Operations and Maintenance Manual
Ball Valves Type AF95D / ANSI

Generalities

The following operation instructions are valid for soft seated ball valves type AF95D.
At correct assembly, maintenance and repair we guarantee a trouble- free function. If the operation- and maintenance manual is not followed correctly, the manufacturer is not responsible for the efficiency and safety of the valves.
The ball valves must not be operated above the limits and rules indicated in the different documents (e.g. operation rules, purchase documents, datasheets). Operation above the indicated limitations can damage the ball valve and finally destroy them.
The descriptions and rules included in this operation- and maintenance manual refer to standard types but apply at the same time for special designs and related constructions.

This operation instruction does not consider:

- Any possible accidents and interruptions which can arise by wrong assembly, operation or commissioning of the valves.
- Any safety rule in relation with the place where the ball valve is installed. The operator is responsible for the observation of the safety rules, also by the assembling staff.

The operation- and maintenance instructions for all other devices or parts of the plant linked to the ball valves have to be considered and checked, but is not subject in this manual.
This operation- and maintenance manual contains important information for the correct installation, operation, maintenance and commissioning of the designated valves.
This has to be read by qualified personnel and considered prior installation and operation of the plant. Not only the general safety instructions must be observed, but also all other rules and regulations in the following chapters.

	**A non- observance of this warning can cause injuries to persons and defects of the machines, e.g.:** **-Injuries caused by leaking valves (e.g. cold/hot, toxic, media content…)** **Improper use of the product characteristics during operation can permanently disturb the ball valve or even become unusable;**

Remarks to the operation manual
The safety instructions of this operation manual act to avoid any accident or injuries to persons

Dangers which can result if safety instructions are not observed.
If the safety instructions are not observed persons, environment and the valve itself valve can be damaged. Possibly the indemnity rights get lost.

The non-observance of the safety instructions can cause dangers, e.g.:

- Break down of important functions of the valve or the unit
- Failure of prescribed methods of commissioning and handling
- Danger to persons caused by electrical, mechanical and chemical impacts
- Damage to the environment caused by a leakage

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Working with safety consciousness
The safety instructions included in this document follow the national regulations for prevention of accidents of Switzerland. Further rules for the avoidance of accidents during operation as well as the compliance with work protection rules have to be considered and assured by the operator in the corresponding country.

Safety instructions for the operator / user
Whenever some hot or cold valve parts could be touched, it may cause injuries.
It must be assured that the parts are constructed in a way that they are protected from contacts.
- The contact protection for moving parts (e.g. coupling) must not be taken during operation.
- Leakage (e.g. at stem, at gaskets) of dangerous medias (explosive, toxic, hot) has to be removed in a way that no danger to persons or environment is given. Trouble- shooting must be started and failure has to be solved.
- Injuries by electrical energy have to be excluded (please consider the details of this subject in the local guidelines for the power supply companies).

	**Valves for higher or lower temperatures (> 50 ° C or <0 ° C) are to protect against accidental contact (for example isolation) or at least to indicate clearly with a warning sign.**

Safety instructions for assembly, commissioning and maintenance
It must be secured that all assembly, commissioning and maintenance work is done by skilled staff under consideration of this operation- and maintenance manual.

Generally, any work at the valve is only allowed if the valve is cooled down and pressure-less. Additionally the evaporation temperature of the media must be lower than the temperature of all wetted parts of the valve.

	**The opening of the valve under pressure can be deadly!**

Generally, any kind of work at the valves can only be done during plant shut-down. Valves which get in touch with health injuring media have to be decontaminated. Immediately after the work is done, all safety and protection devices have to be put in place again. Prior putting the valve into operation again, the rules of the chapter "Start- up/ Commissioning" have to be considered and followed.

Re- assembly and source of spare parts
Any modification of the valves has to be accepted and agreed by the manufacturer. The use of original spare parts and accessories which are authorized by the manufacturer supports the function and safety. If any damage is caused by using other parts the indemnity and warranty can be refused.

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Applicable range

The described soft seated ball valves type AF95D in this manual include the following versions:

Sizes:	½" up to 4" (5" and 6" planning)
Nominal pressure:	ANSI cl. 150
Body material:	CF8M / A216 WCB
Seats:	PTFE (virgin), RPTFE (glass reinforced), C-PTFE (PTFE Graphite)
	Other materials (e.g. TFM®-1600 or PEEK®) on request

Intended usage

Generally, Ball valves are stop valves for "Open / Close" - operation. The correct using and the correct design of the valves (e.g. body material, type of seat seal etc.) depend on the process conditions. Those must be clarified prior ordering and mounting into a plant with the supplier / manufacturer. Amended process conditions may lead to a different construction / design of the ball valve. In the case of the ball valve type AF95D, the flow direction can generally be ignored.

