MAINTENANCE

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Maintenance Handbook for LESER Product Group Compact Performance

Series 437

Typ 437, 438, 439

Series 459

Typ 459, 462, 459 HDD, 462 HDD

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 1003.00 “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 4458 “Compact-Performance_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 4105 “Dismantling instructions for types 437, 438, 439, 481 “

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Chapter	Content	Sources
		LGS 4107 "Dismantling instructions for types 459, 462, 450, 460" LGS 4115 "Cleaning repaired valves"
1.6 Rework of critical parts	Critical dimensions for refinishing disc and nozzle: - Lowest allowable tolerances for refinishing - LDeS 3309.05 includes dimensions for other LESER safety valves. Relevant pages for this valve type: Page 1-2; 17-21	LDeS 3309.05 "Refinishing of seats and discs"
	Rework of the seat: - Procedure of lapping by hand, illustrated with pictures	LGS 4113 "Reworking repaired valves"
1.7 Assembly	Assembly instruction: - Step-by-step instruction for assembly	LGS 4100 "Assembly instructions for type 437, 438, 439, 481" LGS 4102 "Assembly instructions for types 459, 462, 450, 460"
	Torques: - Assembly torques for body-bonnet connection, caps, test gags, O-ring discs and bellows	LGS 3323 "Torques ranges for screw and bolts" LGS 3325 "Torques ranges for O-ring-disc"
	After Assembly: - Color finishing and painting	LGS 4114 "Paint touch-up and painting repaired valves"

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Chapter	Content	Sources
	- Component plate	LGS 4118 “Component plates”
1.8 Spring charts	Spring charts: - Overview of spring ranges for set pressure adjustments and spring selection in bar and psi	LGS 3608 “Spring charts – type 459, 462” LGS 3618 “Spring charts – type 437“ LGS 3619 “Spring charts – type 438“ LGS 3625 “Spring charts – type 439“
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	LGS0201 “Tightness Test”
	Last visual check up	LGS 4117 “Final visual inspection of repaired valves“
1.10 Spare parts	Spare parts list	LWN 481-01 “Spare parts type 437, 438, 439”

public

Chapter	Content	Sources
		LWN 481.01 "Spare parts type 459, 459 HDD, 462, 462 HDD"
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

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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.

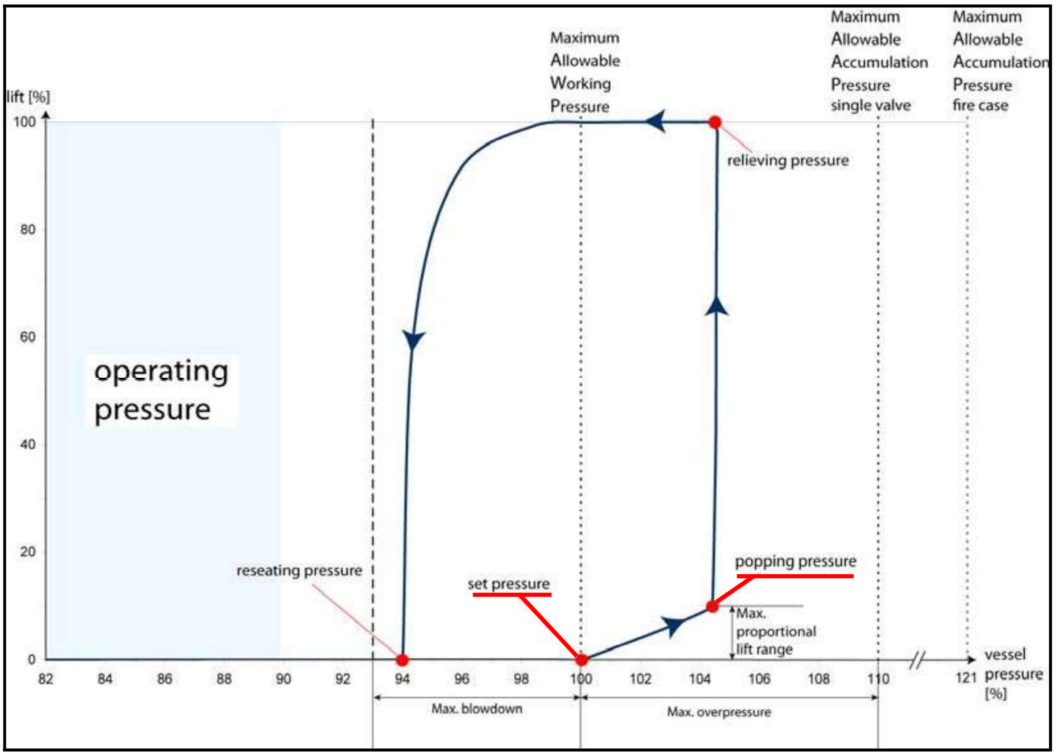

Figure 1: general characteristic of LESER safety valves for steam/gases acc. to ASME VIII

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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.

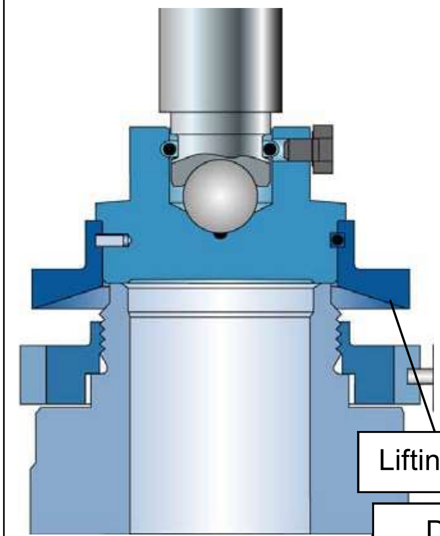
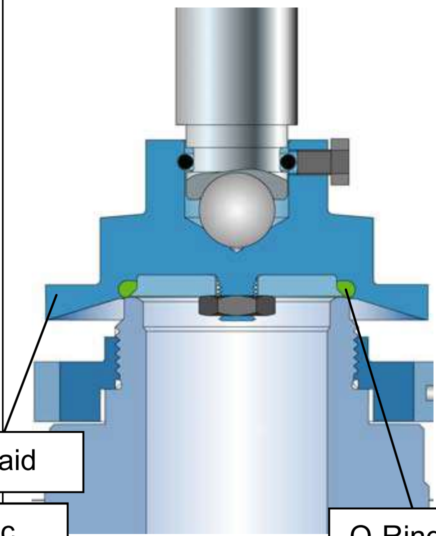
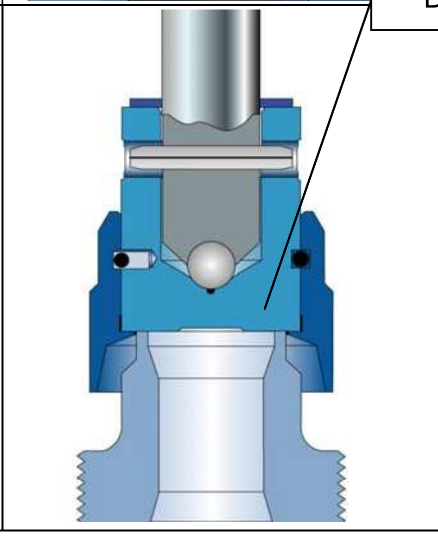
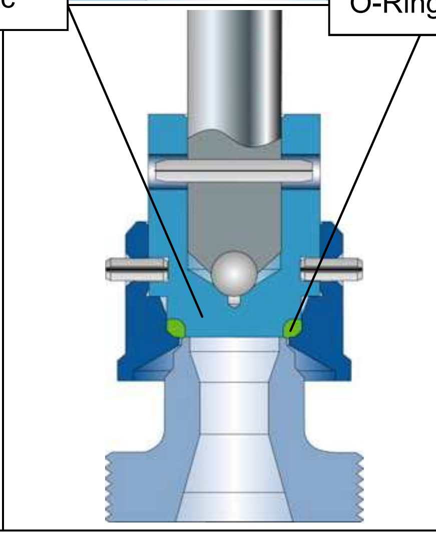
	Metal to metal seat	Soft seat – o-ring disc
Flanged valves (type 526)		
Threaded valves (type 459)		

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 <u>lowest</u> 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.

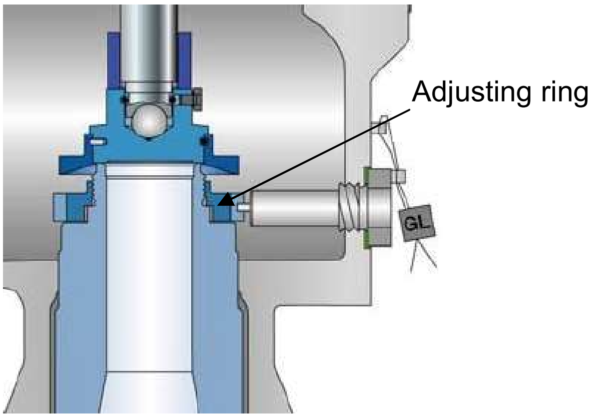


Figure 2: Blowdown ring of LESER's Type 526

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.

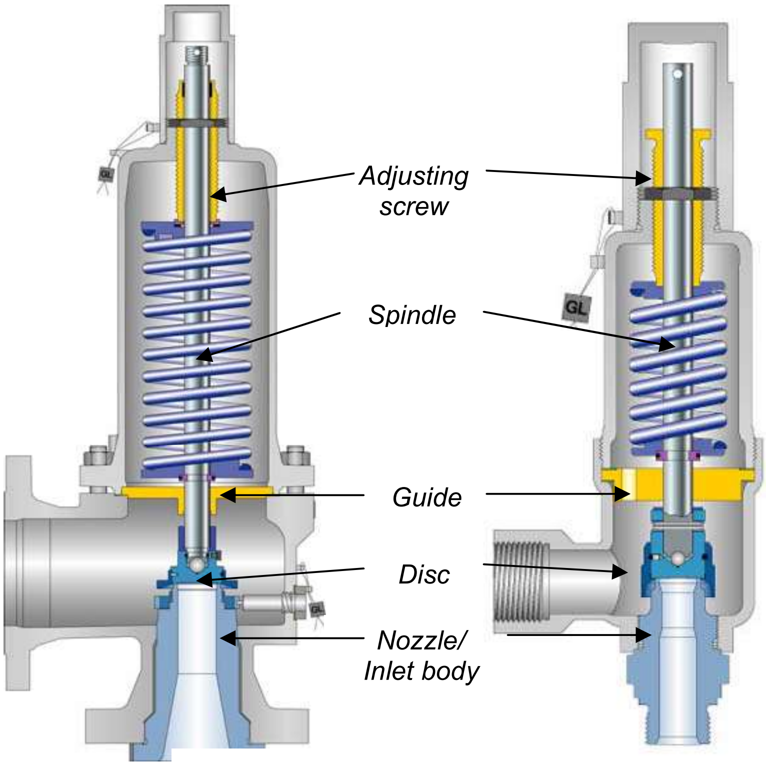


Figure 3: overview of parts providing alignment

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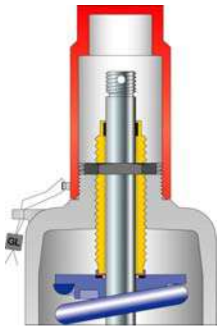
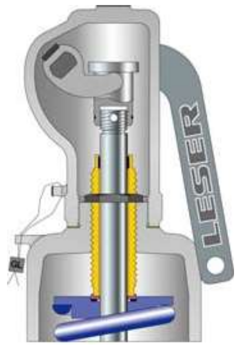
1.4 Lifting devices

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.

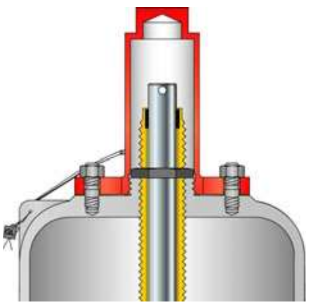


Plain Cap H2
- gastight -

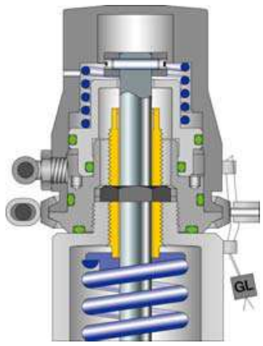
Plain lever H3-
- not gastight -



Packed lever H4
- gastight -



Bolted Cap H1
- gastight -



Pneumatic lever H8
- clean service -

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

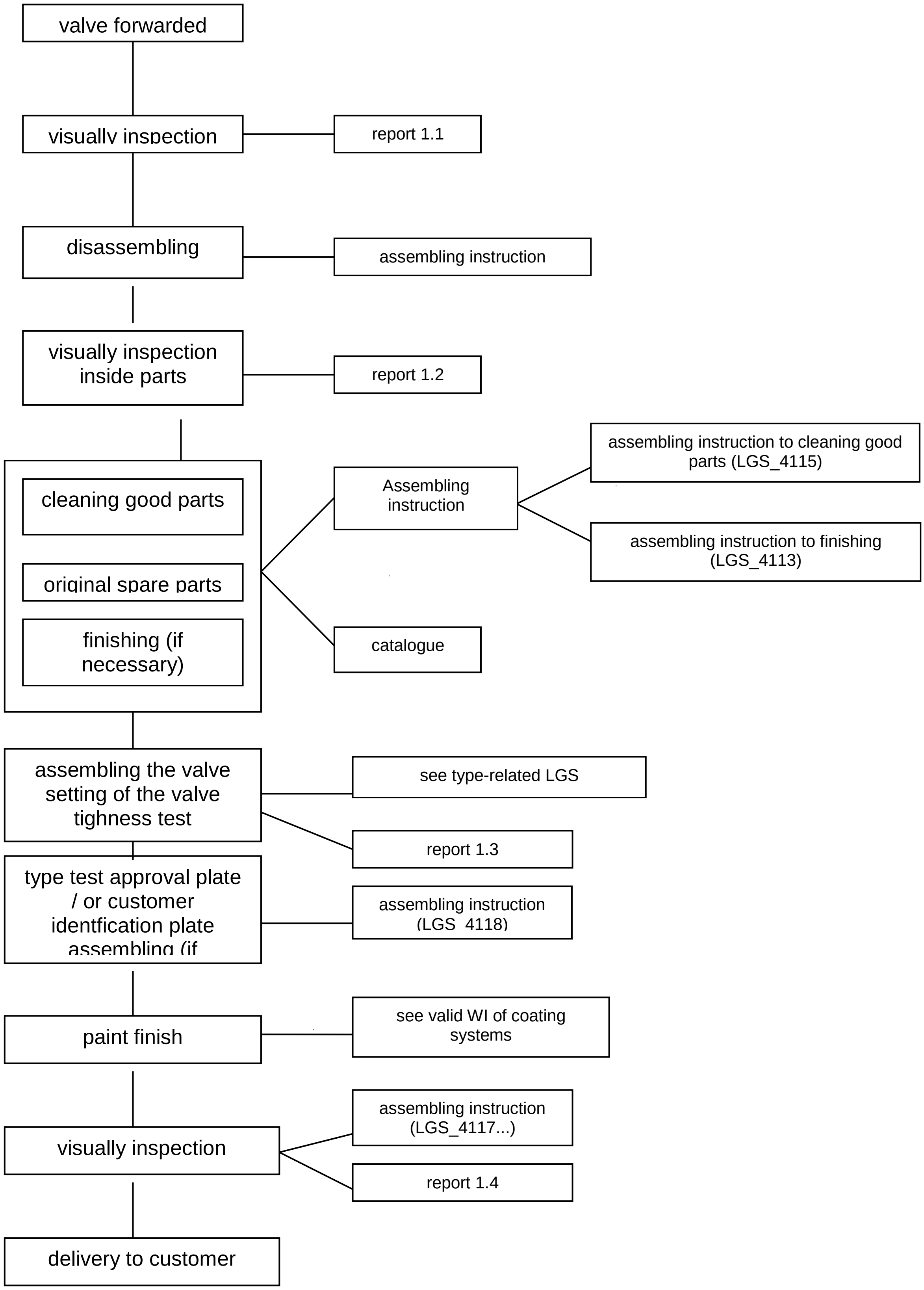
This LGS applies to all members of the LESER Quality Cluster.

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

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1 Purpose

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

External order	**0161.0002**
Internet	**www.sales@leser.com**

4 Designated use of the CP Additional Tool KIT

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

5 Components of the CP Additional Tool KIT

All tools found in this LWN are part of the Standard CP 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 Assembly aid for hexagonal inflow devices

To simplify the assembly of inflow devices for threaded safety valves, there is an assembly aid in the product range shown below with 2 different widths across flats (SW36/SW41).

Designated use

- assembly of threaded safety valves

Fig. 1 Assembly of the CP

Fig. 2 Assembly of the CP

Technical requirements

Requirements / Quality	Data
LWN	351.49
Widths across flats	SW36 / SW41
Vendor	LESER
LESER order number	446.3459.0000
Tool kit number	0161.0002
Internet	www.sales@leser.com

Technical illustration

Illustration 1: Assembly aid for hexagonal inflow devices

5.2 Assembly apparatus

In order to guarantee problem-free installation of the O-ring disc, LESER offers an assembly apparatus that simplifies changing the O-ring.

Designated use

- installation of O-ring disc

Fig. 3 Assembly apparatus for O-ring discs

Technical requirements

Requirements / Quality	Data
LWN	351.49
Measurement range	30 – 150 Nm
Type	462 / 433
Size	DN 15
Vendor	LESER
LESER order number	445.0559.0000
Tool kit number	0161.0002
Internet	www.sales@leser.com

Technical illustration

Illustration 2: Assembly apparatus

5.3 Jaw head

In order to guarantee problem-free installation of the inflow device, LESER recommends a jaw head in combination with the torque wrench recommended by Leser.

Designated use

- assembly of the inflow device
- tightening the lock nut

Fig. 4 Assembly of the inflow device

Fig. 5 Assembly of the outflow device with a fixed torque specification

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Technical requirements

Requirements / Quality	Data	Data
SW	46 mm	55 mm
Square end	24.5x28 mm	24.5x28 mm
Order number	58218046	58218066
LESER order number		
Tool kit number	0161.0002	
Internet	www.sales@leser.com	

Technical illustration

Illustration 3: Jaw head

5.4 Plug-in adapter

In order to guarantee problem-free installation of the inflow device, LESER recommends a plug-in adapter together with the associated jaw head and the torque wrench recommended by Leser.

Designated use

- connector between the torque wrench and jaw head

Technical requirements

Requirements / Quality	Data
Square, inside	24.5x28 mm
Square, outside	14x18 mm
Order number	58290080
LESER order number	
Tool kit number	0161.0002
Internet	www.sales@leser.com

Technical illustration

Illustration 4: Plug-in adapter

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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

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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	

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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

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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

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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

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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

protected

Technical requirements

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

Technical illustration

Illustration 6: Hammer

4.7 Punch numbers

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

Designated use

- marking flanges and bodies


Technical requirements

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

Technical illustration

Illustration 7: Punch numbers

protected

4.8 Punch letters

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

Designated use

- marking flanges and bodies

Technical requirements

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

Technical illustration

Illustration 8: Punch letters

4.9 Brush set

The brush set consists of brushes of different sizes.

Designated use

- repair of paint damage
- application of lubricants

Technical requirements

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

Technical illustration

Illustration 9: Brush set

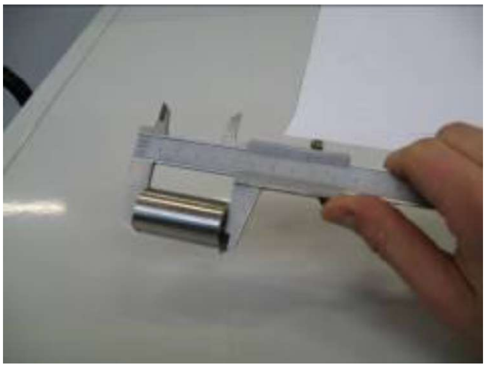
protected

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

protected

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

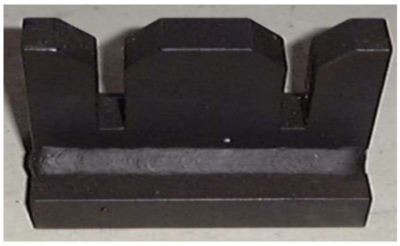


Illustration 19: V-block

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

protected

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

protected

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

protected

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

protected

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

protected

4.21 Wire twisting pliers

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

Designated use

- twisting the sealing wire
- sealing bonnets and bodies

protected

Technical requirements

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

Technical illustration

Illustration 27:Wire twisting pliers

4.22 Sealing blocks

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

Designated use

- sealing safety valves

Technical requirements

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

Technical illustration

Illustration 29:Sealing blocks

protected

4.23 Sealing wire

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

Designated use

- sealing the bonnet and the lever/cap

protected

Technical requirements

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

Technical illustration

Illustration 30: Sealing wire

4.24 Pipe for large spanner

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

Designated use

- lever and bonnet connections

Technical requirements

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

Technical illustration

Illustration 24: Pipe for large spanner

4.25 Folding rule

A folding rule is required for any measuring work.

Designated use

- measuring the outside dimensions of packaging

Technical requirements

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

Technical illustration

Illustration. 32: Folding rule

protected

4.26 Glass plate

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

Designated use

- re-lapping discs

protected

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	

protected

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

protected

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

protected

Technical requirements

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

Technical illustration

Illustration 14: LESER blue paint

Contents

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

public

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.

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public

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

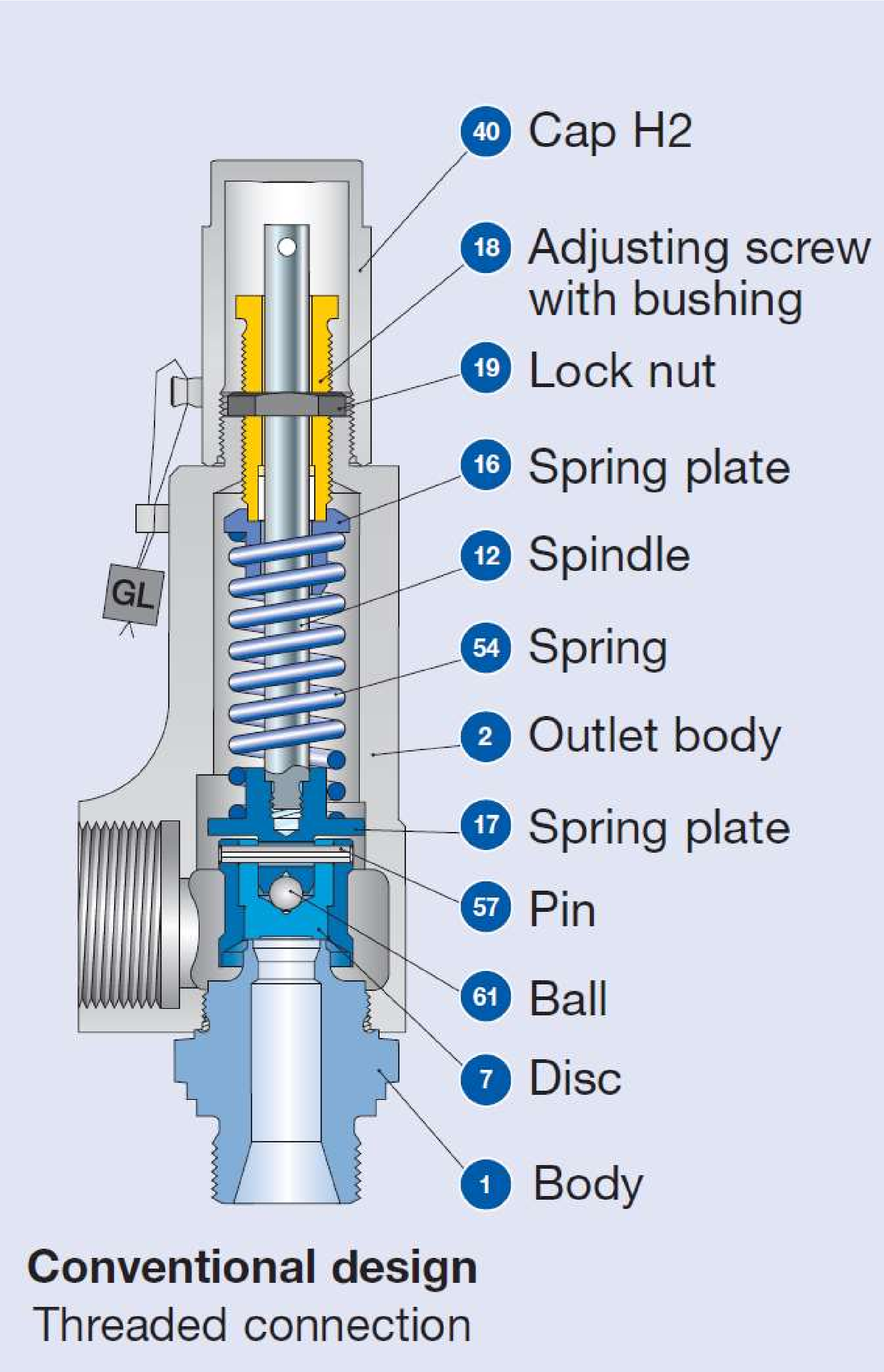

Figure 6-1: Cross-sectional view of type 437

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.	

public

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	

public

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

public

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.	

public

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.	

public

public

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.	

Compact Performance

Types 459, 462, 450, 460

public

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Contents

1 Purpose

This LESER Global Standard (LGS) is disassembly documentation for various 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 applied to the dismantling Compact Performance safety valves in agencies and subsidiaries of LESER GmbH & Co. KG.

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public

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 dismantling operation.

6 General illustration

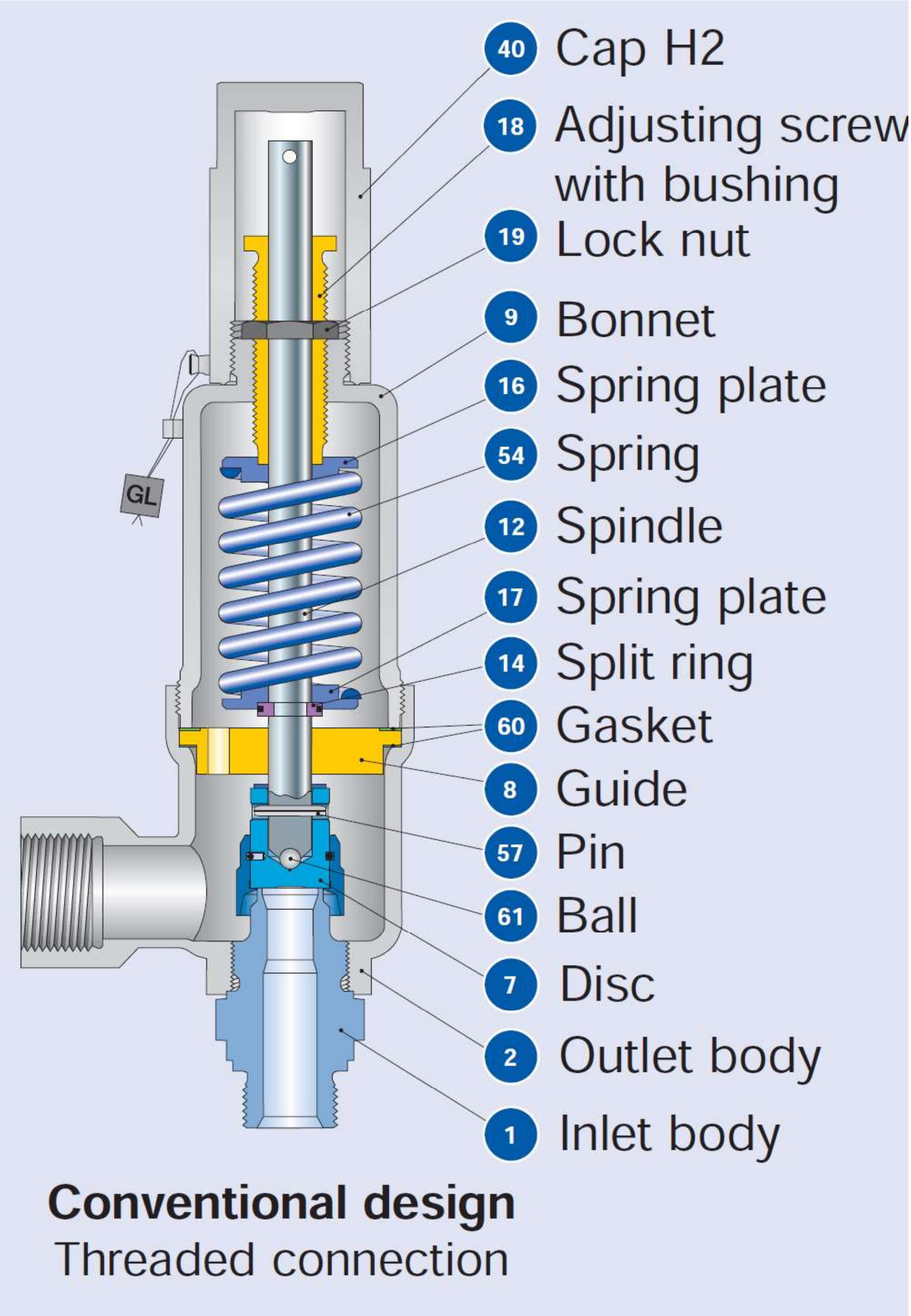

Figure 6.1-1

7 Dismantling the Compact Performance series

7.1 Dismantling lift indicator in H4 lever

Illustrations	Description	Aids / Tools
 **Figure 7.1-1**	Remove lock nut	
 **Figure 7.1-2**	2. Remove nut and screw out the lift indicator completely.	

public

7.2 Dismantling the cap / lever

7.2.1 Dismantling the cap H2

Illustrations	Description	Aids / Tools
 **Figure 7.2.1-1**	Loosen cap and screw it off.	Open-end spanner

public

7.2.2 Dismantling the lever H3

Illustrations	Description	Aids / Tools
 **Figure 7.2.2-1**	Remove retaining washers on both sides. Pull out bolt.	
 **Figure 7.2.2-2**	Pull out the lever.	
 **Figure 7.2.2-3**	Loosen and remove lock screw. Remove plastic ball.	

public

Illustrations	Description	Aids / Tools
 **Figure 7.2.2-4**	Individual parts of lever H3	
 **Figure 7.2.2-5**	Remove the retaining clip and cylinder pin from the spindle cap. Pull the spindle cap off the spindle.	
 **Figure 7.2.2-6**	Spindle cap, retaining clip and cylinder pin	

7.2.3 Dismantling the lever H4

Illustrations	Description	Aids / Tools
 **Figure 7.2.3-1**	Screw lever off. Remove spacers.	
 **Figure 7.2.3-2**	Remove the retaining clip and cylinder pin from the spindle cap. Pull the spindle cap off the spindle.	
 **Figure 7.2.3-3**	Spindle cap, retaining clip and cylinder pin	

7.3 Dismantling outlet

7.3.1 Dismantling outlet flange (conical NPT thread)

Illustrations	Description	Aids / Tools
 **Figure 7.3.1-1**	Place flange over the outlet of the body. Unscrew outlet adapter from outlet body.	Open-end spanner
 **Figure 7.3.1-2**	Unwind sealing tape from the thread of the outlet adapter.	

7.3.2 Dismantling outlet flange (cylindrical thread)

Illustrations	**Description**	**Aids / Tools**
 **Figure 7.3.2-1**	Place flange over the outlet of the body. Screw outlet adapter out of outlet body.	Open-end spanner

7.4 Dismantling the bonnet

7.4.1 Dismantling bonnet (without stainless steel bellows)

Illustrations	Description	Aids / Tools
 **Figure 7.4.1-1**	Secure the spindle/disc against turning.	Open-end spanner, Pin punch
 **Figure 7.4.1-2**	Unscrew and remove the bonnet.	Open-end spanner

7.4.2 Dismantling bonnet (with stainless steel bellows)

Illustrations	**Description**	**Aids / Tools**
 **Figure 7.4.2-1**	Secure the spindle/disc against turning. Unscrew and remove the bonnet.	Open-end spanner Pin punch

7.5 Dismantling the spindle/disc assembly

7.5.1 Dismantling the assembly (with elastomer bellows)

Illustrations	**Description**	**Aids / Tools**
 **Figure 7.5.1-1**	Pull the assembly out of the outlet body carefully. Pull the top spring plate, spring and bottom spring plate from the spindle one after the other.	

