

PHOENIX Armaturenwerke GmbH

Brand: STRACK



Operation Instructions for Lift Plug Valves

BA 200-STS

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Operation Instruction – Lift Plug Valves

Declaration of Conformity acc. to Directive 2014/68/EU

The manufacturer	PHOENIX Armaturenwerke GmbH 34471 Volkmarsen, Germany
declares that the	Brand STRACK , STRACK Armaturenwerke GmbH Lift plug valves types S50 and S51 • Operation with handwheel or gear or gear and actuator
<ol style="list-style-type: none">are pressure bearing equipments within the meaning of the EC Pressure Equipment Directive 2014/68/EU and in conformity with the requirements of this directive, Note: Lift plug valves < DN 32 are not concerned by this directivecan only be used and operated under observance of the attached operation manual N° BA 200-ST5.	

Related standards:

EN 16668	Industrial Valves-Requirements for metallic valves as pressure accessories
EN 12516	Calculation of valve bodies of steel – Part 1: Table method
ASME B16.34	Valves-Flanged, Threaded, and Welding Ends

Description of type and technical features:

STRACK-type data sheets < S50 and S51>

NOTE: This manufacturer declaration is valid for all variants of type mentioned in the STRACK catalogue

Applied procedure for the rating of the conformity:

to Annex II of the Pressure Equipment Directive 2014/68/EU Module „H“

Name of the notified body:

Identification N° of the notified body:

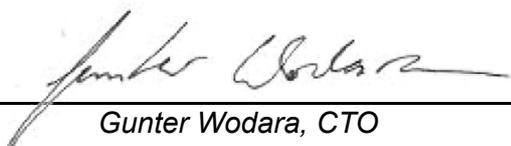
LRQA Deutschland GmbH

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Modifications on Lift plug valves and/or components with consequences for the technical features of the valve, of the “defined use” acc. to section 1 of the operation instruction and which will modify the valve essentially cancel these declarations.

According to the guidelines for the application of the Council’s general direction 2014/34/EU 26.02.2014 for adapting legal regulations valid in the single member countries and dealing with apparatuses and safety systems and their application in areas endangered by explosion, lift plug valves do not have an integrated potential source of sparks as revealed by the danger of releasing sparks analysis. Due to this, lift plug valves are not subject to the guideline mentioned above.

Volkmarsen, 24.08.2023



Gunter Wodara, CTO

Operation Instruction – Lift Plug Valves

Introduction

This instruction shall support the user for installation, operation and maintenance of Lift plug valve types S50 and S51

	<p>The non observance of the following attention and warning notes might cause dangers with the consequence that the manufacturer's guarantee becomes void.</p> <p>For questions in this regard contact the manufacturer, addresses see section 8.</p>
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1 Defined use

After their installation in a piping system (either between flanges or by welding) the use of the Lift plug valves **types S50** and **S51** is exclusively defined as to stop or convey the flow of media within the admitted pressure and temperature limits by manual operation. The use of these Lift plugvalves for media with solid matters, especially with wearing particles is not recommended.

The design document **<Pressure-Temperature-Tables TDB3/1 to 3/5>** (see section 8.1 <Information>) shows the admitted pressure-temperature-range for these valves.

The safety instructions of section 2 <safety instructions> shall be observed.

When Lift plug valves are used in dust loaded environment the use of a protecting cap for the open stem is recommended.

2. Safety instruction

2.1 General safety instructions

Valves are subject to the same safety impositions which are valid for the piping system where the valves shall be installed. Therefore, the present instruction mentions only such kind of safety notes which must additionally be considered for valves.

