

Series KNA/F, KNAP/F,
KNA-D/F, KNAP-D/F
KNA-S/F, KNAP-S/F

Ball Valve to ASME

with ball/stem unit or Al₂O₃-ball and stem
and Richter ENVIPACK universal packing,
full port



WARNING

All RICHTER products are designed and manufactured to the highest standards of workmanship and design and, as of the printing of this document, they meet all applicable industry standards.

These valves are available with components of various materials and should be used only as directed in the product catalog. Installation and maintenance must be performed by qualified personnel.

- ◆ **Do not operate the valves beyond the stated pressure and temperature ratings!**

Misuse, improper installation and improper maintenance may result in personal injury and/or property damage!

Use only valve components consistent with the performance requirements and as directed in these instructions.

- ◆ **Failure to heed these operating instructions may void the warranty!**
- ◆ **If a valve exhibits any indication of leakage, do not operate! Isolate the valve and either repair or replace the valve.**

Keep for future use!

This operating manual must be strictly observed before transport, installation, operation and maintenance etc. in order to avoid damage to persons or property.

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List of Contents

List of Contents	2	8 Malfunctions	11
Relevant documents.....	3	9 Maintenance.....	12
1 Technical data.....	3	9.1 Dismantling ball valve with ball/stem unit ..	12
1.1 Name plate and body identification	4	9.1.1 Ball valve with lever.....	12
1.2 Tightening torques.....	4	9.1.2 Packing bellows.....	12
1.3 Breakaway torques.....	5	9.1.3 Ball valve with actuator.....	12
1.4 Flow values	5	9.2 Assembly with ball/stem unit	12
1.5 Pressure-temperature-diagram	6	9.2.1 Packing bellows.....	12
2 Notes on safety	7	9.2.2 Ball valve with lever.....	12
2.1 Intended use.....	7	9.2.3 Ball valve with actuator.....	12
2.2 For the customer / operator.....	7	9.3 Dismantling ball valve with ball and stem ..	13
2.3 Improper operation	7	9.3.1 Ball and seat rings.....	13
3 Safety notes for applications in potentially explosive areas based on the Directive 94/9/ EC (ATEX)	8	9.3.2 Packing bellows.....	13
3.1 Intended use.....	8	9.3.3 Ball valve with actuator.....	13
4 Safety note for valves, certified to German Clean Air Act (TA Luft).....	9	9.4 Assembly ball valve with ball and stem	13
5 Transport, storage and disposal	9	9.4.1 Packing bellows.....	13
5.1 Storage.....	9	9.4.2 Ball valve with lever.....	13
5.2 Return consignments	9	9.4.3 Ball valve with actuator.....	13
5.3 Disposal.....	9	9.5 Conversion from lever to actuator	14
6 Installation.....	10	10 Drawings	14
6.1 Flange caps and gaskets	10	10.1 Legend	14
6.2 Direction of flow and installation position ..	10	10.2 Sectional drawing ball valve with ball/stem unit and lever	15
6.3 Grounding.....	10	10.3 Sectional drawing ball valve with ball/stem unit and actuator	16
6.4 Test pressure	10	10.4 Sectional drawing ball valve with ball, stem and lever	17
7 Operation.....	11	10.5 Sectional drawing ball valve with ball, stem and actuator	18
7.1 Initial commissioning	11	10.4 View and section ball valve with lever	19
7.2 Improper operation and their consequences	11	10.5 Sections ball valve with actuator	19
7.3 Shutdown	11	10.6 Dimensional drawing ball valve with lever ..	20
		10.7 Dimensional drawing ball valve with actuator	21

Relevant documents

◆ Declaration of conformity acc. to the EC Pressure Equipment Directive 97/23/EG	Extended stem, round	Section	9520-00-3010
◆ Manufacturer's Declaration German Clean Air Act (TA-Luft)	Lever elevation	Dimen.	9520-00-4020
◆ Manufacturer's Declaration SIL	Limit switch IFM	Section	9520-00-3011
◆ Form for Safety Information Concerning the Contamination QM 0912-16-2001_en	Spring return unit Kinetrol	Dimen.	9520-00-4021
◆ For KNAP/F, KNAP-D/F, KNAP-S/F: Operating manual for actuator	Limit switch VDE/VDI	Section	9520-00-3005
◆ Depending on option, relevant drawing:	Initiator Turck	Dimen.	9520-00-4015
Double packing bonnet,	Heating jacket	Schnitt	9520-00-3007
Section 9520-00-3001	Change from manual operation	Dimen.	9520-00-4017
Dimen. 9520-00-4011	to power operation	Dimen.	9520-00-4018
Extended stem, DN 50-100			
Section 9520-00-3009			
Dimen. 9520-00-4022			
Extended stem, DN 150-200			
Section 9520-00-3003			
Dimen. 9520-00-4013			

1 Technical data

Manufacturer:

Richter Chemie-Technik GmbH
Otto-Schott-Str. 2
D-47906 Kempen
Telephone: +49 (0) 2152 146-0
Fax: +49 (0) 2152 146-190
E-Mail: richter-info@idexcorp.com
Internet: <http://www.richter-ct.com>

Designation :

Ball valve with one-piece ball/stem unit with plastic coating, Al₂O₃-ball and stem, full port, maintenance-free self-adjusting Richter ENVIPACK universal packing, seat rings of pure PTFE, cavity reduced as standard feature, two-piece body.

Series:

- KNA/F** → Design with lever or hand gear
- KNAP/F** → Design prepared for pneum., hydr. or electric actuator to ISO 5211
- KNA-D/F** → KNA/F with thick-walled (5mm) body lining
- KNAP-D/F** → KNAP/F with thick-walled (5mm) body lining
- KNA-S/F** → Design stainless steel with lever, FDA conform wetted materials
- KNAP-S/F** → Design prepared for pneum., hydr. or electric actuator to ISO 5211

Certified to German Clean Air Act (TA Luft)

MSS SP 72 General Service

MSS SP 25 Standard Marketing System

API 598 Valve Inspection and Testing

The tests at Richter fulfils the requirements of API 598 on principle. However this standard contains optional, additional tests. These tests are not object of the tests at Richter and have to be arranged by order with Richter (e.g. point 3.3: High Pressure Closure Test).

Face to face: ASME B16.10, Class 150
to 6" column 19
8" column 18

Flange connecting dimensions:
ASME B16.5 Class 150, raised face.

Materials :

Body material:

KNA/F, KNAP/F, KNA-D/F, KNAP-D/F:
Ductile cast iron ASTM A395 / EN-JS 1049

KNA-S/F, KNAP-S/F:
316 investment cast, CF8M (1.4408)

Lining material: PFA/PTFE .../F
On request: antistatic .../F-L
highly permeation-resistant .../F-P

Temperature range :

See pressure-temperature diagram in Section 1.5.

Operating pressure:

1/2" – 6" from vacuum to max.245 psig (17 bar)

8" from vacuum to max.145 psig (10 bar)

to ASME B16.42

See pressure-temperature diagram in Section 1.5.

Ball valve sizes in inch :

KNA/F, KNAP/F, KNA-D/F, KNAP-D/F:

1/2", 3/4", 1", 1 1/2", 2", 3", 4", 6"

8" with reduced bore 6"

KNA-S/F, KNAP-S/F: 1", 1 1/2", 2"

Installation position :

Arbitrary, with low-cavity ball/stem units or an additional relief bore in the ball/stem units a direction arrow indicates the direction of flow.

See Sections 6.2.

Weight, KNA/F, KNA-S/F manually operated:

Nom. size	1/2"	3/4"	1"	1 1/2"	2"
appr. kg	5.6	6	5,6	12	14,5
appr. lbs	12.3	13.2	12.3	26.4	31.9
Nom. size	3"	4"	6"	8"	
appr. kg	33,5	50	91	125	
appr. lbs	73.7	110	200	275	

For weight of actuator, see actuator manufacturer's manual.

Dimensions and individual parts:

See sectional drawings in Section 10.

Wear parts: Seat rings
Packing components
Ball/stem unit
Al₂O₃-ball stem

Options :

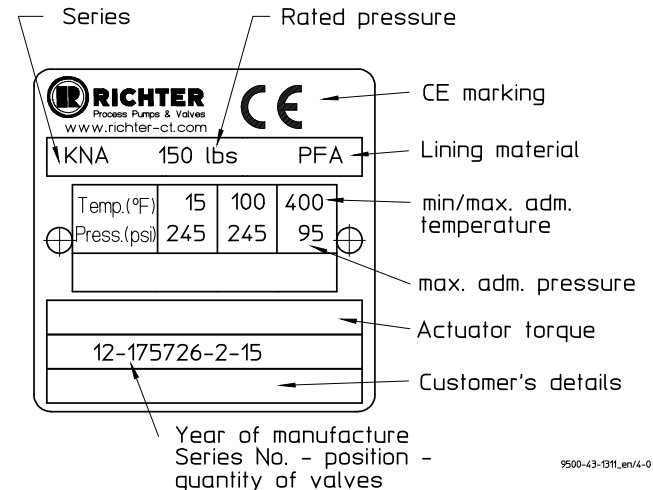
- ◆ Richter ENVIPACK double packing for particularly high safety requirements, self-adjusting.
On request, monitoring and flushing connection.
- ◆ Ball/stem unit extension
- ◆ Hand lever extension
- ◆ Limit switches for remote monitoring of hand and remote-activated ball valves.
- ◆ Stainless steel heating jacket can be retrofitted, suitable for all common heat carriers.

1.1 Name plate and body identification

The stainless steel name plate is undetachably riveted to the body.

If the operator attaches his identification, it must be ensured that the valve matches the application in question.

Example of name plate:



9500-43-131L_en/4-0

Body identification :

The shell bears the following information:

- ◆ Nominal size
- ◆ Rated pressure
- ◆ Body material
- ◆ Manufacturer's identification
- ◆ Melt number/Foundry identification
- ◆ Cast date

1.2 Tightening torques

All screws greased, tighten in diametrically opposite sequence!

The tightening torques for pipe screws and body screws mentioned must not be exceeded. For an exception, see Section 8, Flange connection valve / pipe is leaking.

The following tightening torques are recommended:

Packing screws

Tighten packing gland follower **503** until spring gland follower **502** is in contact without any gap. With 3", 4", 6" and 8" they are 2 spring gland followers **502**. See also Section 10.4 and 10.5.

