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## 1 Purpose

This LESER Global (LGS) describes an overview of LESER documents for Maintenance and Repair of LESER Pilot Operated Safety Valves.

## 2 Scope

This LGS applies to all members of the LESER quality cluster as defined in the global quality management manual.

## 3 References

LGS 4119 to 4138
LWN 753.00

## 4 Introduction

LESER provides maintenance instruction for the LESER product Pilot Operated Safety Valves Serie 810 and 820.

# MAINTENANCE

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## Maintenance Handbook for LESER Product Group

## High Efficiency Series 810, 820

# About MAINTENANCE

MAINTENANCE provides a collection of documents for repairing or maintaining LESER safety valves. The following topics are covered:

- Maintenance Fundamentals of LESER safety valves (terminology, design elements relevant for valve operation)
- Repair process
- Suggested equipment for assembling, disassembling and rework of critical parts
- Disassembly, including sectional drawings
- Rework of critical parts including an overview of critical dimensions
- Assembly, including options
- Spring charts
- Testing procedures (set pressure and leak tests)
- Spare parts lists
- Guidelines for inspection, storage and transport

- **Contents**

| Chapter | Content | Sources |
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| 1.1 Introduction | Introduction and table of contents | LGS 4119<br>"Introduction" |
| 1.2 Maintenance Fundamentals | **Terminology**<br>- Parts<br>- Set pressure<br>- Overpressure & blowdown<br>- Nozzle & disc<br>- Spring<br>- Adjusting ring<br>- Parts providing alignment<br>- Lifting devices<br>**Illustrations**<br>- Main valve<br>- Pop action pilot valve<br>- Modulate action pilot valve<br>- Accessories<br>**Operation procedure**<br>- Main valve<br>- Pop action pilot valve<br>- Modualte action pilot valve | LGS_4120_Maintenance Fundamentals |
| 1.3 Repair process | -Process of Safety Valves to Repair<br>-Repair Traveller POSV | LGS 1111 "Process for Safety Valves to Repair"<br>LGS_4121_Repair Traveller POSV |
| 1.4 Suggested equipment | Equipment for disassembly and lapping<br>- Required equipment<br>- Technical requirements of the tools | LGS_4122_Recommended Equipment POSV<br>LGS_4456_EN_Stand..<br>LGS_1116_Operating materials and supplies for |

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| | - Illustrations<br>- Order numbers | repaired valves_EN |
| 1.5 Disassembly and Cleaning | **Disassembly instruction -step-by-step**<br>- Main valve<br>- Pop action pilot valve<br>-Modulate action pilot valve (diaphragm design)<br>-Modulate action pilot valve (piston design)<br>**Cleaning**<br>- Main valve<br>- Pilot valve<br>- Accessories | LGS_4129 Cleaning the POSV Parts-EN<br>LGS_4128 Disassembly Accessories-EN<br>LGS_4124 Disassembly Main Valve-EN<br>LGS_4126 Disassembly Modulate Action Dia-EN<br>LGS_4127 Disassembly Modulate Action Piston-EN<br>LGS_4125 Disassembly Pop Action Pilot-EN<br>LGS_4123 Separate Pilot Valve from Main |
| 1.6 Rework of critical parts | **Inspection and replacement**<br>- Main Valve<br>- Pilot Valve<br>- Accessories<br>**Critical dimensions for refinishing disc and nozzle**<br>- Lowest allowable tolerances for refinishing | LDeS 3309.05 Refinishing of seats and discs<br>LGS 4130_Inspection Replacement_EN<br>LGS_1113_Reworking repaired valves_EN |

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| 1.7 Assembly | **Tightening torques**<br>- Main valve<br>- Pilot Valve<br>- Accessories<br>**Assembly instruction –step-by-step-**<br>- Main Valve<br>- Pop action pilot valve<br>- Modulate action pilot valve (diaphragm design)<br>- Modulate action pilot valve (piston design)<br>- Accessories | LGS_4135 Assembly Accessories-EN<br>LGS_4131 Assembly Main Valve-EN<br>LGS_4133 Assembly Modulate Action Diaphragm-EN<br>LGS_4134 Assembly Modulate Action Pilot Valve Piston-EN<br>LGS_4132 Assembly Pop Action Pilot Valve-EN<br>LGS_4136 Marriage Pilot Valve and Main Valve-EN<br>LGS 3323 Torques ranges for screws and bolts |
| | **After Assembly**<br>- Color finishing and painting<br>- Component plate | LGS 1114 “Paint touch-up and painting repaired valves”<br>LGS 1118 “Component plates” |
| 1.8 Spring charts | **Spring charts**<br>- Overview of spring ranges for set pressure adjustments and spring selection in bar and psi | LGS 3632 Spring data list type 810<br>LGS 3633 Spring data list type 820 |
| 1.9 Testing Procedures | **Testing set pressure**<br>- Procedures and equipment for setting and testing the cold differential test pressure, including tolerances | LDeS 1001.69 Cold differential test pressure |
| | **Leak testing**<br>- Procedures and equipment for testing functional tightness (disc-nozzle connection) | LGS 4434 Standardisation of Worldwide Warehouses Performing Leak Tests |

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| | - Procedures and equipment for testing shell tightness (nozzle, cap) | |
| | **Tightness requirements**<br>- Seat tightness<br>- Shell tightness<br>- Back seat tightness | LGS 0201 Tightness Test |
| | Last visual check up | LGS 1117 “Final visual inspection of repaired valves“ |
| | Testing procedure instruction | LGS_4137_Testing Procedure Instructions-EN |
| 1.10 Spare parts | **Spare part**<br>- Sectional drawings<br>- Location of the components<br>- Example spare part kit | LGS_4138_Spare Parts-EN |
| 1.11 Installation & storage | **Testing and inspection before installation**<br>- visual inspection of the valve<br>- hydraulic pressure test | Extract from LWN 753-00 “Testing and Inspection of Safety Valves before Installation” |
| | Inspection intervals | Extract from LWN 753-00 Recommendation for Testing and Inspection during Operation” |
| | Storage and transport | Extract from LWN 753-00 “Storage and Handling of Safety Valves” |

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Content

# 1 Maintenance fundamentals Pilot Operated Safety Valve

# 2 Purpose

The purpose of this section is to describe the maintenance fundamentals of the LESER Pilot Operated Safety Valve.

You will find tables to standardize the terminology, covering the most used devices. The tables also include a description of their characteristics. Furthermore cross sectional drawings of the main valve, pilot valve (pop action and modulate action) manifold block and accessories are presented to get an overview of the location. The final section describes the operation procedure of the main valve and the pilot valve.

## 3 Competences

The generation, maintenance and distribution of the documentation takes place in the organisation department. The defaults will be generated by the technical department in consultation with the final assembly department and production planning department.

## 4 Scope

This document must be applied to the disassembling, assembling, rework and refinishing parts of a Pilot Operated Safety Valve in agencies and subsidiaries of LESER GmbH & Co. KG, customers and independent service center.

## 5 Disclaimer

LESER puts in a great deal of effort into making up-to-date and correct documentation available. Nevertheless, LESER GmbH & Co. KG gives no guarantee that the recommended actions presented here are entirely correct and error free.
This document is to be applied exclusively to the specified type. LESER GmbH & Co. KG declines any liability or responsibility for the correctness and completeness of the content.
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LESER GmbH & Co. KG is available to the users of this document to provide additional information.

## 6 Terminology

### 6.1 Parts description acc. to ASME PTC 25: Main valve

| Item | Component | Description per ASME PTC 25 – Parts used by LESER |
|---|---|---|
| **Main valve** | | |
| | Main relieving valve | That part of a pilot-operated pressure relief device through which the rated flow occurs during relief. |
| 1 | Body | A pressure-retaining or containing component of a pressure relief device that supports the parts of the valve assembly and has provision(s) for connecting to the primary and/or secondary pressure source(s). |

| | | |
|---|---|---|
| 2 | Pitot tube | - |
| 5 | Nozzle | A primary pressure- containing component in a safety valve that forms a part or the entire inlet flow passage. |
| 6 | Piston | The moving element in the main relieving valve of a pilot-operated piston-type pressure relief valve which contains the seat that forms the primary pressure containment zone when in contact with the nozzle. |
| 7 | Disc | A component of a direct spring valve or of a pilot in a pilot-operated valve that supports the spring. It may or may not be pressure containing. |
| 9 | Top plate | Closes the body of the main valve. |
| 59 | Dome spring | The element in a safety valve that provides the force to keep the disc on the nozzle. |
| | Dome | The volume on the side of the unbalanced moving member opposite the nozzle in the main relieving valve of a pilot operated pressure relief device. |

Table 1: Parts description acc. to ASME PTC 25



### 6.2 Parts description acc. to ASME PTC 25: Pilot valve

| Item | Component | Description per ASME PTC 25 – Parts used by LESER |
|---|---|---|
| Pilot Valve | | |
| | Pilot | The pressure- or vacuum-sensing component of a pilot-operated pressure relief valve that controls the opening and closing of the main relieving valve. |
| 1 | Body | A pressure-retaining or containing component of a pressure relief device that supports the parts of the valve assembly and has provision(s) for connecting to the primary and/or secondary pressure source(s). |
| 2 | Guide | A component in a direct spring or pilot-operated pressure relief device used to control the lateral movement of the disc or disc |

| | | |
|---|---|---|
| | | holder. |
| 5 | Seat feeding (upper) | The pressure-sealing surfaces of the fixed and moving pressure-containing components. |
| 7 | Disc feeding (upper) | A component of a direct spring valve or of a pilot in a pilot-operated valve that supports the spring. It may or may not be pressure containing. |
| 8 | Disc feeding (lower) | |
| 9 | Bonnet | Or spring step: a load-transferring component in a safety valve that supports the spring. |
| 10 | Bonnet base part | |
| 12/18 | Adjusting screw | A screw used to adjust the set pressure or the reseat pressure of a reclosing pressure relief device. |
| 12 | Spindle | A part whose axial orientation is parallel to the travel of the disc. It may be used in one or more of the following functions: (a) assist in alignment, (b) guide disc travel, and (c) transfer of internal or external forces to the seats. |
| 13 | Seat exhaust (upper) | The pressure-sealing surfaces of the fixed and moving pressure-containing components. |
| 14 | Seat exhaust (lower) | |
| 15 | Plunger | - |
| 17 | Spring plate | Or spring step: a load-transferring component in a safety valve that supports the spring. |
| 40 | Cap | A component used to restrict access and/or protect the adjustment screw in a reclosing pressure-relief device. It may or may not be a pressure containing part. |
| 41 | Piston | The moving element in the main relieving valve of a pilot-operated piston-type pressure relief valve which contains the seat that forms the primary pressure containment zone when in contact with the nozzle. |
| 72 | Diaphragm | A flexible metallic, plastic or elastomer pressure-containing member of a reclosing pressure relief device used to sense pressure or to provide opening or closing force. |

Table 2: Parts description acc. to ASME PTC 25

### 6.3 Parts description acc. to ASME PTC 25: POSV accessories

| Item | Component | Description per ASME PTC 25 – Parts used by LESER |
|---|---|---|
| **Main valve** | | |
| | Field test | A device for in-service or bench testing of a pilot-operated pressure relief device to measure the set pressure. |
| | Backflow preventer | A part or feature of a pilot-operated pressure relief valve used to prevent the valve from opening and flowing backwards when the pressure at the main valve outlet is greater than the pressure at the valve inlet. |

Table 1: Parts description acc. to ASME PTC 25



## 7 Definition of set pressure

ASME PTC 25, 2001, 2.7 OC of PRD
LESER defines the set pressure as the value of increasing inlet static pressure at which the first audible/visible discharge (first steady flow for liquids) for gas and steam occurs. Furthermore a “popping” point of safety valve exists when the vessel pressure rises above the set pressure. At this pressure the valve opens rapidly with small or no increase in system.

## 8 Definition of overpressure

ISO 4126-1, 2004, 3.2.3
Overpressure is defined as the pressure increase over the set pressure at which the valve attains the lift specified by the manufacturer. Usually overpressure is expressed as a percentage of the set pressure. For steam and gas applications the maximum overpressure varies between 3% and 10% depending on applicable code and application. For liquids most codes specify a maximum overpressure of 10%.

## 9 Definition of blowdown

ASME PTC 25, 2001, 2.7 OC of PRD
Blowdown is considered as the difference between actual popping pressure of a pressure relief valve and actual reseating pressure expressed as a percentage of set pressure or in pressure units.

Typical values for the blowdown for POSV are 3% to 15%

Figure 1 and 2 give a graphical representation of the definitions.

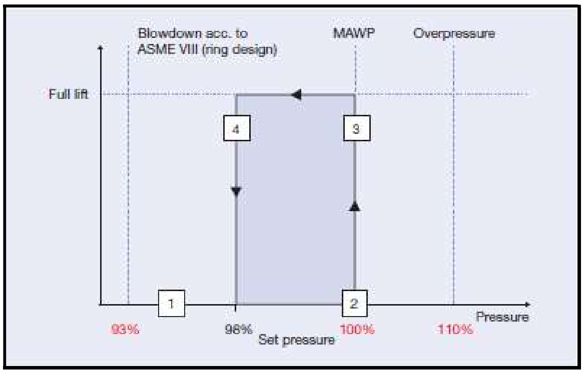

Figure 1: POSV Series 810 – Pop Action

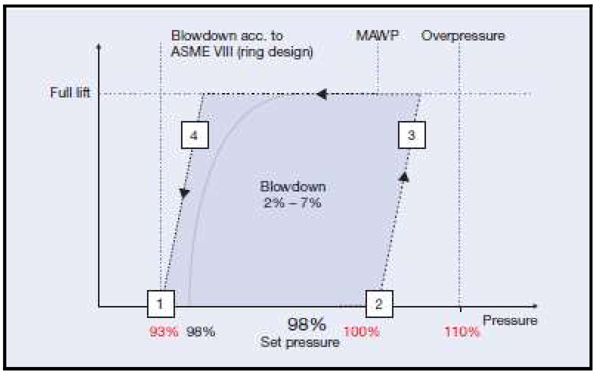

Figure 2: POSV Series 820 – Modulate Action

## 10 General Introduction

### 10.1 Main valve illustration

Below is a schematic drawing of the parts layout for the LESER POSV main valve including both the Standard and Extra Orifice designs.

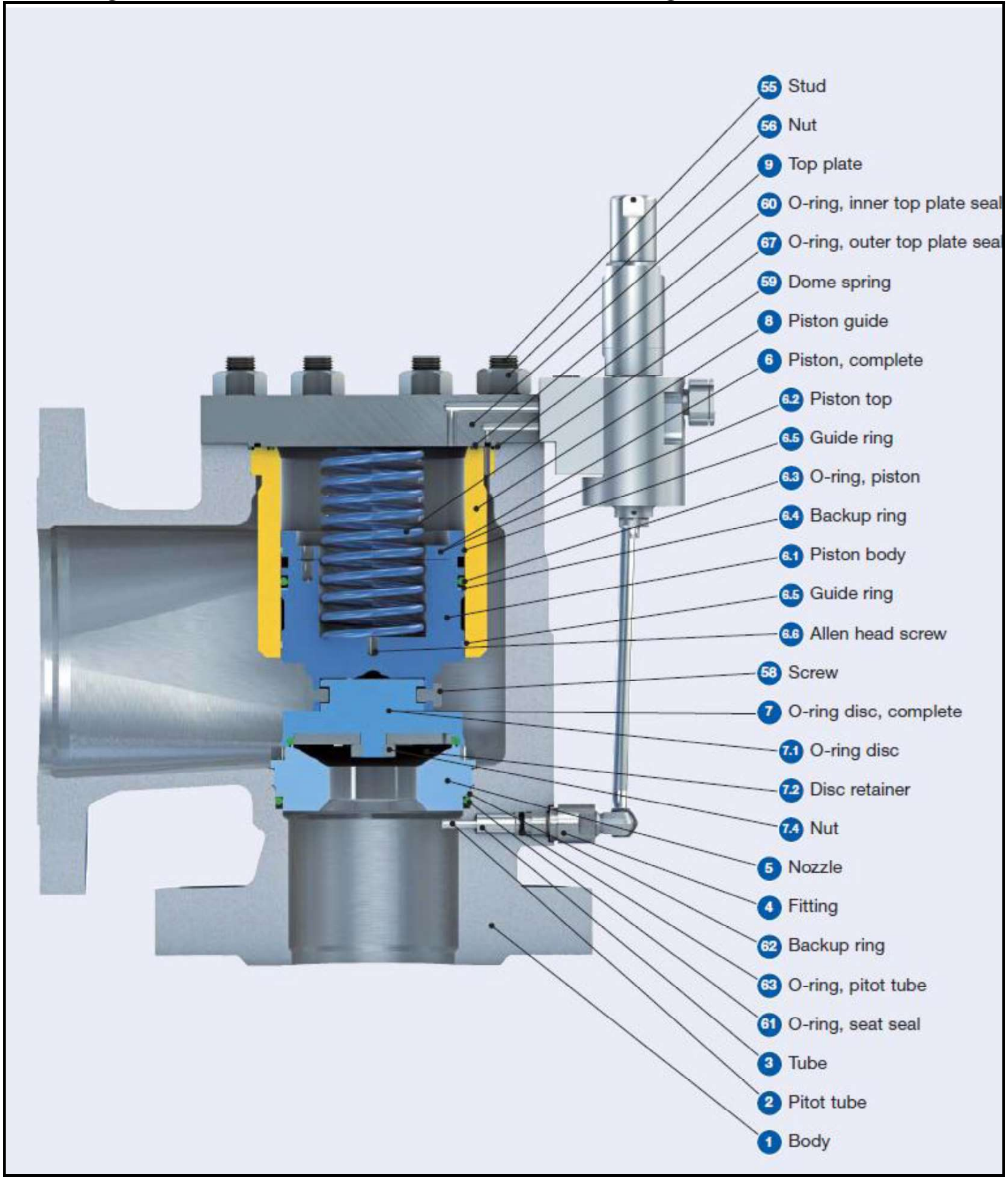


Figure 3: Illustration of the main valve

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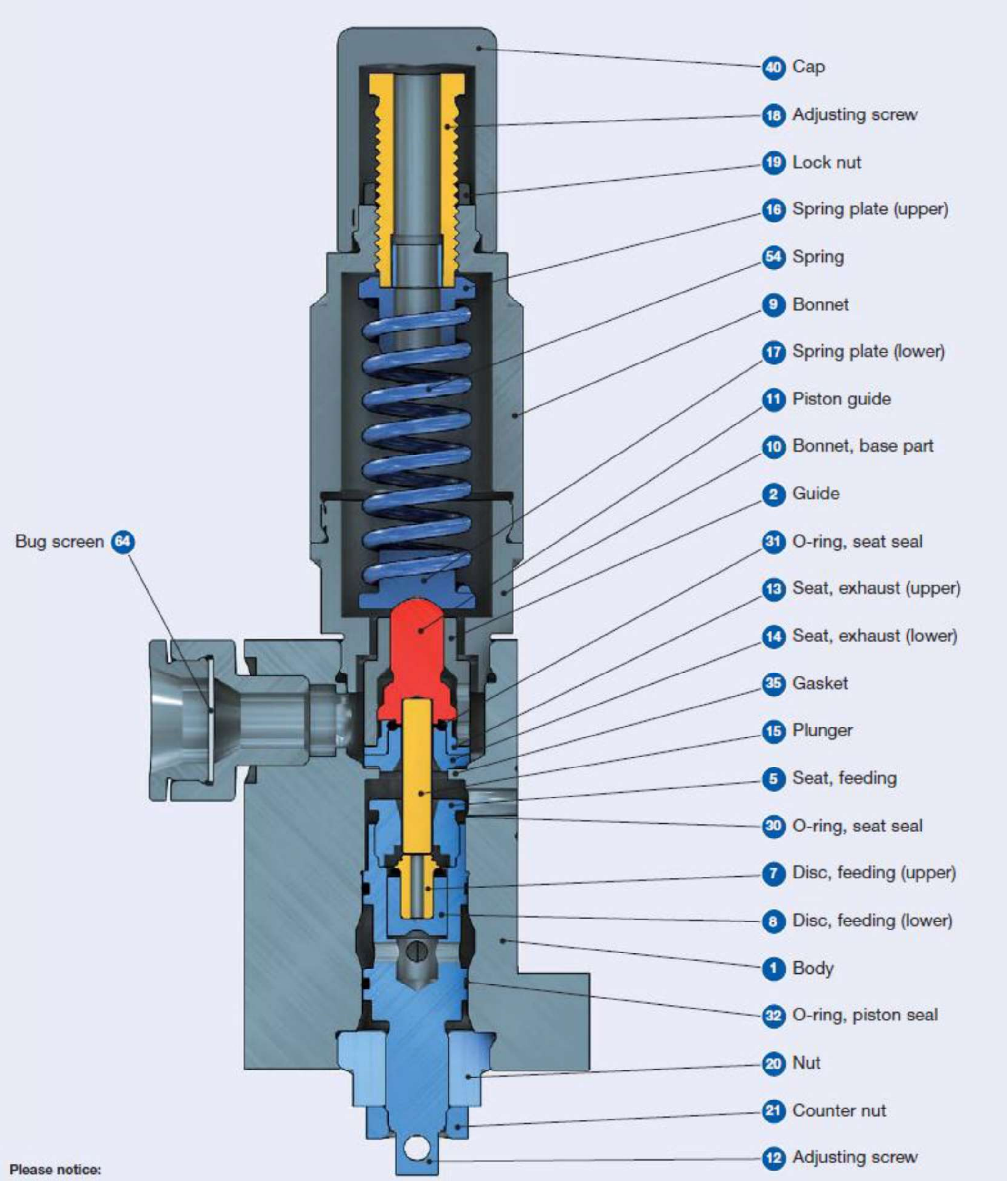
## 10.2 Pop action pilot valve illustration

Figure 4 shows a schematic drawing of the parts layout for the LESER Series 810 – pop action pilot valve




**Please notice:**

- Modifications reserved by LESER.
- LESER can upgrade materials without notice.
- Every part can be replaced by other material acc. to customer specification.

Figure 4: Illustration of Pop Action Pilot Valve

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## 10.3 Illustration of modulate action pilot valve (diaphragm)

Figure 5 shows a schematic drawing of the parts layout for the LESER Series 820 – modulate action pilot valve.

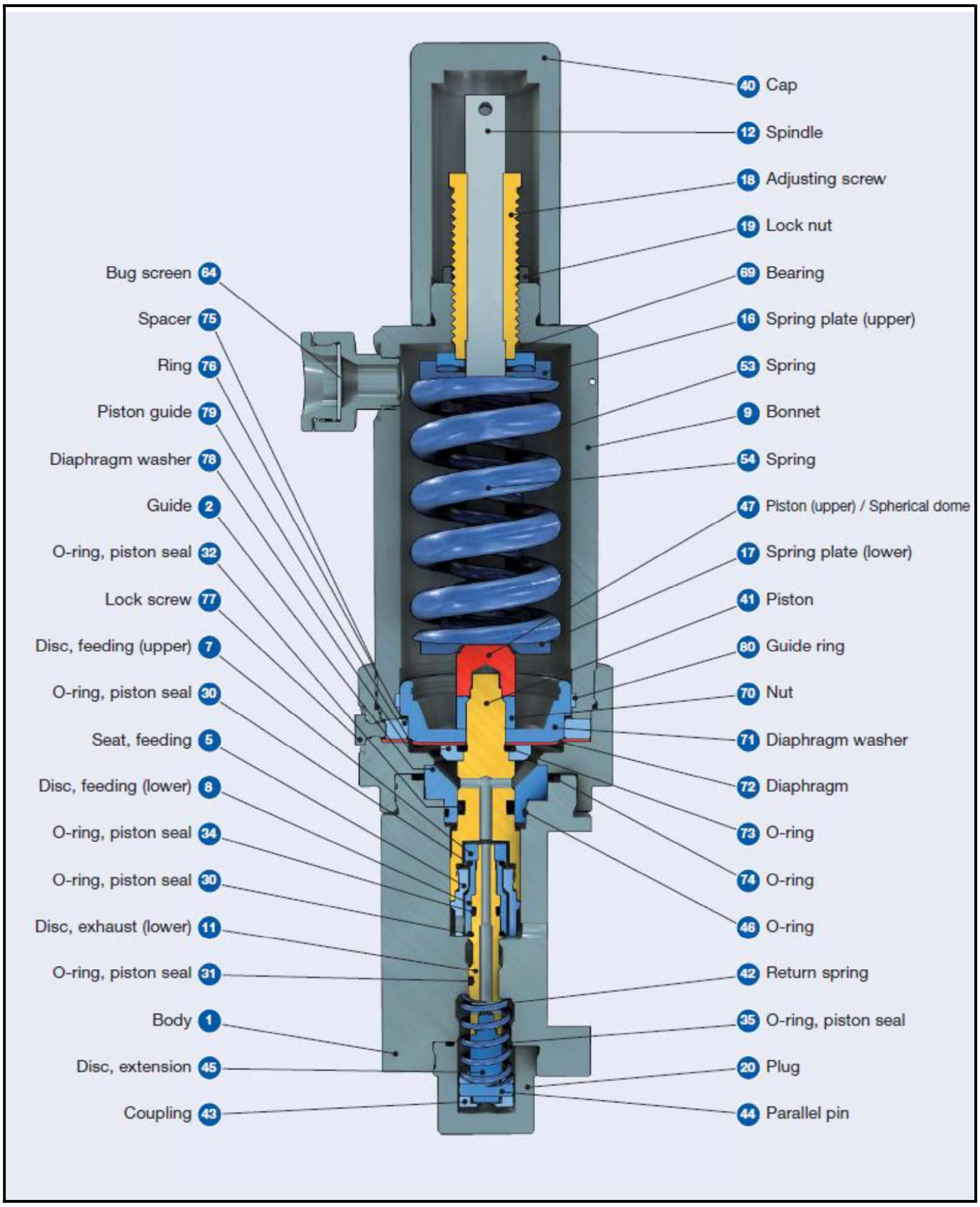


Figure 5: Illustration of Modulate Action Pilot Valve, Diaphragm Design

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## 10.4 Illustration of modulate action pilot valve (piston)

Figure 6 shows a schematic drawing of the parts layout for the LESER Series 820 – modulate action pilot valve.

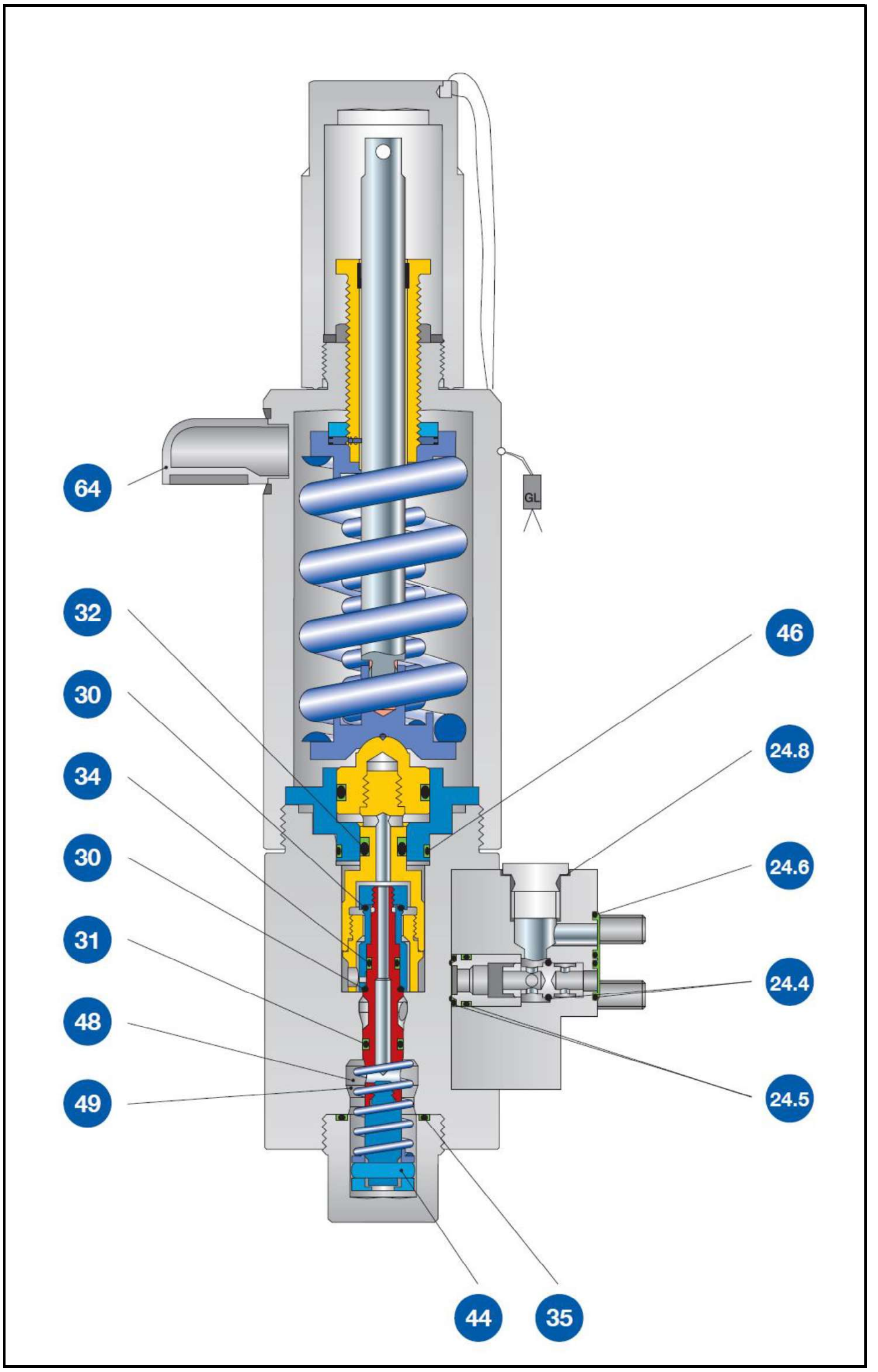



Figure 6: Illustration of modulate action pilot valve, piston design

## 10.5 Manifold block illustration

Below is a schematic drawing of the parts layout for the Manifold block.

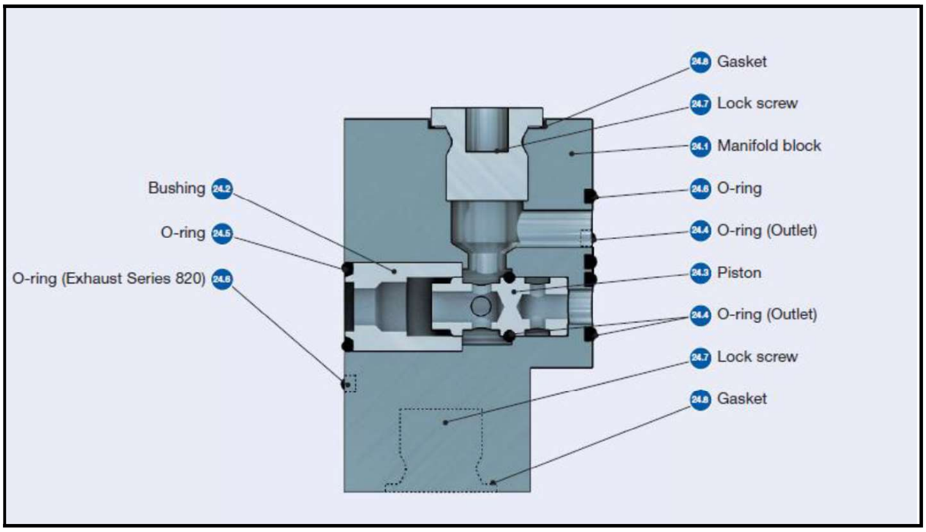



Figure 7: Illustrations of the Manifold Block

## 10.6 Illustration of the Accessories

The following figures show the various types of the LESER accessories for the Pilot Operated Safety Valve


Figure 8: Illustration of the field test connection

Set pressure testing with external test medium

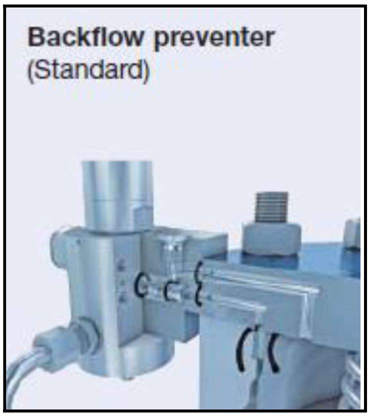


Figure 9: Illustration of the backflow preventer

Prevents return flow of the medium from the discharge into the system to be secured

Figure 10: Illustration of pilot supplyfilter

Filter to prevent plugging of the pilot

Figure 11: Illustration of the manual blowdown

Functional test of main valve piston


Figure 12: Illustration of the remote sensoring

Actual operating pressure sensed to pilot.
No influence of inlet pressure losses, stable function of POSV

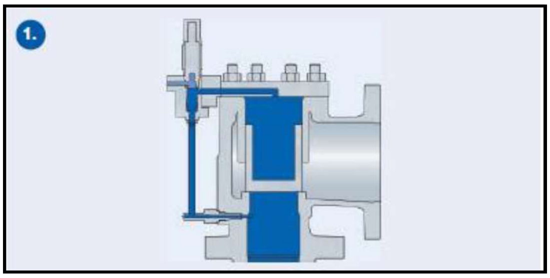
| Further accessories for the POSV | |
|---|---|
| Drain hole | - |
| Pilot lifting device | Mechanical lifting of pilot for verification of POSV operation |
| Pilot test gag | Blocking of operation in case of required hydrostatic testing of vessel |
| Blowdown | Blowdown adjusted:<br>Closing pressure difference as a fixed value between 2 – 15%.<br>Standard adjustment between 3 – 7% |

## 11 Operation procedure

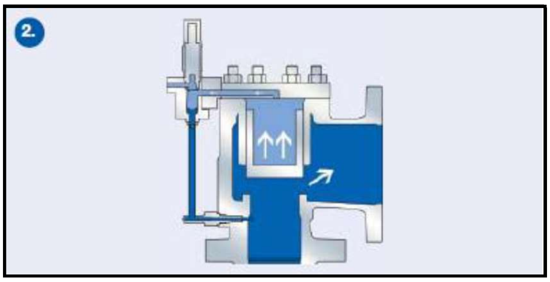
### 11.1 Main valve operation cycle

LESER Pilot Operated Safety Valve (POSV) is controlled by process medium. To achieve this, the system pressure is applied to the pilot valve (= control component for the main valve) via the pressure pickup. The pilot valve then uses the dome above the main valve piston to control the opening and closing of the main valve. While there are specific differences between the Series 810 – Pop Action POSV and the Series 820 – Modulate Action POSV, the basic operation of a LESER POSV can be described as follows. During operation, the POSV goes through these basic operating states:

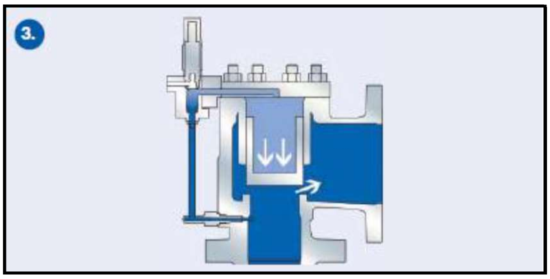
**1. Below set pressure: normal operation**
During normal operation, the system pressure is picked up at the main valve inlet and routed to the dome (see illustration). Since the dome area is larger than the area of the main valve seat, the closing force is greater than the opening force. This keeps the main valve tightly closed.




**2. At set pressure: actuating state**
At set pressure, the pilot valve actuates. The medium is no longer routed to the dome (see illustration). This prevents a further rise in dome pressure. Also, the dome is vented. As a result, the closing force ceases as a precondition for the system overpressure to push the main valve open.

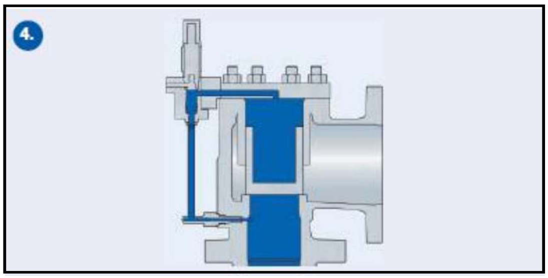



**3. Main valve opening**
The main valve opens. Depending on the design of the pilot valve, this opening is either rapid and complete (Pop Action) or gradual and partial following system pressure (Modulate Action).



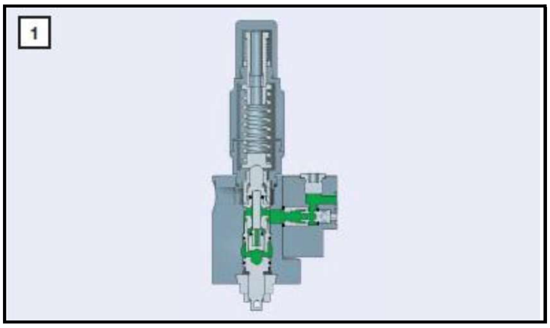

**4. At closing pressure: refilling the dome**

If system pressure drops to closing pressure, the pilot valve actuates and again routes the medium to the dome. The pressure in the dome builds up and the main valve recloses either rapid and complete (Pop Action) or gradual and partial following system pressure (Modulate Action).

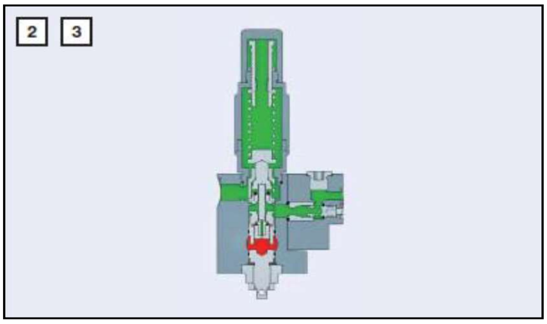


## 11.2 Pop action pilot valve

**1. Below set pressure:**
**normal operation – feeding seat open, exhaust seat closed**
The system pressure is routed to the top side of the main valve piston via the pressure pickup, the pilot valve and the dome of the main valve (see illustration). Since the pressure contact surface is larger on the top side than on the underside of the piston, there is always a stronger net force acting on the top side. The main valve is kept tightly closed.

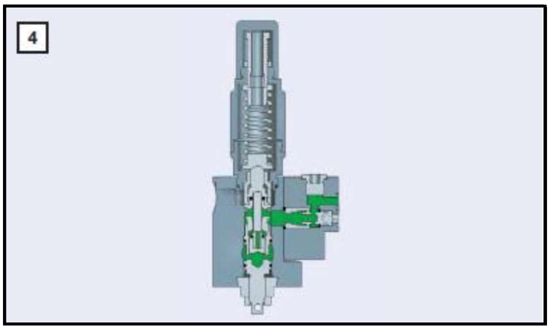



**2. At set pressure:**
**feeding seat opening, exhaust seat closing**
When set pressure is reached, the pilot valve opens the exhaust seat and closes the feeding seat. This releases the dome pressure. The release of dome pressure is a pre-condition for the opening of the main valve by system pressure.

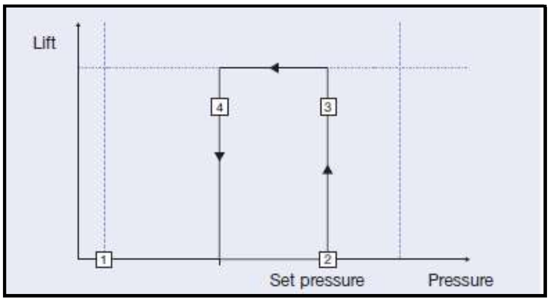



**3. At and above set pressure (+ max. 1%):**
**pop opening**
At set pressure, the main valve opens abruptly and completely feeding seat closed, exhaust seat open (Pop Action) (see bottom chart). The medium is channelled from the dome to atmosphere (see illustration on right).

**4. At closing pressure:**
**feeding seat open, exhaust seat closed**
When the system pressure drops to closing pressure, the pilot valve actuates and again channels the system pressure to the dome of the main valve. Here, the system pressure builds up, the main valve recloses. The closing stage (blowdown) can be adjusted from at least 3% (when pressure loss at the inlet is low) to max. 15% blowdown difference.



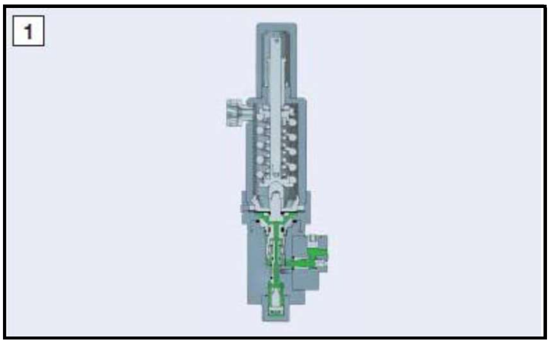
**1** – Below set pressure: normal operation
**2** – At set pressure
**3** – Pop opening
**4** – At closing pressure – blowdown



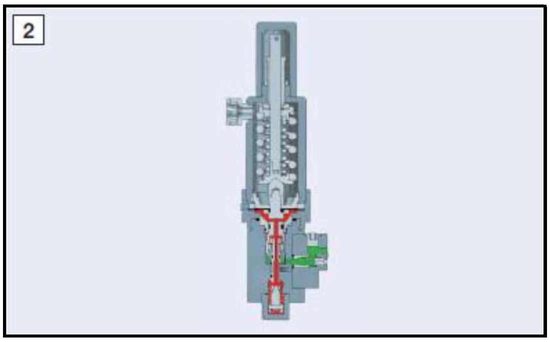

## 11.3 Modulate action pilot valve

The operating cycles of the Series 820 – Modulate Action and the Series 810 – Pop Action POSV differ at two points: shortly before set pressure is reached (see below, 1a) and after reaching set pressure. At this second point actual modulation takes place in the Series 820 – Modulate Action POSV. Modulation means that above set pressure the pilot valve will open the main valve in proportionto overpressure. Thus, there may only be a partial lift of the main valve. This ensures that only as much medium is discharged as is required for pressure reduction. Any unnecessary medium loss is avoided.

**1. Below set pressure:**
**normal operation – feeding seat open, exhaust seat closed**
The system pressure is routed to the dome, keeping the main valve tightly closed (see illustration).
**1a. Near set pressure:**
**feeding seat closed, exhaust seat closed**
**(not shown)**
Shortly before set pressure is reached, the pilot valve closes the dome feeding seat. This keeps the dome pressure stable. A stable dome volume is the pre-condition which allows the rising system pressure to push the main valve open at set pressure.

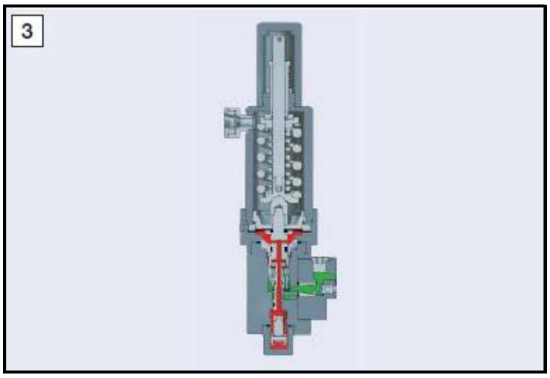


**2. At set pressure (+ max. 1%): feeding seat closed, exhaust seat open**



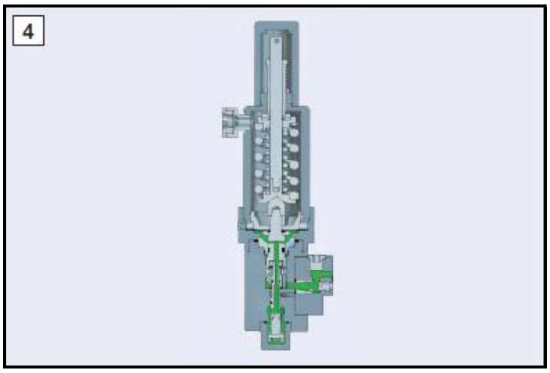

With a further slight pressure increase, set pressure is reached and the pilot valve opens the dome exhaust seat. The dome volume is discharged and the main valve opens.

**3. Modulate opening: feeding seat closed or open, exhaust seat closed or open**



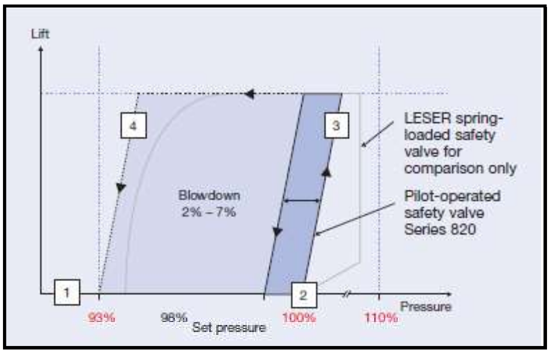

At this point, modulation takes place. This means that if overpressure remains within the modulating range of 93 – 110% of set pressure, the pilot valve will again close the dome exhaust seat. This stops discharge from the dome and keeps the main valve piston unchanged at the achieved lift. The achieved lift will always be enough to ensure pressure reduction, but not more than is required. During blow-off this intermediate state with a stable dome volume and main valve lift can occur repeatedly and at different pressure levels. To change the lift, there can also be partial opening movements with the exhaust seat opened, or closing movements with the feeding seat opened. Modulation ensures that only as much medium is discharged as is necessary to prevent the overpressure from exceeding the modulating range

**4. At closing pressure: full closing – feeding seat open, exhaust seat closed**




When system pressure drops below the modulating range to reach blowdown pressure , the pilot returns to its first state (with feeding seat open and exhaust seat closed). The main valve closes completely.

**1** – Below set pressure: normal operation
**2** – At set pressure
**3** – Pop opening
**4** – At closing pressure – blowdown



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4 Safety valve to repair ........ 2

## 1 Purpose

This LESER Global Standard (LGS) shows the process for safety valves to repair.

## 2 Scope

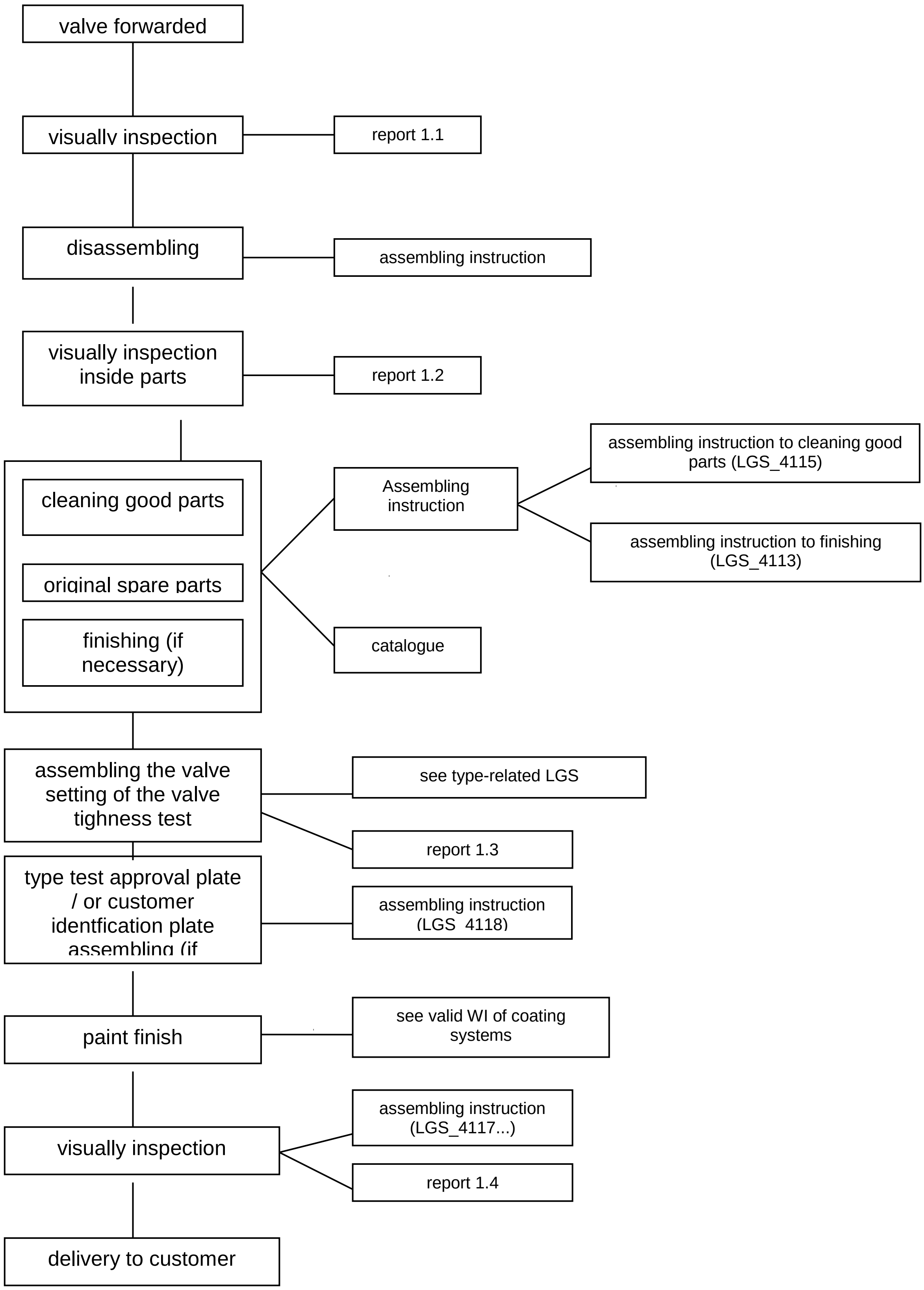
This LGS applies to all members of the LESER Quality Cluster.

## 3 Introduction

The following flow chart shows the process steps, which are necessary for valve repair.

The right side give references to forms of inspection documentation, LESER standards, instructions and spare part lists.

## 4 Safety valve to repair



# Repair Traveller

| | | | |
|---|---|---|---|
| Customer | | | |
| Date | | Valve type | |
| Serial no. / Job no. | | Medium | |

## 1.1 Forwarded Inspection

| | Repair necessary | Remarks |
|---|---|---|
| Painting | ☐ | ____________ |
| Inlet / outlet surface | ☐ | ____________ |
| Lead seal | ☐ | ____________ |
| Type test approval plate | ☐ | ____________ |

## 1.2 Disassembling

| Main Vale | Repair necessary | Remarks |
|---|---|---|
| 50 Dome spring | ☐ | ____________ |
| 6 Piston | ☐ | ____________ |
| 8 Piston guide | ☐ | ____________ |
| 7 Disc | ☐ | ____________ |
| 5 Nozzle | ☐ | ____________ |

9 Top plate ☐ ____________

2 Pitot tube ☐ ____________

3, 4 Fittings / Tubes ☐ ____________

| Pilot Valve POP Act. | Repair necessary | Remarks |
|---|---|---|
| 40 Cap | ☐ | ____________ |
| 18, 12 Adjusting screw | ☐ | ____________ |
| 16, 17 Spring plates | ☐ | ____________ |
| 54 Spring | ☐ | ____________ |
| 9 Bonnet | ☐ | ____________ |
| 2 Guide | ☐ | ____________ |
| 13 Seat, exhaust (upper) | ☐ | ____________ |
| 14 Seat, exhaust (lower) | ☐ | ____________ |
| 15 Plunger | ☐ | ____________ |
| 5 Seat, feeding | ☐ | ____________ |
| 7 Disc, feeding (upper) | ☐ | ____________ |

protected

8 Disc, feeding (lower) ☐ ________________

1 Body ☐ ________________

---

| Pilot Valve Modulate Act. | Repair necessary | Remarks |
|---|---|---|
| 40 Cap | ☐ | ________________ |
| 12 Spindle | ☐ | ________________ |
| 18 Adjusting screw | ☐ | ________________ |
| 16, 17 Spring plates | ☐ | ________________ |
| 54 Spring | ☐ | ________________ |
| 47 Piston upper | ☐ | ________________ |
| 41 Piston | ☐ | ________________ |
| 72 Diaphragm | ☐ | ________________ |
| 42 Return spring | ☐ | ________________ |
| 2 Guide | ☐ | ________________ |
| 7 Disc, feeding (upper) | ☐ | ________________ |

8 Disc, feeding (lower) ☐ ________________

5 Seat, feeding ☐ ________________

11 Disc, exhaust (lower) ☐ ________________

1 Body ☐ ________________

45 Disc extension ☐ ________________



| **Pilot Valve Accessories** | **Repair necessary** | **Remarks** |
|---|---|---|
| Filter | ☐ | ________________ |
| Field test connector (FTC) | ☐ | ________________ |
| Manual blowdown | ☐ | ________________ |

## 1.3 Assembling Inspection

| | | |
|---|---|---|
| Set pressure psig | target: | actual: |
| Seat tightness bubbles / min. | target: | actual: |
| | **i.o.** | **n.i.o.** |
| Backpressure / 6 psig | ☐ | ☐ |

-----------------------------------------------------------------------------------------------------------

## 1.4 Delivery inspection

| | **i.o.** | **n.i.o.** |
|---|---|---|
| Type test approval plate | ☐ | ☐ |
| Painting | ☐ | ☐ |
| Components | ☐ | ☐ |

____________________________
Date/Signature

protected

Inhalt

1 Zweck ........................................................ 1
2 Geltungsbereich ........................................................ 1
3 Einleitung ........................................................ 1
4 Ablaufplan für Reparaturventile ........................................................ 2

## 1 Zweck

Dieser LESER Global Standard (LGS) zeigt den Ablaufplan für Reparaturventile auf.

## 2 Geltungsbereich

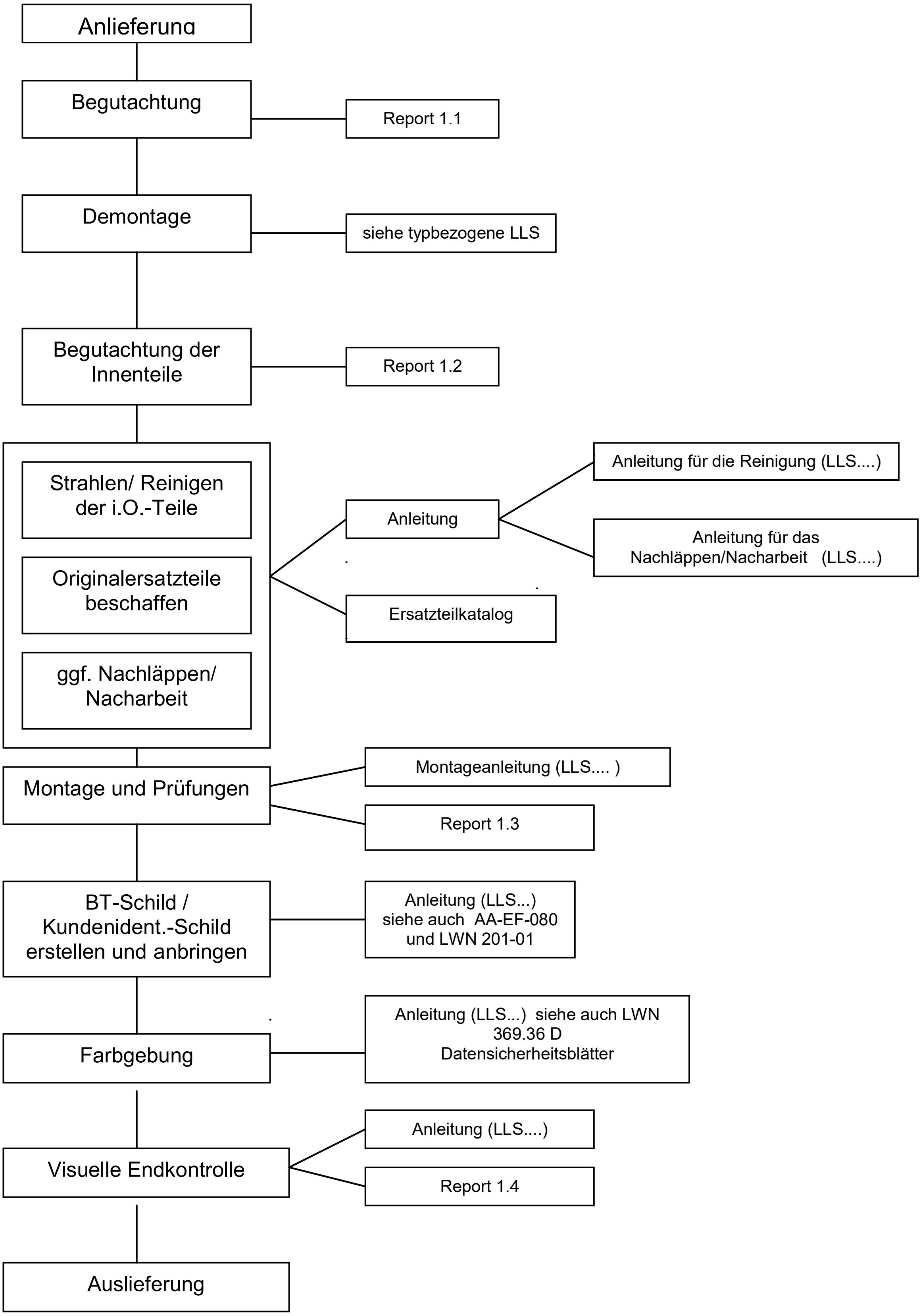
Dieser LGS gilt für alle Mitglieder des LESER Qualitätsverbunds.

## 3 Einleitung

Der nachfolgend aufgezeigte Ablaufplan zeigt die Prozessschritte, die nötig sind, eine Ventilreparatur abzuwickeln.

Die rechte Seite gibt Hinweise auf  Formblätter für Prüfdokumentationen, LESER Werknormen, Anleitungen und Ersatzteilkataloge.

## 4 Ablaufplan für Reparaturventile



Content

**1 Recommended equipment for disassembling, assembling and rework a Pilot Operated Safety Valve ........ 2**
**2 Purpose ........ 2**
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**4 Scope ........ 2**
**5 Disclaimer ........ 2**
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**7 Customized tools for the pilot operated safety valve ........ 10**

## 1 Recommended equipment for disassembling, assembling and rework a Pilot Operated Safety Valve

## 2 Purpose

This document describes the recommended Tool KIT requirements for equipping an agency or a warehouse for goods receiving/storage, adjusting, testing and shipping of a POSV

## 3 Competences

The generation, maintenance and distribution of the documentation takes place in the organisation department. The defaults will be generated by the technical department in consultation with the final assembly department and production planning department.

## 4 Scope

This document must be applied to the disassembling, assembling, rework and refinishing parts of a Pilot Operated Safety Valve in agencies and subsidiaries of LESER GmbH & Co. KG, customers and independent service center.

## 5 Disclaimer

LESER puts in a great deal of effort into making up-to-date and correct documentation available. Nevertheless, LESER GmbH & Co. KG gives no guarantee that the recommended actions presented here are entirely correct and error free. This document is to be applied exclusively to the specified type. LESER GmbH & Co. KG declines any liability or responsibility for the correctness and completeness of the content.
LESER GmbH & Co. KG reserves the right to change the information contained in this document, which is for the products of LESER GmbH & Co. KG and is intended for LESER subsidiaries, at any time and without prior announcement.
LESER GmbH & Co. KG is available to the users of this document to provide additional information.

# 6 Tools for the pilot operated safety valves

## 6.1 Double open-end spanner

The open-end spanner is used for tightening or unscrewing bolts and nuts.

**Designated use**

- Tool for tightening or unscrewing bolts and nuts such as on the top plate.

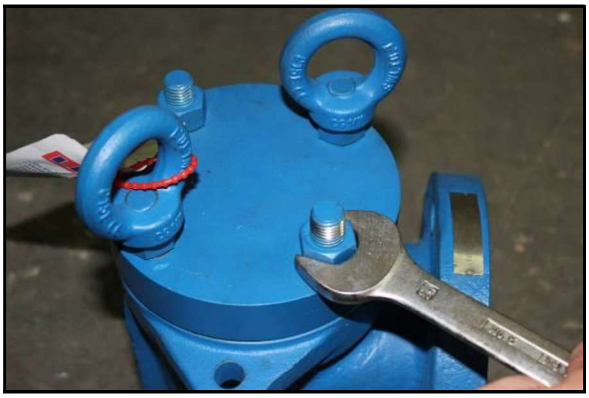


Figure 1: Unscrewing a screw connection


Figure 2: Unscrewing an eyelet

protected

Technical requirements

| Requirements/ quality | Data | Data | Data | Data | Data |
|---|---|---|---|---|---|
| DIN | 3110 | 3110 | 3110 | 3110 | 3110 |
| Spanner width in mm | 8 x 10 | 13 x 15 | 18 x 21 | 19 x 22 | 34 x 36 |
| Length | 140 | 188 | 236 | 236 | 328 |
| Manufacturer | GEDORE | | | | |
| Material | Chrome-vanadium-steel | | | | |
| Vendor | e.g. Hahn & Kolb | | | | |
| External order number | 52012070 | 52012180 | 52012245 | 52012250 | 52012405 |
| LESER order number | Not defined yet | | | | |
| Tool Kit number | Not defined yet | | | | |
| Internet | www.hahn-kolb.de | | | | |

Illustration 1

## 6.2 Ring spanner

The ring spanner is used for tightening or unscrewing bolts and nuts.

**Designated use**

- Tool for tightening or unscrewing bolts and nuts such as top plates.

Figure 3: Ring spanner



Technical requirements

| Requirements/ quality | Data | Data | Data | Data | Data | Data |
|---|---|---|---|---|---|---|
| **DIN** | 3113 | 3113 | 3113 | 3113 | 3113 | 3113 |
| **Spanner width in mm** | 13 | 18 | 24 | 30 | 41 | 46 |
| **Length** | 185 | 245 | 318 | 390 | 520 | 550 |
| **Manufacturer** | GEDORE | | | | | |
| **Material** | Chrome-vanadium-steel | | | | | |
| **Vendor** | e.g. Hahn & Kolb | | | | | |
| **External order number** | 52042630 | 52042680 | 52042740 | 52042800 | 52042880 | 52042890 |
| **LESER order number** | Not defined yet | | | | | |
| **Tool Kit number** | Not defined yet | | | | | |
| **Internet** | www.hahn-kolb.de | | | | | |

## 6.3 Deep cranked ring spanner

The deep cranked ring spanner is used for tightening or unscrewing nuts which are located deeper than the surrounded surface. They are not approachable with an usual open-end spanner.

### Designated use

- Tool for tightening or unscrewing nuts in difficult approachable areas

Figure 4: Deep cranked ring spanner

| Requirements/ quality | Data | Data | Technical illustration |
|---|---|---|---|
| DIN | 3113B | 3113B | |
| Spanner width in mm | 17 | 19 | |
| Length | 232 | 258 | |
| Manufacturer | GEDORE | | |
| Material | Chrome-vanadium-steel | | |
| Vendor | e.g. Hahn & Kolb | | |
| External order number | 52042670 | 52042690 |  |
| LESER order number | Not defined yet | | |
| Tool Kit number | Not defined yet | | |
| Internet | www.hahn-kolb.de | | Illustration 2 |

protected

## 6.4 Single-ended open spanner

Single-ended open spanners are required for tightening or unscrewing the lever and cap.

***Designated use***

- For example lever and cap screw connections

Figure 5: Tightening a cap

Figure 6: Tightening a cap

<table>
<tr><th>Requirements / Quality</th><th>Data</th><th>Data</th><th>Single open end spanner</th></tr>
<tr><td>DIN</td><td colspan="2">894</td><td rowspan="10"><br>Technical illustration 3</td></tr>
<tr><td>Spanner width in mm</td><td colspan="2">70 cranked</td></tr>
<tr><td>Manufacturer</td><td colspan="2">ORION</td></tr>
<tr><td>Material</td><td colspan="2">Special steel</td></tr>
<tr><td>Length</td><td colspan="2">575</td></tr>
<tr><td>Vendor</td><td colspan="2">e.g. Hahn & Kolb</td></tr>
<tr><td>External order number</td><td colspan="2">52002070</td></tr>
<tr><td>LESER order number</td><td colspan="2">Not defined yet</td></tr>
<tr><td>Tool kit number</td><td colspan="2">Not defined yet</td></tr>
<tr><td>Internet</td><td colspan="2">www.hahn-kolb.de</td></tr>
</table>

protected

## 6.5 Allen key

The allen key is used for tightening or unscrewing allen screws.

**Designated use**

- Tool for tightening or unscrewing screws such as used at the manifold block

Figure 7: Allen key with torque wrench

| Requirements / Quality | Data | Illustration : Tool box with allen keys for ratchet/ torque wrench |
|---|---|---|
| **DIN** | - | |
| **Sizes in mm** | 4, 5, 6, 8, 10, 12, 14, 17, 19 | |
| **Manufacturer** | ORION | |
| **Material** | Special steel |  |
| **Vendor** | e.g. Hahn & Kolb | |
| **External order number** | 52458150 | |
| **LESER order number** | Not defined yet | |
| **Tool kit number** | Not defined yet | |
| **Internet** | www.hahn-kolb.de | ***Technical illustration 4*** |

## 6.6 Socket

The socket is used together with the torque wrench (see LGS 4456 standard tool kit) and the plug-in reversible ratchet (see LGS 4456 standard tool kit). It is used, for example, for the screw connection of the top plate to the body.

### Designated use

- Screw connections of top plates

Figure 8: Tightening a nut

Figure 9: Tightening a nut

protected

### Technical requirements

| Requirements / Quality | Data | | |
|---|---|---|---|
| **DIN** | 3120 | | |
| **Size** | 8mm | 41 mm | 50 mm |
| **Material** | Special steel | | |
| **Vendor** | e.g. Hahn & Kolb | | |
| **External order number** | 58612080 | 58972041 | 58972050 |
| **LESER order number** | Not defined yet | | |
| **Tool kit number** | Not defined yet | | |
| **Internet** | www.hahn-kolb.de | | |

***Technical illustration***

Illustration 5:Socket

## 6.7 Impact wrench

The Impact wrench is used for tightening or unscrewing bolts and nuts mechanically. It is just a helpful tool, but not necessary for disassembly or assembly the POSV valve.

### Designated use

- Tool for tightening or unscrewing nuts such as used at the top plate of the POSV



Figure 11: Impact wrench

protected

# 7 Customized tools for the pilot operated safety valve

## 7.1 O-ring mounting aid

The O-ring mounting aid is used for an easier assembly of the O-rings. It is just a helpful tool, but not necessary for disassembly or assembly the POSV valve.

**Designated use**

- Tool for pulling O-rings on their foreseen components such as pistons or seats

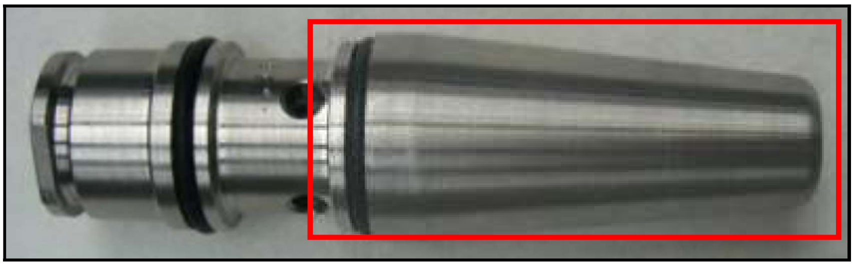


Figure 12: O-ring mounting aid

Figure 13: O-ring mounting aid

Technical requirements

| Requirements / Quality | Data |
|---|---|
| **Diameter [mm]** | 30 ; 32 ; 34 |
| **Length** | Not defined yet |
| **Vendor** | LESER |

| | |
|---|---|
| **LESER order number** | Not defined yet |
| **Tool kit number** | Not defined yet |
| **Order** | sales@leser.com |

## 7.2 Hook for O-rings

The hook for O-rings is used for an easier assembly and disassembly of O-rings.

Figure 14: O-ring tool box

Technical requirements

| Requirements / Quality | Data |
|---|---|
| **Manufacturer** | APSOparts |
| **Material** | metal |
| **Vendor** | e.g. Angst+Pfister Gruppe |
| **External order number** | 11.4052.5000 |
| **LESER order number** | Not defined yet |
| **Tool kit number** | Not defined yet |
| **Internet** | Angst-pfister.com |

protected

## 7.3 Nozzle assembly tool

The nozzle assembly tool is used to insert the nozzle into the main valve body.

**Designated use**

- Tool for assembly the nozzles such as in the main valve body of the POSV

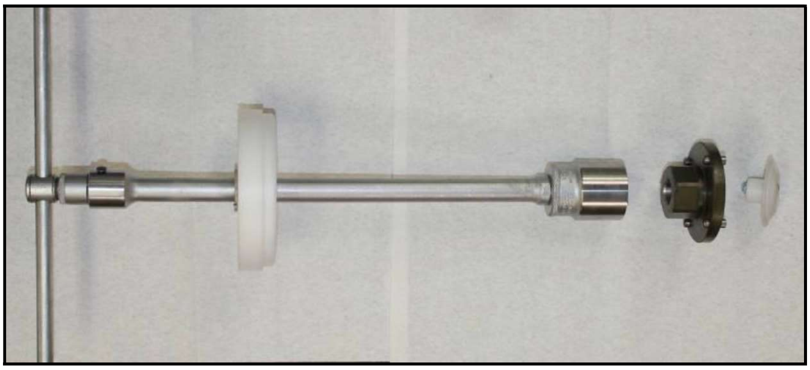


Figure 15: Complete components of the nozzle assembly tool

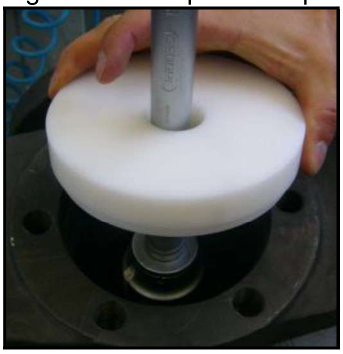


Figure 16: Nozzle assembly tool


Figure 17: Nozzle assembly tool

**NOTE: The socket wrench extension and T-handle are not included in scope of delivery and must be provided by the customer!**

Technical requirements

| Requirements / Quality | Data | Data | Data | Data |
|---|---|---|---|---|
| **Size** | 1,5 x 2 | 1,5 x 3 | 1 x 2 | 2 x 3 |

| | | | | |
|---|---|---|---|---|
| **Material** | Metal ; plastic | | | |
| **Vendor** | LESER | | | |
| **LESER order number** | 445.5239.0000 | 445.5339.0000 | 445.5939.0000 | 445.5439.0000 |
| **Tool kit number** | Not defined yet | | | |
| **Internet** | Leser.com | | | |
| Order | sales@leser.com | | | |

| **Requirements / Quality** | **Data** | **Data** | **Data** | **Data** |
|---|---|---|---|---|
| **Size** | 3 x 4 | 4 x 6 | 6 x 8 | 8 x 10 |
| **Material** | Metal ; plastic | | | |
| **Vendor** | LESER | | | |
| **LESER order number** | 445.5539.0000 | 445.5639.0000 | 445.5739.0000 | 445.5839.0000 |
| **Tool kit number** | Not defined yet | | | |
| **Internet** | www.leser.com | | | |
| **Order** | sales@leser.com | | | |

## 7.4 Pitot tube assembly tool

The pitot tube assembly tool is used to align the pitot tube while tightening the fitting the main valve body.

### Designated use

- Tool to align the pitot tube such as in the main valve body of the POSV.

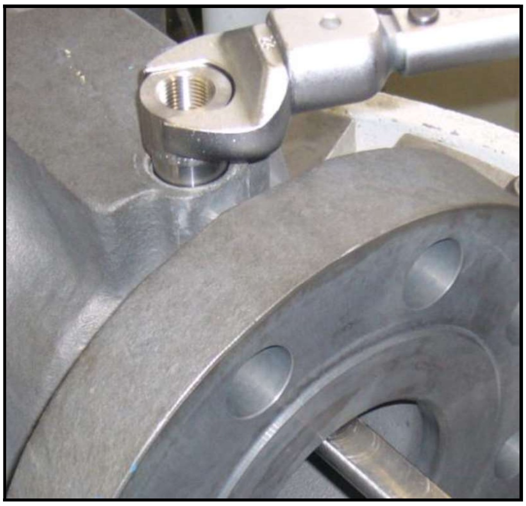


Figure 18: Pitot tube assembly tool

Figure 19 : Pitot assembly tool

Figure 20: Pitot assembly tool

Technical requirements

| Requirements / Quality | Data |
|---|---|
| **Length** | Not defined yet |
| **Quantity** | 1 |
| **Vendor** | LESER |
| **LESER order number** | Not defined yet |
| **Tool kit number** | Not defined yet |
| **Internet** | www.sales@leser.com |



## 7.5 Piston disassembly tool

The disassembly tool is used to pull the piston out of the piston guide. It is just a helpful tool, but not necessary for disassembly or assembly the POSV valve.

### Designated use

- Use the piston disassembly tool during the disassembly process by screwing the tool into the top of the piston. Afterwards you can easily pull the piston out of the guide.


Figure 21: Piston disassembly tool

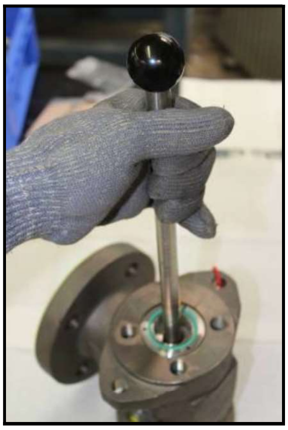


Figure 22: Disassembly of a piston

Technical requirements

| Requirements / Quality | Data |
|---|---|
| **Length** | Not defined yet |
| **Quantity** | 1 |
| **Vendor** | LESER |
| **LESER order number** | Not defined yet |
| **Tool kit number** | Not defined yet |
| **Internet** | www.sales@leser.com |

## 7.6 Gap gage for clamp ring

The gap gage is used to check the connections of the compression fittings.

**Designated use**

- Tool to examine a right connection such as between the tube and main valve.

1. Screw the nut up to the gap gage
2. Pull out the gap gage
3. Tighten the nut a further ¼ - ½ turn

For further details refer to the manufacturer of the compression fitting

Technical requirements

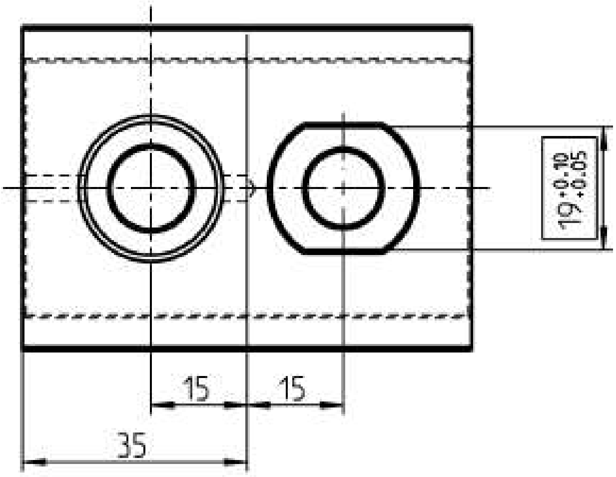
| Requirements / Quality | Data | Technical illustration 6 |
|---|---|---|
| **Manufacturer** | Schwer |  |
| **Material** | metal | |
| **Vendor** | e.g. Schwer | |
| **External order number** | GG | |
| **LESER order number** | Not defined yet | |
| **Tool kit number** | Not defined yet | |
| **Internet** | www.schwer.com | |

## 7.7 Assembling aid pilot

The assembling aid is used for an easier assembly of the seats/ discs and adjusting screws. It is just a helpful tool, but not necessary for disassembly or assembly the POSV valve.

**Designated use**

- Aid in which you can place the adjusting screw or the disc and seat unit of the pilot valve. Therefore it is easier to assembly or disassembly these components




Technical requirements

| Requirements / Quality | Data |
|---|---|
| **Width [mm]** | Not defined yet |
| **Length [mm]** | Not defined yet |
| **Vendor** | LESER |
| **LESER order number** | 60S.2512.4012 |
| **Tool kit number** | Not defined yet |
| **Order** | sales@leser.com |

Content

**1 Purpose ........................................................................................... 1**
**2 Scope ............................................................................................. 1**
**3 Introduction ....................................................................................... 1**
**4 Components of the Standard Tool KIT ...................................................... 2**

## 1 Purpose

This LESER Global (LGS) describes the recommended Took KIT requirements for equipping an agency or a warehouse for goods receiving/storage, adjusting, testing and shipping of safety valves.

## 2 Scope

This LGS applies to all members of the LESER quality cluster as defined in the global quality management manual.

## 3 Introduction

- The Tool KIT is an important part of the equipment of an assembly workplace. It is required for the different work listed for most series of safety valves.

| | |
|---|---|
| **Order number** | **0161.0000** |
| **Internet** | **www.sales@leser.com** |

### 3.1 Designated use

- Assembly of safety valves
- Disassembly of safety valves
- Adjusting the set pressure of safety valves
- Lapping the valve seat
- Repair work

## 4 Components of the Standard Tool KIT

- All tools found in this LWN are part of the Standard Tool KIT. The following pages specify the individual tools through descriptions and by giving practical examples. The technical illustrations show how the respective tools look.

### 4.1 Double-ended open spanner with unequal widths across flats

The double-ended open spanner is used for tightening or unscrewing bolts and nuts.

***Designated use***

- Tool for tightening or unscrewing bolts and nuts such as caps, levers, and inflow devices

Fig. 1 Unscrewing a screw connection

Fig. 2 Sealing the drain hole

***Technical requirements (1)***

| Requirements / Quality | Data | Data | Data |
|---|---|---|---|
| DIN | | 3110 | |
| Spanner width in mm | 16 x 18 | 17 x 19 | 22 x 24 |
| Length | 205 mm | 222 mm | 250 mm |
| Manufacturer | | GEDORE | |
| Material | | Chrome-vanadium-steel | |
| Vendor | | Hahn & Kolb | |
| External order number | 52012-222 | 52012-230 | 52012-290 |

***Technical illustration***

Fig. 1: Double-ended open spanner

| | |
|---|---|
| LESER order number | 596.0058.0000 |
| Tool kit number | 0161.0000 |
| Internet | www.hahn-kolb.de |

### *Technical requirements (2)*

| Requirements / Quality | Data | Data | Data |
|---|---|---|---|
| DIN | | 3110 | |
| Spanner width in mm | 27 x 32 | 41 x 46 | 50 x 55 |
| Manufacturer | | GEDORE | |
| Material | | Chrome-vanadium-steel | |
| Length | 302 mm | 400 mm | 460 mm |
| Vendor | | Hahn & Kolb | |
| External order number | 52012-370 | 52012-420 | 52008-370 |
| LESER order number | 596.0061.000 | 596.0062.000 | 596.0063.000 |
| Tool kit number | | 0161.0000 | |
| Internet | | www.hahn-kolb.de | |

## 4.2 Single-ended open spanner

Single-ended open spanners are required for tightening or unscrewing the lever and cap.

### *Designated use*

- lever and cap screw connections

Fig. 3 Installation of the lever and cap

### *Technical requirements*

| Requirements / Quality | Data | Data |
|---|---|---|
| DIN | 894 | |
| Spanner width in mm | 41 | 60 |
| Manufacturer | ORION | |
| Material | Special steel | |
| Length | 345 mm | 495 mm |
| Head thickness | 14 mm | 18 mm |
| Vendor | Hahn & Kolb | |
| External order number | 52002-041 | 52002-060 |
| LESER order number | 596.0063.0000 | 596.0030.0000 |
| Tool kit number | 0161.0000 | |
| Internet | www.hahn-kolb.de | |

### *Technical illustration*

Illustration 2: Single-ended open spanner

## 4.3 Flat-tip and Phillips PH screwdrivers

The screw driver is required for a variety of auxiliary work such as, for example, to remove jammed workpieces or to insert an O-ring.

### *Designated use*

- screwing in of locking screws (H4 lever)
- insert O-rings (type 462)
- remove jammed workpieces

Fig. 3 Lifting the protective cap

### *Technical requirements*

| Requirements / Quality | Data | Data | Data | Data |
|---|---|---|---|---|
| DIN | 5265A | | | |
| Edge width mm | 3.5 | 4.5 | 5.5 | 6.5 |
| Edge thickness mm | 0.6 | 0.8 | 1.0 | 1.2 |
| Shaft length mm | 100 | 125 | 150 | 150 |
| Total length mm | 204 | 236 | 261 | 268 |
| Vendor | Hahn & Kolb | | | |
| External order number | 52736-120 | 52736-135 | 52736-141 | 52736-150 |
| LESER order number | 596.0039.0000 | | | |
| Tool kit number | 0161.0000 | | | |
| Internet | www.hahn-kolb.de | | | |

### *Technical illustration*

Illustration 3: Flat-head/Phillips screwdriver

protected

## 4.4 Combination pliers

The combination pliers are required as an auxiliary tool for various work. For example, it can be used to cut soft and hard wire. The long cutting edges are suitable for thick cable.

### *Designated use*

- removal of sealing wire

protected

### *Technical requirements*

| Requirements / Quality | Data |
|---|---|
| DIN ISO | 5746 |
| Length | 180 mm |
| Largest Ø that can be cut | 3.4 mm |
| Cutting edges | Induction-hardened 60 HRC |
| Vendor | Hahn & Kolb |
| External order number | 52279-130 |
| LESER order number | 596.0064.0000 |
| Tool kit number | 0161.0000 |
| Internet | www.hahn-kolb.de |

### *Technical illustration*

Illustration 4: Combination pliers

## 4.5 Pin punch

The pin punch is required for the assembly and disassembly of discs and spindles. The pins are driven in and out by means of a pin punch.

### *Designated use*

- driving pins in and out
- fixing the spindle in place, when adjusting the set pressure


### *Technical requirements*

| Requirements / Quality | | Data |
|---|---|---|
| DIN | | 6450 C |
| Tips – Ø | mm | 3 / 4 / 5 / 6 / 7 / 8 |
| Length x thickness mm | | 150 x 10/ 150 x 10/ 150 x 10/ 150 x 10/ 150 x 12/ 150 x 12 |
| Punch head | | Hardened and tempered |
| Delivery | | In holder with base |
| Vendor | | Hahn & Kolb |
| External order number | | 51284-500 |
| LESER order number | | 596.0065.0000 |
| Tool kit number | | 0161.0000 |
| Internet | | www.hahn-kolb.de |

### *Technical illustration*

Illustration 5: Combination pliers

## 4.6 Hammer

The hammer is used for marking flanges and bodies and for fastening individual parts like, for example, discs and spindles.

### *Designated use*

- hammering in punch numbers
- fastening of discs and spindles
- hammering in pins



### *Technical requirements*

| Requirements / Quality | Data | Data |
|---|---|---|
| DIN | 1041 | |
| Weight without handle | 200 | 800 |
| Manufacturer | ORION | |
| External order number | 51180-510 | 51180-560 |
| LESER order number | 596.0066.0000 | 596.0067.0000 |
| Tool kit number | 0161.0000 | |
| Internet | www.hahn-kolb.de | |

### *Technical illustration*

Illustration 6: Hammer

## 4.7 Punch numbers

Punch numbers are required for a variety or marking work. At the request of the customer, the safety valve must also be marked on the edge of the flange or on the body with the set pressure or tag.

### *Designated use*

- marking flanges and bodies

### *Technical requirements*

| Requirements / Quality | Data | Data |
|---|---|---|
| DIN | 1451 | |
| Type of characters | Numbers | |
| Character height | 0.2 mm | 0.6 mm |
| Characters | 0 - 9 | 0 - 9 |
| Number of punches | 9 | |
| Max workpiece strength | 1200 Nm² | 1200 Nm² |
| Hardness on end of punch | 58 – 60 HRC | 58 – 60 HRC |
| Vendor | Hahn & Kolb | |
| External order number | 56930-020 | 56930-060 |
| LESER order number | 596.0068.0000 | 596.0069.0000 |
| Tool kit number | 0161.0000 | |
| Internet | www.hahn-kolb.de | |

### *Technical illustration*

Illustration 7: Punch numbers

protected

## 4.8 Punch letters

Punch letters are required for a variety or marking work. At the request of the customer, the safety valve must also be marked on the edge of the flange or on the body with the set pressure or tag or name.

***Designated use***

- marking flanges and bodies



***Technical requirements***

| Requirements / Quality | Data | Data |
|---|---|---|
| DIN | 1451 | |
| Type of characters | Letters | |
| Character height | 0.2 mm | 0.6 mm |
| Characters | A - Z - & | |
| Number of punches | 27 | |
| Max workpiece strength | 1200 Nm² | 1200 Nm² |
| Hardness on end of punch | 58 – 60 HRC | 58 – 60 HRC |
| Vendor | Hahn & Kolb | |
| External order number | 56932-020 | 56932-060 |
| LESER order number | 596.0070.0000 | 596.0071.0000 |
| Tool kit number | 0161.0000 | |
| Internet | www.hahn-kolb.de | |

***Technical illustration***

Illustration 8: Punch letters

## 4.9 Brush set

The brush set consists of brushes of different sizes.

### *Designated use*

- repair of paint damage
- application of lubricants

### *Technical requirements*

| **Requirements / Quality** | | **Data** |
|---|---|---|
| Flat brush | 1 each | 20 / 25 / 35 / 50 mm |
| Ring brush | 1 each | Size 2 / 4 / 6 |
| Enamel paintbrush | | Size 10 / 12 / 16 |
| Vendor | | Hahn & Kolb |
| External order number | | 56932-005 |
| LESER order number | | 596.0072.0000 |
| Tool kit number | | 0161.0000 |
| Internet | | www.hahn-kolb.de |

### *Technical illustration*

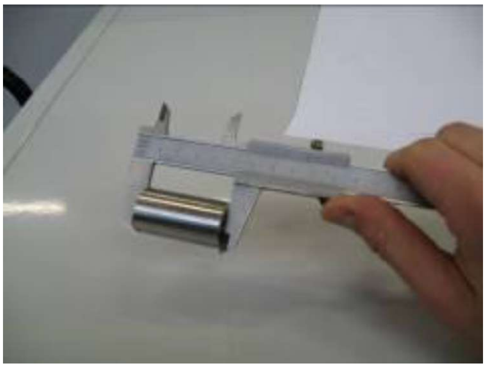
Illustration 9: Brush set

## 4.10 Sliding vernier calliper

Basically, the sliding vernier calliper is used to measure components, for example stroke limits. The set pressure for several identical safety valves can be roughly adjusted with the sliding vernier calliper.

### *Designated use*

- pressure setting
- measuring stroke limits
- measuring components



### *Technical requirements*

| Requirements / Quality | Data |
|---|---|
| DIN | 862 |
| Application | outside, inside, step and depth measurements |
| Material | INOX steel |
| Measuring span | 150 mm |
| Measuring jaw length | 40 mm |
| Length of the vernier | 15.5 mm |
| Manufacturer | ATRON |
| Vendor | Hahn & Kolb |
| External order number | 31065-110 |
| LESER order number | 596.0074.0000 |
| Tool kit number | 0161.0000 |
| Internet | www.hahn-kolb.de |

### *Technical illustration*

Illustration 10: Sliding vernier calliper

## 4.11 Sealing pliers

Sealing pliers are required for sealing the bonnet and the body after setting the pressure of the safety valve.

### *Designated use*

- sealing bonnets and bodies

### *Technical requirements*

| Requirements / Quality | Data |
|---|---|
| Length | 150 mm |
| Seal Ø | 9 mm |
| Colour | Blue |
| Vendor | Hahn & Kolb |
| External order number | 53205-145 |
| LESER order number | 596.0053.0000 |
| Tool kit number | 0161.0000 |
| Internet | www.hahn-kolb.de |

### *Technical illustration*

Illustration 11: Sealing pliers

## 4.12 V-Block

When assembling the disc and spindle, there is a risk of damaging the spindle or disc by incorrect loading. To prevent this, the V-block is used as an underlay or to fix the round components in place.

### *Designated use*

- assembly of discs and spindles
- offloading the spindle



### *Technical requirements*

| Requirements / Quality | Data | Data |
|---|---|---|
| Name | Small V-block | Large V-block |
| Weight | 0.93 kg | 0.90 kg |
| Material | Steel | |
| Vendor | LESER | |
| LESER order number | 445.0759.0000 | 445.0859.0000 |
| Tool kit number | 0161.0000 | |
| Internet | www.sales@leser.com | |

### *Technical illustration*

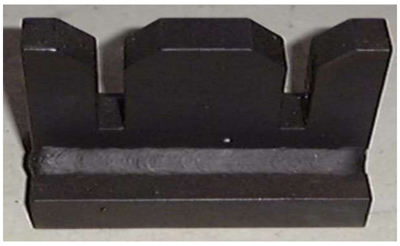


Illustration 19: V-block

## 4.13 Ratchet box

Besides the “ratchet”, the ratchet box contains two different extenders and a number of different sized sockets.

### *Designated use*

- assembly and disassembly work on safety valves
- various screwing work

### *Technical requirements*

| Requirements / Quality | Data |
|---|---|
| Sockets | Hexagonal<br>13 sockets, 4 drive handles |
| Widths across flats | 10, 11, 12, 13, 14, 15, 17, 19, 22, 24, 27, 30, 32 |
| T handle | 1x |
| Universal joint | 1x |
| Reversible ratchet | 1x |
| Box outside dimensions | 410 x 216 x 65 mm |
| Vendor | Hahn & Kolb |
| External order number | 58584-025 |
| LESER order number | 596.0076.0000 |
| Tool kit number | 0161.0000 |
| Internet | www.hahn-kolb.de |

### *Technical illustration*

Illustration 20: Ratchet box

protected

## 4.14 Torque wrench

A defined torque must be applied for screw connections on safety valves (for example for connecting the bonnet and the body). The torque wrench is required for this.
Due to the accessibility of the connection with open-end spanners, such an attachment is recommended.

### *Designated use*

- screw connections of bonnets and bodies
- use with bolt size 9 / 12 mm or alternatively 14 / 18 mm

### *Technical requirements*

| Requirements / Quality | Data | Data |
|---|---|---|
| Measurement range | 20 – 100 Nm | 80 – 400 Nm |
| Scale division value | 1 Nm | 2 Nm |
| Ø of seat for heads | 9 x 12 mm | 14 x 18 mm |
| Jaw size(s) | 19 / 24 | 19 / 24 |
| Length | 400 mm | 607 mm |
| Margin of error | +- 2 % of set value | +- 3 % of set value |
| Torque application | left / right | |
| Vendor | Hahn & Kolb | |
| External order number | 52264-010 | 52264-040 |
| Tool kit number | 0161.0000 | |
| Internet | www.hahn-kolb.de | |

### *Technical illustration*

Illustration 21: Torque wrench

## 4.15 Jaw attachments

Jaw attachments for the torque wrench are required, for example, for connecting the bonnet to the body.
The jaw attachments are used together with the torque wrench (see 6.14).

### *Designated use*

- screw connections of bonnets and bodies
- bolt size 19 / 24 mm

protected

### *Technical requirements*

| Requirements / Quality | Data | Data |
|---|---|---|
| Spanner width | 19 mm | 24 mm |
| Width | 41 mm | 51 mm |
| Height | 9 mm | 11 mm |
| Plug-in shaft | 14 x 18 mm | 14 x 18 mm |
| Vendor | Hahn & Kolb | |
| External order number | 52286-119 | 52286-124 |
| External order LESER | 596.0078.0000 | 596.0079.0000 |
| Tool kit number | 0161.0000 | |
| Internet | www.hahn-kolb.de | |

### *Technical illustration*


Illustration 22: Jaw attachment

## 4.16 Plug-in reversible ratchet

Plug-in reversible ratchets are required, for example, for connecting the bonnet to the body. The plug-in reversible ratchets are used together with the torque wrench (see 6.14).

### *Designated use*

- screw connections of bonnets and bodies
- to hold the socket (see 6.18)

### *Technical requirements*

| Requirements / Quality | Data |
|---|---|
| Cross-section of the plug-in shaft | 14x18 mm |
| Square drive | Square 12.5 = 1/2 Inch |
| Vendor | Hahn & Kolb |
| External order number | 52286-655 |
| Tool kit number | 0161.0000 |
| Internet | www.hahn-kolb.de |

### *Technical illustration*


Illustration 23: Plug-in reversible ratchet

## 4.17 Plug-in adapter

The plug-in adapter is required as a connecting piece for the torque wrench (see 6.14) and the plug-in reversible ratchet (see 6.16). It makes it possible to connect the two tools.

### *Designated use*

- holder of the plug-in reversible ratchet (see 6.16) or the jaw attachments (see 6.14)
- screw connections of bonnets and bodies

**Figure 4.1**



### *Technical requirements*

| Requirements / Quality | Data |
|---|---|
| Plug connection | 9 x 12 mm |
| Drive | Square |
| Step-up | 9 x 12 mm to 14x18 |
| Vendor | Hahn & Kolb |
| External order number | 52286-655 |
| Tool kit number | 0161.0000 |
| Internet | www.hahn-kolb.de |

### *Technical illustration*

Illustration 24: Plug-in adapter

4.18 Socket

The socket is used together with the torque wrench (see 6.14) and the plug-in reversible ratchet (see 6.16). It is used, for example, for the screw connection of the bonnet to the body.

