosen both vent screw (7) slightly and allow oil to continue flowing until it emerges free of bubbles then seal vent screws (7) again. Pump in oil again (max. 2 - 3 pump lifts).
7. After a rest period of at least 30 minutes, repeat the bleeding process.
8. When no more oil emerges from borehole "U", replace knurled cap and vent plate. Push oil level indicator needle back into place.

9.2.2 Mounting position with horizontal piston rod

1. Powerpackage in neutral position, return stroke line and, if appropriate, pneumatic spring, under pressure.
2. Dismount vent plate (5) (Fig. 9.2) together with locking wire and knurled cap of oil filling nipple (3). Borehole "U" (0.6 diameter) becomes visible.
3. Connect filling hose of oil pump loosely to refill nipple. Actuate oil pump in order to pump air out of filling hose. Screw threaded fitting of hose hand tight.
4. Continue pumping oil until it emerges free of bubbles from borehole "U". Stop pumping, mount vent plate. Loosen both vent screws slightly and allow oil to continue flowing until it emerges free of bubbles, then seal vent (7) again.
5. Push a 2 mm diameter pin into HP measuring terminal (Fig. 9.2) until oil emerges free of bubbles.
6. Remove pin.
7. After a rest period of at least 30 minutes repeat the bleeding process.
8. When no more oil emerges from borehole "U", replace knurled cap and vent plate. Push oil level indicator needle back into place.

9.2.3 Mounting position with piston rod pointing upwards

1. Powerpackage in neutral position, return stroke line and, if appropriate, pneumatic spring, under pressure.
2. Dismount vent plate (5) (Fig. 9.2) together with locking wire and knurled cap of oil filling nipple (3). Borehole "U" (0.6 mm diameter) becomes visible.
3. Connect filling hose and oil pump loosely to refill nipple. Actuate oil pump in order to pump air out of the filling hose. Screw threaded fitting of hose handtight.
4. Continue pumping oil until it emerges free of bubbles from borehole "U". Stop pumping and mount vent plate.

5. Loosen both vent screws (7) slightly and allow oil to continue flowing until it emerges free of bubbles, then seal vent screws (7) again.
6. Push a 2 mm diameter pin into HP measuring terminal until oil emerges free of bubbles.
7. Remove pin.
8. After a rest period of at least 30 minutes, repeat the pumping and bleeding process.
9. When no more oil emerges from borehole "U", mount knurled cap and vent plate again. Push oil level indicator needle back into place.

10. Air pressure, oil pressure, pressing force

10.1 Oil pressure/pressing force table for 10 bar Powerpackage**

Type S, S version 50, K

S1. 32. 6	S4. 32. 6	S15.32. 6	S50.50. 6	S100.300. 8	K1. 50. 5	K4. 100. 6	K15.150. 5
S1.100. 6	S4.100. 6	S15.100. 6	S50.100. 6	S100.100.10	K1.100.10	K4.150. 8	K15.200. 5
S1.150. 6	S4.150. 6	S15.150. 6	S50.150. 6	S100.200.10	K1.150.10	K4.200.12	
S1.200. 6	S4.200. 6	S15.200. 6	S50.200. 6	S100.100.18	K1.200.10		
S1. 50.12	S4. 50.12	S15.50. 12	S50.70. 12	S100.300.18		K8.100. 5	
S1.100.12	S4.100.12	S15.100.12	S50.100.12	S100.200.24	K2. 50. 4	K8.150. 5	
S1.150.12	S4.150.12	S15.150.12	S50.150.12	S100.300.30	K2.100. 8	K8.200.10	
S1.200.12	S4.200.12	S15.200.12	S50.200.12		K2.150.12		
					K2.200.12		
S2. 32. 6	S8. 32. 6	S30.50. 6	S75.100.12				
S2.100. 6	S8.100. 6	S30.100. 6	S75.200.12				
S2.150. 6	S8.150. 6	S30.150. 6	S75.300.12				
S2.200. 6	S8.200. 6	S30.200. 6	S75.300.20				
S2. 50.12	S8. 50.12	S30.70. 12	S75.100.22				
S2.100.12	S8.100.12	S30.100.12	S75.200.30				
S2.150.12	S8.150.12	S30.150.12	S75.300.40				
S2.200.12	S8.200.12	S30.200.12					

Air press. (bar)	S1/K1 Pöl F bar kN	S2/K2 Pöl F bar kN	S4/K4 Pöl F bar kN	S8/K8 Pöl F bar kN	S15/K15 Pöl F bar kN	S30/K30 Pöl F bar kN	S50/K50 Pöl F bar kN	S75/K75 Pöl F bar kN	S100/K100 Pöl F bar kN
2	35 1,3	50 2,9	55 6,2	55 11,9	55 23	55 45	40 52	35 93	45 118
3	65 2,4	85 4,9	95 10,6	95 20,2	95 39	95 78	85 108	70 184	90 235
4	95 3,4	130 7,3	130 14,4	135 28,6	130 53	135 110	130 165	105 275	135 352
5	125 4,5	165 9,3	170 18,8	170 36,0	170 69	175 143	175 221	140 366	175 455
6	155 5,6	205 11,5	205 22,7	210 44,4	210 86	215 175	215 272	175 458	215 559
7	185 6,6	245 13,7	245 27,1	245 51,8	245 100	255 208	250 316	210 549	260 676
8	210 7,5	285 15,9	285 31,4	285 60,2	285 116	295 241	295 373	250 653	300 780
9	240 8,6	325 18,1	325 35,8	325 68,6	325 132	340 277	340 429	285 744	345 897
10	275 9,8	365 20,2	360 39,7	365 77,0	365 150	375 306	380 480	320 835	285 1000

S1.250.12	S4.300.12	S15.300.12	S30.300.12	S50.300.12	K1.100.15	K4.100.10	K15.100.10
S1.50.24	S4.400.12	S15.400.12	S30.400.12	S50.400.12	K1.150.20	K4.150.20	K15.200.10
S1.100.24	S4.50.24	S15.50.24	S30.70.20	S50.70.20	K1.100.20	K4.200.20	K15.300.10
S1.150.24	S4.100.24	S15.100.24	S30.100.20	S50.100.20		K4.300.20	K15.400.10
S1.200.24	S4.150.24	S15.150.24	S30.150.20	S50.150.20	K2.100.12	K4.400.20	K15.100.20
	S4.200.24	S15.200.24	S30.200.20	S50.200.20	K2.150.20		K15.200.20
S2.250.12	S8.300.12		S30.300.20	S50.300.20	K2.200.24	K8.150.15	K15.300.20
S2.50.24	S8.400.12		S30.400.20	S50.400.20	K2.300.20	K8.200.20	K15.400.20
S2.100.24	S8.50.24			S50.400.20		K8.300.20	
S2.150.24	S8.100.24			S50.300.30		K8.400.20	
S2.200.24	S8.150.24			S50.400.40			
	S8.200.24						

Air press. (bar)	S1/K1 Pöl F bar kN	S2/K2 Pöl F bar kN	S4/K4 Pöl F bar kN	S8/K8 Pöl F bar kN	S15/K15 Pöl F bar kN	S30/K30 Pöl F bar kN	S50/K50 Pöl F bar kN
2	50 1,8	55 3,2	55 6,2	55 11,9	55 22,7	40 33	45 57
3	85 3,0	95 5,4	95 10,6	95 20,2	95 38,8	85 70	90 114
4	130 4,5	130 7,3	135 15,0	130 27,6	135 55,0	130 106	135 170
5	165 5,8	170 9,5	170 18,8	170 36,0	175 71,1	175 142	175 220
6	205 7,1	205 11,5	210 23,2	210 44,4	215 87,3	215 175	215 270
7	245 8,5	245 13,7	245 27,1	245 51,8	255 103,4	250 204	260 327
8	285 9,9	285 15,9	285 31,4	285 60,2	295 119,6	295 240	300 377
9	325 11,2	325 18,1	325 35,8	325 68,6	340 137,7	340 276	345 434
10	365 12,6	360 20,0	365 40,2	365 77,0	375 151,9	380 300	385 484

S1.100.48	S4.100.44	S8.100.48	S15.100.40	K1.250.20	K30.100.5	K50.100.10
S1.150.48	S4.150.44	S8.150.48	S15.150.40	K1.250.40	K30.150.5	K50.200.10
S1.200.48	S4.200.44	S8.200.48	S15.200.40	K2.300.50	K30.200.5	K50.300.10
S1.150.60	S4.300.44	S8.300.48	S15.300.40		K30.100.10	K50.100.20
S1.200.60	S4.400.44	S8.400.48	S15.400.40	K4.300.50	K30.200.10	K50.200.20
S1.250.60	S4.200.65	S8.200.80	S15.150.60	K4.400.50	K30.300.10	K50.300.20
	S4.300.65	S8.300.80	S15.200.80		K30.400.10	K50.100.40
S2.100.44	S4.400.65	S8.400.80	S15.300.80	K8.300.50	K30.200.20	K50.200.40
S2.150.44			S15.400.80	K8.400.50	K30.300.20	K50.300.40
S2.200.44					K30.400.20	
S2.150.65			S30.150.28	K15.100.40		
S2.200.65			S30.200.34	K15.200.40		
S2.250.65			S30.300.44	K15.300.40		
			S30.400.44	K15.400.40		
					K30.400.40	