 Danger to life	<p>Valves whose admitted pressure-temperature range (=“Rating”) is not sufficient for the operating conditions shall not be used. For materials or pressures or temperatures not indicated in the a.m. <Pressure-Temperature-Tables TDB 3/1 to 3/5> a release note from the manufacturer is mandatory.</p> <p>The disregard of this ordinance can provoke danger to life and cause damages in the piping system.</p>
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 Note	<p><i>Lift plug valves are not suitable for an operation in intermediate position.</i></p> <p>A Lift plug valve shall only be used with its final positions totally open or totally closed.</p>
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2.2 Safety instructions for the user

It is not within the responsibility of the manufacturer and must be safeguarded by the user of the Lift plug valve that

⇒ the valve is only used as required by the “defined use” as described in section 1,

 Danger	<p>Protection against wrong use for the Lift plug valve:</p> <p>It must be absolutely assured that the selected materials of the wetted parts of the Lift plug valve are suitable for the handled media. The manufacturer is not responsible for damages of the Lift plug valve caused by corrosive agents.</p> <p>The disregard of this ordinance can provoke danger for the user and cause damages in the piping system.</p>
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⇒ a gear operator which is fitted to the valve later on shall be adapted to this valve. In the closed position the final stop shall be realised in the seat of the valve,

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- ⇒ the Lift plug valve will be installed workmanlike in the piping system, especially such types of valves which are fitted into the piping system by welding. The wall thickness of the valve body shall be calculated in such a way that an additional load F_z within the usual order of magnitude ($F_z = \pi/4 \cdot DN^2 \cdot PS$) is taken into account for such a workmanlike mounted piping system.

($PS = \text{max. admitted design pressure at ambient temperature}$),

- ⇒ the valve shall be fitted workmanlike with these systems,
- ⇒ inside this piping system the usual flow rates (e.g. 4 m/s for liquids) in continuous operation shall not be exceeded and exceptional operating conditions such as vibrations, water hammers, cavitation and higher percentages of solid matters in the media – especially wearing ones – have to be cleared with the manufacturer,
- ⇒ the using for control-, regulating and expansion processes is not allowed
- ⇒ valves used at operating temperatures $>+50^\circ\text{C}$ or $<-10^\circ\text{C}$, are protected against contact as it is intended for the pertinent piping system,
- ⇒ only qualified staff is used for the operation and maintenance of pressure bearing piping systems.

2.3 Special risks

 Danger to life	<p>The operating stem is sealed by a stuffing box. Before a loosening of the nuts on the gland follower the piping system shall be completely depressurised to avoid the leakage of the media throughout the stuffing box.</p>
 Danger to life	<p>Before the disassembling of the valve out of the piping system and/or before the loosening of the bolts and nuts of the bonnet the system shall be completely depressurised to avoid an uncontrollable fugitive emission of the media. It must be assured that the valve is in semi-open position to enable that the pressure can escape on both sides of the valve.</p>
 Danger	<p><i>Lift plug valves which are used as final shut-off valve:</i> For normal operation, especially with gaseous, hot and/or dangerous media a blind flange or a cover plate shall be fitted on the free outlet or adequately secured against unauthorised operation acc. to the directives of EN 292 – Part 2. Attention during the closing of such valves: Mind the risk of pinching!</p>
 Danger	<p><i>Lift plug valves which are not slowly operated in the starting up phase at service temperatures of $>250^\circ\text{C}$:</i> Leakages might occur. See also section 6.1. <Starting-up phase></p>
 Danger	<p>Whenever a Lift plug valve which is used as final valve shall be opened under pressure load this must be performed with extraordinary care and in such a manner to assure that the outspurring media cannot provoke damages.</p>
 Danger	<p>When a valve shall be disassembled from the piping system exists the risk that the media can flow out of the piping or the valve. In case of liquids which are harmful for the health or dangerous the piping system shall be completely drained before the valve can</p>

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be removed from the system. Caution of **residues coming out of or remaining in dead holes of the valve or the piping system itself.**

2.4 Marking of the Lift plug valve

Each Valve is normally marked as follows:

For	Marking	Note
CE-Mark	CE 0525	Corresponding to PED 2014/68/EU CE-mark only for sizes DN 32 and more
Brand	STRACK (SAG)	Is the logo for <STRACK Armaturenwerke GmbH>
Manufacturer	PHOENIX (PAG)	PHOENIX Armaturenwerke GmbH
Manufacturer-N°	e.g.:98898/02	The first figures before the strike are the factory number, the last figures after the strike = year of manufacture, e.g. /02 = 2002
Date of manufacture	e.g.: 05/02	The first figures before the strike indicate the month of manufacture (05 = May), the figures after the strike = year of manufacture, e.g. (02 = 2002)
Valve type	Type	e.g. Type S 50, see Datasheet STRACK
Body material	e.g.: 1.0619.01	N° of material standard to EN 12516, Part 1
Size	DN or NPS (and numerical value)	Numerical value in mm, e.g. DN 200 or NPS 8
Max. pressure	PS or PN (and numerical value)	Numerical value in [bar] at 20°C, e.g. PS 40
	ANSI and Class (numerical value)	e.g. ANSI 300
Heat-/ Melt N°	e.g.: 25652 or GHW	Heat-/Melt N° of the foundry

3 Transport and Storage

Lift plug valves shall be carefully treated, transported and stored:

- ⇒ The valve shall be stored with its protecting packing and/or with its protecting caps on the inlet and outlet. Valves with a weight of more than 10 kgs shall be stored on pallets (or similar) and be transported in such a state (even on the transport to the installation point).

 Attention	<i>To protect the valve against damages:</i> Ropes and belts shall only be fixed on body-bonnet but never on the handwheel!
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- ⇒ Before its installation the valve shall be normally stored in closed area and shall be protected against detrimental influences such as dirt and humidity.
- ⇒ In particular the handwheel and the end orifices of the Lift plug valves for the connection with the piping system shall not be damaged neither by mechanical nor other influences.
- ⇒ Lift plug valves will be supplied by manufacturer in closed position and shall be stored in this state.

4 Installation into the piping system

4.1. General

For the installation of valves into a piping system the same instructions are valid as for the connection of pipes among themselves and similar piping components. When in a plant the piping and other equipment are insulated, this must also be applied to the built-in gate valves. In addition, the following

Operation Instruction – Lift Plug Valves

instructions are valid for gate valves. For the transport to the installation place please mind the informations given in section 3 of this manual.

 Danger to life	If Lift plug valves are installed in insulated piping systems, or in the area of other insulated equipment, so they must also be insulated. In absence of insulation, plug valves can be damaged. In serious cases, the pressurized parts could be damaged.
 Note	Lift plug valves in horizontal pipes should be installed - if possible – with vertical orientated stem (deviations up to 45° from the vertical line are admitted). Other installation positions in horizontal pipes shall be agreed with the manufacturer.
 Danger to life	Lift Plug valves equipped with hand lever: Hand lever can be moved by the existing operating parameters. The operator must be outside the purview of the hand lever located in the valve operation. The hand lever must be held by the operator only when switching
 Attention	<i>To avoid damages of Lift plug valves with weld ends:</i> During the welding of the valves into the piping system the weld procedure shall be performed in such a way that the applied heat energy is limited, and deviations of the valve body are avoided. Therefore, larger sizes shall be welded in alternating procedures once from one side and then from the other to avoid restraints in the valve's body. During the weld procedure the Lift plug valve shall be brought and kept in the open position until the weld conjunction is cooled down to <math><100^{\circ}\text{C}</math>.
 Danger to life	In case of a posterior installation of a gear operator the interface adaptation, the automatic mechanism, the nominal moment and the sense of the rotation must be adapted to the Lift plug valve. The Lift plug valve shall be closed by turning the handwheel clockwise. Disregard of this imposition can provoke danger for the operator and damages in the piping system.

As far as handwheels are concerned:

 Danger	<i>Handwheels and levers are no "stepboards nor ladders"!</i> Handwheel shall not be charged with heavy loads; this can damage or destruct both the handwheel and/or the Lift plug valve.
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4.2 Working steps

- ⇒ Transport the Lift plug valve in its protecting packing to the installation site and unpack the valve just before its immediate fitting into the system to ensure that the valve is protected against each kind of contamination.
- ⇒ Inspect the valve on possible transport damages. Damaged valves shall not be installed.
- ⇒ Before the installation a functional test shall be performed. The valve must close and open correctly. Perceptible functional failures shall be repaired before the commissioning of the valve. See also section 7 <Trouble shooting>.
- ⇒ Make sure that only valves shall be installed whose pressure rating, type and dimensions of connections correspond to the operating conditions. In this regard also see related marking of the valve.