Pipe screws

Flanges nom. size [inch]	Screws [ASME]	Tightening torque	
		[Nm]	[in-lbs]
1/2"	4 x 1/2"	5	45
3/4"	4 x 1/2"	6	55
1"	4 x 1/2"	8	70
1 1/2"	4 x 1/2"	15	135
2"	4 x 5/8"	25	220
3"	4 x 5/8"	45	400
4"	8 x 5/8"	35	310
6"	8 x 3/4"	80	710
8"	8 x 3/4"	115	1020

Body screws

Nom. size [inch]	Screws [ISO/DIN]	Tightening torque	
		[Nm]	[in-lbs]
1/2"	4 x M12	35	310
3/4"	4 x M12	35	310
1"	4 x M12	35	310
1 1/2"	4 x M16	45	400
2"	4 x M16	45	400
3"	6 x M16	50	445
4"	6 x M20	60	531
6"	8 x M20	150	1335
8"	8 x M24	100	885

1.3 Breakaway torques

Test medium: water 68 °F (20 °C)
Higher breakaway torques may occur with other media.

Ball/stem unit

DN [inch]	Δp in psi				
	≤ 45 [in-lbs]	85 [in-lbs]	145 [in-lbs]	235 [in-lbs]	max. adm [in-lbs]
1/2"	71	71	71	89	620
3/4"	71	71	71	89	620
1"	106	106	106	106	620
1 1/2"	177	177	177	221	1990
2"	221	221	221	266	1990
3"	531	531	575	708	4425
4"	708	708	797	1505	4425
6"	1770	2213	3098	--	19470
8"	1770	2213	3098	--	19913

1 in-lbs = 0.112 Nm

Al₂O₃-ball

DN [inch]	Δp in psi				
	≤ 45 [in-lbs]	85 [in-lbs]	145 [in-lbs]	235 [in-lbs]	max. zulässig [in-lbs]
1/2"	89	89	89	106	248
3/4"	89	89	89	106	248
1"	106	106	106	106	248
1 1/2"	177	221	266	398	708
2"	221	266	310	443	1062
3"	531	885	1416	1947	2215
4"	708	1151	1770	2478	3098
6"	3098	3983	5310	--	10620
8"	3098	3983	5310	--	10620

1 in-lbs = 0.112 Nm

1.4 Flow values

Nom. size [inch]	kv ₁₀₀ [m ³ /h] [m ³ /h]	Cv [US gpm]
1/2"	17.2	20
3/4"	30.9	36
1"	60	70
1 1/2"	190	221
2"	280	326
3"	587	684
4"	1250	1456
6"	2800	3262
8"	3200	3728

1.5 Pressure-temperature-diagram

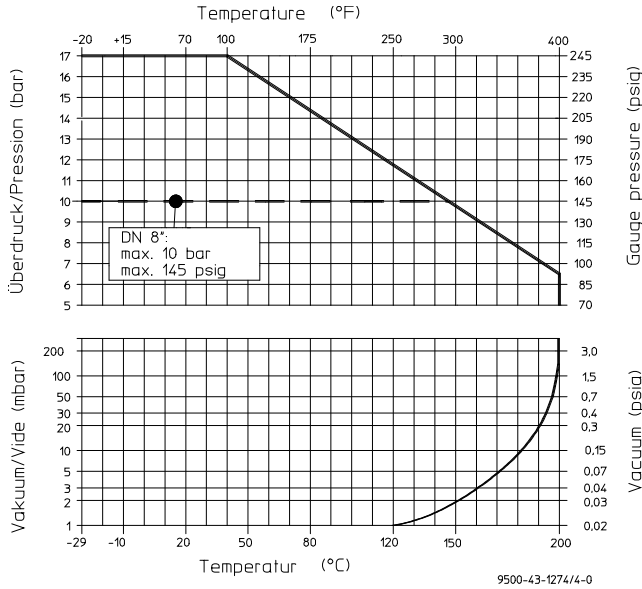
When used in the area of application of ASME, the low temperature of ASTM A395 is limited to -20°F (-29°C).



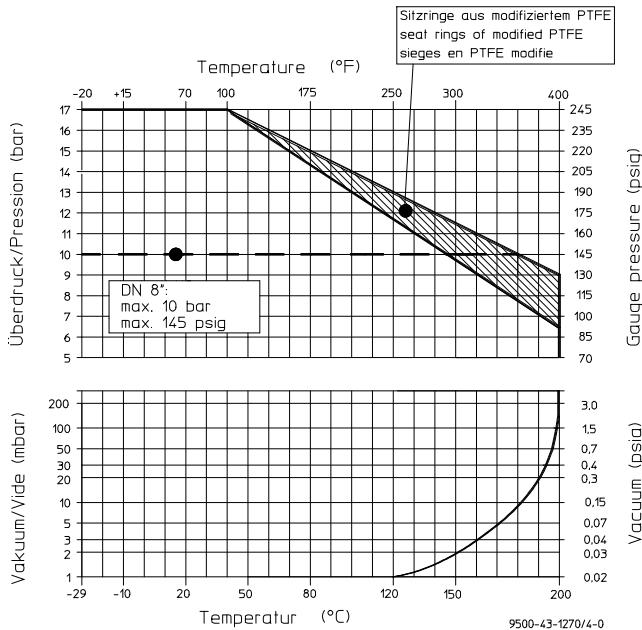
When used in the minus temperature range, the regulations applicable in the country in question must be observed.

According to ASME B16.42

Ball/stem unit



Al₂O₃-ball



2 Notes on safety

This operating manual contains fundamental information which is to be observed during installation, operation and maintenance.

It must therefore be read before installation and commissioning!

For valves which are used in potentially explosive areas, see **Section 3**.

Installation and operation are to be performed by qualified staff.

The area of responsibility, authority and supervision of the staff must be regulated by the customer.



General hazard symbol!
People may be put at risk.



Safety symbol! The valve and its function may be put at risk if this safety symbol is not observed.

It is imperative to observe warnings and signs attached directly to the ball valve and they are to be kept fully legible.



Failure to heed and follow these notes on safety may cause damages to persons and property!

The manufacturer is not responsible for and hereby disclaims all damages resulting from a failure to observe adequate safety precautions in connection with the operation, maintenance and repair of the valves!

For example, non-observance may involve the following hazards:

- ◆ Failure of important functions of the valve/plant.
- ◆ Risk to people from electric, mechanical and chemical effects.
- ◆ Risk to the environment through leaks of hazardous substances.

2.1 Intended use

Ball valves are on/off valves.

Richter ball valves are pressure containing components in accordance with the Pressure Equipment Directive (PED) for the passage and shut-off of fluids. The valves are suitable for vapours, gases and non-boiling liquids of group 1 according to the PED and have a corrosion-resistant plastic lining.



Solids can lead to increased wear, damage to sealing surfaces or to a reduction in the service life of the valve.

The operator must carefully examine in the event of operating data other than those provided whether the designs of the valve, accessories and materials are suitable for the new application (consult the manufacturer).

Ball valves of the series KNA-S/F and KNAP-S/F are preferred for corrosive atmosphere and in clean-room conditions.

2.2 For the customer / operator

When using the valve, it must be ensured that

- ◆ actuators which are retrofitted are adapted to suit the valve
- ◆ hot or cold valve parts are protected by the customer against being touched  
- ◆ the ball valve has been properly installed in the pipe system
- ◆ the usual flow rates are not exceeded in continuous operation.

This is not the manufacturer's responsibility.

Loads caused by earthquakes were not allowed for in the design.



Ball valves which are used as end valves must be sealed with a blind flange at the free connection end and appropriately secured against unauthorised activation.

Fire protection to DIN EN ISO 10497 is not possible (plastic lining and plastic components).

2.3 Improper operation

Permitted operation of these valves is limited to the intended purpose, as shown in **Section 2.1** of these operating instructions.



Under no circumstances must the operating parameters specified on the identification plate and in the pressure-temperature diagram be exceeded.

Failure to operate the valves within the operating parameters voids the warranty!

See also improper operation and their consequences in **Section 7.4**.

3 Safety notes for applications in potentially explosive areas based on the Directive 94/9/ EC (ATEX)

The valves are intended for use in a potentially explosive area and are therefore subject to the conformity assessment procedure of the directive 94/9/EC (ATEX).

As part of this conformity assessment, an ignition hazard analysis to EN 13463-1 to satisfy the fundamental safety and health requirements was conducted with the following result:

- ◆ **The valves do not have any ignition source of their own and can be operated both manually as well as mechanically/electrically.**
- ◆ **The valves are not covered by the scope of application of the ATEX directive and therefore do not need to be identified accordingly.**
- ◆ **The valves may be used in a potentially explosive area.**

Supplementary notes:

- ◆ **Electric/mechanical actuators must be subjected to their own conformity assessment to ATEX.**

It is imperative to observe the individual points of intended use for application in a potentially explosive area.

3.1 Intended use

Improper operation, even for brief periods, may result in serious damage to the unit.

In connection with explosion protection, potential sources of ignition (overheating, electrostatic and induced charges, mechanical and electric sparks) may result from these improper operation; their occurrence can only be prevented by adhering to the intended use.

Furthermore, reference is made in this connection to the Directive 95/C332/06 (ATEX 118a) which contains the minimum regulations for improving the occupational health and safety of the workers who may be at risk from an explosive atmosphere.

A difference is made between two cases for the use of chargeable liquids (conductivity $<10^{-8}$ S/m):

1. Chargeable liquid and non-conductive lining

Charges can occur on the lining surface. As a result, this can produce discharges inside the valve. However, these discharges cannot cause ignitions if the valve is completely filled with medium.

If the valve is not completely filled with medium, e.g. during evacuation and filling, the formation of an explosive atmosphere must be prevented, e.g. by superimposing a layer of nitrogen.

It is recommended to wait 1 hour before removing the valve from the plant in order to permit the elimination of static peak charges.

This means that, to safely prevent ignitions, the valve must be completely filled with medium at all times or else a potentially explosive atmosphere must be excluded by superimposing a layer of inert gas.

2. Chargeable liquid and conductive lining



No hazardous charges can occur as charges are discharged direct via the lining and shell (surface resistance $<10^9$ Ohm, leakage resistance $<10^6$ Ohm).

Static discharges of non-conductive linings are only produced through the interaction with a non-conductive medium and are therefore the responsibility of the plant operator.

Static discharges are not sources of ignition which stem from the valves themselves!

