MAINTENANCE

Maintenance Handbook for LESER Product Group

Clean Service Series 48X

Introduction

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
- Trouble shooting

Contents

Chapter	Content	Sources
1.1 Introduction	Introduction and table of contents	LID 1003.03 “Introduction”
1.2 Maintenance Fundamentals	Terminology: - Parts - Set pressure - Overpressure & blowdown Critical parts: - Nozzle & disc - Spring - Adjusting ring - Parts providing alignment - Lifting devices	LID 1002.00 “Maintenance Fundamentals”
1.3 Repair process	-Process of Safety Valves to Repair -Repair Traveller	LGS 4111 “Process for Safety Valves to Repair” LGS 4112 “Repair Traveller”
1.4 Suggested equipment	Equipment for disassembly and lapping - Required equipment with technical information - Order numbers of LESER equipment - Equipment and materials	LGS 4459 “Clean Service_Tool-Kit Specifications” LGS 4456 “Standard Tool Specification“ LGS 4116 “Operating materials and supplies for repaired valves“
1.5 Disassembly and Cleaning	Disassembly instruction: - Step-by-step instruction for disassembly Cleaning instructions	LGS 4108 “Dismantling instructions for types 483, 484, 485, 488 “

Chapter	Content	Sources
		LGS 4105 “Dismantling instructions for types 437, 438, 439, **481** “ LGS 4115 “Cleaning repaired valves”
1.6 Rework of critical parts		The rework of critical parts like seat and disc does not apply to the Clean Service Series, because all Types have a soft seat disc.
1.7 Assembly	Assembly instruction: - Step-by-step instruction for assembly	LGS 4103 “Assembly instructions for types 483, 484, 485, 488” LGS 4100 “Assembly instructions for types 437, 438, 439, **481**”
	Torques: - Assembly torques for body-bonnet connection, caps, test gags, O-ring discs and bellows	LGS 3323 “Torques for screw, nuts and caps H2 / lifting devices” LGS 3325 “Torques ranges for O-ring-disc”
	After Assembly: - Color finishing and painting - Component plate	LGS 4114 Paint touch-up and painting repaired valves” LGS 4118 Component plates”
1.8 Spring charts	Spring charts: - Overview of spring ranges for set pressure adjustments and spring	LGS 3620 “Spring charts – type 481”

Chapter	Content	Sources
	selection in bar and psi	LGS 3621 “Spring charts – type 483“ LGS 3622 “Spring charts – type 484“ LGS 3623 “Spring charts – type 485” LGS 3624 “Spring charts – type 488”
1.9 Testing Procedures	Testing set pressure: - Procedures and equipment for setting and testing the cold differential test pressure, including tolerances	LDeS 1001.69 “CDTP-Cold differential test pressure”
	Leak testing: - Procedures and equipment for testing functional tightness (disc-nozzle connection) - Procedures and equipment for testing shell tightness (nozzle, cap)	LGS 4434 “Performing Leak Tests”
	Tightness requirements: - Seat tightness - Shell tightness - Back seat tightness	LGS 0201 “Tightness Test”
	Last visual check up	LGS 4117 “Final visual inspection of repaired valves“
1.10 Spare parts	Spare parts list	LWN 483.01 “Spare parts type 481” LWN 483.01 “Spare parts type 483” LWN 483.01

Chapter	Content	Sources
		"Spare parts type 484" LWN 483.01 "Spare parts type 485" LWN 483.01 "Spare parts type 488"
1.11 Installation & storage	Testing and inspection before installation: - visual inspection of the valve - 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"
1.12 Trouble shooting	Typical errors	Extract from LWN 765.01 "Typical Mistakes as a Result of Unauthorized Repair"

1 Maintenance Fundamentals

1.1 Introduction

This chapter deals with basic information considered as necessary for assembly and disassembly of LESER's safety valves. Fundamentals include:

- Parts description
- Definition of overpressure, blowdown and set pressure at LESER
- Explanation of relevant construction elements

1.2 Terminology

1.2.1 Parts Description acc. to ASME PTC 25

Item	Component	Description per ASME PTC 25 – Parts used by LESER
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).
5	**Nozzle**	A primary pressure- containing component in a safety valve that forms a part or the entire inlet flow passage.
5	**Seat**	The pressure-sealing surfaces of the fixed and moving pressure-containing components.
6	**Adjusting ring (blowdown ring)**	A ring assembled to the nozzle or guide of a direct spring valve, used to control the opening characteristics and/or the reseat pressure.
7	**Disc**	A moveable component of a pressure relief device that contains the primary pressure when it rests against the nozzle.
9	**Bonnet**	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	**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.
12	**Spindle (stem)**	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.
15	**Bellows**	A flexible pressure-containing component of a balanced direct spring valve used to prevent changes in set pressure when the valve is subject to superimposed back pressure, or to prevent corrosion between the disc holder and guide.
16/17	**Spring plate (spring step, -button, -washer)**	Or spring step: a load-transferring component in a safety valve that supports the spring.
18	**Adjustment screw**	A screw used to adjust the set pressure or the reseat pressure of a reclosing pressure relief device.
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.
40	**Lift lever**	A device to apply an external force to the stem of a pressure relief valve to manually operate the valve at some pressure below the set pressure
54	**Spring**	The element in a safety valve that provides the force to keep the disc on the nozzle.

Table 1: Parts description acc. to ASME PTC 25

The following parts are described in ASME PTC 25, but are not used in LESER safety valves.

Component	Description per ASME PTC 25	Not used in LESER safety valves, because
Disc holder	A moveable component in a pressure relief device that contains the disc	One piece spindle with different disc design, does not require a disc holder
Yoke	A pressure-retaining component in a pressure relief device that supports the spring in a pressure relief valve or pin in a non-reclosing device but does not enclose them from the surrounding ambient environment	Open bonnets are used for the same purpose.

Table 2: Parts description acc. to ASME PTC 25 – not contained in LESER safety valves

1.2.2 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.

1.2.3 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%.

1.2.4 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 are 4% to 15% for steam and gas and 20% to unlimited for liquids.

Figure 1 gives a graphical representation of the definitions.

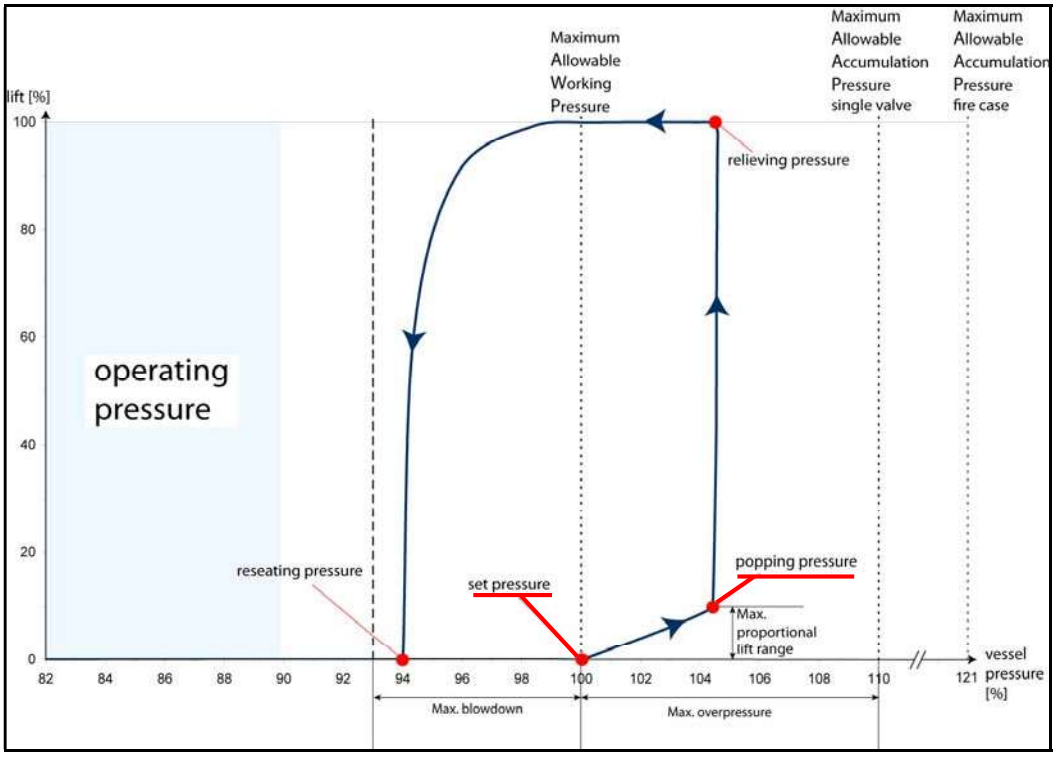


Figure 1: general characteristic of LESER safety valves for steam/gases acc. to ASME VIII

1.3 Critical parts

This chapter contains a description of critical parts influencing the operation characteristic. Emphasized were different disc and nozzle constructions, correct spring selection, positioning and function of the adjustment ring and parts which provide alignment.

1.3.1 Nozzle and disc

The geometry of nozzle and disc is critical to the valve operation. Small changes to the dimensions of these parts can change overpressure, blowdown and general valve operation significantly. Maintenance instructions include default dimensions of these parts in chapter rework of critical dimension. These diameters must be maintained when performing repair and maintenance work. Nozzle and disc also form the seat of the valve. The surface finish of the contact surfaces is critical for the tightness of the safety valve. For a metal to metal seat the contact surfaces are lapped for a specified tightness acc. to API 527 (see chapter rework of critical parts).

Table 3 provides differences between optional disc constructions of flanged and threaded valves.

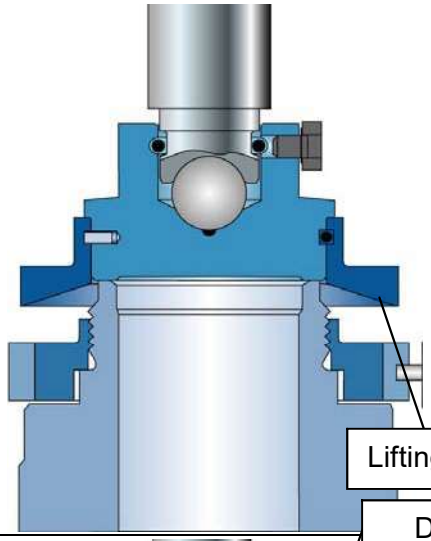
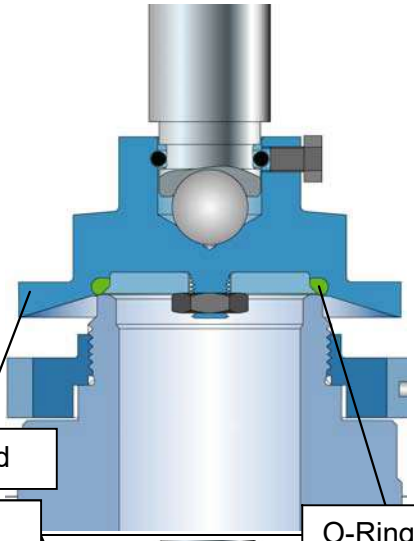
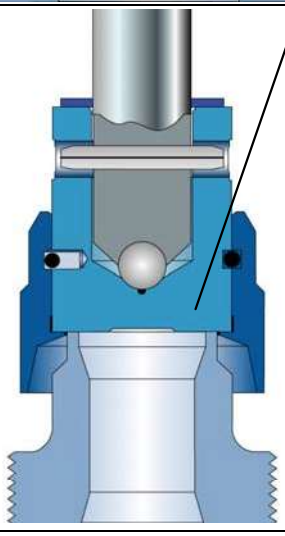
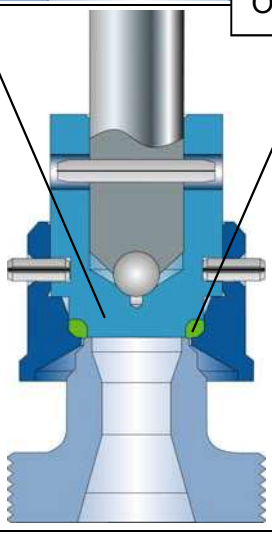
	Metal to metal seat	Soft seat – o-ring disc
Flanged valves (type 526)		
Threaded valves (type 459)		

Table 3: soft seat and metal to metal seat constructions of flanged and threaded valves

1.3.2 Spring

The closing force on the disc is applied by the compression of the spring. When the valve opens, a further compression of the spring must be achieved by the opening forces underneath the disc. The correct spring rate is critical to overpressure and blowdown of the valve. Each spring has a defined set pressure range. The spring charts (chapter 6: spring charts) of the manufacturer must be followed when readjusting or changing the set pressure of the safety valve.
The following table lists the potential consequences of using a spring for a set pressure outside of its range.

Condition	Consequences
Set pressure above spring range	- increased blowdown - risk of excessive spring compression with coils approaching each other, resulting in restricted lift - pressure accumulation in the vessel above acceptable levels due to restricted lift
Set pressure below spring range	- increased overpressure - potential pressure accumulation in the vessel above acceptable levels

Table 4: Influence of incorrect set pressure on overpressure and blowdown

1.3.3 Adjusting Ring

Codes and standards specify limits for the overpressure and blowdown of safety valves. In some designs adjusting rings are used to adjust the overpressure and blowdown of the safety valve in order to meet the requirements of codes and standards. In many of them a 10% accumulation pressure is used as a basis for the design strength calculation of a pressure vessel. Therefore the overpressure for safety valves is limited to 10% of the set pressure for the majority of the applications.

The position of these rings is usually factory set to meet overpressure and blowdown requirements of the applicable codes. The position of the rings can be adjusted to fine tune overpressure and blowdown of the valve.
For the most common design with one lower adjusting ring, changing the ring position has the following effects:

Lowering ring:	overpressure increases, blowdown decreases
Rising ring:	overpressure decreases, blowdown increases

The adjusting ring in LESER's type 526 should be turned to the lowest possible position on the nozzle to ensure all code requirements are met. No further ring adjustment depending on set pressure or medium is required.
The benefit for the user is the easier maintenance, because no complicated ring adjustment is necessary.

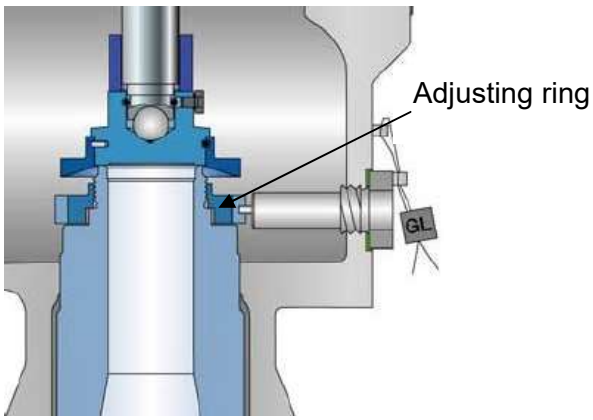


Figure 2: Blowdown ring of LESER's Type 526

1.3.4 Parts Providing Alignment

Correct alignment of nozzle and disc are critical for proper valve operation and tightness. Disc and spindle of the valve will move up and down during valve operation.

Proper guiding of the spindle is essential for trouble free valve performance. The spindle is guided by the guide and the adjusting screw.

When installed, the user must ensure that no dust, particles in the fluid or sticky media may enter the guiding surfaces and negatively influence the valve performance. In some cases the use of a bellows is advisable to protect the guiding parts.

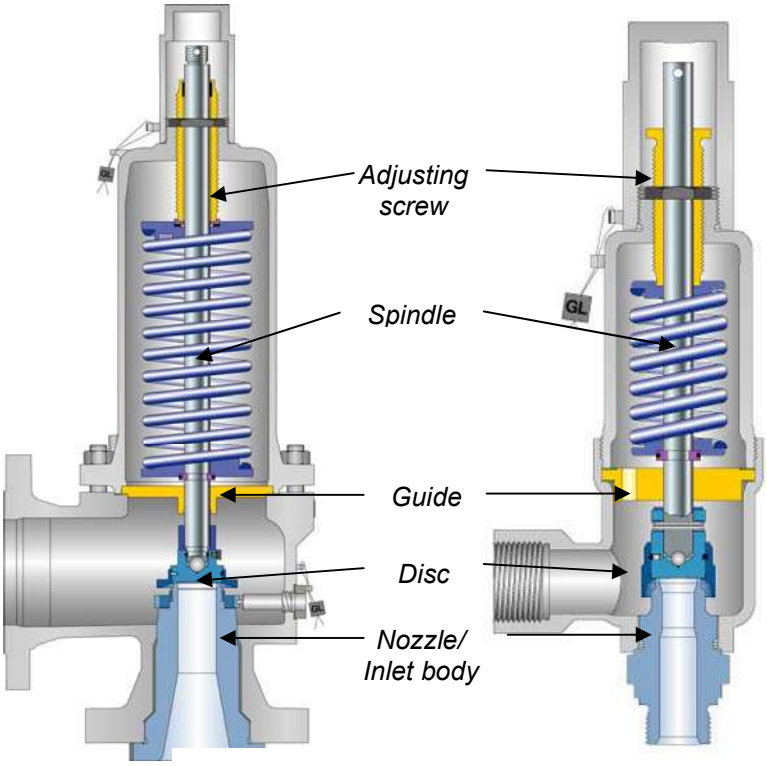


Figure 3: overview of parts providing alignment

1.4 Lifting devices

The standard design for the valve top is a plain cap, covering and sealing the adjustment of the safety valve.
Lifting levers allow users to check if the safety valve is still operational by lifting the disc off the seat. The valve remains in place while testing is performed.
Lifting levers must allow users to lift the disc off the seat when 75% of the set pressure is present at the valve inlet.
Caps and levers are sealed to prevent any unauthorized modification of the set pressure.
Figure 4 offers different caps and lever used for different LESER safety valves.

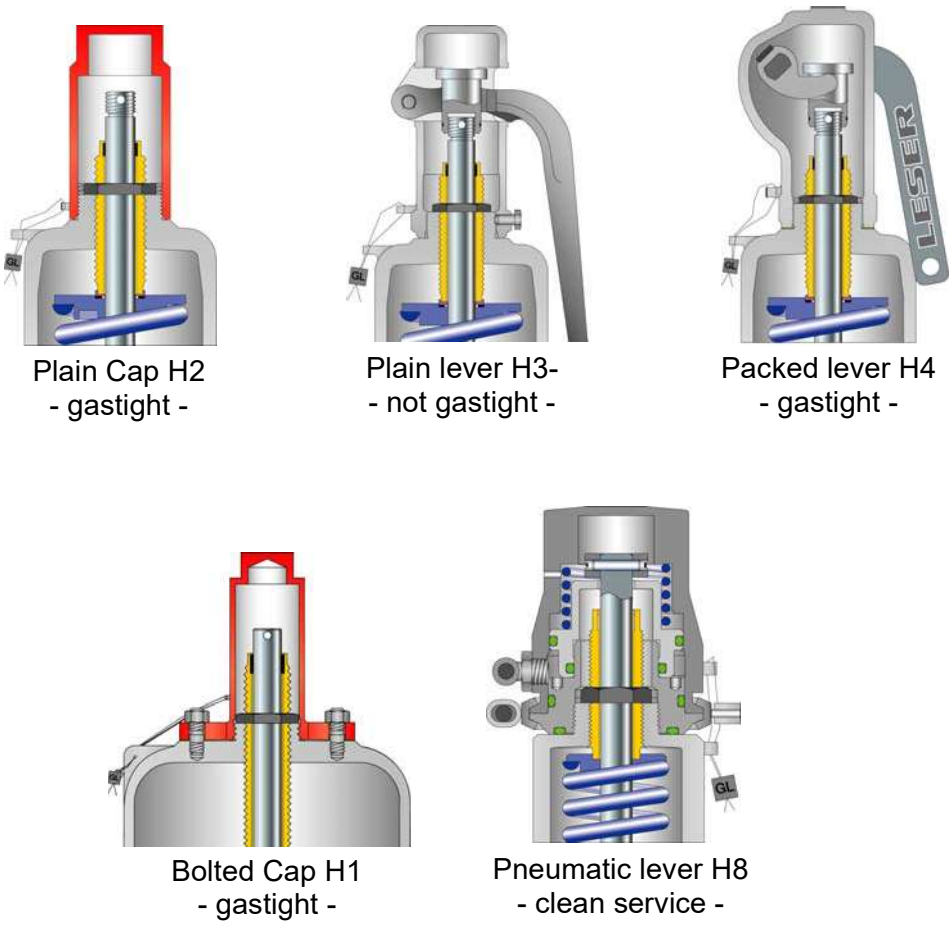


Figure 4: overview of different cap and levers

Content

1 Purpose

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

2 Scope

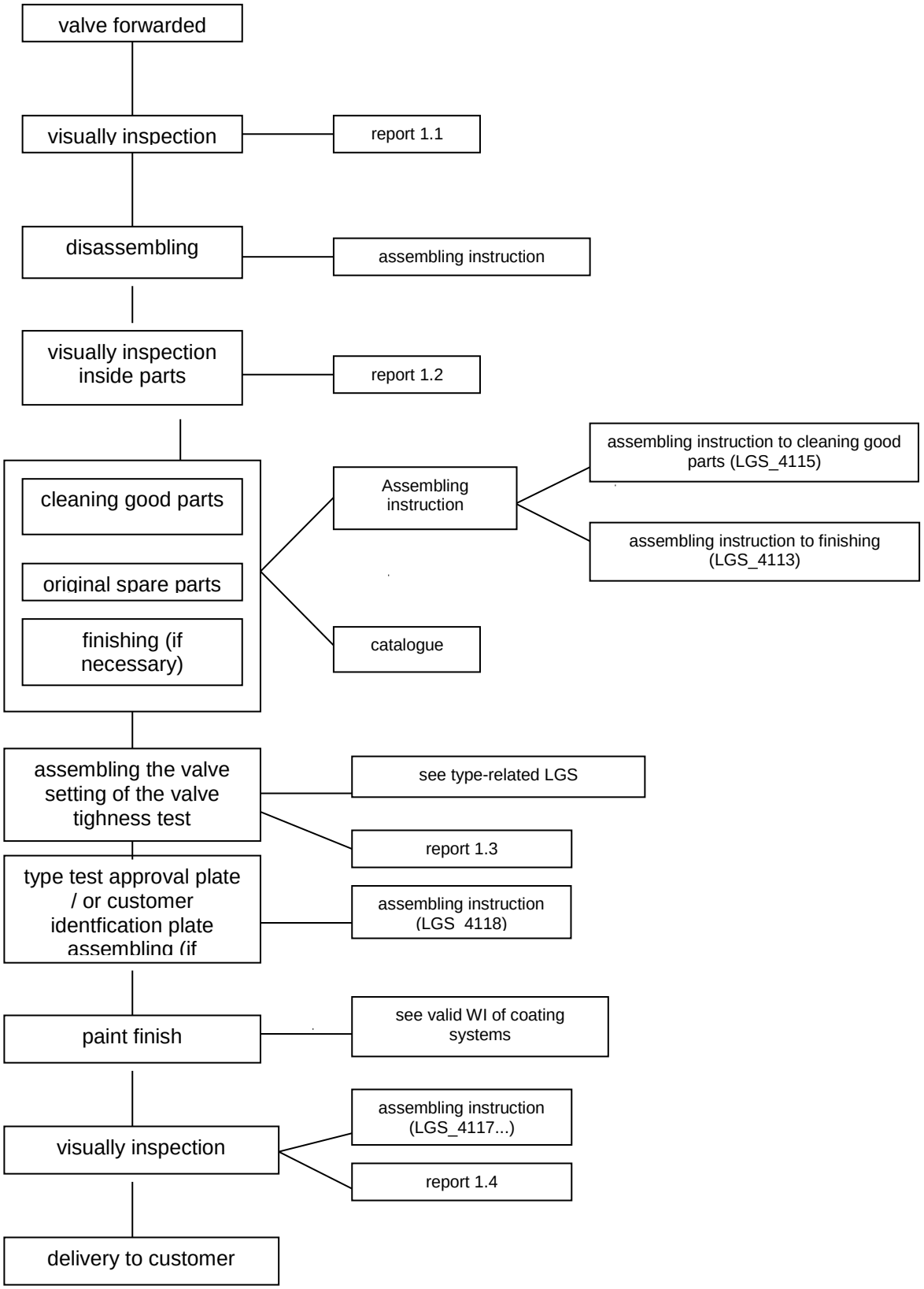
This LGS applies to all members of the LESER Quality Cluster.