Inadmissible duty

Safe operation is only guaranteed if the valve is mounted and used under the general regulations of these operating rules. The technical limits are shown in the technical documentation and must not be exceeded. Additionally the limitations are mentioned below:

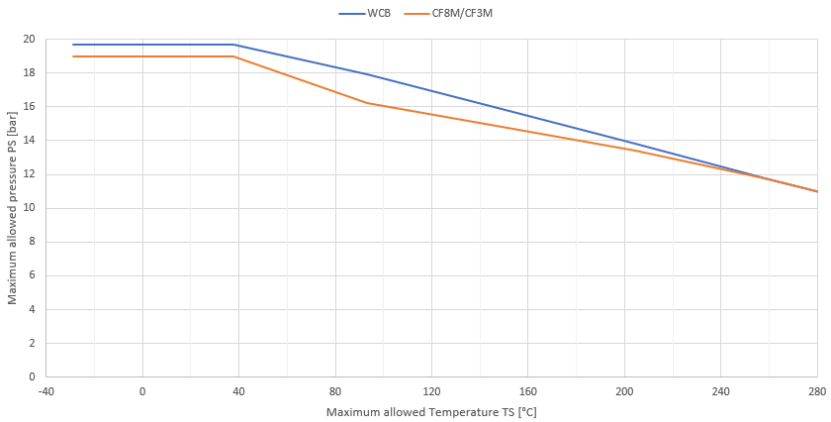
Operating conditions

Body material for A216 WCB	-30°C up to +260°C
Body material for CF8M	-196°C up to +260°C

(depends on the used seat material)

It is important to note that the ball valves with a body material of WCB will not used for aggressive and corrosive media. Working conditions below -30°C are not recommend. In this connection the embrittlement (mechanical strength properties) is most important and must be considered. The correct material selection is up the operator only. The ball valves, type AF95D fulfill the industrial valves standard EN1983.
The working temperatures depend on the used seat materials (p / T diagram in the data sheet) and on the flange standard ANSI B16.5 (Pressure-Temperature-Relation). The lower temperature has to be selected.

Pressure- Temperature-Relation acc. to flange standard ANSI B16.5



Allowable temperature TS		38 °C	93 °C	149 °C	204 °C	260 °C
Allowable pressure PS in barg	A216 WCB	19.7	17.9	15.9	13.8	11.7
	A351 CF8M	19.0	16.2	14.8	13.4	11.7

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Cryogen application

The ball valve with stainless steel body is suitable for low temperature applications. Special installation instructions and measures have to be considered by the operator and its mounting company.

Hazardous areas

The ball valve does not have an effective ignition source. In order to prevent an electrostatic charge, the ball valve has to be electrically connected to other system components. (ground wire).

Torques

Starting torques in Nm for a differential pressure Δp = 0 up to 10 barg and seat with lubricating media

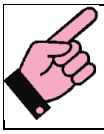
Sizes	Seat material		
	PTFE	RPTFE	CPTFE
1/2"	12	12	14
3/4"	13	13	16
1"	17	18	23
1 1/4"	24	25	30
1 1/2"	43	45	54
2"	55	58	69
2 1/2"	60	63	75
3"	88	92	110
4"	106	111	133
5"	-	-	-
6"	-	-	-

For Explanation:

PTFE : PTFE virgin
RPTFE : PTFE glass-reinforced
CPTFE : PTFE with 25% carbon

The starting torque is considerably influenced by the number of operation cycles! The shown values are averages. If non- lubricating medias are used an increase of the values have to be considered!

The values are to be understood without safety margin at lubricating media. Torques for other seat materials and/or process conditions on request.



The torques above are tested by 20°C and medium water.
other process conditions (higher temperatures, higher working pressures, abrasive, highly viscous media or vapors) require a separate interpretation. In this case please contact the manufacturer or the distributer!