7.5.2 Dismantling the assembly (with stainless steel bellows)

Illustrations	**Description**	**Aids / Tools**
 **Figure 7.5.2-1**	Pull the top spring plate, spring and bottom spring plate from the spindle one after the other.	
 **Figure 7.5.2-2**	Loosen the bonnet spacer with the C-spanner and remove.	C-spanner with a nose

7.5.3 Dismantling the assembly (without bellows)

Illustrations	Description	Aids / Tools
 Figure 7.5.3-1	Pull the assembly out of the outlet body carefully.	

7.6 Dismantling spindle/disc assembly

7.6.1 Dismantling spindle/disc assembly (without bellows)

Illustrations	Description	Aids / Tools
 **Figure 7.6.1-1**	Pull the top spring plate, spring and bottom spring plate from the spindle one after the other.	
 **Figure 7.6.1-2**	Remove retaining clip and half-washers.	
 **Figure 7.6.1-3**	Pull the guide off the spindle.	
 **Figure 7.6.1-4**	Drive the pin out of the spindle with the pin punch. Pull disc off the spindle.	Pin punch

7.6.2 Dismantling spindle/disc assembly (with stainless steel bellows)

Illustrations	Description	Aids / Tools
 **Figure 7.6.2-1**	Drive the pin out of the spindle with the pin punch. Pull disc off the spindle.	Pin punch
 **Figure 7.6.2-2**	Pull the spindle with the bellows out of the cooling zone.	
 **Figure 7.6.2-3**	Remove retaining clip and half-washers. The bellows and spindle cannot be separated because they are glued together.	

public

7.6.3 Dismantling spindle/disc assembly (with elastomer bellows)

Illustrations	Description	Aids / Tools
 **Figure 7.6.3-1**	Cut through cable tie.	
 **Figure 7.6.3-2**	Pull elastomer bellows from the disc and from the guide. Pull the bellows and guide from the spindle.	
 **Figure 7.6.3-3**	Pull out the 4 pins and remove the disc.	

public

7.7 Dismantling the inlet body

7.7.1 Inlet body disassembly for flanged connector

Illustrations	Description	Aids / Tools
 Figure 7.7.1-1	Remove outlet body from inlet body with an open-end spanner.	
 Figure 7.7.1-2	Screw off the outlet body. Remove the loose flange from the inlet body.	

7.7.2 Dismantling inlet body for threaded connector

Illustrations	**Description**	Aids / Tools
 **Figure 7.7.2-1**	Loosen the outlet body with the open-end spanner. Unscrew outlet body from inlet body.	

7.8 Dismantling the pressure screw

Illustrations	Description	Aids / Tools
 **Figure 7.7.2-1**	Screw adjusting screw out of the bonnet	
 **Figure 7.7.2-2**	Unscrew lock nut from adjusting screw.	
 **Figure 7.7.2-3**	Remove PTFE bushing from the 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

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. 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

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. 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

<u>Generally, the wearing of gloves when handling cleaned and unpainted components is compulsory.</u>

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.

protected

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

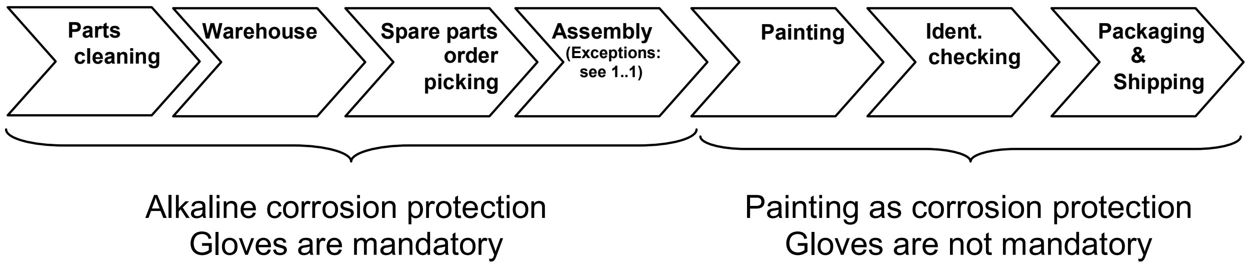

Figure 7.1-1

protected

Content

1 Purpose

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

2 Scope

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

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

3 References

None

4 Conditional Agreement

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

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

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

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

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

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

5 Introduction

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

6 Execution

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

6.1 Measures and facing profile

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

6.2 Surface quality

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

6.3 Test

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

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

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

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

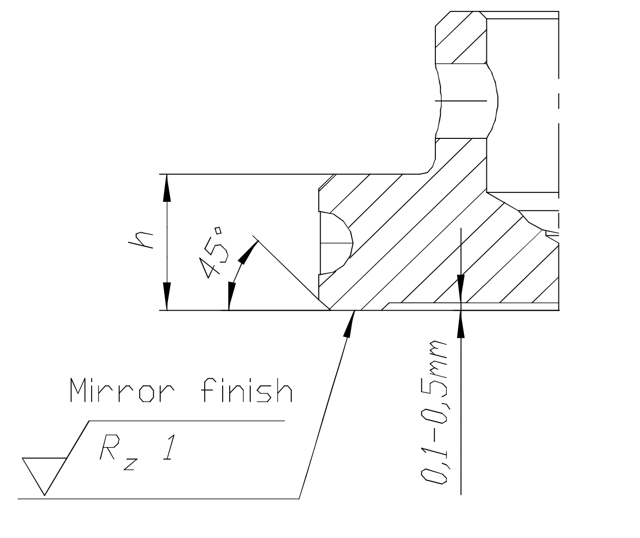

Illustration 5.1

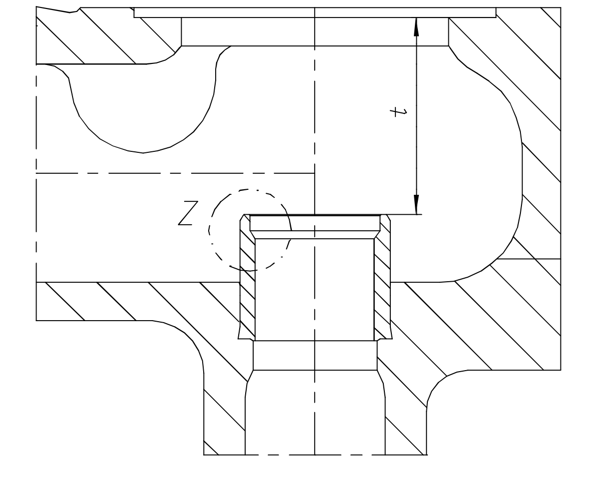

Illustration 5.3

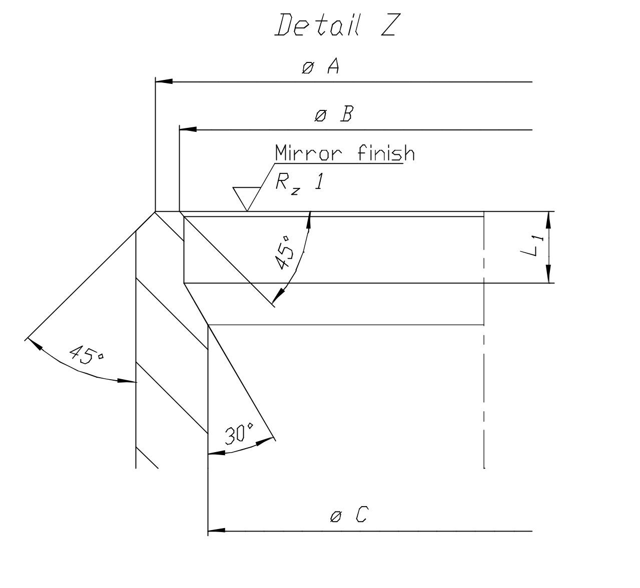

Illustration 5.2

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

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

Table 5.1: seats and discs of type 441 and 421

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

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

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

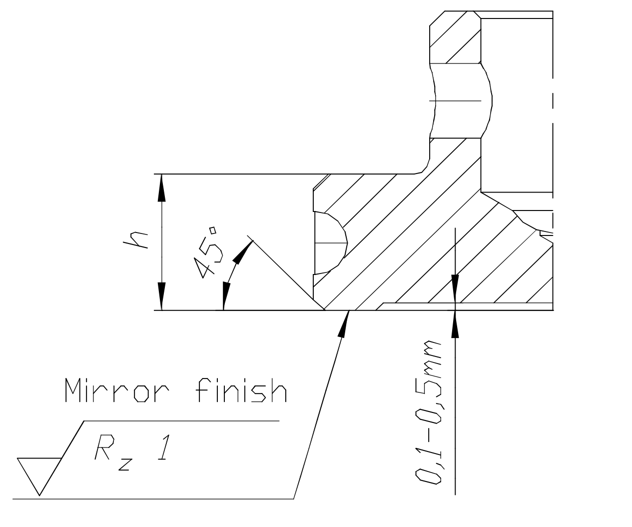

Illustration 6.1

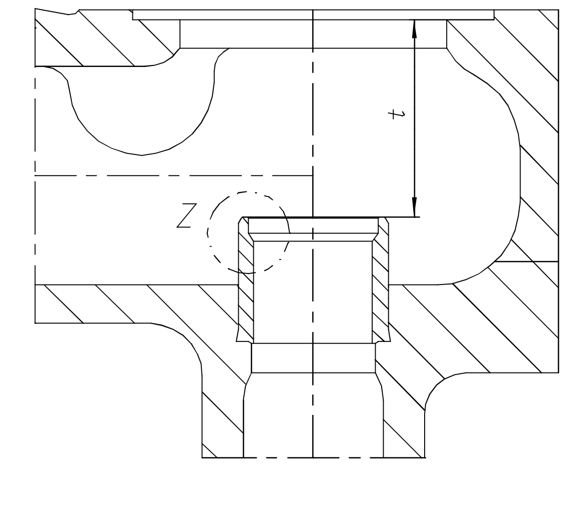

Illustration 6.3

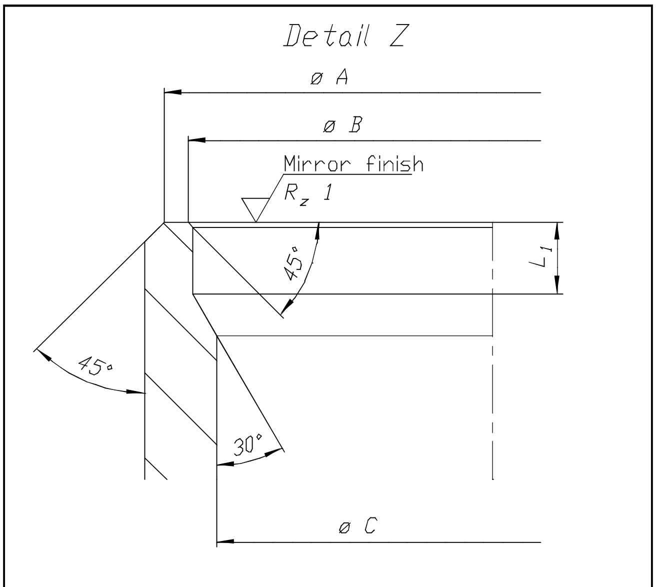

Illustration 6.2

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

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

Table 6.1: seats and discs of type 431 and 411

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

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

Work is to be done according to illustration 7.1

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

The O-ring in the disc must be renewed.

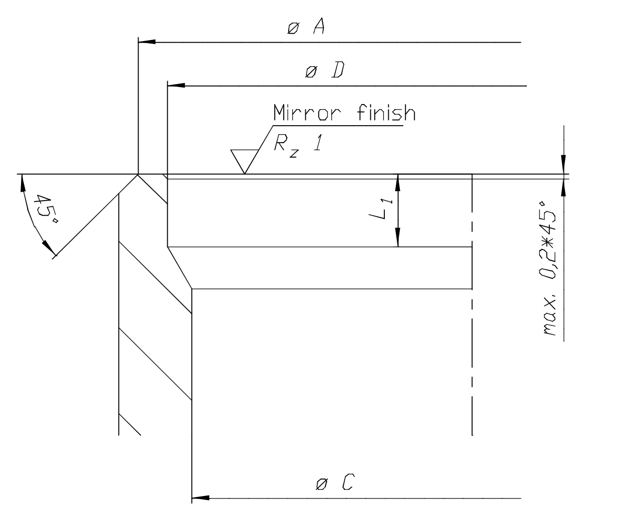

Illustration 7.1

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

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

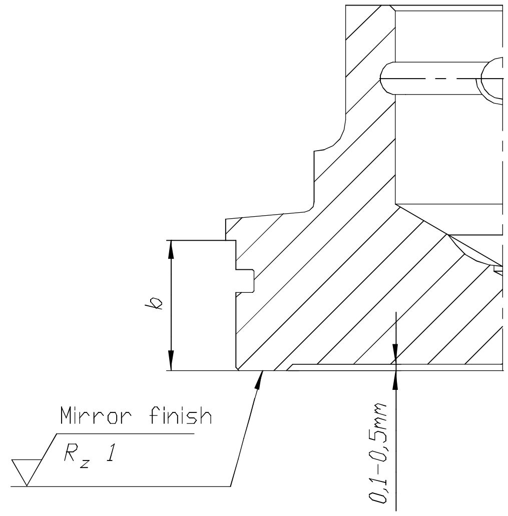

Illustration 8.1

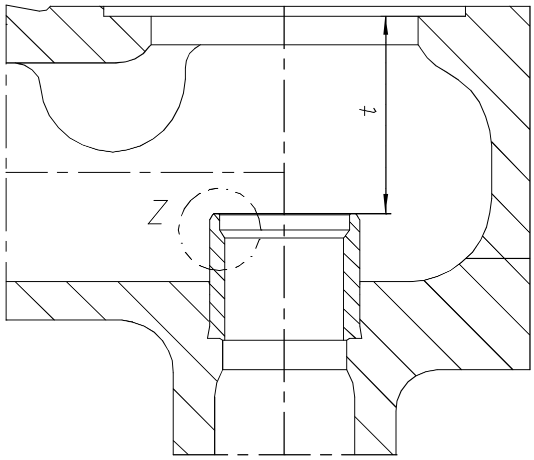

Illustration 8.3

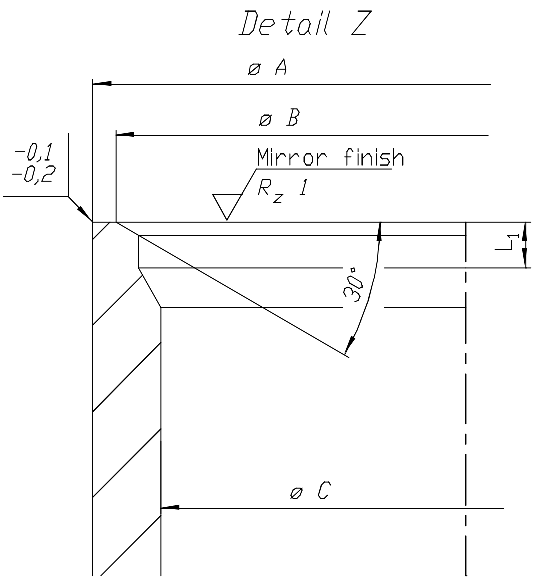

Illustration 8.2

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

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

Table 8.1: seats and discs of type 455

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

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

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

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

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

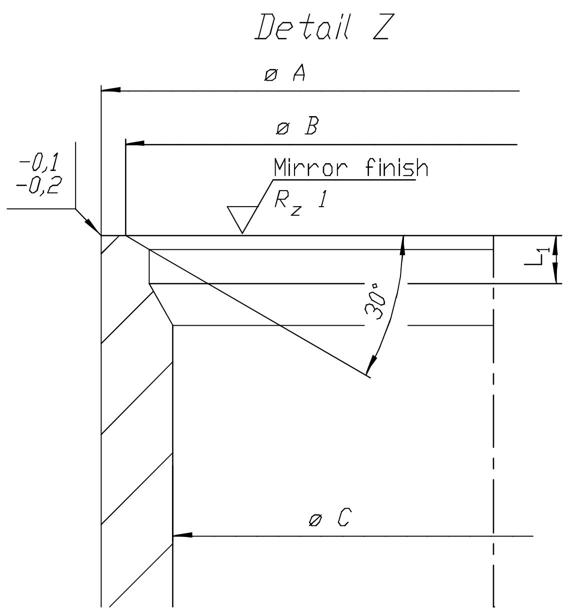

Illustration 9.1

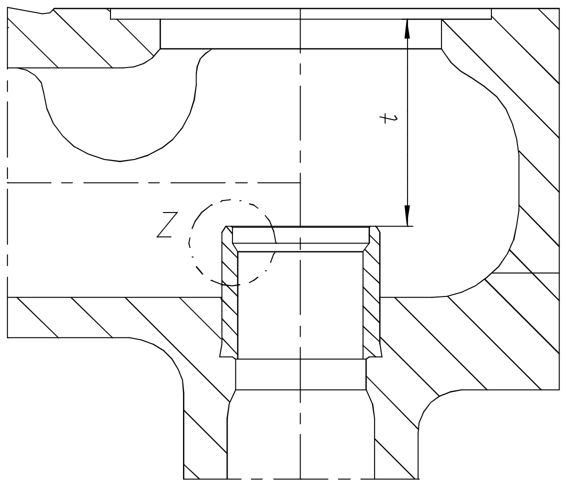

Illustration 9.2

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Table 9.1: seats and discs of type 455 and 456

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

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

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

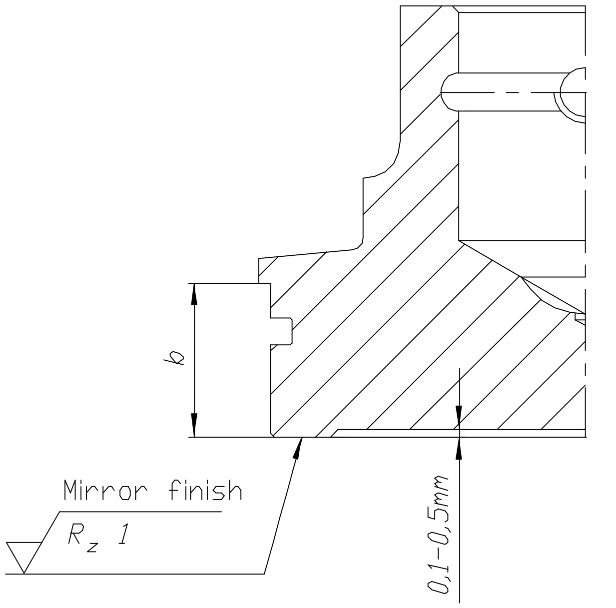


Illustration 10.1

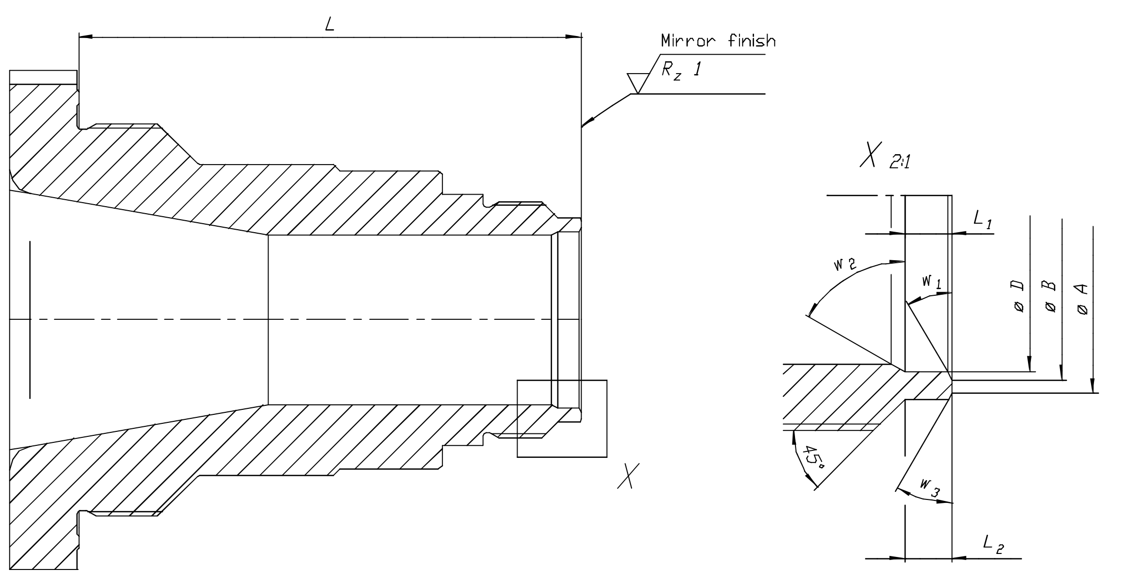


Illustration 10.2

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

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

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

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

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

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

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

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

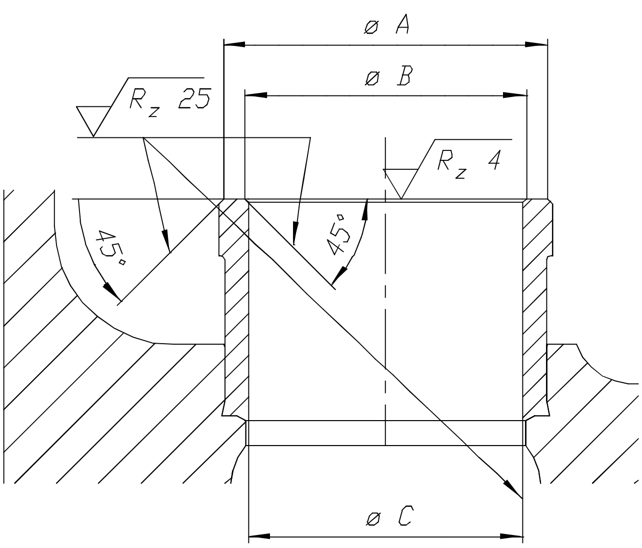


Illustration 11.1

Table 11.1: flat sealing O-ring disc

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

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

14 Refinishing of seat and disc type 526, metal sealing

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

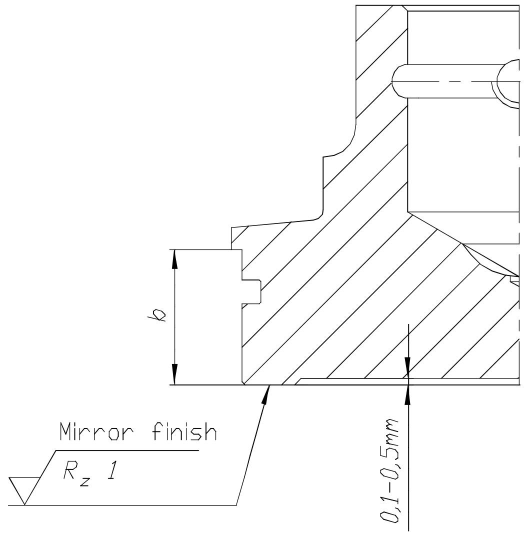


Illustration 12.1

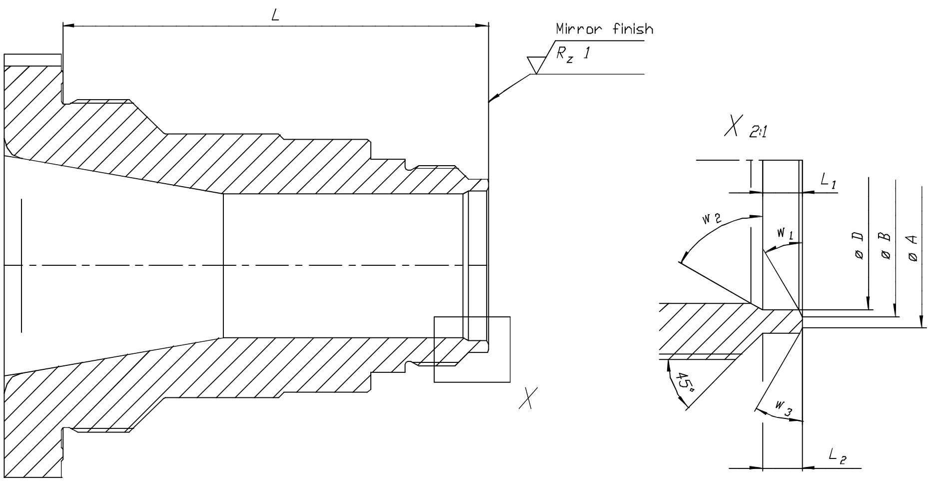


Illustration 12.2

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

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

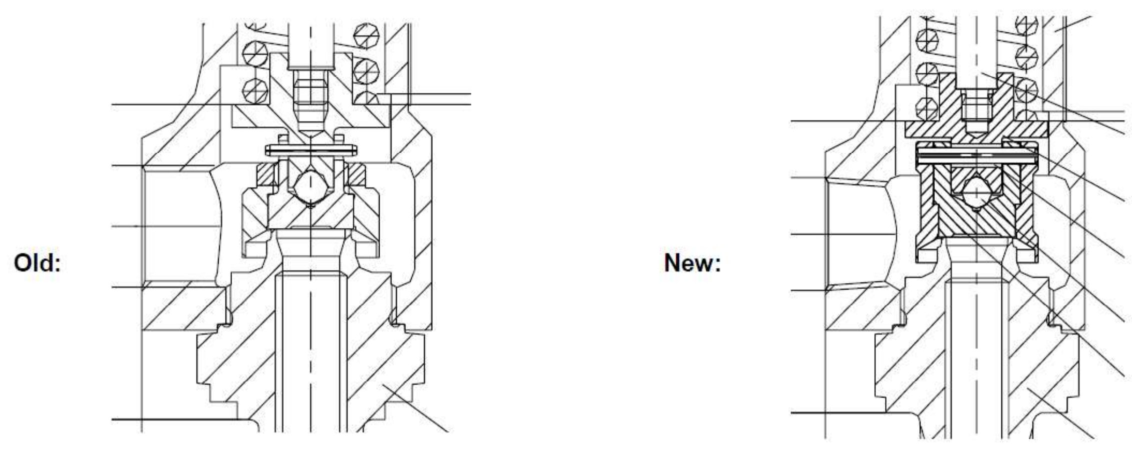
Table 12.1: seats and discs type 526

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

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

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

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



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

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

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

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

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

Table 13.1: Seat and disc type 437

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

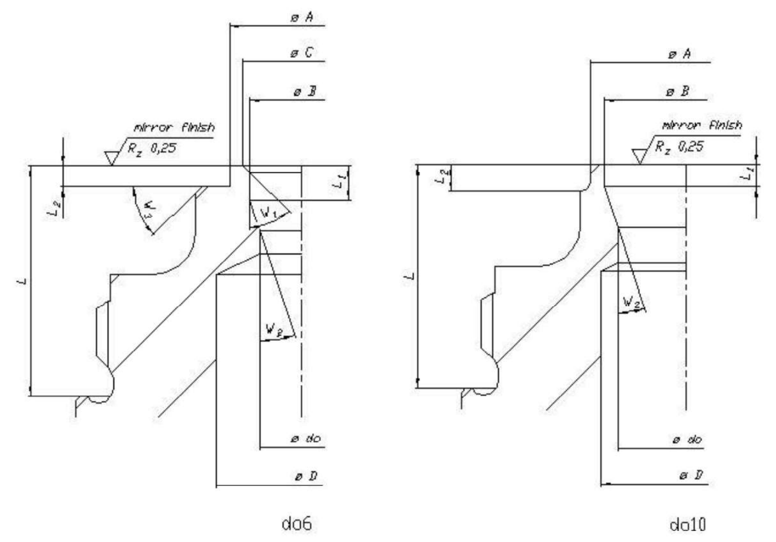


Illustration 13.1

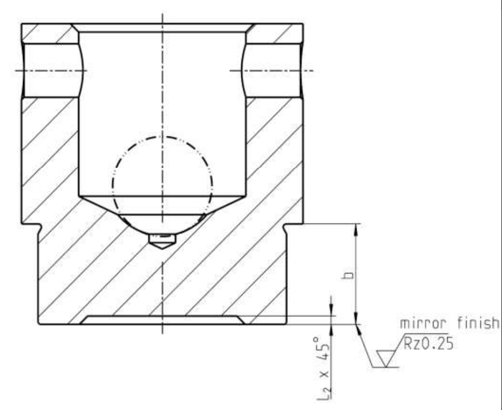


Illustration 13.2

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

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

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

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

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

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

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

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

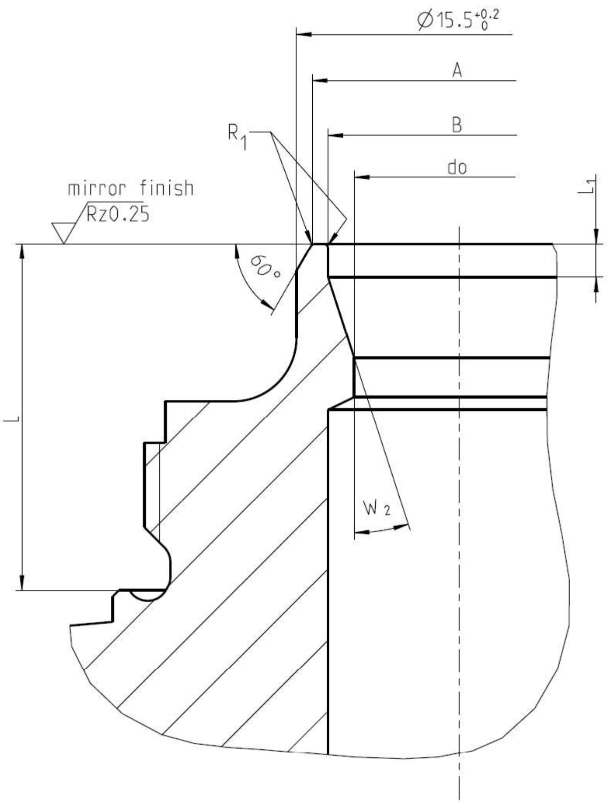


Illustration 13.3

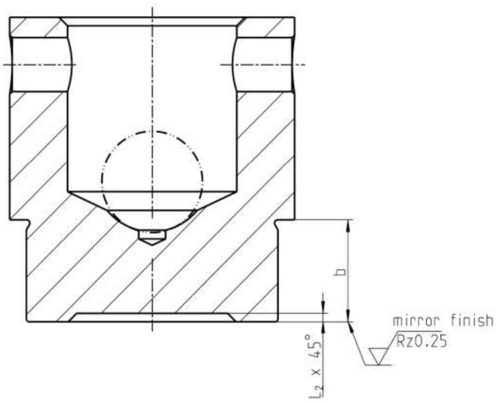


Illustration 13.4

protected

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

Rework shall be done according to illustration 14.1 and table 14.1

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

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

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

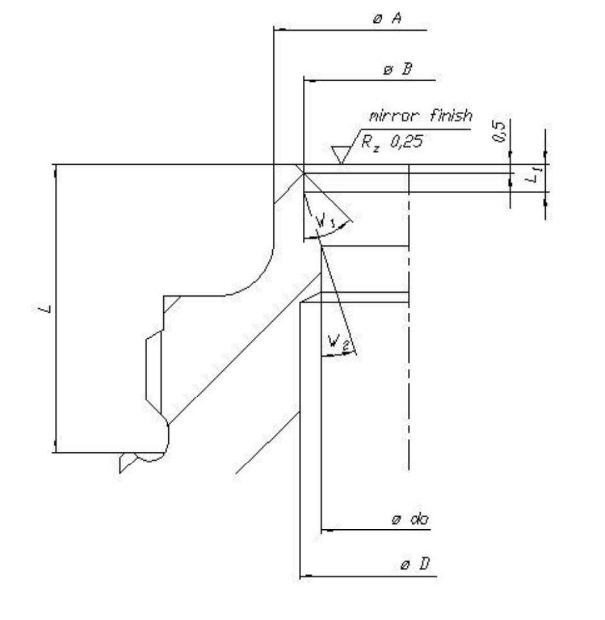


Illustration 14.1

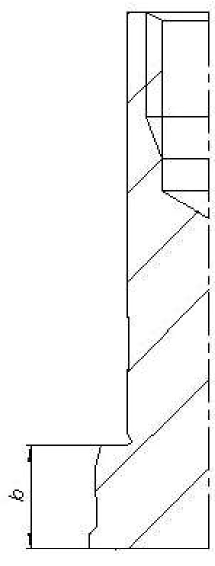


Illustration 14.2

Table 14.1: seats and discs type 438

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

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

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

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

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

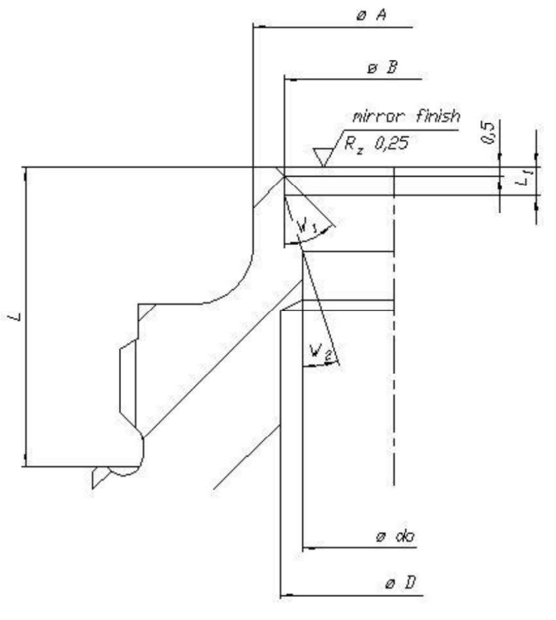


Illustration 15.1

Table 15.1: seats and discs type 439

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

disclosure cat.:	I	proofread:	Bi	published date:	06/17/16	effect. date:	10/15
author:	Haa	released by:	JR	replaces:	309-05	status:	Draft
resp. depart.:	TD	date of release:	05/29/16	revision No.:	4		
doc. type:	LLS	change rep. No.:	NA	retention period:	10y.		