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 Danger to life	No Lift plug valves shall be installed whose admitted pressure-/temperature rating is not sufficient for the operating conditions. This admitted range results in the marking and/or in the design document <Pressure-Temperature-Tables TDB3/1 to 3/5> see also section 1 <Defined use>. Disregard of this precautionary measure can provoke danger to life for the user and damages in the piping system.
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- ⇒ The connections of the piping system shall be in strict alignment with the end connections of the Lift plug valve and have plane parallel ends.
- ⇒ Before the installation the valve and the corresponding pipe shall be carefully cleaned from dirt and contaminations, especially hard foreign particles shall be removed.
- ⇒ The flow direction of Lift plug valve is optional. For special designs with relief holes the direction of the arrow on the body shall be respected.
- ⇒ Introducing the valve (and the flange gasket) into an existing piping system e.g. in case of replacement, the distance between the pipe ends must be dimensioned in such a way that the sealing surfaces of the flanges and the gaskets, too, will not be damaged.

For Lift plug valves with weld ends only:

- ⇒ The weld ends of the valve shall be in true alignment and shall have parallel faces and must be of identical type as the pipes – see type plate of the valve. Opposite weld ends must fit to each other as far as diameters and weld joints are concerned.
- ⇒ Make sure by workmanlike welding that neither worth mentioning tensions will be produced in this piping section or on the valve nor that the Lift plug valve body might get distorted due to unilateral heat introduction during the weld procedure. Only temperatures of <300°C, measured on the body wall, are admitted.
- ⇒ The weldings must be performed workmanlike in such a way that the weld seam has all round about a uniform temperature. Lift plug valves >DN 300 shall be welded in alternation on their opposite sides.
- ⇒ Weld cables shall not be fixed on the valve but exclusively on the pipings.

 Attention	Disregard of this impositions can provoke distorsion of the valve body. Even 1/10mm of permanent distorsion in the seat area of the valve can signify that the valve becomes unserviceable.
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5 Pressure test of the piping section.

For the pressure test of Lift plug valves, the same instructions are valid as imposed for the piping system. In addition, the following shall be considered:

- ⇒ Newly installed pipe system shall be carefully cleansed to flush off all foreign particles.
 - ⇒ The test pressure “PT” of an **opened valve** shall **not exceed the value 1,5 x PS (at 20°C)**
In case that the valve is only marked with PN then $PT = 1,5 \times PN$ [bar] is valid.
- The test pressure “PT” of a **closed valve** shall **not exceed the value 1,1 x PS (at 20°C)**

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6 Starting up, normal operation and maintenance.

6.1 Starting up

When a **Lift plug valve is installed in closed position or as final shut-off device**, during the “starting up phase” of a piping section it must be assured at temperatures of $>100^{\circ}\text{C}$ – especially when Lift plug valves of $>\text{DN } 300$ are involved - that the handled medium will be slowly fed in. Otherwise the valve’s body gets distorted and the valve will leak.

6.2 Normal operation and maintenance

1. Handwheel 1-2 rotations to the left side (counterclockwise) for the lifting of the plug from its position.
2. Lever to put plug into open or close position.
3. Fix the plug again with vice versa rotation of point 1. The plug is now fixed again. **Tightning always (open and close position) with the handwheel clockwise rotation.**

 Attention	Recognition of the Valve Lever in the way of the pipe: open valve position Lever cross way of the pipe: close valve position.
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For multiply valves please see marking for plug positions at the valve (metal plate), catalogue or drawing.

For all kind of Lift plug valves with automatic mechanism the previous points to be shared. Please move the handwheel up to the stroke in rotation same as all other valves. (Open: counter clockwise rotation; shut: clockwise rotation.) All other movement will be done by the automatic mechanism.

The use of **extension rods, levers and similar items to increase the operation moment** is not admitted.

 Note	<i>Lift plug valves are not suitable for an operation in intermediate position.</i> Lift plug valves shall only be used in their final position, i.e. either completely opened or closed. Opening and closing of valves shall be performed smoothly, i.e. without any interruption during the operation procedure.
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Regular maintenance work is not required for Lift plug valves, however, during the inspection of the piping section no leakage shall appear neither on the flanged and/or screwed connections nor on the stuffing box. In case of leakages and repairs please see section 2 – <Safety instructions> and section 7 <Failures>.

