KLINGER Fluid Control

KLINGER FLUID CONTROL

KHO Monoball valve „Advanced“

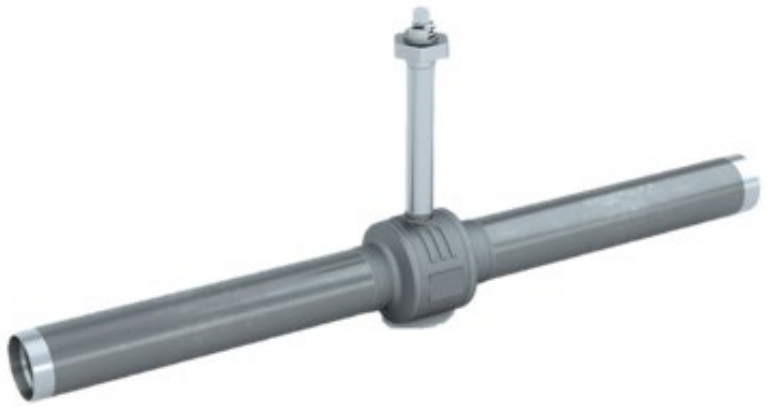
MONOBALL KHO ADVANCED

Agenda

- KHO-U
- Shaft end
- Exchange of stem O-Rings
- Shortening of stem extension DN25/32R25 – DN65/80R65
- Shortening of stem extension DN80/100R80 – DN250
- Materials
- Welding seams & tension
- The ball
- Comparison with sheet metal valves
- Test acc. EN488:2019
- Gear sizing
- Application