Operation

Generally, ball valves do not require and special operation rules.
Please pay attention at opening and closing of the ball valves in order to avoid pressure hammers which could cause injuries to persons and damages to the plant. The lever at a manual operated ball valve must not be moved with force above the stop pin. Otherwise a correct sealing (position closed) is not secured. Depending on the application and type of seat it will be necessary after a certain period of time to replace the ball and the seats due to wear (see chapter "Maintenance"). Generally, abrasive media will reduce the lifetime of the seats and the ball. Under certain circumstances, an adhesive media can completely stop the operation of the valve. In case of automation the process conditions (Properties of the media, temperatures, pressure etc.) must be considered during sizing of the actuator

Commissioning

Ball Valves do not require special instructions for commissioning. Air bubbles in the body should be removed (venting). Put ball in 45° position.

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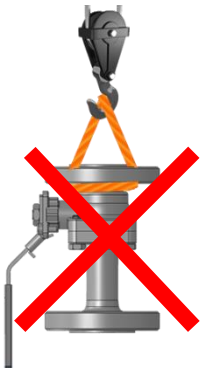
Transport

The ball valves are delivered ready for operation.
Flanges are protected against mechanical damage and pollution with flange caps.
During transportation, make sure that the valves retain their mechanical protection by the flange caps. The transport must take place with suitable transport boxes (e.g., wooden boxes). The ball valves must be secured in the transport boxes against crushing and tilting. Otherwise the valves may be damaged.



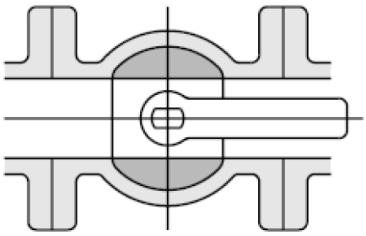
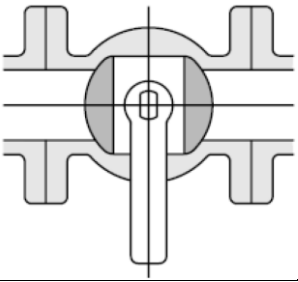
WRONG

CORRECT

Aids for lifting and transport in the plant have to be installed always directly on the body of the valve. The valves must not be picked/ carried on the lever!
Preferably the transport should be done in horizontal position.
Head protection and safety shoes are mandatory!

Storage

The connectors must be covered to prevent the penetration of dirt and dust (preferably with the delivered flange caps). The ball valves have to be stored dry and well ventilated in open ball position. For long-term storage, the valves must be y checked and cleaned periodically. Machined surfaces must be protected by appropriate aids against corrosion. The ball valves must be protected against influences of weather and environment.

	
Ball position "open"	**Ball position "closed"**

Corrosion protection

Carbon steel valves

Valves made of un- alloyed or low- alloyed cast steel (WCB) in standard design are coated with a primer and a 2-components basic coating. The minimum film thickness is 50 µm. The trim parts as well as the inner surfaces are free of paint and coated with a temporary corrosion protection (e.g. oil) only. Machined flange facings have to be protected against outside influences with flange caps.

Stainless steel valves

Valves made of stainless steel in standard will be delivered without any coating.

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Mounting and maintenance

General mounting instructions

	**Turn off all affected by the installation devices / machines / plant! Disconnect the devices / machines / plant from the mains if necessary. Check the real turn off before the work starts!**

Set up warning signs in order to prevent unintentional starting of the devices / machines / plant.

Valves for oxygen use are also marked with "free of oil and grease".
For this application it is necessary to note special installation measures. These are observed by the operator and the mounting companies.

Installation in the pipe

1. Prior installation, the pipe must be cleaned;
2. If necessary, the ball valves must be cleaned from dirt and dust
3. During installation in the pipeline, flanges of the pipeline must be exactly parallel to flange connection of the ball valve. In addition the direction-arrow must show into flow direction
4. Flange connection screws are tightened with a torque spanner. Tighten the screws in a crosswise sequence. The tightening torques are governed by the applicable standards (e.g. EN921-934 and ISO4732, 4032, 4017…)
5. Please consider that the ball valve is mounted in a released condition;
6. Ball valves can be mounted in horizontal and vertical pipelines.