Air press. (bar)	S1/K1 Pöl F bar kN	S2/K2 Pöl F bar kN	S4/K4 Pöl F bar kN	S8/K8 Pöl F bar kN	S15/K15 Pöl F bar kN	S30/K30 Pöl F bar kN	K50 Pöl F bar kN
2	55 2,0	55 3,2	55 6,2	55 11,9	40 16,9	45 37,5	40 51
3	95 3,3	95 5,4	95 10,6	95 20,2	85 35,0	90 74,0	85 105
4	130 4,5	135 7,6	130 14,4	135 28,6	130 53,1	135 110,4	130 165
5	170 5,9	170 9,5	170 18,8	175 37,0	175 71,1	175 142,9	175 220
6	205 7,1	210 11,7	210 23,2	215 45,4	215 87,3	215 175,5	225 280
7	245 8,5	245 13,7	245 27,1	255 53,8	250 101,5	260 211,9	275 345
8	285 9,9	285 15,9	285 31,4	295 62,1	295 119,6	300 244,4	325 410
9	325 11,2	325 18,1	325 35,8	340 71,5	340 137,7	345 280,9	370 465
10	360 12,5	365 20,2	365 40,2	375 78,9	380 153,8	385 313,4	410 515

Type K version 51

K1.51.50.5	K2.51.50.4	K4.51.100.6	K8.51.100.5	K15.51.150.5
K1.51.100.10	K2.51.100.8	K4.51.150.6	K8.51.150.5	K15.51.200.5
K1.51.150.10	K2.51.150.12	K4.51.200.12	K8.51.200.10	
K1.51.200.10	K2.51.200.12			

Air press. (bar)	K1.51 Pöl F bar kN	K2.51 Pöl F bar kN	K4.51 Pöl F bar kN	K8.51 Pöl F bar kN	K15.51 Pöl F bar kN	K30.51 Pöl F bar kN
2	35 1,2	50 2,8	55 6,4	55 11,8	55 23,4	55 42,9
3	65 2,1	85 4,7	95 11,0	95 20,3	95 40,2	90 73,8
4	95 3,1	130 7,0	130 15,1	135 28,7	130 54,9	135 104,7
5	125 4,0	165 8,9	170 19,7	170 36,2	170 71,7	175 135,6
6	155 4,9	205 11,0	205 23,7	210 44,6	210 88,5	215 166,5
7	185 5,9	245 13,1	245 28,3	245 52,0	245 103,3	255 197,4
8	210 6,7	285 15,3	285 32,9	285 60,5	285 120,1	295 228,3
9	240 7,6	325 17,4	325 37,5	325 68,9	325 136,9	340 263,0
10	275 8,7	365 19,5	360 41,5	365 77,4	365 153,7	375 290,1

K1.51.100.15	K2.51.100.12	K4.51.100.10	K8.51.150.15	K15.51.100.10
K1.51.150.20	K2.51.150.20	K4.51.150.20	K8.51.200.20	K15.51.400.10
K1.51.200.20	K2.51.200.24	K4.51.200.20	K8.51.300.20	K15.51.300.10
		K4.51.300.20	K8.51.400.20	K15.51.400.10
		K4.51.400.20		K15.51.100.20
				K15.51.200.20
				K15.51.300.20
				K15.51.400.20

Air-press. (bar)	K1.51 Pöl F bar kN	K2.51 Pöl F bar kN	K4.51 Pöl F bar kN	K8.51 Pöl F bar kN	K15.51 Pöl F bar kN	K30.51 Pöl F bar kN
2	50 1,6	55 3,0	55 6,4	55 11,8	55 23,4	40 31,6
3	85 2,7	95 5,1	95 11,0	95 20,3	95 40,2	85 66,3
4	130 4,1	130 7,0	135 15,6	130 27,7	135 57,0	130 101,0
5	165 5,2	170 9,1	170 19,7	170 36,2	175 73,8	175 135,6
6	205 6,4	205 11,0	210 24,3	210 44,6	215 90,6	215 166,5
7	245 7,6	245 13,1	245 28,3	245 52,0	255 107,4	250 193,7
8	285 8,9	285 15,3	285 32,9	285 60,5	295 124,2	295 228,3
9	325 10,1	325 17,4	325 37,5	325 68,9	340 143,0	340 263,0
10	365 11,3	360 19,3	365 42,5	365 77,4	375 157,8	380 293,9

** Tolerance for technical data ± 5%

K1. 51.250. 20	K8 51.300. 50	K30.51.100. 5	K30.51.200.20	K50.51.100.10
K1. 51.250. 40	K8. 51.400 50	K30.51.150. 5	K30.51.300.20	K50.51.200.10
		K30 51.200. 5	K30 51.400 20	K50.51.300.10
K2. 51.300 20	K15.51.100.40	K30.51.100.10	K30.51.200.40	K50.51.100.20
K2. 51.300. 50	K15.51.200.40	K30.51.200.10	K30.51.300.40	K50.51.200.20
	K15.51.300.40	K30.51.300.10	K30.51.400.40	K50.51.300.20
K4 51.300. 50	K15.51.400 40	K30.51 400.10		K50.51.100.40
K4. 51.400. 50				K50.51.200.40
				K50.51.300.40

Air press (bar)	K1.51		K2.51		K4.51		K8.51		K15.51		K30.51		K50.51	
	Pöi bar	F kN	Pöi bar	F kN	Pöi bar	F kN	Pöi bar	F kN	Pöi bar	F kN	Pöi bar	F kN	Pöi bar	F kN
2	55	1,7	55	3,0	55	6,4	55	11,8	40	17,3	45	35,4	45	55,7
3	95	3,0	95	5,1	95	11,0	95	20,3	85	36,1	90	70,1	90	110,8
4	130	4,1	135	7,3	130	15,1	135	28,7	130	54,9	135	104,7	135	165,8
5	170	5,3	170	9,1	170	19,7	175	37,2	175	73,8	175	135,6	175	214,8
6	205	6,4	210	11,3	210	24,3	215	45,6	215	90,6	215	166,5	215	263,8
7	245	7,6	245	13,1	245	28,3	255	54,0	250	105,3	260	201,2	260	318,9
8	285	8,9	285	15,3	285	32,9	295	62,5	295	124,2	300	232,1	300	367,9
9	325	10,1	325	17,4	325	37,5	340	71,9	340	143,0	345	266,8	345	422,9
10	360	11,2	365	19,5	365	42,1	375	79,4	380	159,8	385	297,7	385	471,9

Type RP, O

Air press (bar)	RP8.32.3		RP15.32.3	
	Pöi bar	F kN	Pöi bar	F kN
2	35	11,0	55	25,0
3	59	18,0	95	42,0
4	90	28,0	130	58,0
5	114	36,0	170	75,0
6	142	44,0	205	91,0
7	170	53,0	245	109,0
8	198	62,0	285	126,0
9	225	70,0	325	144,0
10	253	79,0	360	159,0

Air press (bar)	O4.6		O4.12		O8.6		O8.12		O15.6	
	Pöi bar	F kN	Pöi bar	F kN	Pöi bar	F kN	Pöi bar	F kN	Pöi bar	F kN
2	20	5,8	16	6,4	30	12,0	15	9,0	29	19,0
3	33	9,7	28	11,0	53	22,0	27	17,0	50	33,0
4	50	14,8	38	15,0	73	31,0	38	24,0	71	48,0
5	64	18,9	50	20,0	95	40,0	48	31,0	90	61,0
6	80	23,7	61	25,0	115	48,0	60	39,0	111	75,0
7	95	28,0	73	30,5	138	58,0	69	45,0	130	88,0
8	111	33,0	85	35,0	160	68,0	81	53,0	150	102,0
9	127	38,0	96	39,0	183	78,0	92	60,0	172	117,0
10	142	42,0	107	44,0	202	86,0	103	68,0	193	131,0

** Tolerance for technical data $\pm 5\%$

10.2 Oil pressure/pressing force table for 6 bar Powerpackage Type S, K**

S2.30. 50.6 S2.30.100.6		S4.30 50.6 S4.30.100.6		S8 30. 50.6 S8. 30.100.6		S15.30. 50.6 S15.30.100.6 S15.30.200.6		S30.30. 70. 6 S30.30.200.13		S 50.30. 70 6 S100 30.200. 10	
Air press (bar)	S2/K2 Pöl F bar kN	S4/K4 Pöl F bar kN	S8/K8 Pöl F bar kN	S15/K15 Pöl F bar kN	S30/K30 Pöl F bar kN	S50/K50 Pöl F bar kN	S75 Pöl F bar kN	S100 Pöl F bar kN			
2	90 4,9	75 8,2	100 20,7	95 38,1	85 69,0	70 88,3	65 169	80 207			
3	145 7,8	135 14,6	165 34,0	155 61,9	145 117,2	130 163,1	125 324	160 413			
4	200 10,7	190 20,5	235 48,3	215 85,8	210 169,3	195 244,0	185 479	240 619			
5	260 13,9	240 25,9	300 61,5	275 109,6	275 221,5	255 318,8	240 621	320 824			
6	320 17,1	290 31,3	360 73,8	335 133,5	340 273,6	325 405,9	305 788	400 1030			