We recommend that Lift plug valves which are permanently operated in open position should be three to four times a year be brought for a short period into the closed position.

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7 Trouble shooting

During the remedy of failures section 2 <Safety instructions> shall be absolutely considered.

	<p><i>When a Lift plug valve is removed from systems conveying dangerous media and shall be carried away from the plant:</i></p> <p>Danger then the valve must be professionally decontaminated.</p>	
Kind of failures	Procedures for remedy	Note
<p>Leakage on the flanges to the system or between body and bonnet</p>	<p>Tighten bolts and nuts.</p> <p><i>When the valve is still leaking:</i></p> <p>Remove the valve, considering always the notes in section 2.3 <Special risks> and ask for spare gaskets for the bonnet and correlated instructions at STRACK See section 8 of this manual for more information</p>	<p>Note 1: <i>Spare parts shall be ordered with all indications of the marking of the valve. Only the original STRACK spare parts shall be used for repairs and replacements</i></p>
<p>Leakage on the gland follower</p>	<p><u>Lift plug valves</u></p> <p>Tighten the nuts of the gland follower alternating and clockwise in little steps of max. ¼ turn to ¼ turn until the leakage stops.</p> <p>See section 8 and 10 of this manual for more information the max. admitted torque for the tightening is specified.</p> <p><i>In case the leakage cannot be eliminated by this procedure:</i> Repair will be necessary. See section 8 and 10 for installation of new packing and the necessary instructions.</p> <p><i>In case the nuts of the gland follower shall be loosened or removed (anticlockwise turning):</i></p> <div style="text-align: center;">  Danger to life </div> <p>To protect the staff against possible risks the complete system shall be absolutely depressurised. Mind and consider section 2.3 <Special risks>.</p>	<p>Note 2: <i>When it is noted after the disassembling of the valve that the body and/or trim is not sufficiently resistant against attacks of the media opt for more suitable materials of design</i></p>
<p>Functional failures</p>	<p>Check stem and stem nut.</p> <p><i>When these functional components are ok but not sufficiently lubricated:</i></p> <p>Clean stem from dirt and contaminations and lubricate with a grease compatible with the operating temperatures.</p> <p>For normal operating temperatures lithium saponified greases are sufficient. (standard grease.).</p> <p><i>When this procedure will not remedy the failure:</i> Repair necessary: Remove the valve and inspect, mind the notes of section 2.3 <Special risks>. Ask STRACK for corresponding spares and required instructions.</p>	<p>Note 2: <i>When it is noted after the disassembling of the valve that the body and/or trim is not sufficiently resistant against attacks of the media opt for more suitable materials of design</i></p>

In case of failures on the actuators see attached instructions.

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8 Maintenance works / Replacement of packing

When the packing consists of cords, e.g. PTFE-silk or similar designs, the replacement can be achieved without problems and no explanations are necessary. Therefore, the following statements refer mainly to rings.

Due to the absolute ban of asbestos as basic material for packings and gaskets new materials and designs like slotted or undivided rings are more and more used. Especially when prepressed, ready-made undivided packing rings are used, a design with a splitted spindle (coupled option) offers many advantages compared to an option with a one piece stem because the whole operating mechanism must not be disassembled for this procedure.

8.1 Removal of the old packing

Open the valve completely. Remove coupling (8). Lift the upper spindle (10) with the handwheel (11), thus creating sufficient space between the upper spindle (10) and the lower spindle (7) for the replacement of the packing (15).

Loosen stuffing box nuts (6.2) and pull up gland follower (6) and fix it e.g. with wire or similar. Pick up packing rings (15) and pull it upwards. Then pull out the old packing set (15) carefully using adequate tools.

Surfaces of spindle (7) and packing chamber (5) must not be damaged

Clean packing chamber (5) and check spindle finish.

8.2 Introduction of the new packing

PHÖNIX recommends to use ready made, prepressed rings having the necessary tolerances of the former ones.