	**The flange sealings are to be centered correctly. Please use allowed materials for the screws and nuts only. For a correct flange connection, please use all the flange holes for the assembly. The operator or the site mounting company is responsible for the professional installation.**

	**The permitted pressure may not be exceeded!** **For a new installation or even after a maintenance all pipes have to be flushed and cleaned. Dirt, welding beads and other dirt particles could result in a malfunction, but at least result in a less powerful valve.**

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Dismantling the ball valve

		**The valve must be cooled down and pressure-less! Opening the valve under pressure can be deadly! Head protection and protection glasses and safety shoes are mandatory!**

Prior start of the disassembly of the ball valve out of the pipeline, it is necessary to release any pressure. Electrical and pneumatic components of the system have to be switched off or excluded from the system. The ball valve must be cleaned prior dismantling in case of application with dangerous media (e.g. toxic, caustic)
The cleaning must be confirmed on a separate form in case the valve will be returned to Zuercher Technik AG for revision. This report must be attached with the valve. If the report is not available, it can be requested at Zuercher Technik AG.

Make sure that the valve is pressure- less and empty in the dead areas even behind the ball.

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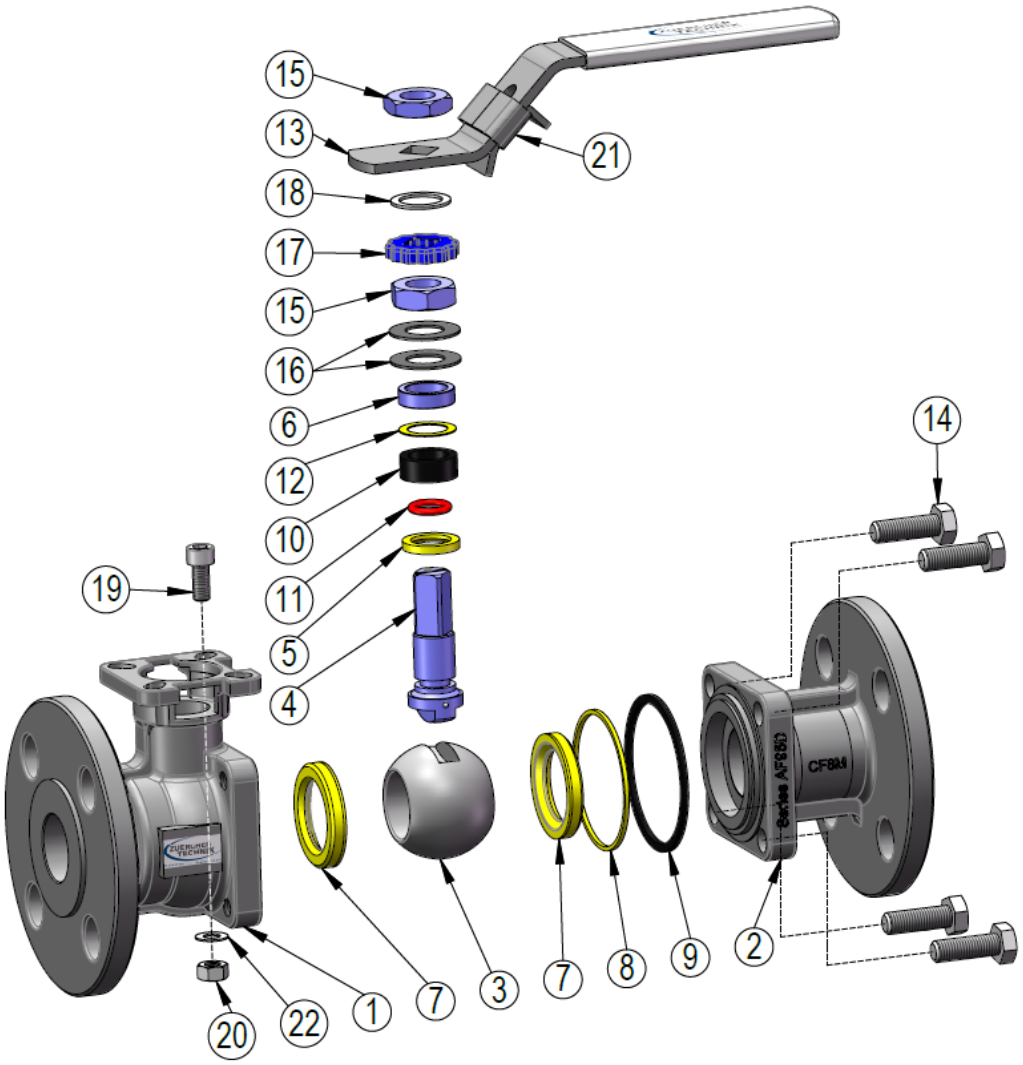
Description / parts / materials