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

	Repair necessary	Remarks
Spring	☐	_____
Spring plate	☐	_____
Disc	☐	_____
Spindle	☐	_____
Guide	☐	_____
Spindle cap	☐	_____
Lifting device	☐	_____

	Repair necessary	Remarks
Seat / full nozzle	☐	_____
Bellows	☐	_____

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

Content

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

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

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

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

protected

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

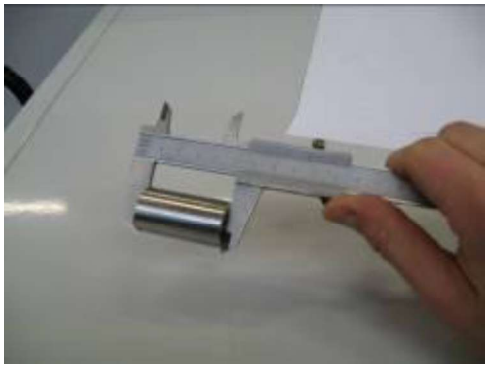
protected

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

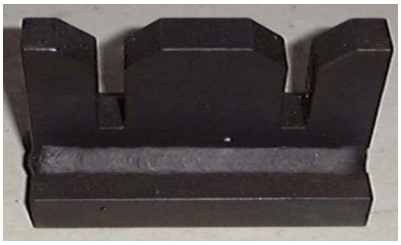


Illustration 19: V-block

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 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

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

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

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

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

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

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 - non-corrosive
Packaging	Can
Weight	1 Kg
Internet	www.molykote.com

Technical illustration

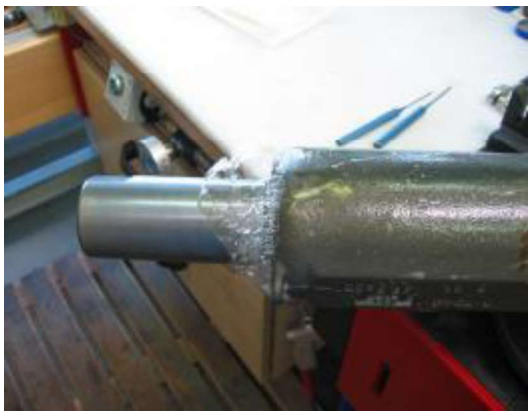
Illustration 12: Molikote

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 - non-corrosive - 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

Content

1 Purpose

This LESER Global (LGS) describes the 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 Clean Service Additional Tool KIT is an assembly of tools that are required for the work on Clean Service safety valves shown in section 5 in addition to the Standard Tool KIT.

Order number	**0161.0003**
Internet	**www.sales@leser.com**

4 Designated use of the Clean Service Additional Tool KIT

- Assembly of safety valves
- Disassembly of safety valves
- Adjusting the set pressure of safety valves

5 Components of the Clean Service Additional Tool KIT

All tools found in this LWN are part of the Clean Service Additional Tool KIT. The following pages specify the individual tools through descriptions and by giving practical examples. The technical illustrations show what the respective tools look like.

5.1 Double-ended open spanner with unequal widths across flats

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

Designated purpose of double-ended open spanners

- manual tool for tightening or unscrewing bolts and nuts such as caps, levers, and inflow devices
- screw connection of a variety of nuts and bolts on the safety valve (e.g. pressure setting of the safety valve).

Fig. 1 Installing the cap

Fig. 2 Pressure setting of the safety valve

Technical requirements

Requirements / Quality	Data	Data
Width across flats in mm	12 x 13	41 x 46
Manufacturer	GEDORE	
Material	Chrome-vanadium-steel	
Design	chrome-plated	
Length	172 mm	400 mm
Vendor	Hahn & Kolb	
Order number number	52012-150	52012-420
LESER order number	596.0089	596.0089
Tool kit number	0161.0003	

Technical illustration

Illustration 1: Double-ended open spanner

Internet	www.hahn-kolb.de

5.2 Hook spanner

The hook spanner is considered to be an assembly tool specifically for bodies (nuts).

Designated purpose of the hook spanner

- assembly of the body
- assembly of the safety valve on an apparatus

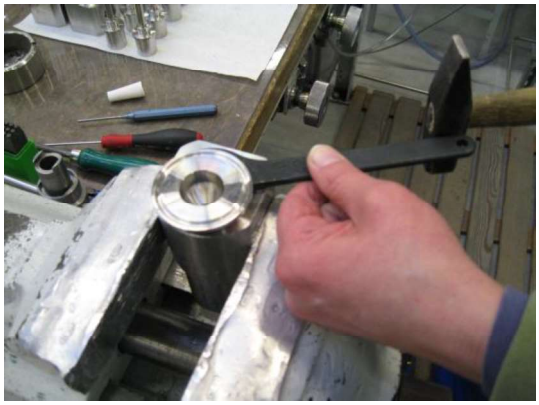


Fig. 3 Installation of the O-ring disc with a C-spanner with nose

Fig. 4 Installation of the O-ring disc

Technical requirements

Requirements / Quality	Data
Code	DIN 1810 A
Nuts, outside Ø	40 – 42 mm
Thickness	5 mm
Length	170 mm
For slotted round nuts	DIN 1804
For roller bearing nuts	DIN 981
Vendor	Hahn & Kolb
Order number number	52100-060
LESER order number	596.0088.0000
Tool kit number	0161.0003
Internet	www.hahn-kolb.de

Technical illustration

Illustration 2: Hook spanner

5.3 Pin-type spanner wrench

The pin-type spanner wrench is to be used specifically as an assembly tool in the assembly of bodies.

Designated purpose of a pin-type spanner wrench

- assembly of the body

Fig. 5 Installation of the O-ring disc with a pin-type spanner wrench

Fig. 6 Installation of the O-ring disc

Technical requirements

Requirements / Quality	Data
Code	DIN 1810 B
Nuts, outside Ø	20 – 22 mm
Pin Ø	2.5 mm
Length	110 mm
For round nuts with a set pin hole in the side	DIN 1816
Vendor	Hahn & Kolb
Order number number	52102-030
LESER order number	596.0087.0000
Tool kit number	0161.0003
Internet	**www.hahn-kolb.de**

Technical illustration

Illustration 3: pin-type spanner wrench

protected

5.4 Aseptic assembly tool

The hook spanner is considered to be an assembly tool specifically for nozzles (nuts).

Designated purpose of the aseptic assembly tool

- assembly of nozzles
- For types 48x, the disc must be installed with the aseptic assembly tool.

Fig. 7 Installation of the Elmoster bellows

Technical requirements

Requirements / Quality	Data	Data	Data
LWN	351.49		
Sizes	DN 25	DN 32 – 50	DN 65 – 100
For valve type	48X		
Vendor	LESER		
LESER order number	445.0139.0000	445.0239.0000	445.0339.0000
Tool kit number	0161.0003		
Internet	www.sales@leser.com		

Technical illustration

Illustration 4: Aseptic assembly tool

Contents

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

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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

Clean Service

Types 483, 484, 485, 488

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resp. depart.:	PP	date of release:	11/8/11	revision No.:	0		
doc. type:	LGS	change rep. No.:	651A	retention period:	10		

Contents

1 Purpose

This LESER Global Standard (LGS) is disassembly documentation for various kinds of dismantling work on LESER safety valves of the Clean Service series. The work steps and tools are described.

2 Scope

This document must be used when dismantling Clean Service safety valves in agencies and subsidiaries of LESER GmbH & Co. KG.

3 Disclaimer

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4 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.

5 General Information

- Gloves must be worn during the entire disassembly.
- Wear safety glasses

6 General illustration

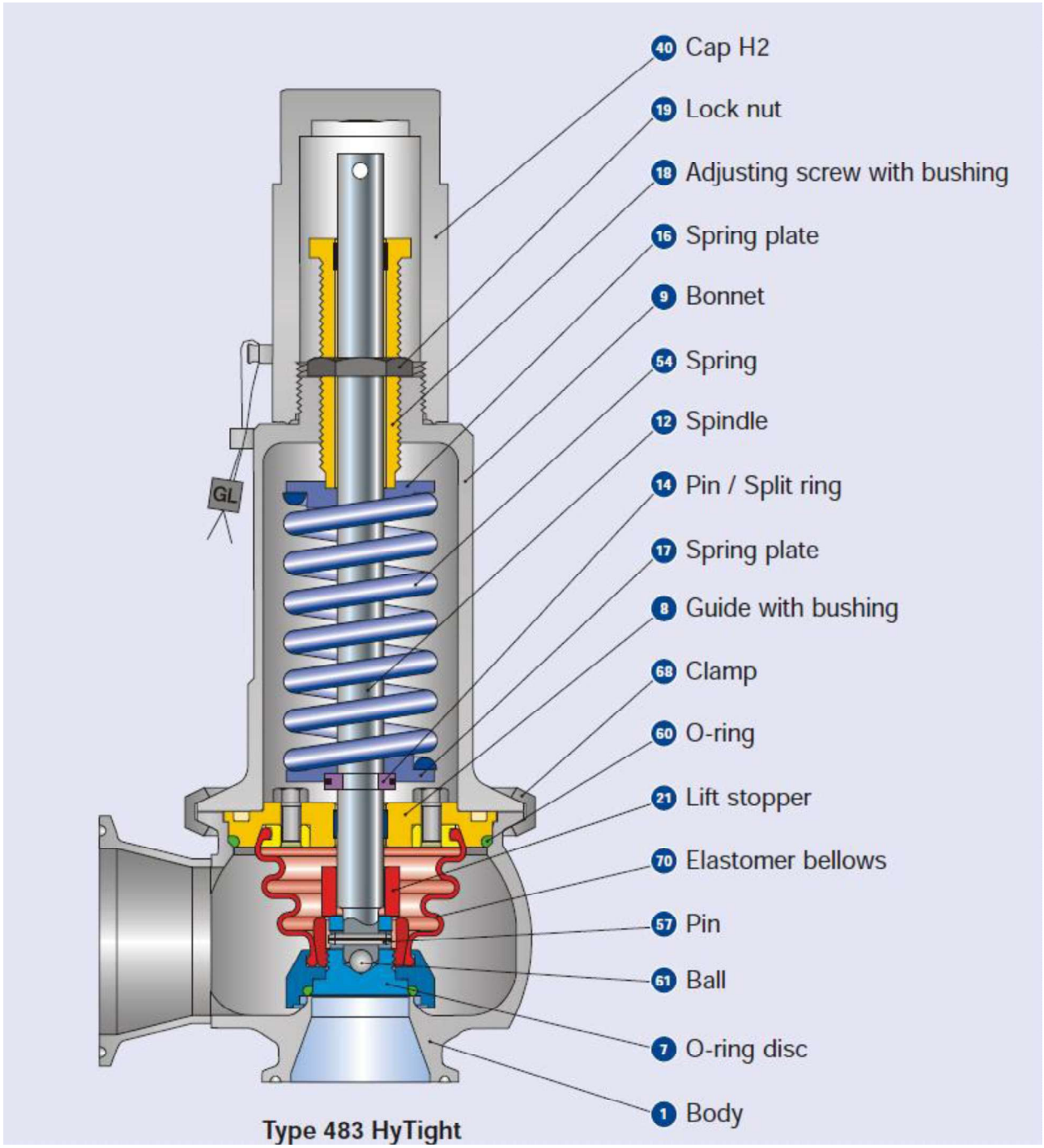


Figure 6-1: Cross-sectional view of type 483 HyThight

7 Dismantling the Clean Service series

7.1 Loosening the cap or lever

7.1.1 Dismantling cap H2

Illustration	Description	Aids / Tools
 Figure 7.1.1-1	Loosen the cap and unscrew it from the bonnet.	Open-end spanner

7.1.2 Dismantling lever H4

Illustration	Description	Aids / Tools
 Figure 7.1.2-1	Loosen and unscrew the screw plug	Screwdriver
 Figure 7.1.2-2	Unscrew the cap from the lever cover	

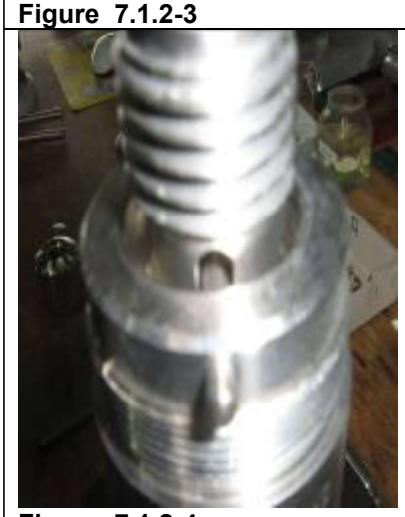
Illustration	Description	Aids / Tools
 **Figure 7.1.2-3**	Unscrew the cap from the lever cover	
 **Figure 7.1.2-4**	Pull out the pin.	
 **Figure 7.1.2-5**	Loosen the lever cover.	Open-end spanner

Illustration	Description	Aids / Tools
 **Figure 7.1.2-6**	Unscrew the lever cover from the bonnet.	
 **Figure 7.1.2-7**	Pull out the pin and pull the spindle cap off the spindle.	
 **Figure 7.1.2-8**	Pull O-ring off the spindle cap.	

7.1.3 Dismantling lever H4

7.1.3.1 Lever H8 (simple piston design)

Illustration	Description	Aids / Tools
 **Figure 7.1.3.1-1**	Hold the cap in place with a second **open-end spanner**.	Open-end spanner
 **Figure 7.1.3.1-2**	Loosening the cap nut also loosens the cap.	Open-end spanner
 **Figure 7.1.3.1-3**	Unscrew and remove the cap (possibly some counter-pressure).	

Illustration	Description	Aids / Tools
 **Figure 7.1.3.1-4**	Remove the spring from the piston.	
 **Figure 7.1.3.1-5**	Remove the small O-ring for securing the pin. Pull the pin. Remove the spindle cap from the spindle.	
 **Figure 7.1.3.1-6**	Remove O-ring.	

Illustration	Description	Aids / Tools
 **Figure 7.1.3.1-7**	Pull the piston off the piston guide.	
 **Figure 7.1.3.1-8**	Remove the O-ring from the groove on the inside of the piston.	
 **Figure 7.1.3.1-9**	Loosen the piston guide with a **C-spanner** and unscrew it from the bonnet.	C-spanner with a nose

Illustration	Description	Aids / Tools
 **Figure 7.1.3.1-10**	Remove the O-ring from the piston guide.	
 **Figure 7.1.3.1-11**	Remove the cap nut from the bonnet.	

7.1.3.2 Lever H8 (double piston design)

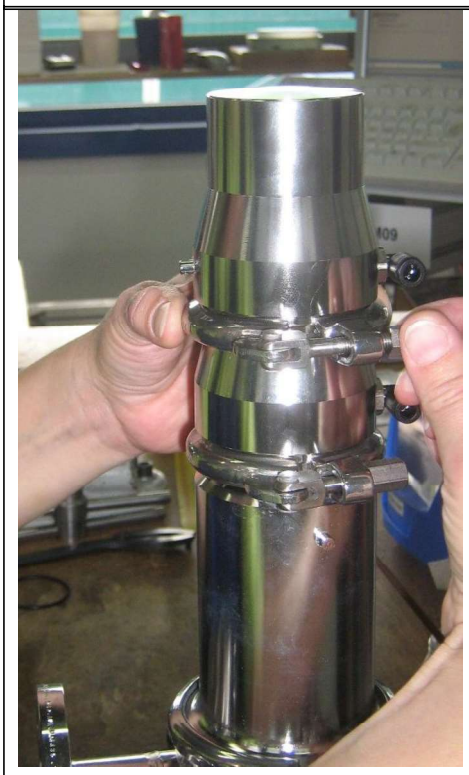
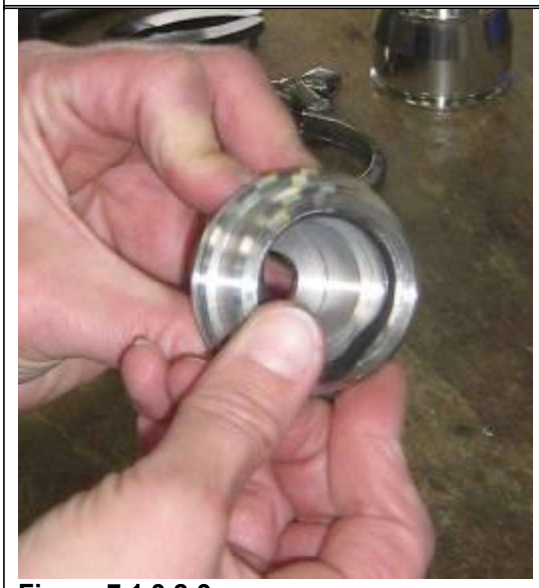
Illustration	Description	Aids / Tools
 **Figure 7.1.3.2-1**	Loosen and remove the split ring, and remove the cap.	
 **Figure 7.1.3.2-2**	Remove the spring from the piston.	

Illustration	Description	Aids / Tools
 **Figure 7.1.3.2-3**	Remove retaining clip and pin. Remove spindle cap.	
 **Figure 7.1.3.2-4**	Remove O-ring and piston.	

Illustration	Description	Aids / Tools
 **Figure 7.1.3.2-5**	Remove O-ring. Loosen and remove split ring. Pull cylinder off the spindle.	
 **Figure 7.1.3.2-6**	Pull off the spring.	

Illustration	Description	Aids / Tools
 **Figure 7.1.3.2-7**	Remove retaining clip and pin. Remove spindle.	
 **Figure 7.1.3.2-8**	Remove the O-ring. Remove piston from piston guide.	

Illustration	Description	Aids / Tools
 **Figure 7.1.3.2-9**	Remove the O-ring from the piston.	
 **Figure 7.1.3.2-10**	Loosen the piston guide with a **C-spanner** and remove it from the bonnet. Remove the O-ring from the piston guide.	C-spanner with a nose

7.2 Dismantling the bonnet

7.2.1 Dismantling pressure spring and adjusting screw

Illustration	Description	Aids / Tools
 Figure 7.2.1-1	Secure the spindle from turning with a pin punch. Loosen lock nut. Unscrew adjusting screw in a clockwise direction until no more spring counter-pressure can be felt.	Open-end spanner, pin punch
 Figure 7.2.1-2	Screw adjusting screw completely out of the bonnet Screw down the lock nut. Remove the PTFE bushing.	

7.2.2 Dismantling bonnet with lift indicator

Illustration	Description	Aids / Tools
 **Figure 7.2.2-1**	Loosen lock nut. Loosen 2 nuts.	Open-end spanner
 **Figure 7.2.2-2**	Twist out the lift indicator.	

Illustration	Description	Aids / Tools
 **Figure 7.2.2-3**	Unscrew split ring until it is loose.	Open-end spanner or ratchet
 **Figure 7.2.2-4**	Remove split ring	

Illustration	Description	Aids / Tools
 **Figure 7.2.2-5**	Remove bonnet.	
 **Figure 7.2.2-6**	Remove the top spring plate, spring, and control sleeve from the bottom spring plate one after the other.	

7.2.3 Dismantling the bonnet without lift indicator

Illustration	Description	Aids / Tools
 **Figure 7.2.3-1**	Unscrew split ring until it is loose.	Open-end spanner or ratchet
 **Figure 7.2.3-2**	Remove split ring	

Illustration	Description	Aids / Tools
 **Figure 7.2.3-3**	Remove bonnet.	
 **Figure 7.2.3-4**	Remove the top spring plate, spring and bottom spring plate from the spindle.	

7.3 Dismantling spindle/disc assembly

7.3.1 Dismantling spindle

Illustration	Description	Aids / Tools
 **Figure 7.3.1-1**	Pull spindle/guide washer out of body.	
 **Figure 7.3.1-2**	**DN 25**: Put bottom spring plate on the spindle and secure through the holes with pin.	
 **Figure 7.3.1-3**	**DN 40:** Put half-washers on the spindle and fasten with retaining clip.	

Illustration	Description	Aids / Tools
 **Figure 7.3.1-4**	Push guide washer on the spindle. Screw both guide washers finger tight with hexagon head bolts.	Open-end spanner or ratchet
 **Figure 7.3.1-5**	Remove O-ring from bottom side of the second guide washer.	
 **Figure 7.3.1-6**	Remove PTFE bushing	

Illustration	Description	Aids / Tools
 Figure 7.3.1-7	Pull the elastomer bellows off the guide washer. Remove the guide washer from the spindle.	
 Figure 7.3.1-8	**For DN 40:** First remove the lift stopper.	
 Figure 7.3.1-9	Use an assembly aid to loosen the cap nut from the disc body.	Assembly aid

Illustration	Description	Aids / Tools
 **Figure 7.3.1-10**	Remove the cap nut from the spindle.	
 **Figure 7.3.1-11**	Drive out the pin. Pull the disc off the spindle. Take the ball out of the disc body.	Pin punch

7.3.2 Dismantling disc

Illustration	Description	Aids / Tools
 **Figure 7.3.2-1**	Push the disc body out of the lifting aid.	
 **Figure 7.3.2-2**	Pull the elastomer bellows out of the lifting aid.	
 **Figure 7.3.2-3**	Elastomer bellows and disc body	
 **Figure 7.3.2-4**	Remove the O-ring from the groove of the lifting aid.	

Compact Performance

Types 437, 438, 439, 481

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Contents

1 Purpose

This LESER Global Standard (LGS) is disassembly documentation for different installation types of LESER safety valves of the Compact Performance series. The required work steps and tools are described.

2 Scope

This document must be used in the removal of Compact Performance 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 completely 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

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

5 General Information

- Gloves must be worn during the entire disassembly operation.
- Wear safety glasses

6 General illustration

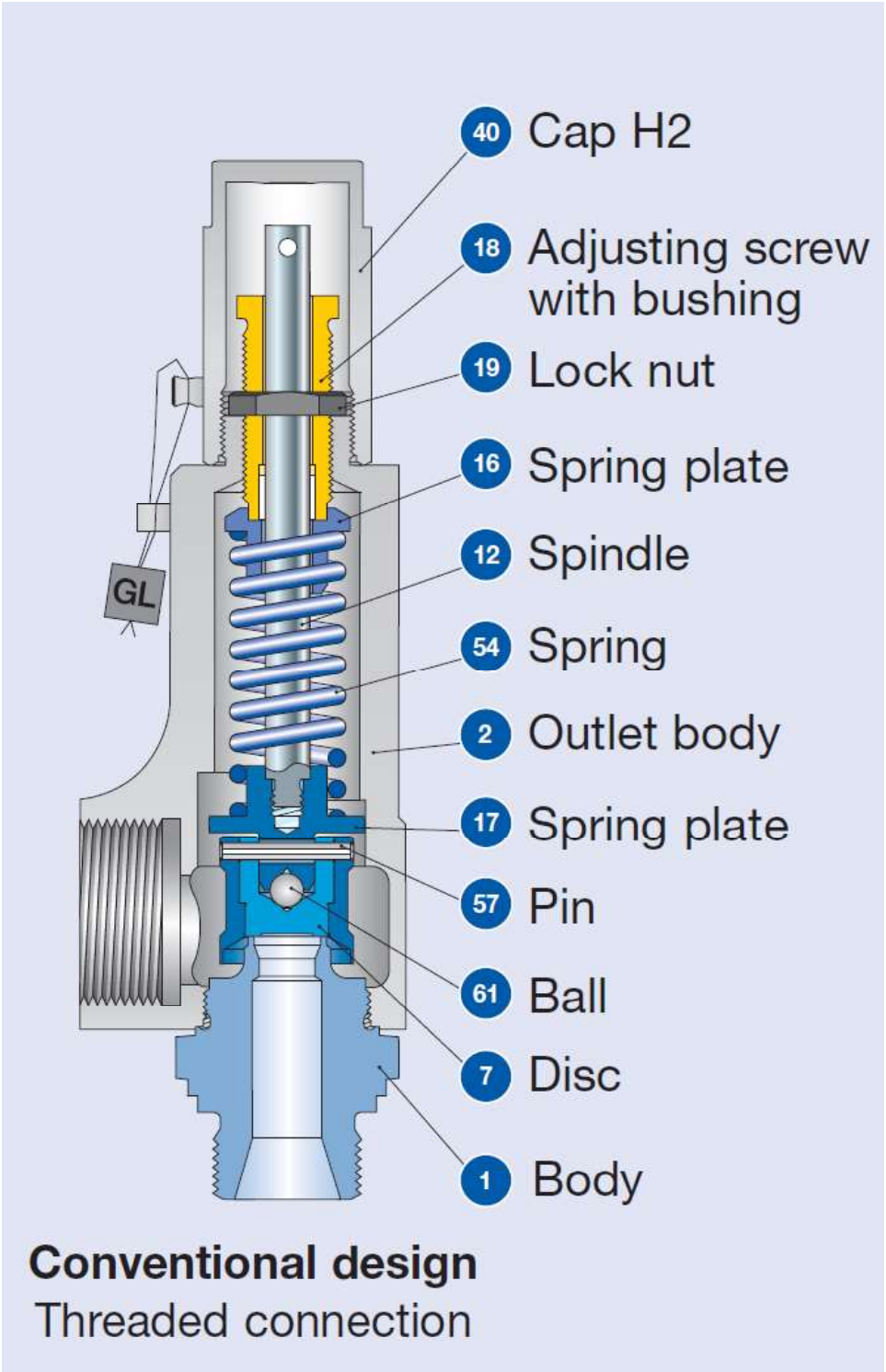

Figure 6-1: Cross-sectional view of type 437

7 Dismantling of the Compact Performance series

Screw the safety valve onto the clamping device in accordance with the assembly device catalogue and remove the sealing if it is present.