VALVE MODEL KHO-U

DN25 – 125 prepared for insulation

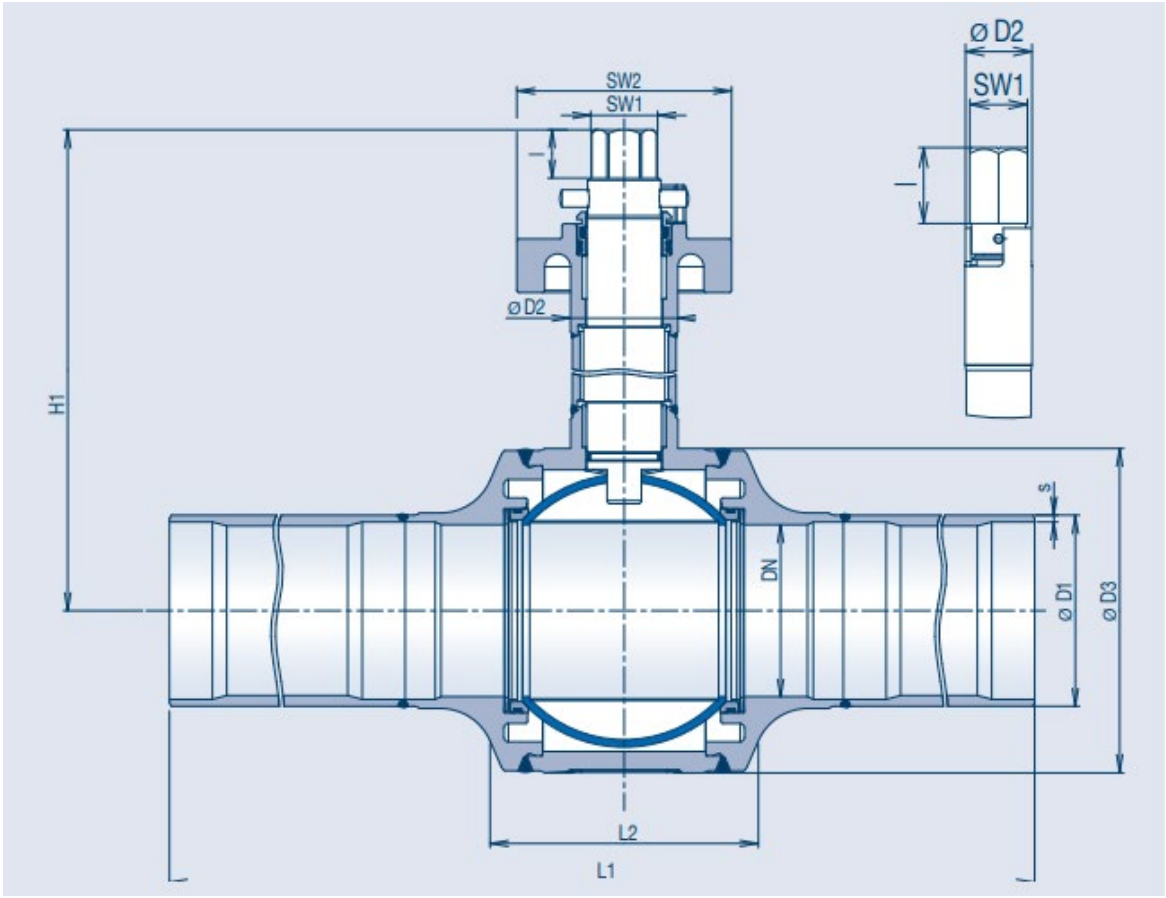


FULL BORE

DN	PN	L1	L2	H1	ØD1	s	ØD2	ØD3	l	SW1	SW2	weight
25	40	1500	78	404	33.7	2.6	22	55	25	19	–	6
32	40	1500	94	410	42.4	3.2	30	67	25	19	–	8.5
40	40	1500	75	418	48.3	3.2	30	84	25	19	–	9.5
50	40	1500	93	433	60.3	3.2	38	101	28	19	–	15.5
65	40	1500	115	443	76.1	3.2	38	125	28	19	–	20.5
80	40	1500	130	457	88.9	3.2	50	151	22.5	27	90	27
100	40	1500	155	472	114.3	3.6	50	185	22.5	27	90	38.5
125	40	1500	205	495	139.7	3.6	50	231	22.5	27	90	51