Sizes 1/2“ up to 2“



Part No.	Description	Material	Spare part
1	Body part	A351 CF8M / A216 WCB	
2	Flange part	A351 CF8M / A216 WCB	
3	Ball	A182 316	
4	Stem	A182 316	
5	Stem seal	PTFE reinforced	X
6	Pressure ring	A182 316	
7	Seat ring (1x SRS)	PTFE reinforced*	X
8	Body sealing (wetted part)	PTFE reinforced	X
9	Body sealing (atmospheric)	Graphite	X
10	Stem packing	Graphite	X

*acc. to sealing configuration

Part No.	Description	Material	Spare part
11	O-Ring	FKM / NBR / FEP	X
12	Slide ring	PTFE	X
13	Lever	A182 304 / PVC	
14	Body screws	A2-70	
15	Stem nut	A182 304	
16	Belleville spring washer	ASTM Type 301	
17	Safety cap	A182 304	
18	Distance washer	A182 304	
19	Cylinder head screw (lock)	A182 304	
20	Hexagon head screw to part 19	A182 304	
21	Locking device	A182 304	
22	Distance washer to part 19	A182 304	

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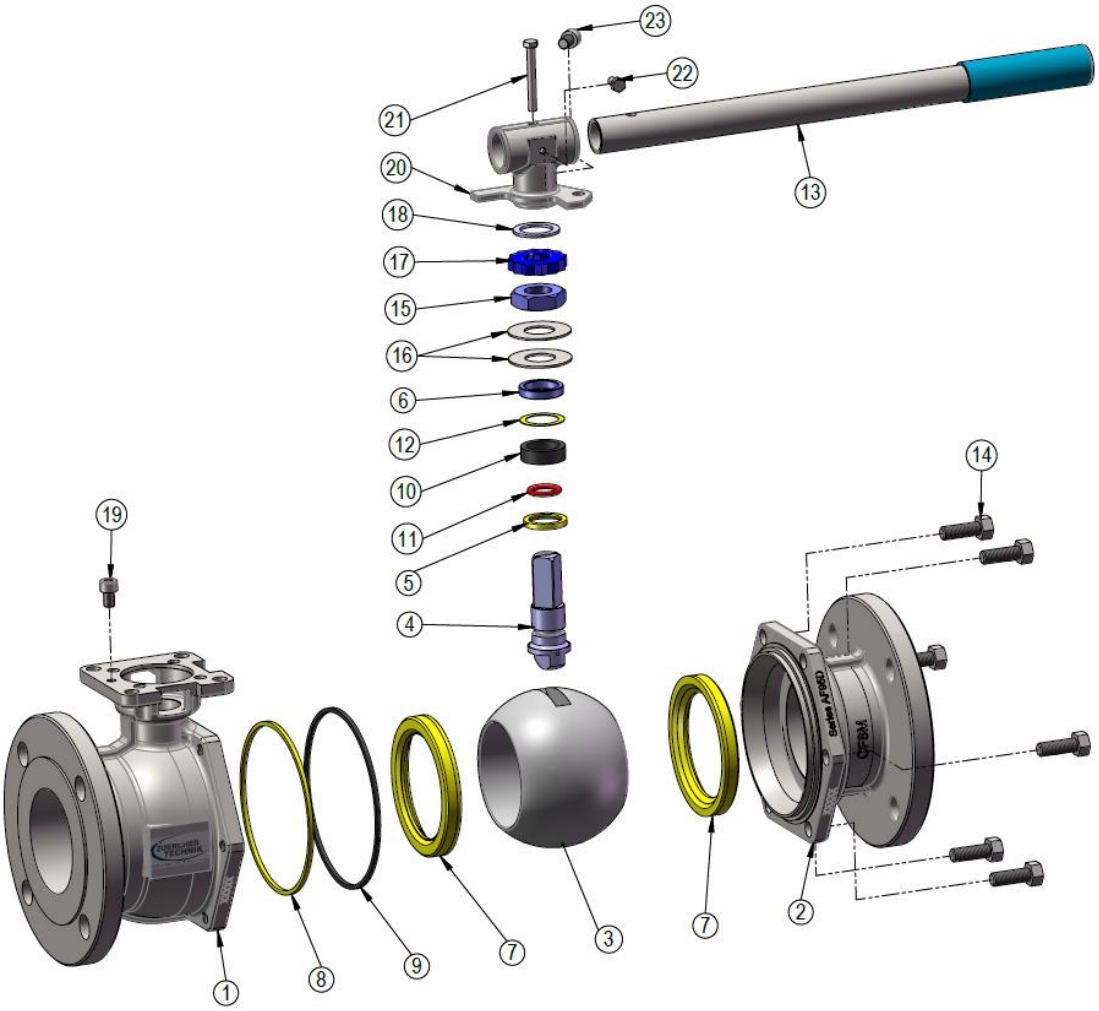
Sizes 2 1/2“up to 6“