8.2.1 Undivided rings

will be simply drawn over the lower spindle (7) and then pressed-down into the packing chamber (5). **For on site service the slotted rings are preferred!**

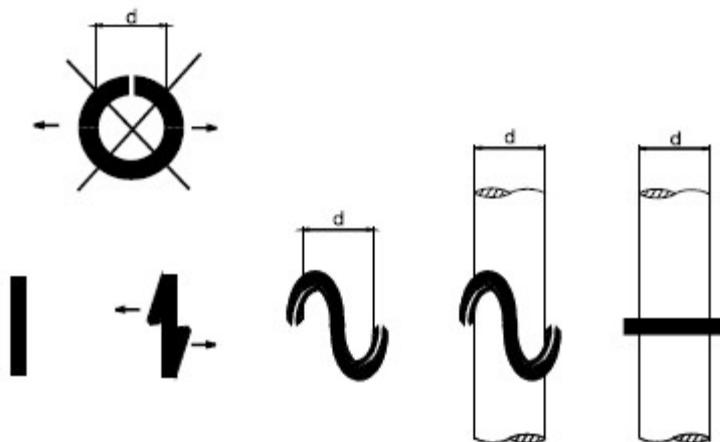
8.2.2 Slotted rings

shall not be expanded in tangential direction but must be opened in axial direction, drawn over the spindle (7) and then plane upset.

Introduce the single rings (15) into the packing chamber (5) with their intersection to the front. Press them down with a suitable packing rod e.g. a divided sleeve. The intersections of the slotted rings (15) must be displaced on each about 90° or 120°.

Packing - Slotted rings (continued)

The packing chamber (5) must be filled up to a level that the gland follower (6) will center perfectly.



After the replacement fit gland follower (6) again and tighten slightly with the stuffing box nuts (6.2).

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Screw down upper spindle (10) and refit it together with the lower spindle (7) inside the coupling (8). Fix the two halves of the coupling with the relevant bolts (8.1) and nuts (8.2). Verify during this procedure that the spindle (7) will move smoothly.

9 Tests/Inspections

Reassemble the valve. Bonnet gasket (18) and packing (15) shall be replaced at each revision. Before mounting gaskets and packings inspect the state of sealing areas. Remachine if necessary. Be careful not to damage the sealing surfaces while removing the old gaskets and packings.

9.1 Hydraulic (pressure) test

Essential components like body and bonnet units had been already tested hydraulically in PHÖNIX's workshops acc. to valid standards and rules. Therefore, only original PHÖNIX spare parts shall be used for repairs. In this case additional hydraulic tests are not recommended by PHÖNIX to make sure that no traces of humidity might remain inside the valve. A pneumatic test always should be preferred.

9.2 Pneumatic (leak) test

Test medium: Dry air (dew point at least 233 K = - 40°C/ -40°F or Nitrogen (N₂))

Test Temperature: 288 K to 309 K = 15°C to 35 °C = 59°F to 95°F

9.3 Pressure and leak test on stem seal

Bring the valve in semi-open position and test it with soapy water solution. Any formation of foam is not acceptable

Test pressure to EN 12266-1 or API 598: 1,1 x nominal pressure rating
Test time: at least 1 minutes

9.4 Leak test on closure

Bring the valve in closed position. Put a blind flange with a flexible hose on the valve outlet. Introduce the other end of the hose into a bottle of water. No bubbles may appear.

Test pressure EN 12266-1 or API 598 6 bar = 85 psi
Test time: at least 1 minutes

9.5 Preservation, Storage

Before using the valves with media which corrode in presence of humidity, e.g. chlorine (Cl₂) dry them thoroughly in an oven for 3 hours at +120°C and store properly in dry rooms.

10 Information

The mentioned <Data-sheets>, <Design documents>, Repair instructions and other information – also in other languages - you can ask for under

Info@phoenix-valvegroup.com oder <http://www.phoenix-valvegroup.com>

or at the following address:

<p>PHOENIX Armaturenwerke GmbH STRACK Armaturenwerke GmbH Am Stadtbruch 6 34471 Volkmarsen</p> <p>Tel.: 05693-988-0 Fax.: 05693-988-140</p>

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10.1 Pressure – Temperature-Rating, Excerpt TDB 3/1 to 3/5

The requirements of DIN EN 12516 – 1 are principally fulfilled.