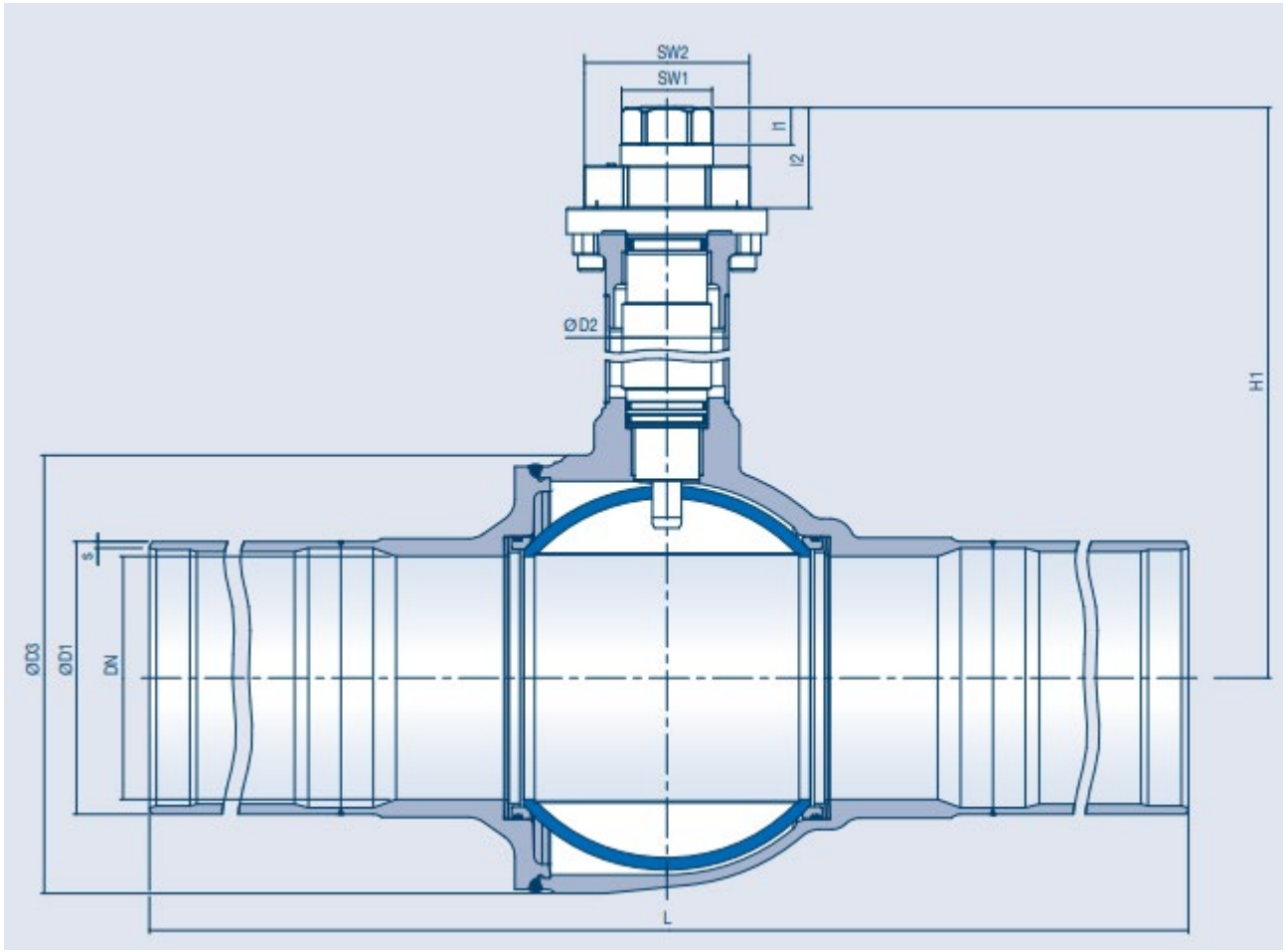
REDUCED BORE

DN	PN	L1	L2	H1	ØD1	s	ØD2	ØD3	l	SW1	SW2	weight
32R25	40	1500	94	404	42.4	3.2	22	55	25	19	–	7.5
40R32	40	1500	96	410	48.3	3.2	30	67	25	19	–	9
50R40	40	1500	73	418	60.3	3.2	30	84	25	19	–	13
65R50	40	1500	82	433	76.1	3.2	38	101	28	19	–	18
80R65	40	1500	115	443	88.9	3.2	38	125	28	19	–	23
100R80	40	1500	125	457	114.3	3.6	50	151	22.5	27	90	34.5
125R100	40	1500	155	472	139.7	3.6	50	185	22.5	27	90	44.5
150R125	40	2000	175	495	168.3	4	50	231	22.5	27	90	72.5



VALVE MODEL KHO-U

DN150 – 250 prepared for insulation



FULL BORE

DN	PN	L1	H1	ØD1	s	ØD2	ØD3	l	SW1	SW2	weight
150	25	2000	526	168.3	4	76	266	23	50	90	83
200	25	2000	567	219.1	4.5	76	362	23	50	90	126
250	25	2000	633	273	5	108	426	35	50	90	182