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

Work is to be done according illustration 16.1, 16.2.

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

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

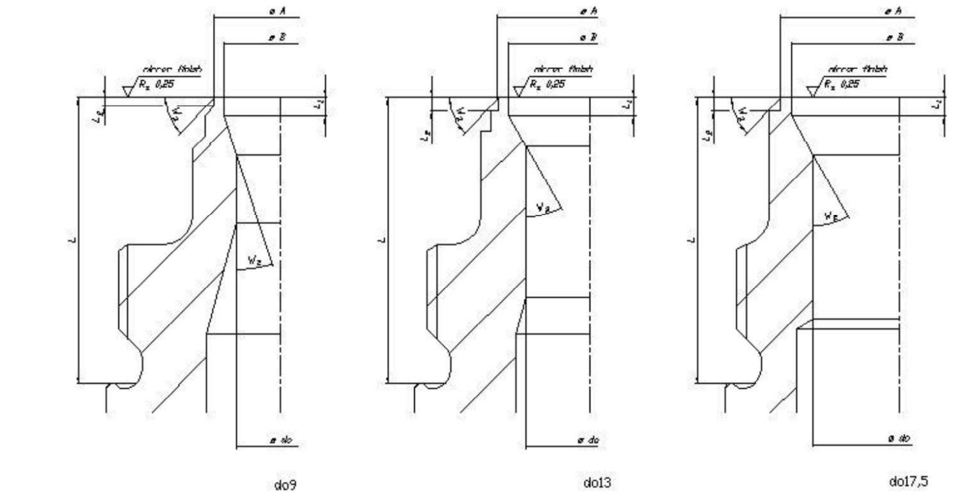


Illustration 16.1

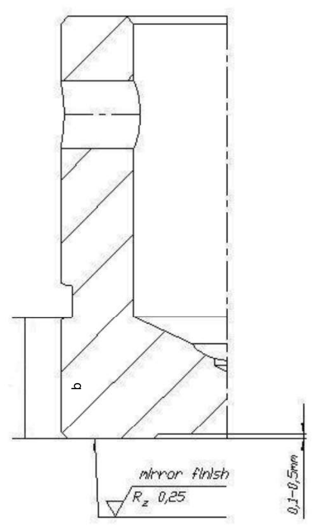


Illustration 16.2

Table 16.1: seats and discs type 459

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

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

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

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

The O-ring in the disc must be renewed.

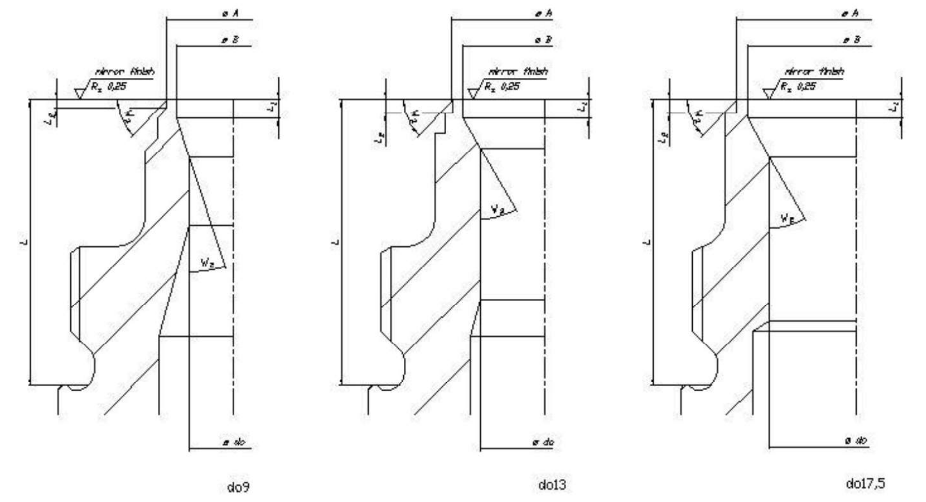


Illustration 17.1

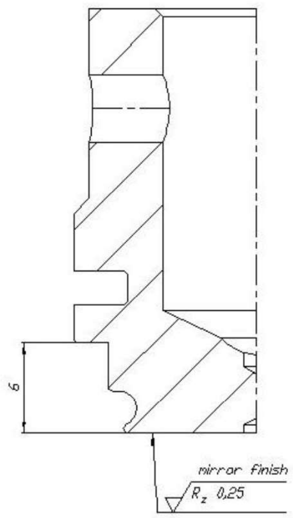


Illustration 17.2

Table 17.1: seats and discs type 462

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

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

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

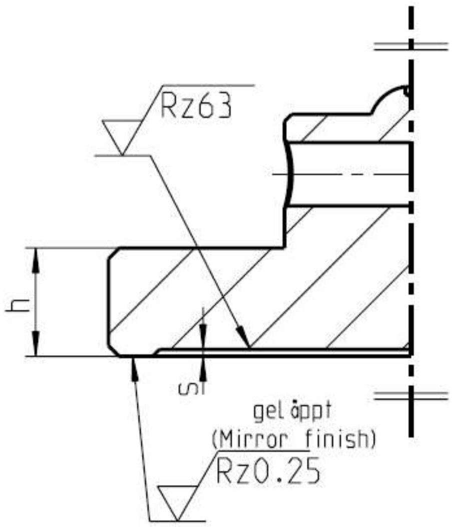

Illustration 18.1: Steel disc

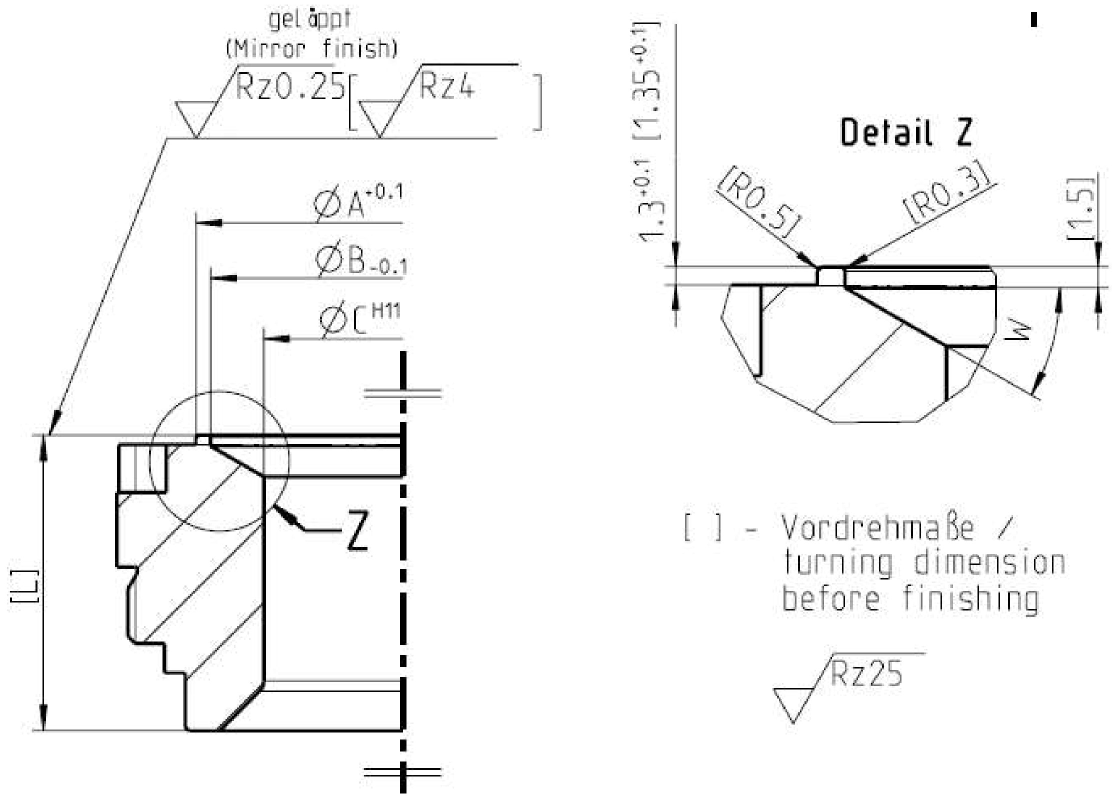

Illustration 18.2: Seat (semi-nozzle)

protected

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

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

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

protected

Contents

1 Purpose

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

2 Scope

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

3 References

LWN 313.32 to 313.40

4 Disclaimer

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

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

5 Qualified fitting personnel

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

6 General Information

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

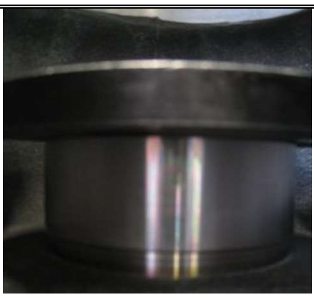
7 Reworking the of the working surfaces

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

8 Re-lapping

8.1 Re-lapping seat and disc sealing surfaces

8.1.1 Lapping with the lapping stamp.

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

protected

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

8.1.2 Re-lapping with a glass plate

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

8.1.3 Re-lapping the nozzle and the disc

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

Alternate methods that ensure the same effect may be used.

public

Compact Performance

TYPES 437, 438, 439, 481

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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

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

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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

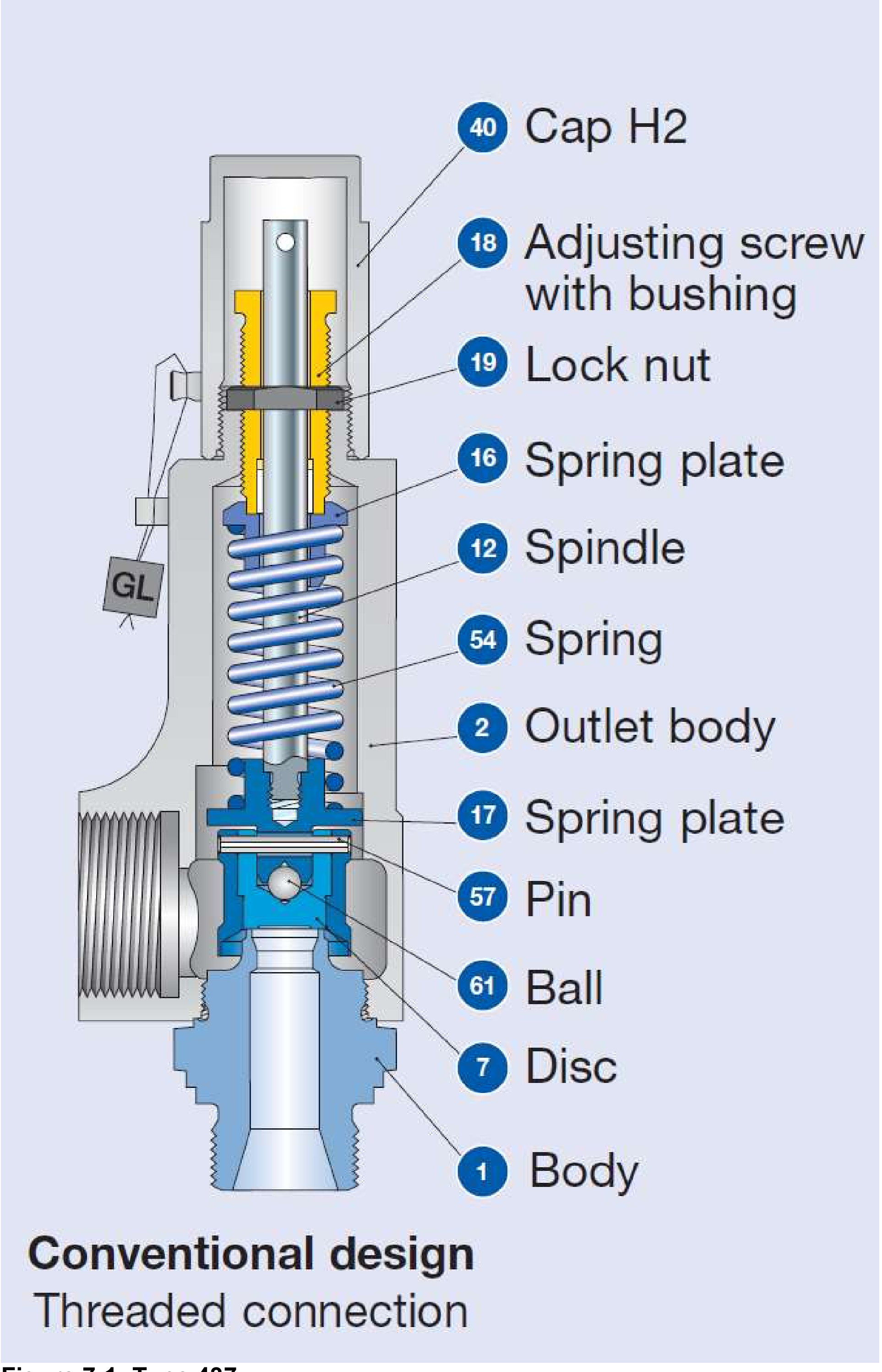
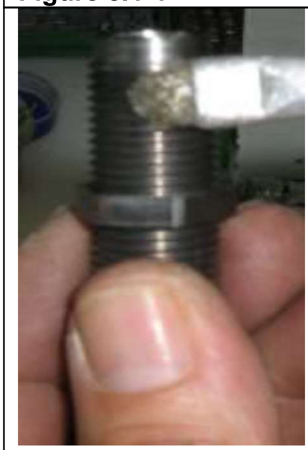


Figure 7-1: Type 437

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)	

public

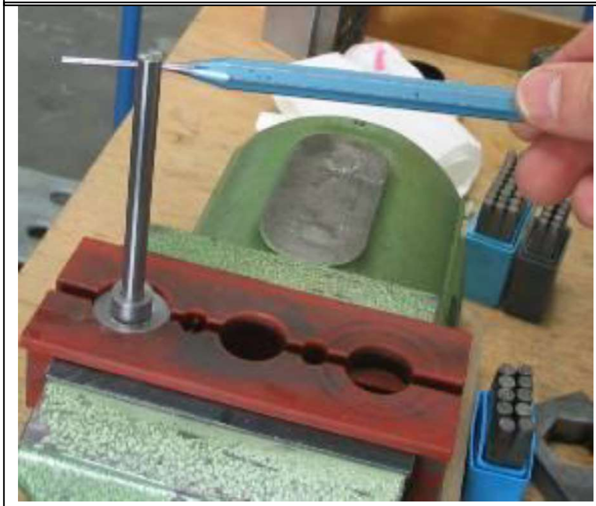
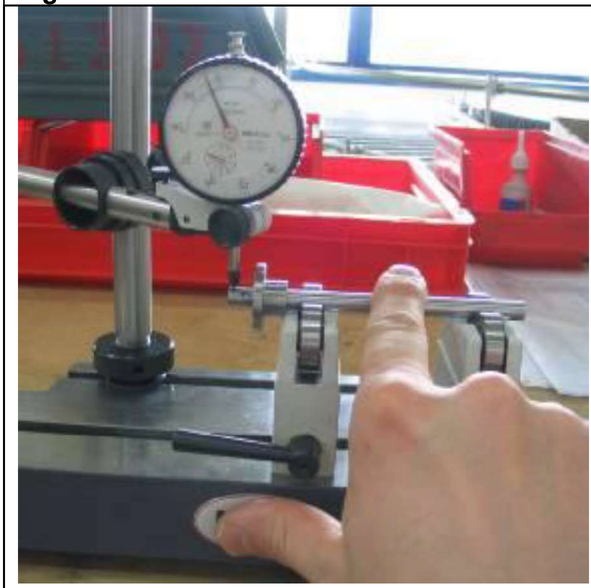
8.2 Assembly of the spindle / disc assembly

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

public

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

public

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.	

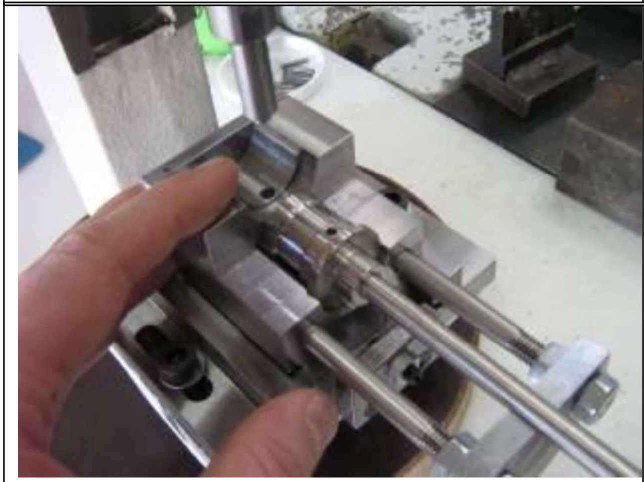
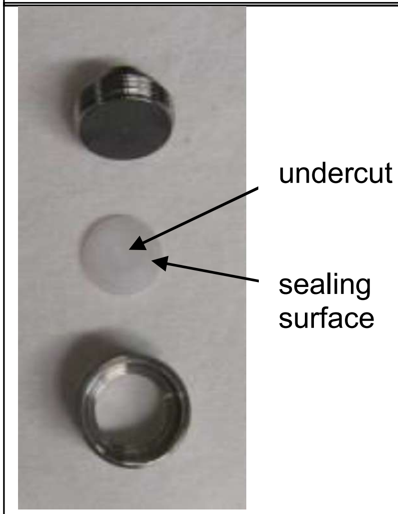
Illustration	**Description**	**Tool / aid**
 **Figure 8.2.1.2-4**	Assemble the spindle with the spring plate into the preassembled parts and place them on the aligning punch in the device.	- Aligning punch, Device
 **Figure 8.2.1.2-5**	Install the pin using a lever press.	- Lever press

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)

public

8.2.2 Plastic sealing plate 437

8.2.2.1 Disc assembly

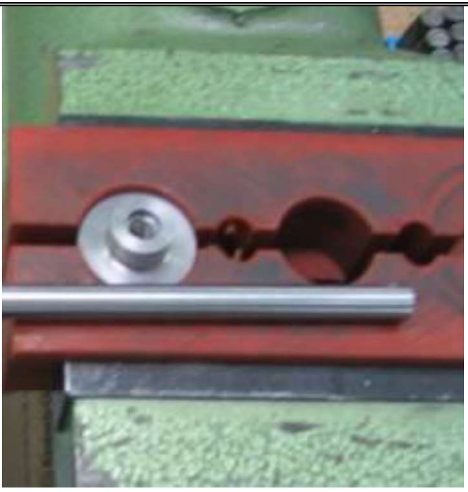
Illustration	**Description**	**Tool / aid**
 **Figure 8.2.2.1-1**	Visual check: Check sealing surface of the sealing plate (outer ring surface) for cleanliness and damage.	
 **Figure 8.2.2.1-2**	Visual check: Check the evenness of the sealing plate (front and back side, no burrs permitted).	
 **Figure 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

public

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

public

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

public

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

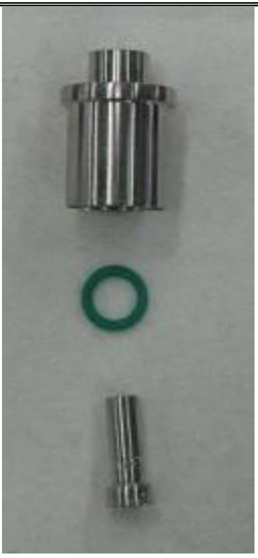
public

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

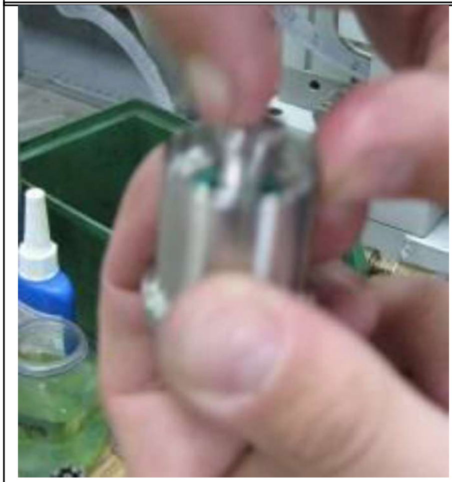
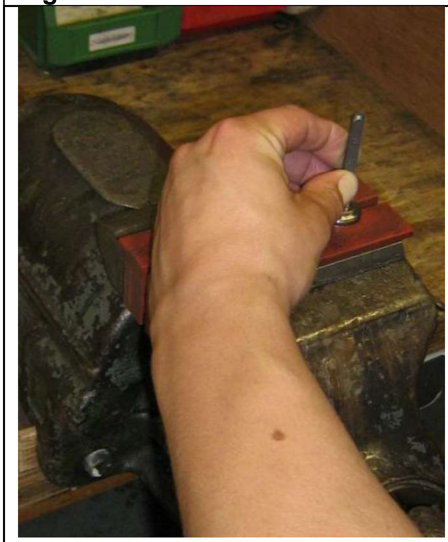
public

8.2.3 Soft seal 438/481

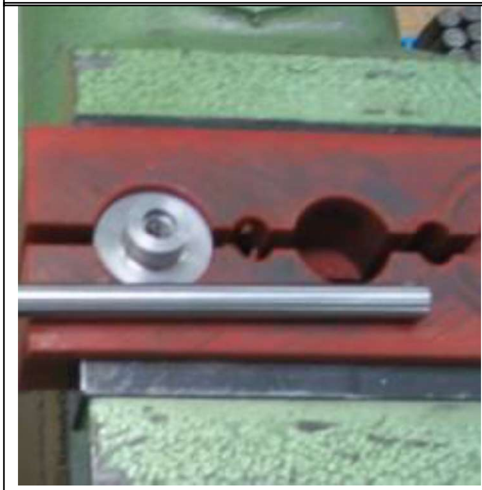
8.2.3.1 Disc assembly - soft seal

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.	

public

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.	

public

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

public

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

8.3.3 Assembly of the inlet body

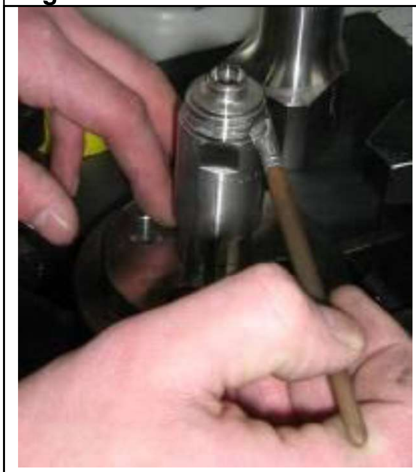
8.3.3.1 Assembly of inlet body for threaded connector (cylindrical thread)

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

public

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 (Ol-56 S / 60H) Torque wrench

public

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

public

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

public

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.	

public

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.	

public

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.	

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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

public

Compact Performance

Types 459, 462, 450, 460

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Contents

public

1 Purpose

This LESER Global Standard (LGS) defines the rules and procedures for special approvals and provides a guideline for local implementation.

2 Scope

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

3 References

LGS 0201 (LWN 220.01)
LGS 3324 (LWN 324-01)
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

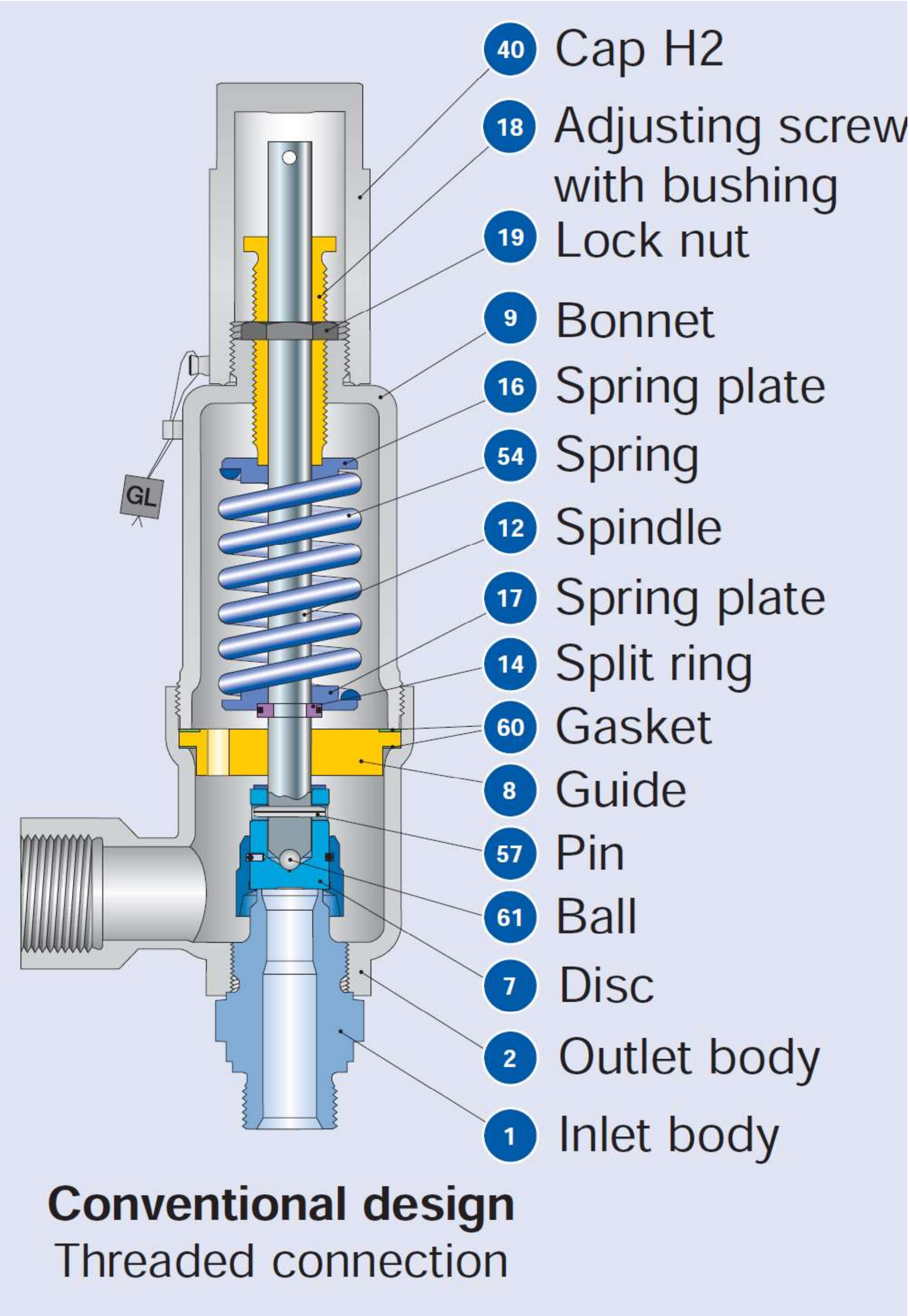


Figure 7-1

public

8 Assembly of the Compact Performance

8.1 Assembly of the adjusting screw

Illustrations	**Description**	**Aids / Tools**
 **Figure 8.1-1**	Put the bushing in the adjusting screw.	
 **Figure 8.1-2**	Assemble the adjusting screw and lock nut.	
 **Figure 8.1-3**	Grease adjusting screw thread	Brush Halocarbon (OI-56 S / 60H)

public

Illustrations	**Description**	**Aids / Tools**
 **Figure 8.1-4**	Grease the front side of the adjusting screw.	Brush Halocarbon (OI-56 S / 60H)
 **Figure 8.1-5**	Screw the adjusting screw into the cap (a few turns).	

public

8.2 Inlet body assembly

8.2.1 Inlet body assembly for threaded connector

<table>
<tr><th>Illustrations</th><th>Description</th><th>Aids / Tools</th></tr>
<tr><td>
Figure 8.2.1-1</td><td>Visual check of inlet body: Check sealing surface for cleanness or damage.
Grease the sealing lip and thread of the inlet body.</td><td>Brush
Halocarbon
(OI-56 S / 60H)</td></tr>
<tr><td>
Figure 8.2.1-2</td><td>Screw the inlet body into the outlet body hand tight.</td><td></td></tr>
<tr><td>
Figure 8.2.1-3</td><td>Screw the assembly device onto the inlet body.
Clamp the body onto the test bench.</td><td>Assembly device, test bench</td></tr>
</table>

public

Illustrations	**Description**	**Aids / Tools**
 **Figure 8.2.1-4**	Tighten the outlet body with 100 Nm.	Torque wrench

8.2.2 Assembly of inlet body for flanged connector

Illustrations	**Description**	**Aids / Tools**
 **Figure 8.2.2-1**	Visual check: Check sealing surface for cleanliness and damage. Grease the sealing lip and thread and clamp the inlet body onto the test bench.	Brush Halocarbon (OI-56 S / 60H)
 **Figure 8.2.2-2**	Screw on the outlet body and tighten at approx. 100 Nm.	Torque wrench

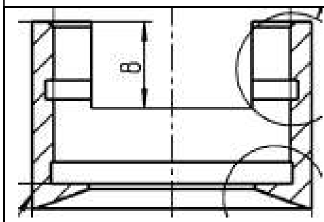
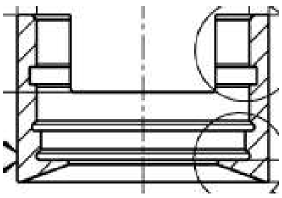
8.3 Assembly of disc assembly

8.3.1 Metallic seal type 459

Illustrations	**Description**	**Aids / Tools**
 **Figure 8.3.1-1**	Disc body, lifting aid, locking ring	
 **Figure 8.3.1-2**	Put the disc body in the lifting aid.	
 **Figure 8.3.1-3**	Put the disc in the assembly device and secure with a screw.	Vice
 **Figure 8.3.1-4**	Insert the retaining clip in the hole on the disc body designated for that purpose. Clamp the assembly device onto the vice and tighten the lifting aid with a C-spanner as far as it will go.	C-spanner with a nose

8.3.2 Plastic sealing plate

The described sealing plate assembly has been replaced by a new assembly variant with regard to optimization. The particular components of the assembly variants must not be interchanged! **The sealing plate assembly must be replaced as a complete assembly unit only.**

Old Illustration	New Illustration	Distinguishing Feature
 **Figure 8.3.2-1**	 **Figure 8.3.2-2**	**The colour of the sealing plate is NOT distinguishing feature!**
 **Figure 8.3.2-3**	 **Figure 8.3.2-4**	**Old disc:** Recess for sealing plate **New disc:** smooth end face
 **Figure 8.3.2-5**	 **Figure 8.3.2-6**	**Old disc:** Sealing plate is integrated inside the disc **New disc:** Sealing plate is positioned on the plate **The colour of the sealing plate is NOT distinguishing feature!**
 **Figure 8.3.2-7**	 **Figure 8.3.2-8**	**Lifting aid**

public

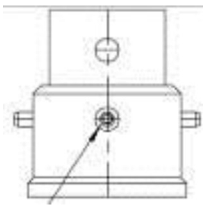
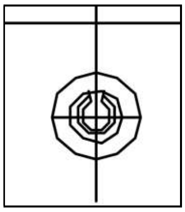
Illustrations	Description	Aids / Tools
 Figure 8.3.2-9	Insert the sealing plate in the disc body (freely turning up)	
 Figure 8.3.2-10	Emboss the code letters of the sealing plate on the edge of the disc.	Punch numbers, Hammer
 Figure 8.3.2-11	Put the body with the sealing plate in the assembly device and secure with a screw.	Assembly Device

Illustrations	**Description**	**Aids / Tools**
 **Figure 8.3.2-12**	Insert the retaining clip in the hole of the disc body designated for that purpose.	
 **Figure 8.3.2-13**	Clamp the assembly device onto the vice and tighten the lifting aid with a C-spanner as far as it will go.	Vice C-spanner with a nose

public

8.3.3 O-ring seal types 462 (do = 9)

Illustrations	Description	Aids / Tools
 Figure 8.3.3-1	Individual parts of the disc with O-ring seal	
 Figure 8.3.3-2	Set pressure <= 5 bar Wet the O-ring with "soapy water" and put it on the disc body. Set pressure > 5 bar Wet the O-ring with pure water and put it on the disc body. Hammer the code letter into the O-ring body according to the O-ring material.	
 Figure 8.3.3-3	Put the disc body in the lifting aid.	