***Designated use***

- screw connections of bonnets and bodies



***Technical requirements***

| Requirements / Quality | Data |
|---|---|
| DIN | 3120 |
| Width across flats | 36 mm |
| Size | Ø 60/49.5 mm |
| Material | 31 Cr V 3 |
| Vendor | Hahn & Kolb |
| External order number | 58596-360 |
| LESER order number | 596.0082.0000 |
| Tool kit number | 0161.0000 |
| Internet | www.hahn-kolb.de |

***Technical illustration***

Illustration 25:Socket

## 4.19 Wire brush

The wire brush made of stainless steel is used on grey cast iron and stainless steel safety valves. Any surface rust can be easily removed with the wire brush.

***Designated use***

- removal of surface rust
- removal of soiling

***Technical requirements***

| **Requirements / Quality** | **Data** | **Data** |
|---|---|---|
| Wire material | Stainless steel | Steel |
| Total length | 290 mm | 290 mm |
| Width | 35 mm | 35 mm |
| Length of wire brushes | 25 mm | 25 mm |
| Wire Ø | 0.3 mm | 0.3 mm |
| Vendor | Hahn & Kolb | |
| External order number | 56726-530 | 56725-530 |
| LESER order number | 596.0083.0000 | |
| Tool kit number | 0161.0000 | |
| Internet | www.hahn-kolb.de | |

***Technical illustration***

Illustration 26: Wire brush

4.20 Safety glasses

The safety glasses are used to protect your eyes. They must be worn during grinding work on safety valves.

***Designated use***

- general safety of the eyes
- to be worn during grinding work on the safety valve

protected

***Technical requirements***

| Requirements / Quality | Data |
|---|---|
| DIN EN | 166 F |
| Manufacturer | ARTILUX |
| Design | with side guards |
| Vendor | Hahn & Kolb |
| External order number | 55660-100 |
| LESER order number | 596.0085.0000 |
| Tool kit number | 0161.0000 |
| Internet | www.hahn-kolb.de |

***Technical illustration***

Illustration 27:Safety glasses

## 4.21 Wire twisting pliers

The wire twisting pliers are required for sealing the bonnet and body. This secures the pressure setting of the safety valve. The sealing wire is twisted and tightened by the pliers.

### *Designated use*

- twisting the sealing wire
- sealing bonnets and bodies

protected

### *Technical requirements*

| Requirements / Quality | Data |
|---|---|
| DIN | 5256 |
| Manufacturer | STAHLWILLE |
| Weight | 0.330 kg |
| Length | 230 mm |
| Vendor | Hahn & Kolb |
| External order number | 53137-010 |
| Tool kit number | 0161.0000 |
| Internet | www.hahn-kolb.de |

### *Technical illustration*

Illustration 27:Wire twisting pliers

## 4.22 Sealing blocks

The sealing blocks are used to seal the cap / lever and thus certify the set pressure that has been set.

### *Designated use*

- sealing safety valves

### *Technical requirements*

| Requirements / Quality | Data |
|---|---|
| Size L x H x D | 9 x 9 x 5 mm |
| Hole □ | 1.5 mm |
| Material | Plastic |
| Temp. application limit | + 85° C |
| Vendor | Johan Pützfeld B.V. |
| LESER order number | 525.0107.0000 |
| Tool kit number | 0161.0000 |
| Internet | www.skiffy.com |

### *Technical illustration*

Illustration 29:Sealing blocks

protected

4.23 Sealing wire

After adjusting the set pressure on the safety valve, LESER must guarantee that the pressure cannot be changed without being noticed. For this measure, LESER seals the lever/cap to the bonnet. Sealing wire is used to connect these components.

***Designated use***

- sealing the bonnet and the lever/cap



***Technical requirements***

| Requirements / Quality | Data |
|---|---|
| Wire material | Galvanised iron wire |
| Delivered as | On a roll |
| Wire gauge | 0.3 – 0.5 mm |
| Quantity | 1 kg |
| For sealing | Lead 9, 12 mm |
| Vendor | Hahn & Kolb |
| External order number | 53212-010 |
| LESER order number | 525.0208.0000 |
| Tool kit number | 0161.0000 |
| Internet | www.hahn-kolb.de |

***Technical illustration***

Illustration 30: Sealing wire

## 4.24 Pipe for large spanner

The pipe for the large spanner is an extension of the spanner. It is used to extend the lever arm when assembling the lever and makes it possible to apply high torque in order to securely connect the bonnet to the lever.

### *Designated use*

- lever and bonnet connections



### *Technical requirements*

| Requirements / Quality | Data |
|---|---|
| Code | EG Class III |
| Diameter | 50 mm |
| Length | 1500 mm |
| Rod gauge | 0.3 – 0.5 mm |
| Quantity | 1 kg |
| For sealing | Lead 9, 12 mm |
| Vendor | LESER |
| LESER order number | 596.0097.0000 |
| Tool kit number | 0161.0000 |
| Internet | www.sales@leser.com |

### *Technical illustration*

Illustration 24: Pipe for large spanner

## 4.25 Folding rule

A folding rule is required for any measuring work.

***Designated use***

- measuring the outside dimensions of packaging

***Technical requirements***

| Requirements / Quality | Data |
|---|---|
| Length | 2 m |
| Material | Wood |
| Width of sections | 16 mm |
| EC class | III |
| Vendor | Hahn & Kolb |
| External order number | 37332-005 |
| LESER order number | TB D |
| Tool kit number | 0161.0000 |
| Internet | www.hahn-kolb.de |

***Technical illustration***

Illustration. 32: Folding rule

protected

## 4.26 Glass plate

For the finishing of the seat and disc, LESER offers lapping stamps, glass plates and lapping material.
The seat and disc with the integrally attached lifting aid and with the same do are lapped with the lapping stamp or glass plate of the same size. Discs with a detachable lifting aid or generally without a lifting aid are **not** lapped with a lapping stamp, but are lapped on a glass plate after disassembling the lifting aid.

### *Designated use*

- re-lapping discs



### *Technical requirements*

| Requirements / Quality | Data |
|---|---|
| LWN | 001.32 |
| Ø | 140 mm |
| Vendor | LESER |
| LESER order number | 828.0000.0016 |
| Tool kit number | 0161.0000 |
| Internet | www.sales@leser.com |

### *Technical illustration*

Illustration 17:Glass plate

## 4.27 Lapping stamp

For the finishing of the seat and disc, LESER offers lapping stamps, glass plates and lapping material.
The seat and disc with the integrally attached lifting aid and with the same do are lapped with the lapping stamp of the same size.

***Designated use***

- relapping seats and nozzles

***Technical illustration***

***Technical requirements (1)***

| Requirements / Quality | Data | Data | Data |
|---|---|---|---|
| Number | 3 | 4 | 5 |
| do | 18 | 23 | 29 |
| Material | 0.6025 / 1.4021 | 0.6025 / 1.4021 | 0.6025 / 1.4021 |
| Manufacturer | | LESER | |
| Length | 205 mm | 222 mm | 250 mm |
| LESER order number | 445.1359.0000 | 445.1459.0000 | 445.1559.0000 |
| Tool kit number | | 0161.0000 | |
| Internet | | www.sales@leser.com | |

### *Technical requirements (2)*

| Requirements / Quality | Data | Data | Data | Data |
|---|---|---|---|---|
| Number | 6 | 7 | 8 | 9 |
| do | 37 | 46 | 60 | 74 |
| Material | 0.6025 / 1.4021 | 0.6025 / 1.4021 | 0.6025 / 1.4021 | 0.6025 / 1.4021 |
| Manufacturer | LESER | | | |
| Length | 172 mm | 205 mm | 222 mm | 250 mm |
| LESER order number | 445.1659.0000 | 445.1759.0000 | 445.1859.0000 | 445.1959.0000 |
| Tool kit number | 0161.0000 | | | |
| Internet | www.sales@leser.com | | | |

| Requirements / Quality | Data | Data | Data | Data |
|---|---|---|---|---|
| Number | 10 | 12 | 13 | 14 |
| do | 92 | 125 | 165 | 200 |
| Material | 0.6025 / 1.4021 | 0.6025 / 1.4021 | 0.6025 / 1.4021 | 0.6025 / 1.4021 |
| Manufacturer | LESER | | | |
| Length | 172 mm | 205 mm | 222 mm | 250 mm |
| LESER order number | 445.2059.0000 | 445.2259.0000 | 445.2359.0000 | 445.2459.0000 |
| Tool kit number | 0161.0000 | | | |
| Internet | www.sales@leser.com | | | |

4.28 Lapping pastes

As a lapping paste, LESER uses ready-to-use, water-soluble lapping pastes with different grit size depending on the damage to the sealing surface.

***Designated use***

- lapping discs

***Technical requirements***

| Requirements / Quality | Data | Data | Data | Data |
|---|---|---|---|---|
| LWN | 001.32 | 001.32 | 001.32 | 001.32 |
| Name | TETRABOR | | | |
| Identifier | F 320 | F 600 | F 800 | F 1200 |
| Grit size in µ | 49 – 17 | 19 – 3 | 14 – 2 | 7 – 1 |
| Packaging | Tube | | | |
| Contents | 75 ml | | | |
| Vendor | Artur Glöckler GmbH | | | |
| LESER order number | 599.0301.0000 | 599.0401.0000 | 599.0101.0000 | 599.0201.0000 |
| Tool kit number | 0161.0000 | | | |
| Internet | http://www.gloeckler.com | | | |

***Technical illustration***


Illustration 15: Lapping paste

4.29 Monocrystalline diamond powder

Monocrystalline diamond powder is mixed with an oil solution to the desired consistency and then applied selectively.
The workpiece is re-lapped through uniform movements on the nozzle or on a glass plate.

***Designated use***

- re-lapping seats and discs



***Technical requirements***

| Requirements / Quality | Data |
|---|---|
| DIN | 001.32 |
| Grit size | 1.5 – 3 µ |
| Package size | 50 g |
| Vendor | Peter Wolters |
| LESER order number | 599.0102.0000 |
| Tool kit number | 0161.0000 |
| Internet | www.peter-wolters.com |

***Technical illustration***

Illustration 16: Monocrystalline diamond powder

4.30 Assembly grease for threads

The assembly grease is used for greasing the adjusting screw. It makes it possible to easily screw the adjusting screw into the bonnet.

***Designated use***

- greasing the adjusting screw
- greasing components for improved ease of access
- protection against fretting and corrosion

***Technical requirements***

| Requirements / Quality | Data |
|---|---|
| Name | Molikote |
| Qualities | - non-combustible<br>- non-corrosive |
| Packaging | Can |
| Weight | 1 Kg |
| Internet | www.molykote.com |

***Technical illustration***

Illustration 12: Molikote

## 4.31 Leak detection spray

The required body seal tightness is checked by means of a leak detection spray. The leak is located based on bubble formation after applying the leak detection spray to the valve contour. In addition, it can also be used to visualise leaks in the manometer screw connections.

### *Designated use*

- external leak testing of the safety valve
- functional leak testing
- testing the seal tightness of manometer screw connections

### *Technical requirements*

| Requirements / Quality | Data |
|---|---|
| Name | Güpoflex |
| Application | Gas and compressed air |
| Qualities | - non-combustible<br>- non-corrosive<br>- toxicologically safe |
| Package size | 500 ml spray can |
| Packaging unit | 10 cans |
| Vendor | GÜPO |
| LESER order number | 596.0094.0000 |
| Tool kit number | 0161.0000 |

### *Technical illustration*


Illustration 13: Leak detection spray

| | |
|---|---|
| Internet | www.guepo.de |

## 4.32 LESER paint, blue

Damaged or scratched valve contours must be repaired by LESER blue paint.

***Designated use***

- repair of damaged valve contours
- repair of scratched valve contours



***Technical requirements***

| Requirements / Quality | Data |
|---|---|
| Name | LESER paint, blue |
| Colour | RAL 5005 |
| Application | Valve body |
| Package size | 500 ml can |
| Packaging unit | 1 can |
| Vendor | LESER |
| LESER order number | 596.0096.0000 |
| Tool kit number | 0161.0000 |
| Internet | www.bfl.dk |

***Technical illustration***

Illustration 14: LESER blue paint

Contents

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6 Operating materials and supplies ........................................................................................ 2

## 1 Purpose

This LESER Global Standard (LGS) provides a list of operating materials that are used during the assembly of LESER safety valves.

## 2 Scope

This document must be observed by all agencies and subsidiaries of LESER GmbH & Co. KG.

## 3 Disclaimer

LESER puts in a great deal of effort into making up-to-date and correct documentation available. Nevertheless, LESER GmbH & Co. KG gives no guarantee that the recommended actions presented here are completely correct and error free. This document is to be used exclusively with the specified type. LESER GmbH & Co. KG declines any liability or responsibility for the correctness and completeness of the content.

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## 4 Qualified fitting personnel

The operating materials/supplies that are used during the installation of LESER safety valves must be used exclusively by trained or qualified fitters. The qualifications must be obtained through the appropriate training measures.

## 5 General Information

Observe the safety regulations and warnings on the packaging.

## 6 Operating materials and supplies

Lapping paste - Tetrabor

Grit size 320
600
800
1200

Monocrystalline diamond powder - material number N145

Grit size 1.5 – 3 µm

Assembly grease

Molykotepaste – D Paste
Klübersynth UH1 14-151

Halocarbon oil

Oleic acid - PH. EUR 6.0 material number N-206

Superglue

Delo-Ca
Delo-ML 5449 anaerobic high temperature resistant

Leak detection spray

Güpoflex for gas & compressed air

Quickleen – universal cleaner

Screw glue – LocTITE 222

Content

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**6 Qualified fitting personnel ........ 2**
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protected

## 1 General information for separating the main valve from the pilot valve

## 2 Purpose

The documentation describes the separation of the main valve and the pilot valve. The description contains every single working step, supplies, tools and appliances.

## 3 Competences

The generation, maintenance and distribution of the documentation takes place in the organisation department. The defaults will be generated by the technical department in consultation with the final assembly department and product planning department.

## 4 Scope

This document must be applied to the dismantling of a Pilot Operated Safety Valve in agencies and subsidiaries of LESER GmbH & Co. KG, customers and independent service center.

## 5 Disclaimer

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## 6 Qualified fitting personnel

LESER safety valves may only be dismantled by trained or qualified fitters. The qualifications must be obtained through the appropriate training measures.

## 7 Remarks

Gloves must be worn during the entire dismantling process.

## 8 Basic safety guidelines

### Dangerous media

Poisoning, caustic burns, burns, injuries
• Use suitable protective devices
• Use suitable collecting tanks.
• Wear suitable protective equipment.

### Foreign bodies in the safety valve

Danger from failure of safety valve or leaks
• Flush the system before installation of a safety valve.
• Check the safety valve for foreign objects.
• Remove foreign objects

### Bug screen is damaged or missing
***(B or option)***

Dirt, objects or insects get into the safety valve. Danger from malfunction of the safety valve.
• Install the bug screen correctly.
• Check the bug screen regularly.

### Ambient temperature is too high

Material expansion. Danger from malfunction of the safety valve.

### Ambient temperature is too low

Icing, freezing vapours, reduced flow rate due to congealing media. Danger from functional disruption of the safety valve.

### Abrasive or corrosive media
Moving parts jam or become stuck. Danger from functional disruption of the safety valve.
• Service the safety valve after each time it opens.

### Media with high proportion of particles
**(only B)**

Deposits and clogging. Danger from malfunction of the safety valve.
• Use a filter with the correct mesh size.
• Use additional filters to increase the filter capacity.

**Residual media in the safety valve**

Poisoning, caustic burns, burns, injuries
• Wear suitable protective equipment.
• Remove residual media

**WARNING**

**Leaky safety valve**
Danger from leaking media due to damaged gaskets and sealing surfaces.
• Protect the safety valve against vibrations and blows especially during transport and installation.
• Check safety valve regularly for leaks.

**Open bonnet or spindle guides**

Danger from leaking media
• Make sure that no danger can arise from leaking media.
• Keep a safe distance.
• Wear suitable protective equipment.

**CAUTION**

**Hot medium**

Burns or scalding.
• Wear suitable protective equipment.

**Hot surfaces**
Burns.
• Wear suitable protective equipment.

**Aggressive medium**

Caustic burns.
• Wear suitable protective equipment.

**Open bonnet or spindle guides**

Pinching danger from moving parts.
• Install suitable safeguards.

**Sharp edges and burrs**

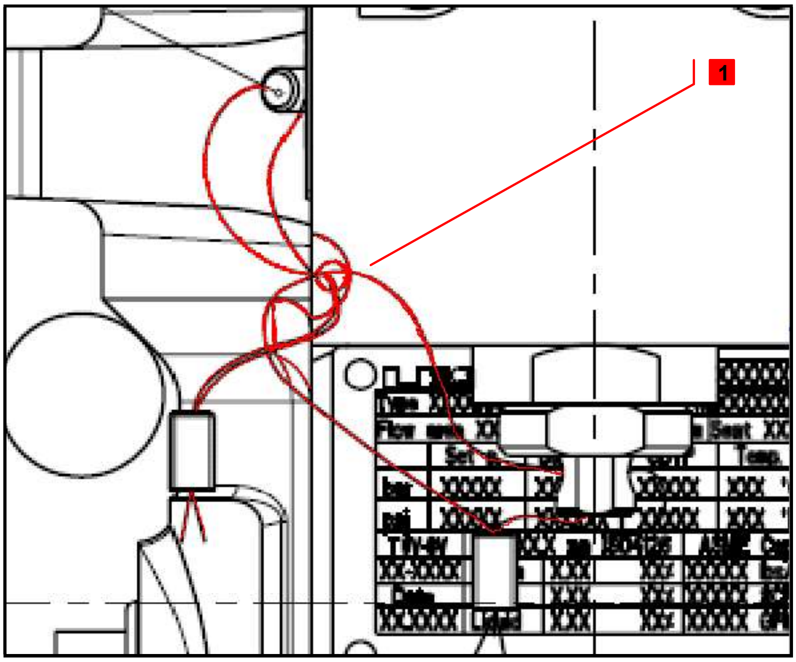
Danger of injury.
• Wear safety gloves.
• Handle the safety valve carefully

**High noise emission**

Hearing damage.
Wear ear protection.

# 9 Disassembly instructions

## 9.1 Removing the seal




**1. Steps – Descriptions**

1 Remove seal with combination pliers

**2. Supplies**

None

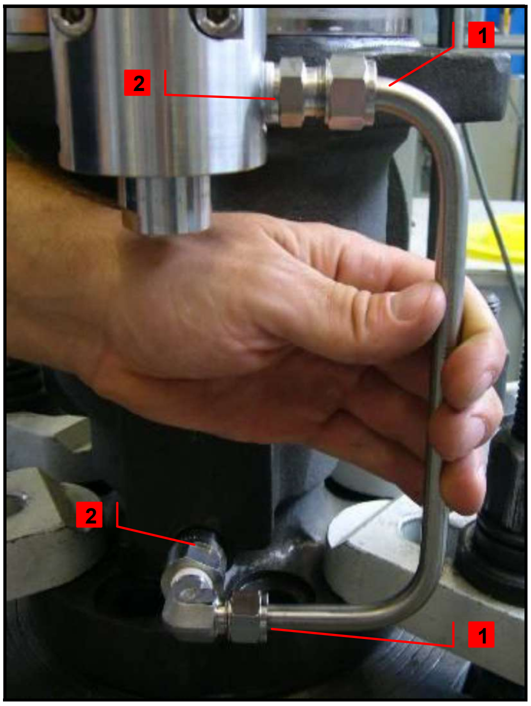
**3. Tools**

Combination pliers

**4. Appliance**

None

## 9.2 Disassembly of the tube




### 1. Steps – Descriptions

**Pay special attention, when opening a closed system regarding any remaining critical media in tubes**

1 Loosen compression fittings

2 While loosing compression fittings counter fittings

Remove tube

protected

### 2. Supplies

None

### 3. Tools

Open-end wrench acc. to LID

### 4. Appliance

Test bench

## 9.3 Removing the pilot valve from the main valve


### 1. Steps – Descriptions

5 Screw off four allen screws

protected

### 2. Supplies

None

### 3. Tools

Allen key acc. to LID

### 4. Appliance

Test bench

Content

**General Information for Disassembling the Main Valve ................................ 1**
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**7.1 General .................................................................................................. 6**
For instructions for removing the POSV pilot valve refer to other applicable LESER disassembly instructions. **........................................................................... 6**

protected

## General Information for Disassembling the Main Valve

## 1 Purpose

This document describes the LESER-approved procedures for disassembly of the main valve (series 810/820) of the pilot operated safety valve (POSV). It describes specific step by step work procedures and identifies all required supplies, tools and appliances.

## 2 Scope

This document applies to all agencies and subsidiaries of LESER GmbH & Co. KG, as well as its customers and independent service centers and must be utilized when disassembling LESER Pilot Operated Safety Valves.

## 3 Responsibilities

The Organization Department is responsible for the generation, maintenance and distribution of this document. The standards for this document are generated by the Technical Department in consultation with the Final Assembly and Production Planning departments.

## 4 Disclaimer

LESER puts a great deal of effort into making up-to-date and correct documentation available. Nevertheless, LESER GmbH & Co. KG gives no guarantee that the recommended actions presented here are entirely correct and error free.
This document is to be applied exclusively to the specified valve type.
LESER GmbH & Co. KG declines any liability or responsibility for the correctness and completeness of the content.
LESER GmbH & Co. KG reserves the right to change the information contained in this document, which is for the products of LESER GmbH & Co. KG and is intended for LESER subsidiaries, at any time and without prior announcement.
LESER GmbH & Co. KG is available to the users of this document to provide additional information as required.

## 5 Qualification of Personnel

LESER safety valves may only be disassembled by trained and qualified fitters. Specific qualifications must be obtained through the appropriate training measures.

## 6 Safety Guidelines

### 6.1 Potential Dangers and Protective Measures

**Dangerous media**

Danger of poisoning, caustic burns, burns, or injury
• Use suitable protective devices
• Use suitable collecting tanks.
• Wear suitable protective equipment.

**Foreign objects in the safety valve**

Danger from failure of safety valve or leakage
• Flush the system before installing a safety valve.
• Check the safety valve for foreign objects.
• Remove foreign objects as necessary

**Damaged or missing bug screen**

Dirt, foreign objects or insects get into the safety valve and cause a danger of safety valve malfunction.
• Install the bug screen correctly.
• Check the bug screen regularly.

**Abrasive or corrosive media**

Moving parts may jam or become stuck and cause a danger of safety valve malfunction.
• Service the safety valve after each opening.
• Use bellows.

**Media with high proportion of particles**

Deposits and clogging cause a danger of safety valve malfunction.
• Use a filter with the correct mesh size.
• Use additional filters to increase overall filter capacity.

**Residual media in the safety valve**

Danger of poisoning, caustic burns, burns, or injuries
• Wear suitable protective equipment.
• Remove residual media

## 6.2 Warnings and Related Protective Measures

### Leaky safety valve

Danger from leaking media due to damaged gaskets and/or sealing surfaces.
- Protect the safety valve against vibrations and blows especially during transport and installation.
- Check safety valve regularly for leaks.

### Open bonnet or spindle guide

Danger from leaking media
- Make sure that no danger can arise from leaking media.
- Keep a safe distance.
- Wear suitable protective equipment.

## 6.3 Cautions and Related Protective Measures

### Hot medium

Burns or scalding.
- Wear suitable protective equipment.

### Hot surfaces

Burns.
- Wear suitable protective equipment.

### Aggressive medium

Caustic burns.
- Wear suitable protective equipment.

### Open bonnet or spindle guide

Pinching danger from moving parts.
- Install suitable safeguards.

### Sharp edges and burrs

Danger of injury.
- Wear safety gloves.
- Handle the safety valve carefully

**High noise emission**

Hearing damage.
• Wear ear protection

### 6.4 Required Protective Equipment

Proper protective gloves must be worn during the entire dismantling process!

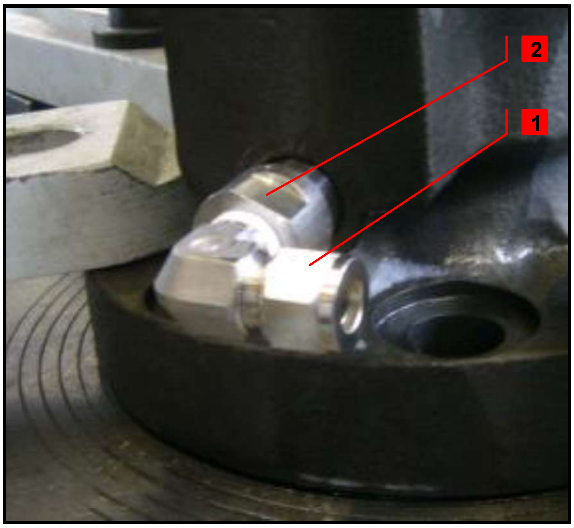
In addition to any protective equipment described in this document and/or required by local and international safety standards proper protective gloves must be worn during the entire disassembly process.

# 7 Disassembly Instructions

## 7.1 General

For instructions for removing the POSV pilot valve refer to other applicable LESER disassembly instructions.

## 7.2 Disassembly of Fittings




**1. Steps – Descriptions**

1 Loosen and screw off angular screw-in fitting, while loosing counter fitting [4]

2 Remove compression fitting

**2. Supplies**

None

**3. Tools**

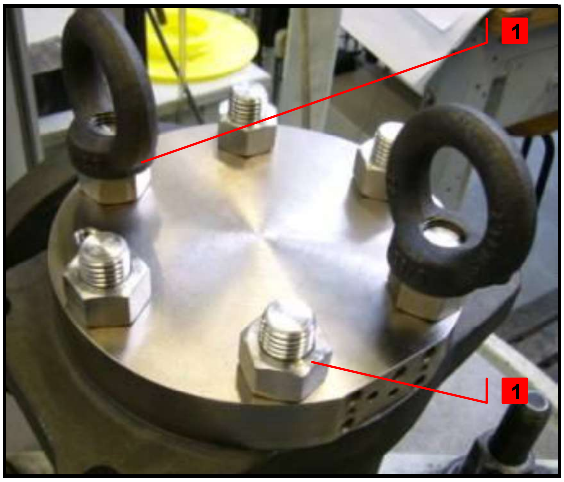
Open-end wrench acc. to LID

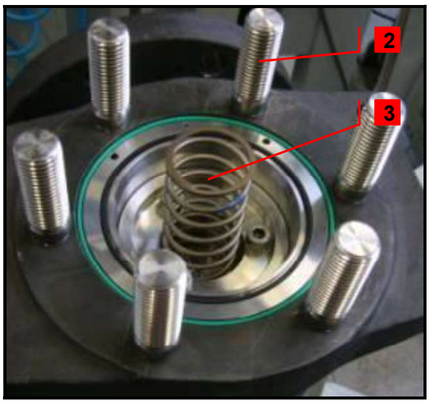
**4. Appliances**

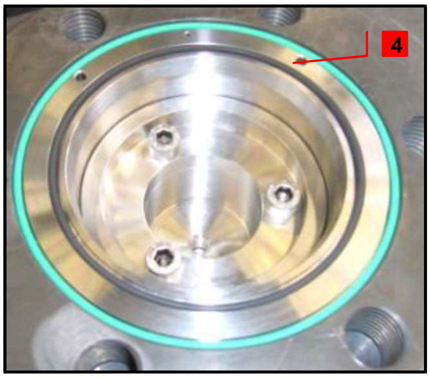
Test bench

protected

## 7.3 Removal the Top Plate





### 1. Steps – Descriptions

1 Loosen ring nuts [57] and screw them off

Loosen and remove nuts [56]

Remove top plate [9]

2 Remove stud bolts [55] (if necessary)

3 Remove dome spring [59]

4 Remove O-rings [60], [67]

5 Remove roll pin [10] (if necessary)

protected

### 2. Supplies

None

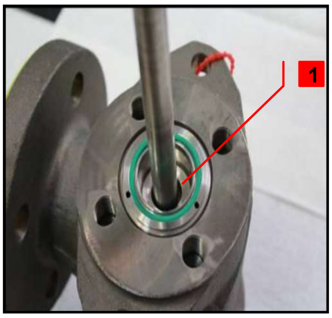
### 3. Tools

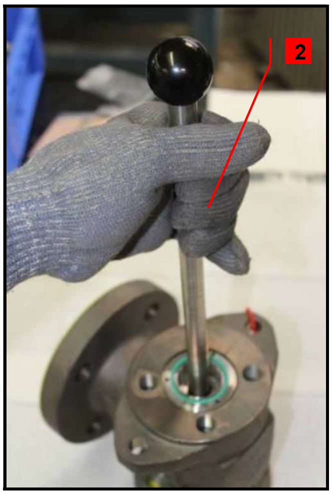
Ring wrench acc. to LID
**Helpful:** Impact wrench acc. to LID

### 4. Appliances

Test bench

## 7.4 Removal of the Piston and Liner





### 1. Steps – Descriptions

1 Screw in piston [6] disassembly tool – if necessary

2 Pull out piston [6] with aid of disassembly tool or by hand - depending on size (nominal size 1x2…2x3 by hand)

3 Pull liner [8] out of body [1]



### 2. Supplies

None

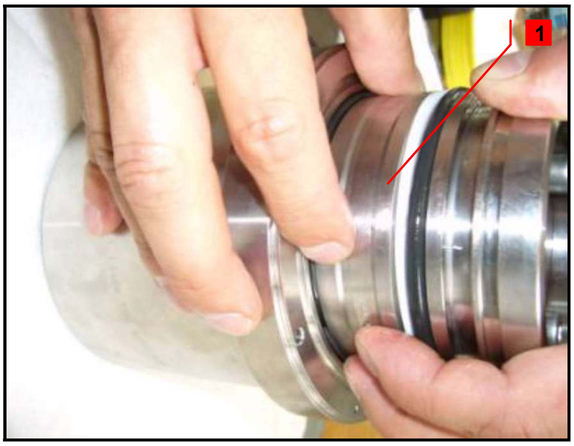
### 3. Tools

**Helpful:** Piston disassembly tool (for nominal size 3x4 and above)

### 4. Appliances

Test-bench

## 7.5 Disassembly of the Piston and Liner




### 1. Steps – Descriptions

**For piston size 1x2…2x3:**

1 Push piston [6] through liner [8] to separate piston [6] and liner [8]

**For piston size 3x4…8x10:**

Pull piston [6] out of liner [8]

### 2. Supplies

None

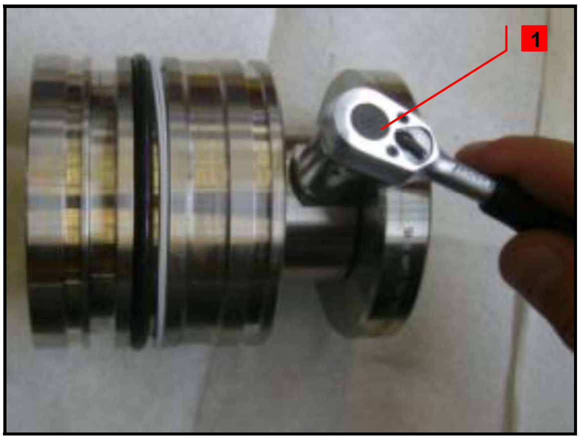
### 3. Tools

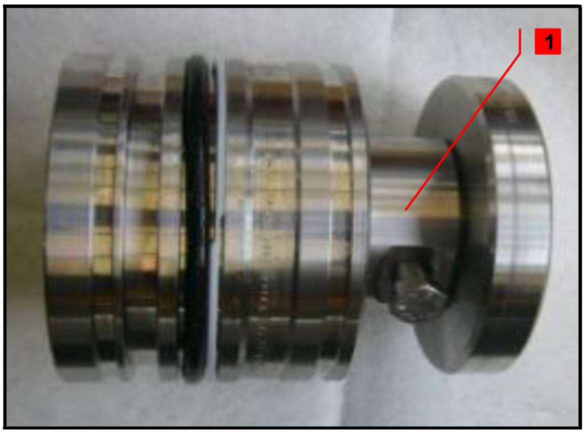
None

### 4. Appliances

None

## 7.6 Disassembly of the Piston and Disc




### 1. Steps – Descriptions

1 Loosen screw [58] with a socket wrench and remove it

protected

### 2. Supplies

None

### 3. Tools

Socket wrench acc. to LID

### 4. Appliances

None

## 7.7 Disassembly of the Piston

### 1. Steps – Descriptions


1 Loosen and remove Allen screws

Separate all components by lifting or pulling them apart

2 Remove O-ring [6.3] , guide rings [6.5] and backup ring [6.4]


protected

### 2. Supplies

None

### 3. Tools

Ratchet with Allen key acc. to LID

### 4. Appliances

Parallel vice with aluminum jaws

## 7.8 Disassembly of the Luproseal OC R20




### 1 Steps – Descriptions

1 Loosen and remove the Allen screws.

Separate all components by lifting or pulling them apart

2 Remove Luproseal lip seal [6.3] OC R20

### 2. Supplies

None

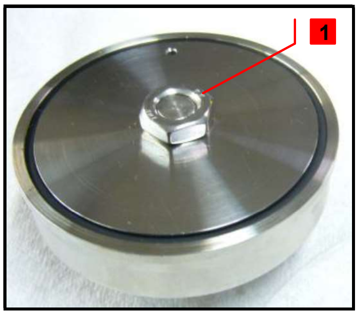
### 3. Tools

Ratchet with Allen key acc. to LID

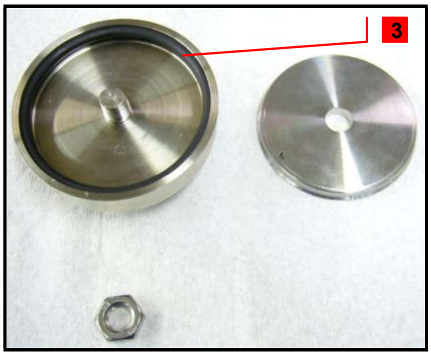
### 4. Appliances

Parallel vice with aluminum jaws

## 7.9 Disassembly the Disc








### 1. Steps – Descriptions

1 Loosen and screw off nut [7.4]

2 Remove retainer [7.2]

**Nominal size 3x4 and above**:
Retainer [7.2] has three threads M8.
Remove retainer by screwing in 3 bolts (M8) and pull apart

3 Take O-ring out of disc [7.1]
by using hook tool.

### 2. Supplies

None

### 3. Tools

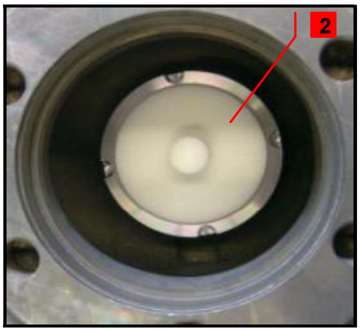
Ring wrench acc. to LID

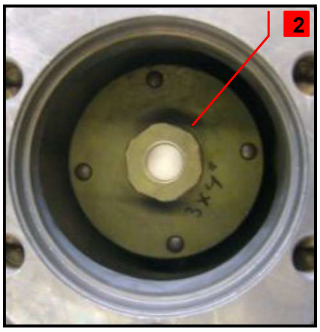
Hook tool for O-rings

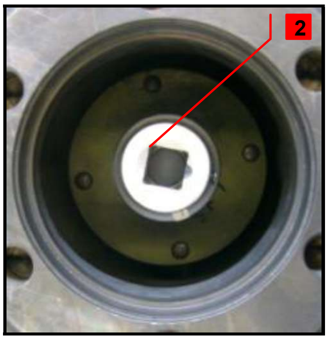
### 4. Appliances

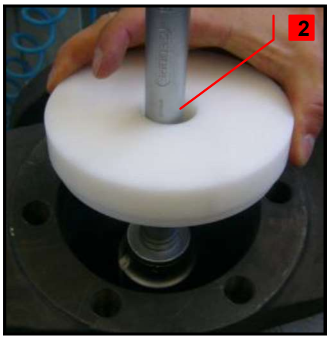
None

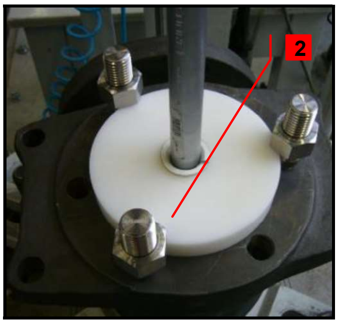
## 7.10 Disassembly of the Seat



### 1. Steps – Descriptions

1 Clamp body [1] at inlet

2 Mount seat-assembly-tool - step by step

Unscrew and remove nozzle [5]

2 Remove O-ring [61] and back up ring [62] of nozzle



### 2. Supplies

None

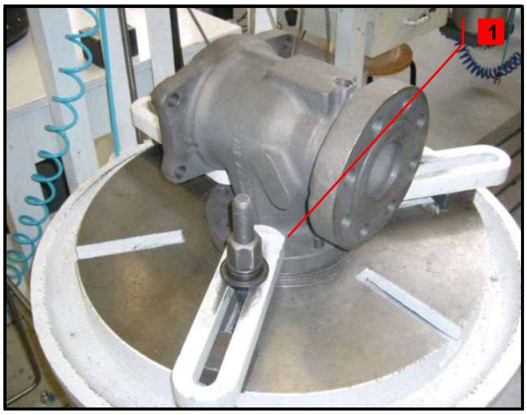
### 3. Tools

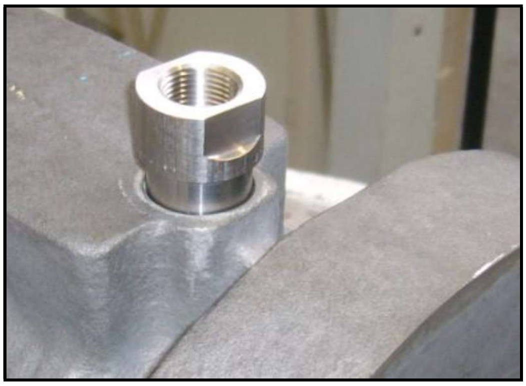
**Necessary**
Seat-assembly-tool acc. to nominal size

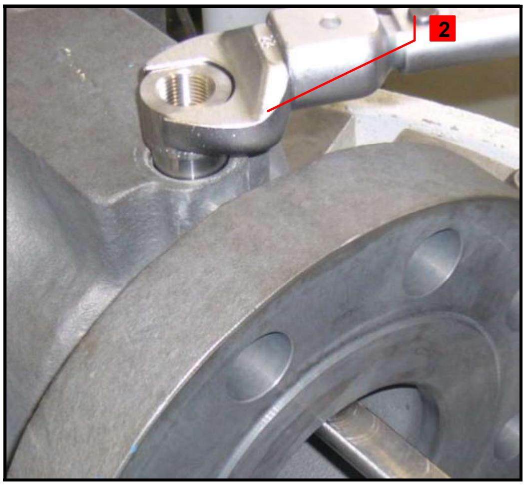
### 4. Appliances

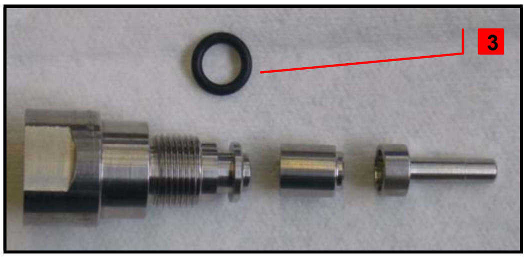
Test bench

## 7.11 Disassembly of the Pitot Tube






### 1. Steps – Descriptions

1 Clamp body with outlet

2 Loosen and remove fitting [4]

Remove pipe and pitot tube

Depending on nominal size, tube [3] may not be applicable.

3 Remove O-ring [63]

protected

### 2. Supplies

None

### 3. Tools

Hook tool for O-rings
Open-end wrench acc. to LID

### 4. Appliances

Test bench

Content

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## 1 General informations for disassembling the Pop Action Pilot

## 2 Purpose

The documentation describes the disassembly of the pop action pilot valve. The description contains every single working step, supplies, tools and appliances.

## 3 Competences

The generation, maintenance and distribution of the documentation takes place in the organisation department. The defaults will be generated by the technical department in consultation with the final assembly department and production planning department.

## 4 Scope

This document must be applied to the dismantling of a Pilot Operated Safety Valve in agencies and subsidiaries of LESER GmbH & Co. KG, customers and independent service center.

## 5 Disclaimer

LESER puts in a great deal of effort into making up-to-date and correct documentation available. Nevertheless, LESER GmbH & Co. KG gives no guarantee that the recommended actions presented here are entirely correct and error free.
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LESER GmbH & Co. KG is available to the users of this document to provide additional information.

## 6 Qualified fitting personnel

LESER safety valves may only be dismantled by trained or qualified fitters. The qualifications must be obtained through the appropriate training measures.

## 7 Remarks

Gloves must be worn during the entire dismantling process.

## 8 Basic safety guidelines

### Dangerous media

Poisoning, caustic burns, burns, injuries
• Use suitable protective devices
• Use suitable collecting tanks.
• Wear suitable protective equipment.

### Foreign bodies in the safety valve

Danger from failure of safety valve or leaks
• Flush the system before installation of a safety valve.
• Check the safety valve for foreign objects.
• Remove foreign objects

### Bug screen is damaged or missing
***(B or option)***

Dirt, objects or insects get into the safety valve. Danger from malfunction of the safety valve.
• Install the bug screen correctly.
• Check the bug screen regularly.

### Ambient temperature is too high

Material expansion. Danger from malfunction of the safety valve.

### Ambient temperature is too low

Icing, freezing vapours, reduced flow rate due to congealing media. Danger from functional disruption of the safety valve.

### Abrasive or corrosive media
Moving parts jam or become stuck. Danger from functional disruption of the safety valve.
• Service the safety valve after each time it opens.

### Media with high proportion of particles
**(only B)**

Deposits and clogging. Danger from malfunction of the safety valve.
• Use a filter with the correct mesh size.
• Use additional filters to increase the filter capacity.

**Residual media in the safety valve**

Poisoning, caustic burns, burns, injuries
• Wear suitable protective equipment.
• Remove residual media

**WARNING**

**Leaky safety valve**
Danger from leaking media due to damaged
gaskets and sealing surfaces.
• Protect the safety valve against vibrations and blows especially during transport and installation.
• Check safety valve regularly for leaks.

**Open bonnet or spindle guides**

Danger from leaking media
• Make sure that no danger can arise from leaking media.
• Keep a safe distance.
• Wear suitable protective equipment.

**CAUTION**

**Hot medium**

Burns or scalding.
• Wear suitable protective equipment.

**Hot surfaces**
Burns.
• Wear suitable protective equipment.

**Aggressive medium**

Caustic burns.
• Wear suitable protective equipment.

**Open bonnet or spindle guides**

Pinching danger from moving parts.
• Install suitable safeguards.

**Sharp edges and burrs**

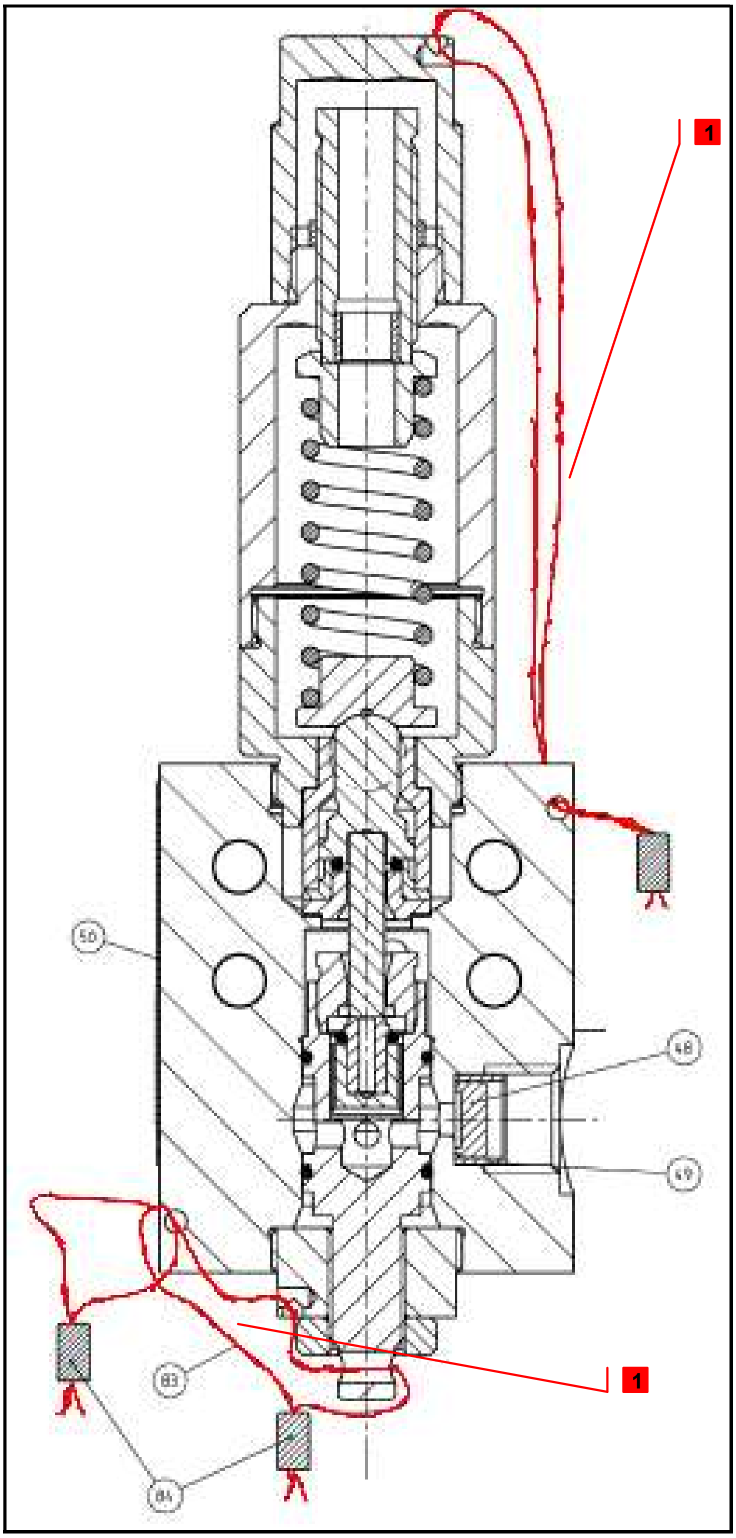
Danger of injury.
• Wear safety gloves.
• Handle the safety valve carefully

**High noise emission**

Hearing damage.
Wear ear protection.

## 9 Disassembly Instructions

### 9.1 Removing the seal




**1. Steps – Descriptions**

1 Cut wire with combination pliers

Pull out seal

**2. Supplies**

None

**3. Tools**

Combination pliers

**4. Appliance**

None

protected

## 9.2 Remove the cap and bug-screen


### 1. Steps – Descriptions

1 Loosen cap [40] and screw off

While loosening cap [40] counter bonnet [9]

2 Unscrew and remove bug-screen [64]

Option Test Gag:
3 Unscrew screw in the cap [40]

While loosening test gag counter bonnet [9]

### 2. Supplies

None

### 3. Tools

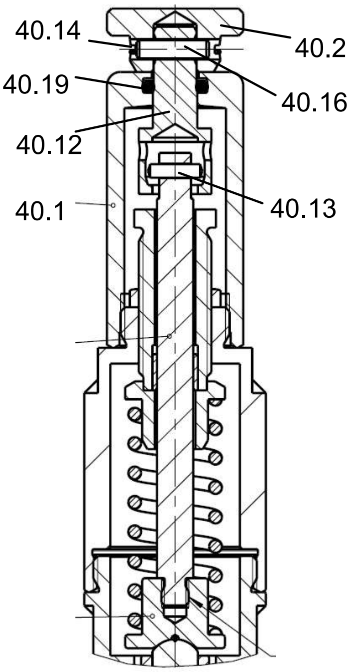
Open-end wrench acc. to LID

### 4. Appliance

Test bench

## 9.3 Disassembly of Pilot Lifting Device









### 1. Steps – Descriptions

2 Tighten cap [40.1]. Put lifting button [40.2] and roll pin [40.16] on coupling [40.12]. Secure roll pin [40.16] with securing ring [40.14]

1 Place coupling [40.12] on the end of spindle [12] and insert parallel pin [40.13]

3 Put o-ring [40.19] in groove of cap [40.1]

4 Screw in spindle [12] into (lower) spring plate [17] hand-tight

**Follow** Error! Reference source not found. **for assembling of bonnet and spring**

5 Cover thread of spindle [12] with adhesive liquid Delo ML 5449

### 2. Supplies

None

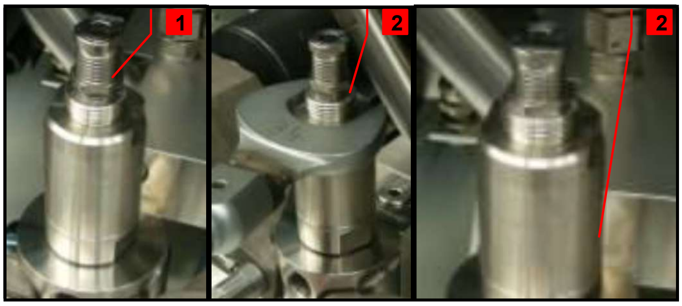
### 3. Tools

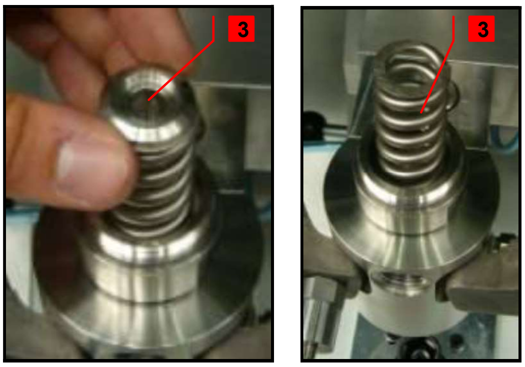
Open-end wrench acc. to LID
Drift pin

### 4. Appliances

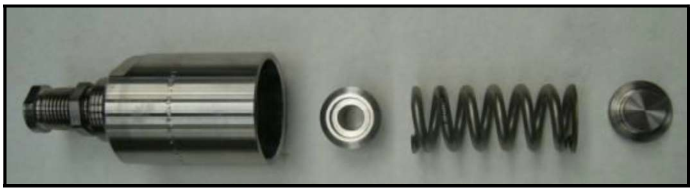
Test bench

## 9.4 Disassembly of the bonnet and spindle unit







### 1. Steps – Descriptions

1 Loosen lock nut [19]
Apply an open-end wrench in a counterclockwise direction on adjusting screw [18] until no more pressure can be felt from spring.

2 Loosen bonnet [9] with open-end wrench and screw it off

3 Remove (upper) spring plate [16], spring and (lower) spring plate [17]

protected

### 2. Supplies

None

### 3. Tools

Open-end wrench acc. to LID

### 4. Appliance

Test bench

## 9.5 Disassembly of the bonnet




### 1. Steps – Descriptions

1 Screw adjusting screw unit out of bonnet [9]

2 Screw off lock nut [19]

3 Detach PTFE-bushing out of adjusting screw [18]



### 2. Supplies

None

### 3. Tools

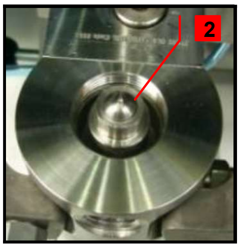
If necessary, in case of sluggishness an open-end wrench

### 4. Appliance

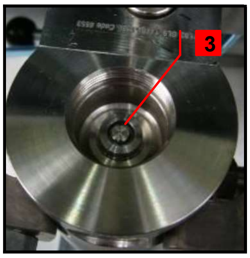
Test bench

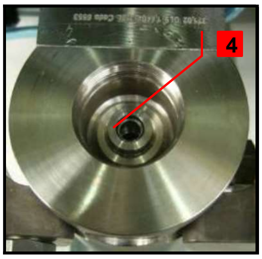
## 9.6 Disassembly of the body

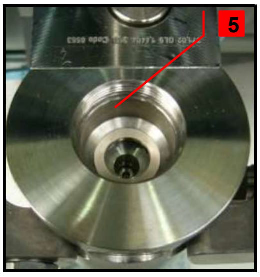









### 1. Steps – Descriptions

1 Screw off bonnet, base part [10] with open-end wrench

2 Remove piston guide [11] and guide [2]

3 Remove plunger [15]

4 Remove (upper) seat, exhaust [13] and (lower) seat, exhaust [14]

5 Remove gasket [35]



### 2. Supplies

None

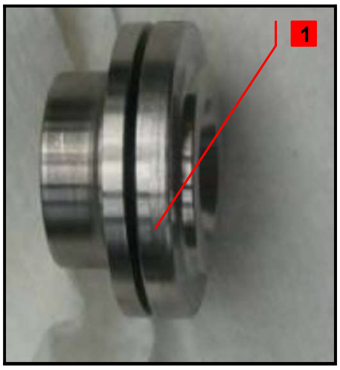
### 3. Tools

Open-end wrench acc. to LID

### 4. Appliance

Test bench

## 9.7 Disassembly of the seat




**1. Steps – Descriptions**

1 Separate seat by pulling (upper) seat, exhaust [13] and (lower) seat , exhaust [14] apart

**2. Supplies**

None

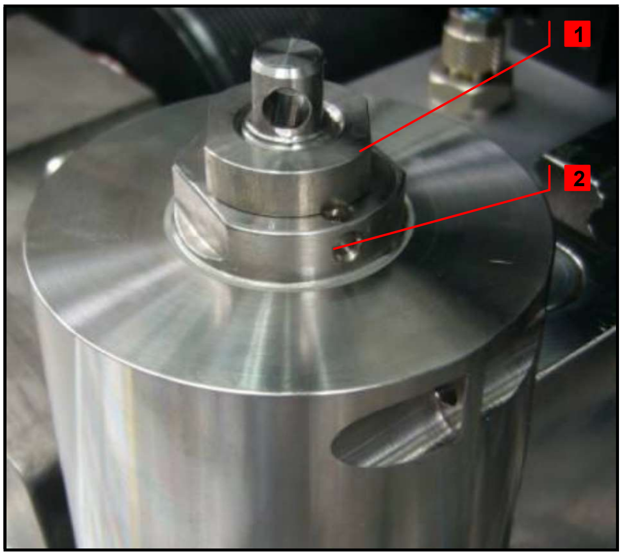
**3. Tools**

None

**4. Appliance**

None

## 9.8 Removing the adjusting screw





### 1. Steps – Descriptions

Measure adjustment of adjusting screw [12] to establish same adjustment after refinishing pilot valve

1 Loosen and remove counter nut [21]

2 Loosen nut [20] of adjusting screw [12]

3 Pull out adjusting screw [12]



### 2. Supplies

None

### 3. Tools

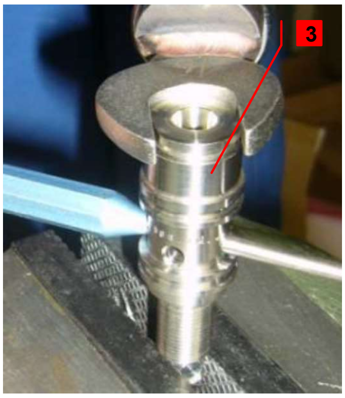
Hook tool for O-rings
Open-end wrench acc. to LID

### 4. Appliance

Test bench

## 9.9 Disassembly of the adjusting screw







### 1. Steps – Descriptions

1 Unscrew nut [20] of adjusting screw [12] with open-end wrench

2 Remove O-rings with hook tool

3 Place adjusting screw [12] in assembling aid pilot (optional: parallel vice with aluminium jaws).
Unscrew seat, feeding [5] and screw it off the adjusting screw [12] with open-end wrench

4 Pull (upper) disc feeding [7] and (lower) disc feeding [8] out of adjusting screw [12]

6 Pull (upper) disc, feeding [7] out of (lower) seat feeding [8]
Remove O-Ring 6,07x1,78 [30] from (upper) disc feeding [7]

### 2. Supplies

None

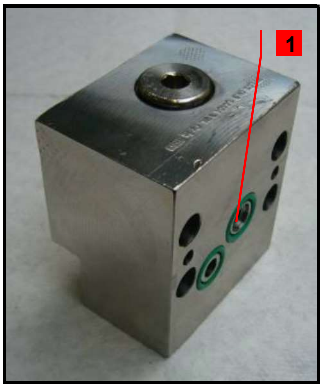
### 3. Tools

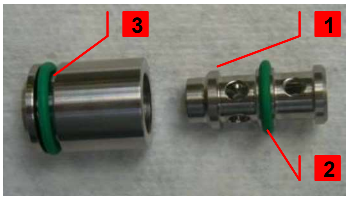
Open-end wrench acc. to LID
Hook tool for O-ring
Drift pin

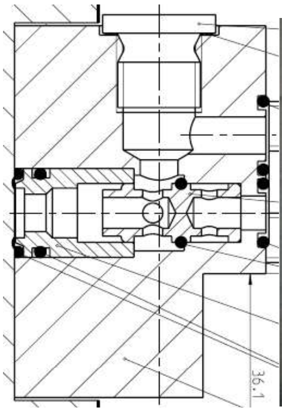
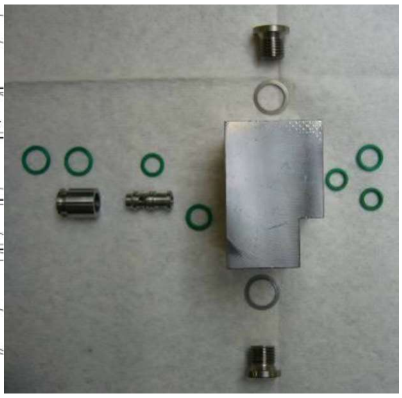
### 4. Appliance

Parallel vice with aluminium jaws
Or as recommended with Assembling aid (60S.2512.4012)

## 9.10 Disassembly of the manifold block





### 1. Steps – Descriptions

1 Remove piston [24.3], bushing [24.2] and O-rings

2 Remove O-rings of piston [24.3]

3 Remove O-rings of bushing [24.2]

4 Screw off lock screw [24.7] and take out gasket [24.8]

### 2. Supplies

None

### 3. Tool

Allen key acc. to LID
Hook tool for O-rings

### 4. Appliance

Parallel vice with aluminium jaws
Test bench

Content

1 General informations for disassembling the Modulate Action Pilot Valve (Diaphragm Design) ........ 2
2 Purpose ........ 2
3 Competences ........ 2
4 Scope ........ 2
5 Disclaimer ........ 2
6 Qualified fitting personnel ........ 2
7 Remarks ........ 2
8 Basic safety guidelines ........ 3
9 Disassembly instructions ........ 6

## 1 General informations for disassembling the Modulate Action Pilot Valve (Diaphragm Design)

## 2 Purpose

The documentation describes the disassembly of the modulate action pilot valve. The description contains every single working step, supplies, tools and appliances.

## 3 Competences

The generation, maintenance and distribution of the documentation takes place in the organisation department. The defaults will be generated by the technical department in consultation with the final assembly department and product planning department.

## 4 Scope

This document must be applied to the dismantling of a Pilot Operated Safety Valve in agencies and subsidiaries of LESER GmbH & Co. KG, customers and independent service center.

## 5 Disclaimer

LESER puts in a great deal of effort into making up-to-date and correct documentation available. Nevertheless, LESER GmbH & Co. KG gives no guarantee that the recommended actions presented here are entirely correct and error free.
This document is to be applied exclusively to the specified type. LESER GmbH & Co. KG declines any liability or responsibility for the correctness and completeness of the content.
LESER GmbH & Co. KG reserves the right to change the information contained in this document, which is for the products of LESER GmbH & Co. KG and is intended for LESER subsidiaries, at any time and without prior announcement.
LESER GmbH & Co. KG is available to the users of this document to provide additional information.

## 6 Qualified fitting personnel

LESER safety valves may only be dismantled by trained or qualified fitters. The qualifications must be obtained through the appropriate training measures.

## 7 Remarks

Gloves must be worn during the entire dismantling process.

## 8 Basic safety guidelines

### Dangerous media

Poisoning, caustic burns, burns, injuries
- Use suitable protective devices
- Use suitable collecting tanks.
- Wear suitable protective equipment.

### Foreign bodies in the safety valve

Danger from failure of safety valve or leaks
- Flush the system before installation of a safety valve.
- Check the safety valve for foreign objects.
- Remove foreign objects

### Bug screen is damaged or missing
***(B or option)***

Dirt, objects or insects get into the safety valve. Danger from malfunction of the safety valve.
- Install the bug screen correctly.
- Check the bug screen regularly.

### Ambient temperature is too high

Material expansion. Danger from malfunction of the safety valve.

### Ambient temperature is too low

Icing, freezing vapours, reduced flow rate due to congealing media. Danger from functional disruption of the safety valve.

### Abrasive or corrosive media
Moving parts jam or become stuck. Danger from functional disruption of the safety valve.
- Service the safety valve after each time it opens.

### Media with high proportion of particles
**(only B)**

Deposits and clogging. Danger from malfunction of the safety valve.

• Use a filter with the correct mesh size.
• Use additional filters to increase the filter capacity.

**Residual media in the safety valve**

Poisoning, caustic burns, burns, injuries
• Wear suitable protective equipment.
• Remove residual media

**WARNING**

**Leaky safety valve**
Danger from leaking media due to damaged
gaskets and sealing surfaces.
• Protect the safety valve against vibrations and blows especially during transport and installation.
• Check safety valve regularly for leaks.

**Open bonnet or spindle guides**

Danger from leaking media
• Make sure that no danger can arise from leaking media.
• Keep a safe distance.
• Wear suitable protective equipment.



**CAUTION**

**Hot medium**

Burns or scalding.
• Wear suitable protective equipment.

**Hot surfaces**
Burns.
• Wear suitable protective equipment.

**Aggressive medium**

Caustic burns.
• Wear suitable protective equipment.

**Open bonnet or spindle guides**

Pinching danger from moving parts.

• Install suitable safeguards.

**Sharp edges and burrs**

Danger of injury.
• Wear safety gloves.
• Handle the safety valve carefully

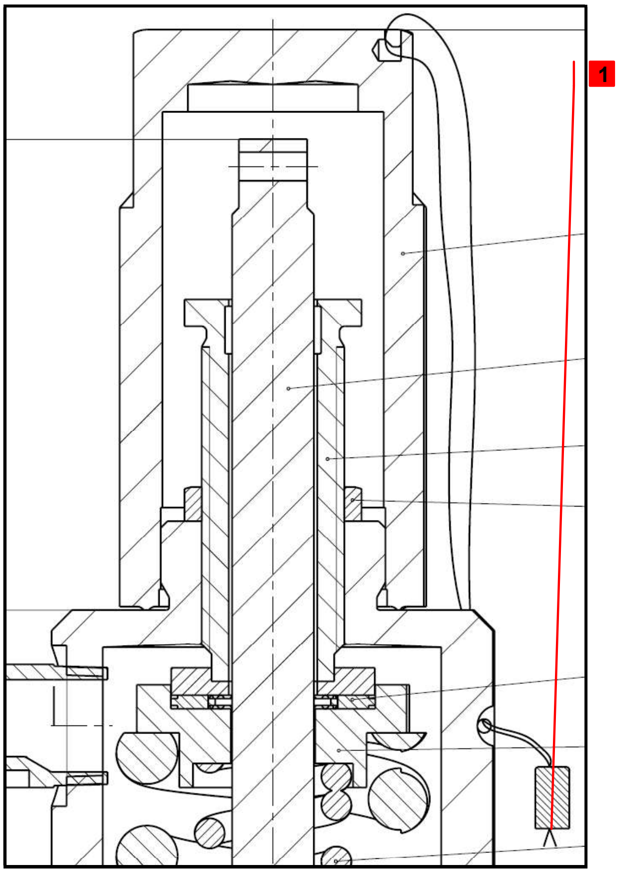
**High noise emission**

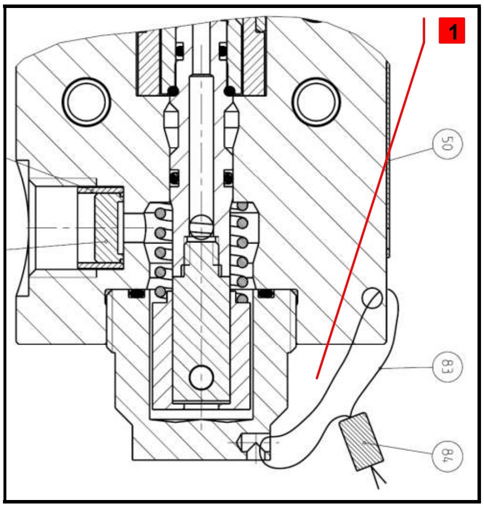
Hearing damage.
Wear ear protection.

# 9 Disassembly instructions

## 9.1 Remove the seal

### 1. Steps – Descriptions




1 Cut wire with combination pliers

Remove seal

### 2. Supplies

None

### 3. Tools

Combination pliers

### 4. Appliance

None

## 9.2 Disassembly of the cap and bug-screen


### 1. Steps – Descriptions

1 Loosen cap [40] with open-end wrench and remove

2 Unscrew and remove bug-screen [64]

Option Test Gag:
Unscrew screw in cap [40]

### 2. Supplies

None

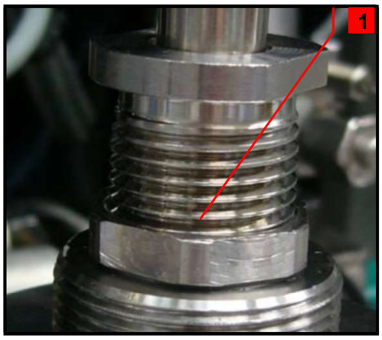
### 3. Tools

Open-end wrench acc. to LID

### 4. Appliance

Test bench

## 9.3 Disassembly of the bonnet and spindle unit








**1. Steps – Descriptions**

1 Loosen lock nut [19] with open-end wrench

2 Apply an open-end wrench in a counterclockwise direction on adjusting screw [18] until no more pressure can be felt from spring.

3 Loosen bonnet [9] with open-end wrench

4 Lift up bonnet [9] along with spindle unit

5 Take spindle unit out of bonnet [9]



**2. Supplies**

None

**3. Tools**

Open-end wrench acc. to LID

**4. Appliance**

Test bench

## 9.4 Disassembly of the spindle unit



### 1. Steps – Descriptions

1 Remove successively bushing; bearing [69]; (upper) spring plate [16] and spring [54] of spindle [12]

2 Screw off (lower) spring plate [17] of spindle [12]

protected

### 2. Supplies

None

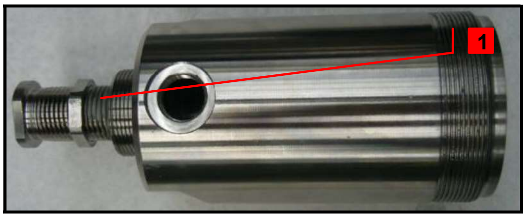
### 3. Tools

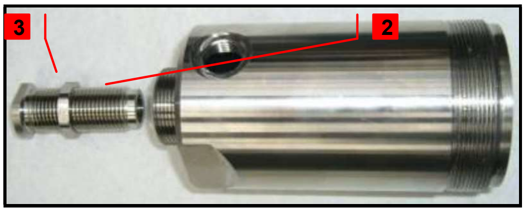
Drift pin

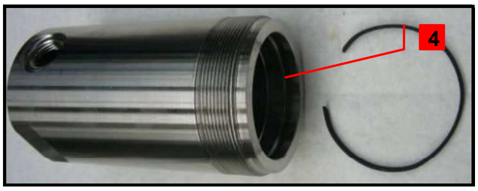
### 4. Appliance

Parallel vice with aluminium jaws

## 9.5 Disassembly of the bonnet






### 1. Steps – Descriptions

1 Loosen lock nut [19] of adjusting screw [18]

2 Screw adjusting screw [18] out of bonnet [9]

3 Completely unscrew lock nut [19] of adjusting screw [18]

4 Remove guide ring [80]

5 Remove (upper) piston [47]

### 2. Supplies

None

### 3. Tools

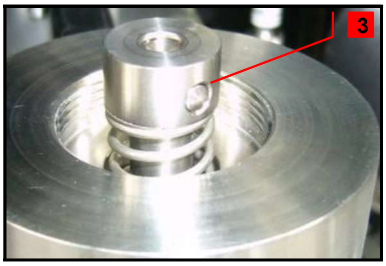
Open-end wrench acc. to LID

### 4. Appliance

None

protected

## 9.6 Disassembly of the body´s bottom side

### 1. Steps – Descriptions

1 Loosen plug [20] with open-end wrench and remove

2 Take out O-ring

3 Remove parallel pin [44] with drift pin

4 Remove coupling [43] and return spring [42] by lifting them upwards



### 2. Supplies

None

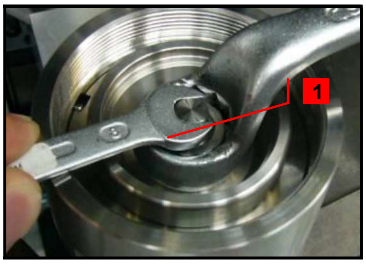
### 3. Tools

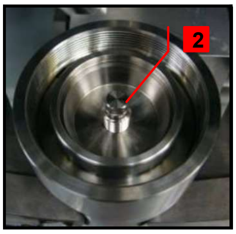
Open-end wrench acc. to LID
Drift pin
Hook tool for O-rings

### 4. Appliance

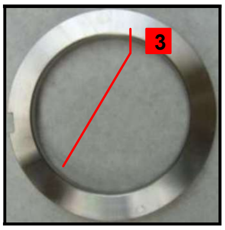
Test bench

## 9.7 Disassembly of the diaphragm

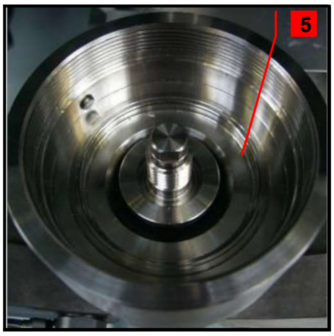








### 1. Steps – Descriptions

1 Loosen nut [70] with cranked ring wrench, while loosening nut [70] counter piston [41]

2 Remove diaphragm washer [71]

3 Remove ring [76]

4 Remove diaphragm [72]

If implemented: Remove FEP protective foil

5 Remove O-ring

6 Remove diaphragm retainer [78]

### 2. Supplies

None

### 3. Tools

Deep cranked ring wrench and Open-end wrench acc. to LID

Hook tool for O-rings

### 4. Appliance

Test bench

## 9.8 Disassembly of the spacer and body




### 1. Steps – Descriptions

1 Loosen lock screw [77] with open-end wrench

2 Unscrew spacer [75] with open-end wrench

3 Remove O-ring



### 2. Supplies

None

### 3. Tools

Ring wrench, open-end wrench and cranked wrench acc. to LID
Hook tool for O-rings

### 4. Appliance

Test bench

## 9.9 Removing the piston unit


### 1. Steps – Descriptions

1 Pull out piston unit



### 2. Supplies

None

### 3. Tools

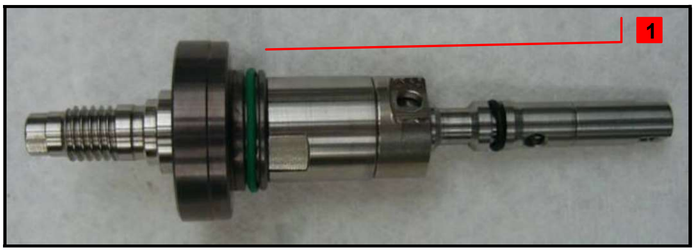
None

### 4. Appliance

Test bench

## 9.10 Removing the guide bush from the piston

### 1. Steps – Descriptions





1 Pull guide bush [2] off piston unit

2 Remove O-rings

protected

### 2. Supplies

None

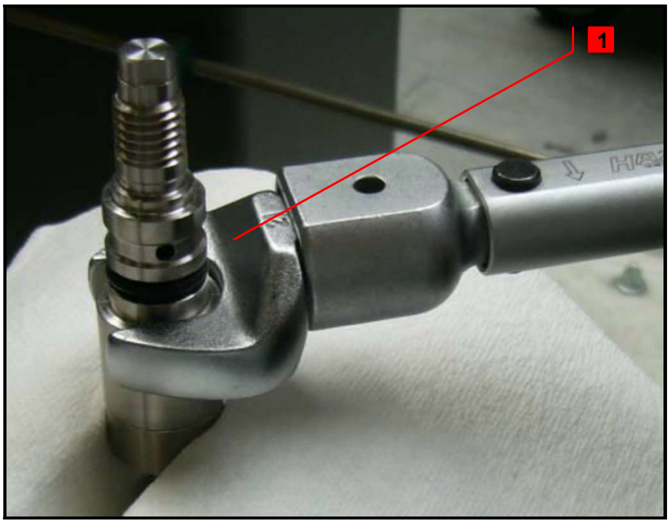
### 3. Tools

Hook tool for O-rings

### 4. Appliance

None

## 9.11 Disassembly of the piston and feed seat unit




### 1. Steps – Descriptions

Place piston unit in parallel vice with aluminium jaws

1 Loosen and remove piston [41] with open-end wrench

### 2. Supplies

None

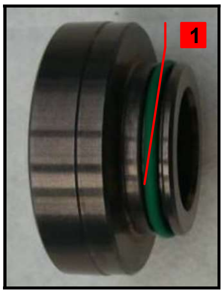
### 3. Tools

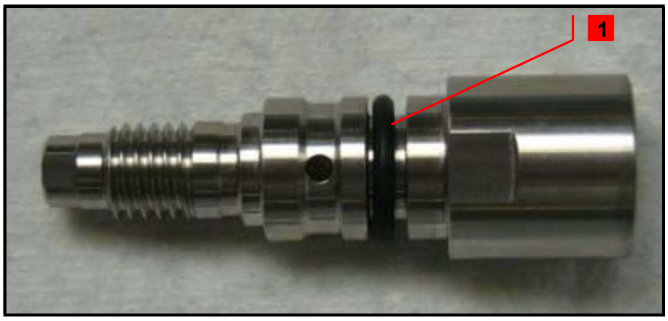
Open-end wrench acc. to LID

### 4. Appliance

Parallel vice with aluminium jaws

## 9.12 Remove the O-rings




### 1. Steps – Descriptions

1 Remove O-rings



### 2. Supplies

None

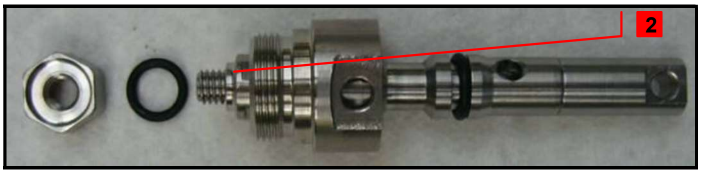
### 3. Tools

Hook tool for O-rings

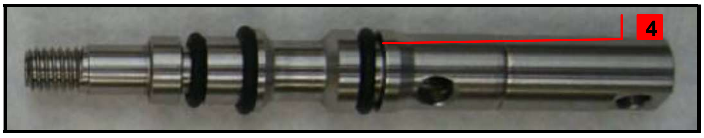
### 4. Appliance

None

## 9.13 Disassembly of the feeding seat unit





### 1. Steps – Descriptions

1 Loosen and unscrew (upper) disc feeding [7] of (lower) disc exhaust [11]

2 Remove O-ring

3 Pull (lower) disc feeding [8] and seat feeding [5] off (lower) disc exhaust [11]

4 Remove O-rings of (lower) disc exhaust [11]

5 Unscrew (lower) disc exhaust [11] and (lower) disc exhaust extension [45]



### 2. Supplies

None

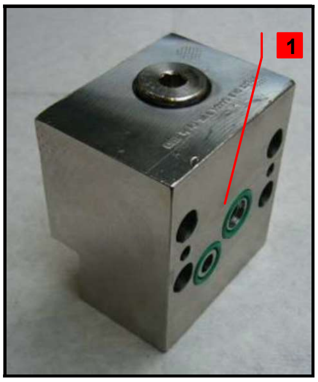
### 3. Tools

Hook tool for O-rings
Drift pin
Open-end wrench acc. to LID

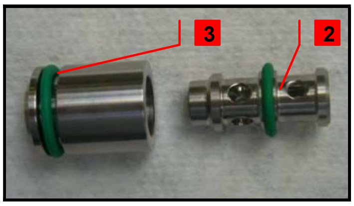
### 4. Appliance

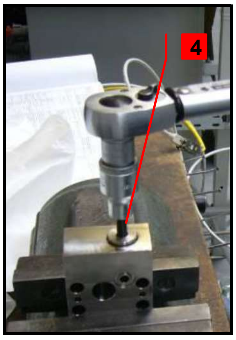
None

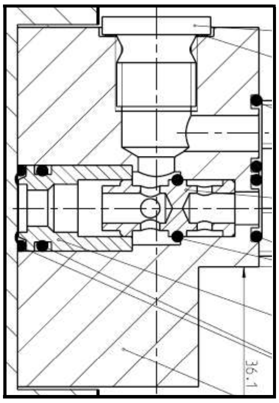
## 9.14 Disassembly of the manifold block

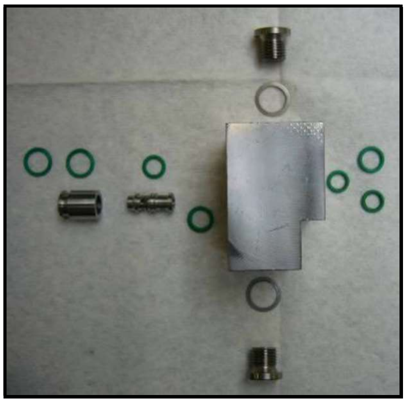








### 1. Steps – Descriptions

1 Remove piston [24.3], bushing[24.2] and O-rings

2 Remove O-rings of piston [24.3]

3 Remove O-rings of bushing [24.2]

4 Screw off lock screw [24.7] and remove gasket [24.8]

### 2. Supplies

None

### 3. Tools

Allen key acc. to LID
Hook tool for O-rings

### 4. Appliance

Parallel vice with aluminium jaws
Test bench

Content

**1 General informations for disassembling the Modulate Action Pilot (Piston Design)........ 2**
**2 Purpose ........ 2**
**3 Competences ........ 2**
**4 Scope ........ 2**
**5 Disclaimer........ 2**
**6 Qualified fitting personnel........ 2**
**7 Remarks........ 2**
**8 Basic safety guidelines ........ 3**
**9 Disassembly instructions........ 6**

## 1 General informations for disassembling the Modulate Action Pilot (Piston Design)

## 2 Purpose

The documentation describes the disassembly of the modulate action pilot valve (piston design). The description contains every single working step, supplies, tools and appliances.

## 3 Competences

The generation, maintenance and distribution of the documentation takes place in the organisation department. The defaults will be generated by the technical department in consultation with the final assembly department and production planning department.

## 4 Scope

This document must be applied to the dismantling of a Pilot Operated Safety Valve in agencies and subsidiaries of LESER GmbH & Co. KG, customers and independent service center.

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## 6 Qualified fitting personnel

LESER safety valves may only be dismantled by trained or qualified fitters. The qualifications must be obtained through the appropriate training measures.

## 7 Remarks

Gloves must be worn during the entire dismantling process.

## 8 Basic safety guidelines

### Dangerous media

Poisoning, caustic burns, burns, injuries
• Use suitable protective devices
• Use suitable collecting tanks.
• Wear suitable protective equipment.

### Foreign bodies in the safety valve

Danger from failure of safety valve or leaks
• Flush the system before installation of a safety valve.
• Check the safety valve for foreign objects.
• Remove foreign objects

### Bug screen is damaged or missing
***(B or option)***

Dirt, objects or insects get into the safety valve. Danger from malfunction of the safety valve.
• Install the bug screen correctly.
• Check the bug screen regularly.

### Ambient temperature is too high

Material expansion. Danger from malfunction of the safety valve.

### Ambient temperature is too low

Icing, freezing vapours, reduced flow rate due to congealing media. Danger from functional disruption of the safety valve.

### Abrasive or corrosive media
Moving parts jam or become stuck. Danger from functional disruption of the safety valve.
• Service the safety valve after each time it opens.

### Media with high proportion of particles
### (only B)

Deposits and clogging. Danger from malfunction of the safety valve.
• Use a filter with the correct mesh size.
• Use additional filters to increase the filter capacity.

**Residual media in the safety valve**

Poisoning, caustic burns, burns, injuries
• Wear suitable protective equipment.
• Remove residual media

**WARNING**

**Leaky safety valve**
Danger from leaking media due to damaged gaskets and sealing surfaces.
• Protect the safety valve against vibrations and blows especially during transport and installation.
• Check safety valve regularly for leaks.

**Open bonnet or spindle guides**

Danger from leaking media
• Make sure that no danger can arise from leaking media.
• Keep a safe distance.
• Wear suitable protective equipment.

**CAUTION**

**Hot medium**

Burns or scalding.
• Wear suitable protective equipment.

**Hot surfaces**
Burns.
• Wear suitable protective equipment.

**Aggressive medium**

Caustic burns.
• Wear suitable protective equipment.

**Open bonnet or spindle guides**

Pinching danger from moving parts.
• Install suitable safeguards.

**Sharp edges and burrs**

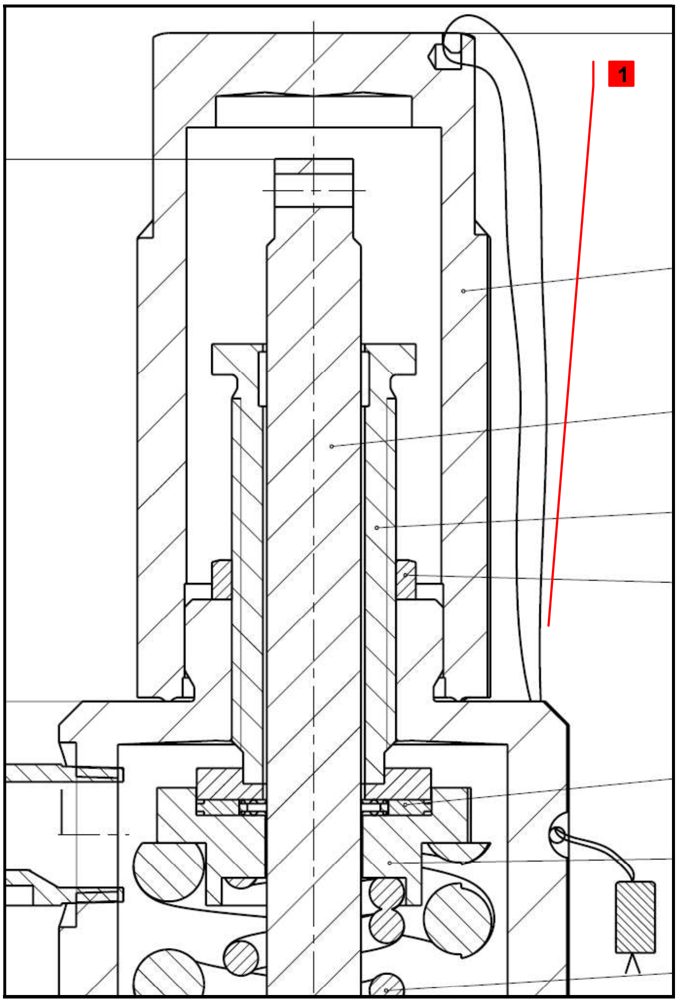
Danger of injury.
• Wear safety gloves.
• Handle the safety valve carefully

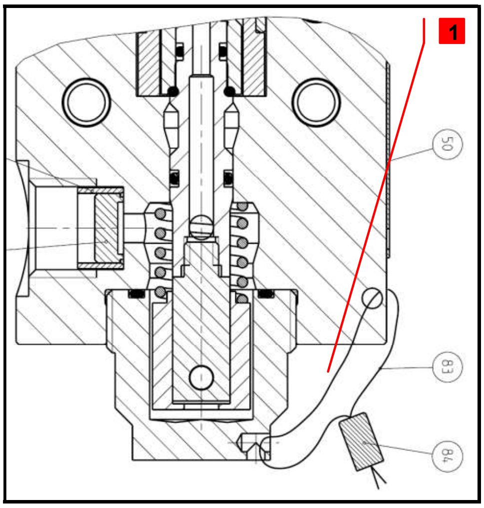
**High noise emission**

Hearing damage.
Wear ear protection.

# 9 Disassembly instructions

## 9.1 Remove the seal




### 1. Steps – Descriptions

1 Cut wire with combination pliers

2 Remove seal

### 2. Supplies

None

### 3. Tools

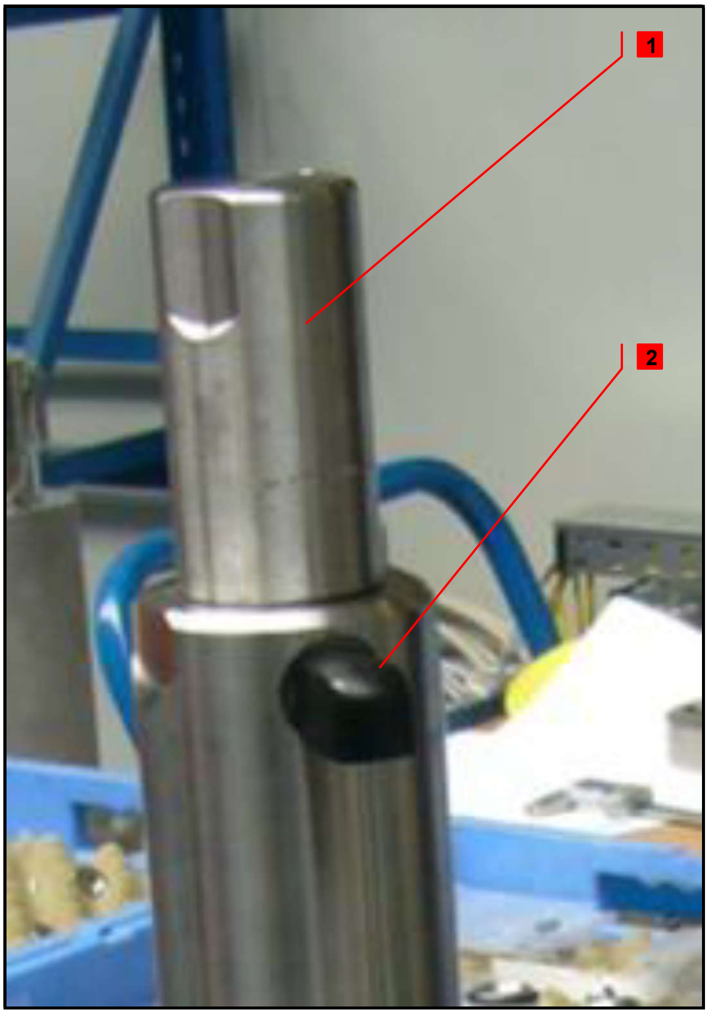
Combination pliers

### 4. Appliance

None

protected

## 9.2 Disassembly of the cap and bug-screen




### 1. Steps – Descriptions

1 Loosen cap [40] with open-end wrench and remove

2 Unscrew and remove bug-screen [64]

Option Test Gag:
Unscrew screw in cap

protected

### 2. Supplies

None

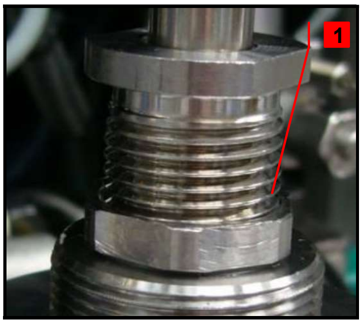
### 3. Tools

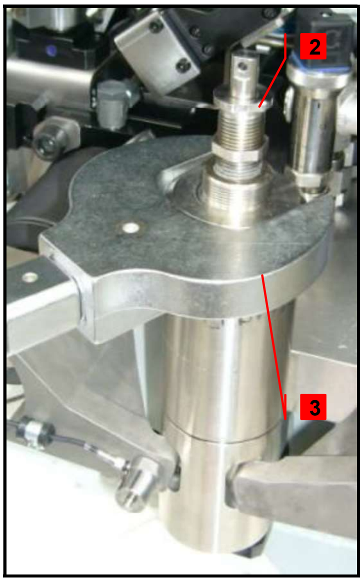
Open-end wrench acc. to LID

### 4. Appliance

Test bench

## 9.3 Disassembly of the bonnet and spindle unit






### 1. Steps – Descriptions

1 Loosen lock nut [19] with open-end wrench

2 Apply an open-end wrench in a counterclockwise direction on adjusting screw [18] until no more pressure can be felt from spring.

