MAINTENANCE

Maintenance Handbook for LESER Product Group API

Series 526

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	Introdocution and table of contents	LID EN 1001-00 “Introduction”
1.2 Maintenance Fundamentals	Terminology: - Parts - Set pressure - Overpressure & blowdown Critical parts: - Nozzle & disc - Spring - Adjusting ring - Parts providing alignment - Lifting devices	LID EN 1002-00 “Maintenance Fundamentals”
1.3 Repair process	-Process of Safety Valves to Repair -Repair Traveller	LGS 4111 “Process of 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 - LGS 4456: Most relevant sections are: Page 1-4; 7; 11-12; 14-17, 28 – 30, 34 - Equipment and materials	LGS 4460 “Specification of the API Tool Kit” 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 4109 “Dismantling instructions for type 526 API“ 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; 15-16	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 4104 “Assembly instructions for type 526 API”
	Torques: - Assembly torques for body-bonnet connection, caps, test gags, O-ring discs and bellows	LGS 3323 “Torques for screw, nuts and caps H2 / lifting devices” LGS 3325 “Torque for O-Ring-Disc and bellows connection“
	After Assembly: - Color finishing and painting - Component plate	LGS 4114 “Paint touch-up and painting repaired valves” LGS 4118 “Component plates”

1.8 Spring charts	Spring charts: - Overview of spring ranges for set pressure adjustments and spring selection in bar and psi	LGS 3630 “Spring charts Type 526“

1.9 Testing Procedures	Testing set pressure: - Procedures and equipment for setting and testing the cold differential test pressure, including tolerances	LDeS 1001.69 “CDTP-Cold differential test pressure”
	Leak testing: - Procedures and equipment for testing functional tightness (disc-nozzle connection) - Procedures and equipment for testing shell tightness (nozzle, cap)	LGS 4434 “Performing Leak Tests”
	Tightness requirements: - Seat tightness - Shell tightness - Back seat tightness	LGS 0201 “Tightness Test”
	Last visual check up	LGS 4117 “Final visual inspection of repaired valves“
1.10 Spare parts	Spare parts list	Extract from LWN 480.00 “Type 526 spare-parts”
1.11 Installation & storage	Testing and inspection before installation: - visual inspection of the valve - hydraulic pressure test	Extract from LWN 753.00 “Installation and Plant Design”
	Inspection intervals	Extract from LWN 753.00 “Installation and Plant Design”
	Storage and transport	Extract from LWN 753.00 “Installation

		and Plant Design”
1.12 Trouble shooting	Typical errors	Extract from LWN 765.01 “Trouble shooting”

1 Maintenance Fundamentals

1.1 Introduction

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

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

1.2 Terminology

1.2.1 Parts Description acc. to ASME PTC 25

Item	Component	Description per ASME PTC 25 – Parts used by LESER
1	**Body**	A pressure-retaining or containing component of a pressure relief device that supports the parts of the valve assembly and has provision(s) for connecting to the primary and/or secondary pressure source(s).
5	**Nozzle**	A primary pressure- containing component in a safety valve that forms a part or the entire inlet flow passage.
5	**Seat**	The pressure-sealing surfaces of the fixed and moving pressure-containing components.
6	**Adjusting ring (blowdown ring)**	A ring assembled to the nozzle or guide of a direct spring valve, used to control the opening characteristics and/or the reseat pressure.
7	**Disc**	A moveable component of a pressure relief device that contains the primary pressure when it rests against the nozzle.
9	**Bonnet**	A component of a direct spring valve or of a pilot in a pilot-operated valve that supports the spring. It may or may not be pressure containing.
8	**Guide**	A component in a direct spring or pilot-operated pressure relief device used to control the lateral movement of the disc or disc holder.
12	**Spindle (stem)**	A part whose axial orientation is parallel to the travel of the disc. It may be used in one or more of the following functions: (a) assist in alignment, (b) guide disc travel, and (c) transfer of internal or external forces to the seats.
15	**Bellows**	A flexible pressure-containing component of a balanced direct spring valve used to prevent changes in set pressure when the valve is subject to superimposed back pressure, or to prevent corrosion between the disc holder and guide.
16/17	**Spring plate (spring step, -button, -washer)**	Or spring step: a load-transferring component in a safety valve that supports the spring.
18	**Adjustment screw**	A screw used to adjust the set pressure or the reseat pressure of a reclosing pressure relief device.
40	**Cap**	A component used to restrict access and/or protect the adjustment screw in a reclosing pressure-relief device. It may or may not be a pressure containing part.
40	**Lift lever**	A device to apply an external force to the stem of a pressure relief valve to manually operate the valve at some pressure below the set pressure
54	**Spring**	The element in a safety valve that provides the force to keep the disc on the nozzle.

Table 1: Parts description acc. to ASME PTC 25

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

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

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

1.2.2 Definition of set pressure

ASME PTC 25, 2001, 2.7 OC of PRD

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

1.2.3 Definition of overpressure

ISO 4126-1, 2004, 3.2.3

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

1.2.4 Definition of blowdown

ASME PTC 25, 2001, 2.7 OC of PRD

Blowdown is considered as the difference between actual popping pressure of a pressure relief valve and actual reseating pressure expressed as a percentage of set pressure or in pressure units.
Typical values for the blowdown are 4% to 15% for steam and gas and 20% to unlimited for liquids.

Figure 1 gives a graphical representation of the definitions.

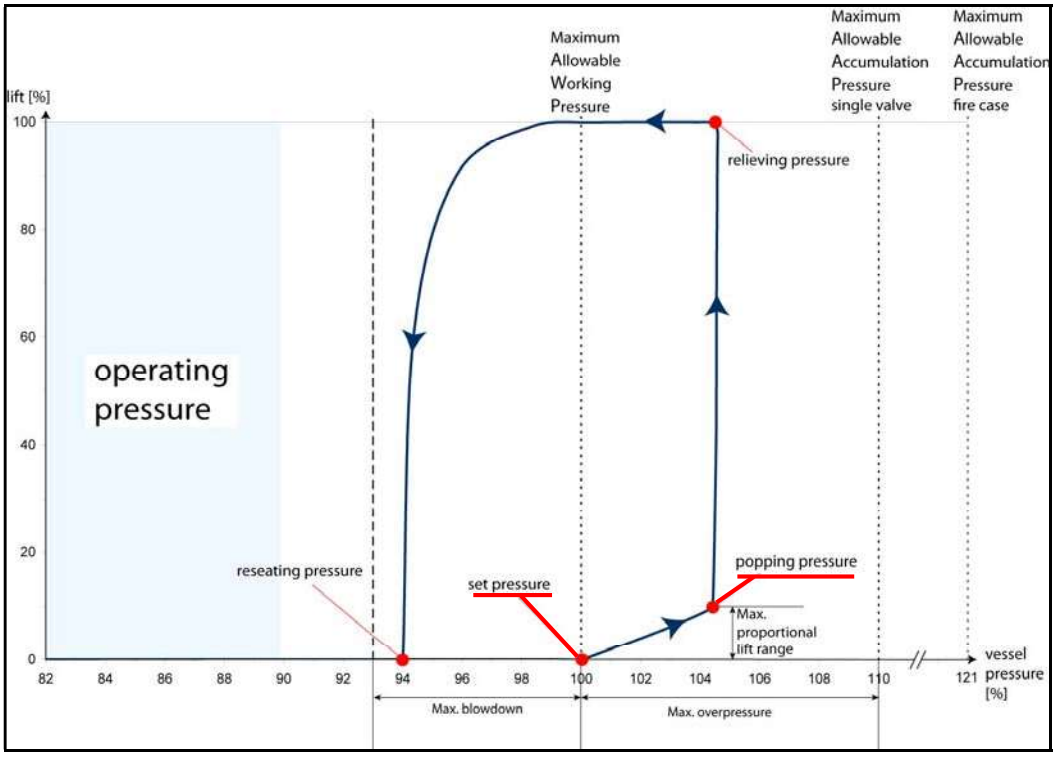


Figure 1: general characteristic of LESER safety valves for steam/gases acc. to ASME VIII

1.3 Critical parts

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

1.3.1 Nozzle and disc

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

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

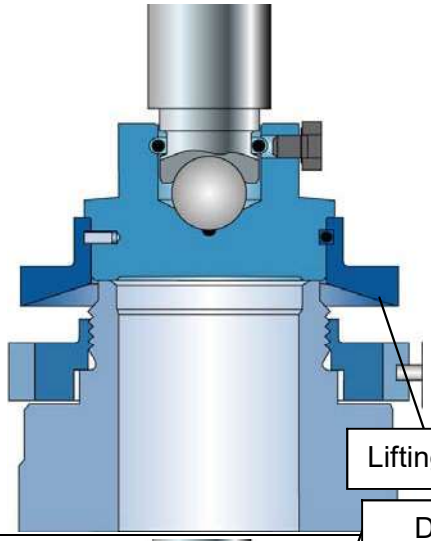
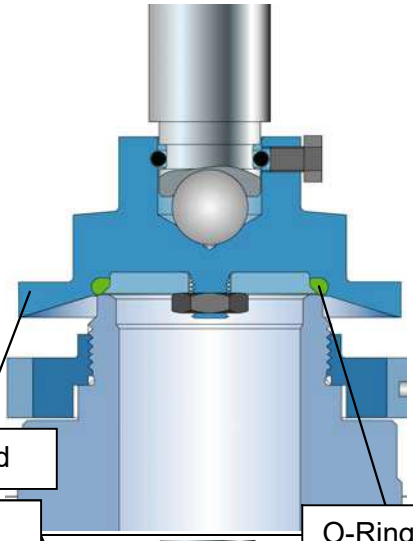
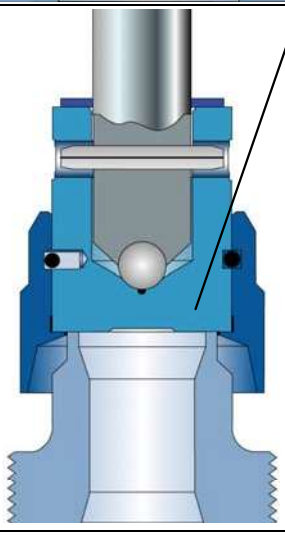
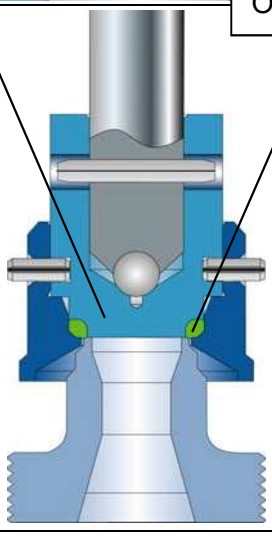
	Metal to metal seat	Soft seat – o-ring disc
Flanged valves (type 526)		
Threaded valves (type 459)		

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

1.3.2 Spring

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

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

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

1.3.3 Adjusting Ring

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

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

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

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

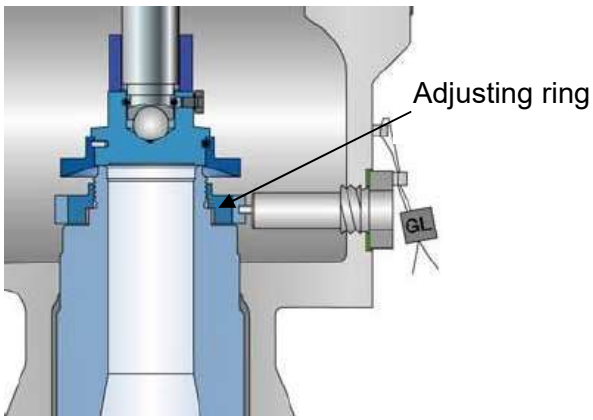


Figure 2: Blowdown ring of LESER's Type 526

1.3.4 Parts Providing Alignment

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

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

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

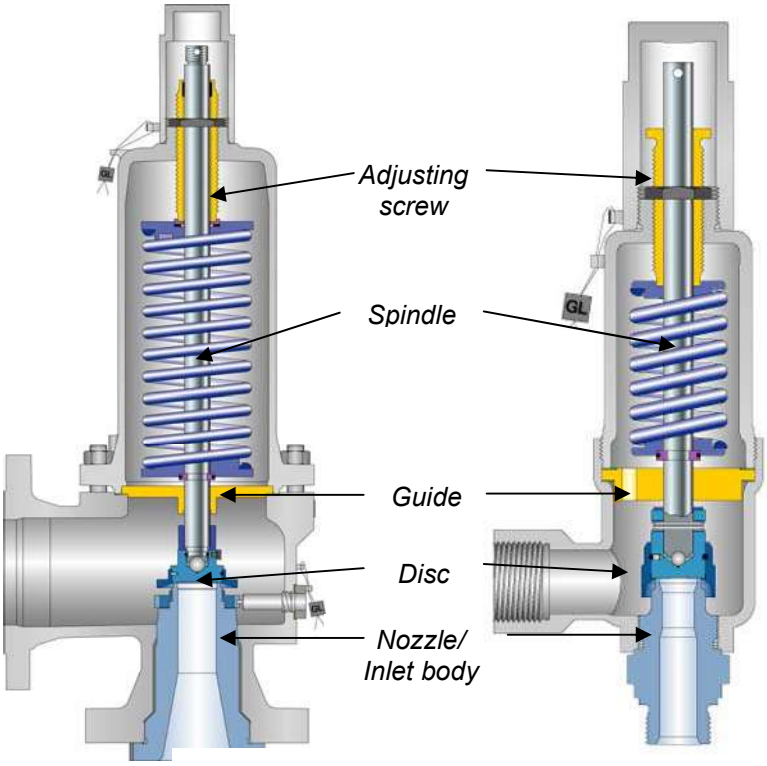


Figure 3: overview of parts providing alignment

1.4 Lifting devices

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

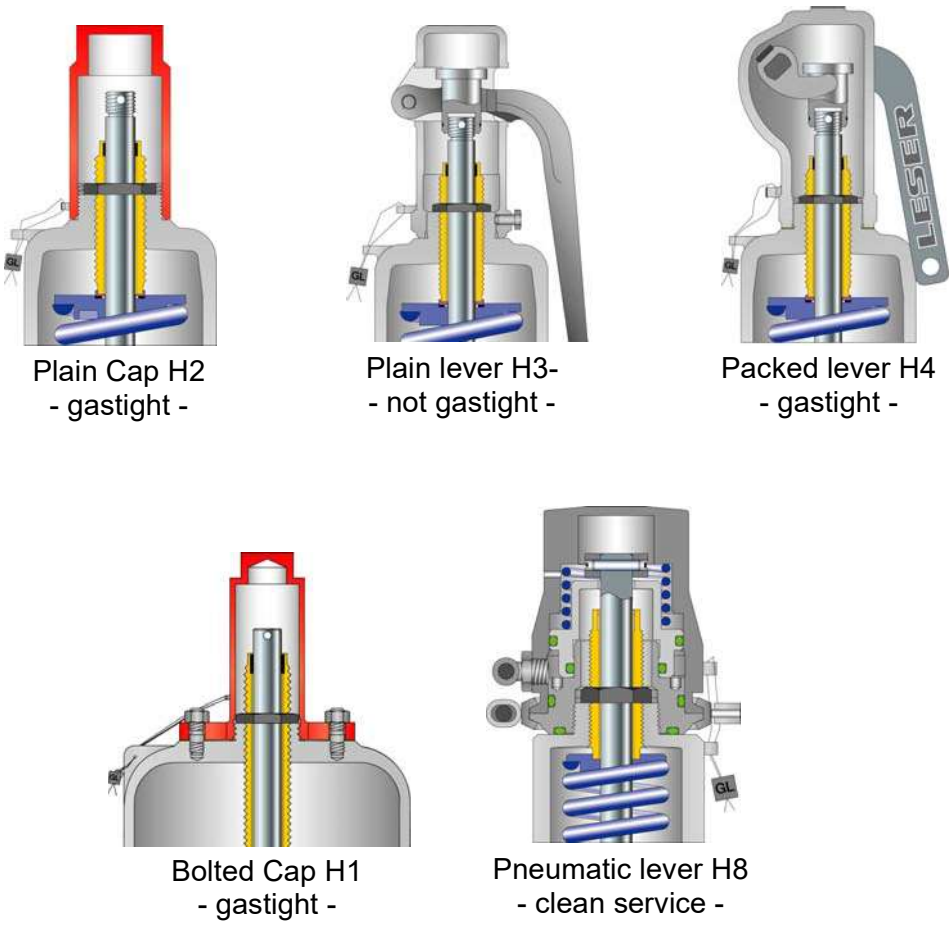


Figure 4: overview of different cap and levers

Content

1 Purpose

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

2 Scope

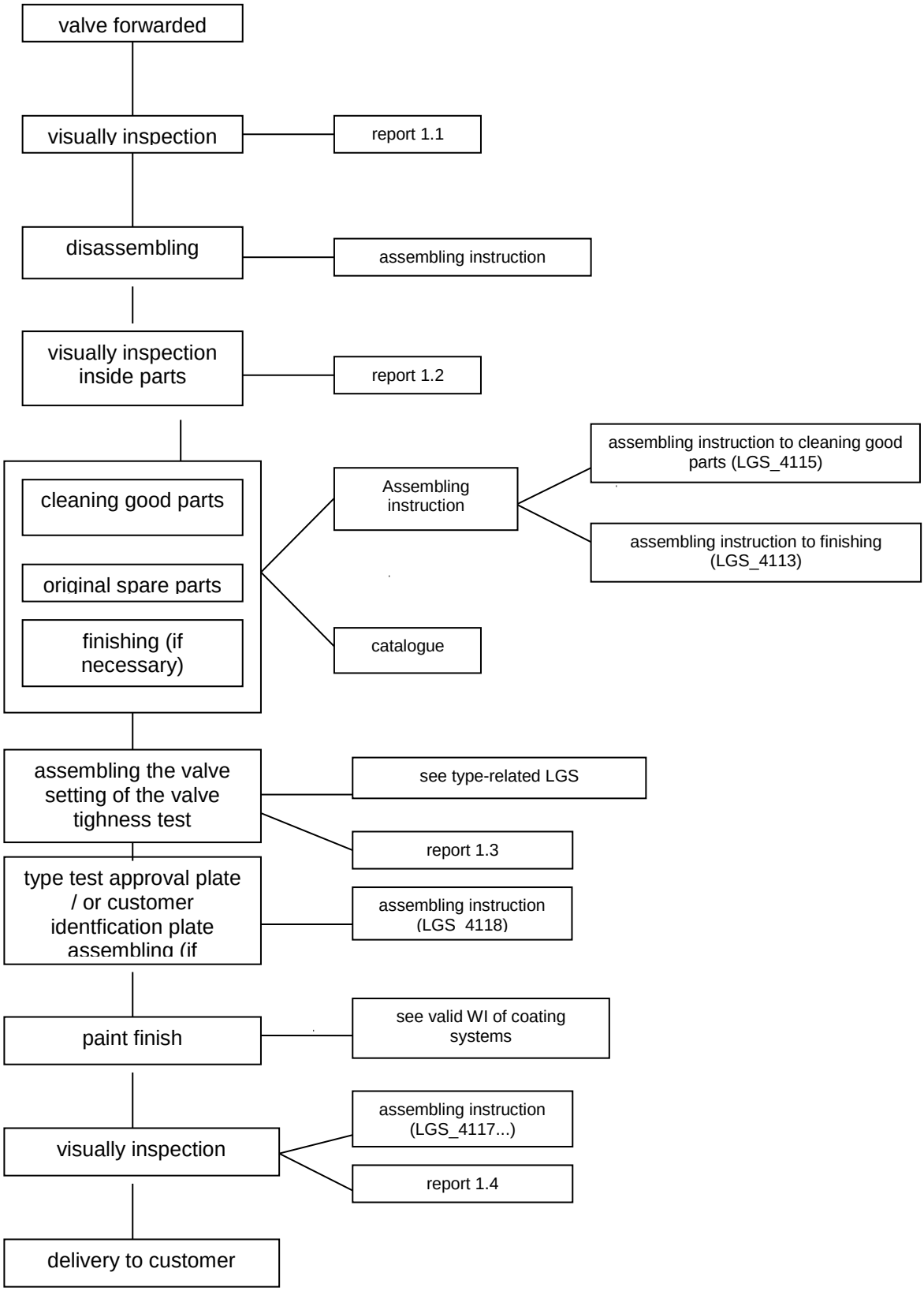
This LGS applies to all members of the LESER Quality Cluster.

3 Introduction

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

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

4 Safety valve to repair



Repair Traveller

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

1.1 Forwarded Inspection

	Repair necessary	Remarks
Painting	☐	_____
Inlet / outlet surface	☐	_____
Lead seal	☐	_____
Type test approval plate	☐	_____

1.2 Disassembling

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

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

1.3 Assembling Inspection

Set pressure psig	target:	actual:
Seat tightness bubbles / min.	target:	actual:

	i.o.	n.i.o.
Backpressure / 6 psig	☐	☐

1.4 Delivery inspection

	i.o.	n.i.o.
Type test approval plate	☐	☐
Painting	☐	☐
Components	☐	☐

_____
Date/Signature

Content

1 Purpose

This LESER Global (LGS) describes the 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 API Additional Tool KIT is an assembly of tools required for work on safety valves of the API 526 series shown in section 5 in addition to the Standard Tool KIT.

Order number	**0161.0004**
Internet	**www.sales@leser.com**

4 Designated use

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

5 Components of the API Additional Tool KIT

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

5.1 Double-ended open spanner with unequal widths across flats

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

Designated use

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

Fig. 1 Unscrewing a screw connection

Fig. 2 Dealing the drain hole

Technical requirements

Requirements / Quality	Data
Width across flats in mm	36 x 41
Manufacturer	GEDORE
Material	Chrome-vanadium-steel
Design	chrome-plated, matt
Jaw position	15°
Length	360 mm
Vendor	Hahn & Kolb
External order number	52012-410
LESER order number	596.0093.0000

Technical illustration

Illustration 1: Double-ended open spanner

Tool kit number	0161.0004
Internet	www.hahn-kolb.de

5.2 Hook spanner

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

Designated purpose of the hook spanner

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

Fig. 3 Installing the nozzle

Fig. 4 Installing the snap ring

Technical requirements

Requirements / Quality	Data	Data
Width across flats in mm	52x55	68x75

Technical illustration

Manufacturer	GEDORE	
Material	Chrome-vanadium-steel	
Design	chrome-plated	
Length	206 mm	240 mm
Vendor	Hahn & Kolb	
External order number	52100-080	52100-100
LESER order number		
Tool kit number	0161.0004	
Internet	www.hahn-kolb.de	

Requirements / Quality	Data	Data	Data	Data	Data
Width across flats in mm	80x90	95x100	120x130	135x145	155x165
Manufacturer	GEDORE				
Material	Chrome-Vanadium-Steel				
Design	chrome-plated				
Length	280 mm	280 mm	335 mm	385 mm	385 mm
Vendor	Hahn & Kolb				
External order number	52100-110	52100-120	52100-140	52100-150	52100-160
LESER order number					
Tool kit number	0161.0004				
Internet	www.hahn-kolb.de				

Requirements / Quality	Data	Data	Data	Data
Width across flats in mm	180x195	205x220	230x245	260x270
Manufacturer	GEDORE			
Material	Chrome-Vanadium-Steel			
Design	chrome-plated			
Length	470 mm	470 mm	568 mm	568 mm
Vendor	Hahn & Kolb			
External order number	52100-170	52100-180	52100-190	52100-200
LESER order number				
Tool kit number	0161.0004			
Internet	www.hahn-kolb.de			

Content

1 Purpose

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

2 Scope

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

3 Introduction

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

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

3.1 Designated use

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

4 Components of the Standard Tool KIT

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

4.1 Double-ended open spanner with unequal widths across flats

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

Designated use

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

Fig. 1 Unscrewing a screw connection

Fig. 2 Sealing the drain hole

Technical requirements (1)

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

Technical illustration

Fig. 1: Double-ended open spanner

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

Technical requirements (2)

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

4.2 Single-ended open spanner

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

Designated use

- lever and cap screw connections

Fig. 3 Installation of the lever and cap

Technical requirements

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

Technical illustration

Illustration 2: Single-ended open spanner

4.3 Flat-tip and Phillips PH screwdrivers

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

Designated use

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

Fig. 3 Lifting the protective cap

Technical requirements

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

Technical illustration

Illustration 3: Flat-head/Phillips screwdriver

4.4 Combination pliers

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

Designated use

- removal of sealing wire

Technical requirements

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

Technical illustration

Illustration 4: Combination pliers

4.5 Pin punch

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

Designated use

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

Technical requirements

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

Technical illustration

Illustration 5: Combination pliers

4.6 Hammer

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

Designated use

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

Technical requirements

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

Technical illustration

Illustration 6: Hammer

4.7 Punch numbers

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

Designated use

- marking flanges and bodies

Technical requirements

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

Technical illustration

Illustration 7: Punch numbers

4.8 Punch letters

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

Designated use

- marking flanges and bodies

Technical requirements

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

Technical illustration

Illustration 8: Punch letters

4.9 Brush set

The brush set consists of brushes of different sizes.

Designated use

- repair of paint damage
- application of lubricants

Technical requirements

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

Technical illustration

Illustration 9: Brush set

4.10 Sliding vernier calliper

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

Designated use

- pressure setting
- measuring stroke limits
- measuring components

Technical requirements

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

Technical illustration

Illustration 10: Sliding vernier calliper

4.11 Sealing pliers

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

Designated use

- sealing bonnets and bodies

Technical requirements

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

Technical illustration

Illustration 11: Sealing pliers

4.12 V-Block

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

Designated use

- assembly of discs and spindles
- offloading the spindle

Technical requirements

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

Technical illustration

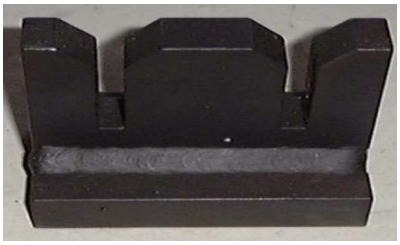


Illustration 19: V-block

4.13 Ratchet box

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

Designated use

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

Technical requirements

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

Technical illustration

Illustration 20: Ratchet box

4.14 Torque wrench

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

Designated use

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

Technical requirements

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

Technical illustration

Illustration 21: Torque wrench

4.15 Jaw attachments

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

Designated use

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

Technical requirements

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

Technical illustration

Illustration 22: Jaw attachment

4.16 Plug-in reversible ratchet

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

Designated use

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

Technical requirements

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

Technical illustration

Illustration 23: Plug-in reversible ratchet

4.17 Plug-in adapter

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

Designated use

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

Figure 4.1

Technical requirements

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

Technical illustration

Illustration 24: Plug-in adapter

4.18 Socket

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

Designated use

- screw connections of bonnets and bodies

Technical requirements

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

Technical illustration

Illustration 25:Socket

4.19 Wire brush

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

Designated use

- removal of surface rust
- removal of soiling

Technical requirements

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

Technical illustration

Illustration 26: Wire brush

4.20 Safety glasses

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

Designated use

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

Technical requirements

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

Technical illustration

Illustration 27:Safety glasses

4.21 Wire twisting pliers

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

Designated use

- twisting the sealing wire
- sealing bonnets and bodies

Technical requirements

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

Technical illustration

Illustration 27:Wire twisting pliers

4.22 Sealing blocks

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

Designated use

- sealing safety valves

Technical requirements

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

Technical illustration

Illustration 29:Sealing blocks

4.23 Sealing wire

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

Designated use

- sealing the bonnet and the lever/cap

Technical requirements

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

Technical illustration

Illustration 30: Sealing wire

4.24 Pipe for large spanner

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

Designated use

- lever and bonnet connections

Technical requirements

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

Technical illustration

Illustration 24: Pipe for large spanner

4.25 Folding rule

A folding rule is required for any measuring work.

Designated use

- measuring the outside dimensions of packaging

Technical requirements

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

Technical illustration

Illustration. 32: Folding rule

4.26 Glass plate

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

Designated use

- re-lapping discs

Technical requirements

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

Technical illustration

Illustration 17:Glass plate

4.27 Lapping stamp

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

Designated use

- relapping seats and nozzles

Technical illustration

Technical requirements (1)

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

Technical requirements (2)

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

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

4.28 Lapping pastes

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

Designated use

- lapping discs

Technical requirements

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

Technical illustration

Illustration 15: Lapping paste

4.29 Monocrystalline diamond powder

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

Designated use

- re-lapping seats and discs

Technical requirements

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

Technical illustration

Illustration 16:
Monocrystalline diamond powder

4.30 Assembly grease for threads

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

Designated use

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

Technical requirements

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

Technical illustration

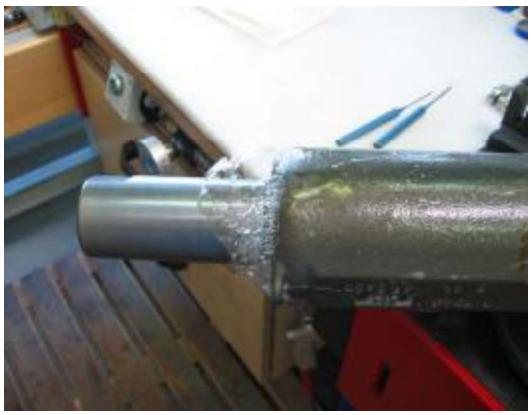
Illustration 12: Molikote

4.31 Leak detection spray

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

Designated use

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



Technical requirements

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

Technical illustration

Illustration 13: Leak detection spray

Internet	www.guepo.de

4.32 LESER paint, blue

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

Designated use

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

Technical requirements

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

Technical illustration

Illustration 14: LESER blue paint

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

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

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4 Qualified fitting personnel

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

5 General Information

Observe the safety regulations and warnings on the packaging.

6 Operating materials and supplies

Lapping paste - Tetrabor

Grit size 320
600
800
1200

Monocrystalline diamond powder - material number N145

Grit size 1.5 – 3 µm

Assembly grease

Molykotepaste – D Paste
Klübersynth UH1 14-151

Halocarbon oil

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

Superglue

Delo-Ca
Delo-ML 5449 anaerobic high temperature resistant

Leak detection spray

Güpoflex for gas & compressed air

Quickleen – universal cleaner

Screw glue – LocTITE 222

Type 526 API

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Contents

1 Purpose

This LESER Global Standard (LGS) describes the disassembly procedure for a LESER safety valve type 526 API.

2 Scope

This document must be applied to the dismantling an API safety valve in agencies and subsidiaries of LESER GmbH & Co. KG.

3 Disclaimer

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

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4 Qualified fitting personnel

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 process.

6 General illustration

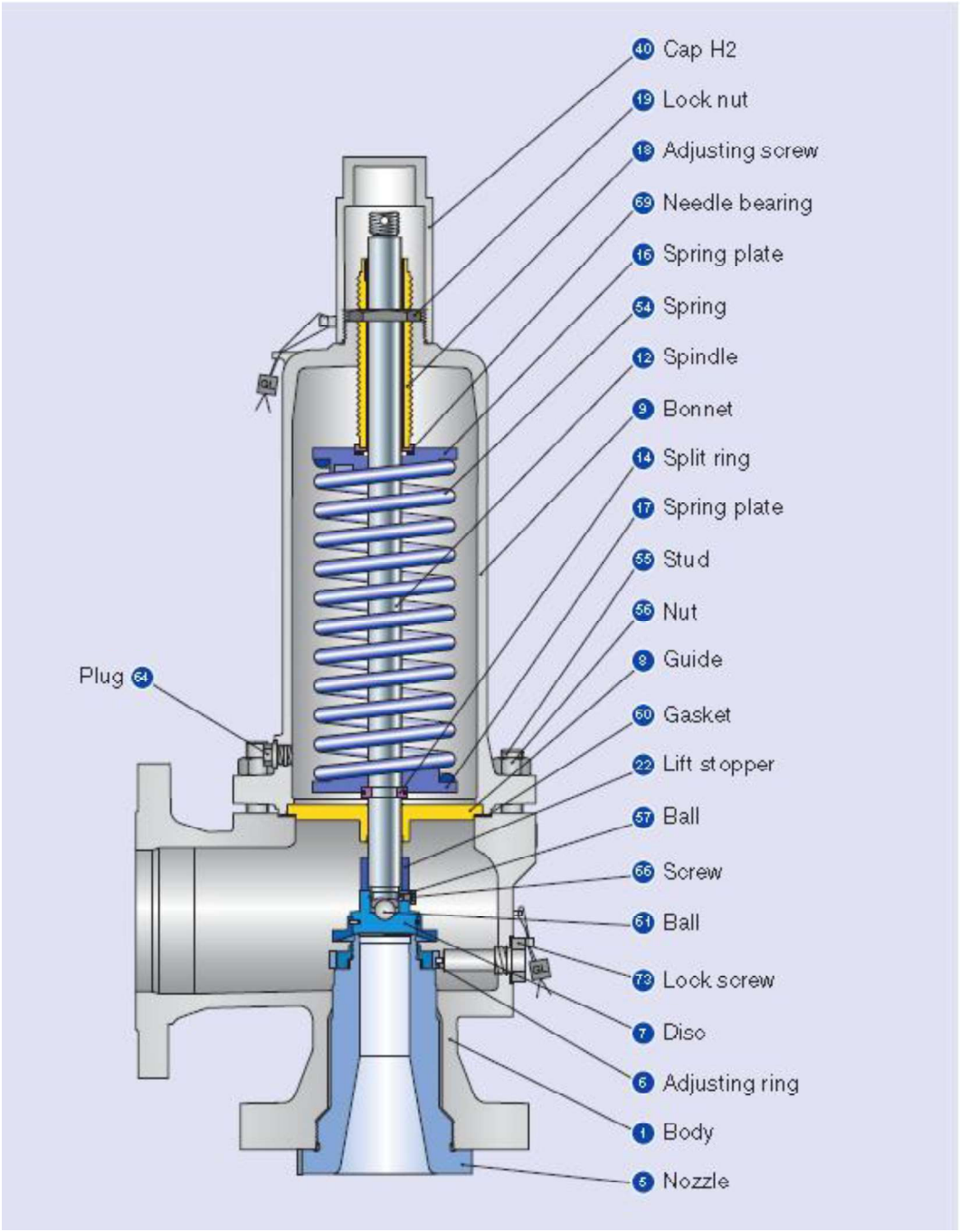


Figure 6-1: Cross-sectional view of type 526

7 Dismantling type 526

7.1 Dismantling caps and lever

7.1.1 Dismantling cap H2

Illustrations	Description	Aids / Tools
 Figure 7.1.1-1	Loosen cap with a spanner and screw off.	Open-end spanner

7.1.2 Dismantling lever H3

Illustrations	Description	Aids / Tools
 Figure 7.1.2-1	Remove retaining washers	
 Figure 7.1.2-2	Pull out the pin and lever.	

Illustrations	Description	Aids / Tools
 Figure 7.1.2-3	Loosen the clamping screw and screw the cap off.	Ring spanner
 Figure 7.1.2-4	Completely unscrew the screw and remove the plastic ball.	
 Figure 7.1.2-5	Remove retaining clip and pin. Pull spindle cap off the spindle.	

7.1.3 Dismantling lever H4

Illustrations	Description	Aids / Tools
 Figure 7.1.3-1	Loosen lever with open-end spanner and screw it off. Remove spacer rings.	Open-end spanner
	Remove the retaining clip and pin. Pull the spindle cap off the spindle.	

Figure 7.1.3-2		

7.2 Dismantling lift indicator

Illustrations	Description	Aids / Tools
 Figure 7.2-1	Loosen the lock nut of the lift indicator Loosen first nut and screw out the lift indicator.	

7.3 Removing the test gag (possible for H2 and H4)

Illustrations	Description	Aids / Tools
 Figure 7.3-1	Loosen and unscrew the screw. Remove sealing ring from the screw.	Open-end spanner

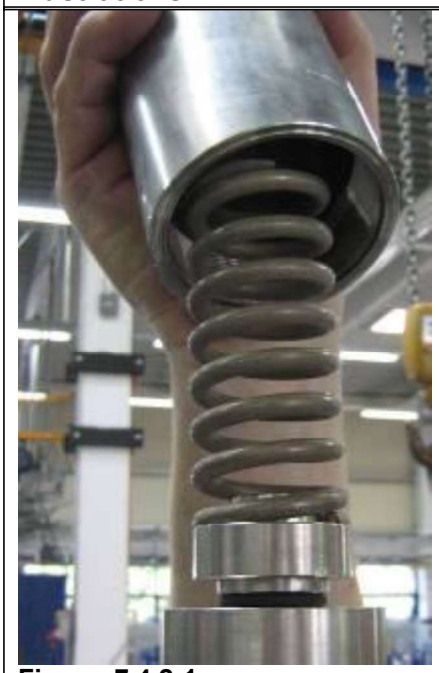
7.4 Dismantling the O-ring damper

7.4.1 Dismantling O-ring damper H2

Illustrations	Description	Aids / Tools
 Figure 7.4.1-1	Loosen the cap and unscrew it from the bonnet.	Open-end spanner
 Figure 7.4.1-2	Remove the retaining spring from the opposite ring.	
 Figure 7.4.1-3	Remove the opposite ring from the support sleeve (1)	

Illustrations	Description	Aids / Tools
 **Figure 7.4.1-4**	Pull O-ring off the spindle over the support sleeve (2).	
 **Figure 7.4.1-5**	Remove the support sleeve from the spindle (3).	

7.4.2 Dismantling O-ring damper H4

Illustrations	Description	Aids / Tools
 Figure 7.4.2-1	Loosen cap and screw it off.	
 Figure 7.4.2-2	Remove spring, first O-ring, support sleeve, opposite ring and second O-ring from the spindle.	

