

# Operations and Maintenance Manual

## Ball Valves

### Type AF90D / AF94D / AF96D



#### **Generalities**

The following operation instructions are valid for soft seated ball valves type AF90D/AF94D/AF96D.

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

### 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.

### Applicable range

The described soft seated ball valves type AF90D/AF94D/AF96D in this manual include the following versions:

Sizes: DN15 up to DN100  
 Nominal pressure: PN16/40, PN16, PN40  
 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.

### 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 DIN 1.0619

-30°C up to +250°C

Body material for DIN 1.4408

-196°C up to +250°C

**(depends on the used seat material)**

It is important to note that the ball valves with a body material of 1.0619 will not be used for aggressive and corrosive media. Working conditions below -30°C are not recommended. In this connection the embrittlement (mechanical strength properties) is most important and must be considered. The correct material selection is up to the operator only. The ball valves, type AF90D/AF94D/AF96D 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 EN1092-1 (Pressure-Temperature-Relation). The lower temperature has to be selected.

### **Pressure- Temperature-Relation acc. to flange standard EN1092-1 and EN19**

working temperature TS	ND	1.0619	1.4408
-30°C up to +50°C	PN16	PS = 16 barg	PS = 16 barg
	PN40	PS = 40 barg	PS = 40 barg
+50°C up to +100°C	PN16	PS = 14.8 barg	PS = 16 barg
	PN40	PS = 37.1 barg	PS = 40 barg
+100°C up to +150°C	PN16	PS = 14.0 barg	PS = 14.5 barg
	PN40	PS = 35.2 barg	PS = 36.3 barg
+150°C up to +200°C	PN16	PS = 13.3 barg	PS = 13.4 barg
	PN40	PS = 33.3 barg	PS = 33.7 barg
+200°C up to +250°C	PN16	PS = 12.1 barg	PS = 12.7 barg
	PN40	PS = 30.4 barg	PS = 31.8 barg

**TS:** max. allowed temperature

**PS:** max. allowed pressure  
 Temperatures between the mentioned values (TS) can be interpolated linearly (=calculated).

### 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  $\Delta p = 0$  up to 10 barg and seat with lubricating media

Sizes	seat material		
	PTFE	RPTFE	CPTFE
DN15	12	12	16
DN20	13	13	17
DN25	16	16	21
DN32	24	24	32
DN40	44	44	58
DN50	55	55	72
DN65	60	60	78
DN80	90	90	117
DN100	130	130	169

#### For Explanation:

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

The values are to be understood incl. 20% 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 distributor!

### Operation

Generally, ball valves do not require and special operation rules.

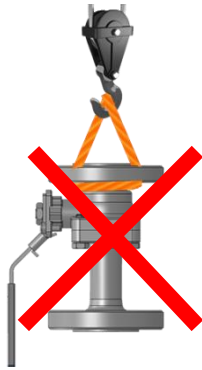
Please pay attention at opening and closing of the ball valves in order to avoid pressure hammers which could cause injuries to persons and damages to the plant. The lever at a manual operated ball valve must not be moved with force above the stop pin. Otherwise a correct sealing (position closed) is 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.

**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**



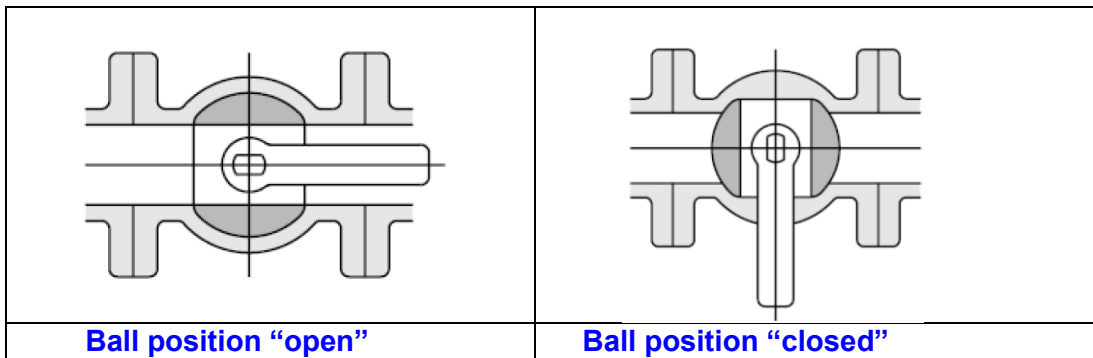
**CORRECT**

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.



**Corrosion protection**

**Carbon steel valves**


Valves made of un- alloyed or low- alloyed cast steel 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.

## Mounting and maintenance

### General mounting instructions

	<p>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!</p>
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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.