3 Loosen bonnet [9] with open-end wrench

4 Lift up bonnet [9] along with spindle unit

5 Take spindle unit out of bonnet [9]

### 2. Supplies

None

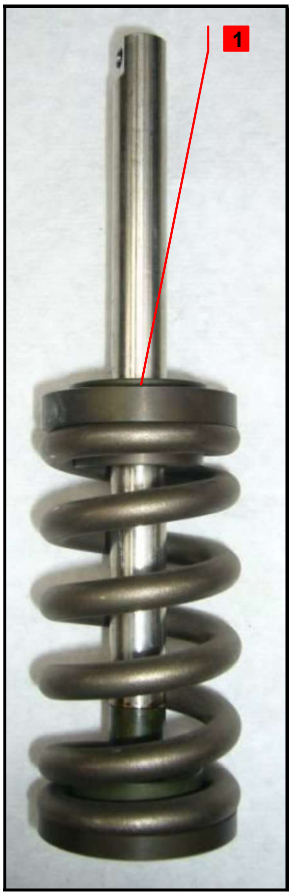
### 3. Tools

Open-end wrench acc. to LID

### 4. Appliance

Test bench

## 9.4 Disassembly of the spindle unit





### 1. Steps – Descriptions

1 Remove successively bushing; bearing [69]; (upper) spring plate [16] and spring [54] of spindle [12]

2 Screw off (lower) spring plate [17] of spindle [12]

protected

### 2. Supplies

None

### 3. Tools

Drift pin

### 4. Appliance

Parallel vice with aluminium jaws

## 9.5 Disassembly of the bonnet


### 1. Steps – Descriptions

1 Loosen lock nut [19] of adjusting screw [18]

2 Screw adjusting screw [18] out of bonnet [9]

3 Completely unscrew lock nut [19] of adjusting screw [18]

protected

### 2. Supplies

None

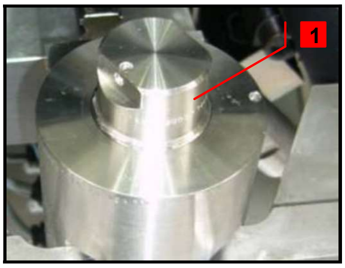
### 3. Tools

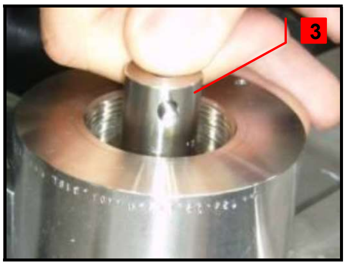
None

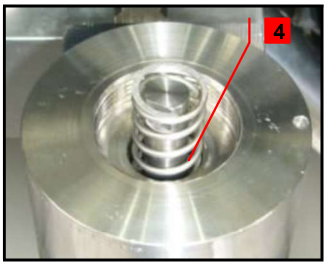
### 4. Appliance

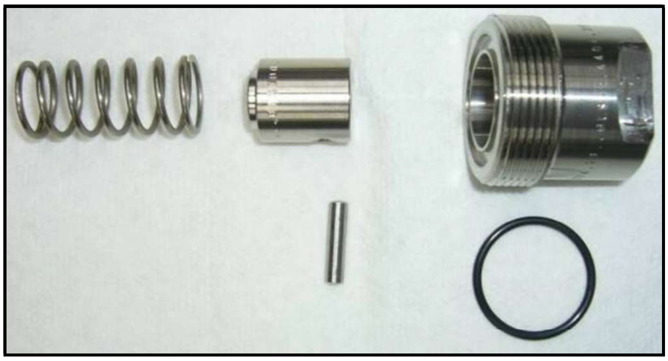
None

## 9.6 Disassembly of the body´s bottom side







**1. Steps – Descriptions**

1 Loosen plug [20] with open-end wrench and screw off

2 Take out O-ring

3 Remove parallel pin [44] with drift pin

4 Remove coupling [43] and return spring [42] by lifting them upwards



**2. Supplies**

None

**3. Tools**

Open-end wrench acc. to LID
Hook tool for O-rings
Drift pin

**4. Appliance**

Test bench


| | | | | | | | |
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| disclosure cat.: | II | proofread: | Cal | published date: | tbd | effect. date: | 02/12 |
| author: | AW | released by: | KUW | replaces: | initial | status: | published |
| resp. depart.: | PP | date of release: | 01/31/12 | revision No.: | 0 | | |
| doc. type: | LGS | change rep. No.: | | retention period: | 10y. | | |

## 9.7 Disassembly of the piston unit and body


### 1. Steps – Descriptions

1 Pull piston unit out of body [1]

protected

### 2. Supplies

None

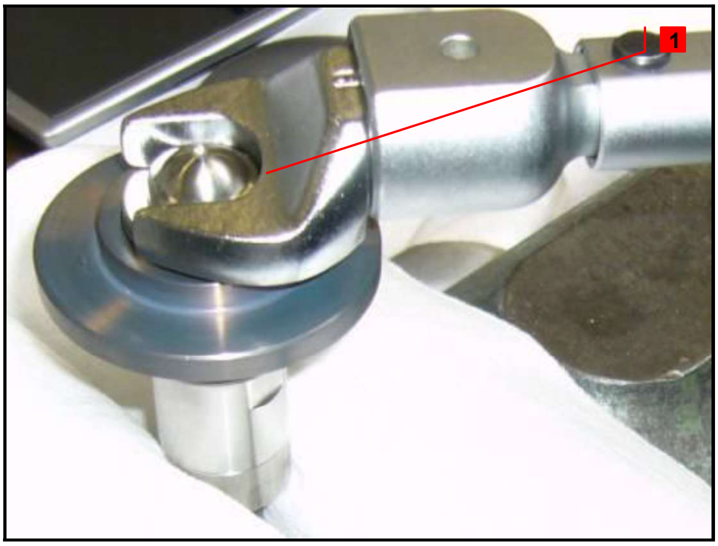
### 3. Tools

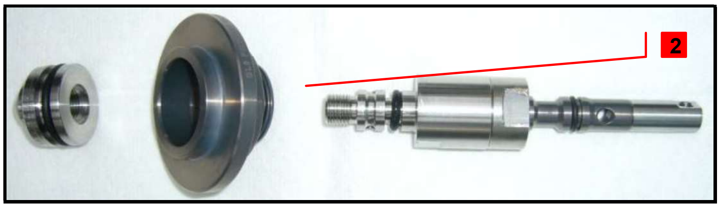
None

### 4. Appliance

Test bench

## 9.8 Disassembly of the guide bush and piston upper




### 1. Steps – Descriptions

Place unit in parallel vice with aluminium jaws

1 Unscrew piston, upper [47]

2 Pull guide bush [2] off piston [41]

### 2. Supplies

None

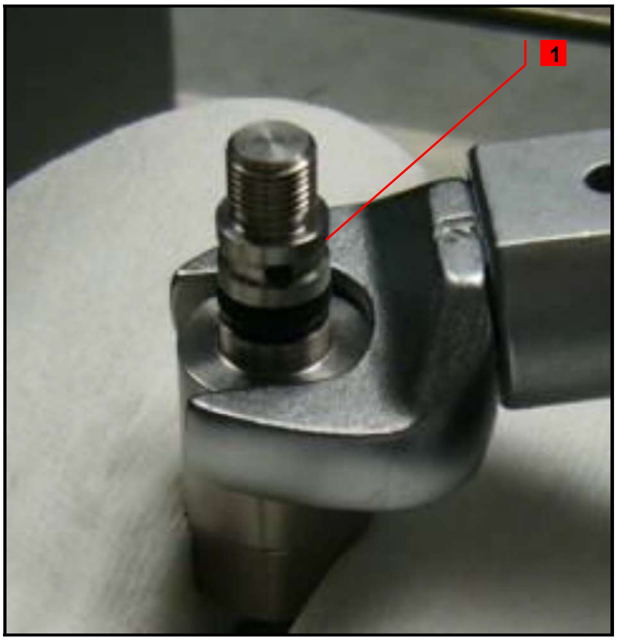
### 3. Tools

Open-end wrench acc. to LID

### 4. Appliance

Parallel vice with aluminium jaws
Assembling aid

## 9.9 Disassembly of the piston and feeding seat unit




### 1. Steps – Descriptions

Place piston unit in parallel vice with aluminium jaws

1 Loosen and remove piston [41] with open-end wrench

protected

### 2. Supplies

None

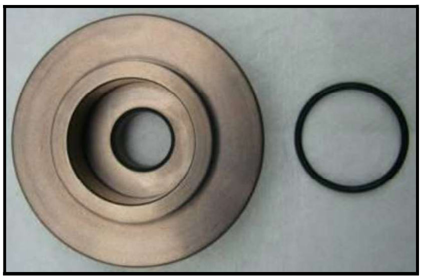
### 3. Tools

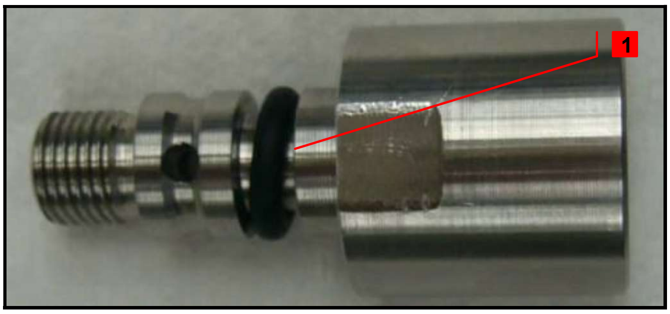
Open-end wrench acc. to LID

### 4. Appliance

Parallel vice with aluminium jaws

## 9.10 Removing the O-rings


### 1. Steps – Descriptions

1 Remove O-rings

### 2. Supplies

None

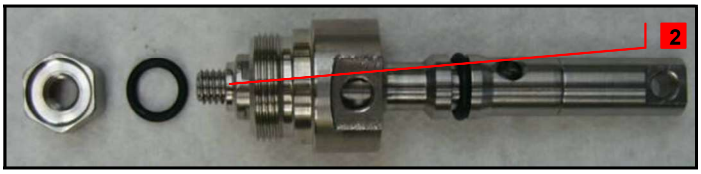
### 3. Tools

Hook tool for O-rings

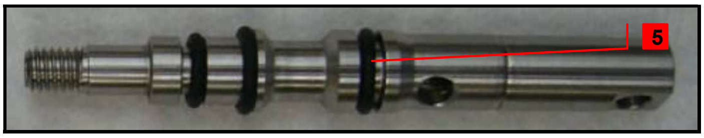
### 4. Appliance

None

### 9.11 Disassembly of the feeding seat unit





**1. Steps – Descriptions**

1 Loosen and unscrew (upper) disc feeding [7] of (lower) disc exhaust [11]

2 Remove O-ring

3 Pull (lower) disc feeding [8] and seat feeding [5] off (lower) disc exhaust [11]

5 Remove O-rings off (lower) disc exhaust [11]

6 Unscrew (lower) disc exhaust [11] and (lower) disc exhaust extension [45]

**2. Supplies**

None

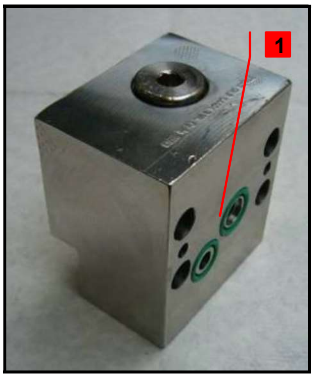
**3. Tools**

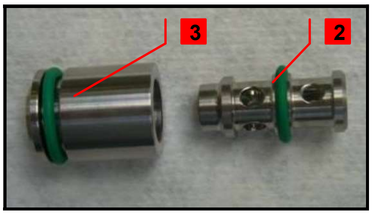
Hook tool for O-rings
Drift pin
Open-end wrench acc. to LID

**4. Appliance**

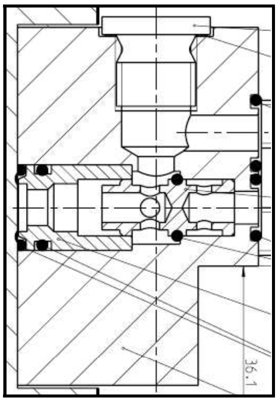
None

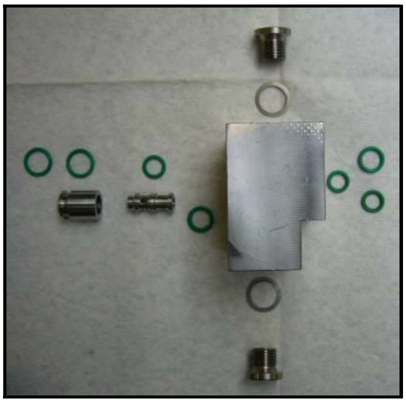
## 9.12 Disassembly of the manifold block







### 1. Steps – Descriptions

1 Remove piston [24.3] bushing [24.4] and O-rings

2 Remove O-rings of piston [24.3]

3 Remove O-rings of bushing [24.4]

4 Screw off lock screw [24.7] and remove gasket [24.8]



### 2. Supplies

None

### 3. Tools

Allen key acc. to LID
Hook tool for O-rings

### 4. Appliance

Parallel vice with aluminium jaws
Test bench

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# 1 General information for disassembling the POSV accessories

## 2 Purpose

The documentation describes the disassembly of the POSV accessories. The description contains every single working step, supplies, tools and appliances.

## 3 Competences

The generation, maintenance and distribution of the documentation takes place in the organisation department. The defaults will be generated by the technical department in consultation with the final assembly department and production planning department.

## 4 Scope

This document must be applied to the assembling of a Pilot Operated Safety Valve with accessories in agencies and subsidiaries of LESER GmbH & Co. KG, customers and independent service center.

## 5 Disclaimer

LESER puts in a great deal of effort into making up-to-date and correct documentation available. Nevertheless, LESER GmbH & Co. KG gives no guarantee that the recommended actions presented here are entirely correct and error free.
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## 6 Qualified fitting personnel

LESER safety valves may only be dismantled by trained or qualified fitters. The qualifications must be obtained through the appropriate training measures.

## 7 Remarks

Gloves must be worn during the entire dismantling process.

## 8 Basic safety guidelines

### Dangerous media

Poisoning, caustic burns, burns, injuries
- Use suitable protective devices
- Use suitable collecting tanks.
- Wear suitable protective equipment.

### Foreign bodies in the safety valve

Danger from failure of safety valve or leaks
- Flush the system before installation of a safety valve.
- Check the safety valve for foreign objects.
- Remove foreign objects

### Bug screen is damaged or missing
***(B or option)***

Dirt, objects or insects get into the safety valve. Danger from malfunction of the safety valve.
- Install the bug screen correctly.
- Check the bug screen regularly.

### Ambient temperature is too high

Material expansion. Danger from malfunction of the safety valve.

### Ambient temperature is too low

Icing, freezing vapours, reduced flow rate due to congealing media. Danger from functional disruption of the safety valve.

### Abrasive or corrosive media
Moving parts jam or become stuck. Danger from functional disruption of the safety valve.
- Service the safety valve after each time it opens.

### Media with high proportion of particles
**(only B)**

Deposits and clogging. Danger from malfunction of the safety valve.
• Use a filter with the correct mesh size.
• Use additional filters to increase the filter capacity.

**Residual media in the safety valve**

Poisoning, caustic burns, burns, injuries
• Wear suitable protective equipment.
• Remove residual media

**WARNING**

**Leaky safety valve**
Danger from leaking media due to damaged gaskets and sealing surfaces.
• Protect the safety valve against vibrations and blows especially during transport and installation.
• Check safety valve regularly for leaks.

**Open bonnet or spindle guides**

Danger from leaking media
• Make sure that no danger can arise from leaking media.
• Keep a safe distance.
• Wear suitable protective equipment.

**CAUTION**

**Hot medium**

Burns or scalding.
• Wear suitable protective equipment.

**Hot surfaces**
Burns.
• Wear suitable protective equipment.

**Aggressive medium**

Caustic burns.
• Wear suitable protective equipment.

**Open bonnet or spindle guides**

Pinching danger from moving parts.
• Install suitable safeguards.

**Sharp edges and burrs**

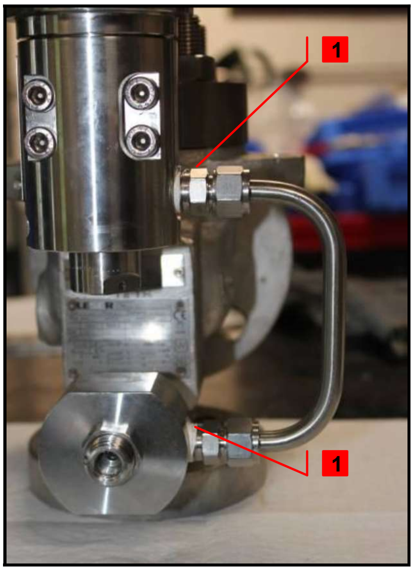
Danger of injury.
• Wear safety gloves.
• Handle the safety valve carefully

**High noise emission**

Hearing damage.
Wear ear protection.

# 9 Disassembly instructions

## 9.1 Disassembly of the FTC (Field Test Connector)




**1. Steps – Descriptions**

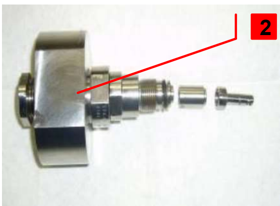
Pay special attention, when opening a closed system regarding any remaining critical media in tubes

**Option A: Remove complete FTC including pitot tube**

1 Screw off compression fitting and remove tube

Make sure that valve body is not connected to inlet pipe

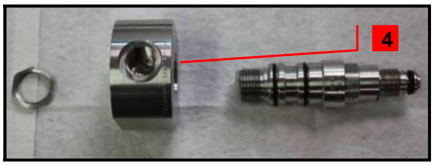
2 Remove complete FTC by loosen fastener (FTC)

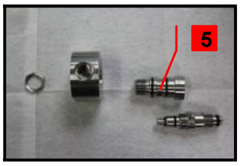




Pull out pitot tube and tube (depends on nominal size)

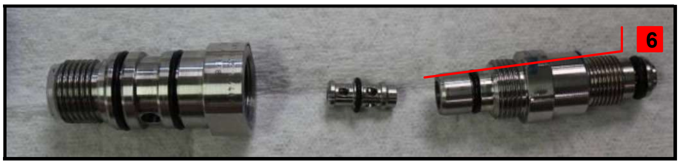
3 4 Loosen lock nut and pull out pressure ring (FTC)




5 Unscrew body (FTC) and fastener (FTC)

6 Pull out piston




7 Remove O-rings


**2. Supplies**

None

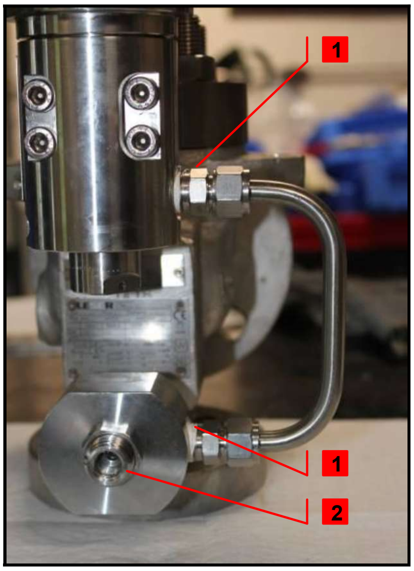
**3. Tools**

Hook tool for O-rings
Open-end wrench acc. to LID

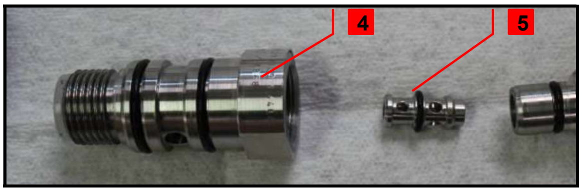
**4. Appliance**

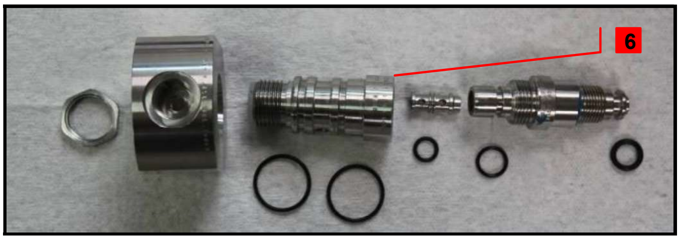
Test bench

## 9.2 Disassembly of the FTC (Field Test Connector)








### 1. Steps – Descriptions

Pay special attention, when opening a closed system regarding any remaining critical media in tubes

**Option B: Remove FTC exclusive pitot tube**

1 Screw off the compression fitting and remove the tube

Make sure that fastener (FTC) stays tightened during disassembly in order that pitot tube stays tightened!

2 Loosen lock nut (FTC)

3 Pull out pressure ring (FTC)

4 Unscrew body (FTC) by securing fastener (FTC) with a second open-end wrench

5 Pull out piston (FTC)

6 Remove O-rings

### 2. Supplies

None

### 3. Tools

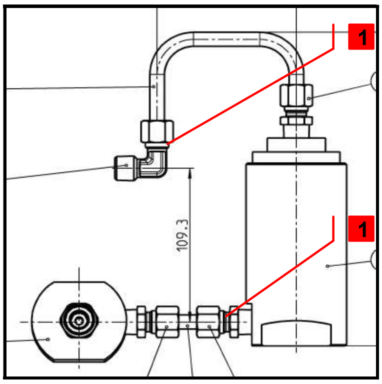
Hook tool for O-rings
Open-end wrench acc. to LID

### 4. Appliance

Test bench

protected

## 9.3 Disassembly of the pilot supply filter










### 1. Steps – Descriptions

1 Loosen compression fitting and remove tube between pilot and pilot supply filter and between pilot supply filter and FTC or main valve

2 Loosen (upper part) housing with open-end wrench and remove including cartridge filter

3 Pull cartridge filter out of (upper part) housing

Remove perforated disc

4 Remove O-ring of cartridge filter and (lower part) filter housing

5 Remove compression fittings of (lower part) housing and (upper part) housing - if necessary

### 2. Supplies

None

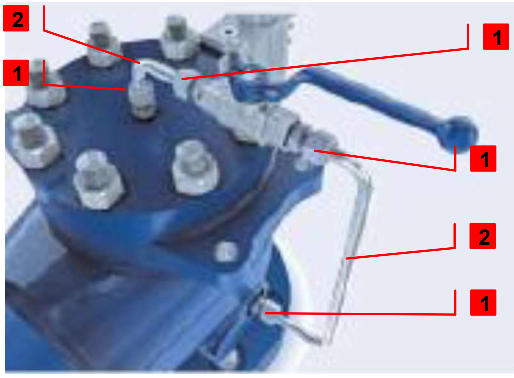
### 3. Tools

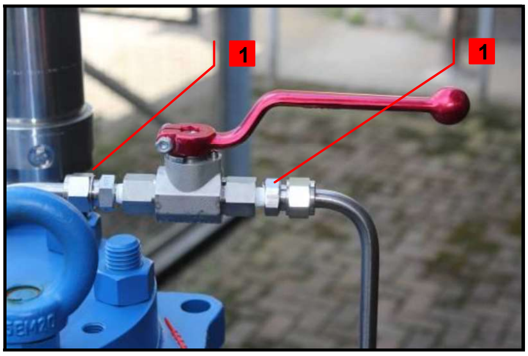
Open-end wrench acc. to LID
Hook tool for O-rings

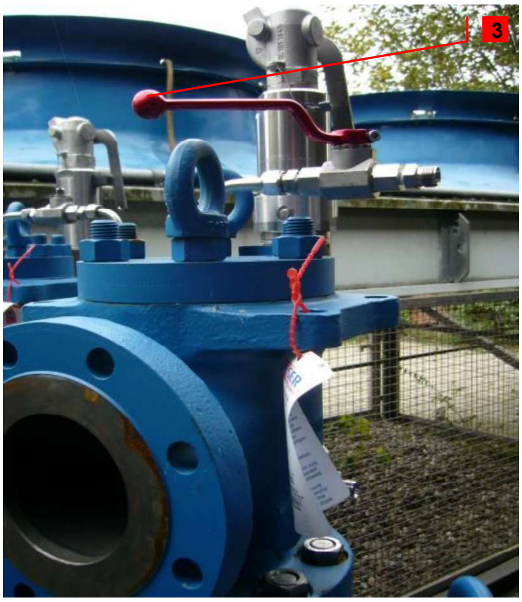
### 4. Appliance

None

## 9.4 Disassembly of the manual blowdown




### 1. Steps – Descriptions

**Option A: Manual blowdown into main valve outlet**

**Make sure that sealing tape is accurately removed from threads and do not fall into dome in any case**

1 Loosen compression fittings

2 Remove L- tube (MBI.2) and U-tube (MBI.1) and male end fittings of top plate, ball valve and body

3 **Option B: Manual blowdown into atmosphere**

1 Loosen compression fittings

2 Remove L- tube (MBI.2) and male fittings of top plate and ball valve

### 2. Supplies

None

### 3. Tools

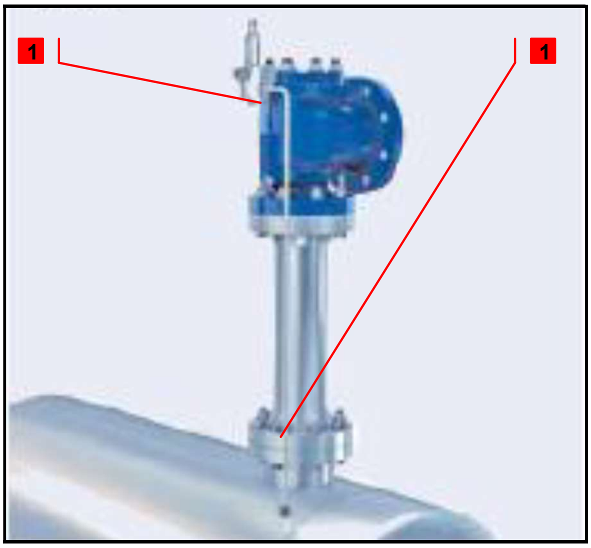
Open-end wrench acc. to LID

### 4. Appliance

None

protected

## 9.5 Disassembly of the remote sensing




**1. Steps – Descriptions**

**Make sure that sealing tape is accurately removed from threads and do not fall into dome in any case**

1 Loosen compression fittings and remove tube and remove male fittings

protected

**2. Supplies**

None

**3. Tools**

Open-end wrench acc. to LID

**4. Appliance**

None

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## 1 General information for assembling the POSV accessories

## 2 Purpose

The documentation describes the assembly of POSV accessories. The description contains every single working step, supplies, tools and appliances.

## 3 Competences

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## 6 Qualified fitting personnel

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## 7 Remarks

- Gloves must be worn during the entire dismantling process.

# 8 Basic safety guidelines

## Dangerous media

Poisoning, caustic burns, burns, injuries
• Use suitable protective devices
• Use suitable collecting tanks.
• Wear suitable protective equipment.

## Foreign bodies in the safety valve

Danger from failure of safety valve or leaks
• Flush the system before installation of a safety valve.
• Check the safety valve for foreign objects.
• Remove foreign objects

## Bug screen is damaged or missing
***(B or option)***

Dirt, objects or insects get into the safety valve. Danger from malfunction of the safety valve.
• Install the bug screen correctly.
• Check the bug screen regularly.

## Ambient temperature is too high

Material expansion. Danger from malfunction of the safety valve.

## Ambient temperature is too low

Icing, freezing vapours, reduced flow rate due to congealing media. Danger from functional disruption of the safety valve.

## Abrasive or corrosive media
Moving parts jam or become stuck. Danger from functional disruption of the safety valve.
• Service the safety valve after each time it opens.

## Media with high proportion of particles

**(only B)**

Deposits and clogging. Danger from malfunction of the safety valve.
• Use a filter with the correct mesh size.
• Use additional filters to increase the filter capacity.

**Residual media in the safety valve**

Poisoning, caustic burns, burns, injuries
• Wear suitable protective equipment.
• Remove residual media

**WARNING**

**Leaky safety valve**
Danger from leaking media due to damaged gaskets and sealing surfaces.
• Protect the safety valve against vibrations and blows especially during transport and installation.
• Check safety valve regularly for leaks.

**Open bonnet or spindle guides**

Danger from leaking media
• Make sure that no danger can arise from leaking media.
• Keep a safe distance.
• Wear suitable protective equipment.

**CAUTION**

**Hot medium**

Burns or scalding.
• Wear suitable protective equipment.

**Hot surfaces**
Burns.
• Wear suitable protective equipment.

**Aggressive medium**

Caustic burns.
• Wear suitable protective equipment.

**Open bonnet or spindle guides**

Pinching danger from moving parts.
• Install suitable safeguards.

**Sharp edges and burrs**

Danger of injury.
• Wear safety gloves.
• Handle the safety valve carefully

**High noise emission**

Hearing damage.
Wear ear protection.

.

## 9 Cleaning the main valve

In case of deep suited soiling on the main valve, use the following four cleaning methods

- Blast cleaning
- Brushing
- Washing
- Cleaning with usual detergents

Disassembly of the main valve acc LID

### 9.1 Blast cleaning

In case of rust, paint or other deep suited soiling use the blast cleaning.

Stainless steel valves - glass bead blast cleaning
Cast steel - sand or bead blast cleaning

The body and top plate must be blasted from the **inside and outside** for as long as it takes to remove all residual paint, rust or other soiling.

- **Caution: Protect the seat sealing surface and working Surfaces, otherwise they will be damaged.**

Figure 1: Flange covering plastic

Figure 2: Flange covering sticker

### 9.2 Brushing

The body´s inside and top plate have to be cleaned with a wire-cup brush and drill / pneumatic grinder until they are clean - until all soiling is removed.

- **Caution: Protect the seat sealing surface and working surfaces, otherwise they will be damaged.**

### 9.3 Washing

When washing, make sure that **all parts** that belong to **one repaired safety valve** are washed together. When filling the washing machine, make sure that the washing medium can flow out of the bodies, bonnets and caps / levers without any residue.

### 9.4 Cleaning with detergents

In case of slight soiling like oil, grease and so on, use a suitable detergent in combination with a cotton cloth or paper towel to clean out all components of the Main Valve.

- **Consider a compatibility of the detergents and the soft sealings**

## 10 Cleaning the pilot valve

Clean the disassembled parts of the pilot valve with a suitable cleaner and a cotton cloth or paper towel.

Disassembly the pilot valve acc. LID

- **Consider a compatibility of the detergents and the soft sealings**

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protected

## 1 General information for assembling the POSV accessories

## 2 Purpose

The documentation describes the assembly of POSV accessories. The description contains every single working step, supplies, tools and appliances.

## 3 Competences

The generation, maintenance and distribution of the documentation takes place in the organisation department. The defaults will be generated by the technical department in consultation with the final assembly department and production planning department.

## 4 Scope

This document must be applied to the assembling of a Pilot Operated Safety Valve with accessories in agencies and subsidiaries of LESER GmbH & Co. KG, customers and independent service center.

## 5 Disclaimer

LESER puts in a great deal of effort into making up-to-date and correct documentation available. Nevertheless, LESER GmbH & Co. KG gives no guarantee that the recommended actions presented here are entirely correct and error free.
This document is to be applied exclusively to the specified type. LESER GmbH & Co. KG declines any liability or responsibility for the correctness and completeness of the content.
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LESER GmbH & Co. KG is available to the users of this document to provide additional information.

## 6 Qualified fitting personnel

LESER safety valves may only be dismantled by trained or qualified fitters. The qualifications must be obtained through the appropriate training measures.

## 7 Remarks

- Gloves must be worn during the entire dismantling process.

## 8 Basic safety guidelines

### Dangerous media

Poisoning, caustic burns, burns, injuries
• Use suitable protective devices
• Use suitable collecting tanks.
• Wear suitable protective equipment.

### Foreign bodies in the safety valve

Danger from failure of safety valve or leaks
• Flush the system before installation of a safety valve.
• Check the safety valve for foreign objects.
• Remove foreign objects

### Bug screen is damaged or missing
***(B or option)***

Dirt, objects or insects get into the safety valve. Danger from malfunction of the safety valve.
• Install the bug screen correctly.
• Check the bug screen regularly.

### Ambient temperature is too high

Material expansion. Danger from malfunction of the safety valve.

### Ambient temperature is too low

Icing, freezing vapours, reduced flow rate due to congealing media. Danger from functional disruption of the safety valve.

### Abrasive or corrosive media
Moving parts jam or become stuck. Danger from functional disruption of the safety valve.
• Service the safety valve after each time it opens.

### Media with high proportion of particles
**(only B)**

Deposits and clogging. Danger from malfunction of the safety valve.
• Use a filter with the correct mesh size.
• Use additional filters to increase the filter capacity.

**Residual media in the safety valve**

Poisoning, caustic burns, burns, injuries
• Wear suitable protective equipment.
• Remove residual media

**WARNING**

**Leaky safety valve**
Danger from leaking media due to damaged gaskets and sealing surfaces.
• Protect the safety valve against vibrations and blows especially during transport and installation.
• Check safety valve regularly for leaks.

**Open bonnet or spindle guides**

Danger from leaking media
• Make sure that no danger can arise from leaking media.
• Keep a safe distance.
• Wear suitable protective equipment.



**CAUTION**

**Hot medium**

Burns or scalding.
• Wear suitable protective equipment.

**Hot surfaces**
Burns.
• Wear suitable protective equipment.

**Aggressive medium**

Caustic burns.
• Wear suitable protective equipment.

**Open bonnet or spindle guides**

Pinching danger from moving parts.
• Install suitable safeguards.

**Sharp edges and burrs**

Danger of injury.
• Wear safety gloves.
• Handle the safety valve carefully

**High noise emission**

Hearing damage.
Wear ear protection.

# 9 Process

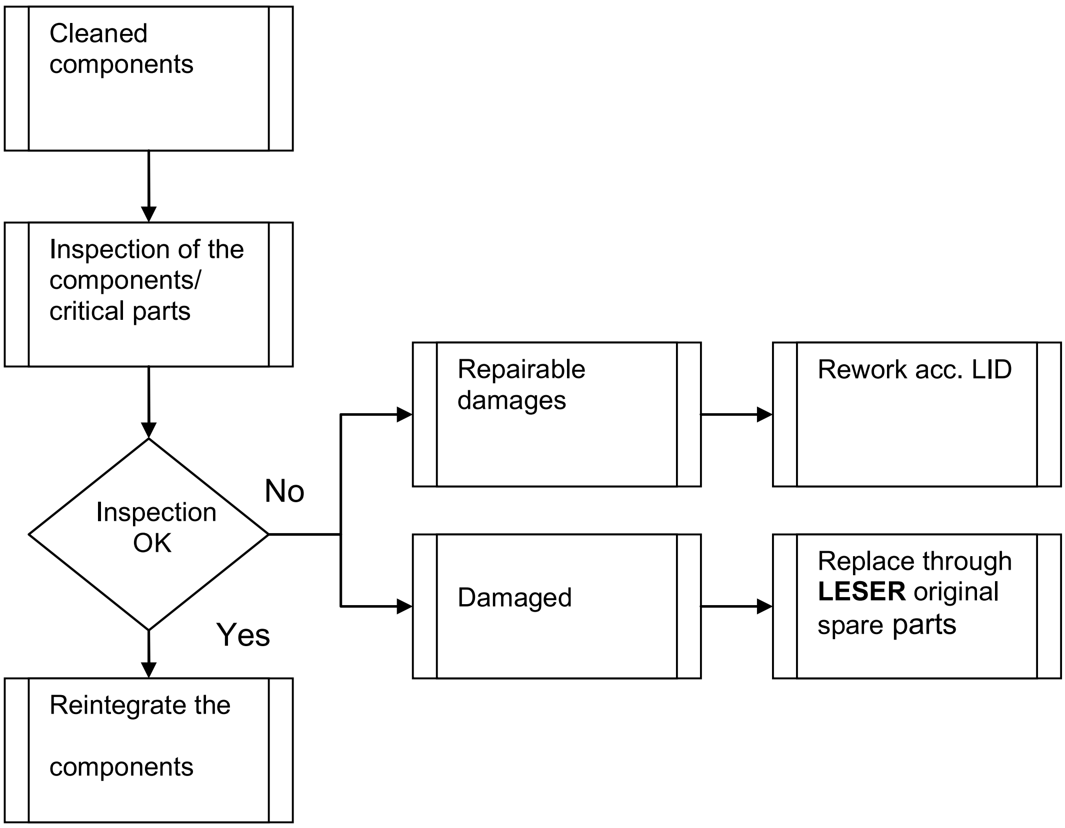


Figure 1

## 10 Critical Parts

During the maintenance procedure pay a special attention to the following parts. They have to suffer a high load during their application. Their viability is determining for the POSV performance.

### 10.1 Main Valve

- O-rings ; guide rings ; back up rings
- Nozzle
- Disc
- Internal tubing in the top plate
- Internal tubing in piston guide
- Piston + piston guide
- Running surfaces

### 10.2 Pilot Valve

- O-rings
- Movable parts
- Running surfaces
- Diaphragm
- Piston
- Nozzle
- Disc

### 10.3 Accessories

- O-rings
- Piston FTC
- Tubes/ fittings

# 11 Inspection of the parts

## 11.1 Main Valve

### 11.1.1 General inspections

Examine all sundries like

- Screws / threads
- Washers
- Spring plates
- Rollpins

referring damages like

- Corrosion
- Worn out areas
- Grooves
- Cracks/fractures

In case of these damages replace the sundries by LESER original spare parts.

### 11.1.2 O-rings; back up rings; guide rings

All O-rings have to be replaced exceptionless and independently on the respective condition of the old part during every maintenance interval, because:

- best possible performance of the reworked safety valve is ensured
- maintenance time is reduced due to omitted testing of old parts

Replace the O-rings only by LESER original spare parts

Independently of replacing the O-rings, examine the condition of every O-ring to check the load of the last work-interval.
In case of highly loaded rings the maintenance intervals should be shortened

This extends to back up rings and guide rings

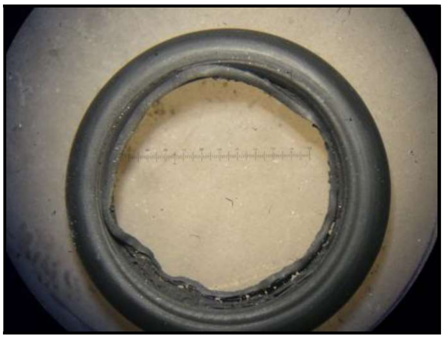

Figure 2: Damaged O-ring

### 11.1.3 Body

Accomplish a visual check of the cleaned main valve body. Make sure that there are no damages through the application or environment on the surface (inside/outside), holes and flange areas such as:

- Rust
- Grooves
- Cracks
- Deformations
- Other kinds of damages

In case of any non-repairable damages on the body do not reintegrate the component for the further application. Replace the body by original LESER spare parts.

In Case of no damages you can reuse the body.

### 11.1.4 Piston complete

Accomplish a visual check of the complete cleaned piston and piston guide. Make sure that there are no damages through the application or contacted medium.

In particular check the surface of the piston body; guide and in addition the internal tubing of the piston guide referring damages like:

- Grooves - caused by the movement
- Worn out areas
- Corrosion of the internal tubing

- Reduction of the bore diameter
- Astringencies of the Internal tubing
- Other kinds of damages

Based on small tolerances in the rework process **consider** the chart with the refinishing tolerances in the LDeS_3309.05_EN

In case of damages replace the piston and piston guide by LESER original spare parts.

**Note: Replace generally piston and piston guide together.**

O-rings; back up rings, guide rings acc LID

### 11.1.5 O-ring disc, complete

Accomplish a visual check for any damages caused though the application such as:

- Grooves in the contact area
- Crushed O-rings
- Cracks
- Corrosion / rust
- Other kinds of damages

In case of damages replace the component by LESER original spare parts.

O-ring acc. LID

### 11.1.6 Nozzle

Accomplish a visual check of the nozzle surface. Make sure that there are no damages such as

- Surface irregularities in the contact area
- Cracks
- Corrosion / rust
- Other kinds of damages

Based on small tolerances in the rework process **consider** the chart with the refinishing tolerances LDeS_3309.05_EN

In case of damages:

Replace the nozzle by LESER original spare parts.

**Note: Replace generally piston and piston guide together.**

### 11.1.7 Top plate

Accomplish a visual check of the top plate. Make sure that there are no damages such as:

- Corrosion of the internal tubings
- Reduction of the bore diameter
- Astringencies of the internal tubings
- Corrosion / Rust on the surface
- Cracks/ fractures
- Other kinds of damages

Figure 3: Rusted top plate

**Caution**: It is not possible to drill out holes with astringencies, reduced diameters or corrosion. If you drill out the hole you will remove the permanent anticorrosive coating.

It is only allowed to purge the internal tubing with water in case of astringencies. In all other cases of damages replace the top plate by LESER original spare parts

### 11.1.8 Pitot tube

Accomplish a visual check of the pitot tube. Examine the surface and diameter. Make sure that there are no damages such as

- Corrosion
- Reduction of the diameter
- Any other kinds of damages

Replace the soft sealing acc. LID

In case of damages replace the pitot tube or any of its components through LESER original spare parts

### 11.1.9 Dome spring

Accomplish a visual check of the spring.
Make sure that there are no damages such as

- Corrosion / Rust
- Fractures
- Permanent compressions
- Other kind of damages

Measure the length of the spring after the disassembly procedure. Check whether the spring has still the original length or suffered any permanent compressions.

In case of damages replace the spring by a spring of LESER original spare parts.

## 11.2 Pilot Valve

### 11.2.1 General inspections

Examine all sundries like

- Screws / threads
- Washers
- Spring plates

referring damages like

- Corrosion
- Worn out areas
- Grooves
- Cracks/fractures
- Other kinds of damages

In case of these damages replace the sundries by LESER original spare parts.

Check the space of the bonnet whether there are any remaining fluids.
- **Occurring fluids may indicate a leaking pilot valve**.

Furthermore check the free movement of every movable part.
- **Sluggishness of the parts may indicate any damages of the components**.


Figure 4: Corroded manifold block

### 11.2.2 O-rings

All O-rings have to be replaced exceptionless during every maintenance interval. Replace the O-rings only with LESER original spare parts to ensure further on a correct operation of the POSV.

Independently of replacing the O-rings examine the condition of every single ring to check the load during the last work-interval

**In case of highly loaded rings the maintenance intervals should be shortened**

This extends to back up rings and guide rings

### 11.2.3 Body, complete bonnet, cap

Make a visual check of the surface and threads. Make sure that there are no damages such as

- Corrosion / rust
- Cracks
- Deformations
- Worn out areas
- Other kinds of damages

In case of damages replace the component by LESER original spare parts.

### 11.2.4 Piston

Examine the piston and its components such as

- Running surfaces
- Contact areas

referring damages like

- Corrosion / rust
- Worn out areas
- Cracks
- Grooves
- Other kinds of damages

In case of such damages replace the components by LESER original spare parts

### 11.2.5 Diaphragm

The Diaphragm has to be replaced exceptionless during every maintenance interval.

Independently of replacing the diaphragm examine the condition of the diaphragm to check the load during the last work-interval

**In case of highly loaded diaphragms the maintenance intervals should be shortened.**

### 11.2.6 Return spring

Examine the spring and make sure that there are no damages like

- Corrosion
- Fractures
- Permanent compressions
- Other kinds of damages

In case of damages replace the spring by LESER original spare parts.

## 11.3 Accessories

### 11.3.1 Field test connector

Accomplish a visual check. In particular examine the inside and running surfaces regarding any damages like

- Corrosion
- Grooves in the running surfaces
- Reduced diameters
- Other kinds of damages

In case of damages replace all concerned components by LESER original spare parts.

### 11.3.2 Pilot supply filter

Accomplish a visual check of the filter.
Examine the cartridge filter referring

- Pollution
- Corrosion
- Astringencies
- Other kinds of pollutions / damages

In case of damages replace the concerned parts by LESER original spare parts

In case of pollution clean the components

### 11.3.3 Manual blowdown

Check the ball valve referring the

- Free movement of the lever
- Damages of the inner ball
- Corrosion
- Any other damages

Check the tubework referring the

- Corrosion
- Reduced diameters

In case of damages replace the ball valve, fittings or tubes by LESER original spare parts.

### 11.3.4 Remote sensing

Accomplish a visual check of the tubes and fittings.
Make sure that there are no damages like

- Astringencies of the tubes
- Corrosion / rust
- Other kinds of damages

In case of damages replace the concerned components by LESER original spare parts.

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## 1 Purpose

This LDeS gives information about the dimensions and the surface quality which have to be observed during the refinishing work, it also provides the work instructions. This LDeS replaces dimensional drawing no. 395 19 09.

## 2 Scope

This LDeS applies to the LESER sites Hamburg and Hohenwestedt. This LDeS is valid for:

- semi nozzles
- discs without lifting gear
- discs with removable lifting gear for screwed nozzles

## 3 References

None

## 4 Conditional Agreement

The further mentioned rules for the refinishing of seats and discs have been issued and explained in all conscience and describe the particular final design of the components.

LESER reserves the right to make necessary modifications at the components without determining these changes in this standard directly. So, if there are any doubts on user side when applying these rules, LESER has to be contacted before performance of rework to clarify the actual situation.

When applying these rules and regulations it has to be considered generally that they describe the refinishing at components which have an effect on the function and capacity of the safety valves. Even marginal deviations to this guidelines can effect a malfunction or constricted capacity of the safety valve and therewith an inadmissible pressure increase can arise during application/operation. This could possibly have serious consequences for humans and environment. Therefore it has to be proceed carefully when applying these rules.

LESER assumes no liability for safety devices which have been repaired or reworked in accordance with this LDeS. The repair shop is solely responsible for the function and capacity of the re-introduced safety device.

The user of this LDeS should be clear on the fact that the repair of a safety device against inadmissible overpressure is subjected to European and international laws. The violation of valid rules will be traced and avenged acc. to relevant legislations.

In case of any doubts during application of this LDeS, LESER has to be consulted before starting repair or rework of LESER safety devices.



## 5 Introduction

If the sealing surfaces of seat and disc have been damaged by frequent setting, for example, or by impurities in the medium, the original sealing quality can be restored by refinishing of the sealing surfaces.

## 6 Execution

The refinishing by smooth turning and grinding with final lapping should be done on the seat and if necessary also on the disc with the least possible swarf. Please see the limiting values in the following tables.

### 6.1 Measures and facing profile

Tables 5.1, 6.1, 8.1, 9.1, 10.1, 11.1, 12.1, 13.1, 14.1, 15.1, 16.1 and 17.1, together with the corresponding illustrations, contain the linear and square dimensions which have to be observed. After processing of the seat surface it is also important that the seat profile is restored moderately using inner and outer chamfers. If necessary the contact surface between the spindle guide and the body has to be refinished coplanar and concentric to the seat.

### 6.2 Surface quality

A surface quality to a mean roughness depth of Rz1 (Mirror Finish) must be achieved on both sealing surfaces through lapping.

### 6.3 Test

In a final test on the mounted valve, it has to be guaranteed that:

- The semi rings on the spindle must be off the guide when the valve is closed.
- The lower spring plate may not touch the guide when the spring is assembled.
- In lift restricted valves, the lift restriction must be checked and if necessary the lift restriction bushing extended.

## 7 Refinishing of seat and disc for types 441 and 421, metal sealing

Work is to be done according to illustrations 5.1, 5.2 and 5.3 and according to table 5.1

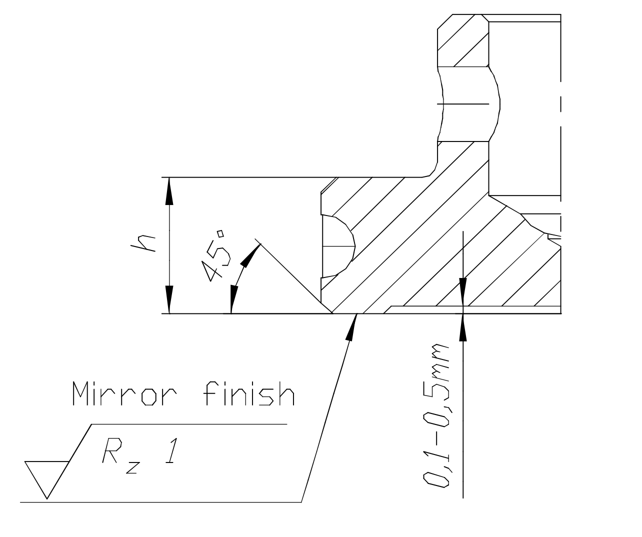


Illustration 5.1

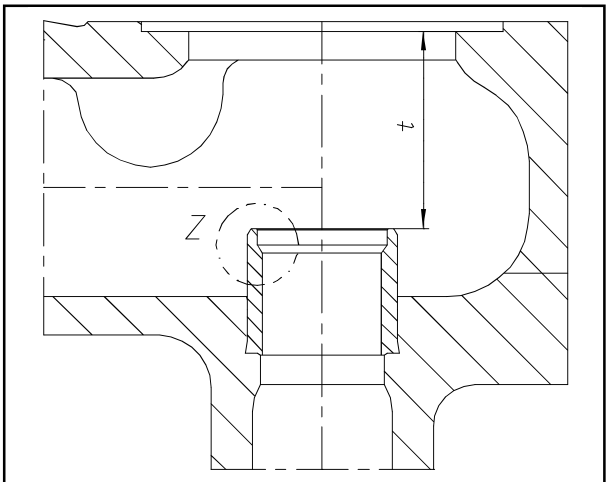


Illustration 5.3

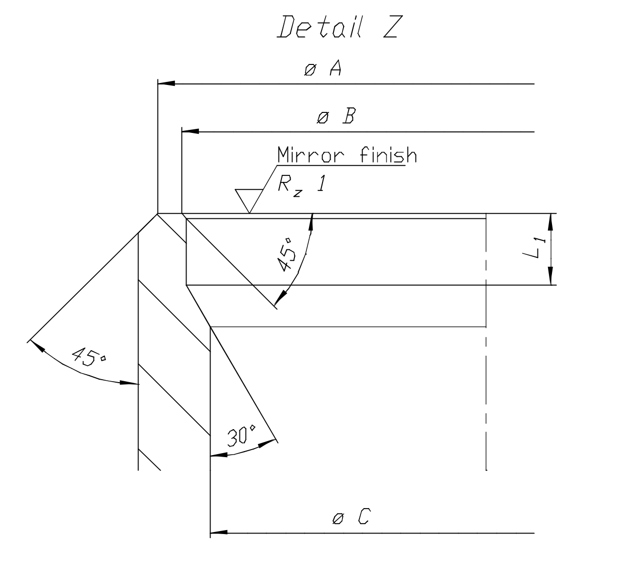


Illustration 5.2

Changes in dimension may only be so large that the highest admissible dimension for t is not exceeded and the smallest admissible dimension for h is not fallen below. The dimensions A and B on the seat must be restored with inner and outer chamfering.



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The recess dimensions "$L_1$" do not have to be reworked by a lathe, but must be preserved at their original order of magnitude. The maximum allowable reduction in "$L_1$" is 0,5 mm.

**Table 5.1: seats and discs of type 441 and 421**

| C [mm] | 441 DN [mm] | 421 DN [mm] | Refinishing of seat: Seat depth T [mm] | Refinishing of seat: Tolerance for t [mm] | Refinishing of seat: B ∅ [mm] | Refinishing of seat: A ∅ [mm] | Refinishing of disc: Boundary height h [mm] | Refinishing of disc: Tolerance for h [mm] |
|---|---|---|---|---|---|---|---|---|
| 18 | 20 | - | 24,5 | +0,5 | $18{,}4_{-0{,}2}$ | $20{,}4^{+0{,}2}$ | 7,0 | -0,2 |
| 23 | 25 | 25 | 38,0 | +0,5 | $25{,}4_{-0{,}2}$ | $27{,}4^{+0{,}2}$ | 9,1 | -0,2 |
| 29 | 32 | 32 | 47,0 | +0,5 | $32{,}4_{-0{,}2}$ | $34{,}4^{+0{,}2}$ | 9,1 | -0,2 |
| 37 | 40 | 40 | 53,0 | +0,5 | $40{,}4_{-0{,}2}$ | $42{,}4^{+0{,}2}$ | 9,1 | -0,25 |
| 46 | 50 | 50 | 53,5 | +0,5 | $50{,}4_{-0{,}3}$ | $53{,}4^{+0{,}3}$ | 10,1 | -0,25 |
| 60 | 65 | 65 | 63,5 | +0,5 | $67{,}0_{-0{,}3}$ | $71{,}0^{+0{,}3}$ | 11,0 | -0,25 |
| 74 | 80 | 80 | 91,0 | +0,8 | $82{,}0_{-0{,}3}$ | $86{,}0^{+0{,}3}$ | 10,0 | -0,3 |
| 92 | 100 | 100 | 114,0 | +0,8 | $103{,}0_{-0{,}3}$ | $108{,}0^{+0{,}3}$ | 11,5 | -0,3 |
| 98 | 125 | 125 | 114,0 | +0,8 | $103{,}0_{-0{,}3}$ | $108{,}0^{+0{,}3}$ | 11,5 | -0,3 |
| 125 | 150 | 150 | 154,5 | +1 | $130{,}0_{-0{,}3}$ | $135{,}0^{+0{,}3}$ | 14,5 | -0,4 |
| 165 | 200 | - | 257,1 | +1 | $180{,}0_{-0{,}4}$ | $186{,}0^{+0{,}4}$ | 15,5 | -0,4 |
| 200 | 250 | - | 273,0 | +1,5 | $220{,}0_{-0{,}4}$ | $226{,}0^{+0{,}4}$ | 17,5 | -0,5 |
| 235 | 300 | - | 318,0 | +1,5 | $259{,}0_{-0{,}5}$ | $265{,}0^{+0{,}5}$ | 28,0 | -0,5 |
| 295 | 400 | - | 391,5 | +1,5 | $326{,}0_{-0{,}5}$ | $332{,}0^{+0{,}5}$ | 32,0 | -0,5 |

## 8 Refinishing of seat and disc for types 431 and 411, metal sealing

Work is to be done according to illustrations 6.1, 6.2 and 6.3 and according to table 6.1.

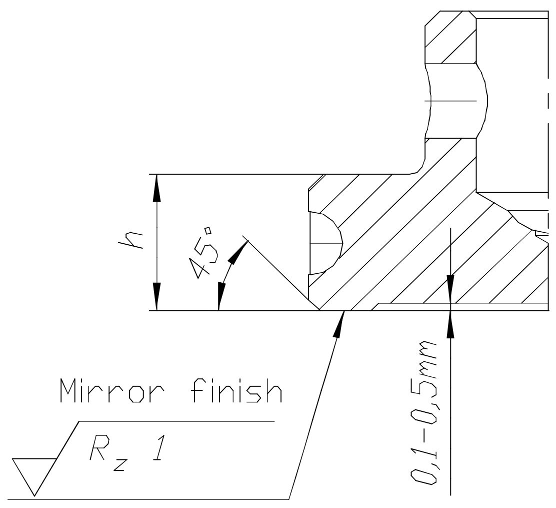


**Illustration 6.1**

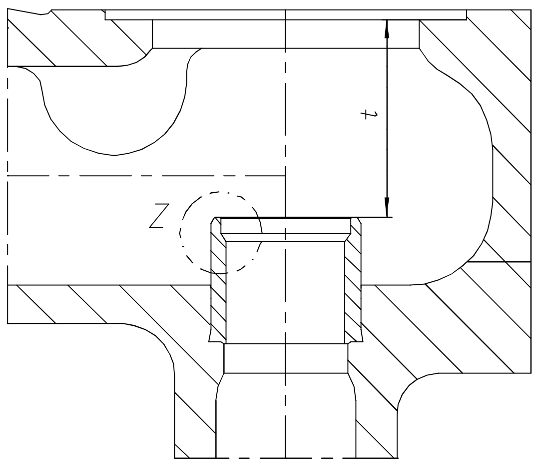


**Illustration 6.3**

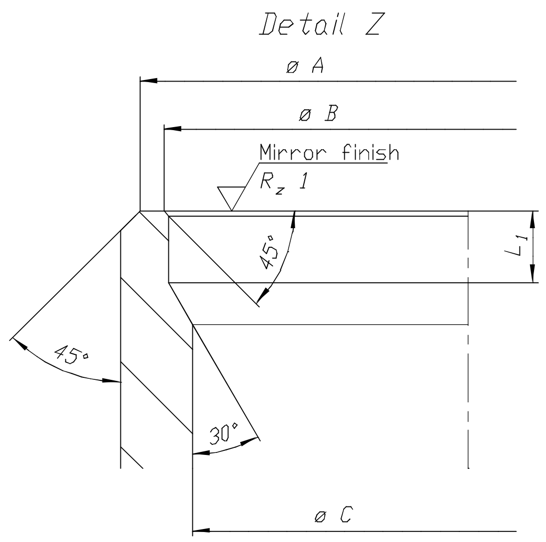


**Illustration 6.2**

Changes in dimension may only be so large that the highest admissible dimension for t is not exceeded and the smallest admissible dimension for h is not fallen below. The dimensions A and B on the seat must be restored with inner and outer chamfering.

The recess dimensions "$L_1$" do not have to be reworked by a lathe, but must be preserved at their original order of magnitude. The maximum allowable reduction in "$L_1$" is 0,5 mm.

**Table 6.1: seats and discs of type 431 and 411**

| C [mm] | 431 DN [mm] | 411 DN [mm] | Refinishing of seat: Seat depth t [mm] | Refinishing of seat: Tolerance for t [mm] | Refinishing of seat: B ∅ [mm] | Refinishing of seat: A ∅ [mm] | Refinishing of disc: Boundary height h [mm] | Refinishing of disc: Tolerance for h [mm] |
|---|---|---|---|---|---|---|---|---|
| 12 | 15 | - | 22,0 | +0,3 | $13{,}7_{-0{,}2}$ | $15{,}3^{+0{,}2}$ | 20 | -0,2 |
| 18 | 20-32 | 20-32 | 22,5 | +0,5 | $18{,}4_{-0{,}2}$ | $20{,}4^{+0{,}2}$ | 7,0 | -0,2 |
| 23 | 40 | 40 | 25,0 | +0,5 | $25{,}4_{-0{,}2}$ | $27{,}4^{+0{,}2}$ | 9,1 | -0,2 |
| 29 | 50 | 50 | 28,0 | +0,5 | $32{,}4_{-0{,}2}$ | $34{,}4^{+0{,}2}$ | 9,1 | -0,2 |
| 37 | 65 | 65 | 35,0 | +0,5 | $40{,}0_{-0{,}2}$ | $42{,}4^{+0{,}2}$ | 9,1 | -0,25 |
| 46 | 80 | 80 | 39,0 | +0,5 | $50{,}4_{-0{,}3}$ | $53{,}4^{+0{,}3}$ | 10,1 | -0,25 |
| 60 | 100 | 100 | 55,0 | +0,5 | $67{,}0_{-0{,}3}$ | $71{,}0^{+0{,}3}$ | 11,0 | -0,25 |
| 74 | 125 | 125 | 62,0 | +0,8 | $82{,}0_{-0{,}3}$ | $86{,}0^{+0{,}3}$ | 10,0 | -0,3 |
| 92 | 150 | 150 | 72,0 | +0,8 | $103{,}0_{-0{,}3}$ | $108{,}0^{+0{,}3}$ | 11,5 | -0,3 |

## 9 Refinishing of seat and disc types 441 and 431, O-ring seals

Work is to be done according to illustration 7.1

The outer chamfer of these seats is responsible for the sealing (see illustration 7.1), therefore the diameter of the seat must not be changed. In case of edge damage, the seat surface may be turned or ground by between 0,2 and 0,4 mm until the damage is removed. After that the edge should be carefully treated with smooth emery paper to restore an angle of 45°. Please make sure that the edge is free for burrs.

The O-ring in the disc must be renewed.

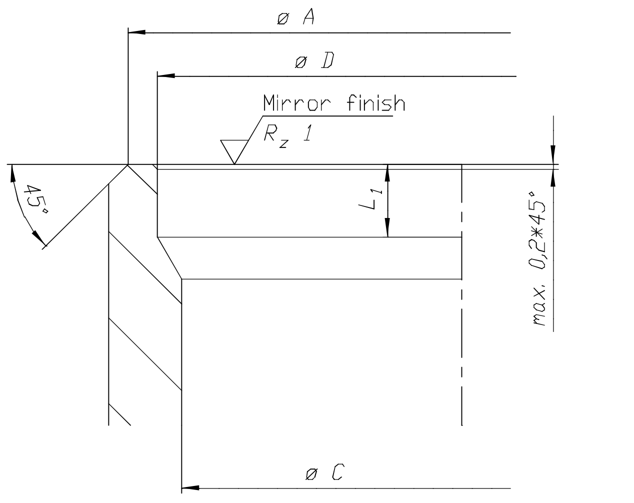


**Illustration 7.1**

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## 10 Refinishing of seat and disc for type 455 and 456, metal sealing

Work is to be carried out according to the illustrations 8.1, 8.2 and 8.3 and according to table 8.1.

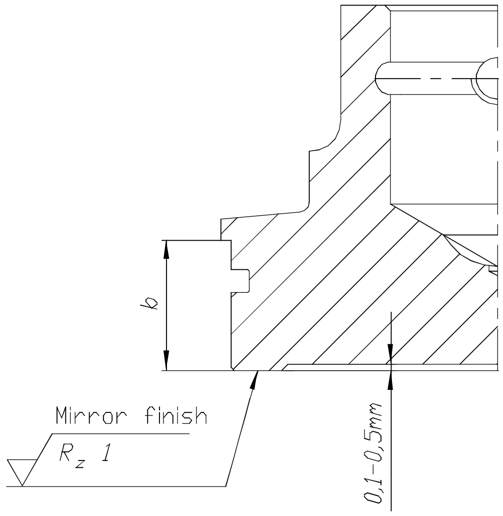



**Illustration 8.1**

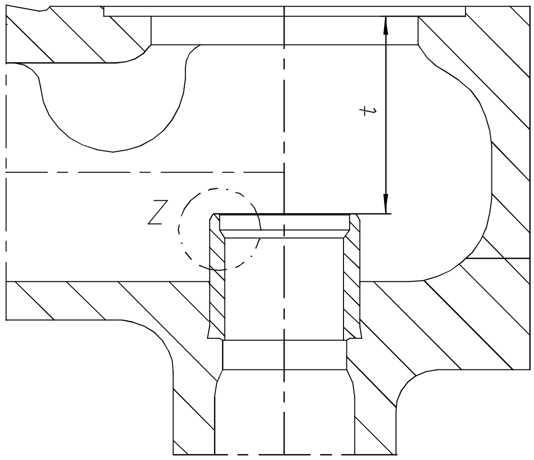



**Illustration 8.3**

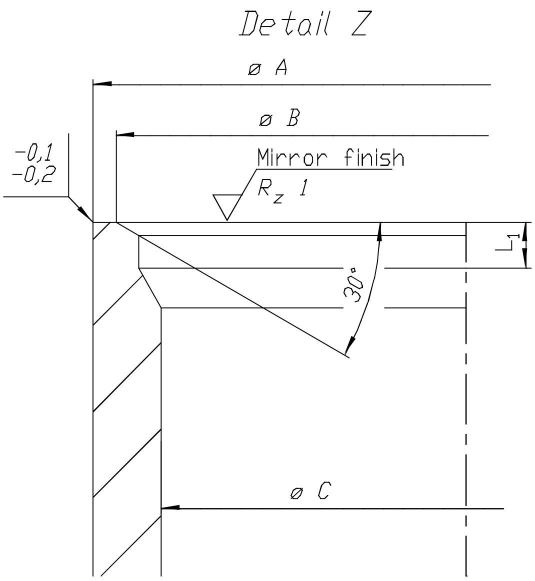



**Illustration 8.2**

Changes in dimension may only be so large that the highest admissible dimension for t is not exceeded and the smallest admissible dimension for b is not fallen below. The dimensions A and B on the seat must be restored with inner and outer chamfering.

The recess dimensions "$L_1$" do not have to be reworked by a lathe, but must be preserved at their original order of magnitude. The maximum allowable reduction in "$L_1$" is 0,5 mm.

**Table 8.1: seats and discs of type 455**

| C [mm] | DN [mm] | Refinishing of seat: Seat depth t [mm] | Refinishing of seat: Tolerance for t [mm] | Refinishing of seat: B ∅ [mm] | Refinishing of seat: A ∅ [mm] | Refinishing of disc: Boundary height b [mm] | Refinishing of disc: Tolerance for b [mm] |
|---|---|---|---|---|---|---|---|
| 20 | 25 | 50,0 | +0,5 | $22{,}5_{-0{,}2}$ | $24{,}5^{+0{,}2}$ | 10,5 | -0,2 |
| 40 | 50 | 66,0 | +0,5 | $46{,}5_{-0{,}2}$ | $49{,}0^{+0{,}2}$ | 12,5 | -0,3 |
| 60 | 80 | 85,0 | +0,5 | $66{,}5_{-0{,}3}$ | $71{,}5^{+0{,}3}$ | 16,0 | -0,3 |
| 74 | 100 | 117,0 | +0,8 | $82{,}0_{-0{,}3}$ | $86{,}0^{+0{,}3}$ | 17,0 | -0,4 |

## 11 Refinishing of seat and disc types 455 and 456, O-Ring seals

Work is to be carried out according to the illustrations 9.1 and 9.3 and according to table 9.1.
In these valves the seal is made at the inner chamfer, this is therefore the important feature. The inner chamber is formed with a 30° angle (see Illustration 9.1).

When refinishing according to Table 9.1, the diameter B has to be restored and the chamfer area with surface quality Rz 10 has to be finished / ground free of burrs.

The O-Ring in the disc has to be renewed.

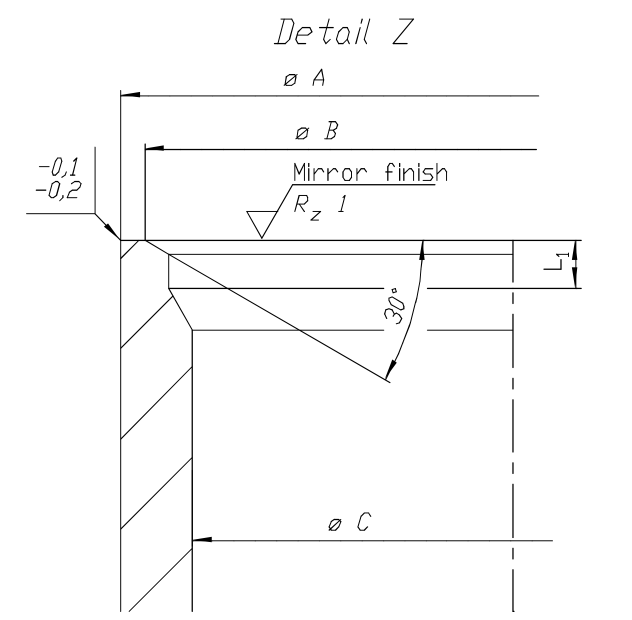



**Illustration 9.1**

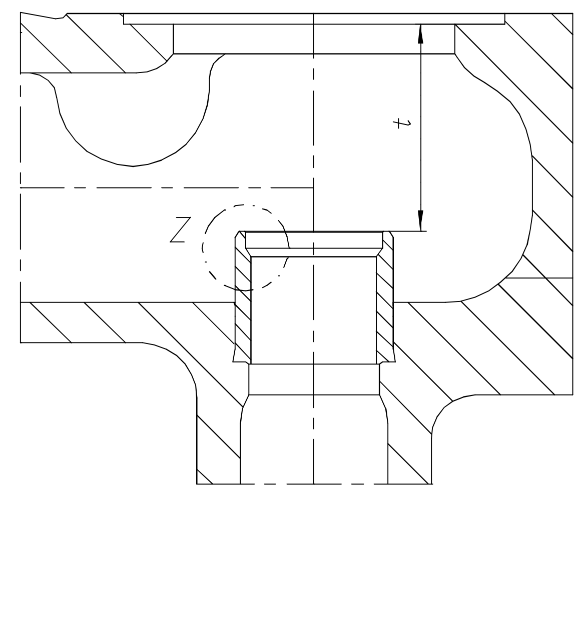



**Illustration 9.2**

**Table 9.1: seats and discs of type 455 and 456**

| C [mm] | DN [mm] | Refinishing of seat: Seat depth t [mm] | Tolerance for t [mm] | B ∅ [mm] | A ∅ [mm] |
|---|---|---|---|---|---|
| 20 | 25 | 50,0 | +0,5 | $22,5_{-0,2}$ | $24,5^{+0,2}$ |
| 40 | 50 | 66,0 | +0,5 | $46,5_{-0,2}$ | $49,0^{+0,2}$ |
| 60 | 80 | 85,0 | +0,5 | $66,5_{-0,3}$ | $71,5^{+0,3}$ |
| 74 | 100 | 117,0 | +0,8 | $82,0_{-0,3}$ | $86,0^{+0,3}$ |

## 12 Refinishing of seat and disc for full nozzle types 457 and 458, metal sealing

Work is to be carried out according to the illustrations 10.1, 10.2 and according to table 10.1.

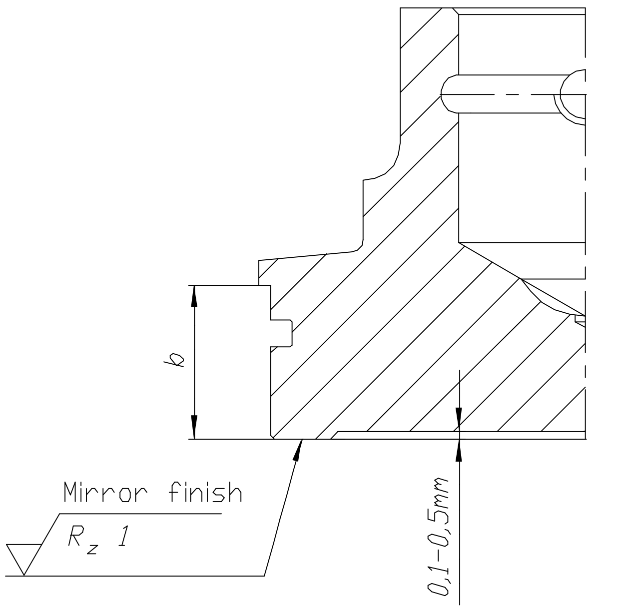



**Illustration 10.1**

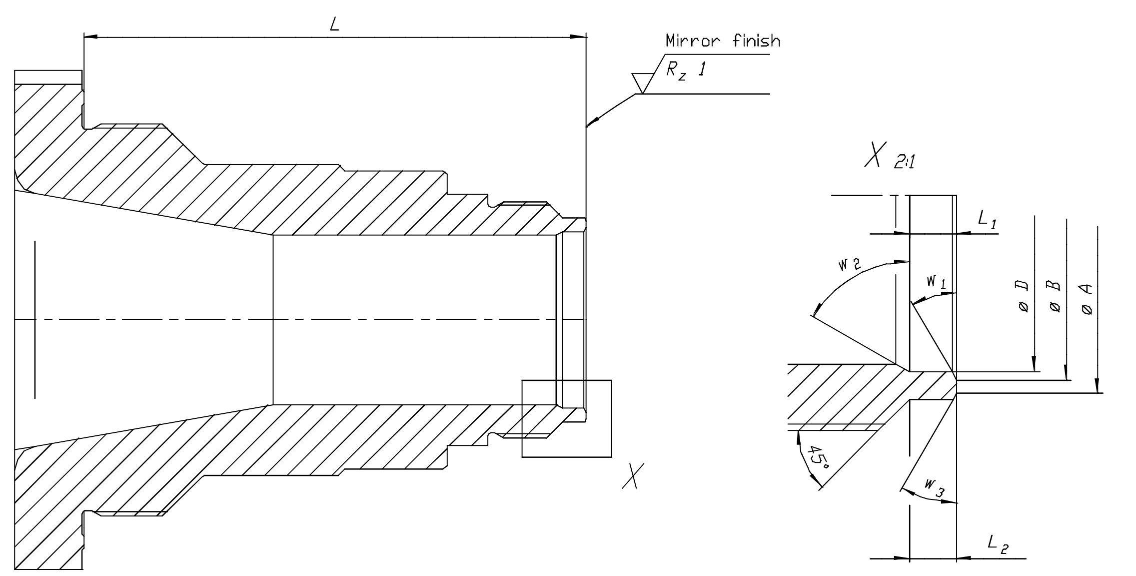



**Illustration 10.2**

Changes in dimension may only be such as not to reduce dimensions b and/or L below the lowest allowable tolerance (see table 10.1). The dimensions A and B on the seat must be restored with inner and outer chamfering.

The recess dimensions "$L_1$" do not have to be reworked by a lathe, but must be preserved at their original order of magnitude. "$L_1$" can be minimized by about a maximum of … (see table 10.1).

**Table 10.1: seats and discs full nozzle type 457/458**

| Valve DN | Seat | | | | | | | | | | | Disc | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Diameter | | | | Length | | | | Angle | | | | |
| | do Ø [mm] | D Ø [mm] | B Ø [mm] | A Ø [mm] | L [mm] | $L_1$ [mm] | $L_2$ [mm] | Tolerance $L; L_1; L_2$ [mm] | $W_1$ [°] | $W_2$ [°] | $W_3$ [°] | b [mm] | Tolerance b [mm] |
| 25 | 15 | 16 | 17 | 19 | 130 | 3 | - | - 0,2 | 30 | 30 | 30 | 10,5 | -0,1 |
| | 20 | 21 | 22,5 | 24,5 | | 3 | - | - 0,2 | | 60 | 30 | | |
| 50 | 30 | 32 | 36 | 39 | 162 | 3,5 | 12,5 | - 0,3 | 30 | 60 | 45 | 12,5 | -0,2 |
| | 40 | 43 | 46 | 49 | | 3 | - | - 0,3 | | | - | | |
| 80 | 50 | 52 | 55,4 | 59,4 | 180 | 3 | 4 | - 0,3 | 30 | 60 | 45 | 17,0 | -0,2 |
| | 60 | 62 | 66,5 | 71,5 | | 4 | - | - 0,3 | | 60 | | | |
| 100 | 50 | 52 | 55,4 | 59,4 | 215 | 3 | 4 | - 0,3 | 30 | 60 | 45 | 17,0 | -0,2 |
| | 60 | 64 | 67,5 | 71,5 | | 5 | - | - 0,3 | 30 | 60 | 45 | 17,0 | -0,2 |
| | 74 | 79 | 82 | 86 | | 5 | 6 | - 0,3 | 30 | 60 | - | 17,0 | -0,2 |
| | 88 | 93 | 99 | 103 | | 6 | - | - 0,3 | 30 | 60 | - | 17,0 | -0,2 |
| 150 | 110 | 116 | 120 | 124 | 277,5 | 5 | - | - 0,3 | 30 | 90 | - | 17,0 | -0,3 |

## 13 Seat geometry for flat sealing O-ring disc design (for valves delivered before 2002)

Work is to be carried out according to the illustration 11.1and according to table 11.1.

The flat sealing O-ring-disc has not been supplied since the redesign of the O-ring dics in 2002. To refinish “old design” discs see the following details.

The flat sealing O-ring disc design is identified internally within Leser by “F-Text” codes L40-43. Where a customer has an O-ring disc valve supplied before 2002, the customer should contact Leser to confirm whether these dimensions are to be used before commencing work on the valve.

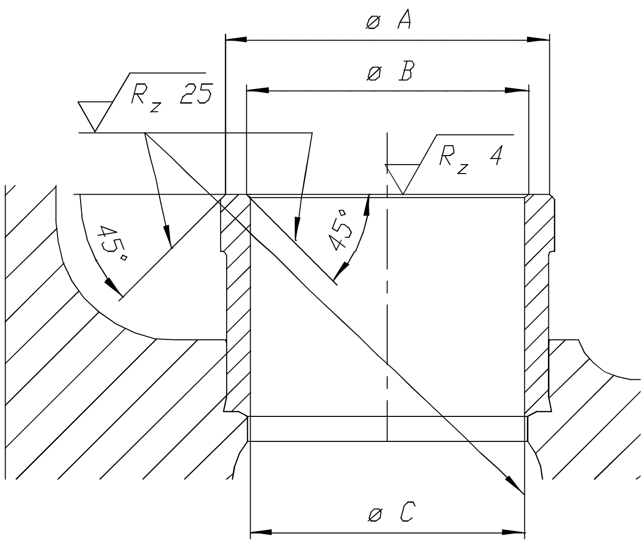



**Illustration 11.1**

**Table 11.1: flat sealing O-ring disc**

| C<br>closest flow area do [mm] | B<br>inner seat chamfer ∅ [mm] | A<br>outer seat chamfer*1 ∅ [mm] |
|---|---|---|
| 18 | $18{,}4_{-0{,}2}$ | $22{,}8^{+0{,}2}$ |
| 23 | $23{,}4_{-0{,}2}$ | $29{,}8^{+0{,}2}$ |
| 29 | $29{,}4_{-0{,}2}$ | $37{,}1^{+0{,}2}$ |
| 37 | $37{,}4_{-0{,}2}$ | $46{,}0^{+0{,}2}$ |
| 46 | $46{,}4_{-0{,}2}$ | $54{,}4^{+0{,}3}$ |
| 60 | $60{,}4_{-0{,}3}$ | $71{,}0^{+0{,}3}$ |
| 74 | $74{,}4_{-0{,}3}$ | $89{,}0^{+0{,}3}$ |
| 92 | $92{,}4_{-0{,}3}$ | $111{,}0^{+0{,}3}$ |
| 98 | $98{,}4_{-0{,}3}$ | $111{,}0^{+0{,}3}$ |
| 125 | $125{,}4_{-0{,}3}$ | $138{,}0^{+0{,}3}$ |

*1) outer seat champfer formed with a 45° angle / free of burrs

## 14 Refinishing of seat and disc type 526, metal sealing

Work is to be carried out according to the illustrations 12.1, 12.2 and according to table 12.1.

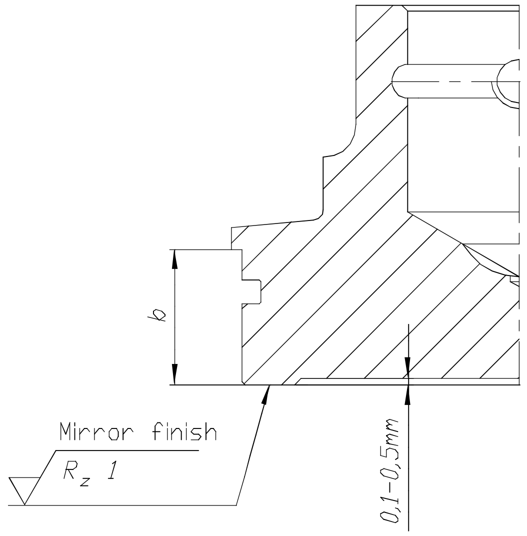



**Illustration 12.1**

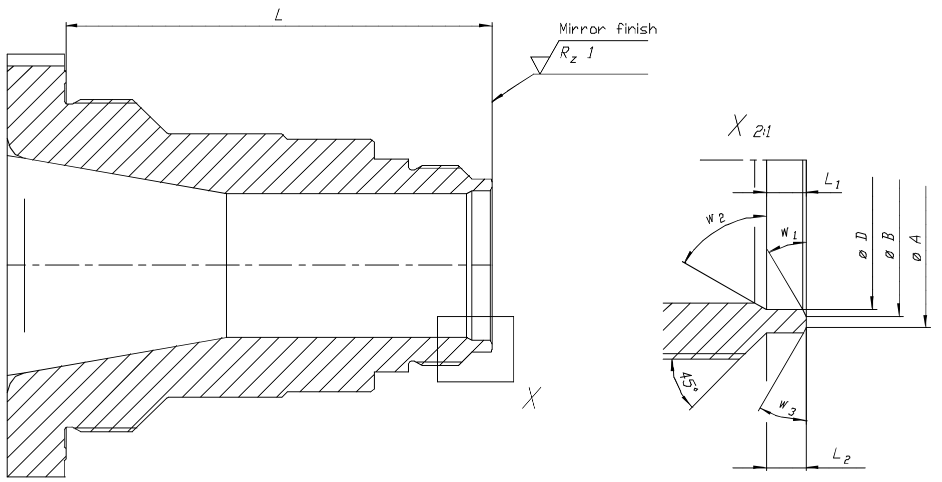



**Illustration 12.2**

Changes in dimension may only be such as not to reduce dimensions b and/or L below the lowest allowable tolerance (see table 12.1). The dimensions A and B on the seat must be restored with inner and outer chamfering.

The recess dimensions "$L_1$" do not have to be reworked by a lathe, but must be preserved at their original order of magnitude. "$L_1$" can be minimized by about a maximum of … (see table 12.1).

**Table 12.1: seats and discs type 526**

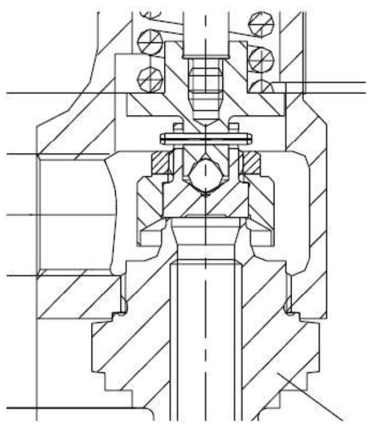
| Orifice | Size | Pressure range Inlet / Outlet [lbs] | Seat | | | | | | | | | | Disc | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Diameter | | | Length | | | | Angle | | | | |
| | | | A ⌀ [mm] | B ⌀ [mm] | D ⌀ [mm] | L [mm] | $L_1$ [mm] | $L_2$ [mm] | Tolerance L; $L_1$; $L_2$ [mm] | $W_1$ [°] | $W_2$ [°] | $W_3$ [°] | b [mm] | Tolerance [mm] |
| E | 1"x2" | 300 x 150 | $19,6^{+0,2}$ | $18,0_{-0,2}$ | 17,4 | 87,3 | 10,0 | - | - 0,2 | 45,0 | 60,0 | 45,0 | 10,5 | -0,1 |
| | 1 ½"x2" | 1500 x 300 | $18,7^{+0,2}$ | $16,6_{-0,2}$ | 16,1 | 87,3 | 5,0 | 3,0 | - 0,2 | 45,0 | 60,0 | 60,0 | 10,5 | -0,1 |
| | 1 ½"x3" | 2500 x 300 | $18,6^{+0,2}$ | $16,6_{-0,2}$ | 16,1 | 122,2 | 5,0 | 3,0 | - 0,2 | 45,0 | 60,0 | 60,0 | 10,5 | -0,1 |
| F | 1 ½"x2" | 900 x 300 | $22,5^{+0,2}$ | $20,5_{-0,2}$ | 19,5 | 106,3 | 5,0 | 3,0 | - 0,2 | 45,0 | 60,0 | 60,0 | 10,5 | -0,2 |
| | 1 ½"x3" | 2500 x 300 | $20,5^{+0,2}$ | $19,1_{-0,2}$ | 19,5 | 122,6 | 5,0 | 3,0 | - 0,2 | 45,0 | 60,0 | 60,0 | 10,5 | -0,2 |
| G | 1½"x3" | 900 x 300 | $27,5^{+0,2}$ | $25,0_{-0,2}$ | 23,5 | 106,3 | 5,0 | 3,0 | - 0,2 | 45,0 | 60,0 | 60,0 | 10,5 | -0,2 |
| | 2"x3" | 1500 x 300 | $27,5^{+0,2}$ | $25,0_{-0,2}$ | 23,5 | 128,1 | 5,0 | 3,0 | - 0,2 | 45,0 | 60,0 | 60,0 | 10,5 | -0,2 |
| H | 1½"x3" | 150 x 150 | $36,0^{+0,2}$ | $33,0_{-0,2}$ | 30,5 | 106,3 | 5,0 | 3,0 | - 0,2 | 45,0 | 60,0 | 45,0 | 10,5 | -0,2 |
| | 2"x3" | 600 x 150 | $35,2^{+0,2}$ | $33,0_{-0,2}$ | 29,4 | 102,2 | 5,0 | 3,0 | - 0,2 | 30,0 | 60,0 | 30,0 | 10,5 | -0,2 |
| | 2"x3" | 1500 x 300 | $35,2^{+0,2}$ | $33,0_{-0,2}$ | 29,4 | 126,5 | 5,0 | 3,0 | - 0,2 | 30,0 | 60,0 | 30,0 | 10,5 | -0,2 |
| J | 2"x3" | 150 x 150 | $43,5^{+0,2}$ | $41,0_{-0,2}$ | 39,0 | 102,2 | 6,0 | 6,0 | - 0,2 | 30,0 | 60,0 | 30,0 | 12,5 | -0,2 |
| | 3"x4" | 900 x 300 | $43,5^{+0,2}$ | $41,0_{-0,2}$ | 37,0 | 156,5 | 6,0 | 6,0 | - 0,3 | 30,0 | 60,0 | 30,0 | 12,5 | -0,2 |
| K | 3"x4" | 150 x 150 | $50,5^{+0,3}$ | $47,0_{-0,2}$ | 45,0 | 127,9 | 6,0 | 6,0 | - 0,2 | 30,0 | 60,0 | 30,0 | 12,5 | -0,2 |
| | 3"x6" | 600 x 150 | $50,5^{+0,3}$ | $47,0_{-0,2}$ | 45,0 | 156,5 | 6,0 | 6,0 | - 0,3 | 30,0 | 60,0 | 30,0 | 12,5 | -0,2 |
| | 3"x6" | 1500 x 300 | $50,5^{+0,3}$ | $47,0_{-0,2}$ | 45,0 | 169 | 6,0 | 7,0 | - 0,3 | 30,0 | 60,0 | 45,0 | 12,5 | -0,2 |
| L | 3"x4" | 150 x 150 | $61,5^{+0,3}$ | $58,0_{-0,2}$ | 56,0 | 127,9 | 6,0 | 6,0 | - 0,2 | 30,0 | 60,0 | 30,0 | 15,0 | -0,2 |
| | 4"x6" | 600 x 150 | $61,5^{+0,3}$ | $58,0_{-0,2}$ | 56,0 | 149,9 | 6,0 | 6,0 | - 0,2 | 30,0 | 60,0 | 30,0 | 15,0 | -0,2 |
| | 4"x6" | 600 x 150 | $61,5^{+0,3}$ | $58,0_{-0,3}$ | 56,0 | 149,9 | 6,0 | 6,0 | - 0,2 | 30,0 | 60,0 | 30,0 | 15,0 | -0,2 |
| | 4"x6" | 1500 x 150 | $61,5^{+0,3}$ | $58,0_{-0,3}$ | 56,0 | 169 | 6,0 | 6,0 | - 0,3 | 30,0 | 60,0 | 30,0 | 15,0 | -0,2 |
| M | 4"x6" | 600 x 150 | $68,0^{+0,3}$ | $64,5_{-0,3}$ | 61,5 | 149,9 | 5,0 | 6,0 | - 0,3 | 30,0 | 60,0 | 30,0 | 15,0 | -0,2 |
| | 4"x6“ | 900 x 150 | $69,0^{+0,3}$ | $64,5_{-0,3}$ | 61,5 | 169 | 5,0 | 6,5 | - 0,3 | 30,0 | 60,0 | 30,0 | 15,0 | -0,2 |
| N | 4"x6“ | 900 x 150 | $74,0^{+0,3}$ | $70,0_{-0,3}$ | 67,0 | 169 | 4,0 | 6,0 | - 0,3 | 30,0 | 60,0 | 30,0 | 15,0 | -0,2 |
| P | 4"x6" | 150 x 150 | $89,0^{+0,3}$ | $85,0_{-0,3}$ | 82,0 | 153,1 | 5,0 | 6,0 | - 0,3 | 30,0 | 45,0 | 45,0 | 15,0 | -0,2 |
| | 4"x6" | 900 x 150 | $89,0^{+0,3}$ | $85,0_{-0,3}$ | 82,0 | 197,5 | 5,0 | 6,0 | - 0,3 | 30,0 | 45,0 | 45,0 | 15,0 | -0,2 |
| Q | 6"x8" | 300 x 150 | $114,5^{+0,3}$ | $111,0_{-0,3}$ | 108,5 | 209,5 | 6,0 | 6,0 | - 0,3 | 45,0 | 45,0 | 45,0 | 17,0 | -0,2 |
| R | 6"x8" | 300 x 150 | $137,5^{+0,3}$ | $133,0_{-0,3}$ | 131,0 | 209,5 | 25,0 | 6,0 | - 0,3 | 45,0 | 60,0 | 45,0 | 17,0 | -0,2 |
| | 6"x10" | 600 x 150 | $137,5^{+0,3}$ | $133,0_{-0,3}$ | 131,0 | 189,3 | 25,0 | 6,0 | - 0,3 | 45,0 | 60,0 | 45,0 | 17,0 | -0,2 |
| T | 8"x10" | 300 x 150 | $171,5^{+0,4}$ | $167,0_{-0,4}$ | 164,0 | 225,7 | 6,0 | 6,0 | - 0,3 | 30,0 | 60,0 | 45,0 | 17,0 | -0,3 |

## 15 Refinishing of seat and disc type 437, metal sealing or sealing plate

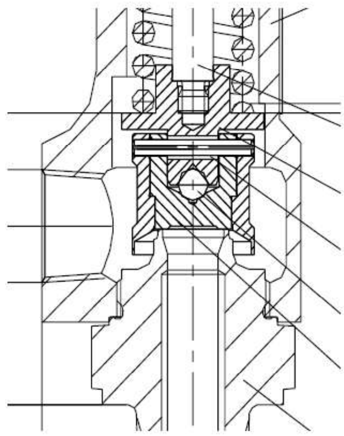
Since 2007 the types 437 do6 + 10 have been converted to the new metal-to-metal disc design. The “old” disc design is not available as spare part at LESER. Instead LESER will offer conversion kits to change over to the new design. For detailed information please ask LESER sales.

**Feature-Benefits Type 437 do = 6 and do = 10 (Stainless steel disc): Old vs. New Disc Design**

Old:



New:



| Feature | Benefit |
|---|---|
| Easy assembly | No torque wrench needed |
| Removable lifting aid | Simple repair of sealing surface |
| Zero-potential assembly of disc | Optimal functional tightness without refinish |
| Conversion kit available | Refitting of every customer valve possible |

Rework shall be done according to illustration 13.1, 13.2 and table 13.1.

Changes in dimension may only be such as not to reduce dimensions b and/or L below the lowest allowable tolerance (see table 13.1). The dimensions A and C on the seat must be restored with inner and outer chamfering.

The recess dimensions "$L_1$" do not have to be reworked.

Remark: Small changes at the seat geometry can have big influence to the function of the safety valve. LESER recommends using the new inlet body and disc.

**Table 13.1: Seat and disc type 437**

| do | Seat | | | | | | | | | | Disc | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Diameter | | | Length | | | | Angle | | | | | |
| | A ∅ [mm] | B ∅ [mm] | C ∅ [mm] | L [mm] | $L_1$ [mm] | $L_2$ [mm] | max. Tolerance L; $L_1$; $L_2$ [mm] | $W_1$ [°] | $W_2$ [°] | $W_3$ [°] | b [mm] | max. Tolerance b [mm] | $L_2$ [mm] |
| 6 | $10{,}5^{-0{,}05}$ | $7{,}5^{+0{,}05}$ | $8{,}5^{+0{,}1}$ | 16,5 | - | 1,5 | - 0,1 | 45 | 18 | 45 | 6,0 | +/- 0,25 | 0,5 |
| 10 | $14{,}0^{-0{,}05}$ | $12{,}0^{+0{,}05}$ | - | 16,5 | - | 2,0 | - 0,1 | - | 18 | - | 6,0 | +/- 0,25 | 0,5 |

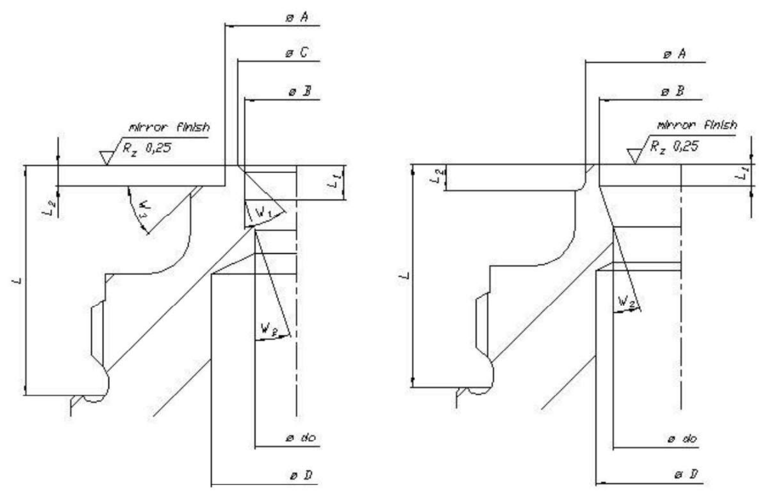


**Illustration 13.1**

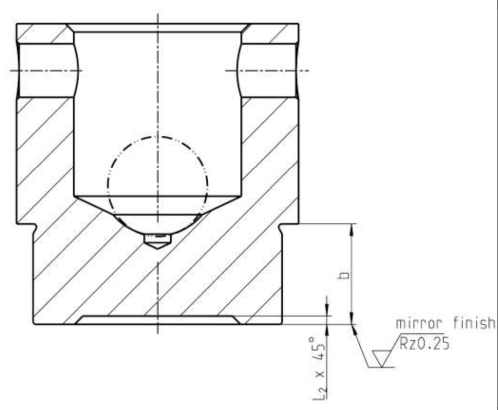


**Illustration 13.2**

Since April 2014 the inlet body of type 437 do10 have been supplied with new seat geometry. The former inlet body is not available as spare part at LESER. The seat geometry of type 437 do6 has been still the same.

The rework of type 437 do10 with new seat geometry shall be done according to illustration 13.1, 13.2 and table 13.2.

Changes in dimension may only be such as not to reduce dimensions b and/or L below the lowest allowable tolerance (see table 13.2). The dimensions A and B on the seat must be restored with inner and outer chamfering.

The recess dimensions "$L_1$" do not have to be reworked.

Remark: Small changes at the seat geometry can have big influence to the function of the safety valve. LESER recommends using the new inlet body and disc.

Within ECO 200071 (valid for serial production since 09/2014) the seat contour of Type 437 do 10 has been optimized (for further informations see LDeS 3001.18 Chapter 5.2). The following table contains the measures of the optimized seat contour for Type 437 do10.

Table 13.2: Seat and disc type 437 with new seat geometry since 2014

| do | Sitz | | | | | | | | | | | Teller | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A ∅ [mm] | B ∅ [mm] | C ∅ [mm] | L [mm] | $L_1$ [mm] | $L_2$ [mm] | max. Toleranz L; $L_1$; $L_2$ [mm] | $R_1$ [mm] | $W_1$ [°] | $W_2$ [°] | $W_3$ [°] | b [mm] | max. Toleranz b [mm] | $L_2$ [mm] |
| 10 | 14,0 $^{-0,05}$ | 12,5$^{+0,05}$ | - | 16,5 | 1,6 | - | - 0,1 | 0,2 | - | 18 | - | 6,0 | +/- 0,25 | 0,5 |

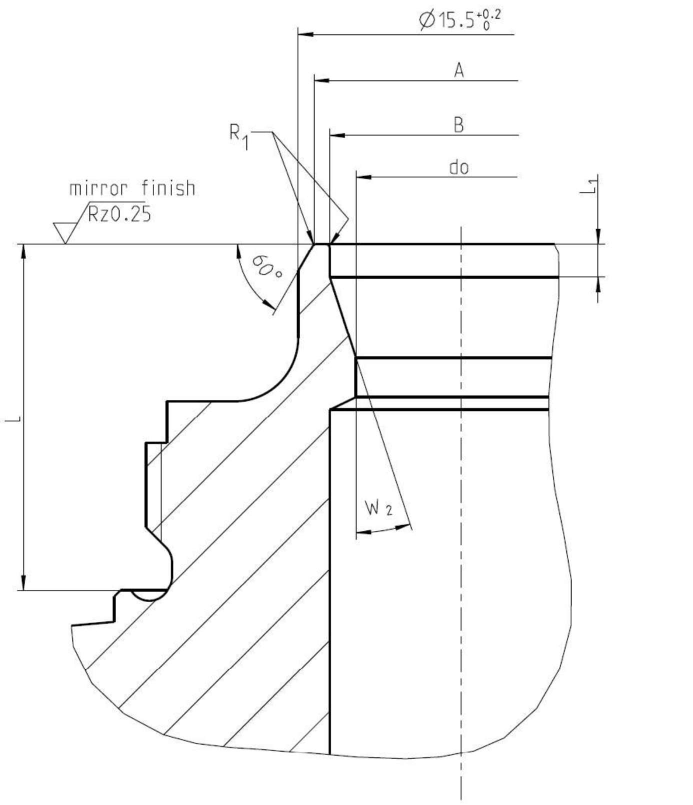


Illustration 13.3

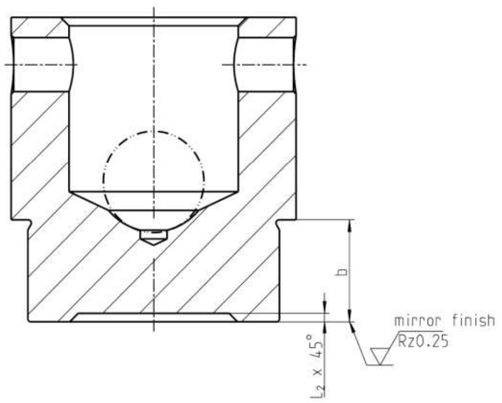


Illustration 13.4

## 16 Refinishing of seat and disc type 438, O-Ring seals

Rework shall be done according to illustration 14.1 and table 14.1

The outer chamfer of these seats is responsible for the sealing (see illustration 14.1), therefore the diameter of the seat must not be changed. In case of edge damage, the seat surface may be reworked by turning and grinding to remove the damages. After that the edge has to be deburred with abrasive paper (grit 400-800).

Changes in dimension may only be such as not to reduce dimensions b and/or L below the lowest allowable tolerance (see table 14.1). The dimensions A and B on the seat must be restored with inner and outer chamfering. The recess dimensions "$L_1$" do not have to be reworked.

The disc may be reworked within the measurement and tolerances according to tabe 14.1. The O-ring in the disc must be renewed.