Illustrations	**Description**	**Aids / Tools**
 **Figure 8.3.3-4**	Put the disc **<u>with spacers</u>** in the assembly device and press it in carefully.   Hammer pins into all four sides of the lifting aid (the axis of the slit of the pin points in the direction of the spindle).	Assembly device

8.3.4 O-Ring seal type 462 (do = 13, do= 17.5)

Illustrations	Description	Aids / Tools
 **Figure 8.3.4-1**	Individual parts of the disc with O-ring seal for type 462	
 **Figure 8.3.4-2**	Wet the O-ring with "soapy water" and put it on the disc body. Hammer the code letter into the O-Ring body according to the O-ring material.	
 **Figure 8.3.4-3**	Wet the inside of the lifting aid with "soapy water".	

Illustrations	Description	Aids / Tools
 **Figure 8.3.4-4**	Put the disc body in the lifting aid and press in with the assembly device. Hammer in the pins on both sides.	

8.4 Assembly of spindle/disc assembly

8.4.1 Assembly of spindle/disc assembly (without bellows)

Illustrations	**Description**	**Aids / Tools**
 **Figure 8.4.1-1**	Insert the ball into the disc body.	
 **Figure 8.4.1-2**	Put the spindle into the disc and secure the parts with a pin (crimp it first inwards at one end to make installation easier)	
 **Figure 8.4.1-3**	Push the guide onto the spindle.	

Illustrations	**Description**	**Aids / Tools**
 **Figure 8.4.1-4**	Fit split rings into the recess of the spindle and secure then with a retaining clip.	
 **Figure 8.4.1-5**	Push the lower spring plate, the spring and the upper spring plate onto the spindle.	

8.4.2 Assembly of spindle/disc assembly (with stainless steel bellows)

Illustrations	**Description**	**Aids / Tools**
 **Figure 8.4.2-1**	Grease spindle	Brush Halocarbon (OI-56 S / 60H)
 **Figure 8.4.2-2**	Put a very small amount of glue on the spindle thread (1 drop).	Glue
 **Figure 8.4.2-3**	Fit the bellows and tighten it quickly hand tight with two pin punches.	Pin punch

Illustrations	Description	Aids / Tools
 **Figure 8.4.2-4**	Fit split rings into the recess of the spindle and secure then with a retaining clip.	
 **Figure 8.4.2-5**	Place the sealing ring in the cooling zone/bonnet spacer.	
 **Figure 8.4.2-6**	Shift the spindle with the bellows through the cooling zone into the disc. Afterwards, put it onto the assembly device and secure it with a pin (first crimp pin inwards at one end to make installation easier).	

public

8.4.3 Assembly of spindle/disc assembly (with elastomer bellows)

Illustrations	Description	Aids / Tools
 **Figure 8.4.3-1**	Insert the ball into the disc body.	
 **Figure 8.4.3-2**	Shift the spindle into the disc and secure with a pin (first crimp the parts inwards at one end to make installation easier)	
 **Figure 8.4.3-3**	Push the bellows onto the assembly aid until the thick end is flush.	Assembly aid
 **Figure 8.4.3-4**	Fit assembly aid with bellows onto the spindle	

public

Illustrations	**Description**	**Aids / Tools**
 **Figure 8.4.3-5**	Put the bellows over the disc by means of the assembly aid.	
 **Figure 8.4.3-6**	Remove the assembly aid from the spindle and put guide on. Put the other end of the bellows over the neck of the guide.	
 **Figure 8.4.3-7**	Secure both sides of the bellows with cable ties. Cut off the overlapping end.	Side cutter or similar

public

8.5 Inserting the spindle/disc assembly

8.5.1 Inserting the assembly (without bellows)

Illustrations	**Description**	**Aids / Tools**
 **Figure 8.5.1-1**	Fit the assembly into the outlet body carefully. In this process, push the guide down and lift the spindle somewhat so that the disc does not touch down. Put the disc with the spindle carefully down onto the seat.	

8.5.2 Inserting the assembly (with stainless steel bellows)

Illustrations	Description	Aids / Tools
 **Figure 8.5.2-1**	Put the assembly on the outlet body and tighten it hand tight. In this process, pull the spindle up somewhat so that the sealing surface is not scratched. Put the disc with the bellows and spindle carefully down onto the seat. Tighten the bonnet spacer with the C-spanner.	C-spanner with a nose
 **Figure 8.5.2-2**	Push the lower spring plate, the spring and the upper spring plate onto the spindle.	

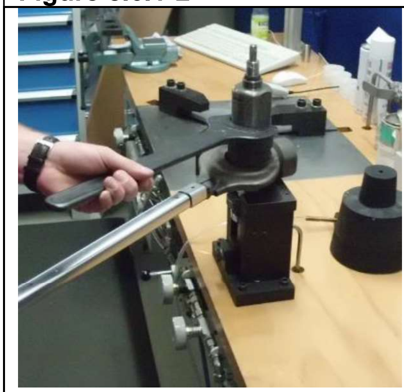
8.5.3 Inserting the assembly (with elastomer bellows)

Illustrations	Description	Aids / Tools
 Figure 8.5.3-1	Put the assembly carefully into the outlet body. In this process, push the guide down and lift the spindle somewhat so that the disc does not touch down. Put the disc with the spindle carefully down onto the seat.	

public

8.6 Assembly of the bonnet

8.6.1 Assembly of bonnet (without stainless steel bellows)

Illustrations	Description	Aids / Tools
 **Figure 8.6.1-1**	Grease the front side and threads of the bonnet and put on carefully.	Brush, Halocarbon (Ol-56 S/ 60H)
 **Figure 8.6.1-2**	Screw the bonnet on hand tight. Secure the spindle/disc against turning.	
 **Figure 8.6.1-3**	Afterwards, tighten the bonnet and hold up the outlet body with the torque wrench.	Open-end spanner and torque wrench

public

8.6.2 Bonnet assembly (with stainless steel bellows)

Illustrations	**Description**	**Aids / Tools**
 **Figure 8.6.2-1**	Grease the front side and threads of the bonnet and put it on carefully.	Brush, Halocarbon (OI-56 S / 60H)
 **Figure 8.6.2-2**	Screw the bonnet on hand tight. Secure the spindle/disc against turning. Afterwards, tighten the bonnet and hold up the outlet body with the torque wrench.	Open-end spanner and torque wrench.

public

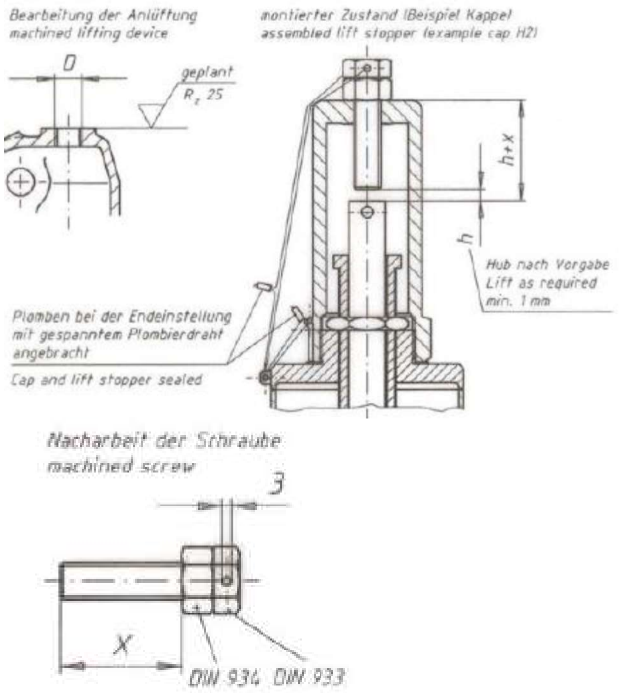
8.7 Determination and installation of the lift stopper

8.7.1 Installation of the lift stopper with ring/sleeve

Illustrations	Description	Aids / Tools
 Figure 8.7.1-1	First of all, insert the spindle assembly into the body **without the spring plate and spring** and screw the bonnet. After installation of the bonnet, determine the spindle overlap in a non-opened state with a depth gauge.	Sliding Vernier calliper
 Figure 8.7.1-2	Open the valve completely by hand (e.g. with a pin punch) through the inlet and determine the spindle overlap once again. **The extent of the lift stopper =** spindle overlap (opened) - (spindle overlap not opened) - lift given in the work plan. Remove spindle assembly carefully off the body	Pin punch
 Figure 8.7.1-3	Put the sleeve/ring with the determined thickness on the spindle between the disc and guide.	

public

8.7.2 Installation of the lift stopper with set screw (taken from LGS 3324)

Illustrations	**Description**	**Aids / Tools**
 **Figure 8.7.2-1**	Use a completely assembled valve to measure the distance "h+x" from the top edge of the cap/lever to the end of the spindle. In accordance with this distance, a screw (DIN 933) is shortened to the size "x". Install the shortened screw with a nut and seal it separately. During the assembly, the screw is secured firmly against the cap, by the nut. Here, the gap between the head of the screw and the nut shall not exceed a maximum of 0.5 mm (approx 1/4 of a screw turn). Seal the screw with PTFE tape within the cap.	

public

8.8 Adjusting the set pressure

Illustrations	**Description**	**Aids / Tools**
 **Figure 8.8-1**	CAUTION: The following instructions apply to all valves covered in this work instruction **<u>except for 4594 with d0=6mm</u>**. LGS 3614 applies in that case. Secure the splint pin against turning when adjusting the adjusting screw. Pressurise the valve and adjust it 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, then 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. Release the pressure when readjusting the adjusting screw. Readjust the adjusting screw and then pressurise the valve again.	

8.9 Testing and documenting the seat tightness.

Illustrations	Description	Aids / Tools
 **Figure 8.9-1**	Raise the valve to its set pressure 3x. After the 3rd opening, throttle the valve from the set pressure to the test pressure. Screw the test cap onto 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 there are leaks, check the components. If necessary, relap the disc and/or seat. If the seal tightness has been met, then document the results. Remove the test cap	Test cap Water tank Test plug

8.10 Assembly of the outlet

8.10.1 Assembly of outlet flange (Outlet adapter with cylindrical thread)

Illustrations	Description	Aids / Tools
 Figure 8.10.1-1	Grease the thread and front side of the outlet adapter.	Brush Halocarbon (OI-56 S / 60H
 Figure 8.10.1-2	Place flange over the outlet of the body. Screw the outlet adapter into the outlet body and tighten it.	Open-end spanner

8.10.2 Assembly of outlet flange (outlet adapter with conical NPT thread)

Illustrations	**Description**	**Aids / Tools**
 **Figure 8.10.2-1**	Wrap the thread of the outlet nozzle with sealing tape (3 full windings in a clockwise direction).	PTFE tape
 **Figure 8.10.2-2**	Place flange over the outlet of the body. Screw the outlet adapter into the outlet body and tighten it. Cut off the sealing tape that is not screwed in.	Knife

public

8.11 Assembly of the cap / lever

8.11.1 Assembly of cap H2

Illustrations	**Description**	**Aids / Tools**
 **Figure 8.11.1-1**	Grease the thread and sealing lip of cap H2.	Brush Halocarbon (OI-56 S / 60H
 **Figure 8.11.1-2**	Screw the lever onto the thread of the bonnet and tighten it by using approx. 80 – 100 Nm. Additional hold up the bonnet with an open end spanner.	Torque wrench and open-end spanner

public

8.11.2 Assembly of lever H3

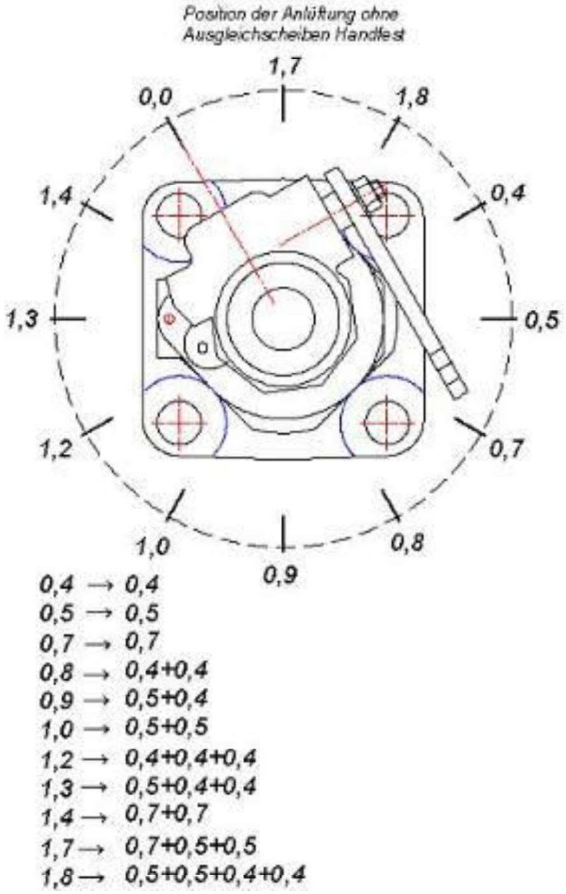
Illustrations	Description	Aids / Tools
 **Figure 8.11.2-1**	Spindle cap with cylinder pin and retaining ring	
 **Figure 8.11.2-2**	Fasten the spindle cap to the spindle with the cylinder pin and retaining ring.	
 **Figure 8.11.2-3**	Individual parts of lever H3	
 **Figure 8.11.2-4**	Screw the lever cover on and put it into position ("nose" must point in the outlet direction). Use spacers, if necessary	

Illustrations	Description	Aids / Tools
 **Figure 8.11.2-5**	Secure the lever with the plastic ball...	
 **Figure 8.11.2-6**	... and locking screw against twisting.	
 **Figure 8.11.2-7**	Putting on the venting lever.	
 **Figure 8.11.2-8**	Fit the bolt and secure it on both sides with retaining clips.	

8.11.3 Assembly of lever H4

Illustrations	**Description**	**Aids / Tools**
 **Figure 8.11.3-1**		
 **Figure 8.11.3-2**	Fasten the spindle cap to the spindle with the cylinder pin and retaining ring.	

public

Illustrations	Description	Aids / Tools
 **Figure 8.11.3-3**	Screw on the lever and put it into position as illustrated by using spacers (the home position in a completely assembled state is at 1.7).	
 **Figure 8.11.3-4**	Put on the determined number of spacers. Grease each spacer as well as the metallic sealing surface individually. Screw on the lever and tighten it with approx. 80 – 100 Nm. Additional hold up the bonnet with an open-end spanner	Torque wrench and open-end spanner

public

8.11.4 Assembly of lift indicator in H4 lever

Illustrations	**Description**	**Aids / Tools**
 **Figure 8.11.4-1**	Position the eccentric hole that the spindle cap is exactly in the middle.	
 **Figure 8.11.4-2**	Secure the position with a lock nut. Screw in the lift indicator as far as it will go, and then unscrew it <u>one turn</u>.	
 **Figure 8.11.4-3**	Secure the position of the lift indicator by tightening the first nut hand tight. Then lock with a second nut.	

public

8.12 Test gag assembly (possible for H2 + H4)

Illustrations	Description	Aids / Tools
 **Figure 8.12-1**	Grease the sealing surface of the short bolt.	Brush Halocarbon (OI-56 S / 60H
 **Figure 8.12-2**	Put on the sealing ring and grease it as well.	Brush Halocarbon (OI-56 S / 60H
 **Figure 8.12-3**	Screw the plug screw into the cap or lever and tighten it with 28-32 Nm (or 72-76 Nm for thread size M16). When blocked, the torque for the longer test gag screw is 20 Nm.	Torque wrench

public

8.13 Documentation and testing the seal tightness to the outside

8.13.1 Testing the seal tightness to the outside for flanged valves through immersion.

Illustrations	**Description**	**Aids / Tools**
 **Figure 8.13.1-1**	Seal the valve at the inlet with a sealing cap.	Sealing cap
 **Figure 8.13.1-2**	Screw a test nozzle onto the outlet.	Test nozzle

public

Illustrations	Description	Aids / Tools
 **Figure 8.13.1-3**	Hook the valve in the testing assembly device.	Testing assembly device
 **Figure 8.13.1-4**	Immerse the valve. Test pressure 6 bar	

<u>Test pressure for valves with elastomer bellows:</u>

Set pressure p0<3 bar: 0.15 x p_0

Set pressure p0≥ 3bar: 2bar

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.

public

8.13.2 Testing the seal tightness to the outside for flanged valve

Illustrations	Description	Aids / Tools
 **Figure 8.13.2-1**	Clamp the outside side of the valve to the test bench. Pressurise the valve with 6 bar.	Test bench
 **Figure 8.13.2-2**	Wet the valve with leak detector spray on the interconnection points and the outlet area.	Leakdetector spray

<u>Test pressure for valves with elastomer bellows:</u>

Set pressure p0<3 bar: 0.15 x p_0

Set pressure p0≥ 3bar: 2bar

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.

public

8.14 Sealing the valve

Illustrations	Description	Aids / Tools
 **Figure 8.14-1**	Connect the sealing hole or lug with the cap/lever and bonnet closely in a clockwise direction. Seal the lever/cap to the outlet body.	

8.15 Visual inspection

Check the valve once again for damage, freedom from burrs, casting faults etc. and replace defective parts if necessary.

Perform visual inspection and document.

Inhalt

protected

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

protected

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 6	M 8		
A4 Klasse 70 (1.4401)	(B8M)	9– 12	16 - 20		

Table 1.2 for screws and nuts for clean service – clamp rings Type 48X

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.

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.

protected

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*

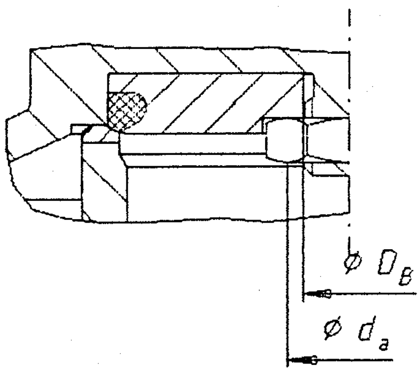


Bild 1

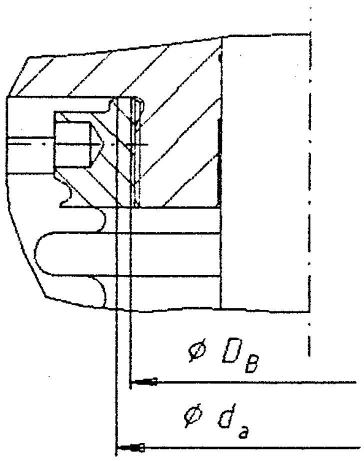


Bild 2

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:

$$M_A = 0{,}9 \text{ x } M_{A\,0{,}9} \tag{1}$$

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

Formel (2) in (1):

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

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

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

$\circ_{0,2}$: 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.

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author:	TK	released by:	JR	replaces:	322-04	status:	published
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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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LESER GmbH & Co. KG is available to the users of this document to provide additional information.

4 Qualified fitting personnel

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

5 General Information

- Wear safety glasses
- Wear respirator/dust mask

6 Paint touch-up and painting repaired valves

For valves that have to be repainted, the facing and the welded-on component/customer ID plates must be masked off correctly. Any additional plates will only be attached after painting, if welding is not required. Open bonnets must be sealed with protective caps. The same applies to any existing threaded holes. Outside threads must be protected with a suitable protective cap / existing painting socket or with masking tape.

Figure 6-1: Protective cap for open bonnet

Figure 6-2: Flange sticker

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author:	Nieh	released by:	KUW	replaces:	initial	status:	published
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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.

protected

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.

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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

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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)

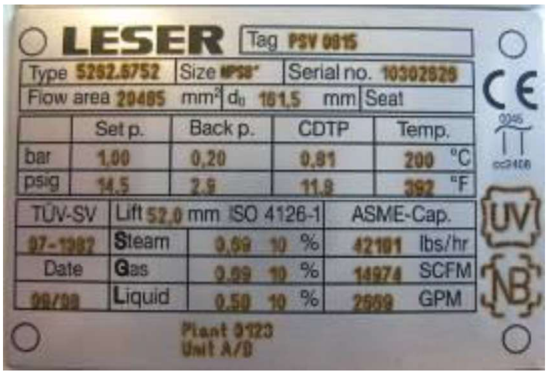


Figure 6.2.1-1

The world plate (NGA) comes in two versions.

protected

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

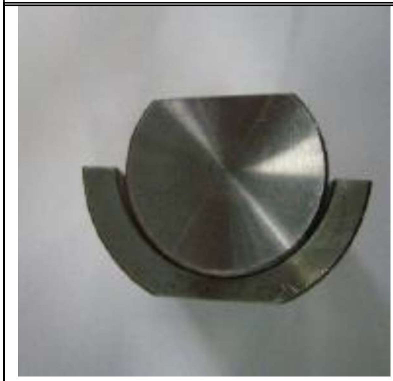
For valves that are designed according to TÜV, the UV and NB symbols are not lasered on.

6.2.1 Pre-curving of the NGA

For bonnets with a curved cross-section, the plate must be pre-curved with a radius. To do this, place the labelled plates in the apparatus with the lettering facing down.

Illustrations	**Description**	**Aids / Tools**
 **Figure 6.2.1-1**	Pre-curving the plate	Apparatus
	Pre-curving the plate for open bonnets (V20-V25)	Apparatus

Figure 6.2.1-2		

Illustrations	Description	Aids / Tools
 **Figure 6.2.1-3**	Adjustment of plate for closed bonnets (V20 - V32)	

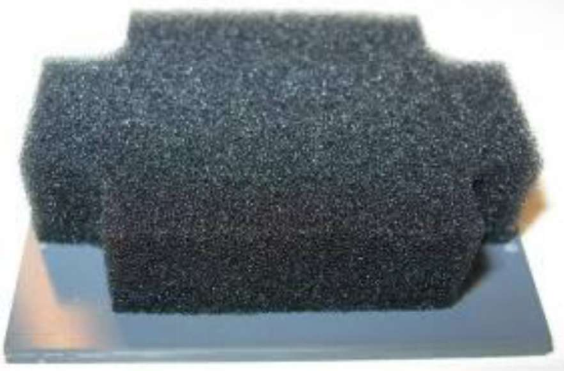
When opening bonnets V20-V25, the plate is bent in the longitudinal direction. To do this, put the labelled plates into the apparatus with the lettering facing down (figure 6.2.1-2).

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**		

protected

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.	

protected

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.	

protected

d) Open bonnet (V40)

Position of the bonnet:

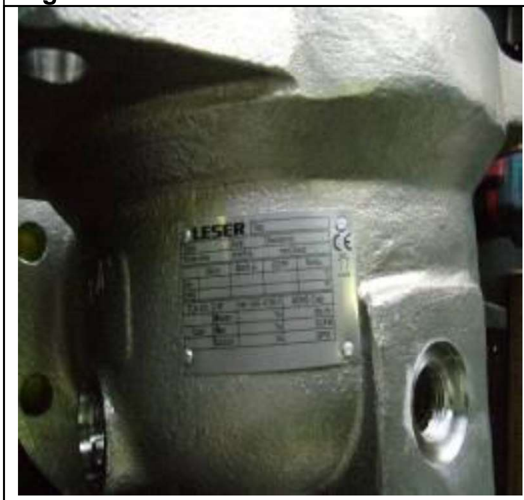
The raised identifier of the product form manufacturer (foundry) is mounted in the direction of the outlet flange.

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 459, 462.

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 459, 462.
The pressure ranges of the various types are given first in pressure-unit [bar, page 2- 8].
This is followed by the pressure-unit [psig, page 9- end].

For additional information please see legend description.

3 References

LDeS 3265.01

4 Legend / Indices

S = Sonderauftrag / special order

Blaue Markierung / blue Marking = Drucklagereinsatz / thrust bearing use

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resp. depart.:	TD	date of release:	12/17/1209/	revision No.:	5		
doc. type:	LGS	change rep. No.:	200135	retention period:	10y.		

Ausführung *(type)*															
Standard (standard)				**Warmfest** (creep-resistant steel)				**Korrosionsfest** (stainless steel)				**Inconel X750**			
p [bar]				**p [bar]**				**p [bar]**				**p [bar]**			
von **p1** *up*	**bis** **p2** *to*	**Feder-Sachnummer** *stock no.*	**Indizes**	**von** **p1** *up*	**bis** **p2** *to*	**Feder-Sachnummer** *stock no.*	**Indizes**	**von** **p1** *up*	**bis** **p2** *to*	**Feder-Sachnummer** *stock no.*	**Indizes**	**von** **p1** *up*	**bis** **p2** *to*	**Feder-Sachnummer** *stock no.*	**Indizes**
								DN 10 do 6				**DN 10 do 6**			
								Type 459 HDD: Stahl-Teller (steel disk)				**Type 459 HDD: Stahl-Teller (steel disk)**			
								200,00	-220,00	540.5124.0000	S	200,00	-220,00	540.5127.0000	S
								220,01	-270,00	540.4114.0000	S	220,01	-270,00	540.5117.0000	S
										540.5134.0205	S			540.5137.0205	S
								270,01	-350,00	540.5124.0000	S	270,01	-350,00	540.5127.0000	S
										540.4314.0205	S			540.4317.0205	S
								350,01	-420,00	540.9404.0000	S	350,01	-420,00	540.9407.0000	S
										540.5134.0205	S			540.5137.0205	S
								420,01	-450,00	540.9404.0000		420,01	-450,00	540.9407.0000	
										540.5134.0205				540.5137.0205	
								450,01	-530,00	540.9414.0000		450,01	-530,00	540.9417.0000	
										540.5134.0205				540.5137.0205	
								530,01	-600,00	540.8094.0000		530,01	-600,00	540.8097.0000	
										540.4314.0205				540.4317.0205	
								600,01	-700,00	540.0054.0000		600,01	-700,00	540.0057.0000	
										540.5134.0205				540.5137.0205	
								700,01	-850,00	540.0064.0000		700,01	-850,00	540.0067.0000	
										540.0434.0205				540.0437.0205	

LESER Global Standard

Federdaten-Tabellen Type 459, 462

Spring data list type 459, 462

Ausführung *(type)*															
Standard (standard)				**warmfest** (creep-resistant steel)				**korrosionsfest** (stainless steel)				**Inconel X750**			
p [bar]				p [bar]				p [bar]				p [bar]			
von **p1** *up*	**bis** **p2** *to*	**Feder-Sachnummer** *stock no.*	**Indizes**	**von** **p1** *up*	**bis** **p2** *to*	**Feder-Sachnummer** *stock no.*	**Indizes**	**von** **p1** *up*	**bis** **p2** *to*	**Feder-Sachnummer** *stock no.*	**Indizes**	**von** **p1** *up*	**bis** **p2** *to*	**Feder-Sachnummer** *stock no.*	**Indizes**
DN 15 do 9				**DN 15 do 9**				**DN 15 do 9**				**DN 15 do 9**			
Type 459 : Stahl-Teller (steel disk)				**Type 459 : Stahl-Teller (steel disk)**				**Type 459 : Stahl-Teller (steel disk)**				**Type 459 : Stahl-Teller (steel disk)**			
1,50	- 2,30	540.8054.0000		1,50	- 2,30	540.8054.0000		1,50	- 2,30	540.8054.0000		1,50	- 2,30	540.8057.0000	
2,31	- 4,00	540.4004.0000		2,31	- 4,00	540.4004.0000		2,31	- 4,00	540.4004.0000		2,31	- 4,00	540.4007.0000	
4,01	- 5,70	540.4014.0000		4,01	- 5,70	540.4014.0000		4,01	- 5,70	540.4014.0000		4,01	- 5,70	540.4017.0000	
5,71	- 7,70	540.5021.0190		5,71	- 7,70	540.4024.0000		5,71	- 7,70	540.4024.0000		5,71	- 7,70	540.5027.0000	
7,71	- 10,20	540.5031.0190		7,71	- 10,20	540.4034.0000		7,71	- 10,20	540.4034.0000		7,71	- 10,20	540.5037.0000	
10,21	- 12,00	540.5041.0190		10,21	- 12,00	540.4044.0000		10,21	- 12,00	540.4044.0000		10,21	- 12,00	540.5047.0000	
12,01	- 18,00	540.5051.0190		12,01	- 18,00	540.4054.0000		12,01	- 18,00	540.4054.0000		12,01	- 18,00	540.5057.0000	
18,01	- 27,50	540.5062.0000		18,01	- 27,50	540.5062.0000		18,01	- 27,50	540.4064.0000		18,01	- 27,50	540.5067.0000	
27,51	- 40,00	540.5072.0000		27,51	- 40,00	540.5072.0000		27,51	- 40,00	540.4074.0000		27,51	- 40,00	540.5077.0000	
40,01	- 58,00	540.5082.0000		40,01	- 58,00	540.5082.0000		40,01	- 58,00	540.4084.0000		40,01	- 58,00	540.5087.0000	
58,01	- 75,00	540.5092.0000		58,01	- 75,00	540.5092.0000		58,01	- 75,00	540.4094.0000		58,01	- 75,00	540.5097.0000	
75,01	-104,00	540.5102.0000		75,01	-104,00	540.5102.0000		75,01	-104,00	540.4104.0000		75,01	-104,00	540.5107.0000	
104,01	-121,00	540.5122.0000		104,01	-121,00	540.5122.0000		104,01	-121,00	540.5124.0000		104,01	-121,00	540.5127.0000	
121,01	-145,00	540.8062.0000		121,01	-145,00	540.8062.0000		121,01	-145,00	540.8064.0000		121,01	-145,00	540.8067.0000	
145,01	-175,00	540.5122.0000 540.5134.0205		145,01	-175,00	540.5122.0000 540.5134.0205		145,01	-175,00	540.5124.0000 540.5134.0205		145,01	-175,00	540.5127.0000 540.5137.0205	
175,01	-200,00	540.8062.0000 540.5134.0205		175,01	-200,00	540.8062.0000 540.5134.0205		175,01	-200,00	540.8064.0000 540.5134.0205		175,01	-200,00	540.8067.0000 540.5137.0205	
200,01	-230,00	540.8062.0000 540.4314.0205		200,01	-230,00	540.8062.0000 540.4314.0205		200,01	-230,00	540.8064.0000 540.4314.0205		200,01	-230,00	540.8067.0000 540.4317.0205	
230,01	-250,00	540.8094.0000		230,01	-250,00	540.8094.0000		230,01	-270,00	540.8094.0000		230,01	-270,00	540.8097.0000	
								270,01	-330,00	540.8094.0000 540.5134.0205		270,01	-330,00	540.8097.0000 540.5137.0205	
								330,01	-400,00	540.8094.0000 540.4314.0205		330,01	-400,00	540.8097.0000 540.4317.0205	
								400,01	-420,00	540.0054.0000 540.5134.0205		400,01	-420,00	540.0057.0000 540.5137.0205	

disclosure cat.:	I	proofread:	MD	published date:	09/25/16	effect. date:	09/16
author:	MSt	released by:	JR	replaces:	060-08	status:	Published
resp. depart.:	TD	date of release:	12/17/1209/	revision No.:	5		
doc. type:	LGS	change rep. No.:	200135	retention period:	10y.		