	<p>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.</p>
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	<p>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.</p>
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## Dismantling the ball valve

		<b>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!</b>
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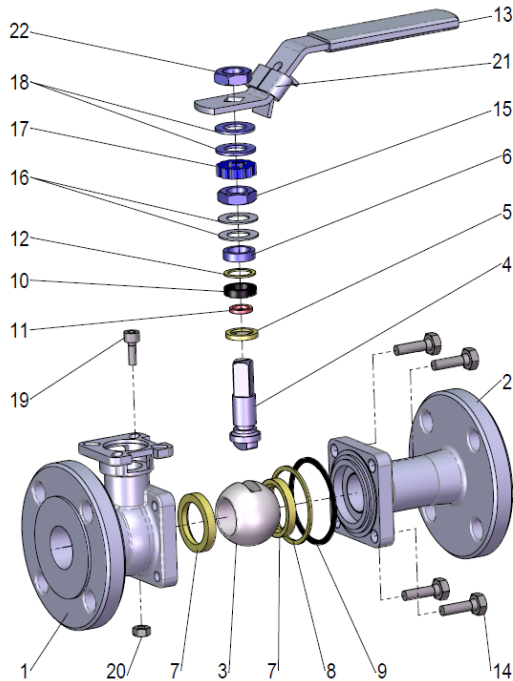
Prior start of the disassembly of the ball valve out of the pipeline, it is necessary to release any pressure. Electrical and pneumatic components of the system have to be switched off or excluded from the system. The ball valve must be cleaned prior dismantling in case of application with dangerous 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.**

## Description / parts / materials

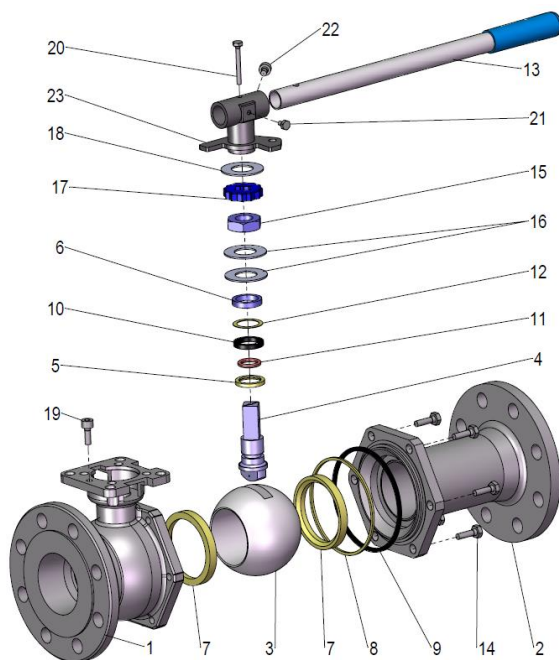
### DN15 – DN50



Pos. Nr.	Description	Material	Spare part
1	Body part	1.4408/1.0619	
2	Flange part	1.4408/1.0619	
3	Ball	1.4401	
4	Shaft	1.4401	
5	Seal ring	PTFE	X
6	Pressure ring	1.4401	
7	Seat	see below*	X
8	Body sealing (wetted)	PTFE	
9	Body sealing (outside)	Graphite	X
10	Shaft packing	Graphite	X
11	O-ring (optional at TA-Luft)	FKM/NBR/FEP	X
12	Slide ring	PTFE	X
13	Lever	SS 304/PVC	
14	Body screw	A2-70	
15	Shaft nut	SS 304	
16	belleville spring washer	1.4301	
17	Safety cap	1.4301	
18	Spacer	1.4301	
19	Cylinder screw (stop)	1.4301	
20	Hexagon nut	SS 304	
21	Locking device	1.4301	
22	Lever nut	SS 304	

\*Material acc. to indication within the article description

### DN65 – DN100



Pos. Nr.	Description	Material	Spare part
1	Body part	1.4408/1.0619	
2	Flange part	1.4408/1.0619	
3	Ball	1.4401	
4	Shaft	1.4401	
5	Seal ring	PTFE	X
6	Pressure ring	1.4401	
7	Seat	see below*	X
8	Body sealing (wetted)	PTFE	
9	Body sealing (outside)	Graphite	X
10	Shaft packing	Graphite	X
11	O-ring (optional at TA-Luft)	FKM/NBR/FEP	X
12	Slide ring	PTFE	X
13	Lever (pipe)	SS 304/PVC	
14	Body screw	A2-70	
15	Shaft nut	SS 304	
16	belleville spring washer	1.4301	
17	Safety cap	1.4301	
18	Spacer	A2	
19	Cylinder screw (stop)	1.4408/1.4308	
20	Hexagon screw	1.4301	
21	Hexagon screw	A2-70	
22	Cylinder screw	A2-70	
23	Adapter	A2-70	

\*Material acc. to indication within the article description




## Procedure for revision / Disassembly

1. Put ball in open position. Lever 13 (at DN15-DN50) or adapter 23 (for DN 65-DN100) 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 prior 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.
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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 DN15-50)
  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. For nominal sizes DN15-50:  
Put spacers 18, lever 13 and lever nut 22 on to the shaft 4 and fasten the lever nut 22 (acc. to table 3).  
For nominal sizes DN65-100:  
Put spacers 18, adapter 23 with lever (pipe) 13 on to the shaft and fasten the screws 20, 21, 22 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 DN15-50), respectively stop pin 19 (for DN65-100).
  15. Check the conductivity of the anti-static device on the shaft 4 (acc. to ATEX). For that, move ball 3 in 45°- position and measure the conductivity between ball 3 and lever 13, respectively between ball 3 and body part 1 with an ohmmeter.