7.1 Removal of the levers and caps

7.1.1 Removal of lever H3

Illustrations	Description	Aids / Tools
 Figure 7.1.1-1	Remove the retaining clip. Drive out the pin with a pin punch. Pull off the knob. Unscrew the lever cover from the outlet body.	Pin punch
 Figure 7.1.1-2	Remove the cylinder pin. Pull the spindle cap off the spindle. Remove the O-ring from the groove of the lever cover.	

public

7.1.2 Dismantling lever H4

Illustrations	Description	Aids / Tools
 **Figure 7.1.2-1**	Unscrew the cylinder pin.	Flat-tip screwdriver Clamping device
 **Figure 7.1.2-2**	Screw off the lever cap. Attention: left-handed thread	
 **Figure 7.1.2-3**	Remove the retaining clip and pin from the spindle cap.	

Illustrations	Description	Aids / Tools
 **Figure 7.1.2-4**	Unscrew lever cover from the outlet body.	Open-end spanner
 **Figure 7.1.2-5**	Remove the cylinder pin. Pull the spindle cap off the spindle.	
 **Figure 7.1.2-6**	Remove the O-ring from the spindle cap	

7.1.3 Dismantling the cap H2

Illustrations	Description	Aids / Tools
 Figure 7.1.3-1	Unscrew cap H2 from the outlet body.	Open-end spanner

7.2 Releasing the pressure spring

Illustrations	Description	Aids / Tools
 Figure 7.2-1	Remove the lock nut. Secure the spindle with the splint pin against turning and remove the adjusting screw. Turn the adjusting screw against the pin punch (do not remove the pin punch), until the spring is completely unstressed and the disc is lifted up from the seat.	Pin punch Open-end spanner

7.3 Dismantling flange connections

Illustrations	Description	Aids / Tools
 Figure 7.3-1	Unscrew outlet adapter from outlet body and remove the sealing tape. Unscrew inlet body from outlet body and remove the sealing tape.	

7.4 Dismantling cylindrical threaded connectors

Illustrations	Description	Aids / Tools
 **Figure 7.4-1**	Remove outlet body from inlet body (spindle and disc are still secured). Remove inlet body from clamping device.	Open-end spanner Pin punch
 **Figure 7.4-2**	Screw inlet body out of outlet body.	

7.5 Removal of the spindle assembly

Illustrations	Description	Aids / Tools
 **Figure 7.5-1**	Remove adjusting screw from splint pin. Pull the splint pin out of the hole. Pull the spindle assembly out of the outlet body.	Pin punch
  **Figure 7.5-2**	Pull the spring plate and spring off the spindle. Remove the pin (connects disc/spindle). Separate disc assembly and spindle.	

7.6 Releasing the adjusting screw

Illustrations	Description	Aids / Tools
 **Figure 7.6-1**	Screw adjusting screw out of outlet body.	
 **Figure 7.6-2**	Unscrew lock nut from adjusting screw.	

Contents

1 Purpose

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

2 Scope

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

3 Disclaimer

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4 Qualified fitting personnel

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

5 General Information

- Gloves must be worn during the entire cleaning process (except for stainless steel and painted valves).
- Wear safety glasses.

6 Cleaning repaired valves

6.1 Blast cleaning

Stainless steel valves - glass bead blast cleaning

Cast steel - sand or bead blast cleaning

The body and bonnet 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 6.1-1: Flange covering, plastic

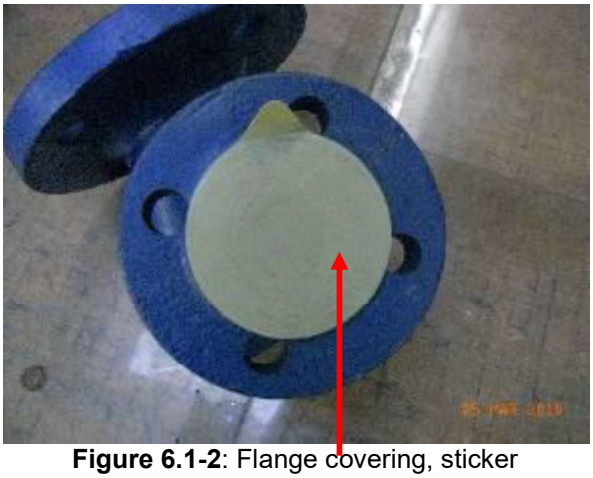

Figure 6.1-2: Flange covering, sticker

protected

6.2 Brushing

The inside parts and inside of the body and bonnet are 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.

6.3 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.

Figure 6.3-1

The bodies must **always** be placed on the lid section.

Figure 6.3-2

WRONG

Figure 6.3-3

RIGHT

Note: Any waste that occurs when cleaning must be disposed of according to the applicable rules and regulations of the respective country.

7 Handling the components

Generally, the wearing of gloves when handling cleaned and unpainted components is compulsory.

Such components must never be touched at any time without protection.
This applies both to employees from the operating as well as administrative areas.

Figure 7-1

Wet gloves must be replaced with dry ones.

Damaged gloves that cannot exclude contact between the metal surface and skin must not be used.

In particular
In particular, valves, especially the sealing surfaces on the flanges and also the interior areas, must not be touched **without** gloves, because these areas will not be protected even in later process steps by paint. Nor may spare parts be touched **without** gloves when unpainted and unpackaged.

7.1 Exceptions:

The requirement for gloves is removed in the following cases:

- assembly of Compact Performance valves (for process-related reasons)
- assembly of stainless steel valves (no danger of corrosion)

It is also mandatory to wear gloves in the initially mentioned cases when performing the order picking for spare parts.

7.2 Process overview

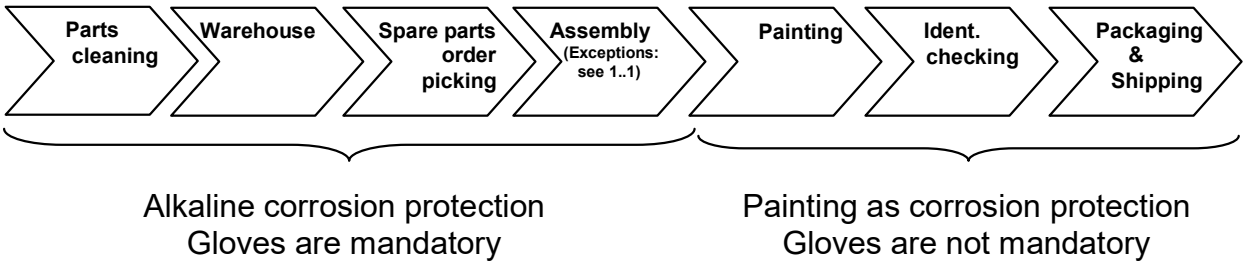

Figure 7.1-1

Clean Service

Types 483, 484, 485, 488

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author:	Nieh	released by:	KUW	replaces:	initial	status:	published
resp. depart.:	PP	date of release:	11/8/11	revision No.:	0		
doc. type:	LGS	change rep. No.:	651A	retention period:	10		

Contents

1 Purpose

This LESER Global Standard (LGS) is assembly documentation for various assembly scenarios for LESER safety valves of the Clean Service series. The required work steps, tools and materials are described.

2 Scope

This document must be applied to the assembly of Clean Service safety valves in agencies and subsidiaries of LESER GmbH & Co. KG.

3 Disclaimer

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4 Qualified assembly personnel

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

5 General Information

- Gloves must be worn during the entire assembly operation.

6 General illustration

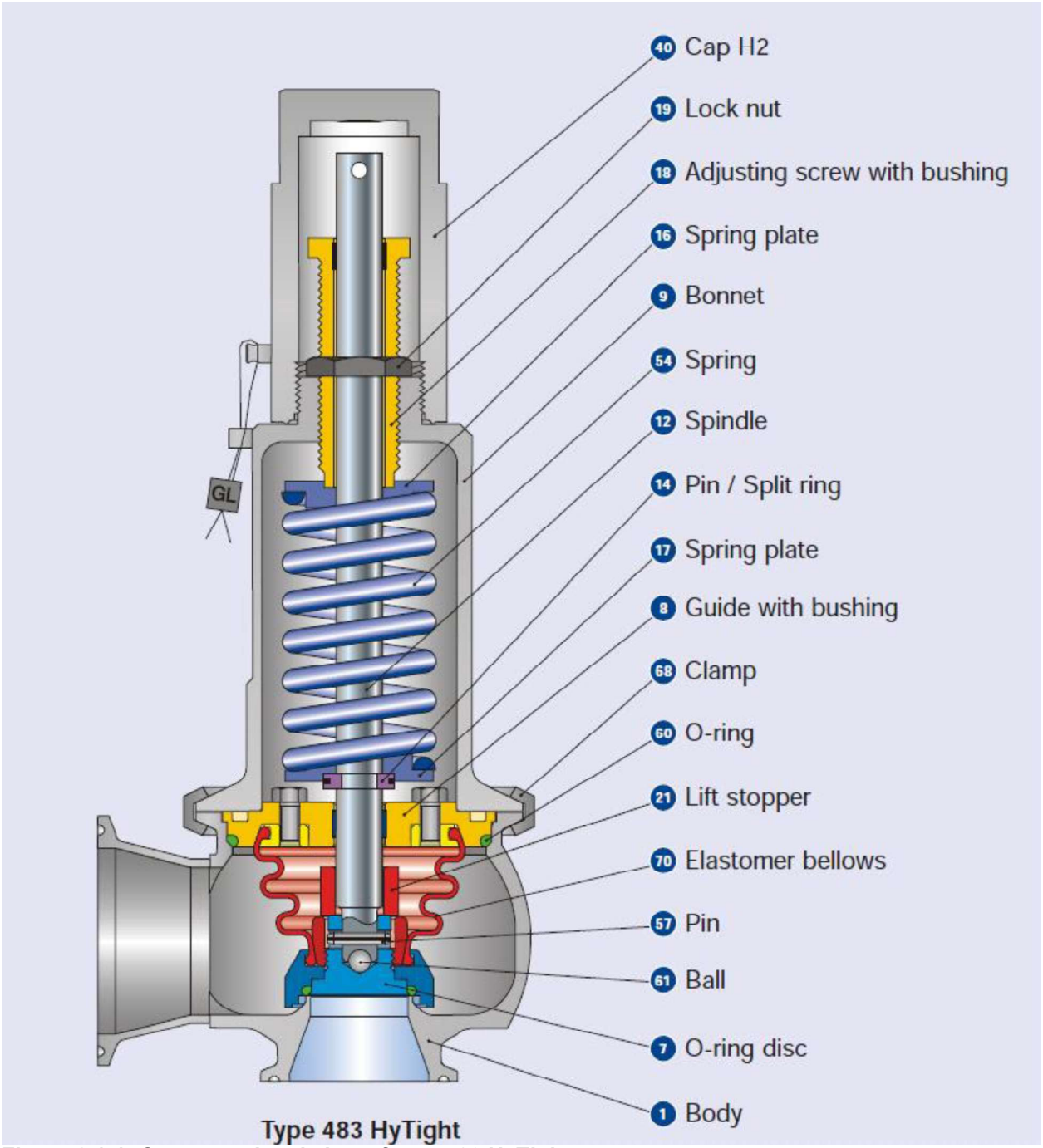


Figure 6.1-1: Cross-sectional view of type 483 HyTight

7 Assembly of the Clean Service series

7.1 Assembly of spindle/disc assembly

7.1.1 Disc assembly

Illustrations	Description	Aids / Tools
 **Figure 7.1.1-1**	Put the O-ring into the groove of the lifting aid.	
 **Figure 7.1.1-2**	Elastomer bellows and disc body	
 **Figure 7.1.1-3**	Fit the elastomer bellows onto the other side of the lifting aid.	
 **Figure 7.1.1-4**	Put the disc body in the lifting aid.	

7.1.2 Assembly of spindle assembly

Illustrations	Description	Aids / Tools
 **Figure 7.1.2-1**	Insert the ball into the disc body. Put the spindle in the disc and secure with a pin.	
 **Figure 7.1.2-2**	Put the cap nut onto the spindle and screw to disc body by means of the assembly aid.	Assembly aid
 **Figure 7.1.2-3**	Push the guide washer onto the spindle and pull the elastomer bellows over it.	

Illustrations	Description	Aids / Tools
 Figure 7.1.2-4	**For DN 40:** Then, push the lift stopper over the spindle.	
 Figure 7.1.2-5	Insert the PTFE bushing. insert the guide washer.	
 Figure 7.1.2-6	Insert O-ring on bottom side of the second guide washer.	
 Figure 7.1.2-7	Push guide washer on the spindle. Screw both guide washers finger tight with hexagon head bolts.	Ring spanner

7.1.3 Inserting the assembly

Illustrations	Description	Aids / Tools
 **Figure 7.1.3-1**	**DN 25:** Put bottom spring plate on the spindle and secure through the holes with pin.	
 **Figure 7.1.3-2**	**DN 40:** Put half-washers on the spindle and fasten with retaining clip.	
 **Figure 7.1.3-3**	Put the assembly on the body. In the process, carefully lower the disc onto the seat.	

7.2 Assembly of the bonnet

7.2.1 Adjusting screw assembly

Illustrations	Description	Aids / Tools
 **Figure 7.2.1-1**	Put the PTFE bushing in the adjusting screw.	
 **Figure 7.2.1-2**	Screw lock nut onto adjusting screw.	Brush Halocarbon
 **Figure 7.2.1-3**	Grease the thread and screw into the bonnet.	

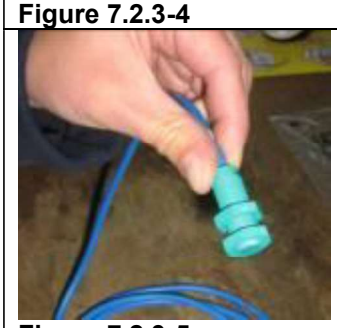
7.2.2 Bonnet without lift indicator

Illustrations	Description	Aids / Tools
 **Figure 7.2.2-1**	Put the bottom spring plate, spring and top spring plate onto the spindle.	
 **Figure 7.2.2-2**	Put the bonnet over the spring onto the body.	
 **Figure 7.2.2-3**	**Caution:** *Surface for BT plate* always opposite the outlet.	

Illustrations	Description	Aids / Tools
 **Figure 7.2.2-4**	Firmly connect the bonnet and body with a split ring.	
 **Figure 7.2.2-5**	Tighten it with the nut.	Ring spanner

7.2.3 Bonnet with lift indicator

Illustrations	Description	Aids / Tools
 **Figure 7.2.3-1**	Put control sleeve on bottom spring plate. Then put on spring and top spring plate.	
 **Figure 7.2.3-2**	Put the bonnet over the spring onto the body. (**Attention**: *Surface for BT plate* always opposite to the outlet.)	
 **Figure 7.2.3-3**	Firmly connect the bonnet and body with a split ring.	

Illustrations	Description	Aids / Tools
 **Figure 7.2.3-4**	Tighten it with the nut.	Ring spanner
 **Figure 7.2.3-5**	Screw nut onto lift indicator.	
 **Figure 7.2.3-6**	Screw lift indicator onto the guide sleeve as far as it will go. Afterwards, unscrew it one full turn.	
 **Figure 7.2.3-7**	Secure the position with the first nut and then tighten the lock nut with the open-end spanner.	Open-end spanner

7.3 Adjusting the set pressure

Illustrations	Description	Aids / Tools
 **Figure 7.3-1**	Slowly pressurise the valve on the test bench to find out whether the valve opens at the set pressure. The set pressure of the valve has been reached when you can hear air escaping. Full opening must be achieved. If the valve opens outside the stipulated set pressure tolerance, then the adjusting screw must be adjusted again. Secure the spindle from turning with a pin punch. Turning the adjusting screw in a clockwise direction causes the valve to open at higher pressure. Turning in a counter-clockwise direction causes the valve to open at lower pressure. Release the pressure before readjusting the adjusting screw. Readjust the adjusting screw and then pressurise the valve again.	Open-end spanner, pin punch
 **Figure 7.3-2**	If the pressure setting has been completed, secure the adjusting screw with a lock nut. Afterwards, check the set pressure once again.	Open-end spanner

7.4 Testing the seat tightness P12

This test is performed for every valve after setting the pressure.

7.5 Testing of the seal tightness of the pressure-bearing body P11

This test is performed for every flanged valve without a nozzle after its assembly P12.

7.6 Assembly of the cap / lever

7.6.1 Assembly of cap H2

Illustrations	Description	Aids / Tools
 **Figure 7.6.1-1**	Grease the thread and sealing lip.	Brush Halocarbon (OI-56 S / 60H)
 **Figure 7.6.1-2**	Screw the cap onto the bonnet and tighten.	Open-end spanner

7.6.2 Assembly of lever H4

Illustrations	Description	Aids / Tools
 **Figure 7.6.2-1**	Pull the O-ring over the spindle cap and grease.	Brush Halocarbon (OI-56 S / 60H)
 **Figure 7.6.2-2**	Put the spindle cap onto the spindle and secure with a pin.	
 **Figure 7.6.2-3**	Grease the sealing lip and thread of the lever cover.	Brush Halocarbon (OI-56 S / 60H)

Illustrations	Description	Aids / Tools
 **Figure 7.6.2-4**	Afterwards, screw the lever cover (bottom section) onto the bonnet and tighten slightly.	Open-end spanner
 **Figure 7.6.2-5**	Pull the spindle cap out entirely and secure with a pin.	
 **Figure 7.6.2-6**	Position the spindle cap in the middle (pin is positioned centrally in the elongated hole)	
 **Figure 7.6.2-7**	Grease the thread of the lever cover (top section).	Brush Halocarbon (OI-56 S / 60H)

Illustrations	Description	Aids / Tools
 **Figure 7.6.2-8**	Grease spindle cap.	Brush Halocarbon (OI-56 S / 60H)
 **Figure 7.6.2-9**	Screw the cap onto the lever cover.	
 **Figure 7.6.2-10**	Screw in and tighten the screw plug.	
 **Figure 7.6.2-11**	Afterwards, screw up the cap as far as it will go so that the screw plug and cap are flush.	Flat-tip screwdriver

Testing the lever:

Pressurise the valve (approx. 90% of the set pressure).

Check the lever by manual venting.

Testing passed: Pressure drops

Testing did not pass: Pressure remains constant

7.6.3 Assembly of lever H8

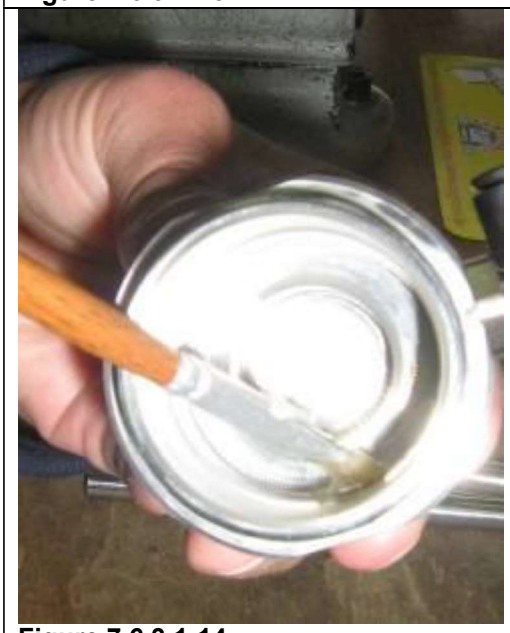
7.6.3.1 Lever H8 (simple piston design)

Illustrations	Description	Aids / Tools
 Figure 7.6.3.1-1	Grease the threads of the cap nut.	Brush Halocarbon (OI-56 S / 60H)
 Figure 7.6.3.1-2	Put the cap nut on the bonnet.	
 Figure 7.6.3.1-3	Grease the O-ring groove of the piston guide, and insert the O-ring avoiding twisting, possibly with the help of a pin punch.	Brush Halocarbon (OI-56 S / 60H)

Illustrations	Description	Aids / Tools
 **Figure 7.6.3.1-4**	Grease O-ring.	Brush Halocarbon (OI-56 S / 60H)
 **Figure 7.6.3.1-5**	Screw piston guide to bonnet and tighten with a C-spanner.	C-spanner with a nose
 **Figure 7.6.3.1-6**	Grease the groove on the inside of the piston.	Brush Halocarbon (OI-56 S / 60H) Pin punch

Illustrations	Description	Aids / Tools
 **Figure 7.6.3.1-7**	Put the O-ring in the groove of the piston and grease again.	Brush Halocarbon (OI-56 S / 60H)
 **Figure 7.6.3.1-8**	Put the piston on the piston guide.	C-spanner with a nose
 **Figure 7.6.3.1-9**	Grease the groove and stretch the O-ring over the piston avoiding any twisting of the ring, possibly with the help of a pin punch.	Pin punch

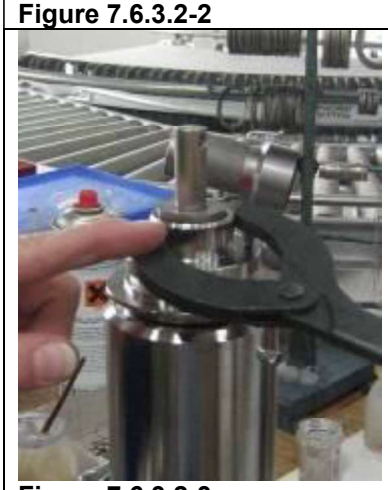
Illustrations	Description	Aids / Tools
 **Figure 7.6.3.1-10**	Afterwards, grease the O-ring.	Brush Halocarbon (OI-56 S / 60H)
 **Figure 7.6.3.1-11**	Put the spindle cap on the spindle and secure with a roll pin. Stretch the small O-ring for securing the pin onto the spindle cap.	
 **Figure 7.6.3.1-12**	Put the spring into the piston.	

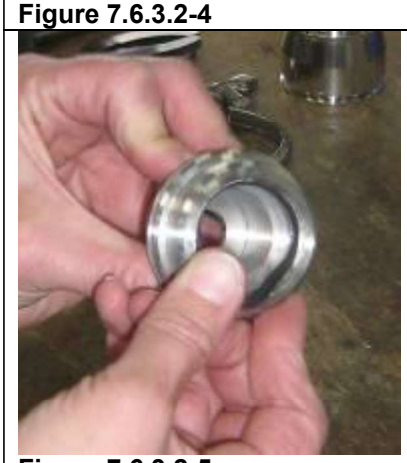
Illustrations	Description	Aids / Tools
 **Figure 7.6.3.1-13**	Twist the angle-screw with the pneumatic valve into the cap and tighten.	
 **Figure 7.6.3.1-14**	Grease the inside of the cap for the O-ring guide.	Brush Halocarbon (OI-56 S / 60H)
 **Figure 7.6.3.1-15**	Put the cap on (possibly some pressure) and tighten.	

Illustrations	Description	Aids / Tools
 **Figure 7.6.3.1-16**	Tightening the cap nut also tightens the cap.	Open-end spanner
 **Figure 7.6.3.1-17**	Afterwards, secure the cap with a second open-end spanner. (The angle-screw must always be opposite the outlet!)	Open-end spanner

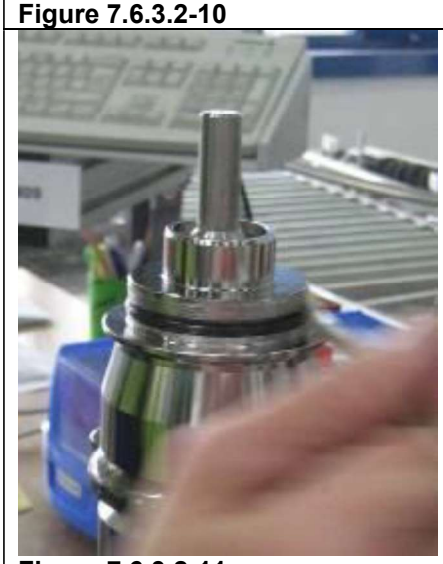
Illustrations	Description	Aids / Tools
 **Figure 7.6.3.1-18**	Pressurise the piston to 6-8 bar line pressure via the pneumatic valve. During the procedure, check through the outlet whether the valve lifts.	
 **Figure 7.6.3.1-19**	Spray/brush the interconnection points with leak detector to check the seal tightness.	Brush Leak detection spray

7.6.3.2 Lever H8 (double piston design)

Illustrations	Description	Aids / Tools
 **Figure 7.6.3.2-1**	Grease the piston guide on the groove for the O-ring.	Brush Halocarbon (OI-56 S / 60H)
 **Figure 7.6.3.2-2**	Insert the O-ring and grease again.	Brush Halocarbon (OI-56 S / 60H)
 **Figure 7.6.3.2-3**	Put piston guide on valve and tighten with a C-spanner.	C-spanner with a nose

Illustrations	Description	Aids / Tools
 Figure 7.6.3.2-4	Insert O-ring avoiding twisting (grease before and after).	Brush Halocarbon (OI-56 S / 60H)
 Figure 7.6.3.2-5	Insert O-ring in piston (grease before and after).	Brush Halocarbon (OI-56 S / 60H)
 Figure 7.6.3.2-6	Put piston on piston guide and put O-ring into the outer groove (grease before and after).	Brush Halocarbon (OI-56 S / 60H)

Illustrations	Description	Aids / Tools
 **Figure 7.6.3.2-7**	Put on the spindle cap and secure with a pin and retaining clip.	
 **Figure 7.6.3.2-8**	Put on the spring.	
 **Figure 7.6.3.2-9**	Put on the cylinder. In the process, make sure the pneumatic valve is opposite the outlet.	