Illustrations	Description	Aids / Tools
 **Figure 7.4.2-3**	Remove the retaining clip and pin. Pull the spindle cap off the spindle.	
 **Figure 7.4.2-4**	Individual parts of the O-ring damper	

7.5 Pressure spring and adjusting screw disassembly

Illustrations	Description	Aids / Tools
 **Figure 7.5-1**	Remove lock nut from adjusting screw.	Open-end spanner
 **Figure 7.5-2**	Secure the spindle from turning with a pin punch. Apply the open-end spanner in a clockwise direction until no more pressure can be felt from the spring.	Pin punch Open-end spanner
 **Figure 7.5-3**	Screw adjusting screw out of the bonnet	

Illustrations	Description	Aids / Tools
 **Figure 7.5-4**	Unscrew the lock nut.	
 **Figure 7.5-5**	Remove plastic bushing	

7.6 Dismantling the bonnet

Illustrations	Description	Aids / Tools
 Figure 7.6-1	Loosen the nuts and unscrew them from the studs. Lift the bonnet off the bolts.	Open-end spanner

7.7 Dismantling spindle/disc assembly

7.7.1 Removing the assembly (with stainless steel bellows)

Illustrations	Description	Aids / Tools
 Figure 7.7.1-1	Pull the top spring plate and axial needle-bearing (if applicable) off the spindle. Remove the spring and bottom spring plate one after the other.	

Illustrations	Description	Aids / Tools
 **Figure 7.7.1-2**	Lift the spindle/disc/cooling zone/guide washer out of the body.	
 **Figure 7.7.1-3**	Remove the retaining clip and half-washers from the spindle.	
 **Figure 7.7.1-4**	Unscrew the clamping screw.	Ring spanner

Illustrations	Description	Aids / Tools
 **Figure 7.7.1-5**	Take the small balls out of the disc.	
 **Figure 7.7.1-6**	Pull the cooling zone off the spindle. The spindle and bellows cannot be disassembled because they are glued together.	⚠

7.7.2 Dismantling spindle/disc assembly (without bellows)

Illustrations	Description	Aids / Tools
 Figure 7.7.2-1	Remove the top spring plate, spring and bottom spring plate from the spindle one after the other. Lift the spindle with the guide washer out of body.	
 Figure 7.7.2-2	Remove the retaining clip and half-washers from the spindle. Pull the guide washer off the spindle.	
 Figure 7.7.2-3	Remove the lift stopper from the spindle, if applicable.	

Illustrations	Description	Aids / Tools
 **Figure 7.7.2-4**	Loosen and unscrew the clamping screw. Shake out the small ball.	Ring spanner
 **Figure 7.7.2-5**	Take the ball out of the disc.	

7.8 Dismantling the disc assembly

7.8.1 Metallic seal

Illustrations	Description	Aids / Tools
 Figure 7.8.1-1	Unscrew the retaining ring with the C-spanner.	Hook spanner
 Figure 7.8.1-2	Remove lifting aid from disc body	

7.8.2 O-ring seal

Illustrations	Description	Aids / Tools
 **Figure 7.8.2-1**	Loosen nut and screw it off.	Open-end spanner
 **Figure 7.8.2-2**	Disc with washer and O-ring	
 **Figure 7.8.2-3**	Remove retainer and O-ring	
 **Figure 7.8.2-4**	Individual parts of the disc assembly with O-ring	

7.8.3 Disc disassembly with sealing plate

Illustrations	Description	Aids / Tools
 **Figure 7.8.3-1**	Loosen nut and screw it off.	Open-end spanner
 **Figure 7.8.3-2**	Remove the retainer from the sealing plate.	
 **Figure 7.8.3-3**	Take the sealing plate out of the disc.	
 **Figure 7.8.3-4**	Individual parts of the disc assembly with sealing plate	

7.9 Unscrewing the locking screw and screw plug

Illustrations	Description	Aids / Tools
 **Figure 7.9-1**	Loosen and remove the screw plug from the side of the body.	Open-end spanner
 **Figure 7.9-2**	Loosen and remove the locking screw from the back part of the body.	Open-end spanner
 **Figure 7.9-3**	Remove the spacer from each of the two screws.	

7.10 Removing the studs from the body

Illustrations	Description	Aids / Tools
 **Figure 7.10-1**	Remove studs with impact wrench. **Tip:** Place the guide washer on the opening of the body so that no studs can fall on the seat.	Impact wrench

7.11 Dismantling the nozzle and blow down ring

Illustrations	Description	Aids / Tools
 Figure 7.11-1	Completely unscrew the blow down ring from the nozzle.	
 Figure 7.11-2	Remove nozzle with C-spanner (put a small protective slab between the nozzle and C-spanner).	Hook spanner
 Figure 7.11-3	Unscrew nozzle from the body.	

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.

LESER GmbH & Co. KG reserves the right to change the information contained in this document, which is for the products of LESER GmbH & Co. KG and is intended for LESER subsidiaries, at any time and without prior announcement.

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

4 Qualified fitting personnel

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

5 General Information

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

6 Cleaning repaired valves

6.1 Blast cleaning

Stainless steel valves - glass bead blast cleaning

Cast steel - sand or bead blast cleaning

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

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

Figure 6.1-1: Flange covering, plastic

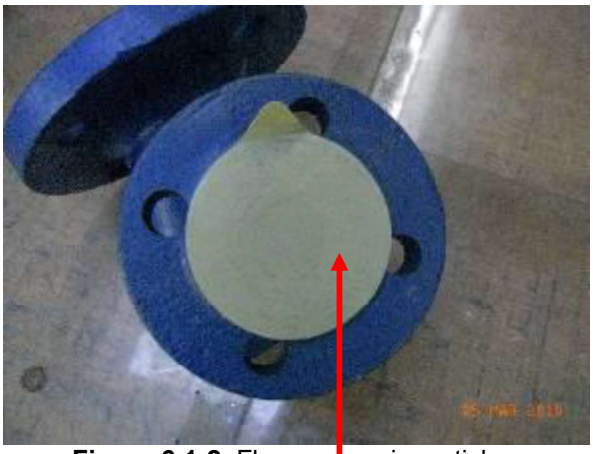


Figure 6.1-2: Flange covering, sticker

6.2 Brushing

The inside parts and inside of the body and bonnet are to be cleaned with a wire-cup brush and drill / pneumatic grinder until they are clean - until all soiling is removed.

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

6.3 Washing

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

Figure 6.3-1

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

Figure 6.3-2

WRONG

Figure 6.3-3

RIGHT

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

7 Handling the components

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

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

Figure 7-1

Wet gloves must be replaced with dry ones.

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

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

7.1 Exceptions:

The requirement for gloves is removed in the following cases:

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

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

7.2 Process overview

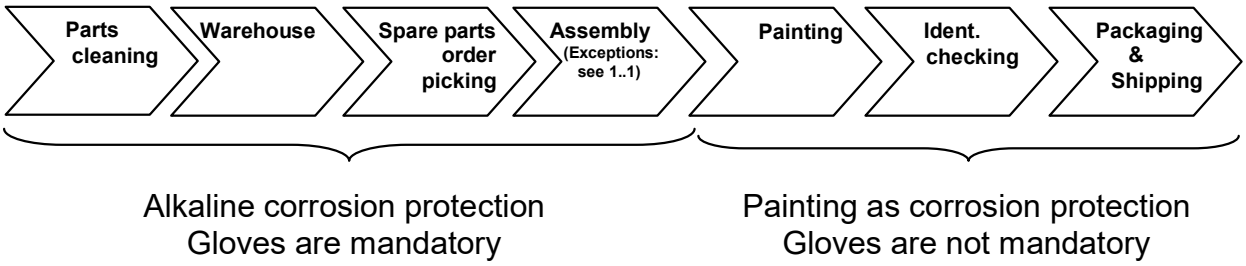


Figure 7.1-1

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

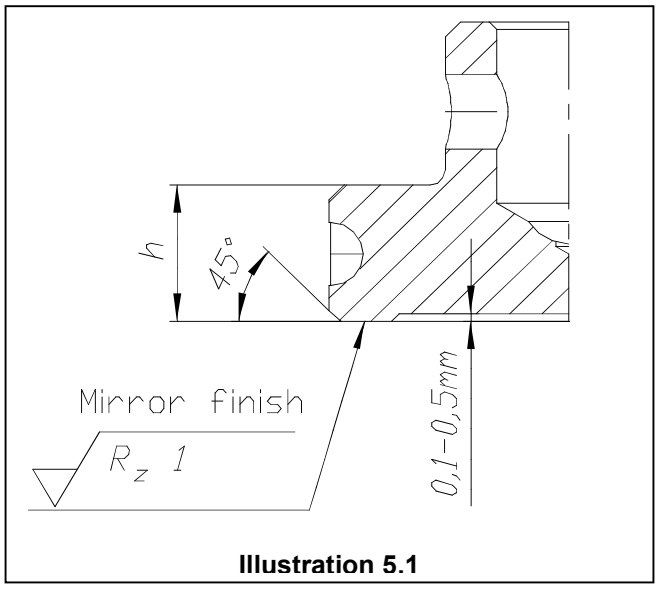


Illustration 5.1

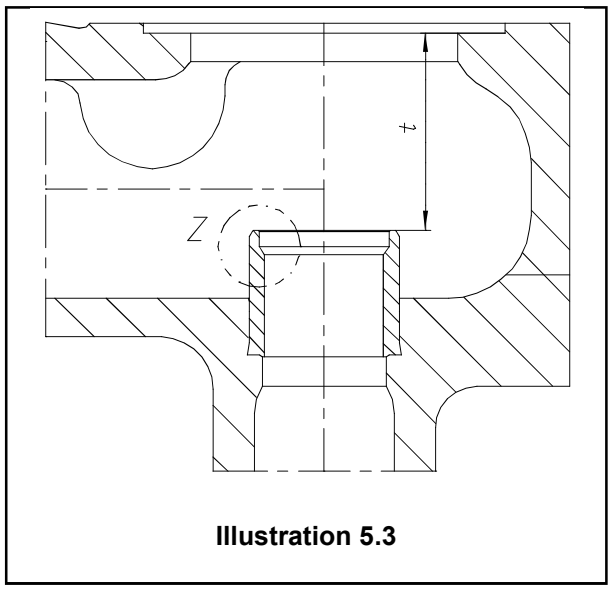


Illustration 5.3

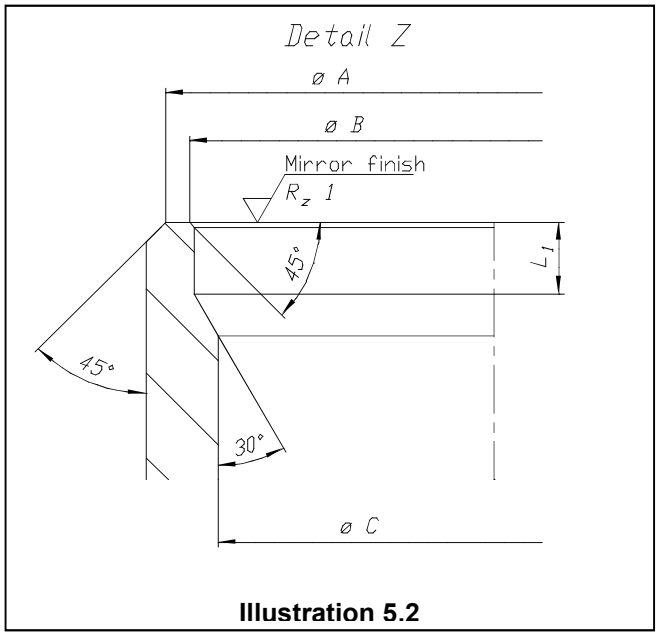


Illustration 5.2

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				Refinishing of disc	
			Seat depth T [mm]	Tolerance for t [mm]	B ∅ [mm]	A ∅ [mm]	Boundary height h [mm]	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.

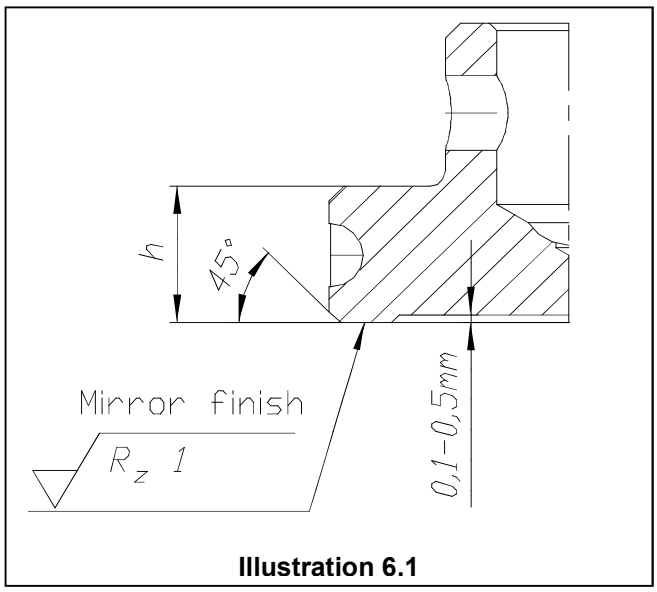


Illustration 6.1

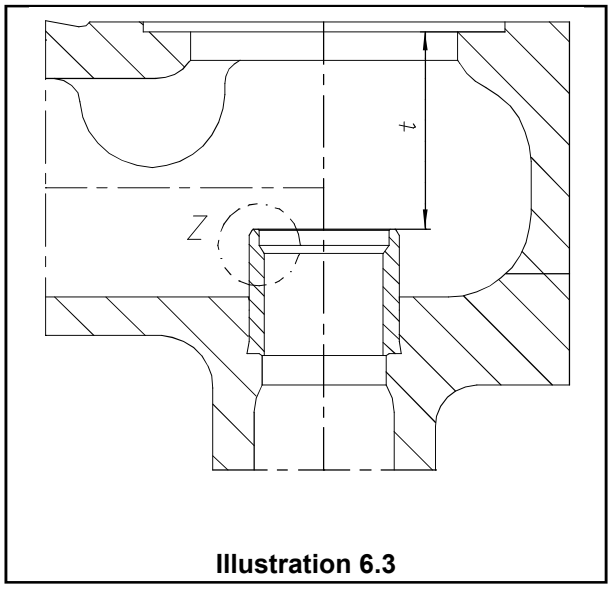


Illustration 6.3

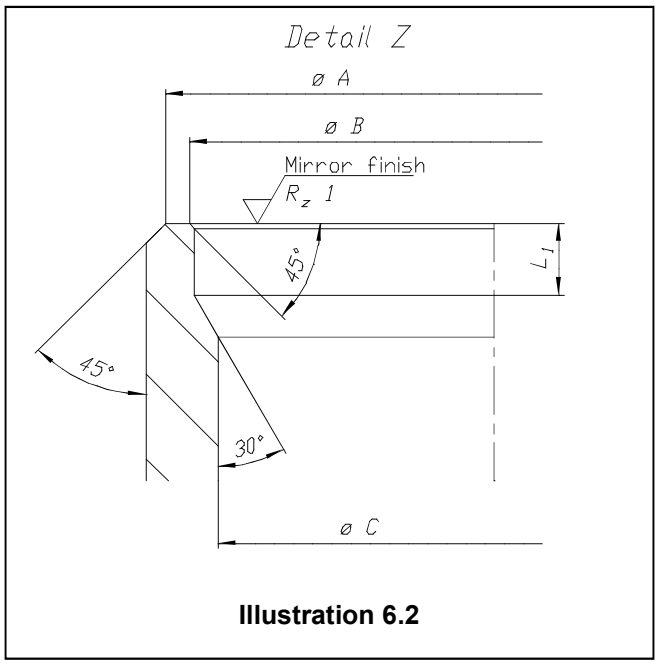


Illustration 6.2

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				Refinishing of disc	
			Seat depth t [mm]	Tolerance for t [mm]	B ∅ [mm]	A ∅ [mm]	Boundary height h [mm]	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.

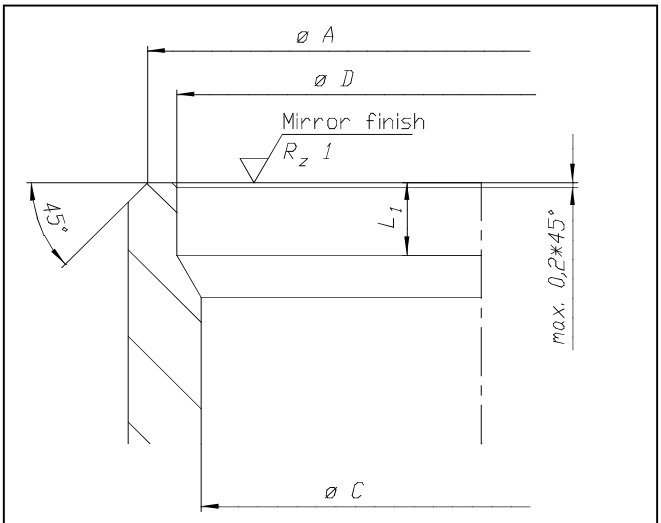


Illustration 7.1

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.

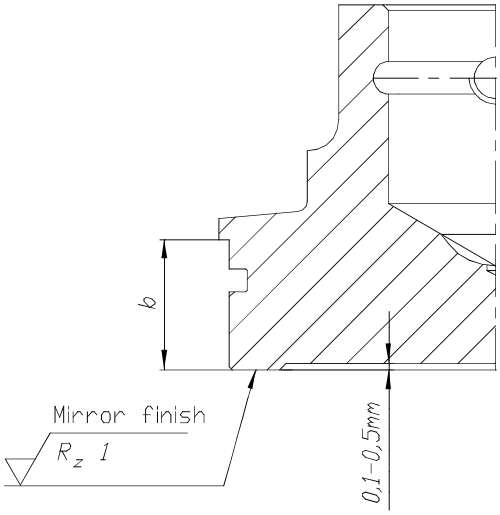


Illustration 8.1

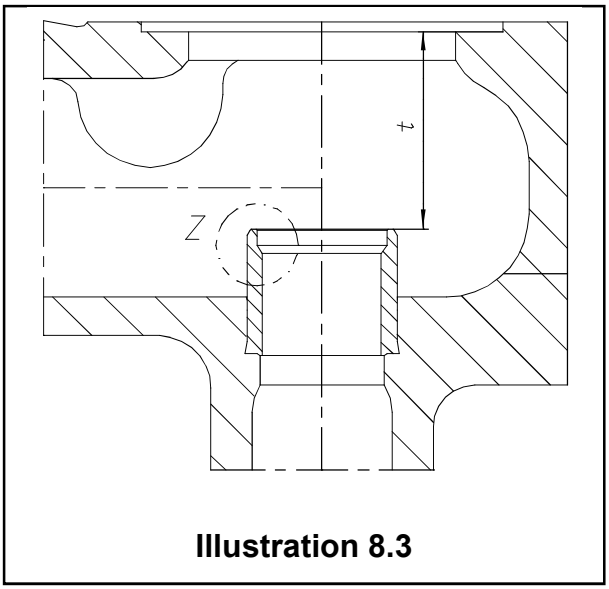


Illustration 8.3

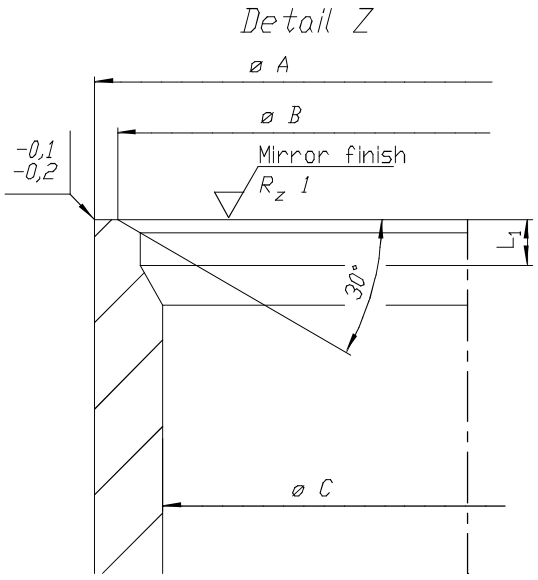


Illustration 8.2

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.

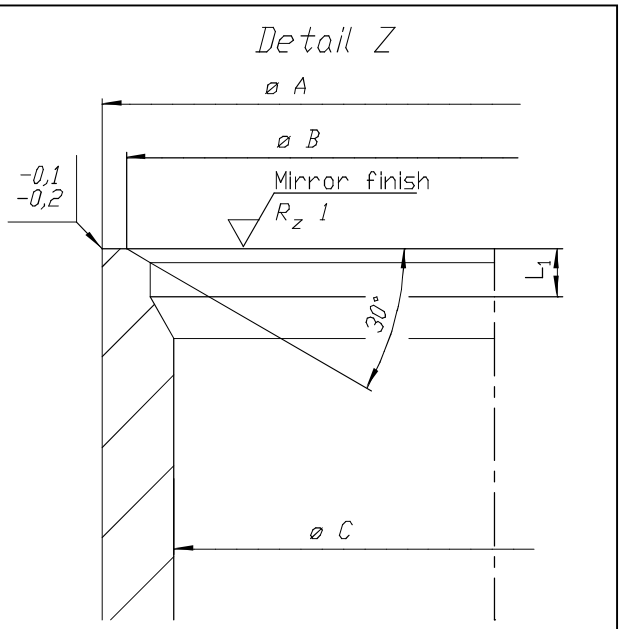


Illustration 9.1

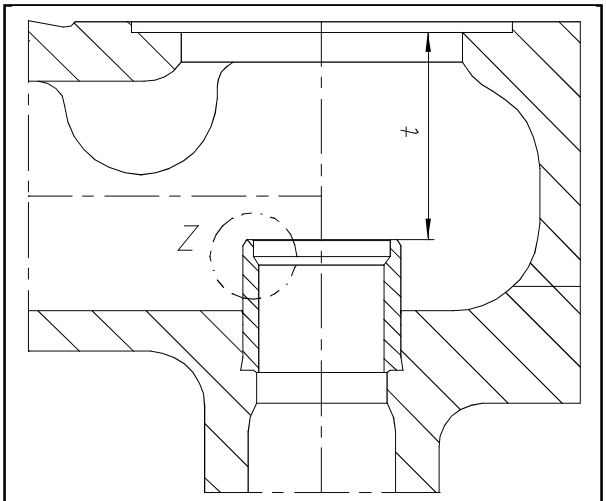


Illustration 9.2

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.

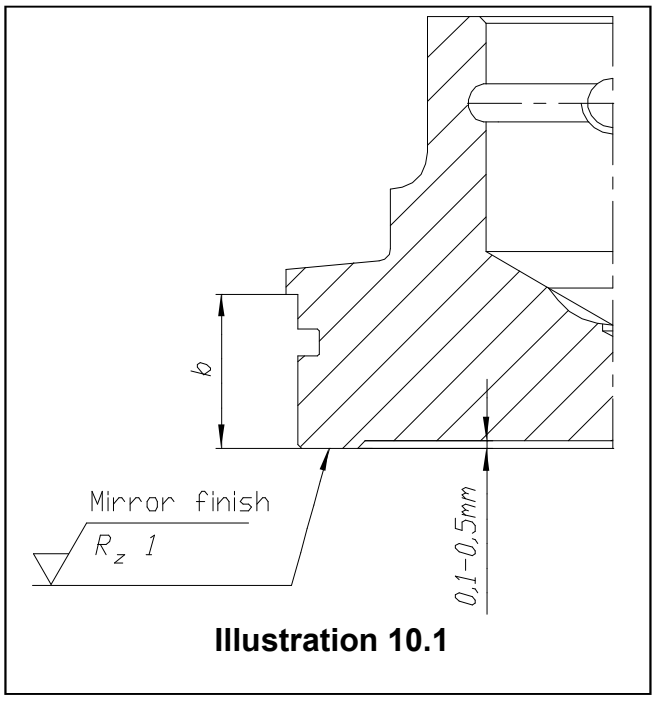


Illustration 10.1

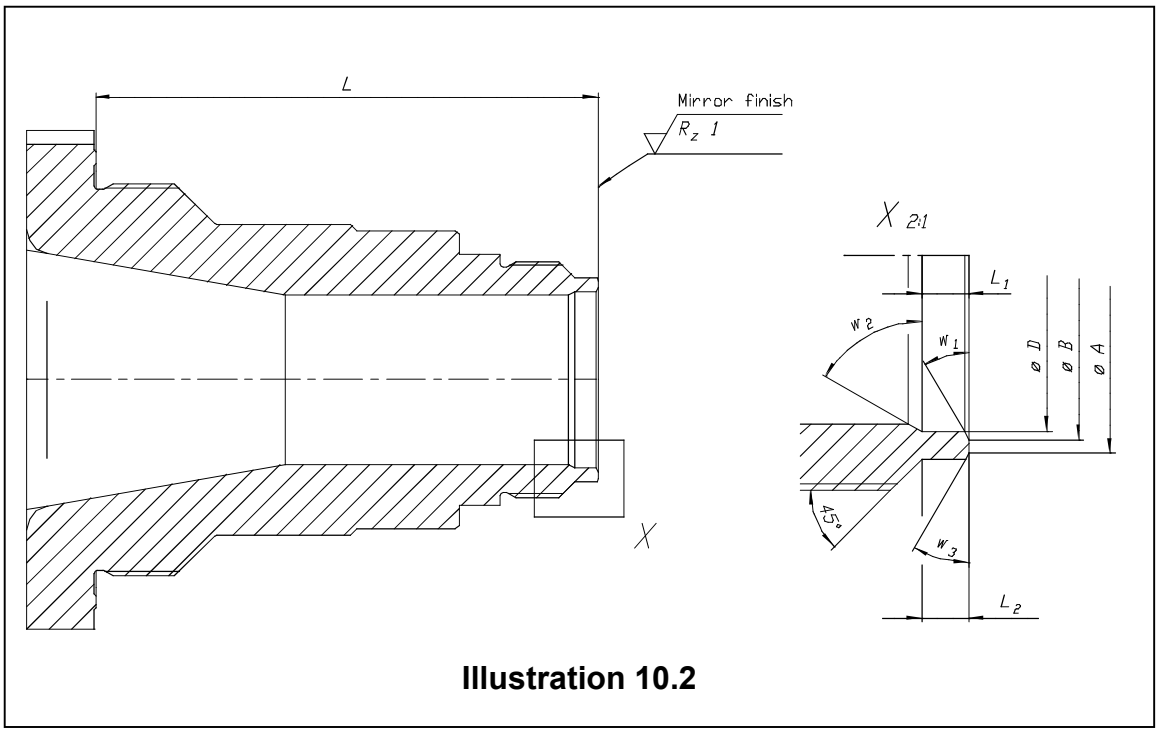


Illustration 10.2

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.

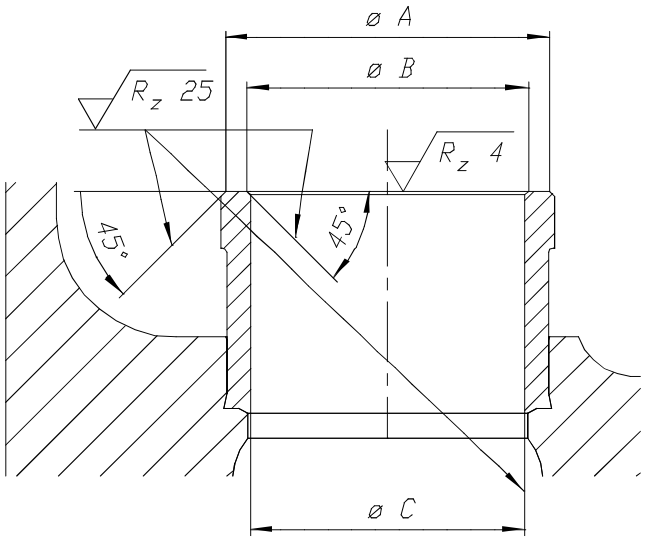


Illustration 11.1

Table 11.1: flat sealing O-ring disc

C	B	A
closest flow area do [mm]	**inner seat chamfer ∅ [mm]**	**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.

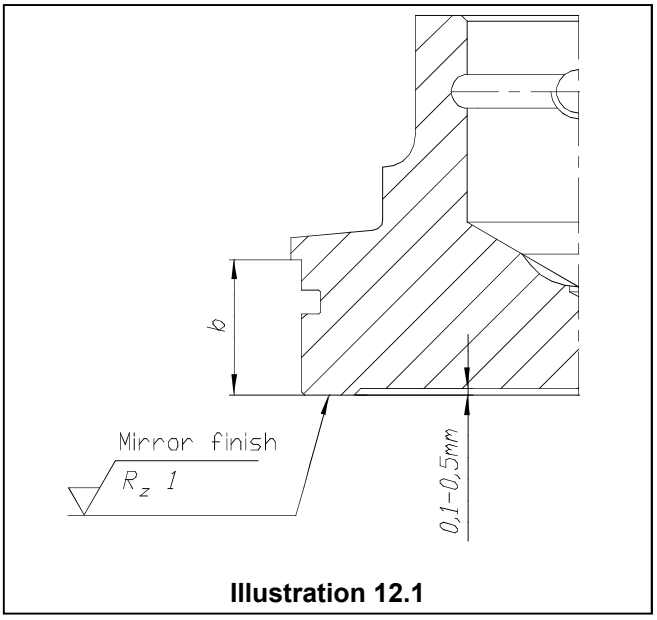


Illustration 12.1

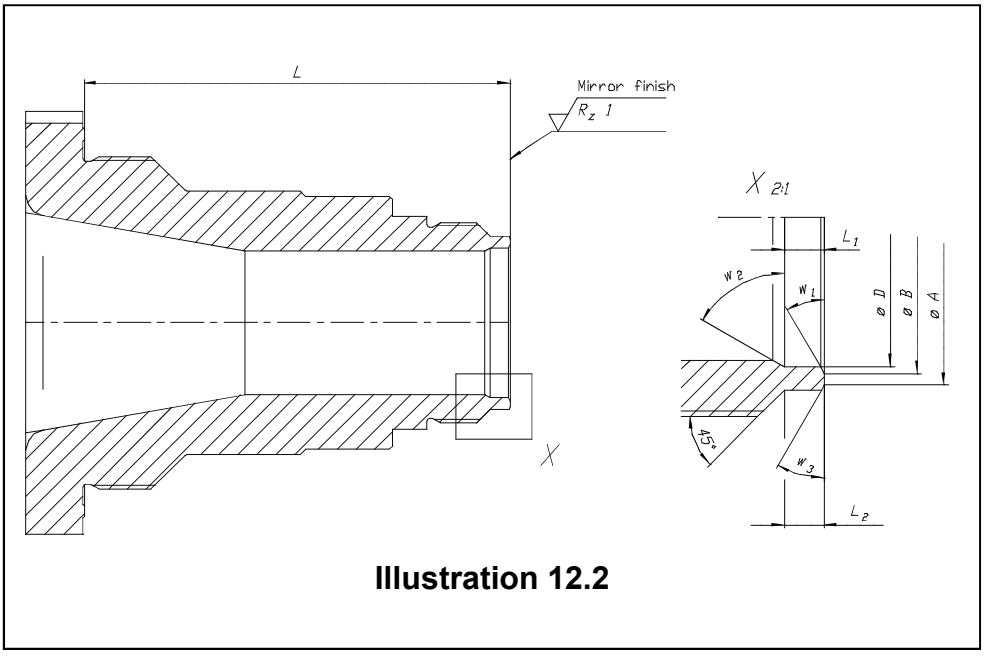


Illustration 12.2

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

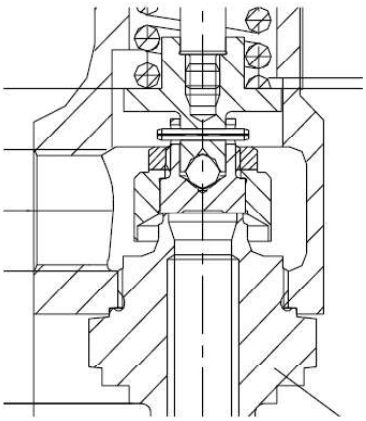
Orifice	Size	Pressure range Inlet / Outlet [lbs]	Seat										Disc	
			Diameter			Length				Angle				
			A Ø [mm]	B Ø [mm]	D Ø [mm]	L [mm]	L_1 [mm]	L_2 [mm]	Tolerance L; L_1; L_2 [mm]	W_1 [°]	W_2 [°]	W_3 [°]	b [mm]	Tolerance [mm]
E	1"x2"	300 x 150	$19,6^{+0,2}$	$18,0_{-0,2}$	17,4	87,3	10,0	-	- 0,2	45,0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

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

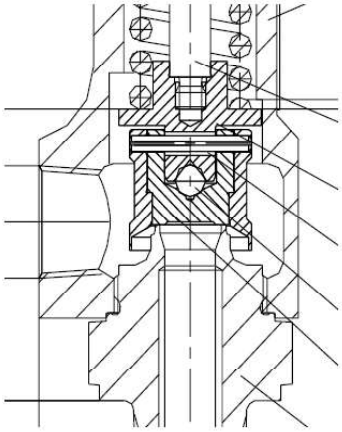
Since 2007 the types 437 do6 + 10 have been converted to the new metal-to-metal disc design. The “old” disc design is not available as spare part at LESER. Instead LESER will offer conversion kits to change over to the new design. For detailed information please ask LESER sales.

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

Old:



New:



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

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

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

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

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

Table 13.1: Seat and disc type 437

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

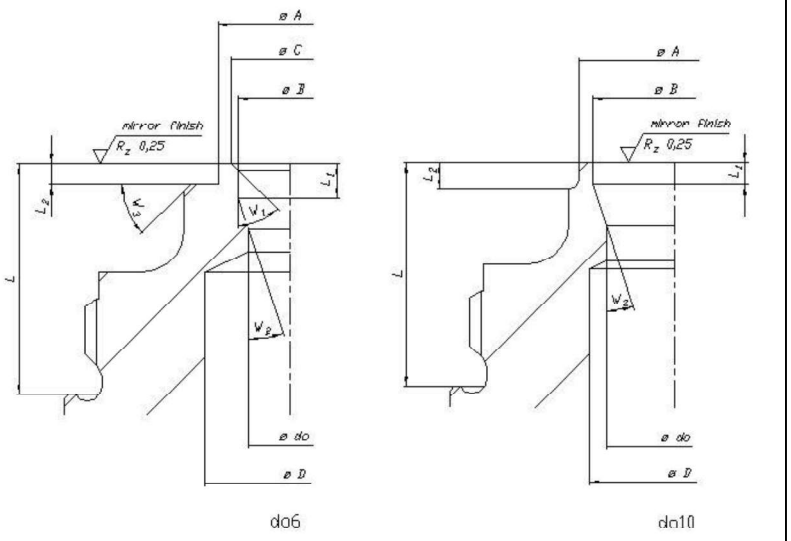


Illustration 13.1

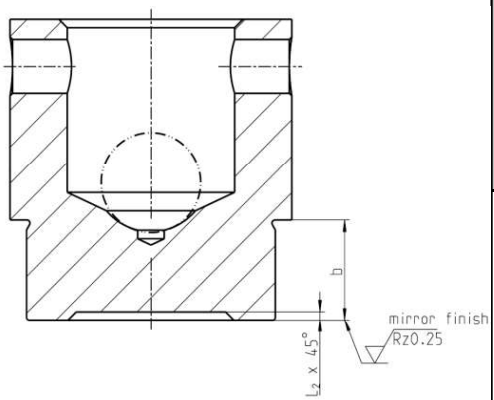


Illustration 13.2

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

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

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

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

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

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

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

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

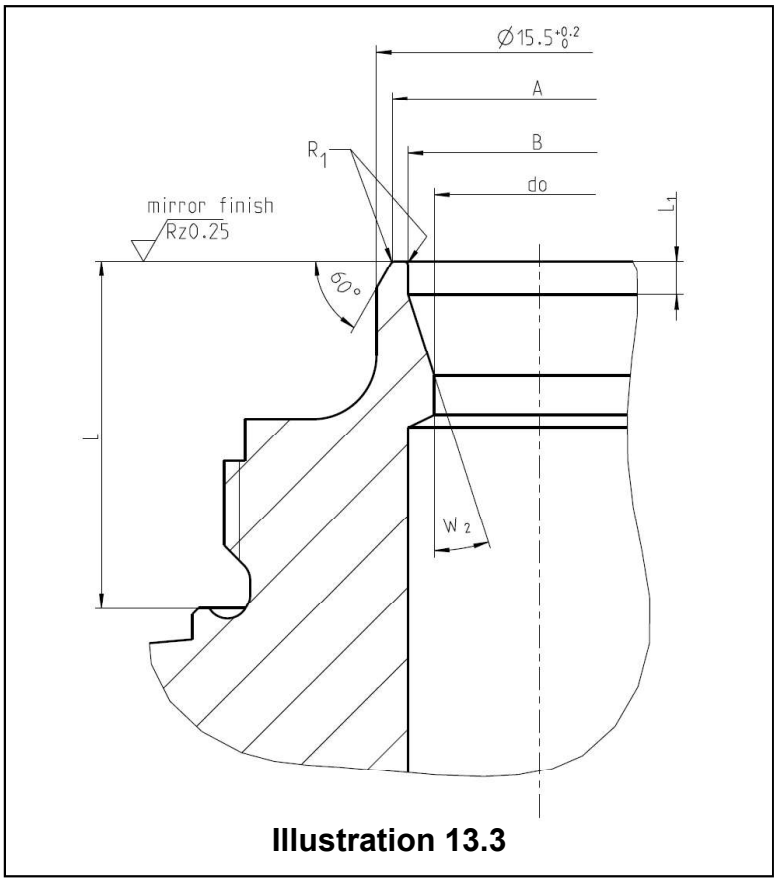


Illustration 13.3

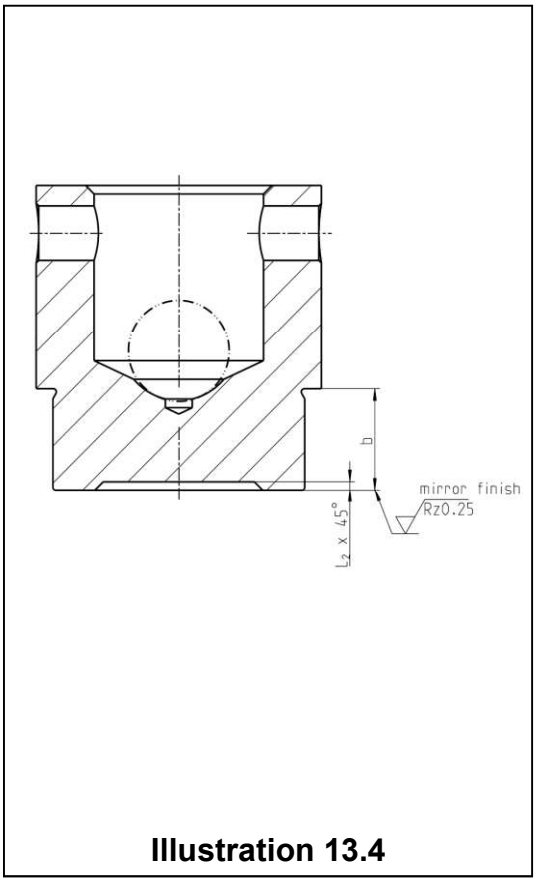


Illustration 13.4

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

Rework shall be done according to illustration 14.1 and table 14.1

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

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

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

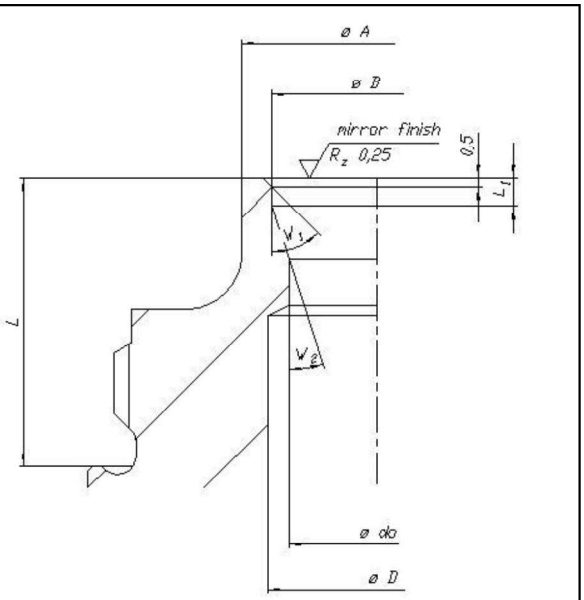


Illustration 14.1

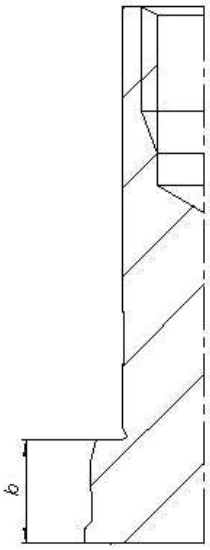


Illustration 14.2

Table 14.1: seats and discs type 438

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

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

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

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

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

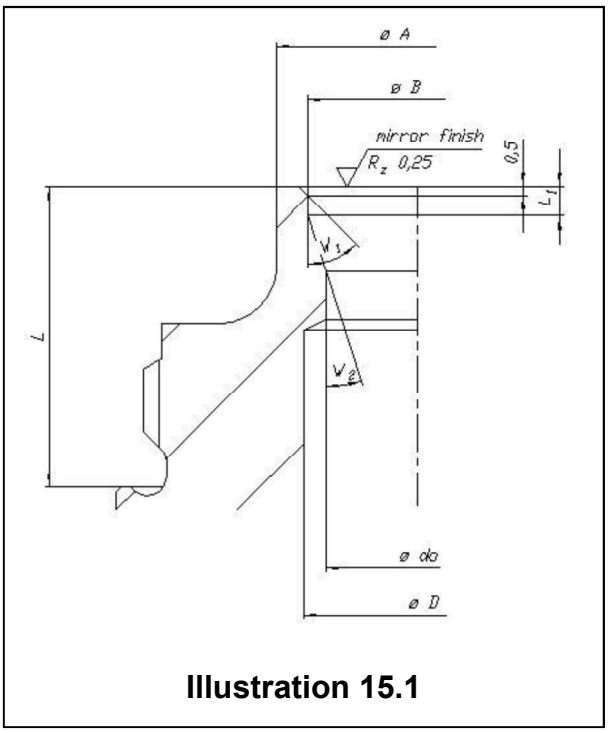


Illustration 15.1

Table 15.1: seats and discs type 439

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

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).