Ausführung *(type)*

Standard (standard)				**warmfest** (creep-resistant steel)				**korrosionsfest** (stainless steel)				**Inconel X750**			
p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes
DN 15 do 9				DN 15 do 9				DN 15 do 9				DN 15 do 9			
Type 462 : O-Ring-Teller (O-ring-disk)				Type 462 : O-Ring-Teller (O-ring-disk)				Type 462 : O-Ring-Teller (O-ring-disk)				Type 462 : O-Ring-Teller (O-ring-disk)			
0,50	- 0,90	540.8034.0000		0,50	- 0,90	540.8034.0000		0,50	- 0,90	540.8034.0000		0,50	- 0,90	540.8037.0000	
0,91	- 1,10	540.8044.0000		0,91	- 1,10	540.8044.0000		0,91	- 1,10	540.8044.0000		0,91	- 1,10	540.8047.0000	
1,11	- 1,90	540.8054.0000		1,11	- 1,90	540.8054.0000		1,11	- 1,90	540.8054.0000		1,11	- 1,90	540.8057.0000	
1,91	- 2,50	540.4004.0000		1,91	- 2,50	540.4004.0000		1,91	- 2,50	540.4004.0000		1,91	- 2,50	540.4007.0000	
2,51	- 4,00	540.4014.0000		2,51	- 4,00	540.4014.0000		2,51	- 4,00	540.4014.0000		2,51	- 4,00	540.4017.0000	
4,01	- 5,10	540.5021.0190		4,01	- 5,10	540.4024.0000		4,01	- 5,10	540.4024.0000		4,01	- 5,10	540.5027.0000	
5,11	- 7,00	540.5031.0190		5,11	- 7,00	540.4034.0000		5,11	- 7,00	540.4034.0000		5,11	- 7,00	540.5037.0000	
7,01	- 10,00	540.5041.0190		7,01	- 10,00	540.4044.0000		7,01	- 10,00	540.4044.0000		7,01	- 10,00	540.5047.0000	
10,01	- 15,00	540.5051.0190		10,01	- 15,00	540.4054.0000		10,01	- 15,00	540.4054.0000		10,01	- 15,00	540.5057.0000	
15,01	- 19,00	540.5062.0000		15,01	- 19,00	540.5062.0000		15,01	- 19,00	540.4064.0000		15,01	- 19,00	540.5067.0000	
19,01	- 36,00	540.5072.0000		19,01	- 36,00	540.5072.0000		19,01	- 36,00	540.4074.0000		19,01	- 36,00	540.5077.0000	
36,01	- 55,00	540.5082.0000		36,01	- 55,00	540.5082.0000		36,01	- 55,00	540.4084.0000		36,01	- 55,00	540.5087.0000	
55,01	- 70,00	540.5092.0000		55,01	- 70,00	540.5092.0000		55,01	- 70,00	540.4094.0000		55,01	- 70,00	540.5097.0000	
70,01	- 85,00	540.5102.0000		70,01	- 85,00	540.5102.0000		70,01	- 85,00	540.4104.0000		70,01	- 85,00	540.5107.0000	
85,01	-100,00	540.5112.0000		85,01	-100,00	540.5112.0000		85,01	-100,00	540.5124.0000		85,01	-100,00	540.5127.0000	
100,01	-125,00	540.8062.0000		100,01	-125,00	540.8062.0000		100,01	-125,00	540.8064.0000		100,01	-125,00	540.8067.0000	
125,01	-170,00	540.8062.0000 540.5134.0205		125,01	-170,00	540.8062.0000 540.5134.0205		125,01	-170,00	540.8064.0000 540.5134.0205		125,01	-170,00	540.8067.0000 540.5137.0205	
170,01	-220,00	540.8094.0000		170,01	-220,00	540.8094.0000		170,01	-220,00	540.8094.0000		170,01	-220,00	540.8097.0000	
220,01	-250,00	540.8094.0000 540.4314.0205		220,01	-280,00	540.8094.0000 540.4314.0205		220,01	-280,00	540.8094.0000 540.4314.0205		220,01	-280,00	540.8097.0000 540.4317.0205	
								280,01	-350,00	540.0054.0000 540.5134.0205		280,01	-350,00	540.0057.0000 540.5137.0205	

Ausführung (type)															
Standard (standard)				**warmfest** (creep-resistant steel)				**korrosionsfest** (stainless steel)				**Inconel X750**			
p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes
DN 15 do 13				DN 15 do 13				DN 15 do 13				DN 15 do 13			
Type 450,459 : Stahl-Teller (steel disk)				Type 450,459 : Stahl-Teller (steel disk)				Type 450,459 : Stahl-Teller (steel disk)				Type 450,459 : Stahl-Teller (steel disk)			
0,20	- 0,25	540.8004.0000		0,20	- 0,25	540.8004.0000		0,20	- 0,25	540.8004.0000		0,20	- 0,25	540.8007.0000	
0,26	- 0,32	540.8014.0000		0,26	- 0,32	540.8014.0000		0,26	- 0,32	540.8014.0000		0,26	- 0,32	540.8017.0000	
0,33	- 0,45	540.8034.0000		0,33	- 0,45	540.8034.0000		0,33	- 0,45	540.8034.0000		0,33	- 0,45	540.8037.0000	
0,46	- 0,70	540.8054.0000		0,46	- 0,70	540.8054.0000		0,46	- 0,70	540.8054.0000		0,46	- 0,70	540.8057.0000	
0,71	- 1,00	540.4004.0000		0,71	- 1,00	540.4004.0000		0,71	- 1,00	540.4004.0000		0,71	- 1,00	540.4007.0000	
1,01	- 1,40	540.4014.0000		1,01	- 1,40	540.4014.0000		1,01	- 1,40	540.4014.0000		1,01	- 1,40	540.4017.0000	
1,41	- 2,20	540.5021.0190		1,41	- 2,20	540.4024.0000		1,41	- 2,20	540.4024.0000		1,41	- 2,20	540.5027.0000	
2,21	- 2,90	540.5031.0190		2,21	- 2,90	540.4034.0000		2,21	- 2,90	540.4034.0000		2,21	- 2,90	540.5037.0000	
2,91	- 4,00	540.5041.0190		2,91	- 4,00	540.4044.0000		2,91	- 4,00	540.4044.0000		2,91	- 4,00	540.5047.0000	
4,01	- 5,80	540.5051.0190		4,01	- 5,80	540.4054.0000		4,01	- 5,80	540.4054.0000		4,01	- 5,80	540.5057.0000	
5,81	- 8,70	540.5062.0000		5,81	- 8,70	540.5062.0000		5,81	- 8,70	540.4064.0000		5,81	- 8,70	540.5067.0000	
8,71	- 13,80	540.5072.0000		8,71	- 13,80	540.5072.0000		8,71	- 13,80	540.4074.0000		8,71	- 13,80	540.5077.0000	
13,81	- 20,50	540.5082.0000		13,81	- 20,50	540.5082.0000		13,81	- 20,50	540.4084.0000		13,81	- 20,50	540.5087.0000	
20,51	- 31,00	540.5092.0000		20,51	- 31,00	540.5092.0000		20,51	- 31,00	540.4094.0000		20,51	- 31,00	540.5097.0000	
31,01	- 44,00	540.5102.0000		31,01	- 44,00	540.5102.0000		31,01	- 44,00	540.4104.0000		31,01	- 44,00	540.5107.0000	
44,01	- 62,00	540.5122.0000		44,01	- 62,00	540.5122.0000		44,01	- 62,00	540.5124.0000		44,01	- 62,00	540.5127.0000	
62,01	- 88,00	540.5122.0000 540.5134.0205		62,01	- 88,00	540.5122.0000 540.5134.0205		62,01	- 88,00	540.5124.0000 540.5134.0205		62,01	- 88,00	540.5127.0000 540.5137.0205	
88,01	-120,00	540.8062.0000 540.4314.0205		88,01	-120,00	540.8062.0000 540.4314.0205		88,01	-120,00	540.8064.0000 540.4314.0205		88,01	-120,00	540.8067.0000 540.4317.0205	
120,01	-135,00	540.8094.0000		120,01	-135,00	540.8094.0000		120,01	-135,00	540.8094.0000		120,01	-135,00	540.8097.0000	
135,01	-170,00	540.8094.0000 540.5134.0205		135,01	-170,00	540.8094.0000 540.5134.0205		135,01	-170,00	540.8094.0000 540.5134.0205		135,01	-170,00	540.8097.0000 540.5137.0205	
170,01	-200,00	540.8094.0000 540.4314.0205		170,01	-200,00	540.8094.0000 540.4314.0205		170,01	-200,00	540.8094.0000 540.4314.0205		170,01	-200,00	540.8097.0000 540.4317.0205	

LESER Global Standard

Federdaten-Tabellen Type 459, 462
Spring data list type 459, 462

Ausführung *(type)*															
Standard (standard)				**warmfest** (creep-resistant steel)				**korrosionsfest** (stainless steel)				**Inconel X750**			
p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes
DN 15 do 13				DN 15 do 13				DN 15 do 13				DN 15 do 13			
Type 460,462 : O-Ring-Teller (O-ring disk)				Type 460,462 : O-Ring-Teller (O-ring disk)				Type 460,462 : O-Ring-Teller (O-ring disk)				Type 460,462 : O-Ring-Teller (O-ring disk)			
0,20	- 1,00	540.8054.0000		0,20	- 1,00	540.8054.0000		0,20	- 1,00	540.8054.0000		0,20	- 1,00	540.8057.0000	
1,00	- 1,75	540.4004.0000		1,00	- 1,75	540.4004.0000		1,00	- 1,75	540.4004.0000		1,00	- 1,75	540.4007.0000	
1,76	- 2,70	540.5031.0190		1,76	- 2,70	540.4034.0000		1,76	- 2,70	540.4034.0000		1,76	- 2,70	540.5037.0000	
2,71	- 4,00	540.5041.0190		2,71	- 4,00	540.4044.0000		2,71	- 4,00	540.4044.0000		2,71	- 4,00	540.5047.0000	
4,01	- 6,05	540.5051.0190		4,01	- 6,05	540.4054.0000		4,01	- 6,05	540.4054.0000		4,01	- 6,05	540.5057.0000	
6,06	- 9,50	540.5062.0000		6,06	- 9,50	540.5062.0000		6,06	- 9,50	540.4064.0000		6,06	- 9,50	540.5067.0000	
9,51	- 14,50	540.5072.0000		9,51	- 14,50	540.5072.0000		9,51	- 14,50	540.4074.0000		9,51	- 14,50	540.5077.0000	
14,51	- 21,50	540.5082.0000		14,51	- 21,50	540.5082.0000		14,51	- 21,50	540.4084.0000		14,51	- 21,50	540.5087.0000	
21,51	- 32,00	540.5092.0000		21,51	- 32,00	540.5092.0000		21,51	- 32,00	540.4094.0000		21,51	- 32,00	540.5097.0000	
32,01	- 48,00	540.5102.0000		32,01	- 48,00	540.5102.0000		32,01	- 48,00	540.4104.0000		32,01	- 48,00	540.5107.0000	
48,01	- 73,00	540.8062.0000		48,01	- 73,00	540.8062.0000		48,01	- 73,00	540.8064.0000		48,01	- 73,00	540.8067.0000	
73,01	-110,00	540.8062.0000 540.4314.0205		73,01	-110,00	540.8062.0000 540.4314.0205		73,01	-110,00	540.8064.0000 540.4314.0205		73,01	-110,00	540.8067.0000 540.4317.0205	
110,01	-135,00	540.8094.0000		110,01	-135,00	540.8094.0000		110,01	-135,00	540.8094.0000		110,01	-135,00	540.8097.0000	
135,01	-160,00	540.8094.0000 540.5134.0205		135,01	-160,00	540.8094.0000 540.5134.0205		135,01	-160,00	540.8094.0000 540.5134.0205		135,01	-160,00	540.8097.0000 540.5137.0205	
160,01	-180,00	540.8094.0000 540.4314.0205		160,01	-180,00	540.8094.0000 540.4314.0205		160,01	-180,00	540.8094.0000 540.4314.0205		160,01	-180,00	540.8097.0000 540.4317.0205	

disclosure cat.:	I	proofread:	MD	published date:	09/25/16	effect. date:	09/16
author:	MSt	released by:	JR	replaces:	060-08	status:	Published
resp. depart.:	TD	date of release:	12/17/1209/	revision No.:	5		
doc. type:	LGS	change rep. No.:	200135	retention period:	10y.		

Ausführung *(type)*															
Standard (standard)				**warmfest** (creep-resistant steel)				**korrosionsfest** (stainless steel)				**Inconel X750**			
p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes
DN 15 x DN 20 (verengtem Austritt) do 13 (narrowed cross-section)															
Type 460,462 : O-Ring-Teller (O-ring disk)															
4,00	- 4,60	540.5041.0190													
4,61	- 6,70	540.4054.0000													
6,71	- 10,30	540.5062.0000													
10,31	- 16,50	540.4074.0000													
16,51	- 25,00	540.5082.0000													
25,01	- 40,00	540.5092.0000													

disclosure cat.:	I	proofread:	MD	published date:	09/25/16	effect. date:	09/16
author:	MSt	released by:	JR	replaces:	060-08	status:	Published
resp. depart.:	TD	date of release:	12/17/1209/	revision No.:	5		
doc. type:	LGS	change rep. No.:	200135	retention period:	10y.		

LESER Global Standard

Federdaten-Tabellen Type 459, 462
Spring data list type 459, 462

Ausführung *(type)*															
Standard (standard)				**warmfest** (creep-resistant steel)				**korrosionsfest** (stainless steel)				**Inconel X750**			
p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes
DN 20 do 17,5				**DN 20 do 17,5**				**DN 20 do 17,5**				**DN 20 do 17,5**			
Type 450,459 : Stahl-Teller (steel disk)				**Type 450,459 : Stahl-Teller (steel disk)**				**Type 450,459 : Stahl-Teller (steel disk)**				**Type 450,459 : Stahl-Teller (steel disk)**			
0,20	- 0,34	540.8044.0000		0,20	- 0,34	540.8044.0000		0,20	- 0,34	540.8044.0000		0,20	- 0,34	540.8047.0000	
0,35	- 0,56	540.8054.0000		0,35	- 0,56	540.8054.0000		0,35	- 0,56	540.8054.0000		0,35	- 0,56	540.8057.0000	
0,57	- 0,90	540.4004.0000		0,57	- 0,90	540.4004.0000		0,57	- 0,90	540.4004.0000		0,57	- 0,90	540.4007.0000	
0,91	- 1,45	540.5021.0190		0,91	- 1,45	540.4024.0000		0,91	- 1,45	540.4024.0000		0,91	- 1,45	540.5027.0000	
1,46	- 1,95	540.4034.0000		1,46	- 1,95	540.4034.0000		1,46	- 1,95	540.4034.0000		1,46	- 1,95	540.5037.0000	
1,96	- 2,50	540.5041.0190		1,96	- 2,50	540.4044.0000		1,96	- 2,50	540.4044.0000		1,96	- 2,50	540.5047.0000	
2,51	- 3,70	540.5051.0190		2,51	- 3,70	540.4054.0000		2,51	- 3,70	540.4054.0000		2,51	- 3,70	540.5057.0000	
3,71	- 5,90	540.5062.0000		3,71	- 5,90	540.5062.0000		3,71	- 5,90	540.4064.0000		3,71	- 5,90	540.5067.0000	
5,91	- 9,40	540.5072.0000		5,91	- 9,40	540.5072.0000		5,91	- 9,40	540.4074.0000		5,91	- 9,40	540.5077.0000	
9,41	- 15,10	540.5082.0000		9,41	- 15,10	540.5082.0000		9,41	- 15,10	540.4084.0000		9,41	- 15,10	540.5087.0000	
15,11	- 23,00	540.5092.0000		15,11	- 23,00	540.5092.0000		15,11	- 23,00	540.4094.0000		15,11	- 23,00	540.5097.0000	
23,01	- 31,00	540.5102.0000		23,01	- 31,00	540.5102.0000		23,01	- 31,00	540.4104.0000		23,01	- 31,00	540.5107.0000	
31,01	- 43,00	540.5122.0000		31,01	- 43,00	540.5122.0000		31,01	- 43,00	540.5124.0000		31,01	- 43,00		S
43,01	- 51,00	540.8062.0000		43,01	- 51,00	540.8062.0000		43,01	- 51,00	540.8064.0000		43,01	- 51,00		S
51,01	- 57,00	540.8062.0000 540.5134.0205		51,01	- 57,00	540.8062.0000 540.5134.0205		51,01	- 57,00	540.8064.0000 540.5134.0205		51,01	- 57,00	540.8067.0000 540.5137.0205	
57,01	- 65,00	540.9414.0000		57,01	- 65,00	540.9414.0000		57,01	- 65,00	540.9414.0000		57,01	- 65,00	540.9417.0000	
65,01	- 78,50	540.9414.0000 540.5134.0205		65,01	- 78,50	540.9414.0000 540.5134.0205		65,01	- 78,50	540.9414.0000 540.5134.0205		65,01	- 78,50	540.9417.0000 540.5137.0205	
78,51	-100,00	540.8094.0000 540.5134.0205		78,51	-100,00	540.8094.0000 540.5134.0205		78,51	-100,00	540.8094.0000 540.5134.0205		78,51	-100,00	540.8097.0000 540.5137.0205	

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doc. type:	LGS	change rep. No.:	200135	retention period:	10y.		

Ausführung *(type)*															
Standard (standard)				**warmfest** (creep-resistant steel)				**korrosionsfest** (stainless steel)				**Inconel X750**			
p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes
DN 20 do 17,5				**DN 20 do 17,5**				**DN 20 do 17,5**				**DN 20 do 17,5**			
Type 460,462 : O-Ring-Teller (O-ring disk)				**Type 460,462 : O-Ring-Teller (O-ring disk)**				**Type 460,462 : O-Ring-Teller (O-ring disk)**				**Type 460,462 : O-Ring-Teller (O-ring disk)**			
0,20	- 0,60	540.8054.0000		0,20	- 0,60	540.8054.0000		0,20	- 0,60	540.8054.0000		0,20	- 0,60	540.8057.0000	
0,61	- 1,00	540.4004.0000		0,61	- 1,00	540.4004.0000		0,61	- 1,00	540.4004.0000		0,61	- 1,00	540.4007.0000	
1,01	- 1,35	540.4024.0000		1,01	- 1,35	540.4024.0000		1,01	- 1,35	540.4024.0000		1,01	- 1,35	540.5027.0000	
1,36	- 1,90	540.4044.0000		1,36	- 1,90	540.4044.0000		1,36	- 1,90	540.4044.0000		1,36	- 1,90	540.5047.0000	
1,91	- 2,75	540.4054.0000		1,91	- 2,75	540.4054.0000		1,91	- 2,75	540.4054.0000		1,91	- 2,75	540.5057.0000	
2,76	- 3,80	540.5062.0000		2,76	- 3,80	540.5062.0000		2,76	- 3,80	540.4064.0000		2,76	- 3,80	540.5067.0000	
3,81	- 5,60	540.5072.0000		3,81	- 5,60	540.5072.0000		3,81	- 5,60	540.4074.0000		3,81	- 5,60	540.5077.0000	
5,61	- 9,25	540.5082.0000		5,61	- 9,25	540.5082.0000		5,61	- 9,25	540.4084.0000		5,61	- 9,25	540.5087.0000	
9,26	- 14,20	540.5092.0000		9,26	- 14,20	540.5092.0000		9,26	- 14,20	540.4094.0000		9,26	- 14,20	540.5097.0000	
14,21	- 19,50	540.5102.0000		14,21	- 19,50	540.5102.0000		14,21	- 19,50	540.4104.0000		14,21	- 19,50	540.5107.0000	
19,51	- 28,30	540.5122.0000		19,51	- 28,30	540.5122.0000		19,51	- 28,30	540.5124.0000		19,51	- 28,30	540.5127.0000	
28,31	- 41,00	540.5122.0000 540.5134.0205		28,31	- 41,00	540.5122.0000 540.5134.0205		28,31	- 41,00	540.5124.0000 540.5134.0205		28,31	- 41,00	540.5127.0000 540.5137.0205	
41,01	- 48,00	540.8062.0000 540.4314.0205		41,01	- 48,00	540.8062.0000 540.4314.0205		41,01	- 48,00	540.8064.0000 540.4314.0205		41,01	- 48,00	540.8067.0000 540.4317.0205	
48,01	- 55,00	540.8094.0000		48,01	- 55,00	540.8094.0000		48,01	- 55,00	540.8094.0000		48,01	- 55,00	540.8097.0000	
55,01	- 72,50	540.8094.0000 540.5134.0205		55,01	- 72,50	540.8094.0000 540.5134.0205		55,01	- 72,50	540.8094.0000 540.5134.0205		55,01	- 72,50	540.8097.0000 540.5137.0205	
72,51	- 92,50	540.8094.0000 540.4314.0205		72,51	- 92,50	540.8094.0000 540.4314.0205		72,51	- 92,50	540.8094.0000 540.4314.0205		72,51	- 92,50	540.8097.0000 540.4317.0205	

LESER Global Standard

Federdaten-Tabellen Type 459, 462
Spring data list type 459, 462

Ausführung *(type)*

Standard (standard)				**Warmfest** (creep-resistant steel)				**Korrosionsfest** (stainless steel)				**Inconel X750**			
p [psig]				p [psig]				p [psig]				p [psig]			
von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes
								DN 10 do 6				**DN 10 do 6**			
								Type 459 HDD: Stahl-Teller (steel disk)				**Type 459 HDD: Stahl-Teller (steel disk)**			
								2900	-3190	540.5124.0000	S	2900	-3190	540.5127.0000	S
								3190	-3915	540.4114.0000	S	3190	-3915	540.5117.0000	S
										540.5134.0205	S			540.5137.0205	S
								3915	-5075	540.5124.0000	S	3915	-5075	540.5127.0000	S
										540.4314.0205	S			540.4317.0205	S
								5075	-6090	540.9404.0000	S	5075	-6090	540.9407.0000	S
										540.5134.0205	S			540.5137.0205	S
								6090	-6525	540.9404.0000		6090	-6525	540.9407.0000	
										540.5134.0205				540.5137.0205	
								6525	-7685	540.9414.0000		6525	-7685	540.9417.0000	
										540.5134.0205				540.5137.0205	
								7685	-8700	540.8094.0000		7685	-8700	540.8097.0000	
										540.4314.0205				540.4317.0205	
								8700	-10150	540.0054.0000		8700	-10150	540.0057.0000	
										540.5134.0205				540.5137.0205	
								10150	-12325	540.0064.0000		10150	-12325	540.0067.0000	
										540.0434.0205				540.0437.0205	

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doc. type:	LGS	change rep. No.:	200135	retention period:	10y.		

LESER Global Standard

Federdaten-Tabellen Type 459, 462
Spring data list type 459, 462

Ausführung *(type)*

Standard (standard)				warmfest (creep-resistant steel)				korrosionsfest (stainless steel)				Inconel X750			
p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes
DN 15 do 9				DN 15 do 9				DN 15 do 9				DN 15 do 9			
Type 459 : Stahl-Teller (steel disk)				Type 459 : Stahl-Teller (steel disk)				Type 459 : Stahl-Teller (steel disk)				Type 459 : Stahl-Teller (steel disk)			
22	-33	540.8054.0000		22	-33	540.8054.0000		22	-33	540.8054.0000		22	-33	540.8057.0000	
33	-58	540.4004.0000		33	-58	540.4004.0000		33	-58	540.4004.0000		33	-58	540.4007.0000	
58	-83	540.4014.0000		58	-83	540.4014.0000		58	-83	540.4014.0000		58	-83	540.4017.0000	
83	-112	540.5021.0190		83	-112	540.4024.0000		83	-112	540.4024.0000		83	-112	540.5027.0000	
112	-148	540.5031.0190		112	-148	540.4034.0000		112	-148	540.4034.0000		112	-148	540.5037.0000	
148	-174	540.5041.0190		148	-174	540.4044.0000		148	-174	540.4044.0000		148	-174	540.5047.0000	
174	-261	540.5051.0190		174	-261	540.4054.0000		174	-261	540.4054.0000		174	-261	540.5057.0000	
261	-399	540.5062.0000		261	-399	540.5062.0000		261	-399	540.4064.0000		261	-399	540.5067.0000	
399	-580	540.5072.0000		399	-580	540.5072.0000		399	-580	540.4074.0000		399	-580	540.5077.0000	
580	-841	540.5082.0000		580	-841	540.5082.0000		580	-841	540.4084.0000		580	-841	540.5087.0000	
841	-1088	540.5092.0000		841	-1088	540.5092.0000		841	-1088	540.4094.0000		841	-1088	540.5097.0000	
1088	-1508	540.5102.0000		1088	-1508	540.5102.0000		1088	-1508	540.4104.0000		1088	-1508	540.5107.0000	
1508	-1755	540.5122.0000		1508	-1755	540.5122.0000		1508	-1755	540.5124.0000		1508	-1755	540.5127.0000	
1755	-2103	540.8062.0000		1755	-2103	540.8062.0000		1755	-2103	540.8064.0000		1755	-2103	540.8067.0000	
2103	-2538	540.5122.0000 540.5134.0205		2103	-2538	540.5122.0000 540.5134.0205		2103	-2538	540.5124.0000 540.5134.0205		2103	-2538	540.5127.0000 540.5137.0205	
2538	-2900	540.8062.0000 540.5134.0205		2538	-2900	540.8062.0000 540.5134.0205		2538	-2900	540.8064.0000 540.5134.0205		2538	-2900	540.8067.0000 540.5137.0205	
2900	-3335	540.8062.0000 540.4314.0205		2900	-3335	540.8062.0000 540.4314.0205		2900	-3335	540.8064.0000 540.4314.0205		2900	-3335	540.8067.0000 540.4317.0205	
3335	-3625	540.8094.0000		3335	-3625	540.8094.0000		3335	-3915	540.8094.0000		3335	-3915	540.8097.0000	
								3915	-4785	540.8094.0000 540.5134.0205		3915	-4785	540.8097.0000 540.5137.0205	
								4785	-5800	540.8094.0000 540.4314.0205		4785	-5800	540.8097.0000 540.4317.0205	
								5800	-6090	540.0054.0000 540.5134.0205		5800	-6090	540.0057.0000 540.5137.0205	

LESER Global Standard

Federdaten-Tabellen Type 459, 462

Spring data list type 459, 462

Ausführung *(type)*

Standard (standard)				**warmfest** (creep-resistant steel)				**korrosionsfest** (stainless steel)				**Inconel X750**			
p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes
DN 15 do 9				DN 15 do 9				DN 15 do 9				DN 15 do 9			
Type 462 : O-Ring-Teller (O-ring-disk)				Type 462 : O-Ring-Teller (O-ring-disk)				Type 462 : O-Ring-Teller (O-ring-disk)				Type 462 : O-Ring-Teller (O-ring-disk)			
7	-13	540.8034.0000		7	-13	540.8034.0000		7	-13	540.8034.0000		7	-13	540.8037.0000	
13	-16	540.8044.0000		13	-16	540.8044.0000		13	-16	540.8044.0000		13	-16	540.8047.0000	
16	-28	540.8054.0000		16	-28	540.8054.0000		16	-28	540.8054.0000		16	-28	540.8057.0000	
28	-36	540.4004.0000		28	-36	540.4004.0000		28	-36	540.4004.0000		28	-36	540.4007.0000	
36	-58	540.4014.0000		36	-58	540.4014.0000		36	-58	540.4014.0000		36	-58	540.4017.0000	
58	-74	540.5021.0190		58	-74	540.4024.0000		58	-74	540.4024.0000		58	-74	540.5027.0000	
74	-102	540.5031.0190		74	-102	540.4034.0000		74	-102	540.4034.0000		74	-102	540.5037.0000	
102	-145	540.5041.0190		102	-145	540.4044.0000		102	-145	540.4044.0000		102	-145	540.5047.0000	
145	-218	540.5051.0190		145	-218	540.4054.0000		145	-218	540.4054.0000		145	-218	540.5057.0000	
218	-276	540.5062.0000		218	-276	540.5062.0000		218	-276	540.4064.0000		218	-276	540.5067.0000	
276	-522	540.5072.0000		276	-522	540.5072.0000		276	-522	540.4074.0000		276	-522	540.5077.0000	
522	-798	540.5082.0000		522	-798	540.5082.0000		522	-798	540.4084.0000		522	-798	540.5087.0000	
798	-1015	540.5092.0000		798	-1015	540.5092.0000		798	-1015	540.4094.0000		798	-1015	540.5097.0000	
1015	-1233	540.5102.0000		1015	-1233	540.5102.0000		1015	-1233	540.4104.0000		1015	-1233	540.5107.0000	
1233	-1450	540.5112.0000		1233	-1450	540.5112.0000		1233	-1450	540.5124.0000		1233	-1450	540.5127.0000	
1450	-1813	540.8062.0000		1450	-1813	540.8062.0000		1450	-1813	540.8064.0000		1450	-1813	540.8067.0000	
1813	-2465	540.8062.0000 540.5134.0205		1813	-2465	540.8062.0000 540.5134.0205		1813	-2465	540.8064.0000 540.5134.0205		1813	-2465	540.8067.0000 540.5137.0205	
2465	-3190	540.8094.0000		2465	-3190	540.8094.0000		2465	-3190	540.8094.0000		2465	-3190	540.8097.0000	
3190	-3625	540.8094.0000 540.4314.0205		3190	-3625	540.8094.0000 540.4314.0205		3190	-4060	540.8094.0000 540.4314.0205		3190	-4060	540.8097.0000 540.4317.0205	
								4060	-5075	540.0054.0000 540.5134.0205		4060	-5075	540.0057.0000 540.5137.0205	