S30.30.150.12		S50.30.150.10		K1.30.100.6 K1.30.200.10		K2.30.100.5 K2.30.200.12		K4.30.100.5 K4.30.200.10		K8.30.200.10	
Air press (bar)	S2/K2 Pöl F bar kN	S4/K4 Pöl F bar kN	S8/K8 Pöl F bar kN	S15/K15 Pöl F bar kN	S30/K30 Pöl F bar kN	S50/K50 Pöl F bar kN					
2	75 4,1	100 10,8	95 19,7	85 34,2	70 57,2	80 100					
3	135 7,3	165 17,7	155 32,0	145 58,1	130 105,4	160 199					
4	190 10,3	235 25,1	215 44,3	210 83,8	195 157,5	240 299					
5	240 12,9	300 32,0	275 56,6	275 109,6	255 205,8	320 398					
6	290 15,6	360 38,4	335 68,9	340 135,4	325 261,8	400 498					

10.3 Fast approach and retracting force table**

Type S, S version 50, K

Air pressure (bar)	S1/K1		S2/K2		S4/K4		S8/K8		S15/K15		S30/K30		S50/K50		S75/100	
	F* daN	R* daN	F* daN	R* daN	F* daN	R* daN	F* daN	R* daN	F* daN	R* daN	F* daN	R* daN	F* daN	R* daN	F* daN	R* daN
2	23	24	47	50	60	66	108	112	152	184	220	310	240	400	420	740
3	34	36	70	75	90	100	162	168	228	276	330	465	360	600	630	1110
4	46	48	94	100	120	132	216	224	304	368	440	620	480	800	840	1480
5	57	60	117	125	150	165	270	280	380	460	550	775	600	1000	1050	1850
6	69	72	140	150	180	195	320	330	450	550	660	930	720	1200	1260	2200
7	80	84	164	175	210	231	378	392	532	644	770	1085	840	1400	1470	2590
8	92	96	188	200	240	264	432	448	608	736	880	1240	960	1600	1680	2960
9	103	108	211	225	270	297	486	504	684	828	990	1355	1080	1800	1890	3330
10	115	120	235	250	300	330	540	560	760	920	1100	1550	1200	2000	2100	3700

Type K, version 51

Air pressure (bar)	K1.51		K2.51		K4.51		K8.51		K15.51		K30.51		K50.51	
	F* daN	R* daN	F* daN	R* daN	F* daN	R* daN	F* daN	R* daN	F* daN	R* daN	F* daN	R* daN	F* daN	R* daN
2	21	24	44	50	59	66	95	112	125	184	201	310	191	400
3	31	36	66	75	80	100	143	168	188	276	302	465	286	600
4	41	48	88	100	107	132	191	224	250	368	403	620	382	800
5	52	60	110	125	134	165	238	280	313	460	503	775	477	1000
6	62	72	132	150	161	195	286	330	376	550	604	930	573	1200
7	73	84	154	175	188	231	334	392	438	644	705	1085	686	1400
8	83	96	176	200	214	264	382	448	501	736	805	1240	764	1600
9	94	108	200	225	241	297	430	504	564	828	906	1355	859	1800
10	104	120	220	250	268	330	477	560	626	920	1007	1550	955	2000

F* = fast approach stroke

R* = retracting force

11. Problems, causes, remedies

11.1 Piston rod doesn't extend

Problem	Cause	Remedy
Piston rod doesn't extend	<ul style="list-style-type: none"> - Compressed air supply insufficient - Main control valve not switching - Piston rod seized up due to shearing forces - Broken spring - No air pressure in the case of a pneumatic spring 	Increase compressed air supply Get it repaired Get it repaired Get it repaired Check compressed air supply

11.2 Powerpackage doesn't switch to power stroke

Problem	Cause	Remedy
No power stroke Does the oil indicator needle show a low oil level?	<ul style="list-style-type: none"> - Hydraulic oil used up; oil indicator needle (79) actuated - Control throttle misadjusted - Air trapped in oil system - Compressed air supply insufficient - Defective sequence valve - Necessary pressing force greater than possible max. 	Refill with hydraulic oil (sect 9) Adjust control throttle (sect. 6.5.1) Bleed system (sect. 9) Increase compressed air supply Get it repaired Install a stronger Powerpackage

11.3 Frequent oil refills necessary

Problem	Cause	Remedy
Loss of oil	<ul style="list-style-type: none"> - Damaged seals - Advance stroke faster than return stroke - Defective oil filling nipple, HP measuring connection or bleed screw defective 	Inspection/repair by repair staff Adjust Get it repaired

11.4 Piston rod doesn't retract

Problem	Cause	Remedy
	<ul style="list-style-type: none"> - Compressed air supply insufficient - Main control valve not switching - Broken spring - In the case of pneumatic spring: no air pressure - Piston rod seized up due to shearing forces - Defective sequence valve 	Check compressed air supply Get it repaired Get it repaired Check compressed air supply Get it repaired Get it repaired

12 Disassembling the Powerpackage

1. Before disassembling the Powerpackage, relieve all compressed air pipes of pressure.



Disassembling the Powerpackage while under pressure causes the individual parts to spring apart suddenly.

2. Drain off oil.

Push in a 2 mm diameter pin at the HP measuring connection (30) until no more oil emerges. Drain off remaining oil by disassembling the oil filling nipple (62) and HP measuring connection (30).



In the case of Powerpackages with pressure springs, the oil is prestressed to approx. 1 bar.

3. Remove tie rods.



In the case of Powerpackages with pressure springs, the components are under spring tension.

4. Once the tie rods have been removed, all other components can be taken apart.

5. Clean parts and change seals with great care.



Make sure the seals are mounted in the right direction.

6. Assemble device.

7. Tighten tie rods to the correct torque (see table).



Tightening to the wrong torque can cause the individual parts to spring apart suddenly, or a sudden escape of oil.

8. Refill with oil.

See chapter 9 pp.

9. Push oil indicator needle (79) back into place.

Tightening moment for powerpackages type S

Type	Outside diameter transmission part (mm) (pos. 7)	Tightening moment (Nm)		Type for example
		working part (pos. 16)	transmission part (pos. 29)	
Powerpackage type S				
S 1	50	13	-	S 1. 32.6
S 1	75	13	13	S 1. 50.24
S 1	85	13	13	S 1.100.48
S 2	75	27	-	S 2. 32.6
S 2	85	27	13	S 2. 50.24
S 2	110	27	27	S 2.100.48
S 4	85	60	-	S 4. 32.6
S 4	110	60	27	S 4. 50.24
S 4	135	60	60	S 4.100.44
S 8	110	110	-	S 8. 32.6
S 8	135	110	60	S 8. 50.24
S 8	170	110	110	S 8.100.48
S 8	190	110	110	S 8.200.80
S15	135	240	-	S15. 32.6
S15	170	240	110	S15. 50.24
S15	190	240	110	S15.100.40
S30	170	600	-	S30. 50. 6 LF
S30	290	600	-	S30. 70.20
S30	267	600	110	S30.150.28
S50	190	1100	-	S50. 50. 6
S50	267	600	110	S50. 70.20
S50	324	-	-	S50.300.30
S75/	267	1100	-	S75.100.12

Tightening moment for powerpackages type K

Type	Outside diameter transmission part (mm) (pos. 7)	Tightening moment (Nm)		Type for example
		working part (pos. 16)	transmission part (pos. 29)	
Powerpackage type K				
K 1	50	13	13	K 1. 50. 5
K 1	75	13	27	K 1. 100.15
K 2	75	27	27	K 2. 50. 4
K 2	85	27	60	K 2. 100.12
K 2	110	27	110	K 2.300.50
K 4	85	60	60	K 4. 100. 6
K 4	110	60	110	K 4. 100.10
K 4	135	60	240	K 4.300.50
K 8	110	110	110	K 8. 100. 5
K 8	135	110	240	K 8. 150.15
K 8	170	110	400	K 8.300.50
K15	135	240	240	K15. 150. 5
K15	190	240	400	K15. 100.10
K15	267	240	240	K15.100.40
K30	267	600	240	K30. 100. 5
K50	324	1100	600	K50. 100.10

Thread and screw head contact have to be greased before tightening.

Tightening moment for powerpackages type O and RP and for screws DIN 912-12.9

Thread	Tightening moment [Nm]
M 6	13
M 8	27
M 10	60
M 12	110
M 16	240
M 22, M 22 x 1,5	600
M 30 x 2	1100

Thread and screw head contact have to be greased before tightening.