SHAFT END & OPERATION

Hexagon and counterholder

T- wrench

Mobile slip -on gear

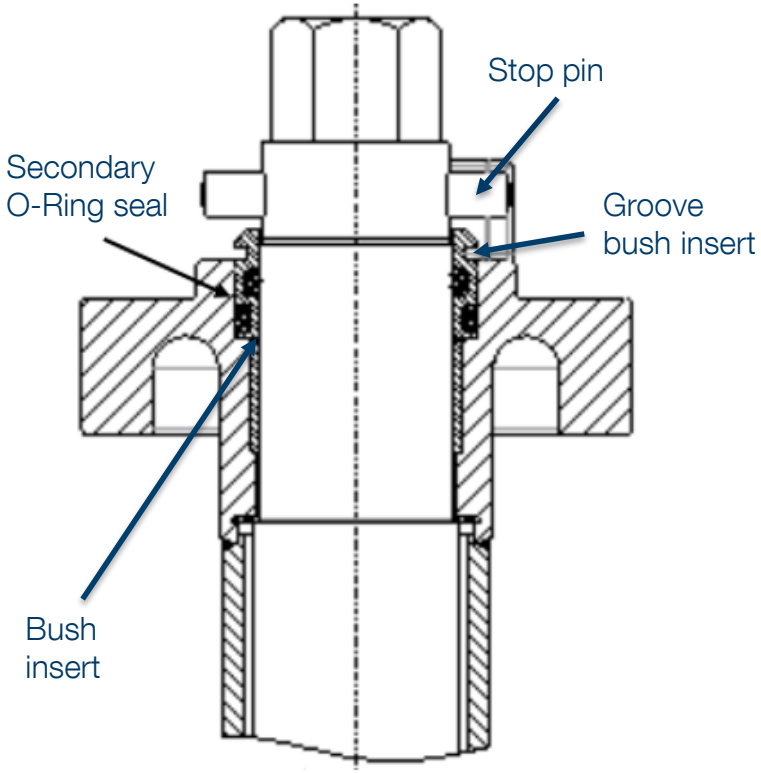
example image
not in KFC portfolio

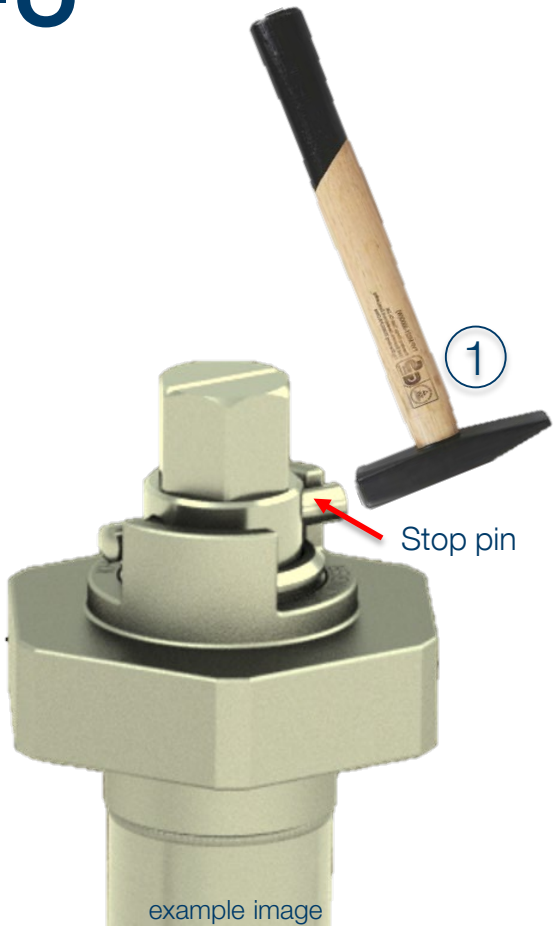
DN	AF1	AF2	Torque Nm
25/ 32R25	19	-	20
32/ 40R32			28
40/ 50R40			42
50/ 65R50			60
65/ 80R65			110
80/ 100R80	27	90	190
100/ 125R100			320
125/ 150R125			490
150	50		530
200			690
250			1420