- The temperature of the medium must not exceed the temperature of the corresponding temperature class or the maximum admissible medium temperature as per the operating manual.
- If the valve is heated (e.g. heating jacket), it must be ensured that the temperature classes prescribed in the Annex are observed.
- To achieve safe and reliable operation, it must be ensured in inspections at regular intervals that the unit is properly serviced and kept in technically perfect order.
- Increased wear to the valve can be expected with the conveyance of liquids containing abrasive constituents. The inspection intervals are to be reduced compared with the usual times.
- Actuators and electric peripherals, such as temperature, pressure and flow sensors etc., must comply with the valid safety requirements and explosion protection provisions.
- The valve must be grounded. This can be achieved in the simplest way via the pipe screws using tooth lock washers. Otherwise grounding must be ensured by other action, e.g. cable bridges.
- Attachments such as actuators, position controllers, limit switches etc. must satisfy the relevant safety regulations as regards explosion protection and, if required, be designed in compliance with ATEX.
- Special attention must be paid to the appropriate safety and explosion protection notes in the respective operating manuals.
- Plastic-lined valves must not be operated with carbon disulphide.

4 Safety note for valves, certified to German Clean Air Act (TA Luft)

On request, this valve can be supplied compliant with the German Clean Air Code.

Certificate / Manufacturer Declaration Validity is dependent on the operating instructions being read and observed.

In particular, servicing must be conducted at regular intervals, and the bolted connections relevant for tightness must be inspected and retightened if necessary.

5 Transport, storage and disposal



It is imperative, for all transport work, to observe generally accepted engineering practice and the accident prevention regulations.



The valve is supplied with flange caps. Do not remove them until just before installation. They protect the plastic surfaces against dirt and mechanical damage.

Handle the goods being transported with care. During transport the valve must be protected against impacts and collisions.

Directly after receipt of the goods, the consignment must be checked for completeness and any in-transit damage.

Do not damage paint protection.

5.1 Storage

If the valve is not installed immediately after delivery, it must be put into proper storage.

It should be stored in a dry, vibration-free and well-ventilated room at as constant a temperature as possible.

Elastomers are to be protected against UV light. In general, a storage period of 10 years should not be exceeded.

5.2 Return consignments



Valves which have conveyed aggressive or toxic media must be well rinsed and cleaned before being returned to the manufacturer's works.



Observe appropriate safety precautions when cleaning the valves of toxic or aggressive media. Appropriate safety clothing and equipment should be worn at all times when working with toxic media!

It is **imperative** to enclose a **safety information sheet / general safety certificate** on the field of application with the return consignment.

Pre-printed forms are enclosed with the installation and operating manual.

Safety precautions and decontamination measures are to be mentioned.

5.3 Disposal

Parts of the valve may be contaminated with medium which is detrimental to health and the environment and therefore cleaning is not sufficient.



Risk of personal injury or damage to the environment due to the medium!

- ◆ Wear protective clothing when work is performed on the valve.
- ◆ Prior to the disposal of the valve:
Collect any medium, etc. which has escaped and dispose of it in accordance with the local regulations.
Neutralise any medium residues in the valve.
- ◆ Separate valve materials (plastics, metals, etc.) and dispose of them in accordance with the local regulations.

6 Installation

- ◆ Examine valve for in-transit damage, damaged ball valves must not be installed.
- ◆ Before installation the valve and the connecting pipe must be carefully cleaned to remove any dirt, especially hard foreign matter.
- ◆ During installation, pay attention to the correct tightening torque, aligned pipes and tension-free assembly.



Ensure that a remotely actuated actuator cannot be accidentally switched on.

6.1 Flange caps and gaskets

- ◆ Leave protective caps on the flanges until just prior to installation.

If plastic sealing surfaces can be damaged, e.g. with mating flanges made of metal or enamel, use PTFE-lined seals with a metal inlay.

These are available as special accessories from the Richter product range.

6.2 Direction of flow and installation position

Installation is independent of the direction of flow.

Any installation position can be chosen.

Otherwise, it is marked by a direction arrow on the ball valve, in the case of cavity-free ball/stem units or ball/stem units and Al₂O₃-balls with an additional relief bore.

Fig. 1 ball/stem unit in closed position

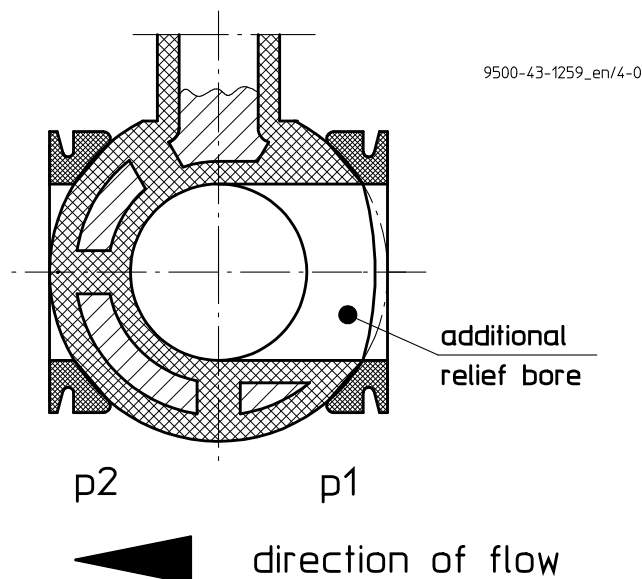
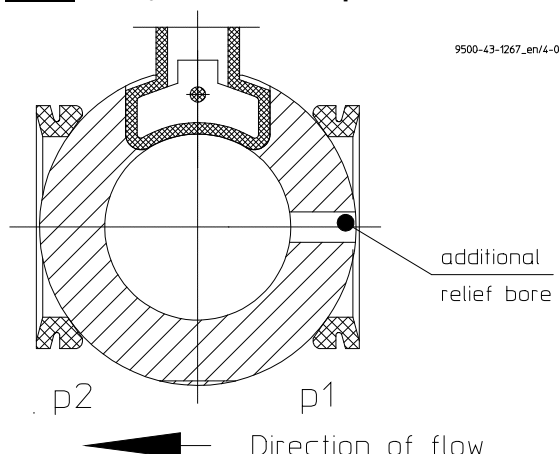


Fig. 1 Al₂O₃-ball in closed position



6.3 Grounding

The valve must be grounded.

The simplest solution is to use tooth lock washers which are placed under one pipe bolt of each flange.

Otherwise grounding must be ensured by different measures e.g. a cable link.

At the customer's request a setscrew M6 with a hex. nut and washer will be provided at each flange as an additional grounding connection.

The ball/stem unit **201** and stem **202** are grounded using a grounding spring washer **557**.

6.4 Test pressure

The test pressure PT of an open valve must not exceed the value of 1.5 x PS(PN) as per the identification of the valve.

7 Operation

7.1 Initial commissioning

Normally, the ball valves have been tested for leaks with air or water. Prior to initial operation check body bolting. For torques see **Section 1.2**.



Unless otherwise agreed, there could be residual amounts of water in the flow section of the ball valve; this could result in a possible reaction with the medium.

To prevent leaks, all connection screws must be checked and retightened if needed after the initial loading of the valve with operating pressure and operating temperature.

For torques see **Section 1.2**.

7.2 Improper operation and their consequences

- ◆ Under no circumstances must the operating parameters specified on the identification plate be exceeded.
- ◆ **Failure to operate the valves within the operating parameters voids the warranty!**
- ◆ The ball valve is an on/off valve and shall not be operated in an intermediate position. Damage to the seat rings, the ball/stem unit or Al₂O₃.ball/stem could occur.
- ◆ Crystallisation may result in damage to the seat rings or ball/stem unit or Al₂O₃.ball/stem. This can be prevented by heating. In extreme cases this may cause blocking.

- ◆ If the ball blocks, do not apply force as the ball/stem unit or Al₂O₃.ball/stem may break if the max. adm. torque is exceeded.
- ◆ Operation with solids leads to increased wear.
- ◆ Operating during cavitation leads to increased wear.
- ◆ Non-observance of the pressure-temperature diagram can lead to damage.
- ◆ Do not subject the lever to heavy loads; the lever or ball valve may be damaged.
- ◆ Do not use a lever extension as otherwise there is a risk of damage.

7.3 Shutdown

The local regulations are to be observed when dismantling the valve.

Prior to undoing the flange connection ensure, that the plant is depressurised and emptied.



Prior to starting any repair work, the valve is to be thoroughly cleaned. Even if the valve has been properly emptied and rinsed, residual medium may still be found in the valve.

After dismantling, immediately protect the valve flanges against mechanical damage with flange caps. See also **Chapter 6.1**.



Ensure that a remotely actuated actuator cannot be accidentally switched on.

8 Malfunctions

- ◆ Flange connection ball valve/pipe is leaking
Retighten the flange screws to a tightening torque according to **Section 1.2**. If this does not remedy the leak, the recommended torques may be exceeded by 10%.
If this also fails to stop the leak, dismantle and inspect the ball valve.
- ◆ Flange connection main body/body end piece is leaking
Retighten body screws. See paragraph "Flange connection valve/pipe is leaking".
- ◆ Packing is leaking
Retighten packing nuts according to the details in **Section 1.2**.
- ◆ Ball valve does not operate
Is the actuator being supplied with power?
Is any directional control valve connected correctly?
Is there any foreign matter in the valve?

- ◆ The ball no longer closes completely

Is the stem deformed?

Is the coupling worn?

With a worm gear or actuator, check whether the end stops can be re-adjusted. The operating manuals of the gear and actuator manufacturers contain accurate instructions.



Never apply force to the lever or use an extension.

1. Try to get the ball valve working again by moving the lever to and from.
2. Remove the lever stop and try to switch against the normal direction of rotation.
3. If actuation is not possible with the max. admissible breakaway torque as per **Section 1.3**, dismantle ball valve and inspect individual components.

9 Maintenance

- ◆ All repair work is to be performed by qualified personnel using the appropriate tools. Generally recognised practice in mechanical engineering is to be observed.
- ◆ For the arrangement, designation and item numbers of all parts of the valve, see **Section 10**.
- ◆ Spare parts are to be ordered with all the details in acc. with the valve identification.
- ◆ Only original spare parts may be installed.
- ◆ To prevent leaks, a regular check of the connection screws should be made in line with the operating requirements.
For torques see **Section 1.2**.

9.1 Dismantling ball valve with ball/stem unit

9.1.1 Ball valve with lever

- Remove lever **203**.
- Take out grounding spring washer **557**.
- Dismantle packing gland follower **503** and spring gland follower **502**.
- The thrust ring **405/1**, packing bellows **403** and retaining washer **526** (not in 6" and 8") are one unit and it is levered out using 2 screwdrivers.
- Undo screw connection body end piece **102** / main body **100**.
- Remove body end piece **102**.
- Remove ball/stem unit **201** in closed position. Pay attention so as not to damage the body lining.
- Remove seat rings **401**.