Illustrations	Description	Aids / Tools
 **Figure 7.6.3.2-10**	Fasten cylinder with split ring.	
 **Figure 7.6.3.2-11**	Pull on O-ring.	
 **Figure 7.6.3.2-12**	Insert O-ring in second piston.	

Illustrations	Description	Aids / Tools
 **Figure 7.6.3.2-13**	Grease all O-rings before and after! Put piston on and insert O-ring.	Brush Halocarbon (OI-56 S / 60H)
 **Figure 7.6.3.2-14**	Put on the spindle cap and secure with a pin and retaining clip.	
 **Figure 7.6.3.2-15**	Put the spring onto the piston.	

Illustrations	Description	Aids / Tools
 **Figure 7.6.3.2-16**	Put on the cap. In the process, make sure the angle-screw is opposite the outlet.	
 **Figure 7.6.3.2-17**	Connect cap with split ring and tighten the nut.	Ring spanner
 **Figure 7.6.3.2-18**	Pressurise the piston to 6-8 bar line pressure via the pneumatic valve. During the procedure, check through the outlet whether the valve lifts. Afterwards, test the seat tightness P12 and seal tightness of the pressure-bearing body P11. Apply leak detector to the interconnection points and look for bubbles.	

7.7 Sealing the valve

Illustrations	Description	Aids / Tools
 **Figure 7.7-1**	Weld on sealing lug if necessary. Closely connect the sealing hole or lug from the cap/lever and bonnet in a clockwise direction. Interlace the wire. Seal the lever/cap to the outlet body.	Sealing wire Sealing block Wire twisting pliers
 **Figure 7.7-1**Error! No sequence specified.	Sealed cap H2	
 **Figure 7.7-2**Error! No sequence specified.	Sealed cap H4	
 **Figure 7.7-3**Error! No sequence specified.	Sealed cap H8 (simple piston design)	

Compact Performance

TYPES 437, 438, 439, 481

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doc. type:	LGS	change rep. No.:	00779A	retention period:	10y.		

Contents

1 Purpose

This LESER Global Standard (LGS) is assembly documentation for various assembly scenarios for LESER safety valves of the Compact Performance series. The required work steps and tools are described.

2 Scope

This document must be applied to the assembly of Compact Performance safety valves in agencies and subsidiaries of LESER GmbH & Co. KG.

3 References

LGS 0201 (LWN 220.01)
LGS 3322 (LWN 322-03)
LGS 3614 (LWN 614-08)

Note: LESER LWN standards will be replaced by LGS, latest editions apply.

4 Disclaimer

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5 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.

6 General Information

- Gloves must be worn during the entire assembly.

7 General illustration

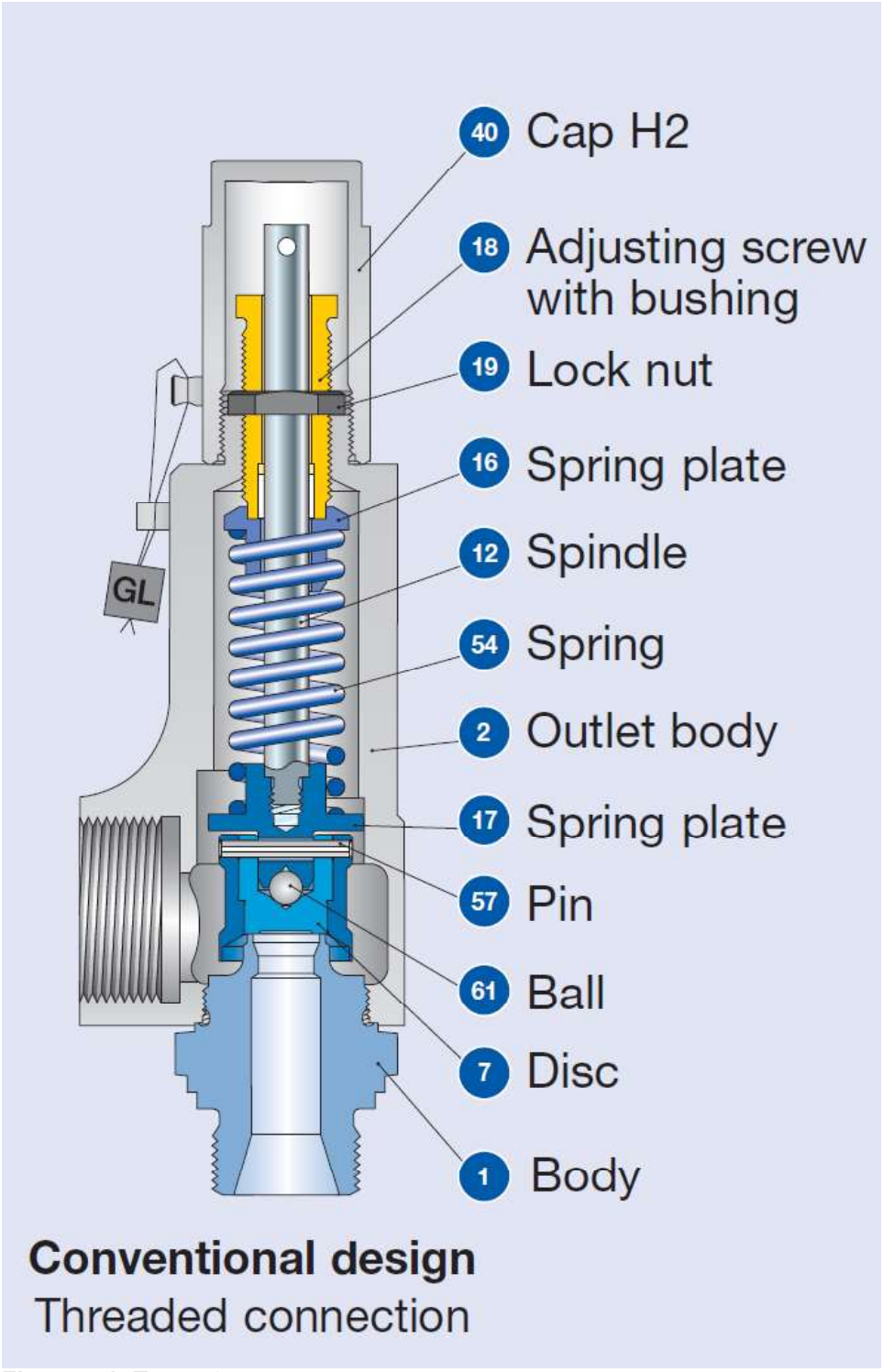
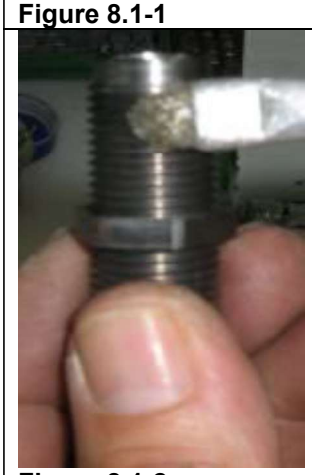


Figure 7-1: Type 437

8 Assembly of the Compact Performance series

8.1 Assembly of the adjusting screw

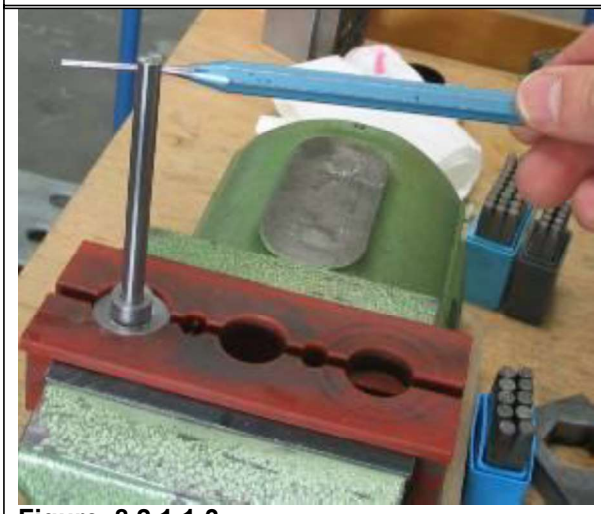
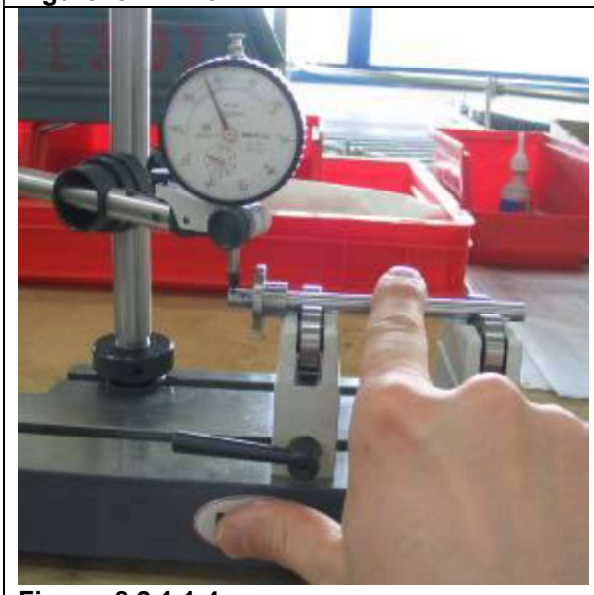
Illustration	Description	Tool / aid
 Figure 8.1-1	Assemble the adjusting screw (incl. PTFE-bushing inside) and lock nut.	
 Figure 8.1-2	Grease the adjusting screw on the thread and end face.	Brush Halocarbon (OI-56 S / 60H)
 Figure 8.1-3	Screw the adjusting screw into the outlet body (a few turns)	

8.2 Assembly of the spindle / disc assembly

8.2.1 Metallic seal 437

8.2.1.1 Spindle / spring plate assembly

Illustration	Description	Tool / aid
 **Figure 8.2.1.1-1**	Put the spring plate into the assembly device and fasten in place with bench vice.	Assembly device, Bench vice
 **Figure 8.2.1.1-2**	Put a very small amount of glue on the spindle thread (1 drop on the thread).	Glue DELO ML 5449

Illustration	Description	Tool / aid
 Figure 8.2.1.1-3	Put the spindle thread in the lower spring plate and screw it in until it is tight to the touch. Push the pin punch through the spindle hole and screw in until it is tight to the touch.	
 Figure 8.2.1.1-4	Roundness check of the spindle/disc assembly Tolerance: max. 0.2mm 	Indicating calliper device

8.2.1.2 Assembly installation

Illustration	Description	Tool / aid
 **Figure 8.2.1.2-1**	Visual check: Check sealing surface for cleanliness and damage. Sharpen the pin.	
 **Figure 8.2.1.2-2**	Assemble the disc body and lifting aid (holes matching each other).	
 **Figure 8.2.1.2-3**	Insert the ball.	

Illustration	Description	Tool / aid
 Figure 8.2.1.2-4	Assemble the spindle with the spring plate into the preassembled parts and place them on the aligning punch in the device.	- Aligning punch, Device
 Figure 8.2.1.2-5	Install the pin using a lever press.	- Lever press

Illustration	Description	Tool / aid
 **Figure 8.2.1.2-6**	Spring plate and spindle assembled.	
 **Figure 8.2.1.2-7**	Install the spring and top spring plate on the spindle. **Only for thrust bearings:** Spring, top spring plate, thrust bearings, bearing washer Grease thrust bearing.	Brush, Halocarbon (OI-56 S / 60H)

8.2.2 Plastic sealing plate 437

8.2.2.1 Disc assembly

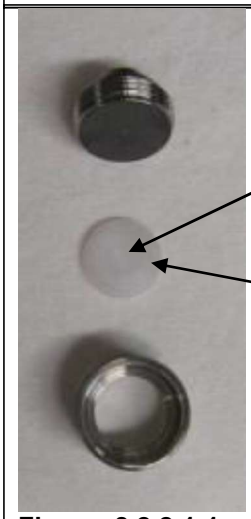
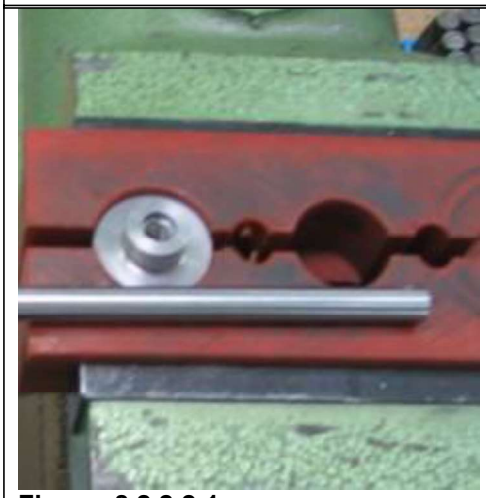
Illustration	Description	Tool / aid
 **Figure 8.2.2.1-1**	Visual check: Check sealing surface of the sealing plate (outer ring surface) for cleanliness and damage.	
 **Figure 8.2.2.1-2**	Visual check: Check the evenness of the sealing plate (front and back side, no burrs permitted).	
 **Figure 8.2.2.1-3**	Screw disc body into the lifting aid hand tight with fixing the sealing plate inside. Clamp parts at lifting aid in device.	Clamping block, Device

Illustration	Description	Tool / aid
 **Figure 8.2.2.1-4**	Tighten the disc body with the special spanner socket using 4 Nm.	 Special spanner socket Torque wrench
 **Figure 8.2.2.1-5**	Mark the material codes of sealing plate into the lifting aid.	Punch numbers, Hammer

8.2.2.2 Spindle / spring plate assembly

Illustration	Description	Tool / aid
 Figure 8.2.2.2-1	Put the spring plate in the device and fasten in place with bench vice.	- Bench vice
 Figure 8.2.2.2-2	Put a very small amount of glue on the spindle thread (1 drop on the thread).	Glue DELO ML 5449
 Figure 8.2.2.2-3	Put the spindle thread in the lower spring plate and screw it in until it is finger-tight. Push the pin punch through the spindle hole and screw in finger tight.	Pin punch

8.2.2.3 Assembly installation

Illustration	Description	Tool / aid
 Figure 8.2.2.3-1	Put the ball into the disc assembly and connect to the spindle / spring plate group.	
 Figure 8.2.2.3-2	Visual check: The pin must have some play in the parts through-hole of the disc body; connect with pin.	Hammer Support area for disc assembly

Illustration	Description	Tool / aid
 **Figure 8.2.2.3-3**	Install the spring and top spring plate on the spindle.	

8.2.3 Soft seal 438/481

8.2.3.1 Disc assembly - soft seal

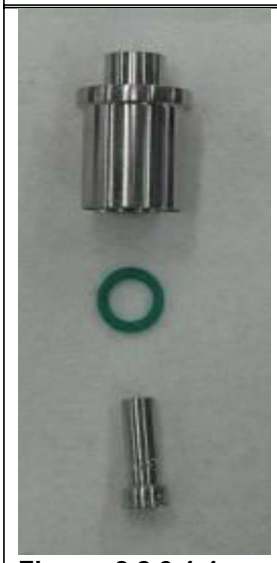
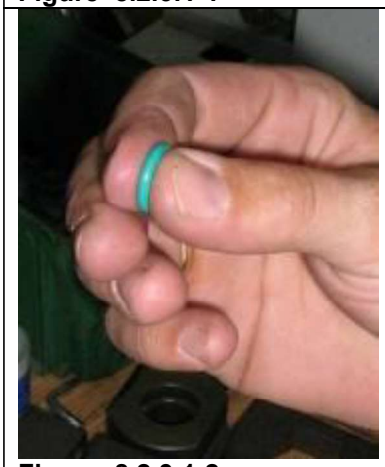
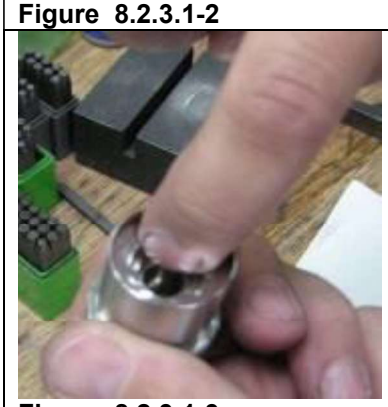
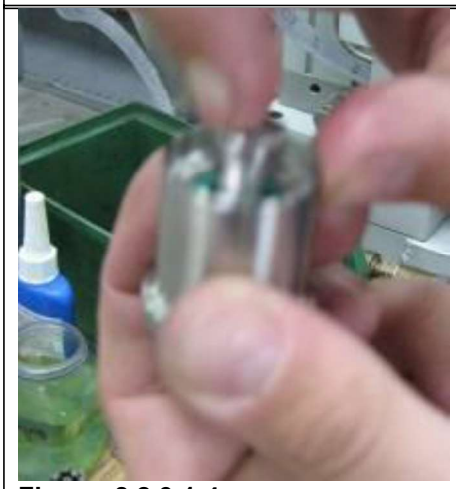
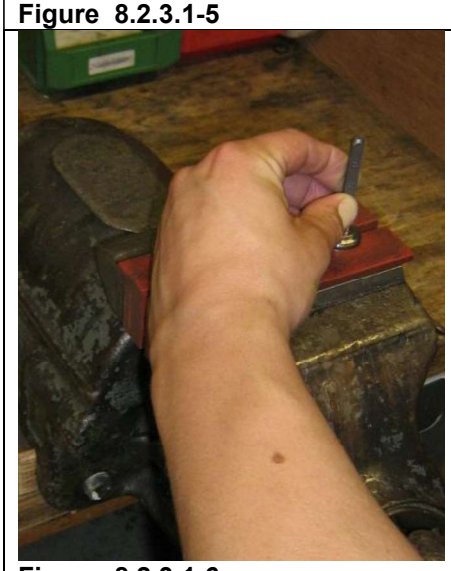
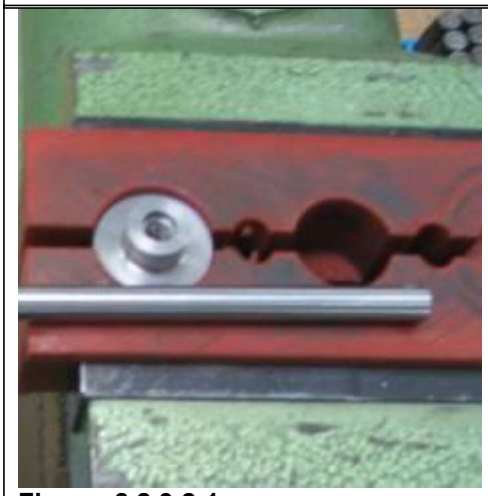
Illustration	Description	Tool / aid
 Figure 8.2.3.1-1	Visual check: Check sealing surface for cleanliness and damage.	
 Figure 8.2.3.1-2	Wet the O-Ring with soapy water.	
 Figure 8.2.3.1-3	Wet the lifting aid with soapy water.	

Illustration	Description	Tool / aid
 Figure 8.2.3.1-4	Place the O-ring in the lifting aid.	
 Figure 8.2.3.1-5	Press the disc into the lifting aid.	
 Figure 8.2.3.1-6	Mark the material codes of the soft seal into the lifting aid.	Punch numbers Hammer

8.2.3.2 Spindle / spring plate assembly

Illustration	Description	Tool / aid
 Figure 8.2.3.2-1	Put the spring plate in the assembly device and fasten in place with clamping block.	Clamping block
 Figure 8.2.3.2-2	If necessary, remove excess glue without leaving any residue.	
 Figure 8.2.3.2-3	Put the spindle thread in the lower spring plate and screw it in until it is finger-tight. Push the pin punch through the spindle hole and screw in finger tight.	Pin punch

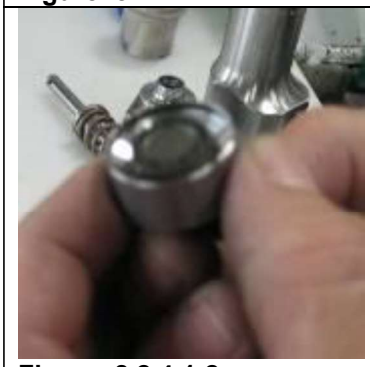
public

8.2.3.3 Assembly installation

Illustration	Description	Tool / aid
 Figure 8.2.3.3-1	Install the spring and top spring plate on the spindle.	

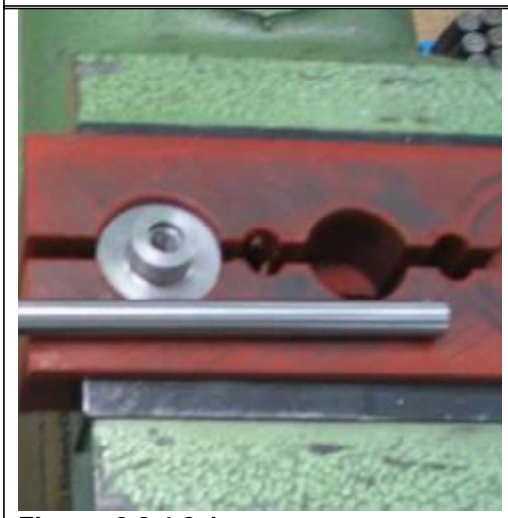
8.2.4 Vulcanised sealing surface 439

8.2.4.1 Disc assembly

Illustration	Description	Tool / aid
 **Figure 8.2.4.1-1**	Visual check: Check sealing surface for cleanliness and damage.	
 **Figure 8.2.4.1-2**	Put disc in the inlet side of the lifting aid and screw together hand tight with lock nut.	
 **Figure 8.2.4.1-3**	Clamp the disc in the assembly device and tighten with the torque wrench. Comply with torque (4 Nm) ⚠	 Special spanner socket Torque wrench Vice

public

8.2.4.2 Spindle / spring plate assembly

Illustration	Description	Tool / aid
 Figure 8.2.4.2-1	Put the spring plate into the assembly device and fasten in place with clamping block.	Clamping block
 Figure 8.2.4.2-2	Put a very small amount of glue on the spindle thread (1 drop on the thread).	Glue DELO ML 5449
 Figure 8.2.4.2-3	Put the spindle thread in the lower spring plate and screw it in until it is finger-tight. Push the pin punch through the spindle hole and screw in finger tight.	Pin punch

8.2.4.3 Assembly installation

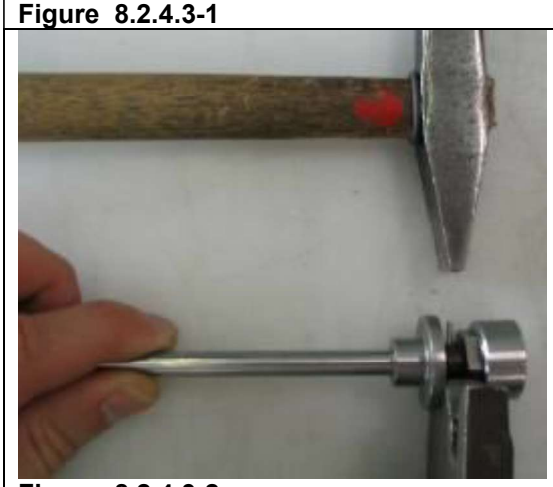
Illustration	Description	Tool / aid
 Figure 8.2.4.3-1	Put the ball in the disc assembly and connect to the spindle / spring plate group.	
 Figure 8.2.4.3-2	Install the pin centred. Visual check: The pin must have some play in the disc through-hole.	Hammer Support area for disc assembly

Illustration	Description	Tool / aid
 **Figure 8.2.4.3-3**	Install the spring and top spring plate on the spindle. Only for thrust bearings: Spring, top spring plate, thrust bearings, bearing washer. **Grease thrust bearings**.	Brush Halocarbon (OI-56 S / 60H)

8.3 Assembly of the inlet body and outlet body

8.3.1 Insertion of the spindle / disc assembly

Illustration	Description	Tool / aid
 Figure 8.3.1-1	Put the spindle assembly (incl. spring and upper spring plate) in the outlet body. Make sure that the spindle slides smoothly into the guide of the adjusting screw bushing and also the lower spring plate in the outlet body.	