Tightening torque for bypass valves

Size	Tightening torque [Nm]
M8 x 0,75 (*)	4
G1/8 (*)	6
G1/4 (*)	10
G3/8 (*)	15

(*) Secure with Loctite

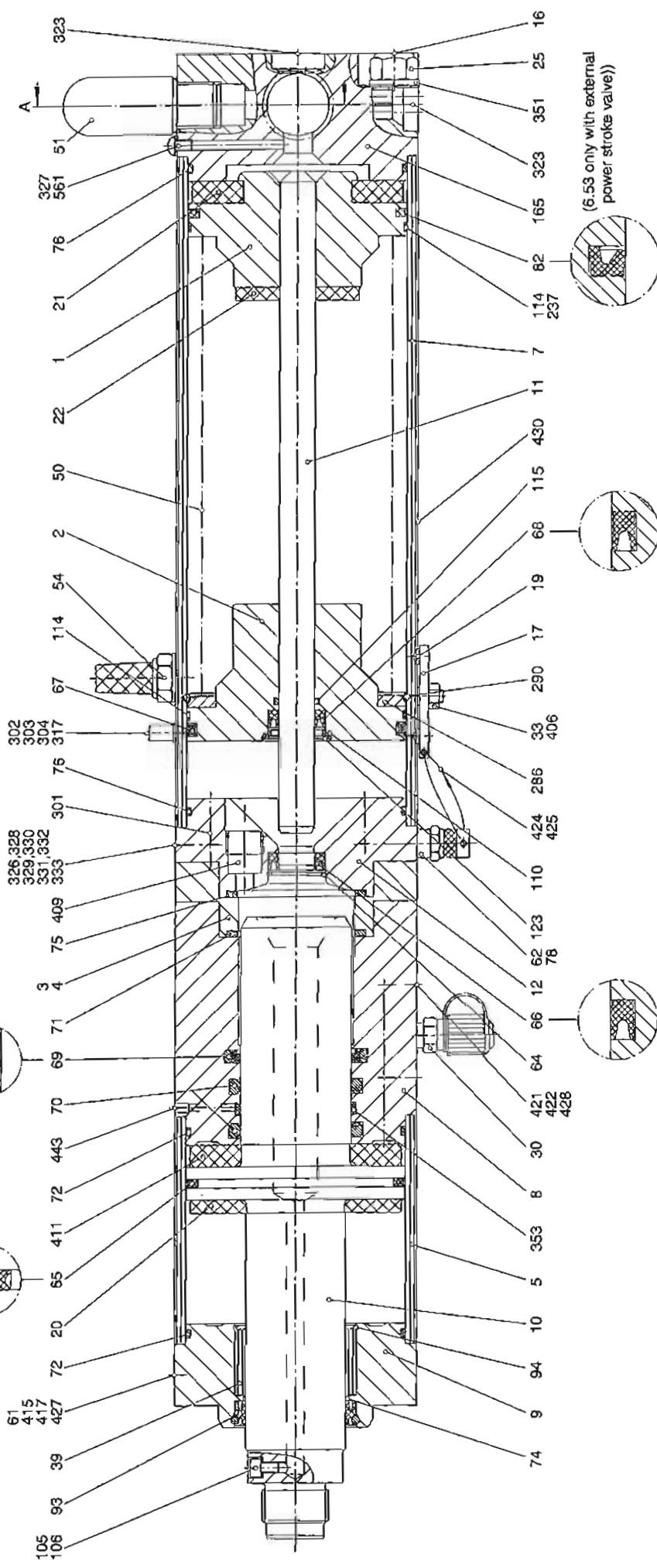
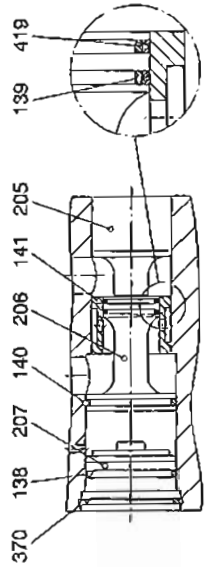
13 Spare parts and possible versions of the Powerpackage

The Powerpackage can be overhauled at our factory. Seal kits are also available for your own repair. You can also ask for a spare part for the control throttle "X" and the sequence valve.

Please always indicate the type and serial number of the Powerpackage and the number of the spare

13.1 Key to Powerpackage type S, with integrated valve and compression spring

Item	Qty.	Description	Item	Qty.	Description	Item	Qty.	Description
1	1	Intensifier Piston	115	1	O-ring	427	1	Control line
2	1	Feed Piston	123	1	Retaining ring	428	1	Power stroke line
3/4	1	Adapter	138	1	O-ring	430	1	Adhesive label oil vent
5	1	Barrel	139	1	O-ring	443	1	Sintered washer
6	1	End cap	140	1	O-ring	561	1	Sealing ring
7	1	Barrel	141	1	Bushing			
8	1	HP cylinder	165	1	End cap with integrated valve			
9	1	Flange						
10	1	Working rod	205	1	Plug			
11	1	Plunger	206	1	Spool			
12	1	HP cylinder cover	207	1	Lid			
16	4	Tie rod	237	1	Guide ring (for intensifiers with inner diameter 45 and 63 only)			
17	1	Bleed plate						
19	2	Seal						
20	1	Cushion						
21	1	Cushion	286	1	Stop ring			
22	1	Cushion	290	1	Round wire ring			
25	4	Nut	301	1	Oil level indicator plug			
30	1	HP measuring connection	302	1	Bushing			
			303	1	Valve slide overfill protection			
33	1	Nut						
39	1	Bushing	304	1	Sintered washer			
43	1	Nameplate	316	1	O-ring			
44	2	Rivet	317	1	Compression spring			
50	1	Compression spring	323	2	Sintered washer (for S1 only)			
51	1	Muffler						
53	1	sequence valve	326	2	Bracket			
			327	1	oval head screw			
54	1	Muffler	328	1	Shackle			
61	1	Flow control "X"	329	1	Holding strap with lock			
62	1	Oil filling nipple	330	2	Screw			
64	1	Retaining ring	331	2	Nut			
65	1	Rod Seal	332	1	Electric switch			
66	1	Lip seal	333	1	Pneumatic switch			
67	1	Quad ring	351	4	Plain washer (only with integrated valve for intensifier inner diameter 100 and S30/K30-Powerpackages)			
68	1	Lip seal						
69	1	Step seal						
70	2	O-ring						
71	1	Edge seal						
72	2	O-ring	353	1	Guide ring			
74	1	O-ring (for S30 only)	370	1	Retaining ring			
75	1	Edge seal	406	1	Threaded stud			
76	2	O-ring	409	misc.	Bypass valve (only for cushion special Powerpackages)			
77	2	O-ring						
78	1	Aluminium sealing ring	411	1	Cushion			
79	1	Oil indicator pin	415	1	Swivelling screw fitting			
80	2	Retaining ring	416	1	Swivelling screw fitting			
81	1	Oil indicator needle	417	1	Sealing ring for item 415			
82	1	Rod Seal	418	1	Sealing ring for item 416			
93	1	Seal wiper	419	1	Delrin ring			
94	1	Retaining ring	421	1	Swivelling screw fitting			
105	1	Usit ring	422	1	Sealing ring for item 421			
106	1	Bleed screw	424	1	Locking wire			
110	1	Ring	425	1	Lead seal for locking			



(6.53 only with external power stroke valve)

- 105
- 106
- 93
- 39
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- 415
- 417
- 427
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- 20
- 65
- 411
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- 443
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- 69
- 71
- 3
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- 75
- 409
- 333
- 301
- 76
- 302
- 303
- 304
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- 67
- 114
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- 22
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- 76
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- 114
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- 78
- 12
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- 421
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- 353
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- 74