LESER Global Standard

Federdaten-Tabellen Type 459, 462
Spring data list type 459, 462

Ausführung *(type)*															
Standard (standard)				**warmfest** (creep-resistant steel)				**korrosionsfest** (stainless steel)				**Inconel X750**			
p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes
DN 15 do 13				DN 15 do 13				DN 15 do 13				DN 15 do 13			
Type 450,459 : Stahl-Teller (steel disk)				Type 450,459 : Stahl-Teller (steel disk)				Type 450,459 : Stahl-Teller (steel disk)				Type 450,459 : Stahl-Teller (steel disk)			
3	- 4	540.8004.0000		3	- 4	540.8004.0000		3	- 4	540.8004.0000		3	- 4	540.8007.0000	
4	- 5	540.8014.0000		4	- 5	540.8014.0000		4	- 5	540.8014.0000		4	- 5	540.8017.0000	
5	- 7	540.8034.0000		5	- 7	540.8034.0000		5	- 7	540.8034.0000		5	- 7	540.8037.0000	
7	-10	540.8054.0000		7	-10	540.8054.0000		7	-10	540.8054.0000		7	-10	540.8057.0000	
10	-14	540.4004.0000		10	-14	540.4004.0000		10	-14	540.4004.0000		10	-14	540.4007.0000	
15	-20	540.4014.0000		15	-20	540.4014.0000		15	-20	540.4014.0000		15	-20	540.4017.0000	
20	-32	540.5021.0190		20	-32	540.4024.0000		20	-32	540.4024.0000		20	-32	540.5027.0000	
32	-42	540.5031.0190		32	-42	540.4034.0000		32	-42	540.4034.0000		32	-42	540.5037.0000	
42	-58	540.5041.0190		42	-58	540.4044.0000		42	-58	540.4044.0000		42	-58	540.5047.0000	
58	-84	540.5051.0190		58	-84	540.4054.0000		58	-84	540.4054.0000		58	-84	540.5057.0000	
84	-126	540.5062.0000		84	-126	540.5062.0000		84	-126	540.4064.0000		84	-126	540.5067.0000	
126	-200	540.5072.0000		126	-200	540.5072.0000		126	-200	540.4074.0000		126	-200	540.5077.0000	
200	-297	540.5082.0000		200	-297	540.5082.0000		200	-297	540.4084.0000		200	-297	540.5087.0000	
297	-450	540.5092.0000		297	-450	540.5092.0000		297	-450	540.4094.0000		297	-450	540.5097.0000	
450	-638	540.5102.0000		450	-638	540.5102.0000		450	-638	540.4104.0000		450	-638	540.5107.0000	
638	-899	540.5122.0000		638	-899	540.5122.0000		638	-899	540.5124.0000		638	-899	540.5127.0000	
899	-1276	540.5122.0000 540.5134.0205		899	-1276	540.5122.0000 540.5134.0205		899	-1276	540.5124.0000 540.5134.0205		899	-1276	540.5127.0000 540.5137.0205	
1276	-1740	540.8062.0000 540.4314.0205		1276	-1740	540.8062.0000 540.4314.0205		1276	-1740	540.8064.0000 540.4314.0205		1276	-1740	540.8067.0000 540.4317.0205	
1740	-1958	540.8094.0000		1740	-1958	540.8094.0000		1740	-1958	540.8094.0000		1740	-1958	540.8097.0000	
1958	-2465	540.8094.0000 540.5134.0205		1958	-2465	540.8094.0000 540.5134.0205		1958	-2465	540.8094.0000 540.5134.0205		1958	-2465	540.8097.0000 540.5137.0205	
2465	-2900	540.8094.0000 540.4314.0205		2465	-2900	540.8094.0000 540.4314.0205		2465	-2900	540.8094.0000 540.4314.0205		2465	-2900	540.8097.0000 540.4317.0205	

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LESER Global Standard
Federdaten-Tabellen Type 459, 462
Spring data list type 459, 462

Ausführung *(type)*

Standard (standard)				**warmfest** (creep-resistant steel)				**korrosionsfest** (stainless steel)				**Inconel X750**			
p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes
DN 15 do 13				DN 15 do 13				DN 15 do 13				DN 15 do 13			
Type 460,462 : O-Ring-Teller (O-ring disk)				Type 460,462 : O-Ring-Teller (O-ring disk)				Type 460,462 : O-Ring-Teller (O-ring disk)				Type 460,462 : O-Ring-Teller (O-ring disk)			
3	-14	540.8054.0000		3	-14	540.8054.0000		3	-14	540.8054.0000		3	-14	540.8057.0000	
15	-26	540.4004.0000		15	-26	540.4004.0000		15	-26	540.4004.0000		15	-26	540.4007.0000	
26	-39	540.5031.0190		26	-39	540.4034.0000		26	-39	540.4034.0000		26	-39	540.5037.0000	
39	-58	540.5041.0190		39	-58	540.4044.0000		39	-58	540.4044.0000		39	-58	540.5047.0000	
58	-88	540.5051.0190		58	-88	540.4054.0000		58	-88	540.4054.0000		58	-88	540.5057.0000	
88	-138	540.5062.0000		88	-138	540.5062.0000		88	-138	540.4064.0000		88	-138	540.5067.0000	
138	-210	540.5072.0000		138	-210	540.5072.0000		138	-210	540.4074.0000		138	-210	540.5077.0000	
210	-312	540.5082.0000		210	-312	540.5082.0000		210	-312	540.4084.0000		210	-312	540.5087.0000	
312	-464	540.5092.0000		312	-464	540.5092.0000		312	-464	540.4094.0000		312	-464	540.5097.0000	
464	-696	540.5102.0000		464	-696	540.5102.0000		464	-696	540.4104.0000		464	-696	540.5107.0000	
696	-1059	540.8062.0000		696	-1059	540.8062.0000		696	-1059	540.8064.0000		696	-1059	540.8067.0000	
1059	-1595	540.8062.0000 540.4314.0205		1059	-1595	540.8062.0000 540.4314.0205		1059	-1595	540.8064.0000 540.4314.0205		1059	-1595	540.8067.0000 540.4317.0205	
1595	-1958	540.8094.0000		1595	-1958	540.8094.0000		1595	-1958	540.8094.0000		1595	-1958	540.8097.0000	
1958	-2320	540.8094.0000 540.5134.0205		1958	-2320	540.8094.0000 540.5134.0205		1958	-2320	540.8094.0000 540.5134.0205		1958	-2320	540.8097.0000 540.5137.0205	
2320	-2610	540.8094.0000 540.4314.0205		2320	-2610	540.8094.0000 540.4314.0205		2320	-2610	540.8094.0000 540.4314.0205		2320	-2610	540.8097.0000 540.4317.0205	

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doc. type:	LGS	change rep. No.:	200135	retention period:	10y.		

Ausführung *(type)*															
Standard (standard)				**warmfest** (creep-resistant steel)				**korrosionsfest** (stainless steel)				**Inconel X750**			
p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes
DN 15 x DN 20 (verengtem Austritt) do 13 (narrowed cross-section)															
Type 460,462 : O-Ring-Teller (O-ring disk)															
58	-66,7	540.5041.0190													
66,8	-97,2	540.4054.0000													
97,3	-149,4	540.5062.0000													
149,5	-239,3	540.4074.0000													
239,4	-362,6	540.5082.0000													
362,7	-580	540.5092.0000													

Ausführung *(type)*															
Standard (standard)				**warmfest** (creep-resistant steel)				**korrosionsfest** (stainless steel)				**Inconel X750**			
p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes
DN 20 do 17,5				DN 20 do 17,5				DN 20 do 17,5				DN 20 do 17,5			
Type 450,459 : Stahl-Teller (steel disk)				Type 450,459 : Stahl-Teller (steel disk)				Type 450,459 : Stahl-Teller (steel disk)				Type 450,459 : Stahl-Teller (steel disk)			
3	- 5	540.8044.0000		3	- 5	540.8044.0000		3	- 5	540.8044.0000		3	- 5	540.8047.0000	
5	- 8	540.8054.0000		5	- 8	540.8054.0000		5	- 8	540.8054.0000		5	- 8	540.8057.0000	
8	-13	540.4004.0000		8	-13	540.4004.0000		8	-13	540.4004.0000		8	-13	540.4007.0000	
13	-21	540.5021.0190		13	-21	540.4024.0000		13	-21	540.4024.0000		13	-21	540.5027.0000	
21	-28	540.4034.0000		21	-28	540.4034.0000		21	-28	540.4034.0000		21	-28	540.5037.0000	
28	-36	540.5041.0190		28	-36	540.4044.0000		28	-36	540.4044.0000		28	-36	540.5047.0000	
36	-54	540.5051.0190		36	-54	540.4054.0000		36	-54	540.4054.0000		36	-54	540.5057.0000	
54	-86	540.5062.0000		54	-86	540.5062.0000		54	-86	540.4064.0000		54	-86	540.5067.0000	
86	-136	540.5072.0000		86	-136	540.5072.0000		86	-136	540.4074.0000		86	-136	540.5077.0000	
136	-219	540.5082.0000		136	-219	540.5082.0000		136	-219	540.4084.0000		136	-219	540.5087.0000	
219	-334	540.5092.0000		219	-334	540.5092.0000		219	-334	540.4094.0000		219	-334	540.5097.0000	
334	-450	540.5102.0000		334	-450	540.5102.0000		334	-450	540.4104.0000		334	-450	540.5107.0000	
450	-624	540.5122.0000		450	-624	540.5122.0000		450	-624	540.5124.0000		450	-624		S
624	-740	540.8062.0000		624	-740	540.8062.0000		624	-740	540.8064.0000		624	-740		S
740	-827	540.8062.0000 540.5134.0205		740	-827	540.8062.0000 540.5134.0205		740	-827	540.8064.0000 540.5134.0205		740	-827	540.8067.0000 540.5137.0205	
827	-943	540.9414.0000		827	-943	540.9414.0000		827	-943	540.9414.0000		827	-943	540.9417.0000	
943	-1138	540.9414.0000 540.5134.0205		943	-1138	540.9414.0000 540.5134.0205		943	-1138	540.9414.0000 540.5134.0205		943	-1138	540.9417.0000 540.5137.0205	
1138	-1450	540.8094.0000 540.5134.0205		1138	-1450	540.8094.0000 540.5134.0205		1138	-1450	540.8094.0000 540.5134.0205		1138	-1450	540.8097.0000 540.5137.0205	

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LESER Global Standard
Federdaten-Tabellen Type 459, 462
Spring data list type 459, 462

Ausführung *(type)*															
Standard (standard)				**warmfest** (creep-resistant steel)				**korrosionsfest** (stainless steel)				**Inconel X750**			
p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes
DN 20 do 17,5				DN 20 do 17,5				DN 20 do 17,5				DN 20 do 17,5			
Type 460,462 : O-Ring-Teller (O-ring disk)				Type 460,462 : O-Ring-Teller (O-ring disk)				Type 460,462 : O-Ring-Teller (O-ring disk)				Type 460,462 : O-Ring-Teller (O-ring disk)			
3	- 9	540.8054.0000		3	- 9	540.8054.0000		3	- 9	540.8054.0000		3	- 9	540.8057.0000	
9	-15	540.4004.0000		9	-15	540.4004.0000		9	-15	540.4004.0000		9	-15	540.4007.0000	
15	-20	540.4024.0000		15	-20	540.4024.0000		15	-20	540.4024.0000		15	-20	540.5027.0000	
20	-28	540.4044.0000		20	-28	540.4044.0000		20	-28	540.4044.0000		20	-28	540.5047.0000	
28	-40	540.4054.0000		28	-40	540.4054.0000		28	-40	540.4054.0000		28	-40	540.5057.0000	
40	-55	540.5062.0000		40	-55	540.5062.0000		40	-55	540.4064.0000		40	-55	540.5067.0000	
55	-81	540.5072.0000		55	-81	540.5072.0000		55	-81	540.4074.0000		55	-81	540.5077.0000	
81	-134	540.5082.0000		81	-134	540.5082.0000		81	-134	540.4084.0000		81	-134	540.5087.0000	
134	-206	540.5092.0000		134	-206	540.5092.0000		134	-206	540.4094.0000		134	-206	540.5097.0000	
206	-283	540.5102.0000		206	-283	540.5102.0000		206	-283	540.4104.0000		206	-283	540.5107.0000	
283	-410	540.5122.0000		283	-410	540.5122.0000		283	-410	540.5124.0000		283	-410	540.5127.0000	
410	-595	540.5122.0000 540.5134.0205		410	-595	540.5122.0000 540.5134.0205		410	-595	540.5124.0000 540.5134.0205		410	-595	540.5127.0000 540.5137.0205	
595	-696	540.8062.0000 540.4314.0205		595	-696	540.8062.0000 540.4314.0205		595	-696	540.8064.0000 540.4314.0205		595	-696	540.8067.0000 540.4317.0205	
696	-798	540.8094.0000		696	-798	540.8094.0000		696	-798	540.8094.0000		696	-798	540.8097.0000	
798	-1051	540.8094.0000 540.5134.0205		798	-1051	540.8094.0000 540.5134.0205		798	-1051	540.8094.0000 540.5134.0205		798	-1051	540.8097.0000 540.5137.0205	
1051	-1341	540.8094.0000 540.4314.0205		1051	-1341	540.8094.0000 540.4314.0205		1051	-1341	540.8094.0000 540.4314.0205		1051	-1341	540.8097.0000 540.4317.0205	

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Content

1 Purpose

This LESER Global Standard (LGS) contains the information about pressure range of all springs, which are installed in type 437.

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 437.
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

- Erklärungen, siehe / explanation, see : LDeS 3060.01, LDeS 3265.01
- Blaue Markierung/ blue marking = Drucklagereinsatz / thrust bearing use

protected

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

Ausführung *(type)*															
Standard (standard)				**warmfest** (creep-resistant steel)				**korrosionsfest** (stainless steel)				**Inconel X750**			
p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes
Type 437 : do10				**Type 437 : do10**				**Type 437 : do10**				**Type 437 : do10**			
0,10	- 0,22	540.0704.0000		0,10	- 0,22	540.0704.0000		0,10	- 0,22	540.0704.0000		0,10	- 0,22	540.0707.0000	
0,23	- 0,40	540.3004.0000		0,23	- 0,40	540.3004.0000		0,23	- 0,40	540.3004.0000		0,23	- 0,40	540.3007.0000	
0,41	- 0,60	540.3014.0000		0,41	- 0,60	540.3014.0000		0,41	- 0,60	540.3014.0000		0,41	- 0,60	540.3017.0000	
0,61	- 1,00	540.3024.0000		0,61	- 1,00	540.3024.0000		0,61	- 1,00	540.3024.0000		0,61	- 1,00	540.3027.0000	
1,01	- 1,50	540.3034.0000		1,01	- 1,50	540.3034.0000		1,01	- 1,50	540.3034.0000		1,01	- 1,50	540.3037.0000	
1,51	- 1,70	540.3044.0000		1,51	- 1,70	540.3044.0000		1,51	- 1,70	540.3044.0000		1,51	- 1,70	540.3047.0000	
1,71	- 2,25	540.3054.0000		1,71	- 2,25	540.3054.0000		1,71	- 2,25	540.3054.0000		1,71	- 2,25	540.3057.0000	
2,26	- 2,75	540.3064.0000		2,26	- 2,75	540.3064.0000		2,26	- 2,75	540.3064.0000		2,26	- 2,75	540.3067.0000	
2,76	- 4,75	540.3074.0000		2,76	- 4,75	540.3074.0000		2,76	- 4,75	540.3074.0000		2,76	- 4,75	540.3077.0000	
4,76	- 7,50	540.3084.0000		4,76	- 7,50	540.3084.0000		4,76	- 7,50	540.3084.0000		4,76	- 7,50	540.3087.0000	
7,51	- 11,00	540.3094.0000		7,51	- 11,00	540.3094.0000		7,51	- 11,00	540.3094.0000		7,51	- 11,00	540.3097.0000	
11,01	- 17,00	540.3104.0000		11,01	- 17,00	540.3104.0000		11,01	- 17,00	540.3104.0000		11,01	- 17,00	540.3107.0000	
17,01	- 25,00	540.3114.0000		17,01	- 25,00	540.3114.0000		17,01	- 25,00	540.3114.0000		17,01	- 25,00	540.3117.0000	
25,01	- 35,00	540.3164.0000		25,01	- 35,00	540.3164.0000		25,01	- 35,00	540.3164.0000		25,01	- 35,00	540.3167.0000	
35,01	- 54,00	540.3174.0000		35,01	- 54,00	540.3174.0000		35,01	- 54,00	540.3174.0000		35,01	- 54,00	540.3177.0000	
54,01	- 68,00	540.3204.0000		54,01	- 68,00	540.3204.0000		54,01	- 68,00	540.3204.0000		54,01	- 68,00	540.3207.0000	
68,01	- 93,00	540.2152.0000		68,01	- 93,00	540.2152.0000									
long version				**long version**				**long version**				**long version**			
								68,01	- 93,00	540.9304.0000		68,01	- 93,00	540.9307.0000	
93,01	-121,00	540.9314.0000		93,01	-121,00	540.9314.0000		93,01	-121,00	540.9314.0000		93,01	-121,00	540.9317.0000	
121,01	-180,00	540.9324.0000		121,01	-180,00	540.9324.0000		121,01	-180,00	540.9324.0000		121,01	-180,00	540.9327.0000	

Ausführung *(type)*															
Standard (standard)				**warmfest** (creep-resistant steel)				**korrosionsfest** (stainless steel)				**Inconel X750**			
p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes
Type 437 : do6				Type 437 : do6				Type 437 : do6				Type 437 : do6			
				D/G long version				D/G long version				D/G long version			
				180,01	-215,00	540.9314.0000		180,01	-215,00	540.9314.0000		180,01	-215,00	540.9317.0000	
				215,01	-330,00	540.9324.0000		215,01	-330,00	540.9324.0000		215,01	-330,00	540.9327.0000	
				330,01	-370,00	540.9332.0000									

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

protected

Ausführung *(type)*

Standard (standard) — Type 437 : do10

von p1 *up* [psig]	bis p2 *to* [psig]	Feder-Sachnummer *stock no.*	Indizes
1	- 3	540.0704.0000	
3	- 6	540.3004.0000	
6	- 9	540.3014.0000	
9	- 15	540.3024.0000	
15	- 22	540.3034.0000	
22	- 25	540.3044.0000	
25	- 33	540.3054.0000	
33	- 40	540.3064.0000	
40	- 69	540.3074.0000	
69	-109	540.3084.0000	
109	-160	540.3094.0000	
160	-247	540.3104.0000	
247	-363	540.3114.0000	
363	-508	540.3164.0000	
508	-783	540.3174.0000	
783	-986	540.3204.0000	
986	-1349	540.2152.0000	
long version			
1349	-1755	540.9314.0000	
1755	-2610	540.9324.0000	

warmfest (creep-resistant steel) — Type 437 : do10

von p1 *up* [psig]	bis p2 *to* [psig]	Feder-Sachnummer *stock no.*	Indizes
1	- 3	540.0704.0000	
3	- 6	540.3004.0000	
6	- 9	540.3014.0000	
9	- 15	540.3024.0000	
15	- 22	540.3034.0000	
22	- 25	540.3044.0000	
25	- 33	540.3054.0000	
33	- 40	540.3064.0000	
40	- 69	540.3074.0000	
69	-109	540.3084.0000	
109	-160	540.3094.0000	
160	-247	540.3104.0000	
247	-363	540.3114.0000	
363	-508	540.3164.0000	
508	-783	540.3174.0000	
783	-986	540.3204.0000	
986	-1349	540.2152.0000	
long version			
1349	-1755	540.9314.0000	
1755	-2610	540.9324.0000	

korrosionsfest (stainless steel) — Type 437 : do10

von p1 *up* [psig]	bis p2 *to* [psig]	Feder-Sachnummer *stock no.*	Indizes
1	- 3	540.0704.0000	
3	- 6	540.3004.0000	
6	- 9	540.3014.0000	
9	- 15	540.3024.0000	
15	- 22	540.3034.0000	
22	- 25	540.3044.0000	
25	- 33	540.3054.0000	
33	- 40	540.3064.0000	
40	- 69	540.3074.0000	
69	-109	540.3084.0000	
109	-160	540.3094.0000	
160	-247	540.3104.0000	
247	-363	540.3114.0000	
363	-508	540.3164.0000	
508	-783	540.3174.0000	
783	-986	540.3204.0000	
long version			
986	-1349	540.9304.0000	
1349	-1755	540.9314.0000	
1755	-2610	540.9324.0000	

Inconel X750 — Type 437 : do10

von p1 *up* [psig]	bis p2 *to* [psig]	Feder-Sachnummer *stock no.*	Indizes
1	- 3	540.0707.0000	
3	- 6	540.3007.0000	
6	- 9	540.3017.0000	
9	- 15	540.3027.0000	
15	- 22	540.3037.0000	
22	- 25	540.3047.0000	
25	- 33	540.3057.0000	
33	- 40	540.3067.0000	
40	- 69	540.3077.0000	
69	-109	540.3087.0000	
109	-160	540.3097.0000	
160	-247	540.3107.0000	
247	-363	540.3117.0000	
363	-508	540.3167.0000	
508	-783	540.3177.0000	
783	-986	540.3207.0000	
long version			
986	-1349	540.9307.0000	
1349	-1755	540.9317.0000	
1755	-2610	540.9327.0000	

Ausführung *(type)*															
Standard (standard)				**warmfest** (creep-resistant steel)				**korrosionsfest** (stainless steel)				**Inconel X750**			
p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes
Type 437 : do6				Type 437 : do6				Type 437 : do6				Type 437 : do6			
				D/G long version				D/G long version				D/G long version			
				2610	-3118	540.9314.0000		2610	-3118	540.9314.0000		2610	-3118	540.9317.0000	
				3118	-4785	540.9324.0000		3118	-4785	540.9324.0000		3118	-4785	540.9327.0000	
				4785	-5365	540.9332.0000									

protected

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Contents

1 Purpose

This LESER Global Standard (LGS) contains the information about pressure range of all springs, which are installed in valve- types 438.

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 438.
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

- Blaue Markierung/ blue marking = Drucklagereinsatz / thrust bearing use

protected

Ausführung *(type)*

Standard *(standard)*

p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices
		438 do10	
5,00	- 6,50	540.3084.0000	
6,51	- 9,70	540.3094.0000	
9,71	- 14,00	540.3104.0000	
14,01	- 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	
68,01	- 93,00	540.2152.0000	
		long version	
93,01	-121,00	540.9314.0000	
121,01	-180,00	540.9324.0000	

warmfest *(creep-resistant steel)*

p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices
		438 do10	
5,00	- 6,50	540.3084.0000	
6,51	- 9,70	540.3094.0000	
9,71	- 14,00	540.3104.0000	
14,01	- 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	
68,01	- 93,00	540.2152.0000	
		long version	
93,01	-121,00	540.9314.0000	
121,01	-180,00	540.9324.0000	

korrosionsfest (stainless steel)

p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices
		438 do10	
5,00	- 6,50	540.3084.0000	
6,51	- 9,70	540.3094.0000	
9,71	- 14,00	540.3104.0000	
14,01	- 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	
		long version	
68,01	- 93,00	540.9304.0000	
93,01	-121,00	540.9314.0000	
121,01	-180,00	540.9324.0000	

Inconel X750

p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices
		438 do10	
5,00	- 6,50	540.3087.0000	
6,51	- 9,70	540.3097.0000	
9,71	- 14,00	540.3107.0000	
14,01	- 26,00	540.3117.0000	
26,01	- 35,00	540.3167.0000	
35,01	- 54,00	540.3177.0000	
54,01	- 68,00	540.3207.0000	
		long version	
68,01	- 93,00	540.9307.0000	
93,01	-121,00	540.9317.0000	
121,01	-180,00	540.9327.0000	

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Ausführung *(type)*															
Standard *(standard)*				**warmfest** *(creep-resistant steel)*				**korrosionsfest (stainless steel)**				**Inconel X750**			
p [psig]				p [psig]				p [psig]				p [psig]			
von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices
	438 do10				**438 do10**				**438 do10**				**438 do10**		
72,5	- 94	540.3084.0000		72,5	- 94	540.3084.0000		72,5	- 94	540.3084.0000		72,5	- 94	540.3087.0000	
94	-141	540.3094.0000		94	-141	540.3094.0000		94	-141	540.3094.0000		94	-141	540.3097.0000	
141	-203	540.3104.0000		141	-203	540.3104.0000		141	-203	540.3104.0000		141	-203	540.3107.0000	
203	-377	540.3114.0000		203	-377	540.3114.0000		203	-377	540.3114.0000		203	-377	540.3117.0000	
377	-508	540.3164.0000		377	-508	540.3164.0000		377	-508	540.3164.0000		377	-508	540.3167.0000	
508	-783	540.3174.0000		508	-783	540.3174.0000		508	-783	540.3174.0000		508	-783	540.3177.0000	
783	-986	540.3204.0000		783	-986	540.3204.0000		783	-986	540.3204.0000		783	-986	540.3207.0000	
986	-1349	540.2152.0000		986	-1349	540.2152.0000									
	long version				**long version**				**long version**				**long version**		
								986	-1349	540.9304.0000		986	-1349	540.9307.0000	
1349	-1755	540.9314.0000		1349	-1755	540.9314.0000		1349	-1755	540.9314.0000		1349	-1755	540.9317.0000	
1755	-2610	540.9324.0000		1755	-2610	540.9324.0000		1755	-2610	540.9324.0000		1755	-2610	540.9327.0000	

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Contents

1 Purpose

This LESER Global Standard (LGS) contains the information about pressure range of all springs which are installed in valve- types 439.

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 439.
The pressure ranges of the various types are given first in pressure-unit [bar].
This is followed by the pressure-unit [psig].

3 References

LDeS 3060.01, LDeS 3265.01

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Ausführung (type)

Standard (standard)				warmfest (creep-resistant)				korrosionsfest (stainless steel)				Inconel X750			
p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes
	439 d0 10				439 d0 10				439 d0 10				439 d0 10		
0,10	- 0,23	540.0704.0000		0,10	- 0,23	540.0704.0000		0,10	- 0,23	540.0704.0000		0,10	- 0,23	540.0707.0000	
0,24	- 0,33	540.3004.0000		0,24	- 0,33	540.3004.0000		0,24	- 0,33	540.3004.0000		0,24	- 0,33	540.3007.0000	
0,34	- 0,50	540.3014.0000		0,34	- 0,50	540.3014.0000		0,34	- 0,50	540.3014.0000		0,34	- 0,50	540.3017.0000	
0,51	- 0,90	540.3024.0000		0,51	- 0,90	540.3024.0000		0,51	- 0,90	540.3024.0000		0,51	- 0,90	540.3027.0000	
0,91	- 1,40	540.3034.0000		0,91	- 1,40	540.3034.0000		0,91	- 1,40	540.3034.0000		0,91	- 1,40	540.3037.0000	
1,41	- 1,80	540.3044.0000		1,41	- 1,80	540.3044.0000		1,41	- 1,80	540.3044.0000		1,41	- 1,80	540.3047.0000	
1,81	- 3,10	540.3054.0000		1,81	- 3,10	540.3054.0000		1,81	- 3,10	540.3054.0000		1,81	- 3,10	540.3057.0000	
3,11	- 4,40	540.3064.0000		3,11	- 4,40	540.3064.0000		3,11	- 4,40	540.3064.0000		3,11	- 4,40	540.3067.0000	
4,41	- 7,00	540.3074.0000		4,41	- 7,00	540.3074.0000		4,41	- 7,00	540.3074.0000		4,41	- 7,00	540.3077.0000	
7,01	- 10,00	540.3084.0000		7,01	- 10,00	540.3084.0000		7,01	- 10,00	540.3084.0000		7,01	- 10,00	540.3087.0000	
10,01	- 16,00	540.3094.0000		10,01	- 16,00	540.3094.0000		10,01	- 16,00	540.3094.0000		10,01	- 16,00	540.3097.0000	

Ausführung (type)

Standard *(standard)*				warmfest *(creep-resistant)*				korrosionsfest *(stainless steel)*				Inconel X750			
p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indizes
	439 d0 10				439 d0 10				439 d0 10				439 d0 10		
1	- 3	540.0704.0000		1	- 3	540.0704.0000		1	- 3	540.0704.0000		1	- 3	540.0707.0000	
3	- 5	540.3004.0000		3	- 5	540.3004.0000		3	- 5	540.3004.0000		3	- 5	540.3007.0000	
5	- 7	540.3014.0000		5	- 7	540.3014.0000		5	- 7	540.3014.0000		5	- 7	540.3017.0000	
7	- 13	540.3024.0000		7	- 13	540.3024.0000		7	- 13	540.3024.0000		7	- 13	540.3027.0000	
13	- 20	540.3034.0000		13	- 20	540.3034.0000		13	- 20	540.3034.0000		13	- 20	540.3037.0000	
20	- 26	540.3044.0000		20	- 26	540.3044.0000		20	- 26	540.3044.0000		20	- 26	540.3047.0000	
26	- 45	540.3054.0000		26	- 45	540.3054.0000		26	- 45	540.3054.0000		26	- 45	540.3057.0000	
45	- 64	540.3064.0000		45	- 64	540.3064.0000		45	- 64	540.3064.0000		45	- 64	540.3067.0000	
64	-102	540.3074.0000		64	-102	540.3074.0000		64	-102	540.3074.0000		64	-102	540.3077.0000	
102	-145	540.3084.0000		102	-145	540.3084.0000		102	-145	540.3084.0000		102	-145	540.3087.0000	
145	-232	540.3094.0000		145	-232	540.3094.0000		145	-232	540.3094.0000		145	-232	540.3097.0000	

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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.

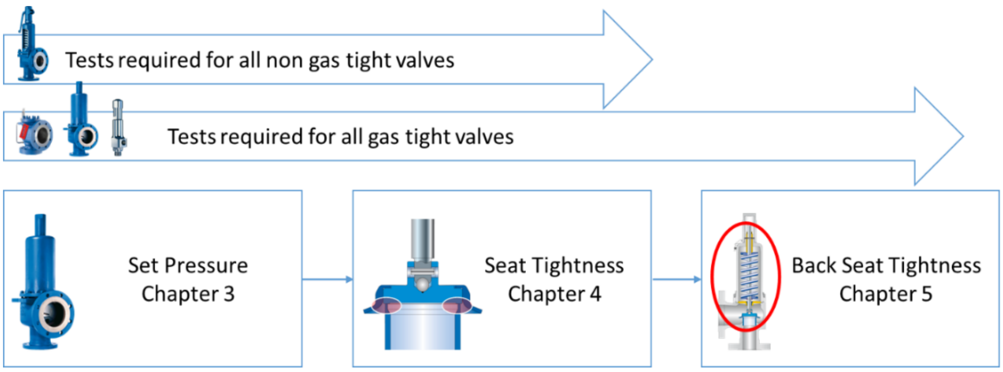


Figure 1: Required tests for gas tight and non-gas tight valves.

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.

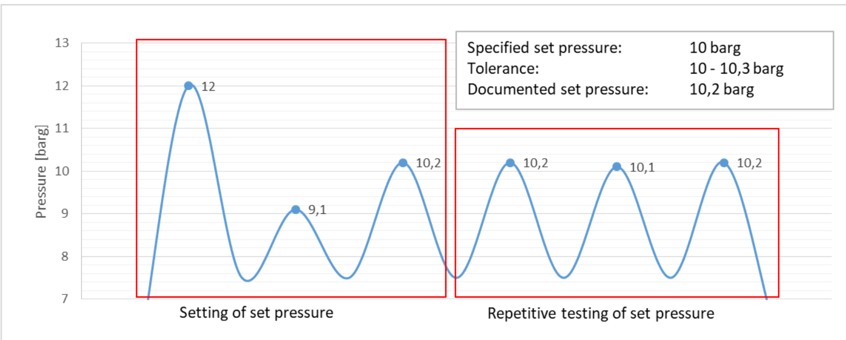


Figure 2: Exemplary set pressure test for 10 barg

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:

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

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		
250	482	1,013	1,021		
200	392	1,007	1,013		
150	302		1,007		
100	212	**No influence of service condition on CDTP, correction factor: 1,000**			
-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)	$0,5 * p_0$
$0,7 \leq p_0 \leq 3,5$ (bar) $10,15 \leq p_0 \leq 50,8$ (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.