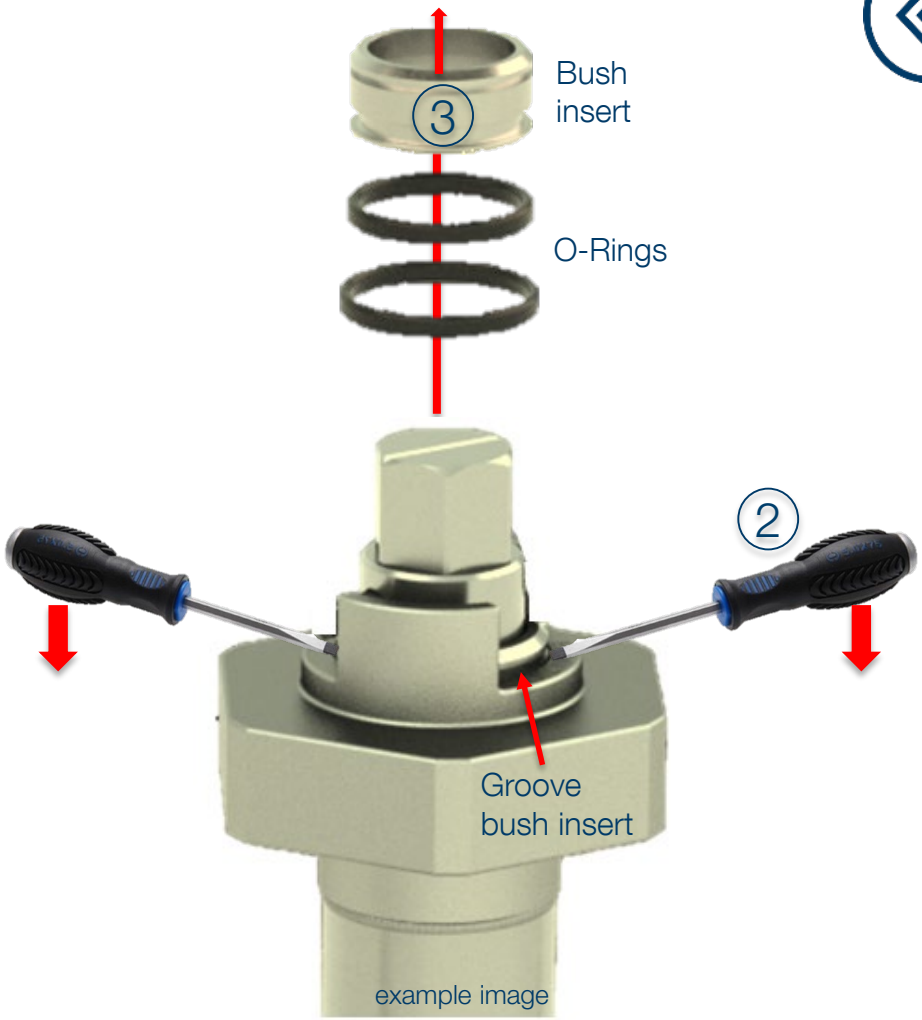
AF1: Wrench size hexagonal
AF2: Wrench size counterholder for operation with mobile slip -on gear

MONOBALL KHO-U

Exchange of stem O-Rings inline



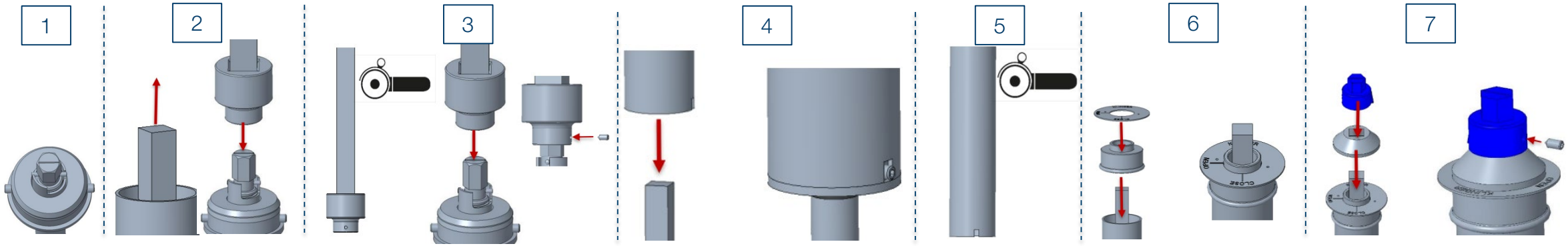




» Bring the valve into the CLOSED position
» (1) Use a suitable instrument (punch and hammer) to hammer the stop pin out of the operating stem.
» (2) Pull out the bushing insert by means of two identically-sized screwdrivers. A groove running around the bushing insert serves as a point of contact where the screwdrivers can be applied.
» (3) Remove the O-rings from the bushing insert and clean it. Lubricate the new O-rings with silicone grease and install them.
» Reassemble in reverse order