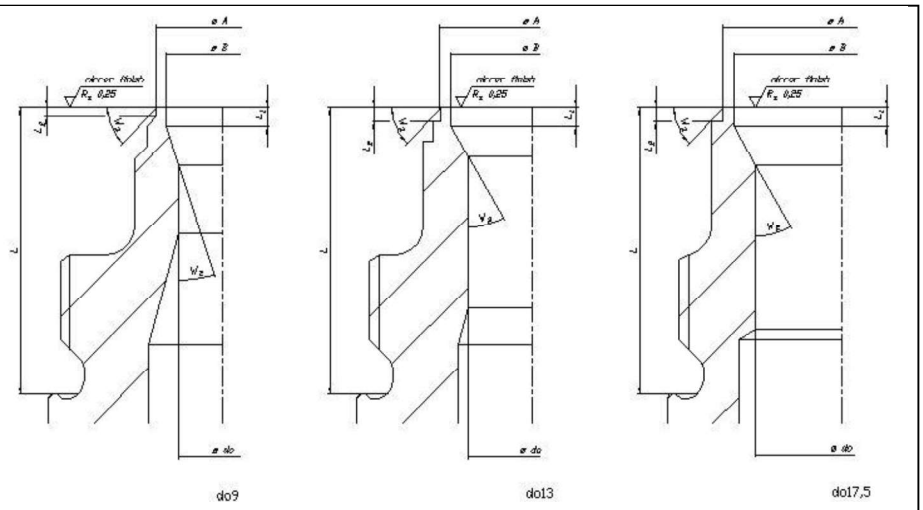


Illustration 16.1

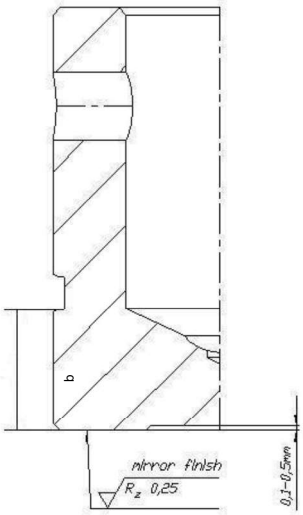


Illustration 16.2

Table 16.1: seats and discs type 459

do	Seat									Disc	
	Diameter		Length				Angle			b	Tolerance b
	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 [°]	[mm]	[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.

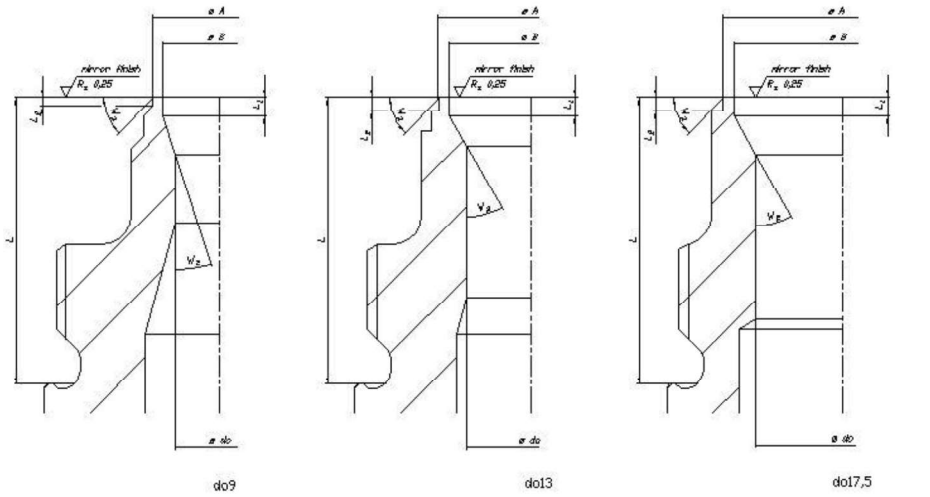


Illustration 17.1

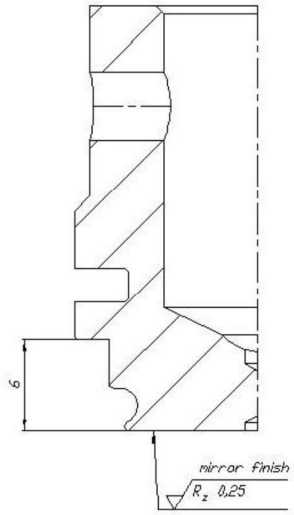


Illustration 17.2

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

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

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

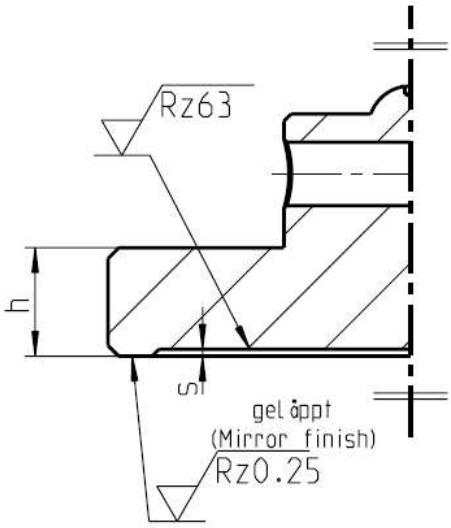


Illustration 18.1: Steel disc

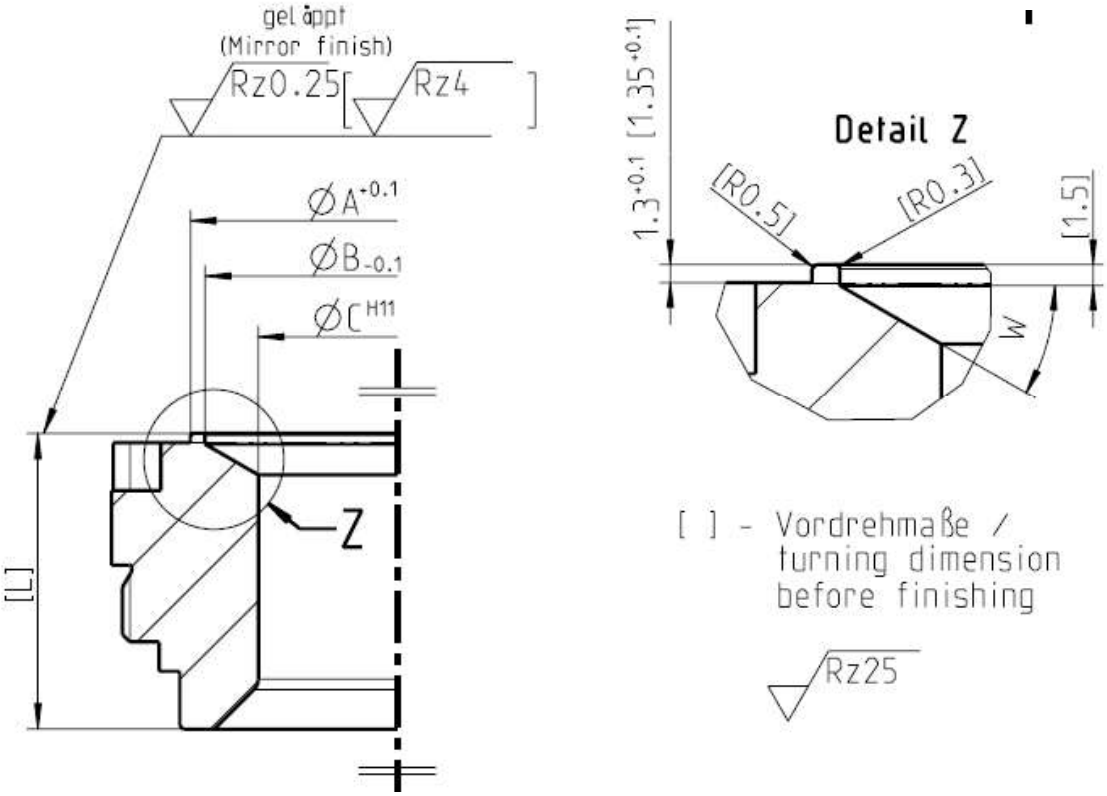


Illustration 18.2: Seat (semi-nozzle)

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

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

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

Contents

1 Purpose

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

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

5 Qualified fitting personnel

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

6 General Information

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

7 Reworking the of the working surfaces

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

8 Re-lapping

8.1 Re-lapping seat and disc sealing surfaces

8.1.1 Lapping with the lapping stamp.

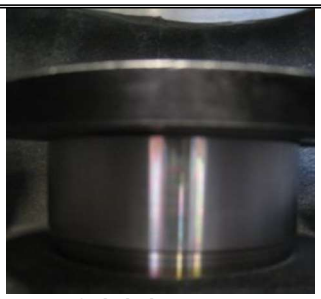
Illustrations	Description	Aids / Tools
 **Figure 8.1.1-1**	The lapping stamp is to be used for reworking damage on the seat sealing surface. Lapping paste and oleic acid must be applied to the lapping stamp. Select the lapping paste depending on the degree of damage. The more severe the damage is, the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

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

8.1.2 Re-lapping with a glass plate

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

8.1.3 Re-lapping the nozzle and the disc

Illustrations	Description	Aids / Tools
 Nozzle **Figure 8.1.3-1**	Re-lapping of the nozzle and the disc is performed separately on a glass plate. 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.

Inhalt

1 Purpose

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

2 Range of application

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

3 References

None

4 Introduction

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

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

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

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

5 Body and bonnet connection

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

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

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

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

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

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

5.1 Type 48x Clamp rings and Split-rings

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

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

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

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

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

6 Caps and lifting devices

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

Table 3: Caps and lifting devices (sealing torque)

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

n.a. Gasket not available for this size

7 Test Gag

7.1 Short locking screws

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

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

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

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

7.2 Long locking screws

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

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

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

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

7.3 Long locking screw as transport locking device

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

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

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

8 Screwed plugs, locking screws (metal sealing)

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

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

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

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

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

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

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

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

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

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

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

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

Inhalt

1 Zweck / Purpose

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

2 Gültigkeitsbereich / Range of application

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

3 Referenzen / References

LGS 3325

4 Geltungsbereich

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

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

4 Range of application

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

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

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

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

Tabelle 1 / *table 1*

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

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

Tabelle 2 / *table 2*

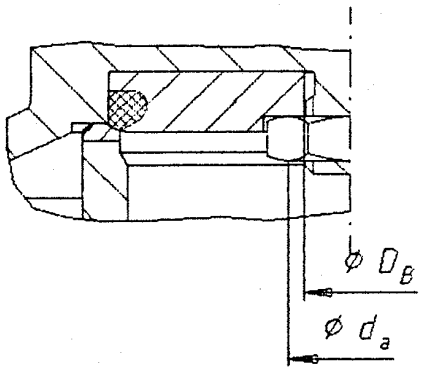


Bild 1

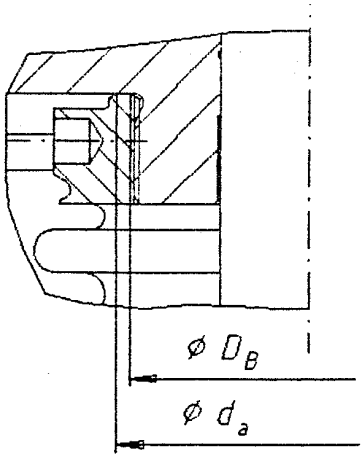


Bild 2

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

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

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

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

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

Formel (2) in (1):

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

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

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

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

d_2: Flankendurchmesser des Gewindes in mm.

P: Steigung des Gewindes.

d_a, D_B: Siehe Bilder 1 und 2.

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

Type 526 API

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author:	Nieh	released by:	KUW	replaces:	initial	status:	Published
resp. depart.:	IE	date of release:	06/14/18	revision No.:	2		
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Contents

1 Purpose

This LESER Global Standard (LGS) describes the assembly procedure for a LESER safety valve type 526 API.

2 Scope

This document must be applied to the assembly of an API safety valve in agencies and subsidiaries of LESER GmbH & Co. KG.

3 References

LGS 3325 (LWN 322-04)
WI 3308-08 (LWN 308-08)
LGS 3323 (LWN 322-03)
WI 3324-01 (LWN 324.01)

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

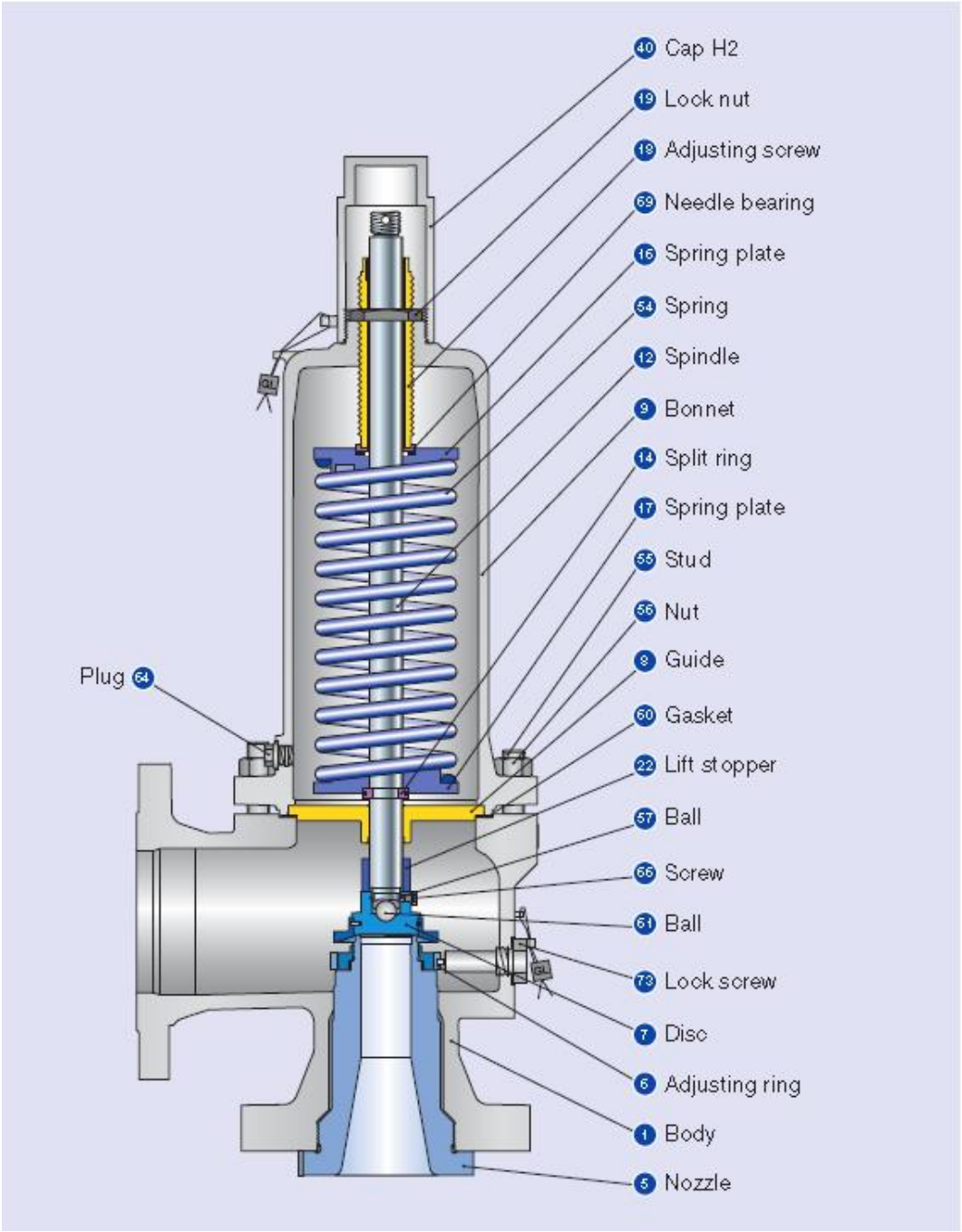


Figure 7-1: Cross-sectional view of API 526

8 Preparation for valve assembly

8.1 Emboss the punch numbers (if requested in the order).

Illustration	Description	Aids / Tools
 Figure 8.1-1	Emboss the code into the edge of the outlet flange (position of the code as per the work plan).	Hammer Punch numbers

9 Assembly of type 526

9.1 Assembly of the nozzle and blow down ring

Illustration	Description	Aids / Tools
 Figure 9.1-1	Grease sealing surface	Brush Assembly grease (Molykote Paste)

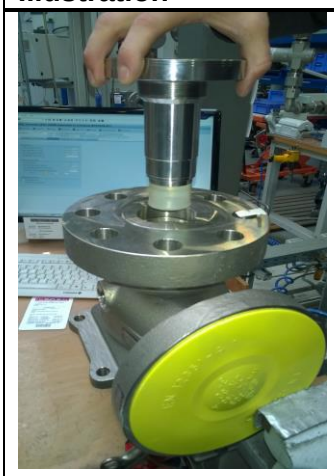
Illustration	Description	Aids / Tools
	While screwing the nozzle into the body, the protection of the nozzle should stay in place to secure the sealing surface against damage.	
 **Figure 9.1-2**	Screw nozzle into the body.	
 **Figure 9.1-3**	Tighten nozzle with C-spanner (put a small protective slab between the nozzle and C-spanner).	C-spanner with a nose

 Figure 9.1-4	Screw the blow down ring completely down to the nozzle.	

9.2 Screw the studs into the body.

Illustration	Description	Aids / Tools
 Figure 9.2-1	Screw in the studs with an impact wrench. **Tip:** Place the guide washer on the opening of the body so that no studs can fall on the seat.	Impact wrench

9.3 Installation of the locking screw and screw plug

Illustration	Description	Aids / Tools
 Figure 9.3-1	Grease the locking screw and screw plug.	Brush Halocarbon (OI-56 S / 60H)

 **Figure 9.3-2**	Grease a spacer ring for each of the screws and put on as a seal.	

Illustration	Description	Aids / Tools
 **Figure 9.3-3**	Screw the locking screw into the back section of the body and tighten.	Open-end spanner
 **Figure 9.3-4**	Screw the screw plug into the side of the body and tighten.	Open-end and ring spanner

9.4 Assembly of disc assembly

9.4.1 Metal seat

Illustration	Description	Aids / Tools
 **Figure 9.4.1-1**	Put disc body and lifting aid together and clamp in place.	Clamping block
 **Figure 9.4.1-2**	Insert retaining ring and tighten with C-spanner.	C-spanner with a nose

9.4.2 O-ring seal

Illustration	Description	Aids / Tools
 **Figure 9.4.2-1**	Individual parts of the disc assembly with O-ring seal	

Illustration	Description	Aids / Tools
 **Figure 9.4.2-2**	Wet O-ring with water and avoid any twisting when introducing it.	
 **Figure 9.4.2-3**	Insert retainer.	
 **Figure 9.4.2-4**	Screw nut onto neck and tighten. (Set torque as per LGS 3325).	Torque wrench with socket attachment Clamping block

Illustration	Description	Aids / Tools
 **Figure 9.4.2-5**	Secure the nut by hitting it with a centre punch	Centre punch Hammer
 **Figure 9.4.2-6**	Emboss the marking for the O-ring material according to WI 3308-08 .	Punch numbers Hammer

9.4.3 Disc with sealing plate

Illustration	Description	Aids / Tools
 **Figure 9.4.3-1**	Individual parts of the disc assembly with sealing plate	
 **Figure 9.4.3-2**	Put the sealing plate in the disc.	
 **Figure 9.4.3-3**	Put the retainer on the sealing plate.	
 **Figure 9.4.3-4**	Screw nuts onto studs and tighten (torque as per LGS 3325). Secure the nut by hitting it with a centre punch Emboss the marking for the sealing plate material according to WI 3308-08 .	Torque wrench with socket attachment Centre punch Hammer Punch numbers

9.5 Assembly of spindle/disc assembly

9.5.1 Assembly of spindle/disc assembly (without bellows)

Illustration	Description	Aids / Tools
 **Figure 9.5.1-1**	Insert the ball into the disc.	
 **Figure 9.5.1-2**	Push on spindle and insert small balls into the screw opening of the disc.	Possibly tweezers
 **Figure 9.5.1-3**	Screw in and tighten the clamping screw.	Ring spanner

Illustration	Description	Aids / Tools
 **Figure 9.5.1-4**	Put on lift stopper, if requested. (variable lift stopper; possibly determine in advance; see Chap. 10)	
 **Figure 9.5.1-5**	Push on guide washer. Put half-washers in the recess of the spindle and secure with a retaining clip.	
 **Figure 9.5.1-6**	Push the lower spring plate, the spring and the upper spring plate onto the spindle.	

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

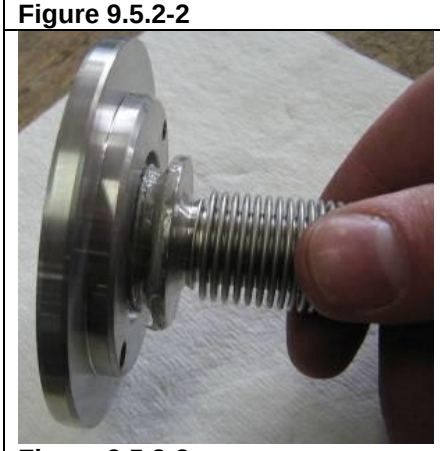
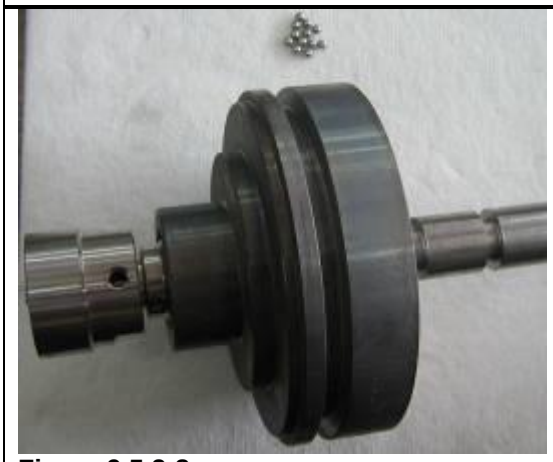
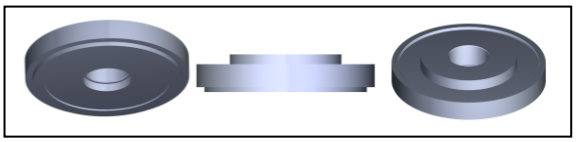
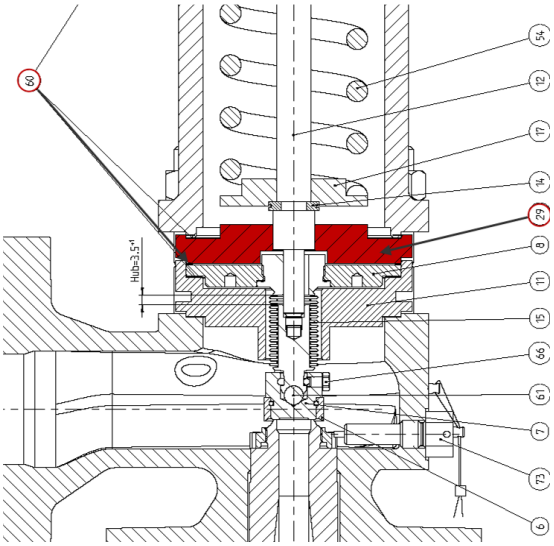
Illustration	Description	Aids / Tools
 **Figure 9.5.2-1**	Stainless steel bellows and guide washer	
 **Figure 9.5.2-2**	Grease the sealing surface and thread of the bellows.	Brush Assembly grease (Molykote Paste)
 **Figure 9.5.2-3**	Twist the guide washer onto the bellows. In some cases, larger bellows have an inside thread and are screwed on the corresponding outside thread of the guide washer.	
	Fix the guide washer in the vice and tighten it. (Torque as per LGS_3323)	

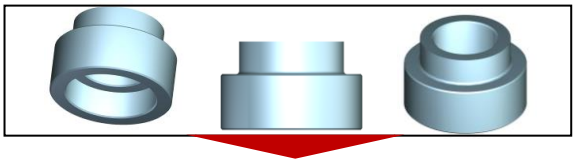
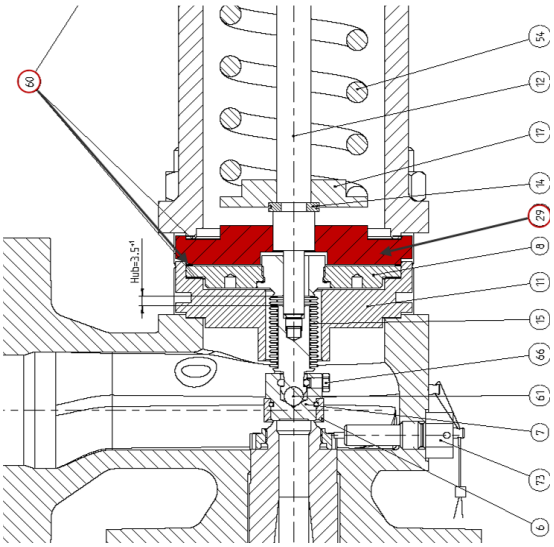
Illustration	Description	Aids / Tools
 **Figure 9.5.2-4**	Stainless steel bellows and guide washer	
 **Figure 9.5.2-5**	Sparingly apply one drop to the thread of the spindle.	Glue DELO ML 5327
 **Figure 9.5.2-6**	Quickly screw the spindle together with the bellows hand tight.	
 **Figure 9.5.2-7**	Put the cooling zone onto the spindle.	

Illustration	Description	Aids / Tools
 **Figure 9.5.2-8**	Put the disc on the spindle. Put the balls into the opening of the disc, or alternatively secure the disc with a pin (depending on the disc version).	
 **Figure 9.5.2-9**	Screw the clamping screw into the disc hole.	Ring spanner
 **Figure 9.5.2-10**	Put half-washer into the recess and secure with a retaining clip.	

9.5.3 Assembly spindle/disc-construction group (with stainless steel bellow and without balanced piston)

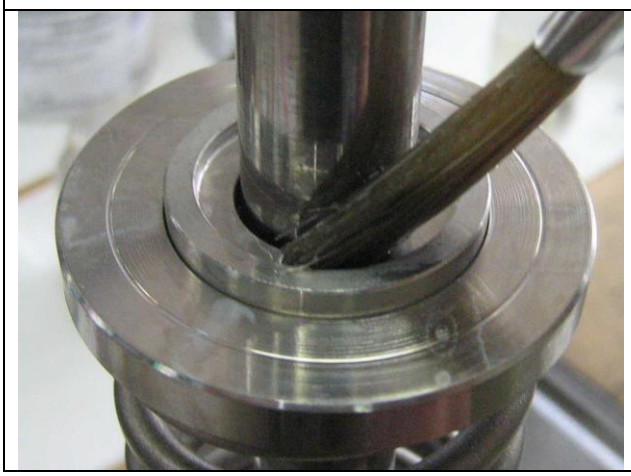
Balanced Piston 	Operate the assembly of the stainless steel bellow like in chapter: 9.5.2. up to incl. Figure 0-8. Then assembly balanced piston as follows.	
	(a) Put the sealing ring (pos.60) on the guide washer. (b) Afterwards push the balanced piston above the spindle. (pos.29)	
	Put half-washer into the recess and secure with a retaining clip.	

9.5.4 Assembly spindle/disc-construction group (with stainless steel bellow and balanced piston)

Balanced piston 	Operate the assembly of the stainless steel bellow like in chapter: 9.5.2. up to incl. Figure 0-8. Then assembly balanced piston as follows.	
	(a) Put the sealing ring (pos.60) on the guide washer. (b) Afterwards push the balanced piston above the spindle. (pos.29)	
	Put half-washer into the recess and secure with a retaining clip.	

9.5.5 Insert construction group (without bellow)

	Insert disc-/spindle construction group carefully into the body. While doing so press the guide washer down and lift the spindle slightly up, so that the disc does not land. Put the disc with the spindle carefully on the seat.	Fixture according to fixture catalogue
 	Put the spring and the upper spring disk on the lower spring disk.	

	If applicable, grease the axial needle roller on the top spring plate.	Brush Halocarbon (OI-56 S / 60H)
	Put the bearing washer on the axial needle roller and grease.	Brush Halocarbon (OI-56 S / 60H)

9.5.6 Inserting the spindle/disc assembly (with stainless steel bellows)

Illustration	Description	Aids / Tools
	Put the sealing into the body.	
	Insert the spindle/disc/cooling zone into the body. In the process, push the guide washer down and lift the spindle somewhat so that the disc does not touch down. Carefully put the disc with the spindle down on the seat.	

Figure 9.5.3-1

 **Figure 9.5.3-2**	Put the bottom spring plate, the spring and the top spring plate on one after the other.	

Illustration	Description	Aids / Tools
 Figure 9.5.3-3	If applicable, grease the axial needle roller on the top spring plate.	Brush Halocarbon (OI-56 S / 60H)
 Figure 9.5.3-4	Put the bearing washer on the axial needle roller and grease.	Brush Halocarbon (OI-56 S / 60H)

9.6 Assembly of the bonnet

Illustration	Description	Aids / Tools
 Figure 9.6-1	Put the bonnet on the studs. Screw nuts onto the studs and tighten. (Set torque as per LGS 3323).	Torque wrench

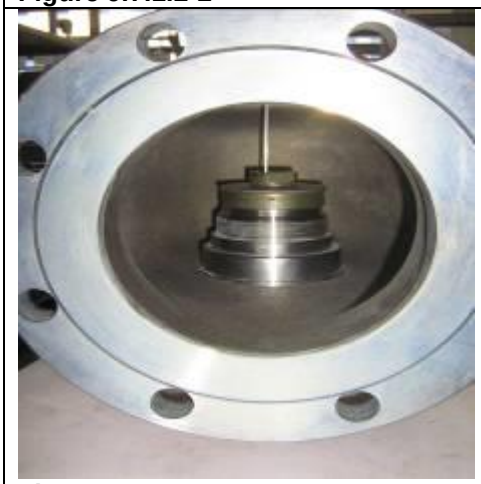
9.7 Determination and installation of the lift stopper

9.7.1 Lift stopper with ring/sleeve

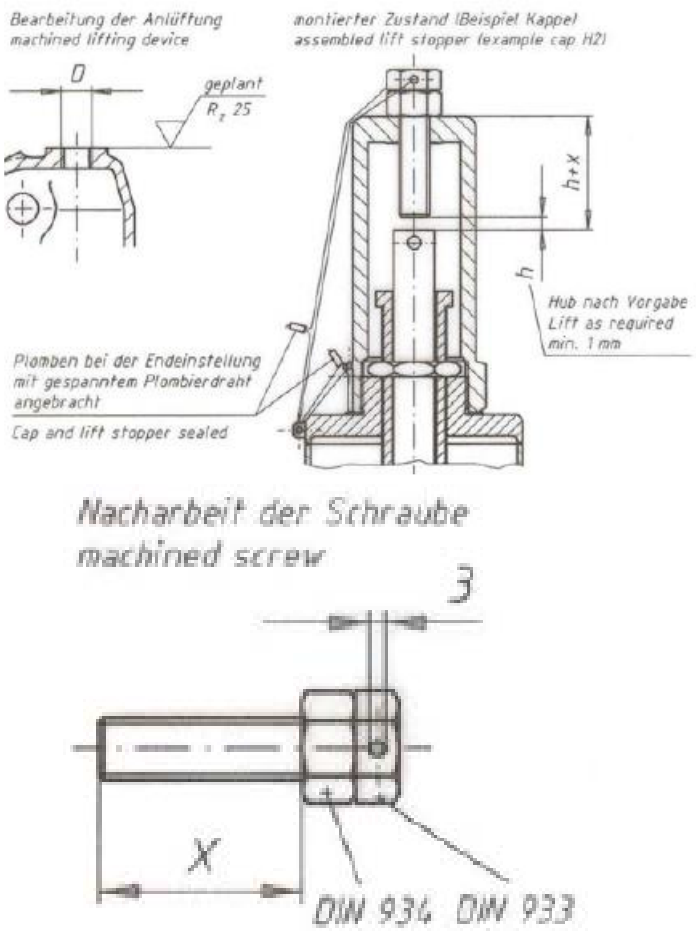
9.7.1.1 Procedure for small valves without bellows (up to approx. DN 65 / 2 1/2").

Illustration	Description	Aids / Tools
 **Figure 9.7.1.1-1**	Take the extent to which the stroke has to be limited from the work order. Insert the spindle/disc assembly without the spring and spring plate. Put on the bonnet and tighten the nuts. Make the adjusting screw and spindle flush.	
 **Figure 9.7.1.1-2**	Clamp the body on the outlet in the vice. Lift the disc with a screwdriver through the inlet as far as it will go.	Screwdriver Clamping block
 **Figure 9.7.1.1-3**	Measure the spindle overlap in an opened state. Deduct the requested stroke from this measurement and have a lift stopper made.	Sliding Vernier calliper

9.7.1.2 Procedure for large valves without bellows (as of approx. DN 80 / 3").

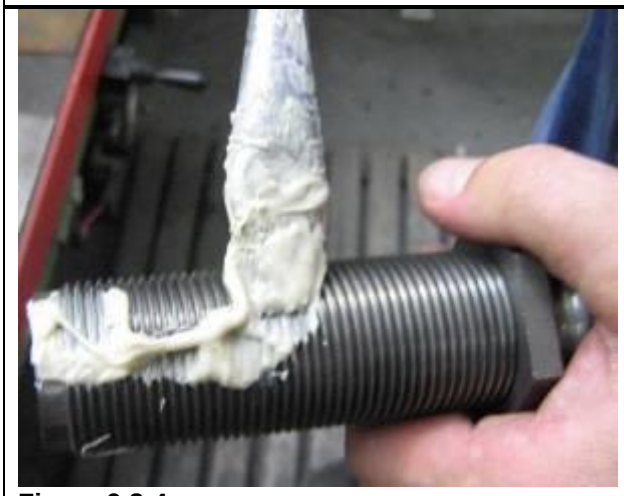
Illustration	Description	Aids / Tools
 **Figure 9.7.1.2-1**	Carefully put the disc on the nozzle and put the sealing ring in the body. Take the extent to which the stroke has to be limited from the job order.	
 **Figure 9.7.1.2-2**	Put the guide washer on the body.	
 **Figure 9.7.1.2-3**	Use the depth gauge to measure the path from the top edge of the guide washer to the top edge of the disc. Deduct the measurement of the guide washer as well as the desired stroke from the order and have the lift stopper made.	