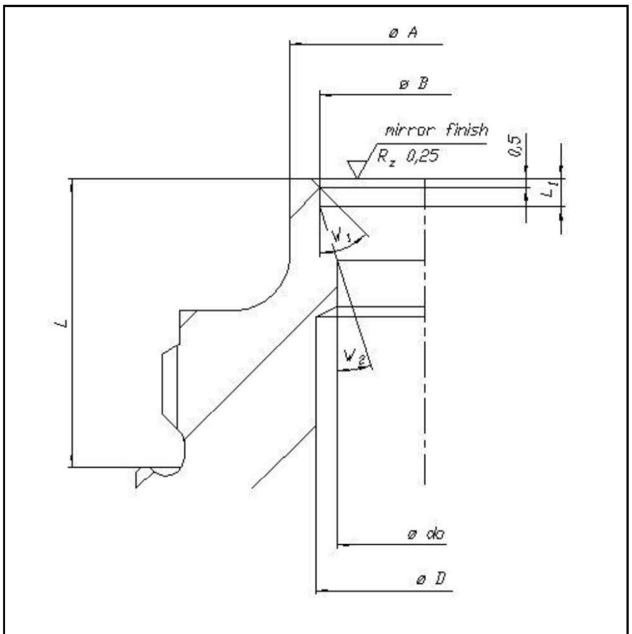



**Illustration 14.1**

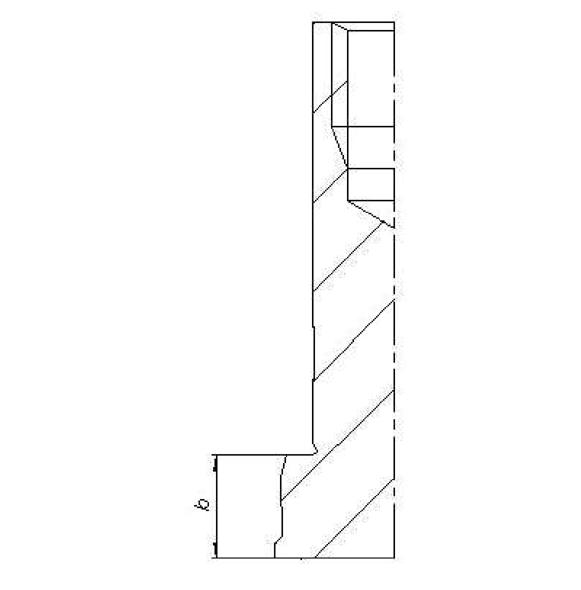



**Illustration 14.2**



**Table 14.1: seats and discs type 438**

| do | Seat | | | | | | | | | Disc | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Diameter | | | Length | | | Angle | | | | |
| | A ∅ [mm] | B ∅ [mm] | D ∅ [mm] | L [mm] | $L_1$ [mm] | Tolerance L; $L_1$ [mm] | $W_1$ [°] | $W_2$ [°] | $W_3$ [°] | b [mm] | Tolerance b [mm] |
| 10 | $15{,}5_{-0{,}1}$ | $12^{+0{,}05}$ | - | 16,5 | 1,6 | - 0,1 | - | 18 | - | 4,9 | + 0,1/-0,2 |

## 17 Refinishing of seat and disc type 439, Vulcanized soft seat

The rework shall be done according to illustration 15.1 and table 15.1.

Changes in dimension may only be such as not to reduce dimensions b and/or L below the lowest allowable tolerance (see table 15.1). The dimensions A and B on the seat must be restored with inner and outer chamfering.

The recess dimensions "$L_1$" do not have to be reworked

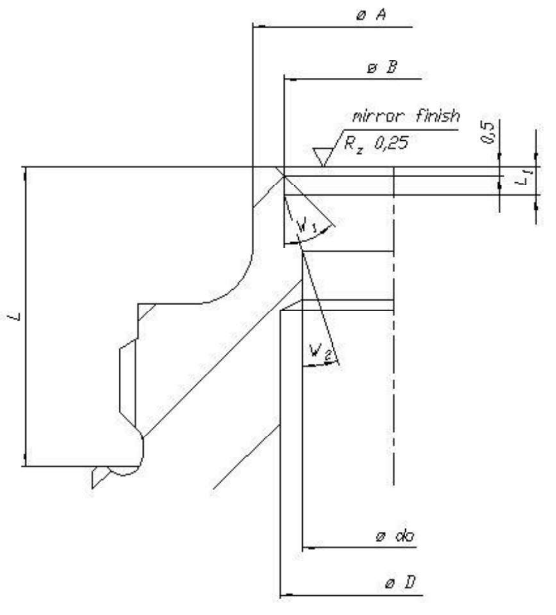



**Illustration 15.1**

**Table 15.1: seats and discs type 439**

| do | Seat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Diameter | | | Length | | | Angle | | |
| | A ∅ [mm] | B ∅ [mm] | D ∅ [mm] | L [mm] | $L_1$ [mm] | Tolerance L; $L_1$ [mm] | $W_1$ [°] | $W_2$ [°] | $W_3$ [°] |
| **10** | $15{,}5_{-0{,}1}$ | $12^{+0{,}05}$ | - | 16,5 | 1,6 | - 0,1 | - | 18 | - |

protected

## 18 Refinishing of seat and disc type 459, metal sealing, sealing plate

Work is to be done according illustration 16.1, 16.2.

Changes in dimension may only be such as not to reduce dimensions b and/or L below the lowest allowable tolerance (see table 16.1). The dimensions A and B on the seat must be restored with inner and outer chamfering.

The recess dimensions "$L_1$" do not have to be reworked by a lathe, but must be preserved at their original order of magnitude. "$L_1$" can be minimized by about a maximum of … (see table 16.1).

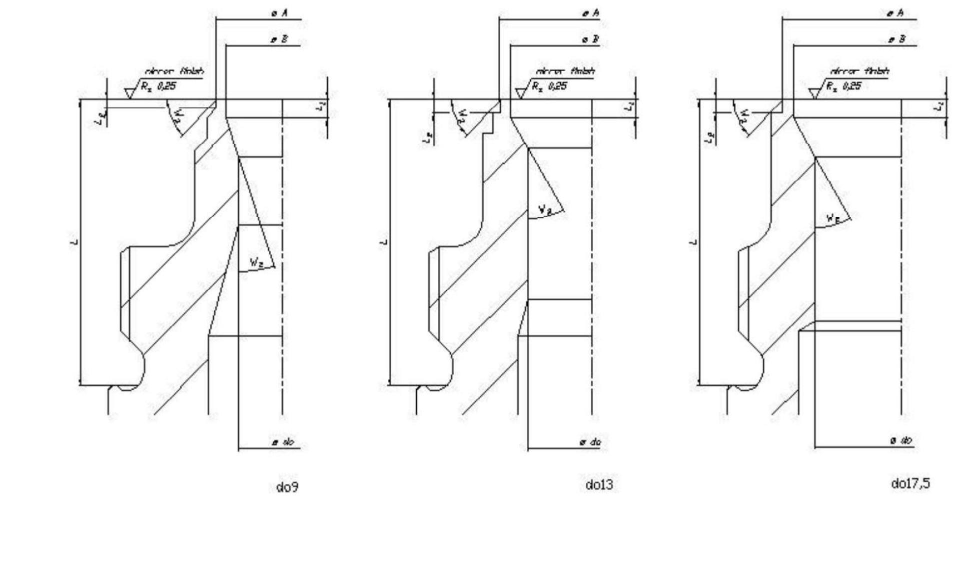



**Illustration 16.1**

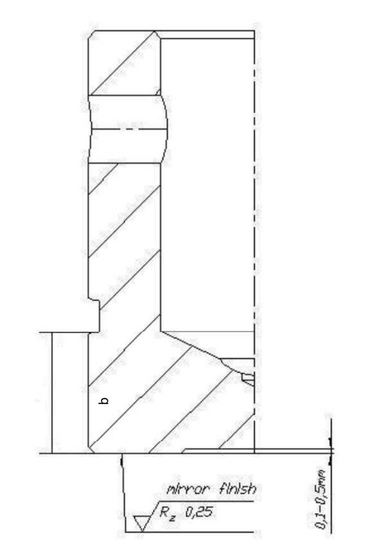



**Illustration 16.2**

**Table 16.1: seats and discs type 459**

| do | Seat | | | | | | | | | Disc | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Diameter | | Length | | | | Angle | | | | |
| | A Ø [mm] | B Ø [mm] | L [mm] | $L_1$ [mm] | $L_2$ [mm] | Tolerance $L; L_1; L_2$ [mm] | $W_1$ [°] | $W_2$ [°] | $W_3$ [°] | b [mm] | Tolerance b [mm] |
| **6** | $10{,}5^{-0{,}05}$ | $8{,}5^{+0{,}1}$ | 29,0 | 2,5 | 0,9 | - 0,1 | - | 18 | 45 | 8,0 | + 0,1 |
| **9** | $12{,}9^{+0{,}1}$ | $11{,}5^{+0{,}05}$ | 29,0 | 2,0 | 1,1 | - 0,1 | - | 18 | 45 | 8,0 | + 0,1 |
| **13** | $18{,}1^{+0{,}1}$ | $16{,}5^{+0{,}05}$ | 29,0 | 2,0 | 1,5 | - 0,1 | - | 30 | 45 | 8,0 | + 0,1 |
| **17,5** | $23{,}8^{+0{,}1}$ | $22{,}0^{+0{,}05}$ | 29,0 | 2,0 | 1,5 | - 0,1 | - | 30 | 45 | 7,9 | + 0,1 |

## 19 Refinishing of seat and disc type 462, O-Ring disc

Work is to be done according to illustration 17.1, 17.2.

The outer chamfer of these seats is responsible for the sealing (see illustration 17.1), therefore the diameter of the seat must not be changed. In case of edge damage, the seat surface may be turned or ground by between 0,2 and 0,4 mm until the damage is removed. Please make sure that the edge is free for burrs.

The O-ring in the disc must be renewed.



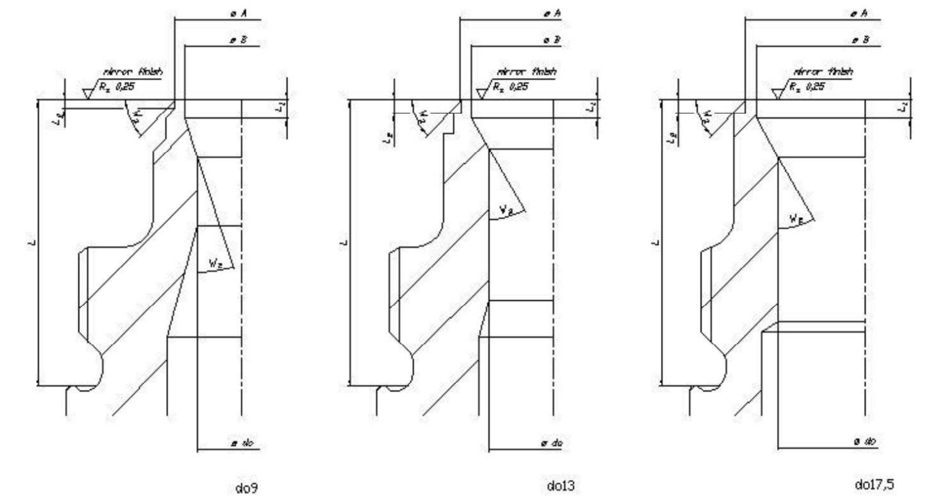



**Illustration 17.1**

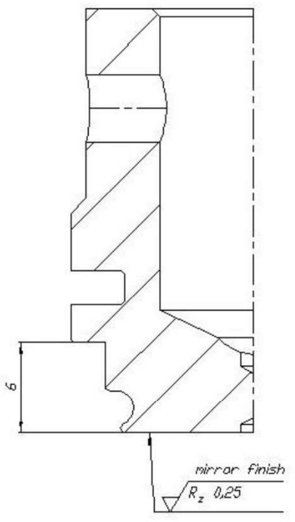



**Illustration 17.2**

**Table 17.1: seats and discs type 462**

| | Seat | | | | | | | | | Disc | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Diameter | | Length | | | | Angle | | | | |
| do | A ∅ [mm] | B ∅ [mm] | L [mm] | $L_1$ [mm] | $L_2$ [mm] | Tolerance $L; L_1; L_2$ [mm] | $W_1$ [°] | $W_2$ [°] | $W_3$ [°] | b [mm] | Tolerance b [mm] |
| **9** | 12,9 | 11,5 | 29,0 | 2,0 | 1,1 | +0,1 | - | 18 | 45 | 5,3 | +0,05 |
| **13** | 18,1 | 16,5 | 29,0 | 2,0 | 1,5 | +0,1 | - | 30 | 45 | 6,0 | +0,05 |
| **17,5** | 23,8 | 22,0 | 29,0 | 2,0 | 1,5 | +0,1 | - | 30 | 45 | 6,0 | -0,1 |

## 20 Refinishing of seat and disc of POSV type 811/821

Rework shall be done in accordance to illustration 18.1, 18.2 and table 18.

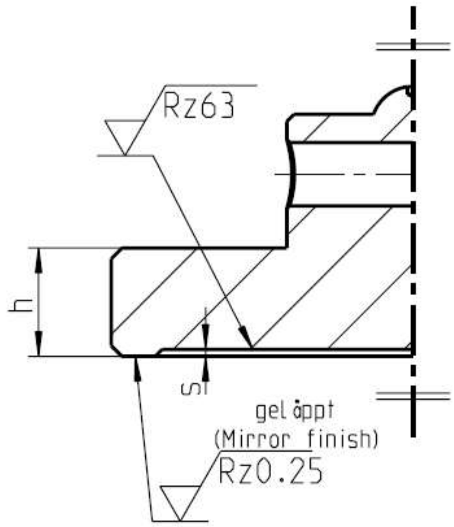



Illustration 18.1: Steel disc

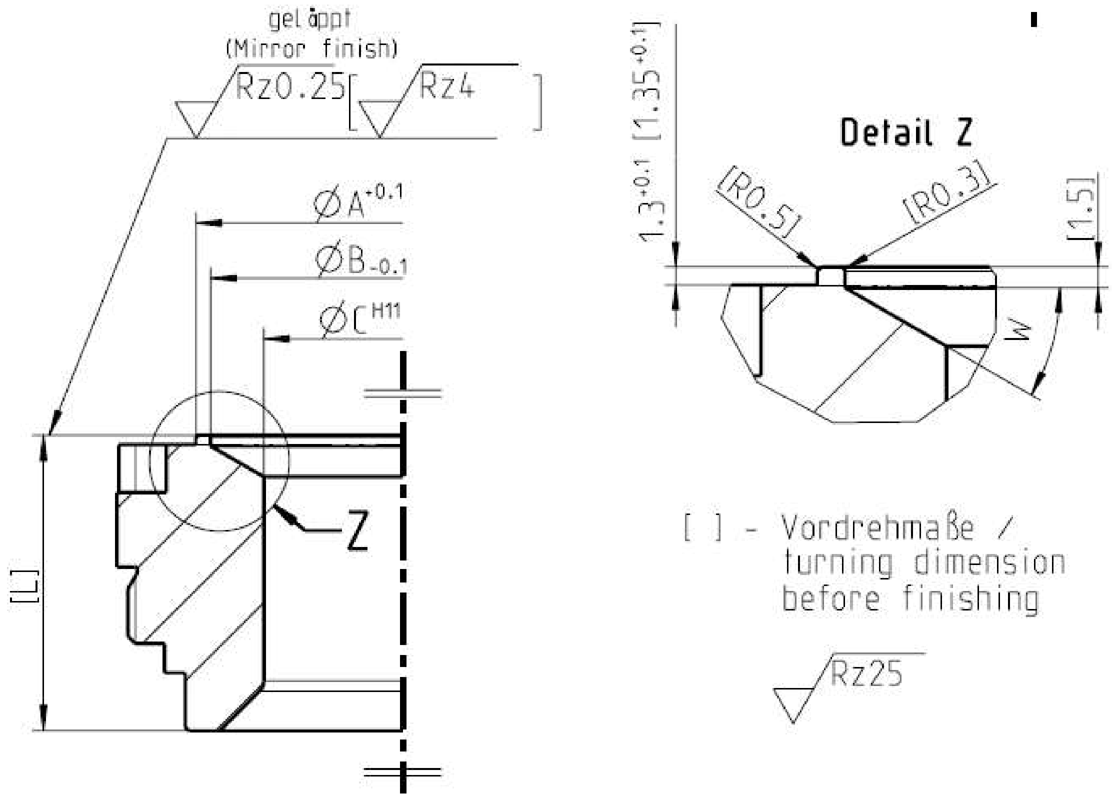



Illustration 18.2: Seat (semi-nozzle)

Rework shall be limited to the lowest allowable dimensions [$L_{min}$] and $h_{min}$. The radii [R 0.5] and [R 0.3] and the shoulder [$1.35^{+0.1}$] at the seat shall be reworked exactly to assure the tightness of the o-ring disc. The rework of the shoulder [1.5] and the angle W of the seat and the shoulder s of the steel disc is recommended.

| NPS xNPS | DN x DN | Orifice | Seat (semi-nozzle) | | | | | | Steel disc | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $A^{+0,1}$ ∅ [mm] | $B_{-0,1}$ ∅ [mm] | $C^{H11}$ ∅ [mm] | [L] [mm] | [$L_{min}$] [mm] | W [°] | h [mm] | $h_{min}$ [mm] | s [mm] |
| 1x2 | 25x50 | D | 29,5 | 26,5 | 11 | 33,4 | 32,4 | 45 | 8,5 | 7,5 | 1 |
| | | E | 29,5 | 26,5 | 14,7 | 33,4 | 32,4 | 45 | 8,5 | 7,5 | 1 |
| | | F | 29,5 | 26,5 | 18,4 | 33,4 | 32,4 | 45 | 8,5 | 7,5 | 1 |
| | | G | 29,5 | 26,5 | 23 | 33,4 | 32,4 | 45 | 8,5 | 7,5 | 1 |
| 1,5x2 | 40x50 | D | 37,5 | 34,5 | 11 | 33,4 | 32,4 | 45 | 10,5 | 9,5 | 1 |
| | | E | 37,5 | 34,5 | 14,7 | 33,4 | 32,4 | 45 | 10,5 | 9,5 | 1 |
| | | F | 37,5 | 34,5 | 18,4 | 33,4 | 32,4 | 45 | 10,5 | 9,5 | 1 |
| | | H | 37,5 | 34,5 | 29 | 33,4 | 32,4 | 45 | 10,5 | 9,5 | 1 |
| 1,5x3 | 40x80 | G | 37,5 | 34,5 | 23,6 | 39,4 | 38,4 | 45 | 10,5 | 9,5 | 1 |
| | | H | 37,5 | 34,5 | 29,4 | 39,4 | 38,4 | 45 | 10,5 | 9,5 | 1 |
| | | J | 38 | 35,7 | 35,7 | 33,4 | 32,4 | - | 10,5 | 9,5 | 1 |
| 2x3 | 50x80 | G | 56,5 | 52,5 | 23,6 | 40,4 | 39,4 | 30 | 13,5 | 12,5 | 1 |
| | | H | 56,5 | 52,5 | 29,4 | 40,4 | 39,4 | 30 | 13,5 | 12,5 | 1 |
| | | J | 56,5 | 52,5 | 38 | 40,4 | 39,4 | 30 | 13,5 | 12,5 | 1 |
| | | K+ | 56,5 | 52,5 | 48 | 35,4 | 34,4 | 30 | 13,5 | 12,5 | 1 |
| 3x4 | 80x100 | J | 80,5 | 76 | 38 | 61,7 | 60,7 | 30 | 15,4 | 14,4 | 1 |
| | | K | 80,5 | 76 | 45 | 61,7 | 60,7 | 30 | 15,4 | 14,4 | 1 |
| | | L | 80,5 | 76 | 56 | 61,7 | 60,7 | 30 | 15,4 | 14,4 | 1 |
| | | N+ | 80,5 | 76 | 75 | 41,7 | 40,7 | 30 | 15,4 | 14,4 | 1 |
| 4x6 | 100x150 | L | 102,5 | 98 | 56 | 64,7 | 63,7 | 30 | 20 | 19 | 2 |
| | | M | 102,5 | 98 | 63 | 64,7 | 63,7 | 30 | 20 | 19 | 2 |
| | | N | 102,5 | 98 | 69 | 64,7 | 63,7 | 30 | 20 | 19 | 2 |
| | | P | 102,5 | 98 | 83 | 50,7 | 49,7 | 30 | 20 | 19 | 2 |
| | | P+ | 102,5 | 98 | 95 | 41,7 | 40,7 | 30 | 20 | 19 | 2 |
| 6x8 | 150x200 | Q | 150 | 145 | 110 | 56,7 | 55,7 | 30 | 30 | 29 | 2 |
| | | R | 150 | 145 | 133 | 56,7 | 55,7 | 30 | 30 | 29 | 2 |
| | | R+ | 150 | 145 | 142 | 46,7 | 45,7 | 30 | 30 | 29 | 2 |
| 8x10 | 200x250 | T | 188 | 182 | 168 | 68,2 | 67,2 | 30 | 30 | 29 | 2 |
| | | T+ | 188 | 182 | 180 | 58,2 | 57,2 | 30 | 30 | 29 | 2 |

**Table 18: Seat and steel disc of type 811/821**

Contents

1 Purpose ........................................................................................................1
2 Scope ..........................................................................................................1
3 References ..................................................................................................1
4 Disclaimer....................................................................................................1
5 Qualified fitting personnel ............................................................................2
6 General Information .....................................................................................2
7 Reworking the of the working surfaces .......................................................2
8 Re-lapping ...................................................................................................2
8.1 Re-lapping seat and disc sealing surfaces ................................................2

## 1 Purpose

This LESER Global Standard (LGS) provides instruction on reworking LESER safety valves. The required work steps and materials are described.

## 2 Scope

This document must be applied when reworking safety valves in agencies and subsidiaries of LESER GmbH & Co. KG.

## 3 References

LWN 313.32 to 313.40

## 4 Disclaimer

LESER puts in a great deal of effort into making up-to-date and correct documentation available. Nevertheless, LESER GmbH & Co. KG gives no guarantee that the recommended actions presented here are entirely correct and error free. This document is to be applied exclusively to the specified type. LESER GmbH & Co. KG declines any liability or responsibility for the correctness and completeness of the content.

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LESER GmbH & Co. KG is available to the users of this document to provide additional information.

## 5 Qualified fitting personnel

The reworking of LESER safety valves may only be performed by trained or qualified fitters. The qualifications must be obtained through the appropriate training measures.

## 6 General Information

- During all work on the working surfaces,
- Wear safety glasses.

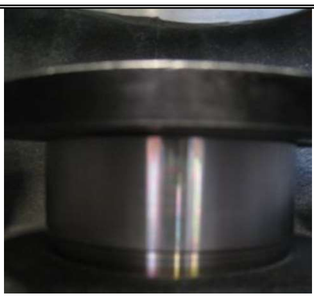
## 7 Reworking the of the working surfaces

When re-turning damaged working surfaces, comply with the specifications of LWN 313.32 to 313.40.

## 8 Re-lapping

### 8.1 Re-lapping seat and disc sealing surfaces

#### 8.1.1 Lapping with the lapping stamp.

| Illustrations | Description | Aids / Tools |
|---|---|---|
|  **Figure 8.1.1-1** | The lapping stamp is to be used for reworking damage on the seat sealing surface. Lapping paste and oleic acid must be applied to the lapping stamp. Select the lapping paste depending on the degree of damage. The more severe the damage is, the coarser the lapping paste that is to be used at the beginning | |
|  Monocrystalline diamond powder Oleic acid **Figure 8.1.1-2** | Wet the disc with the monocrystalline diamond powder and the oleic acid. Four small points on the sealing surface of the disc must be used. Monocrystalline diamond powder is applied to 2 points and oleic acid to the other 2 points. | |

| | | |
|---|---|---|
|  **Figure 8.1.1-3**Error! No sequence specified. | The seat and disc are re-lapped together. The seat and disc are lapped together so that better surface evenness of the disc is achieved. Lapping is performed by slight circular hand movements. | |

8.1.2 Re-lapping with a glass plate

| **Illustrations** | **Description** | **Aids / Tools** |
|---|---|---|
|  Glass plate **Figure 8.1.2-1** | Re-lapping the seat with a glass plate results in greater surface evenness. | |

8.1.3 Re-lapping the nozzle and the disc

| **Illustrations** | **Description** | **Aids / Tools** |
|---|---|---|
|  Nozzle **Figure 8.1.3-1** | Re-lapping of the nozzle and the disc is performed separately on a glass plate.<br><br>Mix the monocrystalline diamond powder together with the oleic acid on the glass plate and then lap the nozzle and the disc. Lapping is performed by slight circular hand movements. | |

**Alternate methods that ensure the same effect may be used.**

Content

1 General information for assembling of main valve .................................. 2
2 Purpose .......................................................................................... 2
3 Competences ................................................................................... 2
4 Scope .............................................................................................. 2
5 Disclaimer ........................................................................................ 2
6 Qualified fitting personnel ................................................................... 2
7 Remarks .......................................................................................... 2
8 Basic safety guidelines ....................................................................... 3
9 Assembly instructions .......................................................................... 6

# 1 General information for assembling of main valve

# 2 Purpose

The documentation describes the assembly of the main valve series 810/820. The description contains every single working step, aids, tools and appliances.

# 3 Competences

The generation, maintenance and distribution of the documentation takes place in the organisation department. The defaults will be generated by the technical department in consultation with the final assembly department and production planning department.

# 4 Scope

This document must be applied to the dismantling of a Pilot Operated Safety Valve in agencies and subsidiaries of LESER GmbH & Co. KG, customers, independent service center.

# 5 Disclaimer

LESER puts in a great deal of effort into making up-to-date and correct documentation available. Nevertheless, LESER GmbH & Co. KG gives no guarantee that the recommended actions presented here are entirely correct and error free.
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# 6 Qualified fitting personnel

LESER safety valves may only be dismantled by trained or qualified fitters. The qualifications must be obtained through the appropriate training measures.

# 7 Remarks

Gloves must be worn during the entire assembly procedure

## 8 Basic safety guidelines

### Dangerous media

Poisoning, caustic burns, burns, injuries
- Use suitable protective devices
- Use suitable collecting tanks.
- Wear suitable protective equipment.

### Foreign bodies in the safety valve

Danger from failure of safety valve or leaks
- Flush the system before installation of a safety valve.
- Check the safety valve for foreign objects.
- Remove foreign objects

### Bug screen is damaged or missing *(B or option)*

Dirt, objects or insects get into the safety valve. Danger from malfunction of the safety valve.
- Install the bug screen correctly.
- Check the bug screen regularly.

### Ambient temperature is too high

Material expansion. Danger from malfunction of the safety valve.

### Ambient temperature is too low

Icing, freezing vapours, reduced flow rate due to congealing media. Danger from functional disruption of the safety valve.

### Abrasive or corrosive media

Moving parts jam or become stuck. Danger from functional disruption of the safety valve.
- Service the safety valve after each time it opens.

### Media with high proportion of particles

**(only B)**

Deposits and clogging. Danger from malfunction of the safety valve.
- Use a filter with the correct mesh size.
- Use additional filters to increase the filter capacity.

**Residual media in the safety valve**

Poisoning, caustic burns, burns, injuries
- Wear suitable protective equipment.
- Remove residual media

**WARNING**

**Leaky safety valve**
Danger from leaking media due to damaged gaskets and sealing surfaces.
- Protect the safety valve against vibrations and blows especially during transport and installation.
- Check safety valve regularly for leaks.

**Open bonnet or spindle guides**

Danger from leaking media
- Make sure that no danger can arise from leaking media.
- Keep a safe distance.
- Wear suitable protective equipment.

**CAUTION**

**Hot medium**

Burns or scalding.
- Wear suitable protective equipment.

**Hot surfaces**
Burns.
- Wear suitable protective equipment.

**Aggressive medium**

Caustic burns.
- Wear suitable protective equipment.

**Open bonnet or spindle guides**

Pinching danger from moving parts.
• Install suitable safeguards.

**Sharp edges and burrs**

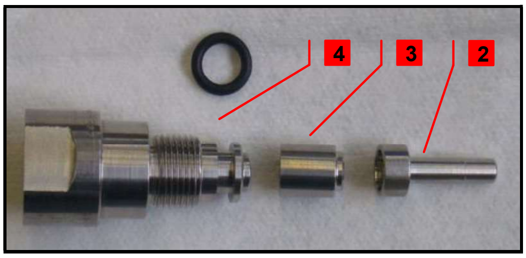
Danger of injury.
• Wear safety gloves.
• Handle the safety valve carefully

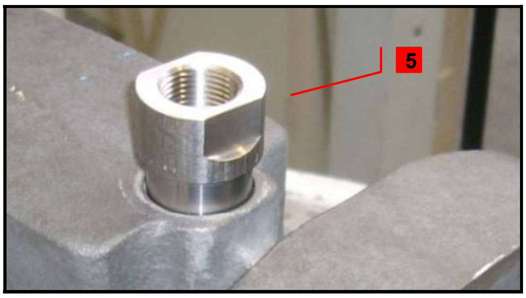
**High noise emission**

Hearing damage.
Wear ear protection.

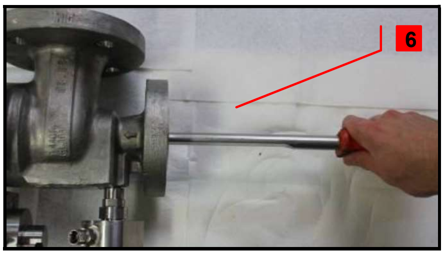
# 9 Assembly instructions

## 9.1 Assembly of the pitot tube






### 1. Steps – Descriptions

1 Span body [1] with outlet on test bench

2 Insert pitot tube [2] in body [1]

3 Complete with tube [3] (depends on nominal size)

4 Cover O-ring [63] (O-ring is 9,19x2,62) with soapy water and pull on fitting [4]

**Make sure that O-rings are twist free**

5 Screw fitting [4] in body [1]

6 While tightening fitting [4], align pitot tube [2] in direction of inlet with pitot tube assembly tool

**Make sure that inlet of pitot tube is aligned within approx. ± 5°**

### 2. Supplies

Soapy water
Molycote D paste
Lubricate components acc. to LID

### 3. Tools

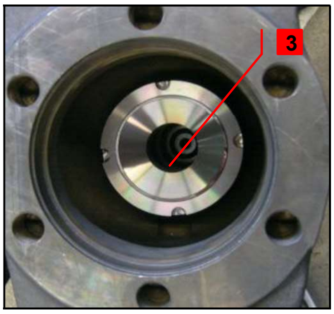
Hook tool for O-rings
**Helpful:** Pitot tube-assembly tool
Open-end wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

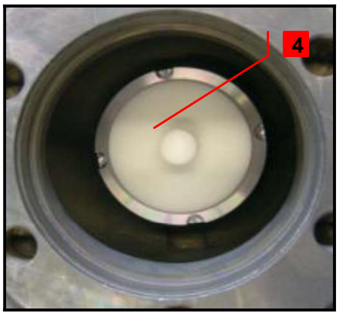
### 4. Appliance

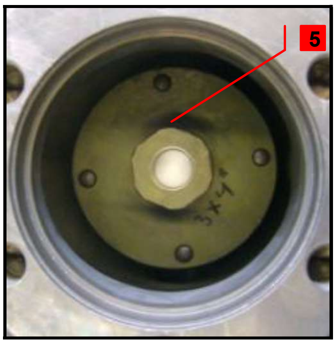
Test bench

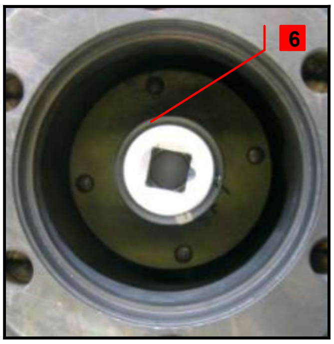
protected

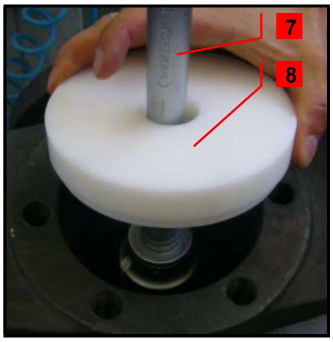
## 9.2 Assembly of the nozzle

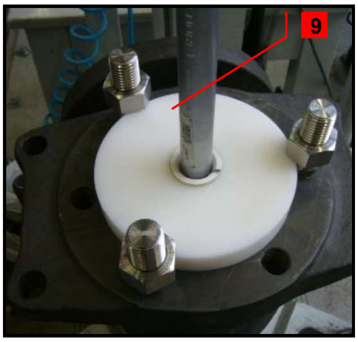













**1. Steps – Descriptions**

**1 Mount the POSV with inlet**
Pull O-ring [61] and back up ring [62] on nozzle [5]
Cover O-ring with soapy water

**Make sure that O-rings are twist free**

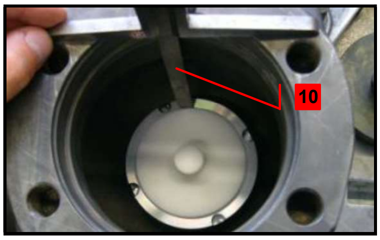
3 Screw nozzle [5] into body [1] by hand
Install nozzle assembly tool in that order: 4 protection cap; 5 adapter; 6 socket wrench; 7 socket extension; 8 guide; 9 fix guide with three nuts
Screw nozzle [5] in with torque wrench

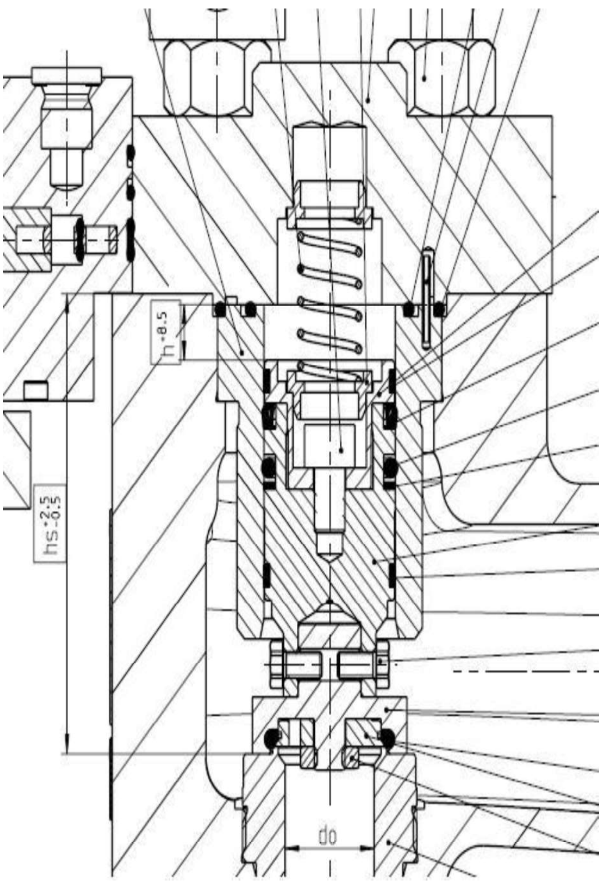
**2. Supplies**
Molykote D Paste
Soapy water
Lubricate components acc. to LID

**3. Tools**
Nozzle-assembly tool acc nominal size
Depth caliper
Torque wrench with square drive ¾"
(Tightening torques acc. to LID)

**4. Appliance**
Test bench

## 9.3 Assembly of the nozzle




### 1. Steps – Descriptions

**10 Check nozzle projection $h_s$**

| Nominal size,Orifice | hs +2,5 / -0,5 [mm] |
|---|---|
| 1x2“ D, E, F, G | 85,3 |
| 1,5x2“ D, E, F, H | 96,3 |
| 1,5x3“ G,H | 106,8 |
| 1,5x3“ J | 112,8 |
| 2x3“ G, H, J | 115,8 |
| 2x3“ K+ | 120,8 |
| 3x4“ J, K, L | 134,3 |
| 3x4“ N+ | 154,3 |
| 4x6“ L, M, N | 167,3 |
| 4x6“ P | 181,3 |
| 4x6“ P+ | 190,3 |
| 6x8“ Q, R | 258,8 |
| 6x8“ R+ | 268,8 |
| 8x10“ T | 324,3 |
| 8x10“ T+ | 334,3 |



### 2. Supplies

Molykote D Paste
Soapy water
Lubricate components acc. to LID

### 3. Tools

Nozzle-assembly tool acc nominal size
Depth caliper
Torque wrench with square drive ¾”
(Tightening torques acc. to LID)

### 4. Appliance

Test bench

## 9.4 Assembly of the O-Ring disc / stainless steel disc




### 1. Steps – Descriptions

Cover O-ring [7.3] with soapy water

1 Place O-ring [7.3] into disc [7.1]

**Make sure that O-ring is twist free**

2 Place disc retainer [7.2] into disc [7.1]

3 Screw on nut [7.4]

**Secure nut by two prick punches**



### 2. Supplies

Soapy water
Lubricate components acc. to LID

### 3. Tools

Ring wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

### 4. Appliance

None

## 9.5 Assembly of the piston and back up ring




### 1. Steps – Descriptions

1 Put piston top [6.2] and piston body [6.1] with O-ring [6.3] and back up ring [6.4] together

2 Lubricate O-ring and guide rings [6.5] with Halocarbon 56 S acc. to LID

3 Screw piston top [6.2] and piston body [6.1] together with allen head screws [6.6]

### 2. Supplies

Halocarbon 56 S
Lubricate components acc. to LID

### 3. Tools

Torque wrench with allen key acc. to LID
Torque wrench (Tightening torques acc. to LID)

### 4. Appliance

Parallel vice with aluminium jaws

## 9.6 Assembly of the luproseal OC R20




### 1. Steps – Descriptions

1 Put piston top [6.2] and piston body [6.1] with luproseal lip seal [6.3] together

3 Screw piston top [6.2] and piston body [6.1] together with allen screws [6.6]



### 2. Supplies

None

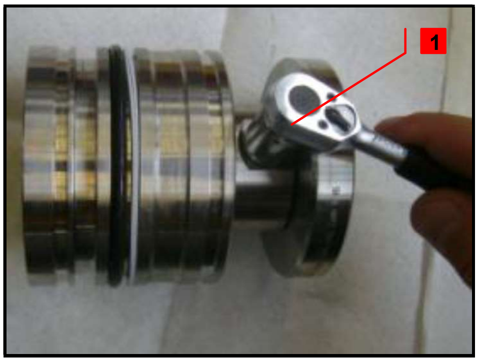
### 3. Tools

Ratchet with allen key acc. to LID

### 4. Appliance

Parallel vice with aluminium jaws

## 9.7 Assembly of the piston and disc




**1. Steps – Descriptions**

1 Screw piston compl. [6] and disc [7] unit - out of step 9.6 and 9.5 - together with hexagon screw [58]

**2. Supplies**

None

**3. Tools**

Socket wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

**4. Appliance**

None

## 9.8 Assembly of the piston and liner




**1. Steps – Descriptions**

Moisten cylinder of liner [8] with Halocarbon 56 S

1 Put guide rings [6.5] on unit
- out of 9.7 –

2 Insert piston complete [6] into liner [8] carefully for nominal size 1x2…2x3 from bottom and for 3x4…8x10 from top of liner [8]

**3 Check visual whether there is a gap of approx. 2-10 mm at each guide ring**

**Make sure that piston [6] is free-moving in liner [8] over it's full length!**

protected

**2. Supplies**

Halocarbon 56 S
Lubricate components acc. to LID

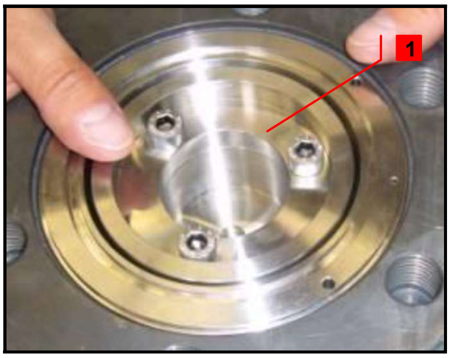
**3. Tools**

None

**4. Appliance**

None

## 9.9 Assembly of the piston with liner and body

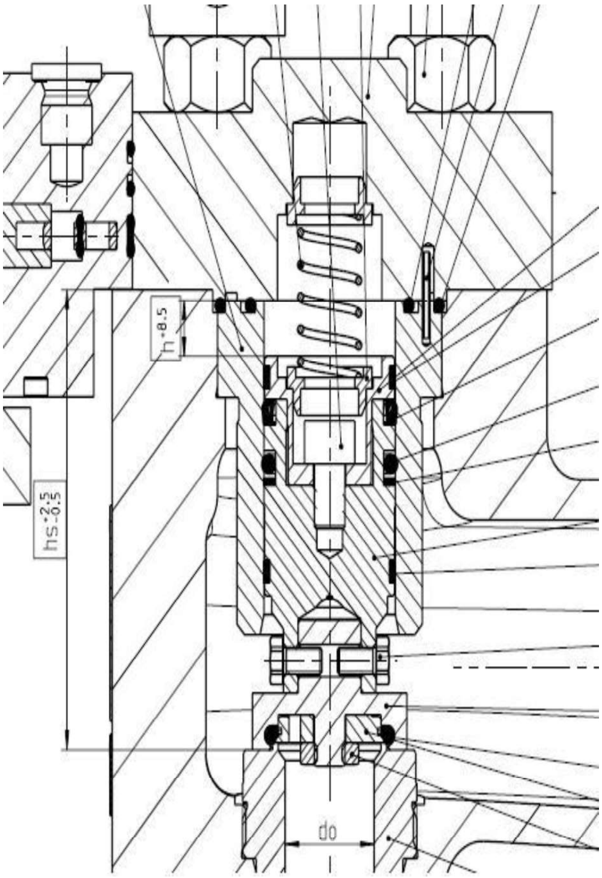



### 1. Steps – Descriptions

1 Place piston [6] and liner [8] into body [1] by using piston disassembly tool for nominal size above 3x4
Push piston [6] into lowest position.

**2 Makesure that minimum lift h of the main valve is reached.**

| Inlet x Size | Orifice [Designator] | Min. Lift [mm] | Min. Lift [inch] |
|---|---|---|---|
| 1 x 2 | D | 4,0 | 0,157 |
| 1 x 2 | E | 4,0 | 0,157 |
| 1 x 2 | F | 4,0 | 0,157 |
| 1 x 2 | G | 8,0 | 0,315 |
| 1,5 x 2 | D | 6,0 | 0,236 |
| 1,5 x 2 | E | 6,0 | 0,236 |
| 1,5 x 2 | F | 6,0 | 0,236 |
| 1,5 x 2 | G | 10,0 | 0,394 |
| 1,5 x 3 | G | 10,0 | 0,394 |
| 1,5 x 3 | H | 10,0 | 0,394 |
| 1,5 x 3 | J | 16,0 | 0,630 |
| 2 x 3 | G | 15,0 | 0,591 |
| 2 x 3 | H | 15,0 | 0,591 |
| 2 x 3 | J | 15,0 | 0,591 |
| 2 x 3 | K+ | 20,0 | 0,787 |
| 3 x 4 | J | 20,0 | 0,787 |
| 3 x 4 | K | 20,0 | 0,787 |
| 3 x 4 | L | 20,0 | 0,787 |
| 3 x 4 | N+ | 40,0 | 1,575 |
| 4 x 6 | L | 20,0 | 0,787 |
| 4 x 6 | M | 20,0 | 0,787 |
| 4 x 6 | N | 20,0 | 0,787 |
| 4 x 6 | P | 34,0 | 1,339 |
| 4 x 6 | P+ | 43,0 | 1,693 |
| 6 x 8 | Q | 60,0 | 2,362 |
| 6 x 8 | R | 60,0 | 2,362 |
| 6 x 8 | R+ | 70,0 | 2,756 |
| 8 x 10 | T | 80,0 | 3,150 |
| 8 x 10 | T+ | 90,0 | 3,543 |




In case of a underrun to minimum Lift – contact nearest LESER contract office/ service center

protected

## 2. Supplies

None

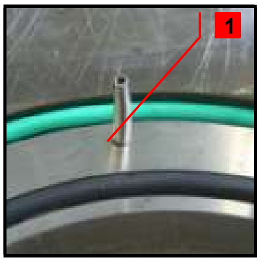
## 3. Tools

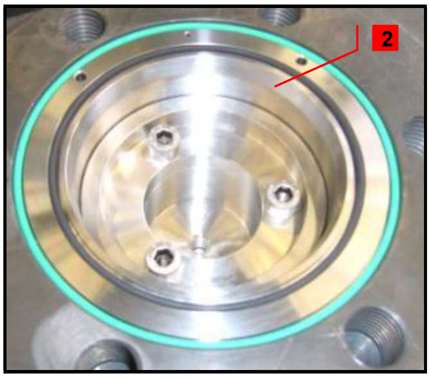
Piston disassembly tool
Depth caliper
Tightening torques acc. to LID

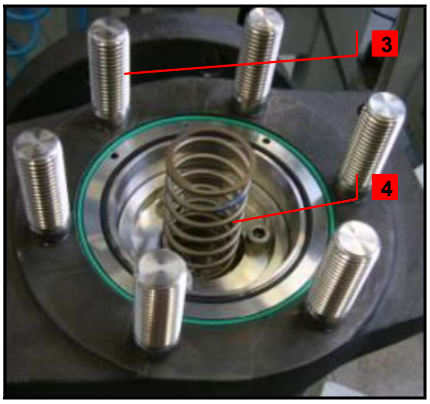
## 4. Appliance

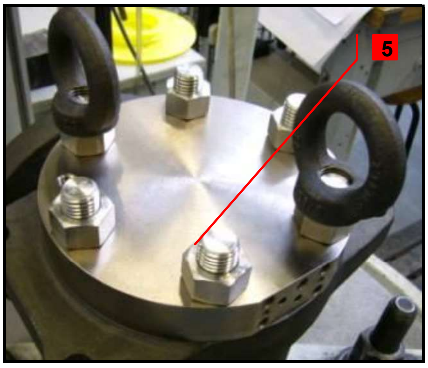
Test bench

## 9.10 Assembly of the top plate




### 1. Steps – Descriptions

1 Stick rollpin [10] into hole of liner [8]

**Make sure that roll pin is orientated to outlet flange**

2 Put O-rings [60, 67] into groove of liner [8] carefully

Lubricate studs with Molycote D paste acc. to LID

3 Screw studs [55] into threaded holes of body [1]

4 Place dome spring [52] in dome

**Make sure that O-rings [60,67] do not pop out of open groove**

5 Assembly top plate [9] on body [1] with nuts [56]

5 Screw ring nuts [57] on studs [55]

### 2. Supplies

Molycote D paste
Lubricate components LID

### 3. Tools

**Helpful:** Impact wrench acc. to LID
Ring wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

### 4. Appliance

Test bench

Content

**1 General information for assembling of pop action pilot valve .................. 2**
**2 Purpose ........................................................................................ 2**
**3 Competences ................................................................................ 2**
**4 Scope ........................................................................................... 2**
**5 Disclaimer..................................................................................... 2**
**6 Qualified fitting personnel.............................................................. 2**
**7 Remarks......................................................................................... 2**
**8 Basic safety guidelines ................................................................... 3**
**9 Assembly instructions..................................................................... 6**

## 1 General information for assembling of pop action pilot valve

## 2 Purpose

The documentation describes the assembly of the pop action pilot valve. The description contains the assembly procedure, additional supplies, tools and appliances.

## 3 Competences

The generation, maintenance and distribution of the documentation take place in the organisation department. The defaults will be generated by the technical department in consultation with the final assembly department and production planning department.

## 4 Scope

This document must be applied to the assembly of a Pilot Operated Safety Valve in agencies and subsidiaries of LESER GmbH & Co. KG, customers and independent service center.

## 5 Disclaimer

LESER puts in a great deal of effort into making up-to-date and correct documentation available. Nevertheless, LESER GmbH & Co. KG gives no guarantee that the recommended actions presented here are entirely correct and error free. This document is to be applied exclusively to the specified type. LESER GmbH & Co. KG declines any liability or responsibility for the correctness and completeness of the content. LESER GmbH & Co. KG reserves the right to change the information contained in this document, which is for the products of LESER GmbH & Co. KG and is intended for LESER subsidiaries, at any time and without prior announcement. LESER GmbH & Co. KG is available to the users of this document to provide additional information.

## 6 Qualified fitting personnel

LESER safety valves may only be assembled by trained or qualified fitters. The qualifications must be obtained through the appropriate training measures.

## 7 Remarks

Gloves must be worn during the entire assembly procedure

## 8 Basic safety guidelines

### Dangerous media

Poisoning, caustic burns, burns, injuries
• Use suitable protective devices
• Use suitable collecting tanks.
• Wear suitable protective equipment.

### Foreign bodies in the safety valve

Danger from failure of safety valve or leaks
• Flush the system before installation of a safety valve.
• Check the safety valve for foreign objects.
• Remove foreign objects

### Bug screen is damaged or missing
***(B or option)***

Dirt, objects or insects get into the safety valve. Danger from malfunction of the safety valve.
• Install the bug screen correctly.
• Check the bug screen regularly.

### Ambient temperature is too high

Material expansion. Danger from malfunction of the safety valve.

### Ambient temperature is too low

Icing, freezing vapours, reduced flow rate due to congealing media. Danger from functional disruption of the safety valve.

### Abrasive or corrosive media
Moving parts jam or become stuck. Danger from functional disruption of the safety valve.
• Service the safety valve after each time it opens.

### Media with high proportion of particles
**(only B)**

Deposits and clogging. Danger from malfunction of the safety valve.
• Use a filter with the correct mesh size.
• Use additional filters to increase the filter capacity.

**Residual media in the safety valve**

Poisoning, caustic burns, burns, injuries
• Wear suitable protective equipment.
• Remove residual media

**WARNING**

**Leaky safety valve**
Danger from leaking media due to damaged gaskets and sealing surfaces.
• Protect the safety valve against vibrations and blows especially during transport and installation.
• Check safety valve regularly for leaks.

**Open bonnet or spindle guides**

Danger from leaking media
• Make sure that no danger can arise from leaking media.
• Keep a safe distance.
• Wear suitable protective equipment.

**CAUTION**

**Hot medium**

Burns or scalding.
• Wear suitable protective equipment.

**Hot surfaces**
Burns.
• Wear suitable protective equipment.

**Aggressive medium**

Caustic burns.
• Wear suitable protective equipment.

**Open bonnet or spindle guides**

Pinching danger from moving parts.
• Install suitable safeguards.

**Sharp edges and burrs**

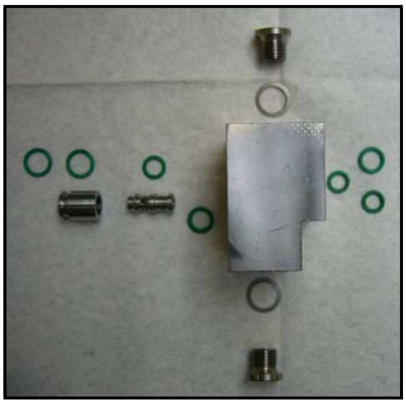
Danger of injury.
• Wear safety gloves.
• Handle the safety valve carefully

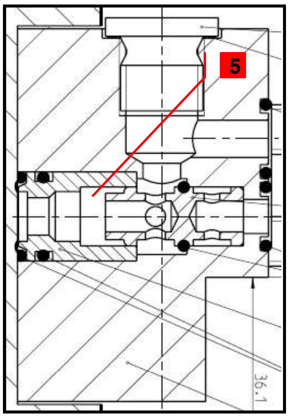
**High noise emission**

Hearing damage.
Wear ear protection.

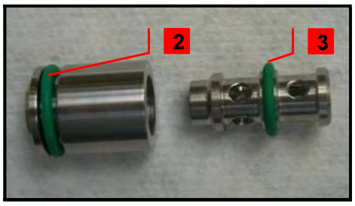
# 9 Assembly instructions

## 9.1 Assembly of the manifold block











### 1. Steps – Descriptions

1 Screw in lock screw [24.7] with gasket [24.8] into manifold block [24.1] Tightening torque acc. to LID

2 Complete bushing [24.2] with O-ring [24.5] (O-ring is 10,82 x 1,78)

3 Complete piston [24.3] with O-ring [24.4] **without soapy water** (O-ring is 7,65 x 1,78)

4 Complete manifold block [24.1] with piston [ 24.3], bushing [24.2] and O-rings
2 x 7,65 x 1,78;
2 x 9,25 x 1,78;
1 x10,82 x 1,78;

**Check the correct orientation of the piston using the diagram 5**

**Check the ease of movement of piston by rotating the manifold block**

### 2. Supplies

Use soapy water for easy assembly of O-rings
Lubricant acc. to LID

### 3.Tools

Allen key acc. to LID
Hook tool for O-rings
Torque wrench (Tightening torques acc. to LID)

### 4. Appliances

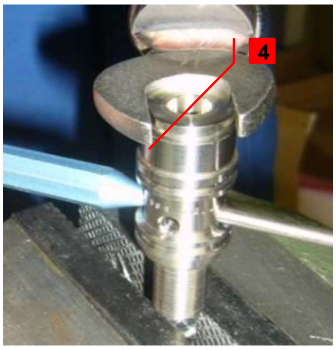
Parallel vice with aluminium jaws
Test bench

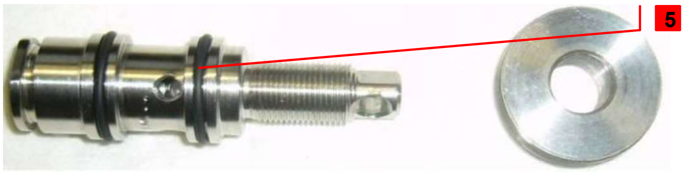
protected

## 9.2 Assembly of the adjusting screw









### 1. Steps – Descriptions

1 Pull O-ring [30] on (upper) feeding disc [7] (O-ring is 6,07x1,78)
**Make sure that O-ring is twist free**
2 Stick (upper) feeding disc into the (lower) feeding disc [8]
3 Insert unit (from 2) into adjusting screw [12]
4 Place adjusting screw into assembling aid (Use parallel vice as an alternative).
Screw in feeding seat (5) into adjusting screw unit while securing adjusting screw with a drift pin. Tightening torque acc. to LID
5 Pull both O-rings [32] on adjusting screw [12] (O-rings are 17,17x1,78)
**Make sure that O-rings are twist free**
6 Lubricate thread M12x1 of adjusting screw [12]. Screw on nut [20] as far as it will go

### 2. Supplies

Halocarbon 56 S
Lubricant acc. to LID

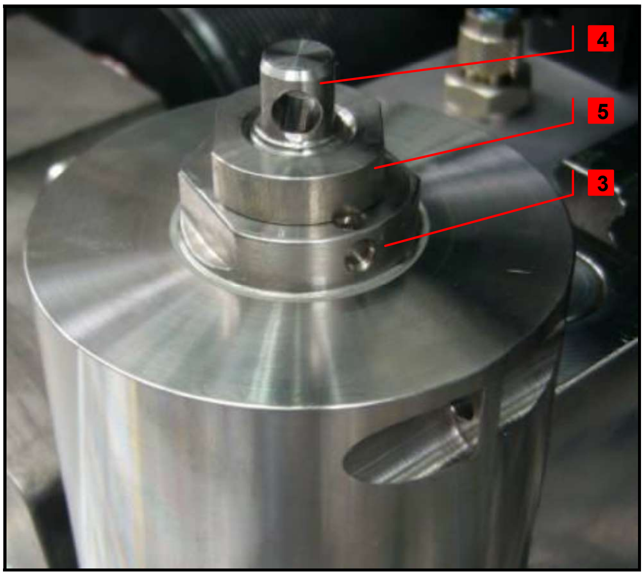
### 3. Tools

Open-end wrench acc. to LID
Hook tool for O-rings
Drift pin
Torque wrench (Tightening torques acc. to LID)

### 4. Appliances

Parallel vice with aluminium jaws
Assembling aid (60S.2512.4012)

## 9.3 Insertion of adjusting screw into body


### 1. Steps – Descriptions

1 Lubricate slide face for O-ring of body [1] with Halocarbon 56S

2 Insert adjusting screw unit from 9.2 into body [1]

3 Screw in nut [20] together with adjusting screw unit and tighten nut [20]

**4 Establish previous adjustment of adjusting screw[12] – measured before the disassembly process**

5 Tighten counter nut [21]

### 2. Supplies

Halocarbon 56S
Lubricant acc. to LID

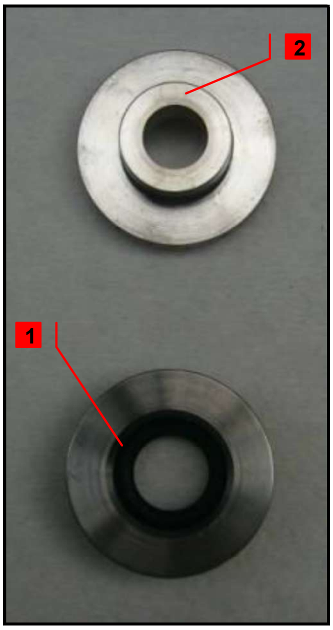
### 3. Tools

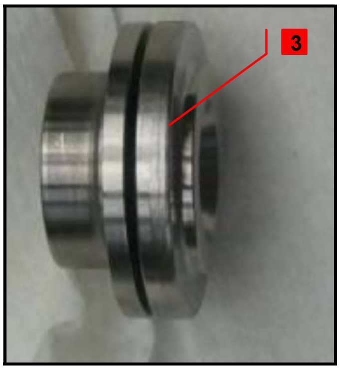
Open-end wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

### 4. Appliances

Test bench

## 9.4 Assembly of exhaust seat


### 1. Steps – Descriptions

1 Place O-ring [31] into (upper) exhaust seat [13].

2 Insert (lower) exhaust seat [14] into (upper) exhaust seat [13] (O-ring is 7,65x1,78)

3 Assembled exhaust seat



### 2. Supplies

None

### 3. Tools

None

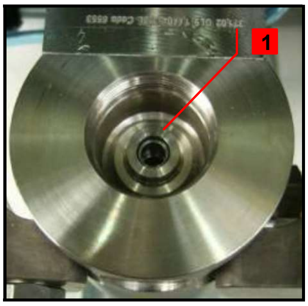
### 4. Appliances

None

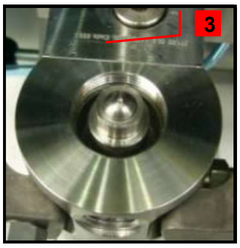


| | | | | | | | |
|---|---|---|---|---|---|---|---|
| disclosure cat.: | II | proofread: | Cal | published date: | tbd | effect. date: | 02/12 |
| author: | AW | released by: | KUW | replaces: | initial | status: | published |
| resp. depart.: | PP | date of release: | 01/31/12 | revision No.: | 0 | | |
| doc. type: | LGS | change rep. No.: | | retention period: | 10y. | | |

## 9.5 Insertion of the outlet valve into the body








### 1. Steps – Descriptions

1 Insert flat gasket [35] and unit from 9.4 into body [1]

2 Insert plunger [15]

3 Insert outlet disc [11] into guide bushing [2] and place both into body

4 Insert, screw in and tighten bonnet (base part) [10]

protected

### 2. Supplies

Halocarbon 56S
Lubricant acc. to LID

### 3. Tools

Open-end wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

### 4. Appliances

Test bench

## 9.6 Preassembly of bonnet




### 1. Steps – Descriptions

1 Insert PTFE-bushing into adjusting screw [18]

2 Lubricate thread of adjusting screw [18] with Molykote D paste

3 Screw lock nut [19] on adjusting screw [18]

4 Screw in adjusting screw unit into bonnet [9]

protected

### 2. Supplies

Molykote D paste (Halocarbon 56S as an alternative)
Lubricant acc. to LID

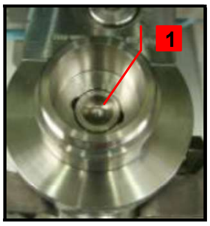
### 3. Tools

None

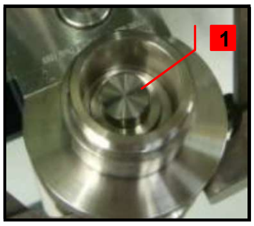
### 4. Appliances

None

## 9.7 Assembly of bonnet and spring












### 1. Steps – Descriptions

**Make sure that spring is selected in accordance with spring chart LGS 3632**

1 Place (lower) spring plate [17] and spring [54] onto outlet disc [11]
Note: If a pilot lifting device is applied follow 9.8 for spindle assembly.

2 Place (upper) spring plate [16] into spring [54]

3 Screw on bonnet [9] on base part [10] by hand

Make sure that upper spring plate [16] is vertically aligned to adjusting screw [18] by screwing in adjusting screw as far as possible until spring force is felt. If necessary use a drift pin to align

4 Tighten bonnet [9] while securing base part [10] with an open-end wrench

**Follow test procedure instructions acc. to LIDxxx**

### 2. Supplies

Lubricant acc. to LID

### 3. Tools

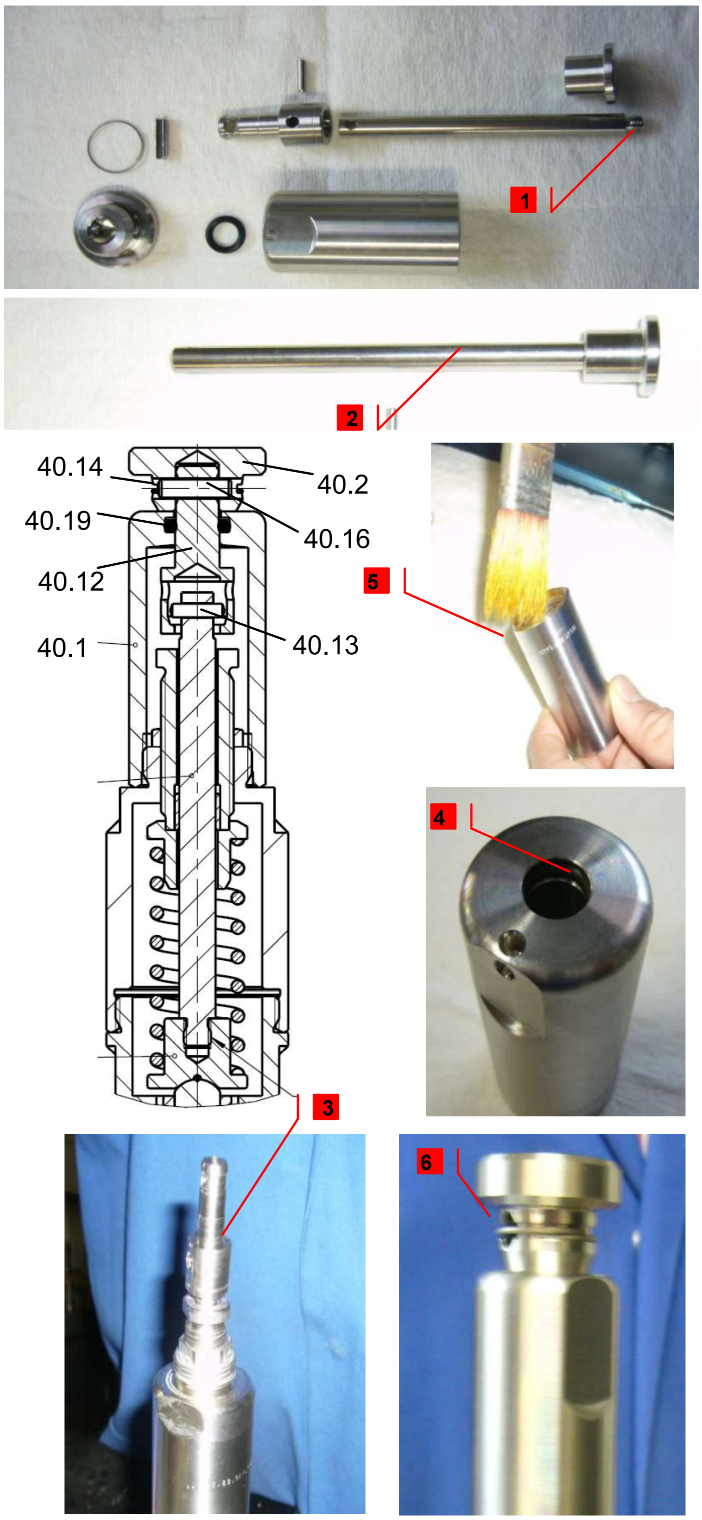
Open-end wrench acc. to LID
Drift pin
Torque wrench (Tightening torques acc. to LID)

### 4. Appliances

Test bench

protected

## 9.8 Assembly of Pilot Lifting Device




### 1. Steps – Descriptions

1 Cover thread of spindle [12] with adhesive liquid Delo ML 5449
2 Screw in spindle [12] into (lower) spring plate [17] hand-tight

**Follow 9.7 for assembling of bonnet and spring**

3 Place coupling [40.12] on the end of spindle [12] and insert parallel pin [40.13]

4 Put o-ring [40.19] in groove of cap [40.1]

5 Lubricate thread of cap [40.1] with Molykote D paste

6 Tighten cap [40.1]. Put lifting button [40.2] and roll pin [40.16] on coupling [40.12]. Secure roll pin [40.16] with securing ring [40.14]

### 2. Supplies

Molykote D paste (Halocarbon 56S as an alternative)
Adhesive liquid Delo ML 5449
Lubricant acc. to LID

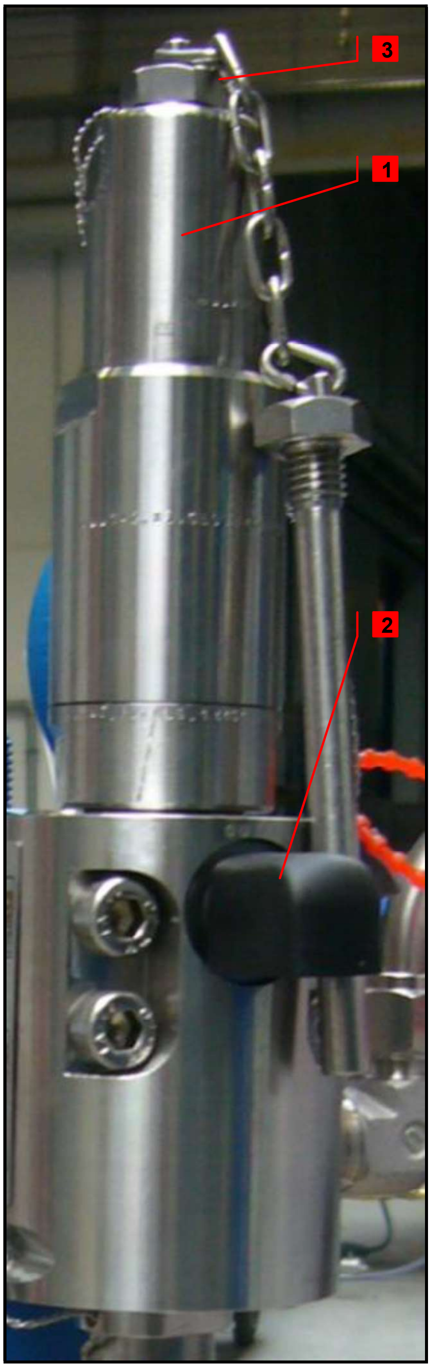
### 3. Tools

Open-end wrench acc. to LID
Drift pin
Torque wrench (Tightening torques acc. to LID)

### 4. Appliances

Test bench

## 9.9 Completion




### 1. Steps – Descriptions

Conduct completion of valve after test procedure

1 Tighten cap [40]

2 Screw in bug-screen [64]

In case of test gag:
3 Screw in short hexagon bolt [TG.5] into cap [40] and tighten cap

protected

### 2. Supplies

None

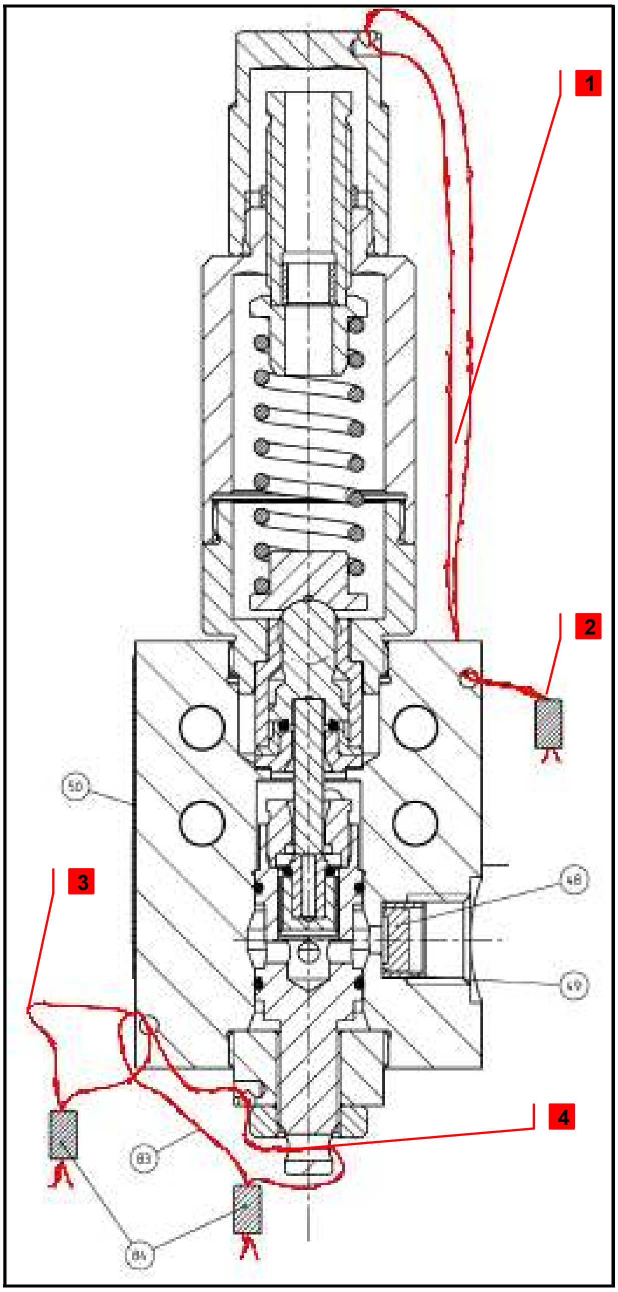
### 3. Tools

Open-end wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

### 4. Appliances

Test bench

## 9.10 Sealing the valve




### 1. Steps – Descriptions

**Seal valve after all assembly and test procedures**

Note: Sealing prevents unauthorized appliance of set pressure, blowdown adjustment and separation of pilot and main valve

1 Pass wire through hole in cap [40]. Wind wire tight around bonnet [9] in clockwise direction. Pass ends of wire through hole in body [1]

2 Close the wire ends with seal

**In case of inspection, sealing is done by a regulatory body e.g. TÜV, NBBI**

3 Seal body [1] with main valve body separately

4 Seal adjusting screw [12] with body [1] separately

### 2. Supplies

None

### 3. Tools

Sealing pliers

### 4. Appliances

None

Content

**1 General informations for disassembling the modulate action valve with diaphragm ........ 2**
**2 Purpose ........ 2**
**3 Competence ........ 2**
**4 Scope ........ 2**
**5 Disclaimer ........ 2**
**6 Qualified fitting personnel ........ 2**
**7 Remarks ........ 2**
**8 Basic safety guidelines ........ 3**
**9 Assembly instructions ........ 6**

## 1 General informations for disassembling the modulate action valve with diaphragm

## 2 Purpose

The documentation describes the disassembly of the modulate action pilot valve with diaphragm. The description contains every single working step, supplies, tools and appliances.

## 3 Competence

The generation, maintenance and distribution of the documentation takes place in the organisation department. The defaults will be generated by the technical department in consultation with the final assembly department and production planning department.

## 4 Scope

This document must be applied to the dismantling of a Pilot Operated Safety Valve in agencies and subsidiaries of LESER GmbH & Co. KG, customers and independent service center.

## 5 Disclaimer

LESER puts in a great deal of effort into making up-to-date and correct documentation available. Nevertheless, LESER GmbH & Co. KG gives no guarantee that the recommended actions presented here are entirely correct and error free.
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LESER GmbH & Co. KG is available to the users of this document to provide additional information.

## 6 Qualified fitting personnel

LESER safety valves may only be dismantled by trained or qualified fitters. The qualifications must be obtained through the appropriate training measures.

## 7 Remarks

Gloves must be worn during the entire dismantling process.

## 8 Basic safety guidelines

### Dangerous media

Poisoning, caustic burns, burns, injuries
- Use suitable protective devices
- Use suitable collecting tanks.
- Wear suitable protective equipment.

### Foreign bodies in the safety valve

Danger from failure of safety valve or leaks
- Flush the system before installation of a safety valve.
- Check the safety valve for foreign objects.
- Remove foreign objects

### Bug screen is damaged or missing
***(B or option)***

Dirt, objects or insects get into the safety valve. Danger from malfunction of the safety valve.
- Install the bug screen correctly.
- Check the bug screen regularly.

### Ambient temperature is too high

Material expansion. Danger from malfunction of the safety valve.

### Ambient temperature is too low

Icing, freezing vapours, reduced flow rate due to congealing media. Danger from functional disruption of the safety valve.

### Abrasive or corrosive media
Moving parts jam or become stuck. Danger from functional disruption of the safety valve.
- Service the safety valve after each time it opens.

### Media with high proportion of particles
**(only B)**

Deposits and clogging. Danger from malfunction of the safety valve.
• Use a filter with the correct mesh size.
• Use additional filters to increase the filter capacity.

**Residual media in the safety valve**

Poisoning, caustic burns, burns, injuries
• Wear suitable protective equipment.
• Remove residual media

**WARNING**

**Leaky safety valve**
Danger from leaking media due to damaged
gaskets and sealing surfaces.
• Protect the safety valve against vibrations and blows especially during transport and installation.
• Check safety valve regularly for leaks.

**Open bonnet or spindle guides**

Danger from leaking media
• Make sure that no danger can arise from leaking media.
• Keep a safe distance.
• Wear suitable protective equipment.

**CAUTION**

**Hot medium**

Burns or scalding.
• Wear suitable protective equipment.

**Hot surfaces**
Burns.
• Wear suitable protective equipment.

**Aggressive medium**

Caustic burns.
• Wear suitable protective equipment.

**Open bonnet or spindle guides**

Pinching danger from moving parts.
• Install suitable safeguards.

**Sharp edges and burrs**

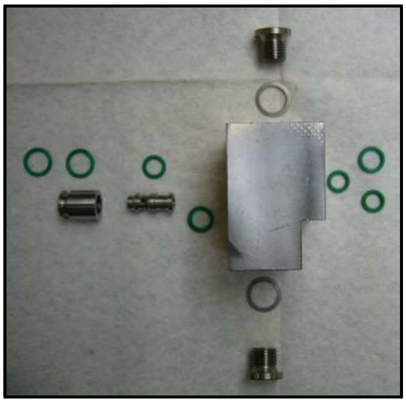
Danger of injury.
• Wear safety gloves.
• Handle the safety valve carefully

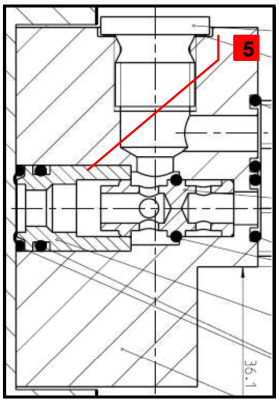
**High noise emission**

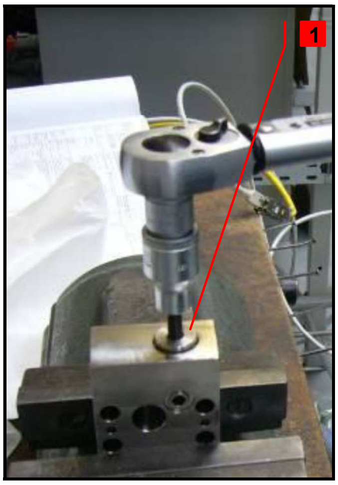
Hearing damage.
Wear ear protection.

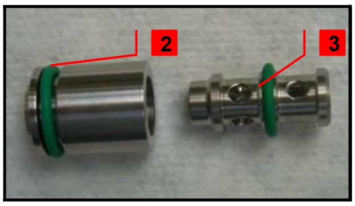
# 9 Assembly instructions

## 9.1 Assembly of the manifold block







### 1. Steps – Descriptions

1 Screw lock screw [24.7] with gasket [24.8] into manifold block [24.1]

2 Complete bushing [24.2] with O-ring [24.5] (O-ring is 10,82 x 1,78)

3 Complete piston [24.3] with O-ring [24.4] (O-ring is 7,65 x 1,78 )

**Without soapy water!**

4 Complete manifold block [24.1] with piston [24.3], bushing [24.2] and O-rings
2 x 7,65 x 1,78 ;
2 x 9,25 x 1,78;
1 x 10,82 x 1,78

5 Consider the correct alignment of piston

**Check the ease of movement of piston by rotating manifold block**

### 2. Supplies

Soapy water [24.5]
Lubricate components acc. to LID

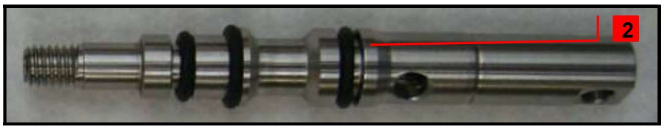
### 3. Tools

Allen key acc. to LID
Hook tool for O-rings
Tightening torques acc. to LID

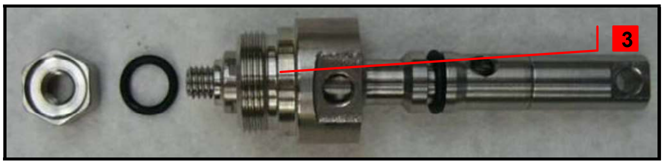
### 4. Appliance

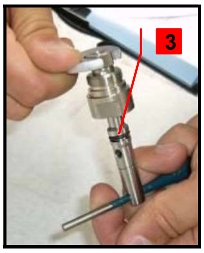
Parallel vice with aluminium jaws
Test bench

## 9.2 Assembly of the feeding seat unit






### 1. Steps – Descriptions

1 Screw (lower) disc exhaust [11] together with (lower) disc exhaust extension [45]
Cover O-ring (30 below + 34) with soapy water
2 Pull O-rings (30 below, 31, 34) on disc exhaust (lower) [11]
**Caution: Do not mix up O-ring (31) with PTFE-coating with O-rings (30 lower)!**
**Make sure that O-rings are twist free**
3 Stick (lower) disc, feeding [8] and seat feeding [5] on (lower) disc exhaust [11], put O-ring [30 upper] on (lower) disc, feeding [8] screw together with (upper) disc feeding [7]
**Make sure that O-rings are twist free**

### 2. Supplies

Soapy water
Lubricate components acc. to LID

### 3. Tools

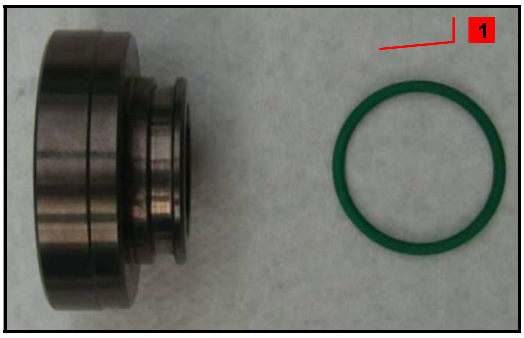
**Helpful:** O-ring-mounting aid (30+34)
Hook tool for O-rings
Drift pin
Open-end wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

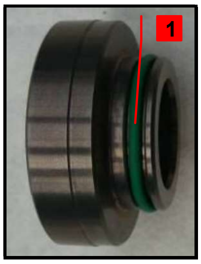
### 4. Appliance

None

protected

## 9.3 Assembly of the O-ring 32 + 46




### 1. Steps – Descriptions

1 Cover O-ring [46] (O-ring is 21,95 x 1,78 ) with soapy water and pull O-ring on guide bush [2]

2 Cover O-ring [32] (O-ring is 12,37 x 2,62 ) with soapy water and pull O-ring on piston [41]

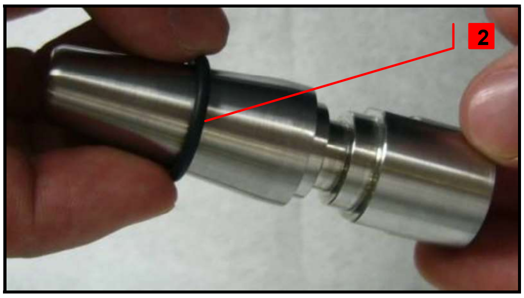
**Make sure that O-rings are twist free**




### 2. Supplies

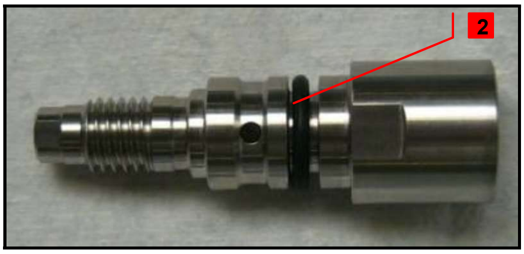
Soapy water
Lubricate components acc. to LID

### 3. Tools



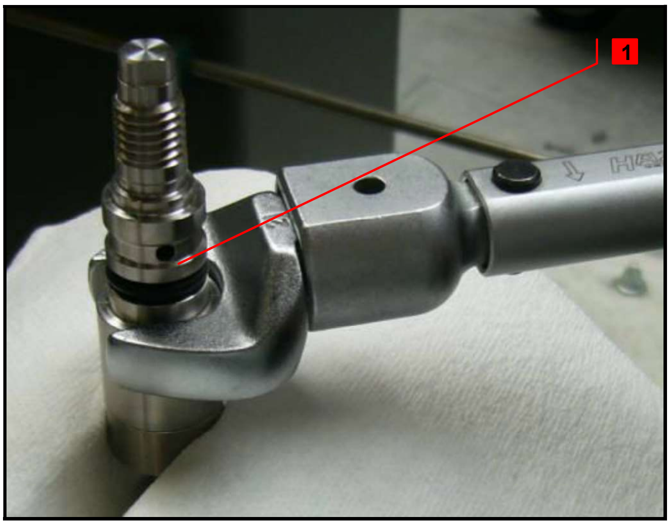

**Helpful:** O-ring mounting aid [32]
Hook tool for O-rings

### 4. Appliance




None

## 9.4 Assembly of the piston and seat unit




**1. Steps – Descriptions**

Remove protection cap of piston [41] – if necessary

Place disc/seat unit –out of 9.2- in parallel vice with aluminium jaws

1 Screw piston [41] on disc/seat unit - out of 9.2

**2. Supplies**

Lubricate components acc. to LID

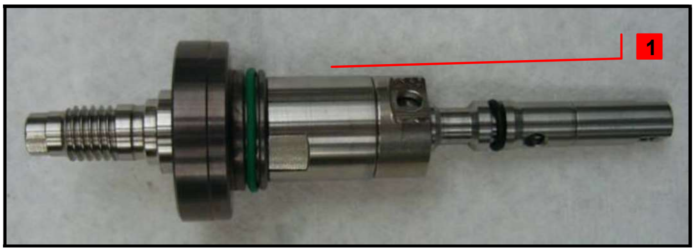
**3. Tools**

Open-end wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

**4. Appliance**

Parallel vice with aluminium jaws
Assembling aid

## 9.5 Assembly of the piston and guide bush


### 1. Steps – Descriptions

1 Cover O-ring [32] with soapy water and pull guide bush [2] on piston [41]

**Test ease of movement**

protected

### 2. Supplies

Soapy water
Lubricate components acc. to LID

### 3. Tools

None

### 4. Appliance

None

## 9.6 Insert disc and piston unit into the body



### 1. Steps – Descriptions

Blow out dust before assembly

1 Cover O-Ring [31+46] with soapy water

2 Insert disc, piston, guide unit carefully and completely into body [1]

protected

### 2. Supplies

Soapy water
Lubricate components acc. to LID

### 3. Tools

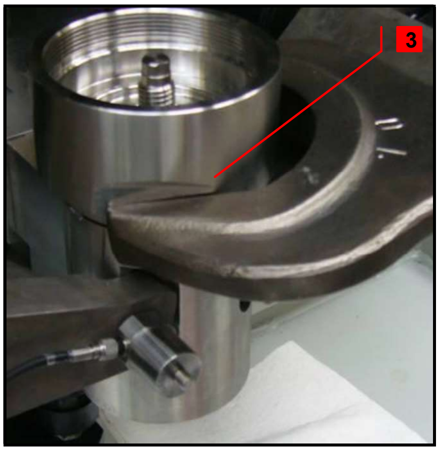
Brush

### 4. Appliance

Test bench

## 9.7 Assembly of the spacer and body







### 1. Steps – Descriptions

1 Put O-ring [74] into groove of body [1]

2 Lubricate thread of body [1] (M56x1,5)

3 Screw on spacer [75]

4 Tightening lock screw (hexagon screw) [77]



### 2. Supplies

Molykote D Paste
Lubricate components acc. to LID

### 3. ,Tools

Ring wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

### 4. Appliance

Test bench

## 9.8 Assembly of the diaphragm


**1. Steps – Descriptions**

1 Push diaphragm retainer [78] on piston [41]
2 Cover O-ring [73] (O-ring is 10,77x2,62 9) with soapy water
3 Put O-ring (73) into groove
**Optional: Check FEP-protection foil (79) for any damage**
Optional: put in FEP-protection foil
**Check diaphragm for any damage**
4 Insert diaphragm [72] with labelling to bottom
5 Insert ring [76]
(hexagon screw for positioning)
6 Push diaphragm washer [71] on piston
7 Lubricate thread of piston [41]
8 Screw nut [70] until 1 mm against stop by hand
9 Tightening nut with wrench and counter piston with a second wrench

**2. Supplies**

Soapy water
Molykote D paste
Lubricate components acc. to LID

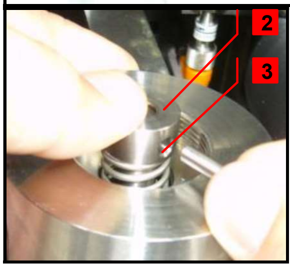
**3. Tools**

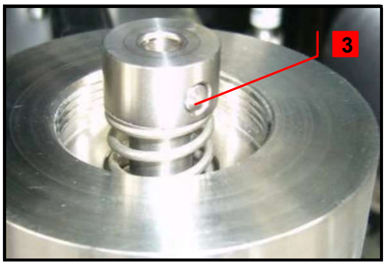
Ring wrench acc. to LID
Open-end wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

**4. Appliance**

Test bench

## 9.9 Closing the body´s bottom side





**1. Steps – Descriptions**

Spin body [1] by 180°

1 Insert return spring [42] into body [1]

2 Put coupling [43] on lower end of spring,

3 Span return spring [42] with coupling [43] and save coupling [43] by sticking parallel pin [44] into hole

4 Put O-ring [35] (O-ring is 21,95x1,78) into groove of plug [20]

5 Lubricate thread of plug [20]

6 Screw plug [20] and body [1] together

**2. Supplies**

Molykote D Paste
Lubricate components acc. to LID

**3. Tools**

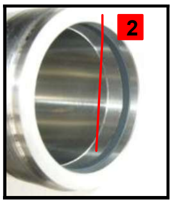
Open-end wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

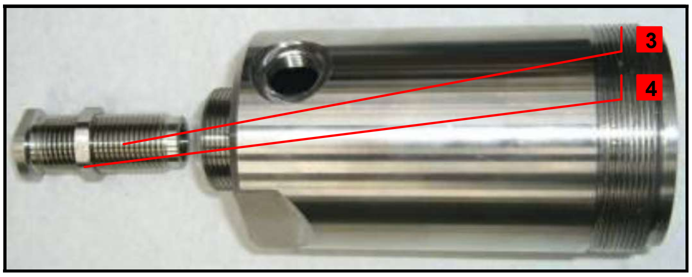
**4. Appliance**

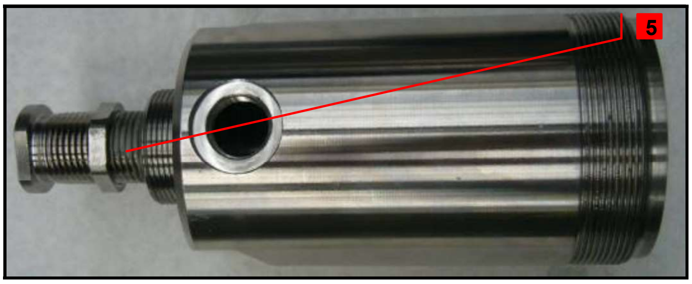
Test bench

## 9.10 Assembly of the bonnet




### 1. Steps – Descriptions

Spin body [1] by 180°
1 Place (upper) piston [47] on piston [41]
**Check free movement of (upper) piston [47] to avoid a clamp**
2 Put guide ring [80] into groove of bonnet [9]
**Make sure, whether guiding ring is completely in groove**
3 Lubricate thread of adjusting screw [18]
4 Screw lock nut [19] on adjusting screw [18]
**Check ease of movement of adjusting screw [18]**
5 Screw adjusting screw unit approx 15 mm into bonnet [9]

### 2. Supplies

Molykote D Paste
Lubricate components acc. to LID

### 3. Tools

None

### 4. Appliance

None

## 9.11 Assembly of the spindle unit



### 1. Steps – Descriptions

1 Cover thread of spindle [12] with screw locking liquid Delo ML 5449

2 Screw spindle [12] and (lower) spring plate [17] together

3 Put on in that order: spring [54] (optional inner spring [53]), (upper) spring plate [16], needle bearing [69.2] (lubricate bearing) and washer [69.1]



### 2. Supplies

Screw locking liquid Delo ML 5449
Molykote D Paste
Lubricate components acc. to LID

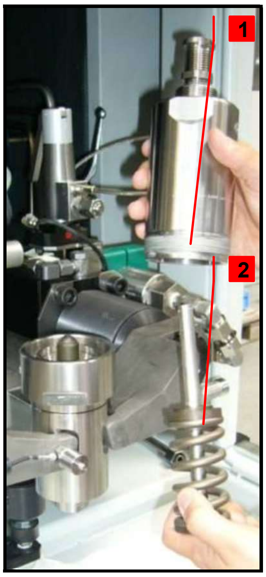
### 3. Tools

Drift pin
Torque wrench (Tightening torques acc. to LID)

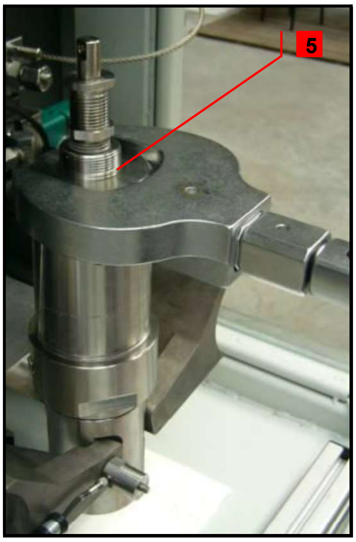
### 4. Appliance

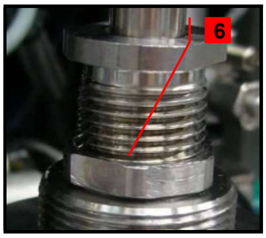
Parallel vice with aluminium jaws

## 9.12 Assembly of the bonnet and body






### 1. Steps – Descriptions

1 Lubricate thread of bonnet [9]

2 Put spindle [12] unit on (upper) piston [47] and hold on

3 Put bonnet [9] over spindle unit and insert spindle into adjusting screw [18]

4 Screw on bonnet [9] hand tight

5 Tighten bonnet [9]

6 **Screw lock nut [19] until 1 mm against bonnet**

### 2. Supplies

Molykote D Paste
Lubricate components acc. to LID

### 3. Tools

Open-end wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

### 4. Appliance

Test bench

## 9.13 Completion


**1. Steps – Descriptions**

1 Screw on cap [40] loosely

2 Screw in bug-screen [64]

Option Test Gag:
Screw short screw [TG.5] into cap [40] (finger tight)

**2. Supplies**

None

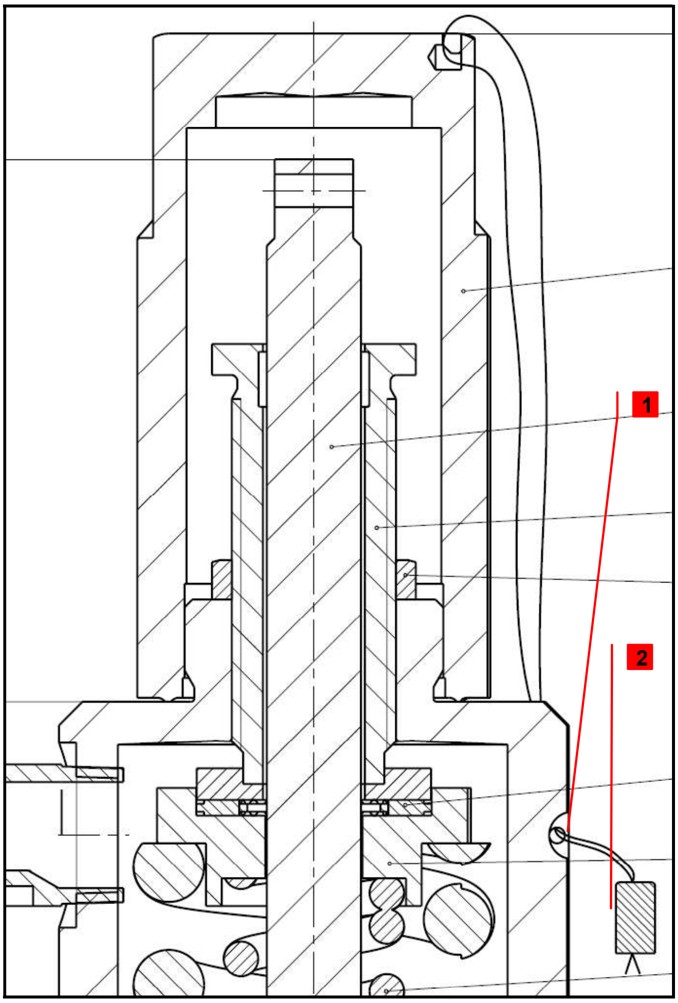
**3. Tools**

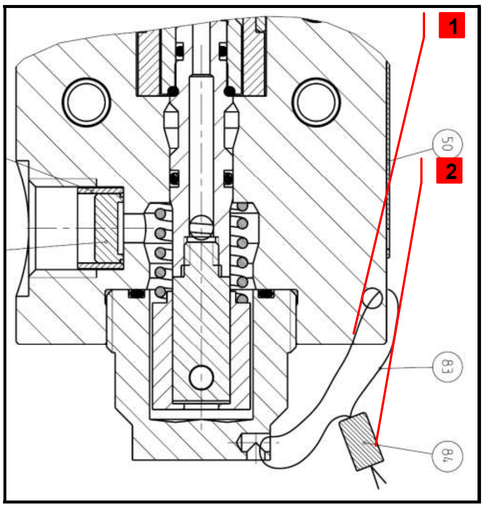
Open-end wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

**4. Appliance**

Test bench

## 9.14 Sealing the valve




### 1. Steps – Descriptions

**Sealing after assembly and test with main valve!**
Seal valve, if a constructive possibility exists. Otherwise you have to weld on sealing noses (cap; bonnet; bonnet)

1 Connect sealing hole/ nose of cap and bonnet with wire tight and in clockwise

2 Close wire ends with seal

**Note: In case of required certifications (TÜV etc.) sealing ensued after the certification**

protected

### 2. Supplies

None

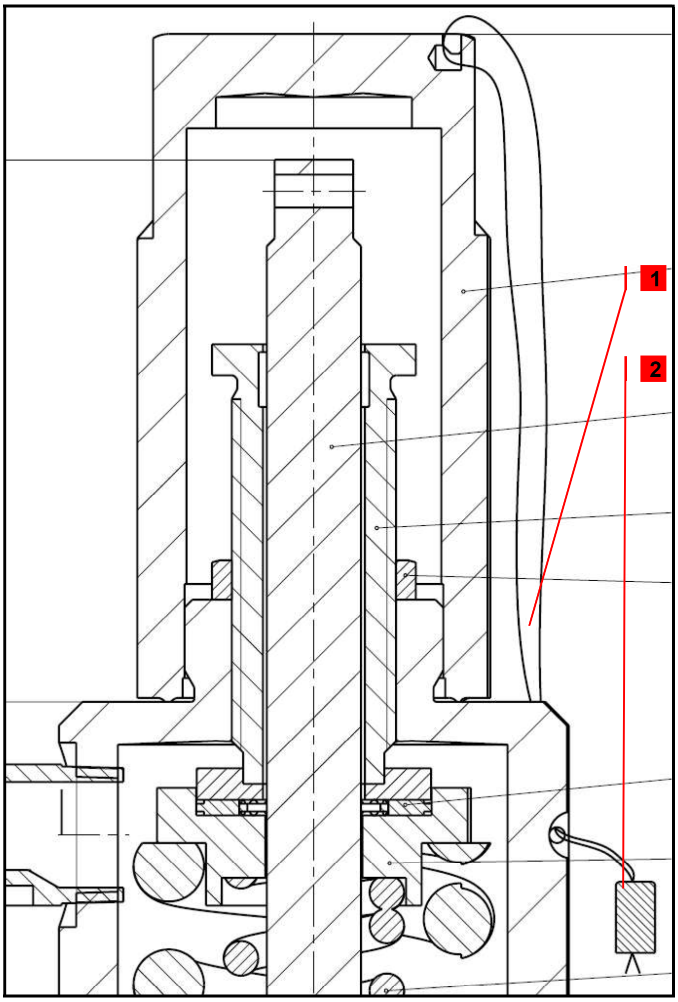
### 3. Tools

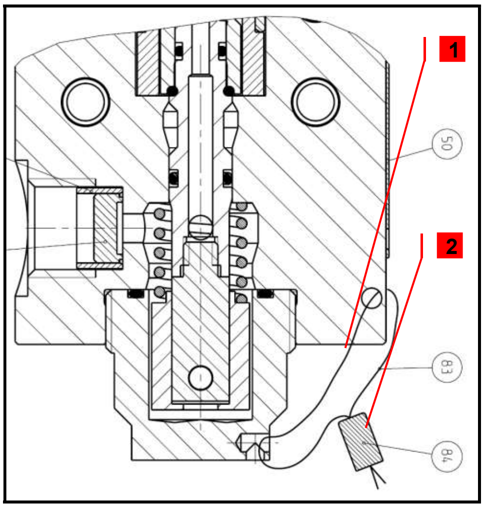
Sealing pliers

### 4. Appliance

None

## 9.11 Sealing the valve




### 1. Steps – Descriptions

**Sealing after assembly and test with main valve!**
Seal valve, if constructive possibility exists. Otherwise next workstation has to weld on sealing noses (cap; bonnet; body)

1 Connect sealing hole/ nose of cap and bonnet with wire tight and in clockwise

2 Close wire ends with seal

**Note: In case of required certifications (TÜV etc.) sealing ensued after certification**

### 2. Supplies

None

### 3. Tools

Sealing pliers

### 4. Appliance

None

Content

1 **General informations for disassembling the modulate pilot valve (piston) 2**
2 **Purpose ... 2**
3 **Competences ... 2**
4 **Scope ... 2**
5 **Disclaimer ... 2**
6 **Qualified fitting personnel ... 2**
7 **Remarks ... 2**
8 **Basic safety guidelines ... 3**
9 **Assembly instructions ... 6**

# 1 General informations for disassembling the modulate pilot valve (piston)

# 2 Purpose

The documentation describes the disassembly of the modulate action pilot valve with piston. The description contains every single working step, supplies, tools and appliances.