STEM EXTENSION DN25/32R25 – DN65/80R65

Instruction for shortening

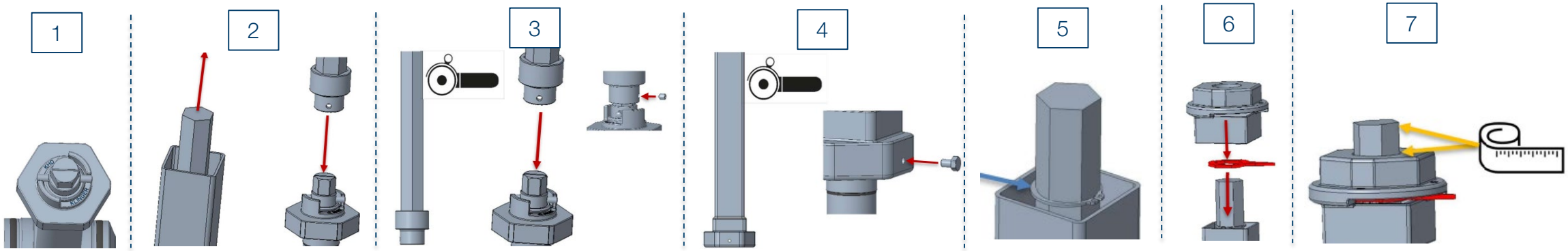


example images

(1) Bring the valve in OPEN position.
(2) Remove the actuating piece (4KT 27/32 or 6KT 27), sealing cap and type plate of the extension. Pull the square rod with welded-on nut SW19 out of the pipe and push the nut onto the hexagon SW19 on the ball valve until it stops.
(3) Cut the top of the square bar to match the soil cover (e.g. with a cutting disc) and deburr it. Then place it on the ball valve using the nut and clamp it in place with the grub screw on the side.
(4) Place the pipe over the square rod onto the ball valve.
(5) Measure and mark the length of the pipe. To do this, move the holder for the plastic pipe accordingly. The square rod must protrude 60mm (+/- 3mm) from the pipe for the 6KT 27 actuating piece and 75mm (+/- 3mm) for the 4KT 27/32 actuating piece. Remove the pipe from the valve, cut it off and deburr it. Then put it back on the ball valve.
(6) Place the plastic cap with the type plate over the square rod on the pipe. Make sure the "OPEN" or "CLOSED" marking on the type plate is in the correct position. The "OPEN" marking must be in line with the pipe axis.
(7) Put on the sealing cap and actuating piece. Actuating piece 6KT 27 has an indicator nose which points to the "OPEN" position. With the actuating piece 4KT 27/32, the hexagon screw serves as a position indicator and must point to the "OPEN" position.

STEM EXTENSION DN80/100R80 – DN250

Instruction for shortening



example images

(1) Bring the valve in OPEN position.
(2) Remove the cover cap with the direction arrow from he square tube of the extension. Pull the hexagon rod with welded adapter SW36/SW50 out of the square tube and push it onto the hexagon SW36/SW50 on the ball valve until it stops.
(3) Cut the hexagonal rod at the top to match the soil cover (e.g. cutting disc) und deburr it. Then put it back on the ball valve and clamp it with the grub screw on the side.
(4) Place the square tube over the hexagon rod onto the ball valve, measure and mark. The hexagon must protrude 65mm (+/-3mm) from the square tube. Remove the tube from the valve, cut it off and deburr it. Then place it back on the ball valve. Make sure that the surface of the square tube is parallel or at the right angle to the tube axis. Now tighten the hexagon screws on the sides at the bottom.
(5) Clamp the circlip onto the rod at the height of the upper edge of the square tube (serves as a support for the pointer).
(6) Place the cover cap with the pointer inserted over the hexagonal rod onto the square tube. Make sure that the OPEN marking is in line with the tube axis and that the pointer points to the OPEN position.
(7) Finally, check whether the hexagon protrudes 25mm (+/-2mm) from the top of the cover cap.