9.1.2 Packing bellows

- Remove retaining washer **526**.
- Separate thrust ring **405/1** and packing bellows **403** by pushing them apart.

9.1.3 Ball valve with actuator

- Remove actuator **850** and coupling **804**.
- Dismantle packing gland follower **503** and spring gland follower **502**.
- Remove bracket **510**.

Further dismantling is performed as described in **Section 9.1.1**.

9.2 Assembly with ball/stem unit

- Prior to assembly all parts are to be cleaned and the plastic-lined components checked for damage.
- Insert seat rings **401** in the main body **101** and body end piece **102**.
- Mount ball/stem unit **201** in closed position. Pay attention so as not to damage the body lining.
- An additional bore in the ball/stem unit, e.g. to ensure it is cavity-free, must lie on the p1 side in the closed position.
- Mount body end piece **102**. Tighten the body screws to a tightening torque according to **Section 1.2** in diametrically opposite sequence.

9.2.1 Packing bellows

- Press thrust ring **405/1** into packing bellows **403**.
- Install retaining washer **526** (not in 6" and 8").
- Press unit into main body **101**.
- Press in grounding spring washer **557**.

9.2.2 Ball valve with lever

- Mount lever stop **577**, spring gland follower **502** (at 3", 4", 6" and 8" are 2 spring gland followers) and packing gland follower **503**. Tighten packing nuts until there is no gap between packing gland follower and spring gland follower. See **Section 1.2 and 10**
- Seal any tapped bores still open with plugs.
- Mount lever **203**.

9.2.3 Ball valve with actuator

- Mount spring gland follower **502** (at 3", 4", 6" and 8" are 2 spring gland followers) and packing gland follower **503**. Tighten packing nuts until there is no gap between packing gland follower and spring gland follower. See **Section 1.2 and 10**.
- Mount bracket **510** with the opening at right angles to the direction of flow.
- Mount coupling **804** and actuator **850**. Observe the actuator position in accordance with the actuator operating manual.
- Observe the ball/stem position in accordance with the position of the actuator.

9.3 Dismantling ball valve with ball and stem

It is possible with a ball valve with ball and stem to replace the seat rings and ball without dismantling the entire ball valve.

It is equally possible to remove the packing gland follower, spring gland follower and packing insert? without dismantling the body.

The entire ball valve must merely be taken apart to remove the stem.

For sectional drawings, see [Section 10](#).

9.3.1 Ball and seat rings

- Move ball **200** into the 'closed' position.
- Undo body nuts and bolts.
- Remove body end piece **102**.
- Remove ball **200** from the main body **101** by swivelling it.
- Remove seat rings **401** from the main body **101** and body end piece **102** and replace.

9.3.2 Packing bellows

- Remove lever **203**.
- Dismantle packing gland follower **503** and spring gland follower **502**.
- Remove grounding spring washer **557**.
- The thrust ring **405/1**, packing bellows **403** and retaining washer **526** (not in 6" and 8") are one unit and it is levered out using 2 screwdrivers.
- Remove retaining washer **526**.
- Separate thrust ring **405/1** and packing bellows **403** by pushing them apart.

9.3.3 Ball valve with actuator

- Remove actuator **850** and coupling **804**.
- Dismantle packing gland follower **503** and spring gland follower **502**.
- Remove bracket **510**.

Further dismantling is performed as described in [Section 9.3.1](#).

9.4 Assembly ball valve with ball and stem

- Prior to assembly all parts are to be cleaned and the plastic-lined components checked for damage.
- Insert seat rings **401** in the main body **101** and body end piece **102**.
- Insert stem **202** from inside into the main body **101**. In the case of 6" and 8" with an additional disc **550/1**.
- Move stem **202** into the 'closed' position. Swivel ball **200** into the stem **202**. Any pressure-relief or drain bore must lie on the p1 side in the "off" position. See also [Section 6.2](#).
- Mount body end piece **102**. Tighten the body screws to a tightening torque according to [Section 1.2](#) in diametrically opposite sequence.

9.4.1 Packing bellows

- Press thrust ring **405/1** into packing bellows **403**.
- Install retaining washer **526 526** (not in 6" and 8/6").
- Press unit into body end piece **102**.
- Press in grounding spring washer **557**.

9.4.2 Ball valve with lever

- Mount lever stop **577**, spring gland follower **502** (in 3", 4", 6" and 8" they are 2 spring gland followers **502**) and packing gland follower **503**. Tighten packing nuts until there is no gap between packing gland follower and spring gland follower. See [Section 1.2 and 10](#).
- Seal any tapped bores still open with plugs.
- Mount lever **203**.

9.4.3 Ball valve with actuator

- Mount spring gland follower **502** (in 3", 4", 6" and 8" they are 2 spring gland followers **502**) and packing gland follower **503**. Tighten packing nuts until there is no gap between packing gland follower and spring gland follower. See [Section 1.2 and 10](#).
- Mount bracket **510** with the opening at right angles to the direction of flow.
- Mount coupling **804** and actuator **850**. Observe the actuator position in accordance with the actuator operating manual.
- Observe the ball and stem position in accordance with the position of the actuator.

9.5 Conversion from lever to actuator

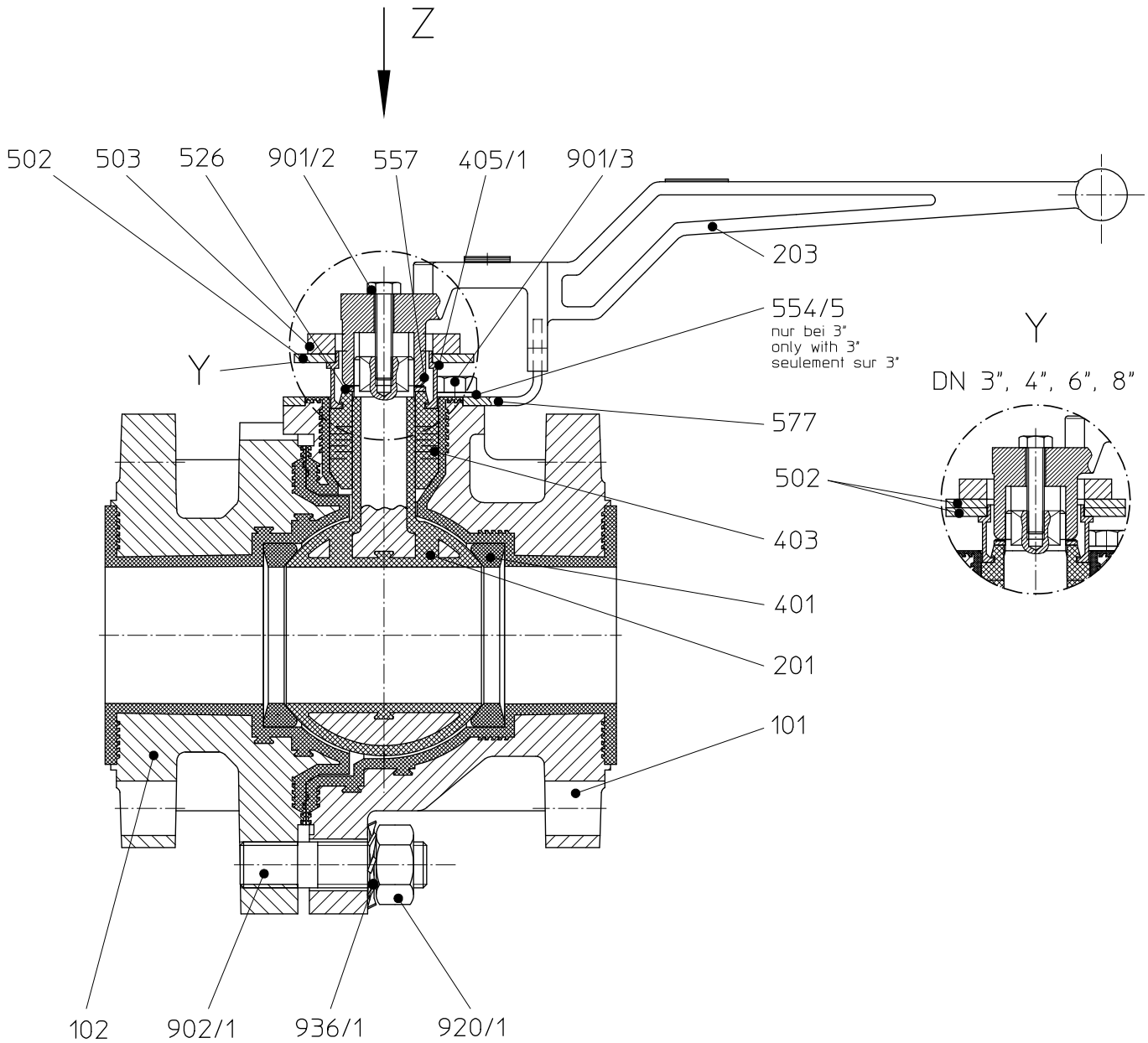
- Select the actuator in accordance with the instructions of the actuator manufacturer.
- Remove lever **203**.
- Remove lever stop **577** and plug.
- Check the fits of the coupling **804**, bracket **510** and actuator **850**.
- Mount bracket **510** with the opening at right angles to the direction of flow.
- Mount coupling **804** and actuator **850**. Observe the actuator position in accordance with the actuator operating manual.