13.2 Key to Powerpackage type S, with pneumatic spring

Item	Qty.	Description	Item	Qty.	Description	Item	Qty.	Description
1	1	Intensifier piston	123	2	Retaining ring	419	1	Delrin ring
2	1	Feed piston	138	1	O-ring	421	1	Swivelling screw fitting
3/4	1	Adapter	139	1	O-ring	422	1	Sealing ring for item 421
5	1	Barrel	140	1	O-ring	424	1	Locking wire
6	1	End cap	141	1	Bushing	425	1	Lead seal for locking wire
7	1	Barrel	165	1	End cap with integrated valve	427	1	Control line
8	1	HP cylinder						
9	1	Flange	205	1	Plug	428	1	Power stroke line
10	1	Working rod	206	1	Spool	430	1	Adhesive label, oil vent
11	1	Plunger	207	1	Lid	443	1	Sintered washer
12	1	HP cylinder cover	237	1	Guide ring (for intensifier inner diameter 45 and 63 only)	460	1	Pneumatic spring assembly
16	4	Ti rod						
17	1	Bleed plate				461	1	Pressure regulator
19	2	Seal				462	1	Muffler
20	1	Cushion	286	1	Stop ring	463	1	Double nipple
21	1	Cushion	290	-	Round wire ring	464	2	Reducing nipple
22	1	Cushion	301	1	Oil level indicator plug	465	1	Sealing ring
25	4	Nut	302	1	Bushing	470	1	Pressure gauge
30	1	HP measuring connection	303	1	Valve slide overfill protection	471	1	Flow control valve OR
						472	1	Elbow
33	1	Nut	304	1	Sintered washer	473	1	Elbow
39	1	Bushing	316	1	O-ring	474	1	PU hose
43	1	Nameplate	317	1	Compression spring	475	1	Straight screw-in fitting
44	2	Rivet	323	2	Sintered washer (for S1 only)	476	1	L-shaped screw-in piece
50	-	Compression spring						
51	1	Muffler	326	2	Bracket	477	1	Reducer
53	1	sequence valve	327	1	Oval head screw	543	1	Plug
54	-	Muffler	328	1	Shackle	544	1	Vent plug
61	1	Flow control "X"	329	1	Holding strap with lock	561	1	Sealing ring
62	1	Oil filling nipple	330	2	Screw	563	2	O-ring
64	1	Retaining ring	331	2	Nut			
65	1	Rod seal	332	1	Electric switch			
66	1	Lip seal	333	1	Pneumatic switch			
67	2	Lip seal	351	4	Plain washer (only with integrated valve for intensifier inner diameter 100 and S30/K30-Powerpackages)			
68	2	Lip seal						
69	1	Step seal						
70	2	O-ring						
71	1	Edge seal						
72	2	O-ring	353	1	Guide ring			
74	1	O-ring (for S30 only)	370	1	Retaining ring			
75	1	Edge seal	375	1	Air tube (intensifier inner diameter from 160 upwards)			
76	2	O-ring						
77	2	O-ring						
78	1	Aluminium sealing ring	398	1	Intermediate ring (only for Powerpackage with pneumatic spring)			
79	1	Oil indicator pin						
80	2	Retaining ring	406	1	Threaded stud			
81	1	Oil indicator needle	409	misc.	Bypass valve (only for cushion special Powerpackages)			
82	1	Rod seal						
93	1	Seal wiper						
94	1	Retaining ring	410	2	Rod seal			
105	1	Usit ring	411	1	Cushion			
106	1	Bleed screw	415	1	Swivelling screw fitting			
110	2	Ring	416	1	Swivelling screw fitting			
114	3	Guide ring	417	1	Sealing ring for item 415			

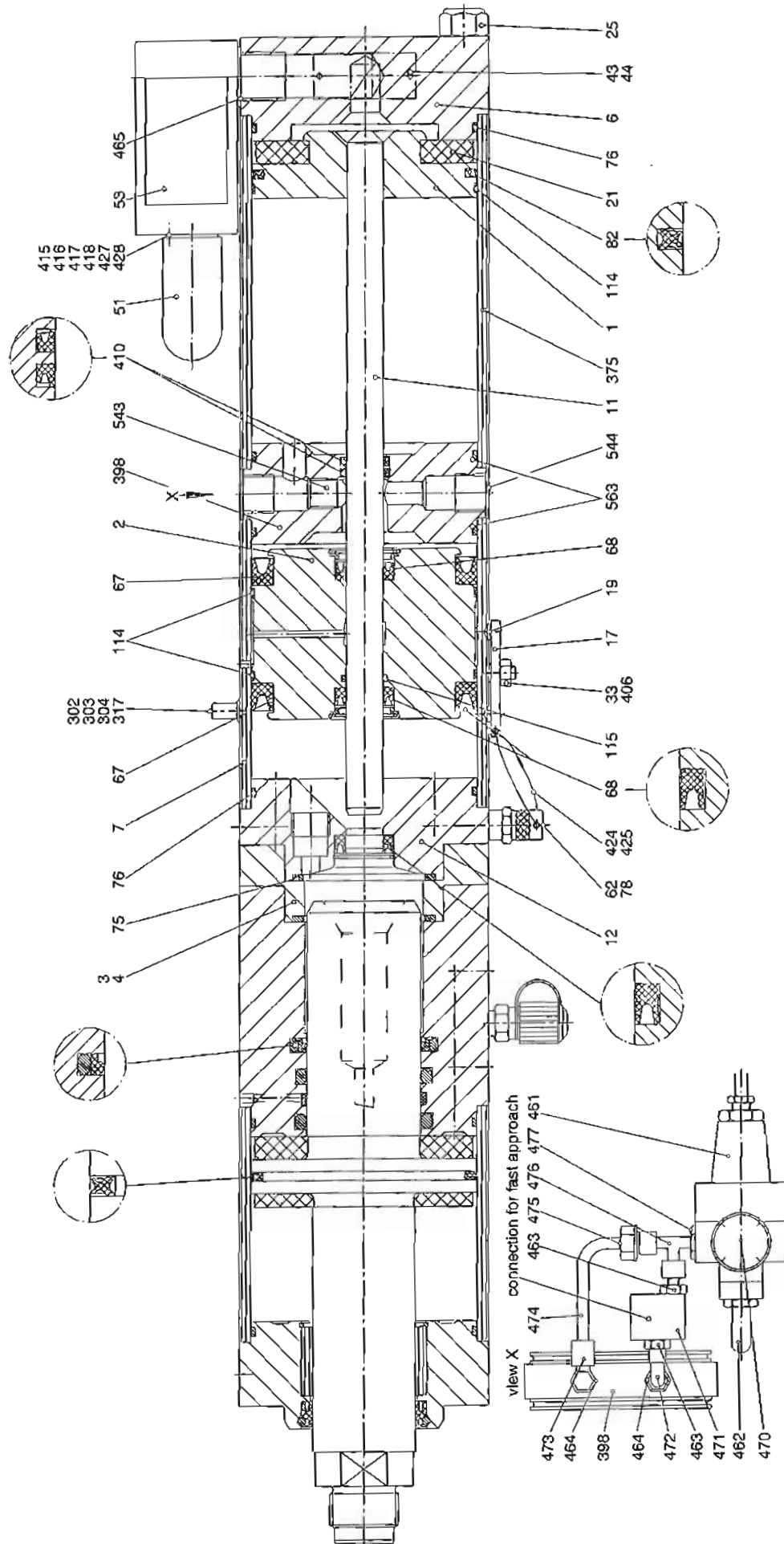
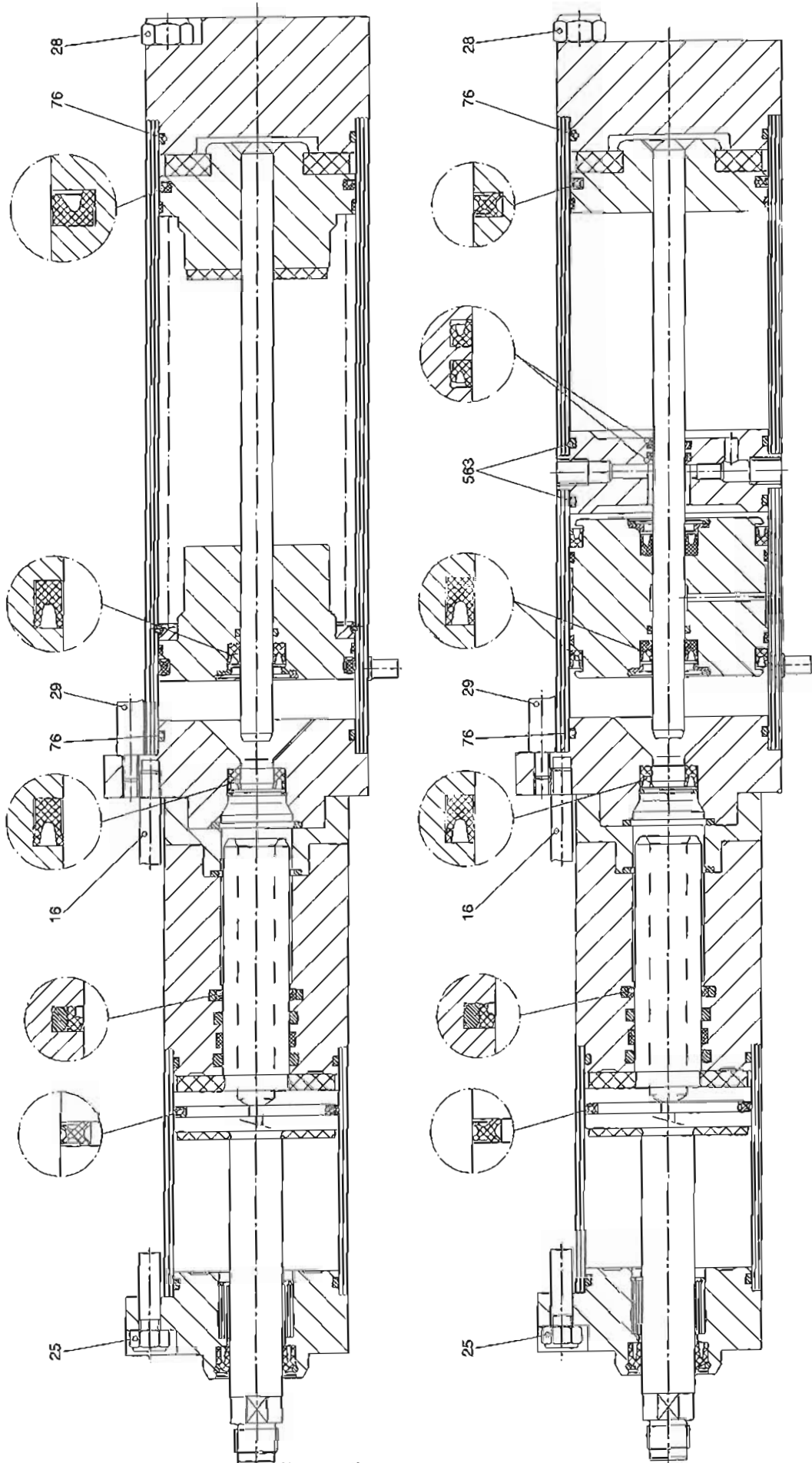