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4	Stem	A182 316	
5	Stem seal	PTFE reinforced	X
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11	O-Ring	FKM / NBR / FEP	X
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14	Body screws	A2-70	
15	Stem nut	A182 304	
16	Belleville spring washer	ASTM Type 301	
17	Safety cap	A182 304	
18	Distance washer	A182 304	
19	Cylinder head screw (lock)	A182 304	
20	Adapter	A351 CF8M	
21	Hexagon head screw	A182 304	
22	Hexagon head screw	A182 304	
23	Cylinder head screw	A182 304	

*acc. to sealing configuration

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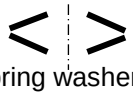
Procedure for revision / Disassembly

1. Put ball in open position. Lever 13 (for ½" – 2") or adapter 20 (for 2 ½" – 6") or mounted actuator and Spacers needs to be removed.
2. Remove safety cap 17.
3. Remove shaft nut 15.
4. Remove belleville spring washer 16 and pressure ring 6.
5. Put ball 3 in closed position. Please loose body screws 14 and remove them.
6. Split body part 1 and flange part 2 carefully. Please take out ball 3 in closed position.
7. Remove body sealings 8 (PTFE/RPTFE) and 9 (graphite) and both seats 7. (In case of design with pressure relief system, remove the O-ring too)
8. Push shaft 4 inside with a plastic mallet and get it out.
9. Remove shaft packing 10 and slide ring 12.
10. Remove seal ring 5 and optionally O-ring 11 (depend on execution).
11. Clean ball 3, shaft 4, body part 1 and flange part 2 and check on further damages. Damaged parts should not be used again and must be replaced.

If the shaft and/or the anti- static device is damaged, the shaft has to be changed completely.

Procedure for revision / Assembly

1. Have the suitable spare parts available prior start of the assembly.
   Only original spare parts are to be used.
2. Clean all wetted parts pior assembly and check on possible damages.
3. After cleaning of all single parts have to be dried.
4. If necessary, damaged parts should be replaced by new original parts.
5. During assembly, put new body sealings 8 and 9 in. Please check that the new body sealings 8 and 9 are cleaned and show no damages.
6. Put shaft 4 with seal ring 5 (and optionally O-ring 11) from inside into the body part 1 and push vertical up.
7. Get shaft packing 10 in the body part 1.
8. The shaft packing 10 (graphite) must be pre-pressed with support of a bush.
   After that, please put slide ring 12 (PTFE) on shaft packing.



9. Bring pressure ring 6 and belleville spring washers 16 (Belleville spring washers on opposite side) in.
10. Fasten the shaft nut acc. to the torque (acc. to table 2).
    After achievement of the torque, the shaft nut 15 needs to be turned in clockwise direction for the orientation of the safety cap 17 till the safety cap 17 can fall above the shaft nut 15
    (only for ½" – 2")
11. Put seat 7 and ball 5 in body part 1. Turn shaft 4 in suitable position to be able to move the ball 3 with the notch.
12. Put the flange part 2 with inserted seat 7 (at execution with pressure relief system with O-ring) carefully on to the body part 1. After that, please fasten the screws 14 (please consider fastening torque of the body screws 14 (acc. to table 1)).
13. <u>For nominal sizes ½" – 2"):</u>
    Put spacers 18, lever 13 and lever nut 22 on to the shaft 4 and fasten the lever nut 22 (acc. to table 3).
    <u>For nominal sizes 2 ½" – 6"):</u>
    Put spacers 18, adapter 20 with lever (pipe) 13 on to the shaft and fasten the screws 21, 22, 23 in this sequence (acc. to table 3).
14. Move ball 3 several times (at least three times) in full- open and full- closed position. Please check the safe screw connection of the stop pin 19 with hexagon nut 20 (for ½" – 2"), respectively stop pin 19 (for <u>2 ½" – 6"):</u>
15. Check the conductibility of the anti-static device on the shaft 4 (acc. to ATEX).
    For that, move ball 3 in 45°- position and measure the conductibility between ball 3 and lever 13, respectively between ball 3 and body part 1 with an ohmmeter.