8.3.2 Securing the disc

Illustration	Description	Tool / aid
 Figure 8.3.2-1	Push the splint pin through the hole of the spindle. Lift the spindle with the pin punch. Wedge the splint pin by screwing out the adjusting screw (for following assembly steps).	Pin punch

public

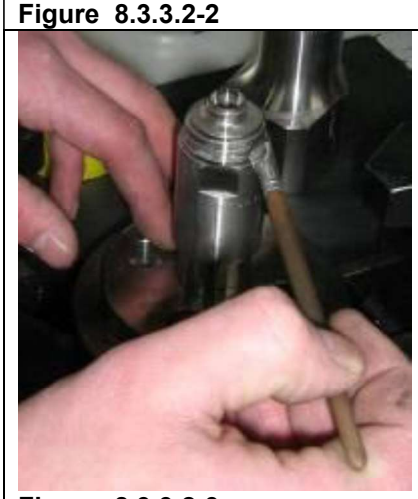
8.3.3 Assembly of the inlet body

8.3.3.1 Assembly of inlet body for threaded connector (cylindrical thread)

Illustration	Description	Tool / aid
 **Figure 8.3.3.1-1**	Visual check of inlet body: Check sealing surface for cleanliness and damage. Grease the thread of the inlet body.	Brush Halocarbon (OI-56 S / 60H)
 **Figure 8.3.3.1-2**	The disc is in a secured state (see 8.3.2) Screw the inlet body into the outlet body hand tight.	
 **Figure 8.3.3.1-3**	The disc is in a secured state (see 8.3.2) Clamp the inlet body on the device (if necessary: by using an adapter).	Clamping devices, adapter

Illustration	Description	Tool / aid
 **Figure 8.3.3.1-4**	The disc is in a secured state (see 8.3.2)	
 **Figure 8.3.3.1-5**	Tighten the inlet body with the specified torque (100 Nm). ⚠	Torque wrench

8.3.3.2 Assembly of inlet body for flanged connector (cylindrical thread)

Illustration	Description	Tool / aid
 **Figure 8.3.3.2-1**	ANSI flange ½" 150 lbs only: Before gluing the inlet body to the inlet nozzle, make sure that the sealing surface and the sealing strip are lightly greased with Halocarbon.	Halocarbon (OI-56 S / 60H)
 **Figure 8.3.3.2-2**	ANSI flange ½" 150 lbs only: Inlet body screwed together with the inlet nozzle.	
 **Figure 8.3.3.2-3**	Visual check: Check sealing surface for cleanliness and damage. The disc is in a secured state (see 8.3.2) Grease the inlet body and screw it into the outlet body.	Brush Halocarbon (OI-56 S / 60H) Glue DELO CA 2106

public

 **Figure 8.3.3.2-4**	Tighten the inlet body with the specified torque (100 Nm).	Pin punch Torque wrench

8.3.4 Assembly of the outlet flange

8.3.4.1 Assembly of outlet adapter with cylindrical thread

Illustration	Description	Tool / aid
 Figure 8.3.4.1-1	Grease the sealing lip and thread of the outlet adapter. Fit the outlet flange over the outlet adapter, screw the adapter into the outlet body and tighten it. Tighten the outlet adapter with the specified torque (100 Nm).	Brush Halocarbon (OI-56 S / 60H) Torque wrench

8.3.4.2 Assembly of outlet adapter with a conical thread (NPT)

Illustration	Description	Tool / aid
 **Figure 8.3.4.2-1**	Apply sealing tape to the thread of the outlet flange.	Sealing tape
 **Figure 8.3.4.2-2**	Screw the outlet adapter into the outlet body and tighten it.	

8.4 Adjusting the set pressure

Illustration	Description	Tool / aid
 **Figure 8.4-1**	Secure the spindle with splint pin against turning when adjusting the adjusting screw. Pressurise the valve and adjust to the set pressure with the adjusting screw in accordance with the specification. Check whether the valve opens at the set pressure. The set pressure of the valve has been reached when you can hear air escaping. Full opening must be achieved. If the valve opens outside the stipulated set pressure tolerance, the adjusting screw must be adjusted again. → Turning in a clockwise direction causes the valve to open at higher pressure. → Turning in a counter-clockwise direction causes the valve to open at lower pressure. When resetting the adjusting screw, first of all release the pressure. Remark: In case of 437 with d0=6mm, LGS 3614 must be considered.	Pin punch Open-end spanner Pressure gauge

8.5 Testing and documenting the seat tightness.

Illustration	Description	Tool / aid
 **Figure 8.5-1**	Raise the valve to its set pressure 3 times. After the 3rd opening, throttle the valve from the set pressure to the test pressure. Screw the test cap on to the outlet body. Seal the valve outlet with the test plug thereby connecting it to the water tank. Adjust the valve to the given test pressure. Check the functional seal tightness according to the order specifications and LGS 0201. If the seal tightness is not met, then enter the number of bubbles that are counted in the fields. If the seal tightness has not been met after 3 attempts, then initiate a fault report. If the seal tightness has been met in accordance with the specifications, then document the results in Report 1.3 "Number of Bubbles". Unscrew test cap	Kellog test assembly device

8.6 Assembly of the cap and lever

8.6.1 Assembly of cap H2

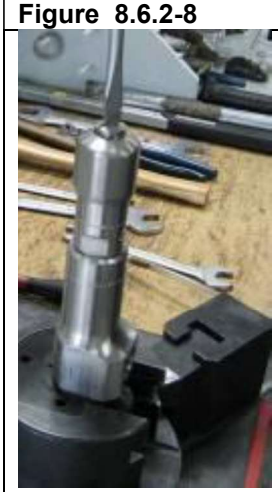
Illustration	Description	Tool / aid
 **Figure 8.6.1-1**	Grease the thread and sealing lip of cap H2. Put on the E-CTFE sealing ring if it is shown in the parts list. Caution: The sealing ring may only be used once. If it is necessary to disassemble the cap, the sealing ring must be replaced.	Brush Halocarbon (OI-56 S / 60H)
 **Figure 8.6.1-2**	Screw the cap on and tighten it with a spanner (torque as per LGS 3322).	Torque wrench

8.6.2 Assembly of lever H4

Illustration	Description	Tool / aid
 **Figure 8.6.2-1**	Roll the O-ring onto the spindle cap.	
 **Figure 8.6.2-2**	Put the spindle cap onto the spindle and connect with a cylinder pin.	
 **Figure 8.6.2-3**	Grease the O-ring well (1). Grease the threads of the spindle cap (2). Put on the E-CTFE sealing ring if it is shown in the parts list. **Caution:** The sealing ring may only be used once. If it is necessary to disassemble the cap, the sealing ring must be replaced.	(1) Klübersynth UH 14-151 / 60H (2) Halocarbon (OI-56 S / 60H)

public

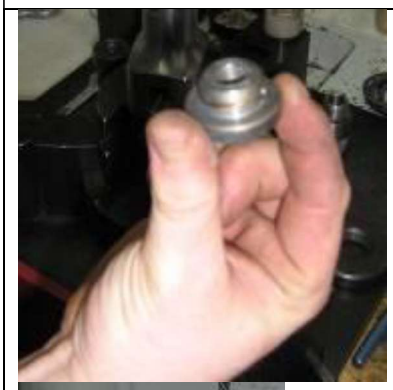
Illustration	Description	Tool / aid
 **Figure 8.6.2-4**	Grease the thread and sealing lip of the lever cover.	Brush Halocarbon (OI-56 S / 60H)
 **Figure 8.6.2-5**	Screw the lever cover onto the thread of the outlet body and tighten using approx. 60 - 75 Nm.	Torque wrench
 **Figure 8.6.2-6**	Fit the pin into the hole of the lever cover and the slot of the spindle cap and secure it with the retaining clip.	

Illustration	Description	Tool / aid
 Figure 8.6.2-7	Press the spindle cap down after assembly.	
 Figure 8.6.2-8	Grease the threads of the lever cap and install it. Attention: left-handed thread	Brush Halocarbon (OI-56 S / 60H)
 Figure 8.6.2-9	Screw in cylinder pin / nut is flush when closed. Set lever to "closed" / the inscription "CLOSED" can be read on the cap limit stop.  Check the lever after assembly to make sure that it works (release compressed air with each lever).	Flat-tip screwdriver

public

8.6.3 Assembly of lever H3

Illustration	Description	Tool / aid
 Figure 8.6.3-1	Individual parts of the assembly	
 Figure 8.6.3-2	Place the O-ring in the groove of the lever cover.	
 Figure 8.6.3-3	Put the spindle cap onto the spindle and connect with a cylinder pin.	

Illustration	Description	Tool / aid
 **Figure 8.6.3-4**	Grease the thread and sealing lip of the lever cover.	Brush Halocarbon (Oil 56 S / 60H)
  **Figure 8.6.3-5**	Screw the lever cover onto the thread of the outlet body and tighten it using approx. 60 - 75 Nm. Pull up the spindle cap and install the knob with the pin and secure with the retaining clip. Press the knob down after assembly.	Torque wrench

8.7 Testing the seal tightness to the outside

8.7.1 Testing the seal tightness to the outside (threaded valve)

Illustration	Description	Tool / aid
 Figure 8.7.1-1	Seal the valve at the inlet with a sealing cap.	Sealing cap
 Figure 8.7.1-2	Install a test connector to the outlet.	Test connector

Illustration	Description	Tool / aid
 **Figure 8.7.1-3**	Clamp the outlet side of the valve in the test assembly device and apply 6 bar of pressure.	
 **Figure 8.7.1-4**	Pressure testing by immersion: Check whether any bubbles can be seen on the outside contour of the safety valve. If the seal tightness is good (no bubbles), document the test result. If there are any leaks, check the affected sealing surfaces and seals for damage and then test again. Dry the valve with compressed air.	

8.7.2 Testing the seal tightness to the outside (flanged valve)

Illustration	Description	Tool / aid
 Figure 8.7.2-1	Clamp the outlet side of the valve to the test bench. Pressurise the valve with 6 bar. Wet the valve with leak detector on the interconnection points and the outlet area. If the seal tightness is good (no bubbles), document the test result. If there are any leaks, check the affected sealing surfaces and seals for damage and then test again. Dry the valve with compressed air.	

8.8 Sealing the valve

Illustration	Description	Tool / aid
 Figure 8.8-1	Connect the sealing wire closely by using the shortest path. Seal the lever, or alternatively cap H2 to the outlet body.	

public

Inhalt

1 Purpose

This LESER Global Standard (LGS) describes torques ranges for screws and bolts.

2 Range of application

This LGS is valid for all members of LESER Quality union.

3 References

None

4 Introduction

The above torque ranges are valid for material marked full shaft screws or full shaft bolts and nuts used for the connection between body and bonnet according to AD-B7 and similar applications.

The torque ranges are valid for lubricated threads with a friction factor or 0,1 and rectangular facings of the nuts in relation to the bore. With the above torques about 70 – 90 % of the yield strength of the material is reached.

For higher friction factors (0,12 – 0,15) the higher valves for the torque are required. The maximum limits must not be exceeded.

Data base: The 70 % valves (low torque valve) for friction factor 0,1 are taken from the catalogue of „Fa. Gebr. Grohmann, 1991, Wissenswertes über Edelstahlschrauben".

5 Body and bonnet connection

Material	Material equivalent	Min. – max. Torque [Nm]					
DIN	ASME	Thread					
		M10	M 12	M 16	M 20	M 24	M 27
Ck 35/ C 35 (1.1181)	Steel	18 - 22	28 - 36	68 - 87	130 - 166	255 - 288	
A4 Klasse 70 (1.4401)	A193 B8M Cl.2	25 - 30	45 - 58	108 - 138	204 - 261	202 – 258	310 - 345
	A193 B8M Cl.1	25 - 30	45 - 58	108 - 138	204 - 261	202 – 258	
5.6	-	19 - 22	30 - 39	73 - 93	--	--	--
8.8	-	40 - 45	65 - 84	155 - 198	--	--	--
	A320 Gr. B8M	25 - 30	45 - 58	108 - 138	204 - 261	202 – 258	310 - 345
1.7225	A 193 Gr. B7		60 - 70	135 - 170	220 - 250	280 – 320	450-480
	A 320 Gr. L7		60 - 70	135 - 170	220 - 250	280 – 320	450-480
	A 320 Gr. L7M		60 – 70	135 - 170	220 - 250	280 – 320	450-480
1.4301	A 193 Gr. B8 CL. 2		60 - 70	135 - 170	250 - 260	250 – 300	
	A 193 Gr. B8T CL. 2			135 - 170	250 - 260		
	A320 Gr. B8 CL. 2	35 - 40	60 - 70	135 - 170	250 - 260	250 - 300	
1.4462	SA-479	25 - 30	45 - 58	108 - 138	204 - 261	202 – 258	310 - 345
1.4501	SA-479	25 - 30	45 - 58	108 - 138	204 - 261	202 – 258	
	A 193 Gr. B7M		60 - 70	135 - 170	220 - 250	280 – 320	
	A453 Gr.660 Class D		70-85	160-190	280-300	340-360	
A5 Klasse 70 (1.4571)		25 - 30	45 - 58	108 - 138	204 - 261	202 – 258	310 - 345
2.4819	N10276	19 - 22	30 - 39	73 - 93	170-185	280-300	
	B8MLCuN-Cl.1B	18 - 22	28 - 36	68 - 87	130 - 166	255 - 288	
Torque to yield bolts:							
17709	A 193 Gr. B16	-	31 - 37	98 - 118	190 - 228	280 - 320	
	A 193 Gr. B7	-	31 - 37	98 - 118	190 - 228	280 - 320	

Table 1.1 for screws and nuts DIN 931, 933, 938 and EN 24032

Note: In case of Gylon gasket application, the nuts resp. screws have to be tightened again after 15 min.

Material DIN	Material-equivalent ASME	Min. – max. Torque [Nm] * Thread M 12	M 16		
Ck 35/ C 35 (1.1181)	Steel	39 – 41	59 - 61		
5.6	-	39 – 41	59 - 61		

Table 2 for screws and nuts for safety valves Type 447/547

*) The above mentioned torqueses are based on field tests. They allow a tight connection without destroying the PTFE-material.

5.1 Type 48x Clamp rings and Split-rings

Table .1 + Table .2 list torques for screws and nuts for connection of body and bonnet for clean service valves - Type 48X.

Table 2.1: Torques for nuts for **Clamp rings** for clean service - Type 48X

Material DIN	Material-equivalent ASME	Torque [Nm] Thread M 6	M 8
KLAPPRING (1.4404)	(SS316)	6	14

Table 2.2: Torques for screws and nuts for clean service **Split-rings** - Type 48X

Material DIN	Material-equivalent ASME	Torque [Nm] Thread M 6	M 8	M 10
A4 Klasse 70 (1.4401)	(B8M)	11	26	51

6 Caps and lifting devices

Size	Thread	Torque [Nm]**		Wrench size
		Standard	HALAR-coated gasket	
0	M 24 x 1,5	60 – 75	60 - 75	SW 27
I	M 33 x 1,5	80 – 100	60 - 75	SW 46
II	M 42 x 1,5	100 – 125	100 - 125	SW 55
III	M 60 x 1,5	140 – 175	240 - 270	SW 75
IV+V	M 75 x 1,5	175 – 220	n.a.	SW 95

Table 3: Caps and lifting devices (sealing torque)

**) To achieve manually with 200 mm extended wrench.
Sufficient for clean and lubricated threads and not damaged sealing surfaces.

n.a. Gasket not available for this size

7 Test Gag

7.1 Short locking screws

For tightening of the short locking screws (pos. 2, e.g. drawing 190.0309-XX-B01) the torque ranges of table 4 are recommended.

Cap size Size lifting device	Thread size	Torque [Nm]***
0	M12	28 - 32
I	M12	
II	M12	
III	M12	
IV	M16	72 -76
V	M16	

Table 4: Test Gag: Recommended starting torque ranges for short screws

***) The used sealing rings out of vulcanised fibre may not be deformed further because they are soft sealings.

7.2 Long locking screws

For tightening of the long locking screws (pos. 1, e.g. drawing 190.0309-XX-B01) the torque ranges of table 5 are recommended.

Cap size Size lifting device	Thread size	Torque [Nm]*
0	M12	15
I	M12	
II	M12	20
III	M12	
IV	M16	35
V	M16	

Table 5: Test Gag: Recommended starting torque ranges for long screws

*) The torques ranges are not valid for O-ring discs and sealing plates designs. In case of need they have to be required at TB/DD.

7.3 Long locking screw as transport locking device

For tightening the long locking screw as transport locking device (e.g. drawing 190.0809-XX-B01) the torques are adjusted acc. to table 6.

Cap size Size lifting device	Thread size	Torque (All types) [Nm]
0	M12	4
I	M12	
II	M12	
III	M12	
IV	M16	
V	M16	

Table 6 Torque specification of long locking screw as transport locking device.

8 Screwed plugs, locking screws (metal sealing)

Material DIN	Material equivalent ASME	Min. – max. torques [Nm] * Gewinde			
		G 1/8	G1/4	G1/2	
A4 Klasse 70 (1.4401)	(B8M)	15 - 20	35-40	65-90	

Table 7: Recommended locking torques for screwed plugs (e. g. Type 526)

*) Lower values are valid for sealing with sealing ring acc. to DIN 7603.

9 Nozzles, inlet bodies and screwed bonnets (T459/462)

Benennung/Name	Orifice/DN do or Size	Druckstufe/ Pressure Class	Gewindegröße Thread size	Anzugs-drehmoment Torque [Nm]
SITZBUCHSE/Nozzle 526 1E2	1 D+E2	150-600	M38x1,5	95
SITZBUCHSE/Nozzle 526 1.5E2	1,5 D+E2	900 -1500	M38x1,5	95
SITZBUCHSE/Nozzle 526 1.5F2	1,5 F2	150-1500	M48x1,5	95
SITZBUCHSE/Nozzle 526 1.5G3	1,5 G3	150-900	M48x1,5	95
SITZBUCHSE/Nozzle 526 1.5H3	1,5 H3	150-300	M48x1,5	95
SITZBUCHSE/Nozzle 526 1.5EF3	1,5 E+F3	2500	M48x1,5	95
SITZBUCHSE/Nozzle 526 2H3	2 H3	150-1500	M64x1,5	115
SITZBUCHSE/Nozzle 526 2J3	2 J3	150-300L	M64x1,5	115
SITZBUCHSE/Nozzle 526 2G+H3	2 G+H3	2500	M64x1,5	115
SITZBUCHSE/Nozzle 526 3K4	3 K4	150-600	M100x2	300
SITZBUCHSE/Nozzle 526 3L4	3 L4	150-300L	M100x2	300
SITZBUCHSE/Nozzle 526 3J4	3 J4	300-1500	M100x2	300

SITZBUCHSE/Nozzle 526 3K4/6	3 K4/6	900-1500	M100x2	300
SITZBUCHSE/Nozzle 526 4L 6	4 L6	300-600	M120x2	430
SITZBUCHSE/Nozzle 526 4L6	4L6	900-1500	M120x2	430
SITZBUCHSE/Nozzle 526 4M6	4 M6	150-900	M120x2	430
SITZBUCHSE/Nozzle 526 4N6	4N6	150-900	M120x2	430
SITZBUCHSE/Nozzle 526 4P6	4 P6	150-900	M120x2	430
SITZBUCHSE/Nozzle 526 6Q8	6 Q8	150-600	M165x2	610
SITZBUCHSE/Nozzle 526 6R8	6 R8/10	150-600	M165x2	610
SITZBUCHSE/Nozzle 526 8T10	8 T10	150-300	M220x2	700
Type 457/458				
SITZBUCHSE Nozzle 458 DN 25/ 15	d015	Alle/all	M36x1,5	
SITZBUCHSE Nozzle 458 DN 25/ 20	do20	Alle/all	M36x1,5	**95**
SITZBUCHSE Nozzle 458 DN 50/ 30	do30	Alle/all	M64x1,5	
SITZBUCHSE Nozzle 458 DN 50/ 40	do40	Alle/all	M64x1,5	**115**
SITZBUCHSE Nozzle 458 DN 80/ 50	do50	Alle/all	M100x2	**300**
SITZBUCHSE Nozzle 458 DN 80/ 60	do60	Alle/all	M100x2	
SITZBUCHSE Nozzle 458 DN100 do50	do50	Alle/all	M120x2	
SITZBUCHSE Nozzle 458 DN100 do60	do60	Alle/all	M120x2	
SITZBUCHSE Nozzle 458 DN100 do74	do74	Alle/all	M120x2	
SITZBUCHSE Nozzle 458 DN100 do88	do88	Alle/all	M120x2	**450**
SITZBUCHSE Nozzle 458 DN150/110	do110	Alle/all	M165x2	**650**
Type 441/442 Sitzbuchse/Full nozzle				
DN25	do23	Alle/all	M36x1,5	**95**
DN40	do29+37	Alle/all	M48x1,5 M52x1,5	**95**
DN50	do46	Alle/all	M64x1,5	**115**
3"	do60	Alle/all	M85x1,5	**115**
DN80	do60	Alle/all	M100x2	**300**
DN100	do92	Alle/all	M120x2	**450**
Type 437/438/439 Eintrittskörper/Inlet body				
do6+10		Alle/all	M30x1,5	**90**

Type 459/462 Eintrittskörper/Inlet body				
do6+9,13 und 17,5	Alle/all	Alle/all	M33x1,5	**100**
Type 459/462 Gehäuse/Federhaube Outlet body/Bonnet/ Spacer			M64x1,5	**250**
do6+9,13 und 17,5	Alle/all	Alle/all	M33x1,5	**100**
Type 431/433 PN160				
Klemmring/Sitzbuchse Clamps/nozzles	do12	Alle/all	M33x1,5	**100**

Table 8 Recommended torques of valve nozzles for type 441/442; 457/458 and 526, inlet bodies of type 437/438/438/459 and 462 and screwed bonnets (type 459/462)

10 Torques for sealing plate disks (valve types 441/433/526)

Sealing plate disks of valve types 441/433/526 had been modified in project Vendi 95 (ECO 200295) and therefore the torques in table 9 for the fixing nuts are valid.

Thread Size Fixing Nut	Torque [Nm]
M5	**4**
M8	**15**
M12	**43**
M16	**70**

Table 9: Torques for sealing plate disks 441/433/526

Inhalt

1 Zweck / Purpose

Dieser LESER Global Standard (LGS) beschreibt Anzugsdrehmomente für O-Ring-Teller.
This LESER Global Standard (LGS) describes torques ranges for o-ring-disc.

2 Gültigkeitsbereich / Range of application

Dieser LGS gilt für die alle Mitglieder des LESER Qualitätsverbunds.
This LGS is valid for all members of LESER Quality union.

3 Referenzen / References

LGS 3325

4 Geltungsbereich

Die in den Tabellen angegebenen Montage-Anzugsmomente M_A sollen dazu dienen, dass eine Überbeanspruchung (Verdrehung) der Gewindeverbindung beim Festziehen verhindert wird. In Tabelle 2 werden außerdem empfohlene Drehmomente zur Erzielung von Dichtheit genannt.

Bemerkung:
Die Angaben über die Montage-Anzugsdrehmomente sind als annähernde Richtwerte zu betrachten, da das Anzugsdrehmoment durch unterschiedliche Oberflächen- und Schmierverhältnisse, aber auch durch mehrmaliges Anziehen und Lösen der Verbindung beeinflusst wird. Deshalb ist auch eine genaue Berechnung des Anzugsdrehmoments kaum möglich.
Seite 2 dieser LGS ist nur für den LESER internen Gebrauch bestimmt.

4 Range of application

The below mentioned torques MA are maximum valves to avoid damages to the threaded connections. In table 2 alson recommended torques for achieving tightness are mentioned.

Remark:
The torque values shall be taken as a recommendation. Different lubrification, frequent assembly and disassembly can influence the values substantially.
Page 2 of this LGS is limited for LESER internal use.

5 O-Ring-Teller Befestigung, Teller aus 1.4404 / *o-ring-disc, material 1.4404*

Gewindegröße *Thread size*	M 5	M 8	M 10	M 12	M 16	M 30
Max. M_A [Nm]	2	21	40	70	100	570
M_A empfohlen [Nm] *M_A recommended*	2-3	12-15	20-25	45-50	65-70	85-90

Tabelle 1 / *table 1*

6 Faltenbalg-Anschlussteil aus 1.4404 / *bellows connection, material 1.4404*

Gewindegröße *Thread size*	M 24 x 1,5	M 27 x 1,5	M 30 x 1,5	M 36 x 1,5	M 40 x 1,5	M 48 x 1,5	M 60 x 1,5
Max. M_A [Nm]	232	336	500	828	1220	2015	4000
M_A empfohlen *M_A recommended*	60-75	70-85	75 - 90	90-110	100 - 120	110-135	140-175

Tabelle 2 / *table 2*

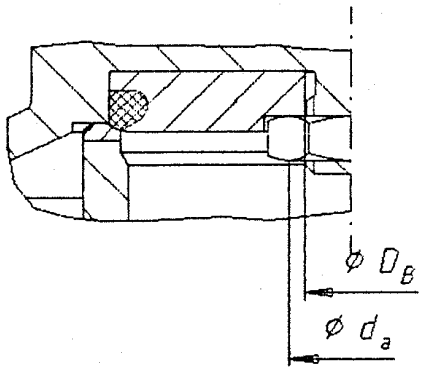


Bild 1

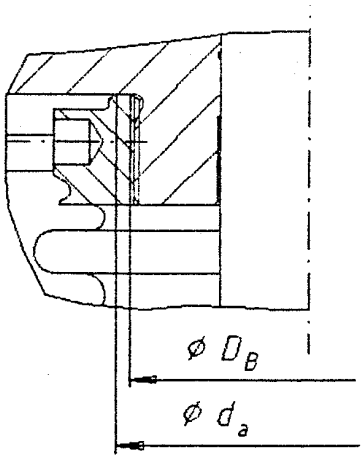


Bild 2

7 Berechnungsformeln (LESER-intern) / *Calculation formulas (LESER internal)*

Annähernde Berechnungsformel für das Anzugsdrehmoment der Schraubenverbindungen bei O-Ring-Teller und oberem Faltenbalg-Anschlussteil.