10 Drawings

10.1 Legend

101	main body	557	grounding spring washer
102	body end piece	577	lever stop
200	ball	804	coupling
201	ball/stem unit		includes:
202	stem	500	ring (Option)
203	lever	952	pressure spring
401	seat ring	980/1	round head grooved pin
403	packing bellows	850	actuator
405/1	thrust ring	901/x	hex. screw
502	spring gland follower	902/1	stud screw
503	packing gland follower	904/1	set screw
510	bracket	914/2	hex. socket screw (only F07)
526	retaining washer ($\frac{1}{2}$ ", $\frac{3}{4}$ ", 1", 1 $\frac{1}{2}$ ", 2", 3", 4")	918/1	threaded rod (6", 8")
550/1	disc (6", 8")	920/x	hex. nut
554/1	washer	936/x	toothed lock washer (not included)
554/5	washer (3")		

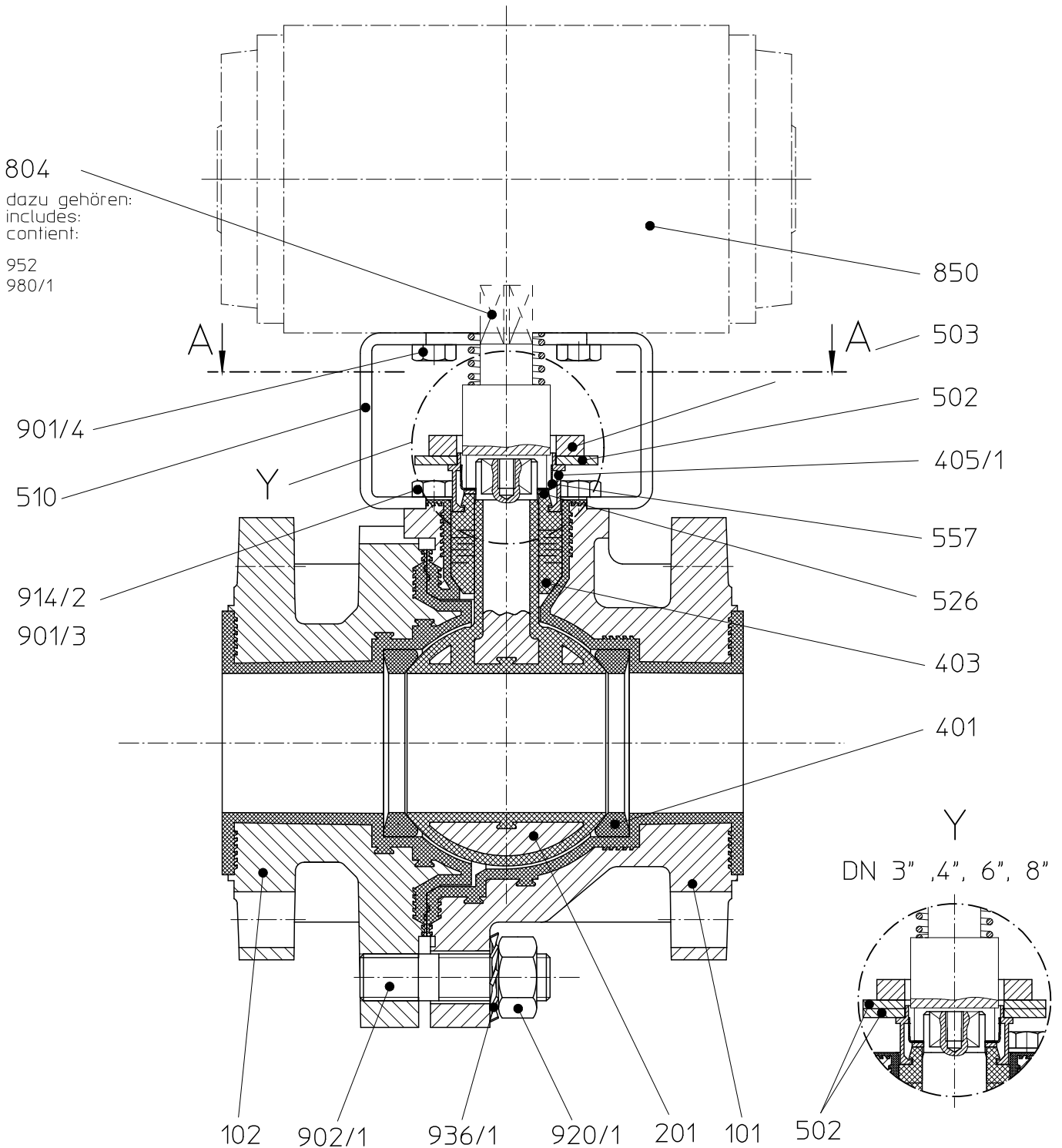
10.2 Sectional drawing ball valve with ball/stem unit and lever



9520-00-3120/4-0

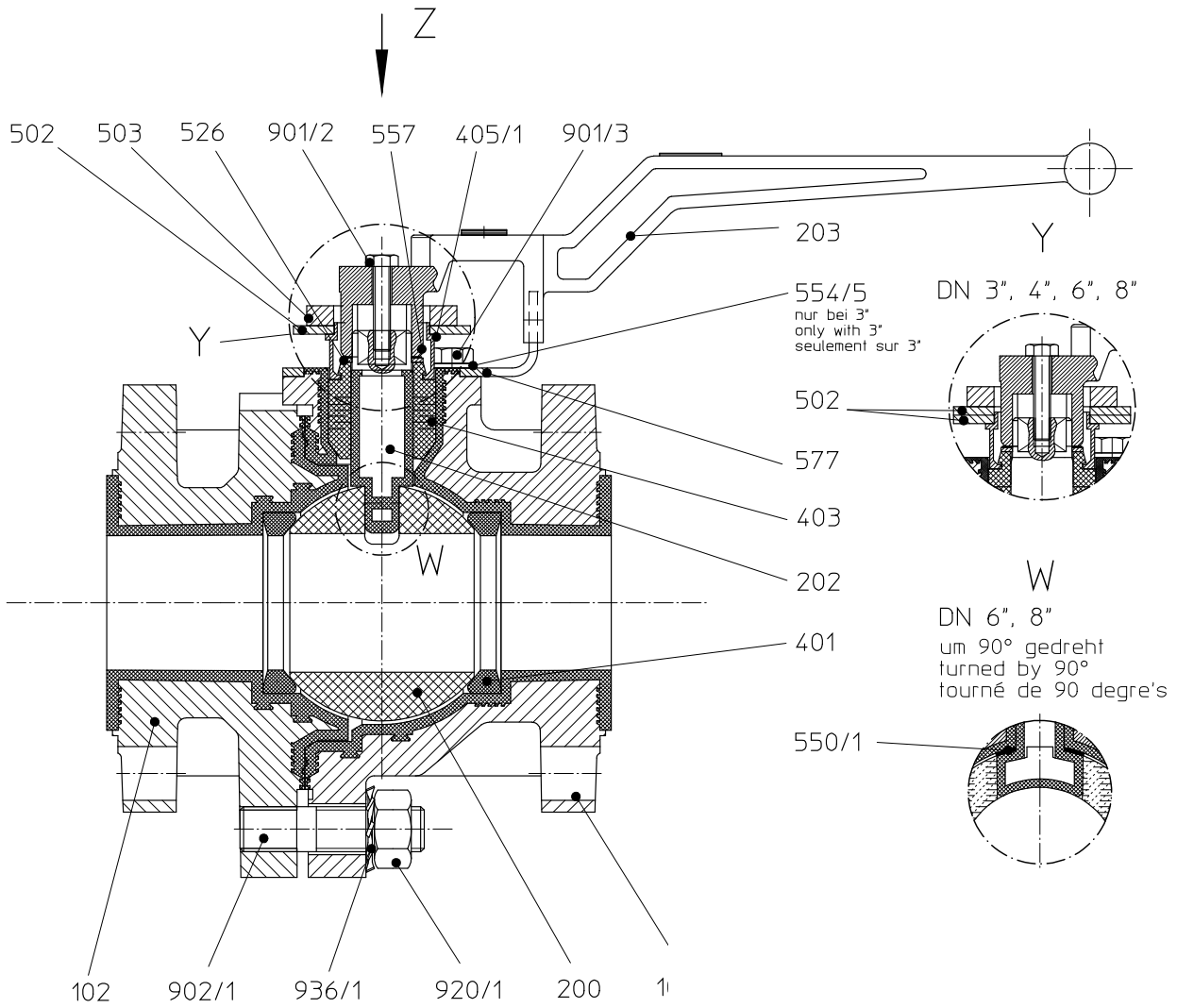
Holes of the flange and housing screws view turned 45°

10.3 Sectional drawing ball valve with ball/stem unit and actuator



Holes of the flange- and housing screws view displaced by 45°

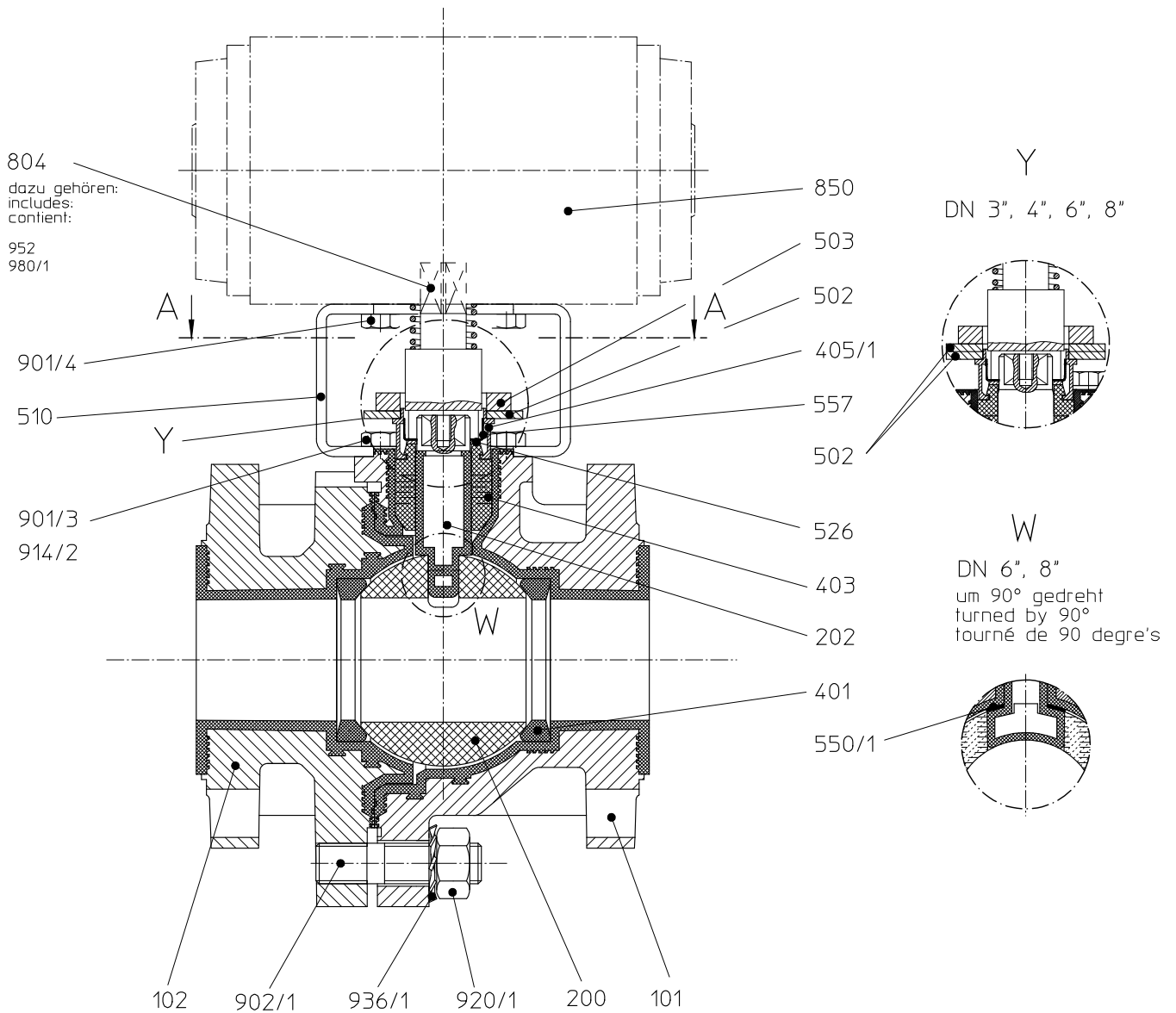
10.4 Sectional drawing ball valve with ball, stem and lever