Fig. 13.2 Powerpackage type S, with pneumatic spring

all other items not indicated are the same as in the

13.3 Key to Powerpackage type S, with enlarged intensifier section

Item	Qty.	Description	Item	Qty.	Description	Item	Qty.	Description
1	1	Intensifier piston	110	2	Ring	419	1	Delrin ring
2	1	Feed piston	114	3	Guide ring	421	1	Swivelling screw fitting
3/4	1	Adapter	115	1	O-ring	422	1	Sealing ring for item 421
5	1	Barrel	123	2	Retaining ring	424	1	Locking wire
6	1	End cap	138	1	O-ring	425	1	Lead seal for locking wire
7	1	Barrel	139	1	O-ring	427	1	Control line
8	1	HP cylinder	140	1	O-ring	428	1	Power stroke line
9	1	Flange	141	1	Bushing	430	1	Adhesive label, oil vent
10	1	Working rod	165	1	End cap with integrated valve	443	1	Sintered washer
11	1	Plunger				561	1	Sealing ring
12	1	HP cylinder cover	205	1	Plug	563	2	O-ring
16	4	Tie rod	206	1	Spool			
17	1	Bleed plate	207	1	Lid			
19	2	Seal	237	1	Guide ring (only for intensifier inner diameter 45 and 63)			
20	1	Cushion						
21	1	Cushion						
22	1	Cushion	286	-	Stop ring			
25	4	Nut	290	-	Round wire ring			
28	4	Nut	301	1	Oil level indicator plug			
29	4	Tie rod	303	1	Valve slide overfill protection			
30	1	HP measuring connection	304	1	Sintered washer			
33	1	Nut	316	1	O-ring			
39	1	Bushing	317	1	Compression spring			
43	1	Nameplate	323	2	Sintered washer (for S1 only)			
44	-	Rivet						
50	-	Compression spring	326	2	Bracket			
51	1	Muffler	327	1	oval head screw			
53	1	sequence valve	328	1	Shackle			
			329	1	Holding strap with lock			
54	1	Muffler	330	2	Screw			
61	1	Flow control „X“	331	2	Nut			
62	1	Oil filling nipple	332	1	Electric switch			
64	1	Retaining ring	333	1	Pneumatic switch			
65	1	Rod seal	351	4	Plain washer (only with integrated valve for intensifier inner diameter 100 and S30/K30-Powerpackages)			
66	1	Lip seal						
67	2	Quad ring (lip seal)						
68	2	Lip seal						
69	1	Step seal						
70	2	O-ring	353	1	Guide ring			
71	1	Edge seal	375	1	Air tube (intensifier inner diameter from 160 upwards)			
72	2	O-ring						
74	1	O-ring (for S30 only)						
75	1	Edge seal	398	1	Intermediate ring (only for Powerpackage with pneumatic spring)			
76	2	O-ring						
77	2	O-ring						
78	1	Aluminium sealing ring	406	1	Threaded stud			
			409	misc.	Bypass valve (only for cushion special Powerpackages)			
79	1	Oil indicator pin						
80	2	Retaining ring						
81	1	Oil indicator needle	410	2	Rod seal			
82	1	Rod seal	411	1	Cushion			
93	1	Seal wiper	415	1	Swivelling screw fitting			
94	1	Retaining ring	416	1	Swivelling screw fitting			
105	1	Usit ring	417	1	Sealing ring for item 415			



13.3 Powerpackage type S, with enlarged intensifier section
 all other items not indicated are the same as in the

13.4 Key to Powerpackage type S, special model S "50"

Item	Qty.	Description	Item	Qty.	Description	Item	Qty.	Description	
1	1	Intensifier piston	82	1	Rod seal	398	1	Intermediate ring (only for Powerpackage with pneumatic spring)	
2	1	Feed piston	93	1	Seal wiper				
3/4	1	Adapter	94	1	Retaining ring				
5	1	Barrel	105	1	Usit ring	406	1	Threaded stud	
6	1	End cap	106	1	Screw	409	misc.	Bypass valve (only for cushion special Powerpackages)	
7	1	Barrel	110	2	Ring				
8	1	HP cylinder	114	2	Guide ring				
9	1	Flange	115	1	O-ring	410	2	Rod seal	
10	1	Working rod	123	2	Retaining ring	411	1	Cushion	
11	1	Plunger	138	1	O-ring	415	1	Swivelling screw fitting	
12	1	HP cylinder cover	139	1	O-ring	416	1	Swivelling screw fitting	
14	1	Adjustable adapter	140	1	O-ring	417	1	Sealing ring for item 415	
16	4	Tie rod	141	1	Bushing	418	1	Sealing ring for item 416	
17	1	Bleed plate	165	1	End cap with integrated valve	419	1	Delrin ring	
18	misc.	Expansion bolt				421	1	Swivelling screw fitting	
19	2	Seal	166	4	Tie rod	422	1	Sealing ring for item 421	
20	1	Cushion	177	1	End cage	424	1	Locking wire	
21	1	Cushion	179	1	Protective tube	425	1	Lead seal for locking wire	
22	1	Cushion	205	1	Plug				
24	1	Sleeve	206	1	Spool	427	1	Control line	
25	4	Nut	207	1	Lid	428	1	Power stroke line	
28	4	Nut	219	1	DU bush	430	1	Adhesive label, oil vent	
29	4	Tie rod	237	1	Guide ring (only for intensifier inner diameter 45 and 63)	443	1	Sintered washer	
30	1	HP measuring connection				448	4	Nut	
						478	3	Screw	
33	1	Nut	286	-	Stop ring	562	1	Nut	
39	1	Bushing	290	-	Round wire ring				
41	1	Centering piece	301	1	Oil level indicator plug				
42	1	Plunger extension	303	1	Valve slide overflow protection				
43	1	Nameplate							
44	2	Rivet	304	1	Sintered washer				
50	1	Compression spring	316	1	O-ring				
51	1	Muffler	317	1	Compression spring				
53	1	sequence valve	323	2	Sintered washer (for S1 only)				
54	1	Muffler	326	2	Bracket				
61	1	Flow control „X“	327	1	Set screw				
62	1	Oil filling nipple	328	1	Shackle				
64	1	Retaining ring	329	1	Holding strap with lock				
65	1	Rod seal	330	2	Screw				
66	1	Lip seal	331	2	Nut				
67	2	Quad ring (lip seal)	332	1	Electric switch				
68	2	Lip seal	333	1	Pneumatic switch				
69	1	Step seal	350	1	Lip seal				
70	2	O-ring	351	4	Plain washer (only with integrated valve for intensifier inner diameter 100 and S30/ K30-Powerpackages)				
71	1	Edge seal							
72	2	O-ring							
74	1	O-ring (for S30 only)							
75	1	Edge seal							
76	2	O-ring	353	1	Guide ring				
77	2	O-ring	370	1	Retaining ring				
78	1	Aluminium sealing ring	375	1	Air tube (intensifier inner diameter from 160 upwards)				
79	1	Oil indicator pin							
80	2	O-ring							