# 3 Competences

The generation, maintenance and distribution of the documentation takes place in the organisation department. The defaults will be generated by the technical department in consultation with the final assembly department and production planning department.

# 4 Scope

This document must be applied to the dismantling of a Pilot Operated Safety Valve in agencies and subsidiaries of LESER GmbH & Co. KG, customers and independent service center.

# 5 Disclaimer

LESER puts in a great deal of effort into making up-to-date and correct documentation available. Nevertheless, LESER GmbH & Co. KG gives no guarantee that the recommended actions presented here are entirely correct and error free.
This document is to be applied exclusively to the specified type. LESER GmbH & Co. KG declines any liability or responsibility for the correctness and completeness of the content.
LESER GmbH & Co. KG reserves the right to change the information contained in this document, which is for the products of LESER GmbH & Co. KG and is intended for LESER subsidiaries, at any time and without prior announcement.
LESER GmbH & Co. KG is available to the users of this document to provide additional information.

# 6 Qualified fitting personnel

LESER safety valves may only be dismantled by trained or qualified fitters. The qualifications must be obtained through the appropriate training measures.

# 7 Remarks

Gloves must be worn during the entire dismantling process.

## 8 Basic safety guidelines

### Dangerous media

Poisoning, caustic burns, burns, injuries
• Use suitable protective devices
• Use suitable collecting tanks.
• Wear suitable protective equipment.

### Foreign bodies in the safety valve

Danger from failure of safety valve or leaks
• Flush the system before installation of a safety valve.
• Check the safety valve for foreign objects.
• Remove foreign objects

### Bug screen is damaged or missing
***(B or option)***

Dirt, objects or insects get into the safety valve. Danger from malfunction of the safety valve.
• Install the bug screen correctly.
• Check the bug screen regularly.

### Ambient temperature is too high

Material expansion. Danger from malfunction of the safety valve.

### Ambient temperature is too low

Icing, freezing vapours, reduced flow rate due to congealing media. Danger from functional disruption of the safety valve.

### Abrasive or corrosive media
Moving parts jam or become stuck. Danger from functional disruption of the safety valve.
• Service the safety valve after each time it opens.

### Media with high proportion of particles

**(only B)**

Deposits and clogging. Danger from malfunction of the safety valve.
• Use a filter with the correct mesh size.
• Use additional filters to increase the filter capacity.

**Residual media in the safety valve**

Poisoning, caustic burns, burns, injuries
• Wear suitable protective equipment.
• Remove residual media

**WARNING**

**Leaky safety valve**
Danger from leaking media due to damaged
gaskets and sealing surfaces.
• Protect the safety valve against vibrations and blows especially during transport and installation.
• Check safety valve regularly for leaks.

**Open bonnet or spindle guides**

Danger from leaking media
• Make sure that no danger can arise from leaking media.
• Keep a safe distance.
• Wear suitable protective equipment.

**CAUTION**

**Hot medium**

Burns or scalding.
• Wear suitable protective equipment.

**Hot surfaces**
Burns.
• Wear suitable protective equipment.

**Aggressive medium**

Caustic burns.
• Wear suitable protective equipment.

### Open bonnet or spindle guides

Pinching danger from moving parts.
• Install suitable safeguards.

### Sharp edges and burrs

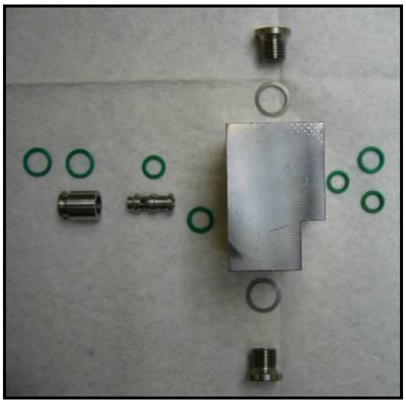
Danger of injury.
• Wear safety gloves.
• Handle the safety valve carefully

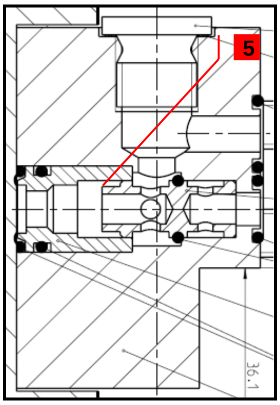
### High noise emission

Hearing damage.
Wear ear protection.

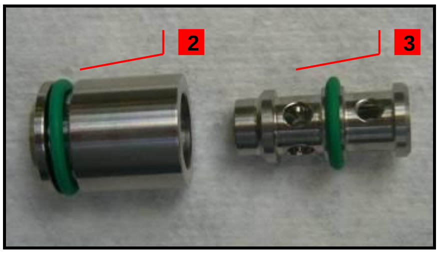
# 9 Assembly instructions

## 9.1 Assembly of the manifold block











**1. Steps – Descriptions**

1 Screw in lock screw [24.7] with gasket [24.8] into manifold block [24.1]

2 Complete bushing [24.2] with O-ring [24.5] (O-ring is 10,82 x 1,78)

3 Complete piston [24.3] with O- ring [24.4] (O-ring is 7,65 x 1,78).

**Without soapy water!**

4 Complete manifold block [24.1] with piston [24.3], bushing [24.2] and O-rings
2 x 7,65 x 1,78;
2 x 9,25 x 1,78;
1 x 10,82 x 1,78;

5 Consider correct alignment of piston

**Check the ease of movement of piston by rotating manifold block**

**2. Supplies**

Soapy water [24.5]
Lubricate components acc. to LID

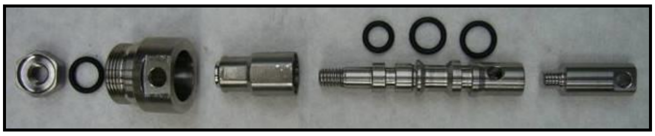
**3. Tools**

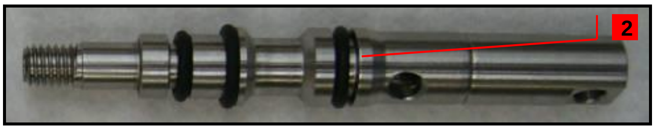
Allen key acc. to LID
Hook tool for O-rings
Torque wrench (Tightening torques acc. to LID)

**4. Appliance**

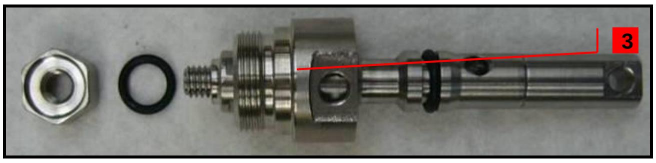
Parallel vice with aluminium jaws
Test bench

## Assembly of the seat unit










### 1. Steps – Descriptions

1 Screw (lower) disc, exhaust [11] together with (lower) disc exhaust, extension [45]

Cover O-ring (30 below + 34) with soapy water

2 Pull O-rings (30 below, 31, 34) on (lower) disc exhaust [11]

**Caution: Do not mix up O-rings (31) with PTFE-coating with O-rings (30 lower)!**
**Make sure that O-rings are twist free**

3 Stick (lower) disc, feeding [8] and seat  feeding [5] on (lower) disc exhaust [11], put the O-ring [30 upper] on (lower) disc, feeding [8] screw together with (upper) disc feeding [7]
4 After assembly there has to be a gap between (lower) disc, feeding [8] and (upper) disc feeding [7].
**Make sure that O-rings are twist free**

### 2. Supplies

Soapy water
Lubricate components acc. to LID

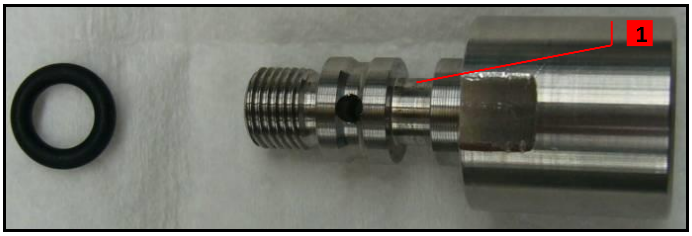
### 3. Tools

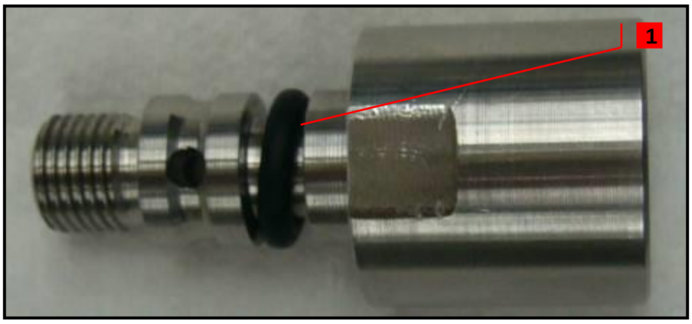
**Helpful:** O-ring-mounting aid (30 + 34)
Hook tool for O-rings
Drift pin
Open-end wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

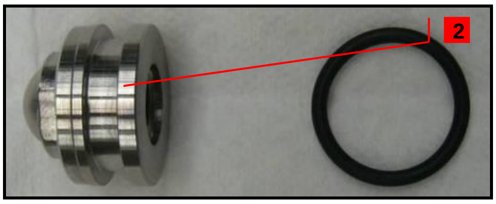
### 4. Appliance

None

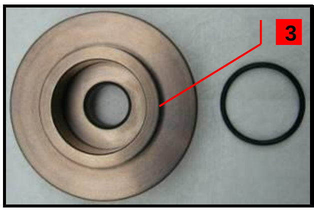
## 9.2 Assembly of the O-ring 32 + 33 + 46









### 1. Steps – Descriptions

**As from 100 bar, mount additional back up rings (81 + 82)!**

1 Cover O-ring [32] (O-ring is 7,59 x 2,62) with soapy water pull O-ring on piston [41]

2 Cover O-ring [33] (O-ring is 20,29 x 2,62) with soapy water and pull O-ring on piston, upper [47]

3 Cover O-ring [46] (O-ring is 21,95 x 1,78) with soapy water and pull O-ring on guide bush [2]

**Make sure that O-rings are twist free**

### 2. Supplies

Soapy water
Lubricate components acc. to LID

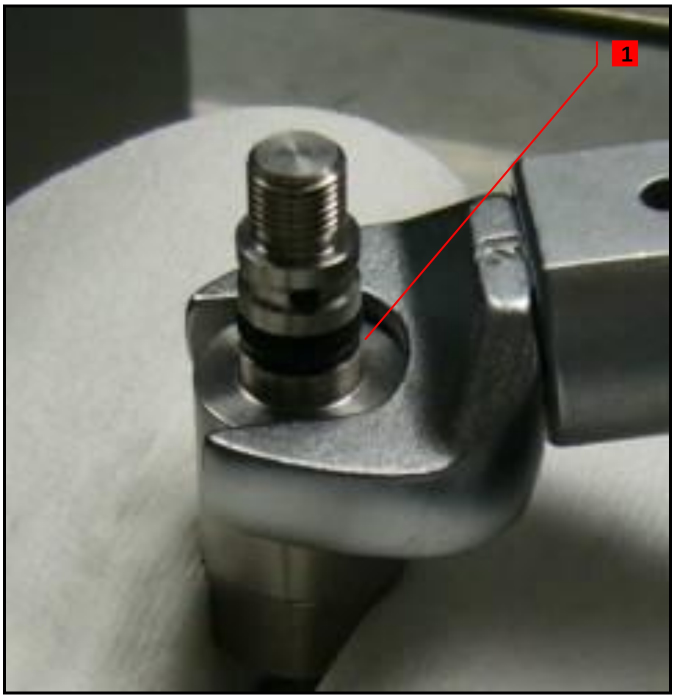
### 3. Tools

**Helpful:** O-ring mounting aid [32]
Hook tool for O-rings
Torque wrench (Tightening torques acc. to LID)

### 4. Appliance

None

## 9.3 Assembly of the piston and seat unit




### 1. Steps – Descriptions

Remove protection cap of piston [41] - if necessary

Place disc/seat unit –out of 9.2- in parallel vice with aluminium jams

1 Screw piston [41] on seat unit –out of 9.2



### 2. Supplies

Halocabon 56S
Lubricate components acc. to LID

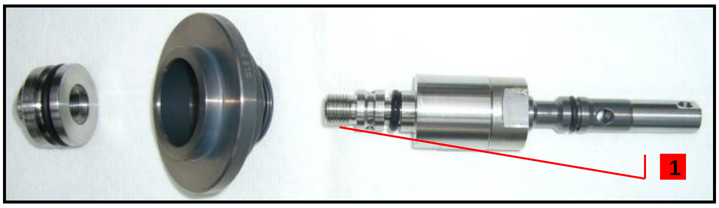
### 3. Tools

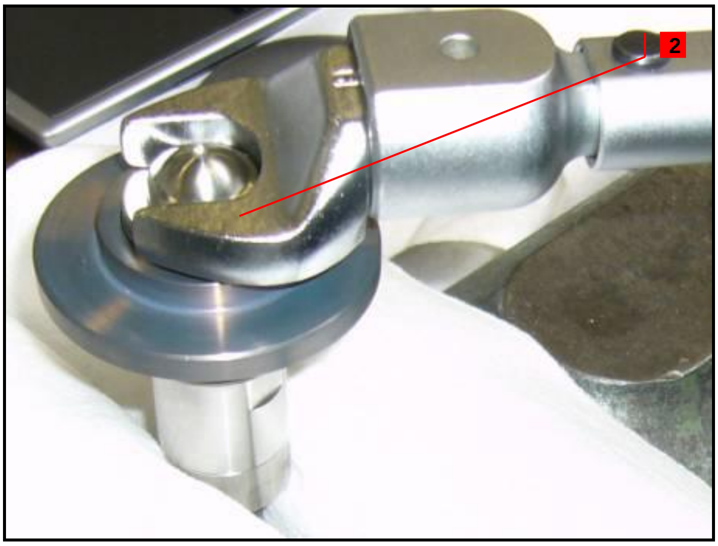
Open-end wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

### 4. Appliance

Parallel vice with aluminium jaws

## 9.4 Assembly of the seat/disc unit, guide bush and piston, upper




### 1. Steps – Descriptions

Cover O-ring [32] with soapy water

Place seat,piston unit in parallel vice with aluminium jams

1 Lubricate thread of piston [41]

Cover O-ring [33] with soapy water

2 Stick guide bush [2] on piston [41] and screw together with piston, upper [47]

protected

### 2. Supplies

Soapy water
Molykote D Paste
Lubricate components acc. to LID

### 3. Tools

Open-end wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

### 4. Appliance

Parallel vice with aluminium jaws
Assembling aid

## 9.5 Insert disc, piston unit into the body


### 1. Steps – Descriptions

Blow out dust before assembly

Cover O-ring [31+46] with soapy water

1 Insert disc, piston unit carefully and completely into body [1]

**Test the ease of movement**

protected

### 2. Supplies

Soapy water
Lubricate components acc. to LID

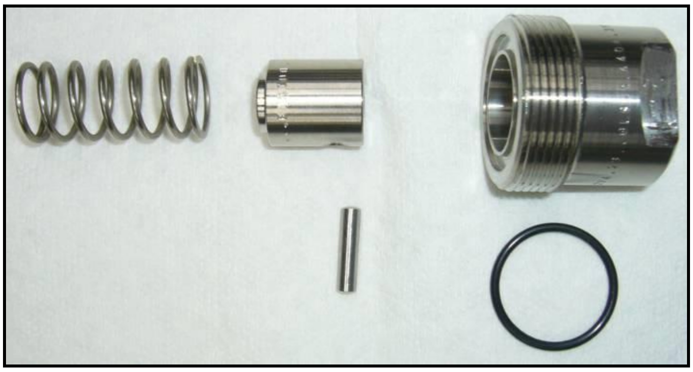
### 3. Tools

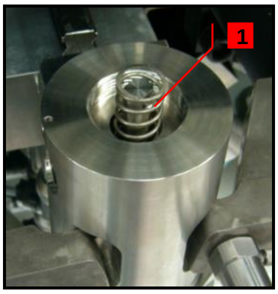
None

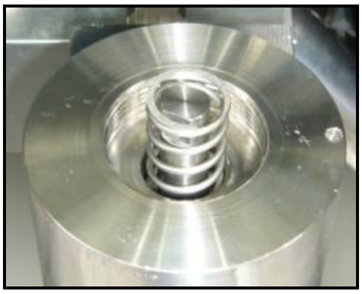
### 4. Appliance

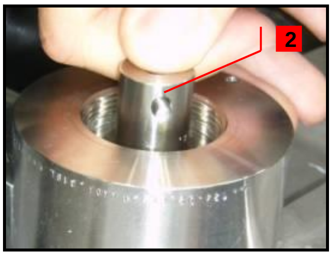
Test bench

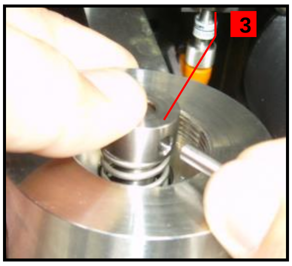
## 9.6 Closing the body´s bottom side

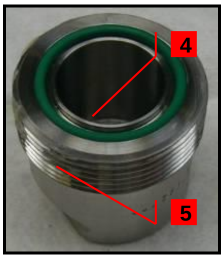


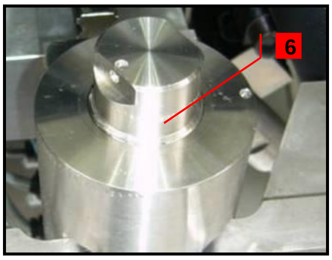





**1. Steps – Descriptions**

Spin body [1] by 180°

1 Insert return spring [42] into body [1]

2 Put coupling  [43] on lower end of spring

3 Span return spring [42] with coupling [43] and save coupling by sticking parallel pin [44] into hole

4 Put O-ring [35] (O-ring is 21,95x1,78) into groove of plug [20]

5 Lubricate thread of plug [20]

6 Screw plug [20] and body [1] together

**2. Supplies**

Molykote D Paste
Lubricate components acc. to LID

**3. Tools**

Open-end wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

**4. Appliance**

Test bench

## 9.7 Assembly of the bonnet


### 1. Steps – Descriptions

1 Lubricate threat of adjusting screw [18]

2 Screw lock nut [19] on adjusting screw [18]

**Check the ease of movement of adjusting screw [18]**

3 Screw adjusting screw [18] approx. 15 mm into bonnet [9]



### 2. Supplies

Molykote D Paste
Lubricate components acc. to LID

### 3. Tools

None

### 4. Appliance

None


| | | | | | | | |
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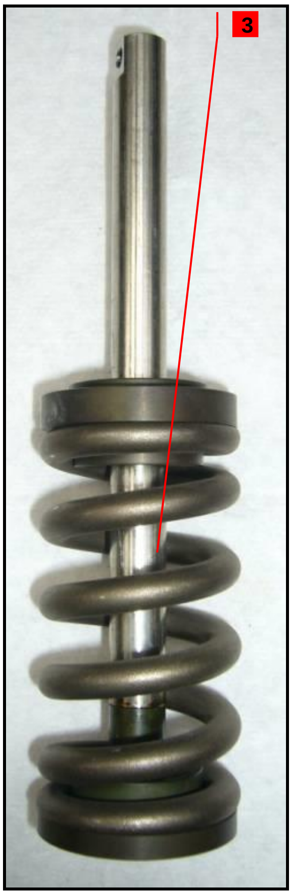
| disclosure cat.: | II | proofread: | SSt | published date: | 02/06/18 | effect. date: | 02/18 |
| author: | AW | released by: | KUW | replaces: | initial | status: | Published |
| resp. depart.: | IE | date of release: | 02/06/18 | revision No.: | 1 | | |
| doc. type: | LGS | change rep. No.: | NA | retention period: | 10y. | | |

## 9.8 Assembly of the spindle unit


### 1. Steps – Descriptions

1 Cover thread of spindle [12] with screw locking liquid Delo ML 5327

2 Screw spindle [12] and (lower) spring plate [17] together

3 Put on in that order: spring [54] (optional inner spring [53]), spring plate (upper) [16], needle bearing [69.2] (lubricate needle bearing) and washer [69.1]

protected

### 2. Supplies

Screw locking liquid Delo ML 5327
Molykote D Paste
Lubricate components acc. to LID

### 3. Tools

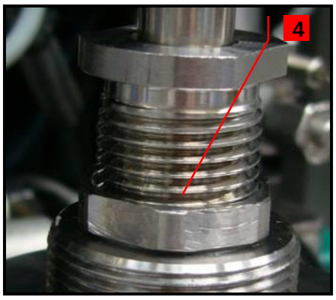
Drift pin
Torque wrench (Tightening torques acc. to LID)

### 4. Appliance

Parallel vice with aluminium jaws

## 9.9 Assembly of the bonnet and body




### 1. Steps – Descriptions

1 Lubricate thread of bonnet [9]

Put spindle unit on piston, upper unit and hold on

2 Put bonnet [9] over spindle unit and insert spindle into adjusting screw [18]

Screw on bonnet [9] - hand tight

3 Tighten bonnet

**4 Screw lock nut (19) until 1 mm against bonnet**

### 2. Supplies

Molykote D Paste
Lubricate components acc. to LID

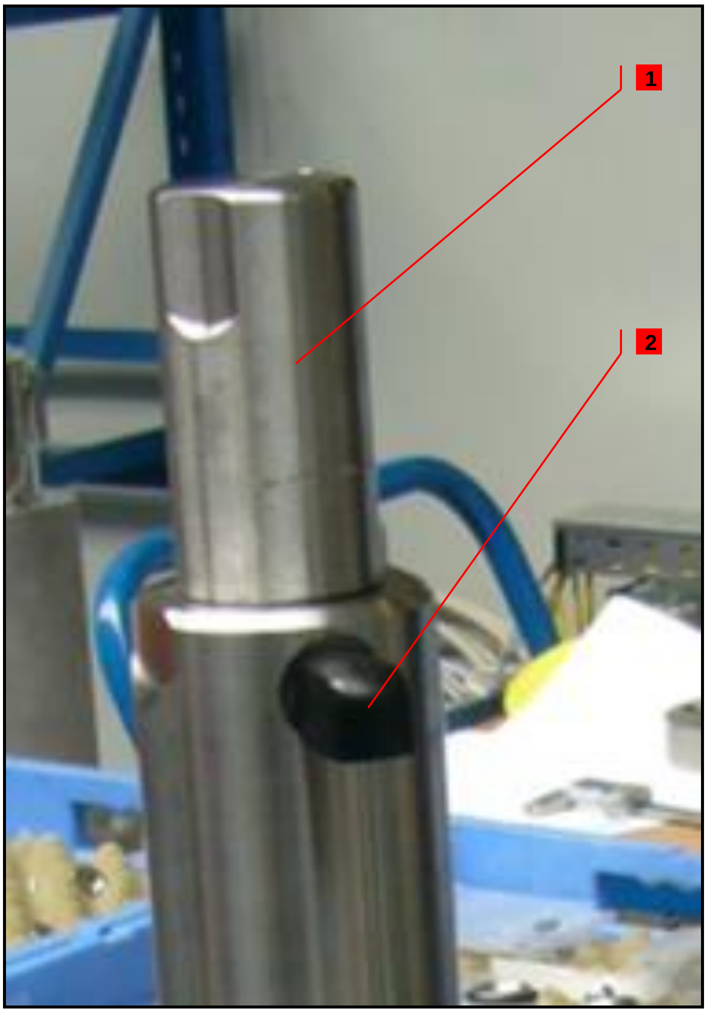
### 3. Tools

Open-end wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

### 4. Appliance

Test bench

## 9.10 Completion




**1. Steps – Descriptions**

1 Screw on cap [40] loosely

2 Screw in bug-screen [64]

Option Test Gag:
Screw short screw [TG.5] into cap [40] (finger tight)

**2. Supplies**

None

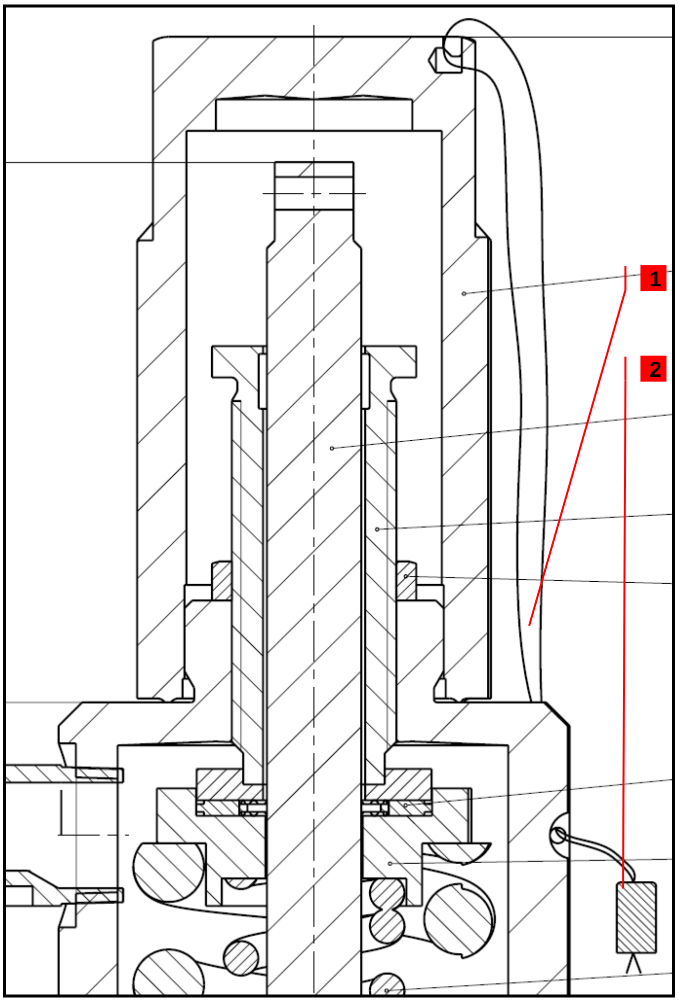
**3. Tools**

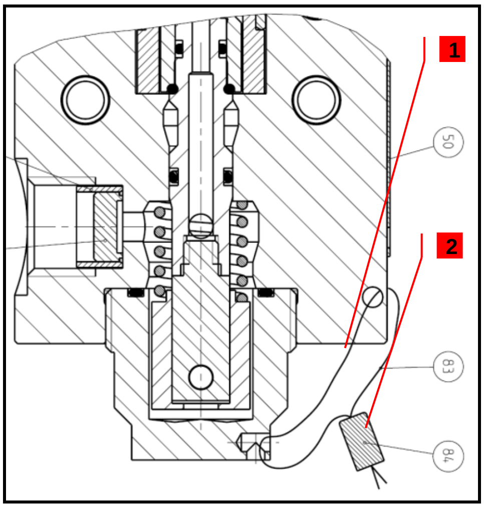
Open-end wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

**4. Appliance**

Test bench

## 9.11 Sealing the valve




### 1. Steps – Descriptions

**Sealing after assembly and test with main valve!**
Seal valve, if constructive possibility exists. Otherwise next workstation has to weld on sealing noses (cap; bonnet; body)

1 Connect sealing hole/ nose of cap and bonnet with wire tight and in clockwise

2 Close wire ends with seal

**Note: In case of required certifications (TÜV etc.) sealing ensued after certification**

protected

### 2. Supplies

None

### 3. Tools

Sealing pliers

### 4. Appliance

None

Content

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2 **Purpose** ..................................................................................... 2
3 **Competences** ............................................................................ 2
4 **Scope** ....................................................................................... 2
5 **Disclaimer** .................................................................................. 2
6 **Qualified fitting personnel** ............................................................ 2
7 **Remarks** .................................................................................... 2
8 **Basic safety guidelines** ................................................................ 3
9 **Assembly instructions** ................................................................. 6

## 1 General information for assembling the POSV accessories

## 2 Purpose

The documentation describes the assembly of POSV accessories. The description contains every single working step, supplies, tools and appliances.

## 3 Competences

The generation, maintenance and distribution of the documentation takes place in the organisation department. The defaults will be generated by the technical department in consultation with the final assembly department and production planning department.

## 4 Scope

This document must be applied to the assembling of a Pilot Operated Safety Valve with accessories in agencies and subsidiaries of LESER GmbH & Co. KG, customers and independent service center.

## 5 Disclaimer

LESER puts in a great deal of effort into making up-to-date and correct documentation available. Nevertheless, LESER GmbH & Co. KG gives no guarantee that the recommended actions presented here are entirely correct and error free.
This document is to be applied exclusively to the specified type. LESER GmbH & Co. KG declines any liability or responsibility for the correctness and completeness of the content.
LESER GmbH & Co. KG reserves the right to change the information contained in this document, which is for the products of LESER GmbH & Co. KG and is intended for LESER subsidiaries, at any time and without prior announcement.
LESER GmbH & Co. KG is available to the users of this document to provide additional information.

## 6 Qualified fitting personnel

LESER safety valves may only be dismantled by trained or qualified fitters. The qualifications must be obtained through the appropriate training measures.

## 7 Remarks

- Gloves must be worn during the entire dismantling process.

## 8 Basic safety guidelines

### Dangerous media

Poisoning, caustic burns, burns, injuries
• Use suitable protective devices
• Use suitable collecting tanks.
• Wear suitable protective equipment.

### Foreign bodies in the safety valve

Danger from failure of safety valve or leaks
• Flush the system before installation of a safety valve.
• Check the safety valve for foreign objects.
• Remove foreign objects

### Bug screen is damaged or missing
***(B or option)***

Dirt, objects or insects get into the safety valve. Danger from malfunction of the safety valve.
• Install the bug screen correctly.
• Check the bug screen regularly.

### Ambient temperature is too high

Material expansion. Danger from malfunction of the safety valve.

### Ambient temperature is too low

Icing, freezing vapours, reduced flow rate due to congealing media. Danger from functional disruption of the safety valve.

### Abrasive or corrosive media
Moving parts jam or become stuck. Danger from functional disruption of the safety valve.
• Service the safety valve after each time it opens.

### Media with high proportion of particles
**(only B)**

Deposits and clogging. Danger from malfunction of the safety valve.

• Use a filter with the correct mesh size.
• Use additional filters to increase the filter capacity.

**Residual media in the safety valve**

Poisoning, caustic burns, burns, injuries
• Wear suitable protective equipment.
• Remove residual media

**WARNING**

**Leaky safety valve**
Danger from leaking media due to damaged gaskets and sealing surfaces.
• Protect the safety valve against vibrations and blows especially during transport and installation.
• Check safety valve regularly for leaks.

**Open bonnet or spindle guides**

Danger from leaking media
• Make sure that no danger can arise from leaking media.
• Keep a safe distance.
• Wear suitable protective equipment.



**CAUTION**

**Hot medium**

Burns or scalding.
• Wear suitable protective equipment.

**Hot surfaces**
Burns.
• Wear suitable protective equipment.

**Aggressive medium**

Caustic burns.
• Wear suitable protective equipment.

**Open bonnet or spindle guides**

Pinching danger from moving parts.

• Install suitable safeguards.

**Sharp edges and burrs**

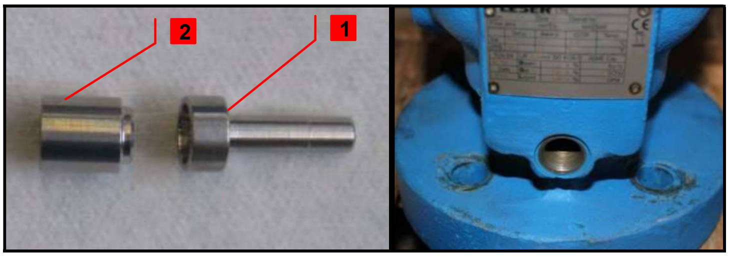
Danger of injury.
• Wear safety gloves.
• Handle the safety valve carefully

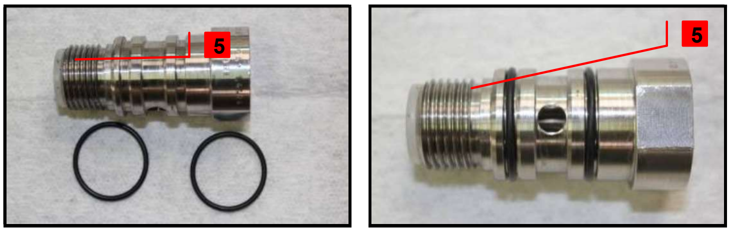
**High noise emission**

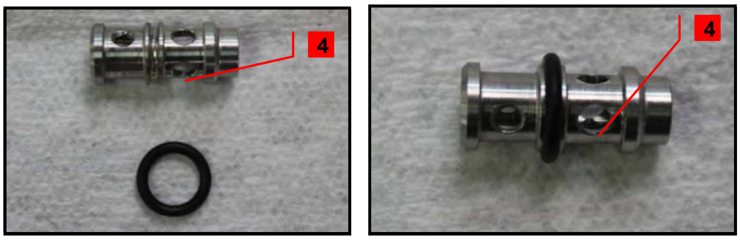
Hearing damage.
Wear ear protection.

# 9 Assembly instructions

## 9.1 Assembly of the FTC (Field Test Connector)





**1. Steps – Descriptions**

**Option A: Assembly FTC inclusive pitot tube**

1 Insert pitot tube [2] into body [1]

2 Complete with tube [3]
(depending on nominal size)

3 Complete fastener (FTC.2) with O-ring [63] and O-ring (FTC.7). Cover O-ring with soapy water

**Make sure that O-rings are free of twists**

4 Complete piston (FTC.4) with O-ring (FTC.6)

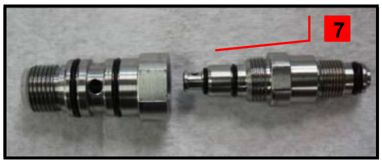
**Consider correct alignment of piston**

**Make sure that O-rings are free of twists**

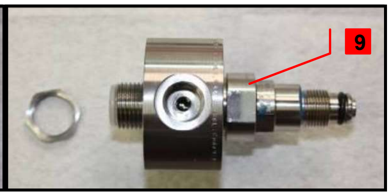
5 Complete body (FTC.1) with O-rings (FTC.8), cover O-rings with soapy water

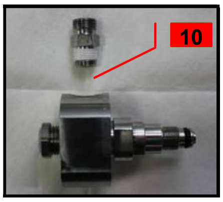
**Make sure that O-rings are free of twists**

protected

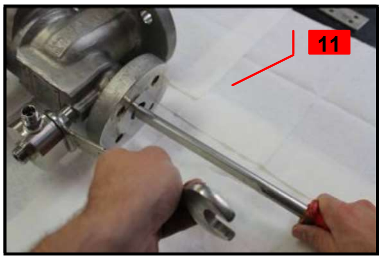



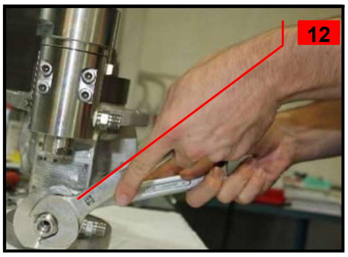







## 1. Steps – Descriptions

6 Insert piston (FTC.4) into fastener (FTC.2)

7 , 8 Screw together body (FTC.1) and fastener (FTC.2)

**Check ease of movement of piston by rotating this assembly group**

9 Cover O-rings (FTC.8) with soapy water, mount pressure ring (FTC.3), align pressure ring and screw on „handwarm" lock nut.

10 Wrap thread of compression fitting $1\frac{1}{2}$ turn with PTFE tape and screw it into pressure ring (FTC.3).

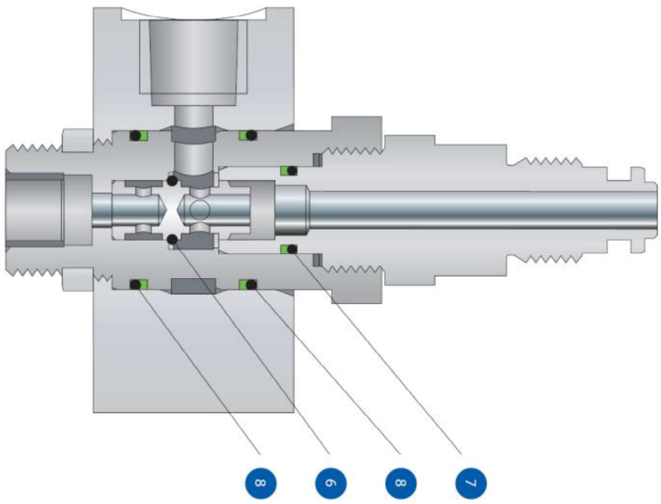
11 Screw in fastener (FTC2) with complete FTC into body, while tightening fastener, **align pitot tube [2] in direction of inlet with pitot tube assembly tool**

12 While mounting tube align the pressure ring (FTC.3) (possibly with pilot supply filter) exactly in direction of pilot valve and tighten lock nut (FTC.5)
Orientate pressure ring (FTC.2) so that compression fitting faces horizontally to right (viewing direction to outlet)

After assembly of tube (possibly with pilot supply filter) pressure ring then lock nut (FTC.3) has to be tightened

protected

## 1. Steps – Descriptions



**Option B: Assembly of FTC in case that fastener (FTC) and pitot tube haven´t been disassembled**

Start with step 6, but note

**Check the free –moving of piston before assembly**

**Make sure that fastener (FTC) stays tight and in correct alignment to inlet pipe!**



## 2. Supplies

PTFE tape
Soapy water
Molycote D paste
Lubricate components acc. to LID

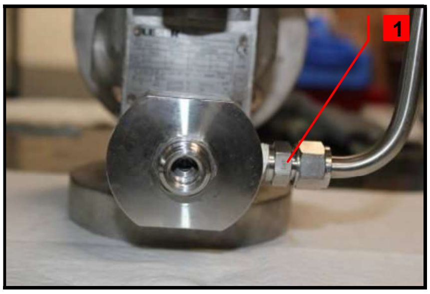
## 3. Tools

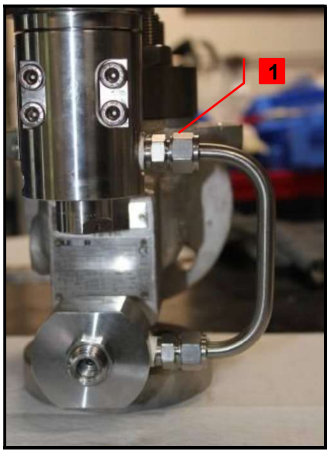
Drift pin
Open-end wrench acc. to LID
Pitot tube assembly tool
Torque wrench (Tightening torques acc. to LID)

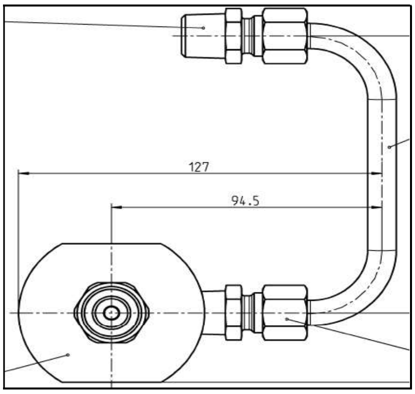
## 4. Appliance

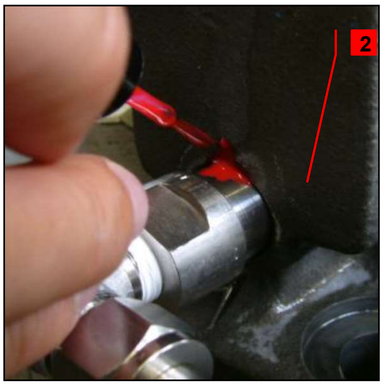
Test bench

## 9.2 Assembly of the FTC tubework




**1. Steps – Descriptions**

Wrap thread of compression fitting $1\frac{1}{2}$ turn with PTFE tape and screw it into pilot valve

1 Connect tube

Tighten compression fittings – use gap gage

**Consider assembly instructions of manufacturer for compression fittings.**

**Accomplish a visual check, after assembly, whether pitot tube is twisted or not**

2 Apply sealing wax on fitting, after finishing assembly of tubework

**2. Supplies**

Sealing wax
PTFE tape
Lubricate components acc. to LID

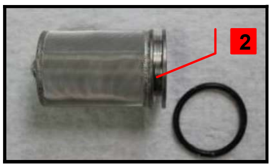
**3. Tools**

Open-end wrench acc. to LID
Gap gage for compression fitting
Torque wrench (Tightening torques acc. to LID)

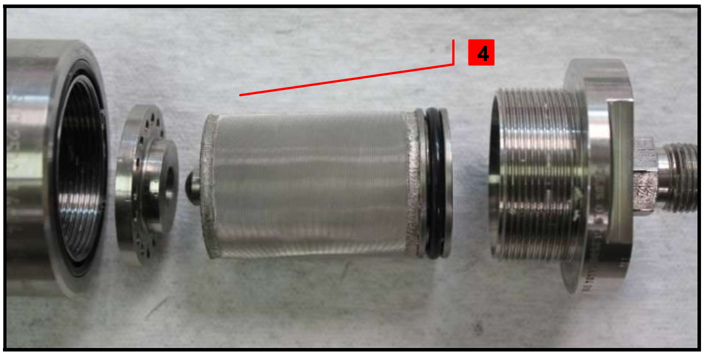
**4. Appliance**

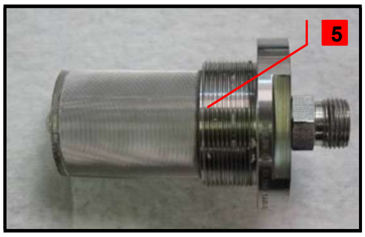
None

## 9.3 Assembly of the pilot supply filter






### 1. Steps – Descriptions

1 Put O-ring into groove of (lower part) housing

2 3 Pull O-ring into groove of cartridge filter

4 Put perforated disc into (lower part) housing

5 Insert cartridge filter into (upper part) housing

Screw (upper part) housing including cartridge filter into body

### 2. Supplies

Lubricate components acc. to LID

### 3. Tools

Open-end wrench acc. to LID
Hook tool for O-rings
Torque wrench (Tightening torques acc. to LID)

### 4. Appliance

Parallel vice with aluminium jaws

protected

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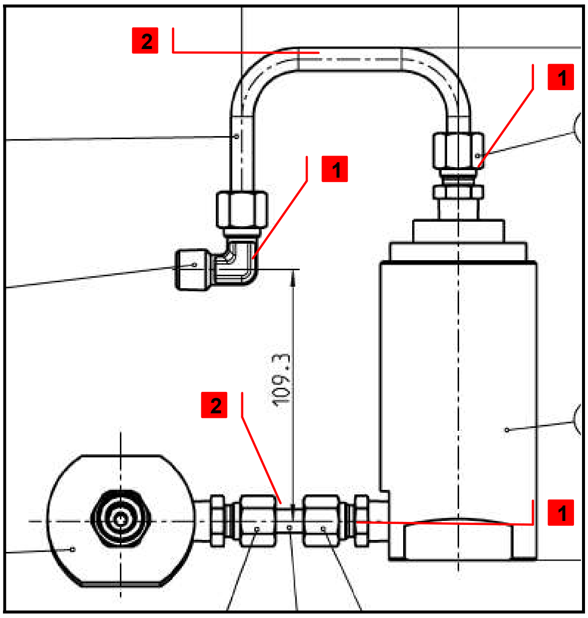
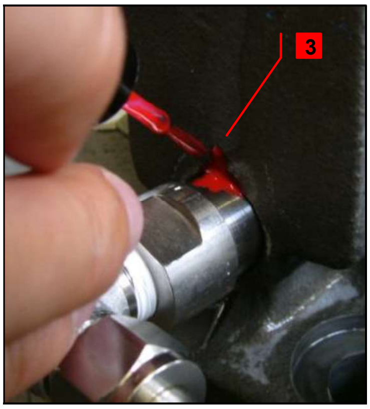
| author: | AW | released by: | KUW | replaces: | initial | status: | published |
| resp. depart.: | PP | date of release: | 01/31/12 | revision No.: | 0 | | |
| doc. type: | LGS | change rep. No.: | | retention period: | 10y. | | |

## 9.4 Assembly of the pilot supply filter tubework (with FTC)




### 1. Steps – Descriptions

1 Wrap thread of compression fittings $1\frac{1}{2}$ turn with PTFE tape and screw them into pilot valve and pilot supply filter

2 Connect tube between FTC and pilot supply filter and between pilot supply filter and pilot valve

**Tighten compression fittings - use gap gage**

**Consider assembly instructions of manufacturer for compression fittings.**

**Accomplish a visual check, after assembly, whether tube is twisted or not**

**Make sure that pilot tube is aligned after assembly**

3 Apply sealing wax on fitting, after assembly of tubework

protected

### 2. Supplies

Sealing wax
PTFE tape

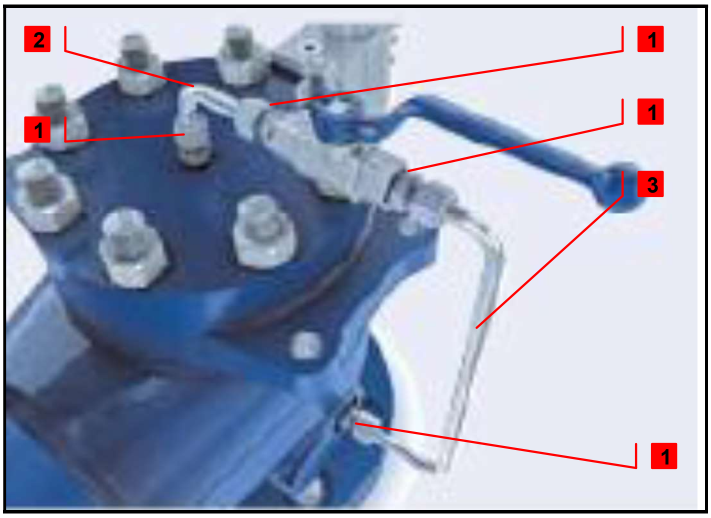
### 3. Tools

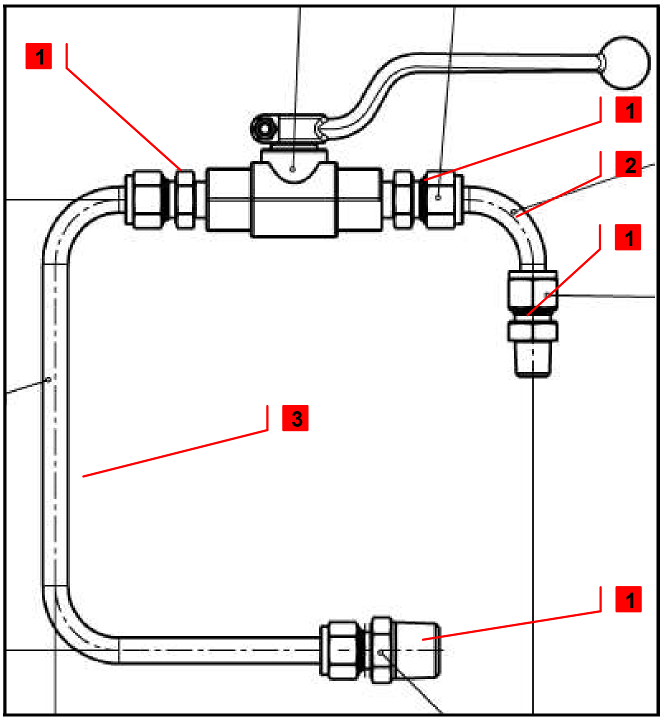
Open-end wrench acc. to LID
Gap gage for compression fittings
Torque wrench (Tightening torques acc. to LID)

### 4. Appliance

None

## 9.5 Assembly of the manual blowdown




**1. Steps – Descriptions**

1 Wrap threads of compression fittings $1\frac{1}{2}$ turn with PTFE tape and screw them into ball valve and main valve

**Option A: Manual blowdown into main valve outlet**

2 Mount L-tube (MBl.2) between top plate [9] and ball valve

3 Mount U-tube (MBl.3) between ball valve and body [1]

**Tighten compression fittings – use gap gage**

**Consider assembly instructions of manufacturer for compression fittings.**

**Accomplish a visual check, after assembly, whether tube is twisted or not**

Close ball valve (MBl.1), screw off lever, tightening screw, fix lever sideways on ball valve with a strap

**Option B: Manual blowdown into atmosphere**

3 Mount L-tube (MBl.2) between top plate and ball valve, align ball valve in direction of outlet

**Tighten compression fittings- use the gap gage**

Close ball valve (MBl.1), screw off lever, screw on screw, fix lever sideways on ball valve with a strap

**2. Supplies**

None

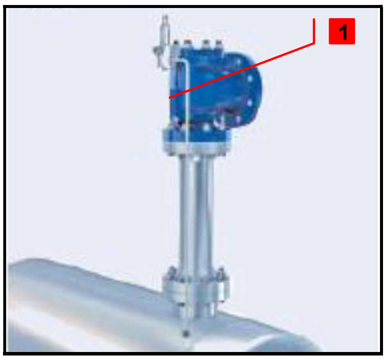
**3. Tools**

Gap gage for compression fittings
Open-end wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)

**4. Appliance**

None

## 9.6 Assembly of the remote sensing




**1. Steps – Descriptions**

1 Wrap threads of compression fittings 1 $\frac{1}{2}$ turn with PTFE tape and screw them into pilot valve and pressure taking hole
Connect tube

Tighten compression fittings – use gap gage

**Consider assembly instructions of manufacturer for compression fittings.**

**Accomplish a visual check, after assembly, whether tube is twisted or not**

protected

**2. Supplies**

None

**3. Tools**

Open-end wrench acc. to LID
Torque wrench (Tightening torques acc. to LID)
Gap gage for compression .
fitting

**4. Appliance**

None

Content

**1 General information for separating the Main Valve from the Pilot Valve . 2**
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## 1 General information for separating the Main Valve from the Pilot Valve

## 2 Purpose

The documentation describes the marriage of the main valve and the pilot valve. The description contains every single working step, supplies, tools and appliances.

## 3 Competences

The generation, maintenance and distribution of the documentation takes place in the organisation department. The defaults will be generated by the technical department in consultation with the final assembly department and production planning department.

## 4 Scope

This document must be applied to the dismantling of a Pilot Operated Safety Valve in agencies and subsidiaries of LESER GmbH & Co. KG customers and independent service center.

## 5 Disclaimer

LESER puts in a great deal of effort into making up-to-date and correct documentation available. Nevertheless, LESER GmbH & Co. KG gives no guarantee that the recommended actions presented here are entirely correct and error free.
This document is to be applied exclusively to the specified type. LESER GmbH & Co. KG declines any liability or responsibility for the correctness and completeness of the content.
LESER GmbH & Co. KG reserves the right to change the information contained in this document, which is for the products of LESER GmbH & Co. KG and is intended for LESER subsidiaries, at any time and without prior announcement.
LESER GmbH & Co. KG is available to the users of this document to provide additional information.

## 6 Qualified fitting personnel

LESER safety valves may only be dismantled by trained or qualified fitters. The qualifications must be obtained through the appropriate training measures.

## 7 Remarks

Gloves must be worn during the entire dismantling process.

## 8 Basic safety guidelines

### Dangerous media

Poisoning, caustic burns, burns, injuries
- Use suitable protective devices
- Use suitable collecting tanks.
- Wear suitable protective equipment.

### Foreign bodies in the safety valve

Danger from failure of safety valve or leaks
- Flush the system before installation of a safety valve.
- Check the safety valve for foreign objects.
- Remove foreign objects

### Bug screen is damaged or missing *(B or option)*

Dirt, objects or insects get into the safety valve. Danger from malfunction of the safety valve.
- Install the bug screen correctly.
- Check the bug screen regularly.

### Ambient temperature is too high

Material expansion. Danger from malfunction of the safety valve.

### Ambient temperature is too low

Icing, freezing vapours, reduced flow rate due to congealing media. Danger from functional disruption of the safety valve.

### Abrasive or corrosive media

Moving parts jam or become stuck. Danger from functional disruption of the safety valve.
- Service the safety valve after each time it opens.

### Media with high proportion of particles

**(only B)**

Deposits and clogging. Danger from malfunction of the safety valve.
• Use a filter with the correct mesh size.
• Use additional filters to increase the filter capacity.

**Residual media in the safety valve**

Poisoning, caustic burns, burns, injuries
• Wear suitable protective equipment.
• Remove residual media

**WARNING**

**Leaky safety valve**
Danger from leaking media due to damaged
gaskets and sealing surfaces.
• Protect the safety valve against vibrations and blows especially during transport and installation.
• Check safety valve regularly for leaks.

**Open bonnet or spindle guides**

Danger from leaking media
• Make sure that no danger can arise from leaking media.
• Keep a safe distance.
• Wear suitable protective equipment.

**CAUTION**

**Hot medium**

Burns or scalding.
• Wear suitable protective equipment.

**Hot surfaces**
Burns.
• Wear suitable protective equipment.

**Aggressive medium**

Caustic burns.
• Wear suitable protective equipment.

**Open bonnet or spindle guides**

Pinching danger from moving parts.
• Install suitable safeguards.

**Sharp edges and burrs**

Danger of injury.
• Wear safety gloves.
• Handle the safety valve carefully

**High noise emission**

Hearing damage.
Wear ear protection.

# 9 Disassembly instructions

## 9.1 Marriage of the pilot valve and the main valve


**1. Steps – Descriptions**

1 Screw pilot valve and manifold block with 4 screws [22] on top plate [9] of main valve

**2. Supplies**

Lubricate components acc. to LID

**3. Tools**

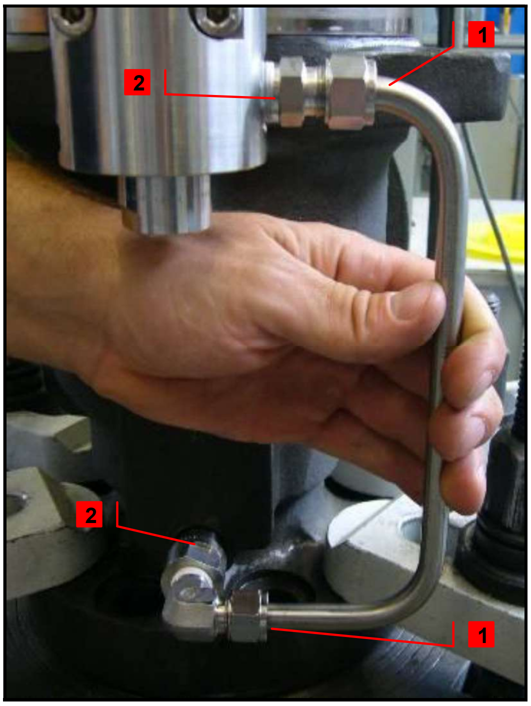
Allen key acc. to LID
Torque wrench (Tightening torques acc. to LID)

**4. Appliance**

protected

Test bench

## 9.2 Assembly of the tube




**1. Steps – Descriptions**

1 Stick tube into fitting of pilot valve and main valve

2 Screw on compression fittings. Use gap gage and while tightening compression fittings counter fittings.

**Consider assembly instructions of manufacturer for compression fittings.**

**2. Supplies**

None

**3. Tools**

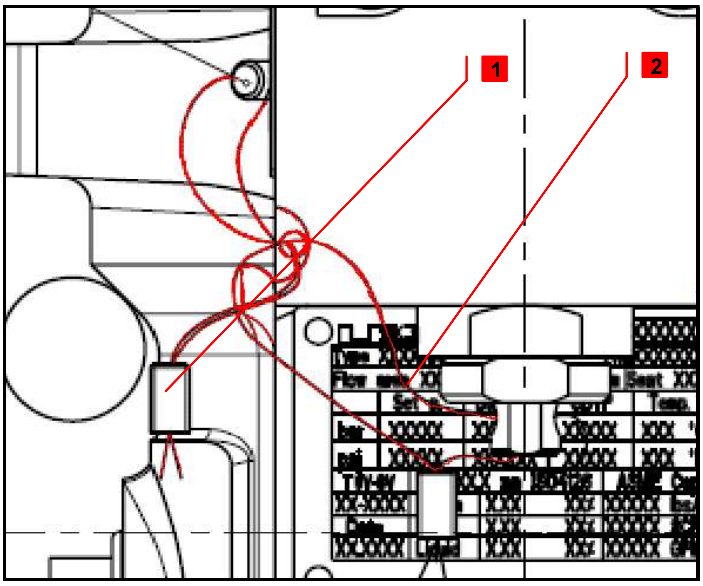
Open-end wrench acc. to LID
Gap gage for compression fittings

**4. Appliance**

Test bench

protected

## 9.3 Sealing the valve


### 1. Steps – Descriptions

**Sealing after assembly and passed tests!**

Seal valve, if constructive possibility exists. Otherwise next workstation has to weld on sealing noses (cap; bonnet; body)

1 Connect sealing hole/ nose of pilot valve and main valve with wire tight and in clockwise

2 Close wire ends with seal

**Note: In case of required certifications (TÜV etc.) sealing ensued after certification**

protected

### 2. Supplies

None

### 3. Tools

Sealing pliers

### 4. Appliance

None

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## 1 Purpose

This LESER global standard (LGS) describes tightening torques and lubrication of pilot safety valves.

## 2 Scope

This LGS pertains to all LESER quality associates.

## 3 References

None

## 4 Pop Action Pilot Type 8104.1000 und 8104.2000

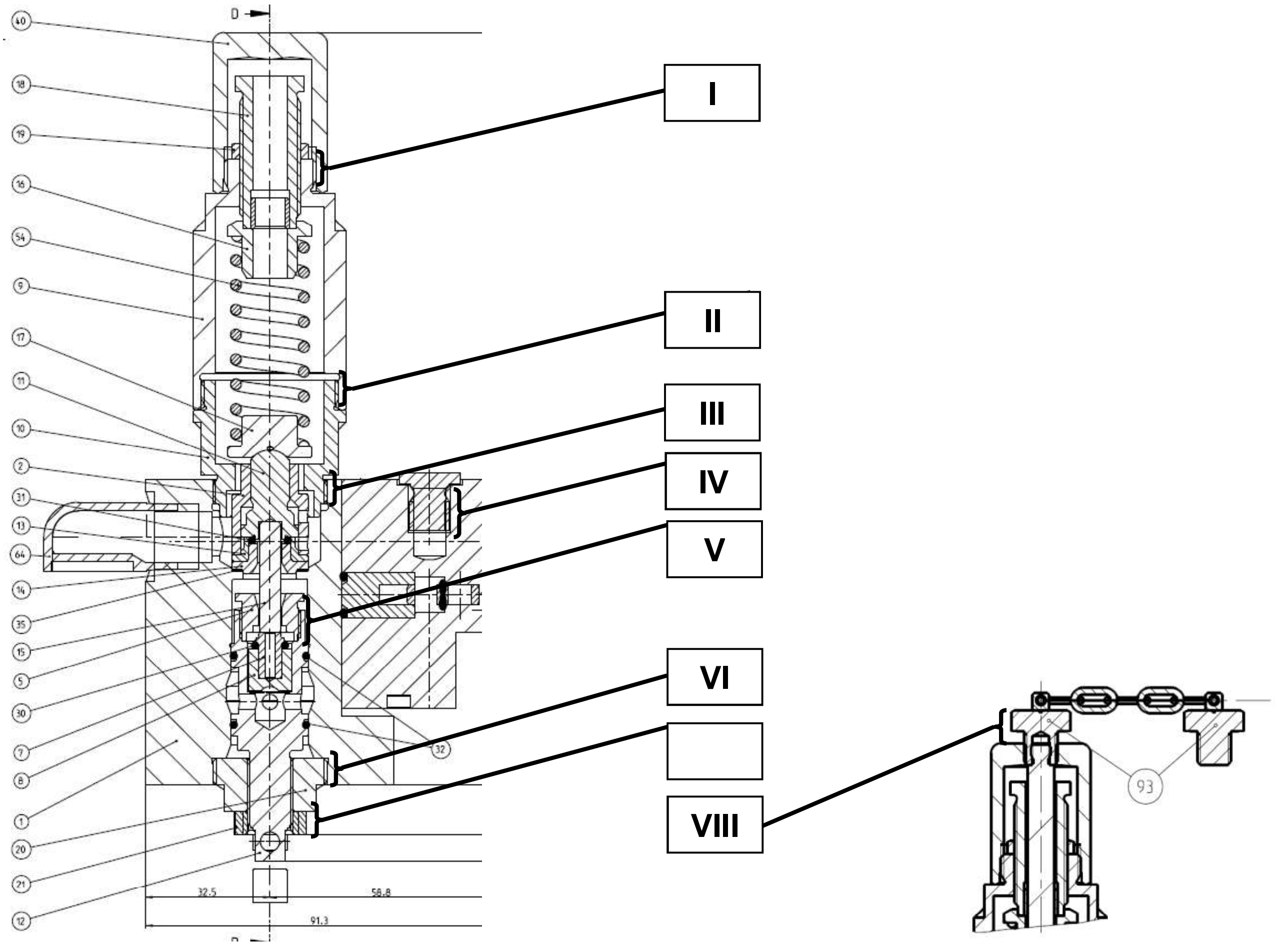


Figure 1: Cross section pop action pilot valve

| Index | Thread connections [pos. number] | Thread | SW | Torque [Nm] | Lubrication | Tool |
|---|---|---|---|---|---|---|
| **I** | Bonnet [9 ] / cap /lever [40] | M24 x 1,5 | 27 | 50-55 | Molykote D Paste | Open-end spanner |
| **II** | Bonnet [9] / bonnet base part [10] | M36 x 1,5 | 34 | 60-70 | Halocarbon-oil 56 S | Open-end spanner |
| **III** | Bonnet base part [10] / bod [1] | M30 x 1,5 | 36 cranked | 70-80 | Halocarbon-oil 56 S | Open-end spanner |
| **IV** | Manifold block [24.1] / plug [24.7] | G1/4 | 6 | 55-60 | Halocarbon-oil 56 S | Allen key |
| **V** | Seat, feeding [5] / adjusting screw [12] | M16 x 1 | 16 | 30-35 | Halocarbon-oil 56 S | Open-end spanner |
| **VI** | Nut [20] / body [1] | M33 x 1,5 | 24 | 45-50 | Molykote D paste | Open-end spanner |
| **VII** | Counter nut [21] / adjusting screw [12] | M12 x 1 | 19 | 25-30 | Molykote D Paste | Open-end spanner |
| **VIII** | Test gag [93] / bonnet [9] | M10 | 16 | 40-50 | Halocarbon-oil 56 S | Open-end spanner |

Table 1: Overview of the pop action pilot valve screw connections

## 5 Modulate action pilot valve Type 8204.1000 (diaphragm)

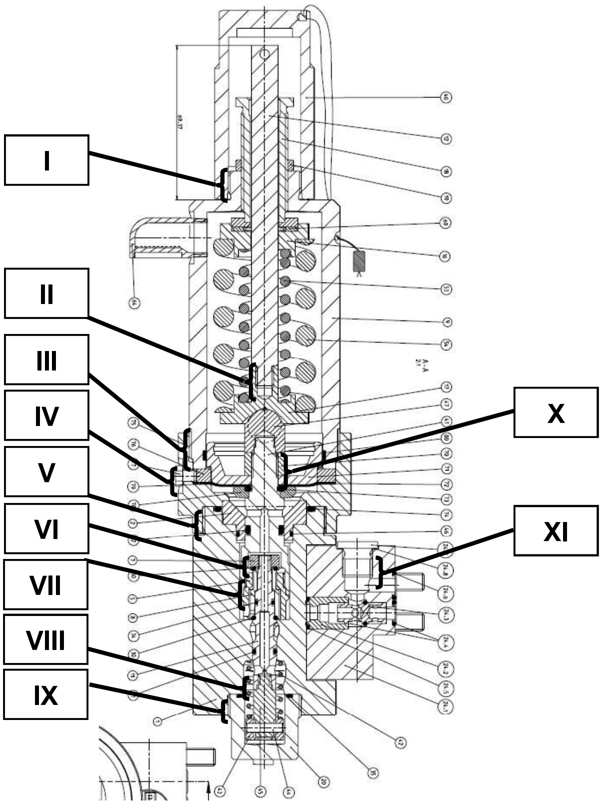

Figure 2: Cross section of the modulate action pilot valve (diaphragm)

| Index | Thread connection [Pos. Nummer] | Thread | SW | Torque [Nm] | Lubrication | Tool |
|---|---|---|---|---|---|---|
| **I** | Bonnet [9] / cap [40] | M33 x 1,5 | 41 | 55-65 | Molykote D paste | Open-end spanner |
| **II** | Spidle [12] / spring plate [17] | M8 | 10 | Paste into Delo ML 5449 | --- | Open-end spanner |
| **III** | Bonnet [9]/ spacer [75] | M68 x 1,5 | 60 | 140-150 | Halocarbon-oil 56 S | Open-end spanner |
| **IV** | Hexagon-screw | M5 | 8 | 4-6 | --- | Ring spanner |
| **V** | Spacer [75] / body [1] | M56 x 1,5 | 70 cranked | 170-180 | Molykote D paste | Open-end spanner |
| **VI** | Disc feeding (upper) [7] / disc exhaust (lower) [11] | M6 | 13 | 8-10 | --- | Open-end spanner |
| **VII** | Seat feeding [5] / piston [41] | M18 x 1 | 21 | 65-70 | --- | Open-end spanner |
| **VIII** | Disc exhaust (lower) [11]/ disc extension [45] | M6 | 8 | 8-10 | --- | Open-end spanner |
| **IX** | Plug [20] / body [1] | M33 x 1,5 | 26 | 45-50 | Molykote D paste | Open-end spanner |
| **X** | Nut [70] / piston [41] | M12 | 19/8 | 22-26 | --- | Deep cranked double ring spanner + os |
| **XI** | Manifold block [24.1] / plug [24.7] | G1/4 | 6 | 55-60 | Halocarbon-oil 56 S | Allen key |

Table 2: Overview of the modulate action pilot valve (diaphragm) screw connections

## 6 Modulate action pilot valve Type 8204.2000 und 8204.3000 (piston up to 3713psi)

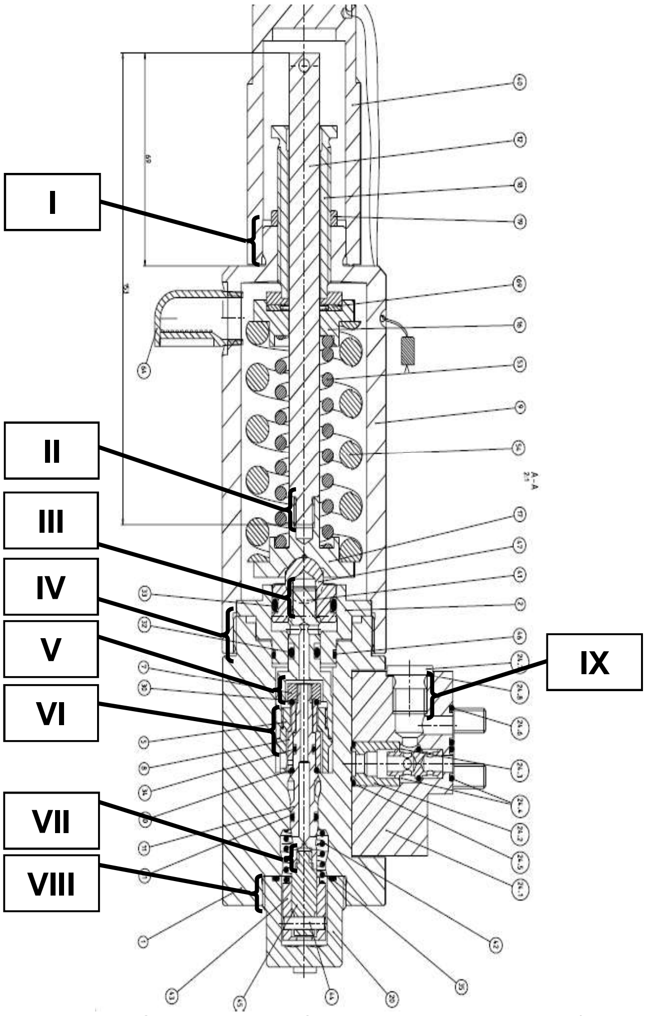


Figure 3: Cross section of the modulate pilot valve (piston)

| Index | Thread connection [Pos. Nummer] | Thread | SW | Torque [Nm] | Lubrication | Tools |
|---|---|---|---|---|---|---|
| **I** | Bonnet [9]/ cap [40] | M33 x 1,5 | 41 | 55-65 | Molykote D paste | Open-end spanner |
| **II** | Spindle[12]/ Spring plate (lower) [17] | M8 | 10 | Paste into Delo ML 5449 | --- | Open-end spanner |
| **III** | Piston (upper) [47] / piston [41] | M10 | 15 | 22-26 | --- | Open-end spanner |
| **IV** | Body [1] / bonnet [9] | M56 x 1,5 | 60 | 140-150 | Molykote D paste | Open-end spanner |
| **V** | Disc feeding (upper) [7] / disc exhaust (lower) [11] | M6 | 13 | 8-10 | --- | Open-end spanner |
| **VI** | Seat,feeding [5] / piston [41] | M18 x 1 | 21 | 65-70 | --- | Open-end spanner |
| **VII** | Disc exhaust (lower) [11] / Disc extension [45] | M6 | 8 | 8-10 | --- | Open-end spanner |
| **VIII** | Plug [20]/ Body [1] | M33 x 1,5 | 26 | 45-50 | Molykote D paste | Open-end spanner |
| **X** | Manifold block [24.1] / plug [24.7] | G1/4 | 6 | 55-60 | Halocarbon-oil 56 S | Allen key |

Table 3: Overview of the modulate action pilot valve (piston) screw connections

## 7 Modulate action pilot valve Type 8204.4000 (piston over 3713psi)

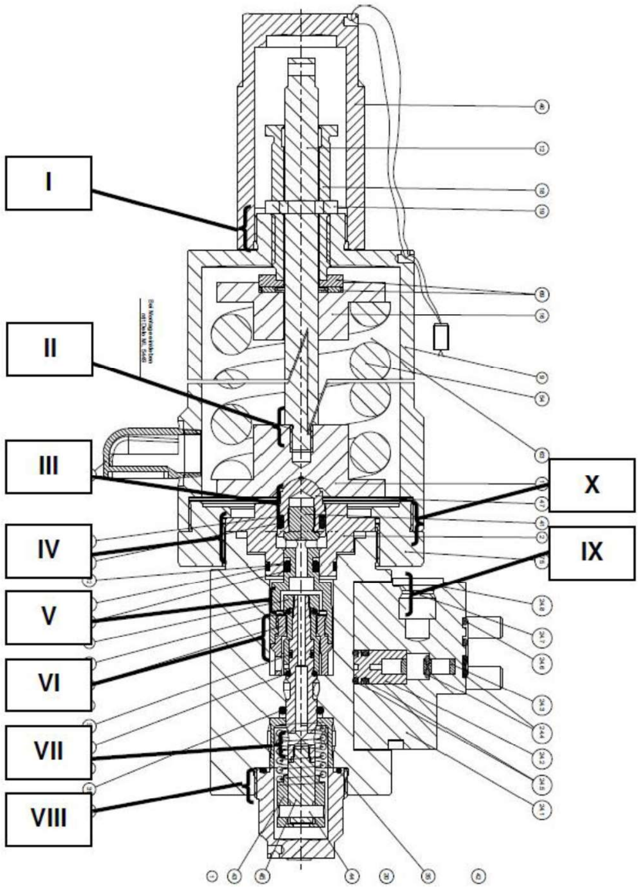


Figure 4: Cross section of the modulate pilot valve (piston)

| Index | Thread connection [Pos. Number] | Thread | SW | Torque [Nm] | Lubrication | Tools |
|---|---|---|---|---|---|---|
| I | Bonnet [9]/ cap [40] | M33 x 1,5 | 41 | 55-65 | Molykote D paste | Open-end spanner |
| II | Spindle[12]/ Spring plate (lower) [17] | M8 | 10 | Paste into Delo ML 5449 | --- | Open-end spanner |
| III | Piston (upper) [47] / piston [41] | M10 | 15 | 22-26 | --- | Open-end spanner |
| IV | Body [1] / distance ring [75] | M56 x 1,5 | 70 | 140-150 | Molykote D paste | Open-end spanner |
| V | Disc feeding (upper) [7] / disc exhaust (lower) [11] | M6 | 13 | 8-10 | --- | Open-end spanner |
| VI | Seat,feeding [5] / piston [41] | M18 x 1 | 21 | 65-70 | --- | Open-end spanner |
| VII | Disc exhaust (lower) [11] / Disc extension [45] | M6 | 8 | 8-10 | --- | Open-end spanner |
| VIII | Plug [20]/ Body [1] | M33 x 1,5 | 26 | 45-50 | Molykote D paste | Open-end spanner |
| IX | Manifold block [24.1] / plug [24.7] | G1/4 | 6 | 55-60 | Halocarbon-oil 56 S | Allen key |
| X | distance ring [75] / Bonnet [9 | M80x1 | 80 | 130-140 | Molykote D paste | Open-end spanner |

Table 4: Overview of the modulate action pilot valve (piston) screw connections

## 8 Main valve Semi Nozzle and Full Nozzle

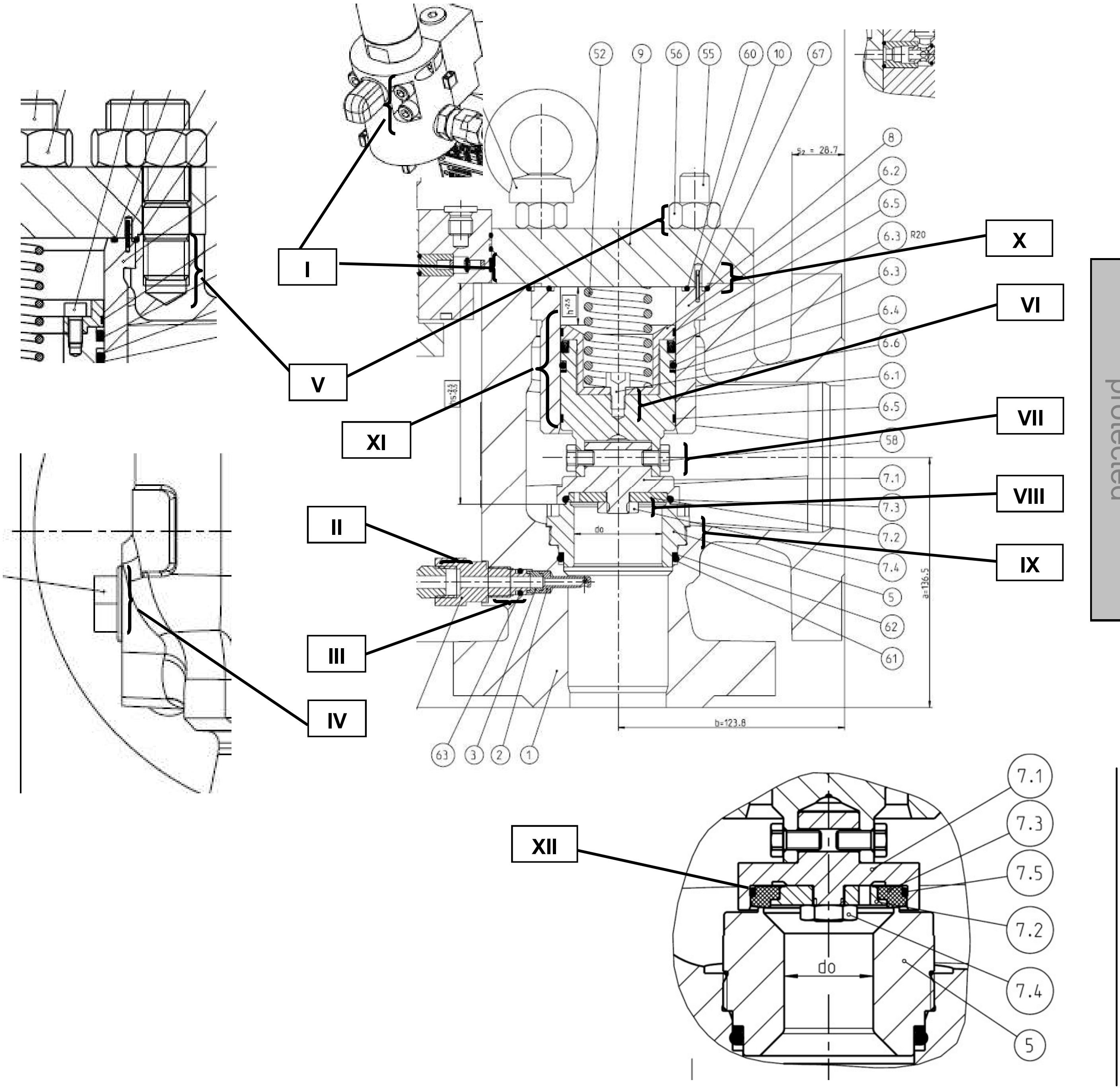


Figure 5: Cross section of the main valve, Semi-Nozzle

| Size | Index | Components [Pos. Number] | Thread | SW | Torque [Nm] | Lubrication | Tool |
|---|---|---|---|---|---|---|---|
| All | I | M8-allen head screw / top plate [9] | M8 | 6 | 18-20 | --- | Allen key |
| | II | Tubing / pitot tube [4] | NPT 3/8" | 27 | Tighten clamp ring with gap gage acc. manufactor | | Open-end spanner |
| | III | Pitot tube [4] / body [1] | G 3/8" | 22 | 65-75 | Molykote D paste | Open-end spanner |
| | IV | Drain hole [84] / body [1] | G 1/4" 1x2 till1,5x3 | | 45-55 | | Open-end spanner |
| | | | G 1/ 2" | | 80-120 | Molykote D paste | Open-end spanner |
| | | | NPT 1/2" | | --- | --- | Open-end spanner |
| | X | O Ring [67] / Top Plate [9] | --- | --- | --- | Schmierfett Klübersynth UH 1-14/151 | --- |
| | XI | Piston compl. [6] / Liner [8] | --- | --- | --- | Halocarbon oil 56S | --- |
| | XII | O Ring [7.5] / Sealing plate disc [7.1] | --- | --- | --- | Halocarbon oil 56S | --- |



| Size | Index | Components [Pos. Number] | Thread | SW | Torque [Nm] | Lubrication | Tool |
|---|---|---|---|---|---|---|---|
| 1 x 2 | V | Top plate [9] / nut [56] Stud Bolt [55] / body [1] | M16 M20 | 24 30 | 80 140 | Molykote D paste | Impact wrench + ring spanner |
| | VI | Piston top [6.2] / piston body [6.1] | M8 | 6 | 35-40 | --- | Allen key |
| | VII | Pisto compl. [6] / disc compl. [7] | M5 | 8 | 25-30 | --- | Socket |
| | VIII | Sealing Plate [7.1], O-ring disc [7.1] / nut [7.4] | M8 | 13 | 12-15 | --- | Ring spanner |
| | IX | Nozzle [5] / body [1] | M45 x 1,5 | 41 | 100-110 | Molykote D paste | Socket+ nozzle assembly tool |
| 1,5 x 2 | V | Top plate [9] / nut [56] Stud Bolt [55] / body [1] | M16 M20 M27 | 24 30 41 | 80 140 290 | Molykote D paste | Impact wrench + ring spanner |
| | VI | Piston top [6.2] / piston body [6.1] | M8 | 6 | 35-40 | --- | Allen key |
| | VII | Piston compl. [6] / disc compl. [7] | M5 | 8 | 25-30 | --- | Socket |
| | VIII | Sealing Plate [7.1], O-ring disc [7.1] / nut [7.4] | M8 | 13 | 12-15 | --- | Ring spanner |
| | IX | Nozzle [5] / body [1] | M56 x 1,5 | 50 | 115-125 | Molykote D paste | Socket + nozzle assembly tool |

| Size | Index | Components [Pos. Number] | Thread | SW | Torque [Nm] | Lubrication | Tool |
|---|---|---|---|---|---|---|---|
| **1,5 x 3** | **V** | Top plate [9] / nut [56]<br>Stud Bolt [55] / body [1] | M16<br>M20<br>M27 | 24<br>30<br>41 | 80<br>140<br>290 | Molykote D paste | Impact wrench + ring spanner |
| | **VI** | Piston top [6.2] / piston body [6.1] | M8 | 6 | 35-40 | --- | Allen key |
| | **VII** | Piston compl. [6] / disc compl. [7] | M5 | 8 | 25-30 | --- | Socket |
| | **VIII** | Sealing Plate [7.1], O-ring disc [7.1] / nut [7.4] | M8 | 13 | 12-15 | --- | Ring spanner |
| | **IX** | Nozzle [5] / Body [1] | M56 x 1,5 | 50 | 115-125 | Molykote D paste | Socket + nozzle assembly tool |
| **2 x 3** | **V** | Top plate [9] / nut [56]<br>Stud Bolt [55] / body [1] | M16<br>M27 | 24 | 80<br>290 | Molykote D paste | Impact wrench + ring spanner |
| | **VI** | Piston top [6.2] / Piston body [6.1] | M8 | 6 | 35-40 | --- | Allen key |
| | **VII** | Piston compl. [6] / disc compl. [7] | M8 | 13 | 35-40 | --- | Socket |
| | **VIII** | Sealing Plate [7.1], O-ring disc [7.1] / Nut [7.4] | M12 | 18 | 45-50 | --- | Ring spanner |
| | **IX** | Nozzle [5] / Body [1] | M75 x 1,5 | 41 | 130-150 | Molykote D paste | Socket + nozzle assembly tool |
| **3 x 4** | **V** | Top plate [9] / nut [56]<br>Stud Bolt [55] / body [1] | M20<br>M27 | 30<br>41 | 140<br>290 | Molykote D paste | Impact wrench + ring spanner |
| | **VI** | Piston top [6.2] / piston body [6.1] | M8 | 6 | 35-40 | --- | Allen key |
| | **VII** | Piston comp. [6] / disc compl. [7] | M8 | 13 | 35-40 | --- | Socket |
| | **VIII** | Sealing Plate [7.1], O-ring disc [7.1] / nuts [7.4] | M12 | 18 | 45-50 | --- | Ring spanner |
| | **IX** | Nozzle [5] / body [1] | M100 x 2 | 41 | 150-170 | Molykote D paste | Socket + nozzle assemly tool |
| **4 x 6** | **V** | Top plate [9] / nut [56]<br>Stud Bolt [55] / body [1] | M20<br>M27 | 30<br>41 | 140<br>290 | Molykote D paste | Impact wrench + ring spanner |
| | **VI** | Piston top [6.2] / piston body [6.1] | M8 | 6 | 35-40 | --- | Allen key |
| | **VII** | Piston compl. [6] / disc compl. [7] | M8 | 13 | 35-40 | --- | Socket |
| | **VIII** | Sealing Plate [7.1], O-ring disc [7.1] / nut [7.4] | M16 | 24 | 65-70 | --- | Ring spanner |
| | **IX** | nozzle [5] / body [1] | M126 x 2 | 41 | 180-200 | Molykote D paste | Socket + nozzle assembly tool |

| Size | Index | Components [Pos. Number] | Thread | SW | Torque [Nm] | Lubrication | Tool |
|---|---|---|---|---|---|---|---|
| **6 x 8** | **V** | Top plate [9] / nut [56] Stud Bolt [55] / body [1] | M27 | 41 | 290 | Molykote D paste | Impact wrench + ring spanner |
| | **VI** | Piston top [6.2] / piston body [6.1] | M8 | 6 | 35-40 | --- | Allen key |
| | **VII** | Piston compl. [6] / disc compl. [7] | M8 | 13 | 35-40 | --- | Socket |
| | **VIII** | Sealing Plate [7.1], O-ring disc [7.1] / nut [7.4] | M30 | 46 | 85-90 | --- | Ring spanner |
| | **IX** | nozzle [5] / body [1] | M175 x 2 | 41 | 230-250 | Molykote D paste | Socket + nozzle assembly tool |
| **8 x 10** | **V** | Top plate [9] / nut [56] Stud Bolt [55] / body [1] | M27 | 41 | 290 | Molykote D paste | Impact wrench + ring spanner |
| | **VI** | Piston top [6.2] / piston body [6.1] | M8 | 6 | 35-40 | --- | Allen key |
| | **VII** | Piston compl. [6] / disc compl.[7] | M8 | 13 | 35-40 | --- | Socket |
| | **VIII** | Sealing Plate [7.1], O-ring disc [7.1] / nut [7.4] | M30 | 46 | 85-90 | --- | Ring spanner |
| | **IX** | Nozzle [5] / body [1] | M220 x 2 | 41 | 230-250 | Molykote D paste | Socket + nozzle assembly tool |

Table 5: Overview main valve screw connections

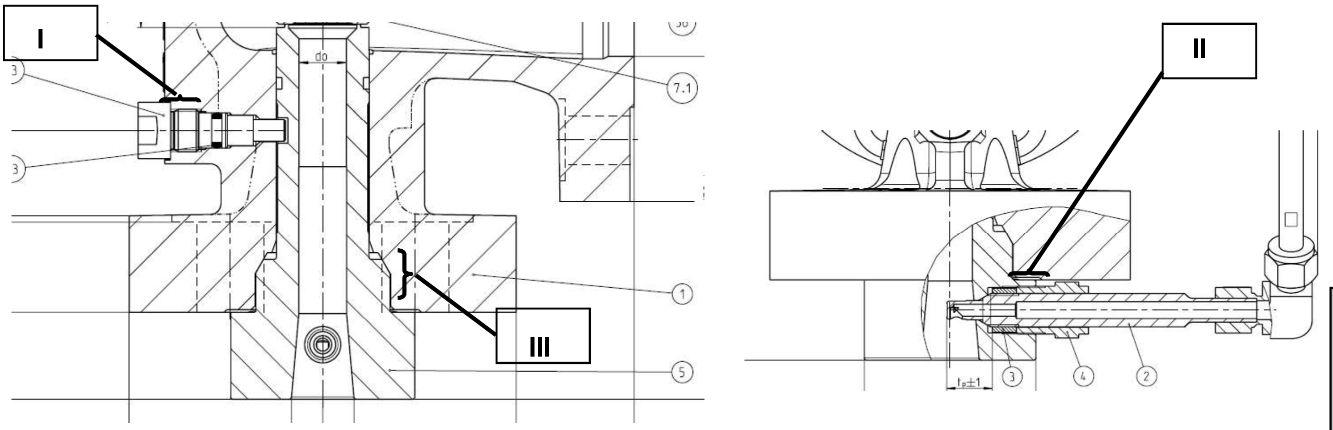


Figure 6: Cross section of the main valve, Full-Nozzle

| Size | Index | Components [Pos. Number] | Thread | SW | Torque [Nm] | Lubrication | Tool |
|---|---|---|---|---|---|---|---|
| **All** | **I** | Locking Screw [73] / body [1] | G 3/8" | 19 | 65 - 75 | Molykote D paste | Open-end spanner |
| **All** | **II** | Tube Fitting – High Pressure [4] / Full Nozzle [5] | M20 x 1 | 21 | 75 | Molykote D paste | Open-end spanner |
| **All** | **III** | Body [1] / Full Nozzle [5] | ---- | ---- | ---- | Molykote D paste | ---- |

Table 6: Overview main valve screw connections

# 9 Accessories

## 9.1 Standard tubing

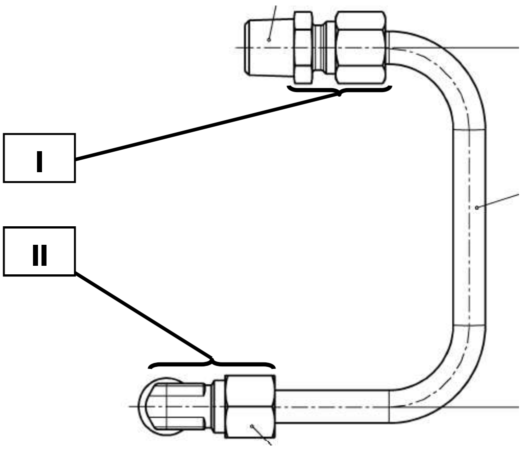


Figure 7: Standard tubing

| Components | | Index | Thread | SW | Torque [Nm] |
|---|---|---|---|---|---|
| Standard tubing | Pilot valve | I | NPT 3/8“ | 18 / 19 | Tighten clamp ring with gap gage acc. manufactor |
| | Body | II | NPT 3/8“ | 16 / 19 | Tighten clamp ring with gap gage acc. manufactor |

Table 7: Overview of the standard tubing screw connections

## 9.2 Field-test-connector (FTC)

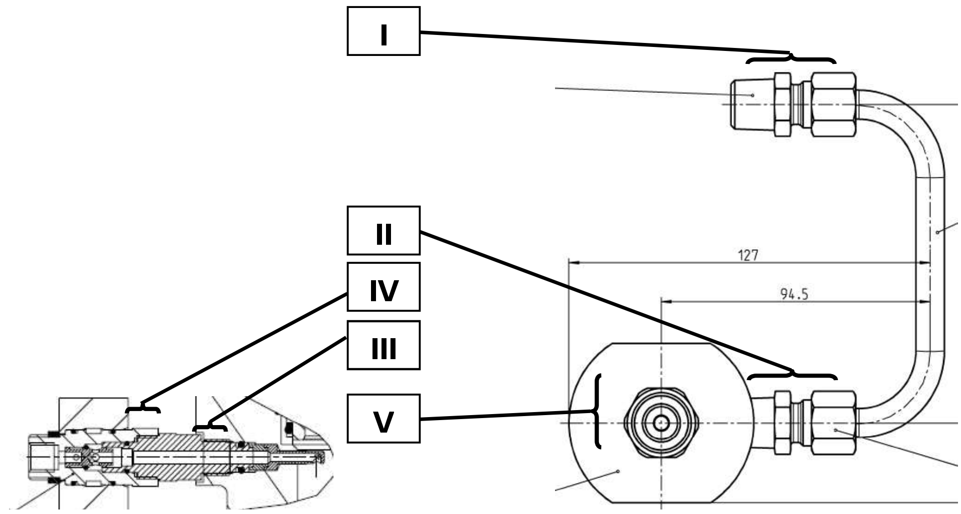


Figure 8: Tubing with FTC

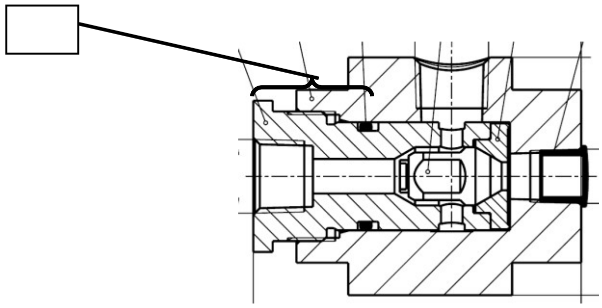

Figure 9: Tubing with FTC full-nozzle

| Components | | Index | Thread | SW | Torque [Nm] | Lubrication | Tool |
|---|---|---|---|---|---|---|---|
| FTC | Pilot valve | I | NPT 3/8“ | 18 / 19 | Tighten clamp ring with gap gage acc. manufactor | --- | Open-end spanner |
| | Tube | II | NPT 3/8“ | 18 / 19 | Tighten clamp ring with gap gage acc. manufactor | --- | Open-end spanner |
| | Pitot tube | III | G 3/8" | 22 | 60-70 | Molykote D Paste | Open-end spanner |
| | Body (FTC) / Clasp (FTC) | IV | M20x1,5 | 27/ 22 | 100-120 | Halocarbo-oil 56 S | Open-end spanner |
| | Body (FTC) / Clasp (FTC) Full Nozzle | VI | M30x1,5 | 32 | 100 -120 | Halocarbo-oil 56 S | Open-end spanner |
| | Nut FTC | V | G 1/2“ | 24 | 45-50 | Halocarbo-oil 56 S | Open-end spanner |

Table 8: Overview of the FTC screw connections




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| disclosure cat.: | II | proofread: | Haa | published date: | 9/25/14 | effect. date: | 9/14 |
| author: | TK | released by: | JR | replaces: | 3322- | status: | published |
| resp. depart.: | **TB** | date of release: | 9/25/14 | revision No.: | 4 | | |
| doc. type: | LGS | change rep. No.: | 200153 | retention period: | 10y. | | |

## 9.3 FTC and Pilot supply filter

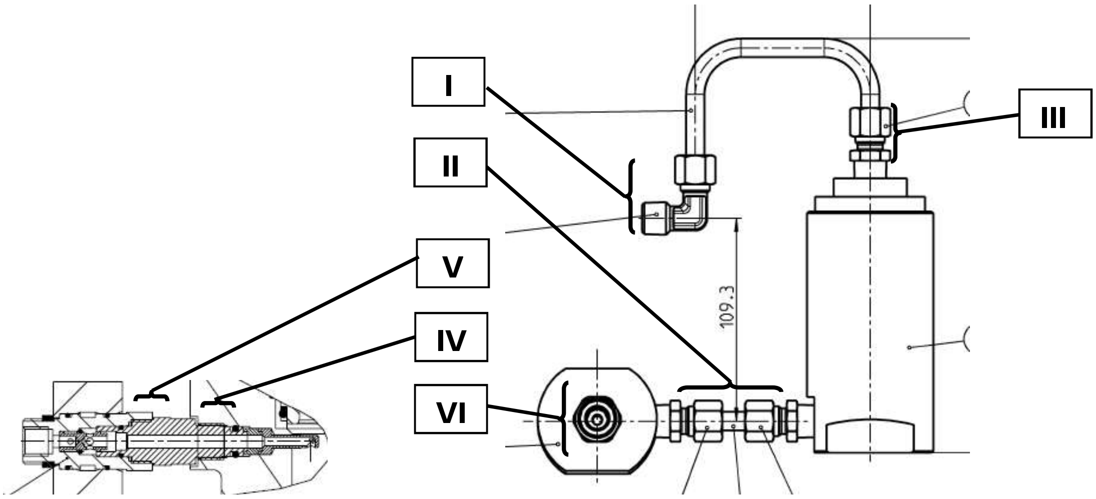


Figure 10: Tubing with FTC and pilot supply filter

| Components | | Index | Thread | SW | Torque [Nm] | Lubircation | Tool |
|---|---|---|---|---|---|---|---|
| FTC + filter | Pilot valve | I | NPT 3/8“ | 16 / 19 | Tighten clamp ring with gap gage acc. manufactor | --- | Open-end spanner |
| | Tube | II | NPT 3/8“ | 18 / 19 | Tighten clamp ring with gap gage acc. manufactor | --- | Open-end spanner |
| | Filter | III | NPT 3/8“ | 18 / 19 | Tighten clamp ring with gap gage acc. manufactor | --- | Open-end spanner |
| | Pitot tube | IV | G 3/8" | 22 | 60-70 | Molykote D Paste | Open-end spanner |
| | Body (FTC) / Clasp (FTC) | V | M20x1,5 | 27/ 22 | 100-120 | Halocarbo-oil 56 S | Open-end spanner |
| | Nut FTC | VI | G 1/2“ | 24 | 45-50 | Halocarbo-oil 56 S | Open-end spanner |

Table 9: Overview of the FTC and filter screw connections

## 9.4 Manual blowdown

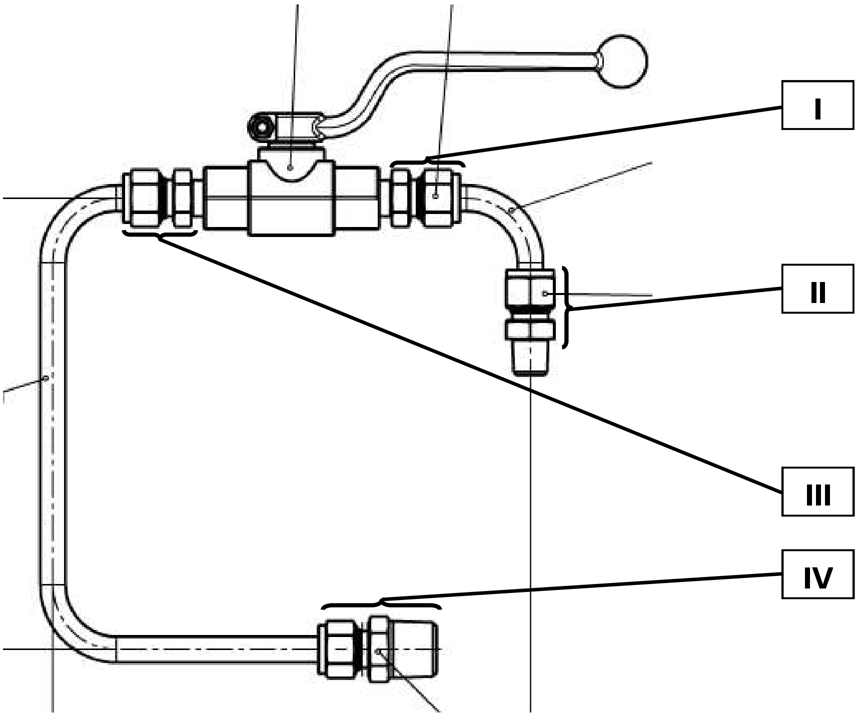


Figure 11: Manual Blowdown

| Components | | Index | Thread | SW | Torque [Nm] |
|---|---|---|---|---|---|
| Manual Blowdown | Manual Blowdown | I | NPT 1/8“ | 18 / 19 | Tighten clamp ring with gap gage acc. manufactor |
| | Top plate | II | NPT 1/8“ | 18 / 19 | Tighten clamp ring with gap gage acc. manufactor |
| | Tube | III | NPT 1/8“ | 18 / 19 | Tighten clamp ring with gap gage acc. manufactor |
| | Body | IV | NPT 1/2“ | 18 / 19 | Tighten clamp ring with gap gage acc. manufactor |

Table 10: Overview of the manual blowdown screw connections

## 9.5 Needle valve for FTC

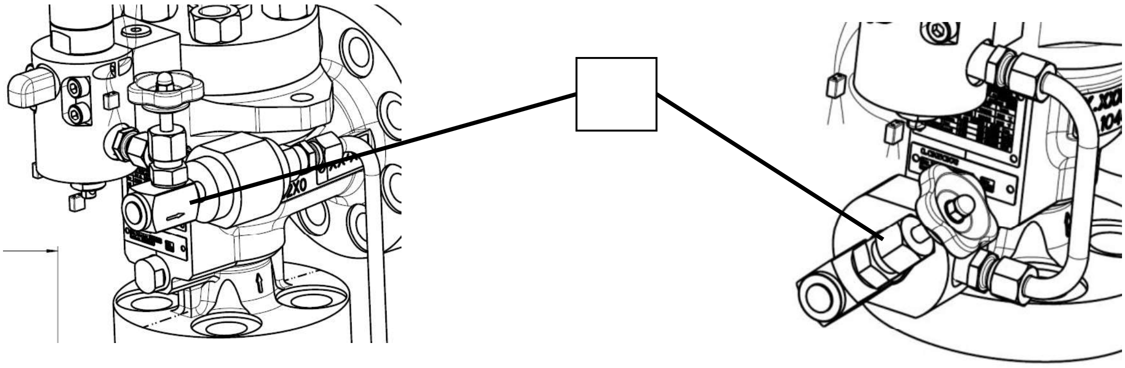

Figure 11: Field test connector with needle valve (left see full nozzle, right see semi nozzle)

| **Components** | | **Index** | **Thread** | **SW** | **Torque [Nm]** |
|---|---|---|---|---|---|
| FTC | Nadelventil | I | NPT 1/4“ | 25 | Insert with Teflon tape and adjust as shown in figure |

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## 1 Purpose

This LESER Global Standard (LGS) provides instructions on attaching the name plates of LESER safety valves. The required work steps and materials are described.