9.7.2 Lift stopper with set screw (taken from WI 3324-01)

Illustration	Description	Aids / Tools
 **Figure 9.7.1.2-1**	Take the extent to which the stroke has to be limited from the job order. Use a completely assembled valve to measure the distance from the top edge of the cap/lever to the end of the spindle. Deduct the measurement of the guide washer as well as the desired stroke from the order and have the lift stopper made. Seal the screws with PTFE tape, screw them in and tighten. (Set torque as per LGS 3323).	PTFE tape Sliding Vernier calliper

9.8 Assembly of the adjusting screw

Illustration	Description	Aids / Tools
 **Figure 9.8-1**	Individual parts of the adjusting screw	
 **Figure 9.8-2**	Put the bushing in the adjusting screw.	
 **Figure 9.8-3**	Screw the lock nut on approximately three-quarters of the way down the adjusting screw.	

Illustration	Description	Aids / Tools
 **Figure 9.8-4**	Grease adjusting screw	Brush Assembly grease (Molykote Paste)
 **Figure 9.8-5**	Screw the adjusting screw into the bonnet until resistance from the spring is felt.	

9.9 Adjusting the set pressure

Illustration	Description	Aids / Tools
 **Figure 9.9-1**	Secure the spindle from turning with a pin punch.	Pin punch Open-end spanner
 **Figure 9.9-2**	Slowly pressurise the valve on the test bench to find out whether the valve opens at the set pressure. The set pressure of the valve has been reached when you can hear air escaping. Full opening must be achieved. If the valve opens outside the stipulated set pressure tolerance, then the adjusting screw must be adjusted again. 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.	Open-end spanner
 **Figure 9.9-2**	If the pressure setting has been completed, secure the adjusting screw with a lock nut. Afterwards, check the set pressure once again.	Open-end spanner

9.10 Testing the seat tightness P12

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

The exact execution of the test is described in a separate work instruction ***AA-EF-013***.

9.11 Assembly of the cap / lever

9.11.1 Assembly of cap H2

Illustration	Description	Aids / Tools
 **Figure 9.11.1-1**	Grease the thread and sealing face of the cap.	Brush Halocarbon (OI-56 S / 60H)
 **Figure 9.11.1-2**	Screw on the cap and tighten with a spanner. (Set torque as per LGS 3323).	Open-end spanner

9.11.2 Assembly of lever H3

Illustration	Description	Aids / Tools
 **Figure 9.11.2-1**	Put the spindle cap onto the spindle and secure with a pin and retaining clip.	
 **Figure 9.11.2-2**	Put clamping screw into H3 cap at designated place.	Ring spanner
 **Figure 9.11.2-3**	Put the small plastic balls in the hole of the adjusting screw.	
 **Figure 9.11.2-4**	Grease the thread of the lever and screw it onto the bonnet (lever must be opposite from outlet).	Brush Halocarbon (OI-56 S / 60H)

Illustration	Description	Aids / Tools
 **Figure 9.11.2-5**	Insert the venting lever into the spindle cap.	
 **Figure 9.11.2-6**	Use a pin and retaining washers to secure the venting lever.	
 **Figure 9.11.2-7**	Make sure that the lever has enough play to vent.	
 **Figure 9.11.2-8**	Tighten the clamping screw on the lever.	Ring spanner

9.11.3 Special assembly of the Cap H3

There are different variations to assemble the H3 Cap.

The variation A describes the standard variation.

The variation B is pulled by the option code M08 and as well shown in the work plan.

The variations B and C are dealt with exclusively in the EOM.

.

Variante	Beschreibung	Steuerung	H3 Anlüftung
A	Position: **Standard**	-/-	
B	Position: **90° versetzt zum Standard** (Richtung Austritt)	**Sonder**	
C	Position: **180° versetzt zum Standard** (Richtung Austritt)	**M08**	
D	Position: **270° versetzt zum Standard** (Richtung Austritt)	**Sonder**	

Cap H4

9.11.4 Test of the lifting fork position

right

wrong

***Lüftegabel** assembled wrong (position)*

1. working steps

- Before the assembly of the already assembled H4 cap the position of the lifting fork within the cap has to be checked to guarantee that the cap is working properly.
    - With it take a look from the thread side into the cap and check the position of the lifting fork.

2. aid

- k.A.

3. tool

- k.A.

4. device

- k.A.

9.11.5 Assembly of lever H4

Illustration	Description	Aids / Tools
 **Figure 9.11.5-1**	Put the spindle cap onto the spindle and secure with a pin and retaining clip.	
 **Figure 9.11.5-2**	Align the lever with sealing rings so that the lever arm is parallel to the outlet.	
 **Figure 9.11.5-3**	Grease the lever and sealing rings. Put them on and tighten with an open-end spanner (torque as per LGS 3323).	Open-end spanner Torque wrench

9.11.6 Special assembly of the cap H4

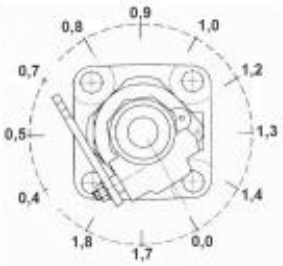
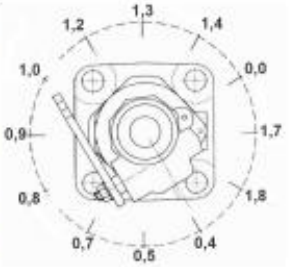
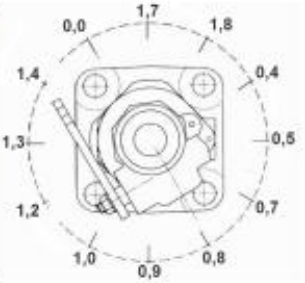
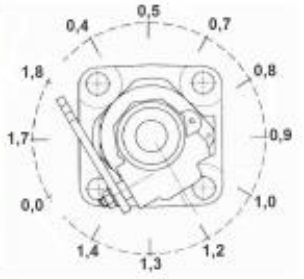
There are different variations to assemble the H4 cap.

The variation A describes the standard variation.

The variation B is pulled by the option code M08 and as well shown in the work plan.

The variations B and C are dealt with exclusively in the EOM.

.

Variante	Beschreibung	Steuerung	H4 Anlüftung	
A	Position: **Standard**	-/-		
B	Position: **90° versetzt zum Standard** (Richtung Austritt)	Sonder		
C	Position: **180° versetzt zum Standard** (Richtung Austritt)	M08		
D	Position: **270° versetzt zum Standard** (Richtung Austritt)	Sonder		

9.12 Assembly of the lift indicator

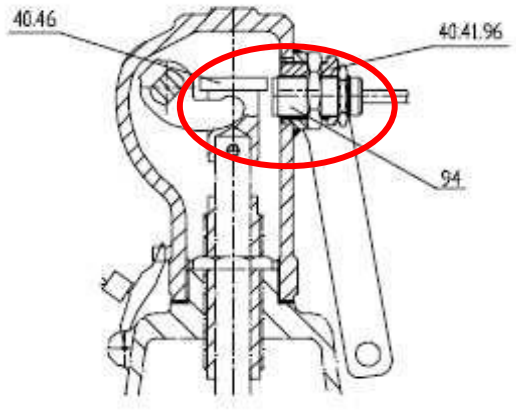
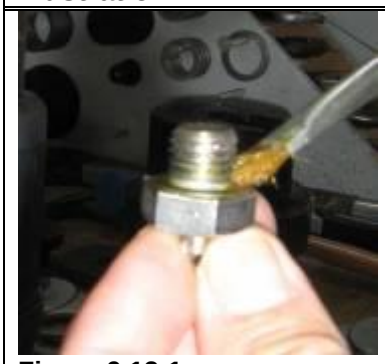
Illustration	Description	Aids / Tools
 **Figure 9.12-1**	Individual parts of the lift indicator	
 **Figure 9.12-2**	Put the cap into position as described in 13.3 and secure.	Open-end spanner
 **Figure 9.12-3**	Put the eccentric hole of the holder into such a position that the collar of the spindle cap would seal on top with the edge of the lift indicator (see illustration).	

Illustration	Description	Aids / Tools
 **Figure 9.12-4**	Secure the position with a lock nut.	
 **Figure 9.12-5**	Screw the lift indicator into the collar of the spindle cap as far as it will go. Then unscrew it one complete turn. Secure the position of the lift indicator by tightening the first nut hand tight. Then lock with a second nut.	

9.13 Installation of the test gag (possible for H2 and H4)

Illustration	Description	Aids / Tools
 **Figure 9.13-1**	Grease the sealing surface of the short bolt.	Brush Halocarbon (OI-56 S / 60H)
 **Figure 9.13-2**	Put on the sealing ring and grease it as well.	Brush Halocarbon (OI-56 S / 60H)
 **Figure 9.13-3**	Screw the test gag into the cap or lever and tighten (torque as per LGS 3323).	

9.14 Installation of the different O-ring dampers

9.14.1 O-ring damper H2

Illustration	Description	Aids / Tools
 **Figure 9.14.1-1**	Individual parts of the O-ring damper H2	
 **Figure 9.14.1-2**	Put the support sleeve onto the adjusting screw.	
 **Figure 9.14.1-3**	Put O-ring onto the spindle over the support sleeve. The O-ring must not sit on the cross hole or a thread, if one is present. ⚠	

Illustration	Description	Aids / Tools
 **Figure 9.14.1-4**	Put the counter ring onto the O-ring or support sleeve.	
 **Figure 9.14.1-5**	Put retaining spring onto the counter ring.	
 **Figure 9.14.1-6**	Grease the cap on the thread. Screw it onto the bonnet and tighten (torque as per LGS 3323).	Open-end spanner

9.14.2 O-ring damper H4

Illustration	Description	Aids / Tools
 **Figure 9.14.2-1**	Individual parts of the O-ring damper H4	
 **Figure 9.14.2-2**	Fasten the O-ring damper on the spindle with a steel pin and retaining clip. Then assemble the H4 lever cover as described in 12.43.	
 **Figure 9.14.2-3**		

Illustration	Description	Aids / Tools
 **Figure 9.14.2-4**	Put the first O-ring - counter ring - second O-ring - support sleeve - spring - cap onto the lever one after the other.	
 **Figure 9.14.2-5**		
 **Figure 9.14.2-6**	Grease, screw on and tighten the thread and sealing lip of the cap (torque as per LGS 3323).	Halocarbon (OI-56 S / 60H) Open-end spanner

9.15 Adjusting the set pressure

Pressurise the valve as per the workplace description.

Check whether the valve opens at the set pressure. The set pressure of the valve has been reached when the pressure display remains constant when the line pressure increases. It must fully open.

The valve must open within the tolerance range 3 times in succession.

Document the set pressure.

9.16 Testing the seal tightness of the back seal P21 (seal tightness to the outside)

This test is performed for every gas-tight valve after its assembly.

9.17 Sealing the valve

Illustration	Description	Aids / Tools
 **Figure 9.17-1**	If structurally possible (sealing hole/lug on cap/lever and bonnet exist), then seal the valve. Otherwise sealing lugs must be welded on. Closely connect the sealing hole or lug from the cap/lever and bonnet in a clockwise direction, and connect the locking screw and sealing lug with sealing wire and seal the ends of the wire with a lead seal. If classification approvals (TÜV etc.) are required, then seal afterwards.	Sealing pliers Wire twisting pliers Sealing block Wire

Contents

1 Purpose

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

2 Scope

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

3 Disclaimer

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

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4 Qualified fitting personnel

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

5 General Information

- Wear safety glasses
- Wear respirator/dust mask

6 Paint touch-up and painting repaired valves

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

Figure 6-1: Protective cap for open bonnet

Figure 6-2: Flange sticker

protected

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

Figure 6-3: Component plate sticker

Figure 6-4: Protective cap

Figure 6-5: Component plate sticker

Figure 6-6: Protective cap

Figure 6-7: Masking tape

Figure 6-8: Protective cap

Figure 6-9

The layer thickness of the coat of paint should be ~ 40µm for one coat of paint.

Contents

1 Purpose

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

4 Qualified fitting personnel

The name plates of LESER safety valves must attached exclusively by trained or qualified fitters. The relevant qualifications must be obtained through appropriate training measures.

5 General Information

- Gloves must be worn for all fitting work (except for stainless steel and painted valves).
- Wear safety glasses.

6 Attaching component/customer identification plates

If grooved pins with round heads are not required, the plate is to be welded to the designated place with the spot welding device.

The world plate (NGA) is fastened to the bonnet. In exceptional cases, it may also be fastened with grooved pins with round heads, in which case it may also be fastened to the body.

The standard plate is welded to the flat surface designated for that purpose.

Types 437, 438, 439 - outlet body

Types 459, 462, - bonnet

No fastening with grooved pins with round heads

Flanged valves - on the **right** side as seen from the outlet side. **Exception**: Types 457 / 458 / 526 - on the back side using the set screw

6.1 Standard plate

Figure 6.2.1-1

The standard plate comes in two versions.

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

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

Attachment locations for standard component plates

Figure 6.2.1-2: Type 459

Figure 6.2.1-3: Type 462

Figure 6.2.1-4: Type 437

Figure 6.2.1-5: Type 462

Figure 6.2.1-6: Standard plate on a flanged valve

Figure **6.2.1-7**: Types 457 / 458 / 526

6.2 World plate (NGA)

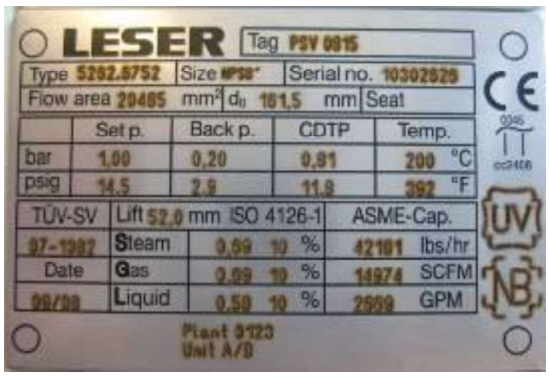


Figure 6.2.1-1

The world plate (NGA) comes in two versions.

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

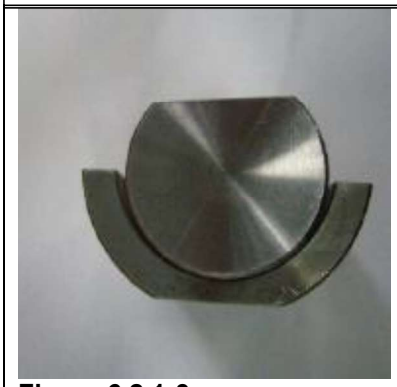
For valves that are designed according to TÜV, the UV and NB symbols are not lasered on.

6.2.1 Pre-curving of the NGA

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

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

Figure 6.2.1-2		

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

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

6.2.2 Corrosion protection

All valves that are painted must have corrosion protection under the world sign. To do this, apply the standard primer coat (BURCHARTH'S BLUE - 60M.0120.0001) to the respective place with a sponge.

Illustrations	Description	Aids / Tools
 Figure 6.2.2-1		

Illustrations	Description	Aids / Tools
 **Figure 6.2.2-2**		Sponge
 **Figure 6.2.2-3**	The points where the world plate will be welded must be free of paint.	

6.3 Fastening to bonnets with welding spots

6.3.1 Quadratic cross-section

Illustrations	Description	Aids / Tools
 Figure 6.3.1-1	For API valves, the world plate is fastened to the bonnet of the valve with welding spots. For versions of closed bonnets with a quadratic cross-section, the world plate is attached vertically to the front side of the valve approx. 5 mm above the bevelled edge.	

6.3.2 High Performance valves

For the High Performance series, the world plate is always attached to the bonnet. However, the location where the plate is attached is different for individual bonnet sizes.

a) Closed bonnets (V20 - V32)

Illustrations	Description	Aids / Tools
 Figure 6.3.2-1	The world plate is attached to the bonnet (V20 - V32). For closed bonnets, the world plate is displaced 90° with respect to the eyelet for the sealing wire so that the plate is located on the opposite side of the outlet for a completely assembled valve.	

b) Open bonnets (V20 - V25)

Illustrations	Description	Aids / Tools
 Figure 6.3.2-2	The world plate is attached to open bonnets V20 - V25. It is attached above the cast LESER lettering and should be flush with the letter "L". The plate must be mounted so that it can be read from the right (as shown in the picture).	

c) Open bonnet (V32)

Illustrations	Description	Aids / Tools
 Figure 6.3.2-3	For open bonnets V32, the world plate is displaced 90° with respect to the eyelet in front of the sealing wire so that the plate is displaced by 90° with respect to the outlet for a completely assembled valve. The top edge of the plate should be flush with the bevel of the bonnet.	

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

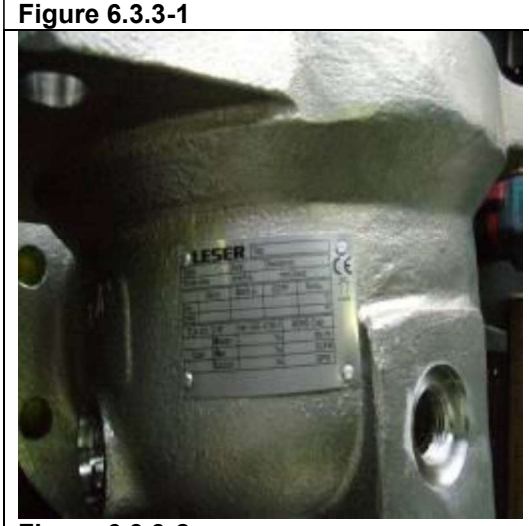
The raised identifier of the product form manufacturer (foundry) is mounted in the direction of the outlet flange.

Position of the world plate

The world plate is positioned on the free back side on the bottom edge of the bonnet.

6.3.3 Fastening with grooved pins with round heads

Illustrations	Description	Aids / Tools

 **Figure 6.3.3-1**	The plate is also curved for this purpose. When grooved pins with round heads are used for fastening, the world plate must be fastened at the back or at the side of the body for the API valve.	
 **Figure 6.3.3-2**		

Contents

1 Purpose

This LESER Global Standard (LGS) contains the information about pressure range of all springs, which are installed in valve- type 526.

2 Scope

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

This LGS contains information about the pressure range of all springs, which are installed in valve- type 526.
The pressure ranges of the various types are given first in pressure-unit [bar, page 2- 24].
This is followed by the pressure-unit [psig, page 25- end].

For additional information please see legend description.

3 References

LDeS 3060.01, LDeS 3265.01

4 Legend / Indices

- S = Sonderauftrag / special order
- O = oberen Spindeleinstich verwenden / use upper spindle groove
- FT oder / or SP = Sonder-Federteller / special spring plate
- Blaue Markierung/ blue marking = Drucklagereinsatz / thrust bearing use
- P = Sonderpreis / special price
- Faba = Faltenbalgeinsatz/ bellow use

Ausführung *(model)*															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar]				**p [bar]**				**p [bar]**				**p [bar]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
1D2				**1D2**				**1D2**				**1D2**			
0,30	- 0,50	gewichtsbel.	S	0,30	- 0,50	gewichtsbel.	S	0,30	- 0,50	gewichtsbel.	S	0,30	- 0,50	gewichtsbel.	S
0,51	- 0,70	540.8204.0000		0,51	- 0,70	540.8204.0000		0,51	- 0,70	540.8204.0000		0,51	- 0,70	540.8207.0000	
0,71	- 1,20	540.8204.0000	O	0,71	- 1,20	540.8204.0000	O	0,71	- 1,20	540.8204.0000	O	0,71	- 1,20	540.8207.0000	O
1,21	- 1,50	540.8224.0000		1,21	- 1,50	540.8224.0000		1,21	- 1,50	540.8224.0000		1,21	- 1,50	540.8227.0000	
1,51	- 1,90	540.8224.0000	O	1,51	- 1,90	540.8224.0000	O	1,51	- 1,90	540.8224.0000	O	1,51	- 1,90	540.8227.0000	O
1,91	- 2,30	540.8234.0000		1,91	- 2,30	540.8234.0000		1,91	- 2,30	540.8234.0000		1,91	- 2,30	540.8237.0000	
2,31	- 3,20	540.8234.0000	O	2,31	- 3,20	540.8234.0000	O	2,31	- 3,20	540.8234.0000	O	2,31	- 3,20	540.8237.0000	O
3,21	- 4,30	540.4364.0000		3,21	- 4,30	540.4364.0000		3,21	- 4,30	540.4364.0000		3,21	- 4,30	540.4367.0000	
4,31	- 6,80	540.4364.0000	O	4,31	- 6,80	540.4364.0000	O	4,31	- 6,80	540.4364.0000	O	4,31	- 6,80	540.4367.0000	O
6,81	- 11,00	540.4374.0000	O	6,81	- 11,00	540.4374.0000	O	6,81	- 11,00	540.4374.0000	O	6,81	- 11,00	540.4377.0000	O
11,01	- 11,80	540.4394.0000		11,01	- 11,80	540.4394.0000		11,01	- 11,80	540.4394.0000		11,01	- 11,80	540.4397.0000	
11,81	- 16,30	540.4394.0000	O	11,81	- 16,30	540.4394.0000	O	11,81	- 16,30	540.4394.0000	O	11,81	- 16,30	540.4397.0000	O
16,31	- 19,50	540.9434.0000		16,31	- 19,50	540.9434.0000		16,31	- 19,50	540.9434.0000		16,31	- 19,50	540.9437.0000	
19,51	- 24,00	540.9434.0000	O	19,51	- 24,00	540.9434.0000	O	19,51	- 24,00	540.9434.0000	O	19,51	- 24,00	540.9437.0000	O
24,01	- 24,50	540.4414.0000		24,01	- 24,50	540.4414.0000		24,01	- 24,50	540.4414.0000		24,01	- 24,50	540.4417.0000	
24,51	- 34,00	540.4414.0000	O	24,51	- 34,00	540.4414.0000	O	24,51	- 34,00	540.4414.0000	O	24,51	- 34,00	540.4417.0000	O
34,01	- 45,00	540.4424.0000	O	34,01	- 45,00	540.4424.0000	O	34,01	- 45,00	540.4424.0000	O	34,01	- 45,00	540.4427.0000	O
45,01	- 65,00	540.4434.0000	O	45,01	- 65,00	540.4434.0000	O	45,01	- 65,00	540.4434.0000	O	45,01	- 65,00	540.4437.0000	O
65,01	- 83,00	540.4444.0000	O	65,01	- 83,00	540.4444.0000	O	65,01	- 83,00	540.4444.0000	O	65,01	- 83,00	540.4447.0000	O
83,01	- 91,70	540.4444.0000 540.9474.0205	O	83,01	- 91,70	540.4444.0000 540.9474.0205	O	83,01	- 91,70	540.4444.0000 540.9474.0205	O	83,01	- 91,70	540.4447.0000 540.9477.0205	O
91,71	-102,00	540.4464.0000	O	91,71	-102,00	540.4464.0000	O	91,71	-102,00	540.4464.0000	O	91,71	-102,00	540.4467.0000	O

Ausführung *(model)*

warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices
1 1/2D2				**1 1/2D2**				**1 1/2D2**				**1 1/2D2**			
5,00	- 7,50	540.8434.0000		5,00	- 7,50	540.8434.0000		5,00	- 7,50	540.8434.0000		5,00	- 7,50	540.8437.0000	
7,51	- 11,50	540.4654.0000		7,51	- 11,50	540.4654.0000		7,51	- 11,50	540.4654.0000		7,51	- 11,50	540.4657.0000	
11,51	- 18,50	540.4674.0000		11,51	- 18,50	540.4674.0000		11,51	- 18,50	540.4674.0000		11,51	- 18,50	540.4677.0000	
18,51	- 28,00	540.4684.0000		18,51	- 28,00	540.4684.0000		18,51	- 28,00	540.4684.0000		18,51	- 28,00	540.4687.0000	
28,01	- 40,00	540.4694.0000		28,01	- 40,00	540.4694.0000		28,01	- 40,00	540.4694.0000		28,01	- 40,00	540.4697.0000	
40,01	- 58,00	540.4704.0000		40,01	- 58,00	540.4704.0000		40,01	- 58,00	540.4704.0000		40,01	- 58,00	540.4707.0000	
58,01	- 80,00	540.4714.0000		58,01	- 80,00	540.4714.0000		58,01	- 80,00	540.4714.0000		58,01	- 80,00	540.4717.0000	
80,01	-120,00	540.5632.0000		80,01	-120,00	540.5632.0000		80,01	-120,00	540.4724.0000		80,01	-120,00	540.4727.0000	
120,01	-175,00	540.4734.0000		120,01	-175,00	540.4734.0000		120,01	-175,00	540.4734.0000		120,01	-175,00	540.4737.0000	
175,01	-255,40	540.5652.0000		175,01	-255,40	540.5652.0000		175,01	-255,40	540.4724.0000		175,01	-255,40	540.4727.0000	
										540.9604.0000				540.9607.0205	
1 1/2D3				**1 1/2D3**				**1 1/2D3**				**1 1/2D3**			
18,50	- 28,00	540.4684.0000		18,50	- 28,00	540.4684.0000		18,50	- 28,00	540.4684.0000		18,50	- 28,00	540.4687.0000	
28,01	- 40,00	540.4694.0000		28,01	- 40,00	540.4694.0000		28,01	- 40,00	540.4694.0000		28,01	- 40,00	540.4697.0000	
40,01	- 58,00	540.4704.0000		40,01	- 58,00	540.4704.0000		40,01	- 58,00	540.4704.0000		40,01	- 58,00	540.4707.0000	
58,01	- 80,00	540.4714.0000		58,01	- 80,00	540.4714.0000		58,01	- 80,00	540.4714.0000		58,01	- 80,00	540.4717.0000	
80,01	-120,00	540.4724.0000		80,01	-120,00	540.4724.0000		80,01	-120,00	540.4724.0000		80,01	-120,00	540.4727.0000	
120,01	-150,00	540.4734.0000		120,01	-150,00	540.4734.0000		120,01	-150,00	540.4734.0000		120,01	-150,00	540.4737.0000	
150,01	-225,00	540.9634.0000		150,01	-225,00	540.9634.0000		150,01	-225,00	540.9634.0000		150,01	-225,00	540.9637.0000	
225,01	-310,00	540.9644.0000		225,01	-310,00	540.9644.0000		225,01	-310,00	540.9644.0000		225,01	-310,00	540.9647.0000	
310,01	-413,70	540.9644.0000 540.9604.0000		310,01	-413,70	540.9644.0000 540.9604.0000		310,01	-413,70	540.9644.0000 540.9604.0000		310,01	-413,70	540.9647.0000 540.9607.0205	

Ausführung *(model)*															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar]				**p [bar]**				**p [bar]**				**p [bar]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
1E2				**1E2**				**1E2**				**1E2**			
0,30	- 0,50	gewichtsbel.	S	0,30	- 0,50	gewichtsbel.	S	0,30	- 0,50	gewichtsbel.	S	0,30	- 0,50	gewichtsbel.	S
0,51	- 0,70	540.8204.0000		0,51	- 0,70	540.8204.0000		0,51	- 0,70	540.8204.0000		0,51	- 0,70	540.8207.0000	
0,71	- 1,20	540.8204.0000	O	0,71	- 1,20	540.8204.0000	O	0,71	- 1,20	540.8204.0000	O	0,71	- 1,20	540.8207.0000	O
1,21	- 1,50	540.8224.0000		1,21	- 1,50	540.8224.0000		1,21	- 1,50	540.8224.0000		1,21	- 1,50	540.8227.0000	
1,51	- 1,90	540.8224.0000	O	1,51	- 1,90	540.8224.0000	O	1,51	- 1,90	540.8224.0000	O	1,51	- 1,90	540.8227.0000	O
1,91	- 2,30	540.8234.0000		1,91	- 2,30	540.8234.0000		1,91	- 2,30	540.8234.0000		1,91	- 2,30	540.8237.0000	
2,31	- 3,20	540.8234.0000	O	2,31	- 3,20	540.8234.0000	O	2,31	- 3,20	540.8234.0000	O	2,31	- 3,20	540.8237.0000	O
3,21	- 4,30	540.4364.0000		3,21	- 4,30	540.4364.0000		3,21	- 4,30	540.4364.0000		3,21	- 4,30	540.4367.0000	
4,31	- 6,80	540.4364.0000	O	4,31	- 6,80	540.4364.0000	O	4,31	- 6,80	540.4364.0000	O	4,31	- 6,80	540.4367.0000	O
6,81	- 11,00	540.4374.0000	O	6,81	- 11,00	540.4374.0000	O	6,81	- 11,00	540.4374.0000	O	6,81	- 11,00	540.4377.0000	O
11,01	- 11,80	540.4394.0000		11,01	- 11,80	540.4394.0000		11,01	- 11,80	540.4394.0000		11,01	- 11,80	540.4397.0000	
11,81	- 16,30	540.4394.0000	O	11,81	- 16,30	540.4394.0000	O	11,81	- 16,30	540.4394.0000	O	11,81	- 16,30	540.4397.0000	O
16,31	- 19,50	540.9434.0000		16,31	- 19,50	540.9434.0000		16,31	- 19,50	540.9434.0000		16,31	- 19,50	540.9437.0000	
19,51	- 24,00	540.9434.0000	O	19,51	- 24,00	540.9434.0000	O	19,51	- 24,00	540.9434.0000	O	19,51	- 24,00	540.9437.0000	O
24,01	- 24,50	540.4414.0000		24,01	- 24,50	540.4414.0000		24,01	- 24,50	540.4414.0000		24,01	- 24,50	540.4417.0000	
24,51	- 34,00	540.4414.0000	O	24,51	- 34,00	540.4414.0000	O	24,51	- 34,00	540.4414.0000	O	24,51	- 34,00	540.4417.0000	O
34,01	- 45,00	540.4424.0000	O	34,01	- 45,00	540.4424.0000	O	34,01	- 45,00	540.4424.0000	O	34,01	- 45,00	540.4427.0000	O
45,01	- 65,00	540.4434.0000	O	45,01	- 65,00	540.4434.0000	O	45,01	- 65,00	540.4434.0000	O	45,01	- 65,00	540.4437.0000	O
65,01	- 83,00	540.4444.0000	O	65,01	- 83,00	540.4444.0000	O	65,01	- 83,00	540.4444.0000	O	65,01	- 83,00	540.4447.0000	O
83,01	- 91,70	540.4444.0000 540.9474.0205	O	83,01	- 91,70	540.4444.0000 540.9474.0205	O	83,01	- 91,70	540.4444.0000 540.9474.0205	O	83,01	- 91,70	540.4447.0000 540.9477.0205	O
91,71	-102,00	540.4464.0000	O	91,71	-102,00	540.4464.0000	O	91,71	-102,00	540.4464.0000	O	91,71	-102,00	540.4467.0000	O

Ausführung *(model)*

warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices
1 1/2E2				**1 1/2E2**				**1 1/2E2**				**1 1/2E2**			
5,00	- 7,50	540.8434.0000		5,00	- 7,50	540.8434.0000		5,00	- 7,50	540.8434.0000		5,00	- 7,50	540.8437.0000	
7,51	- 11,50	540.4654.0000		7,51	- 11,50	540.4654.0000		7,51	- 11,50	540.4654.0000		7,51	- 11,50	540.4657.0000	
11,51	- 18,50	540.4674.0000		11,51	- 18,50	540.4674.0000		11,51	- 18,50	540.4674.0000		11,51	- 18,50	540.4677.0000	
18,51	- 28,00	540.4684.0000		18,51	- 28,00	540.4684.0000		18,51	- 28,00	540.4684.0000		18,51	- 28,00	540.4687.0000	
28,01	- 40,00	540.4694.0000		28,01	- 40,00	540.4694.0000		28,01	- 40,00	540.4694.0000		28,01	- 40,00	540.4697.0000	
40,01	- 58,00	540.4704.0000		40,01	- 58,00	540.4704.0000		40,01	- 58,00	540.4704.0000		40,01	- 58,00	540.4707.0000	
58,01	- 80,00	540.4714.0000		58,01	- 80,00	540.4714.0000		58,01	- 80,00	540.4714.0000		58,01	- 80,00	540.4717.0000	
80,01	-120,00	540.5632.0000		80,01	-120,00	540.5632.0000		80,01	-120,00	540.4724.0000		80,01	-120,00	540.4727.0000	
120,01	-175,00	540.4734.0000		120,01	-175,00	540.4734.0000		120,01	-175,00	540.4734.0000		120,01	-175,00	540.4737.0000	
175,01	-255,40	540.5652.0000		175,01	-255,40	540.5652.0000		175,01	-255,40	540.4724.0000		175,01	-255,40	540.4727.0000	
										540.9604.0000				540.9607.0205	
1 1/2E3				**1 1/2E3**				**1 1/2E3**				**1 1/2E3**			
18,50	- 28,00	540.4684.0000		18,50	- 28,00	540.4684.0000		18,50	- 28,00	540.4684.0000		18,50	- 28,00	540.4687.0000	
28,01	- 40,00	540.4694.0000		28,01	- 40,00	540.4694.0000		28,01	- 40,00	540.4694.0000		28,01	- 40,00	540.4697.0000	
40,01	- 58,00	540.4704.0000		40,01	- 58,00	540.4704.0000		40,01	- 58,00	540.4704.0000		40,01	- 58,00	540.4707.0000	
58,01	- 80,00	540.4714.0000		58,01	- 80,00	540.4714.0000		58,01	- 80,00	540.4714.0000		58,01	- 80,00	540.4717.0000	
80,01	-120,00	540.4724.0000		80,01	-120,00	540.4724.0000		80,01	-120,00	540.4724.0000		80,01	-120,00	540.4727.0000	
120,01	-150,00	540.4734.0000		120,01	-150,00	540.4734.0000		120,01	-150,00	540.4734.0000		120,01	-150,00	540.4737.0000	
150,01	-225,00	540.9634.0000		150,01	-225,00	540.9634.0000		150,01	-225,00	540.9634.0000		150,01	-225,00	540.9637.0000	
225,01	-310,00	540.9644.0000		225,01	-310,00	540.9644.0000		225,01	-310,00	540.9644.0000		225,01	-310,00	540.9647.0000	
310,01	-413,70	540.9644.0000 540.9604.0000		310,01	-413,70	540.9644.0000 540.9604.0000		310,01	-413,70	540.9644.0000 540.9604.0000		310,01	-413,70	540.9647.0000 540.9607.0205	

Ausführung *(model)*															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar]				**p [bar]**				**p [bar]**				**p [bar]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
1 1/2F2				**1 1/2F2**				**1 1/2F2**				**1 1/2F2**			
0,30	- 0,50	gewichtsbel.	S	0,30	- 0,50	gewichtsbel.	S	0,30	- 0,50	gewichtsbel.	S	0,30	- 0,50	gewichtsbel.	S
0,51	- 1,20	540.8404.0000		0,51	- 1,20	540.8404.0000		0,51	- 1,20	540.8404.0000		0,51	- 1,20	540.8407.0000	
1,21	- 1,60	540.8424.0000		1,21	- 1,60	540.8424.0000		1,21	- 1,60	540.8424.0000		1,21	- 1,60	540.8427.0000	
1,61	- 2,00	540.8434.0000		1,61	- 2,00	540.8434.0000		1,61	- 2,00	540.8434.0000		1,61	- 2,00	540.8437.0000	
2,01	- 2,70	540.4654.0000		2,01	- 2,70	540.4654.0000		2,01	- 2,70	540.4654.0000		2,01	- 2,70	540.4657.0000	
2,71	- 3,60	540.4664.0000		2,71	- 3,60	540.4664.0000		2,71	- 3,60	540.4664.0000		2,71	- 3,60	540.4667.0000	
3,61	- 5,10	540.4674.0000		3,61	- 5,10	540.4674.0000		3,61	- 5,10	540.4674.0000		3,61	- 5,10	540.4677.0000	
5,11	- 8,10	540.4684.0000		5,11	- 8,10	540.4684.0000		5,11	- 8,10	540.4684.0000		5,11	- 8,10	540.4687.0000	
8,11	- 12,00	540.4694.0000		8,11	- 12,00	540.4694.0000		8,11	- 12,00	540.4694.0000		8,11	- 12,00	540.4697.0000	
12,01	- 17,00	540.4704.0000		12,01	- 17,00	540.4704.0000		12,01	- 17,00	540.4704.0000		12,01	- 17,00	540.4707.0000	
17,01	- 24,50	540.4714.0000		17,01	- 24,50	540.4714.0000		17,01	- 24,50	540.4714.0000		17,01	- 24,50	540.4717.0000	
24,51	- 33,00	540.8494.0000		24,51	- 33,00	540.8494.0000		24,51	- 33,00	540.8494.0000		24,51	- 33,00	540.8497.0000	
33,01	- 54,00	540.4734.0000		33,01	- 54,00	540.4734.0000		33,01	- 54,00	540.4734.0000		33,01	- 54,00	540.4737.0000	
54,01	- 75,60	540.9634.0000		54,01	- 75,60	540.9634.0000		54,01	- 75,60	540.9634.0000		54,01	- 75,60	540.9637.0000	
75,61	-102,00	540.9644.0000		75,61	-102,00	540.9644.0000		75,61	-102,00	540.9644.0000		75,61	-102,00	540.9647.0000	