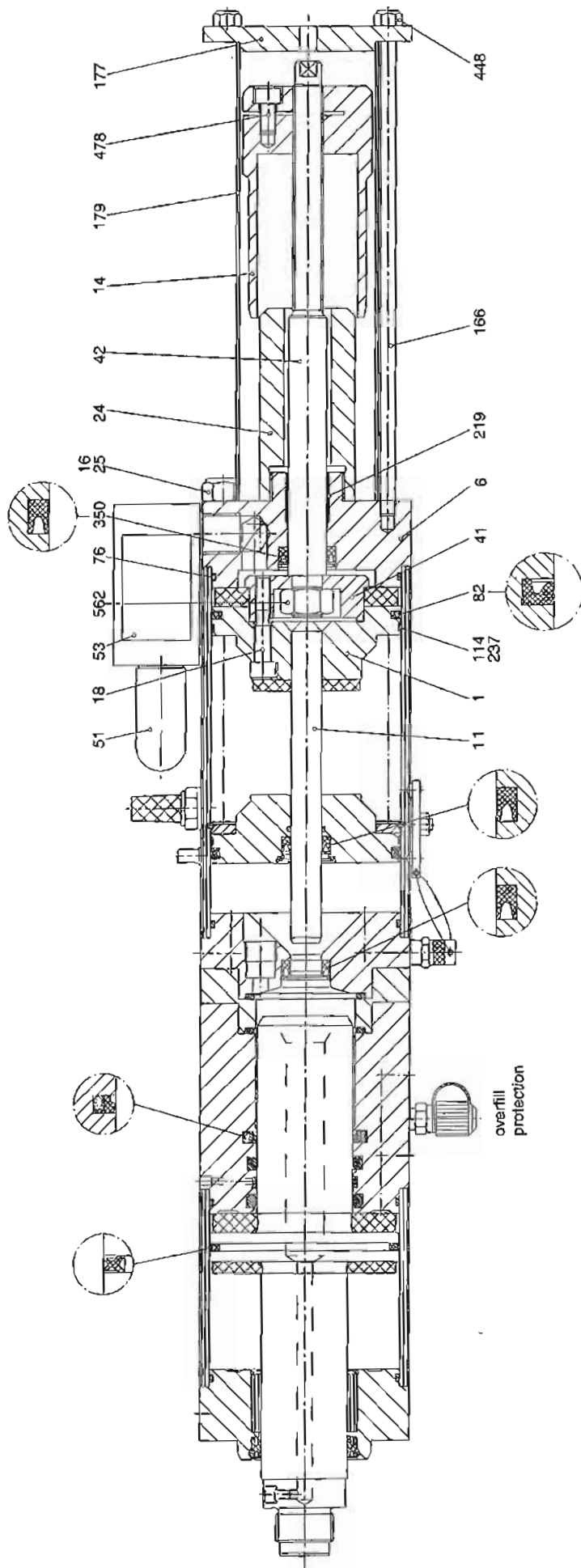


Fig. 13.4 Powerpackage type S, special model S "50"

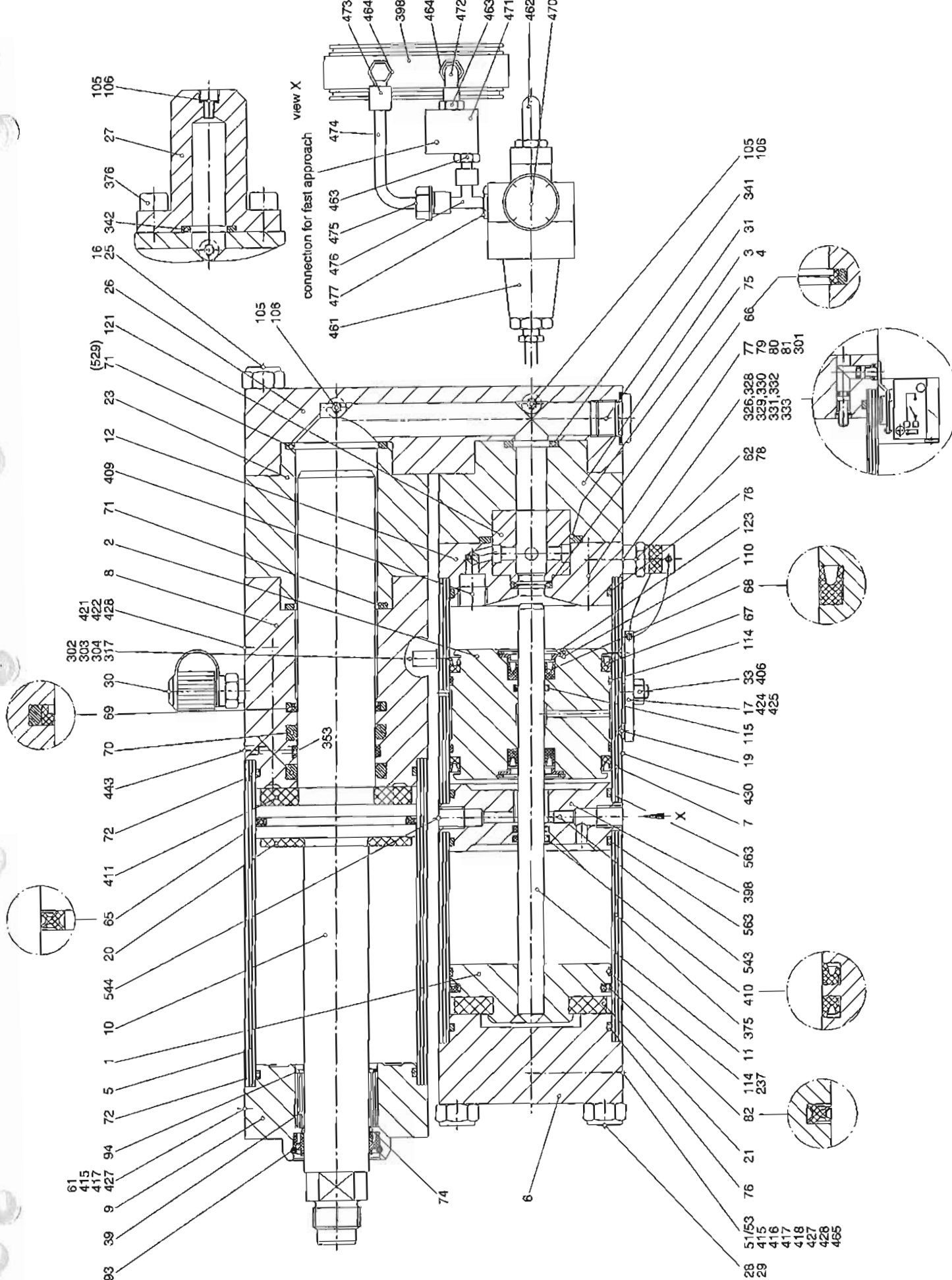
all other items not indicated are the same as in the

13.5 Key to Powerpackage type K with integrated valve and compression spring

Item	Qty.	Description	Item	Qty.	Description	Item	Qty.	Description
1	1	Intensifier piston	106	2	Bleed screw	410	-	Rod seal
2	1	Feed piston	110	1	Ring	411	1	Cushion
3/4	1	Adapter	114	2	Guide ring	415	1	Swivelling screw fitting
5	1	Barrel	115	1	O-ring	416	1	Swivelling screw fitting
6	1	End cap	121	1	Ring	417	1	Sealing ring for item 415
7	1	Barrel	123	1	Retaining ring	418	1	Sealing ring for item 416
8	1	HP cylinder	138	1	O-ring	419	1	Delrin ring
9	1	Flange	139	1	O-ring	421	1	Swivelling screw fitting
10	1	Working rod	140	1	O-ring	422	1	Sealing ring for item 421
11	1	Plunger	141	1	Bushing	424	1	Locking wire
12	1	HP cylinder cover	165	1	End cap with integrated valve	425	1	Lead seal for locking wire
16	4	Tie rod						
17	1	Bleed plate	205	1	Plug	427	1	Control line
19	2	Seal	206	1	Spool	428	1	Power stroke line
20	1	Cushion	207	1	Lid	430	1	Adhesive label, oil vent
21	1	Cushion	237	1	Guide ring (only for intensifier inner diameter 45 and 63)	443	1	Sintered washer
23	1	Adapter				529	1	Edge seal
25	4	Nut				561	1	Sealing ring
26	1	Intensifier flange	286	1	Stop ring			
27	1	Sleeve	290	1	Round wire ring			
28	4	Nut	301	1	Oil level indicator plug			
29	4	Tie rod	303	1	Valve slide overflow protection			
30	1	HP measuring-connection	304	1	Sintered washer			
31	1	Vent plug	316	1	O-ring			
33	1	Nut	317	1	Compression spring			
39	1	Bushing	323	2	Sintered washer (for S1 only)			
43	1	Nameplate						
44	2	Rivet	326	2	Bracket			
50	1	Compression spring	327	1	Oval head screw			
51	1	Muffler	328	1	Shackle			
53	1	sequence valve	329	1	Holding strap with lock			
54	1	Muffler	330	2	Screw			
61	1	Flow control „X“	331	2	Nut			
62	1	Oil filling nipple	332	1	Electric switch			
65	1	Rod seal	333	1	Pneumatic switch			
66	1	Lip seal	341	1	Edge seal			
67	1	Quad ring (lip seal)	342	1	Edge seal			
68	1	Lip seal	351	4	Plain washer (only with integrated valve for intensifier inner diameter 100 and S30/K30-Powerpackages)			
69	1	Step seal						
70	2	O-ring						
71	2	Edge seal						
72	2	O-ring						
74	1	O-ring (for S30 only)	353	1	Guide ring			
75	1	Edge seal	370	1	Retaining ring			
76	2	O-ring	375	-	Air tube (intensifier inner diameter from 160 upwards)			
77	2	O-ring						
78	1	Aluminium sealing ring	376	misc.	Cheese head screw			
79	1	Oil indicator pin	398	-	Intermediate ring (only for Powerpackage with pneumatic spring)			
80	2	Retaining ring						
81	1	Oil indicator needle						
82	1	Rod seal	406	1	Threaded stud			
93	1	Seal wiper	409	misc.	Bypass valve (only for cushion special			
94	1	Retaining ring						