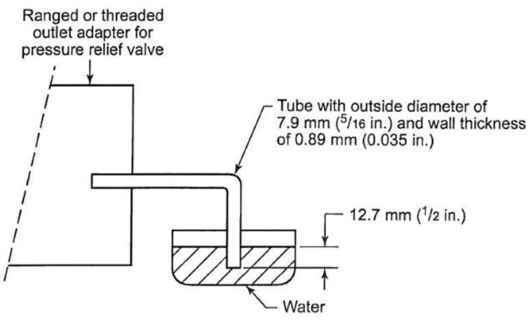


Figure 3: Apparatus to test seat tightness with air. (API 527)

4.2.1.2 Acceptance Criteria

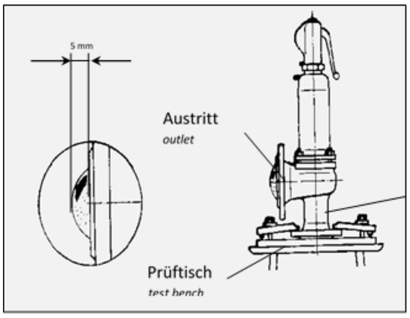
	Set pressure po (related to 16°C)		**Allowed Number of Bubbles [Bubbles / min]**	
	bar	psi	d0 < 18 [mm]	d0 > 18 [mm]
Metal-to-metal sealing	0,1 - 66	1,45 - 657,3	40	20
	> 66 - 165	> 657,3 - 2393,1	60	30
	> 165 - 700	> 2393,1 - 10152,6	80	40
Soft sealing plate	All ranges		20	10
Soft sealing O-Ring or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

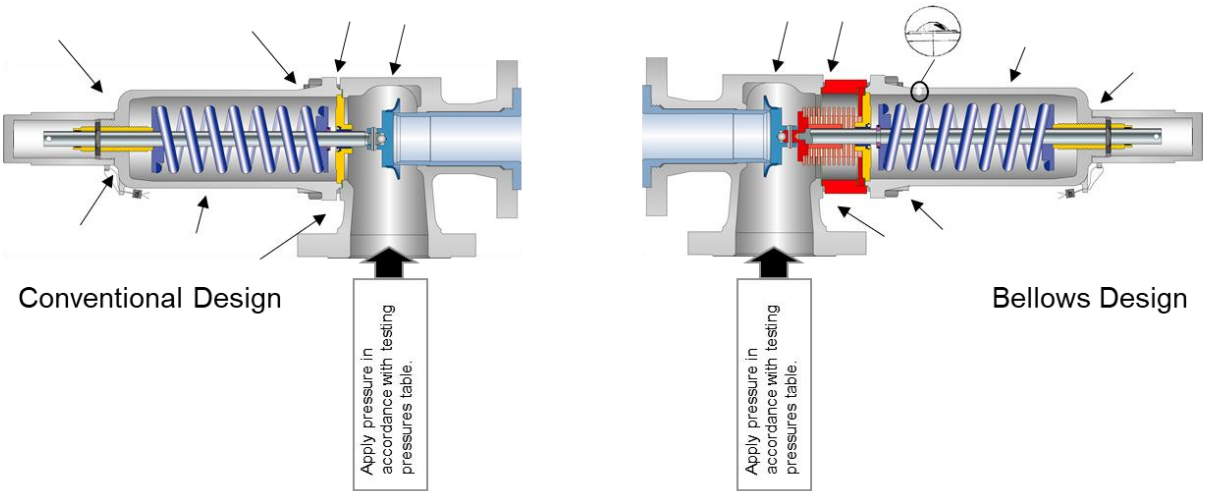
4.4.2 Acceptance Criteria

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.

14 Appendix 1: Seat tightness requirements acc. to API 527

API 527

Test medium		Set pressure p_o (relating to 16°C) bar	Set pressure p_o MPa	Test conditions: After testing of set pressure p_o / Blow down up o — Test pressure	Test Time (Min; BZ = damping time, PZ = Test Time) DN ≤50 ≤2" BZ	DN ≤50 ≤2" PZ	DN 65...100 21/2...4" BZ	DN 65...100 21/2...4" PZ	DN >100 >4" BZ	DN >100 >4" PZ	Tightness requirements $d_0 \leq$ 18mm — Leakage rate (related to 16°C; bubble volume V_B= 0,295 cm³, tube ∅ = 6,12mm): Number of bubbles bubble/ min	Leakage volume cm³/ min	Leakage rate Mbar l/s	d_0 > 18mm — Leakage rate (related to 16°C; bubble volume V_B= 0,295 cm³, tube ∅ = 6,12mm): Number of bubbles Bubble/ min	Leakage volume cm³/ min	Leakage rate Mbar l/s
Air (Gases)	Metal-to-metal sealing	1,03-68,9 103 130 172 207 276 385 414	0,103-6,896 10,3 13,0 17,2 20,7 27,6 38,5 41,4	if $p_o \leq$ 3,45 bar (0,345 MPa) then $p_{Prüf\,test} = p_0$ - 0,345 bar (0,0345 MPa)	1	1	2	1	5	1	40 60 80 100 100	11,80 17,70 23,60 29,50 29,50	$1,9x10^{-1}$ $2,8x10^{-1}$ $3,8x10^{-1}$ $4,7x10^{-1}$ $4,7x10^{-1}$	20 30 40 50 60 80 100 100	5,90 8,85 11,80 14,75 17,70 23,60 29,50 29,50	$9,4x10^{-2}$ $1,4x10^{-1}$ $1,8x10^{-1}$ $2,3x10^{-1}$ $2,8x10^{-1}$ $3,8x10^{-1}$ $4,7x10^{-1}$ $4,7x10^{-1}$
	Soft sealing	-	-		1	1	2	1	5	1	0	0	$<4,7x10^{-3}$	0	0	$<4,7x10^{-3}$
Steam	Metal-to-metal sealing Soft sealing	-	-	if p_0 >3,45 bar (0,345 MPa) then $p_{Prüf.\,test}$= 0,9*p_o	BZ= damping time = 3 min TZ= test time = 1 min						No recognized or visible leakage					
Water	Metal-to-metal sealing	-	-		TZ- test time = 1 min						***NW≥1" (DN25)*** Leakage volume ≤10cm³/h x Inlet nominal size / inch (Leakage volume ≤0,166cm³/min x Inlet nominal size /inch) ***NW<1" (DN25)*** *leakage volume* ≤10cm³/h*					
	Soft sealing	-	-		TZ- test time = 1 min						No leakage					

2) Note: see Appendix 6

15 Appendix 2: Seat tightness LESER Standard tightness requirement for spring safety valve

LESER-Standard	Test conditions						Tightness requirements							
							$d_0 \leq$ 18mm				$d_0 >$ 18mm			
	Test medium		Set pressure p_o (related to 16°C)		Test pressure p_{test} After testing of set pressure p_o Blow down up to... Test pressure	Test time BZ-damping time TZ-Test time	Leakage rate (related to 16°C; bubble volume V_B= 0,295 cm^3 tube ∅ = 6,12mm)				Leakage rate (related to 16°C; bubble volume V_B= 0,295 cm^3 tube ∅ = 6,12mm)			
			Pressure stages acc. to LGS 0222 bar	MPa	Blow-down of... Test pressure	s / min	Number of bubbles bubble/min	Leakage volume cm^3/min	Leakage volume mm³/sec	Leakage rate mbarl/s	Number of bubbles bubble/min	Leakage volume cm^3/min	Leakage volume mm³/sec	Leakage rate mbarl/s
	Air (Gases)	Metal-to-metal sealing	0,1- 66	0,01- 6,6	if $0{,}1 < p_o < 0{,}7$ (bar) $0{,}01 < p_o < 0{,}07$ (MPa) then $P_{test} = 0{,}5 \cdot p_0$	BZ = 10s TZ = 10s	40	11,80	196,66	1,9x10^{-1}	20	5,90	98,33	9,4x10^{-2}
			>66-165	>6,6-16,5			60	17,70	295,00	2,8x10^{-1}	30	8,85	147,50	1,4x10^{-1}
			>165- 700	>16,5- 70,0			80	23,60	393,33	3,8x10^{-1}	40	11,80	196,66	1,8x10^{-1}
		Soft sealing plate	-	-		BZ= 10s TZ = 10s	20	5,90	98,33	9,4x10^{-2}	10	2,95	49,16	4,7x10^{-2}
		Soft sealing O-Ring or disc With vulcanized soft sealing	-	-	if $0{,}7 \leq p_o \leq 3{,}5$ (bar) $0{,}07 \leq p_o \leq 0{,}35$ (MPa) then $p_{test} = p_0 - 0{,}35$bar	BZ =10s TZ = 10s	0	0	0	≤9x10^{-5}	0	0	0	≤9x10^{-5}
	Steam	Metal-to-metal sealing Soft sealing	-	-	if $p_0 > 3{,}5$ bar $p_o > 0{,}35$ (MPa) then $p_{test} = 0{,}9 \cdot p_o$	BZ = 3 min PZ = 1 min	No recognized or visible leakage No indication of pressure drop at the pressure gauge							
	Water	Metal-to-metal sealing Soft sealing	-	-		TZ = 1 min	See Appendix 2.1							

Appendix 2.1: Seat tightness LESER Standard tightness requirement, testing with water

Test Medium	Seat	Nominal size		Tightness requirements – Leakage – Leakage volume			Water Drops (related to 16°C; Drop volume $V_T = 0,1\ cm^3$)	
		DN	inch	cm³/h	cm³/h	cm³/min	drop / min	drop / min
							exakt	Abgerundet
Water	Metal-seated	**Nominal size** >= 1“ (DN25) Leakage volume ≤10cm³/h x nominal size in inch) (Leakage ≤0,166 cm³/min x nominal size in inch)						
		25	1	10 x 1	10	0,166666667	1,666666667	1
		40	1 1/2	10 x 1 1/2	15	0,25	2,5	2
		50	2	10 x 2	20	0,333333333	3,333333333	3
		80	3	10 x 3	30	0,5	5	5
		100	4	10 x 4	40	0,666666667	6,666666667	6
		125	5	10 x 5	50	0,833333333	8,333333333	8
		150	6	10 x 6	60	1	10	10
		200	8	10 x 8	80	1,333333333	13,33333333	13
		250	10	10 x 10	100	1,666666667	16,66666667	16
		300	12	10x12	120	2	20	20
		400	16	10x16	160	2,666666667	26,66666667	26
		Nominal size < 1“ (DN25) Leakage volume ≤ 10cm³/h (≤ 0,166cm³ min)						
					10	0,166666667	1,666666667	1
	Soft - seated			No visible leakage				

16 Appendix 3: Seat tightness LESER increased tightness requirements

LESER - increased tightness

Test medium		Set pressure p_o (related to 16°C)		Test pressure $p_{prüf}$ After testing of set pressure p_o Blow down up to ... Test pressure	Test time BZ=damping time TZ = test time	$d_0 \leq 18$mm Leakage rate (related to 16°C; Bubble volume V_B= 0,295 cm^3 tube ∅ = 6,12mm)				$d_0 > 18$mm Leakage rate (related to 16°C; Bubble volume V_B= 0,295 cm^3 tube ∅ = 6,12mm)			
		Pressure stage acc. to LGS 0222		Blow-down of... Test pressure		Number of bubbles	Leakage volume		Leakage rate	Number of bubbles	Lekage volume		Leakage rate
		bar	MPa			bubble/min	cm^3/min	mm^3/sec	mbarl/s	bubble/min	cm^3/min	mm^3/sec	(mbarl/s)
Air (Gases)	Metal-to-metal sealing	0,1-66	0,01-6,6	if $0,1< p_o < 0,7$ (bar) $0,01 < p_o < 0,07$ (MPa) then $P_{test} = 0,5*p_0$	BZ- =10s TZ = 10s	20	5,90	98,33	$9,4x10^{-2}$	10	2,95	49,16	$4,7x10^{-2}$
		>66-165	>6,6-16,5			30	8,85	147,5	$1,4x10^{-1}$	15	4,42	73,66	$7,0x10^{-2}$
		>165-700	>16,5-70,0			40	11,80	196,66	$1,8x10^{-1}$	20	5,90	98,33	$9,4x10^{-2}$
	Soft sealing	-	-		-	Increased tightness not possible, ref. to App. 2: Standard tightness requirements							
Steam	Metal-to-metal sealing	-	-	If $0,7 \leq p_o \leq 3,5$ (bar) $0,07 \leq p_o \leq 0,35$ (MPa) Then $p_{test} = p_0 - 0,35$bar (0,035 Mpa)	BZ =3 min TZ- = 1 min	No recognized or visible leakage No indication of pressure drop at the pressure gauge							
	Soft sealing	-	-		-	Increased tightness not possible, ref. to App. 2: Standard tightness requirements							
Water	Metal-to-metal sealing	-	-	if $p_0 > 3,5$ bar po >0,35 (MPa) then $p_{test} = 0,9*p_o$	TZ = 1 min	No recognized or visible leakage							
	Soft sealing	-	-		-	Increased tightness not possible, ref. to App. 2: Standard tightness requirements							

17 Appendix 4: Seat tightness LESER increased tightness requirements POSV, Type 810, Pop Action pilot

	Seat Type	Set pressure po			Test pressure, $ptest_f$		Test time		Leakage rate (Maximum)		
		Pounds per Square Inch Gauge (psig)	bar	Mega -Pascals, MPa	bar		BZ=damping time Pz = test time		Number of bubbles bubble/min	Leakage volume cm^3/ min	Leakage rate mbar* l/s
Type 811- Pop Action Pilot	Metal-to-metal sealing (Main Valve) and Metallic or soft sealing Or soft sealing (Pilot)	15 - 1000	1,03 - 68,9	0,103 - 6,896	if: $p_0 \leq 3,45$ than: $p_{test} = p_0 - 0,345$ If : $p_0 > 3,45$ Than: $P_{test.} = 0,9*po$	Additional testing for POSV with $p_0 > 30$ bar than $p_{test.} = 0,3 *po$	DN < =50 (<= 2")	BZ = 1 PZ = 1	20	5,9	9,4x10-2
		>1000 - 1500	> 68,9 - 130	> 6,896 - 10,3					30	8,85	1,4x10-1
		>1500 - 2000	> 130 - 172	> 10,3 - 13					40	11,8	1,8x10-1
		> 2000 - 2500	> 172 - 207	> 13 - 17,2					50	14,75	2,3x10-1
		> 2500 - 3000	> 207 - 276	> 17,2 - 20,7			DN 65-100 (21/2...4")	BZ = 2 PZ = 1	60	17,7	2,8x10-1
		> 3000 - 4000	> 276 - 385	> 20,7 - 27,6					80	23,6	3,8x10-1
		> 4000 - 6170	> 385 - 425	> 27,6 - 42,5			DN > 100 (> 4")	BZ = 5 PZ = 1	100	29,5	4,7x10-1
	Soft sealing (O-ring or sealing plate at main valve) And Metalic or soft sealing (Pilot)	15 - 6170	1,03 - 425	0,103 - 42,5					No recognized or visible leakage	-	<4,7x10-3

18 Appendix 4: Seat tightness LESER increased tightness requirements POSV, Type 810, Modulate Action Pilot

Baugruppe	Seat Type	Set pressure po: Pounds per Square Inch Gauge (psig)	Set pressure po: bar	Set pressure po: Mega -Pascals, MPa	Test pressure, $ptest_f$: bar	Test pressure, $ptest_f$: bar	Test time: BZ=damping time Pz = test time	Test time	Leakage rate (Maximum): Number of bubbles bubble/min	Leakage volume cm^3/ min	Leakage rate mbar* l/s
Type 821 - Modulate Action Pilot	Metal-to-metal sealing (Main Valve and pilot)	15 - 1000	1,03 - 68,9	0,103 - 6,896	if: $p_o \leq 3{,}45$ than: $p_{test} = p_0 - 0{,}345$	Additional testing for POSV with p_0 >30 bar than $p_{test.} = 0{,}3$ *po	DN < =50 (<= 2“)	BZ = 1 PZ = 1	40	11,8	1,9x10-1
		>1000 - 1500	> 68,9 - 130	> 6,896 - 10,3					60	17,7	2,8x10-1
		>1500 - 2000	> 130 - 172	> 10,3 - 13					80	23,6	3,8x10-1
		> 2000 - 6170	> 172 - 425	> 13 - 42,5					100	29,5	4,7x10-1
	Metal-to-metal sealing (Main Valve) and soft sealing (Pilot)	15 - 1000	1,03 - 68,9	0,103 - 6,896					20	5,9	9,4x10-2
		>1000 - 1500	> 68,9 - 130	> 6,896 - 10,3			DN 65-100 (21/2...4“)	BZ = 2 PZ = 1	30	8,85	1,4x10-1
		>1500 - 2000	> 130 - 172	> 10,3 - 13					40	11,8	1,8x10-1
	Soft sealing (main valve) and Metal-to-metal sealing (Pilot)	> 2000 - 2500	> 172 - 207	> 13 - 17,2	If : p_0 >3,45 Than: $P_{test.} = 0{,}9$*po				50	14,75	2,3x10-1
		> 2500 - 3000	> 207 - 276	> 17,2 - 20,7					60	17,7	2,8x10-1
		> 3000 - 4000	> 276 - 385	> 20,7 - 27,6			DN > 100 (> 4“)	BZ = 5 PZ = 1	80	23,6	3,8x10-1
		> 4000 - 6170	> 385 - 425	> 27,6 - 42,5					100	29,5	4,7x10-1
	Soft sealing (O-Ring or sealing plate at main valve) and soft sealing (Pilot)	15- 6170	1,03 - 425	0,103 - 42,5					No recognized or visible leakage	-	<4,7x10-3

19 Back Seat tightness, LESER standard requirements for POSVs

Set pressure po	Test pressure, p test, bar/ psig			Test Duration Sec.		Leakage rate Bubble / Min			Test procedure at LESER
	Pilot	POSV +							
		Pop Pilot	Modulate Action			Pilot	Main Valve	POSV	
po	if: $p_o \leq 6$ then: ptest = 1,1x p_0 if $p_o > 6$ then: p_{test} = 6 bar	if: $p_o \leq 6$ then: p_{test} = 1,1x p_0 if: $p_o > 6$ then: p_{test} = 6 bar	if: $p_o \leq 2{,}5$ then: p_{test} = 1,1x p_0 if: $p_o > 2{,}5$ then: p_{test} = 2,5 bar	DN < = 200 (<= 8") DN > 250 to 450 (10" to 18")	15 30	No recognized or visible leakage	No recognized or visible leakage	No recognized or visible leakage	Babble emission and / or Application with tests fluid

20 Seat tightness acc. to PAS 1085 -SV

	Seat Type	Set pressure, po			Test pressure, p test,	Nennweite	Test Time		Leakage rate	
		Pounds per Square Inch Gauge (psig)	bar	Mega -Pascals, MPa	bar		BZ=damping time [Min.]	Pz = test time [Min.]	Number of bubbles bubble/min	Leakage volume cm^3/ min
Seat tightness acc. to PAS 1085	Metal-to-metal sealing and soft sealing	≥ 15 < 15	≥ 1,0 < 1,0	≥ 0,1 < 0,1	97% x p0 90% x p0	DN ≤ 200 (DN ≤ 8“)	1	1	3	0,89
	Metal-to-metal sealing and soft sealing	≥ 15 < 15	≥ 1,0 < 1,0	≥ 0,1 < 0,1	97% x p0 90% x p0	DN > 200 (DN >8“)	3	1	3	0,89

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

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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)

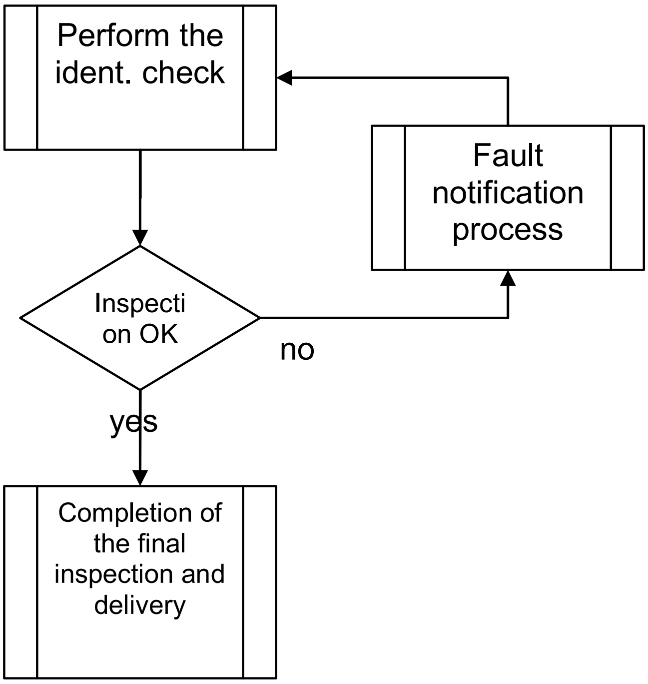

Figure 6-1

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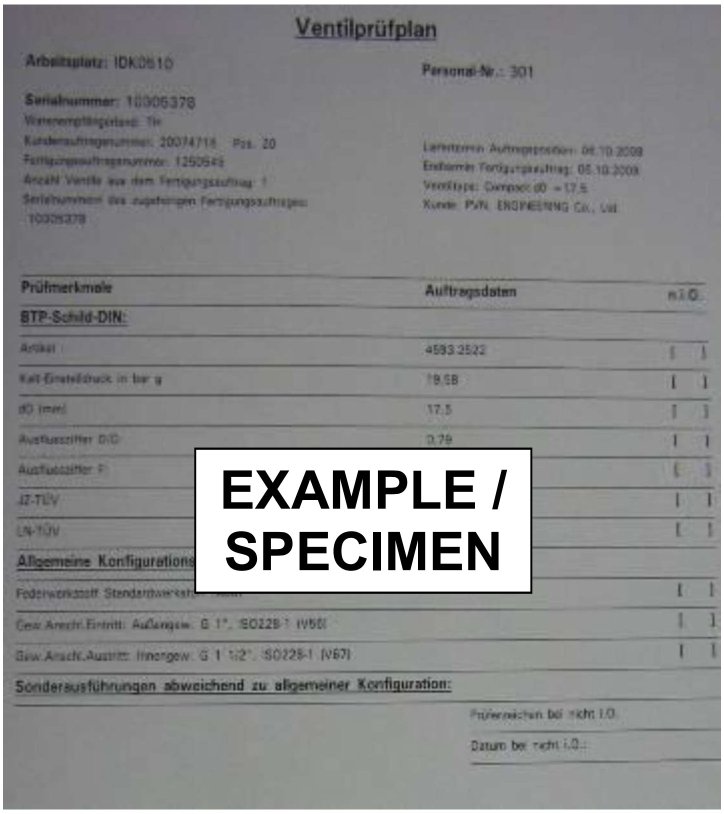
7 Performing the final inspection

7.1 General inspections

a) Compare the content of the valve inspection plan or repair order to the valve model.


Ventilprüfplan

Arbeitsplatz: IDK0510 | Personal-Nr.: 301

Serialnummer: 10306378

Kundenauftragsnummer: 20074718 Pos. 20

Fertigungsauftragsnummer: 1250649

Endtermin Fertigungsauftrag: 05.10.2008

Kunde: PVN ENGINEERING Co., Ltd

Prüfmerkmale	Auftragsdaten	n.i.O.
BTP-Schild-DIN:		
Artikel:	4593.2522	[ ]
Kalt-Einstelldruck in bar g	19.58	[ ]
d0 [mm]	17.5	[ ]
Ausflussziffer D/G	0.79	[ ]
Ausflussziffer F		[ ]
JZ-TÜV		[ ]
LN-TÜV		[ ]
Allgemeine Konfigurations		
Federwerkstoff: Standardwerkst		[ ]
Gew.Anschl.Eintritt: Außengew. G 1", ISO228-1 (V50)		[ ]
Gew.Anschl.Austritt: Innengew. G 1 1/2", ISO228-1 (V67)		[ ]
Sonderausführungen abweichend zu allgemeiner Konfiguration:		

Prüferzeichen bei nicht i.O.:

Datum bei nicht i.O.:

Figure 7.1-1

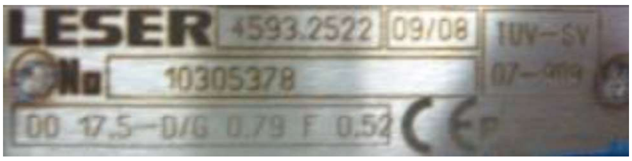


Figure 7.1-2: Check the type number against the valve inspection plan / repair order	**Figure 7.1-3:** Check the BT plate / customer ID plate data against the valve inspection plan / repair order

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7.2 Visual inspection of other items

7.2.1 Inspection of the paintwork

a) Valve is not completely painted

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

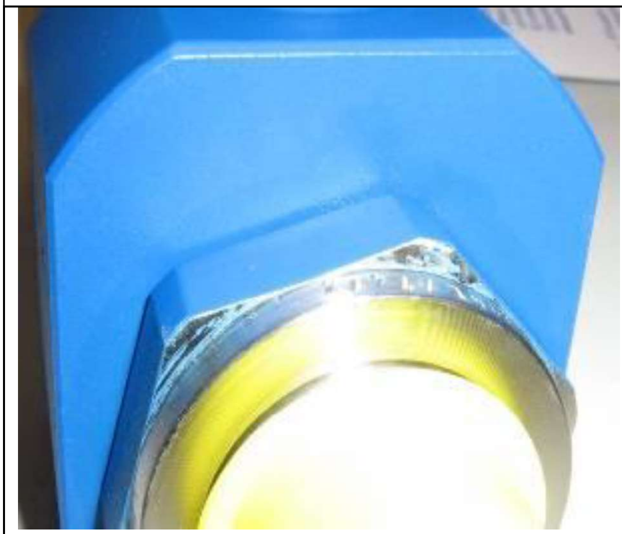
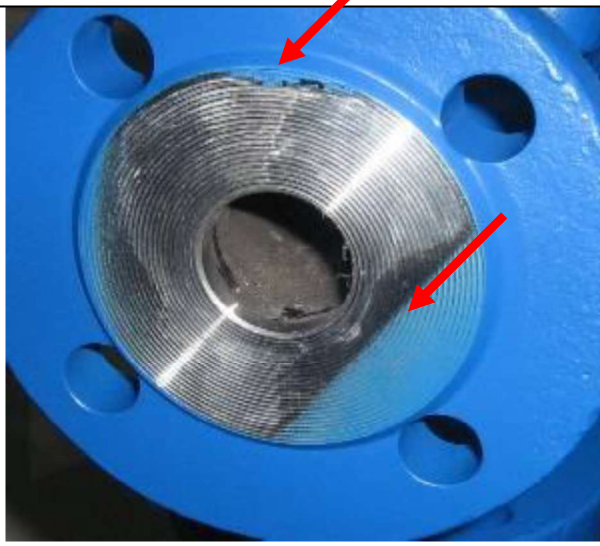
OK specimen:	**Rejected specimen:**
 **Figure 7.2.1-7**	

	Figure 7.2.1-8

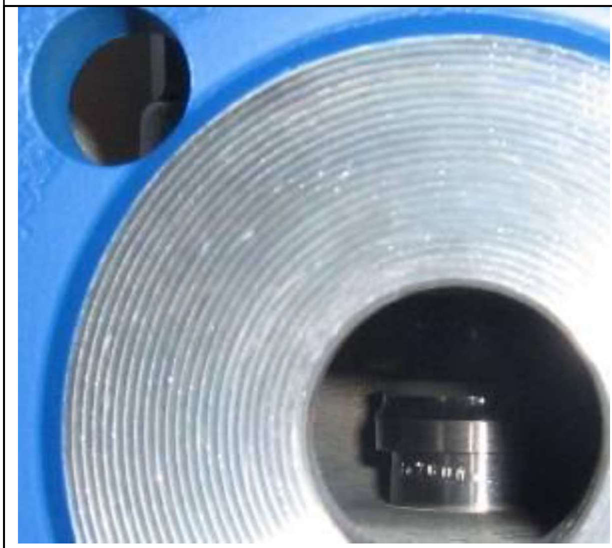
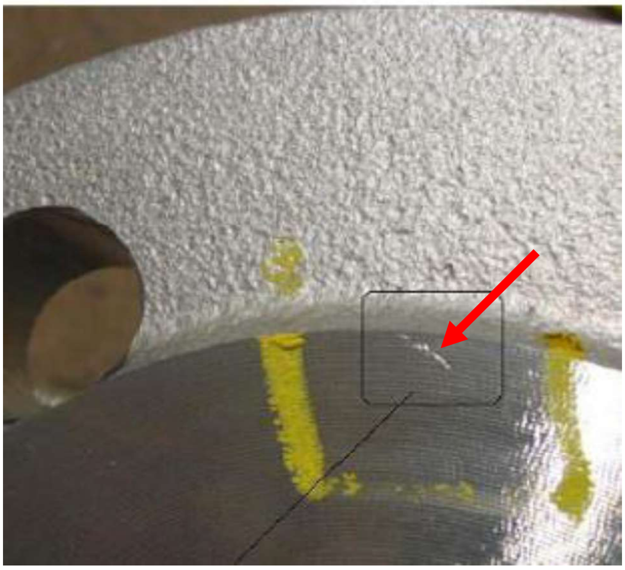
d) Paint on masked off areas

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]		6	10
Actual Orifice area A_0 [mm^2]		28.3	78.5
Actual Orifice diameter d_0 [inch]		0.236	0.394
Actual Orifice area A_0 [inch^2]		0.044	0.122

Body (Item 1): Male thread			Material-No. / Art.-No.							
		Connection Size	$^3/_8$"	$^1/_2$"	$^3/_4$"	1"	$^3/_8$"	$^1/_2$"	$^3/_4$"	1"
DIN ISO 228-1	**G**	1.4104	–	–	–	–	136.5239.9000	136.4439.9000	136.4539.9000	136.5839.9000
		316L	–	–	–	–	136.5249.9000	136.4449.9000	136.4549.9000	136.4849.9000
		316L stellited	136.5169.9000	136.4369.9000	136.5569.9000	136.6769.9000	–	–	–	–
	R	316L	–	–	–	–	–	136.4449.9220	136.4549.9220	136.5849.9220
		316L stellited	–	136.4369.9220	136.5569.9220	136.6769.9220	–	–	–	–
ASME B1.20.1	**NPT**	316L	–	–	–	–	–	136.4449.9204	136.4549.9204	136.5849.9204
		316L stellited	–	136.4369.9204	136.5569.9204	136.6769.9204	–	–	–	–

Body (Item 1): Female thread			Material-No. / Art.-No.							
		Connection Size	$^3/_8$"	$^1/_2$"	$^3/_4$"	1"	$^3/_8$"	$^1/_2$"	$^3/_4$"	1"
DIN ISO 228-1	**G**	316L	–	–	–	–	–	136.4449.9210	136.4549.9210	136.5849.9210
		316L stellited	–	136.4369.9210	136.5569.9210	136.6769.9210	–	–	–	–
ISO 7-1/BS 21	**Rc**	316L	–	–	–	–	–	136.4449.9222	136.4549.9222	136.5849.9222
		316L stellited	–	136.4369.9222	136.5569.9222	136.6769.9222	–	136.4449.9222	136.4549.9222	136.5869.9222
ASME B1.20.1	**NPT**	316L	–	–	–	–	–	136.4449.9211	136.4549.9211	136.5849.9211
		316L stellited	–	136.4369.9211	136.5569.9211	136.6769.9211	–	–	–	–