16. Following, the valve has 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: <b>Body screws (part No. 14)</b>							
Nominal size	Torque	Screws for face to face series 1+28 (F1) PN 16/40		Width across flats AF	Screws for face to face series 27 (F4)		Qty. Screws
		Hexahon screw (A2-70)			Hexagon screw	Bolt & Nut	
DN15	35 Nm	M8x16		13	M8x16	---	4
DN20	35 Nm	M8x25		13	M8x25	---	4
DN25	35 Nm	M8x25		13	M8x25	---	4
DN32	35 Nm	M8x25		13	M8x25	---	4
DN40	55 Nm	M10x30		17	---	M10x36	4
DN50	80 Nm	M12x30		19	---	M12x36 (0.5d Mu)	4
		<b>PN16</b>	<b>PN40</b>				
DN65	55 Nm	M10x30	M10x40	17	---	M10x35	6
DN80	55 Nm	M10x30	M10x40	17	---	M10x40	6
DN100	80 Nm	M12x30	M12x40	19	---	M12x35 (0.5d Mu)	6

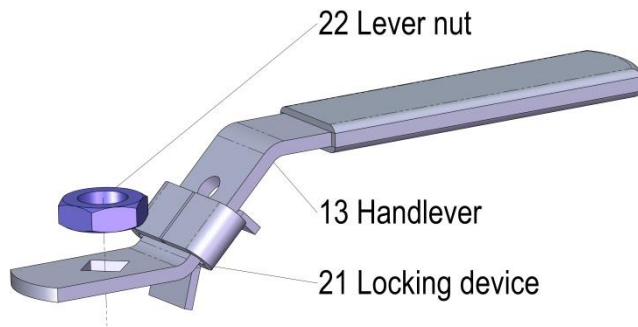
table 2

Fastening torque: <b>Shaft screw (part No. 15)</b>							
Nominal size	Torque	Kind of thread	Width across flats AF	Qty.			
DN15	10 Nm	7/16-UNF	11-16	1			
DN20	10 Nm	7/16-UNF	11-16	1			
DN25	13 Nm	9/16-UNF	22	1			
DN32	13 Nm	9/16-UNF	22	1			
DN40	16 Nm	M18x2.5	27	1			
DN50	16 Nm	M18x2.5	27	1			
DN65	22 Nm	M24x3	36	1			
DN80	22 Nm	M24x3	36	1			
DN100	25 Nm	M24x3	36	1			

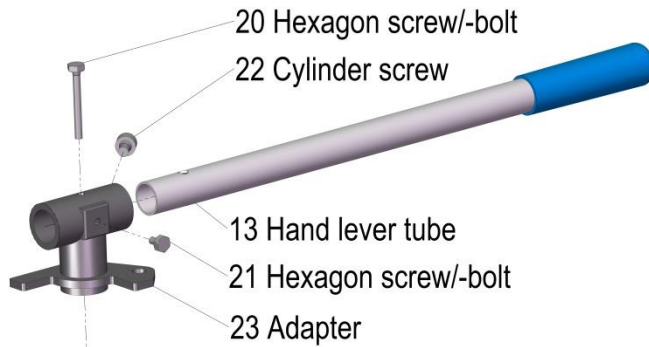
table 3

Fastening torque: <b>Lever screw (part No. 22) and screws for adapter (part No. 23)</b>							
Nominal size	Torque	Kind of thread	Width across flats AF	Qty.			
DN15	35-40 Nm	7/16-UNF	11-16	1			
DN20	35-40 Nm	7/16-UNF	11-16	1			
DN25	40-45 Nm	9/16-UNF	22	1			
DN32	40-45 Nm	9/16-UNF	22	1			
DN40	55-60 Nm	M18x2.5	27	1			
DN50	55-60 Nm	M18x2.5	27	1			
		<b>Screws for adapter and round lever (pipe)</b>					
DN65	manual	Hexagon screw M6x50 + M6x8 / cylinder screw M8x12 (each 1pc.)					
DN80	manual	Hexagon screw M6x50 + M6x8 / cylinder screw M8x12 (each 1pc.)					
DN100	manual	Hexagon screw M6x50 + M6x8 / cylinder screw M8x12 (each 1pc.)					

**Fixation for hand lever for type AF90D/AF94D/AF96D    DN15 – DN50**



**Fixation for hand lever for type AF90D/AF94D/AF96D    DN65 – DN100**



**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 fulfill the requirements of the pressure equipment directive 2014/68/EU. The used conformity mode corresponds to Module A2.



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Germany



Any certificate and confirmation is not valid without company seal and signature and must be forwarded to any 3rd 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](http://www.zuercher.com).

## **Your contact**

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