Montage-Anzugsdrehmoment: M_A
Die in LGS 3325 Blatt 1 angegebenen Tabellen beinhalten die Montage-Anzugsdrehmomente, die nach folgender annähernder Berechnungsformel errechnet sind:

$$M_A = 0{,}9 \times M_{A\,0{,}9} \qquad (1)$$

$$M_{A\,0{,}9} = 0{,}45 * A_s * o_{0,2} * d_2 * \left(\mu_{ges} * \left(1 + \frac{d_a + D_B}{2 * d_2} \right) + \frac{P}{\pi * d_2} \right) \qquad (2)$$

Formel (2) in (1):

$$M_A = 0{,}4 * A_s * o_{0,2} * d_2 * \left(\mu_{ges} * \left(1 + \frac{d_a + D_B}{2 * d_2} \right) + \frac{P}{\pi * d_2} \right) \qquad (3)$$

$M_{A\,0,9}$: Das maximale Anzugsdrehmoment, bei dem 90% der Streckgrenze ausgenutzt wird, in Nmm.

A_S: Spannungsquerschnitt des Gewindes in mm² (siehe Gewindetabellen).

$o_{0,2}$: Streckgrenze der Raumtemperatur in N/mm².

d_2: Flankendurchmesser des Gewindes in mm.

P: Steigung des Gewindes.

d_a, D_B: Siehe Bilder 1 und 2.

$\mu_{ges.}$: Gesamtreibungszahl
$\mu_{ges.} \approx 0{,}14$ im Normalfall, trocken.
$\mu_{ges.} \approx 0{,}1$ bei Gewinden mit MOS_2 - Paste geschmiert.

Contents

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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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

protected

disclosure cat.:	II	proofread:	OR	published date:	9/14/11	effect. date:	18.11.201
author:	Nieh	released by:	KUW	replaces:	initial	status:	published
resp. depart.:	PP	date of release:	11/8/11	revision No.:	0		
doc. type:	LGS	change rep. No.:	651A	retention period:	10		

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.

Contents

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

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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 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

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)

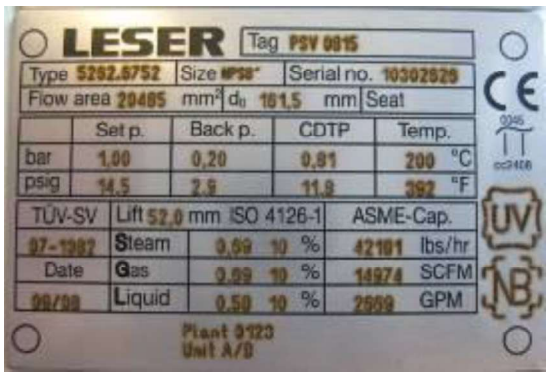


Figure 6.2.1-1

The world plate (NGA) comes in two versions.

For valves that are designed according to ASME (feature N68/N70), the version is created with the UV and NB symbols.

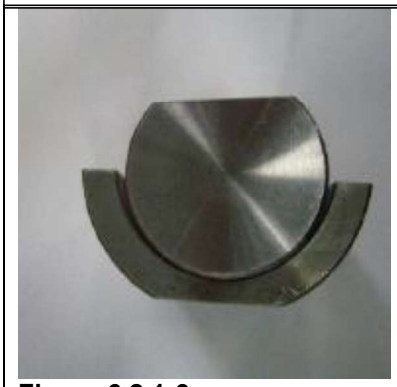
For valves that are designed according to TÜV, the UV and NB symbols are not lasered on.

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
 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
 Figure 6.2.2-1		

Illustrations	Description	Aids / Tools
 **Figure 6.2.2-2**		Sponge
 **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 High Performance series, the world plate is always attached to the bonnet. 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). 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". 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. The top edge of the plate should be flush with the bevel of the bonnet.	

d) Open bonnet (V40)
Position of the bonnet:

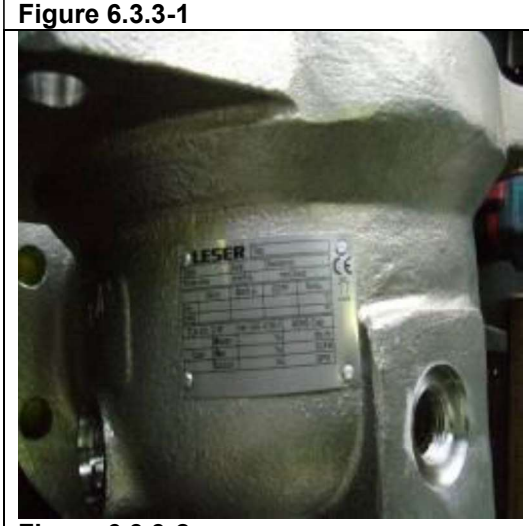
The raised identifier of the product form manufacturer (foundry) is mounted in the direction of the outlet flange.

Position of the world plate

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. 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**		

Contents

1 Purpose

This LESER Global Standard (LGS) contains the information about pressure range of all springs, which are installed in valve- types 481.

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- types 481.
The pressure ranges of the various types are given first in pressure-unit [bar].This is followed by the pressure-unit [psig].

For additional information please see legend description.

3 References

LDeS 3060.01, LDeS 3265.01

Erklärungen siehe / explanation see : LGS 3600

Ausführung

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	**korrosionsfest** *(stainless steel)* p [bar] von p1 up	bis p2 to	Feder-Sachnummer stock no.	Indizes
									481 do10		
								mit vulkanisierter Weichdichtung (vulcanised soft seal)			
								0,10	- 0,23	540.0704.0000	
								0,24	- 0,33	540.3004.0000	
								0,34	- 0,50	540.3014.0000	
								0,51	- 0,90	540.3024.0000	
								0,91	- 1,40	540.3034.0000	
								1,41	- 1,80	540.3044.0000	
								1,81	- 3,10	540.3054.0000	
								3,11	- 4,40	540.3064.0000	
								4,41	- 7,00	540.3074.0000	
								7,01	- 10,00	540.3084.0000	
								10,01	- 16,00	540.3094.0000	
									481 do10		
								mit O-Ring-Teller (o-ring-disc)			
								16,01	- 26,00	540.3114.0000	
								26,01	- 35,00	540.3164.0000	
								35,01	- 54,00	540.3174.0000	
								54,01	- 68,00	540.3204.0000	

Erklärungen siehe / explanation see : LGS 3600

Ausführung *(model)*

p [psig] von p1 up	bis p2 to	Feder-Materialnummer stock no.	Indizes	p [psig] von p1 up	bis p2 to	Feder-Materialnummer stock no.	Indizes	p [psig] von p1 up	bis p2 to	Feder-Materialnummer stock no.	Indizes
								korrosionsfest *(stainless steel)*			
								481 do10			
								mit vulkanisierter Weichdichtung (vulcanised soft seal)			
								1	- 3	540.0704.0000	
								3	- 5	540.3004.0000	
								5	- 7	540.3014.0000	
								7	- 13	540.3024.0000	
								13	- 20	540.3034.0000	
								20	- 26	540.3044.0000	
								26	- 45	540.3054.0000	
								45	- 64	540.3064.0000	
								64	-102	540.3074.0000	
								102	-145	540.3084.0000	
								145	-232	540.3094.0000	
								mit O-Ring-Teller (o-ring-disc)			
								232	-377	540.3114.0000	
								377	-508	540.3164.0000	
								508	-783	540.3174.0000	
								783	-986	540.3204.0000	

Contents

1 Purpose

This LESER Global Standard (LGS) contains the information about pressure range of all springs, which are installed in valve- types 483.

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- types 483.
The pressure ranges of the various types are given first in pressure-unit [bar, page 2-3].
This is followed by the pressure-unit [psig, page 4- end].

For additional information please see legend description.

3 References

LDeS 3060.01, LDeS 3265.01

4 Legend / Indices

- S = Sonderauftrag / special order

Erklärungen siehe / explanation see : LGS 3600

Ausführung

Standard *(standard)*				**Standard** *(standard)*				**Standard** *(standard)*			
p [bar]				**p [bar]**				**p [bar]**			
von	**bis**	**Feder-**	**Indizes**	**von**	**bis**	**Feder-**	**Indizes**	**von**	**bis**	**Feder-**	**Indizes**
p1	**p2**	**Sachnummer**		**p1**	**p2**	**Sachnummer**		**p1**	**p2**	**Sachnummer**	
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
								483 DN 25 do 13			
								0,30	- 0,37	540.3014.0000	
								0,38	- 0,55	540.3024.0000	
								0,56	- 0,83	540.3034.0000	
								0,84	- 1,24	540.3044.0000	
								1,25	- 1,80	540.3054.0000	
								1,81	- 2,45	540.3064.0000	
								2,46	- 3,20	540.3074.0000	
								3,21	- 4,50	540.3084.0000	
								4,51	- 6,60	540.3094.0000	
								6,61	- 9,75	540.3104.0000	
								9,76	- 16,00	540.3114.0000	
								Federdaten-Tabelle gültig ab 13.12.00 *spring data list valid since 13.12.00*			
								483 DN 40 do 25			
								0,10	- 0,14	540.8014.0000	
								0,15	- 0,21	540.8024.0000	
								0,22	- 0,29	540.8034.0000	
								0,30	- 0,37	540.8044.0000	
								0,38	- 0,59	540.8054.0000	
								0,60	- 0,97	540.4004.0000	
								0,98	- 1,40	540.4014.0000	
								1,41	- 1,90	540.4024.0000	
								1,91	- 2,55	540.4034.0000	
								2,56	- 3,40	540.4044.0000	
								3,41	- 4,80	540.4054.0000	
								4,81	- 7,00	540.4064.0000	
								7,01	- 9,90	540.4074.0000	
								9,91	- 12,75	540.4084.0000	
								12,76	- 16,00	540.4094.0000	

Erklärungen siehe / explanation see : LGS 3600

Ausführung

Standard *(standard)*				**Standard** *(standard)*				**Standard** *(standard)*			
p [bar]				**p [bar]**				**p [bar]**			
von *up* **p1**	**bis** *to* **p2**	**Feder-Sachnummer** *stock no.*	**Indizes**	**von** *up* **p1**	**bis** *to* **p2**	**Feder-Sachnummer** *stock no.*	**Indizes**	**von** *up* **p1**	**bis** *to* **p2**	**Feder-Sachnummer** *stock no.*	**Indizes**
								483 DN 25 do 13			
								0,10	- 0,20		S
								0,21	- 0,27	540.3004.0000	
								0,28	- 0,41	540.3014.0000	
								0,42	- 0,65	540.3024.0000	
								0,66	- 1,00	540.3034.0000	
								1,01	- 1,40	540.3044.0000	
								1,41	- 1,98	540.3054.0000	
								1,99	- 2,85	540.3064.0000	
								2,86	- 3,75	540.3074.0000	
								3,76	- 4,55	540.3084.0000	
								4,56	- 6,10	540.3094.0000	
								6,11	- 10,40	540.3104.0000	
								10,41	- 16,00	540.3114.0000	
								Federdaten gültig bis 13.12.00 *spring data-list valid until 13.12.00*			

Erklärungen siehe / explanation see : LGS 3600

Ausführung (type)

Standard *(standard)*				**Standard** *(standard)*				**Standard** *(standard)*			
p [psig]				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**	**Indizes**	**von**	**bis**	**Feder-**	**Indizes**	**von**	**bis**	**Feder-**	**Indizes**
p1	**p2**	**Materialnummer**		**p1**	**p2**	**Materialnummer**		**p1**	**p2**	**Materialnummer**	
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
										483 DN 25 do 13	
								4	- 6	540.3014.0000	
								6	- 8	540.3024.0000	
								8	- 12	540.3034.0000	
								12	- 18	540.3044.0000	
								18	- 26	540.3054.0000	
								26	- 36	540.3064.0000	
								36	- 47	540.3074.0000	
								47	- 65	540.3084.0000	
								65	- 96	540.3094.0000	
								96	-142	540.3104.0000	
								142	-232	540.3114.0000	
								Federdaten-Tabelle gültig ab *spring data list valid since*			
										483 DN 40 do 25	
								1	- 2	540.8014.0000	
								2	- 3	540.8024.0000	
								3	- 4	540.8034.0000	
								4	- 6	540.8044.0000	
								6	- 9	540.8054.0000	
								9	- 14	540.4004.0000	
								14	- 20	540.4014.0000	
								20	- 28	540.4024.0000	
								28	- 37	540.4034.0000	
								37	- 49	540.4044.0000	
								49	- 70	540.4054.0000	
								70	-102	540.4064.0000	
								102	-144	540.4074.0000	
								144	-185	540.4084.0000	
								185	-232	540.4094.0000	

Erklärungen siehe / explanation see : LGS 3600

Ausführung (type)

Standard *(standard)*				**Standard** *(standard)*				**Standard** *(standard)*			
p [psig]				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**	**Indizes**	**von**	**bis**	**Feder-**	**Indizes**	**von**	**bis**	**Feder-**	**Indizes**
p1	**p2**	**Materialnummer**		**p1**	**p2**	**Materialnummer**		**p1**	**p2**	**Materialnummer**	
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
									483 DN 25 do 13		
								1	- 3		S
								3	- 4	540.3004.0000	
								4	- 6	540.3014.0000	
								6	- 10	540.3024.0000	
								10	- 15	540.3034.0000	
								15	- 20	540.3044.0000	
								20	- 29	540.3054.0000	
								29	- 41	540.3064.0000	
								41	- 55	540.3074.0000	
								55	- 66	540.3084.0000	
								66	- 89	540.3094.0000	
								89	-151	540.3104.0000	
								151	-232	540.3114.0000	
								Federdaten gültig bis 13.12.00 *spring data-list valid until 13.12.00*			

Contents

1 Purpose

This LESER Global Standard (LGS) contains the information about pressure range of all springs which are installed in valve- types 484.

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- types 484.
The pressure ranges of the various types are given first in pressure-unit [bar].
This is followed by the pressure-unit [psig].

For additional information please see legend description.

3 References

LDeS 3060.01, LDeS 3265.01

Erklärungen, siehe / explanation, see : LGS 3600

Ausführung

Standard *(standard)*				**Standard** *(standard)*				**Standard** *(standard)*			
p [bar]				**p [bar]**				**p [bar]**			
von	**bis**	**Feder-**	**Indizes**	**von**	**bis**	**Feder-**	**Indizes**	**von**	**bis**	**Feder-**	**Indizes**
p1	**p2**	**Sachnummer**		**p1**	**p2**	**Sachnummer**		**p1**	**p2**	**Sachnummer**	
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
								484 DN25 do13			
								0,30	- 0,37	540.3014.0000	
								0,38	- 0,55	540.3024.0000	
								0,56	- 0,83	540.3034.0000	
								0,84	- 1,24	540.3044.0000	
								1,25	- 1,80	540.3054.0000	
								1,81	- 2,45	540.3064.0000	
								2,46	- 3,20	540.3074.0000	
								3,21	- 4,50	540.3084.0000	
								4,51	- 6,60	540.3094.0000	
								6,61	- 9,75	540.3104.0000	
								9,76	- 16,00	540.3114.0000	
								484 DN 40 do 25			
								0,10	- 0,14	540.8014.0000	
								0,15	- 0,21	540.8024.0000	
								0,22	- 0,29	540.8034.0000	
								0,30	- 0,37	540.8044.0000	
								0,38	- 0,59	540.8054.0000	
								0,60	- 0,97	540.4004.0000	
								0,98	- 1,40	540.4014.0000	
								1,41	- 1,90	540.4024.0000	
								1,91	- 2,55	540.4034.0000	
								2,56	- 3,40	540.4044.0000	
								3,41	- 4,80	540.4054.0000	
								4,81	- 7,00	540.4064.0000	
								7,01	- 9,90	540.4074.0000	
								9,91	- 12,75	540.4084.0000	
								12,76	- 16,00	540.4094.0000	

Erklärungen, siehe / explanation, see : LGS 3600

Ausführung (type)

Standard *(standard)*				**Standard** *(standard)*				**Standard** *(standard)*			
p [psig]				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**	**Indizes**	**von**	**bis**	**Feder-**	**Indizes**	**von**	**bis**	**Feder-**	**Indizes**
p1	**p2**	**Materialnummer**		**p1**	**p2**	**Materialnummer**		**p1**	**p2**	**Materialnummer**	
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
								484 DN25 do13			
								4	- 6	540.3014.0000	
								6	- 8	540.3024.0000	
								8	- 12	540.3034.0000	
								12	- 18	540.3044.0000	
								18	- 26	540.3054.0000	
								26	- 36	540.3064.0000	
								36	- 47	540.3074.0000	
								47	- 65	540.3084.0000	
								65	- 96	540.3094.0000	
								96	-142	540.3104.0000	
								142	-232	540.3114.0000	
								484 DN 40 do 25			
								1	- 2	540.8014.0000	
								2	- 3	540.8024.0000	
								3	- 4	540.8034.0000	
								4	- 6	540.8044.0000	
								6	- 9	540.8054.0000	
								9	- 14	540.4004.0000	
								14	- 20	540.4014.0000	
								20	- 28	540.4024.0000	
								28	- 37	540.4034.0000	
								37	- 49	540.4044.0000	
								49	- 70	540.4054.0000	
								70	-102	540.4064.0000	
								102	-144	540.4074.0000	
								144	-185	540.4084.0000	
								185	-232	540.4094.0000	

Contents

1 Purpose

This LESER Global Standard (LGS) contains the information about pressure range of all springs which are installed in valve- types 485.

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- types 485.
The pressure ranges of the various types are given first in pressure-unit [bar].
This is followed by the pressure-unit [psig].

For additional information please see legend description.

3 References

LDeS 3060.01, LDeS 3265.01

4 Legend / Indices

- *1 = Druckbereiche ausgeführt mit ORD-Bauteilen gem. WI 3061.07 /
  Pressure range fitted with ORD-parts acc. to WI 3061.07

Erklärungen siehe / explanation see : LGS 3600

Ausführung

Standard *(standard)*				**Standard** *(standard)*				**Standard** *(standard)*			
p [bar]				**p [bar]**				**p [bar]**			
von	**bis**	**Feder-**	**Indizes**	**von**	**bis**	**Feder-**	**Indizes**	**von**	**bis**	**Feder-**	**Indizes**
p1	**p2**	**Sachnummer**		**p1**	**p2**	**Sachnummer**		**p1**	**p2**	**Sachnummer**	
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
									485 DN 25 do13		
								0,30	- 0,46	540.3014.0000	
								0,47	- 0,65	540.3024.0000	
								0,66	- 1,00	540.3034.0000	
								1,01	- 1,40	540.3044.0000	
								1,41	- 1,98	540.3054.0000	
								1,99	- 2,85	540.3064.0000	
								2,86	- 4,00	540.3074.0000	
								4,01	- 5,00	540.3084.0000	*1
								5,01	- 7,75	540.3094.0000	*1
								7,76	- 10,80	540.3104.0000	*1
								10,81	- 16,00	540.3114.0000	*1
									485 DN 40 do25		
								0,10	- 0,14	540.8014.0000	
								0,15	- 0,21	540.8024.0000	
								0,22	- 0,29	540.8034.0000	
								0,30	- 0,37	540.8044.0000	
								0,38	- 0,59	540.8054.0000	
								0,60	- 0,97	540.4004.0000	
								0,98	- 1,40	540.4014.0000	
								1,41	- 1,90	540.4024.0000	
								1,91	- 2,55	540.4034.0000	*1
								2,56	- 3,40	540.4044.0000	*1
								3,41	- 4,80	540.4054.0000	*1
								4,81	- 7,00	540.4064.0000	*1
								7,01	- 9,90	540.4074.0000	*1
								9,91	- 12,75	540.4084.0000	*1
								12,76	- 16,00	540.4094.0000	*1

Erklärungen siehe / explanation see : LGS 3600

Ausführung *(model)*

Standard *(standard)*				**Standard** *(standard)*				**Standard** *(standard)*			
p [psig]				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**	**Indizes**	**von**	**bis**	**Feder-**	**Indizes**	**von**	**bis**	**Feder-**	**Indizes**
p1	**p2**	**Materialnummer**		**p1**	**p2**	**Materialnummer**		**p1**	**p2**	**Materialnummer**	
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
									485 DN 25 do13		
								4	- 7	540.3014.0000	
								7	-10	540.3024.0000	
								10	-15	540.3034.0000	
								15	-20	540.3044.0000	
								20	-29	540.3054.0000	
								29	-41	540.3064.0000	
								41	-58	540.3074.0000	
								58	-73	540.3084.0000	*1
								73	-113	540.3094.0000	*1
								113	-157	540.3104.0000	*1
								157	-232	540.3114.0000	*1
									485 DN 40 do25		
								1	- 2	540.8014.0000	
								2	- 3	540.8024.0000	
								3	- 4	540.8034.0000	
								4	- 6	540.8044.0000	
								6	- 9	540.8054.0000	
								9	-14	540.4004.0000	
								14	-20	540.4014.0000	
								20	-28	540.4024.0000	
								28	-37	540.4034.0000	*1
								37	-49	540.4044.0000	*1
								49	-70	540.4054.0000	*1
								70	-102	540.4064.0000	*1
								102	-144	540.4074.0000	*1
								144	-185	540.4084.0000	*1
								185	-232	540.4094.0000	*1

Contents

1 Purpose

This LESER Global Standard (LGS) contains the information about pressure range of all springs, which are installed in valve- types 488.

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- types 488.
The pressure ranges of the various types are given first in pressure-unit [bar].
This is followed by the pressure-unit [psig].

For additional information please see legend description.