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16. Following, the valve have to be tested on pressure, tightness and function acc. to EN12266-1.
17. After successful testing the valve can be used again. In case the valve will be stored, it must be kept in open position.

Torques for screws and nuts

table 1

Fastening torque: Body Screws (part Nr. 14)			
NS	Hexagon Screws A2-70 acc. ASME B16.10		
	Torque Nm	Width across flats AF	Qty. Screws
1/2"	22	13	4
3/4"	22	13	4
1"	22	13	4
1 1/4"	22	13	4
1 1/2"	40	16	4
2"	45	18	4
2 1/2"	40	16	6
3"	40	16	6
4"	40	16	6
5"	-		
6"	-		

table 2

Fastening torque: Shaft Nuts (part Nr. 15)			
NS	Torque Nm	Width across flats AF	Qty. Nuts
1/2"	10	17	2
3/4"	10	17	2
1"	13	22	2
1 1/4"	13	22	2
1 1/2"	16	27	2
2"	16	27	2
2 1/2"	22	36	1
3"	22	36	1
4"	22	36	1
5"	-		
6"	-		

table 3

Fastening Torque: Lever Nut (Nr. 15) and Screws Adapter (Nr. 21,22,23)				
NS	Torque Nm	Width across flats AF	Qty. Screws	
1/2"	manual	17	1	
3/4"	manual	17	1	
1"	manual	22	1	
1 1/4"	manual	22	1	
1 1/2"	manual	27	1	
2"	manual	27	1	
	Screws for Adapter and Lever tube			
2 1/2"	manual	M6x50 + M6x8 / Cyl.-Screw M8x12		
3"	manual	M6x50 + M6x8 / Cyl.-Screw M8x12		
4"	manual	M6x50 + M6x8 / Cyl.-Screw M8x12		
5"	-			
6"	-			

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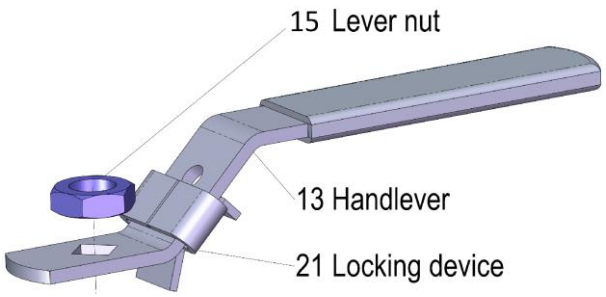
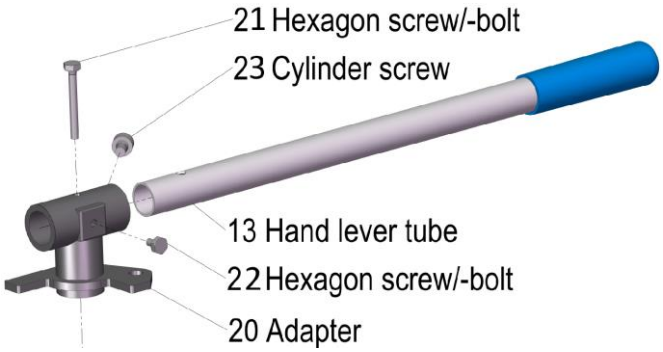
Fixation for hand lever for type AF95D **Sizes 1/2" – 2'':**



Fixation for hand lever for type AF95D **Sizes 2 ½" – 6":**



Conformity

In accordance to the pressure equipment directive 2014/68/EU (previously 97/23/EG)
Zuercher Technik AG states that the previously described products in the delivered design will fulfil the requirements of the pressure equipment directive 2014/68/EU. The used conformity mode corresponds to Module A2.

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Westendstrasse 199
DE-80686 Munich
Germany

Any certificate and confirmation is not valid without company seal and signature and must be forwarded to any 3td party without change. Any change must be approved in written form by Zuercher Technik AG.

Warranty

Our general terms and conditions are valid.
If these are not available, it can be requested at Zuercher Technik AG or downloaded from **www.zuercher.com.**

Your contact

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