## 2 Scope

This LGS must be applied when attaching the name plates of safety valves in agencies and subsidiaries of LESER GmbH & Co. KG.

## 3 Disclaimer

LESER puts in a great deal of effort into making up-to-date and correct documentation available. Nevertheless, LESER GmbH & Co. KG gives no guarantee that the recommended actions presented here are entirely correct and error free. This document is to be applied exclusively to the specified type. LESER GmbH & Co. KG declines any liability or responsibility for the correctness and completeness of the content.

LESER GmbH & Co. KG reserves the right to change the information contained in this document, which is for the products of LESER GmbH & Co. KG and is intended for LESER subsidiaries, at any time and without prior announcement.

LESER GmbH & Co. KG is available to the users of this document to provide additional information.

## 4 Qualified fitting personnel

The name plates of LESER safety valves must attached exclusively by trained or qualified fitters. The relevant qualifications must be obtained through appropriate training measures.

## 5 General Information

- Gloves must be worn for all fitting work (except for stainless steel and painted valves).
- Wear safety glasses.

## 6 Attaching component/customer identification plates

If grooved pins with round heads are not required, the plate is to be welded to the designated place with the spot welding device.

The world plate (NGA) is fastened to the bonnet. In exceptional cases, it may also be fastened with grooved pins with round heads, in which case it may also be fastened to the body.

The standard plate is welded to the flat surface designated for that purpose.

Types 437, 438, 439 - outlet body

Types 459, 462, - bonnet

**No fastening with grooved pins with round heads**

Flanged valves - on the **right** side as seen from the outlet side. **Exception**: Types 457 / 458 / 526 - on the back side using the set screw

6.1 Standard plate

**Figure 6.2.1-1**

The standard plate comes in two versions.

For valves that are designed according to ASME (feature N68/N70), the version is created with the UV and NB symbols.

For valves that are designed according to TÜV, the UV and NB symbols are not included.

**Attachment locations for standard component plates**

**Figure 6.2.1-2:** Type 459

**Figure 6.2.1-3:** Type 462

protected

**Figure 6.2.1-4:** Type 437

**Figure 6.2.1-5:** Type 462

**Figure 6.2.1-6:** Standard plate on a flanged valve

Figure **6.2.1-7**: Types 457 / 458 / 526

## 6.2 World plate (NGA)

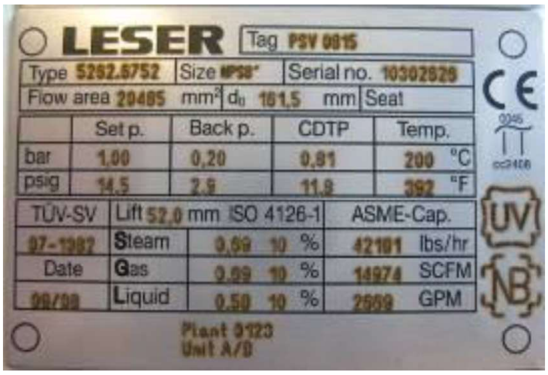



**Figure 6.2.1-1**

The world plate (NGA) comes in two versions.

protected

For valves that are designed according to ASME (feature N68/N70), the version is created with the UV and NB symbols.

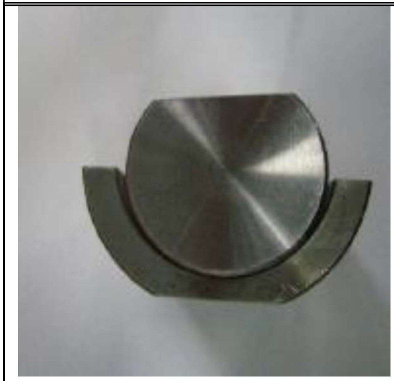
For valves that are designed according to TÜV, the UV and NB symbols are not lasered on.

### 6.2.1 Pre-curving of the NGA

For bonnets with a curved cross-section, the plate must be pre-curved with a radius. To do this, place the labelled plates in the apparatus with the lettering facing down.

| Illustrations | Description | Aids / Tools |
|---|---|---|
|  **Figure 6.2.1-1** | Pre-curving the plate | Apparatus |
|  | Pre-curving the plate for open bonnets (V20-V25) | Apparatus |

| Figure 6.2.1-2 | | |
|---|---|---|

| Illustrations | Description | Aids / Tools |
|---|---|---|
| <br>Figure 6.2.1-3 | Adjustment of plate for closed bonnets (V20 - V32) | |

When opening bonnets V20-V25, the plate is bent in the longitudinal direction. To do this, put the labelled plates into the apparatus with the lettering facing down (figure 6.2.1-2).

### 6.2.2 Corrosion protection

All valves that are painted must have corrosion protection under the world sign. To do this, apply the standard primer coat (BURCHARTH'S BLUE - 60M.0120.0001) to the respective place with a sponge.

| Illustrations | Description | Aids / Tools |
|---|---|---|
| <br>Figure 6.2.2-1 | | |

| Illustrations | Description | Aids / Tools |
|---|---|---|
| <br>**Figure 6.2.2-2** | | Sponge |
| <br>**Figure 6.2.2-3** | The points where the world plate will be welded must be free of paint. | |

## 6.3 Fastening to bonnets with welding spots

### 6.3.1 Quadratic cross-section

| Illustrations | Description | Aids / Tools |
|---|---|---|
|  **Figure 6.3.1-1** | For API valves, the world plate is fastened to the bonnet of the valve with welding spots. For versions of closed bonnets with a quadratic cross-section, the world plate is attached vertically to the front side of the valve approx. 5 mm above the bevelled edge. | |

### 6.3.2 High Performance valves

For the <u>High Performance</u> series, the world plate is <u>always</u> attached to the <u>bonnet</u>. However, the location where the plate is attached is different for individual bonnet sizes.

a) Closed bonnets (V20 - V32)

| Illustrations | Description | Aids / Tools |
|---|---|---|
|   **Figure 6.3.2-1** | The world plate is attached to the bonnet (V20 - V32).<br><br>For closed bonnets, the world plate is displaced 90° with respect to the eyelet for the sealing wire so that the plate is located on the opposite side of the outlet for a completely assembled valve. | |

b) Open bonnets (V20 - V25)

| **Illustrations** | **Description** | **Aids / Tools** |
|---|---|---|
|  **Figure 6.3.2-2** | The world plate is attached to open bonnets V20 - V25. It is attached above the cast LESER lettering and should be flush with the letter "L".<br><br>The plate must be mounted so that it can be read from the right (as shown in the picture). | |

c) Open bonnet (V32)

| **Illustrations** | **Description** | **Aids / Tools** |
|---|---|---|
|  **Figure 6.3.2-3** | For open bonnets V32, the world plate is displaced 90° with respect to the eyelet in front of the sealing wire so that the plate is displaced by 90° with respect to the outlet for a completely assembled valve.<br><br>The top edge of the plate should be flush with the bevel of the bonnet. | |



d) Open bonnet (V40)
<u>Position of the bonnet:</u>

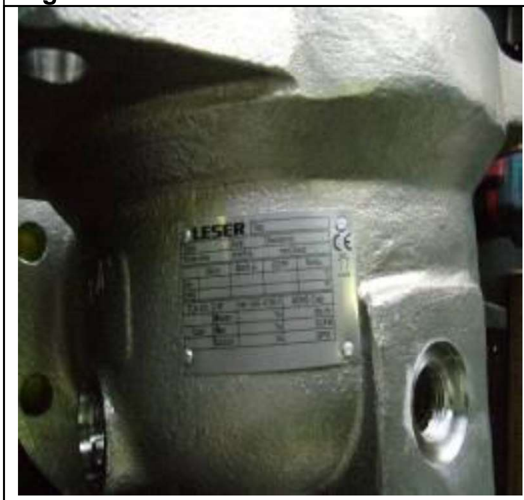
The raised identifier of the product form manufacturer (foundry) is mounted in the direction of the outlet flange.

<u>Position of the world plate</u>

The world plate is positioned on the free back side on the bottom edge of the bonnet.

6.3.3 Fastening with grooved pins with round heads

| **Illustrations** | **Description** | **Aids / Tools** |
|---|---|---|

| | | |
|---|---|---|
|   **Figure 6.3.3-1** | The plate is also curved for this purpose.<br><br>When grooved pins with round heads are used for fastening, the world plate must be fastened at the back or at the side of the body for the API valve. | |
|   **Figure 6.3.3-2** | | |

protected

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2 Scope ..........................................................................................................1
3 Disclaimer ....................................................................................................1
4 Qualified fitting personnel ............................................................................1
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6 Paint touch-up and painting repaired valves ................................................2

## 1 Purpose

This LESER Global Standard (LGS) provides instructions on painting LESER safety valves. The required work steps and materials are described.

## 2 Scope

This document must be applied when painting safety valves in agencies and subsidiaries of LESER GmbH & Co. KG.

## 3 Disclaimer

LESER puts in a great deal of effort into making up-to-date and correct documentation available. Nevertheless, LESER GmbH & Co. KG gives no guarantee that the recommended actions presented here are entirely correct and error free. This document is to be applied exclusively to the specified type. LESER GmbH & Co. KG declines any liability or responsibility for the correctness and completeness of the content.

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LESER GmbH & Co. KG is available to the users of this document to provide additional information.

## 4 Qualified fitting personnel

The assembly of LESER safety valves may only be performed by trained or qualified fitters. The qualifications must be obtained through the appropriate training measures.

## 5 General Information

- Wear safety glasses
- Wear respirator/dust mask

## 6 Paint touch-up and painting repaired valves

For valves that have to be repainted, the facing and the welded-on component/customer ID plates must be masked off correctly. Any additional plates will only be attached after painting, if welding is not required. Open bonnets must be sealed with protective caps. The same applies to any existing threaded holes. Outside threads must be protected with a suitable protective cap / existing painting socket or with masking tape.

**Figure 6-1:** Protective cap for open bonnet

**Figure 6-2**: Flange sticker

**Figure 6-3:** Component plate sticker


**Figure 6-4**: Protective cap

**Figure 6-5:** Component plate sticker

**Figure 6-6**: Protective cap

**Figure 6-7:** Masking tape

**Figure 6-8**: Protective cap

**Figure 6-9**

The layer thickness of the coat of paint should be ~ 40µm for one coat of paint.

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*Erklärungen siehe / explanation see : LGS 3600 / Orifice D-T+*

**Ausführung** *(model)*

| **warmfest** *(creep-resistant steel)* | | | | **hochwarmfest** *(high creep-resistant steel)* | | | | **korrosionsfest** *(stainless steel)* | | | | **Inconel X750** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| p [ bar ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes | p [ bar ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes | p [ bar ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes | p [ bar ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
| | | **1D2 - 2K+3** | | | | **1D2 - 2K+3** | | | | **1D2 - 2K+3** | | | | **1D2 - 2K+3** | |
| | | **Standard Version Lo=55** | | | | **Standard Version Lo=55** | | | | **Standard Version Lo=55** | | | | **Standard Version Lo=55** | |
| 1,00 | - 1,50 | 540.3024.0000 | | | | | | 1,00 | - 1,50 | 540.3024.0000 | | 1,00 | - 1,50 | 540.3027.0000 | |
| 1,51 | - 2,30 | 540.3034.0000 | | | | | | 1,51 | - 2,30 | 540.3034.0000 | | 1,51 | - 2,30 | 540.3037.0000 | |
| 2,31 | - 3,50 | 540.3044.0000 | | | | | | 2,31 | - 3,50 | 540.3044.0000 | | 2,31 | - 3,50 | 540.3047.0000 | |
| 3,51 | - 5,50 | 540.3054.0000 | | | | | | 3,51 | - 5,50 | 540.3054.0000 | | 3,51 | - 5,50 | 540.3057.0000 | |
| 5,51 | - 8,50 | 540.3064.0000 | | | | | | 5,51 | - 8,50 | 540.3064.0000 | | 5,51 | - 8,50 | 540.3067.0000 | |
| 8,51 | - 13,00 | 540.3074.0000 | | | | | | 8,51 | - 13,00 | 540.3074.0000 | | 8,51 | - 13,00 | 540.3077.0000 | |
| 13,01 | - 19,00 | 540.3084.0000 | | | | | | 13,01 | - 19,00 | 540.3084.0000 | | 13,01 | - 19,00 | 540.3087.0000 | |
| 19,01 | - 26,50 | 540.3094.0000 | | | | | | 19,01 | - 26,50 | 540.3094.0000 | | 19,01 | - 26,50 | 540.3097.0000 | |
| 26,51 | - 37,50 | 540.3104.0000 | | | | | | 26,51 | - 37,50 | 540.3104.0000 | | 26,51 | - 37,50 | 540.3107.0000 | |
| 37,51 | - 52,50 | 540.3114.0000 | | | | | | 37,51 | - 52,50 | 540.3114.0000 | | 37,51 | - 52,50 | 540.3117.0000 | |
| 52,51 | - 75,50 | 540.3164.0000 | | | | | | 52,51 | - 75,50 | 540.3164.0000 | | 52,51 | - 75,50 | 540.3167.0000 | |
| 75,51 | - 113,50 | 540.3174.0000 | | | | | | 75,51 | - 113,50 | 540.3174.0000 | | 75,51 | - 113,50 | 540.3177.0000 | |
| 113,51 | - 151,00 | 540.3204.0000 | | | | | | 113,51 | - 151,00 | 540.3204.0000 | | 113,51 | - 151,00 | 540.3207.0000 | |
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| 214,01 | - 309,00 | 540.9314.0000 | | | | | | 214,01 | - 309,00 | 540.9314.0000 | | 214,01 | - 309,00 | 540.9317.0000 | |
| 309,01 | - 426,00 | 540.9324.0000 | | | | | | 309,01 | - 426,00 | 540.9324.0000 | | 309,01 | - 426,00 | 540.9327.0000 | |
| | | **3J4 - 4P+6** | | | | **3J4 - 4P+6** | | | | **3J4 - 4P+6** | | | | **3J4 - 4P+6** | |
| | | **Standard Version Lo=55** | | | | **Standard Version Lo=55** | | | | **Standard Version Lo=55** | | | | **Standard Version Lo=55** | |
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| 13,01 | - 19,00 | 540.3084.0000 | | | | | | 13,01 | - 19,00 | 540.3084.0000 | | 13,01 | - 19,00 | 540.3087.0000 | |
| 19,01 | - 26,50 | 540.3094.0000 | | | | | | 19,01 | - 26,50 | 540.3094.0000 | | 19,01 | - 26,50 | 540.3097.0000 | |
| 26,51 | - 37,50 | 540.3104.0000 | | | | | | 26,51 | - 37,50 | 540.3104.0000 | | 26,51 | - 37,50 | 540.3107.0000 | |
| 37,51 | - 52,50 | 540.3114.0000 | | | | | | 37,51 | - 52,50 | 540.3114.0000 | | 37,51 | - 52,50 | 540.3117.0000 | |
| 52,51 | - 75,50 | 540.3164.0000 | | | | | | 52,51 | - 75,50 | 540.3164.0000 | | 52,51 | - 75,50 | 540.3167.0000 | |
| 75,51 | - 113,50 | 540.3174.0000 | | | | | | 75,51 | - 113,50 | 540.3174.0000 | | 75,51 | - 113,50 | 540.3177.0000 | |
| 113,51 | - 151,00 | 540.3204.0000 | | | | | | 113,51 | - 151,00 | 540.3204.0000 | | 13,51 | - 151,00 | 540.3207.0000 | |
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| 214,01 | - 256,00 | 540.9314.0000 | | | | | | 214,01 | - 256,00 | 540.9314.0000 | | 214,01 | - 256,00 | 540.9317.0000 | |
| | | **6Q8 - 8T+10** | | | | **6Q8 - 8T+10** | | | | **6Q8 - 8T+10** | | | | **6Q8 - 8T+10** | |
| | | **Standard Version Lo=55** | | | | **Standard Version Lo=55** | | | | **Standard Version Lo=55** | | | | **Standard Version Lo=55** | |
| 1,00 | - 1,50 | 540.3024.0000 | | | | | | 1,00 | - 1,50 | 540.3024.0000 | | 1,00 | - 1,50 | 540.3027.0000 | |
| 1,51 | - 2,30 | 540.3034.0000 | | | | | | 1,51 | - 2,30 | 540.3034.0000 | | 1,51 | - 2,30 | 540.3037.0000 | |
| 2,31 | - 3,50 | 540.3044.0000 | | | | | | 2,31 | - 3,50 | 540.3044.0000 | | 2,31 | - 3,50 | 540.3047.0000 | |
| 3,51 | - 5,50 | 540.3054.0000 | | | | | | 3,51 | - 5,50 | 540.3054.0000 | | 3,51 | - 5,50 | 540.3057.0000 | |
| 5,51 | - 8,50 | 540.3064.0000 | | | | | | 5,51 | - 8,50 | 540.3064.0000 | | 5,51 | - 8,50 | 540.3067.0000 | |
| 8,51 | - 13,00 | 540.3074.0000 | | | | | | 8,51 | - 13,00 | 540.3074.0000 | | 8,51 | - 13,00 | 540.3077.0000 | |
| 13,01 | - 19,00 | 540.3084.0000 | | | | | | 13,01 | - 19,00 | 540.3084.0000 | | 13,01 | - 19,00 | 540.3087.0000 | |
| 19,01 | - 26,50 | 540.3094.0000 | | | | | | 19,01 | - 26,50 | 540.3094.0000 | | 19,01 | - 26,50 | 540.3097.0000 | |
| 26,51 | - 37,50 | 540.3104.0000 | | | | | | 26,51 | - 37,50 | 540.3104.0000 | | 26,51 | - 37,50 | 540.3107.0000 | |
| 37,51 | - 52,50 | 540.3114.0000 | | | | | | 37,51 | - 52,50 | 540.3114.0000 | | 37,51 | - 52,50 | 540.3117.0000 | |
| 52,51 | - 75,50 | 540.3164.0000 | | | | | | 52,51 | - 75,50 | 540.3164.0000 | | 52,51 | - 75,50 | 540.3167.0000 | |
| 75,51 | - 102,00 | 540.3174.0000 | | | | | | 75,51 | - 102,00 | 540.3174.0000 | | 75,51 | - 102,00 | 540.3177.0000 | |

protected

**Ausführung** *(model)*

| **warmfest** *(creep-resistant steel)* | | | | **hochwarmfest** *(high creep-resistant steel)* | | | | **korrosionsfest** *(stainless steel)* | | | | **Inconel X750** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes | p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes | p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes | p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
| | | **1D2 - 2K+3** | | | | **1D2 - 2K+3** | | | | **1D2 - 2K+3** | | | | **1D2 - 2K+3** | |
| | | **Standard Version Lo=55** | | | | **Standard Version Lo=55** | | | | **Standard Version Lo=55** | | | | **Standard Version Lo=55** | |
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| 21,9 | - 33,4 | 540.3034.0000 | | | | | | 21,9 | - 33,4 | 540.3034.0000 | | 21,9 | - 33,4 | 540.3037.0000 | |
| 33,5 | - 50,8 | 540.3044.0000 | | | | | | 33,5 | - 50,8 | 540.3044.0000 | | 33,5 | - 50,8 | 540.3047.0000 | |
| 50,9 | - 79,8 | 540.3054.0000 | | | | | | 50,9 | - 79,8 | 540.3054.0000 | | 50,9 | - 79,8 | 540.3057.0000 | |
| 79,9 | - 123 | 540.3064.0000 | | | | | | 79,9 | - 123 | 540.3064.0000 | | 79,9 | - 123 | 540.3067.0000 | |
| 123 | - 189 | 540.3074.0000 | | | | | | 123 | - 189 | 540.3074.0000 | | 123 | - 189 | 540.3077.0000 | |
| 189 | - 276 | 540.3084.0000 | | | | | | 189 | - 276 | 540.3084.0000 | | 189 | - 276 | 540.3087.0000 | |
| 276 | - 384 | 540.3094.0000 | | | | | | 276 | - 384 | 540.3094.0000 | | 276 | - 384 | 540.3097.0000 | |
| 384 | - 544 | 540.3104.0000 | | | | | | 384 | - 544 | 540.3104.0000 | | 384 | - 544 | 540.3107.0000 | |
| 544 | - 762 | 540.3114.0000 | | | | | | 544 | - 762 | 540.3114.0000 | | 544 | - 762 | 540.3117.0000 | |
| 762 | - 1095 | 540.3164.0000 | | | | | | 762 | - 1095 | 540.3164.0000 | | 762 | - 1095 | 540.3167.0000 | |
| 1095 | - 1646 | 540.3174.0000 | | | | | | 1095 | - 1646 | 540.3174.0000 | | 1095 | - 1646 | 540.3177.0000 | |
| 1646 | - 2190 | 540.3204.0000 | | | | | | 1646 | - 2190 | 540.3204.0000 | | 1646 | - 2190 | 540.3207.0000 | |
| | | **Long Version Lo=75** | | | | **Long Version Lo=75** | | | | **Long Version Lo=75** | | | | **Long Version Lo=75** | |
| 2190 | - 3104 | 540.9304.0000 | | | | | | 2190 | - 3104 | 540.9304.0000 | | 2190 | - 3104 | 540.9307.0000 | |
| 3104 | - 4482 | 540.9314.0000 | | | | | | 3104 | - 4482 | 540.9314.0000 | | 3104 | - 4482 | 540.9317.0000 | |
| 4482 | - 6179 | 540.9324.0000 | | | | | | 4482 | - 6179 | 540.9324.0000 | | 4482 | - 6179 | 540.9327.0000 | |
| | | **3J4 - 4P+6** | | | | **3J4 - 4P+6** | | | | **3J4 - 4P+6** | | | | **3J4 - 4P+6** | |
| | | **Standard Version Lo=55** | | | | **Standard Version Lo=55** | | | | **Standard Version Lo=55** | | | | **Standard Version Lo=55** | |
| 14,5 | - 21,8 | 540.3024.0000 | | | | | | 14,5 | - 21,8 | 540.3024.0000 | | 14,5 | - 21,8 | 540.3027.0000 | |
| 21,9 | - 33,4 | 540.3034.0000 | | | | | | 21,9 | - 33,4 | 540.3034.0000 | | 21,9 | - 33,4 | 540.3037.0000 | |
| 33,5 | - 50,8 | 540.3044.0000 | | | | | | 33,5 | - 50,8 | 540.3044.0000 | | 33,5 | - 50,8 | 540.3047.0000 | |
| 50,9 | - 79,8 | 540.3054.0000 | | | | | | 50,9 | - 79,8 | 540.3054.0000 | | 50,9 | - 79,8 | 540.3057.0000 | |
| 79,9 | - 123 | 540.3064.0000 | | | | | | 79,9 | - 123 | 540.3064.0000 | | 79,9 | - 123 | 540.3067.0000 | |
| 123 | - 189 | 540.3074.0000 | | | | | | 123 | - 189 | 540.3074.0000 | | 123 | - 189 | 540.3077.0000 | |
| 189 | - 276 | 540.3084.0000 | | | | | | 189 | - 276 | 540.3084.0000 | | 189 | - 276 | 540.3087.0000 | |
| 276 | - 384 | 540.3094.0000 | | | | | | 276 | - 384 | 540.3094.0000 | | 276 | - 384 | 540.3097.0000 | |
| 384 | - 544 | 540.3104.0000 | | | | | | 384 | - 544 | 540.3104.0000 | | 384 | - 544 | 540.3107.0000 | |
| 544 | - 762 | 540.3114.0000 | | | | | | 544 | - 762 | 540.3114.0000 | | 544 | - 762 | 540.3117.0000 | |
| 762 | - 1095 | 540.3164.0000 | | | | | | 762 | - 1095 | 540.3164.0000 | | 762 | - 1095 | 540.3167.0000 | |
| 1095 | - 1646 | 540.3174.0000 | | | | | | 1095 | - 1646 | 540.3174.0000 | | 1095 | - 1646 | 540.3177.0000 | |
| 1646 | - 2190 | 540.3204.0000 | | | | | | 1646 | - 2190 | 540.3204.0000 | | 1646 | - 2190 | 540.3207.0000 | |
| | | **Long Version Lo=75** | | | | **Long Version Lo=75** | | | | **Long Version Lo=75** | | | | **Long Version Lo=75** | |
| 2190 | - 3104 | 540.9304.0000 | | | | | | 2190 | - 3104 | 540.9304.0000 | | 2190 | - 3104 | 540.9307.0000 | |
| 3104 | - 3713 | 540.9314.0000 | | | | | | 3104 | - 3713 | 540.9314.0000 | | 3104 | - 3713 | 540.9317.0000 | |
| | | **6Q8 - 8T+10** | | | | **6Q8 - 8T+10** | | | | **6Q8 - 8T+10** | | | | **6Q8 - 8T+10** | |
| | | **Standard Version Lo=55** | | | | **Standard Version Lo=55** | | | | **Standard Version Lo=55** | | | | **Standard Version Lo=55** | |
| 14,5 | - 21,8 | 540.3024.0000 | | | | | | 14,5 | - 21,8 | 540.3024.0000 | | 14,5 | - 21,8 | 540.3027.0000 | |
| 21,9 | - 33,4 | 540.3034.0000 | | | | | | 21,9 | - 33,4 | 540.3034.0000 | | 21,9 | - 33,4 | 540.3037.0000 | |
| 33,5 | - 50,8 | 540.3044.0000 | | | | | | 33,5 | - 50,8 | 540.3044.0000 | | 33,5 | - 50,8 | 540.3047.0000 | |
| 50,9 | - 79,8 | 540.3054.0000 | | | | | | 50,9 | - 79,8 | 540.3054.0000 | | 50,9 | - 79,8 | 540.3057.0000 | |
| 79,9 | - 123 | 540.3064.0000 | | | | | | 79,9 | - 123 | 540.3064.0000 | | 79,9 | - 123 | 540.3067.0000 | |
| 123 | - 189 | 540.3074.0000 | | | | | | 123 | - 189 | 540.3074.0000 | | 123 | - 189 | 540.3077.0000 | |
| 189 | - 276 | 540.3084.0000 | | | | | | 189 | - 276 | 540.3084.0000 | | 189 | - 276 | 540.3087.0000 | |
| 276 | - 384 | 540.3094.0000 | | | | | | 276 | - 384 | 540.3094.0000 | | 276 | - 384 | 540.3097.0000 | |
| 384 | - 544 | 540.3104.0000 | | | | | | 384 | - 544 | 540.3104.0000 | | 384 | - 544 | 540.3107.0000 | |
| 544 | - 762 | 540.3114.0000 | | | | | | 544 | - 762 | 540.3114.0000 | | 544 | - 762 | 540.3117.0000 | |
| 762 | - 1095 | 540.3164.0000 | | | | | | 762 | - 1095 | 540.3164.0000 | | 762 | - 1095 | 540.3167.0000 | |
| 1095 | - 1479 | 540.3174.0000 | | | | | | 1095 | - 1479 | 540.3174.0000 | | 1095 | - 1479 | 540.3177.0000 | |


| disclosure cat.: | II | proofread: | BJ | published date: | 10/6/11 | effect. date: | 10/11 |
|---|---|---|---|---|---|---|---|
| author: | Schm | released by: | BJ | replaces: | 060.32 | status: | published |
| resp. depart.: | TB | date of release: | 9/16/11 | revision No.: | 0 | | |
| doc. type: | LGS | change rep. No.: | 00888A | retention period: | 10y. | | |

Contents

**1 Purpose .......................... 1**
**2 Scope ............................. 1**
**3 References ..................... 1**

## 1 Purpose

This LESER Global Standard (LGS) contains the information about pressure range of all springs, which are installed in valve- type 820.

## 2 Scope

This LGS applies to all members of the LESER quality cluster as defined in the global quality management manual.

This LGS contains information about the pressure range of all springs, which are installed in valve- type 820.

The pressure ranges of the various models are given first in pressure-unit [bar].
This is followed by the pressure-unit [psig].

## 3 References

LDeS 3060.01, LDeS 3265.01


| | | | | | | | |
|---|---|---|---|---|---|---|---|
| disclosure cat.: | II | proofread: | TK | published date: | 07/01/15 | effect. date: | 10/11 |
| author: | Schm | released by: | JR | replaces: | 060-333 | status: | Published |
| resp. depart.: | TD | date of release: | 07/01/15 | revision No.: | 3 | | |
| doc. type: | LGS | change rep. No.: | 200075 | retention period: | 10y. | | |

| Ausführung *(model)* | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Standard** (standard) | | | | **warmfest** (creep-resistant steel) | | | | **korrosionsfest** (stainless steel) | | | | **Inconel X750 (high creep-resistant steel)** | | | |
| **p [ bar ] von p1** *up* | **bis p2** *to* | **Feder-Sachnummer** *stock no.* | **Indizes** | **p [ bar ] von p1** *up* | **bis p2** *to* | **Feder-Sachnummer** *stock no.* | **Indizes** | **p [ bar ] von p1** *up* | **bis p2** *to* | **Feder-Sachnummer** *stock no.* | **Indizes** | **p [ bar ] von p1** *up* | **bis p2** *to* | **Feder-Sachnummer** *stock no.* | **Indizes** |
| **1D2 - 2K+3 Membran/ diaphragm** | | | | **1D2 - 2K+3 Membran/ diaphragm** | | | | **1D2 - 2K+3 Membran/ diaphragm** | | | | **1D2 - 2K+3 Membran/ diaphragm** | | | |
| 1,00 | - 1,38 | 540.4074.0000 | | 1,00 | - 1,38 | 540.4074.0000 | | 1,00 | - 1,38 | 540.4074.0000 | | 1,00 | - 1,38 | 540.4077.0000 | |
| 1,39 | - 1,86 | 540.4084.0000 | | 1,39 | - 1,86 | 540.4084.0000 | | 1,39 | - 1,86 | 540.4084.0000 | | 1,39 | - 1,86 | 540.4087.0000 | |
| 1,87 | - 2,50 | 540.4094.0000 | | 1,87 | - 2,50 | 540.4094.0000 | | 1,87 | - 2,50 | 540.4094.0000 | | 1,87 | - 2,50 | 540.4097.0000 | |
| 2,51 | - 3,50 | 540.4104.0000 | | 2,51 | - 3,50 | 540.4104.0000 | | 2,51 | - 3,50 | 540.4104.0000 | | 2,51 | - 3,50 | 540.4107.0000 | |
| 3,51 | - 4,90 | 540.5124.0000 | | 3,51 | - 4,90 | 540.5124.0000 | | 3,51 | - 4,90 | 540.5124.0000 | | 3,51 | - 4,90 | 540.5127.0000 | |
| 4,91 | - 6,40 | 540.8064.0000 | | 4,91 | - 6,40 | 540.8064.0000 | | 4,91 | - 6,40 | 540.8064.0000 | | 4,91 | - 6,40 | 540.8067.0000 | |
| 6,41 | - 8,50 | 540.9404.0000 | | 6,41 | - 8,50 | 540.9404.0000 | | 6,41 | - 8,50 | 540.9404.0000 | | 6,41 | - 8,50 | 540.9407.0000 | |
| 8,51 | - 11,00 | 540.9414.0000 | | 8,51 | - 11,00 | 540.9414.0000 | | 8,51 | - 11,00 | 540.9414.0000 | | 8,51 | - 11,00 | 540.9417.0000 | |
| 11,01 | - 14,00 | 540.8094.0000 | | 11,01 | - 14,00 | 540.8094.0000 | | 11,01 | - 14,00 | 540.8094.0000 | | 11,01 | - 14,00 | 540.8097.0000 | |
| 14,01 | - 17,00 | 540.8094.0000 | | 14,01 | - 17,00 | 540.8094.0000 | | 14,01 | - 17,00 | 540.8094.0000 | | 14,01 | - 17,00 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 17,01 | - 20,00 | 540.0054.0000 | | 17,01 | - 20,00 | 540.0054.0000 | | 17,01 | - 20,00 | 540.0054.0000 | | 17,01 | - 20,00 | 540.0057.0000 | |
| 20,01 | - 30,00 | 540.0054.0000 | | 20,01 | - 30,00 | 540.0054.0000 | | 20,01 | - 30,00 | 540.0054.0000 | | 20,01 | - 30,00 | 540.0057.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | |
| 30,01 | - 40,00 | 540.9414.0000 | | 30,01 | - 40,00 | 540.9414.0000 | | 30,01 | - 40,00 | 540.9414.0000 | | 30,01 | - 40,00 | 540.9417.0000 | |
| 40,01 | - 50,00 | 540.8094.0000 | | 40,01 | - 50,00 | 540.8094.0000 | | 40,01 | - 50,00 | 540.8094.0000 | | 40,01 | - 50,00 | 540.8097.0000 | |
| 50,01 | - 60,00 | 540.8094.0000 | | 50,01 | - 60,00 | 540.8094.0000 | | 50,01 | - 60,00 | 540.8094.0000 | | 50,01 | - 60,00 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 60,01 | - 70,00 | 540.0054.0000 | | 60,01 | - 70,00 | 540.0054.0000 | | 60,01 | - 70,00 | 540.0054.0000 | | 60,01 | - 70,00 | 540.0057.0000 | |
| 70,01 | - 102,05 | 540.0054.0000 | | 70,01 | - 102,05 | 540.0054.0000 | | 70,01 | - 102,05 | 540.0054.0000 | | 70,01 | - 102,05 | 540.0057.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| **Kolben/ piston do = 17.5** | | | | **Kolben/ piston do = 17.5** | | | | **Kolben/ piston do = 17.5** | | | | **Kolben/ piston do = 17.5** | | | |
| 102,06 | - 115,00 | 540.8094.0000 | | 102,06 | - 115,00 | 540.8094.0000 | | 102,06 | - 115,00 | 540.8094.0000 | | 102,06 | - 115,00 | 540.8097.0000 | |
| 115,01 | - 145,00 | 540.8094.0000 | | 115,01 | - 145,00 | 540.8094.0000 | | 115,01 | - 145,00 | 540.8094.0000 | | 115,01 | - 145,00 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 145,01 | - 185,00 | 540.0054.0000 | | 145,01 | - 185,00 | 540.0054.0000 | | 145,01 | - 185,00 | 540.0054.0000 | | 145,01 | - 185,00 | 540.0057.0000 | |
| 185,01 | - 256,00 | 540.0054.0000 | | 185,01 | - 256,00 | 540.0054.0000 | | 185,01 | - 256,00 | 540.0054.0000 | | 185,01 | - 256,00 | 540.0057.0000 | |
| | | 540.9374.0205 | | | | 540.9374.0205 | | | | 540.9374.0205 | | | | 540.9377.0205 | |
| 256,01 | - 305,00 | 540.1804.0000 | | 256,01 | - 305,00 | 540.1804.0000 | | 256,01 | - 305,00 | 540.1804.0000 | | 256,01 | - 305,00 | 540.1807.0000 | |
| 305,01 | - 360,00 | 540.1814.0000 | | 305,01 | - 360,00 | 540.1814.0000 | | 305,01 | - 360,00 | 540.1814.0000 | | 305,01 | - 360,00 | 540.1817.0000 | |
| 360,01 | - 426,00 | 540.1824.0000 | | 360,01 | - 426,00 | 540.1824.0000 | | 360,01 | - 426,00 | 540.1824.0000 | | 360,01 | - 426,00 | 540.1827.0000 | |

## Ausführung *(model)*

### Standard (standard)

| p [ bar ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
|---|---|---|---|
| **3J4 - 4P+6 Membran/ diaphragm** | | | |
| 1,00 | - 1,38 | 540.4074.0000 | |
| 1,39 | - 1,86 | 540.4084.0000 | |
| 1,87 | - 2,50 | 540.4094.0000 | |
| 2,51 | - 3,50 | 540.4104.0000 | |
| 3,51 | - 4,90 | 540.5124.0000 | |
| 4,91 | - 6,40 | 540.8064.0000 | |
| 6,41 | - 8,50 | 540.9404.0000 | |
| 8,51 | - 11,00 | 540.9414.0000 | |
| 11,01 | - 14,00 | 540.8094.0000 | |
| 14,01 | - 17,00 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 17,01 | - 20,00 | 540.0054.0000 | |
| 20,01 | - 30,00 | 540.0054.0000 | |
| | | 540.4314.0205 | |
| **Kolben/ piston do = 25.5** | | | |
| 30,01 | - 40,00 | 540.9414.0000 | |
| 40,01 | - 50,00 | 540.8094.0000 | |
| 50,01 | - 60,00 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 60,01 | - 70,00 | 540.0054.0000 | |
| 70,01 | - 102,05 | 540.0054.0000 | |
| | | 540.4314.0205 | |
| **Kolben/ piston do = 17.5** | | | |
| 102,06 | - 115,00 | 540.8094.0000 | |
| 115,01 | - 145,00 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 145,01 | - 185,00 | 540.0054.0000 | |
| 185,01 | - 256,00 | 540.0054.0000 | |
| | | 540.9374.0205 | |

### warmfest (creep-resistant steel)

| p [ bar ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
|---|---|---|---|
| **3J4 - 4P+6 Membran/ diaphragm** | | | |
| 1,00 | - 1,38 | 540.4074.0000 | |
| 1,39 | - 1,86 | 540.4084.0000 | |
| 1,87 | - 2,50 | 540.4094.0000 | |
| 2,51 | - 3,50 | 540.4104.0000 | |
| 3,51 | - 4,90 | 540.5124.0000 | |
| 4,91 | - 6,40 | 540.8064.0000 | |
| 6,41 | - 8,50 | 540.9404.0000 | |
| 8,51 | - 11,00 | 540.9414.0000 | |
| 11,01 | - 14,00 | 540.8094.0000 | |
| 14,01 | - 17,00 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 17,01 | - 20,00 | 540.0054.0000 | |
| 20,01 | - 30,00 | 540.0054.0000 | |
| | | 540.4314.0205 | |
| **Kolben/ piston do = 25.5** | | | |
| 30,01 | - 40,00 | 540.9414.0000 | |
| 40,01 | - 50,00 | 540.8094.0000 | |
| 50,01 | - 60,00 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 60,01 | - 70,00 | 540.0054.0000 | |
| 70,01 | - 102,05 | 540.0054.0000 | |
| | | 540.4314.0205 | |
| **Kolben/ piston do = 17.5** | | | |
| 102,06 | - 115,00 | 540.8094.0000 | |
| 115,01 | - 145,00 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 145,01 | - 185,00 | 540.0054.0000 | |
| 185,01 | - 256,00 | 540.0054.0000 | |
| | | 540.9374.0205 | |

### korrosionsfest (stainless steel)

| p [ bar ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
|---|---|---|---|
| **3J4 - 4P+6 Membran/ diaphragm** | | | |
| 1,00 | - 1,38 | 540.4074.0000 | |
| 1,39 | - 1,86 | 540.4084.0000 | |
| 1,87 | - 2,50 | 540.4094.0000 | |
| 2,51 | - 3,50 | 540.4104.0000 | |
| 3,51 | - 4,90 | 540.5124.0000 | |
| 4,91 | - 6,40 | 540.8064.0000 | |
| 6,41 | - 8,50 | 540.9404.0000 | |
| 8,51 | - 11,00 | 540.9414.0000 | |
| 11,01 | - 14,00 | 540.8094.0000 | |
| 14,01 | - 17,00 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 17,01 | - 20,00 | 540.0054.0000 | |
| 20,01 | - 30,00 | 540.0054.0000 | |
| | | 540.4314.0205 | |
| **Kolben/ piston do = 25.5** | | | |
| 30,01 | - 40,00 | 540.9414.0000 | |
| 40,01 | - 50,00 | 540.8094.0000 | |
| 50,01 | - 60,00 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 60,01 | - 70,00 | 540.0054.0000 | |
| 70,01 | - 102,05 | 540.0054.0000 | |
| | | 540.4314.0205 | |
| **Kolben/ piston do = 17.5** | | | |
| 102,06 | - 115,00 | 540.8094.0000 | |
| 115,01 | - 145,00 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 145,01 | - 185,00 | 540.0054.0000 | |
| 185,01 | - 256,00 | 540.0054.0000 | |
| | | 540.9374.0205 | |

### Inconel X750 (high creep-resistant steel)

| p [ bar ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
|---|---|---|---|
| **3J4 - 4P+6 Membran/ diaphragm** | | | |
| 1,00 | - 1,38 | 540.4077.0000 | |
| 1,39 | - 1,86 | 540.4087.0000 | |
| 1,87 | - 2,50 | 540.4097.0000 | |
| 2,51 | - 3,50 | 540.4107.0000 | |
| 3,51 | - 4,90 | 540.5127.0000 | |
| 4,91 | - 6,40 | 540.8067.0000 | |
| 6,41 | - 8,50 | 540.9407.0000 | |
| 8,51 | - 11,00 | 540.9417.0000 | |
| 11,01 | - 14,00 | 540.8097.0000 | |
| 14,01 | - 17,00 | 540.8097.0000 | |
| | | 540.4317.0205 | |
| 17,01 | - 20,00 | 540.0057.0000 | |
| 20,01 | - 30,00 | 540.0057.0000 | |
| | | 540.4317.0205 | |
| **Kolben/ piston do = 25.5** | | | |
| 30,01 | - 40,00 | 540.9417.0000 | |
| 40,01 | - 50,00 | 540.8097.0000 | |
| 50,01 | - 60,00 | 540.8097.0000 | |
| | | 540.4317.0205 | |
| 60,01 | - 70,00 | 540.0057.0000 | |
| 70,01 | - 102,05 | 540.0057.0000 | |
| | | 540.4317.0205 | |
| **Kolben/ piston do = 17.5** | | | |
| 102,06 | - 115,00 | 540.8097.0000 | |
| 115,01 | - 145,00 | 540.8097.0000 | |
| | | 540.4317.0205 | |
| 145,01 | - 185,00 | 540.0057.0000 | |
| 185,01 | - 256,00 | 540.0057.0000 | |
| | | 540.9377.0205 | |



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| disclosure cat.: | II | proofread: | TK | published date: | 07/01/15 | effect. date: | 10/11 |
| author: | Schm | released by: | JR | replaces: | 060-333 | status: | Published |
| resp. depart.: | TD | date of release: | 07/01/15 | revision No.: | 3 | | |
| doc. type: | LGS | change rep. No.: | 200075 | retention period: | 10y. | | |

| **Ausführung** *(model)* | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Standard** (standard) | | | | **warmfest** (creep-resistant steel) | | | | **korrosionsfest** (stainless steel) | | | | **Inconel X750 (high creep-resistant steel)** | | | |
| **p [ bar ] von p1** *up* | **bis p2** *to* | **Feder-Sachnummer** *stock no.* | **Indizes** | **p [ bar ] von p1** *up* | **bis p2** *to* | **Feder-Sachnummer** *stock no.* | **Indizes** | **p [ bar ] von p1** *up* | **bis p2** *to* | **Feder-Sachnummer** *stock no.* | **Indizes** | **p [ bar ] von p1** *up* | **bis p2** *to* | **Feder-Sachnummer** *stock no.* | **Indizes** |
| **6Q8 - 8T+10 Membran/ diaphragm** | | | | **6Q8 - 8T+10 Membran/ diaphragm** | | | | **6Q8 - 8T+10 Membran/ diaphragm** | | | | **6Q8 - 8T+10 Membran/ diaphragm** | | | |
| 1,00 | - 1,38 | 540.4074.0000 | | 1,00 | - 1,38 | 540.4074.0000 | | 1,00 | - 1,38 | 540.4074.0000 | | 1,00 | - 1,38 | 540.4077.0000 | |
| 1,39 | - 1,86 | 540.4084.0000 | | 1,39 | - 1,86 | 540.4084.0000 | | 1,39 | - 1,86 | 540.4084.0000 | | 1,39 | - 1,86 | 540.4087.0000 | |
| 1,87 | - 2,50 | 540.4094.0000 | | 1,87 | - 2,50 | 540.4094.0000 | | 1,87 | - 2,50 | 540.4094.0000 | | 1,87 | - 2,50 | 540.4097.0000 | |
| 2,51 | - 3,50 | 540.4104.0000 | | 2,51 | - 3,50 | 540.4104.0000 | | 2,51 | - 3,50 | 540.4104.0000 | | 2,51 | - 3,50 | 540.4107.0000 | |
| 3,51 | - 4,90 | 540.5124.0000 | | 3,51 | - 4,90 | 540.5124.0000 | | 3,51 | - 4,90 | 540.5124.0000 | | 3,51 | - 4,90 | 540.5127.0000 | |
| 4,91 | - 6,40 | 540.8064.0000 | | 4,91 | - 6,40 | 540.8064.0000 | | 4,91 | - 6,40 | 540.8064.0000 | | 4,91 | - 6,40 | 540.8067.0000 | |
| 6,41 | - 8,50 | 540.9404.0000 | | 6,41 | - 8,50 | 540.9404.0000 | | 6,41 | - 8,50 | 540.9404.0000 | | 6,41 | - 8,50 | 540.9407.0000 | |
| 8,51 | - 11,00 | 540.9414.0000 | | 8,51 | - 11,00 | 540.9414.0000 | | 8,51 | - 11,00 | 540.9414.0000 | | 8,51 | - 11,00 | 540.9417.0000 | |
| 11,01 | - 14,00 | 540.8094.0000 | | 11,01 | - 14,00 | 540.8094.0000 | | 11,01 | - 14,00 | 540.8094.0000 | | 11,01 | - 14,00 | 540.8097.0000 | |
| 14,01 | - 17,00 | 540.8094.0000 | | 14,01 | - 17,00 | 540.8094.0000 | | 14,01 | - 17,00 | 540.8094.0000 | | 14,01 | - 17,00 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 17,01 | - 20,00 | 540.0054.0000 | | 17,01 | - 20,00 | 540.0054.0000 | | 17,01 | - 20,00 | 540.0054.0000 | | 17,01 | - 20,00 | 540.0057.0000 | |
| 20,01 | - 30,00 | 540.0054.0000 | | 20,01 | - 30,00 | 540.0054.0000 | | 20,01 | - 30,00 | 540.0054.0000 | | 20,01 | - 30,00 | 540.0057.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | |
| 30,01 | - 40,00 | 540.9414.0000 | | 30,01 | - 40,00 | 540.9414.0000 | | 30,01 | - 40,00 | 540.9414.0000 | | 30,01 | - 40,00 | 540.9417.0000 | |
| 40,01 | - 50,00 | 540.8094.0000 | | 40,01 | - 50,00 | 540.8094.0000 | | 40,01 | - 50,00 | 540.8094.0000 | | 40,01 | - 50,00 | 540.8097.0000 | |
| 50,01 | - 60,00 | 540.8094.0000 | | 50,01 | - 60,00 | 540.8094.0000 | | 50,01 | - 60,00 | 540.8094.0000 | | 50,01 | - 60,00 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 60,01 | - 70,00 | 540.0054.0000 | | 60,01 | - 70,00 | 540.0054.0000 | | 60,01 | - 70,00 | 540.0054.0000 | | 60,01 | - 70,00 | 540.0057.0000 | |
| 70,01 | - 102,05 | 540.0054.0000 | | 70,01 | - 102,05 | 540.0054.0000 | | 70,01 | - 102,05 | 540.0054.0000 | | 70,01 | - 102,05 | 540.0057.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |



| | | | | | | | |
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| doc. type: | LGS | change rep. No.: | 200075 | retention period: | 10y. | | |

| Ausführung *(model)* | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Standard** (standard) | | | | **warmfest** (creep-resistant steel) | | | | **korrosionsfest** (stainless steel) | | | | **Inconel X750 (high creep-resistant steel)** | | | |
| **p [ psig ] von p1** *up* | **bis p2** *to* | **Feder-Sachnummer** *stock no.* | **Indizes** | **p [ psig ] von p1** *up* | **bis p2** *to* | **Feder-Sachnummer** *stock no.* | **Indizes** | **p [ psig ] von p1** *up* | **bis p2** *to* | **Feder-Sachnummer** *stock no.* | **Indizes** | **p [ psig ] von p1** *up* | **bis p2** *to* | **Feder-Sachnummer** *stock no.* | **Indizes** |
| **1D2 - 2K+3 Membran/ diaphragm** | | | | **1D2 - 2K+3 Membran/ diaphragm** | | | | **1D2 - 2K+3 Membran/ diaphragm** | | | | **1D2 - 2K+3 Membran/ diaphragm** | | | |
| 14,5 | - 20,0 | 540.4074.0000 | | 14,5 | - 20,0 | 540.4074.0000 | | 14,5 | - 20,0 | 540.4074.0000 | | 14,5 | - 20,0 | 540.4077.0000 | |
| 20,1 | - 27,0 | 540.4084.0000 | | 20,1 | - 27,0 | 540.4084.0000 | | 20,1 | - 27,0 | 540.4084.0000 | | 20,1 | - 27,0 | 540.4087.0000 | |
| 27,1 | - 36,3 | 540.4094.0000 | | 27,1 | - 36,3 | 540.4094.0000 | | 27,1 | - 36,3 | 540.4094.0000 | | 27,1 | - 36,3 | 540.4097.0000 | |
| 36,4 | - 50,8 | 540.4104.0000 | | 36,4 | - 50,8 | 540.4104.0000 | | 36,4 | - 50,8 | 540.4104.0000 | | 36,4 | - 50,8 | 540.4107.0000 | |
| 50,9 | - 71,1 | 540.5124.0000 | | 50,9 | - 71,1 | 540.5124.0000 | | 50,9 | - 71,1 | 540.5124.0000 | | 50,9 | - 71,1 | 540.5127.0000 | |
| 71,2 | - 92,8 | 540.8064.0000 | | 71,2 | - 92,8 | 540.8064.0000 | | 71,2 | - 92,8 | 540.8064.0000 | | 71,2 | - 92,8 | 540.8067.0000 | |
| 92,9 | - 123 | 540.9404.0000 | | 92,9 | - 123 | 540.9404.0000 | | 92,9 | - 123 | 540.9404.0000 | | 92,9 | - 123 | 540.9407.0000 | |
| 123 | - 160 | 540.9414.0000 | | 123 | - 160 | 540.9414.0000 | | 123 | - 160 | 540.9414.0000 | | 123 | - 160 | 540.9417.0000 | |
| 160 | - 203 | 540.8094.0000 | | 160 | - 203 | 540.8094.0000 | | 160 | - 203 | 540.8094.0000 | | 160 | - 203 | 540.8097.0000 | |
| 203 | - 247 | 540.8094.0000 | | 203 | - 247 | 540.8094.0000 | | 203 | - 247 | 540.8094.0000 | | 203 | - 247 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 247 | - 290 | 540.0054.0000 | | 247 | - 290 | 540.0054.0000 | | 247 | - 290 | 540.0054.0000 | | 247 | - 290 | 540.0057.0000 | |
| 290 | - 435 | 540.0054.0000 | | 290 | - 435 | 540.0054.0000 | | 290 | - 435 | 540.0054.0000 | | 290 | - 435 | 540.0057.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | |
| 435 | - 580 | 540.9414.0000 | | 435 | - 580 | 540.9414.0000 | | 435 | - 580 | 540.9414.0000 | | 435 | - 580 | 540.9417.0000 | |
| 580 | - 725 | 540.8094.0000 | | 580 | - 725 | 540.8094.0000 | | 580 | - 725 | 540.8094.0000 | | 580 | - 725 | 540.8097.0000 | |
| 725 | - 870 | 540.8094.0000 | | 725 | - 870 | 540.8094.0000 | | 725 | - 870 | 540.8094.0000 | | 725 | - 870 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 870 | - 1015 | 540.0054.0000 | | 870 | - 1015 | 540.0054.0000 | | 870 | - 1015 | 540.0054.0000 | | 870 | - 1015 | 540.0057.0000 | |
| 1015 | - 1480 | 540.0054.0000 | | 1015 | - 1480 | 540.0054.0000 | | 1015 | - 1480 | 540.0054.0000 | | 1015 | - 1480 | 540.0057.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| **Kolben/ piston do = 17.5** | | | | **Kolben/ piston do = 17.5** | | | | **Kolben/ piston do = 17.5** | | | | **Kolben/ piston do = 17.5** | | | |
| 1480 | - 1668 | 540.8094.0000 | | 1480 | - 1668 | 540.8094.0000 | | 1480 | - 1668 | 540.8094.0000 | | 1480 | - 1668 | 540.8097.0000 | |
| 1668 | - 2103 | 540.8094.0000 | | 1668 | - 2103 | 540.8094.0000 | | 1668 | - 2103 | 540.8094.0000 | | 1668 | - 2103 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 2103 | - 2683 | 540.0054.0000 | | 2103 | - 2683 | 540.0054.0000 | | 2103 | - 2683 | 540.0054.0000 | | 2103 | - 2683 | 540.0057.0000 | |
| 2683 | - 3713 | 540.0054.0000 | | 2683 | - 3713 | 540.0054.0000 | | 2683 | - 3713 | 540.0054.0000 | | 2683 | - 3713 | 540.0057.0000 | |
| | | 540.9374.0205 | | | | 540.9374.0205 | | | | 540.9374.0205 | | | | 540.9377.0205 | |
| 3713 | - 4424 | 540.1804.0000 | | 3713 | - 4424 | 540.1804.0000 | | 3713 | - 4424 | 540.1804.0000 | | 3713 | - 4424 | 540.1807.0000 | |
| 4424 | - 5221 | 540.1814.0000 | | 4424 | - 5221 | 540.1814.0000 | | 4424 | - 5221 | 540.1814.0000 | | 4424 | - 5221 | 540.1817.0000 | |
| 5221 | - 6179 | 540.1824.0000 | | 5221 | - 6179 | 540.1824.0000 | | 5221 | - 6179 | 540.1824.0000 | | 5221 | - 6179 | 540.1827.0000 | |



| | | | | | | | |
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| doc. type: | LGS | change rep. No.: | 200075 | retention period: | 10y. | | |

**Ausführung** *(model)*

| **Standard** (standard) | | | | **warmfest** (creep-resistant steel) | | | | **korrosionsfest** (stainless steel) | | | | **Inconel X750 (high creep-resistant steel)** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes | p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes | p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes | p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
| **3J4 - 4P+6 Membran/ diaphragm** | | | | **3J4 - 4P+6 Membran/ diaphragm** | | | | **3J4 - 4P+6 Membran/ diaphragm** | | | | **3J4 - 4P+6 Membran/ diaphragm** | | | |
| 14,5 | - 20,0 | 540.4074.0000 | | 14,5 | - 20,0 | 540.4074.0000 | | 14,5 | - 20,0 | 540.4074.0000 | | 14,5 | - 20,0 | 540.4077.0000 | |
| 20,1 | - 27,0 | 540.4084.0000 | | 20,1 | - 27,0 | 540.4084.0000 | | 20,1 | - 27,0 | 540.4084.0000 | | 20,1 | - 27,0 | 540.4087.0000 | |
| 27,1 | - 36,3 | 540.4094.0000 | | 27,1 | - 36,3 | 540.4094.0000 | | 27,1 | - 36,3 | 540.4094.0000 | | 27,1 | - 36,3 | 540.4097.0000 | |
| 36,4 | - 50,8 | 540.4104.0000 | | 36,4 | - 50,8 | 540.4104.0000 | | 36,4 | - 50,8 | 540.4104.0000 | | 36,4 | - 50,8 | 540.4107.0000 | |
| 50,9 | - 71,1 | 540.5124.0000 | | 50,9 | - 71,1 | 540.5124.0000 | | 50,9 | - 71,1 | 540.5124.0000 | | 50,9 | - 71,1 | 540.5127.0000 | |
| 71,2 | - 92,8 | 540.8064.0000 | | 71,2 | - 92,8 | 540.8064.0000 | | 71,2 | - 92,8 | 540.8064.0000 | | 71,2 | - 92,8 | 540.8067.0000 | |
| 92,9 | - 123 | 540.9404.0000 | | 92,9 | - 123 | 540.9404.0000 | | 92,9 | - 123 | 540.9404.0000 | | 92,9 | - 123 | 540.9407.0000 | |
| 123 | - 160 | 540.9414.0000 | | 123 | - 160 | 540.9414.0000 | | 123 | - 160 | 540.9414.0000 | | 123 | - 160 | 540.9417.0000 | |
| 160 | - 203 | 540.8094.0000 | | 160 | - 203 | 540.8094.0000 | | 160 | - 203 | 540.8094.0000 | | 160 | - 203 | 540.8097.0000 | |
| 203 | - 247 | 540.8094.0000 | | 203 | - 247 | 540.8094.0000 | | 203 | - 247 | 540.8094.0000 | | 203 | - 247 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 247 | - 290 | 540.0054.0000 | | 247 | - 290 | 540.0054.0000 | | 247 | - 290 | 540.0054.0000 | | 247 | - 290 | 540.0057.0000 | |
| 290 | - 435 | 540.0054.0000 | | 290 | - 435 | 540.0054.0000 | | 290 | - 435 | 540.0054.0000 | | 290 | - 435 | 540.0057.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | |
| 435 | - 580 | 540.9414.0000 | | 435 | - 580 | 540.9414.0000 | | 435 | - 580 | 540.9414.0000 | | 435 | - 580 | 540.9417.0000 | |
| 580 | - 725 | 540.8094.0000 | | 580 | - 725 | 540.8094.0000 | | 580 | - 725 | 540.8094.0000 | | 580 | - 725 | 540.8097.0000 | |
| 725 | - 870 | 540.8094.0000 | | 725 | - 870 | 540.8094.0000 | | 725 | - 870 | 540.8094.0000 | | 725 | - 870 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 870 | - 1015 | 540.0054.0000 | | 870 | - 1015 | 540.0054.0000 | | 870 | - 1015 | 540.0054.0000 | | 870 | - 1015 | 540.0057.0000 | |
| 1015 | - 1480 | 540.0054.0000 | | 1015 | - 1480 | 540.0054.0000 | | 1015 | - 1480 | 540.0054.0000 | | 1015 | - 1480 | 540.0057.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| **Kolben/ piston do = 17.5** | | | | **Kolben/ piston do = 17.5** | | | | **Kolben/ piston do = 17.5** | | | | **Kolben/ piston do = 17.5** | | | |
| 1480 | - 1668 | 540.8094.0000 | | 1480 | - 1668 | 540.8094.0000 | | 1480 | - 1668 | 540.8094.0000 | | 1480 | - 1668 | 540.8097.0000 | |
| 1668 | - 2103 | 540.8094.0000 | | 1668 | - 2103 | 540.8094.0000 | | 1668 | - 2103 | 540.8094.0000 | | 1668 | - 2103 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 2103 | - 2683 | 540.0054.0000 | | 2103 | - 2683 | 540.0054.0000 | | 2103 | - 2683 | 540.0054.0000 | | 2103 | - 2683 | 540.0057.0000 | |
| 2683 | - 3713 | 540.0054.0000 | | 2683 | - 3713 | 540.0054.0000 | | 2683 | - 3713 | 540.0054.0000 | | 2683 | - 3713 | 540.0057.0000 | |
| | | 540.9374.0205 | | | | 540.9374.0205 | | | | 540.9374.0205 | | | | 540.9377.0205 | |



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## Ausführung *(model)*

### **Standard** (standard)

| p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
|---|---|---|---|
| **6Q8 - 8T+10 Membran/ diaphragm** | | | |
| 14,5 | - 20,0 | 540.4074.0000 | |
| 20,1 | - 27,0 | 540.4084.0000 | |
| 27,1 | - 36,3 | 540.4094.0000 | |
| 36,4 | - 50,8 | 540.4104.0000 | |
| 50,9 | - 71,1 | 540.5124.0000 | |
| 71,2 | - 92,8 | 540.8064.0000 | |
| 92,9 | - 123 | 540.9404.0000 | |
| 123 | - 160 | 540.9414.0000 | |
| 160 | - 203 | 540.8094.0000 | |
| 203 | - 247 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 247 | - 290 | 540.0054.0000 | |
| 290 | - 435 | 540.0054.0000 | |
| | | 540.4314.0205 | |
| **Kolben/ piston do = 25.5** | | | |
| 435 | - 580 | 540.9414.0000 | |
| 580 | - 725 | 540.8094.0000 | |
| 725 | - 870 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 870 | - 1015 | 540.0054.0000 | |
| 1015 | - 1480 | 540.0054.0000 | |
| | | 540.4314.0205 | |

### **warmfest** (creep-resistant steel)

| p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
|---|---|---|---|
| **6Q8 - 8T+10 Membran/ diaphragm** | | | |
| 14,5 | - 20,0 | 540.4074.0000 | |
| 20,1 | - 27,0 | 540.4084.0000 | |
| 27,1 | - 36,3 | 540.4094.0000 | |
| 36,4 | - 50,8 | 540.4104.0000 | |
| 50,9 | - 71,1 | 540.5124.0000 | |
| 71,2 | - 92,8 | 540.8064.0000 | |
| 92,9 | - 123 | 540.9404.0000 | |
| 123 | - 160 | 540.9414.0000 | |
| 160 | - 203 | 540.8094.0000 | |
| 203 | - 247 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 247 | - 290 | 540.0054.0000 | |
| 290 | - 435 | 540.0054.0000 | |
| | | 540.4314.0205 | |
| **Kolben/ piston do = 25.5** | | | |
| 435 | - 580 | 540.9414.0000 | |
| 580 | - 725 | 540.8094.0000 | |
| 725 | - 870 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 870 | - 1015 | 540.0054.0000 | |
| 1015 | - 1480 | 540.0054.0000 | |
| | | 540.4314.0205 | |

### **korrosionsfest** (stainless steel)

| p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
|---|---|---|---|
| **6Q8 - 8T+10 Membran/ diaphragm** | | | |
| 14,5 | - 20,0 | 540.4074.0000 | |
| 20,1 | - 27,0 | 540.4084.0000 | |
| 27,1 | - 36,3 | 540.4094.0000 | |
| 36,4 | - 50,8 | 540.4104.0000 | |
| 50,9 | - 71,1 | 540.5124.0000 | |
| 71,2 | - 92,8 | 540.8064.0000 | |
| 92,9 | - 123 | 540.9404.0000 | |
| 123 | - 160 | 540.9414.0000 | |
| 160 | - 203 | 540.8094.0000 | |
| 203 | - 247 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 247 | - 290 | 540.0054.0000 | |
| 290 | - 435 | 540.0054.0000 | |
| | | 540.4314.0205 | |
| **Kolben/ piston do = 25.5** | | | |
| 435 | - 580 | 540.9414.0000 | |
| 580 | - 725 | 540.8094.0000 | |
| 725 | - 870 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 870 | - 1015 | 540.0054.0000 | |
| 1015 | - 1480 | 540.0054.0000 | |
| | | 540.4314.0205 | |

### **Inconel X750 (high creep-resistant steel)**

| p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
|---|---|---|---|
| **6Q8 - 8T+10 Membran/ diaphragm** | | | |
| 14,5 | - 20,0 | 540.4077.0000 | |
| 20,1 | - 27,0 | 540.4087.0000 | |
| 27,1 | - 36,3 | 540.4097.0000 | |
| 36,4 | - 50,8 | 540.4107.0000 | |
| 50,9 | - 71,1 | 540.5127.0000 | |
| 71,2 | - 92,8 | 540.8067.0000 | |
| 92,9 | - 123 | 540.9407.0000 | |
| 123 | - 160 | 540.9417.0000 | |
| 160 | - 203 | 540.8097.0000 | |
| 203 | - 247 | 540.8097.0000 | |
| | | 540.4317.0205 | |
| 247 | - 290 | 540.0057.0000 | |
| 290 | - 435 | 540.0057.0000 | |
| | | 540.4317.0205 | |
| **Kolben/ piston do = 25.5** | | | |
| 435 | - 580 | 540.9417.0000 | |
| 580 | - 725 | 540.8097.0000 | |
| 725 | - 870 | 540.8097.0000 | |
| | | 540.4317.0205 | |
| 870 | - 1015 | 540.0057.0000 | |
| 1015 | - 1480 | 540.0057.0000 | |
| | | 540.4317.0205 | |


| disclosure cat.: | II | proofread: | TK | published date: | 07/01/15 | effect. date: | 10/11 |
|---|---|---|---|---|---|---|---|
| author: | Schm | released by: | JR | replaces: | 060-333 | status: | Published |
| resp. depart.: | TD | date of release: | 07/01/15 | revision No.: | 3 | | |
| doc. type: | LGS | change rep. No.: | 200075 | retention period: | 10y. | | |

Contents

**1 Purpose ........................ 1**
**2 Scope ........................... 1**
**3 References ..................... 1**

## 1 Purpose

This LESER Global Standard (LGS) contains the information about pressure range of all springs, which are installed in valve- type 820.

## 2 Scope

This LGS applies to all members of the LESER quality cluster as defined in the global quality management manual.

This LGS contains information about the pressure range of all springs, which are installed in valve- type 820.

The pressure ranges of the various models are given first in pressure-unit [bar].
This is followed by the pressure-unit [psig].

## 3 References

LDeS 3060.01, LDeS 3265.01

| Ausführung *(model)* | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Standard** (standard) | | | | **warmfest** (creep-resistant steel) | | | | **korrosionsfest** (stainless steel) | | | | **Inconel X750 (high creep-resistant steel)** | | | |
| **p [ bar ] von p1** *up* | **bis p2** *to* | **Feder-Sachnummer** *stock no.* | **Indizes** | **p [ bar ] von p1** *up* | **bis p2** *to* | **Feder-Sachnummer** *stock no.* | **Indizes** | **p [ bar ] von p1** *up* | **bis p2** *to* | **Feder-Sachnummer** *stock no.* | **Indizes** | **p [ bar ] von p1** *up* | **bis p2** *to* | **Feder-Sachnummer** *stock no.* | **Indizes** |
| **1D2 - 2K+3 Membran/ diaphragm** | | | | **1D2 - 2K+3 Membran/ diaphragm** | | | | **1D2 - 2K+3 Membran/ diaphragm** | | | | **1D2 - 2K+3 Membran/ diaphragm** | | | |
| 1,00 | - 1,38 | 540.4074.0000 | | 1,00 | - 1,38 | 540.4074.0000 | | 1,00 | - 1,38 | 540.4074.0000 | | 1,00 | - 1,38 | 540.4077.0000 | |
| 1,39 | - 1,86 | 540.4084.0000 | | 1,39 | - 1,86 | 540.4084.0000 | | 1,39 | - 1,86 | 540.4084.0000 | | 1,39 | - 1,86 | 540.4087.0000 | |
| 1,87 | - 2,50 | 540.4094.0000 | | 1,87 | - 2,50 | 540.4094.0000 | | 1,87 | - 2,50 | 540.4094.0000 | | 1,87 | - 2,50 | 540.4097.0000 | |
| 2,51 | - 3,50 | 540.4104.0000 | | 2,51 | - 3,50 | 540.4104.0000 | | 2,51 | - 3,50 | 540.4104.0000 | | 2,51 | - 3,50 | 540.4107.0000 | |
| 3,51 | - 4,90 | 540.5124.0000 | | 3,51 | - 4,90 | 540.5124.0000 | | 3,51 | - 4,90 | 540.5124.0000 | | 3,51 | - 4,90 | 540.5127.0000 | |
| 4,91 | - 6,40 | 540.8064.0000 | | 4,91 | - 6,40 | 540.8064.0000 | | 4,91 | - 6,40 | 540.8064.0000 | | 4,91 | - 6,40 | 540.8067.0000 | |
| 6,41 | - 8,50 | 540.9404.0000 | | 6,41 | - 8,50 | 540.9404.0000 | | 6,41 | - 8,50 | 540.9404.0000 | | 6,41 | - 8,50 | 540.9407.0000 | |
| 8,51 | - 11,00 | 540.9414.0000 | | 8,51 | - 11,00 | 540.9414.0000 | | 8,51 | - 11,00 | 540.9414.0000 | | 8,51 | - 11,00 | 540.9417.0000 | |
| 11,01 | - 14,00 | 540.8094.0000 | | 11,01 | - 14,00 | 540.8094.0000 | | 11,01 | - 14,00 | 540.8094.0000 | | 11,01 | - 14,00 | 540.8097.0000 | |
| 14,01 | - 17,00 | 540.8094.0000 | | 14,01 | - 17,00 | 540.8094.0000 | | 14,01 | - 17,00 | 540.8094.0000 | | 14,01 | - 17,00 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 17,01 | - 20,00 | 540.0054.0000 | | 17,01 | - 20,00 | 540.0054.0000 | | 17,01 | - 20,00 | 540.0054.0000 | | 17,01 | - 20,00 | 540.0057.0000 | |
| 20,01 | - 30,00 | 540.0054.0000 | | 20,01 | - 30,00 | 540.0054.0000 | | 20,01 | - 30,00 | 540.0054.0000 | | 20,01 | - 30,00 | 540.0057.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | |
| 30,01 | - 40,00 | 540.9414.0000 | | 30,01 | - 40,00 | 540.9414.0000 | | 30,01 | - 40,00 | 540.9414.0000 | | 30,01 | - 40,00 | 540.9417.0000 | |
| 40,01 | - 50,00 | 540.8094.0000 | | 40,01 | - 50,00 | 540.8094.0000 | | 40,01 | - 50,00 | 540.8094.0000 | | 40,01 | - 50,00 | 540.8097.0000 | |
| 50,01 | - 60,00 | 540.8094.0000 | | 50,01 | - 60,00 | 540.8094.0000 | | 50,01 | - 60,00 | 540.8094.0000 | | 50,01 | - 60,00 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 60,01 | - 70,00 | 540.0054.0000 | | 60,01 | - 70,00 | 540.0054.0000 | | 60,01 | - 70,00 | 540.0054.0000 | | 60,01 | - 70,00 | 540.0057.0000 | |
| 70,01 | - 102,05 | 540.0054.0000 | | 70,01 | - 102,05 | 540.0054.0000 | | 70,01 | - 102,05 | 540.0054.0000 | | 70,01 | - 102,05 | 540.0057.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| **Kolben/ piston do = 17.5** | | | | **Kolben/ piston do = 17.5** | | | | **Kolben/ piston do = 17.5** | | | | **Kolben/ piston do = 17.5** | | | |
| 102,06 | - 115,00 | 540.8094.0000 | | 102,06 | - 115,00 | 540.8094.0000 | | 102,06 | - 115,00 | 540.8094.0000 | | 102,06 | - 115,00 | 540.8097.0000 | |
| 115,01 | - 145,00 | 540.8094.0000 | | 115,01 | - 145,00 | 540.8094.0000 | | 115,01 | - 145,00 | 540.8094.0000 | | 115,01 | - 145,00 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 145,01 | - 185,00 | 540.0054.0000 | | 145,01 | - 185,00 | 540.0054.0000 | | 145,01 | - 185,00 | 540.0054.0000 | | 145,01 | - 185,00 | 540.0057.0000 | |
| 185,01 | - 256,00 | 540.0054.0000 | | 185,01 | - 256,00 | 540.0054.0000 | | 185,01 | - 256,00 | 540.0054.0000 | | 185,01 | - 256,00 | 540.0057.0000 | |
| | | 540.9374.0205 | | | | 540.9374.0205 | | | | 540.9374.0205 | | | | 540.9377.0205 | |
| 256,01 | - 305,00 | 540.1804.0000 | | 256,01 | - 305,00 | 540.1804.0000 | | 256,01 | - 305,00 | 540.1804.0000 | | 256,01 | - 305,00 | 540.1807.0000 | |
| 305,01 | - 360,00 | 540.1814.0000 | | 305,01 | - 360,00 | 540.1814.0000 | | 305,01 | - 360,00 | 540.1814.0000 | | 305,01 | - 360,00 | 540.1817.0000 | |
| 360,01 | - 426,00 | 540.1824.0000 | | 360,01 | - 426,00 | 540.1824.0000 | | 360,01 | - 426,00 | 540.1824.0000 | | 360,01 | - 426,00 | 540.1827.0000 | |

# LESER Global Standard

Federdaten-Tabellen Type 820 Orifice D-T+
Spring data list type 820 Orifice D-T+

| Ausführung *(model)* | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Standard** (standard) | | | | **warmfest** (creep-resistant steel) | | | | **korrosionsfest** (stainless steel) | | | | **Inconel X750 (high creep-resistant steel)** | | | |
| p [ bar ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes | p [ bar ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes | p [ bar ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes | p [ bar ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
| **3J4 - 4P+6 Membran/ diaphragm** | | | | **3J4 - 4P+6 Membran/ diaphragm** | | | | **3J4 - 4P+6 Membran/ diaphragm** | | | | **3J4 - 4P+6 Membran/ diaphragm** | | | |
| 1,00 | - 1,38 | 540.4074.0000 | | 1,00 | - 1,38 | 540.4074.0000 | | 1,00 | - 1,38 | 540.4074.0000 | | 1,00 | - 1,38 | 540.4077.0000 | |
| 1,39 | - 1,86 | 540.4084.0000 | | 1,39 | - 1,86 | 540.4084.0000 | | 1,39 | - 1,86 | 540.4084.0000 | | 1,39 | - 1,86 | 540.4087.0000 | |
| 1,87 | - 2,50 | 540.4094.0000 | | 1,87 | - 2,50 | 540.4094.0000 | | 1,87 | - 2,50 | 540.4094.0000 | | 1,87 | - 2,50 | 540.4097.0000 | |
| 2,51 | - 3,50 | 540.4104.0000 | | 2,51 | - 3,50 | 540.4104.0000 | | 2,51 | - 3,50 | 540.4104.0000 | | 2,51 | - 3,50 | 540.4107.0000 | |
| 3,51 | - 4,90 | 540.5124.0000 | | 3,51 | - 4,90 | 540.5124.0000 | | 3,51 | - 4,90 | 540.5124.0000 | | 3,51 | - 4,90 | 540.5127.0000 | |
| 4,91 | - 6,40 | 540.8064.0000 | | 4,91 | - 6,40 | 540.8064.0000 | | 4,91 | - 6,40 | 540.8064.0000 | | 4,91 | - 6,40 | 540.8067.0000 | |
| 6,41 | - 8,50 | 540.9404.0000 | | 6,41 | - 8,50 | 540.9404.0000 | | 6,41 | - 8,50 | 540.9404.0000 | | 6,41 | - 8,50 | 540.9407.0000 | |
| 8,51 | - 11,00 | 540.9414.0000 | | 8,51 | - 11,00 | 540.9414.0000 | | 8,51 | - 11,00 | 540.9414.0000 | | 8,51 | - 11,00 | 540.9417.0000 | |
| 11,01 | - 14,00 | 540.8094.0000 | | 11,01 | - 14,00 | 540.8094.0000 | | 11,01 | - 14,00 | 540.8094.0000 | | 11,01 | - 14,00 | 540.8097.0000 | |
| 14,01 | - 17,00 | 540.8094.0000 | | 14,01 | - 17,00 | 540.8094.0000 | | 14,01 | - 17,00 | 540.8094.0000 | | 14,01 | - 17,00 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 17,01 | - 20,00 | 540.0054.0000 | | 17,01 | - 20,00 | 540.0054.0000 | | 17,01 | - 20,00 | 540.0054.0000 | | 17,01 | - 20,00 | 540.0057.0000 | |
| 20,01 | - 30,00 | 540.0054.0000 | | 20,01 | - 30,00 | 540.0054.0000 | | 20,01 | - 30,00 | 540.0054.0000 | | 20,01 | - 30,00 | 540.0057.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | |
| 30,01 | - 40,00 | 540.9414.0000 | | 30,01 | - 40,00 | 540.9414.0000 | | 30,01 | - 40,00 | 540.9414.0000 | | 30,01 | - 40,00 | 540.9417.0000 | |
| 40,01 | - 50,00 | 540.8094.0000 | | 40,01 | - 50,00 | 540.8094.0000 | | 40,01 | - 50,00 | 540.8094.0000 | | 40,01 | - 50,00 | 540.8097.0000 | |
| 50,01 | - 60,00 | 540.8094.0000 | | 50,01 | - 60,00 | 540.8094.0000 | | 50,01 | - 60,00 | 540.8094.0000 | | 50,01 | - 60,00 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 60,01 | - 70,00 | 540.0054.0000 | | 60,01 | - 70,00 | 540.0054.0000 | | 60,01 | - 70,00 | 540.0054.0000 | | 60,01 | - 70,00 | 540.0057.0000 | |
| 70,01 | - 102,05 | 540.0054.0000 | | 70,01 | - 102,05 | 540.0054.0000 | | 70,01 | - 102,05 | 540.0054.0000 | | 70,01 | - 102,05 | 540.0057.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| **Kolben/ piston do = 17.5** | | | | **Kolben/ piston do = 17.5** | | | | **Kolben/ piston do = 17.5** | | | | **Kolben/ piston do = 17.5** | | | |
| 102,06 | - 115,00 | 540.8094.0000 | | 102,06 | - 115,00 | 540.8094.0000 | | 102,06 | - 115,00 | 540.8094.0000 | | 102,06 | - 115,00 | 540.8097.0000 | |
| 115,01 | - 145,00 | 540.8094.0000 | | 115,01 | - 145,00 | 540.8094.0000 | | 115,01 | - 145,00 | 540.8094.0000 | | 115,01 | - 145,00 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 145,01 | - 185,00 | 540.0054.0000 | | 145,01 | - 185,00 | 540.0054.0000 | | 145,01 | - 185,00 | 540.0054.0000 | | 145,01 | - 185,00 | 540.0057.0000 | |
| 185,01 | - 256,00 | 540.0054.0000 | | 185,01 | - 256,00 | 540.0054.0000 | | 185,01 | - 256,00 | 540.0054.0000 | | 185,01 | - 256,00 | 540.0057.0000 | |
| | | 540.9374.0205 | | | | 540.9374.0205 | | | | 540.9374.0205 | | | | 540.9377.0205 | |



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| disclosure cat.: | II | proofread: | TK | published date: | 07/01/15 | effect. date: | 10/11 |
| author: | Schm | released by: | JR | replaces: | 060-333 | status: | Published |
| resp. depart.: | TD | date of release: | 07/01/15 | revision No.: | 3 | | |
| doc. type: | LGS | change rep. No.: | 200075 | retention period: | 10y. | | |

| Ausführung *(model)* | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Standard** (standard) | | | | **warmfest** (creep-resistant steel) | | | | **korrosionsfest** (stainless steel) | | | | **Inconel X750 (high creep-resistant steel)** | | | |
| **p [ bar ] von p1** *up* | **bis p2** *to* | **Feder-Sachnummer** *stock no.* | **Indizes** | **p [ bar ] von p1** *up* | **bis p2** *to* | **Feder-Sachnummer** *stock no.* | **Indizes** | **p [ bar ] von p1** *up* | **bis p2** *to* | **Feder-Sachnummer** *stock no.* | **Indizes** | **p [ bar ] von p1** *up* | **bis p2** *to* | **Feder-Sachnummer** *stock no.* | **Indizes** |
| **6Q8 - 8T+10 Membran/ diaphragm** | | | | **6Q8 - 8T+10 Membran/ diaphragm** | | | | **6Q8 - 8T+10 Membran/ diaphragm** | | | | **6Q8 - 8T+10 Membran/ diaphragm** | | | |
| 1,00 | - 1,38 | 540.4074.0000 | | 1,00 | - 1,38 | 540.4074.0000 | | 1,00 | - 1,38 | 540.4074.0000 | | 1,00 | - 1,38 | 540.4077.0000 | |
| 1,39 | - 1,86 | 540.4084.0000 | | 1,39 | - 1,86 | 540.4084.0000 | | 1,39 | - 1,86 | 540.4084.0000 | | 1,39 | - 1,86 | 540.4087.0000 | |
| 1,87 | - 2,50 | 540.4094.0000 | | 1,87 | - 2,50 | 540.4094.0000 | | 1,87 | - 2,50 | 540.4094.0000 | | 1,87 | - 2,50 | 540.4097.0000 | |
| 2,51 | - 3,50 | 540.4104.0000 | | 2,51 | - 3,50 | 540.4104.0000 | | 2,51 | - 3,50 | 540.4104.0000 | | 2,51 | - 3,50 | 540.4107.0000 | |
| 3,51 | - 4,90 | 540.5124.0000 | | 3,51 | - 4,90 | 540.5124.0000 | | 3,51 | - 4,90 | 540.5124.0000 | | 3,51 | - 4,90 | 540.5127.0000 | |
| 4,91 | - 6,40 | 540.8064.0000 | | 4,91 | - 6,40 | 540.8064.0000 | | 4,91 | - 6,40 | 540.8064.0000 | | 4,91 | - 6,40 | 540.8067.0000 | |
| 6,41 | - 8,50 | 540.9404.0000 | | 6,41 | - 8,50 | 540.9404.0000 | | 6,41 | - 8,50 | 540.9404.0000 | | 6,41 | - 8,50 | 540.9407.0000 | |
| 8,51 | - 11,00 | 540.9414.0000 | | 8,51 | - 11,00 | 540.9414.0000 | | 8,51 | - 11,00 | 540.9414.0000 | | 8,51 | - 11,00 | 540.9417.0000 | |
| 11,01 | - 14,00 | 540.8094.0000 | | 11,01 | - 14,00 | 540.8094.0000 | | 11,01 | - 14,00 | 540.8094.0000 | | 11,01 | - 14,00 | 540.8097.0000 | |
| 14,01 | - 17,00 | 540.8094.0000 | | 14,01 | - 17,00 | 540.8094.0000 | | 14,01 | - 17,00 | 540.8094.0000 | | 14,01 | - 17,00 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 17,01 | - 20,00 | 540.0054.0000 | | 17,01 | - 20,00 | 540.0054.0000 | | 17,01 | - 20,00 | 540.0054.0000 | | 17,01 | - 20,00 | 540.0057.0000 | |
| 20,01 | - 30,00 | 540.0054.0000 | | 20,01 | - 30,00 | 540.0054.0000 | | 20,01 | - 30,00 | 540.0054.0000 | | 20,01 | - 30,00 | 540.0057.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | |
| 30,01 | - 40,00 | 540.9414.0000 | | 30,01 | - 40,00 | 540.9414.0000 | | 30,01 | - 40,00 | 540.9414.0000 | | 30,01 | - 40,00 | 540.9417.0000 | |
| 40,01 | - 50,00 | 540.8094.0000 | | 40,01 | - 50,00 | 540.8094.0000 | | 40,01 | - 50,00 | 540.8094.0000 | | 40,01 | - 50,00 | 540.8097.0000 | |
| 50,01 | - 60,00 | 540.8094.0000 | | 50,01 | - 60,00 | 540.8094.0000 | | 50,01 | - 60,00 | 540.8094.0000 | | 50,01 | - 60,00 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 60,01 | - 70,00 | 540.0054.0000 | | 60,01 | - 70,00 | 540.0054.0000 | | 60,01 | - 70,00 | 540.0054.0000 | | 60,01 | - 70,00 | 540.0057.0000 | |
| 70,01 | - 102,05 | 540.0054.0000 | | 70,01 | - 102,05 | 540.0054.0000 | | 70,01 | - 102,05 | 540.0054.0000 | | 70,01 | - 102,05 | 540.0057.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| disclosure cat.: | II | proofread: | TK | published date: | 07/01/15 | effect. date: | 10/11 |
| author: | Schm | released by: | JR | replaces: | 060-333 | status: | Published |
| resp. depart.: | TD | date of release: | 07/01/15 | revision No.: | 3 | | |
| doc. type: | LGS | change rep. No.: | 200075 | retention period: | 10y. | | |