9520-00-3120/4-0

Holes of the flange- and housing screws view displaced by 45°

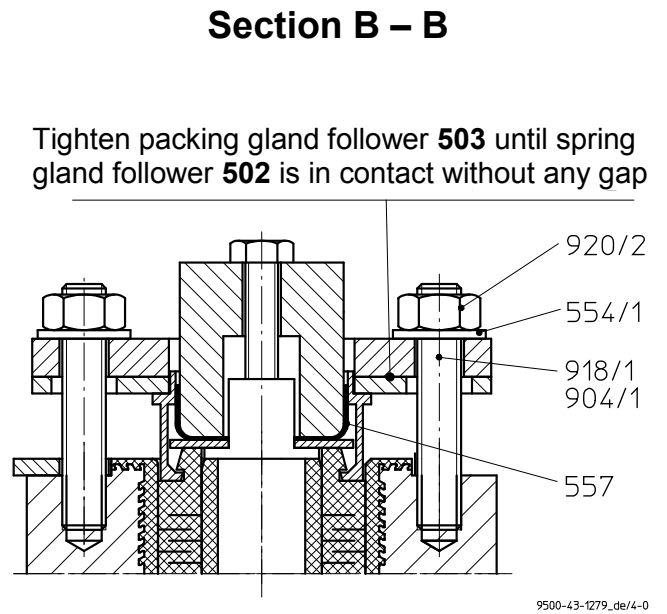
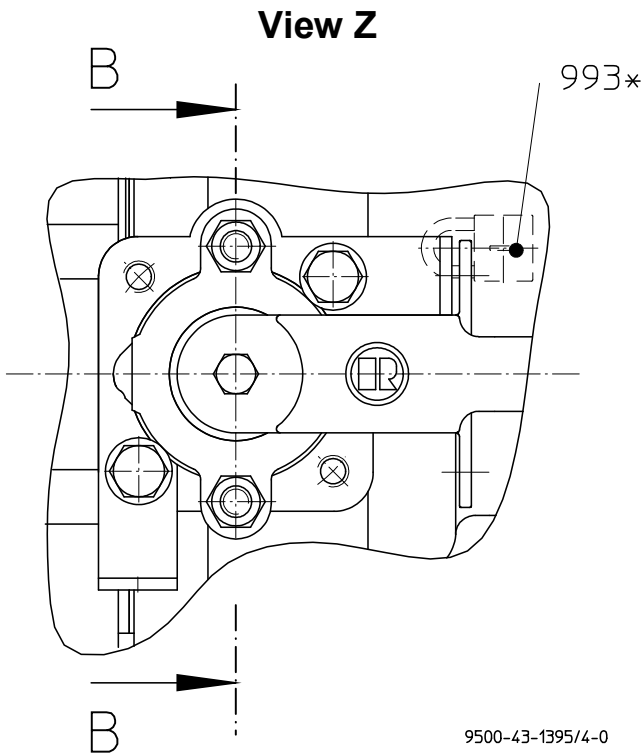
10.5 Sectional drawing ball valve with ball, stem and actuator



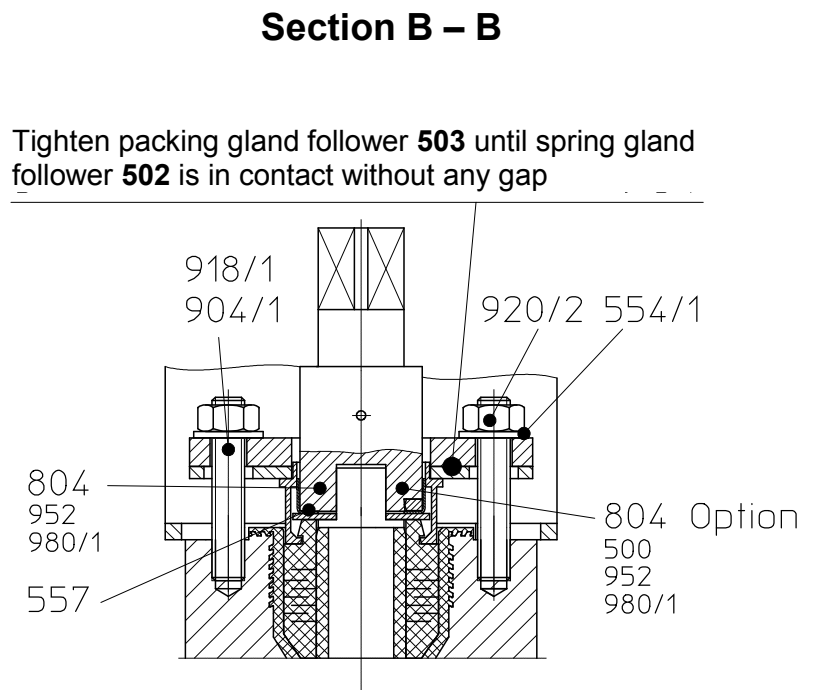
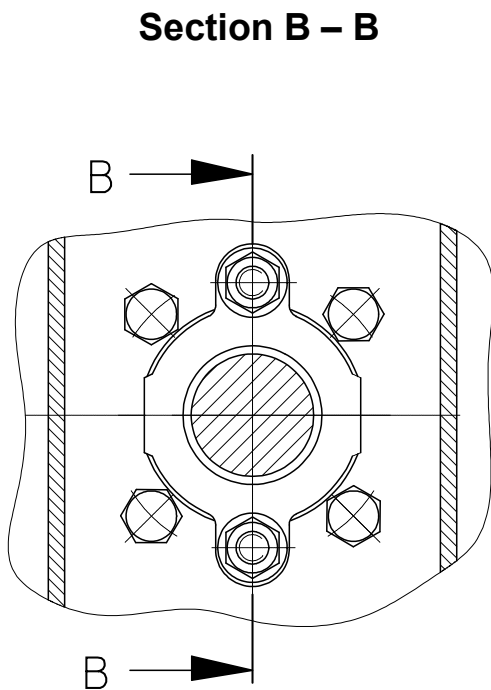
9520-00-3130/4-0

Holes of the flange- and housing screws view displaced by 45°

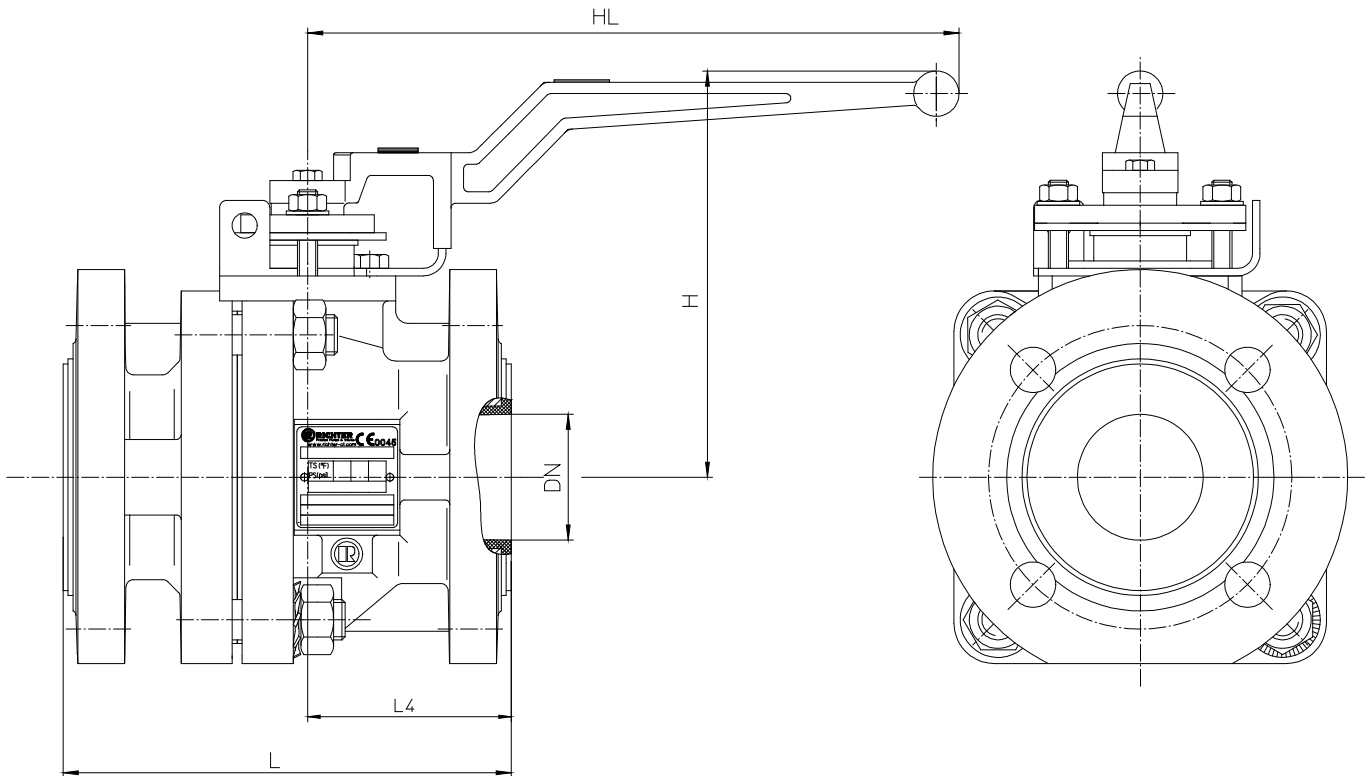
10.4 View and section ball valve with lever