Low alloyed and not alloyed steels

PN	DN-range	Admitted oper. pressure (bar) at oper. temperatures (°C)						
		-60*	-10	120	200	300	400	450
10	15-500	7,5	10	10	8	6	6	5
16	15-500	12	16	16	15	12	9	6
25	15-500	18,75	25	25	23	18	14	12
40	15-300	30	40	40	38	30	24	20
63	15-150	47,25	63	63	55	41	35	32
100	15-150	75	100	100	85	62	53	51
160	15-150	120	160	160	130	96	84	81

* AD-W10, Load case II

- Stainless steels

PN	DN-range	Admitted oper. pressure (bar) at oper. temperatures (°C)						
		-196*	-10	120	200	300	400	
10	15-500	10	10	10	8	6	6	
16	15-500	16	16	16	15	12	11	
25	15-500	25	25	25	23	18	16	
40	15-300	40	40	40	36	30	25	
63	15-150	63	63	63	50	44	40	
100	15-150	100	100	100	80	70	64	
160	15-150	160	160	160	130	112	103	

for SS 1.4571

- Low temperature steels

PN	DN-range	Admitted oper. pressure (bar) at oper. temperatures (°C)						
		-60*	-50	-10	120	200	300	
10	15-500	10	10	10	10	8	6	
16	15-500	16	16	16	16	15	12	
25	15-500	25	25	25	25	23	18	
40	15-300	40	40	40	40	36	30	
63	15-150	63	63	63	63	55	41	
100	15-150	100	100	100	100	85	62	
160	15-150	160	160	160	160	130	96	

* 1.0488

For steels not mentioned in these tables the user shall contact the manufacturer/supplier of the valve.

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10.2 Bolting torques for Liftplug valves

Class 150 Bolt material 1.7709, Nut material 1.7258 or equal ASTM Material

Valve Size	Body-bonnet flange	Trunnion sleeve	Packing nuts *
1	52 Nm / 38 lb-ft	N/A	8 Nm / 6 lb-ft
2	125 Nm / 92 lb-ft	N/A	8 Nm / 6 lb-ft
3	420 Nm / 310 lb-ft	N/A	8 Nm / 6 lb-ft
4	125 Nm / 92 lb-ft	N/A	12 Nm / 9 lb-ft
6	420 Nm / 310 lb-ft	125 Nm / 92 lb-ft	15 Nm / 11 lb-ft
8	860 Nm / 635 lb-ft	125 Nm / 92 lb-ft	18 Nm / 13 lb-ft
10	630 Nm / 465 lb-ft	125 Nm / 92 lb-ft	27 Nm / 20 lb-ft
12	630 Nm / 465 lb-ft	52 Nm / 38 lb-ft	40 Nm / 30 lb-ft

Class 300 Bolt material 1.7709, Nut material 1.7258 or equal ASTM Material

Valve Size	Body-bonnet flange	Trunnion sleeve	Packing nuts *
1	52 Nm / 38 lb-ft	N/A	10 Nm / 7 lb-ft
2	125 Nm / 92 lb-ft	N/A	15 Nm / 11 lb-ft
3	420 Nm / 310 lb-ft	N/A	15 Nm / 11 lb-ft
4	125 Nm / 92 lb-ft	125 Nm / 92 lb-ft	25 Nm / 18 lb-ft
6	420 Nm / 310 lb-ft	125 Nm / 92 lb-ft	40 Nm / 30 lb-ft
8	860 Nm / 635 lb-ft	125 Nm / 92 lb-ft	40 Nm / 30 lb-ft
10	860 Nm / 635 lb-ft	125 Nm / 92 lb-ft	65 Nm / 48 lb-ft
12	630 Nm / 465 lb-ft	125 Nm / 92 lb-ft	95 Nm / 71 lb-ft

* Values in tables represent minimum torque values. Verify upon shell test. Increase in small steps if necessary until leak stops.

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11 Sectional drawing