## Ausführung *(model)*

**Standard** (standard)

| p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
|---|---|---|---|
| **1D2 - 2K+3 Membran/ diaphragm** | | | |
| 14,5 | - 20,0 | 540.4074.0000 | |
| 20,1 | - 27,0 | 540.4084.0000 | |
| 27,1 | - 36,3 | 540.4094.0000 | |
| 36,4 | - 50,8 | 540.4104.0000 | |
| 50,9 | - 71,1 | 540.5124.0000 | |
| 71,2 | - 92,8 | 540.8064.0000 | |
| 92,9 | - 123 | 540.9404.0000 | |
| 123 | - 160 | 540.9414.0000 | |
| 160 | - 203 | 540.8094.0000 | |
| 203 | - 247 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 247 | - 290 | 540.0054.0000 | |
| 290 | - 435 | 540.0054.0000 | |
| | | 540.4314.0205 | |
| **Kolben/ piston do = 25.5** | | | |
| 435 | - 580 | 540.9414.0000 | |
| 580 | - 725 | 540.8094.0000 | |
| 725 | - 870 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 870 | - 1015 | 540.0054.0000 | |
| 1015 | - 1480 | 540.0054.0000 | |
| | | 540.4314.0205 | |
| **Kolben/ piston do = 17.5** | | | |
| 1480 | - 1668 | 540.8094.0000 | |
| 1668 | - 2103 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 2103 | - 2683 | 540.0054.0000 | |
| 2683 | - 3713 | 540.0054.0000 | |
| | | 540.9374.0205 | |
| 3713 | - 4424 | 540.1804.0000 | |
| 4424 | - 5221 | 540.1814.0000 | |
| 5221 | - 6179 | 540.1824.0000 | |

**warmfest** (creep-resistant steel)

| p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
|---|---|---|---|
| **1D2 - 2K+3 Membran/ diaphragm** | | | |
| 14,5 | - 20,0 | 540.4074.0000 | |
| 20,1 | - 27,0 | 540.4084.0000 | |
| 27,1 | - 36,3 | 540.4094.0000 | |
| 36,4 | - 50,8 | 540.4104.0000 | |
| 50,9 | - 71,1 | 540.5124.0000 | |
| 71,2 | - 92,8 | 540.8064.0000 | |
| 92,9 | - 123 | 540.9404.0000 | |
| 123 | - 160 | 540.9414.0000 | |
| 160 | - 203 | 540.8094.0000 | |
| 203 | - 247 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 247 | - 290 | 540.0054.0000 | |
| 290 | - 435 | 540.0054.0000 | |
| | | 540.4314.0205 | |
| **Kolben/ piston do = 25.5** | | | |
| 435 | - 580 | 540.9414.0000 | |
| 580 | - 725 | 540.8094.0000 | |
| 725 | - 870 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 870 | - 1015 | 540.0054.0000 | |
| 1015 | - 1480 | 540.0054.0000 | |
| | | 540.4314.0205 | |
| **Kolben/ piston do = 17.5** | | | |
| 1480 | - 1668 | 540.8094.0000 | |
| 1668 | - 2103 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 2103 | - 2683 | 540.0054.0000 | |
| 2683 | - 3713 | 540.0054.0000 | |
| | | 540.9374.0205 | |
| 3713 | - 4424 | 540.1804.0000 | |
| 4424 | - 5221 | 540.1814.0000 | |
| 5221 | - 6179 | 540.1824.0000 | |

**korrosionsfest** (stainless steel)

| p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
|---|---|---|---|
| **1D2 - 2K+3 Membran/ diaphragm** | | | |
| 14,5 | - 20,0 | 540.4074.0000 | |
| 20,1 | - 27,0 | 540.4084.0000 | |
| 27,1 | - 36,3 | 540.4094.0000 | |
| 36,4 | - 50,8 | 540.4104.0000 | |
| 50,9 | - 71,1 | 540.5124.0000 | |
| 71,2 | - 92,8 | 540.8064.0000 | |
| 92,9 | - 123 | 540.9404.0000 | |
| 123 | - 160 | 540.9414.0000 | |
| 160 | - 203 | 540.8094.0000 | |
| 203 | - 247 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 247 | - 290 | 540.0054.0000 | |
| 290 | - 435 | 540.0054.0000 | |
| | | 540.4314.0205 | |
| **Kolben/ piston do = 25.5** | | | |
| 435 | - 580 | 540.9414.0000 | |
| 580 | - 725 | 540.8094.0000 | |
| 725 | - 870 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 870 | - 1015 | 540.0054.0000 | |
| 1015 | - 1480 | 540.0054.0000 | |
| | | 540.4314.0205 | |
| **Kolben/ piston do = 17.5** | | | |
| 1480 | - 1668 | 540.8094.0000 | |
| 1668 | - 2103 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 2103 | - 2683 | 540.0054.0000 | |
| 2683 | - 3713 | 540.0054.0000 | |
| | | 540.9374.0205 | |
| 3713 | - 4424 | 540.1804.0000 | |
| 4424 | - 5221 | 540.1814.0000 | |
| 5221 | - 6179 | 540.1824.0000 | |

**Inconel X750 (high creep-resistant steel)**

| p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
|---|---|---|---|
| **1D2 - 2K+3 Membran/ diaphragm** | | | |
| 14,5 | - 20,0 | 540.4077.0000 | |
| 20,1 | - 27,0 | 540.4087.0000 | |
| 27,1 | - 36,3 | 540.4097.0000 | |
| 36,4 | - 50,8 | 540.4107.0000 | |
| 50,9 | - 71,1 | 540.5127.0000 | |
| 71,2 | - 92,8 | 540.8067.0000 | |
| 92,9 | - 123 | 540.9407.0000 | |
| 123 | - 160 | 540.9417.0000 | |
| 160 | - 203 | 540.8097.0000 | |
| 203 | - 247 | 540.8097.0000 | |
| | | 540.4317.0205 | |
| 247 | - 290 | 540.0057.0000 | |
| 290 | - 435 | 540.0057.0000 | |
| | | 540.4317.0205 | |
| **Kolben/ piston do = 25.5** | | | |
| 435 | - 580 | 540.9417.0000 | |
| 580 | - 725 | 540.8097.0000 | |
| 725 | - 870 | 540.8097.0000 | |
| | | 540.4317.0205 | |
| 870 | - 1015 | 540.0057.0000 | |
| 1015 | - 1480 | 540.0057.0000 | |
| | | 540.4317.0205 | |
| **Kolben/ piston do = 17.5** | | | |
| 1480 | - 1668 | 540.8097.0000 | |
| 1668 | - 2103 | 540.8097.0000 | |
| | | 540.4317.0205 | |
| 2103 | - 2683 | 540.0057.0000 | |
| 2683 | - 3713 | 540.0057.0000 | |
| | | 540.9377.0205 | |
| 3713 | - 4424 | 540.1807.0000 | |
| 4424 | - 5221 | 540.1817.0000 | |
| 5221 | - 6179 | 540.1827.0000 | |


| | | | | | | | |
|---|---|---|---|---|---|---|---|
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| resp. depart.: | TD | date of release: | 07/01/15 | revision No.: | 3 | | |
| doc. type: | LGS | change rep. No.: | 200075 | retention period: | 10y. | | |

**Ausführung** *(model)*

| **Standard** (standard) | | | | **warmfest** (creep-resistant steel) | | | | **korrosionsfest** (stainless steel) | | | | **Inconel X750 (high creep-resistant steel)** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes | p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes | p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes | p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
| **3J4 - 4P+6 Membran/ diaphragm** | | | | **3J4 - 4P+6 Membran/ diaphragm** | | | | **3J4 - 4P+6 Membran/ diaphragm** | | | | **3J4 - 4P+6 Membran/ diaphragm** | | | |
| 14,5 | - 20,0 | 540.4074.0000 | | 14,5 | - 20,0 | 540.4074.0000 | | 14,5 | - 20,0 | 540.4074.0000 | | 14,5 | - 20,0 | 540.4077.0000 | |
| 20,1 | - 27,0 | 540.4084.0000 | | 20,1 | - 27,0 | 540.4084.0000 | | 20,1 | - 27,0 | 540.4084.0000 | | 20,1 | - 27,0 | 540.4087.0000 | |
| 27,1 | - 36,3 | 540.4094.0000 | | 27,1 | - 36,3 | 540.4094.0000 | | 27,1 | - 36,3 | 540.4094.0000 | | 27,1 | - 36,3 | 540.4097.0000 | |
| 36,4 | - 50,8 | 540.4104.0000 | | 36,4 | - 50,8 | 540.4104.0000 | | 36,4 | - 50,8 | 540.4104.0000 | | 36,4 | - 50,8 | 540.4107.0000 | |
| 50,9 | - 71,1 | 540.5124.0000 | | 50,9 | - 71,1 | 540.5124.0000 | | 50,9 | - 71,1 | 540.5124.0000 | | 50,9 | - 71,1 | 540.5127.0000 | |
| 71,2 | - 92,8 | 540.8064.0000 | | 71,2 | - 92,8 | 540.8064.0000 | | 71,2 | - 92,8 | 540.8064.0000 | | 71,2 | - 92,8 | 540.8067.0000 | |
| 92,9 | - 123 | 540.9404.0000 | | 92,9 | - 123 | 540.9404.0000 | | 92,9 | - 123 | 540.9404.0000 | | 92,9 | - 123 | 540.9407.0000 | |
| 123 | - 160 | 540.9414.0000 | | 123 | - 160 | 540.9414.0000 | | 123 | - 160 | 540.9414.0000 | | 123 | - 160 | 540.9417.0000 | |
| 160 | - 203 | 540.8094.0000 | | 160 | - 203 | 540.8094.0000 | | 160 | - 203 | 540.8094.0000 | | 160 | - 203 | 540.8097.0000 | |
| 203 | - 247 | 540.8094.0000 | | 203 | - 247 | 540.8094.0000 | | 203 | - 247 | 540.8094.0000 | | 203 | - 247 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 247 | - 290 | 540.0054.0000 | | 247 | - 290 | 540.0054.0000 | | 247 | - 290 | 540.0054.0000 | | 247 | - 290 | 540.0057.0000 | |
| 290 | - 435 | 540.0054.0000 | | 290 | - 435 | 540.0054.0000 | | 290 | - 435 | 540.0054.0000 | | 290 | - 435 | 540.0057.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | | **Kolben/ piston do = 25.5** | | | |
| 435 | - 580 | 540.9414.0000 | | 435 | - 580 | 540.9414.0000 | | 435 | - 580 | 540.9414.0000 | | 435 | - 580 | 540.9417.0000 | |
| 580 | - 725 | 540.8094.0000 | | 580 | - 725 | 540.8094.0000 | | 580 | - 725 | 540.8094.0000 | | 580 | - 725 | 540.8097.0000 | |
| 725 | - 870 | 540.8094.0000 | | 725 | - 870 | 540.8094.0000 | | 725 | - 870 | 540.8094.0000 | | 725 | - 870 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 870 | - 1015 | 540.0054.0000 | | 870 | - 1015 | 540.0054.0000 | | 870 | - 1015 | 540.0054.0000 | | 870 | - 1015 | 540.0057.0000 | |
| 1015 | - 1480 | 540.0054.0000 | | 1015 | - 1480 | 540.0054.0000 | | 1015 | - 1480 | 540.0054.0000 | | 1015 | - 1480 | 540.0057.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| **Kolben/ piston do = 17.5** | | | | **Kolben/ piston do = 17.5** | | | | **Kolben/ piston do = 17.5** | | | | **Kolben/ piston do = 17.5** | | | |
| 1480 | - 1668 | 540.8094.0000 | | 1480 | - 1668 | 540.8094.0000 | | 1480 | - 1668 | 540.8094.0000 | | 1480 | - 1668 | 540.8097.0000 | |
| 1668 | - 2103 | 540.8094.0000 | | 1668 | - 2103 | 540.8094.0000 | | 1668 | - 2103 | 540.8094.0000 | | 1668 | - 2103 | 540.8097.0000 | |
| | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4314.0205 | | | | 540.4317.0205 | |
| 2103 | - 2683 | 540.0054.0000 | | 2103 | - 2683 | 540.0054.0000 | | 2103 | - 2683 | 540.0054.0000 | | 2103 | - 2683 | 540.0057.0000 | |
| 2683 | - 3713 | 540.0054.0000 | | 2683 | - 3713 | 540.0054.0000 | | 2683 | - 3713 | 540.0054.0000 | | 2683 | - 3713 | 540.0057.0000 | |
| | | 540.9374.0205 | | | | 540.9374.0205 | | | | 540.9374.0205 | | | | 540.9377.0205 | |

## Ausführung (model)

### Standard (standard)

| p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
|---|---|---|---|
| **6Q8 - 8T+10 Membran/ diaphragm** | | | |
| 14,5 | - 20,0 | 540.4074.0000 | |
| 20,1 | - 27,0 | 540.4084.0000 | |
| 27,1 | - 36,3 | 540.4094.0000 | |
| 36,4 | - 50,8 | 540.4104.0000 | |
| 50,9 | - 71,1 | 540.5124.0000 | |
| 71,2 | - 92,8 | 540.8064.0000 | |
| 92,9 | - 123 | 540.9404.0000 | |
| 123 | - 160 | 540.9414.0000 | |
| 160 | - 203 | 540.8094.0000 | |
| 203 | - 247 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 247 | - 290 | 540.0054.0000 | |
| 290 | - 435 | 540.0054.0000 | |
| | | 540.4314.0205 | |
| **Kolben/ piston do = 25.5** | | | |
| 435 | - 580 | 540.9414.0000 | |
| 580 | - 725 | 540.8094.0000 | |
| 725 | - 870 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 870 | - 1015 | 540.0054.0000 | |
| 1015 | - 1480 | 540.0054.0000 | |
| | | 540.4314.0205 | |

### warmfest (creep-resistant steel)

| p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
|---|---|---|---|
| **6Q8 - 8T+10 Membran/ diaphragm** | | | |
| 14,5 | - 20,0 | 540.4074.0000 | |
| 20,1 | - 27,0 | 540.4084.0000 | |
| 27,1 | - 36,3 | 540.4094.0000 | |
| 36,4 | - 50,8 | 540.4104.0000 | |
| 50,9 | - 71,1 | 540.5124.0000 | |
| 71,2 | - 92,8 | 540.8064.0000 | |
| 92,9 | - 123 | 540.9404.0000 | |
| 123 | - 160 | 540.9414.0000 | |
| 160 | - 203 | 540.8094.0000 | |
| 203 | - 247 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 247 | - 290 | 540.0054.0000 | |
| 290 | - 435 | 540.0054.0000 | |
| | | 540.4314.0205 | |
| **Kolben/ piston do = 25.5** | | | |
| 435 | - 580 | 540.9414.0000 | |
| 580 | - 725 | 540.8094.0000 | |
| 725 | - 870 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 870 | - 1015 | 540.0054.0000 | |
| 1015 | - 1480 | 540.0054.0000 | |
| | | 540.4314.0205 | |

### korrosionsfest (stainless steel)

| p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
|---|---|---|---|
| **6Q8 - 8T+10 Membran/ diaphragm** | | | |
| 14,5 | - 20,0 | 540.4074.0000 | |
| 20,1 | - 27,0 | 540.4084.0000 | |
| 27,1 | - 36,3 | 540.4094.0000 | |
| 36,4 | - 50,8 | 540.4104.0000 | |
| 50,9 | - 71,1 | 540.5124.0000 | |
| 71,2 | - 92,8 | 540.8064.0000 | |
| 92,9 | - 123 | 540.9404.0000 | |
| 123 | - 160 | 540.9414.0000 | |
| 160 | - 203 | 540.8094.0000 | |
| 203 | - 247 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 247 | - 290 | 540.0054.0000 | |
| 290 | - 435 | 540.0054.0000 | |
| | | 540.4314.0205 | |
| **Kolben/ piston do = 25.5** | | | |
| 435 | - 580 | 540.9414.0000 | |
| 580 | - 725 | 540.8094.0000 | |
| 725 | - 870 | 540.8094.0000 | |
| | | 540.4314.0205 | |
| 870 | - 1015 | 540.0054.0000 | |
| 1015 | - 1480 | 540.0054.0000 | |
| | | 540.4314.0205 | |

### Inconel X750 (high creep-resistant steel)

| p [ psig ] von p1 *up* | bis p2 *to* | Feder-Sachnummer *stock no.* | Indizes |
|---|---|---|---|
| **6Q8 - 8T+10 Membran/ diaphragm** | | | |
| 14,5 | - 20,0 | 540.4077.0000 | |
| 20,1 | - 27,0 | 540.4087.0000 | |
| 27,1 | - 36,3 | 540.4097.0000 | |
| 36,4 | - 50,8 | 540.4107.0000 | |
| 50,9 | - 71,1 | 540.5127.0000 | |
| 71,2 | - 92,8 | 540.8067.0000 | |
| 92,9 | - 123 | 540.9407.0000 | |
| 123 | - 160 | 540.9417.0000 | |
| 160 | - 203 | 540.8097.0000 | |
| 203 | - 247 | 540.8097.0000 | |
| | | 540.4317.0205 | |
| 247 | - 290 | 540.0057.0000 | |
| 290 | - 435 | 540.0057.0000 | |
| | | 540.4317.0205 | |
| **Kolben/ piston do = 25.5** | | | |
| 435 | - 580 | 540.9417.0000 | |
| 580 | - 725 | 540.8097.0000 | |
| 725 | - 870 | 540.8097.0000 | |
| | | 540.4317.0205 | |
| 870 | - 1015 | 540.0057.0000 | |
| 1015 | - 1480 | 540.0057.0000 | |
| | | 540.4317.0205 | |

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## 1 General information for assembling the POSV accessories

## 2 Purpose

The documentation describes the assembly of POSV accessories. The description contains every single working step, supplies, tools and appliances.

## 3 Competences

The generation, maintenance and distribution of the documentation takes place in the organisation department. The defaults will be generated by the technical department in consultation with the final assembly department and production planning department.

## 4 Scope

This document must be applied to the assembling of a Pilot Operated Safety Valve with accessories in agencies and subsidiaries of LESER GmbH & Co. KG, customers and independent service center.

## 5 Disclaimer

1. LESER puts in a great deal of effort into making up-to-date and correct
2. documentation available. Nevertheless, LESER GmbH & Co. KG gives no guarantee
3. that the recommended actions presented here are entirely correct and error free.
4. This document is to be applied exclusively to the specified type. LESER GmbH & Co.
5. KG declines any liability or responsibility for the correctness and completeness of the
6. content.
7. LESER GmbH & Co. KG reserves the right to change the information contained in
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9. for LESER subsidiaries, at any time and without prior announcement.

LESER GmbH & Co. KG is available to the users of this document to provide

10. additional information.
11.

## 6 Qualified fitting personnel

LESER safety valves may only be dismantled by trained or qualified fitters. The qualifications must be obtained through the appropriate training measures.

## 7 Remarks

- Gloves must be worn during the entire dismantling process.

## 8 Basic safety guidelines

### Dangerous media

Poisoning, caustic burns, burns, injuries
- Use suitable protective devices
- Use suitable collecting tanks.
- Wear suitable protective equipment.

### Foreign bodies in the safety valve

Danger from failure of safety valve or leaks
- Flush the system before installation of a safety valve.
- Check the safety valve for foreign objects.
- Remove foreign objects

### Bug screen is damaged or missing
***(B or option)***

Dirt, objects or insects get into the safety valve. Danger from malfunction of the safety valve.
- Install the bug screen correctly.
- Check the bug screen regularly.

### Ambient temperature is too high

Material expansion. Danger from malfunction of the safety valve.

### Ambient temperature is too low

Icing, freezing vapours, reduced flow rate due to congealing media. Danger from functional disruption of the safety valve.

### Abrasive or corrosive media
Moving parts jam or become stuck. Danger from functional disruption of the safety valve.
- Service the safety valve after each time it opens.

### Media with high proportion of particles

**(only B)**

Deposits and clogging. Danger from malfunction of the safety valve.
• Use a filter with the correct mesh size.
• Use additional filters to increase the filter capacity.

**Residual media in the safety valve**

Poisoning, caustic burns, burns, injuries
• Wear suitable protective equipment.
• Remove residual media

**WARNING**

**Leaky safety valve**
Danger from leaking media due to damaged gaskets and sealing surfaces.
• Protect the safety valve against vibrations and blows especially during transport and installation.
• Check safety valve regularly for leaks.

**Open bonnet or spindle guides**

Danger from leaking media
• Make sure that no danger can arise from leaking media.
• Keep a safe distance.
• Wear suitable protective equipment.

**CAUTION**

**Hot medium**

Burns or scalding.
• Wear suitable protective equipment.

**Hot surfaces**
Burns.
• Wear suitable protective equipment.

**Aggressive medium**

Caustic burns.
• Wear suitable protective equipment.

**Open bonnet or spindle guides**

Pinching danger from moving parts.
• Install suitable safeguards.

**Sharp edges and burrs**

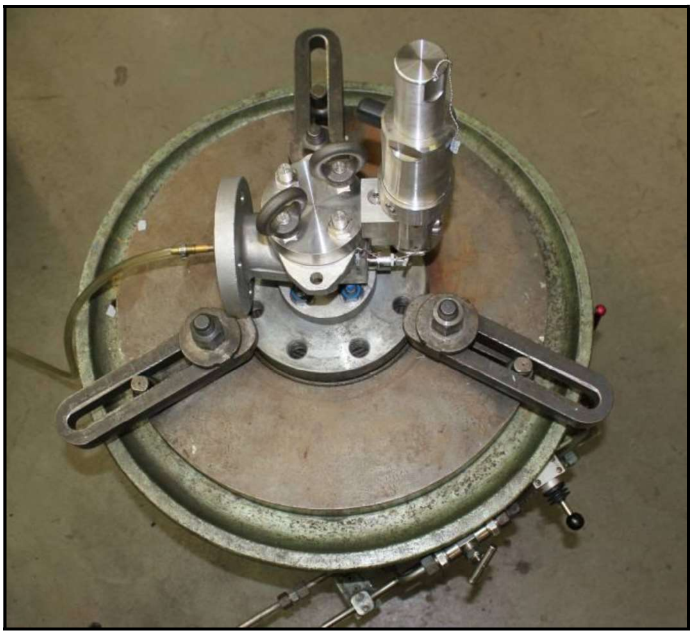
Danger of injury.
• Wear safety gloves.
• Handle the safety valve carefully

**High noise emission**

Hearing damage.
Wear ear protection.

## 9 Testing instructions

### 9.1 Proper installation of the POSV on the test bench



**1. Steps - Descriptions**

- Place the Main Valve with the flange on the test bench
- Make sure that the air supply of the bench is directly beneath the inlet of the main valve
- Use a soft sealing between the main valve inlet and the test bench
- Place the clamping claws on the flange
- Fasten the clamping claws with the compressed air

protected

**2. Aids**

- Soft sealings

**3. Tools**

- Open-end spanner acc. test bench

**4. Appliance**

- Test bench

## 9.2 Test devices


**1. Steps - Descriptions**

- Test bench
- Bubble counting unit (Kellog test)
- Rubber plugs/ test plugs
- Leak detection spray



**2. Aids**

- None

**3. Tools**

- None

**4. Appliance**

- Rubber plug
- Test bench

## 9.3 Test the set pressure adjustment

**1. Steps - Descriptions**

- Mount POSV acc. step 9.1 with the inlet on the test bench
- Check set pressure 3x
- If necessary: Screw off the cap; loosen the lock nut; readjust the adjusting screw - acc. LID disassembly / assembly
- Check set pressure 3 x
- Repeat procedure until the set pressure is 3 x **OK**
- Afterwards fasten the lock nut and cap – acc. LID assembly

**2. Aids**

- None

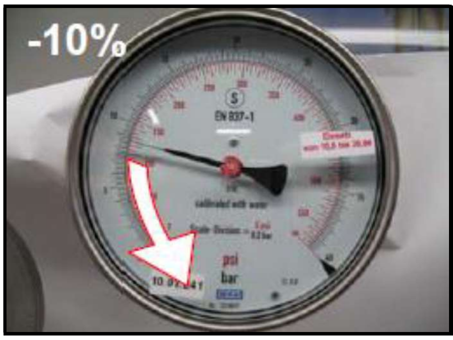
**3. Tools**

- Open-end spanner acc. test bench

**4. Appliance**

- Test bench

## 9.4 Seat tightness test




### 1. Steps - Descriptions

- Mount POSV acc. test description with the inlet on the test bench
- Trigger the safety valve once
- Lower the pressure by 10% of the set pressure
- In case of set pressures ≤3.5 bar (50.76 psi) by 0.35 bar (5.08 psi)
- Place the hose of the bubble counting unit in the rubber plug
- Start after 10 sec to count the bubbles
- Compare the result with the LID to decide whether the POSV pass the test or not

### 2. Aids

- None

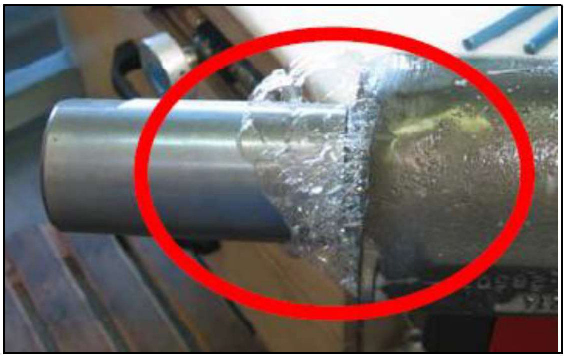
### 3. Tools

- Open-end spanner acc. test bench

### 4. Appliance

- Test bench
- Rubber plug acc. DM
- Bubble counting unit

## 9.5 Shell tightness test



**1. Steps - Descriptions**

- Mount the POSV acc. step 9.1 with the inlet on the test bench
- Charge the POSV with a pressure close to the set pressure – Make sure that the POSV does not reach the set pressure
- After establishing a suitable pressure cover the contact areas, fittings, threads and so on with leak detection spray
- Observe these areas to detect any leaks
- Leaks will be indicated by bubbles
- When there is no recognized foam the test is passed

**2. Aids**

- Leak detection spray

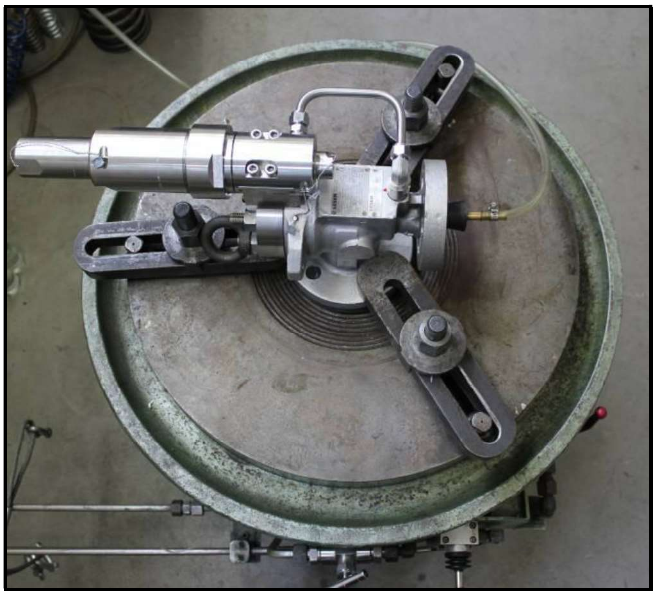
**3. Tools**

- Open-end spanner acc. test bench

**4. Appliance**

- Test bench

## 9.6 Back seat tightness, test P21 (tightness outwards)



**1. Steps - Description**

- Mount the POSV acc. test description with the outlet on the test bench
- Establish a test pressure of 6 bar
- Cover all connections, threads, fittings with leak detection spray
- When no foam is recognized, the test is passed
- Connect the bubble counting unit
- Start after 10 sec to count the bubbles
- Compare the result with the LID to decide whether the POSV pass the test or not

**2. Aids**

- None

**3. Tools**

- None

**4. Appliance**

- Rubber plug
- Bubble counting unit
- Test bench

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## 1 Purpose

This LESER Global (LGS) compiles the requirements of standards and describes the procedure of tightness testing of safety valves and pilot operated safety valves and also their Certification.

## 2 Scope

This LGS applies to all members of the LESER quality cluster, as well as at national and overseas representatives and approved LESER service repair shops, in case of service on LESER's account.

## 3 References

LID_DE 1704.41, LGS 0201, LGS 0222, LDeS_0201.02

| | |
|---|---|
| DIN EN ISO 4126-1 | Safety devices for protection against excessive pressure<br>Part 1: Safety valves, |
| DIN EN ISO 4126-4 | Safety devices for protection against excessive pressure<br>Part 4: Pilot-operated safety valves |
| DIN EN ISO 12266-1 | Industrial valves: Testing of valves, part 1: Pressure tests, test procedures and acceptance criteria |

| | |
|---|---|
| DIN EN ISO 12266-2 | Industrial valves – Testing of valves, part 2: Tests, test procedures and acceptance criteria, supplementary requirements |
| DIN EN 1593 | Tightness test, bubble test |
| DIN EN 14291 | Foam producing solutions for leak detection on gas installations |
| DIN EN 10204 | Metallic products- Types of inspection documents |
| | |
| ASME Code Section VIII | Rules for Construction of Pressure Vessels |
| API 527 | American Petroleum Institute<br>Seat Tightness of Pressure Relief Valves |

## 4 Introduction

All LESER safety valves have to be test on tightness except SKD Kits Compact Performance-Valves (ref. to LID_DE 1704.41).

The tightness test is a production test and is set up to ensure that each safety valve fulfils the requirements for which they have been design without suffering from leakage of pressurized parts or seals.
The tightness test is standard practised at LESER (100 %) after the set pressure was be demonstrated.

The leakage rates shall be document. In case the observed leakage rate exceeds the defined specification limit, the valve must be subject to the LESER quality rework process.

The test requirements and acceptance criteria shall be according to Appendix.

### 4.1 Test media

The following test media are to be use at LESER: Air, helium, water and steam.

The test medium for determining the seat tightness, air, steam or water, shall be the same as that used for determining the set pressure of the valve.
For dual- service valves, the test medium, air, steam or water, shall be the same as the primary relieving medium. (API Standard 527).

Upon customer request, LESER can conduct the tightness test using Helium as test medium for higher accuracy.

### 4.2 Pressure range

The set pressure range by safety valve is regulate as follows:

- acc. to ASME Code pressure range starts with 15 psi (1,03 bar)
- acc. to DGRL 97/23 pressure range starts with 0,5 bar
- acc. to DIN EN ISO 4126-1 pressure range starts with 0,1 bar.

The test pressure for the leakage is applied according the set pressure range.

### 4.3 Test pressure

The test pressure is regulated according set pressure range and requirement by API527 for each test procedure and is fixed in Appendix 1 to 11.

### 4.4 Test duration

The test duration is regulated according standards requirement for each test procedure and is fixed in Appendix 1 to 11.

### 4.5 Temperature

As a standard technique, the minimum or maximum temperature shall not be bellow 5°C (40°F) nor above 50°C (125°F) during the test. (ASME Code Section V, Article 10).

### 4.6 Acceptance Criteria

Leakage rates, measured during the determined test period, shall not exceed the fixed leakage rates defined for the relevant types/designs. The leakages rates are fixed in Appendix.

## 5 Test Procedures at LESER

Following test procedures for tightness are to be applied for LESER safety valves and POSVs:

- Seat tightness test procedure, Test P12
- Shell tightness test procedure, Test P11
- Back seat Tightness test procedure, Test P21
- Tightness test procedure for pressure seals

Test medium is water, gas (air or helium) and steam.

## 6 Test Equipment at LESER

The LESER safety valves are assembled and tested on an assembly and test benches. The assembly and test benches consist of the following subunits:

- fixture system (incl. adaptors)
- pressure system (air)
- pressure measurement system
- bubble count device (Kellog test)
- valve submerge basin

LESER POSVs are assembled and tested on assembly and test benches for POSVs. The benches consist of the following sub units:

- pilot assembly and test bench where the pilots are assembled and set
- assembly and test bench for fully assembled POSV: in this place the full POSV is assembled, set and tested.

## 7 Seat tightness test procedure, Test P12

### 7.1 Definition

Seat tightness means tightness between seat and disc. A safety valve/POSV is considered to be tight between seat and disc, if all requirements of the relevant standard are performed.

Following measures for determination of seat tightness can be used:
- Leakage Rate in mbar l/s,
- Leakage Volume in cm³/min. and
- Number of bubbles/min.

Testing of seat tightness will be carried out at ambient temperature.

## 7.2 Requirements of LESER

Due to the fact that API 527 is the sole international approved standard which regulates tightness requirements for safety valves in special, LESER in its function as global company refers to this standard only. However, LESER considers also tightness requirements acc. to DIN EN 12266 and EN ISO 4126-4.

*Appendix 1: Seat tightness API 527 Requirements*
Test conditions and requirements for seat tightness acc. to API 527 are subject of this Appendix.

*Appendix 2: Seat tightness, LESER standard requirements for SVs,*
Test conditions and tightness requirements acc. to API 527 and DIN EN 12266 for seat tightness and general requirements are deviated in Appendix 2 to 4.

*Appendix 3: Seat tightness, LESER improved tightness requirements for SVs,*
Test conditions and requirements of tightness for increased tightness are summarized in this Appendix. The allowable leakage rate for metal-sealing safety valves with “increased tightness” equals half of allowable leakage rate for “general tightness”. It has to be considered that in case of tightness requirements which exceed the standard higher lapping effort and higher costs will arise.

*Appendix 4: Seat tightness, LESER standard requirements for POSVs*
Test conditions and requirements for seat tightness acc. to API 527, EN ISO 4126-4 and DIN EN 12266 of POSVs (standard requirements) are subject of this Appendix.

## 7.3 Scope

The testing procedure of seat tightness for each valve occurs after setting and checking of cold differential set pressure on test bench in accordance with operation chart, which is deposited in SAP System.

## 7.4 Test media

The following test media are to be used at LESER: Air, helium, water and steam.

## 7.5 Test pressure

The pressure range is regulated as follows:
- Acc. to ASME Code pressure range starts with 15 psi (1,03 bar)
- Acc. to DGRL 97/23 pressure range starts with 0,5 bar
- Acc. to DIN EN ISO 4126-1 pressure range starts with 0,1 bar.

At LESER the performance of pressure range and test pressure requirements acc. to API 527 is as follows (table 1):

| Set pressure / cold differential set pressure, $p_0$ , bar | Test pressure, $p_{test}$ bar |
|---|---|
| $0,1 < p_0 < 0,7$ | $0,5^* p_0$ |
| $0,7 \le p_0 \le 3,5$ | $p_0 - 0,35$ |
| $p_0 > 3,5$ | $0,9^* p_0$ |

Table 1: Test pressures for seat tightness testing

**7.6** Test duration

After a short damping time, the test pressure has to be retained over the entire determined test period (ref. to App. 2 and 4).

**7.7** Test method for the seat tightness test

Considering a.m. requirements of LESER, following test procedures are utilized for seat leakage test:

- Seat tightness test procedure with air, procedure of bubble counting
- Seat tightness test procedure acc. to PAS 1085
- Seat tightness test procedure with air, application of test fluid
- Seat tightness test procedure with helium
- Seat tightness test procedure with water
- Seat tightness test procedure with steam

## 7.8 Testing of seat tightness with air, bubbles emission test procedure

### 7.8.1 Applicability

This procedure of seat leakage test with air, counting number of bubbles, is practised in case of safety valves with gastight design (lifting device H4, cap H2, closed bonnet).
For POSVs this test is first carried out on the pilot, afterwards the full system (POSV) is tested.

### 7.8.2 Test Equipment for SVs (Kellog-Test)

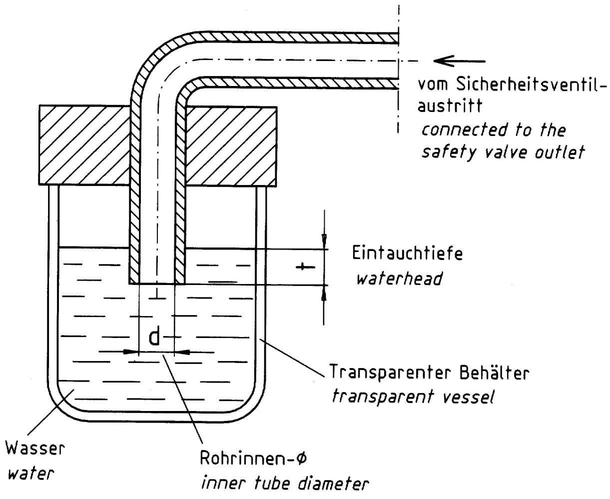
Testing of seat tightness with air, counting number of bubbles is practised at assembler working place. Following parts are components of the assembly work place:

- Clamp station (with adapter discs)
- Pressure system (air)
- Pressure gauge system
- Bubble counting instrument

Following features of bubble counting instrument, shown in fig. 1, correspond to API 527:

- Inner tube diameter Ø = 6,12 mm
- Water head t =12,7 mm
- Bubble volume = 0,295 cm³

Fig. 1




### 7.8.3 Test Equipment for POSVs

The test of seat tightness of the pilot is tested on the pilot assembly bench. For this purpose a bubble test device fulfilling the requirements of API 527 is installed.
The full POSV the test is carried out on the PSV assembly bench, which is also equipped with a bubble test device.
A sketch of the bubble test device is given by graph 1. This device is fulfilling the API527 requirements with the following parameters:

### 7.8.4 Test duration

After a short damping time, the test pressure has to be retained over the entire determined test period (ref. to App. 2 and 4).

### 7.8.5 Test pressure

After setting and checking of cold differential set pressure p0 a blow down up to test pressure ptest has to be carried out. The test pressure ptest is defined in table 1.

Attention:
For POSV with a set pressure greater than 30 bar, the seat tightness is additionally checked at 30% of the set pressure after the functional tightness test.

### 7.8.6 Test description

**Spring Safety Valves**
Angle typed flanged safety valves are mounted via clamping jaw vertically at the inlet 0flange on the test bench. For the sealing a rubber pad is laid down under the inlet flange of safety valve. For safety valves with screwed connection, a clamping device with screwed connection is needed. After valve setting the leakage test is carried out.

The pressure will be reduced by 10% resp. in case of set pressures ≤ 3,5 bar by 0,35 bar. After 10 seconds of slowdown the leakage rate will be determined (test time 10 s). The amount of air leakage escaping from the inlet via the seal between seat and disc causes a low excess pressure in the closed outlet chamber. This excess pressure will be decomposed in the water tank in form of escaping bubbles. The escaping bubbles are counted in determined test time (ref. to appendix 2 and 3). The volume of bubbles is defined by resp. depends on the water head and inner width of dipping tube.

The leakage rate shall not exceed the limited leakage rates depending on the flow area $d_0$ and valve design as mentioned in appendix 2 and 3.

**POSV**

The testing of POSVs corresponds to a two sets sequence:

1/

The pilot is fixed on the PILOT assembly bench, set and tested for tightness. Pilot bodies along with the manifold block are attached to the pilot assembly bench with four screws. Sealing is achieved using suitable o-rings.
After assembly and pressure setting of the pilot the seat tightness test is carried out. The inlet pressure is increased to meet the test pressure and after a defined damping period the leakage rate is determined. The bubble test device is hooked up to the outlet and the bubbles created within the test period are counted.
The testing procedures are implemented as part of the overall assembly and testing procedure of the control program.

2/

Every completed POSV is tested for its respective CDTP. Usually this is achieved by setting the PILOT and therefore no additional setting is required. Consequently tightness of the seat is tested.

For the fully assembled POSV the tightness of the seat is defined as the tightness between seat and disk of the main valve.
For the test the inlet of the POSV is clamped (perpendicular) to the test bench. The pressure in the inlet is increased to the respective test pressure and after a suitable damping period the leakage rate is determined. The observable bubbles within the testing period are then counted.

### 7.8.7 Acceptance criteria

Leakage rates, measured during the determined test period, shall not exceed the fixed leakage rates defined for the relevant types/designs. The leakages rates are fixed in Appendix 2 and 4.

The seat tightness standard - requirements of spring safety valve made in Works- Hohenwestedt are defined at LDeS 0201.02.

#### 7.8.8 Certification

The testing of seat tightness with air (bubble emission procedure) is documented in the SAP system and confirmed by inspection test certificate 3.1 acc. to DIN EN 10204. (LESER CGA)
If test report for seat leakage test is required, it has to be accessed with option code M66.

### 7.9 Testing of seat tightness of safety valve with sealing plate disc

This requirements shall be applied to spring loaded safety valve with configuration sealing plate discs at PTFE, Kel - F or VESPEL materials only.

For all spring loaded safety valves with seal plate configuration, test pressure is defined as described in 15 Appendix 2:

$p_{test}$ = $p_0$ x (formula, please find in column “Test pressure“ under 15 Appendix 2)
$p_{test}$ = test pressure
$p_0$ = cold differential test pressure

The test duration shall be applied according with the Appendix 2 and 3.

Leakage Test

1. Before starting the seat tightness test, the set pressure shall be demonstrated according at LGS0202.
2. The safety valve shall than waiting for 48 hours.
3. After 48 Hours the seat tightness test as described above shall be determinate again.
4. In case the valve has opened/lifted any time after the 48hour period, the procedure has to be repeated beginning with step 2.

### 7.10 Tightness Test acc. to PAS 1085:2008

#### 7.10.1 Scope

The seat tightness test according to PAS 1085 is only applied to spring loaded safety valves. The seat tightness test is only applied to safety valves in gas tight configurations (lifting aid H4, cap H2 and closed bonnet).

#### 7.10.2 Test Pressure, Stabilizing Time and Inspection Time

The test pressure and stabilizing time depend on the CDTP and the nominal size, respectively. The inspection time is 1 minute for all safety valves.
The defined stabilizing times and test pressures are listed in tables 2 and 3.

| Set pressure, $p_0$ bar | Test pressure, $ptest_f$ bar |
|---|---|
| >= 1,0 | 0,97 x $p_0$ |
| < 1,0 | 0,9 x $p_0$ |

Table 2: Test pressure for seat tightness test, acc. to PAS 1085

| Nominal size | Stabilizing time | Inspection Time | Allowed leakage (Bubbles/Minute) |
|---|---|---|---|
| Up to DN 200 | 1 min. | 1 min. | 3 |
| Over DN 250 | 3 min. | 1 min. | 3 |

Table 3: Stabilizing Time, Inspection Time and leakage rates acc. to PAS 1085

### 7.10.3 Test Procedure

- Fix safety valve on test bench in upright position
- Adjust set pressure of safety valves acc. to LGS 0202
- Release pressure and attach inspection tube to outlet, then increase pressure to test pressure according to table 2.
- Determination of leakage rate starts after the stabilizing time defined in table 3 or latest after the release of the first bubble from the tube opening.
- The determination of the leakage rate is done over a period of one minute. Relevant are only those bubbles, which were released from the tube during this inspection time.
- The observed number of relevant bubbles is recorded. If this number exceeds the allowed number of bubbles as defined in table 3, the valve must be subject to the LESER quality rework process.

### 7.10.4 Acceptance Criteria

The test parameters and the acceptance criteria are listed in the table of appendix 14.12 (seat tightness acc. PAS 1085 for safety valves).

## 7.11 Seat tightness test procedure with air, another method

### 7.11.1 Applicability

In case of non-gas tight safety valve design (lifting device H3, open bonnet), the seat leakage test is carried out with procedure of applying test fluid (acc. to DIN EN 1593). The application of test fluid is a qualitative test procedure, because the quantitative procedure of bubble counting (leakage rate) is not possible.

### 7.11.2 Test equipment

The seat leakage test by using air, procedure of test fluid application, can be carried out at the assembly working place. Following parts are components of the assembly working place:

- Clamp station (with adapter discs)
- Pressure system (air)
- Pressure gauge system
- Bubble counting instrument

As test fluid a foamy lotion acc. to DIN EN 14291, leakage finder, is used. The test fluid shall be non-volatile (it shall not dry at test temperature during test period) and viscous.

### 7.11.3 Test description

Angle typed flanged safety valves are mounted via clamping jaw vertically at the inlet flange on the test bench. For the sealing a rubber pad is laid down under the inlet flange of safety valve (fig. 2).

After setting of safety valve the seat leakage test is carried out. A foamy lotion is drawn over the outlet orifice. The extension under pressure impact and the accumulate leakage volume can be observed at the outlet.

Test time amounts 5 seconds. The sealing between seat and disc fulfils the tightness requirements of this standard, if arises bubble extends not more than 5 mm during test time.

In case of nominal sizes $DN_A \geq$ DN100 an opening reducing rubber plug is adopted, because only for nominal sizes up to $\leq$ DN 80 bubbles can be drawn reliable.

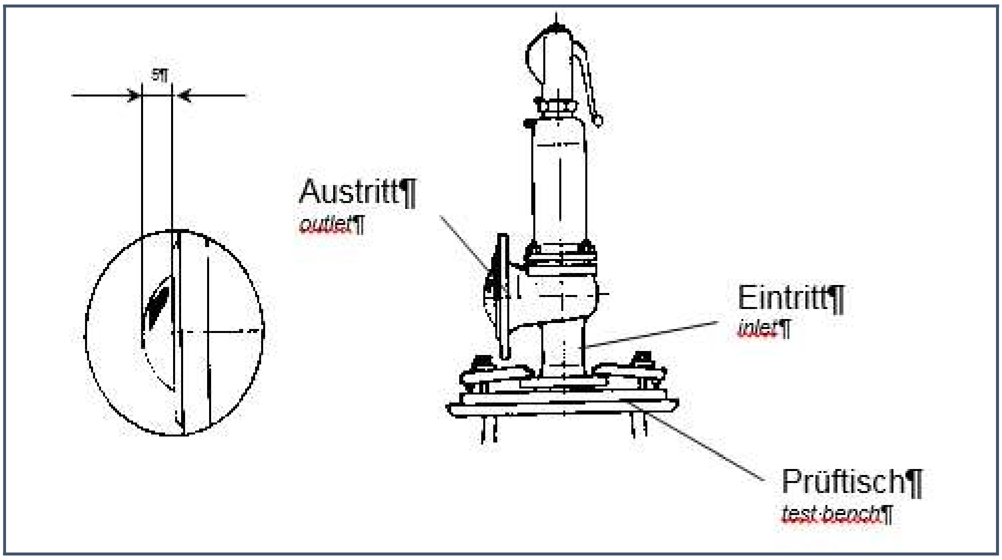



Fig. 2

### 7.11.4 Certification, Option Code

The testing of seat tightness with air, applying of test liquid procedure, is documented in the SAP system and confirmed by an inspection certificate according to DIN EN 10204.

If inspection certificate for seat tightness test is required, it has to be accessed with option code M22.

## 7.12 Seat tightness test procedure with helium

### 7.12.1 Applicability

The testing of seat tightness with helium is a special case of testing and is practised on customer demand only. This test can be carried out for all safety valve types, even though the helium test is very extensive for open valves.

### 7.12.2 Test equipment

LESER uses a helium leak detector for the helium test procedure:
Technical Characteristic:

| | |
|---|---|
| Max. Pressure | 15 mbar |
| Minimum detectable Helium. Leakage rate: | |
| - Vacuum method | ≤ 5* $10^{-12}$ mbar l/sec |
| - sniffing method | < 1* $10^{-7}$ mbar l/sec |
| Maximum indicated Helium- Leakage rate | 0,1 mbar l/sec |
| Measuring range | 12 decade |

### 7.12.3 Test method

With this helium leak detector different test procedures for seat tightness can be practised. LESER uses following test methods:

- Procedure of overpressure (sniffing method)
- Procedure of leakage detector in vacuum.(spraying method)

### 7.12.4 Test pressure

The test pressure has to correspond to the pressure values at ambient temperature mentioned in App. 2 and 3.

### 7.12.5 Test duration

The test pressure has to hold up at least 5 min.

### 7.12.6 Test description

*Overpressure procedure (sniffing method):*

After setting the relevant safety valve with air on cold-differential set pressure, it will be carried to the helium test lab. After safety valve is mounted via clamping jaw at the inlet flange on the test bench, it will be pressurized with helium. After reaching the test pressure leakage rate is determined via probe at the outlet.

*Procedure of leakage detection in vacuum:*

After setting the relevant safety valve with air on cold- differential set pressure, it will be carried to the helium test lab.

Via adapter the valve is connected airproof with the helium leakage detector at the inlet. After evacuation (vacuum occurs in the fitting) an airgun is injection helium between disc and sealing in the outlet. The test result is metered after 5 min.

7.12.7 Acceptance criteria

Leakage rates, measured during the determined test period, shall not exceed the fixed leakage rates defined for the relevant types/designs.
In case of metal-to-metal sealed safety valves leakage rates up to $10^{-3}$ mbar l/s are possible. Dependent on the test procedure leakage rates up to $10^{-9}$ mbar l/s can be reached in case of soft-sealed safety valves.
The standard test value for seat tightness of LESER safety valves with soft seal amounts < $1x10^{-5}$ mbar l/s.
Following option codes shall be used for seat leakage test with helium:

- Option Code N62, for sniffing method
- Option Code M86, for vacuum method

7.12.8 Certification

The testing of seat tightness with helium is documented in the SAP system and confirmed by inspection test certificate acc. to DIN EN 10204 / test report.
Following information are to be considered:

- Test subject
- Requirements of Standard
- Reference terms / Main technical characteristics
  Test medium, Helium
  Test equipment: helium leakage detector
- Test results
- Test method for each test result
- Relevant Units, mbar l/s, for each test result.

If inspection certificate for seat tightness test with helium is required, it has to be accessed with following option code:

- M 77 for seat tightness, overpressure procedure (sniffing method)
- M 81 for seat tightness, procedure of leakage detection in vacuum

## 7.13 Seat tightness test procedure with water

7.13.1 Scope

All valves, which are set with medium water, must be seat tightness tested. The seat tightness test is carried out with the medium water after setting up the set pressure.

The test conditions, test pressure, test time and allowed leakage are defined in Appendix 2 resp. 3.

7.13.2 Test description

The valve shall be mounting vertically on the water test stand. Before the leakage test, the set pressure must be determined.
After a successful set pressure test with water, the seat tightness test follows.

The pressure shall be lowered to zero.

Wait until no more water drains/flows off the outlet area. It is not allowed to wipe dry the moistened outlet area (or the used testing device (stream detector)) of the valve.

Steadily the inlet pressure shall than be increased to the test pressure.
When reach the test pressure the valve outlet area shall be observed for 1 minute.

The leakage of the seat is determined by counting of draining off water drops in outlet area of the valve or in the testing device.

### 7.13.1 Acceptance criteria

The leakage rate shall not exceed the acceptance criteria defined in Appendix 2.1.

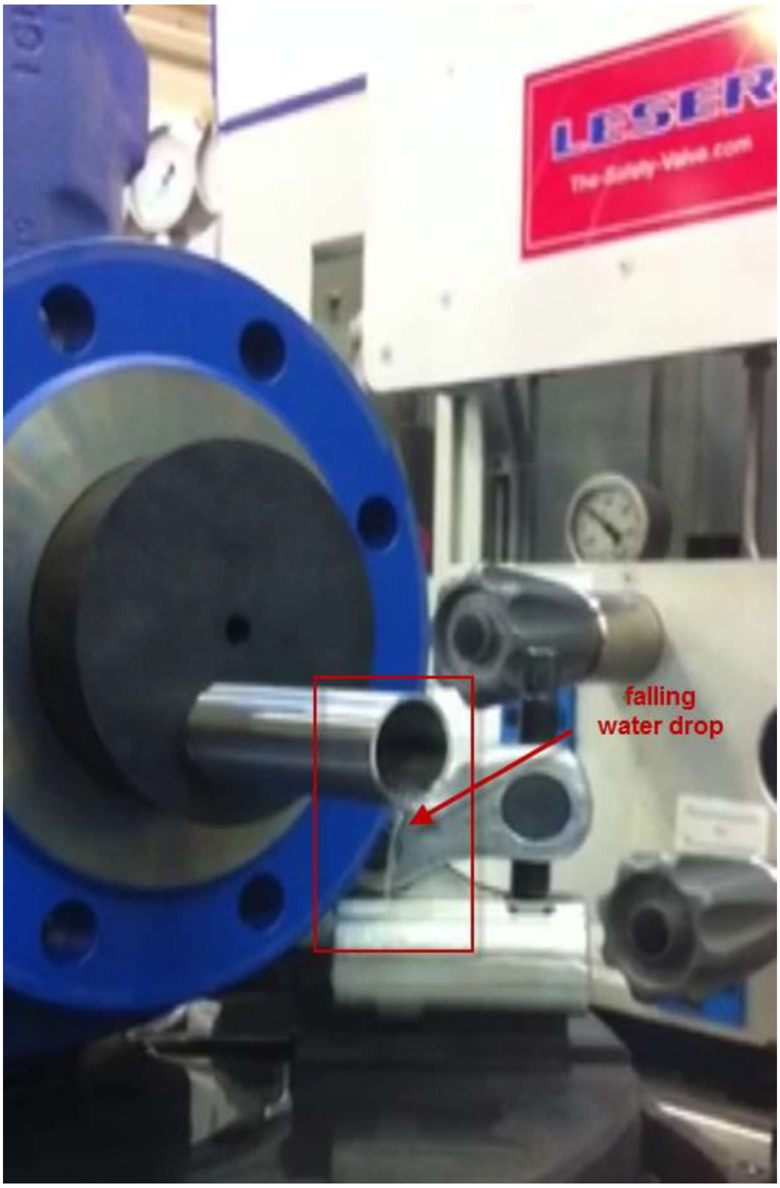



Photo 4: Falling water drop at the edge of stream detector

### 7.14 Seat tightness test procedure with steam

#### 7.14.1 Applicability

Testing of seat tightness with steam is practised for safety valves, which are set on cold-differential set pressure with steam.

#### 7.14.2 Test equipment

The test is carried out at the steam test lab in Hohenwestedt site.

#### 7.14.3 Test pressure

The test pressure has to be in accordance with test values determined in Appendices 2 and 3.

#### 7.14.4 Test duration

The test pressure has to be retained acc. to the determined test period in Appendices 2 and 3.

#### 7.14.5 Test description

After setting the relevant valve on cold-differential test pressure and testing, the seat leakage test is carried out with steam. The pressure is to be dropped to test pressure and after a short damping time the qualitative statement can be determined.

#### 7.14.6 Acceptance criteria, Option Code

The valve obtains to be tight, if the qualitative estimation criteria acc. to App. 2 resp. 3 are fulfilled: no noticeable or visible leakage, no pressure drop at the pressure gauge is recognized.

#### 7.14.7 Certification

The seat leakage test with steam is documented in the SAP system and confirmed by inspection test certificate acc. to DIN EN 10204.

## 8 Shell Tightness test procedure P11

### 8.1 Applicability

The shell tightness test procedure, at LESER called body tightness, is carried out for all LESER safety valves, Pilot Operated Safety Valves and Change Over Valves. For Safety Valves with a heating jacket the shell tightness test procedure is carried out at the heating jacket itself including all connections.

### 8.2 General, Definition

The shell tightness test procedure is a collateral production pressure test to prove the tightness of pressure retaining body and is carried out at LESER as a standard test.

Designation acc. to DIN EN 12266-1:
Shell Tightness, test procedure P11-EN 12266-1

## 8.3 Test procedure at LESER

For shell tightness test procedure the test fluid is coated onto body surface at the inlet area.
During the shell tightness test the test object is subjected to the test medium air up to a certain test pressure. The surface of the test object including all connections is than wetted with a test liquid and subjected to a visual inspection.

## 8.4 Depth of inspection

The shell tightness test is conducted for each valve in gas tight design.

## 8.5 Test equipment

The shell tightness test procedure is carried out on assembly test benches.

As test fluid a foamy lotion acc. to DIN EN 14291, leakage finder, is used.
The test fluid shall be non-volatile and viscous.

## 8.6 Test medium

In General this test is carried out with air at ambient temperature.

## 8.7 Test pressure

The shell tightness test procedure is carried out with a test pressure of 6 bar (±1).

## 8.8 Test duration

The test pressure has to be retained acc. to the determined test period in table 4.

Table 4: Minimum test time for testing of pressure retaining body

| Nominal size | Minimum test time [s] |
|---|---|
| Up to DN 50 | 15 |
| From DN 65 up to DN 150 | 60 |
| From DN 200 up to DN 300 | 120 |
| DN 350 and higher | 300 |

## 8.9 Test description

The valve is clamped on the inlet side on the test bench and then pressurized to a test pressure of 6 bar (±1). The valve is then wetted on the surface with the test liquid and subjected to a visual inspection.

For valves with a heating jacket design, the heating jacket including connections must be also pressurized to a test pressure of 6 bar (±1) and the surfaces must be wetted with the test liquid. Subsequently, a visual inspection of the surfaces and connections is carried out.

**8.10** Acceptance criteria

There shall be no continuous bubble formation which could indicate a leak in the wall or at the connections.

**8.11** Certification, Option Code

The shell tightness test with air is confirmed by inspection test certificate acc. to DIN EN 10204. As standard testing the leakage test of pressure retaining body effects without access of option code. The certification of the test is controlled by option code M18

## 9 Back seat tightness, test P21 (tightness outwards)

**9.1** Scope

The tightness test of the back sealing, LESER named it tightness outwards, is carried out at all LESER's safety valves in gastight design and at all POSV.

**9.2** Definition

The test is a pre-expediting pressure test for certification that the determined leakage rate of the back sealing is kept to the moment of the manufacture.

The tightness outwards has reference to the test of the tightness at the connections body/bonnet, bonnet/lifting device H4 (cap H2) as well as the outlet of the body.

POSV at the connections:
Top plat and body with spray, manifold block and top plate with spray and at backflow preventer with the Kellog –test method.

Marking in accordance with DIN EN 12266-2,
Tightness of back seal, test P21-EN 12266.2

**9.3** Applicability

The tightness of the back seal, test P21, is in accordance with the task schedule which is deposited in the data base of the SAP-system for every safety valve in gastight design. At LESERs', this test is standard which is integrated in the production process.

**9.4** Test equipment

At LESER's the test of the tightness of the back seal takes place at the test benches.

**9.5** Test medium

At LESERS's, this test is carried out standard with air in room temperature. The back seat tightness can be realized with helium test procedure if the customer requests.

## 9.6 Test pressure

The test pressure for tightness of back seal, test P21, tightness outwards, shall be a minimum of 1,1 times the allowable pressure or (6±1) bar whereby the lower value counts (in accordance with DIN EN 12266-2).
Standard LESER carries out this test with a test pressure of 6 bar with the exception of:

- Safety valves beginning with a nominal size DN 200 will be tested with a test pressure of 2,5 bar/air 36 psig .
- For safety valves with PTFE - or elastomer components the pressure must be limited as follows:
    - for initial pressures / set pressures $p_0 < 3$ bar to 0,15 x $p_0$ bar and
    - for initial pressures / set pressures $p_0 \geq 3$ bar to 2 bar (28 PSIG) to avoid damages

Test pressures outside of the scope of the standard must be coordinated between the customer and LESER (VK/TB).

## 9.7 Test duration

The test pressure must be maintained at least for the test period determined in table 5 (in accordance with DIN E 12266-2).

Table 5: Minimum test period for testing of the tightness of the back seal

| Nominal size | Minimum test period<br>s |
|---|---|
| > DN 50 | 15 |
| from DN 65 to DN 200 | 15 |
| DN 250 to DN 450 | 30 |

## 9.8 Test requirements for POSV

*Appendix 5: Back Seat tightness, LESER standard requirements for POSVs*
Test conditions and requirements for back seat tightness acc. DIN EN 12266 of POSVs (standard requirements) are subject of this Appendix.

## 9.9 Test description

**Operation with application of the test fluids (DIN EN 1593)**

This test procedure will be used for safety valves when the dipping is impractical.
The testing of the tightness of back seal, tightness outwards, will be controlled in standard cases. After testing of the seat leakage and the test pressure the safety valve will be tightened (outlet) on the test bench and admitted with pressure.
Reaching the test pressure, the safety valves will be sprayed at the connections and the outlet area with a non- volatile and viscous test fluid. If there is no frothing formation recognizable the tested areas are all right.

**Dipping procedure (DIN EN 1593)**

This test procedure is applicable for compact performance safety valves.
The safety valve will be sealed (inlet) with an unscrewed sealing cap. After that the safety valve will be clamped (outlet) in the test bench and dipped into the diving basin (water)

The specified test pressure 6 bar / air will start. If there are no bubbles on the outside surface of the safety valve the tested safety valve is all right.
The test pressure will blow off and the safety valve will be detached from the test control unit.

**Remark!** During the test period the test pressure has to be kept constantly.
The safety vale should be blistered dry with compressed air.

**9.10** Helium test

This testing method, tightness of the back seal with helium, will be realized if customer requires. Apart from testing with air the test can also be realized with Helium. The determined leakage rate will be >$10^{-5}$ mbar l / s in standard cases

With the leak detector used by LESER, the tightness test with the vacuum-method is realized.

The safety valve will be sealed (at the inlet) with a sealing cap. Afterwards the safety valve will be clamped (at the outlet) on the leak detector. When the evacuation process is finished (in the safety valve is now a vacuum) helium will be sprayed with an air gun on every connection for 3 – 4 sec. The test result will be read if the LED display is stabled.

**9.11** Certification, Option Code

The back seat tightness test tightness outwards, will be mentioned in the SAP system and confirmed with the inspection certificate in accordance with DIN EN 10204

As a standard test with air, the tightness test of the back sealing, tightness outwards, will follow without option code.
The tightness test of the back sealing, tightness outwards, with Helium will be regulated with option code N64.
If inspection certificate for back seat test tightness outwards is required, it has to be accessed with following Option Codes:

- M 28 Back seat tightness test outwards, application of test fluids
- M 78 Back seat tightness test outwards, dipping procedure
- M 82 Back seat tightness test outwards with helium, overpressure method (sniffing method)

# 10 Tightness of Pressure Seals of POSVs

**10.1** Scope

The tightness test of pressure seals is carried out on all LESER POSV.

**10.2** Definition

The tightness of pressure seals refers to the tightness verification of the valve, the loading and unloading tubes (pilot, manifold block, main valve), pilot and tubing (pilot, tubing, pilot tube).

**10.3** Test Procedure

The tightness test of the pressure sealing is carried out using the bubble count procedure and/or with the application of a leakage detection agent (foaming test).

**10.4** Applicability

The tightness test of pressure seals is performed according to the work plan defined in the SAP system for every POSV. At LESER this test is a standard test integrated into the assembly procedures,

**10.5** Test Equipment

The tightness test of pressure seals is carried out on the assembly benches for POSV: The pilot is tested at the pilot assembly bench and the completed POSV is then testes on the POSV assembly bench.
For the Kellogg test the bubble count device at the assembly bench is used.
For the foaming test an foaming fluid according to DIN 14291 is used. This fluid must be non-volatile (it may not dry within the testing period at the test temperature) and viscous.

**10.6** Test Media

At LESER these tests are performed using air at ambient temperatures.

**10.7** Test Pressure

The test is carried out at 10% or 0.35bar whichever is greater below set pressure.

**10.8** Test Duration

The test pressure must be applied for one minute.

**10.9** Test Procedure

The tightness test of pressure seals is carried out during and after assembly of the complete POSV. A detailed description of the testing procedure is documented within the assembly instructions for POSVs.
The following seals/connections are tested for tightness:
Pilot:
- The connection between adjusting screw and body is tested during assembly - bubble count method.
- After setting of CDTP and test of the seat tightness:
    - Connection between manifold block and body – leakage finder
- Tightness at BFP (set to position „forward“) – bubble count method.

POSV:
After testing of the set pressure the tightness test of the pressurized seals is carried out on the seals.

**10.10** Acceptance Criteria

No leakage of the pressure seals may occur.

**10.11** Certification

The tightness testing of pressure seals is always documented within the SAP system and is certified by a 3.1 inspection certificate according to DIN EN 10204.

## 11 Qualifications of the staff

The test staffs are in the situation, because of their professional knowledge as well as physical qualifications to carry out the a. m. test procedures correctly.

## 12 Certification

Test results are reported standardly in the SAP system and are proved by an inspection certificate according to 3.1 of DIN EN 10204.
Following information has to be included in the inspection certificate 3.1:

- Test subject
- Requirements of Standard
- Used procedures
- Reference terms / technical characteristics
  Test medium, test liquid, test device
- Test results
- Test method for each test result
- Relevant units, mbar l/s, for each test result.

## 13 Demands of standards

Following standards are considered for the tightness tests at LESER's:

DIN EN ISO 4126-1, Safety devices for protection against excessive pressure Part 1: Safety valves, chapter. 6 Production testing, 6.6 Seat leakage test:
„The seat leakage test of a safety valve shall be carried out. The test procedure and leakage rate shall be agreed between the manufacturer and the purchaser"

DIN EN ISO 4126-4, Safety devices for protection against excessive pressure Part 4: Pilot-operated safety valves, Chapter 6 Production Testing,
6.6 Seat leakage test:
„The seat leakage test of the pilot operated safety valve shall be carried out after the adjustment of the set or the cold differential test pressure. The test procedure and the leakage rate shall be agreed between the manufacturer and the purchaser. When it is not the case, the values in 6.6.3 and 6.6.4 shall be used."
6.7 Pressure Seals
„All pressure seals between valve, loading/unloading line and sensing line shall be leak tested. If appropriate, hold for 1 min at 10% or 0.35 bar whichever is the greater below set pressure, using air or nitrogen. Leakage is not acceptable.

ASME Code Section VIII Rules for Construction of Pressure Vessels,
Part UG-136(d) Production Testing by Manufacturers and Assemblers
UG- 136 (d) (3) The secondary pressure zone of each closed bonnet pressure relief valve exceeding NPS 1 (DN 25) inlet size when such pressure relief valves are designed for discharge to a closed system shall be tested with air or other gas at a pressure of at least 30 psi (200kPa). There shall not be visible sign of leakage."

UG- 136(d) (5) After completion of the tests required by (d) (4) above, a seat tightness test shall be conducted. Unless otherwise designated by a Manufacturer's published pressure relief valve specification or another specification agreed to by the user, the seat tightness test and acceptance criteria shall be in accordance with API 527."

DIN EN 12266-1 Industrial valves: Testing of valves, part 1: Pressure tests, test procedures and acceptance criteria- Mandatory requirements, edition 2003, chapter.4 Test requirements:

4.2 „Every valve shall be subjected to the shell tightness test, reference P11, listed in Table 1. "

DIN EN 12266-2 Industrial valves – Testing of valves, part 2: Tests, test procedures and acceptance criteria, edition 2003, A.3 Back seat tightness, test P21

## 14 Appendix 1: Seat tightness requirements acc. to API 527

API 527

| Test medium | | Set pressure $p_o$ (relating to 16°C) bar | Set pressure $p_o$ MPa | After testing of set pressure $p_o$ / Blow down up o<br>Test pressure | Test Time (BZ = damping time, PZ = Test Time) Min<br>DN ≤50 ≤2" BZ | DN ≤50 ≤2" PZ | DN 65...100 21/2...4" BZ | DN 65...100 21/2...4" PZ | DN >100 >4" BZ | DN >100 >4" PZ | $d_0 \le$ 18mm Leakage rate (related to 16°C; bubble volume $V_B$= 0,295 cm³, tube ∅ = 6,12mm)<br>Number of bubbles bubble/ min | $d_0 \le$ 18mm Leakage volume cm³/ min | $d_0 \le$ 18mm Leakage rate Mbar l/s | $d_0$ > 18mm Leakage rate (related to 16°C; bubble volume $V_B$= 0,295 cm³, tube ∅ = 6,12mm)<br>Number of bubbles Bubble/ min | $d_0$ > 18mm Leakage volume cm³/ min | $d_0$ > 18mm Leakage rate Mbar l/s |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Air (Gases) | Metal-to-metal sealing | 1,03-68,9<br>103<br>130<br>172<br>207<br>276<br>385<br>414 | 0,103-6,896<br>10,3<br>13,0<br>17,2<br>20,7<br>27,6<br>38,5<br>41,4 | if $p_o \le$ 3,45 bar (0,345 MPa) then $p_{Prüf\ test}$ = $p_0$ - 0,345 bar (0,0345 MPa) | 1 | 1 | 2 | 1 | 5 | 1 | 40<br>60<br>80<br>100<br><br><br><br>100 | 11,80<br>17,70<br>23,60<br>29,50<br><br><br><br>29,50 | $1{,}9 \times 10^{-1}$<br>$2{,}8 \times 10^{-1}$<br>$3{,}8 \times 10^{-1}$<br>$4{,}7 \times 10^{-1}$<br><br><br><br>$4{,}7 \times 10^{-1}$ | 20<br>30<br>40<br>50<br>60<br>80<br>100<br>100 | 5,90<br>8,85<br>11,80<br>14,75<br>17,70<br>23,60<br>29,50<br>29,50 | $9{,}4 \times 10^{-2}$<br>$1{,}4 \times 10^{-1}$<br>$1{,}8 \times 10^{-1}$<br>$2{,}3 \times 10^{-1}$<br>$2{,}8 \times 10^{-1}$<br>$3{,}8 \times 10^{-1}$<br>$4{,}7 \times 10^{-1}$<br>$4{,}7 \times 10^{-1}$ |
| Air (Gases) | Soft sealing | - | - | | 1 | 1 | 2 | 1 | 5 | 1 | 0 | 0 | $<4{,}7 \times 10^{-3}$ | 0 | 0 | $<4{,}7 \times 10^{-3}$ |
| Steam | Metal-to-metal sealing Soft sealing | - | - | if $p_0$ >3,45 bar (0,345 MPa) then $p_{Prüf.\ test}$ = 0,9*$p_o$ | BZ= damping time = 3 min<br>TZ= test time = 1 min | | | | | | No recognized or visible leakage | | | | | |
| Water | Metal-to-metal sealing | - | - | | TZ- test time = 1 min | | | | | | ***NW≥1" (DN25)***<br>Leakage volume ≤10cm³/h x Inlet nominal size / inch<br>(Leakage volume ≤0,166cm³/min x Inlet nominal size /inch)<br>***NW<1" (DN25)***<br>*leakage volume* ≤10cm³/h* | | | | | |
| Water | Soft sealing | - | - | | TZ- test time = 1 min | | | | | | No leakage | | | | | |

2) Note: see Appendix 6

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# 15 Appendix 2: Seat tightness LESER Standard tightness requirement for spring safety valve

| LESER-Standard | Test conditions | | | | | | Tightness requirements | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Test medium | | Set pressure $p_o$ (related to 16°C) | | Test pressure $p_{test}$ After testing of set pressure $p_o$ Blow down up to... Test pressure | Test time BZ-damping time TZ-Test time | $d_0 \leq$ 18mm Leakage rate (related to 16°C; bubble volume $V_B$= 0,295 cm³ tube ∅ = 6,12mm) | | | | $d_0 >$ 18mm Leakage rate (related to 16°C; bubble volume $V_B$= 0,295 cm³ tube ∅ = 6,12mm) | | | |
| | | | Pressure stages acc. to LGS 0222 bar | MPa | Blow-down of... Test pressure | s / min | Number of bubbles bubble/min | Leakage volume cm³/min | Leakage volume mm³/sec | Leakage rate mbarl/s | Number of bubbles bubble/min | Leakage volume cm³/min | Leakage volume mm³/sec | Leakage rate mbarl/s |
| | Air (Gases) | Metal-to-metal sealing | 0,1- 66 | 0,01- 6,6 | if 0,1< $p_o$ < 0,7 (bar) 0,01 < $p_o$ < 0,07 (MPa) then $P_{test}$ = 0,5*$p_0$ | BZ = 10s TZ = 10s | 40 | 11,80 | 196,66 | 1,9x10$^{-1}$ | 20 | 5,90 | 98,33 | 9,4x10$^{-2}$ |
| | | | >66-165 | >6,6-16,5 | | | 60 | 17,70 | 295,00 | 2,8x10$^{-1}$ | 30 | 8,85 | 147,50 | 1,4x10$^{-1}$ |
| | | | >165- 700 | >16,5- 70,0 | | | 80 | 23,60 | 393,33 | 3,8x10$^{-1}$ | 40 | 11,80 | 196,66 | 1,8x10$^{-1}$ |
| | | Soft sealing plate | - | - | | BZ= 10s TZ = 10s | 20 | 5,90 | 98,33 | 9,4x10$^{-2}$ | 10 | 2,95 | 49,16 | 4,7x10$^{-2}$ |
| | | Soft sealing O-Ring or disc With vulcanized soft sealing | - | - | if 0,7 ≤ $p_o$ ≤ 3,5 (bar) 0,07 ≤ po ≤ 0,35 (MPa) then $p_{test}$= $p_0$ - 0,35bar | BZ =10s TZ = 10s | 0 | 0 | 0 | ≤9x10$^{-5}$ | 0 | 0 | 0 | ≤9x10$^{-5}$ |
| | Steam | Metal-to-metal sealing Soft sealing | - | - | if $p_0$ > 3,5 bar po >0,35 (MPa) then $p_{test}$ = 0,9*$p_o$ | BZ = 3 min PZ = 1 min | No recognized or visible leakage No indication of pressure drop at the pressure gauge | | | | | | | |
| | Water | Metal-to-metal sealing Soft sealing | - | - | | TZ = 1 min | See Appendix 2.1 | | | | | | | |

## Appendix 2.1: Seat tightness LESER Standard tightness requirement, testing with water

| Test Medium | Seat | Nominal size | | Tightness requirements | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Leakage | | | | |
| | | | | Leakage volume | | | Water Drops (related to 16°C; Drop volume $V_T$ = 0,1 $cm^3$) | |
| | | DN | inch | $cm^3/h$ | $cm^3/h$ | $cm^3/min$ | drop / min | drop / min |
| | | | | | | | exakt | Abgerundet |
| Water | Metal-seated | **Nominal size** >= 1“ (DN25) Leakage volume ≤10$cm^3$/h x nominal size in inch ) (Leakage ≤0,166 $cm^3$/min x nominal size in inch) | | | | | | |
| | | 25 | 1 | 10 x 1 | 10 | 0,166666667 | 1,666666667 | 1 |
| | | 40 | 1 1/2 | 10 x 1 1/2 | 15 | 0,25 | 2,5 | 2 |
| | | 50 | 2 | 10 x 2 | 20 | 0,333333333 | 3,333333333 | 3 |
| | | 80 | 3 | 10 x 3 | 30 | 0,5 | 5 | 5 |
| | | 100 | 4 | 10 x 4 | 40 | 0,666666667 | 6,666666667 | 6 |
| | | 125 | 5 | 10 x 5 | 50 | 0,833333333 | 8,333333333 | 8 |
| | | 150 | 6 | 10 x 6 | 60 | 1 | 10 | 10 |
| | | 200 | 8 | 10 x 8 | 80 | 1,333333333 | 13,33333333 | 13 |
| | | 250 | 10 | 10 x 10 | 100 | 1,666666667 | 16,66666667 | 16 |
| | | 300 | 12 | 10x12 | 120 | 2 | 20 | 20 |
| | | 400 | 16 | 10x16 | 160 | 2,666666667 | 26,66666667 | 26 |
| | | Nominal size < 1“ (DN25) Leakage volume ≤ 10$cm^3$/h (≤ 0,166$cm^3$ min) | | | | | | |
| | | | | | 10 | 0,166666667 | 1,666666667 | 1 |
| | Soft - seated | | | No visible leakage | | | | |

## 16 Appendix 3: Seat tightness LESER increased tightness requirements

LESER - increased tightness

| Test medium | | Test conditions: Set pressure $p_o$ (related to 16°C) – Pressure stage acc. to LGS 0222: bar | MPa | Test pressure $p_{prüf}$ – After testing of set pressure $p_o$ Blow down up to ... Test pressure – Blow-down of... Test pressure | Test time – BZ=damping time TZ = test time | Test requirements: $d_0 \leq$ 18mm – Leakage rate (related to 16°C; Bubble volume $V_B$= 0,295 cm³ tube ∅ = 6,12mm) – Number of bubbles bubble/min | Leakage volume cm³/min | Leakage volume mm³/sec | Leakage rate mbarl/s | $d_0 >$ 18mm – Leakage rate (related to 16°C; Bubble volume $V_B$= 0,295 cm³ tube ∅ = 6,12mm) – Number of bubbles bubble/min | Lekage volume cm³/min | Lekage volume mm³/sec | Leakage rate (mbarl/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Air (Gases) | Metal-to-metal sealing | 0,1-66 | 0,01-6,6 | if 0,1< $p_o$ < 0,7 (bar) 0,01 < $p_o$ < 0,07 (MPa) then $P_{test}$ = 0,5*$p_0$ | BZ- =10s TZ = 10s | 20 | 5,90 | 98,33 | 9,4x10$^{-2}$ | 10 | 2,95 | 49,16 | 4,7x10$^{-2}$ |
| | | >66-165 | >6,6-16,5 | | | 30 | 8,85 | 147,5 | 1,4x10$^{-1}$ | 15 | 4,42 | 73,66 | 7,0x10$^{-2}$ |
| | | >165-700 | >16,5-70,0 | | | 40 | 11,80 | 196,66 | 1,8x10$^{-1}$ | 20 | 5,90 | 98,33 | 9,4x10$^{-2}$ |
| | Soft sealing | - | - | | - | Increased tightness not possible, ref. to App. 2: Standard tightness requirements | | | | | | | |
| Steam | Metal-to-metal sealing | - | - | If 0,7 ≤ $p_o$ ≤3,5 (bar) 0,07 ≤ po ≤ 0,35 (MPa) Then $p_{test}$= $p_0$ - 0,35bar (0,035 Mpa) | BZ =3 min TZ- = 1 min | No recognized or visible leakage No indication of pressure drop at the pressure gauge | | | | | | | |
| | Soft sealing | - | - | | - | Increased tightness not possible, ref. to App. 2: Standard tightness requirements | | | | | | | |
| Water | Metal-to-metal sealing | - | - | if $p_0$ > 3,5 bar po >0,35 (MPa) then $p_{test}$ = 0,9*$p_o$ | TZ = 1 min | No recognized or visible leakage | | | | | | | |
| | Soft sealing | - | - | | - | Increased tightness not possible, ref. to App. 2: Standard tightness requirements | | | | | | | |

## 17 Appendix 4: Seat tightness LESER increased tightness requirements POSV, Type 810, Pop Action pilot

| | Seat Type | Set pressure po: Pounds per Square Inch Gauge (psig) | Set pressure po: bar | Set pressure po: Mega -Pascals, MPa | Test pressure, ptest$_f$: bar | | Test time: BZ=damping time Pz = test time | | Leakage rate (Maximum): Number of bubbles bubble/min | Leakage rate (Maximum): Leakage volume cm³/ min | Leakage rate (Maximum): Leakage rate mbar* l/s |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Type 811- Pop Action Pilot** | Metal-to-metal sealing (Main Valve)<br><br>and<br><br>Metallic or soft sealing Or soft sealing (Pilot) | 15 - 1000 | 1,03 - 68,9 | 0,103 - 6,896 | if:<br>$p_o \le 3,45$<br><br>than:<br>$p_{test} = p_0 - 0,345$<br><br>If :<br>$p_0 > 3,45$<br><br>Than:<br>$P_{test.} = 0,9*po$ | Additional testing for POSV with<br><br>$p_0 > 30$ bar<br><br>than<br>$p_{test.} = 0,3*po$ | DN < =50 (<= 2“)<br><br>DN 65-100 (21/2...4“)<br><br>DN > 100 (> 4“) | BZ = 1<br>PZ = 1<br><br>BZ = 2<br>PZ = 1<br><br>BZ = 5<br>PZ = 1 | 20 | 5,9 | 9,4x10-2 |
| | | >1000 - 1500 | > 68,9 - 130 | > 6,896 - 10,3 | | | | | 30 | 8,85 | 1,4x10-1 |
| | | >1500 - 2000 | > 130 - 172 | > 10,3 - 13 | | | | | 40 | 11,8 | 1,8x10-1 |
| | | > 2000 - 2500 | > 172 - 207 | > 13 - 17,2 | | | | | 50 | 14,75 | 2,3x10-1 |
| | | > 2500 - 3000 | > 207 - 276 | > 17,2 - 20,7 | | | | | 60 | 17,7 | 2,8x10-1 |
| | | > 3000 - 4000 | > 276 - 385 | > 20,7 - 27,6 | | | | | 80 | 23,6 | 3,8x10-1 |
| | | > 4000 - 6170 | > 385 - 425 | > 27,6 - 42,5 | | | | | 100 | 29,5 | 4,7x10-1 |
| | Soft sealing (O-ring or sealing plate at main valve)<br><br>And<br><br>Metalic or soft sealing (Pilot) | 15 - 6170 | 1,03 - 425 | 0,103 - 42,5 | | | | | No recognized or visible leakage | - | <4,7x10-3 |

## 18 Appendix 4: Seat tightness LESER increased tightness requirements POSV, Type 810, Modulate Action Pilot

| Baugruppe | Seat Type | Set pressure po | | | Test pressure, ptest$_f$ | | Test time | | Leakage rate (Maximum) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Pounds per Square Inch Gauge (psig) | bar | Mega -Pascals, MPa | bar | | BZ=damping time Pz = test time | | Number of bubbles bubble/min | Leakage volume $cm^3$/ min | Leakage rate mbar* l/s |
| Type 821 - Modulate Action Pilot | Metal-to-metal sealing (Main Valve and pilot) | 15 - 1000 | 1,03 - 68,9 | 0,103 - 6,896 | | | | | 40 | 11,8 | 1,9x10-1 |
| | | >1000 - 1500 | > 68,9 - 130 | > 6,896 - 10,3 | | | | | 60 | 17,7 | 2,8x10-1 |
| | | >1500 - 2000 | > 130 - 172 | > 10,3 - 13 | | | | | 80 | 23,6 | 3,8x10-1 |
| | | > 2000 - 6170 | > 172 - 425 | > 13 - 42,5 | if: $p_0 \leq 3{,}45$ than: $p_{test} = p_0 - 0{,}345$ | Additional testing for POSV with $p_0$ >30 bar than $p_{test.} = 0{,}3 *po$ | DN < =50 (<= 2“) | BZ = 1 PZ = 1 | 100 | 29,5 | 4,7x10-1 |
| | Metal-to-metal sealing (Main Valve) and soft sealing (Pilot) | 15 - 1000 | 1,03 - 68,9 | 0,103 - 6,896 | | | | | 20 | 5,9 | 9,4x10-2 |
| | | >1000 - 1500 | > 68,9 - 130 | > 6,896 - 10,3 | | | | | 30 | 8,85 | 1,4x10-1 |
| | | >1500 - 2000 | > 130 - 172 | > 10,3 - 13 | | | DN 65-100 (21/2...4“) | BZ = 2 PZ = 1 | 40 | 11,8 | 1,8x10-1 |
| | | > 2000 - 2500 | > 172 - 207 | > 13 - 17,2 | If : $p_0$ >3,45 Than: $P_{test.}$= 0,9*po | | | | 50 | 14,75 | 2,3x10-1 |
| | Soft sealing (main valve ) and Metal-to-metal sealing (Pilot) | > 2500 - 3000 | > 207 - 276 | > 17,2 - 20,7 | | | | | 60 | 17,7 | 2,8x10-1 |
| | | > 3000 - 4000 | > 276 - 385 | > 20,7 - 27,6 | | | DN > 100 (> 4“) | BZ = 5 PZ = 1 | 80 | 23,6 | 3,8x10-1 |
| | | > 4000 - 6170 | > 385 - 425 | > 27,6 - 42,5 | | | | | 100 | 29,5 | 4,7x10-1 |
| | Soft sealing (O-Ring or sealing plate at main valve ) and soft sealing (Pilot) | 15- 6170 | 1,03 - 425 | 0,103 - 42,5 | | | | | No recognized or visible leakage | - | <4,7x10-3 |

## 19 Back Seat tightness, LESER standard requirements for POSVs

| Set pressure po | Test pressure, p test, bar/ psig | | | Test Duration Sec. | | Leakage rate Bubble / Min | | | Test procedure at LESER |
|---|---|---|---|---|---|---|---|---|---|
| | Pilot | POSV + Pop Pilot | POSV + Modulate Action | | | Pilot | Main Valve | POSV | |
| po | if: $p_o \leq 6$<br>then: ptest = 1,1x $p_0$<br><br>if $p_o > 6$<br>then: $p_{test}$ = 6 bar | if: $p_o \leq 6$<br>then: $p_{test}$ = 1,1x $p_0$<br><br>if: $p_o > 6$<br>then: $p_{test}$ = 6 bar | if: $p_o \leq 2,5$<br>then: $p_{test}$ = 1,1x $p_0$<br><br>if: $p_o > 2,5$<br>then: $p_{test}$ = 2,5 bar | DN < = 200 (<= 8")<br><br>DN > 250 to 450 (10" to 18") | 15<br><br>30 | No recognized or visible leakage | No recognized or visible leakage | No recognized or visible leakage | Babble emission<br>and / or<br>Application with tests fluid |

## 20 Seat tightness acc. to PAS 1085 -SV

| | Seat Type | Set pressure, po | | | Test pressure, p test, | Nennweite | Test Time | | Leakage rate | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Pounds per Square Inch Gauge (psig) | bar | Mega -Pascals, MPa | bar | | BZ=damping time [ Min. ] | Pz = test time [ Min. ] | Number of bubbles bubble/min | Leakage volume $cm^3$/ min |
| Seat tightness acc. to PAS 1085 | Metal-to-metal sealing and soft sealing | ≥ 15<br>< 15 | ≥ 1,0<br>< 1,0 | ≥ 0,1<br>< 0,1 | 97% x p0<br>90% x p0 | DN ≤ 200 (DN ≤ 8“) | 1 | 1 | 3 | 0,89 |
| | Metal-to-metal sealing and soft sealing | ≥ 15<br>< 15 | ≥ 1,0<br>< 1,0 | ≥ 0,1<br>< 0,1 | 97% x p0<br>90% x p0 | DN > 200 (DN >8“) | 3 | 1 | 3 | 0,89 |

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## 1 Purpose

This LESER Deutschland Standard (LDeS) describes the definition of CDTP and the use of CDTP correction for LESER safety valves.

## 2 Scope

This LDeS applies to the LESER sites Hamburg and Hohenwestedt.

## 3 References

None

## 4 Introduction

According to international standards like ASME VIII and ISO 4126-1 and 4126-4 the service conditions are to be considered for setting at ambient temperature.

## 5 What is CDTP?

Cold differential test pressure (CDTP) is defined in standard

- DIN EN ISO 4126-1 Edition 2004, chapter 3.2.5
- ASME Sec. VIII, Div. 1, Edition 2010, UG 136 (d) 4
- API 520-1 8. Edition 2008, chapter 3.4.1
- ASME PTC 25 - 2008 chapter 2.7

CDTP is used if correction of set pressure of safety valves according to deviation of service conditions is necessary.

Extract from ASME Sec. VIII, Div. 1, UG 136 (d) 4:
When a valve is adjusted to correct for service conditions of superimposed back pressure, temperature, or the differential in popping pressure between steam and air, the actual test pressure (cold differential test pressure) shall be marked on the valve per 129

Extract from DIN EN ISO 4126-1 chapter 3.2.5:
statischer Druck auf der Eintrittsseite, bei dem ein Sicherheitsventil auf dem Prüfstand zu öffnen beginnt.
ANMERKUNG Dieser Druck schließt Korrekturen für Betriebsbedingungen, z. B. Gegendruck und/oder Temperatur, ein.

Extract from API 520 chapter 3.13:
Cold differential test pressure
The pressure at which a pressure relief valve is adjusted to open on the test stand. The cold differential test pressure includes corrections for the service conditions of backpressure or temperature or both.

Extract from API 520 chapter 4.2.3:
The actual service conditions under which a pressure relief valve is required to open, may be different form the conditions at which the pressure relief valve is set to operate on a test stand. To compensate for this effect, a CDTP is specified for adjusting the set pressure of the valve on the test stand. The CDTP may include a correction for actual service conditions of back pressure and/or temperature.

Extract from ASME PTC 25-2008 chapter 2.7:
the inlet static pressure at which a pressure relief valve is adjusted to open on the test stand. This test pressure includes corrections for service conditions of superimposed back pressure and/ or temperature.

## 6 What is CDTP Correction?

The CDTP correction is the correction of set pressure at test bench conditions to achieve the correct set pressure at service conditions.

## 7 Which influences on safety valves are covered with the setting at CDTP?

The set pressure on test bench deviating from service condition is influenced by:

- temperature
- superimposed back pressure

Basically effects at the setting by:

- set pressure tolerance
- medium

The CDTP only covers influences of superimposed back pressure and/or temperature.

## 8 How is the CDTP Correction calculated?

The CDTP correction is provided by the manufacturer. LESER has done measurements on steam test laboratory at high temperature service conditions. These measurements have been monitored and plotted as curve which has been approved by German TÜV Nord. In case of superimposed back pressure and temperature the corrected set pressure is calculated with a formula. This formula is valid for conventional or balanced bellows design.
The formula is valid for LESER standard spring materials only, 1.1200, 1.7102, 1.8159, 1.4310. For High Alloy and Tungsten spring material the correction is not used, exclusive Inconel as defined in table in chapter 8.2.

The term $(p_{set} - p_a)$ considers influences of superimposed backpressure.