3 References

LDeS 3060.01, LDeS 3265.01

4 Legend / Indices

- S = Sonderauftrag / special order

Ausführung *(model)*

korrosionsfest (stainless steel) p [bar]				**korrosionsfest** (stainless steel) p [bar]				**korrosionsfest** (stainless steel) p [bar]			
von *up* **p1**	**bis** *to* **p2**	**Feder-Sachnummer** *stock no.*	**Indizes**	**von** *up* **p1**	**bis** *to* **p2**	**Feder-Sachnummer** *stock no.*	**Indizes**	**von** *up* **p1**	**bis** *to* **p2**	**Feder-Sachnummer** *stock no.*	**Indizes**
	DN 25 do 23				**DN 40 do 37**				**DN 50 do 46**		
								0,20	- 0,24		S
0,10	- 0,19	540.8024.0000		0,10	- 0,19	540.8404.0000		0,25	- 0,34	540.8404.0000	
0,20	- 0,29	540.8034.0000		0,20	- 0,33	540.8414.0000		0,35	- 0,48	540.8414.0000	
0,30	- 0,40	540.8044.0000		0,34	- 0,55	540.8424.0000		0,49	- 0,65	540.8424.0000	
0,41	- 0,55	540.8054.0000		0,56	- 0,80	540.8434.0000		0,66	- 1,00	540.8434.0000	
0,56	- 0,75	540.4004.0000		0,81	- 1,20	540.4654.0000		1,01	- 1,40	540.4654.0000	
0,76	- 1,05	540.4014.0000		1,21	- 1,50	540.4664.0000		1,41	- 1,94	540.4664.0000	
1,06	- 1,40	540.4024.0000		1,51	- 2,20	540.4674.0000		1,95	- 2,74	540.4674.0000	
1,41	- 1,80	540.4034.0000		2,21	- 2,60	540.4684.0000		2,75	- 3,70	540.4684.0000	
1,81	- 2,25	540.4044.0000		2,61	- 3,40	540.4694.0000		3,71	- 5,35	540.4694.0000	
2,26	- 3,50	540.4054.0000		3,41	- 5,40	540.4704.0000		5,36	- 7,90	540.4704.0000	
3,51	- 5,00	540.4064.0000		5,41	- 8,50	540.4714.0000		7,91	-10,90	540.4714.0000	
5,01	- 8,50	540.4074.0000		8,51	-12,50	540.9604.0000		10,91	-15,00	540.8494.0000	
8,51	-12,50	540.4084.0000		12,51	-16,00	540.4724.0000					
12,51	-16,00	540.4344.0000									
	DN 65 do 60				**DN 80 do 74**				**DN 100 do 92**		
0,10	- 0,22		S	0,21	- 0,25		S	0,10	- 0,15		S
0,23	- 0,28	540.8424.0000		0,26	- 0,35	540.8534.0000		0,16	- 0,23	540.8534.0000	
0,29	- 0,40	540.8434.0000		0,36	- 0,60	540.5704.0000		0,24	- 0,43	540.5704.0000	
0,41	- 0,57	540.4654.0000		0,61	- 1,00	540.5714.0000		0,44	- 0,59	540.5714.0000	
0,58	- 0,76	540.4664.0000		1,01	- 1,30	540.5724.0000		0,60	- 0,84	540.5724.0000	
0,77	- 1,15	540.4674.0000		1,31	- 1,70	540.5734.0000		0,85	- 1,25	540.5734.0000	
1,16	- 1,50	540.4684.0000		1,71	- 2,40	540.5744.0000		1,26	- 1,35	540.5744.0000	
1,51	- 2,00	540.4694.0000		2,41	- 3,40	540.5754.0000		1,36	- 2,40	540.5754.0000	
2,01	- 2,85	540.4704.0000		3,41	- 4,30	540.5764.0000		2,41	- 3,20	540.5764.0000	
2,86	- 3,50	540.4714.0000		4,31	- 5,60	540.9724.0205		3,21	- 4,50	540.5774.0000	
3,51	- 4,30	540.8494.0000		5,61	- 7,50	540.5774.0000		4,51	- 6,20	540.5784.0000	
4,31	- 5,10	540.9604.0000		7,51	-10,34	540.5784.0000		6,21	- 8,20	540.5784.0000	
5,11	- 6,90	540.4724.0000								540.9924.0205	
6,91	- 8,80	540.4734.0000									
8,81	-10,34	540.4704.0000									
		540.9604.0000									

Ausführung *(model)*

Korrosionsfest *(stainless steel)*				**korrosionsfest** *(stainless steel)*				**korrosionsfest** *(stainless steel)*			
p [psig]				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**	**Indizes**	**von**	**bis**	**Feder-**	**Indizes**	**von**	**bis**	**Feder-**	**Indizes**
p1	**p2**	**Sachnummer**		**p1**	**p2**	**Sachnummer**		**p1**	**p2**	**Sachnummer**	
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
	DN 25 do 23				**DN 40 do 37**				**DN 50 do 46**		
								2,9	3,5		S
1	- 3	540.8024.0000		1	- 3	540.8404.0000		3,6	5,0	540.8404.0000	
3	- 4	540.8034.0000		3	- 5	540.8414.0000		5,1	7,0	540.8414.0000	
4	- 6	540.8044.0000		5	- 8	540.8424.0000		7,1	9,5	540.8424.0000	
6	- 8	540.8054.0000		8	- 12	540.8434.0000		9,6	14,5	540.8434.0000	
8	- 11	540.4004.0000		12	- 17	540.4654.0000		14,6	20,3	540.4654.0000	
11	- 15	540.4014.0000		17	- 22	540.4664.0000		20,4	28,2	540.4664.0000	
15	- 20	540.4024.0000		22	- 32	540.4674.0000		28,3	39,8	540.4674.0000	
20	- 26	540.4034.0000		32	- 38	540.4684.0000		39,9	53,7	540.4684.0000	
26	- 33	540.4044.0000		38	- 49	540.4694.0000		53,8	77,6	540.4694.0000	
33	- 51	540.4054.0000		49	- 78	540.4704.0000		77,7	114,6	540.4704.0000	
51	- 73	540.4064.0000		78	-123	540.4714.0000		114,7	158,1	540.4714.0000	
73	-123	540.4074.0000		123	-181	540.9604.0000		158,2	217,5	540.8494.0000	
123	-181	540.4084.0000		191	-232	540.4724.0000					
181	-232	540.4344.0000									
	DN 65 do 60				**DN 80 do 74**				**DN 100 do 92**		
1	- 3		S	3	- 4		S	1	- 2		S
3	- 4	540.8424.0000		4	- 5	540.8534.0000		2	- 3	540.8534.0000	
4	- 6	540.8434.0000		5	- 9	540.5704.0000		3	- 6	540.5704.0000	
6	- 8	540.4654.0000		9	- 15	540.5714.0000		6	- 9	540.5714.0000	
8	- 11	540.4664.0000		15	- 19	540.5724.0000		9	- 12	540.5724.0000	
11	- 17	540.4674.0000		19	- 25	540.5734.0000		12	- 18	540.5734.0000	
17	- 22	540.4684.0000		25	- 35	540.5744.0000		18	- 25	540.5744.0000	
22	- 29	540.4694.0000		35	- 49	540.5754.0000		25	- 35	540.5754.0000	
29	- 41	540.4704.0000		49	- 62	540.5764.0000		35	- 46	540.5764.0000	
41	- 51	540.4714.0000		62	- 81	540.9724.0000		46	- 65	540.5774.0000	
51	- 62	540.8494.0000		81	-109	540.5774.0000		65	- 90	540.5784.0000	
62	- 74	540.9604.0000		109	-150	540.5784.0000		90	-119	540.5784.0000	
74	-100	540.4724.0000								540.9924.0205	
100	-127	540.4734.0000									
127	-150	540.4704.0000									
		540.9604.0000									

1 Purpose

The purpose of this LESER information document (LID) is to provide valve repair shops with a guideline and the necessary assessment criteria to test LESER safety valves after assembly. It is valid for all LESER safety valves except the Clean Service “Easy to Maintain” configuration. Please refer to LGS 0201 and 0202 for those valves.

2 Overview

This document describes the tests that need to be done for every new or repaired LESER safety valve after the valve is assembled. It is written with external service partners, like LESER partners, LARCs or Assemblers, in mind. Therefore, no explanation for certain procedures or acceptance criteria is given. Please consult the referenced documents for detailed information. The image below shows what tests are required for gas tight and non-gas tight valves and in what chapter of this document the testing procedures can be found.

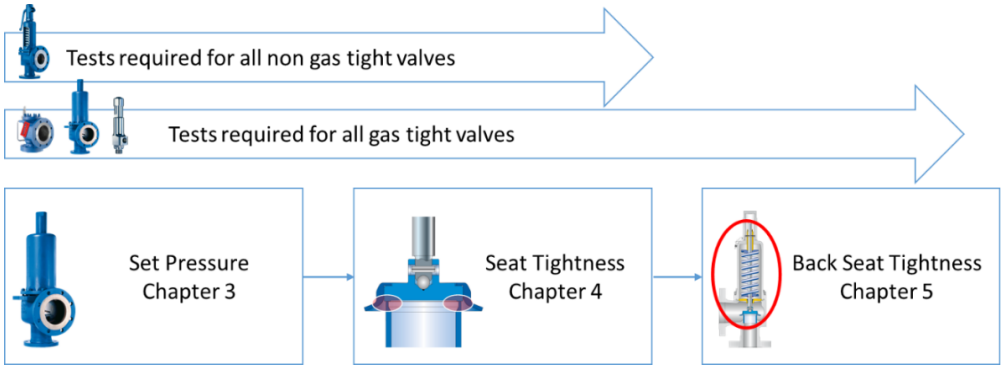


Figure 1: Required tests for gas tight and non-gas tight valves.

3 Cold differential set pressure test

Each safety valve shall be adjusted to its designated set or cold differential test pressure (hereafter CDTP). The purpose of this test is to ensure that all the safety valves meet the requirements for which they have been designed. CDTP is used if correction of set pressure of safety valves according to deviation of service conditions is necessary (temperatures and superimposed constant back pressure). The test medium is used according to the below table, if not otherwise specified by the customer.

Table 1: Medium of operation vs test medium

Medium of Operation	Test medium for valves with CE (PED)	Test medium for valves with UV (ASME)
Gas	Air at room temperature	Air at room temperature
Liquid	Air at room temperature	Water at room temperature
Steam	Air at room temperature	Steam (see ASME UG-136(d)(4) for exemption)

Each safety valve will be pressurized and the set pressure will be determined at the cold differential test pressure. The set pressure tolerances for LESER valves are as per below table:

Table 2: Set pressure tolerances

Set Pressure P_{set}	Tolerance
$P_{set} \leq$ 1,65 barg (24 psig)	+ 0,05 barg (1 psig)
1,65 barg (24 psig) < P_{set} < 3,96 barg (58 psig)	+ 0,1 barg (2 psig)
$P_{set} \geq$ 3,96 barg (58 psig)	+ 3%

For evaluation of actual set pressure 3 single serial values have to be within a repeat accuracy of 1%. The average value of these 3 single values is the determined actual set pressure, which has to be within the above specified allowable tolerance. See the below sample graphic for 10 barg.

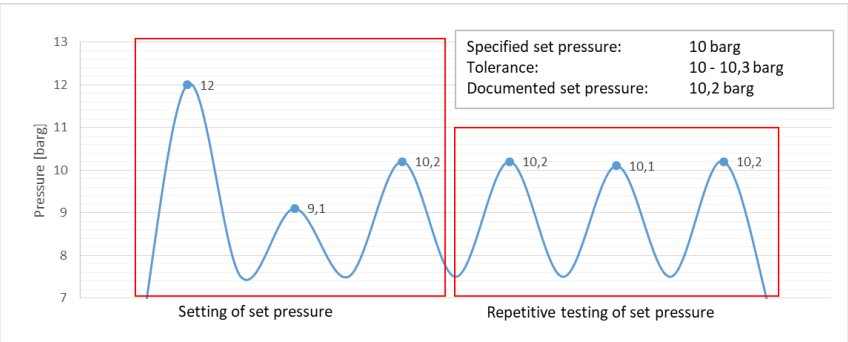


Figure 2: Exemplary set pressure test for 10 barg

3.1 CDTP Correction

The CDTP-correction is the correction of set pressure at test bench condition to achieve the correct set pressure at service condition. For calculating the CDTP, the below formula applies:

LESER datasheet of CDTP (Cold differential test pressure)

$P_{CDTP} = (P_{set} - P_a) * k_T$ $P_{CDTP} = (P_{set} * k_{af}) * k_T$ (Type 459/462 w. bellows only)

P_{CDTP}: cold differential test pressure [psig or barg]
P_{set}: set pressure at service conditions [psig or barg]
P_a: constant superimposed back pressure [psig or barg]
k_T : correction factor for CDTP , temperature influence [-]
k_{af}: correction factor for type 459 / 462 w. bellows, deviating effective area influence [-]

The correction factors for k_T and k_{af} can be found in the two following tables, where missing values can be interpolated using the below formula:

$$y = y_0 + (x - x_0) * \frac{y_1 - y_0}{x_1 - x_0} \quad ; with\ y: k_T / k_{af}\ and\ x: °C / °F$$

Table 3: CDTP correction factor k_T calculation

°C	°F	Conventional		Balanced Bellows or Inconel spring	
		Open Bonnet	Closed Bonnet	Open Bonnet	Closed Bonnet
550	1022	Limitation at 427°C	Limitation at 350°C	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	No influence of service condition on CDTP, correction factor: 1,000	
250	482	1,013	1,021		
200	392	1,007	1,013		
150	302	No influence of service condition on CDTP, correction factor: 1,000	1,007		
100	212				
-250	-418				

Table 4: Deviating effective area correction factor k_{af} for 459/462

P_a/P_{set} * 100 [%]	k_{af}		P_a/P_{set} * 100 [%]	k_{af}	
	d_0 = 9 [mm]	d_0= 17,5 [mm]		d_0 = 9 [mm]	d_0= 17,5 [mm]
0,0	0,999	0,998	14,0	1,048	0,904
1,0	1,001	0,990	16,0	1,059	0,893
2,0	1,003	0,983	18,0	1,070	0,882
3,0	1,005	0,975	20,0	1,083	0,872
4,0	1,008	0,968	22,0	1,097	0,863
5,0	1,011	0,961	24,0	1,111	0,855
6,0	1,014	0,954	26,0	1,126	0,847
7,0	1,018	0,947	28,0	1,143	0,840
8,0	1,021	0,940	30,0	1,160	0,833
9,0	1,025	0,934	32,0	1,178	0,827
10,0	1,029	0,927	34,0	1,197	0,822
12,0	1,038	0,915	35,0	1,207	0,819

3.2 Set Pressure Definitions

LESER's set pressure definitions are as following:

Test Procedure	Set Pressure Definition	Additional Notes
Air	Initial Audible Discharge	Simmer point (Not pop)
Water	First Steady Stream	Water streaming steadily and perpendicularly (90°) from the outlet
Steam	Initial Audible Discharge	Valve seat to be heated to min. 50° C (122° F)

For all testing media: during the interval starting at 90% of the set pressure, the rate of pressure increase shall not exceed 2.0 psi/sec [0.15bar/sec.] or whatever lesser rate of increase is necessary for the accurate and repeatable reading of the pressure.

3.3 Test Procedure for Air

After assembly the safety valve will be pressurized and adjusted via adjusting screw to the given set pressure. The procedure of setting and testing of cold differential test pressure with air is described exactly for each valve type in the working instructions (assembly / installation documentation). The set pressure is reached when the first discharge of air is audible. A saturated opening with clear clicking noise or crack shall be reached. A slow response is not allowed.

3.4 Test Procedure for Water

The valve is first set on air to the desired cold differential test pressure. Then it is mounted on the water test bench and the inlet body is filled with water, without an air cushion. This is ensured by increase of pressure to the safety valve until the first water flow drains off. After the air cushion was removed from the inlet the pressure must be reduced to 0 bar (psig). Then, the set pressure is set with water. The set pressure of the valves is reached when you see the first continuous water flow, the first steady stream.

3.5 Test Procedure for Steam

The safety valves are initially set and tested on air. The assembly and pressure preset on air of safety valves with pressure setting to steam is carried out the same way as for safety valves on air. The steam generator and the steam test bench are started up in accordance with the instruction manual. The test bench is warmed up at approx. 90 % of CDTP until the test temperature has been reached.

Each safety valve then has to be opened min. 3 times to warm up the valve seat and the valve disk to min. 50°C (above 50°C no condensation will occur below the seat). Alternatively, the valve may be opened using a mechanical lifting device so that the valve reaches the required test temperature.

The set pressure of the valve is reached when the discharge of steam is audible (swooshing or roaring hiss sound). It is important to ensure that the audible sound is indicating the start of the opening of the valve (equilibrium of pressure induced force and spring force is reached) and not just the beginning of leakage between the disc and seat caused by system pressure approaching set pressure (slight hissing sound).

3.6 Differences in the procedure for POSVs

In case where a special pilot test bench is available the pilot control should be set to cold differential set pressure, together with the blow down for pop action pilots, on its own. After setting the pilot and performing the leak test, the complete POSV is assembled. Each complete POSV is then tested for its definite cold set pressure. If this has been achieved by setting the pilot, then no other settings are necessary. However, if there are deviations from the specified cold set pressure, then they will be corrected by resetting the pilot.

If no special pilot test bench is available the whole pilot operated safety valve is assembled first and then set pressure testing and leakage test are performed on the valve as a whole, using the procedures for flanged safety valves.

After setting the POSV on water the assembly must be cleared of any water residue. Therefore, the pilot assembly shall be actuated two times at the test-bench with air. Then, the plug of the pilot (Item 20) shall be removed to release the water. Compressed air is then used to blow dry the return spring area. The plug shall be re-assembled after this. Next, the pilot and manifold block will be detached from the main valve. The manifold block shall be dried with compressed air and assembled again.

4 Seat Tightness Test

All LESER safety valves have to be tested on tightness. The tightness test 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 practiced at LESER after the set pressure is demonstrated. The leakage rates shall be documented. 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. As a standard technique, the minimum or maximum temperature shall not be below 5°C (40°F) nor above 50°C (122°F) during the test.

The test pressure, procedures and acceptance criteria for each medium are described in the following subchapters.

4.1 Test Pressure for all mediums

Set Pressure / CDTP, p_0	Test pressure, p_{test}
0,1 < p_0 < 0,7 (bar) 1,45 < p_0 < 10,15 (psi)	0,5 * p_0
0,7 ≤ p_0 ≤ 3,5 (bar) 10,15 ≤ p_0 ≤ 50,8 (psi)	p_0 - 0,35 (bar) p_0 - 5,08 (psi)
p_0 > 3,5 (bar) p_0 > 50,8 (psi)	0,9 * p_0

4.2 Seat Tightness Test on Air

4.2.1 Testing on air for gas tight safety valves

4.2.1.1 Procedure

Testing on air is done according to and with the specified equipment in the API 527. The valve shall be vertically mounted on the test stand, and the test apparatus shall be attached to the valve outlet. All openings-including but not limited to caps, drain holes, vents, and outlets-shall be closed.

The valve shall then reach set pressure once and afterwards the inlet pressure is decreased to the test pressure. The water shall then be observed for 1 minute at the test pressure and the number of bubbles counted.

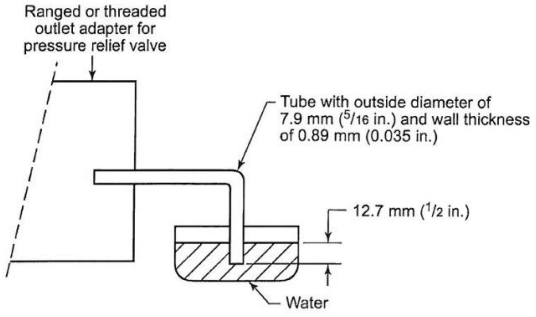


Figure 3: Apparatus to test seat tightness with air. (API 527)

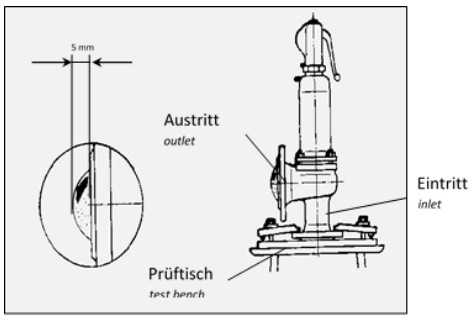
4.2.1.2 Acceptance Criteria

	Set pressure po (related to 16°C)		Allowed Number of Bubbles [Bubbles / min]	
	bar	psi	d0 < 18 [mm]	d0 > 18 [mm]
Metal-to-metal sealing	0,1 - 66	1,45 - 657,3	40	20
	> 66 - 165	> 657,3 - 2393,1	60	30
	> 165 - 700	> 2393,1 - 10152,6	80	40
Soft sealing plate	All ranges		20	10
Soft sealing O-Ring or disc with vulcanized soft sealing	All ranges		0	0

4.2.2 Testing on air for non-gas tight safety

4.2.2.1 Procedure

The 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 the safety valve.



After setting of the safety valve the seat leakage test is carried out. A foamy lotion is drawn over the outlet orifice. The extension under pressure and the leakage volume is then observed at the outlet for 1 minute at test pressure.

4.2.2.2 Acceptance Criteria

The sealing between seat and disc fulfils the tightness requirements, if the bubble extends not more than 5 mm.

4.3 Seat Tightness Test on Water

4.3.1 Procedure

Before starting the seat tightness test the inlet body bowl shall be filled with water, which shall be allowed to stabilize with no visible flow from the valve outlet. The inlet pressure shall then be increased to the test pressure. The valve shall then be observed for 1 minute at test pressure.

4.3.2 Acceptance Criteria

	Nominal Inlet Size DN and NPS	10	15	20	25	40	50	80	100	125	150	200	250	300	400
		3/8"	1/2"	3/4"	1"	1 1/2"	2"	3"	4"	5"	6"	8"	10"	12"	16"
Allowable number of water drops per inlet size	Metal seated	1				2	3	5	6	8	10	13	16	20	26
	Soft seated	No visible leakage													

4.4 Seat Tightness Test on Steam

4.4.1 Procedure

Any condensate in the body bowl shall be removed before the seat tightness test. Air (or nitrogen) may be used to dry condensate. After any condensate has been removed, the inlet pressure shall be increased to the test pressure and be held for at least three minutes to heat up the valve. Tightness is then checked visually using a black background. The valve shall be observed for leakage for at least one minute.

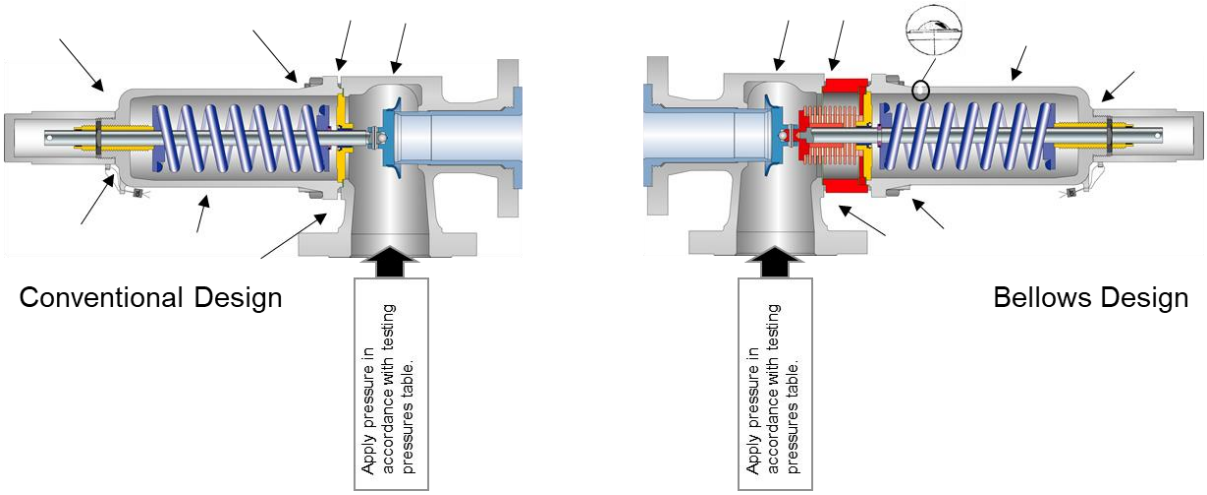
4.4.2 Acceptance Criteria

No recognized or visible leakage.

5 Back seat tightness (Outlet tightness)

5.1.1 Procedure

The tightness test of the back sealing, LESER named it tightness outwards, is carried out for all LESER's safety valves in gastight design and for all POSVs. 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. In case of a balanced bellows design the test fluid is drawn over the drainage whole in the bonnet.



The below testing times and test pressures apply.

Table 5: Testing pressures and times for back seat tightness test

Nominal Size	Minimum test time [s]	Test pressure P_{test} Normal		Test pressure P_{test} PFTE / Elamstomer components			
				p0 < 3 bar		p0 ≥ 3 bar	
		bar	psi	bar	psi	bar	psi
≤ DN 50 (2")	15	6	87	0.15 x P0	0.15 x P0	2	28
DN 65 (3") - DN 150 (6")	60	6	87				
≥ DN 200 (8")	60	2,5	36				

5.1.2 Acceptance Criteria

The acceptance criteria is that no foam appears on the tested area and the fluid film over the drainage whole does not have a bubble.

Contents

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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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)

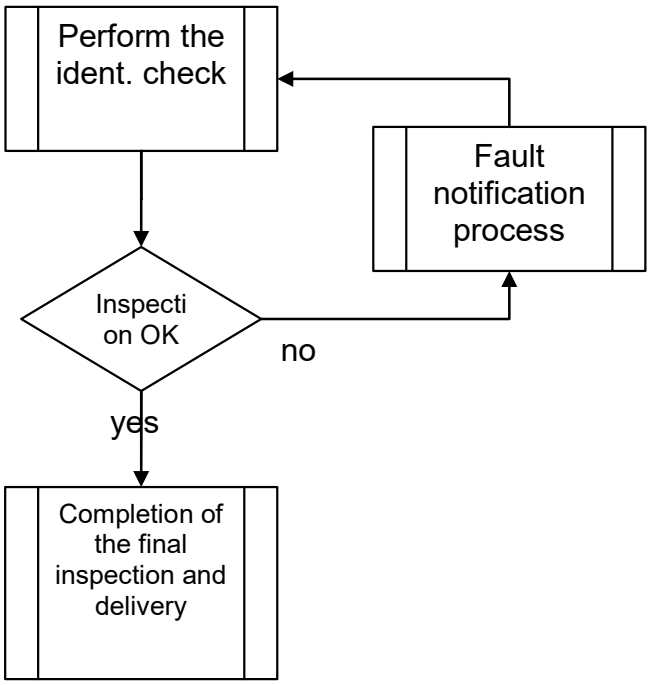


Figure 6-1

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.