Ausführung *(model)*															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar]				**p [bar]**				**p [bar]**				**p [bar]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
1 1/2F3				**1 1/2F3**				**1 1/2F3**				**1 1/2F3**			
0,30	- 0,50	gewichtsbel.	S	0,30	- 0,50	gewichtsbel.	S	0,30	- 0,50	gewichtsbel.	S	0,30	- 0,50	gewichtsbel.	S
0,51	- 1,20	540.8404.0000		0,51	- 1,20	540.8404.0000		0,51	- 1,20	540.8404.0000		0,51	- 1,20	540.8407.0000	
1,21	- 1,60	540.8424.0000		1,21	- 1,60	540.8424.0000		1,21	- 1,60	540.8424.0000		1,21	- 1,60	540.8427.0000	
1,61	- 2,00	540.8434.0000		1,61	- 2,00	540.8434.0000		1,61	- 2,00	540.8434.0000		1,61	- 2,00	540.8437.0000	
2,01	- 2,70	540.4654.0000		2,01	- 2,70	540.4654.0000		2,01	- 2,70	540.4654.0000		2,01	- 2,70	540.4657.0000	
2,71	- 3,60	540.4664.0000		2,71	- 3,60	540.4664.0000		2,71	- 3,60	540.4664.0000		2,71	- 3,60	540.4667.0000	
3,61	- 5,10	540.4674.0000		3,61	- 5,10	540.4674.0000		3,61	- 5,10	540.4674.0000		3,61	- 5,10	540.4677.0000	
5,11	- 8,10	540.4684.0000		5,11	- 8,10	540.4684.0000		5,11	- 8,10	540.4684.0000		5,11	- 8,10	540.4687.0000	
8,11	- 12,00	540.4694.0000		8,11	- 12,00	540.4694.0000		8,11	- 12,00	540.4694.0000		8,11	- 12,00	540.4697.0000	
12,01	- 17,00	540.4704.0000		12,01	- 17,00	540.4704.0000		12,01	- 17,00	540.4704.0000		12,01	- 17,00	540.4707.0000	
17,01	- 24,50	540.4714.0000		17,01	- 24,50	540.4714.0000		17,01	- 24,50	540.4714.0000		17,01	- 24,50	540.4717.0000	
24,51	- 33,00	540.8494.0000		24,51	- 33,00	540.8494.0000		24,51	- 33,00	540.8494.0000		24,51	- 33,00	540.8497.0000	
33,01	- 54,00	540.4734.0000		33,01	- 54,00	540.4734.0000		33,01	- 54,00	540.4734.0000		33,01	- 54,00	540.4737.0000	
54,01	- 75,60	540.9634.0000		54,01	- 75,60	540.9634.0000		54,01	- 75,60	540.9634.0000		54,01	- 75,60	540.9637.0000	
75,61	-102,00	540.9644.0000		75,61	-102,00	540.9644.0000		75,61	-102,00	540.9644.0000		75,61	-102,00	540.9647.0000	
102,01	-140,00	540.9654.0000		102,01	-140,00	540.9654.0000		102,01	-140,00	540.9654.0000		102,01	-140,00	540.9657.0000	
140,01	-190,00	540.9644.0000 540.9604.0000		140,01	-190,00	540.9644.0000 540.9604.0000		140,01	-190,00	540.9644.0000 540.9604.0000		140,01	-190,00	540.9647.0000 540.9607.0205	
190,01	-255,40		S	190,01	-255,40		S	190,01	-255,40		S	190,01	-255,40		S
255,41	-344,70		S	255,41	-344,70		S	255,41	-344,70		S	255,41	-344,70		S

Ausführung *(model)*															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices
1 1/2G3				**1 1/2G3**				**1 1/2G3**				**1 1/2G3**			
0,20	- 0,65	gewichtsbel.	S	0,20	- 0,65	gewichtsbel.	S	0,20	- 0,65	gewichtsbel.	S	0,20	- 0,65	gewichtsbel.	S
0,66	- 1,20	540.8404.0000		0,66	- 1,20	540.8404.0000		0,66	- 1,20	540.8404.0000		0,66	- 1,20	540.8407.0000	
1,21	- 1,70	540.8424.0000		1,21	- 1,70	540.8424.0000		1,21	- 1,70	540.8424.0000		1,21	- 1,70	540.8427.0000	
1,71	- 3,20	540.8434.0000		1,71	- 3,20	540.8434.0000		1,71	- 3,20	540.8434.0000		1,71	- 3,20	540.8437.0000	
3,21	- 5,00	540.4654.0000		3,21	- 5,00	540.4654.0000		3,21	- 5,00	540.4654.0000		3,21	- 5,00	540.4657.0000	
5,01	- 7,00	540.4664.0000		5,01	- 7,00	540.4664.0000		5,01	- 7,00	540.4664.0000		5,01	- 7,00	540.4667.0000	
7,01	- 9,00	540.4674.0000		7,01	- 9,00	540.4674.0000		7,01	- 9,00	540.4674.0000		7,01	- 9,00	540.4677.0000	
9,01	- 12,00	540.4684.0000		9,01	- 12,00	540.4684.0000		9,01	- 12,00	540.4684.0000		9,01	- 12,00	540.4687.0000	
12,01	- 17,50	540.4694.0000		12,01	- 17,50	540.4694.0000		12,01	- 17,50	540.4694.0000		12,01	- 17,50	540.4697.0000	
17,51	- 21,50	540.4704.0000		17,51	- 21,50	540.4704.0000		17,51	- 21,50	540.4704.0000		17,51	- 21,50	540.4707.0000	
21,51	- 30,00	540.4714.0000		21,51	- 30,00	540.4714.0000		21,51	- 30,00	540.4714.0000		21,51	- 30,00	540.4717.0000	
30,01	- 40,00	540.8494.0000		30,01	- 40,00	540.8494.0000		30,01	- 40,00	540.8494.0000		30,01	- 40,00	540.8497.0000	
40,01	- 52,00	540.4734.0000		40,01	- 52,00	540.4734.0000		40,01	- 52,00	540.4734.0000		40,01	- 52,00	540.4737.0000	
52,01	- 77,00	540.9634.0000		52,01	- 77,00	540.9634.0000		52,01	- 77,00	540.9634.0000		52,01	- 77,00	540.9637.0000	
77,01	-108,00	540.9644.0000		77,01	-108,00	540.9644.0000		77,01	-108,00	540.9644.0000		77,01	-108,00	540.9647.0000	
108,01	-153,10	540.9644.0000 540.9604.0000		108,01	-153,10	540.9644.0000 540.9604.0000		108,01	-153,10	540.9644.0000 540.9604.0000		108,01	-153,10	540.9647.0000 540.9607.0205	

Ausführung *(model)*															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar]				**p [bar]**				**p [bar]**				**p [bar]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
2G3				**2G3**				**2G3**				**2G3**			
5,00	- 7,00	540.5702.0000		5,00	- 7,00	540.5702.0000		5,00	- 7,00	540.5704.0000		5,00	- 7,00	540.5707.0000	
7,01	- 9,00	540.5712.0000		7,01	- 9,00	540.5712.0000		7,01	- 9,00	540.5714.0000		7,01	- 9,00	540.5717.0000	
9,01	- 11,50	540.5722.0000		9,01	- 11,50	540.5722.0000		9,01	- 11,50	540.5724.0000		9,01	- 11,50	540.5727.0000	
11,51	- 15,00	540.5732.0000		11,51	- 15,00	540.5732.0000		11,51	- 15,00	540.5734.0000		11,51	- 15,00	540.5737.0000	
15,01	- 19,00	540.5742.0000		15,01	- 19,00	540.5742.0000		15,01	- 19,00	540.5744.0000		15,01	- 19,00	540.5747.0000	
19,01	- 27,00	540.5752.0000		19,01	- 27,00	540.5752.0000		19,01	- 27,00	540.5754.0000		19,01	- 27,00	540.5757.0000	
27,01	- 38,00	540.5762.0000		27,01	- 38,00	540.5762.0000		27,01	- 38,00	540.5764.0000		27,01	- 38,00	540.5767.0000	
38,01	- 53,00	540.5772.0000		38,01	- 53,00	540.5772.0000		38,01	- 53,00	540.5774.0000		38,01	- 53,00	540.5777.0000	
53,01	- 75,00	540.5782.0000		53,01	- 75,00	540.5782.0000		53,01	- 75,00	540.5784.0000		53,01	- 75,00	540.5787.0000	
75,01	-105,00	540.5792.0000		75,01	-105,00	540.5792.0000		75,01	-105,00	540.5784.0000		75,01	-105,00	540.5787.0000	
105,01	-150,00	540.5802.0000		105,01	-150,00	540.5802.0000				540.9724.0205				540.9727.0205	
		540.9924.0205				540.9924.0205		105,01	-150,00	540.9494.0000		105,01	-150,00	540.9497.0000	
150,01	-219,00	540.5802.0000		150,01	-219,00	540.5802.0000		150,01	-219,00	540.9494.0000		150,01	-219,00	540.9497.0000	
		540.4982.0205				540.4982.0205				540.9724.0205				540.9727.0205	
219,01	-255,40	540.9492.0000		219,01	-255,40	540.9492.0000		219,01	-255,40	540.9494.0000		219,01	-255,40	540.9497.0000	
		540.4982.0205				540.4982.0205				540.4984.0205				540.4987.0205	
1 1/2H3				**1 1/2H3**				**1 1/2H3**				**1 1/2H3**			
0,20	- 0,40	gewichtsbel.	S	0,20	- 0,40	gewichtsbel.	S	0,20	- 0,40	gewichtsbel.	S	0,20	- 0,40	gewichtsbel.	S
0,41	- 1,00	540.8414.0000		0,41	- 1,00	540.8414.0000		0,41	- 1,00	540.8414.0000		0,41	- 1,00	540.8417.0000	
1,01	- 1,70	540.8434.0000		1,01	- 1,70	540.8434.0000		1,01	- 1,70	540.8434.0000		1,01	- 1,70	540.8437.0000	
1,71	- 2,80	540.4664.0000		1,71	- 2,80	540.4664.0000		1,71	- 2,80	540.4664.0000		1,71	- 2,80	540.4667.0000	
2,81	- 3,80	540.4674.0000		2,81	- 3,80	540.4674.0000		2,81	- 3,80	540.4674.0000		2,81	- 3,80	540.4677.0000	
3,81	- 6,50	540.4684.0000		3,81	- 6,50	540.4684.0000		3,81	- 6,50	540.4684.0000		3,81	- 6,50	540.4687.0000	
6,51	- 9,50	540.4694.0000		6,51	- 9,50	540.4694.0000		6,51	- 9,50	540.4694.0000		6,51	- 9,50	540.4697.0000	
9,51	- 12,50	540.4704.0000		9,51	- 12,50	540.4704.0000		9,51	- 12,50	540.4704.0000		9,51	- 12,50	540.4707.0000	
12,51	- 19,70	540.4714.0000		12,51	- 19,70	540.4714.0000		12,51	- 19,70	540.4714.0000		12,51	- 19,70	540.4717.0000	

Ausführung *(model)*															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar]				**p [bar]**				**p [bar]**				**p [bar]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
2H3				**2H3**				**2H3**				**2H3**			
0,30	- 0,60	gewichtsbel.	S	0,30	- 0,60	gewichtsbel.	S	0,30	- 0,60	gewichtsbel.	S	0,30	- 0,60	gewichtsbel.	S
0,61	- 1,00	540.8514.0000		0,61	- 1,00	540.8514.0000		0,61	- 1,00	540.8514.0000		0,61	- 1,00	540.8517.0000	
1,01	- 1,60	540.8532.0000		1,01	- 1,60	540.8532.0000		1,01	- 1,60	540.8534.0000		1,01	- 1,60	540.8537.0000	
1,61	- 2,00	540.8542.0000		1,61	- 2,00	540.8542.0000		1,61	- 2,00	540.8504.0000		1,61	- 2,00	540.8507.0000	
2,01	- 2,80	540.8542.0000	O	2,01	- 2,80	540.8542.0000	O	2,01	- 2,80	540.8504.0000	O	2,01	- 2,80	540.8507.0000	O
2,81	- 3,80	540.8552.0000	O	2,81	- 3,80	540.8552.0000	O	2,81	- 3,80	540.8554.0000	O	2,81	- 3,80	540.8557.0000	O
3,81	- 5,90	540.5712.0000		3,81	- 5,90	540.5712.0000		3,81	- 5,90	540.5714.0000		3,81	- 5,90	540.5717.0000	
5,91	- 7,50	540.5722.0000		5,91	- 7,50	540.5722.0000		5,91	- 7,50	540.5724.0000		5,91	- 7,50	540.5727.0000	
7,51	- 10,00	540.5732.0000		7,51	- 10,00	540.5732.0000		7,51	- 10,00	540.5734.0000		7,51	- 10,00	540.5737.0000	
10,01	- 14,00	540.5742.0000		10,01	- 14,00	540.5742.0000		10,01	- 14,00	540.5744.0000		10,01	- 14,00	540.5747.0000	
14,01	- 23,00	540.5752.0000		14,01	- 23,00	540.5752.0000		14,01	- 23,00	540.5754.0000		14,01	- 23,00	540.5757.0000	
23,01	- 30,00	540.5762.0000		23,01	- 30,00	540.5762.0000		23,01	- 30,00	540.5764.0000		23,01	- 30,00	540.5767.0000	
30,01	- 42,00	540.5772.0000		30,01	- 42,00	540.5772.0000		30,01	- 42,00	540.5774.0000		30,01	- 42,00	540.5777.0000	
42,01	- 56,20	540.5782.0000		42,01	- 56,20	540.5782.0000		42,01	- 56,20	540.5784.0000		42,01	- 56,20	540.5787.0000	
56,21	- 75,00	540.9752.0000 540.4962.0205		56,21	- 75,00	540.9752.0000 540.4962.0205		56,21	- 75,00	540.5774.0000 540.9724.0205		56,21	- 75,00	540.5777.0000 540.9727.0205	
75,01	-103,00	540.5802.0000		75,01	-103,00	540.5802.0000		75,01	-103,00	540.5804.0000		75,01	-103,00	540.5807.0000	
103,01	-135,00	540.5802.0000 540.9722.0205		103,01	-135,00	540.5802.0000 540.9722.0205		103,01	-135,00	540.5804.0000 540.9724.0205		103,01	-135,00	540.5807.0000 540.9727.0205	
135,01	-189,60	540.9492.0000 540.4982.0205		135,01	-189,60	540.9492.0000 540.4982.0205		135,01	-189,60	540.9494.0000 540.4984.0205		135,01	-189,60	540.9497.0000 540.4987.0205	

Ausführung *(model)*															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar]				**p [bar]**				**p [bar]**				**p [bar]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
2J3				**2J3**				**2J3**				**2J3**			
0,20	- 0,90	gewichtsbel.	S	0,20	- 0,90	gewichtsbel.	S	0,20	- 0,90	gewichtsbel.	S	0,20	- 0,90	gewichtsbel.	S
0,91	- 1,50	540.8532.0000		0,91	- 1,50	540.8532.0000		0,91	- 1,50	540.8534.0000		0,91	- 1,50	540.8537.0000	
1,51	- 2,50	540.5702.0000		1,51	- 2,50	540.5702.0000		1,51	- 2,50	540.5704.0000		1,51	- 2,50	540.5707.0000	
2,51	- 3,00	540.5712.0000		2,51	- 3,00	540.5712.0000		2,51	- 3,00	540.5714.0000		2,51	- 3,00	540.5717.0000	
3,01	- 4,00	540.5722.0000		3,01	- 4,00	540.5722.0000		3,01	- 4,00	540.5724.0000		3,01	- 4,00	540.5727.0000	
4,01	- 5,50	540.5732.0000		4,01	- 5,50	540.5732.0000		4,01	- 5,50	540.5734.0000		4,01	- 5,50	540.5737.0000	
5,51	- 7,50	540.5742.0000		5,51	- 7,50	540.5742.0000		5,51	- 7,50	540.5744.0000		5,51	- 7,50	540.5747.0000	
7,51	- 11,50	540.5752.0000		7,51	- 11,50	540.5752.0000		7,51	- 11,50	540.5754.0000		7,51	- 11,50	540.5757.0000	
11,51	- 15,00	540.5762.0000		11,51	- 15,00	540.5762.0000		11,51	- 15,00	540.5764.0000		11,51	- 15,00	540.5767.0000	
15,01	- 19,70	540.5772.0000		15,01	- 19,70	540.5772.0000		15,01	- 19,70	540.5774.0000		15,01	- 19,70	540.5777.0000	
3J4				**3J4**				**3J4**				**3J4**			
0,80	- 1,10	540.8624.0000		0,80	- 1,10	540.8624.0000		0,80	- 1,10	540.8624.0000		0,80	- 1,10	540.8627.0000	
1,11	- 1,50	540.8632.0000		1,11	- 1,50	540.8632.0000		1,11	- 1,50	540.8634.0000		1,11	- 1,50	540.8637.0000	
1,51	- 2,00	540.8642.0000		1,51	- 2,00	540.8642.0000		1,51	- 2,00	540.8644.0000		1,51	- 2,00	540.8647.0000	
2,01	- 2,70	540.8642.0000	O	2,01	- 2,70	540.8642.0000	O	2,01	- 2,70	540.8644.0000	O	2,01	- 2,70	540.8647.0000	O
2,71	- 4,20	540.8652.0000	O	2,71	- 4,20	540.8652.0000	O	2,71	- 4,20	540.8654.0000	O	2,71	- 4,20	540.8657.0000	O
4,21	- 6,00	540.5812.0000	O	4,21	- 6,00	540.5812.0000	O	4,21	- 6,00	540.5814.0000	O	4,21	- 6,00	540.5817.0000	O
6,01	- 7,50	540.5832.0000		6,01	- 7,50	540.5832.0000		6,01	- 7,50	540.5834.0000		6,01	- 7,50	540.5837.0000	
7,51	- 11,00	540.5842.0000		7,51	- 11,00	540.5842.0000		7,51	- 11,00	540.5844.0000		7,51	- 11,00	540.5847.0000	
11,01	- 15,50	540.5852.0000		11,01	- 15,50	540.5852.0000		11,01	- 15,50	540.5854.0000		11,01	- 15,50	540.5857.0000	
15,51	- 21,50	540.5862.0000		15,51	- 21,50	540.5862.0000		15,51	- 21,50	540.5864.0000		15,51	- 21,50	540.5867.0000	
21,51	- 30,50	540.5872.0000		21,51	- 30,50	540.5872.0000		21,51	- 30,50	540.5874.0000		21,51	- 30,50	540.5877.0000	
30,51	- 44,00	540.5882.0000		30,51	- 44,00	540.5882.0000		30,51	- 44,00	540.5884.0000		30,51	- 44,00	540.5887.0000	
44,01	- 62,50	540.5892.0000		44,01	- 62,50	540.5892.0000		44,01	- 62,50	540.5894.0000		44,01	- 62,50	540.5897.0000	
62,51	- 82,00	540.9862.0000		62,51	- 82,00	540.9862.0000		62,51	- 82,00	540.9864.0000		62,51	- 82,00	540.9867.0000	
82,01	-107,00	540.5892.0000 540.9872.0000		82,01	-107,00	540.5892.0000 540.9872.0000		82,01	-107,00	540.5894.0000 540.9874.0205		82,01	-107,00	540.5897.0000 540.9877.0000	
107,01	-126,00	540.9862.0000 540.9872.0000		107,01	-126,00	540.9862.0000 540.9872.0000		107,01	-126,00	540.9864.0000 540.9874.0205		107,01	-126,00	540.9867.0000 540.9877.0000	
126,01	-158,00	540.8682.0000 540.9872.0000		126,01	-158,00	540.8682.0000 540.9872.0000		126,01	-158,00	540.8684.0000 540.9874.0205		126,01	-158,00	540.8687.0000 540.9877.0000	
158,01	-186,20		S	158,01	-186,20		S	158,01	-186,20		S	158,01	-186,20		S

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doc. type:	LGS	change rep.	00841A	retention	10y.		

Ausführung *(model)*															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar]				**p [bar]**				**p [bar]**				**p [bar]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
3K4				**3K4**				**3K4**				**3K4**			
0,30	- 0,40	gewichtsbel.	S	0,30	- 0,40	gewichtsbel.	S	0,30	- 0,40	gewichtsbel.	S	0,30	- 0,40	gewichtsbel.	S
0,41	- 0,60	540.8612.0000		0,41	- 0,60	540.8612.0000		0,41	- 0,60	540.8614.0000		0,41	- 0,60	540.8617.0000	
0,61	- 1,00	540.8632.0000		0,61	- 1,00	540.8632.0000		0,61	- 1,30	540.8634.0000		0,61	- 1,30	540.8637.0000	
1,01	- 1,30	540.8632.0000	O	1,01	- 1,30	540.8632.0000	O								
1,31	- 2,20	540.8652.0000		1,31	- 2,20	540.8652.0000		1,31	- 2,20	540.8654.0000		1,31	- 2,20	540.8657.0000	
2,21	- 3,00	540.5812.0000		2,21	- 3,00	540.5812.0000		2,21	- 3,00	540.5814.0000		2,21	- 3,00	540.5817.0000	
3,01	- 4,00	540.5822.0000		3,01	- 4,00	540.5822.0000		3,01	- 4,00	540.5824.0000		3,01	- 4,00	540.5827.0000	
4,01	- 5,50	540.5832.0000		4,01	- 5,50	540.5832.0000		4,01	- 5,50	540.5834.0000		4,01	- 5,50	540.5837.0000	
5,51	- 7,50	540.5842.0000		5,51	- 7,50	540.5842.0000		5,51	- 7,50	540.5844.0000		5,51	- 7,50	540.5847.0000	
7,51	- 10,50	540.5852.0000		7,51	- 10,50	540.5852.0000		7,51	- 10,50	540.5854.0000		7,51	- 10,50	540.5857.0000	
10,51	- 15,50	540.5862.0000		10,51	- 15,50	540.5862.0000		10,51	- 15,50	540.5864.0000		10,51	- 15,50	540.5867.0000	
15,51	- 20,50	540.5872.0000		15,51	- 20,50	540.5872.0000		15,51	- 20,50	540.5874.0000		15,51	- 20,50	540.5877.0000	
20,51	- 28,30	540.5882.0000		20,51	- 28,30	540.5882.0000		20,51	- 28,30	540.5884.0000		20,51	- 28,30	540.5887.0000	
28,31	- 38,50	540.5892.0000		28,31	- 38,50	540.5892.0000		28,31	- 38,50	540.5894.0000		28,31	- 38,50	540.5897.0000	
38,51	- 51,00	540.9862.0000		38,51	- 51,00	540.9862.0000		38,51	- 51,00	540.9864.0000		38,51	- 51,00	540.9867.0000	
51,01	- 72,00	540.8682.0000		51,01	- 72,00	540.8682.0000		51,01	- 72,00	540.8684.0000		51,01	- 72,00	540.8687.0000	
72,01	-102,00	540.8682.0000 540.9872.0000		72,01	-102,00	540.8682.0000 540.9872.0000		72,01	-102,00	540.8684.0000 540.9874.0205		72,01	-102,00	540.8687.0000 540.9877.0205	

Ausführung *(model)*

warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar]				**p [bar]**				**p [bar]**				**p [bar]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
3K6				**3K6**				**3K6**				**3K6**			
2,30	- 3,20	540.5912.0000		2,30	- 3,20	540.5912.0000		2,30	- 3,20	540.5914.0000		2,30	- 3,20	540.5917.0000	
3,21	- 4,40	540.5922.0000		3,21	- 4,40	540.5922.0000		3,21	- 4,40	540.5924.0000		3,21	- 4,40	540.5927.0000	
4,41	- 6,00	540.5932.0000		4,41	- 6,00	540.5932.0000		4,41	- 6,00	540.5934.0000		4,41	- 6,00	540.5937.0000	
6,01	- 8,50	540.5942.0000		6,01	- 8,50	540.5942.0000		6,01	- 8,50	540.5944.0000		6,01	- 8,50	540.5947.0000	
8,51	- 11,50	540.5952.0000		8,51	- 11,50	540.5952.0000		8,51	- 11,50	540.5954.0000		8,51	- 11,50	540.5957.0000	
11,51	- 15,00	540.5962.0000		11,51	- 15,00	540.5962.0000		11,51	- 15,00	540.5964.0000		11,51	- 15,00	540.5967.0000	
15,01	- 21,00	540.5972.0000		15,01	- 21,00	540.5972.0000		15,01	- 21,00	540.5974.0000		15,01	- 21,00	540.5977.0000	
21,01	- 29,00	540.9952.0000		21,01	- 29,00	540.9952.0000		21,01	- 29,00	540.9954.0000		21,01	- 29,00	540.9957.0000	
29,01	- 39,00	540.5984.0000		29,01	- 39,00	540.5984.0000		29,01	- 39,00	540.5984.0000		29,01	- 39,00	540.5987.0000	
39,01	- 51,70	540.4994.0000		39,01	- 51,70	540.4994.0000		39,01	- 51,70	540.4994.0000		39,01	- 51,70	540.4997.0000	
51,71	- 70,00	540.9552.0000		51,71	- 70,00	540.9552.0000		51,71	- 70,00	540.1374.0000	FT	51,71	- 70,00	540.1377.0000	FT
70,01	- 90,00	540.9952.0000 540.4994.0000		70,01	- 90,00	540.9952.0000 540.4994.0000		70,01	- 90,00	540.9954.0000 540.4994.0000		70,01	- 90,00	540.9957.0000 540.4997.0000	
90,01	-112,50	540.9962.0000 540.4994.0000		90,01	-112,50	540.9962.0000 540.4994.0000		90,01	-112,50	540.9964.0000 540.4994.0000		90,01	-112,50	540.9967.0000 540.4997.0000	
112,51	-140,70	540.9552.0000 540.9542.0205		112,51	-140,70	540.9552.0000 540.9542.0205		112,51	-153,10		S	112,51	-153,10		S
140,71	-153,10		S	140,71	-153,10		S								

Ausführung (model)															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar]				**p [bar]**				**p [bar]**				**p [bar]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
3L4				**3L4**				**3L4**				**3L4**			
0,30	- 0,50	540.8612.0000		0,30	- 0,50	540.8612.0000		0,30	- 0,50	540.8614.0000		0,30	- 0,50	540.8617.0000	
0,51	- 0,90	540.8632.0000		0,51	- 0,90	540.8632.0000		0,51	- 0,70	540.8634.0000		0,51	- 0,70	540.8637.0000	
								0,71	- 0,90	540.8634.0000	O	0,71	- 0,90	540.8637.0000	O
0,91	- 1,50	540.8652.0000		0,91	- 1,50	540.8652.0000		0,91	- 1,50	540.8654.0000		0,91	- 1,50	540.8657.0000	
1,51	- 2,00	540.5812.0000		1,51	- 2,00	540.5812.0000		1,51	- 2,00	540.5814.0000		1,51	- 2,00	540.5817.0000	
2,01	- 3,00	540.5822.0000		2,01	- 3,00	540.5822.0000		2,01	- 3,00	540.5824.0000	O	2,01	- 3,00	540.5827.0000	O
3,01	- 4,30	540.5832.0000		3,01	- 4,30	540.5832.0000		3,01	- 4,30	540.5834.0000	O	3,01	- 4,30	540.5837.0000	O
4,31	- 5,50	540.5842.0000		4,31	- 5,50	540.5842.0000		4,31	- 6,50	540.5844.0000	O	4,31	- 6,50	540.5847.0000	O
5,51	- 6,50	540.5842.0000	O	5,51	- 6,50	540.5842.0000	O								
6,51	- 7,60	540.5852.0000		6,51	- 7,60	540.5852.0000		6,51	- 9,00	540.5854.0000	O	6,51	- 9,00	540.5857.0000	O
7,61	- 9,00	540.5852.0000	O	7,61	- 9,00	540.5852.0000	O								
9,01	- 10,90	540.5862.0000		9,01	- 10,90	540.5862.0000		9,01	- 12,50	540.5864.0000	O	9,01	- 12,50	540.5867.0000	O
10,91	- 12,50	540.5862.0000	O	10,91	- 12,50	540.5862.0000	O								
12,51	- 16,50	540.5872.0000		12,51	- 16,50	540.5872.0000		12,51	- 16,50	540.5874.0000	O	12,51	- 16,50	540.5877.0000	O
16,51	- 19,70	540.5882.0000		16,51	- 19,70	540.5882.0000		16,51	- 19,70	540.5884.0000		16,51	- 19,70	540.5887.0000	

Ausführung *(model)*															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar]				**p [bar]**				**p [bar]**				**p [bar]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
4L6				**4L6**				**4L6**				**4L6**			
0,20	- 0,69	gewichtsbel.	S	0,20	- 0,69	gewichtsbel.	S	0,20	- 0,69	gewichtsbel.	S	0,20	- 0,69	gewichtsbel.	S
0,70	- 1,20	540.8732.0000		0,70	- 1,20	540.8732.0000		0,70	- 1,20	540.8734.0000		0,70	- 1,20	540.8737.0000	
1,21	- 1,50	540.8742.0000		1,21	- 1,50	540.8742.0000		1,21	- 1,50	540.8744.0000		1,21	- 1,50	540.8747.0000	
1,51	- 1,80	540.8752.0000		1,51	- 1,80	540.8752.0000		1,51	- 1,80	540.8754.0000		1,51	- 1,80	540.8757.0000	
1,81	- 3,00	540.5922.0000		1,81	- 3,00	540.5922.0000		1,81	- 3,00	540.5924.0000		1,81	- 3,00	540.5927.0000	
3,01	- 3,90	540.5932.0000		3,01	- 3,90	540.5932.0000		3,01	- 3,90	540.5934.0000		3,01	- 3,90	540.5937.0000	
3,91	- 5,50	540.5942.0000		3,91	- 5,50	540.5942.0000		3,91	- 5,50	540.5944.0000		3,91	- 5,50	540.5947.0000	
5,51	- 7,30	540.5952.0000		5,51	- 7,30	540.5952.0000		5,51	- 7,30	540.5954.0000		5,51	- 7,30	540.5957.0000	
7,31	- 9,80	540.5962.0000		7,31	- 9,80	540.5962.0000		7,31	- 9,80	540.5964.0000		7,31	- 9,80	540.5967.0000	
9,81	- 13,50	540.5972.0000		9,81	- 13,50	540.5972.0000		9,81	- 13,50	540.5974.0000		9,81	- 13,50	540.5977.0000	
13,51	- 16,60	540.9952.0000		13,51	- 16,60	540.9952.0000		13,51	- 16,60	540.9954.0000		13,51	- 16,60	540.9957.0000	
16,61	- 20,40	540.5982.0000		16,61	- 20,40	540.5982.0000		16,61	- 20,40	540.5984.0000		16,61	- 20,40	540.5987.0000	
20,41	- 25,50	540.4994.0000		20,41	- 25,50	540.4994.0000		20,41	- 25,50	540.4994.0000		20,41	- 25,50	540.4997.0000	
25,51	- 35,20	540.5982.0000 540.9534.0000		25,51	- 35,20	540.5982.0000 540.9534.0000		25,51	- 35,20	540.5984.0000 540.9534.0000		25,51	- 35,20	540.5987.0000 540.9537.0000	
35,21	- 43,00	540.9962.0000 540.9534.0000		35,21	- 43,00	540.9962.0000 540.9534.0000		35,21	- 43,00	540.9964.0000 540.9534.0000		35,21	- 43,00	540.9967.0000 540.9537.0000	
43,01	- 53,00	540.9962.0000 540.4994.0000		43,01	- 53,00	540.9962.0000 540.4994.0000		43,01	- 53,00	540.9964.0000 540.4994.0000		43,01	- 53,00	540.9967.0000 540.4997.0000	
53,01	- 67,00	540.9552.0000 540.9542.0205		53,01	- 67,00	540.9552.0000 540.9542.0205		53,01	- 67,00		FT;S	53,01	- 67,00	540.1377.0000 540.1487.0205	FT
67,01	- 88,00	540.1392.0000 540.1482.0205	FT	67,01	- 88,00	540.1392.0000 540.1482.0205	FT	67,01	- 88,00	540.1384.0000 540.1494.0205	FT	67,01	- 88,00	540.1387.0000 540.1497.0205	FT
88,01	-103,40	540.1392.0000 540.1492.0205	FT	88,01	-103,40	540.1392.0000 540.1492.0205	FT	88,01	-103,40	540.1392.0000 540.1492.0205	FT/ Faba	88,01	-103,40	540.1397.0000 540.1497.0205	FT

Disclosure cat.:	II	proofread by:	MD	publish date:	3/25/15	effect.dat	3/15
author:	Schm	released by:	JR	replaces:	060-30	status:	publishe
resp. depart.:	TB	date of	3/25/15	revision No.:	3		
doc. type:	LGS	change rep.	00841A	retention	10y.		

Ausführung *(model)*															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar]				**p [bar]**				**p [bar]**				**p [bar]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
4M6				**4M6**				**4M6**				**4M6**			
0,20	- 0,50	gewichtsbel.	S	0,20	- 0,50	gewichtsbel.	S	0,20	- 0,50	gewichtsbel.	S	0,20	- 0,50	gewichtsbel.	S
0,51	- 0,75	540.8732.0000		0,51	- 0,75	540.8732.0000		0,51	- 0,75	540.8734.0000		0,51	- 0,75	540.8737.0000	
0,76	- 0,90	540.8742.0000		0,76	- 0,90	540.8742.0000		0,76	- 0,90	540.8744.0000		0,76	- 0,90	540.8747.0000	
0,91	- 1,40	540.8752.0000		0,91	- 1,40	540.8752.0000		0,91	- 1,40	540.8754.0000		0,91	- 1,40	540.8757.0000	
1,41	- 2,00	540.5912.0000		1,41	- 2,00	540.5912.0000		1,41	- 2,00	540.5914.0000		1,41	- 2,00	540.5917.0000	
2,01	- 2,90	540.5922.0000		2,01	- 2,90	540.5922.0000		2,01	- 2,90	540.5924.0000		2,01	- 2,90	540.5927.0000	
2,91	- 3,80	540.5932.0000		2,91	- 3,80	540.5932.0000		2,91	- 3,80	540.5934.0000		2,91	- 3,80	540.5937.0000	
3,81	- 5,50	540.5942.0000		3,81	- 5,50	540.5942.0000		3,81	- 5,50	540.5944.0000		3,81	- 5,50	540.5947.0000	
5,51	- 7,00	540.5952.0000		5,51	- 7,00	540.5952.0000		5,51	- 7,00	540.5954.0000		5,51	- 7,00	540.5957.0000	
7,01	- 10,00	540.5962.0000		7,01	- 10,00	540.5962.0000		7,01	- 10,00	540.5964.0000		7,01	- 10,00	540.5967.0000	
10,01	- 12,50	540.5972.0000		10,01	- 12,50	540.5972.0000		10,01	- 12,50	540.5974.0000		10,01	- 12,50	540.5977.0000	
12,51	- 15,50	540.9952.0000		12,51	- 15,50	540.9952.0000		12,51	- 15,50	540.9954.0000		12,51	- 15,50	540.9957.0000	
15,51	- 20,00	540.5982.0000		15,51	- 20,00	540.5982.0000		15,51	- 20,00	540.5984.0000		15,51	- 20,00	540.5987.0000	
20,01	- 27,00	540.9962.0000		20,01	- 27,00	540.9962.0000		20,01	- 27,00	540.9964.0000		20,01	- 27,00	540.9967.0000	
27,01	- 34,00	540.9952.0000 540.9982.0205		27,01	- 34,00	540.9952.0000 540.9982.0205		27,01	- 34,00	540.9954.0000 540.9984.0205		27,01	- 34,00	540.9957.0000 540.9987.0205	
34,01	- 44,00	540.9962.0000 540.9982.0205		34,01	- 44,00	540.9962.0000 540.9982.0205		34,01	- 44,00	540.9964.0000 540.9984.0205		34,01	- 44,00	540.9967.0000 540.9987.0205	
44,01	- 56,70	540.9962.0000 540.4992.0000		44,01	- 56,70	540.9962.0000 540.4992.0000		44,01	- 49,60	540.9964.0000 540.4994.0000		44,01	- 49,60	540.9967.0000 540.4997.0000	
								49,61	- 56,70	540.9962.0000 540.4992.0000	S; Faba	49,61	- 56,70	540.9967.0000 540.4997.0000	
56,71	- 75,80	540.9552.0000 540.9542.0205		56,71	- 75,80	540.9552.0000 540.9542.0205		56,71	- 75,80	540.9552.0000 540.9542.0205	S; Faba	56,71	- 73,00	540.9557.0000 540.9547.0205	
												73,01	- 75,80		S

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author:	Schm	released by:	JR	replaces:	060-30	status:	publishe
resp. depart.:	TB	date of	3/25/15	revision No.:	3		
doc. type:	LGS	change rep.	00841A	retention	10y.		