The factor $k_T$ covers influences of temperature.

| Design | Superimposed backpressure variable (0 – x) [bar g] | Superimposed backpressure constant y [bar g] | Built-up backpressure [bar g] |
|---|---|---|---|
| Conventional | $p_a = x$ | $p_a = y$ | Not valid for calculation |
| Bellows | $p_a = 0$ | $p_a = 0$ | Not valid for calculation |

Table 1: backpressure according to different safety valve design

### 8.1 Description of formula

$$p_{cdtp} = (p_{set} - p_a) * k_T$$

$p_{set}$: set pressure at service conditions [psig or barg]
$p_a$: superimposed back pressure, constant or variable [psig or barg]. If variable and conventional design, the max. superimposed back pressure should be used. If balanced bellows design is used $p_a$ is set to 0 bar or 0 psig.
$k_T$: correction factor for CDTP [-], this is depending on valve design/conventional design/balanced bellows design/open or closed bonnet
T: temperature in [°C]

### 8.2 Calculation formula:

| | | |
|---|---|---|
| Open or closed bonnet with balanced bellows | $k_T$=0,97339+0,00039(T-200)-0,0000015477(T-200)$^2$+0,0000000029977(T-200)$^3$ | equation (1) |
| Closed bonnet conventional design | $k_T$=0,97339+0,00039T-0,0000015477T$^2$+0,0000000029977T$^3$ | equation (2) |
| Open bonnet | $k_T$=0,97339+0,00039(T-50)- | |

| | | |
|---|---|---|
| conventional design | $0{,}0000015477(T-50)^2+0{,}0000000029977(T-50)^3$ | equation (3) |

Table 2: Formulas of $k_T$ calculation

## LESER datasheet of CDTP (Cold differential test pressure)

$$p_{cdtp} = (p_{set} - p_a) * k_T \qquad p_{cdtp} = (p_{set} * k_{af}) * k_T$$ **(Type 459/462 only)**

$p_{cdtp}$: cold differential test pressure [psig or barg]
$p_{set}$: set pressure at service conditions [psig or barg]
$p_a$: superimposed back pressure, constant ($p_a$ is equal $p_{af}$) [psig or barg]
$k_T$ : correction factor for CDTP , temperature influence [-]
$k_{af}$: correction factor for type 459 / 462, deviating effective area influence [-]

| °C | °F | Open bonnet conventional | Closed bonnet conventional | Open bonnet balanced bellows or Inconel spring with or without bellows | Closed bonnet balanced bellows or Inconel spring with or without bellows |
|---|---|---|---|---|---|
| 550 | 1022 | Limitation at 427°C (only with balanced bellows) | Limitation at 350°C (only with balanced bellows) | 1,049 | 1,049 |
| 500 | 932 | | | 1,032 | 1,032 |
| 450 | 842 | | | 1,021 | 1,021 |
| 400 | 752 | 1,049 | | 1,013 | 1,013 |
| 350 | 662 | 1,032 | 1,049 | 1,007 | 1,007 |
| 300 | 572 | 1,021 | 1,032 | 1,000 | 1,000 |
| 250 | 482 | 1,013 | 1,021 | | |
| 200 | 392 | 1,007 | 1,013 | | |
| 150 | 302 | 1,000 | 1,007 | | |
| 100 | 212 | No influence of service condition on CDTP, correction factor: 1,000 | | | |
| 50 | 122 | | | | |
| 0 | 32 | | | | |
| -50 | -58 | | | | |
| -100 | -148 | | | | |
| -150 | -238 | | | | |
| -200 | -328 | | | | |
| -250 | -418 | | | | |

Table 3: correction factor $k_T$ depending ond safety valve design

| LESER diagram $k_{af}$ for for type 459 / 462 | | | | | |
|---|---|---|---|---|---|
| $p_{af}/p$ * 100 [%] | $d_0$ = 9 [mm] | $d_0$= 17,5 [mm] | $p_{af}/p$ * 100 [%] | $d_0$ = 9 [mm] | $d_0$= 17,5 [mm] |
| 0,0 | 0,999 | 0,998 | 20,0 | 1,083 | 0,872 |
| 1,0 | 1,001 | 0,990 | 22,0 | 1,097 | 0,863 |
| 2,0 | 1,003 | 0,983 | 24,0 | 1,111 | 0,855 |
| 3,0 | 1,005 | 0,975 | 26,0 | 1,126 | 0,847 |
| 4,0 | 1,008 | 0,968 | 28,0 | 1,143 | 0,840 |
| 5,0 | 1,011 | 0,961 | 30,0 | 1,160 | 0,833 |
| 6,0 | 1,014 | 0,954 | 32,0 | 1,178 | 0,827 |
| 7,0 | 1,018 | 0,947 | 34,0 | 1,197 | 0,822 |
| 8,0 | 1,021 | 0,940 | 35,0 | 1,207 | 0,819 |
| 9,0 | 1,025 | 0,934 | | | |
| 10,0 | 1,029 | 0,927 | | | |
| 12,0 | 1,038 | 0,915 | | | |
| 14,0 | 1,048 | 0,904 | | | |
| 16,0 | 1,059 | 0,893 | | | |
| 18,0 | 1,070 | 0,882 | | | |

Note: Types 459/462 with do = 13mm is not influenced by correction factor $k_{af}$. It is in all case = 1.correction factor $k_T$ depending on safety valve design

protected

## 9 How does LESER set the safety valves depending on different service conditions with temperature and back pressure?

LESER has made steam tests on LESER test laboratory. These measurements have been monitored, evaluated and processed into a correction curve. This curve was approved by German TÜV Nord to be an adequate practicable procedure to correct set pressure to cold differential test pressure concerning deviation of service conditions. The original confirmation of TÜV Nord and an English translation is attached in chapter 9.
Please note, that for gas service the setting is defined as “first audible discharge”. For full opening of valve please add another 10%.

## 10 How is the influence of balanced bellows?

### 10.1 How is the influence of balanced bellows in general for safety valves?

The stainless steel bellows protect the upper area of safety valves against temperature and compensate backpressure. The medium cannot get in contact with the spring. This avoids changes of mechanical properties of spring material and influences the setting. This effect is valid until limits of spring material.

Conventional design:

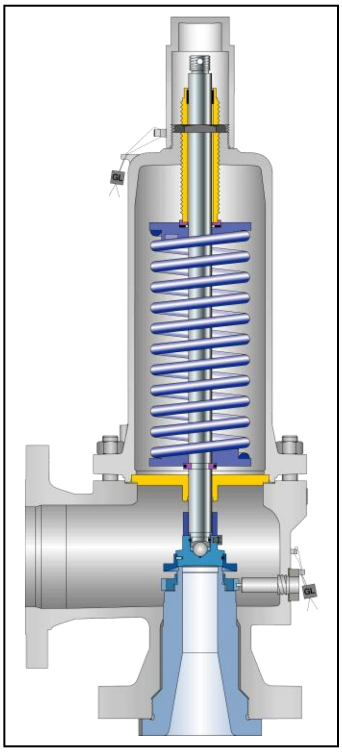


Figure 3:

Balanced bellows design:

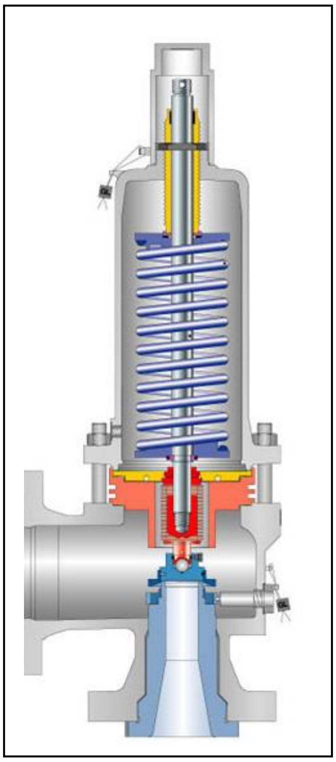


Figure 4:

10.2 How is the influence of balanced bellows in case of type 459 / 462 safety valves?

For these two types the different discharge diameters $d_o$= 9, 13 and 17,5 mm have influence on the correction of CDTP. This is based on the design of balanced bellows. The same stainless steel bellows are implemented in all three $d_o$'s. The effective area of $d_o$ = 13mm design is equal to the balancing area of stainless steel bellows. A correction for differing effective areas ($d_o$ = 9 mm and $d_o$ = 17,5 mm) of seat area and balancing area have to be considered with the additional correction factor $k_{af}$ .
Please refer to LDeS 1037.07 for detailed information.

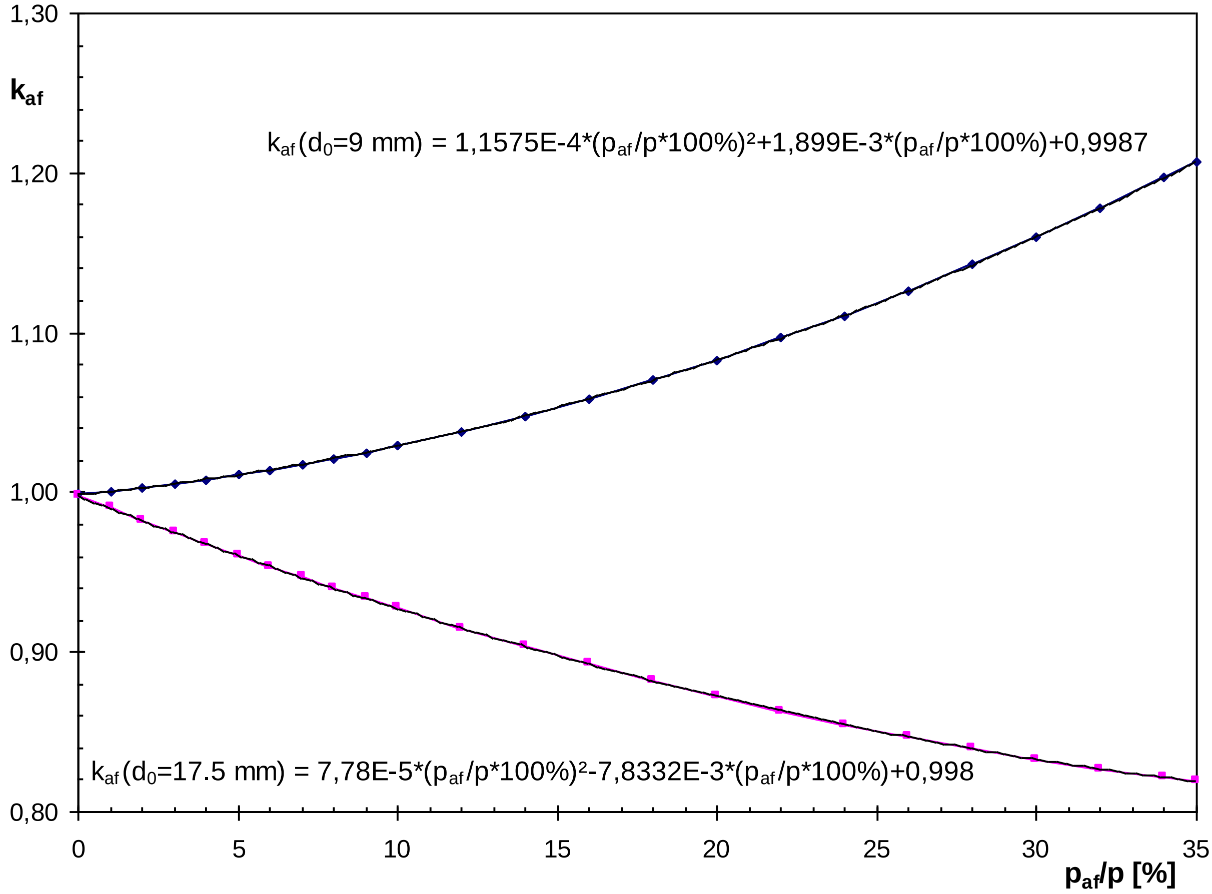



Diagram 1: correction factor $k_{af}$ for balanced bellows design for type 459 / 462

## 11 How does an open/closed bonnet influence the CDTP?

The bonnet design could be open or closed design.

Open Design:

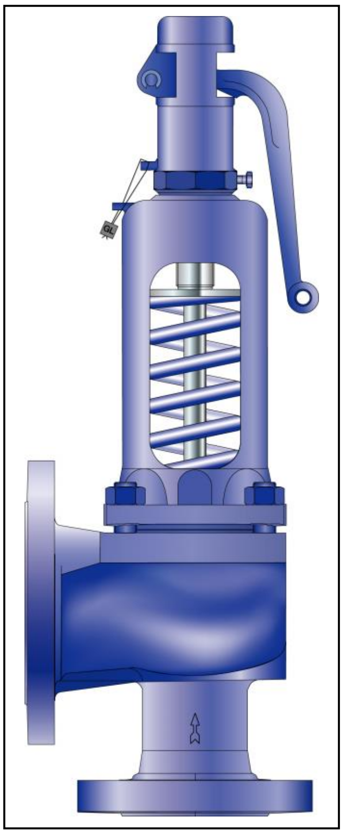


Figure 5:

Closed Design:


Figure 6:

Open design is recommended for applications which are not harmful for the environment. Closed design is recommended for applications with higher safety aspects. This has to be preselected by the customer.

The open bonnet design allows higher temperatures of medium because of the cooling effect with free circulation of air. The temperature increase in comparison to closed bonnet design is smaller. The correction factor is listed in table 1.

## 12 How does the spring material influence the CDTP?

The spring material limits the maximum temperature at the spring. These limits are documented by spring purchaser or in LDeS 1001.52.
The formula is valid for LESER standard spring materials only, 1.1200, 1.7102, 1.8159, 1.4310. For High Alloy and Tungsten spring material the correction is not used, exclusive Inconel as defined in table in chapter 8.2.

| Spring material | DIN designation | ASME designation | Maximum medium temperature | Temperature range, temperature measured at spring |
|---|---|---|---|---|
| Carbon | 1.1200 / **Sort SH** | - | 200°C (392°F) | -30°C - 100 °C (-22°F - 212°F) |
| Creep resistant | 1.8159 / **51CrV4**<br>1.7102 / **54SiCr6** | ASTM A322 Grade 6150 | 550°C (1022°F) | -60°C - 220 °C (-76°F - 428°F) |
| Stainless steel | 1.4310 / **X10CrNi18-8** | ASTM A313 Grade 302 | 550°C (1022°F) | -196°C - 280 °C (-321°F - 536°F) |
| Inconel | 2.4669 / **NiCr15Fe7TiAl** | ASTM B 637-98 | 600°C (1112°F) | -200°C - 500 °C (-328°F - 932°F) |
| Hastelloy C4 | 2.4610 / **NiMo16Cr16Ti** | ASTM B 574-99 | 550°C (1022°F) | Max. 450°C (842°F) |
| Tungsten BH12 | 1.2605 / **X35CrWMoV5** | EN ISO 4957 (12/1999) | 550°C (1022°F) | Max. 500°C (932°F) |

Table 4: material and temperature limits

If these limits are exceeded the spring characteristics are no more valid. The influence on relaxation is stated in DIN EN 13906-1 or DIN 2089 (old invalid version).

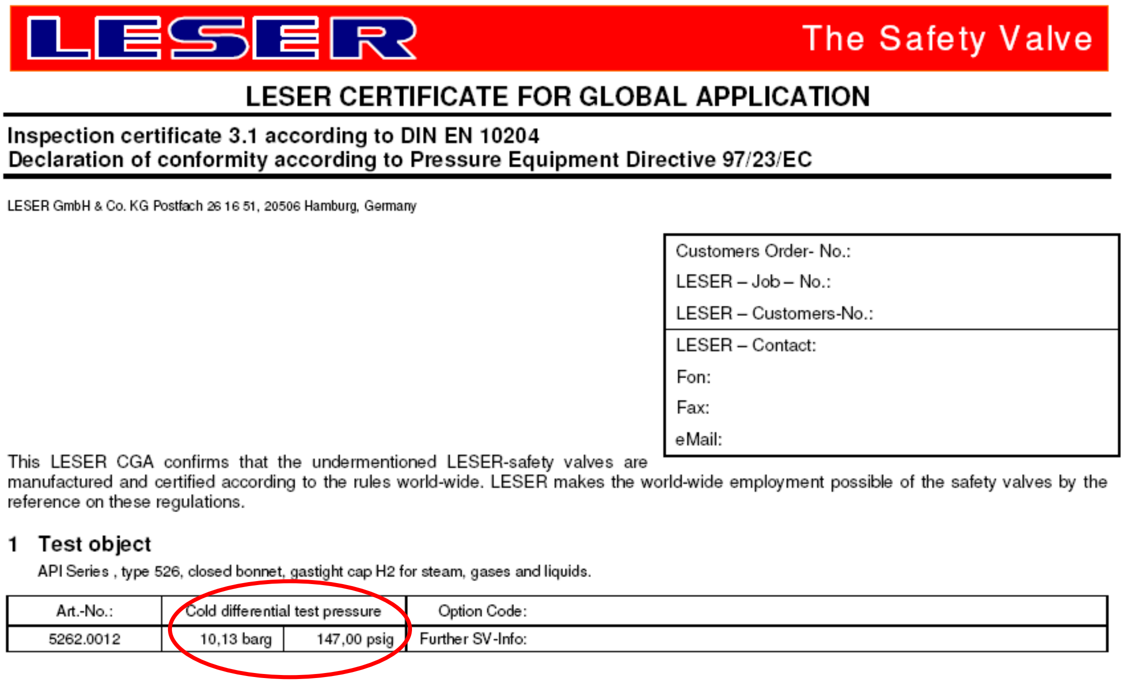
The effect on CDTP correction is covered with the stated correction factor in chapter 3. The spring material has no significant effect on the test results.

## 13 How does the medium influence the CDTP?

The medium has no significant influence on CDTP.

## 14 Where can CDTP values be found?

CGA:



The Safety Valve

**LESER CERTIFICATE FOR GLOBAL APPLICATION**

**Inspection certificate 3.1 according to DIN EN 10204**
**Declaration of conformity according to Pressure Equipment Directive 97/23/EC**

LESER GmbH & Co. KG Postfach 26 16 51, 20506 Hamburg, Germany

| |
|---|
| Customers Order- No.: |
| LESER – Job – No.: |
| LESER – Customers-No.: |
| LESER – Contact: |
| Fon: |
| Fax: |
| eMail: |

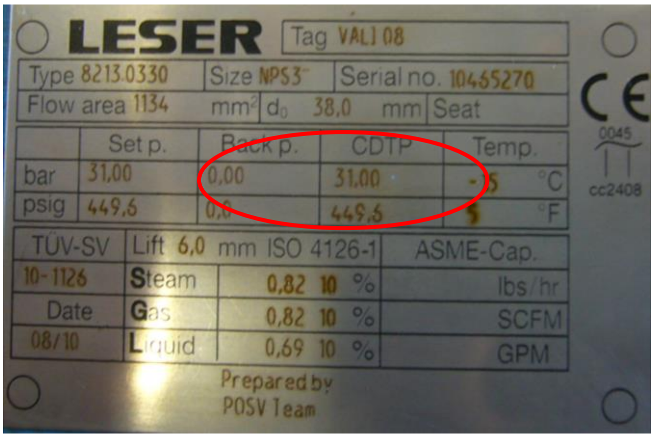
This LESER CGA confirms that the undermentioned LESER-safety valves are manufactured and certified according to the rules world-wide. LESER makes the world-wide employment possible of the safety valves by the reference on these regulations.

**1 Test object**

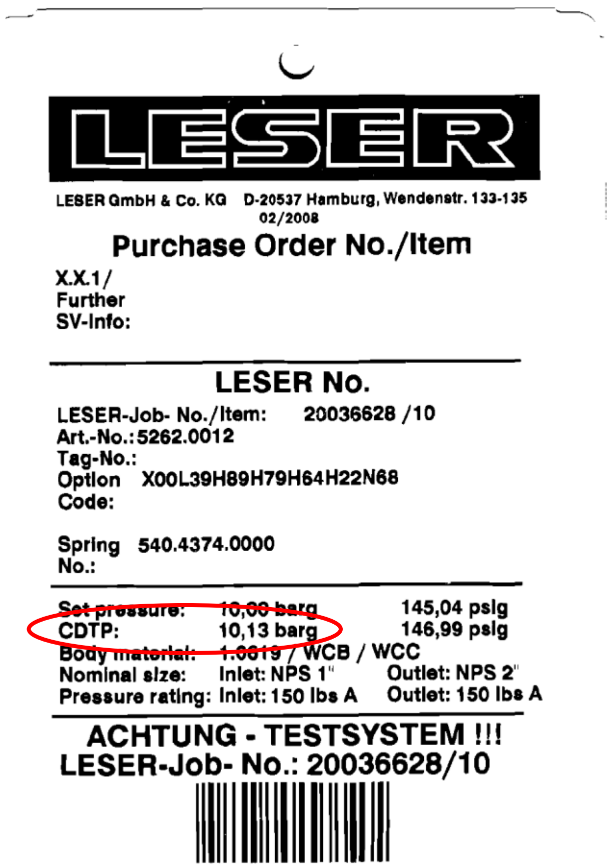
API Series , type 526, closed bonnet, gastight cap H2 for steam, gases and liquids.

| Art.-No.: | Cold differential test pressure | | Option Code: |
|---|---|---|---|
| 5262.0012 | 10,13 barg | 147,00 psig | Further SV-Info: |

Nameplate ASME:



LESER-TAG:




## 15 Example

### 15.1 Example: Temperature influence

Design: Type 441, open bonnet
Service condition: $p_{set}$ = 10barg (145 psig), $p_a$ = 0barg, t = 320°C ( 608°F), Steam

$$p_{cdtp} = (p_{set} - p_a) * k_T$$

$k_T$: according to equation (3) in chapter 3:
$k_T$ = 1,025
$p_a$ = 0, because of no backpressure

**$p_{cdtp}$ = 10 barg * 1,025 = 10,25 barg (148,66 psig)**

Set pressure tolerance: 0–3%

**$p_{cdtpmin}$ = 10,25 barg +0,00*10,25 barg = 10,25 barg (148,66 psig)**
**$p_{cdtpmin}$ = 10,25 barg +0,03*10,25 barg = 10,56 barg (153,16 psig)**

15.2 Example: Temperature and constant backpressure influence

Design: Type 459 do = 9mm, closed bonnet, balanced bellows
Service condition: $p_{set}$ = 50barg (725 psig), $p_a$ = 5barg (72,5 psig), t = 400°C ( 752°F), Air

$$p_{cdtp} = (p_{set} * k_{af}) * k_T$$

$k_T$: according to equation (1) in chapter 3:
$k_T$ = 1,013
$k_{af}$: According to diagram 1 in chapter 5.1:
$k_{af}$ = 1,029

**$p_{cdtp}$ = 50 barg * 1,029 * 1,013= 52,12 barg (755,74 psig)**

Set pressure tolerance: 0–3%

**$p_{cdtpmin}$ = 52,12 barg +0,00*52,12 barg = 52,12 barg (755,74 psig)**
**$p_{cdtpmin}$ = 52,12 barg +0,03*52,12 barg = 53,68 barg (778,36 psig)**

15.3 Example: Temperature and variable backpressure influence

Design: Type 441, closed bonnet,
Service condition: $p_{set}$ = 10barg (145 psig), $p_a$ = 0 – 1,5 barg, t = 320°C ( 608°F), air

$k_T$: according to equation (2) in chapter 3:
$k_T$ = 1,038
$p_a$ = 1,5 barg, because of conventional design and worst case situation

**$p_{cdtp}$ = (10 barg – 1,5barg) * 1,038 = 8,82 barg (127,93 psig)**

Set pressure tolerance: 0–3%

**$p_{cdtpmin}$ = 8,82 barg +0,00*8,82 barg = 8,82 barg (127,89 psig)**
**$p_{cdtpmin}$ = 8,82 barg +0,03*8,82 barg = 9,09 barg (131,81 psig)**

## 16 Original confirmation of German TÜV Nord

Technischer Überwachungs-Verein Nord e. V.

TÜV NORD

TÜV Nord e. V. · Postfach 54 02 20 · 22502 Hamburg

Leser GmbH & Co. KG
z. Hd. Herrn Stremme
Wendenstrasse 133-135

20537 Hamburg

| Ihr Zeichen | Ihre Nachricht vom | Durchwahl (040) | Bitte bei Antwort angeben | Datum |
|---|---|---|---|---|
| | | 8557-2613<br>Herr Schwenn | BM SV LESER ALLG | 05.06.96 |

**Kalteinstellung von Sicherheitsventilen**

Sehr geehrter Herr Stremme,

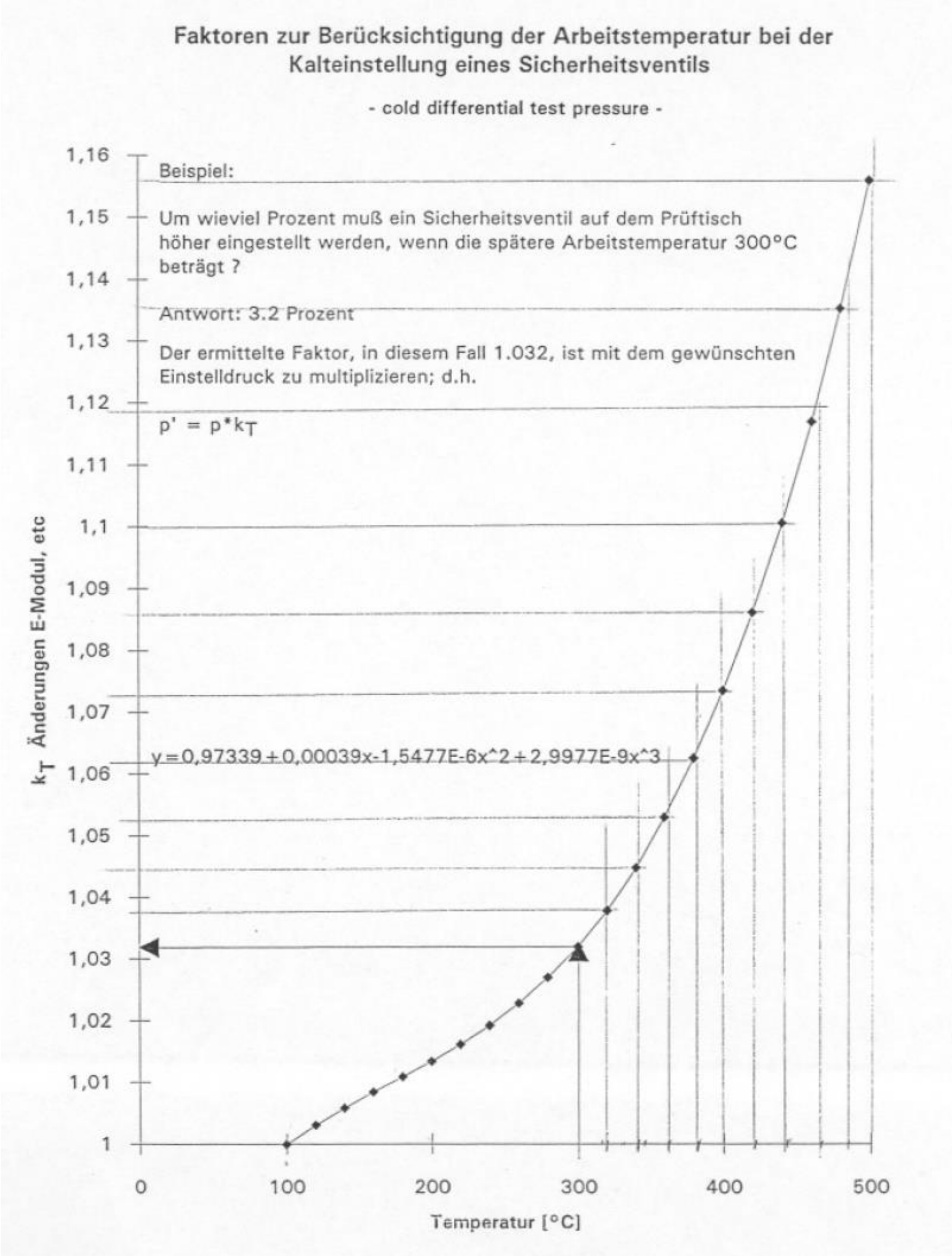
den Weg, die Temperatur bei Kalteinstellungen von Sicherheitsventilen nach dem beigefügten Diagramm zu berücksichtigen, halten wir für realistisch.
Aus dem beigefügten Diagramm kann der Multiplikatiosfaktor für die Kalteinstellung bei der vorgesehenen Temperatur entnommen werden.
Dieses Verfahren wird nur dann zur Anwendung kommen, wenn der Kunde dieses ausdrücklich wünscht und in der Spalte "zusätzliche Herstellerangaben" vermerkt.

Mit freundlichem Gruß

Abteilung Anlagen-
und Verfahrenssicherheit
Fachgruppe Armaturen
Der Leiter

Schwenn

Anlage
1 Diagramm

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|---|---|---|---|---|---|---|---|
| author: | Cal | released by: | KHa | replaces: | 001-69 | status: | Published |
| resp. depart.: | M | date of release: | 09/02/18 | revision No.: | 1 | | |
| doc. type: | LLS | change rep. No.: | NA | retention period: | 10y. | | |

Translation by LESER:
*Dear Mr. Stremme,*

*We think it is a realistic way to consider the temperature at the Cold Differential Test Pressure of safety valves according to the enclosed diagram.*

*The multiplication factor for the Cold Differential Test Pressure at the operating temperature is given by the enclosed diagram.*

*This procedure will be applied only if the customer states it explicitly and annotated this on the column "further manufacturers' instructions".*

*Sincerely yours*

*Schwenn*
*TÜV Inspector*



## 17 CDTP for POSV

(Separate chapter beside spring loaded safety valve)

Which influences on safety valves are covered with the setting at CDTP?
The set pressure on test bench deviating from service condition is influence by:
- Temperature

Basically effects at the setting by:
- set pressure tolerance
- medium

The CDTP only covers influences of temperature. The superimposed back pressure does not affect the set pressure, because it is completely balanced design.

## 18 How is the CDTP correction calculated?

The calculation is based on pressure testing under temperature of POSV. The results have been curves which are composed in formulas.

The formula is as follows:

$$y = 1+ (((0,0221*\text{operating temp.}) - 0,5348)/100)$$

Formula for Pop Action with boarders: > 3 bar and > 100°C.
Formula for Modulate Action with boarders: >3 bar and < -20°C or > 100°C.

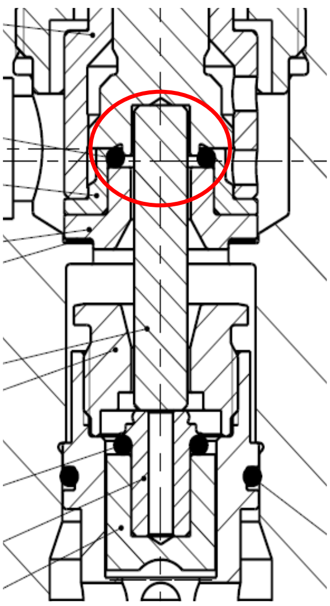
| °C | °F | Pop Action Pilot | Modulate Action Pilot |
|---|---|---|---|
| 180 | 356 | 1,0344 | |
| 150 | 302 | 1,0278 | |
| 100 | 212 | 1,0168 | |
| 50 | 122 | No influence | No influence |
| 20 | 68 | | |
| -20 | -4 | | 0,9902 |
| -40 | -40 | | 0,9858 |

table 5: Correction factor $k_T$ for LESER POSV

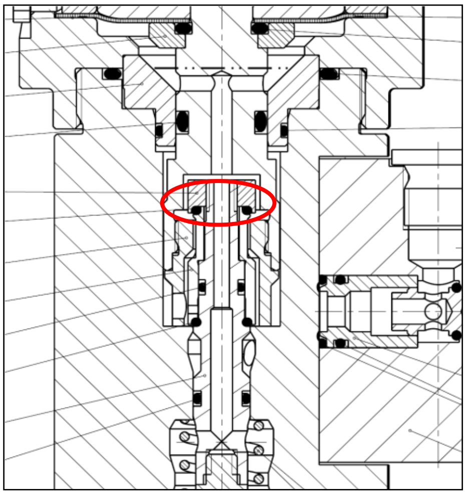


## 19 How does the design of pilot control have influence on the CDTP?

The pressure chambers in the Pop Action Pilot are sealed with soft sealing discs. Above temperatures of 100°C the effective area of o-ring geometry is influenced. The result is a deviation of set pressure.



The Modulate Action Pilot design is based on several soft sealings to tighten the pressure chambers. If the temperature is lower than -20°C or higher than 100°C the effective area of o-ring geometry is influenced. The result is a deviation of set pressure.



**In which documents you will find the CDTP-value?**

See chapter 9

**Sample**

Temperature influence
Design: Pop Action Pilot
Service condition: $p_{set}$ = 10barg (145 psig), pa = 0barg, t = 125°C ( 257°F), gases

$p_{cdtp}$ = (1+ (((0,0221*operating temp.) - 0,5348)/100))*$p_{set}$
$p_{cdtp}$ = (1+ (((0,0221*125) - 0,5348)/100))*10 bar = 10,22 bar (148,19 psig)

## 20 CDTP Correction for Precipitate Installation of Spring Loaded Safety Valves

This correction factor is used with exeption of above-mentioned operating conditions such as bellows design for mounting position (precipitate) of the valves. As the valves' pressure is set for upright mounting position, the weights of moving parts incl. valve spring apply a closing pressure on the valve sealing surfaces. In case of precipitate installation, the share of load pressure of these weights is missing, however, as closing force on the valve sealing surfaces and consequently, the valve would open sooner without a correction of the set pressure. In order to guarantee that the valves open in time and correctly when installed precipitately, the valve pressure must be set with this correction factor.
The calculation basis for the CDTP correction of the set pressure for precipitate installation can be found under following folder:
N:\TB\1_Sekretariat\TB Informationsdateien\berechnung_p_Einbau_kopfüber_boy

## 21 Example

### 21.1 Example 1: Influence of temperature and precipitate mounting position:

Design: Type 441 DN80, open bonnet
Service condition: $p_{set}$ = 4,2barg (61,51 psig), $p_a$ = 0barg, t = 320°C (608°F), superheated steam

a.) CDTP – correction for temperature influence:

$$p_{cdtp} = (p_{set} - p_a) * k_T$$

$k_T$: acc. to equation (3) in chapter 3:
$k_T$ = 1,022
$p_a$ = 0, as no back pressure

**$p_{cdtp}$ = 4,2 barg * 1,022 = 4,29 barg (62,2 psig)**

b.) CDTP – correction for precipitate mounting position: Pkcdtp= 0,2barg (see link)

c.) Total correction factor = Pcdtp+Pkctdp= 4,29barg+0,2barg=4,49barg(65,1 psig)

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## 1 Purpose

This LESER Global Standard (LGS) provides instruction on the visual final inspection of LESER safety valves. The required work steps and materials are described.

## 2 Scope

This document must be observed in the visual final inspection of safety valves in agencies and subsidiaries of LESER GmbH & Co. KG.

## 3 Disclaimer

LESER puts in a great deal of effort into making up-to-date and correct documentation available. Nevertheless, LESER GmbH & Co. KG gives no guarantee that the recommended actions presented here are entirely correct and error free. This document is to be applied exclusively to the specified type. LESER GmbH & Co. KG declines any liability or responsibility for the correctness and completeness of the content.

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LESER GmbH & Co. KG is available to the users of this document to provide additional information.

## 4 Qualified fitting personnel

The visual final inspection of LESER safety valves may only be performed by trained or qualified fitters. The qualifications must be obtained through the appropriate training measures.

## 5 General Information

- Gloves must be worn during the final inspection of oil and grease-free safety valves.

## 6 Flow chart for the visual inspection (final inspection)

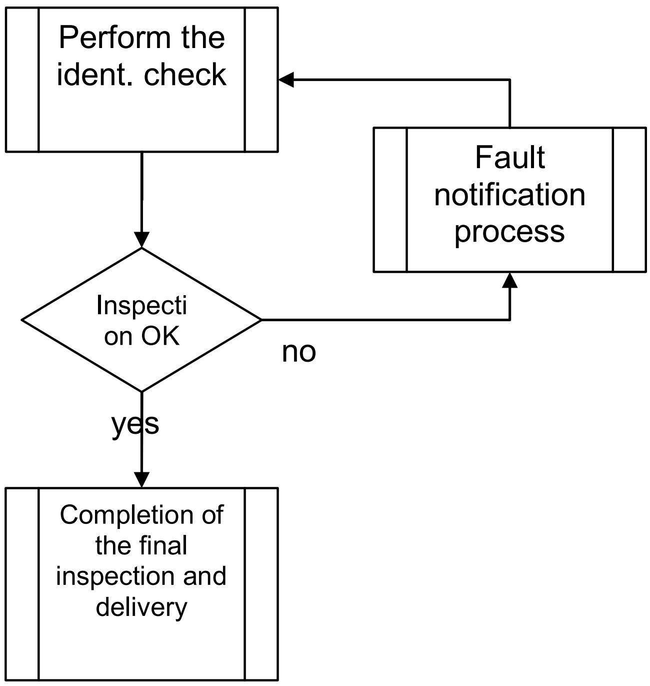
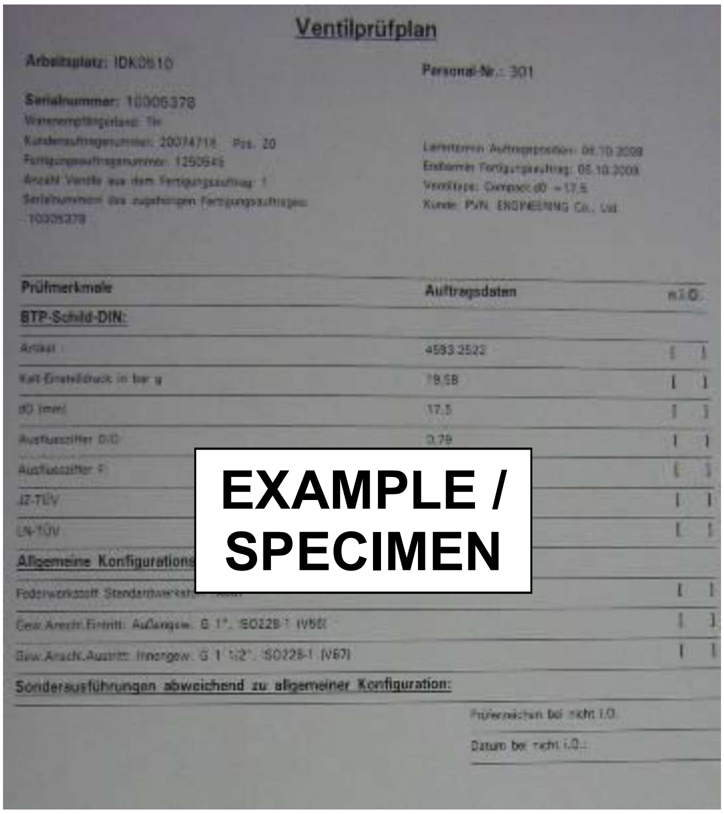



**Figure 6-1**

# 7 Performing the final inspection

## 7.1 General inspections

a) Compare the content of the valve inspection plan or repair order to the valve model.



Ventilprüfplan

Arbeitsplatz: IDK0510

Personal-Nr.: 301

Seriennummer: 10306378

Kundenauftragsnummer: 20074718 Pos. 20

Fertigungsauftragsnummer: 1250645

Anzahl Ventile aus dem Fertigungsauftrag: 1

Seriennummern des zugehörigen Fertigungsauftrages: 10306378

Endtermin Fertigungsauftrag: 05.10.2008

Ventiltype: Compact d0 = 17.5

Kunde: PVN ENGINEERING Co., Ltd

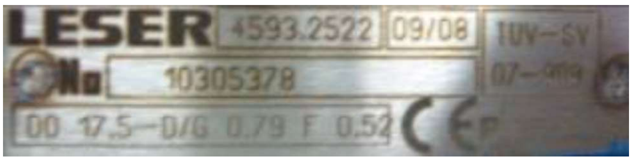
| Prüfmerkmale | Auftragsdaten | n.i.O. |
|---|---|---|
| BTP-Schild-DIN: | | |
| Artikel | 4593.2522 | [ ] |
| Kalt-Einstelldruck in bar g | 19.58 | [ ] |
| d0 (mm) | 17.5 | [ ] |
| Ausflussziffer D/G | 0.79 | [ ] |
| Ausflussziffer F | | [ ] |
| JZ-TÜV | | [ ] |
| LN-TÜV | | [ ] |
| Allgemeine Konfiguration: | | |
| Federwerkstoff: Standardwerkstoff | | [ ] |
| Gew.Anschl.Eintritt: Außengew. G 1", ISO228-1 (V50) | | [ ] |
| Gew.Anschl.Austritt: Innengew. G 1 1/2", ISO228-1 (V67) | | [ ] |
| Sonderausführungen abweichend zu allgemeiner Konfiguration: | | |

Prüferzeichen bei nicht i.O.

Datum bei nicht i.O.:

EXAMPLE / SPECIMEN

**Figure 7.1-1**




| | |
|---|---|
| **Figure 7.1-2:** Check the type number against the valve inspection plan / repair order | **Figure 7.1-3:** Check the BT plate / customer ID plate data against the valve inspection plan / repair order |

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7.2 Visual inspection of other items

7.2.1 Inspection of the paintwork

a) Valve is not completely painted

| **OK specimen:** | **Rejected specimen:** |
|---|---|
| <br>**Figure 7.2.1-1** | <br>**Figure 7.2.1-2** |

b) Paint coat is cracked (too much paint)

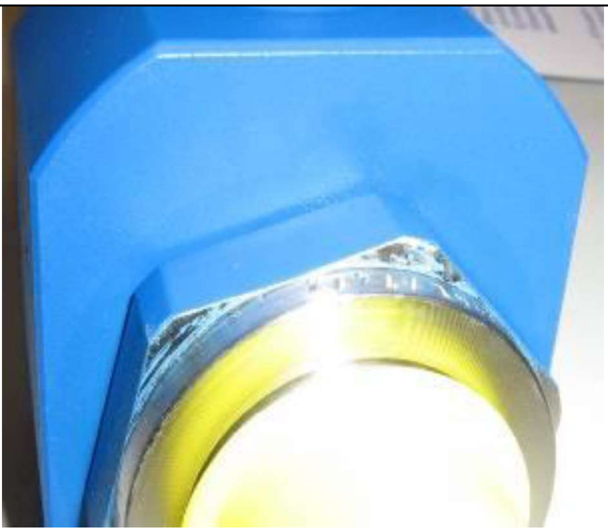
| **OK specimen:** | **Rejected specimen:** |
|---|---|
| <br>**Figure 7.2.1-3** | <br>**Figure 7.2.1-4** |

protected

c) Paint coat is not complete due to oil / grease

| **OK specimen:** | **Rejected specimen:** |
|---|---|
| <br>**Figure 7.2.1-5** | <br>**Figure 7.2.1-6** |



| **OK specimen:** | **Rejected specimen:** |
|---|---|
| <br>**Figure 7.2.1-7** |  |

| | |
|---|---|
| | **Figure 7.2.1-8** |

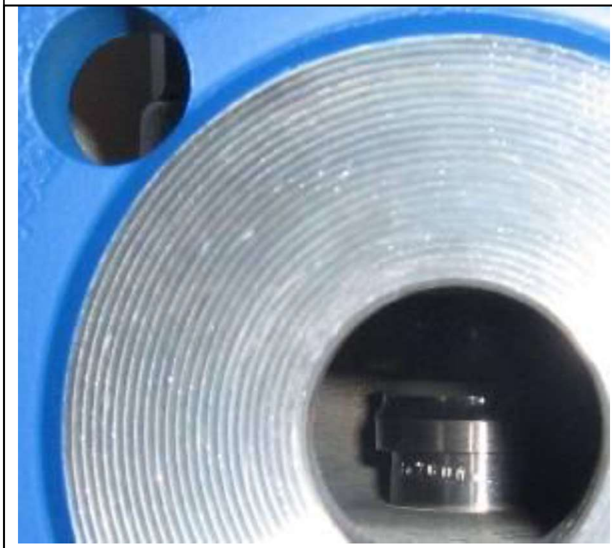
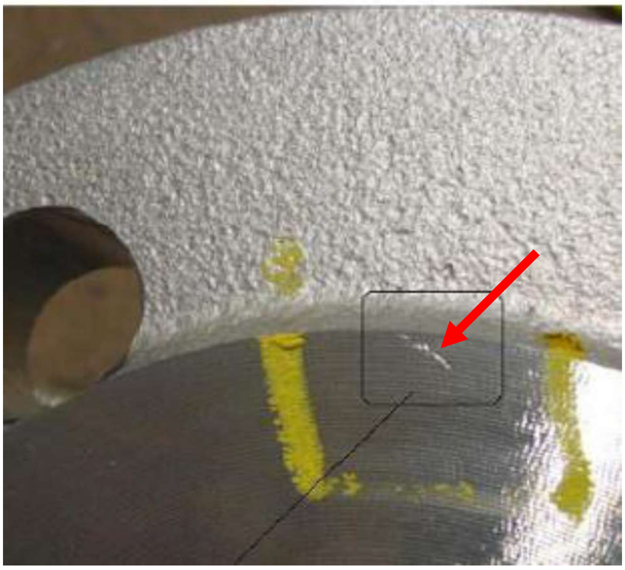
d) Paint on masked off areas

| **OK specimen:** | **Rejected specimen:** |
|---|---|
| <br>**Figure 7.2.1-9** | <br>**Figure 7.2.1-10** |

| **OK specimen:** | **Rejected specimen:** |
|---|---|
| <br>**Figure 7.2.1-11** | <br>**Figure 7.2.1-12** |

**Reason: The legibility of the plate is not guaranteed.**

### 7.2.2 Inspection of the sealing surfaces

| **OK specimen:** | **Rejected specimen:** |
|---|---|
| <br>**Figure 7.2.2-1** | <br>**Figure 7.2.2-2** |



### 7.2.3 Inspection of the seal

| **OK specimen:** | **Rejected specimen:** |
|---|---|
| <br>**Figure 7.2.3-1** | Seal is missing for sealed valves, or it is not crimped. |

If the result of the inspection is okay, then the safety valve is sent for packaging and shipment.

## 7.3 Fault notification process

- If the result of the inspection is not okay, then the fitting is sent to the fault notification process that is to be determined.
- The final inspection is performed again after completion of the fault notification process.

Content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## 1 Purpose

This LESER Global (LGS) describes professional application of the test procedures. It summarises the user information in a target-group-oriented manner.

## 2 Scope

This LGS applies to all members of the LESER quality cluster as defined in the global quality management manual.

## 3 References

LGS 0201, LGS 4430, LGS 4432, LGS 4433, LGS 4455, LGS 4431,

The standards that are taken into consideration and applied by LESER for testing for leaks are established in LGS 0201.
It also contains the

- standard requirements for functional seal tightness (seat seal tightness) as well as
- increased seal tightness requirements of the functional seal tightness (seat seal tightness) for
- gas-tight and non-gas-tight valves.

## 4 Introduction

# Performing Leak Tests

The instructions for leak testing presented here describe the leak tests that are used for:

- safety valves in a gas-tight design and
- safety valves in a non-gas-tight design

protected

**Information:**
Always keep the test manual
at the assembly test bench.
The manual must always be immediately available.

### 4.1 Improper use

Uses of the test equipment other than those given in this document are forbidden. Improper use may have adverse effects on the operation and consequently lead to inaccurate test results.

### 4.2 Informal measures

The operating manual must always be kept at the testing station and used in the event of any unclarity in the test procedure.

## 4.3 Operational materials and supplies

The operational materials and supplies given in the following must be ready for use in testing safety valves in a gas-tight and non-gas-tight design.

Leak detection spray
Material no.: 0161.0000


Fig. 1: Leak detection

Valve-specific test caps
Material no.: not yet defined

Fig. 2: Test caps

Valve-specific test plugs
Material no.: 0172.0001

Fig. 3: Test plugs

Bubble counting unit (Kellog Tester)
Material no.: 0172.0001

Fig. 4: Bubble counting

Accessories for threaded valves
Material no.: 0151.0002

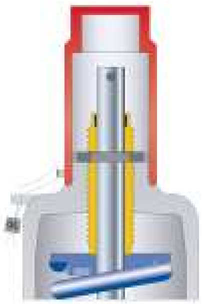
Fig. 5: Accessories

Water expansion kit
Material no.: 0171.0001

Fig. 6: Water expansion kit

## 5 Distinguishing features of valve designs

### 5.1 Safety valves in a gas-tight design

| Flanged valves | | |
|---|---|---|
| Closed bonnet | Closed lever (H4) | Closed lever (H2) |
|  |  |  |

| Threaded valves |
|---|
|  |



### 5.2 Safety valves in a non-gas-tight design

| Flanged valves | |
|---|---|
| Open bonnet | Open lever (H3) |
|  |  |

| disclosure cat.: | II | proofread: | Kuw | published date: | 8/31/11 | effect. date: | 10/11 |
|---|---|---|---|---|---|---|---|
| author: | Kro | released by: | KUW | replaces: | 369-34 | status: | published |
| resp. depart.: | PP | date of release: | 9/15/11 | revision No.: | 0 | | |
| doc. type: | LGS | change rep. No.: | 00882A | retention period: | 10y. | | |

## 6 Test description

### 6.1 Safety valves in a gas-tight design

#### 6.1.1 Flanged valves

**1.**

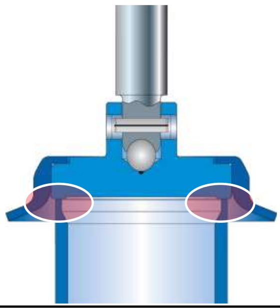
**Valve assembly:**
The safety valve is assembled and adjusted to the set pressure (see assembly documentation)

- LWN 369.30
- LWN 369.32
- LWN 369.33

**2.**

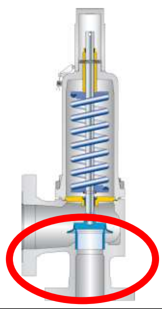
**Testing of the functional seal tightness (seat seal tightness):**

- Testing of functional seal tightness with air
- Testing of functional seal tightness with water



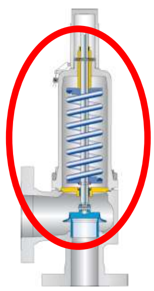
**3.**

**Testing of the body seal:**
Testing of body seal tightness with air and application of a test liquid



**4.**

**Testing of the back seal:**
Testing of the interconnection points and the entire outlet area with the aid of air and by application of a test liquid.



## 1. Valve assembly:

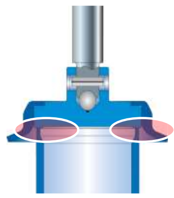
The valve must be assembled according to the assembly documentation.

- LGS 4430
- LGS 4432
- LGS 4433

Fig. 7: API gas-tight



## 2. Testing of the functional seal tightness with air and water:



**Test data for testing the functional seal tightness with air:**
The following test data must be observed when testing the functional seal tightness with gas-tight valves.

| | **Test data** |
|---|---|
| Test characteristic | Seal tightness between the seat and disc |
| Testing standard | Number of bubbles per second, see LGS 0201, Attachment 1-3 |
| Testing depth | Every safety valve, 100% testing |
| Test medium | Air |
| Test pressure | 90% of set pressure |
| Testing device | Bubble counting unit |
| Length of test | Settling time of at least 10 seconds + testing time of 10 seconds |

**Test data for testing the functional seal tightness with water:**
The following test data must be observed when testing the functional seal tightness with gas-tight valves.

| | **Test data** |
|---|---|
| Test characteristic | Seal tightness between the seat and disc |
| Testing standard | Leak volume [cm³/min.] depending on the nominal diameter, see LGS 0201, TABLE 3 |
| Testing depth | Only at the request of the customer |
| Test medium | Water |
| Test pressure | 90% of set pressure |
| Testing device | Water expansion kit, LGS 4455 |

**Auxiliary materials:**


| | | | | | | | |
|---|---|---|---|---|---|---|---|
| disclosure cat.: | II | proofread: | Kuw | published date: | 8/31/11 | effect. date: | 10/11 |
| author: | Kro | released by: | KUW | replaces: | 369-34 | status: | published |
| resp. depart.: | PP | date of release: | 9/15/11 | revision No.: | 0 | | |
| doc. type: | LGS | change rep. No.: | 00882A | retention period: | 10y. | | |

The following auxiliary materials must be available when testing the functional seal tightness.

| **Auxiliary material** | **Material no.** |
|---|---|
| Valve-specific test caps | not yet defined |
| Valve-specific test plugs | 0172.0001 |
| Bubble counting unit (Kellog tester) | 0172.0001 |
| Water expansion kit<br>(on customer request) | 0171.0001 |

*__Note:__*
Tests with water are only permissible if the functional operation of the safety valve will not be adversely affected. A qualitative assessment of the leak volume as per LGS 0201 Table 3 cannot be conducted in a technically reasonable way.

If a quantitative statement is requested (leak rate) on the functional seal tightness for safety valves that must be set with water, then the functional seal tightness of the valves will be tested with air after finishing the adjustment of the set pressure.

Testing of the functional seal tightness with water can only represent a quantitative statement.

## Testing of functional seal tightness with air

**Operations:**

a) The inlet side of the safety valve must be vertically attached to the chuck.

⚠ Clean sealing surfaces are a basic requirement for accurate measurement results.

Fig. 8: Clamped on valve

b) Select the correct test cap and then install the gas-tight test cap on the bonnet.

⚠ Tighten the test cap finger-tight. No test air may escape.

Fig. 9: Select the test cap

c) Select a tapered end-plug to fit the outlet and insert the test plug in the outlet flange of the safety valve.

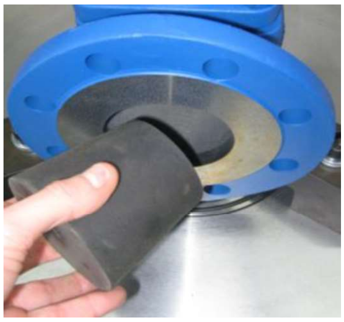


Fig. 10: Install the test plug

d) Trigger the safety valve once. Then lower the pressure by 10% of the set pressure, or more precisely, by 0.35 bar (5.08 psi) for set pressures ≤3.5 bar (50.76 psi).

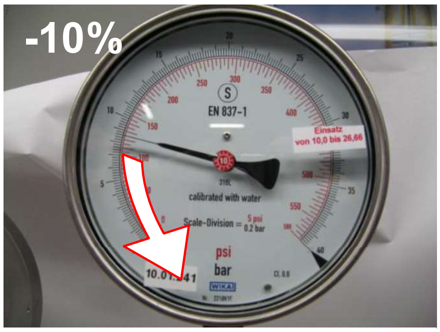



Fig. 11: Test pressure reduction

e) If the pressure has been set as described, then place the hose of the bubble counting device on the already-installed end plug.

⚠ No test air may escape from the connection.

Fig. 12: Installation of the test hose

f) First, switch on the test lighting in the bubble counting device. Then count the bubbles per minute as per LWN 220.01.

⚠ Allow a settling time of 10 seconds before counting the bubbles.

The number of air bubbles that are determined must be less than or equal to the tolerance specification (LWN 220.01, Appendix 1-3).

***Test passed:***
If the number of bubbles is less than or equal to the specification, then the test has been passed.

***Test not passed:***
If the number of bubbles is greater than the specification in LWN 220.01 Appendix 1-3, then then test has not been passed. In this case, the valve will be reworked
(see Reworking 369.37) and the test performed again.

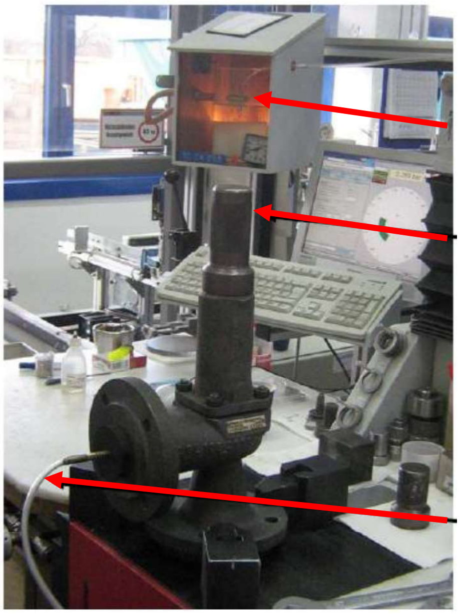


Fig. 13 Test setup

protected

## Testing of functional seal tightness with water

Fig. 14: Clamping on the valve

**Operations:**

a) The inlet side of the safety valve must be vertically attached to the chuck.

Clean sealing surfaces are a basic requirement for accurate measurement results.

Fig. 15: Water expansion kit

b) Pressure must be applied to the safety valve with the help of the water expansion kit (see LWN 369.55) and caused to trigger one time.

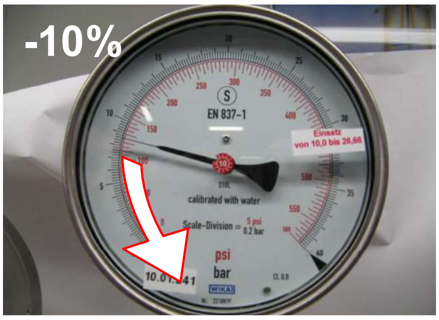



Fig .16: Pressure reduction by 10%

c) Then lower the pressure by 10% of the set pressure, or more precisely by 0.35 bar (5.08 psi) for set pressures ≤3.5 bar (50.76 psi).

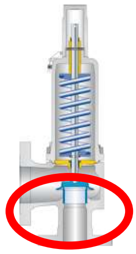
d) After a settling time of 10 seconds, a qualitative assessment of the leak volume must be performed as per LWN 220-01.

A quantitative assessment of the leak volume cannot be conducted in a technically reasonable way.

An additional test of functional seal tightness with air is necessary.

Fig .17: Functional seal tightness with water

## 3. Testing body seal tightness:



**Test data:**
The following test data must be observed when testing the seal tightness of the pressure-bearing body.

| | **Test data** |
|---|---|
| Test characteristic | Testing the body seal tightness |
| Testing standard | The valve must not have any visual signs of leaks |
| Testing depth | Every safety valve with a cast body and a rolled-in seat, 100% testing |
| Test medium | Air |
| Test pressure | The test pressure is 6 bar (87.02 psi) |
| Testing device | Application of test liquid |
| Length of test | Settling time of at least 10 seconds +<br>15 seconds up to DN 50<br>60 seconds up to DN 200<br>180 seconds above DN 200 |

**Auxiliary materials:**
The following auxiliary materials must be provided when testing the body seal tightness.

| **Auxiliary material** | **Material no.** |
|---|---|
| Leak detection spray | 0161.0000 |

**Operations:**

a) The inlet side of the safety valve must be vertically attached to the chuck.

Fig. 18: Clamped on valve

⚠ Clean sealing surfaces are the basic requirement for accurate measurement results.

b) Apply test pressure of 6 bar (87.02) psi to the safety valve.

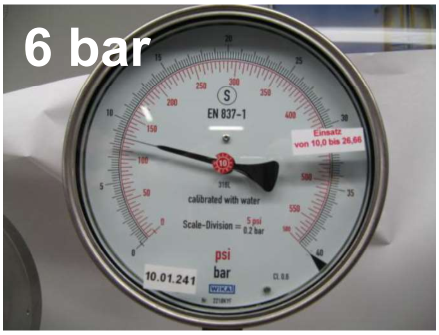



Fig. 19: Test pressure 6 bar

c) When the test pressure of 6 bar (87.02 psi) is reached, spray the body with test liquid on the inlet side between the markings (see Figure 19).

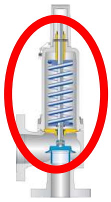
⚠ Allow a settling time of 10 seconds before the test.

***Test passed:***
If there is no foam formation on the body, then the test has been passed.

***Test not passed:***
If there is foam formation on the body, then the test has not been passed.
If it is possible to repair the damage, then the test must be conducted again.

Fig. 20: Testing zone

## 4. Testing of the back seal:



**Test data:**
The following test data must be observed when testing the back seal.

| | **Test data** |
|---|---|
| Test characteristic | Testing of the seal tightness of the valve on the outlet side |
| Testing standard | The valve must not have any visual signs of leaks |
| Testing depth | Every safety valve with a gas-tight design, 100% testing |
| Test medium | Air |
| Test pressure | 6 bar (87.02 psi) |
| Testing device | Application of test liquid |
| Length of test | Settling time of at least 10 seconds +<br>15 seconds up to DN 200<br>30 seconds above DN 200 |



**Auxiliary materials:**
The following auxiliary materials must be provided when testing the back seal.

| **Auxiliary material** | **Material no.** |
|---|---|
| Leak detection spray | 0161.0000 |

**Operations:**

a) The outlet side of the safety valve must be attached to the chuck.

Fig.: 21: Clamping on the valve

Clean sealing surfaces are the basic requirement for accurate measurement results.

b) Apply test pressure of 6 bar (87.02) psi to the safety valve with the help of the hand-wheel needle valves.


Fig. 22: Test pressure 6 bar

c) When the test pressure of 6 bar (87.02 psi) is reached, spray the body with test liquid on the outlet side between the markings (see Figure 23).

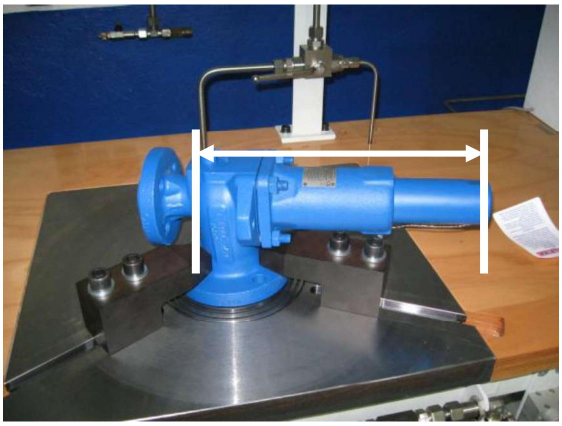


Fig. 23: Testing zone

Allow a settling time of 10 seconds before testing.

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***Test passed:***
If there is no foam formation on the surface of the valve, then the test has been passed.

***Test not passed:***
If there is foam formation on the surface of the valve, then the test has not been passed.

If it is possible to repair the damage, then the test must be conducted again.

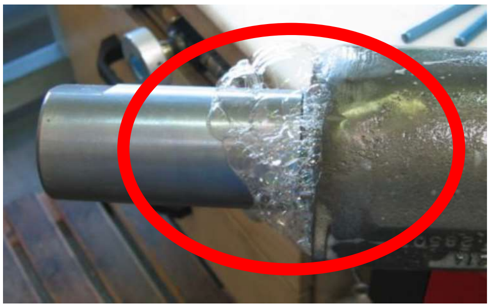
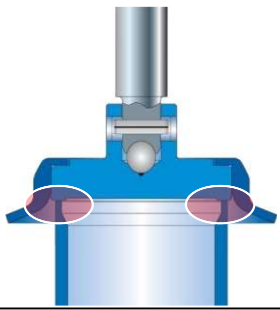
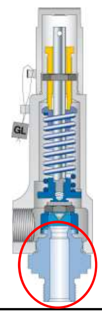
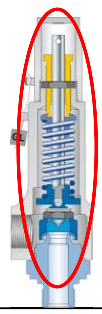


Fig. 24: Foam formation

### 6.1.2 Threaded valves

| | | |
|---|---|---|
| **1.** | **Valve assembly:**<br>The safety valve is assembled and adjusted to the set pressure (see assembly documentation)<br>• LWN 369.31 |  |
| **2.** | **Testing of functional seal tightness (seat seal tightness):**<br>• Testing of the functional seal tightness with air<br>• Testing of the functional seal tightness with water |  |
| **3.** | **Testing body seal tightness:**<br>Testing of the body seal tightness with air and application of testing liquid |  |
| **4.** | **Testing of the back seal:**<br>Testing of the interconnection points and the entire outlet area with the help of air and by applying test liquid. |  |

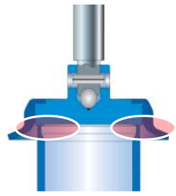
## 1. Valve assembly:

The valve must be assembled according to the assembly documentation.

- LGS 4431

Fig. 30: CP valve

## 2. Testing of functional seal tightness with air and water:



**Test data for testing functional seal tightness with air:**
The following test data must be observed when testing the functional seal tightness with gas-tight valves.

| | **Test data** |
|---|---|
| Test characteristic | Seal tightness between the seat and disc |
| Testing standard | Number of bubbles per second, see LGS 0201, Attachment 1-3 |
| Testing depth | Every safety valve, 100% testing |
| Test medium | Air |
| Test pressure | 90% of set pressure |
| Testing device | Bubble counting unit |
| Length of test | Settling time of at least 10 seconds + testing time of 10 seconds |

**Test data for testing functional seal tightness with water:**
The following test data must be observed when testing the functional seal tightness with gas-tight valves.

| | **Test data** |
|---|---|
| Test characteristic | Seal tightness between the seat and disc |
| Testing standard | Leak volume [cm³/min.] depending on the nominal diameter, see LGS 0201, TABLE 3 |
| Testing depth | Only at the request of the customer |
| Test medium | Water |
| Test pressure | 90% of set pressure |
| Testing device | Water expansion kit, LGS 4455 |

**Auxiliary materials:**
The following auxiliary materials must be provided when testing the seal tightness of the seat for threaded valves.

| Auxiliary material | Material no. |
|---|---|
| Valve-specific test plugs | 0172.0001 |
| Accessories for threaded valves | 0151.0002 |
| Bubble counting unit (Kellog tester) | 0172.0001 |
| Water expansion kit (on customer request) | 0171.0001 |



*Note:*
Tests with water are only permissible if the functional operation of the safety valve will not be adversely affected. A quantitative assessment of the leak volume as per LGS 0201 Table 3 cannot be conducted in a technically reasonable way.

If a quantitative statement is requested (leak rate) on the functional seal tightness for safety valves that must be set with water, then the functional seal tightness of the valves will be tested with air after finishing the adjustment of the set pressure.

Testing of the functional seal tightness with water can only represent a quantitative statement.

**Testing of functional seal tightness with air:**

**Operations:**

Fig. 32: Clamping the valve in the clamping device

a) The inlet side of the safety valve must be vertically attached to the clamping device (see LWN 0121.0001).

Clean sealing surfaces are a basic requirement for accurate measurement results.

Fig. 33: Clamping on the Manual Basic Test Bench

b) If the test is performed on the Manual Basic Test Bench, then the valve must be attached to the test bench with the help of the accessories for threaded valves (material no.: 0151.0002) as shown in Figure 33.

Clean sealing surfaces are a basic requirement for accurate measurement results.

c) Select a tapered end-plug to fit the outlet and insert the test plug in the outlet flange of the safety valve.

Fig. 34: Inserting the test plug

d) Trigger the safety valve to trigger once. Then lower the pressure by 10% of the set pressure, or more precisely, by 0.35 bar (5.08 psi) for set pressures ≤3.5 bar (50.76 psi).

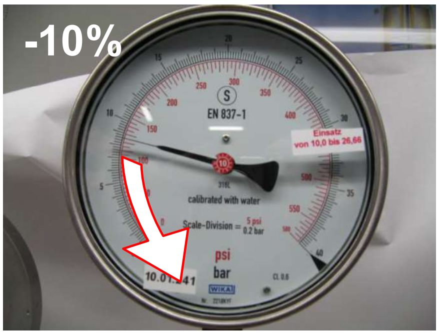



Fig. 35: Pressure reduction by 10%

e) If the pressure has been set as described, then place the hose of the bubble counting device on the already installed end-plug.

Fig. 36: Mounting the bubble hose

No test air may escape from the connection.

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f) First, switch on the test lighting in the bubble counting device. Then count the bubbles per minute as per LWN 220.01.

Allow a settling time of 10 seconds before counting the bubbles.

The number of air bubbles that are determined must be less than or equal to the tolerance specification (LWN 220.01).

***Test passed:***
If the number of bubbles is less than or equal to the tolerance specification, the the test has been passed.

***Test not passed:***
If the number of bubbles is greater than the tolerance specification, then the test has not been passed. In this case, the valve will be reworked (see LWN 369.37) and the test performed again.

Fig. 37: Counting bubbles

**Testing of the functional seal tightness with water:**

**Operations:**

a) The inlet side of the safety valve must be attached to the testing device with the help of the additional screw connections (material no. 0151.0002). To do this, the respective thread adapter must be first screwed on.

Clean sealing surfaces are a basic requirement for accurate measurement results.

Fig. 38: Thread adapter

Fig. 39: Fixing the base unit in position

b) In addition, the base unit of the accessories for threaded valves (material no. 0151.0002) must be attached to the test bench.

Fig. 40: Screwing in the valve

c) The safety valve must be attached to the base unit with the adapter.

d) Pressure must be applied to the safety valve with the help of the water expansion kit (see LWN 369.55) and caused to trigger one time.

Fig. 43: Water expansion kit



e) Then lower the pressure by 10% of the set pressure, or more precisely, by 0.35 bar (5.08 psi) for set pressures ≤3.5 bar (50.76 psi).

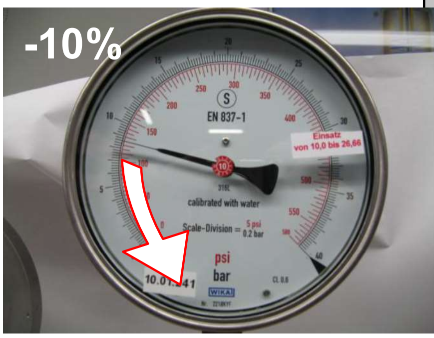



Fig .44: Pressure reduction by 10%

f) After a settling time of 10 seconds, a qualitative assessment of the leak volume must be performed as per LWN 220-01.

A quantitative assessment of the leak volume cannot be conducted in a technically reasonable way.

An additional test of the functional seal tightness with air is necessary.

Fig .45: Functional seal tightness with water

## 3. Testing body seal tightness:

**Test data:**
The following test data must be observed when testing the body seal tightness.

| | **Test data** |
|---|---|
| Test characteristic | Testing of the seal tightness of the pressure-bearing body |
| Testing standard | The body must not have any visual signs of leaks |
| Testing depth | Every safety valve with a cast body and a rolled-in seat, 100% testing |
| Test medium | Air |
| Test pressure | 6 bar (87.02 psi) |
| Testing device | Application of test liquid |
| Length of test | Settling time of at least 10 seconds + |

protected

**Auxiliary materials:**
The following auxiliary materials must be provided when testing the seal tightness of the pressure-bearing body for threaded valves.

| **Auxiliary material** | **Material no.** |
|---|---|
| Leak detection spray | 0161.0000 |
| Accessories for threaded valves | 0151.0002 |

**Operations:**

Fig. 46: Clamping the valve in the clamping device

a) The inlet side of the safety valve must be vertically attached to the clamping device.

Clean sealing surfaces are a basic requirement for accurate measurement results.

Fig. 47: Clamping on the Manual Basic Test Bench

b) If the test is performed on the Manual Basic Test Bench, then the valve must be attached to the test bench with the help of the accessories for threaded valves (material no.: 0151.0002) as shown in Figure 47.

Clean sealing surfaces are a basic requirement for accurate measurement results.

c) Apply test pressure of 6 bar (87.02) psi to the safety valve.


Fig. 48: Test pressure 6 bar

d) When the test pressure of 6 bar (87.02 psi) is reached, spray the body with test liquid on the inlet side between the markings (see Figure 49).

Fig. 49: Testing zone

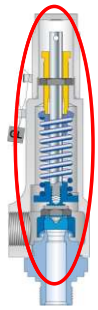
Allow a settling time of 10 seconds before the test.

***Test passed:***
If there is no foam formation on the body, then the test has been passed.

***Test not passed:***
If there is foam formation on the body, then the test has not been passed.
If it is possible to repair the damage, then the test must be conducted again.

Fig. 51: Bubble formation

## 4. Testing of the back seal:



**Test data:**
The following test data must be observed when testing the back seal.

**Test data**

| | |
|---|---|
| Test characteristic | Testing of the seal tightness of the valve on the outlet side |
| Testing standard | The valve must not have any visual signs of leaks |
| Testing depth | Every safety valve with a gas-tight design, 100% testing |
| Test medium | Air |
| Test pressure | 6 bar (87.02 psi) |
| Testing device | Application of test liquid |
| Length of test | Settling time of at least 10 seconds +<br>15 seconds up to DN 200<br>30 seconds above DN 200 |



**Auxiliary materials:**
The following auxiliary materials must be provided when testing the back seal.

| **Auxiliary material** | **Material no.** |
|---|---|
| Leak detection spray | 0161.0000 |
| Thread adapter<br>(Only for the Manual Basic Test Bench) | 0151.0002 |

a) The outlet side of the safety valve must be attached to the testing device with the help of the additional screw connections. To do this, the respective thread adapter must be screwed on first.

Fig. 52: Screw in the thread adapter

Clean sealing surfaces are a basic requirement for accurate measurement results.

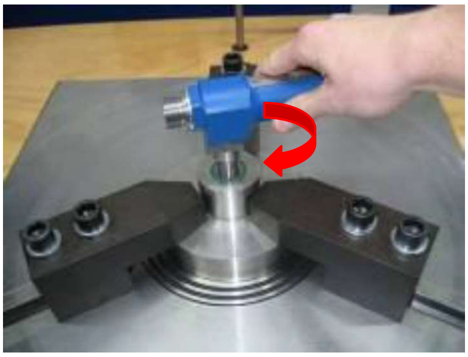


Fig. 53: Screw the valve into the adapter

b) In addition, the base unit must be attached to the test bench. The safety valve must be attached to the base unit with the adapter.

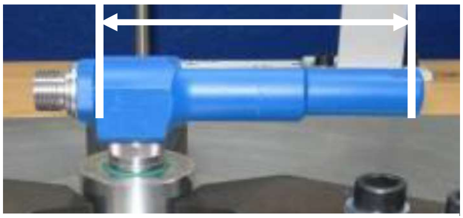


Fig. 54: marked testing zone

c) The testing zone is marked in colour (see Figure 54)

d) Test the marked zone with leak detection spray.

Fig. 55: Applying the leak detection spray



e) Count the bubbles per minute according to LWN 220.01.

Allow a settling time of 10 seconds before counting the bubbles.

***Test passed:***
If there is no foam formation on the body, then test has been passed.

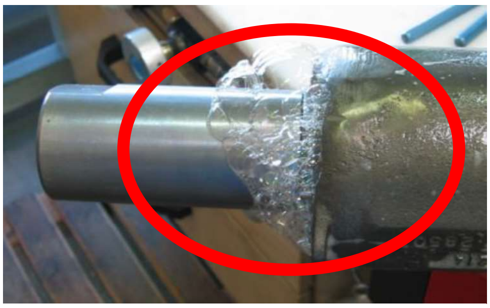
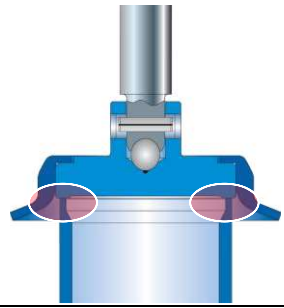
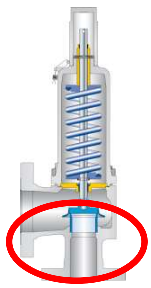


Fig. 56: Foam formation

***Test not passed:***
If there is foam formation on the body, then test has not been passed.
If it is possible to repair the damage, then the test must be conducted again.

## 6.2 Safety valves in a non-gas-tight design:

### 6.2.1 Flanged valves

| | | |
|---|---|---|
| **1.** | **Valve assembly:**<br>The safety valve is assembled and adjusted to the set pressure (see assembly documentation)<br>• LWN 369.30<br>• LWN 369.32<br>• LWN 369.33 |  |
| **2.** | **Testing of the functional seal tightness:**<br>Testing of the functional seal tightness with air and application of testing liquid |  |
| **3.** | **Testing the body seal tightness:**<br>Testing of the body seal tightness with air and application of testing liquid |  |

## 1. Valve assembly:

The valve must be assembled according to the assembly documentation.

- LGS 4430
- LGS 4432
- LGS 4433

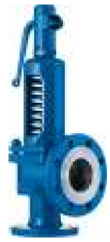
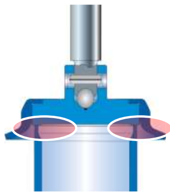


Fig. 58: API non-gas-tight



## 2. Testing of functional seal tightness:

**Test data:**
The following test data must be observed when testing functional seal tightness with non-gas-tight valves.

| | Test data |
|---|---|
| Test characteristic | Seal tightness between the seat and disc |
| Testing standard | The blow-hole at the outlet must not extend more than 5mm |
| Testing depth | Every safety valve, 100% testing |
| Test medium | Air |
| Test pressure | 90% of set pressure |
| Testing device | Application of test liquid |
| Length of test | Settling time of at least 10 seconds + testing time of 5 seconds |

**Auxiliary materials:**
The following auxiliary materials must be provided when testing the functional seal tightness of non-gas-tight valves.

| Auxiliary material | Material no. |
|---|---|
| Valve-specific test plugs | 0172.0001 |
| Leak detection spray | 0161.0000 |

**Operations:**

a) The outlet side of the safety valve must be attached to the chuck.

Fig. 59: Clamped on valve

⚠ Clean sealing surfaces are a basic requirement for accurate measurement results.



b) Apply test pressure of 6 bar (87.02) psi to the safety valve.


Fig. 60: Test pressure 6 bar

c) When the test pressure of 6 bar (87.02 psi) is reached, put the rubber test plug in the outlet flange.

Fig. 61: Inserting the test plug

d) The opening of the test plug must be sprayed with leak detection liquid.

Fig.62: Application of the leak detection liquid

The extension of the blow-out must be observed for 10 seconds.

***Test passed:***
If the blow-out remains as it is and does not burst, then the test is considered to have passed.

***Test not passed:***
If the blow-out projects more than 5 mm or bursts, then the test is considered to have failed. If it possible to repair the damage, then the test must be conducted again.

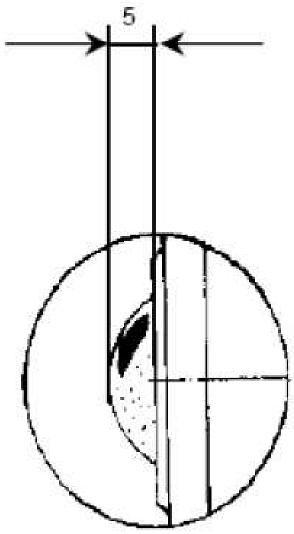



Fig. 63: Blow-out extension

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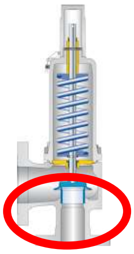
## 3. Testing body seal tightness:



**Test data:**
The following test data must be observed when testing the body seal tightness.

| | Test data |
|---|---|
| Test characteristic | Testing of the seal tightness of the pressure-bearing body |
| Testing standard | The body must not have any visual signs of leaks |
| Testing depth | Every safety valve with a cast body and a rolled-in seat, 100% testing |
| Test medium | Air |
| Test pressure | A test pressure must be chosen that is slightly lower than the set pressure. |
| Testing device | Application of test liquid |
| Length of test | Settling time of at least 10 seconds +<br>15 seconds up to DN 50<br>60 seconds up to DN 200<br>180 seconds above DN 200 |

**Auxiliary materials:**
The following auxiliary materials must be provided when testing body seal tightness for non-gas-tight valves.

| Auxiliary material | Material no. |
|---|---|
| Leak detection spray | 0161.0000 |




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| disclosure cat.: | II | proofread: | Kuw | published date: | 8/31/11 | effect. date: | 10/11 |
| author: | Kro | released by: | KUW | replaces: | 369-34 | status: | published |
| resp. depart.: | PP | date of release: | 9/15/11 | revision No.: | 0 | | |
| doc. type: | LGS | change rep. No.: | 00882A | retention period: | 10y. | | |

**Operations:**

a) The inlet side of the safety valve must be vertically attached to the chuck.

Fig. 64: Clamped on valve

⚠ Clean sealing surfaces are the basic requirement for accurate measurement results.

b) Apply test pressure of 6 bar (87.02) psi to the safety valve.


Fig. 65: Test pressure 6 bar

c) When the test pressure of 6 bar (87.02 psi) is reached, spray the body with test liquid on the inlet side between the markings (see Figure 65).

⚠ Allow a settling time of 10 seconds before the test.

***Test passed:***
If there is no foam formation on the body, then the test has been passed.

***Test not passed:***
If there is foam formation on the body, then the test has not been passed. If it is possible to repair the damage, then the test must be conducted again.

Fig. 48  Body with market testing zone

Content

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**2 Application advices ........................................................ 2**
**3 Assembly and maintenance Instructions .................................. 2**
**4 Relationship of spare part kits and safety valves ......................... 2**
**5 Sample spare part kit ........................................................ 2**



## 1 Scope

This document supports the use of a spare part kit for LESER pilot operated safety valves.

## 2 Application advices

This spare part kit provides all spare parts which are recommended by LESER to be replaced during rework of a safety valve. LESER proposes to replace those parts generally – independent on the respective condition of the old part, because:

- best possible performance of the reworked safety valve is ensured
- maintenance time is reduced due to omitted testing of old parts
- easy warehouse-handling of the complete kit instead of single parts

Depending on the condition, further components of the valve may have to be replaced.

## 3 Assembly and maintenance Instructions

For assembly and maintenance instructions please refer to the LESER website www.leser.com under “Maintenance”.

## 4 Relationship of spare part kits and safety valves

Article numbers of spare part kits for pilot valves and other valve sizes or pressure ratings can be found in the LESER pricelist.

LESER Spare part Kits LID number:

LID_DE 3700.30 – LID_DE 3700.65

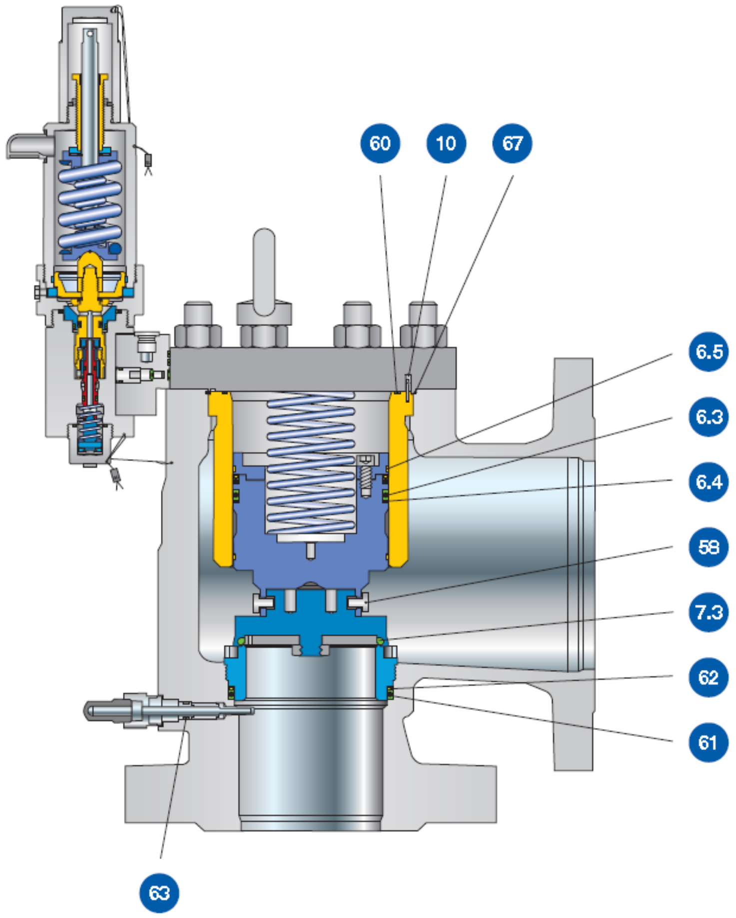


## 5 Sample spare part kit

Main valve 1½”x3”with FFKM soft sealing flange rating class (inlet) 150-600

## 5.1 Kit components and sectional drawing of the assembly

The position of the components is illustrated in the following picture:




| Item | Component | Size [mm] | Material | Material-No. | Qty. | Photo |
|---|---|---|---|---|---|---|

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| | | | | | | |
|---|---|---|---|---|---|---|
| 6.3 | O-ring | L 34.52 x 3.53 | FFKM | 502.0345.3591 | 1 |  |
| 7.3 | O-ring | L 34.52 x 3.53 | FFKM | 502.0345.3591 | 1 | |
| 60 | O-ring, inner top plate seal | L 50.47 x 2.62 | FFKM | 502.0504.2691 | 1 | |
| 61 | O-ring, seat seal | L 44.04x3.53 | FFKM | 502.0440.3591 | 1 | |
| 63 | O-ring, pilot tube | L 9.19x2.62 | FFKM | 502.0091.2691 | 1 | |
| 67 | O-ring, outer top plate seal | L 72.69 x 2.62 | FFKM | 502.0726.2691 | 1 | |
| 6.4 | Backup ring | 42 x 3,00 x 0,70 | PTFE | 493.0305.0000 | 1 |  |
| 6.5 | Guide ring | d= 42 | PTFE- carbon filler | 498.0206.0000 | 2 |  |
| 10 | Parallel pin | 2x16 | 1.4310 | 480.0305.0000 | 1 |  |
| 58 | Screw | M5x10 | 1.4301 | 451.0316.0000 | 2 |  |
| 62 | Backup ring | 51 x 2,85 x 0,70 | PTFE | 493.1805.0000 | 1 |  |

## 5.2 Lubricants

| Item | Component | Size [mm] | Material | Material-No. | Qty. | Photo |
|---|---|---|---|---|---|---|
| General application – small packaging | | | | | | |
| | Lubricant | 22 x 47 | Molykote D | 333.0660.0001 | 1 |  |
| | Lubricant oil | 22 x 61 | Halocarbon oil 56S | 333.0660.0016 | 1 |  |
| General application – large packaging | | | | | | |
| | Lubricant | | Molykote D | 596.0094.0000 | 1kg |  |
| | Lubricant oil | | Halocarbon oil 56S | 596.0110.0000 | 2kg |  |
| Oxygen / Oil & grease free application – in Preparation. | | | | | | |

Please refer to producer-websites for additional information (handling instruction, technical data sheet, safety data sheet etc.):

Molykote: [https://www.dupont.com](https://www.dupont.com)
Halocarbon: [https://www.halocarbon.com](https://www.halocarbon.com)

### 6.2.13 Storage and Handling of Safety Valves

"Because cleanliness is essential to the satisfactory operation and tightness of a safety valve, precautions should be taken to keep out all foreign materials during storage or transportation. Safety valves should be closed off properly at both inlet and outlet flanges. Specific care should be taken to keep the valve inlet absolutely clean.
If possible, safety valves should be stored indoors, on pallets, and away from dirt and other forms of contamination.
Safety valves should be handled with care and should not be subjected to shock. Otherwise, considerable internal damage or misalignment can occur and seat tightness may be adversely affected."[7)]
Depending on the size and weight of the safety valve, the quantity of safety valves in one shipment, and the shipping method, LESER offers different types of packing (see LWN 617.08), e.g.:

Individual safety valve in a cardboard box (Figure 6.2.13-1)
Tied-down on a pallet (Figure 6.2.13-2)
Cardboard or wooden crate (Figure 6.2.13-3)

*Figure 6.2.13-1: Individual cardboard box*

*Figure 6.2.13-2: Tied-down on a pallet*

*Figure 6.2.13-3 Wooden crate*

During storage until installation, safety valves should be kept in their own packaging. The advantages of the LESER types of packing are:

- Due to secure packaging, no damage during transport.
- Unpacking of safety valves before stocking is not necessary.
- Safety valves are protected against dust and dirt during storage.
- Easy and space-saving storage of safety valves on shelves or racking.
- Easy identification of the content from the outside via labels (Figure 6.2.13-4).

*Figure 6.2.13-4: Outside label on a cardboard box*

It is also possible to transport LESER Safety valves horizontally. The advantages of this kind of transportation are:

► requires little space
► less freight charge
► lower risk of damages in horizontal transport due to lower center of gravity

---

7) API RP 520 Part II, 5th Edition 2003, Sect. 12.2

## 6.2.12 Recommendation for Testing and Inspection during Operation

When and how often safety valves should be inspected is a frequently asked question. This question cannot be answered in general but has to be regarded for each application individually.

### 6.2.12.1 Inspection Intervals for LESER Safety Valves

Due to the individual operating conditions and in consideration of the different mediums, LESER gives no general reference for an inspection time interval.

In coordination between LESER, different operators, and the notified body, the following procedure has proven itself:

1. Determination of an ininitial inspection time interval:

In accordance with the operating conditions an initial interval of 24 month has proven itself. If the safety valve opens frequently or the medium is corrosive the inspection time interval should be 12 months.

2. Inspection of safety valves after this period of time:

- Set pressure repeat accuracy (this requirement is fulfilled if the set pressure corresponds to the test pressure with a tolerance of ± 3 %)
- Tightness test of the safety valve (this requirement is fulfilled if the tightness is tested according to API standard 527 or LWN 220.01)
- Testing of the mobility (this requirement is fulfilled if the safety valve can be opened with the lifting device at an operating pressure >75 % without the use of any additional tools).

3. Adapting the inspection time interval

The inspection time interval can be increased if the safety valve fulfills the requirements of the above mentioned tests. If not, the interval should be reduced to 12 months or less. In case the following inspection fulfills the requirements again the inspection interval can be lengthened by two month.

If the safety valve is leaking the inspection has to be done immediately.

### 6.2.12.2 Statements in Codes and Standards

Within the below stated codes and standards the following guidelines for inspection intervals for LESER safety valves are important:

API Recommended Practice 576, Inspection of Pressure-Relieving Devices
Chapter 6.4:
"The inspection of pressure-relieving devices provides data that can be evaluated to determine a safe and economical frequency of scheduled inspections. This frequency varies widely with the various operating conditions and environments to which relief devices are subjected. Inspections may usually be less frequent when operation is satisfactory and more frequent when corrosion, fouling, and leakage problems occur. Historical records reflecting periodic test results and service experiences for each relief device are valuable guides for establishing safe and economical inspection frequencies.
A definite time interval between inspections or tests should be established for every pressure-relieving device on operating equipment. Depending on operating experiences, this interval may vary from one installation to another. The time interval should be sufficiently firm to ensure that the inspection or test is made, but it should also be flexible enough to permit revision as justified by past test records."

In API 510, the subsection on pressure-relieving devices establishes a maximum interval between device inspections or tests of 10 years. It also indicates that the intervals between pressure relief device testing or inspection should be determined by the performance of the devices in the particular service concerned.

AD2000-Merkblatt A2: Safety Devices against excess pressure – Safety Valves
Chapter 4.7:
"Tests on the response pressure and checks on the smooth running of moving parts within the guides shall be carried out at regular intervals. The intervals for regular tests shall be stipulated by the user in accordance with the operating conditions, using as a basis the recommendations of the manufacturer and the relevant third party. These tests and checks shall be carried out at the latest on the occasion of the external or internal tests on the relevant pressure vessel."

Ordinance on Industrial Safety and Health – BetrSichV (Betriebssicherheitsverordnung).
Section 15 – Recurrent inspection
" (1) An installation subject to monitoring and its components shall be subjected to recurrent inspections in certain intervals by an approved body to ensure their proper condition with respect to its operation. The operator shall determine the inspection intervals of the entire installation and its components on the basis of a technical safety assessment..."

The following testing periods for category IV pressure equipment (including safety valves) are defined in section 15:

- External inspection: 2 Years
- Internal inspection: 5 Years
- Strength inspection: 10 Years

### 6.2.11 Testing and Inspection of Safety Valves before Installation

“The condition of all safety valves should be visually inspected before installation. Before installation all protective materials on the valve flanges have to be completely removed. Bonnet shipping plugs must be removed from balanced safety valves.”[6)]
API 520 Part II recommends that the inlet surface must be cleaned, since foreign materials clinging to the inside of the nozzle will be blown across the seats when the safety valve is operated. Some of these materials may damage the seats or get trapped between the seats in such a way that they cause leakage. Valves should be tested before installation to confirm their set pressure.

| |
|---|
| LESER Note:<br>Due to the LESER types of packing, LESER safety valves are delivered ready-to-install. As long as safety valves remain in the packing during storage, the safety valves do not need to be inspected, cleaned or tested before initial installation. For more details see the LESER operating instructions. |

[6)] API RP 520 Part II, 5th Edition 2003, Sect. 12.3

### 6.2.11.1 Pressure Test before Operation

Before a plant can be started up a hydraulic pressure test has to be performed. For this test all safety valves in the system must be prevented from opening.
Three different possibilities are feasible:

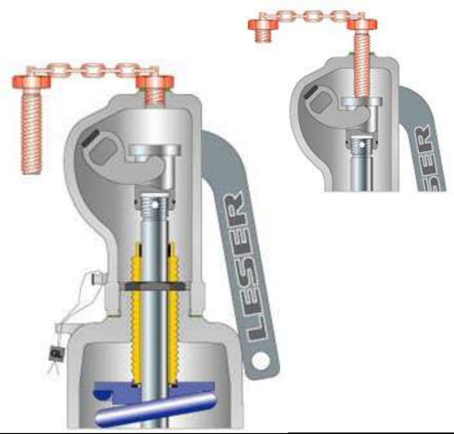
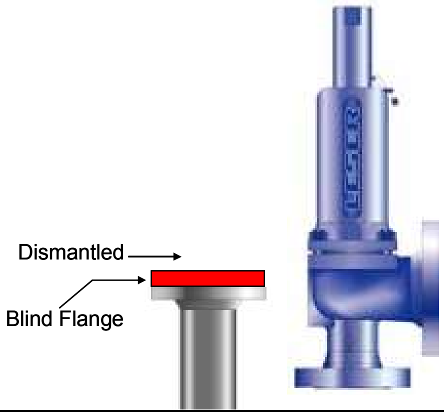
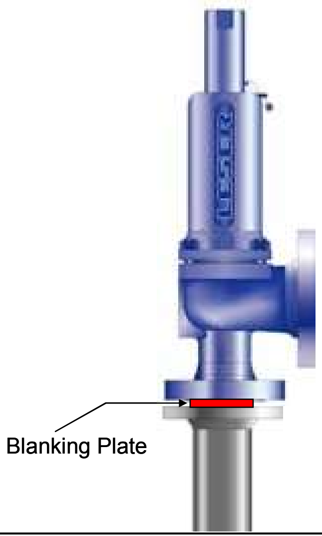
| Possibility | Figure | Description |
|---|---|---|
| Test gag |  | The test gag blocks the spindle and keeps the safety valve tight while the system pressure exceeds the set pressure.<br>Advantage: It is possible to perform pressure tests in a system without dismantling the safety valve.<br>After testing, the test gag must be removed! Otherwise the safety valve cannot protect the system against unallowable overpressure. |
| Blind flange |  | The safety valve is replaced by a blind flange for the duration of the pressure test. After testing the safety valve has to be reinstalled. |
| Blanking plate/<br>Isolation plate |  | To block the safety valve during a pressure test a blanking plate is placed between inlet pipe and safety valve.<br>After testing, the blanking plate must be removed! Otherwise the safety valve cannot protect the system against unallowable overpressure. |

*Table 6.2.11.1-1:Options for the hydraulic pressure test*