10.5 Sections ball valve with actuator



10.6 Dimensional drawing ball valve with lever



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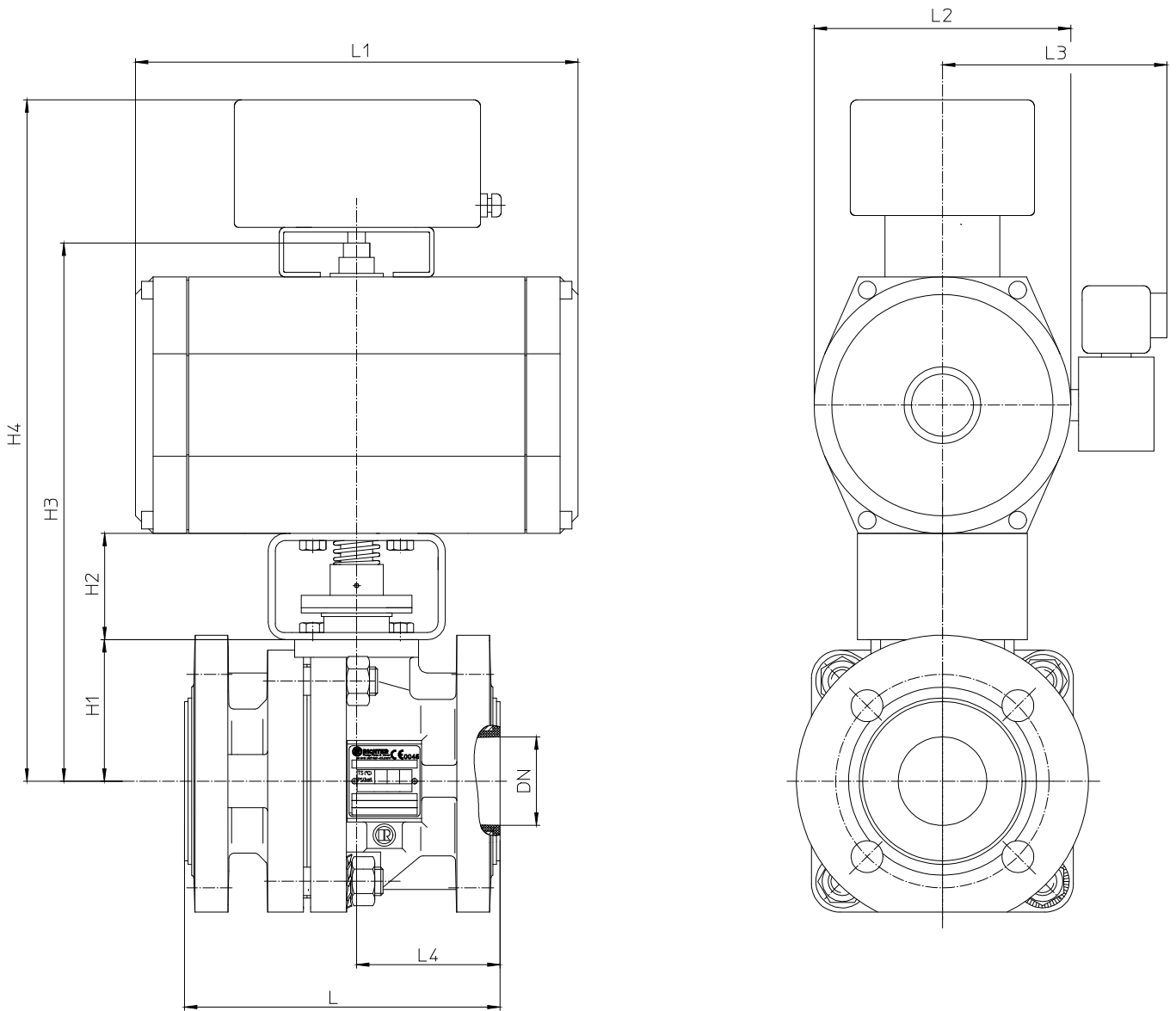
KNA/F		x	x	x	x	x	x	x	x	x
KNA-S/F				x	x	x				
KNA-D/F				x	x	x	x	x	x	x
DN		1/2"	3/4"	1"	1 1/2"	2"	3"	4"	6"	8" ¹⁾
L	inch [mm]	5.12 [130]	5.91 [150]	5.0 [127]	6.5 [165]	7.0 [178]	8.0 [203]	9.0 [229]	10.5 [267]	18.0 [457]
L4	inch [mm]	2.32 [59]	2.32 [59]	2.2 [56]	3.0 [76]	3.18 [81]	3.7 [94]	4.21 [107]	5.12 [130]	8.79 [223,5]
HL	inch [mm]	7.05 [179]			10.2 [259]		16.1 [410]		20.2 [513]	20.2 [513]
H	inch [mm]	5.12 [130]			6.1 [155]		7.09 [180]	7.68 [195]	10.4 [265]	10.4 [265]

¹⁾ DN 8" with reduced bore 6"

6" and 8": At $\Delta p > \text{approx. } 2 \text{ bar}$ a worm gear is recommended instead of hand lever.

Flange connecting dimensions:
ASME B16.5 Class 150, raised face

10.7 Dimensional drawing ball valve with actuator



KNA/F		x	x	x	x	x	x	x	x	x
KNA-S/F				x	x	x				
KNA-D/F				x	x	x	x	x	x	x
DN		½"	¾"	1"	1½"	2"	3"	4"	6"	8" ¹⁾
H1	inch [mm]	1.97 [50]			3.03 [77]	3.15 [80]	4.64 [118]	5.27 [134]	7.24 [184]	
H2	inch [mm]	2.32 [60]			2.32 ²⁾ [60**]		3.15 [80]		3.94 [100]	
H3	inch [mm]									
H4	inch [mm]									
L	inch [mm]	5.12 [130]	5.91 [150]	5.0 [127]	6.5 [165]	7.0 [178]	7.99 [203]	9.01 [229]	10.51 [267]	17.99 [457]
L1	inch [mm]									
L2	inch [mm]									
L3	inch [mm]									
L4	inch [mm]	2.32 [59]	2.32 [59]	2.2 [56]	3.0 [76]	3.18 [81]	3.7 [94]	4.21 [107]	5.12 [130]	8.79 [223,5]
Connect. dimen. acc. to ISO 5211		F05			F07		F10		F12	

¹⁾ DN8" with reduced bore 6"



²⁾ H2 = 3.15" (80mm) if F10 or F12 on the actuator side

Dimensions H3, H4, L1, L2 and L3 vary depending on the actuator manufacturer.

Flange connecting dimensions

ASME B16.5 Class 150, raised face

CE Konformitätserklärung nach EN ISO//IEC 17050
Declaration of Conformity according to EN ISO//IEC 17050

Produkt <i>Product</i>	Kunststoffausgekleidete Dreharmaturen <i>Plastic lined quarter turn valves</i>		
Bauart <i>Design</i>	Kugelhahn, Regel-Kugelhahn, Kompakt-Kugelhahn, Bodenablass-Kugelhahn, Absperr- und Regelklappe <i>Ball valve, control ball valve, sandwich ball valve, bottom drain ball valve, shut-off and control butterfly valve</i>		
Baureihe <i>Serie</i>	KN..., KNA..., BVA..., BVI..., KNR..., KNAR..., KH..., KK..., KK-FU., KA-N..., NK..., NKL..., NKS...		
Nennweite <i>Size</i>	DN 15 bis DN 400, ½" bis 16" <i>DN 15 to DN 400, ½" to 16"</i>		
Seriennummer <i>Series number</i>	ab/from 29.12.2009		
EU-Richtlinie <i>EU-Directive</i>	97/23/EG Druckgeräterichtlinie <i>97/23/EC Pressure Equipment</i>	2006/42/EG ²⁾ <i>2006/42/EC ²⁾</i>	Maschinenrichtlinie <i>Directive Machinery</i>
Angewandte Technische Spezifikation <i>Applied Technical Specification</i>	DIN EN ISO 12100-2 AD 2000		
Überwachungsverfahren <i>Surveillance Procedure</i>	97/23/EG Zertifizierungsstelle für Druckgeräte der TÜV Nord Systems GmbH & Co. KG Notified Body 0045		
Konformitätsbewertungsverfahren 97/23/EG <i>Conformity assessment procedure 97/23/EC</i>	Modul H		
Kennzeichnung <i>Marking</i>	97/23/EG ¹⁾ 97/23/EC ¹⁾ ≥ DN 32, ≥ 1"		0045
	2006/42/EG ²⁾ 2006/42/EC ²⁾		


Das Unternehmen Richter Chemie-Technik GmbH bescheinigt hiermit, dass die o.a. Baureihen die grundsätzlichen Anforderungen der aufgeführten Richtlinien und Normen erfüllt.
Richter Chemie-Technik GmbH confirms that the basic requirements of the above specified directives and standards have been fulfilled.

- ¹⁾ Für nicht aufgeführte Nennweiten ist eine Kennzeichnung nicht zulässig.
For sizes not listed a marking is not permitted.
²⁾ Alle Armaturen, mit Ausnahme der Armaturen mit Handbetätigung.
For all valves, with exceptions to valves with hand operation

Kempen, 14.01.2011



G. Kleining
Leiter Forschung & Entwicklung
Manager Research & Development



A. Linges
Leiter Qualitätsmanagement
Quality Manager

Herstellererklärung / *Manufacturer's Declaration*

TA-Luft / *German Clean Air Act (TA-Luft)*

Richter Kugelhahn / *Richter Ball Valve*

Hiermit erklären wir, dass die Kugelhähne der Baureihen
Hereby we declare, that the ball valves of the series

KN, KNR, KNA, KNAR, KNB, KNBR, KNA-S; BVA, BVI, KK, KK/FU, KH; KA-N

die Anforderung bezüglich der Gleichwertigkeit gemäß Ziffer 5.2.6.4 der Technischen Anleitung-Luft (TA-Luft vom 01.10.2002 / VDI 2440 Ziffer 3.3.1.3) erfüllen.

Grundlage sind die "Prüfgrundsätze für den Eignungsnachweis von Spindelabdichtungen in Armaturen als gleichwertig nach TA-Luft" des TÜV Süddeutschland Bau und Betrieb GmbH vom 22.09.1992.