Ausführung *(model)*																	
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar]				**p [bar]**				**p [bar]**				**p [bar]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
4N6				**4N6**				**4N6**				**4N6**			
0,20	- 0,40	gewichtsbel.	S	0,20	- 0,40	gewichtsbel.	S	0,20	- 0,40	gewichtsbel.	S	0,20	- 0,40	gewichtsbel.	S
0,41	- 0,70	540.8732.0000		0,41	- 0,70	540.8732.0000		0,41	- 0,70	540.8734.0000		0,41	- 0,70	540.8737.0000	
0,71	- 1,45	540.8752.0000		0,71	- 1,45	540.8752.0000		0,71	- 1,45	540.8754.0000		0,71	- 1,45	540.8757.0000	
1,46	- 2,30	540.5922.0000		1,46	- 2,30	540.5922.0000		1,46	- 2,30	540.5924.0000		1,46	- 2,30	540.5927.0000	
2,31	- 3,10	540.5932.0000		2,31	- 3,10	540.5932.0000		2,31	- 3,10	540.5934.0000		2,31	- 3,10	540.5937.0000	
3,11	- 4,00	540.5942.0000		3,11	- 4,00	540.5942.0000		3,11	- 4,00	540.5944.0000		3,11	- 4,00	540.5947.0000	
4,01	- 5,80	540.5952.0000		4,01	- 5,80	540.5952.0000		4,01	- 5,80	540.5954.0000		4,01	- 5,80	540.5957.0000	
5,81	- 8,00	540.5962.0000		5,81	- 8,00	540.5962.0000		5,81	- 8,00	540.5964.0000		5,81	- 8,00	540.5967.0000	
8,01	- 10,50	540.5972.0000		8,01	- 10,50	540.5972.0000		8,01	- 10,50	540.5974.0000		8,01	- 10,50	540.5977.0000	
10,51	- 13,50	540.9952.0000		10,51	- 13,50	540.9952.0000		10,51	- 13,50	540.9954.0000		10,51	- 13,50	540.9957.0000	
13,51	- 17,00	540.5982.0000		13,51	- 17,00	540.5982.0000		13,51	- 17,00	540.5984.0000		13,51	- 17,00	540.5987.0000	
17,01	- 21,50	540.4992.0000		17,01	- 21,50	540.4992.0000		17,01	- 21,50	540.4994.0000		17,01	- 21,50	540.4997.0000	
21,51	- 26,00	540.5972.0000 540.9534.0000		21,51	- 26,00	540.5972.0000 540.9534.0000		21,51	- 26,00	540.5974.0000 540.9534.0000		21,51	- 26,00	540.5977.0000 540.9537.0000	
26,01	- 31,50	540.5982.0000 540.9534.0000		26,01	- 31,50	540.5982.0000 540.9534.0000		26,01	- 31,50	540.5984.0000 540.9534.0000		26,01	- 31,50	540.5987.0000 540.9537.0000	
31,51	- 37,50	540.9962.0000 540.9534.0000		31,51	- 37,50	540.9962.0000 540.9534.0000		31,51	- 37,50	540.9964.0000 540.9534.0000		31,51	- 37,50	540.9967.0000 540.9537.0000	
37,51	- 45,00	540.9962.0000 540.4992.0000		37,51	- 45,00	540.9962.0000 540.4992.0000		37,51	- 45,00	540.9964.0000 540.4994.0000		37,51	- 45,00	540.9967.0000 540.4997.0000	
45,01	- 53,00	540.9552.0000 540.4992.0000		45,01	- 53,00	540.9552.0000 540.4992.0000		45,01	- 53,00		FT; S	45,01	- 53,00	540.1377.0000 540.1487.0205	FT
53,01	- 68,90	540.1374.0000 540.1492.0205	FT	53,01	- 68,90	540.1374.0000 540.1492.0205	FT	53,01	- 68,90		FT; S	53,01	- 68,90		FT; S

Ausführung *(model)*															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar]				**p [bar]**				**p [bar]**				**p [bar]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
4P6				**4P6**				**4P6**				**4P6**			
0,12	- 0,35	gewichtsbel.	S	0,12	- 0,35	gewichtsbel.	S	0,12	- 0,35	gewichtsbel.	S	0,12	- 0,35	gewichtsbel.	S
0,36	- 0,55	540.8732.0000		0,36	- 0,55	540.8732.0000		0,36	- 0,55	540.8734.0000		0,36	- 0,55	540.8737.0000	
0,56	- 0,70	540.8742.0000		0,56	- 0,70	540.8742.0000		0,56	- 0,70	540.8744.0000		0,56	- 0,70	540.8747.0000	
0,71	- 1,10	540.8752.0000		0,71	- 1,10	540.8752.0000		0,71	- 1,10	540.8754.0000		0,71	- 1,10	540.8757.0000	
1,11	- 1,70	540.5912.0000		1,11	- 1,70	540.5912.0000		1,11	- 1,70	540.5914.0000		1,11	- 1,70	540.5917.0000	
1,71	- 2,10	540.5922.0000		1,71	- 2,10	540.5922.0000		1,71	- 2,10	540.5924.0000		1,71	- 2,10	540.5927.0000	
2,11	- 3,10	540.5932.0000		2,11	- 3,10	540.5932.0000		2,11	- 3,10	540.5934.0000		2,11	- 3,10	540.5937.0000	
3,11	- 4,40	540.5942.0000		3,11	- 4,40	540.5942.0000		3,11	- 4,40	540.5944.0000		3,11	- 4,40	540.5947.0000	
4,41	- 6,20	540.5952.0000		4,41	- 6,20	540.5952.0000		4,41	- 6,20	540.5954.0000		4,41	- 6,20	540.5957.0000	
6,21	- 8,40	540.5962.0000		6,21	- 8,40	540.5962.0000		6,21	- 8,40	540.5964.0000		6,21	- 8,40	540.5967.0000	
8,41	- 11,50	540.5972.0000		8,41	- 11,50	540.5972.0000		8,41	- 11,50	540.5974.0000		8,41	- 11,50	540.5977.0000	
11,51	- 13,80	540.9952.0000		11,51	- 13,80	540.9952.0000		11,51	- 13,80	540.9954.0000		11,51	- 13,80	540.9957.0000	
13,81	- 19,70	540.5982.0000		13,81	- 19,70	540.5982.0000		13,81	- 19,70		S	13,81	- 19,70	540.5987.0000	

Ausführung *(model)*															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [bar] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices
4P6 300-900#				**4P6 300-900#**				**4P6 300-900#**				**4P6 300-900#**			
0,25	- 0,40	gewichtsbel.	S	0,25	- 0,40	gewichtsbel.	S	0,25	- 0,40	gewichtsbel.	S	0,25	- 0,40	gewichtsbel.	S
0,41	- 0,60	540.8832.0000	O	0,41	- 0,60	540.8832.0000	O	0,41	- 0,60	540.8834.0000	O	0,41	- 0,60	540.8837.0000	O
0,61	- 0,90	540.8842.0000	O	0,61	- 0,90	540.8842.0000	O	0,61	- 0,90	540.8844.0000	O	0,61	- 0,90	540.8847.0000	O
0,91	- 1,40	540.8862.0000	O	0,91	- 1,40	540.8862.0000	O	0,91	- 1,40	540.8864.0000	O	0,91	- 1,40	540.8867.0000	O
1,41	- 2,10	540.8872.0000	O	1,41	- 2,10	540.8872.0000	O	1,41	- 2,10	540.8874.0000	O	1,41	- 2,10	540.8877.0000	O
2,11	- 3,00	540.8882.0000	O	2,11	- 3,00	540.8882.0000	O	2,11	- 3,00	540.8884.0000	O	2,11	- 3,00	540.8887.0000	O
3,01	- 4,00	540.8892.0000	O	3,01	- 4,00	540.8892.0000	O	3,01	- 4,00	540.8894.0000	O	3,01	- 4,00	540.8897.0000	O
4,01	- 5,40	540.8902.0000	O	4,01	- 5,40	540.8902.0000	O	4,01	- 5,40	540.8904.0000	O	4,01	- 5,40	540.8907.0000	O
5,41	- 7,20	540.8852.0000 540.8982.0205	O	5,41	- 7,20	540.8852.0000 540.8982.0205	O	5,41	- 7,20	540.8854.0000 540.8984.0205	O	5,41	- 7,20	540.8857.0000 540.8987.0205	O
7,21	- 9,30	540.8912.0000	O	7,21	- 9,30	540.8912.0000	O	7,21	- 9,30	540.8914.0000	O	7,21	- 9,30	540.8917.0000	O
9,31	- 12,50	540.8922.0000	O	9,31	- 12,50	540.8922.0000	O	9,31	- 12,50	540.8924.0000	O	9,31	- 12,50	540.8927.0000	O
12,51	- 16,00	540.8942.0000	O	12,51	- 16,00	540.8942.0000	O	12,51	- 16,00	540.8944.0000	O	12,51	- 16,00	540.8947.0000	O
16,01	- 21,00	540.8942.0000 540.8972.0205	O	16,01	- 21,00	540.8942.0000 540.8972.0205	O	16,01	- 21,00	540.8944.0000 540.8974.0205	O	16,01	- 21,00	540.8947.0000 540.8977.0205	O
21,01	- 27,00	540.8942.0000 540.8982.0205 540.0044.0000	O	21,01	- 27,00	540.8942.0000 540.8982.0205 540.0044.0000	O	21,01	- 27,00	540.8944.0000 540.8984.0205 540.0044.0000	O	21,01	- 27,00	540.8947.0000 540.8987.0205 540.0047.0000	O
27,01	- 34,00	540.9552.0000 540.9982.0205	FT; O	27,01	- 34,00	540.9552.0000 540.9982.0205	FT; O	27,01	- 34,00	540.9554.0000 540.9984.0205	FT; O	27,01	- 34,00	540.9557.0000 540.9987.0205	O
34,01	- 42,50	540.9552.0000 540.9542.0205	FT; O	34,01	- 42,50	540.9552.0000 540.9542.0205	FT; O	34,01	- 42,50	540.9554.0000 540.9544.0205	FT; O				
42,51	- 49,00	540.9842.0000 540.9542.0205	FT; O	42,51	- 49,00	540.9842.0000 540.9542.0205	FT; O	42,51	- 49,00	540.9842.0000 540.9542.0205	FT;S;O Faba				
49,01	- 59,00	540.9832.0000 540.9542.0205	FT; O	49,01	- 59,00	540.9832.0000 540.9542.0205	FT; O	49,01	- 59,00	540.9832.0000 540.9542.0205	FT;S;O Faba				
59,01	- 68,90	540.9832.0000 540.9992.0205	FT; O	59,01	- 68,90	540.9832.0000 540.9992.0205	FT; O	59,01	- 68,90	540.9832.0000 540.9992.0205	FT;S;O Faba				

Ausführung *(model)*																	
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar]				**p [bar]**				**p [bar]**				**p [bar]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
6Q8				**6Q8**				**6Q8**				**6Q8**			
0,20	- 0,33	gewichtsbel.	S	0,20	- 0,33	gewichtsbel.	S	0,20	- 0,33	gewichtsbel.	S	0,20	- 0,33	gewichtsbel.	S
0,34	- 0,60	540.8832.0000	O	0,34	- 0,60	540.8832.0000	O	0,34	- 0,60	540.8834.0000	O	0,34	- 0,60	540.8837.0000	O
0,61	- 0,86	540.8842.0000	O	0,61	- 0,86	540.8842.0000	O	0,61	- 0,86	540.8844.0000	O	0,61	- 0,86	540.8847.0000	O
0,87	- 1,50	540.8862.0000	O	0,87	- 1,50	540.8862.0000	O	0,87	- 1,50	540.8864.0000	O	0,87	- 1,50	540.8867.0000	O
1,51	- 2,20	540.8872.0000	O	1,51	- 2,20	540.8872.0000	O	1,51	- 2,20	540.8874.0000	O	1,51	- 2,20	540.8877.0000	O
2,21	- 2,80	540.8882.0000	O	2,21	- 2,80	540.8882.0000	O	2,21	- 2,80	540.8884.0000	O	2,21	- 2,80	540.8887.0000	O
2,81	- 3,80	540.8892.0000	O	2,81	- 3,80	540.8892.0000	O	2,81	- 3,80	540.8894.0000	O	2,81	- 3,80	540.8897.0000	O
3,81	- 4,60	540.8902.0000	O	3,81	- 4,60	540.8902.0000	O	3,81	- 4,60	540.8904.0000	O	3,81	- 4,60	540.8907.0000	O
4,61	- 5,90	540.8852.0000 540.1132.0205	O	4,61	- 5,90	540.8852.0000 540.1132.0205	O	4,61	- 5,90	540.8854.0000 540.1134.0205	O	4,61	- 5,90	540.8857.0000 540.1137.0205	O
5,91	- 7,90	540.8912.0000	O	5,91	- 7,90	540.8912.0000	O	5,91	- 7,90	540.8914.0000	O	5,91	- 7,90	540.8917.0000	O
7,91	- 9,85	540.8902.0000 540.1132.0205	O	7,91	- 9,85	540.8902.0000 540.1132.0205	O	7,91	- 9,85	540.8904.0000 540.1134.0205	O	7,91	- 9,85	540.8907.0000 540.1137.0205	O
9,86	- 13,70	540.8942.0000	O	9,86	- 13,70	540.8942.0000	O	9,86	- 13,70	540.1124.0000 540.1024.0000		9,86	- 13,70	540.1127.0000 540.1027.0000	
13,71	- 18,50	540.8942.0000 540.8972.0205	O	13,71	- 18,50	540.8942.0000 540.8972.0205	O	13,71	- 18,50	540.1124.0000 540.1144.0205		13,71	- 18,50	540.1127.0000 540.1147.0205	
18,51	- 20,70	540.1262.0000		18,51	- 20,70	540.1262.0000		18,51	- 20,70	540.1124.0000 540.1144.0205 540.1024.0000		18,51	- 20,70	540.1127.0000 540.1147.0205 540.1027.0000	
20,71	- 25,00	540.1262.0000 540.1042.0000		20,71	- 25,00	540.1262.0000 540.1042.0000		20,71	- 25,00	540.1262.0000 540.1042.0000	Faba	20,71	- 25,00	540.1267.0000 540.1047.0000	
25,01	- 32,60	540.1262.0000 540.1152.0205		25,01	- 32,60	540.1262.0000 540.1152.0205		25,01	- 32,60	540.1262.0000 540.1152.0205	Faba	25,01	- 32,60	540.1267.0000 540.1157.0205	
32,61	- 35,40	540.1262.0000 540.1152.0205 540.1042.0000		32,61	- 35,40	540.1262.0000 540.1152.0205 540.1042.0000		32,61	- 35,40	540.1262.0000 540.1152.0205 540.1042.0000	Faba	32,61	- 35,40	540.1267.0000 540.1157.0205 540.1047.0000	
35,41	- 41,40	540.1272.0000 540.1152.0205 540.1042.0000		35,41	- 41,40	540.1272.0000 540.1152.0205 540.1042.0000		35,41	- 41,40	540.1272.0000 540.1152.0205 540.1042.0000	Faba	35,41	- 41,40		S
41,41	- 47,00	540.1602.0000 540.1612.0205	FT	41,41	- 47,00	540.1602.0000 540.1612.0205	FT	41,41	- 47,00	540.1602.0000 540.1612.0205	FT;S Faba				

Ausführung *(model)*

warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar] **von** **p1** *up*	**bis** **p2** *to*	**Feder-Sachnummer** *stock no.*	**Indices**	**p [bar]** **von** **p1** *up*	**bis** **p2** *to*	**Feder-Sachnummer** *stock no.*	**Indices**	**p [bar]** **von** **p1** *up*	**bis** **p2** *to*	**Feder-Sachnummer** *stock no.*	**Indices**	**p [bar]** **von** **p1** *up*	**bis** **p2** *to*	**Feder-Sachnummer** *stock no.*	**Indices**
6Q8				**6Q8**				**6Q8**							
47,01	- 55,00	540.1602.0000 540.1622.0205	FT	47,01	- 55,00	540.1602.0000 540.1622.0205	FT	47,01	- 55,00	540.1602.0000 540.1622.0205	FT;S Faba				
55,01	- 64,00	540.1602.0000 540.1632.0205	FT	55,01	- 64,00	540.1602.0000 540.1632.0205	FT	55,01	- 64,00	540.1602.0000 540.1632.0205	FT;S Faba				
64,01	- 70,00	540.1702.0000 540.1632.0205	FT	64,01	- 70,00	540.1702.0000 540.1632.0205	FT	64,01	- 70,00	540.1702.0000 540.1632.0205	FT;S Faba				
6R8				**6R8**				**6R8**				**6R8**			
0,20	- 0,40	540.8832.0000		0,20	- 0,40	540.8832.0000		0,20	- 0,40	540.8834.0000		0,20	- 0,40	540.8837.0000	
0,41	- 0,65	540.8842.0000		0,41	- 0,65	540.8842.0000		0,41	- 0,65	540.8844.0000		0,41	- 0,65	540.8847.0000	
0,66	- 1,00	540.8862.0000		0,66	- 1,00	540.8862.0000		0,66	- 1,00	540.8864.0000		0,66	- 1,00	540.8867.0000	
1,01	- 1,55	540.8872.0000		1,01	- 1,55	540.8872.0000		1,01	- 1,55	540.8874.0000		1,01	- 1,55	540.8877.0000	
1,56	- 2,15	540.8882.0000		1,56	- 2,15	540.8882.0000		1,56	- 2,15	540.8884.0000		1,56	- 2,15	540.8887.0000	
2,16	- 3,05	540.8892.0000	O from 2,90	2,16	- 3,05	540.8892.0000	O from 2,90	2,16	- 3,05	540.8894.0000	O from 2,90	2,16	- 3,05	540.8897.0000	O from 2,90
3,06	- 4,05	540.8902.0000	O	3,06	- 4,05	540.8902.0000	O	3,06	- 4,05	540.8904.0000	O	3,06	- 4,05	540.8907.0000	O
4,06	- 5,10	540.8882.0000		4,06	- 5,10	540.8882.0000		4,06	- 5,10	540.8884.0000		4,06	- 5,10	540.8887.0000	
		540.8972.0205				540.8972.0205				540.8974.0205				540.8977.0205	
5,11	- 6,05	540.8892.0000 540.8972.0205		5,11	- 6,05	540.8892.0000 540.8972.0205		5,11	- 6,05	540.8894.0000 540.8974.0205		5,11	- 6,05	540.8897.0000 540.8977.0205	
6,06	- 6,90	540.8892.0000 540.8982.0205		6,06	- 6,90	540.8892.0000 540.8982.0205		6,06	- 6,90	540.8894.0000 540.8984.0205		6,06	- 6,90	540.8897.0000 540.8987.0205	
6,91	- 10,0		S	6,91	- 10,0		S	6,91	- 10,0		S	6,91	- 10,0		S

Ausführung *(model)*

warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar]				**p [bar]**				**p [bar]**				**p [bar]**			
von *up* **p1**	**bis** *to* **p2**	**Feder-Sachnummer** *stock no.*	**Indices**	**von** *up* **p1**	**bis** *to* **p2**	**Feder-Sachnummer** *stock no.*	**Indices**	**von** *up* **p1**	**bis** *to* **p2**	**Feder-Sachnummer** *stock no.*	**Indices**	**von** *up* **p1**	**bis** *to* **p2**	**Feder-Sachnummer** *stock no.*	**Indices**
6R10				**6R10**				**6R10**				**6R10**			
0,20	- 0,40	540.8832.0000	O	0,20	- 0,40	540.8832.0000	O	0,20	- 0,40	540.8834.0000	O	0,20	- 0,40	540.8837.0000	O
0,41	- 0,70	540.8842.0000	O	0,41	- 0,70	540.8842.0000	O	0,41	- 0,70	540.8844.0000	O	0,41	- 0,70	540.8847.0000	O
0,71	- 1,00	540.8862.0000	O	0,71	- 1,00	540.8862.0000	O	0,71	- 1,00	540.8864.0000	O	0,71	- 1,00	540.8867.0000	O
1,01	- 1,50	540.8872.0000	O	1,01	- 1,50	540.8872.0000	O	1,01	- 1,50	540.8874.0000	O	1,01	- 1,50	540.8877.0000	O
1,51	- 2,00	540.8882.0000	O	1,51	- 2,00	540.8882.0000	O	1,51	- 2,00	540.8884.0000	O	1,51	- 2,00	540.8887.0000	O
2,01	- 3,00	540.8892.0000	O	2,01	- 3,00	540.8892.0000	O	2,01	- 3,00	540.8894.0000	O	2,01	- 3,00	540.8897.0000	O
3,01	- 3,90	540.8902.0000	O	3,01	- 3,90	540.8902.0000	O	3,01	- 3,90	540.8904.0000	O	3,01	- 3,90	540.8907.0000	O
3,90	- 5,00	540.8882.0000 540.8982.0205	O	3,90	- 5,00	540.8882.0000 540.8982.0205	O	3,90	- 5,00	540.8884.0000 540.8984.0205	O	3,90	- 5,00	540.8887.0000 540.8987.0205	O
5,01	- 6,50	540.9112.0000		5,01	- 6,50	540.9112.0000		5,01	- 6,50	540.9112.0000	Faba	5,01	- 6,50	540.9117.0000	FT;S;P
6,51	- 8,40	540.9122.0000		6,51	- 8,40	540.9122.0000		6,51	- 8,40	540.9122.0000	Faba	6,51	- 8,40	540.9127.0000	FT;S;P
8,41	- 11,25	540.9132.0000		8,41	- 11,25	540.9132.0000		8,41	- 11,25	540.9132.0000	Faba	8,41	- 11,25	540.9137.0000	FT;S;P
11,26	- 15,00	540.9132.0000 540.9092.0205		11,26	- 15,00	540.9132.0000 540.9092.0205		11,26	- 15,00	540.9132.0000 540.9092.0205	Faba	11,26	- 15,00	540.9137.0000 540.9097.0205	FT;S;P
15,01	- 20,70	540.9152.0000 540.9092.0205		15,01	- 20,70	540.9152.0000 540.9092.0205		15,01	- 20,70	540.9152.0000 540.9092.0205	Faba	15,01	- 20,70	540.9157.0000 540.9097.0205	FT;S;P
20,71	- 27,00	840.0332.1000 540.9092.0205	FT	20,71	- 27,00	840.0332.1000 540.9092.0205	FT	20,71	- 27,00	840.0332.1000 540.9092.0205	FT;S Faba				
27,01	- 35,00	840.0332.1000 840.0962.1205	FT	27,01	- 35,00	840.0332.1000 840.0962.1205	FT	27,01	- 35,00	840.0332.1000 840.0962.1205	FT;S Faba				
35,01	- 44,00	840.0332.1000 540.1662.0205	FT	35,01	- 44,00	840.0332.1000 540.1662.0205	FT	35,01	- 44,00	840.0332.1000 540.1662.0205	FT;S Faba				
44,01	- 55,00	540.0992.0000 840.1732.0205	FT	44,01	- 55,00	540.0992.0000 840.1732.0205	FT	44,01	- 55,00	540.0992.0000 840.1732.0205	FT;S Faba				
55,01	- 63,00	540.0992.0000 540.1662.0205 540.1682.0000	FT	55,01	- 63,00	540.0992.0000 540.1662.0205 540.1682.0000	FT	55,01	- 63,00	540.0992.0000 540.1662.0205 540.1682.0000	FT;S Faba				

Ausführung *(model)*															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [bar]				**p [bar]**				**p [bar]**				**p [bar]**			
von *up* **p1**	**bis** *to* **p2**	**Feder-Sachnummer** *stock no.*	**Indices**	**von** *up* **p1**	**bis** *to* **p2**	**Feder-Sachnummer** *stock no.*	**Indices**	**von** *up* **p1**	**bis** *to* **p2**	**Feder-Sachnummer** *stock no.*	**Indices**	**von** *up* **p1**	**bis** *to* **p2**	**Feder-Sachnummer** *stock no.*	**Indices**
8T10				**8T10**				**8T10**				**8T10**			
0,25	- 0,41	540.8842.0000	O	0,25	- 0,41	540.8842.0000	O	0,25	- 0,41	540.8844.0000	O	0,25	- 0,41	540.8847.0000	O
0,42	- 0,70	540.8862.0000	O	0,42	- 0,70	540.8862.0000	O	0,42	- 0,70	540.8864.0000	O	0,42	- 0,70	540.8867.0000	O
0,71	- 1,05	540.8872.0000	O	0,71	- 1,05	540.8872.0000	O	0,71	- 1,05	540.8874.0000	O	0,71	- 1,05	540.8877.0000	O
1,06	- 1,50	540.8882.0000	O	1,06	- 1,50	540.8882.0000	O	1,06	- 1,50	540.8884.0000	O	1,06	- 1,50	540.8887.0000	O
1,51	- 2,20	540.8892.0000	O	1,51	- 2,20	540.8892.0000	O	1,51	- 2,20	540.8894.0000	O	1,51	- 2,20	540.8897.0000	O
2,20	- 2,90	540.8902.0000	O	2,20	- 2,90	540.8902.0000	O	2,20	- 2,90	540.8904.0000	O	2,20	- 2,90	540.8907.0000	O
2,91	- 3,75	540.8912.0000	O	2,91	- 3,75	540.8912.0000	O	2,91	- 3,75	540.8914.0000	O	2,91	- 3,75	540.8917.0000	O
3,76	- 4,84	540.9112.0000	FT	3,76	- 4,84	540.9112.0000	FT	3,76	- 4,84	540.9112.0000	FT, Faba	3,76	- 4,84	540.9117.0000	FT;S;P
4,85	- 6,25	540.9122.0000	FT	4,85	- 6,25	540.9122.0000	FT	4,85	- 6,25	540.9122.0000	FT, Faba	4,85	- 6,25	540.9127.0000	FT;S;P
6,26	- 8,10	540.9132.0000	FT	6,26	- 8,10	540.9132.0000	FT	6,26	- 8,10	540.9132.0000	FT, Faba	6,26	- 8,10	540.9137.0000	FT;S;P
8,11	- 10,50	540.9132.0000 540.9092.0205	FT	8,11	- 10,50	540.9132.0000 540.9092.0205	FT	8,11	- 10,50	540.9132.0000 540.9092.0205	FT;S Faba	8,11	- 10,50	540.9137.0000 540.9097.0205	FT;S;P
10,51	- 13,70	540.9152.0000 540.9092.0205	FT	10,51	- 13,70	540.9152.0000 540.9092.0205	FT	10,51	- 13,70	540.9152.0000 540.9092.0205	FT;S Faba	10,51	- 13,70	540.9157.0000 540.9097.0205	FT;S;P
13,71	- 18,00	540.1752.0000	FT	13,71	- 18,00	540.1752.0000	FT	13,71	- 18,00	540.1752.0000	FT;S; Faba	13,71	- 20,70		S
18,01	- 23,00	540.0952.0000	FT	18,01	- 23,00	540.0952.0000	FT	18,01	- 23,00	540.0952.0000	FT;S; Faba				
23,01	- 27,00	540.0952.0000 540.1762.0205	FT	23,01	- 27,00	540.0952.0000 540.1762.0205	FT	23,01	- 27,00	540.0952.0000 540.1762.0205	FT;S Faba				
27,01	- 32,00	540.0952.0000 540.1772.0205	FT	27,01	- 32,00	540.0952.0000 540.1772.0205	FT	27,01	- 32,00	540.0952.0000 540.1772.0205	FT;S Faba				
32,01	- 36,00	540.0952.0000 840.2362.0205	S	32,01	- 36,00	540.0952.0000 840.2362.0205	S	32,01	- 36,00	540.0952.0000 840.2362.0205	FT;S Faba				

Ausführung *(model)*																	
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig]				**p [psig]**				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
1D2				**1D2**				**1D2**				**1D2**			
4 - 7		weight-loaded	S	4 - 7		weight-loaded	S	4 - 7		weight-loaded	S	4 - 7		weight-loaded	S
7 - 10		540.8204.0000		7 - 10		540.8204.0000		7 - 10		540.8204.0000		7 - 10		540.8207.0000	
10 - 17		540.8204.0000	O	10 - 17		540.8204.0000	O	10 - 17		540.8204.0000	O	10 - 17		540.8207.0000	O
17 - 22		540.8224.0000		17 - 22		540.8224.0000		17 - 22		540.8224.0000		17 - 22		540.8227.0000	
22 - 28		540.8224.0000	O	22 - 28		540.8224.0000	O	22 - 28		540.8224.0000	O	22 - 28		540.8227.0000	O
28 - 33		540.8234.0000		28 - 33		540.8234.0000		28 - 33		540.8234.0000		28 - 33		540.8237.0000	
33 - 46		540.8234.0000	O	33 - 46		540.8234.0000	O	33 - 46		540.8234.0000	O	33 - 46		540.8237.0000	O
46 - 62		540.4364.0000		46 - 62		540.4364.0000		46 - 62		540.4364.0000		46 - 62		540.4367.0000	
62 - 99		540.4364.0000	O	62 - 99		540.4364.0000	O	62 - 99		540.4364.0000	O	62 - 99		540.4367.0000	O
99 - 160		540.4374.0000	O	99 - 160		540.4374.0000	O	99 - 160		540.4374.0000	O	99 - 160		540.4377.0000	O
160 - 171		540.4394.0000		160 - 171		540.4394.0000		160 - 171		540.4394.0000		160 - 171		540.4397.0000	
171 - 236		540.4394.0000	O	171 - 236		540.4394.0000	O	171 - 236		540.4394.0000	O	171 - 236		540.4397.0000	O
236 - 283		540.9434.0000		236 - 283		540.9434.0000		236 - 283		540.9434.0000		236 - 283		540.9437.0000	
283 - 348		540.9434.0000	O	283 - 348		540.9434.0000	O	283 - 348		540.9434.0000	O	283 - 348		540.9437.0000	O
348 - 355		540.4414.0000		348 - 355		540.4414.0000		348 - 355		540.4414.0000		348 - 355		540.4417.0000	
355 - 493		540.4414.0000	O	355 - 493		540.4414.0000	O	355 - 493		540.4414.0000	O	355 - 493		540.4417.0000	O
493 - 653		540.4424.0000	O	493 - 653		540.4424.0000	O	493 - 653		540.4424.0000	O	493 - 653		540.4427.0000	O
653 - 943		540.4434.0000	O	653 - 943		540.4434.0000	O	653 - 943		540.4434.0000	O	653 - 943		540.4437.0000	O
943 - 1204		540.4444.0000	O	943 - 1204		540.4444.0000	O	943 - 1204		540.4444.0000	O	943 - 1204		540.4447.0000	O
1204 - 1330		540.4444.0000 540.9474.0205	O	1204 - 1330		540.4444.0000 540.9474.0205	O	1204 - 1330		540.4444.0000 540.9474.0205	O	1204 - 1330		540.4447.0000 540.9477.0205	O
1330 - 1479		540.4464.0000	O	1330 - 1479		540.4464.0000	O	1330 - 1479		540.4464.0000	O	1330 - 1479		540.4467.0000	O

Ausführung *(model)*

warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig]				**p [psig]**				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
1 1/2D2				**1 1/2D2**				**1 1/2D2**				**1 1/2D2**			
73	- 109	540.8434.0000		73	- 109	540.8434.0000		73	- 109	540.8434.0000		73	- 109	540.8437.0000	
109	- 167	540.4654.0000		109	- 167	540.4654.0000		109	- 167	540.4654.0000		109	- 167	540.4657.0000	
167	- 268	540.4674.0000		167	- 268	540.4674.0000		167	- 268	540.4674.0000		167	- 268	540.4677.0000	
268	- 406	540.4684.0000		268	- 406	540.4684.0000		268	- 406	540.4684.0000		268	- 406	540.4687.0000	
406	- 580	540.4694.0000		406	- 580	540.4694.0000		406	- 580	540.4694.0000		406	- 580	540.4697.0000	
580	- 841	540.4704.0000		580	- 841	540.4704.0000		580	- 841	540.4704.0000		580	- 841	540.4707.0000	
841	- 1160	540.4714.0000		841	- 1160	540.4714.0000		841	- 1160	540.4714.0000		841	- 1160	540.4717.0000	
1160	- 1740	540.5632.0000		1160	- 1740	540.5632.0000		1160	- 1740	540.4724.0000		1160	- 1740	540.4727.0000	
1740	- 2538	540.4734.0000		1740	- 2538	540.4734.0000		1740	- 2538	540.4734.0000		1740	- 2538	540.4737.0000	
2538	- 3705	540.5652.0000		2538	- 3705	540.5652.0000		2538	- 3705	540.4724.0000		2538	- 3705	540.4727.0000	
										540.9604.0000				540.9607.0205	
1 1/2D3				**1 1/2D3**				**1 1/2D3**				**1 1/2D3**			
268	- 406	540.4684.0000		268	- 406	540.4684.0000		268	- 406	540.4684.0000		268	- 406	540.4687.0000	
406	- 580	540.4694.0000		406	- 580	540.4694.0000		406	- 580	540.4694.0000		406	- 580	540.4697.0000	
580	- 841	540.4704.0000		580	- 841	540.4704.0000		580	- 841	540.4704.0000		580	- 841	540.4707.0000	
841	- 1160	540.4714.0000		841	- 1160	540.4714.0000		841	- 1160	540.4714.0000		841	- 1160	540.4717.0000	
1160	- 1740	540.4724.0000		1160	- 1740	540.4724.0000		1160	- 1740	540.4724.0000		1160	- 1740	540.4727.0000	
1740	- 2175	540.4734.0000		1740	- 2175	540.4734.0000		1740	- 2175	540.4734.0000		1740	- 2175	540.4737.0000	
2175	- 3263	540.9634.0000		2175	- 3263	540.9634.0000		2175	- 3263	540.9634.0000		2175	- 3263	540.9637.0000	
3263	- 4495	540.9644.0000		3263	- 4495	540.9644.0000		3263	- 4495	540.9644.0000		3263	- 4495	540.9647.0000	
4495	- 6000	540.9644.0000		4495	- 6000	540.9644.0000		4495	- 6000	540.9644.0000		4495	- 6000	540.9647.0000	
		540.9604.0000				540.9604.0000				540.9604.0000				540.9607.0205	

Ausführung *(model)*																	
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig]				**p [psig]**				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
1E2				**1E2**				**1E2**				**1E2**			
4 - 7		weight-loaded	S	4 - 7		weight-loaded	S	4 - 7		weight-loaded	S	4 - 7		weight-loaded	S
7 - 10		540.8204.0000		7 - 10		540.8204.0000		7 - 10		540.8204.0000		7 - 10		540.8207.0000	
10 - 17		540.8204.0000	O	10 - 17		540.8204.0000	O	10 - 17		540.8204.0000	O	10 - 17		540.8207.0000	O
17 - 22		540.8224.0000		17 - 22		540.8224.0000		17 - 22		540.8224.0000		17 - 22		540.8227.0000	
22 - 28		540.8224.0000	O	22 - 28		540.8224.0000	O	22 - 28		540.8224.0000	O	22 - 28		540.8227.0000	O
28 - 33		540.8234.0000		28 - 33		540.8234.0000		28 - 33		540.8234.0000		28 - 33		540.8237.0000	
33 - 46		540.8234.0000	O	33 - 46		540.8234.0000	O	33 - 46		540.8234.0000	O	33 - 46		540.8237.0000	O
46 - 62		540.4364.0000		46 - 62		540.4364.0000		46 - 62		540.4364.0000		46 - 62		540.4367.0000	
62 - 99		540.4364.0000	O	62 - 99		540.4364.0000	O	62 - 99		540.4364.0000	O	62 - 99		540.4367.0000	O
99 - 160		540.4374.0000	O	99 - 160		540.4374.0000	O	99 - 160		540.4374.0000	O	99 - 160		540.4377.0000	O
160 - 171		540.4394.0000		160 - 171		540.4394.0000		160 - 171		540.4394.0000		160 - 171		540.4397.0000	
171 - 236		540.4394.0000	O	171 - 236		540.4394.0000	O	171 - 236		540.4394.0000	O	171 - 236		540.4397.0000	O
236 - 283		540.9434.0000		236 - 283		540.9434.0000		236 - 283		540.9434.0000		236 - 283		540.9437.0000	
283 - 348		540.9434.0000	O	283 - 348		540.9434.0000	O	283 - 348		540.9434.0000	O	283 - 348		540.9437.0000	O
348 - 355		540.4414.0000		348 - 355		540.4414.0000		348 - 355		540.4414.0000		348 - 355		540.4417.0000	
355 - 493		540.4414.0000	O	355 - 493		540.4414.0000	O	355 - 493		540.4414.0000	O	355 - 493		540.4417.0000	O
493 - 653		540.4424.0000	O	493 - 653		540.4424.0000	O	493 - 653		540.4424.0000	O	493 - 653		540.4427.0000	O
653 - 943		540.4434.0000	O	653 - 943		540.4434.0000	O	653 - 943		540.4434.0000	O	653 - 943		540.4437.0000	O
943 - 1204		540.4444.0000	O	943 - 1204		540.4444.0000	O	943 - 1204		540.4444.0000	O	943 - 1204		540.4447.0000	O
1204 - 1330		540.4444.0000 540.9474.0205	O	1204 - 1330		540.4444.0000 540.9474.0205	O	1204 - 1330		540.4444.0000 540.9474.0205	O	1204 - 1330		540.4447.0000 540.9477.0205	O
1330 - 1479		540.4464.0000	O	1330 - 1479		540.4464.0000	O	1330 - 1479		540.4464.0000	O	1330 - 1479		540.4467.0000	O

Ausführung *(model)*															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig]				**p [psig]**				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
1 1/2E2				**1 1/2E2**				**1 1/2E2**				**1 1/2E2**			
73	- 109	540.8434.0000		73	- 109	540.8434.0000		73	- 109	540.8434.0000		73	- 109	540.8437.0000	
109	- 167	540.4654.0000		109	- 167	540.4654.0000		109	- 167	540.4654.0000		109	- 167	540.4657.0000	
167	- 268	540.4674.0000		167	- 268	540.4674.0000		167	- 268	540.4674.0000		167	- 268	540.4677.0000	
268	- 406	540.4684.0000		268	- 406	540.4684.0000		268	- 406	540.4684.0000		268	- 406	540.4687.0000	
406	- 580	540.4694.0000		406	- 580	540.4694.0000		406	- 580	540.4694.0000		406	- 580	540.4697.0000	
580	- 841	540.4704.0000		580	- 841	540.4704.0000		580	- 841	540.4704.0000		580	- 841	540.4707.0000	
841	- 1160	540.4714.0000		841	- 1160	540.4714.0000		841	- 1160	540.4714.0000		841	- 1160	540.4717.0000	
1160	- 1740	540.5632.0000		1160	- 1740	540.5632.0000		1160	- 1740	540.4724.0000		1160	- 1740	540.4727.0000	
1740	- 2538	540.4734.0000		1740	- 2538	540.4734.0000		1740	- 2538	540.4734.0000		1740	- 2538	540.4737.0000	
2538	- 3705	540.5652.0000		2538	- 3705	540.5652.0000		2538	- 3705	540.4724.0000		2538	- 3705	540.4727.0000	
										540.9604.0000				540.9607.0205	
1 1/2E3				**1 1/2E3**				**1 1/2E3**				**1 1/2E3**			
268	- 406	540.4684.0000		268	- 406	540.4684.0000		268	- 406	540.4684.0000		268	- 406	540.4687.0000	
406	- 580	540.4694.0000		406	- 580	540.4694.0000		406	- 580	540.4694.0000		406	- 580	540.4697.0000	
580	- 841	540.4704.0000		580	- 841	540.4704.0000		580	- 841	540.4704.0000		580	- 841	540.4707.0000	
841	- 1160	540.4714.0000		841	- 1160	540.4714.0000		841	- 1160	540.4714.0000		841	- 1160	540.4717.0000	
1160	- 1740	540.4724.0000		1160	- 1740	540.4724.0000		1160	- 1740	540.4724.0000		1160	- 1740	540.4727.0000	
1740	- 2175	540.4734.0000		1740	- 2175	540.4734.0000		1740	- 2175	540.4734.0000		1740	- 2175	540.4737.0000	
2175	- 3263	540.9634.0000		2175	- 3263	540.9634.0000		2175	- 3263	540.9634.0000		2175	- 3263	540.9637.0000	
3263	- 4495	540.9644.0000		3263	- 4495	540.9644.0000		3263	- 4495	540.9644.0000		3263	- 4495	540.9647.0000	
4495	- 6000	540.9644.0000		4495	- 6000	540.9644.0000		4495	- 6000	540.9644.0000		4495	- 6000	540.9647.0000	
		540.9604.0000				540.9604.0000				540.9604.0000				540.9607.0205	