13.6 Key to Powerpackage type K with pneumatic spring

Item	Qty.	Description	Item	Qty.	Description	Item	Qty.	Description
1	1	Intensifier piston	106	2	Bleed screw	410	2	Rod seal
2	1	Feed piston	110	2	Ring	411	1	Cushion
3/4	1	Adapter	114	3	Guide ring	415	1	Swivelling screw fitting
5	1	Barrel	115	1	O-ring	416	1	Swivelling screw fitting
6	1	End cap	121	1	Ring	417	1	Sealing ring for item 415
7	1	Barrel	123	2	Retaining ring	418	1	Sealing ring for item 416
8	1	HP cylinder	138	1	O-ring	419	1	Delrin ring
9	1	Flange	139	1	O-ring	421	1	Swivelling screw fitting
10	1	Working rod	140	1	O-ring	422	1	Sealing ring for item 421
11	1	Plunger	141	1	Bushing	424	1	Locking wire
12	1	HP cylinder cover	165	1	End cap with integrated valve	425	1	Lead seal for locking wire
16	4	Tie rod						
17	1	Bleed plate	205	1	Plug	427	1	Control line
19	2	Seal	206	1	Spool	428	1	Power stroke line
20	1	Cushion	207	1	Lid	430	1	Adhesive label, oil vent
21	1	Cushion	237	1	Guide ring (only for intensifier inner diameter 45 and 63)	443	1	Sintered washer
23	1	Adapter				460	1	Pneumatic spring assembly
25	4	Nut						
26	1	Intensifier flange	286	1	Stop ring	461	1	Pressure regulator
27	1	Sleeve	290	1	Round wire ring	462	1	Muffler
28	4	Nut	301	1	Oil level indicator plug	463	1	Double nipple
29	4	Tie rod	303	1	Valve slide overfill protection	464	2	Reducing nipple
30	1	HP measuring connection	304	1	Sintered washer	465	1	Sealing ring
31	1	Vent plug	316	1	O-ring	470	1	Pressure gauge
33	1	Nut	317	1	Compression spring	471	1	Flow control valve OR
39	1	Bushing	323	2	Sintered washer (for K1 only)	472	1	Elbow
43	1	Nameplate				473	1	Elbow
44	2	Rivet	326	2	Bracket	474	1	PU hose
50	1	Compression spring	327	1	Oval head screw	475	1	Straight screw-in fitting
51	1	Muffler	328	1	Shackle	476	1	L-shaped screw-in piece
53	1	sequence valve	329	1	Holding strap with lock	477	1	Reducer
54	1	Muffler	330	2	Screw	529	1	Edge seal
61	1	Flow control „X“	331	2	Nut	543	1	Plug
62	1	Oil filling nipple	332	1	Electric switch	544	1	Vent plug
65	1	Rod seal	333	1	Pneumatic switch	561	1	Sealing ring
66	1	Step seal	341	1	Edge seal	563	2	O-ring
67	1	Quad ring (lip seal)	342	1	Edge seal			
68	2	Lip seal	351	4	Plain washer (only with integrated valve for intensifier inner diameter 100 and S30/ K30-Powerpackages)			
69	1	Step seal						
70	2	O-ring						
71	2	Edge seal						
72	2	O-ring						
74	1	O-ring (for S30 only)	353	1	Guide ring			
75	1	Edge seal	370	1	Retaining ring			
76	4	O-ring	375	-	Air tube (intensifier inner diameter from 160 upwards)			
77	2	O-ring						
78	1	Aluminium sealing ring	376	misc.	Cheese head screw			
79	1	Oil indicator pin	398	1	Intermediate ring (only for Powerpackage with pneumatic spring)			
80	2	Retaining ring						
81	1	Oil indicator needle						
82	1	Rod seal	406	1	Threaded stud			
93	1	Seal wiper	409	misc.	Bypass valve (only for cushion special			
94	1	Retaining ring						



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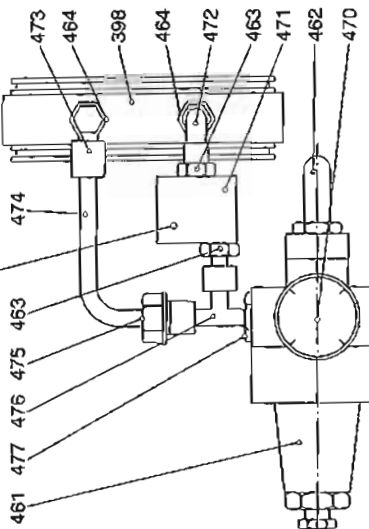
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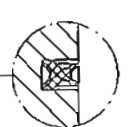
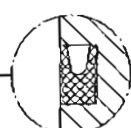
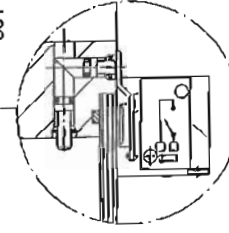
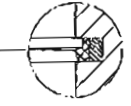
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13.7 Key to Powerpackage type K, special model K "51"

Item	Qty.	Description	Item	Qty.	Description	Item	Qty.	Description
1	1	Intensifier piston	105	2	Usit ring	375	1	Air tube (intensifier inner diameter from 160 upwards)
2	1	Feed piston	106	2	Bleed screw			
3/4	1	Adapter	110	1	Ring			
5	1	Barrel	114	2	Guide ring	376	misc.	Cheese head screw
6	1	End cap	115	1	O-ring	377	4	Cheese head screws
7	1	Barrel	121	1	Ring	398	1	Intermediate ring (only for Powerpackage with pneumatic spring)
8	1	HP cylinder	122	1	Safety hood			
9	1	Flange	123	1	Retaining ring			
10	1	Working rod	138	1	O-ring	406	1	Threaded stud
11	1	Plunger	139	1	O-ring	409	misc.	Bypass valve (only for cushion special Powerpackages)
12	1	HP cylinder cover	140	1	O-ring			
14	1	Adjustable adapter	141	1	Bushing			
16	4	Tie rod	165	1	End cap with integrated valve	410	-	Rod seal
17	1	Bleed plate				411	1	Cushion
19	2	Seal	177	1	Fastening ring	415	1	Swivelling screw fitting
20	1	Cushion	179	1	Protective sleeve	416	1	Swivelling screw fitting
21	1	Cushion	205	1	Plug	417	1	Sealing ring for item 415
23	1	Adapter	206	1	Spool	418	1	Sealing ring for item 416
25	4	Nut	207	1	Lid	419	1	Delrin ring
26	1	Intensifier flange	237	1	Guide ring (only for intensifier inner diameter 45 and 63)	421	1	Swivelling screw fitting
27	1	Sleeve				422	1	Sealing ring for item 421
28	4	Nut				424	1	Locking wire
29	4	Tie rod	286	1	Stop ring	425	1	Lead seal for locking wire
30	1	HP measuring connection	290	1	Round wire ring			
			301	1	Oil level indicator plug	427	1	Control line
31	1	Vent plug	303	1	Valve slide overfill protection	428	1	Power stroke line
33	1	Nut				430	1	Adhesive label, oil vent
39	1	Bushing	304	1	Sintered washer	443	1	Sintered washer
43	1	Nameplate	314	1	Ring	478	3	Cheese head screw
44	2	Rivet	316	1	O-ring	529	1	Edge seal
50	1	Compression spring	317	1	Compression spring	561	1	Sealing ring
51	1	Muffler	323	2	Sintered washer (for K1 only)			
53	1	sequence valve						
54	1	Muffler	326	2	Bracket			
61	1	Flow control „X“	327	1	Oval head screw			
62	1	Oil filling nipple	328	1	Shackle			
65	1	Rod seal	329	1	Holding strap with lock			
66	1	Step seal	330	2	Screw			
67	1	Quad ring (lip seal)	331	2	Nut			
68	1	Lip seal	332	1	Electric switch			
69	1	Step seal	333	1	Pneumatic switch			
70	2	O-ring	336	1	O-ring			
71	2	Edge seal	337	1	O-ring			
72	2	O-ring	338	1	Step seal			
74	1	O-ring (for S30 only)	339	1	Guide ring			
75	1	Edge seal	340	1	Retaining ring			
76	2	O-ring	341	1	Edge seal			
77	2	O-ring	342	1	Edge seal			
78	1	Aluminium sealing ring	351	4	Plain washer (only with integrated valve for intensifier inner diameter 100 and S30/K30-Powerpackages)			
79	1	Oil indicator pin						
80	2	Retaining ring						
81	1	Oil indicator needle						
82	1	Rod seal	353	1	Guide ring			
93	1	Seal wiper	370	1	Retaining ring			

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