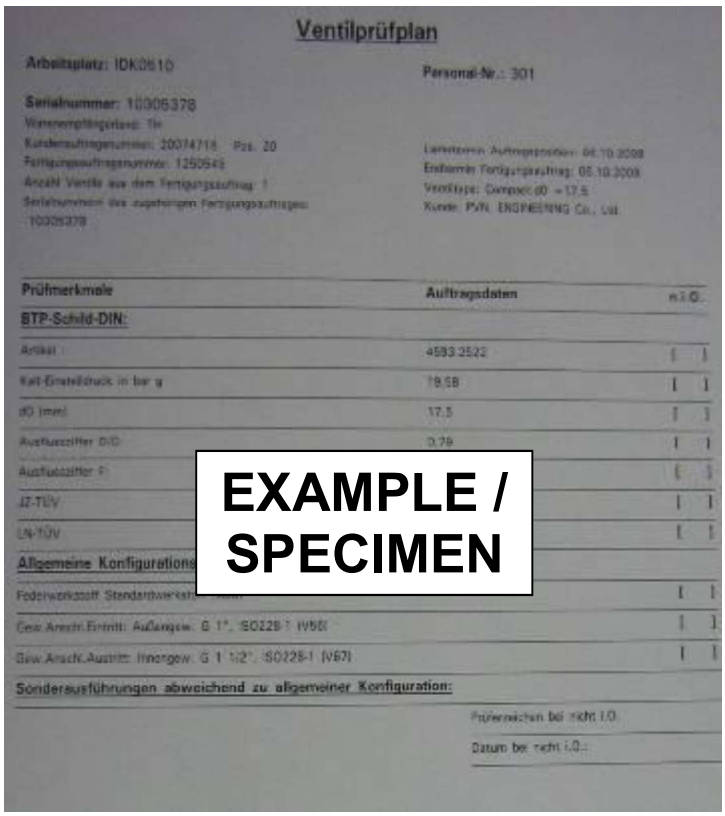


Figure 7.1-1

Figure 7.1-2: Check the type number against the valve inspection plan / repair order

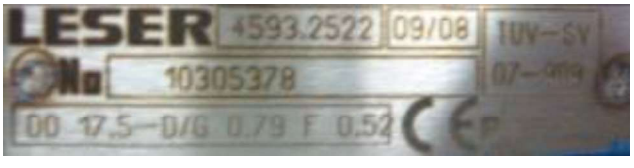


Figure 7.1-3: Check the BT plate / customer ID plate data against the valve inspection plan / repair order

7.2 Visual inspection of other items

7.2.1 Inspection of the paintwork

a) Valve is not completely painted

OK specimen:	**Rejected specimen:**
	
Figure 7.2.1-1	**Figure 7.2.1-2**

b) Paint coat is cracked (too much paint)

OK specimen:	**Rejected specimen:**
	
Figure 7.2.1-3	**Figure 7.2.1-4**

c) Paint coat is not complete due to oil / grease

OK specimen:	**Rejected specimen:**
	
Figure 7.2.1-5	**Figure 7.2.1-6**

OK specimen:	**Rejected specimen:**

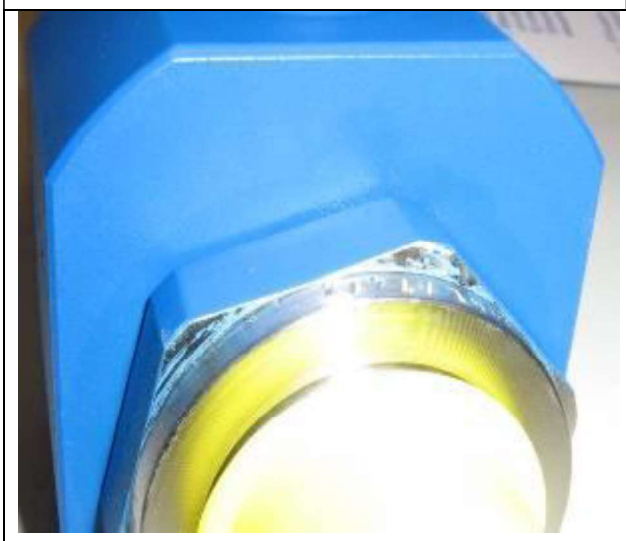
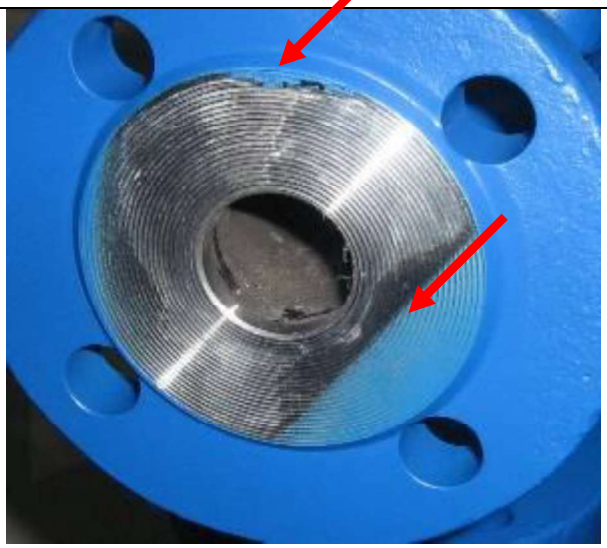



Figure 7.2.1-7	

	Figure 7.2.1-8

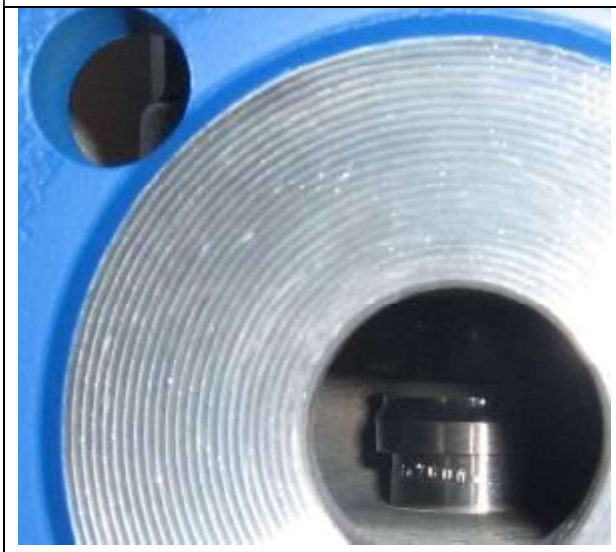
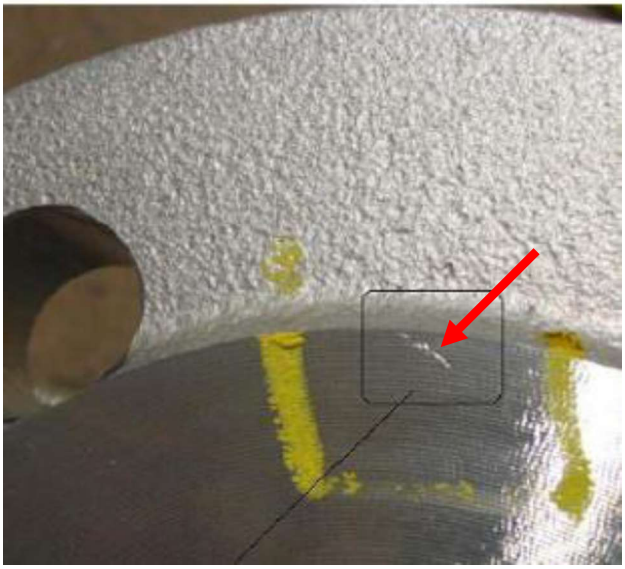
d) Paint on masked off areas

OK specimen:	**Rejected specimen:**
	
Figure 7.2.1-9	**Figure 7.2.1-10**

OK specimen:	**Rejected specimen:**
	
Figure 7.2.1-11	**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:**
 **Figure 7.2.2-1**	 **Figure 7.2.2-2**

7.2.3 Inspection of the seal

OK specimen:	**Rejected specimen:**
 **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.

Order information – Spare parts

Spare parts

Actual Orifice diameter d_0 [mm]			10	
Actual Orifice area A_0 [mm²]			78,5	
Actual Orifice diameter d_0 [inch]			0,394	
Actual Orifice area A_0 [inch²]			0,122	
Inlet body (Item 1)			**Material-No. / Art.-No.**	
Inlet body	CO	Connection size	$^3/_4$"	1"
		1.4404	–	136.4649.9265
	SO	Connection size	DN 15	DN 25
		1.4404	136.4649.9271	136.4649.9263
Disc with vulcanized soft seal (Item 7)			**Material-No. / Art.-No.**	
Disc	1.4404	EPDM "D" FDA USP VI	200.9049.9041	
		CR "K"	200.9049.9051	
		FKM "L" FDA	200.9049.9071	
		NBR "N"	200.9049.9081	
		FFKM "C" FDA USP VI	200.9049.9091	
Disc – soft seal with O-ring (Item 7)			**Material-No. / Art.-No.**	
Disc	1.4404	EPDM "D" FDA USP VI	200.8349.9741	
		CR "K"	200.8349.9751	
		FKM "L" FDA	200.8349.9771	
		NBR "N"	200.8349.9781	
		FFKM "C" FDA USP VI	200.8349.9721	
O-ring – soft seal (Item 7.4)			**Material-No. / Art.-No.**	
O-ring		EPDM "D" FDA USP VI	502.0107.2641	
		CR "K"	502.0107.2651	
		FKM "L" FDA	502.0107.2671	
		NBR "N"	502.0107.2681	
		FFKM "C" FDA USP VI	502.0107.2621	

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Order information – Spare parts

Spare parts

	Actual Orifice diameter d_0 [mm]		13	25
	Actual Orifice area A_0 [mm²]		133	491
	Actual Orifice diameter d_0 [inch]		0,512	0,984
	Actual Orifice area A_0 [inch²]		0,206	0,761
Disc (Item 7): Soft seal				**Material-No. / Art.-No.**
Disc 1.4435	EPDM	"D"	200.8169.9741	200.2569.9741
	CR	"K"	200.8169.9751	200.2569.9751
	FKM	"L"	200.8169.9771	200.2569.9771
	NBR	"N"	200.8169.9781	200.2569.9781
	FFKM	"C"	200.8169.9791	200.2569.9791
	Assembly tool for Aseptic O-ring disc		tool not required for this valve size	445.0139.0000
O-ring (Item 7.4): Soft seal				**Material-No. / Art.-No.**
O-ring	EPDM	"D"	502.0123.2641	502.0250.2641
	CR	"K"	502.0123.2651	502.0250.2651
	FKM	"L"	502.0123.2671	502.0250.2671
	NBR	"N"	502.0123.2681	502.0250.2681
	FFKM	"C"	502.0123.2691	502.0250.2691
Pin / Split ring (Item 14)				**Material-No. / Art.-No.**
Pin / Split ring		Spindle Ø [mm]	8	12
		1.4310 / 1.4404	480.0405.0000	251.0149.0000
Pin (Item 57)				**Material-No. / Art.-No.**
Pin		Ø [mm]	3	3
		1.4310	480.0405.0000	480.0405.0000
O-ring body / guide (Item 60)				**Material-No. / Art.-No.**
O-ring	EPDM	"D"	502.0460.3041	502.0600.3041
Ball (Item 61)				**Material-No. / Art.-No.**
Ball		Ø [mm]	6	6
		1.4401	510.0104.0000	510.0104.0000
Bellows (Item 70)				**Material-No. / Art.-No.**
Bellows	EPDM	"D"	224.2349.9000	224.2449.9000
	FFKM	"C"	on request	on request

Order information – Spare parts

Spare parts

Actual Orifice diameter d_0 [mm]			13	25
Actual Orifice area A_0 [mm²]			133	491
Actual Orifice diameter d_0 [inch]			0,512	0,984
Actual Orifice area A_0 [inch²]			0,206	0,761
Disc (Item 7): Soft seal			**Material-No. / Art.-No.**	
Disc 1.4435	EPDM	“D”	200.8169.9741	200.2569.9741
	CR	“K”	200.8169.9751	200.2569.9751
	FKM	“L”	200.8169.9771	200.2569.9771
	NBR	“N”	200.8169.9781	200.2569.9781
	FFKM	“C”	200.8169.9791	200.2569.9791
Assembly tool for Aseptic O-ring disc			tool not required for this valve size	445.0139.0000
O-ring (Item 7.4)			**Material-No. / Art.-No.**	
O-ring	EPDM	“D”	502.0123.2641	502.0250.2641
	CR	“K”	502.0123.2651	502.0250.2651
	FKM	“L”	502.0123.2671	502.0250.2671
	NBR	“N”	502.0123.2681	502.0250.2681
	FFKM	“C”	502.0123.2691	502.0250.2691
Pin / Split ring (Item 14)			**Material-No. / Art.-No.**	
Pin / Split ring		Spindle Ø [mm]	8	12
		1.4310 / 1.4404	480.0405.0000	251.0149.0000
Pin (Item 57)			**Material-No. / Art.-No.**	
Pin		Ø [mm]	3	3
		1.4310	480.0405.0000	480.0405.0000
O-ring body / guide (Item 60)			**Material-No. / Art.-No.**	
O-ring	EPDM	“D”	502.0460.3041	502.0600.3041
	FFKM	“C”	502.0123.3021	502.0600.3021
Ball (Item 61)			**Material-No. / Art.-No.**	
Ball		Ø [mm]	6	6
		1.4401	510.0104.0000	510.0104.0000
O-ring vessel connection (Item 67)			**Material-No. / Art.-No.**	
O-ring	EPDM	“D”	502.0460.3041	502.0600.3041
Bellows (Item 70)			**Material-No. / Art.-No.**	
Bellows	EPDM	“D”	224.2329.9000	224.2429.9000
	FFKM	“C”	on request	on request

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Order information – Spare parts

Spare Parts

Actual Orifice diameter d_0 [mm]			13	25
Actual Orifice area A_0 [mm²]			133	491
Actual Orifice diameter d_0 [inch]			0,512	0,984
Actual Orifice area A_0 [inch²]			0,206	0,761
Disc – (Item 7): Soft seal			**Material-No. / Art.-No.**	
Disc 1.4435	EPDM	“D”	200.8169.9741	200.2569.9741
	CR	“K”	200.8169.9751	200.2569.9751
	FKM	“L”	200.8169.9771	200.2569.9771
	NBR	“N”	200.8169.9781	200.2569.9781
	FFKM	“C”	200.8169.9791	200.2569.9791
Assembly tool for Aseptic O-ring disc			tool not required for this valve size	445.0139.0000
O-ring (Item 7.4): Soft seal			**Material-No. / Art.-No.**	
O-ring	EPDM	“D”	502.0123.2641	502.0250.2641
	CR	“K”	502.0123.2651	502.0250.2651
	FKM	“L”	502.0123.2671	502.0250.2671
	NBR	“N”	502.0123.2681	502.0250.2681
	FFKM	“C”	502.0123.2691	502.0250.2691
Pin / Split ring (Item 14)			**Material-No. / Art.-No.**	
Pin / Split ring		Spindle Ø [mm]	8	12
		1.4310 / 1.4404	480.0405.0000	251.0149.0000
Pin (Item 57)			**Material-No. / Art.-No.**	
Pin		Ø [mm]	3	3
		1.4310	480.0405.0000	480.0405.0000
O-ring body / guide (Item 60)			**Material-No. / Art.-No.**	
O-ring	EPDM	“D”	502.0460.3041	502.0600.3041
	FFKM	“C”	502.0460.3021	502.0600.3021
Ball (Item 61)			**Material-No. / Art.-No.**	
Ball		Ø [mm]	6	6
		1.4401	510.0104.0000	510.0104.0000
O-ring pipework connection (Item 67)			**Material-No. / Art.-No.**	
O-ring	EPDM	“D”	502.0180.3041	502.0300.3041
Bellows (Item 70)			**Material-No. / Art.-No.**	
Bellows	EPDM	“D”	224.2349.9000	224.2449.9000
	FFKM	“C”	on request	on request

Order information – Spare parts

Type 488 – HyTight

Actual Orifice diameter d_0 [mm]			23	37	46	60	74	92
Actual Orifice area A_0 [mm²]			416	1075	1662	2827	4301	6648
Actual Orifice diameter d_0 [inch]			0,906	1,457	1,811	2,362	2,913	3,622
Actual Orifice area A_0 [inch²]			0,644	1,667	2,576	4,383	6,666	10,304
Disc – soft seal (Item 7)					Material-No. / Art.-No.			
Disc 1.4404	EPDM	"D"	205.3549.9741	205.3649.9741	205.3749.9741	205.3849.9741	205.3949.9741	205.4049.9741
	CR	"K"	205.3549.9751	205.3649.9751	205.3749.9751	205.3849.9751	205.3949.9751	205.4049.9751
	FKM	"L"	205.3549.9771	205.3649.9771	205.3749.9771	205.3849.9771	205.3949.9771	205.4049.9771
	FFKM	"C"	205.3549.9791	205.3649.9791	205.3749.9791	205.3849.9791	205.3949.9791	205.4049.9791
Disc – soft seal (Item 7.4)					Material-No. / Art.-No.			
O-ring	EPDM	"D"	502.0249.3541	502.0408.3541	502.0503.3541	502.0660.5341	502.0819.5341	502.1041.5341
	CR	"K"	502.0249.3551	502.0408.3551	502.0503.3551	502.0660.5351	502.0819.5351	502.1041.5351
	FKM	"L"	502.0249.3571	502.0408.3571	502.0503.3571	502.0660.5371	502.0819.5371	502.1041.5371
	FFKM	"C"	502.0249.3591	502.0408.3591	502.0503.3591	502.0660.5391	502.0819.5391	502.1041.5391
Split ring (Item 14)					Material-No. / Art.-No.			
Split ring		Spindle Ø [mm]	12	16	16	16	20	20
		1.4404	251.0149.0000	251.0249.0000	251.0249.0000	251.0249.0000	251.0349.0000	251.0349.0000
Pin (Item 57)					Material-No. / Art.-No.			
Pin		Ø [mm]	3	4	4	5	5	5
		1.4310	480.3205.0000	480.1605.0000	480.1605.0000	480.3005.0000	480.3105.0000	480.3105.0000
O-ring body / guide (Item 60)					Material-No. / Art.-No.			
O-ring	EPDM	"D"	502.0600.3041	502.0850.4041	502.0850.4041	502.1130.4041	502.1380.4041	502.1580.5041
Ball (Item 61)					Material-No. / Art.-No.			
Ball		Ø [mm]	6	9	9	12	12	15
		1.4401	510.0104.0000	510.0204.0000	510.0204.0000	510.0304.0000	510.0304.0000	510.0404.0000
Bellows (Item 70)					Material-No. / Art.-No.			
Bellows	EPDM	"D"	224.2849.9000	224.2949.9000	224.2949.9000	224.2649.9000	224.2649.9000	224.2649.9000

Type 488 – Design 2002

Disc – Metal to metal seat (Item 7)					Material-No. / Art.-No.			
Disc		1.4404	225.4049.9000	210.0949.9000	210.1049.9000	210.1949.9000	210.2049.9000	210.2349.9000
		1.4404 electropolished	225.4049.9700	210.0949.9700	210.1049.9700	210.1949.9700	210.2049.9700	210.2349.9700
O-ring disc (Item 7)					Material-No. / Art.-No.			
O-ring disc	EPDM	"D"	200.5049.9041	200.5249.9041	200.5349.9041	200.5449.9041	200.5549.9041	200.5649.9041
	CR	"K"	200.5049.9051	200.5249.9051	200.5349.9051	200.5449.9051	200.5549.9051	200.5649.9051
	FKM	"L"	200.5049.9071	200.5249.9071	200.5349.9071	200.5449.9071	200.5549.9071	200.5649.9071
	FFKM	"C"	200.5049.9091	200.5249.9091	200.5349.9091	200.5449.9091	200.5549.9091	200.5649.9091
O-ring for design 2002 version (Item 7.4)					Material-No. / Art.-No.			
O-ring	EPDM	"D"	502.0249.3541	502.0408.3541	502.0503.3541	502.0660.5341	502.0819.5341	502.1041.5341
	CR	"K"	502.0249.3551	502.0408.3551	502.0503.3551	502.0660.5351	502.0819.5351	502.1041.5351
	FKM	"L"	502.0249.3571	502.0408.3571	502.0503.3571	502.0660.5371	502.0819.5371	502.1041.5371
	FFKM	"C"	502.0249.3591	502.0408.3591	502.0503.3591	502.0660.5391	502.0819.5391	502.1041.5391
Split ring (Item 14)					Material-No. / Art.-No.			
Split ring		Spindle Ø [mm]	12	16	16	16	20	20
		1.4404	251.0149.0000	251.0249.0000	251.0249.0000	251.0249.0000	251.0349.0000	251.0349.0000
Pin (Item 57)					Material-No. / Art.-No.			
Pin		Ø [mm]	3	4	4	5	5	5
		1.4310	480.0205.0000	480.0605.0000	480.0605.0000	480.0905.0000	480.1005.0000	480.1005.0000
O-ring (Item 60)					Material-No. / Art.-No.			
O-ring	EPDM	"D"	502.0600.3041	502.0850.4041	502.0850.4041	502.1130.4041	502.1380.4041	502.1580.5041
Ball (Item 61)					Material-No. / Art.-No.			
Ball		Ball Ø [mm]	6	9	9	12	12	15
		1.4401	510.0104.0000	510.0204.0000	510.0204.0000	510.0304.0000	510.0304.0000	510.0404.0000
Bellows (Item 70)					Material-No. / Art.-No.			
Bellows	EPDM	"D"	224.0479.0000	521.0307.0000	521.0307.0000	521.0107.0000	521.0408.0000	521.0408.0000
Hose clamp (Item 71)					Material-No. / Art.-No.			
Hose clamp		1.4301	524.0606.0000	524.0706.0000	524.0706.0000	524.0806.0000	–	–
		1.4401	–	–	–	–	524.0505.0000	524.0505.0000
Hose clamp (Item 72)					Material-No. / Art.-No.			
Hose clamp		1.4301	524.0606.0000	524.0706.0000	524.0706.0000	524.0806.0000	524.0906.0000	524.0906.0000

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

6.2.13 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

6.2.11 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:
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:

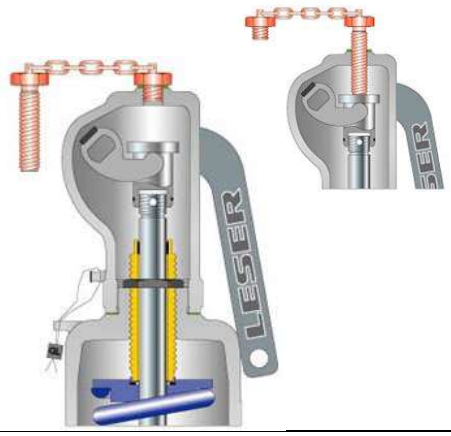
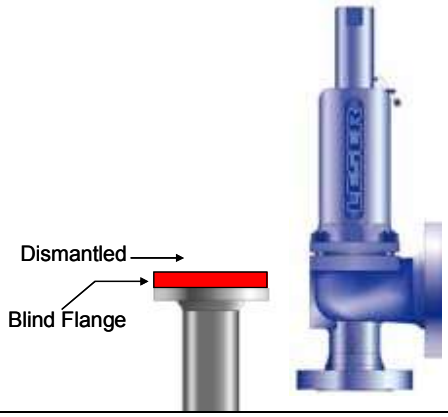
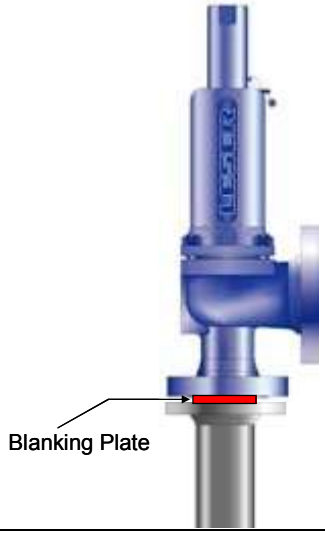
Possibility	Figure	Description
Test gag		The test gag blocks the spindle and keeps the safety valve tight while the system pressure exceeds the set pressure. Advantage: It is possible to perform pressure tests in a system without dismantling the safety valve. After testing, the test gag must be removed! 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/ Isolation plate		To block the safety valve during a pressure test a blanking plate is placed between inlet pipe and safety valve. 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

4 Typical Mistakes as a Result of Unauthorized Repair

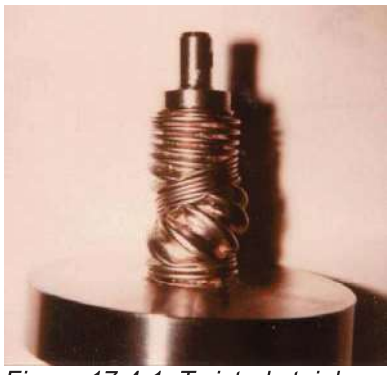


Figure 17.4-1: Twisted stainless steel bellows

Safety valves are safety devices and improper repair may cause damage to equipment and serious injury or death! The following table lists typical mistakes that are made when repair is performed by unauthorized or untrained personnel or when maintenance instructions are not followed.

No.	Mistake	Effect
1	Assembly of incorrect spring	1. Spring is too soft: Safety valve closes too late 2. Spring is too strong: Safety valve opens too late
2	Spring is compressed to solid after assembly	Safety valve does not open or does not achieve the required lift
3	Wrong disc is mounted	The safety valve may have the wrong operating characteristic for the application
4	Due to excessive machining of seat/ disc the tolerances of the critical dimensions (chamfer) may be exceeded	The safety valve will have the wrong operating characteristic
5	After repair lifting aid was not reinstalled	The safety valve will have the wrong operating characteristic
6	After repair lift restriction was not reinstalled	The safety valve will blow off with a higher capacity. Pressure drop in the inlet and outlet line may occur as well as chattering
7	During assembly the spindle was not secured against rotation: → the stainless steel bellows is twisted	Safety valve does not open
8	Unsuitable or insufficient grease is used for the lubrication of the actuator of the pneumatic lifting device H8	The Lifting device H8 fails; the safety valve continues to function
9	Lifting lever left in open position - lever with knob - H4 for Clean Service	The safety valves stays open