Ausführung *(model)*

warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig]				**p [psig]**				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
1 1/2F2				**1 1/2F2**				**1 1/2F2**				**1 1/2F2**			
4	- 7	weight-loaded	S	4	- 7	weight-loaded	S	4	- 7	weight-loaded	S	4	- 7	weight-loaded	S
7	- 17	540.8404.0000		7	- 17	540.8404.0000		7	- 17	540.8404.0000		7	- 17	540.8407.0000	
18	- 23	540.8424.0000		18	- 23	540.8424.0000		18	- 23	540.8424.0000		18	- 23	540.8427.0000	
23	- 29	540.8434.0000		23	- 29	540.8434.0000		23	- 29	540.8434.0000		23	- 29	540.8437.0000	
29	- 39	540.4654.0000		29	- 39	540.4654.0000		29	- 39	540.4654.0000		29	- 39	540.4657.0000	
39	- 52	540.4664.0000		39	- 52	540.4664.0000		39	- 52	540.4664.0000		39	- 52	540.4667.0000	
52	- 74	540.4674.0000		52	- 74	540.4674.0000		52	- 74	540.4674.0000		52	- 74	540.4677.0000	
74	- 117	540.4684.0000		74	- 117	540.4684.0000		74	- 117	540.4684.0000		74	- 117	540.4687.0000	
118	- 174	540.4694.0000		118	- 174	540.4694.0000		118	- 174	540.4694.0000		118	- 174	540.4697.0000	
174	- 247	540.4704.0000		174	- 247	540.4704.0000		174	- 247	540.4704.0000		174	- 247	540.4707.0000	
247	- 355	540.4714.0000		247	- 355	540.4714.0000		247	- 355	540.4714.0000		247	- 355	540.4717.0000	
355	- 479	540.8494.0000		355	- 479	540.8494.0000		355	- 479	540.8494.0000		355	- 479	540.8497.0000	
479	- 783	540.4734.0000		479	- 783	540.4734.0000		479	- 783	540.4734.0000		479	- 783	540.4737.0000	
783	- 1096	540.9634.0000		783	- 1096	540.9634.0000		783	- 1096	540.9634.0000		783	- 1096	540.9637.0000	
1096	- 1480	540.9644.0000		1096	- 1480	540.9644.0000		1096	- 1480	540.9644.0000		1096	- 1480	540.9647.0000	

Ausführung *(model)*															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig]				**p [psig]**				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
1 1/2F3				**1 1/2F3**				**1 1/2F3**				**1 1/2F3**			
4	- 7	weight-loaded	S	4	- 7	weight-loaded	S	4	- 7	weight-loaded	S	4	- 7	weight-loaded	S
7	- 17	540.8404.0000		7	- 17	540.8404.0000		7	- 17	540.8404.0000		7	- 17	540.8407.0000	
18	- 23	540.8424.0000		18	- 23	540.8424.0000		18	- 23	540.8424.0000		18	- 23	540.8427.0000	
23	- 29	540.8434.0000		23	- 29	540.8434.0000		23	- 29	540.8434.0000		23	- 29	540.8437.0000	
29	- 39	540.4654.0000		29	- 39	540.4654.0000		29	- 39	540.4654.0000		29	- 39	540.4657.0000	
39	- 52	540.4664.0000		39	- 52	540.4664.0000		39	- 52	540.4664.0000		39	- 52	540.4667.0000	
52	- 74	540.4674.0000		52	- 74	540.4674.0000		52	- 74	540.4674.0000		52	- 74	540.4677.0000	
74	- 117	540.4684.0000		74	- 117	540.4684.0000		74	- 117	540.4684.0000		74	- 117	540.4687.0000	
118	- 174	540.4694.0000		118	- 174	540.4694.0000		118	- 174	540.4694.0000		118	- 174	540.4697.0000	
174	- 247	540.4704.0000		174	- 247	540.4704.0000		174	- 247	540.4704.0000		174	- 247	540.4707.0000	
247	- 355	540.4714.0000		247	- 355	540.4714.0000		247	- 355	540.4714.0000		247	- 355	540.4717.0000	
355	- 479	540.8494.0000		355	- 479	540.8494.0000		355	- 479	540.8494.0000		355	- 479	540.8497.0000	
479	- 783	540.4734.0000		479	- 783	540.4734.0000		479	- 783	540.4734.0000		479	- 783	540.4737.0000	
783	- 1096	540.9634.0000		783	- 1096	540.9634.0000		783	- 1096	540.9634.0000		783	- 1096	540.9637.0000	
1096	- 1479	540.9644.0000		1096	- 1479	540.9644.0000		1096	- 1479	540.9644.0000		1096	- 1479	540.9647.0000	
1479	- 2030	540.9654.0000		1479	- 2030	540.9654.0000		1479	- 2030	540.9654.0000		1479	- 2030	540.9657.0000	
2030	- 2755	540.9644.0000 540.9604.0000		2030	- 2755	540.9644.0000 540.9604.0000		2030	- 2755	540.9644.0000 540.9604.0000		2030	- 2755	540.9647.0000 540.9607.0205	
2755	- 3703		S	2755	- 3703		S	2755	- 3703		S	2755	- 3703		S
3703	- 5000		S	3703	- 5000		S	3703	- 5000		S	3703	- 5000		S

Ausführung *(model)*																	
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig]				**p [psig]**				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
1 1/2G3				**1 1/2G3**				**1 1/2G3**				**1 1/2G3**			
3	- 9	weight-loaded	S	3	- 9	weight-loaded	S	3	- 9	weight-loaded	S	3	- 9	weight-loaded	S
10	- 17	540.8404.0000		10	- 17	540.8404.0000		10	- 17	540.8404.0000		10	- 17	540.8407.0000	
18	- 25	540.8424.0000		18	- 25	540.8424.0000		18	- 25	540.8424.0000		18	- 25	540.8427.0000	
25	- 46	540.8434.0000		25	- 46	540.8434.0000		25	- 46	540.8434.0000		25	- 46	540.8437.0000	
47	- 73	540.4654.0000		47	- 73	540.4654.0000		47	- 73	540.4654.0000		47	- 73	540.4657.0000	
73	- 102	540.4664.0000		73	- 102	540.4664.0000		73	- 102	540.4664.0000		73	- 102	540.4667.0000	
102	- 131	540.4674.0000		102	- 131	540.4674.0000		102	- 131	540.4674.0000		102	- 131	540.4677.0000	
131	- 174	540.4684.0000		131	- 174	540.4684.0000		131	- 174	540.4684.0000		131	- 174	540.4687.0000	
174	- 254	540.4694.0000		174	- 254	540.4694.0000		174	- 254	540.4694.0000		174	- 254	540.4697.0000	
254	- 312	540.4704.0000		254	- 312	540.4704.0000		254	- 312	540.4704.0000		254	- 312	540.4707.0000	
312	- 435	540.4714.0000		312	- 435	540.4714.0000		312	- 435	540.4714.0000		312	- 435	540.4717.0000	
435	- 580	540.8494.0000		435	- 580	540.8494.0000		435	- 580	540.8494.0000		435	- 580	540.8497.0000	
580	- 754	540.4734.0000		580	- 754	540.4734.0000		580	- 754	540.4734.0000		580	- 754	540.4737.0000	
754	- 1117	540.9634.0000		754	- 1117	540.9634.0000		754	- 1117	540.9634.0000		754	- 1117	540.9637.0000	
1117	- 1566	540.9644.0000		1117	- 1566	540.9644.0000		1117	- 1566	540.9644.0000		1117	- 1566	540.9647.0000	
1566	- 2220	540.9644.0000 540.9604.0000		1566	- 2220	540.9644.0000 540.9604.0000		1566	- 2220	540.9644.0000 540.9604.0000		1566	- 2220	540.9647.0000 540.9607.0205	

Ausführung *(model)*															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig]				**p [psig]**				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
2G3				**2G3**				**2G3**				**2G3**			
73	- 102	540.5702.0000		73	- 102	540.5702.0000		73	- 102	540.5704.0000		73	- 102	540.5707.0000	
102	- 131	540.5712.0000		102	- 131	540.5712.0000		102	- 131	540.5714.0000		102	- 131	540.5717.0000	
131	- 167	540.5722.0000		131	- 167	540.5722.0000		131	- 167	540.5724.0000		131	- 167	540.5727.0000	
167	- 218	540.5732.0000		167	- 218	540.5732.0000		167	- 218	540.5734.0000		167	- 218	540.5737.0000	
218	- 276	540.5742.0000		218	- 276	540.5742.0000		218	- 276	540.5744.0000		218	- 276	540.5747.0000	
276	- 392	540.5752.0000		276	- 392	540.5752.0000		276	- 392	540.5754.0000		276	- 392	540.5757.0000	
392	- 551	540.5762.0000		392	- 551	540.5762.0000		392	- 551	540.5764.0000		392	- 551	540.5767.0000	
551	- 769	540.5772.0000		551	- 769	540.5772.0000		551	- 769	540.5774.0000		551	- 769	540.5777.0000	
769	- 1088	540.5782.0000		769	- 1088	540.5782.0000		769	- 1088	540.5784.0000		769	- 1088	540.5787.0000	
1088	- 1523	540.5792.0000		1088	- 1523	540.5792.0000		1088	- 1523	540.5784.0000		1088	- 1523	540.5787.0000	
1523	- 2175	540.5802.0000		1523	- 2175	540.5802.0000		1523	- 2175	540.9724.0205		1523	- 2175	540.9727.0205	
		540.9924.0205				540.9924.0205				540.9494.0000				540.9497.0000	
2175	- 3176	540.5802.0000		2175	- 3176	540.5802.0000		2175	- 3176	540.9494.0000		2175	- 3176	540.9497.0000	
		540.4982.0205				540.4982.0205				540.9724.0205				540.9727.0205	
3176	- 3705	540.9492.0000		3176	- 3705	540.9492.0000		3176	- 3705	540.9494.0000		3176	- 3705	540.9497.0000	
		540.4982.0205				540.4982.0205				540.4984.0205				540.4987.0205	
1 1/2H3				**1 1/2H3**				**1 1/2H3**				**1 1/2H3**			
3	- 6	gewichtsbel.	S	3	- 6	gewichtsbel.	S	3	- 6	gewichtsbel.	S	3	- 6	gewichtsbel.	S
6	- 15	540.8414.0000		6	- 15	540.8414.0000		6	- 15	540.8414.0000		6	- 15	540.8417.0000	
15	- 25	540.8434.0000		15	- 25	540.8434.0000		15	- 25	540.8434.0000		15	- 25	540.8437.0000	
25	- 41	540.4664.0000		25	- 41	540.4664.0000		25	- 41	540.4664.0000		25	- 41	540.4667.0000	
41	- 55	540.4674.0000		41	- 55	540.4674.0000		41	- 55	540.4674.0000		41	- 55	540.4677.0000	
55	- 94	540.4684.0000		55	- 94	540.4684.0000		55	- 94	540.4684.0000		55	- 94	540.4687.0000	
94	- 138	540.4694.0000		94	- 138	540.4694.0000		94	- 138	540.4694.0000		94	- 138	540.4697.0000	
138	- 181	540.4704.0000		138	- 181	540.4704.0000		138	- 181	540.4704.0000		138	- 181	540.4707.0000	
181	- 285	540.4714.0000		181	- 285	540.4714.0000		181	- 285	540.4714.0000		181	- 285	540.4717.0000	

Ausführung *(model)*																	
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig]				**p [psig]**				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
2H3				**2H3**				**2H3**				**2H3**			
4 - 9		weight-loaded	S	4 - 9		weight-loaded	S	4 - 9		weight-loaded	S	4 - 9		weight-loaded	S
9 - 15		540.8514.0000		9 - 15		540.8514.0000		9 - 15		540.8514.0000		9 - 15		540.8517.0000	
15 - 23		540.8532.0000		15 - 23		540.8532.0000		15 - 23		540.8534.0000		15 - 23		540.8537.0000	
23 - 29		540.8542.0000		23 - 29		540.8542.0000		23 - 29		540.8504.0000		23 - 29		540.8507.0000	
29 - 41		540.8542.0000	O	29 - 41		540.8542.0000	O	29 - 41		540.8504.0000	O	29 - 41		540.8507.0000	O
41 - 55		540.8552.0000	O	41 - 55		540.8552.0000	O	41 - 55		540.8554.0000	O	41 - 55		540.8557.0000	O
55 - 86		540.5712.0000		55 - 86		540.5712.0000		55 - 86		540.5714.0000		55 - 86		540.5717.0000	
86 - 109		540.5722.0000		86 - 109		540.5722.0000		86 - 109		540.5724.0000		86 - 109		540.5727.0000	
109 - 145		540.5732.0000		109 - 145		540.5732.0000		109 - 145		540.5734.0000		109 - 145		540.5737.0000	
145 - 203		540.5742.0000		145 - 203		540.5742.0000		145 - 203		540.5744.0000		145 - 203		540.5747.0000	
203 - 334		540.5752.0000		203 - 334		540.5752.0000		203 - 334		540.5754.0000		203 - 334		540.5757.0000	
334 - 435		540.5762.0000		334 - 435		540.5762.0000		334 - 435		540.5764.0000		334 - 435		540.5767.0000	
435 - 609		540.5772.0000		435 - 609		540.5772.0000		435 - 609		540.5774.0000		435 - 609		540.5777.0000	
609 - 815		540.5782.0000		609 - 815		540.5782.0000		609 - 815		540.5784.0000		609 - 815		540.5787.0000	
815 - 1088		540.9752.0000 540.4962.0205		815 - 1088		540.9752.0000 540.4962.0205		815 - 1088		540.5774.0000 540.9724.0205		815 - 1088		540.5777.0000 540.9727.0205	
1088 - 1494		540.5802.0000		1088 - 1494		540.5802.0000		1088 - 1494		540.5804.0000		1088 - 1494		540.5807.0000	
1494 - 1958		540.5802.0000 540.9722.0205		1494 - 1958		540.5802.0000 540.9722.0205		1494 - 1958		540.5804.0000 540.9724.0205		1494 - 1958		540.5807.0000 540.9727.0205	
1958 - 2750		540.9492.0000 540.4982.0205		1958 - 2750		540.9492.0000 540.4982.0205		1958 - 2750		540.9494.0000 540.4984.0205		1958 - 2750		540.9497.0000 540.4987.0205	

Ausführung *(model)*															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig]				**p [psig]**				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
2J3				**2J3**				**2J3**				**2J3**			
3 - 13		weight-loaded	S	3 - 13		weight-loaded	S	3 - 13		weight-loaded	S	3 - 13		weight-loaded	S
13 - 22		540.8532.0000		13 - 22		540.8532.0000		13 - 22		540.8534.0000		13 - 22		540.8537.0000	
22 - 36		540.5702.0000		22 - 36		540.5702.0000		22 - 36		540.5704.0000		22 - 36		540.5707.0000	
36 - 44		540.5712.0000		36 - 44		540.5712.0000		36 - 44		540.5714.0000		36 - 44		540.5717.0000	
44 - 58		540.5722.0000		44 - 58		540.5722.0000		44 - 58		540.5724.0000		44 - 58		540.5727.0000	
58 - 80		540.5732.0000		58 - 80		540.5732.0000		58 - 80		540.5734.0000		58 - 80		540.5737.0000	
80 - 109		540.5742.0000		80 - 109		540.5742.0000		80 - 109		540.5744.0000		80 - 109		540.5747.0000	
109 - 167		540.5752.0000		109 - 167		540.5752.0000		109 - 167		540.5754.0000		109 - 167		540.5757.0000	
167 - 218		540.5762.0000		167 - 218		540.5762.0000		167 - 218		540.5764.0000		167 - 218		540.5767.0000	
218 - 285		540.5772.0000		218 - 285		540.5772.0000		218 - 285		540.5774.0000		218 - 285		540.5777.0000	
3J4				**3J4**				**3J4**				**3J4**			
12 - 16		540.8624.0000		12 - 16		540.8624.0000		12 - 16		540.8624.0000		12 - 16		540.8627.0000	
16 - 22		540.8632.0000		16 - 22		540.8632.0000		16 - 22		540.8634.0000		16 - 22		540.8637.0000	
22 - 29		540.8642.0000		22 - 29		540.8642.0000		22 - 29		540.8644.0000		22 - 29		540.8647.0000	
29 - 39		540.8642.0000	O	29 - 39		540.8642.0000	O	29 - 39		540.8644.0000	O	29 - 39		540.8647.0000	O
39 - 61		540.8652.0000	O	39 - 61		540.8652.0000	O	39 - 61		540.8654.0000	O	39 - 61		540.8657.0000	O
61 - 87		540.5812.0000	O	61 - 87		540.5812.0000	O	61 - 87		540.5814.0000	O	61 - 87		540.5817.0000	O
87 - 109		540.5832.0000		87 - 109		540.5832.0000		87 - 109		540.5834.0000		87 - 109		540.5837.0000	
109 - 160		540.5842.0000		109 - 160		540.5842.0000		109 - 160		540.5844.0000		109 - 160		540.5847.0000	
160 - 225		540.5852.0000		160 - 225		540.5852.0000		160 - 225		540.5854.0000		160 - 225		540.5857.0000	
225 - 312		540.5862.0000		225 - 312		540.5862.0000		225 - 312		540.5864.0000		225 - 312		540.5867.0000	
312 - 442		540.5872.0000		312 - 442		540.5872.0000		312 - 442		540.5874.0000		312 - 442		540.5877.0000	
442 - 638		540.5882.0000		442 - 638		540.5882.0000		442 - 638		540.5884.0000		442 - 638		540.5887.0000	
638 - 906		540.5892.0000		638 - 906		540.5892.0000		638 - 906		540.5894.0000		638 - 906		540.5897.0000	
906 - 1189		540.9862.0000		906 - 1189		540.9862.0000		906 - 1189		540.9864.0000		906 - 1189		540.9867.0000	
1189 - 1552		540.5892.0000 540.9872.0000		1189 - 1552		540.5892.0000 540.9872.0000		1189 - 1552		540.5894.0000 540.9874.0205		1189 - 1552		540.5897.0000 540.9877.0000	
1552 - 1827		540.9862.0000 540.9872.0000		1552 - 1827		540.9862.0000 540.9872.0000		1552 - 1827		540.9864.0000 540.9874.0205		1552 - 1827		540.9867.0000 540.9877.0000	
1827 - 2291		540.8682.0000 540.9872.0000		1827 - 2291		540.8682.0000 540.9872.0000		1827 - 2291		540.8684.0000 540.9874.0205		1827 - 2291		540.8687.0000 540.9877.0000	
2291 - 2700			S	2291 - 2700			S	2291 - 2700			S	2291 - 2700			S

Disclosure cat.:	II	proofread by:	MD	publish date:	3/25/15	effect.dat	3/15
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resp. depart.:	TB	date of	3/25/15	revision No.:	3		
doc. type:	LGS	change rep.	00841A	retention	10y.		

Ausführung *(model)*

warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig]				**p [psig]**				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
3K4				**3K4**				**3K4**				**3K4**			
4 - 6		weight-loaded	S	4 - 6		weight-loaded	S	4 - 6		weight-loaded	S	4 - 6		weight-loaded	S
6 - 9		540.8612.0000		6 - 9		540.8612.0000		6 - 9		540.8614.0000		6 - 9		540.8617.0000	
9 - 15		540.8632.0000		9 - 15		540.8632.0000		9 - 19		540.8634.0000		9 - 19		540.8637.0000	
15 - 19		540.8632.0000	O	15 - 19		540.8632.0000	O								
19 - 32		540.8652.0000		19 - 32		540.8652.0000		19 - 32		540.8654.0000		19 - 32		540.8657.0000	
32 - 44		540.5812.0000		32 - 44		540.5812.0000		32 - 44		540.5814.0000		32 - 44		540.5817.0000	
44 - 58		540.5822.0000		44 - 58		540.5822.0000		44 - 58		540.5824.0000		44 - 58		540.5827.0000	
58 - 80		540.5832.0000		58 - 80		540.5832.0000		58 - 80		540.5834.0000		58 - 80		540.5837.0000	
80 - 109		540.5842.0000		80 - 109		540.5842.0000		80 - 109		540.5844.0000		80 - 109		540.5847.0000	
109 - 152		540.5852.0000		109 - 152		540.5852.0000		109 - 152		540.5854.0000		109 - 152		540.5857.0000	
152 - 225		540.5862.0000		152 - 225		540.5862.0000		152 - 225		540.5864.0000		152 - 225		540.5867.0000	
225 - 297		540.5872.0000		225 - 297		540.5872.0000		225 - 297		540.5874.0000		225 - 297		540.5877.0000	
297 - 410		540.5882.0000		297 - 410		540.5882.0000		297 - 410		540.5884.0000		297 - 410		540.5887.0000	
410 - 558		540.5892.0000		410 - 558		540.5892.0000		410 - 558		540.5894.0000		410 - 558		540.5897.0000	
558 - 740		540.9862.0000		558 - 740		540.9862.0000		558 - 740		540.9864.0000		558 - 740		540.9867.0000	
740 - 1044		540.8682.0000		740 - 1044		540.8682.0000		740 - 1044		540.8684.0000		740 - 1044		540.8687.0000	
1044 - 1480		540.8682.0000 540.9872.0000		1044 - 1480		540.8682.0000 540.9872.0000		1044 - 1480		540.8684.0000 540.9874.0205		1044 - 1480		540.8687.0000 540.9877.0205	

Ausführung *(model)*															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig]				**p [psig]**				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
3K6				**3K6**				**3K6**				**3K6**			
33	- 46	540.5912.0000		33	- 46	540.5912.0000		33	- 46	540.5914.0000		33	- 46	540.5917.0000	
47	- 64	540.5922.0000		47	- 64	540.5922.0000		47	- 64	540.5924.0000		47	- 64	540.5927.0000	
64	- 87	540.5932.0000		64	- 87	540.5932.0000		64	- 87	540.5934.0000		64	- 87	540.5937.0000	
87	- 123	540.5942.0000		87	- 123	540.5942.0000		87	- 123	540.5944.0000		87	- 123	540.5947.0000	
123	- 167	540.5952.0000		123	- 167	540.5952.0000		123	- 167	540.5954.0000		123	- 167	540.5957.0000	
167	- 218	540.5962.0000		167	- 218	540.5962.0000		167	- 218	540.5964.0000		167	- 218	540.5967.0000	
218	- 305	540.5972.0000		218	- 305	540.5972.0000		218	- 305	540.5974.0000		218	- 305	540.5977.0000	
305	- 421	540.9952.0000		305	- 421	540.9952.0000		305	- 421	540.9954.0000		305	- 421	540.9957.0000	
421	- 566	540.5984.0000		421	- 566	540.5984.0000		421	- 566	540.5984.0000		421	- 566	540.5987.0000	
566	- 750	540.4994.0000		566	- 750	540.4994.0000		566	- 750	540.4994.0000		566	- 750	540.4997.0000	
750	- 1015	540.9552.0000		750	- 1015	540.9552.0000		750	- 1015	540.1374.0000	FT	750	- 1015	540.1377.0000	FT
1015	- 1305	540.9952.0000 540.4994.0000		1015	- 1305	540.9952.0000 540.4994.0000		1015	- 1305	540.9954.0000 540.4994.0000		1015	- 1305	540.9957.0000 540.4997.0000	
1305	- 1631	540.9962.0000 540.4994.0000		1305	- 1631	540.9962.0000 540.4994.0000		1305	- 1631	540.9964.0000 540.4994.0000		1305	- 1631	540.9967.0000 540.4997.0000	
1631	- 2040	540.9552.0000 540.9542.0205		1631	- 2040	540.9552.0000 540.9542.0205		1631	- 2020		S	1631	- 2020		S
2040	- 2220	540.9832.0000 540.9982.0205		2040	- 2220	540.9832.0000 540.9982.0205									

Ausführung (model)

warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig]				**p [psig]**				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
3L4				**3L4**				**3L4**				**3L4**			
4	- 7	540.8612.0000		4	- 7	540.8612.0000		4	- 7	540.8614.0000		4	- 7	540.8617.0000	
7	- 13	540.8632.0000		7	- 13	540.8632.0000		7	- 13	540.8634.0000		7	- 13	540.8637.0000	
										540.8634.0000	O			540.8637.0000	O
13	- 22	540.8652.0000		13	- 22	540.8652.0000		13	- 22	540.8654.0000		13	- 22	540.8657.0000	
22	- 29	540.5812.0000		22	- 29	540.5812.0000		22	- 29	540.5814.0000		22	- 29	540.5817.0000	
29	- 44	540.5822.0000		29	- 44	540.5822.0000		29	- 44	540.5824.0000	O	29	- 44	540.5827.0000	O
44	- 62	540.5832.0000		44	- 62	540.5832.0000		44	- 62	540.5834.0000	O	44	- 62	540.5837.0000	O
62	- 80	540.5842.0000		62	- 80	540.5842.0000		62	- 80	540.5844.0000	O	62	- 80	540.5847.0000	O
80	- 94	540.5842.0000	O	80	- 94	540.5842.0000	O	80	- 94			80	- 94		
94	- 110	540.5852.0000		94	- 110	540.5852.0000		94	- 110	540.5854.0000	O	94	- 110	540.5857.0000	O
110	- 131	540.5852.0000	O	110	- 131	540.5852.0000	O	110	- 131			110	- 131		
131	- 158	540.5862.0000		131	- 158	540.5862.0000		131	- 158	540.5864.0000	O	131	- 158	540.5867.0000	O
158	- 181	540.5862.0000	O	158	- 181	540.5862.0000	O	158	- 181			158	- 181		
181	- 239	540.5872.0000		181	- 239	540.5872.0000		181	- 239	540.5874.0000	O	181	- 239	540.5877.0000	O
239	- 285	540.5882.0000		239	- 285	540.5882.0000		239	- 285	540.5884.0000		239	- 285	540.5887.0000	

Ausführung *(model)*

warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices
4L6				**4L6**				**4L6**				**4L6**			
3 - 10		weight-loaded	S	3 - 10		weight-loaded	S	3 - 10		weight-loaded	S	3 - 10		weight-loaded	S
10 - 17		540.8732.0000		10 - 17		540.8732.0000		10 - 17		540.8734.0000		10 - 17		540.8737.0000	
18 - 22		540.8742.0000		18 - 22		540.8742.0000		18 - 22		540.8744.0000		18 - 22		540.8747.0000	
22 - 26		540.8752.0000		22 - 26		540.8752.0000		22 - 26		540.8754.0000		22 - 26		540.8757.0000	
26 - 44		540.5922.0000		26 - 44		540.5922.0000		26 - 44		540.5924.0000		26 - 44		540.5927.0000	
44 - 57		540.5932.0000		44 - 57		540.5932.0000		44 - 57		540.5934.0000		44 - 57		540.5937.0000	
57 - 80		540.5942.0000		57 - 80		540.5942.0000		57 - 80		540.5944.0000		57 - 80		540.5947.0000	
80 - 106		540.5952.0000		80 - 106		540.5952.0000		80 - 106		540.5954.0000		80 - 106		540.5957.0000	
106 - 142		540.5962.0000		106 - 142		540.5962.0000		106 - 142		540.5964.0000		106 - 142		540.5967.0000	
142 - 196		540.5972.0000		142 - 196		540.5972.0000		142 - 196		540.5974.0000		142 - 196		540.5977.0000	
196 - 241		540.9952.0000		196 - 241		540.9952.0000		196 - 241		540.9954.0000		196 - 241		540.9957.0000	
241 - 296		540.5982.0000		241 - 296		540.5982.0000		241 - 296		540.5984.0000		241 - 296		540.5987.0000	
296 - 370		540.4994.0000		296 - 370		540.4994.0000		296 - 370		540.4994.0000		296 - 370		540.4997.0000	
370 - 510		540.5982.0000 540.9534.0000		370 - 510		540.5982.0000 540.9534.0000		370 - 510		540.5984.0000 540.9534.0000		370 - 510		540.5987.0000 540.9537.0000	
511 - 624		540.9962.0000 540.9534.0000		511 - 624		540.9962.0000 540.9534.0000		511 - 624		540.9964.0000 540.9534.0000		511 - 624		540.9967.0000 540.9537.0000	
624 - 769		540.9962.0000 540.4994.0000		624 - 769		540.9962.0000 540.4994.0000		624 - 769		540.9964.0000 540.4994.0000		624 - 769		540.9967.0000 540.4997.0000	
769 - 972		540.9552.0000 540.9542.0205		769 - 972		540.9552.0000 540.9542.0205		769 - 972			FT; S	769 - 972		540.1377.0000 540.1487.0205	FT
972 - 1276		540.1392.0000 540.1482.0205	FT	972 - 1276		540.1392.0000 540.1482.0205	FT	972 - 1276		540.1384.0000 540.1494.0205	FT	972 - 1276		540.1387.0000 540.1497.0205	FT
1276 - 1500		540.1392.0000 540.1492.0205	FT	1276 - 1500		540.1392.0000 540.1492.0205	FT	1276 - 1500		540.1392.0000 540.1492.0205	FT / Faba	1276 - 1500		540.1397.0000 540.1497.0205	FT

Ausführung *(model)*

warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices
4M6				**4M6**				**4M6**				**4M6**			
3 - 7		weight-loaded	S	3 - 7		weight-loaded	S	3 - 7		weight-loaded	S	3 - 7		weight-loaded	S
7 - 11		540.8732.0000		7 - 11		540.8732.0000		7 - 11		540.8734.0000		7 - 11		540.8737.0000	
11 - 13		540.8742.0000		11 - 13		540.8742.0000		11 - 13		540.8744.0000		11 - 13		540.8747.0000	
13 - 20		540.8752.0000		13 - 20		540.8752.0000		13 - 20		540.8754.0000		13 - 20		540.8757.0000	
20 - 29		540.5912.0000		20 - 29		540.5912.0000		20 - 29		540.5914.0000		20 - 29		540.5917.0000	
29 - 42		540.5922.0000		29 - 42		540.5922.0000		29 - 42		540.5924.0000		29 - 42		540.5927.0000	
42 - 55		540.5932.0000		42 - 55		540.5932.0000		42 - 55		540.5934.0000		42 - 55		540.5937.0000	
55 - 80		540.5942.0000		55 - 80		540.5942.0000		55 - 80		540.5944.0000		55 - 80		540.5947.0000	
80 - 102		540.5952.0000		80 - 102		540.5952.0000		80 - 102		540.5954.0000		80 - 102		540.5957.0000	
102 - 145		540.5962.0000		102 - 145		540.5962.0000		102 - 145		540.5964.0000		102 - 145		540.5967.0000	
145 - 181		540.5972.0000		145 - 181		540.5972.0000		145 - 181		540.5974.0000		145 - 181		540.5977.0000	
181 - 225		540.9952.0000		181 - 225		540.9952.0000		181 - 225		540.9954.0000		181 - 225		540.9957.0000	
225 - 290		540.5982.0000		225 - 290		540.5982.0000		225 - 290		540.5984.0000		225 - 290		540.5987.0000	
290 - 392		540.9962.0000		290 - 392		540.9962.0000		290 - 392		540.9964.0000		290 - 392		540.9967.0000	
392 - 493		540.9952.0000 540.9982.0205		392 - 493		540.9952.0000 540.9982.0205		392 - 493		540.9954.0000 540.9984.0205		392 - 493		540.9957.0000 540.9987.0205	
493 - 638		540.9962.0000 540.9982.0205		493 - 638		540.9962.0000 540.9982.0205		493 - 638		540.9964.0000 540.9984.0205		493 - 638		540.9967.0000 540.9987.0205	
638 - 822		540.9962.0000 540.4992.0000		638 - 822		540.9962.0000 540.4992.0000		638 - 719		540.9964.0000 540.4994.0000		638 - 719		540.9967.0000 540.4997.0000	
								719 - 822		540.9962.0000 540.4992.0000	S; Faba	719 - 822		540.9967.0000 540.4997.0000	
822 - 1100		540.9552.0000 540.9542.0205		822 - 1100		540.9552.0000 540.9542.0205		822 - 1100		540.9552.0000 540.9542.0205	S; Faba	822 - 1058		540.9557.0000 540.9547.0205	
												1058 - 1100			S

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Ausführung *(model)*

warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig]				**p [psig]**				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
4N6				**4N6**				**4N6**				**4N6**			
3	- 6	weight-loaded	S	3	- 6	weight-loaded	S	3	- 6	weight-loaded	S	3	- 6	weight-loaded	S
6	- 10	540.8732.0000		6	- 10	540.8732.0000		6	- 10	540.8734.0000		6	- 10	540.8737.0000	
10	- 21	540.8752.0000		10	- 21	540.8752.0000		10	- 21	540.8754.0000		10	- 21	540.8757.0000	
21	- 33	540.5922.0000		21	- 33	540.5922.0000		21	- 33	540.5924.0000		21	- 33	540.5927.0000	
33	- 45	540.5932.0000		33	- 45	540.5932.0000		33	- 45	540.5934.0000		33	- 45	540.5937.0000	
45	- 58	540.5942.0000		45	- 58	540.5942.0000		45	- 58	540.5944.0000		45	- 58	540.5947.0000	
58	- 84	540.5952.0000		58	- 84	540.5952.0000		58	- 84	540.5954.0000		58	- 84	540.5957.0000	
84	- 116	540.5962.0000		84	- 116	540.5962.0000		84	- 116	540.5964.0000		84	- 116	540.5967.0000	
116	- 152	540.5972.0000		116	- 152	540.5972.0000		116	- 152	540.5974.0000		116	- 152	540.5977.0000	
152	- 196	540.9952.0000		152	- 196	540.9952.0000		152	- 196	540.9954.0000		152	- 196	540.9957.0000	
196	- 247	540.5982.0000		196	- 247	540.5982.0000		196	- 247	540.5984.0000		196	- 247	540.5987.0000	
247	- 312	540.4992.0000		247	- 312	540.4992.0000		247	- 312	540.4994.0000		247	- 312	540.4997.0000	
312	- 377	540.5972.0000 540.9534.0000		312	- 377	540.5972.0000 540.9534.0000		312	- 377	540.5974.0000 540.9534.0000		312	- 377	540.5977.0000 540.9537.0000	
377	- 457	540.5982.0000 540.9534.0000		377	- 457	540.5982.0000 540.9534.0000		377	- 457	540.5984.0000 540.9534.0000		377	- 457	540.5987.0000 540.9537.0000	
457	- 544	540.9962.0000 540.9534.0000		457	- 544	540.9962.0000 540.9534.0000		457	- 544	540.9964.0000 540.9534.0000		457	- 544	540.9967.0000 540.9537.0000	
544	- 653	540.9962.0000 540.4992.0000		544	- 653	540.9962.0000 540.4992.0000		544	- 653	540.9964.0000 540.4994.0000		544	- 653	540.9967.0000 540.4997.0000	
653	- 769	540.9552.0000 540.4992.0000		653	- 769	540.9552.0000 540.4992.0000		653	- 769		FT;S	653	- 769	540.1377.0000 540.1487.0205	FT
769	- 1000	540.1374.0000 540.1492.0205	FT	769	- 1000	540.1374.0000 540.1492.0205	FT	769	- 1000		FT;S	769	- 1000		FT;S

Ausführung *(model)*

warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig]				**p [psig]**				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
4P6				**4P6**				**4P6**				**4P6**			
2 - 5		weight-loaded	S	2 - 5		weight-loaded	S	2 - 5		weight-loaded	S	2 - 5		weight-loaded	S
5 - 8		540.8732.0000		5 - 8		540.8732.0000		5 - 8		540.8734.0000		5 - 8		540.8737.0000	
8 - 10		540.8742.0000		8 - 10		540.8742.0000		8 - 10		540.8744.0000		8 - 10		540.8747.0000	
10 - 16		540.8752.0000		10 - 16		540.8752.0000		10 - 16		540.8754.0000		10 - 16		540.8757.0000	
16 - 25		540.5912.0000		16 - 25		540.5912.0000		16 - 25		540.5914.0000		16 - 25		540.5917.0000	
25 - 30		540.5922.0000		25 - 30		540.5922.0000		25 - 30		540.5924.0000		25 - 30		540.5927.0000	
31 - 45		540.5932.0000		31 - 45		540.5932.0000		31 - 45		540.5934.0000		31 - 45		540.5937.0000	
45 - 64		540.5942.0000		45 - 64		540.5942.0000		45 - 64		540.5944.0000		45 - 64		540.5947.0000	
64 - 90		540.5952.0000		64 - 90		540.5952.0000		64 - 90		540.5954.0000		64 - 90		540.5957.0000	
90 - 122		540.5962.0000		90 - 122		540.5962.0000		90 - 122		540.5964.0000		90 - 122		540.5967.0000	
122 - 167		540.5972.0000		122 - 167		540.5972.0000		122 - 167		540.5974.0000		122 - 167		540.5977.0000	
167 - 200		540.9952.0000		167 - 200		540.9952.0000		167 - 200		540.9954.0000		167 - 200		540.9957.0000	
200 - 285		540.5982.0000		200 - 285		540.5982.0000		200 - 285			S	200 - 285		540.5987.0000	