Zusätzlich beinhaltet die Herstellererklärung den Eignungsnachweis einer Spindelabdichtung und einer inneren Flanschverbindung gemäß VDI 2440 hinsichtlich Dichtheit bzw. der Einhaltung der spezifischen Leckagerate nach TA-Luft $\lambda \leq 10^{-4} \frac{\text{mbar} \cdot \text{l}}{\text{s} \cdot \text{m}}$ und einer erweiterten Prüfung unter Betriebsbedingungen.

Voraussetzung für die Gültigkeit der Herstellererklärung ist das Beachten und Einhalten der Betriebsanleitung. Insbesondere sind regelmäßige Wartungsintervalle durchzuführen und die dichtheitsrelevanten Schraubverbindungen zu überprüfen und, wenn notwendig, nachzuziehen.

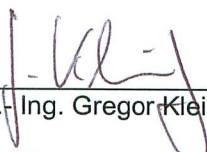
meets the requirement relating to the equivalence according to Section 5.2.6.4 of the German Clean Air Act (Clean Air Act dated 01.10.2002 / VDI 2440 Section 3.3.1.3).

The basics are the "Testing principles for the suitability verification of stem seals in valves as being equivalent in accordance to the German Clean Air Act of the TÜV Süddeutschland Bau und Betrieb GmbH dated 22 September 1992.

Additionally, the manufacture's declaration contains the suitability verification of a stem seal and internal flange connection in accordance to VDI 2440 with regard to tightness and the observance of the specific leakage rate according to the German Clean Air Act $\lambda \leq 10^{-4} \frac{\text{mbar} \cdot \text{l}}{\text{s} \cdot \text{m}}$ and an extended test under the above-mentioned operating conditions.

Manufacturer's declaration validity is dependent on the operating instructions being read and observed. In particular, service must be conducted at regular intervals and the bolted connection relevant for tightness should be inspected and retightened if necessary.

Kempen, 01.03.2010


Dipl.-Ing. Gregor Kleining

Leiter Forschung & Entwicklung
Manager Research & Development


Dipl. Wirt.- Ing. Alexander Linges
Leiter Qualitätsmanagement
Quality Manager

Kempen, 27.01.2011

SIL

Declaration by the Manufacturer

Functional Safety according to IEC 61508

We declare, that the devices

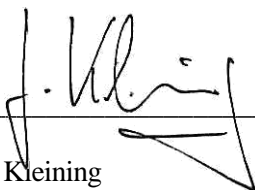
KN, KNR, KNA, KNAR, KNP, KNRP, KNAP, KNARP

are suitable for use in a safety related application, if the safety instructions and the following parameters are observed:

Device Type:	A
Proof Test Interval:	≤ 1 year
HFT:	0 (single channel usage)
λ_{SU} :	129 FIT
λ_{SD} :	14 FIT
λ_{DU} :	108 FIT
λ_{DD} :	36 FIT
SFF:	62,5 %
PFDAvg:	4,73 10⁻⁴ (for T_{Proof} = 1 year)
MTBF:	398 years

Safety Integrity Level: SIL 2

The specified values are valid only for the valve. Accessories such as an actuator, solenoid valves, limit switches etc. are not included.



Gregor Kleining
Dir. Research & Development

Alexander Linges
Quality Manager

Safety Information / **Declaration of No Objection** Concerning the Contamination of Richter-Pumps, -Valves and Components

1 SCOPE AND PURPOSE

Each entrepreneur (operator) carries the responsibility for the health and safety of his employees. This extends also to the personnel, who implements repairs with the operator or with the contractor.

Enclosed declaration is for the information of the contractor concerning the possible contamination of the pumps, valves and component sent in for repair. On the basis of this information for the contractor is it possible to meet the necessary preventive action during the execution of the repair.

Note: The same regulations apply to repairs **on-site**.

2 PREPARATION OF DISPATCH

Before the dispatch of the aggregates the operator must fill in the following declaration completely and attach it to the shipping documents. The shipping instructions indicated in the respective manual are to be considered, for example:

- Discharge of operational liquids
- remove filter inserts
- lock all openings hermetically
- proper packing
- Dispatch in suitable transport container
- Declaration of the contamination fixed **outside!!** on the packing

Declaration about the Contamination of Richter Pumps, -Valves and Components

The repair and/or maintenance of pumps, valves and components can only be implemented if a completely filled out declaration is available. If this is not the case, delay of the work will occur. If this declaration is not attached to the devices, which have to be repaired, the transmission can be rejected.

Every aggregate has to have it's own declaration.

This declaration may be filled out and signed only by authorized technical personnel of the operator.

Contractor/dep./institute : _____ Street : _____ Postcode, city: _____ Contact person: _____ Phone : _____ Fax : _____ End user : _____	Reason for transmitting <input checked="" type="checkbox"/> Please mark the applicable Repair: <input type="checkbox"/> subject to fee <input type="checkbox"/> Warranty Exchange: <input type="checkbox"/> subject to fee <input type="checkbox"/> Warranty <input type="checkbox"/> Exchange/ Replacement already initiated/received Return: <input type="checkbox"/> Leasing <input type="checkbox"/> Loan <input type="checkbox"/> for credit note																																												
A. Details of Richter-product:																																													
Classification: _____ Article number: _____ Serial number: _____	Failure description: _____ Equipment: _____ Application tool: _____ Application process: _____																																												
B. Condition of the Richter-product:																																													
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:30%;"></th> <th style="width:10%; text-align: center;">no¹⁾</th> <th style="width:10%; text-align: center;">yes</th> <th style="width:10%; text-align: center;">no</th> </tr> </thead> <tbody> <tr> <td>Was it in operation ?</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>Drained (product/operating supply item) ?</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>All openings hermetically locked!</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Cleaned ?</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>		no ¹⁾	yes	no	Was it in operation ?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Drained (product/operating supply item) ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	All openings hermetically locked!	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cleaned ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:60%;"></th> <th style="width:10%; text-align: center;">no¹⁾</th> <th style="width:10%; text-align: center;">yes</th> </tr> </thead> <tbody> <tr> <td>Contamination : toxic</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>caustic</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>flammable</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>explosive²⁾</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>mikrobiological²⁾</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>radioactive³⁾</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>other pollutant</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>		no ¹⁾	yes	Contamination : toxic	<input type="checkbox"/>	<input type="checkbox"/>	caustic	<input type="checkbox"/>	<input type="checkbox"/>	flammable	<input type="checkbox"/>	<input type="checkbox"/>	explosive ²⁾	<input type="checkbox"/>	<input type="checkbox"/>	mikrobiological ²⁾	<input type="checkbox"/>	<input type="checkbox"/>	radioactive ³⁾	<input type="checkbox"/>	<input type="checkbox"/>	other pollutant	<input type="checkbox"/>	<input type="checkbox"/>
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other pollutant	<input type="checkbox"/>	<input type="checkbox"/>																																											
If yes, with which cleaning agent: _____ and with which cleaning method: _____																																													
¹⁾ if "no", then forward to D. ← ²⁾ Aggregates, which are contaminated with microbiological or explosive substances, are only accepted with documented evidence of an approved cleaning. ³⁾ Aggregates, which are contaminated with radioactive substances, are not accepted in principle.																																													
C. Details of the discharged materials (must be filled out imperatively)																																													
1. With which materials did the aggregate come into contact ? Trade name and/or chemical designation of operational funds and discharged materials, material properties, e.g. as per safety data sheet (e.g. toxic, inflammable, caustic)																																													
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:30%;"></th> <th style="width:30%; text-align: center;">no</th> <th style="width:30%; text-align: center;">yes</th> </tr> </thead> <tbody> <tr> <td>X Trade name: _____ Chemical designation: _____</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>a) _____</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>b) _____</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>c) _____</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>d) _____</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>			no	yes	X Trade name: _____ Chemical designation: _____	<input type="checkbox"/>	<input type="checkbox"/>	a) _____	<input type="checkbox"/>	<input type="checkbox"/>	b) _____	<input type="checkbox"/>	<input type="checkbox"/>	c) _____	<input type="checkbox"/>	<input type="checkbox"/>	d) _____	<input type="checkbox"/>	<input type="checkbox"/>																										
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c) _____	<input type="checkbox"/>	<input type="checkbox"/>																																											
d) _____	<input type="checkbox"/>	<input type="checkbox"/>																																											
2. Are the materials specified above harmful to health ? ←																																													
3. Dangerous decomposition products during thermal load ? ← If yes, which ones ?																																													

D. Mandatory declaration: We assure that the data in this explanation are truthful and complete and as a signatory I am able to form an opinion about this. We are aware that we are responsible towards the contractor for damages, which results from incomplete and incorrect data. We commit ourselves to exempt the contractor from claims for damages of thirds resulting from incomplete or incorrect data. We are aware that we are directly responsible towards thirds, irrespective of this declaration, which belongs in particularly to the employees of the contractor consigned with the handling repair of the product.

Name of the authorized person (in block letters): _____

_____ Date

_____ Signature

Company stamp

FAX

Fax No. ()

Pages (incl. cover sheet) ()

To:

()

Richter Chemie-Technik GmbH
Otto-Schott-Straße 2
D-47906 Kempen

Telefon +49 (0) 21 52/146-0
Telefax +49 (0) 21 52/146-190

richter-info@richter-ct.com
www.richter-ct.com

Contact person:
()

Reference:
()

Extension:
- ()

E-Mail Address:
()

Date:
()

Your order No.: ()

Our Kom. No.: ()

Serial No.: ()

Dear Sirs,

The compliance with laws for the industrial safety obligates all commercial enterprises to protect their employees and/or humans and environment against harmful effects while handling dangerous materials.

The laws are such as: the Health and Safety at Work Act (ArbStättV), the Ordinance on Harzadous Substances (GefStoffV, BIOSTOFFV), the procedures for the prevention of accidents as well as regulations to environmental protection, e.g. the Waste Management Law (AbfG) and the Water Resources Act (WHG)

An inspection/repair of Richter products and parts will only take place, if the attached explanation is filled out correctly and completely by authorized and qualified technical personnel and is available.

In principle, radioactively loaded devices sent in, are not accepted.

Despite careful draining and cleaning of the devices, safety precautions should be necessary however, the essential information must be given.

The enclosed declaration of no objection is part of the inspection/repair order. Even if this certificate is available, we reserve the right to reject the acceptance of this order for other reasons.

Best regards
RICHTER CHEMIE-TECHNIK GMBH

Enclosures

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