Body (Item 1): Flange design			Material-No. / Art.-No.	
DN 15 / NPS $^1/_2$"	PN 40 – 400	316L	–	136.6349.9208
	CL150	316L	–	136.4449.9202
	CL300 – 2500	316L	136.4369.9208	136.6349.9208
DN 20 / NPS $^3/_4$"	PN 40 – 160	316L	136.5569.9208	136.4549.9208
	CL150 – 2500	316L	136.5569.9208	136.4549.9208
DN 25 / NPS 1"	PN 40 – 400	316L	136.6769.9208	136.4449.9208
	CL150 – 2500	316L	136.6769.9208	136.4449.9208
Disc (Item 7): Metal to metal			**Material-No. / Art.-No.**	
Disc	1.4122	420 RM	–	205.3339.9000
	1.4404	316L	–	205.3349.9000
		316L stellited	205.3169.9000	–
Disc with sealing plate (Item 7)			**Material-No. / Art.-No.**	
Disc		PTFE "A"	200.9249.9005	200.8449.9005
	1.4404	PCTFE "G"	200.9249.9006	200.8449.9006
		SP "T"	200.9249.9007	200.8449.9007
Sealing plate (Item 7.3)			**Material-No. / Art.-No.**	
Sealing plate		PTFE "A"	236.3259.0000	236.2859.0000
		PCTFE "G"	236.3269.0000	236.2869.0000
		SP "T"	236.3279.0000	236.2879.0000
Pin (Item 57)			**Material-No. / Art.-No.**	
Pin		1.4310	480.2405.0000	480.2405.0000
Ball (Item 61)			**Material-No. / Art.-No.**	
Ball		Ball Ø [mm]	6	6
		1.4401	510.0104.0000	510.0104.0000

Order information – Spare parts

Spare parts						
		Actual Orifice diameter d_0 [mm]	10			
		Actual Orifice area A_0 [mm^2]	78.5			
		Actual Orifice diameter d_0 [inch]	0.394			
		Actual Orifice area A_0 [inch^2]	0.122			
Body (Item 1): Male thread			**Material-No. / Art.-No.**			
		Connection Size	$^3/_8$"	$^1/_2$"	$^3/_4$"	1"
DIN ISO 228-1	**G**	1.4104	136.5339.9000	136.4939.9000	136.5439.9000	136.6839.9000
		316L	136.5349.9000	136.4949.9000	136.5449.9000	136.6849.9000
ISO 7-1/BS 21	**R**	316L	–	136.4949.9220	136.5449.9220	136.6849.9220
ASME B1.20.1	**NPT**	316L	–	136.4949.9204	136.5449.9204	136.6849.9204

Body (Item 1): Female thread			**Material-No. / Art.-No.**			
		Connection Size	$^3/_8$"	$^1/_2$"	$^3/_4$"	1"
DIN ISO 228-1	**G**	316L	–	136.4949.9210	136.5449.9210	136.6849.9210
ISO 7-1/BS 21	**Rc**	316L	–	136.4949.9222	136.5449.9222	136.6849.9222
ASME B1.20.1	**NPT**	316L	–	136.4949.9211	136.5449.9211	136.6849.9211

Body (Item 1): Flange design			**Material-No. / Art.-No.**
DN 15 / NPS $^1/_2$"	PN 40 – 400	316L	136.4949.9208
	CL150	316L	136.4949.9202
	CL300 – 2500	316L	136.4949.9208
DN 20 / NPS $^3/_4$"	PN 40 – 160	316L	136.5449.9208
	CL150 – 2500	316L	136.5449.9208
DN 25 / NPS 1"	PN 40 – 400	316L	136.6449.9208
	CL150	316L	136.6849.9202
	CL150 – 2500	316L	136.6449.9208
Disc with O-ring (Item 7)			**Material-No. / Art.-No.**
Disc		NBR "N"	200.8349.9781
		CR "K"	200.8349.9751
		EPDM "D"	200.8349.9741
		FKM "L"	200.8349.9771
		FFKM "C"	200.8349.9791
O-ring (Item 7.4)			**Material-No. / Art.-No.**
O-ring		NBR "N"	502.0107.2681
		CR "K"	502.0107.2651
		EPDM "D"	502.0107.2641
		FKM "L"	502.0107.2671
		FFKM "C"	502.0107.2691

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Order information – Spare parts

Spare parts						
Actual Orifice diameter d_0 [mm]			10			
Actual Orifice area A_0 [mm^2]			78.5			
Actual Orifice diameter d_0 [inch]			0.394			
Actual Orifice area A_0 [inch^2]			0.122			
Body (Item 1): Male thread						
		Connection Size	$^3/_8$"	$^1/_2$"	$^3/_4$"	1"
DIN ISO 228-1	**G**	1.4104	136.5339.9000	136.4939.9000	136.5439.9000	136.6839.9000
		316L	136.5349.9000	136.4949.9000	136.5449.9000	136.6849.9000
ISO 7-1/BS 21	**R**	316L	–	136.4949.9220	136.5449.9220	136.6849.9220
ASME B1.20.1	**NPT**	316L	–	136.4949.9204	136.5449.9204	136.6849.9204

Body (Item 1): Female thread						
		Connection Size	$^3/_8$"	$^1/_2$"	$^3/_4$"	1"
DIN ISO 228-1	**G**	316L	–	136.4949.9210	136.5449.9210	136.6849.9210
ISO 7-1/BS 21	**R**	316L	–	136.4949.9222	136.5449.9222	136.6849.9222
ASME B1.20.1	**NPT**	316L	–	136.4949.9211	136.5449.9211	136.6849.9211

Body (Item 1): Flange design			
DN 15 / NPS $^1/_2$"	PN 40 – 400	316L	136.4949.9208
	CL150	316L	136.4949.9202
	CL300 – 2500	316L	136.4949.9208
DN 20 / NPS $^3/_4$"	PN 40 – 160	316L	123.5449.9208
	CL150 – 2500	316L	123.5449.9208
DN 25 / NPS 1"	PN 40 – 400	316L	136.6449.9208
	CL150	316L	136.6849.9202
	CL300 – 2500	316L	136.6449.9208

Vulcanized soft seal disc (Item 7)		**Material-No. / Art.-No.**
Disc	NBR “N”	200.9049.9081
	CR “K”	200.9049.9051
	EPDM “D”	200.9049.9041
	FKM “L”	200.9049.9071
	FFKM “C”	200.9049.9091
Disc (Item 7.1): With vulcanized soft seal		**Material-No. / Art.-No.**
Soft seal	NBR “N”	212.5249.9081
	CR “K”	212.5249.9051
	EPDM “D”	212.5249.9041
	FKM “L”	212.5249.9071
	FFKM “C”	2125249.9091
Pin (Item 57)		**Material-No. / Art.-No.**
Pin	1.4310	480.0305.0000
Ball (Item 61)		**Material-No. / Art.-No.**
Ball	Ball ⌀ [mm]	6
	1.4401	510.0104.0000

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Order information – Spare parts

Spare parts

		Actual Orifice diameter d_0 [mm]	9					
		Actual Orifice area A_0 [mm^2]	63,6					
		Actual Orifice diameter d_0 [inch]	0,354					
		Actual Orifice area A_0 [inch^2]	0,099					
Body (Item 1): Male thread			**Material-No. / Art.-No.**					
		Connection size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1	**G**	1.4104	–	136.7539.9000	136.7639.9000	–	–	–
		316L	–	136.7549.9000	136.7649.9000	–	–	–
		316L stellited	–	136.7569.9000	136.7669.9000	–	–	–
ISO 7-1/BS 21	**R**	316L	–	136.7549.9220	136.7649.9220	–	–	–
		316L stellited	–	136.7569.9220	136.7669.9220	–	–	–
ASME B1.20.1	**NPT**	316L	–	136.7549.9204	136.7649.9204	–	–	–
		316L stellited	–	136.7569.9204	136.7669.9204	–	–	–
Body (Item 1): Female thread			**Material-No. / Art.-No.**					
DIN ISO 228-1	**G**	316L	136.7449.9210	136.7549.9210	136.7649.9210	–	–	–
		316L stellited	136.7469.9210	136.7569.210	136.7669.9210	–	–	–
ISO 7-1/BS 21	**Rc**	316L	136.7449.9222	136.7549.9222	136.7649.9222	–	–	–
		316L stellited	136.7469.9222	136.7569.9222	136.7669.9222	–	–	–
ASME B1.20.1	**NPT**	316L	136.7449.9211	136.7549.9211	136.7649.9211	–	–	–
		316L stellited	136.7469.9211	136.7569.9211	136.7669.9211	–	–	–

		Actual Orifice diameter d_0 [mm]	13					
		Actual Orifice area A_0 [mm^2]	133					
		Actual Orifice diameter d_0 [inch]	0,512					
		Actual Orifice area A_0 [inch^2]	0,206					
Body (Item 1): Male thread			**Material-No. / Art.-No.**					
		Connection size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1	**G**	1.4104	–	136.8039.9000	136.8139.9000	–	–	–
		316L	–	136.8049.9000	136.8149.9000	–	–	–
		316L stellited	–	136.8069.9000	136.8169.9000	–	–	–
ISO 7-1/BS 21	**R**	316L	–	136.8049.9220	136.8149.9220	–	–	–
		316L stellited	–	136.8069.9220	136.8169.9220	–	–	–
ASME B1.20.1	**NPT**	316L	–	136.8049.9204	136.8149.9204	–	–	–
		316L stellited	–	136.8069.9204	136.8169.9204	–	–	–
Body (Item 1): Female thread			**Material-No. / Art.-No.**					
DIN ISO 228-1	**G**	316L	136.7949.9210	136.8049.9210	136.8149.9210	–	–	–
		316L stellited	–	–	–	–	–	–
ISO 7-1/BS 21	**Rc**	316L	136.7949.9222	136.8049.9222	136.8149.9222	–	–	–
		316L stellited	136.7969.9222	136.8069.9222	136.8169.9222	–	–	–
ASME B1.20.1	**NPT**	316L	136.7949.9211	136.8049.9211	136.8149.9211	–	–	–
		316L stellited	–	136.7569.9211	136.7669.9211	–	–	–

		Actual Orifice diameter d_0 [mm]	17,5					
		Actual Orifice area A_0 [mm^2]	241					
		Actual Orifice diameter d_0 [inch]	0,689					
		Actual Orifice area A_0 [inch^2]	0,374					
Body (Item 1): Male thread			**Material-No. / Art.-No.**					
		Connection size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1	**G**	1.4104	–	–	136.3639.9000	–	136.8639.9000	–
		316L	–	–	136.3649.9000	136.8549.9000	136.8649.9000	–
		316L stellited	–	–	–	–	–	–
ISO 7-1/BS 21	**R**	316L	–	–	136.3649.9220	–	136.8649.9220	–
		316L stellited	–	–	–	–	-	–
ASME B1.20.1	**NPT**	316L	–	–	136.3649.9204	136.8549.9204	136.8649.9204	136.8749.9204
		316L stellited	–	–	–	–	–	–
Body (Item 1): Female thread			**Material-No. / Art.-No.**					
DIN ISO 228-1	**G**	316L	–	–	136.3649.9000	136.8549.9000	136.8649.9000	–
		316L stellited	–	–	–	–	–	–
ISO 7-1/BS 21	**Rc**	316L	–	136.8049.9222	136.3649.9222	–	136.8649.9222	–
		316L stellited	–	136.8069.9222	–	–	–	–
ASME B1.20.1	**NPT**	316L	–	136.8449.9211	136.3649.9211	136.8549.9211	136.8649.9211	–
		316L stellited	–	–	–	–	–	–

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Order information – Spare parts

Spare parts						
Actual Orifice diameter d_0 [mm]				9	13	17.5
Actual Orifice area A_0 [mm^2]				63.6	133	241
Actual Orifice diameter d_0 [inch]				0.354	0.512	0.689
Actual Orifice area A_0 [inch^2]				0.099	0.206	0.374
Body (Item 1): Flange design					**Material-No. / Art.-No.**	
DN 15 / NPS 1/2"	PN 40 – 400		316L	136.7449.9208	136.7949.9208	–
	CL300 – 2500					
DN 20 / NPS 3/4"	PN 40 – 400		316L	136.3949.9208	136.5049.9208	136.8449.9208
	CL150 – 2500					
DN 25 / NPS 1"	PN 40 – 400		316L	136.3449.9208	136.3549.9208	136.3649.9208
	CL150		316L	136.7649.9202	136.8149.9202	136.3649.9202
	CL300 – 2500			136.3449.9208	136.3549.9208	136.3649.9208
Disc (Item 7): Metal to metal					**Material-No. / Art.-No.**	
Disc	1.4122		420 RM	200.2039.9000	200.2139.9000	200.2239.9000
	1.4404		316L	200.2049.9000	200.2149.9000	200.2249.9001
			316L stellited	200.2069.9118	200.2169.9118	–
Disc (Item 7): With sealing plate					**Material-No. / Art.-No.**	
Disc		PTFE	"A"	200.2049.9005	200.2149.9005	200.2249.9005
	1.4404	PCTFE	"G"	200.2049.9006	200.2149.9006	200.2249.9006
		SP	"T"	200.2049.9007	200.2149.9007	200.2249.9007
Disc (Item 7.3): Sealing plate					**Material-No. / Art.-No.**	
Sealing plate		PTFE	"A"	236.3559.0000	236.3559.0000	236.0859.0000
		PCTFE	"G"	236.3569.0000	236.3569.0000	236.0869.0000
		SP	"T"	236.3579.0000	236.3579.0000	236.0879.0000
Pin (Item 57)					**Material-No. / Art.-No.**	
Pin			1.4310	480.0505.0000	480.0505.0000	480.0505.0000
Gasket – outlet body / bonnet (Item 60)					**Material-No. / Art.-No.**	
Gasket			Graphite + 1.4401	500.2407.0000	500.2407.0000	500.2407.0000
Option code L68			Gylon (Filled PTFE)	500.2405.0000	500.2405.0000	500.2405.0000
Ball (Item 61)					**Material-No. / Art.-No.**	
Ball			Ø [mm]	6	6	6
			1.4401	510.0104.0000	510.0104.0000	510.0104.0000
Bellows and bellows conversion kit (Item 15)					**Material-No. / Art.-No.**	
Stainless steel bellows			1.4571 / 316Ti		p ≤ 40 bar / 580 psig = 400.7949.0000	
			1.4571 / 316Ti		p > 40 bar / 580 psig = 400.6349.0000	
Conversion kit			≤ PN 40/CL600		5021.1050	
			> PN 40/CL600		5021.1051	

Order information – Spare Parts

Spare parts

	6			9			13		
Actual Orifice diameter d_0 [mm]	6			9			13		
Actual Orifice area A_0 [mm²]	28.3			63.6			133		
Actual Orifice diameter d_0 [inch]	0.236			0.354			0.512		
Actual Orifice area A_0 [inch²]	0.044			0.099			0.206		
Body (Item 1): Male thread	**Material-No. / Art.-No.**								
Connection Size	1/2"	3/4"	1"	1/2"	3/4"	1"	1/2"	1/2"	1"
DIN ISO 228-1 **G** 316L stellited	136.6969.9000	136.7069.9000	136.7169.9000	–	136.7569.9000	136.7669.9000	–	136.8069.9000	136.8169.9000
ISO 7-1/BS 21 **R** 316L stellited	136.6969.9220	136.7069.9220	136.7169.9220	–	136.7569.9220	136.7669.9220	–	136.8069.9220	136.8169.9220
ASME B1.20.1 **NPT** 316L stellited	136.6969.9204	136.7069.9204	136.7169.9204	–	136.7569.9204	136.7669.9204	–	136.8069.9204	136.8169.9204
Body (Item 1): Female thread	**Material-No. / Art.-No.**								
DIN ISO 228-1 **G** 316L stellited	136.6969.9210	136.7069.9210	136.7169.9210	136.7469.9210	136.7569.210	136.7669.9210	–	–	–
ISO 7-1/BS 21 **Rc** 316L stellited	136.6969.9222	136.7069.9222	136.7169.9222	136.7469.9222	136.7569.9222	136.7669.9222	136.7969.9222	136.8069.9222	136.8169.9222
ASME B1.20.1 **NPT** 316L stellited	136.6969.9211	136.7069.9211	136.7169.9211	136.7469.9211	136.7569.9211	136.7669.9211	–	–	–

Body (Item 1): Flange design			**Material-No. / Art.-No.**		
DN 15 / NPS 1/2"	PN 40 – PN 400	316L stellited	136.6969.9208	136.7469.9208	136.7969.9208
	CL300 – CL2500	316L stellited			
DN 20 / NPS 3/4"	PN 40 – PN 400	316L stellited	136.7069.9208	136.3969.9208	136.5069.9208
	CL150 – CL2500	316L stellited			
DN 25 / NPS 1"	PN 40 – PN 400	316L stellited	136.7169.9208	136.3469.9208	136.3569.9208
	CL150	316L stellited		136.7669.9202	136.8169.9202
	CL300 – CL2500	316L stellited		136.3469.9208	136.3569.9208
Disc (Item 7): Metal to metal			**Material-No. / Art.-No.**		
Disc	1.4404	316L stellited	200.3269.9118 (L) / 200.3969.9118 (S/G)	200.2069.9118	200.2169.9118
Disc with sealing plate (Item 7)			**Material-No. / Art.-No.**		
Disc	1.4404	PCTFE “G”	–	200.2149.9006	200.2249.9006
		SP “T”	–	200.2149.9007	200.2249.9007
Sealing plate (Item 7.3)			**Material-No. / Art.-No.**		
Sealing plate	1.4404	PCTFE “G”	–	236.3569.0000	236. 0869.0000
		SP “T”	–	236.3579.0000	236.0879.0000
Pin (Item 57)			**Material-No. / Art.-No.**		
Pin		1.4310	200.2039.9000	200.2039.9000	200.2139.9000
Gasket – outlet body / bonnet (Item 60)			**Material-No. / Art.-No.**		
Gasket		Graphite + 1.4401	500.2407.0000	500.2407.0000	500.2407.0000
Option code L68 Gylon (Filled PTFE)			500.2405.0000	500.2407.0000	500.2407.0000
Ball (Item 61)			**Material-No. / Art.-No.**		
Ball		Ball Ø [mm]	6	6	6
		1.4401	510.0104.0000	510.0104.0000	510.0104.0000
Bellows and belows conversion kit (Item 15)					
Stainless steel bellows		1.4571/316Ti	p ≤ 40 bar / 580 psig = 400.7949.0000		
			p > 40 bar / 580 psig = 400.6349.0000		
Conversion kit		≤ PN 40 / CL600	5021.1050		
		> PN 40 / CL600	5021.1051		

Order information – Spare parts

Spare parts

		Actual Orifice diameter d_0 [mm]	9					
		Actual Orifice area A_0 [mm^2]	63.6					
		Actual Orifice diameter d_0 [inch]	0.354					
		Actual Orifice area A_0 [$inch^2$]	0.099					
Body (Item 1): Male thread			**Material-No. / Art.-No.**					
		Connection size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1	**G**	1.4104	–	136.7539.9000	136.7639.9000	–	–	–
		316L	–	136.7549.9000	136.7649.9000	–	–	–
		316L stellited	–	136.7569.9000	136.7669.9000	–	–	–
ISO 7-1/BS 21	**R**	316L	–	136.7549.9220	136.7649.9220	–	–	–
		316L stellited	–	136.7569.9220	136.7669.9220	–	–	–
ASME B1.20.1	**NPT**	316L	–	136.7549.9204	136.7649.9204	–	–	–
		316L stellited	–	136.7569.9204	136.7669.9204	–	–	–
Body (Item 1): Female thread			**Material-No. / Art.-No.**					
DIN ISO 228-1	**G**	316L	136.7449.9210	136.7549.9210	136.7649.9210	–	–	–
		316L stellited	136.7469.9210	136.7569.210	136.7669.9210	–	–	–
ISO 7-1/BS 21	**Rc**	316L	136.7449.9222	136.7549.9222	136.7649.9222	–	–	–
		316L stellited	136.7469.9222	136.7569.9222	136.7669.9222	–	–	–
ASME B1.20.1	**NPT**	316L	136.7449.9211	136.7549.9211	136.7649.9211	–	–	–
		316L stellited	136.7469.9211	136.7569.9211	136.7669.9211	–	–	–
		Actual Orifice diameter d_0 [mm]	13					
		Actual Orifice area A_0 [mm^2]	133					
		Actual Orifice diameter d_0 [inch]	0.512					
		Actual Orifice area A_0 [$inch^2$]	0.206					
Body (Item 1): Male thread			**Material-No. / Art.-No.**					
		Connection size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1	**G**	1.4104	–	136.8039.9000	136.8139.9000	–	–	–
		316L	–	136.8049.9000	136.8149.9000	–	–	–
		316L stellited	–	136.8069.9000	136.8169.9000	–	–	–
ISO 7-1/BS 21	**R**	316L	–	136.8049.9220	136.8149.9220	–	–	–
		316L stellited	–	136.8069.9220	136.8169.9220	–	–	–
ASME B1.20.1	**NPT**	316L	–	136.8049.9204	136.8149.9204	–	–	–
		316L stellited	–	136.8069.9204	136.8169.9204	–	–	–
Body (Item 1): Female thread			**Material-No. / Art.-No.**					
DIN ISO 228-1	**G**	316L	136.7949.9210	136.8049.9210	136.8149.9210	–	–	–
		316L stellited	–	–	–	–	–	–
ISO 7-1/BS 21	**Rc**	316L	136.7949.9222	136.8049.9222	136.8149.9222	–	–	–
		316L stellited	136.7969.9222	136.8069.9222	136.8169.9222	–	–	–
ASME B1.20.1	**NPT**	316L	136.7949.9211	136.8049.9211	136.8149.9211	–	–	–
		316L stellited	–	136.7569.9211	136.7669.9211	–	–	–
		Actual Orifice diameter d_0 [mm]	17.5					
		Actual Orifice area A_0 [mm^2]	241					
		Actual Orifice diameter d_0 [inch]	0.689					
		Actual Orifice area A_0 [$inch^2$]	0.374					
Body (Item 1): Male thread			**Material-No. / Art.-No.**					
		Connection size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1	**G**	1.4104	–	–	136.3639.9000	–	136.8639.9000	–
		316L	–	–	136.3649.9000	136.8549.9000	136.8649.9000	–
		316L stellited	–	–	–	–	–	–
ISO 7-1/BS 21	**R**	316L	–	–	136.3649.9220	–	136.8649.9220	–
		316L stellited	–	–	–	–	-	–
ASME B1.20.1	**NPT**	316L	–	–	136.3649.9204	136.8549.9204	136.8649.9204	136.8749.9204
		316L stellited	–	–	–	–	–	–
Body (Item 1): Female th read			**Material-No. / Art.-No.**					
DIN ISO 228-1	**G**	316L	–	–	136.3649.9000	136.8549.9000	136.8649.9000	–
		316L stellited	–	–	–	–	–	–
ISO 7-1/BS 21	**Rc**	316L	–	136.8049.9222	136.3649.9222	–	136.8649.9222	–
		316L stellited	–	136.8069.9222	–	–	–	–
ASME B1.20.1	**NPT**	316L	–	136.8449.9211	136.3649.9211	136.8549.9211	136.8649.9211	–
		316L stellited	–	–	–	–	–	–

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Order information – Spare parts

Spare parts					
Actual Orifice diameter d_0 [mm]			9	13	17.5
Actual Orifice area A_0 [mm^2]			63.6	133	241
Actual Orifice diameter d_0 [inch]			0.354	0.512	0.689
Actual Orifice area A_0 [inch^2]			0.099	0.206	0.374
Body (Item 1): Flange design			Material-No. / Art.-No.		
DN 15 / NPS $^1/_2$"	PN 40 – 400 / CL300 – 2500	316L	136.7449.9208	136.7949.9208	–
DN 20 / NPS $^3/_4$"	PN 40 – 400 / CL150 – 2500	316L	136.3949.9208	136.5049.9208	136.8449.9208
DN 25 / NPS 1"	PN 40 – 400	316L	136.3449.9208	136.3549.9208	136.3649.9208
	CL150	316L	136.7649.9202	136.8149.9202	136.3649.9202
	CL300 – 2500	316L	136.3449.9208	136.3549.9208	136.3649.9208
Disc (Item 7): Soft seal with O-ring			Material-No. / Art.-No.		
Disc	NBR	“N”	200.9349.9081	220.4549.9081	220.4649.9081
	EPDM	“D”	200.9349.9041	220.4549.9041	220.4649.9041
	CR	“K”	200.9349.9051	220.4549.9051	220.4649.9051
	FKM	“L”	200.9349.9071	220.4549.9071	220.4649.9071
	FFKM	“C”	200.9349.9091	220.4549.9091	220.4649.9091
Disc (Item 7.4): O-ring			Material-No. / Art.-No.		
	NBR	“N”	502.0123.2681	502.0139.2681	502.0202.2681
	EPDM	“D”	502.0123.2641	502.0139.2641	502.0202.2641
	CR	“K”	502.0123.2651	502.0139.2651	502.0202.2651
	FKM	“L”	502.0123.2671	502.0139.2671	502.0202.2671
	FFKM	“C”	502.0123.2691	502.0139.2691	502.0202.2691
Pin (Item 57)			Material-No. / Art.-No.		
Pin	1.4310		480.0505.0000	480.0505.0000	480.0505.0000
Gasket – outlet body / bonnet (Item 60)			Material-No. / Art.-No.		
Gasket	Graphite + 1.4401		500.2407.0000	500.2407.0000	500.2407.0000
Option code L68	Gylon (Filled PTFE)		500.2405.0000	500.2405.0000	500.2405.0000
Ball (Item 61)			Material-No. / Art.-No.		
Ball	Ø [mm]		6	6	6
	1.4401		510.0104.0000	510.0104.0000	510.0104.0000
Bellows and bellows conversion kit (Item 15)			Material-No. / Art.-No.		
Stainless steel bellows	1.4571 / 316Ti		p ≤ 40 bar / 580 psig = 400.7949.0000		
			p > 40 bar / 580 psig = 400.6349.0000		
Conversion kit	≤ PN 40/CL600		5021.1050		
	> PN 40/CL600		5021.1051		

Order information – Spare Parts

Spare parts

Actual Orifice diameter d_0 [mm]			9			13		
Actual Orifice area A_0 [mm^2]			63.6			133		
Actual Orifice diameter d_0 [inch]			0.354			0.512		
Actual Orifice area A_0 [inch^2]			0.099			0.206		
Body (Item 1): Male thread								
Connection size			1/2"	3/4"	1"	1/2"	1/2"	1"
DIN ISO 228-1	**G**	316L	–	136.7549.9000	136.7649.9000	–	136.8049.9000	136.8149.9000
ISO 7-1/BS 21	**R**	316L	–	136.7549.9220	136.7649.9220	–	136.8049.9220	136.8149.9220
ASME B1.20.1	**NPT**	316L	–	136.7549.9204	136.7649.9204	–	136.8049.9204	136.8149.9204
Body (Item 1): Female thread								
DIN ISO 228-1	**G**	316L	136.7449.9210	136.7549.9210	136.7649.9210	136.7949.9210	136.8049.9210	136.8149.9210
ISO 7-1/BS 21	**R**	316L	136.7449.9222	136.7549.9222	136.7649.9222	136.7949.9222	136.8049.9222	136.8149.9222
ASME B1.20.1	**NPT**	316L	136.7449.9211	136.7549.9211	136.7649.9211	136.7949.9211	136.8049.9211	136.8149.9211

Body (Item 1): Flange design			**Material-No. / Art.-No.**	
DN 15 / NPS 1/2"	PN 40 – 400 CL300 – 2500	316L	136.7449.9208	136.7949.9208
DN 20 / NPS 3/4"	PN 40 – 400 CL150 – 2500	316L	136.3949.9208	136.5049.9208
DN 25 / NPS 1"	PN 40 – 400	316L	136.3449.9208	136.3549.9208
	CL150		136.7649.9202	136.8149.9202
	CL300 – 2500		136.3449.9208	136.3549.9208
Disc with O-ring (Item 7)			**Material-No. / Art.-No.**	
Disc	NBR	“N”	200.9349.9081	220.4549.9081
	CR	“K”	200.9349.9051	220.4549.9041
	EPDM	“D”	200.9349.9041	220.4549.9051
	FKM	“L”	200.9349.9071	220.4549.9071
	FFKM	“C”	200.9349.9091	220.4549.9091
O-ring (Item 7.4)			**Material-No. / Art.-No.**	
	NBR	“N”	502.0123.2681	502.0139.2681
	CR	“K”	502.0123.2651	502.0139.2641
	EPDM	“D”	502.0123.2641	502.0139.2651
	FKM	“L”	502.0123.2671	502.0139.2671
	FFKM	“C”	502.0123.2691	502.0139.2691
Pin (Item 57)			**Material-No. / Art.-No.**	
Pin		1.4310	480.0505.0000	480.0505.0000
Gasket – outlet body / bonnet (Item 60)			**Material-No. / Art.-No.**	
Gasket		Graphite + 1.4401	500.2407.0000	500.2407.0000
Option code L68		Gylon (Filled PTFE)	500.2405.0000	500.2405.0000
Ball (Item 61)			**Material-No. / Art.-No.**	
Ball		Ø [mm]	6	6
		1.4401	510.0105.0000	510.0105.0000
Bellows and bellows conversion kit (Item 15)			**Material-No. / Art.-No.**	
Stainless steel bellows		1.4571 / 316Ti	p ≤ 40 bar / 580 psig = 400.7949.0000	
			p > 40 bar / 580 psig = 400.6349.0000	
Conversion kit		≤ PN 40/CL600	5021.1050	
		> PN 40/CL600	5021.1051	

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:

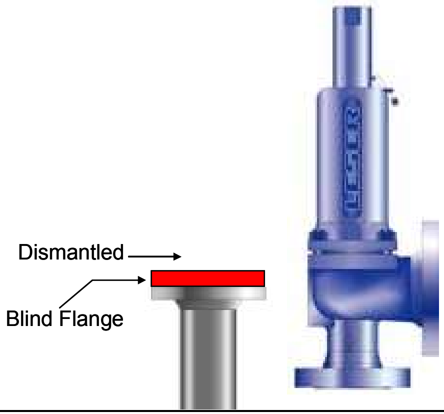
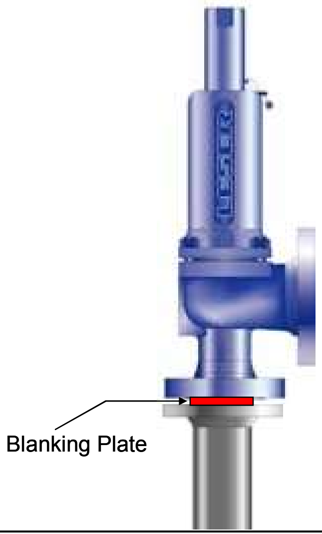
Possibility	Figure	Description
Test gag		The test gag blocks the spindle and keeps the safety valve tight while the system pressure exceeds the set pressure. Advantage: It is possible to perform pressure tests in a system without dismantling the safety valve. After testing, the test gag must be removed! 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

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

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[7)] API RP 520 Part II, 5th Edition 2003, Sect. 12.2

4 Typical Mistakes as a Result of Unauthorized Repair

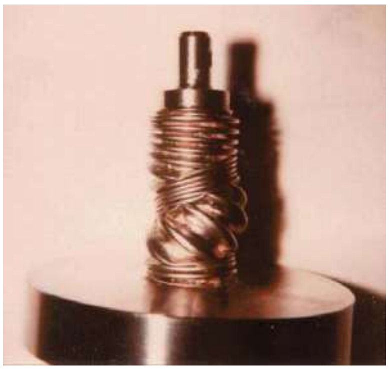

Figure 17.4-1: Twisted stainless steel bellows

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