Ausführung *(model)*															
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig]				**p [psig]**				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
4P6 300-900#				**4P6 300-900#**				**4P6 300-900#**				**4P6 300-900#**			
4	- 6	weight-loaded	S	4	- 6	weight-loaded	S	4	- 6	weight-loaded	S	4	- 6	weight-loaded	S
6	- 9	540.8832.0000	O	6	- 9	540.8832.0000	O	6	- 9	540.8834.0000	O	6	- 9	540.8837.0000	O
9	- 13	540.8842.0000	O	9	- 13	540.8842.0000	O	9	- 13	540.8844.0000	O	9	- 13	540.8847.0000	O
13	- 20	540.8862.0000	O	13	- 20	540.8862.0000	O	13	- 20	540.8864.0000	O	13	- 20	540.8867.0000	O
20	- 30	540.8872.0000	O	20	- 30	540.8872.0000	O	20	- 30	540.8874.0000	O	20	- 30	540.8877.0000	O
31	- 44	540.8882.0000	O	31	- 44	540.8882.0000	O	31	- 44	540.8884.0000	O	31	- 44	540.8887.0000	O
44	- 58	540.8892.0000	O	44	- 58	540.8892.0000	O	44	- 58	540.8894.0000	O	44	- 58	540.8897.0000	O
58	- 78	540.8902.0000	O	58	- 78	540.8902.0000	O	58	- 78	540.8904.0000	O	58	- 78	540.8907.0000	O
78	- 104	540.8852.0000 540.8982.0205	O	78	- 104	540.8852.0000 540.8982.0205	O	78	- 104	540.8854.0000 540.8984.0205	O	78	- 104	540.8857.0000 540.8987.0205	O
105	- 135	540.8912.0000	O	105	- 135	540.8912.0000	O	105	- 135	540.8914.0000	O	105	- 135	540.8917.0000	O
135	- 181	540.8922.0000	O	135	- 181	540.8922.0000	O	135	- 181	540.8924.0000	O	135	- 181	540.8927.0000	O
181	- 232	540.8942.0000	O	181	- 232	540.8942.0000	O	181	- 232	540.8944.0000	O	181	- 232	540.8947.0000	O
232	- 305	540.8942.0000 540.8972.0205	O	232	- 305	540.8942.0000 540.8972.0205	O	232	- 305	540.8944.0000 540.8974.0205	O	232	- 305	540.8947.0000 540.8977.0205	O
305	- 392	540.8942.0000 540.8982.0205 540.0044.0000	O	305	- 392	540.8942.0000 540.8982.0205 540.0044.0000	O	305	- 392	540.8944.0000 540.8984.0205 540.0044.0000	O	305	- 392	540.8947.0000 540.8987.0205 540.0047.0000	O
392	- 493	540.9552.0000 540.9982.0205	FT; O	392	- 493	540.9552.0000 540.9982.0205	FT; O	392	- 493	540.9554.0000 540.9984.0205	FT; O	392	- 493	540.9557.0000 540.9987.0205	O
493	- 616	540.9552.0000 540.9542.0205	FT; O	493	- 616	540.9552.0000 540.9542.0205	FT; O	493	- 616	540.9554.0000 540.9544.0205	FT; O				
616	- 711	540.9842.0000 540.9542.0205	FT; O	616	- 711	540.9842.0000 540.9542.0205	FT; O	616	- 711	540.9842.0000 540.9542.0205	FT;S;O Faba				
711	- 856	540.9832.0000 540.9542.0205	FT; O	711	- 856	540.9832.0000 540.9542.0205	FT; O	711	- 856	540.9832.0000 540.9542.0205	FT;S;O Faba				
856	- 1000	540.9832.0000 540.9992.0205	FT; O	856	- 1000	540.9832.0000 540.9992.0205	FT; O	856	- 1000	540.9832.0000 540.9992.0205	FT;S;O Faba				

Ausführung *(model)*																	
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig]				**p [psig]**				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
6Q8				**6Q8**				**6Q8**				**6Q8**			
3	- 5	weight-loaded	S	3	- 5	weight-loaded	S	3	- 5	weight-loaded	S	3	- 5	weight-loaded	S
5	- 9	540.8832.0000	O	5	- 9	540.8832.0000	O	5	- 9	540.8834.0000	O	5	- 9	540.8837.0000	O
9	- 12	540.8842.0000	O	9	- 12	540.8842.0000	O	9	- 12	540.8844.0000	O	9	- 12	540.8847.0000	O
13	- 22	540.8862.0000	O	13	- 22	540.8862.0000	O	13	- 22	540.8864.0000	O	13	- 22	540.8867.0000	O
22	- 32	540.8872.0000	O	22	- 32	540.8872.0000	O	22	- 32	540.8874.0000	O	22	- 32	540.8877.0000	O
32	- 41	540.8882.0000	O	32	- 41	540.8882.0000	O	32	- 41	540.8884.0000	O	32	- 41	540.8887.0000	O
41	- 55	540.8892.0000	O	41	- 55	540.8892.0000	O	41	- 55	540.8894.0000	O	41	- 55	540.8897.0000	O
55	- 67	540.8902.0000	O	55	- 67	540.8902.0000	O	55	- 67	540.8904.0000	O	55	- 67	540.8907.0000	O
67	- 86	540.8852.0000 540.1132.0205	O	67	- 86	540.8852.0000 540.1132.0205	O	67	- 86	540.8854.0000 540.1134.0205	O	67	- 86	540.8857.0000 540.1137.0205	O
86	- 115	540.8912.0000	O	86	- 115	540.8912.0000	O	86	- 115	540.8914.0000	O	86	- 115	540.8917.0000	O
115	- 143	540.8902.0000 540.1132.0205	O	115	- 143	540.8902.0000 540.1132.0205	O	115	- 143	540.8904.0000 540.1134.0205	O	115	- 143	540.8907.0000 540.1137.0205	O
143	- 199	540.8942.0000	O	143	- 199	540.8942.0000	O	143	- 199	540.1124.0000 540.1024.0000		143	- 199	540.1127.0000 540.1027.0000	
199	- 268	540.8942.0000 540.8972.0205	O	199	- 268	540.8942.0000 540.8972.0205	O	199	- 268	540.1124.0000 540.1144.0205		199	- 268	540.1127.0000 540.1147.0205	
268	- 300	540.1262.0000		268	- 300	540.1262.0000		268	- 300	540.1124.0000 540.1144.0205 540.1024.0000		268	- 300	540.1127.0000 540.1147.0205 540.1027.0000	
300	- 363	540.1262.0000 540.1042.0000		300	- 363	540.1262.0000 540.1042.0000		300	- 363	540.1262.0000 540.1042.0000		300	- 363	540.1267.0000 540.1047.0000	
363	- 473	540.1262.0000 540.1152.0205		363	- 473	540.1262.0000 540.1152.0205		363	- 473	540.1262.0000 540.1152.0205		363	- 473	540.1267.0000 540.1157.0205	
473	- 513	540.1262.0000 540.1152.0205 540.1042.0000		473	- 513	540.1262.0000 540.1152.0205 540.1042.0000		473	- 513	540.1262.0000 540.1152.0205 540.1042.0000		473	- 513	540.1267.0000 540.1157.0205 540.1047.0000	
513	- 600	540.1272.0000 540.1152.0205 540.1042.0000		513	- 600	540.1272.0000 540.1152.0205 540.1042.0000		513	- 600	540.1272.0000 540.1152.0205 540.1042.0000		513	- 600		S
600	- 682	540.1602.0000 540.1612.0205	FT	600	- 682	540.1602.0000 540.1612.0205	FT	600	- 682	540.1602.0000 540.1612.0205	FT; S				

Ausführung *(model)*

warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices	p [psig] von p1 *up*	bis p2 *to*	Feder-Sachnummer *stock no.*	Indices
6Q8				**6Q8**				**6Q8**							
682	- 797	540.1602.0000 540.1622.0205	FT	682	- 797	540.1602.0000 540.1622.0205	FT	682	- 797	540.1602.0000 540.1622.0205	FT;S Faba				
797	- 928	540.1602.0000 540.1632.0205	FT	797	- 928	540.1602.0000 540.1632.0205	FT	797	- 928	540.1602.0000 540.1632.0205	FT;S Faba				
928	- 1015	540.1702.0000 540.1632.0205	FT	928	- 1015	540.1702.0000 540.1632.0205	FT	928	- 1015	540.1702.0000 540.1632.0205	FT;S Faba				
6R8				**6R8**				**6R8**				**6R8**			
3	- 6	540.8832.0000		3	- 6	540.8832.0000		3	- 6	540.8834.0000		3	- 6	540.8837.0000	
6	- 9	540.8842.0000		6	- 9	540.8842.0000		6	- 9	540.8844.0000		6	- 9	540.8847.0000	
10	- 15	540.8862.0000		10	- 15	540.8862.0000		10	- 15	540.8864.0000		10	- 15	540.8867.0000	
15	- 22	540.8872.0000		15	- 22	540.8872.0000		15	- 22	540.8874.0000		15	- 22	540.8877.0000	
23	- 31	540.8882.0000		23	- 31	540.8882.0000		23	- 31	540.8884.0000		23	- 31	540.8887.0000	
31	- 44	540.8892.0000	O from 42	31	- 44	540.8892.0000	O from 42	31	- 44	540.8894.0000	O from 42	31	- 44	540.8897.0000	O from 42
44	- 59	540.8902.0000	O	44	- 59	540.8902.0000	O	44	- 59	540.8904.0000	O	44	- 59	540.8907.0000	O
59	- 74	540.8882.0000		59	- 74	540.8882.0000		59	- 74	540.8884.0000		59	- 74	540.8887.0000	
		540.8972.0205				540.8972.0205				540.8974.0205				540.8977.0205	
74	- 88	540.8892.0000 540.8972.0205		74	- 88	540.8892.0000 540.8972.0205		74	- 88	540.8894.0000 540.8974.0205		74	- 88	540.8897.0000 540.8977.0205	
88	- 100	540.8892.0000 540.8982.0205		88	- 104	540.8892.0000 540.8982.0205		88	- 104	540.8894.0000 540.8984.0205		88	- 104	540.8897.0000 540.8987.0205	
100	- 145		S	100	- 145		S	100	- 145		S	100	- 145		S

Ausführung *(model)*																	
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig]				**p [psig]**				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
6R10				**6R10**				**6R10**				**6R10**			
3	- 6	540.8832.0000	O	3	- 6	540.8832.0000	O	3	- 6	540.8834.0000	O	3	- 6	540.8837.0000	O
6	- 10	540.8842.0000	O	6	- 10	540.8842.0000	O	6	- 10	540.8844.0000	O	6	- 10	540.8847.0000	O
10	- 15	540.8862.0000	O	10	- 15	540.8862.0000	O	10	- 15	540.8864.0000	O	10	- 15	540.8867.0000	O
15	- 22	540.8872.0000	O	15	- 22	540.8872.0000	O	15	- 22	540.8874.0000	O	15	- 22	540.8877.0000	O
22	- 29	540.8882.0000	O	22	- 29	540.8882.0000	O	22	- 29	540.8884.0000	O	22	- 29	540.8887.0000	O
29	- 44	540.8892.0000	O	29	- 44	540.8892.0000	O	29	- 44	540.8894.0000	O	29	- 44	540.8897.0000	O
44	- 57	540.8902.0000	O	44	- 57	540.8902.0000	O	44	- 57	540.8904.0000	O	44	- 57	540.8907.0000	O
57	- 73	540.8882.0000 540.8982.0205	O	57	- 73	540.8882.0000 540.8982.0205	O	57	- 73	540.8884.0000 540.8984.0205	O	57	- 73	540.8887.0000 540.8987.0205	O
73	- 94	540.9112.0000		73	- 94	540.9112.0000		73	- 94	540.9112.0000		73	- 94	540.9117.0000	FT;S;P
94	- 122	540.9122.0000		94	- 122	540.9122.0000		94	- 122	540.9122.0000		94	- 122	540.9127.0000	FT;S;P
122	- 163	540.9132.0000		122	- 163	540.9132.0000		122	- 163	540.9132.0000		122	- 163	540.9137.0000	FT;S;P
163	- 218	540.9132.0000 540.9092.0205		163	- 218	540.9132.0000 540.9092.0205		163	- 218	540.9132.0000 540.9092.0205		163	- 218	540.9137.0000 540.9097.0205	FT;S;P
218	- 300	540.9152.0000 540.9092.0205		218	- 300	540.9152.0000 540.9092.0205		218	- 300	540.9152.0000 540.9092.0205		218	- 300	540.9157.0000 540.9097.0205	FT;S;P
300	- 391	840.0332.1000 540.9092.0205	FT	300	- 391	840.0332.1000 540.9092.0205	FT	300	- 391	840.0332.1000 540.9092.0205	FT;S Faba				
391	- 507	840.0332.1000 840.0962.1205	FT	391	- 507	840.0332.1000 840.0962.1205	FT	391	- 507	840.0332.1000 840.0962.1205	FT;S Faba				
507	- 638	840.0332.1000 540.1662.0205	FT	507	- 638	840.0332.1000 540.1662.0205	FT	507	- 638	840.0332.1000 540.1662.0205	FT;S Faba				
638	- 797	540.0992.0000 840.1732.0205	FT	638	- 797	540.0992.0000 840.1732.0205	FT	638	- 797	540.0992.0000 840.1732.0205	FT;S Faba				
797	- 913	540.0992.0000 540.1662.0205 540.1682.0000	FT	797	- 913	540.0992.0000 540.1662.0205 540.1682.0000	FT	797	- 913	540.0992.0000 540.1662.0205 540.1682.0000	FT;S Faba				

Ausführung *(model)*																	
warmfest *(creep-resistant steel)*				**hochwarmfest** *(high creep-resistant steel)*				**korrosionsfest** *(stainless steel)*				**Inconel X750**			
p [psig]				**p [psig]**				**p [psig]**				**p [psig]**			
von	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**		**von**	**bis**	**Feder-**	
p1	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**	**p1**	**p2**	**Sachnummer**	**Indices**
up	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*		*up*	*to*	*stock no.*	
8T10				**8T10**				**8T10**				**8T10**			
4 - 6		540.8842.0000	O	4 - 6		540.8842.0000	O	4 - 6		540.8844.0000	O	4 - 6		540.8847.0000	O
6 - 10		540.8862.0000	O	6 - 10		540.8862.0000	O	6 - 10		540.8864.0000	O	6 - 10		540.8867.0000	O
10 - 15		540.8872.0000	O	10 - 15		540.8872.0000	O	10 - 15		540.8874.0000	O	10 - 15		540.8877.0000	O
15 - 22		540.8882.0000	O	15 - 22		540.8882.0000	O	15 - 22		540.8884.0000	O	15 - 22		540.8887.0000	O
22 - 32		540.8892.0000	O	22 - 32		540.8892.0000	O	22 - 32		540.8894.0000	O	22 - 32		540.8897.0000	O
32 - 42		540.8902.0000	O	32 - 42		540.8902.0000	O	32 - 42		540.8904.0000	O	32 - 42		540.8907.0000	O
42 - 54		540.8912.0000	O	42 - 54		540.8912.0000	O	42 - 54		540.8914.0000	O	42 - 54		540.8917.0000	O
55 - 70		540.9112.0000	FT	55 - 70		540.9112.0000	FT	55 - 70		540.9112.0000	FT, Faba	55 - 70		540.9117.0000	FT;S;P
70 - 91		540.9122.0000	FT	70 - 91		540.9122.0000	FT	70 - 91		540.9122.0000	FT, Faba	70 - 91		540.9127.0000	FT;S;P
91 - 117		540.9132.0000	FT	91 - 117		540.9132.0000	FT	91 - 117		540.9132.0000	FT, Faba	91 - 117		540.9137.0000	FT;S;P
118 - 152		540.9132.0000 540.9092.0205	FT	118 - 152		540.9132.0000 540.9092.0205	FT	118 - 152		540.9132.0000 540.9092.0205	FT;S Faba	118 - 152		540.9137.0000 540.9097.0205	FT;S;P
152 - 199		540.9152.0000 540.9092.0205	FT	152 - 199		540.9152.0000 540.9092.0205	FT	152 - 199		540.9152.0000 540.9092.0205	FT;S Faba	152 - 199		540.9157.0000 540.9097.0205	FT;S;P
199 - 261		540.1752.0000	FT	199 - 261		540.1752.0000	FT	199 - 261		540.1752.0000	FT;S; Faba	199 - 300			S
261 - 333		540.0952.0000	FT	261 - 333		540.0952.0000	FT	261 - 333		540.0952.0000	FT;S; Faba				
333 - 391		540.0952.0000 540.1762.0205	FT	333 - 391		540.0952.0000 540.1762.0205	FT	333 - 391		540.0952.0000 540.1762.0205	FT;S; Faba				
391 - 464		540.0952.0000 540.1772.0205	FT	391 - 464		540.0952.0000 540.1772.0205	FT	391 - 464		540.0952.0000 540.1772.0205	FT;S; Faba				
464 - 522		540.0952.0000 840.2362.0205	S	464 - 522		540.0952.0000 840.2362.0205	S	464 - 522		540.0952.0000 840.2362.0205	FT;S; Faba				

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3 Cold differential set pressure test

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

Table 1: Medium of operation vs test medium

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

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

Table 2: Set pressure tolerances

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

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

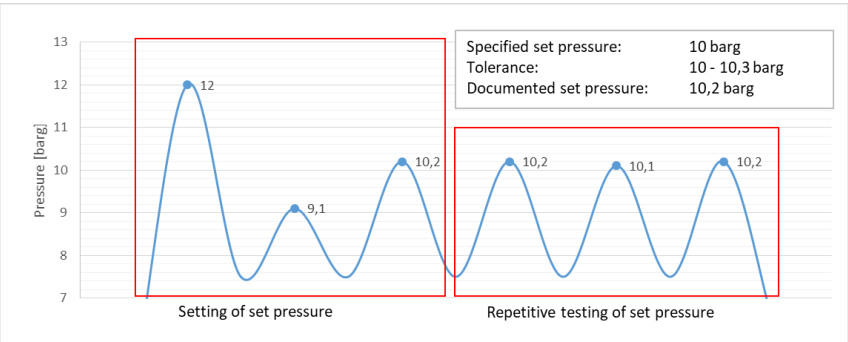


Figure 2: Exemplary set pressure test for 10 barg

3.1 CDTP Correction

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

LESER datasheet of CDTP (Cold differential test pressure)

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

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

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

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

Table 3: CDTP correction factor k_T calculation

°C	°F	Conventional		Balanced Bellows or Inconel spring	
		Open Bonnet	Closed Bonnet	Open Bonnet	Closed Bonnet
550	1022	Limitation at 427°C	Limitation at 350°C	1,049	1,049
500	932			1,032	1,032
450	842			1,021	1,021
400	752	1,049		1,013	1,013
350	662	1,032	1,049	1,007	1,007
300	572	1,021	1,032	No influence of service condition on CDTP, correction factor: 1,000	
250	482	1,013	1,021		
200	392	1,007	1,013		
150	302	No influence of service condition on CDTP, correction factor: 1,000	1,007		
100	212				
-250	-418				

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

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

3.2 Set Pressure Definitions

LESER's set pressure definitions are as following:

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

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

3.3 Test Procedure for Air

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

3.4 Test Procedure for Water

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

3.5 Test Procedure for Steam

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

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

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

3.6 Differences in the procedure for POSVs

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

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

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

4 Seat Tightness Test

All LESER safety valves have to be tested on tightness. The tightness test is set up to ensure that each safety valve fulfils the requirements for which they have been design without suffering from leakage of pressurized parts or seals. The tightness test is standard practiced at LESER after the set pressure is demonstrated. The leakage rates shall be documented. The test medium for determining the seat tightness, air, steam or water, shall be the same as that used for determining the set pressure of the valve. For dual- service valves, the test medium, air, steam or water, shall be the same as the primary relieving

medium. As a standard technique, the minimum or maximum temperature shall not be below 5°C (40°F) nor above 50°C (122°F) during the test.

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

4.1 Test Pressure for all mediums

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

4.2 Seat Tightness Test on Air

4.2.1 Testing on air for gas tight safety valves

4.2.1.1 Procedure

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

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

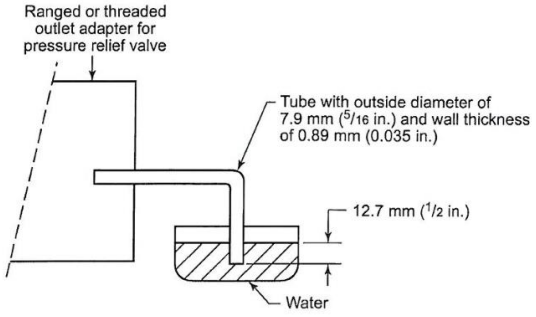


Figure 3: Apparatus to test seat tightness with air. (API 527)

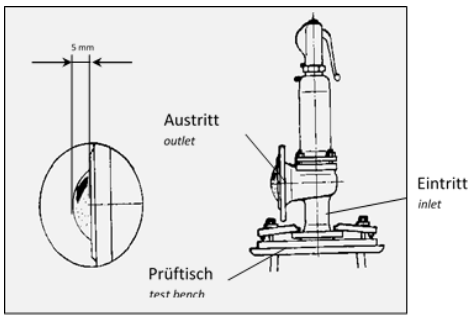
4.2.1.2 Acceptance Criteria

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

4.2.2 Testing on air for non-gas tight safety

4.2.2.1 Procedure

The safety valves are mounted via clamping jaw vertically at the inlet flange on the test bench. For the sealing a rubber pad is laid down under the inlet flange of the safety valve.



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

4.2.2.2 Acceptance Criteria

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

4.3 Seat Tightness Test on Water

4.3.1 Procedure

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

4.3.2 Acceptance Criteria

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

4.4 Seat Tightness Test on Steam

4.4.1 Procedure

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

4.4.2 Acceptance Criteria

No recognized or visible leakage.

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.

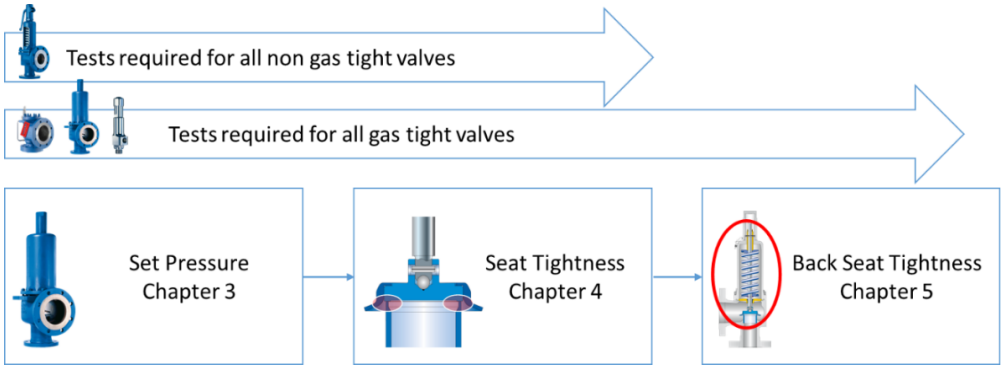
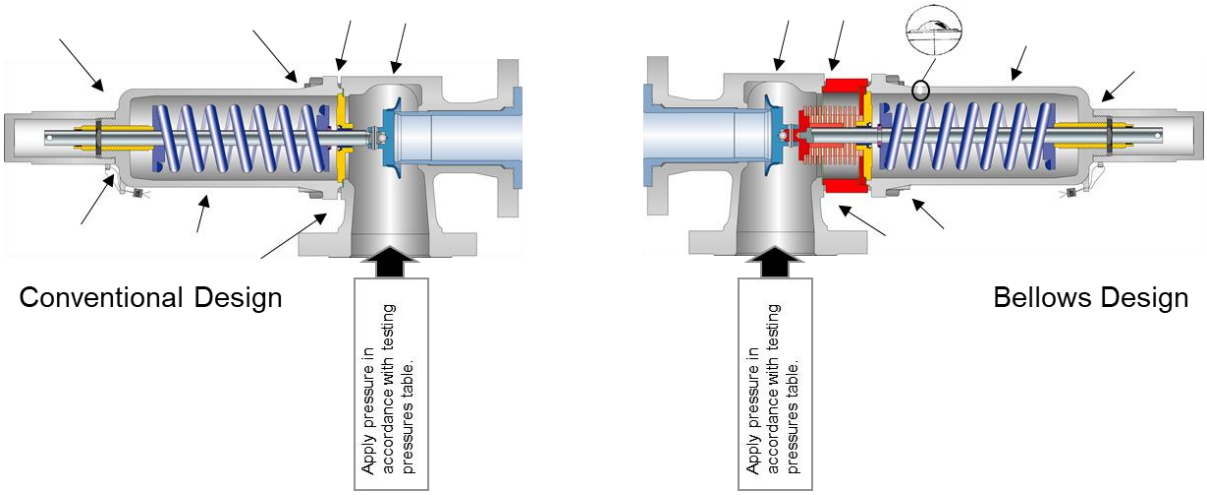


Figure 1: Required tests for gas tight and non-gas tight valves.

5 Back seat tightness (Outlet tightness)

5.1.1 Procedure

The tightness test of the back sealing, LESER named it tightness outwards, is carried out for all LESER's safety valves in gastight design and for all POSVs. After testing of the seat leakage and the test pressure the safety valve will be tightened (outlet) on the test bench and admitted with pressure. Reaching the test pressure, the safety valves will be sprayed at the connections and the outlet area with a non- volatile and viscous test fluid. In case of a balanced bellows design the test fluid is drawn over the drainage whole in the bonnet.



The below testing times and test pressures apply.

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

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

5.1.2 Acceptance Criteria

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

Contents

1 Purpose

This LESER Global Standard (LGS) provides instruction on the visual final inspection of LESER safety valves. The required work steps and materials are described.

2 Scope

This document must be observed in the visual final inspection of safety valves in agencies and subsidiaries of LESER GmbH & Co. KG.

3 Disclaimer

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

LESER GmbH & Co. KG reserves the right to change the information contained in this document, which is for the products of LESER GmbH & Co. KG and is intended for LESER subsidiaries, at any time and without prior announcement.

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

4 Qualified fitting personnel

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

5 General Information

- Gloves must be worn during the final inspection of oil and grease-free safety valves.

6 Flow chart for the visual inspection (final inspection)

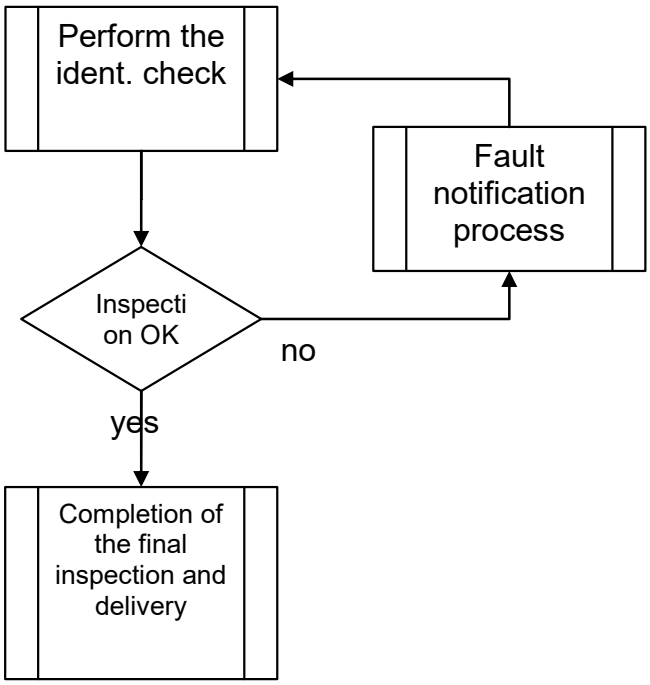


Figure 6-1

7 Performing the final inspection

7.1 General inspections

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

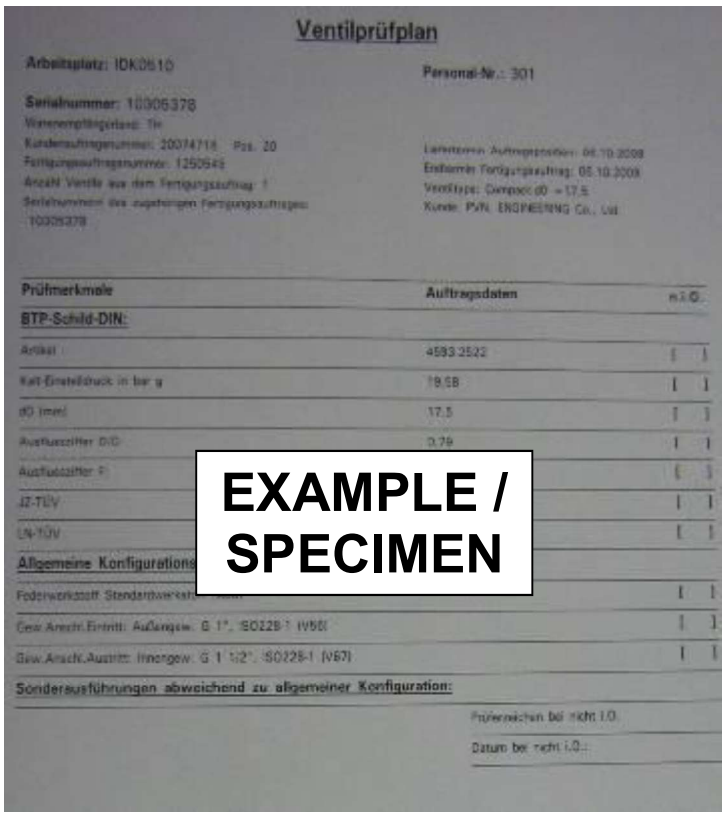


Figure 7.1-1

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

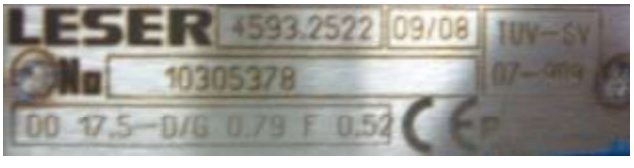


Figure 7.1-3: Check the BT plate / customer ID plate data against the valve inspection plan / repair order

7.2 Visual inspection of other items

7.2.1 Inspection of the paintwork

a) Valve is not completely painted

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

b) Paint coat is cracked (too much paint)

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

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

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

OK specimen:	**Rejected specimen:**

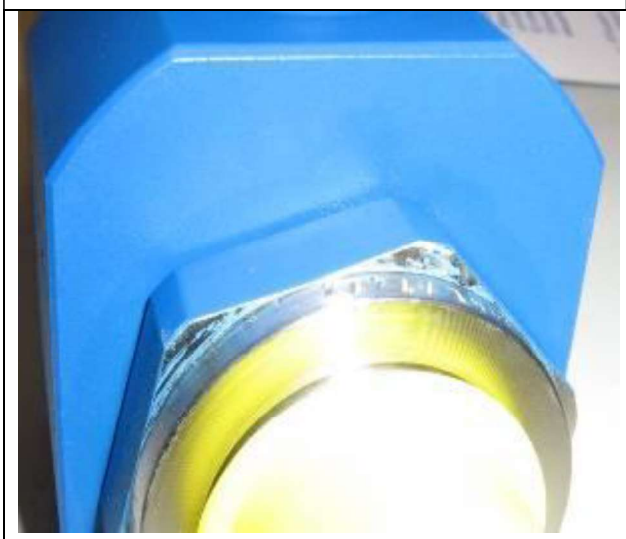
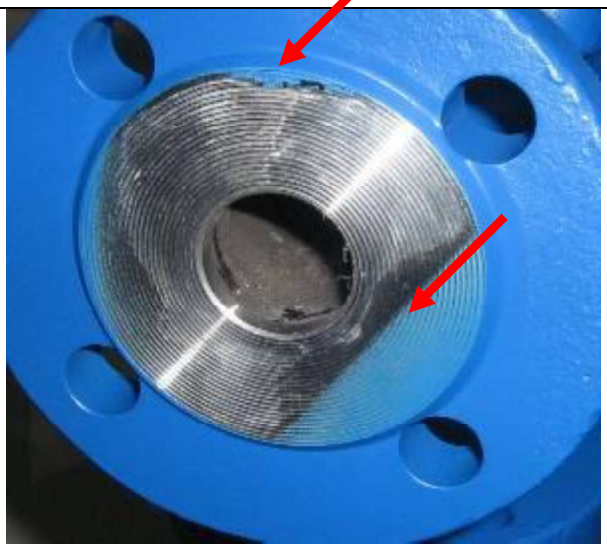



Figure 7.2.1-7	

	Figure 7.2.1-8

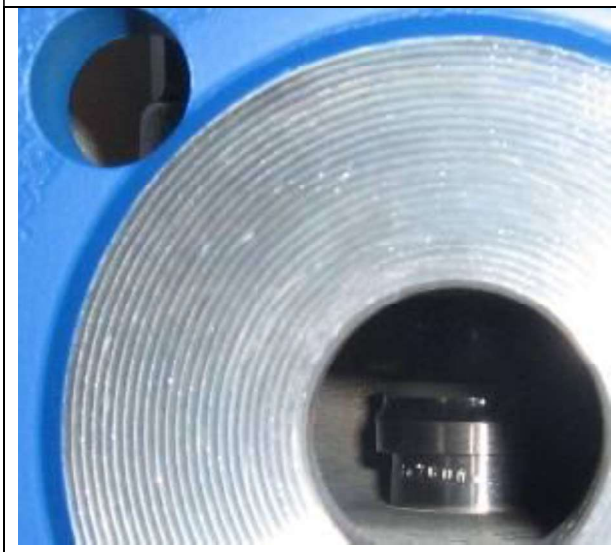
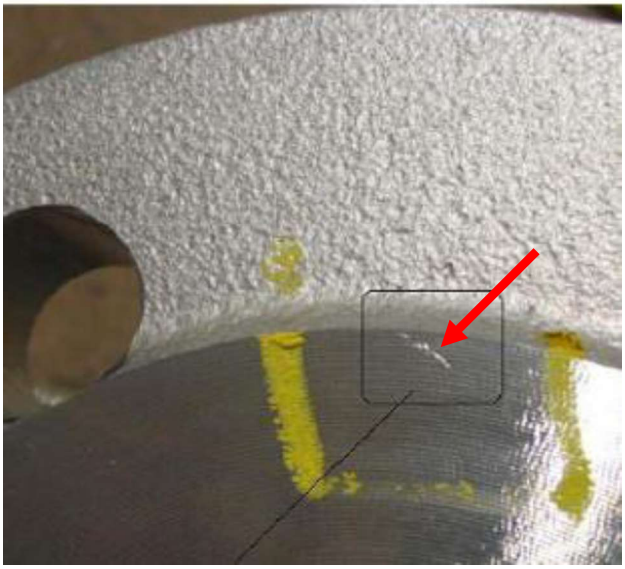
d) Paint on masked off areas

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

OK specimen:	**Rejected specimen:**
	
Figure 7.2.1-11	**Figure 7.2.1-12**

Reason: The legibility of the plate is not guaranteed.

7.2.2 Inspection of the sealing surfaces

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

7.2.3 Inspection of the seal

OK specimen:	**Rejected specimen:**
 **Figure 7.2.3-1**	Seal is missing for sealed valves, or it is not crimped.

If the result of the inspection is okay, then the safety valve is sent for packaging and shipment.

7.3 Fault notification process

- If the result of the inspection is not okay, then the fitting is sent to the fault notification process that is to be determined.
- The final inspection is performed again after completion of the fault notification process.

Type 526
Spare parts kits

The spare parts kit provides all spare parts which are recommended by LESER to be replaced during rework of a safety valve.

Content

Item	Component	Material	Quantity
7.5	Securing ring (Disc)	1.4571 316Ti	1
14	Split ring	1.4404 316L	2
57	Ball	1.4401 316	15
59	Securing ring[1)]	1.4571 316Ti	1
60	Gasket[2)]	Graphite / 1.4401 Graphite / 316	3
61	Ball	1.4401 316	1
66	Screw	1.4401 316	1
73.2	Gasket (Lock screw)	1.4401 316	1

[1)] Kits 5012.1118 and 5012.1119: Kits don't contain securing ring due to re-usable ring bush in the safety valve.
[2)] Kit 5012.1109: Three additional gaskets are enclosed for use in type 5267 (WC6).

Article numbers

Orifice	Inlet flange rating class of the safety valve						
	CL150	CL300L	CL300	CL600	CL900	CL1500	CL2500
D	5012.1101				5012.1102		
E							
F	5012.1103						
G	5012.1104					5012.1121	
H	5012.1105		5012.1106				
J	5012.1107		5012.1108				
K	5012.1109				5012.1110		
L	5012.1111		5012.1112				
M	5012.1113						
N	5012.1114						
P	5012.1115		5012.1116				
Q	5012.1117						
R	5012.1118		5012.1119				
T	5012.1120						

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:

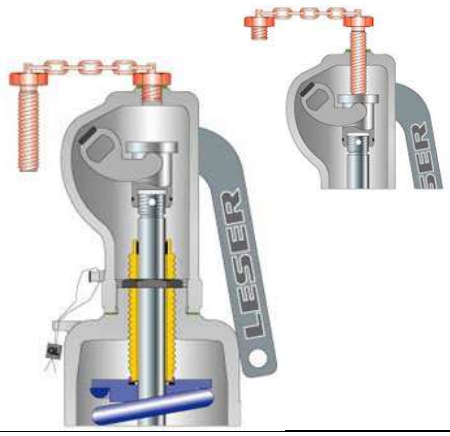
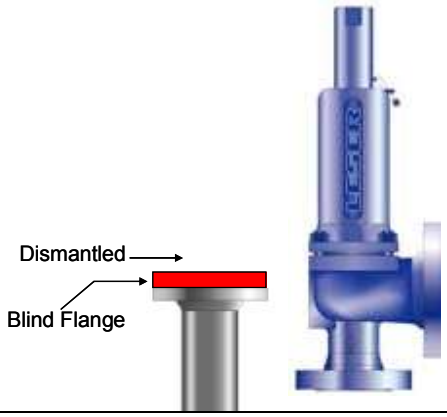
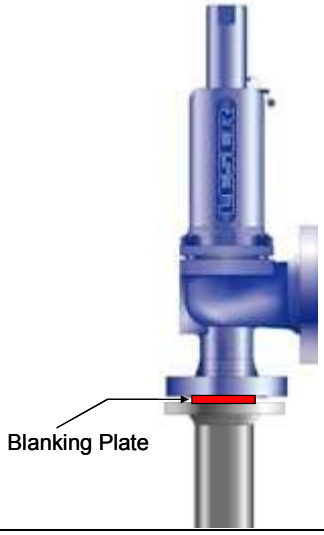
Possibility	Figure	Description
Test gag		The test gag blocks the spindle and keeps the safety valve tight while the system pressure exceeds the set pressure. Advantage: It is possible to perform pressure tests in a system without dismantling the safety valve. After testing, the test gag must be removed!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

[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