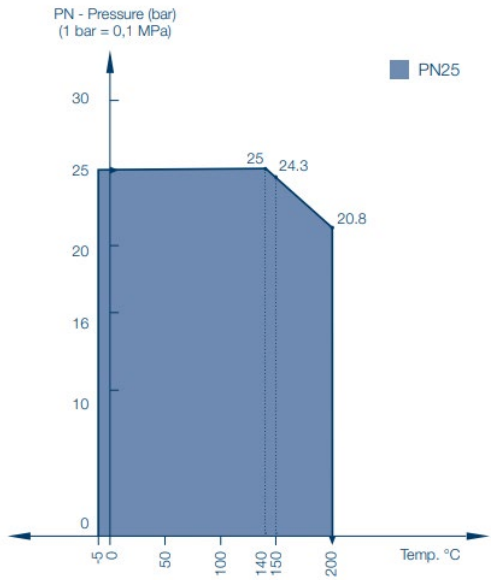
VALVE MODEL KHO-U

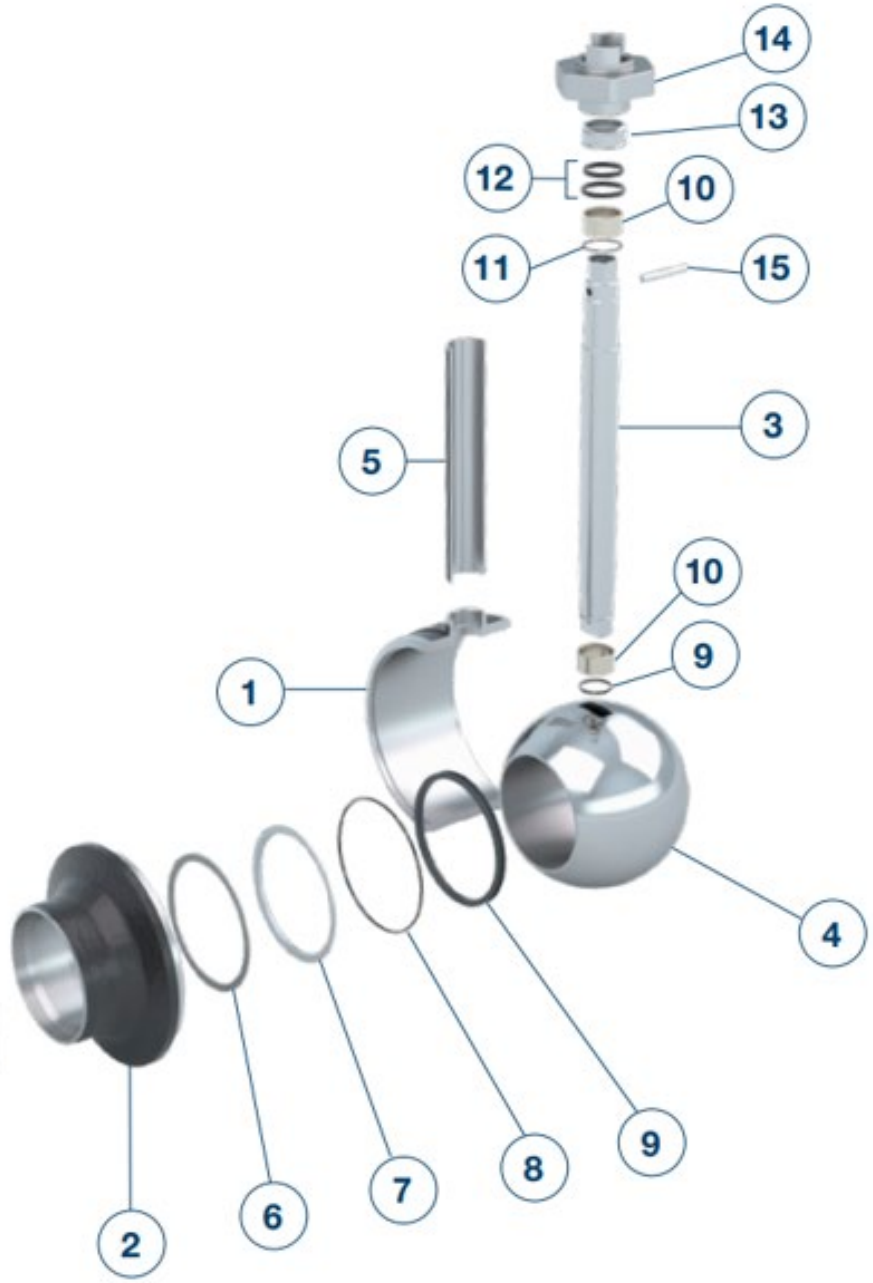
Bill of material

Parts list

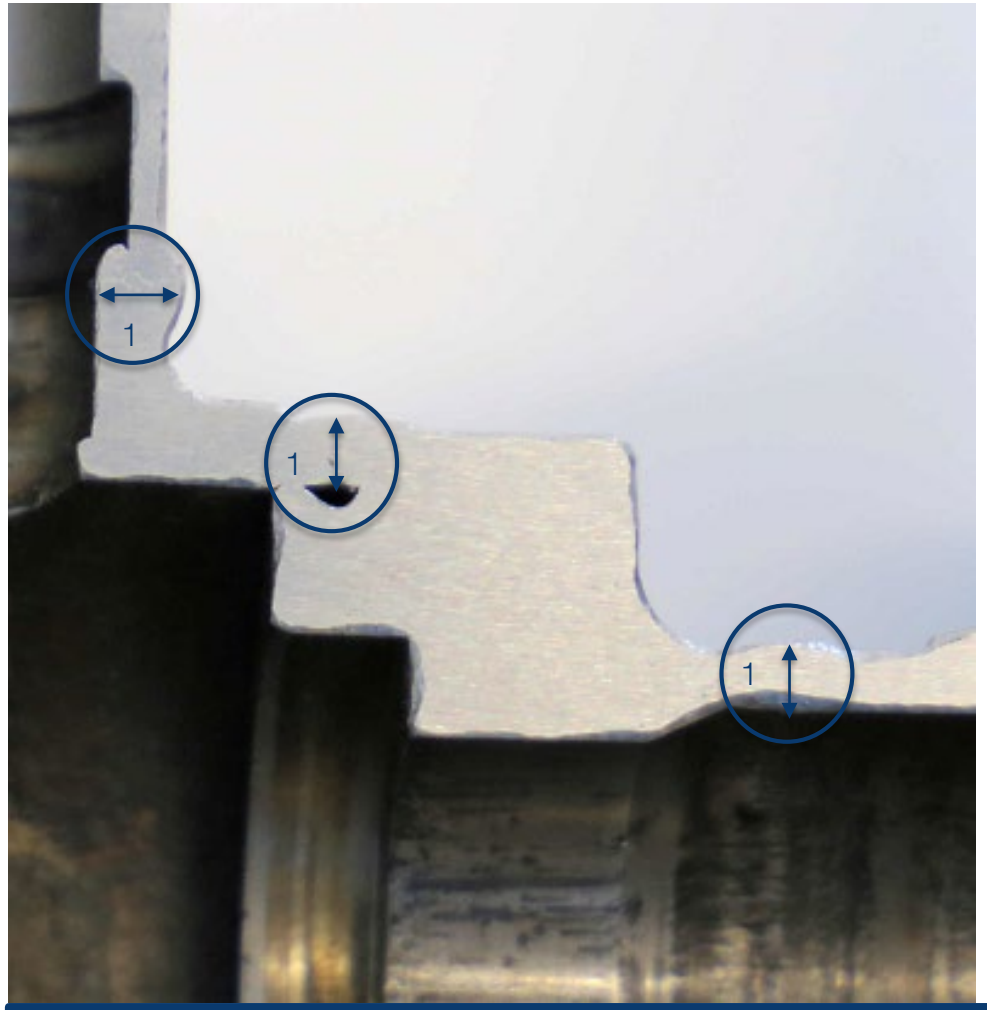
Pos.	number	name	material
1	1	Housing	1.0619
2	2	End-piece	S355J / S235J / 1.0619
3	1	Operating Shaft	1.4104
4	1	Ball	1.4308 / AISI 304L
5	1	Shaft	1.4301
6	2	Belleville washer	1.4310
7	2	Sealing ring holder	1.4301
8	2	Sealing ring	KFC-25
9	3	O-Ring	FEPM
10	2	Bearing bush	St/Bz/PTFE
11	1	Bearing disc	KFC-15
12	2	O-Ring	FKM
13	1	Bush insert	1.4104
14	1	Stem pipe upper part	1.4408
15	1	Grooved pin	1.4305
16	2	Weld-on pipe	P235GH / P265GH

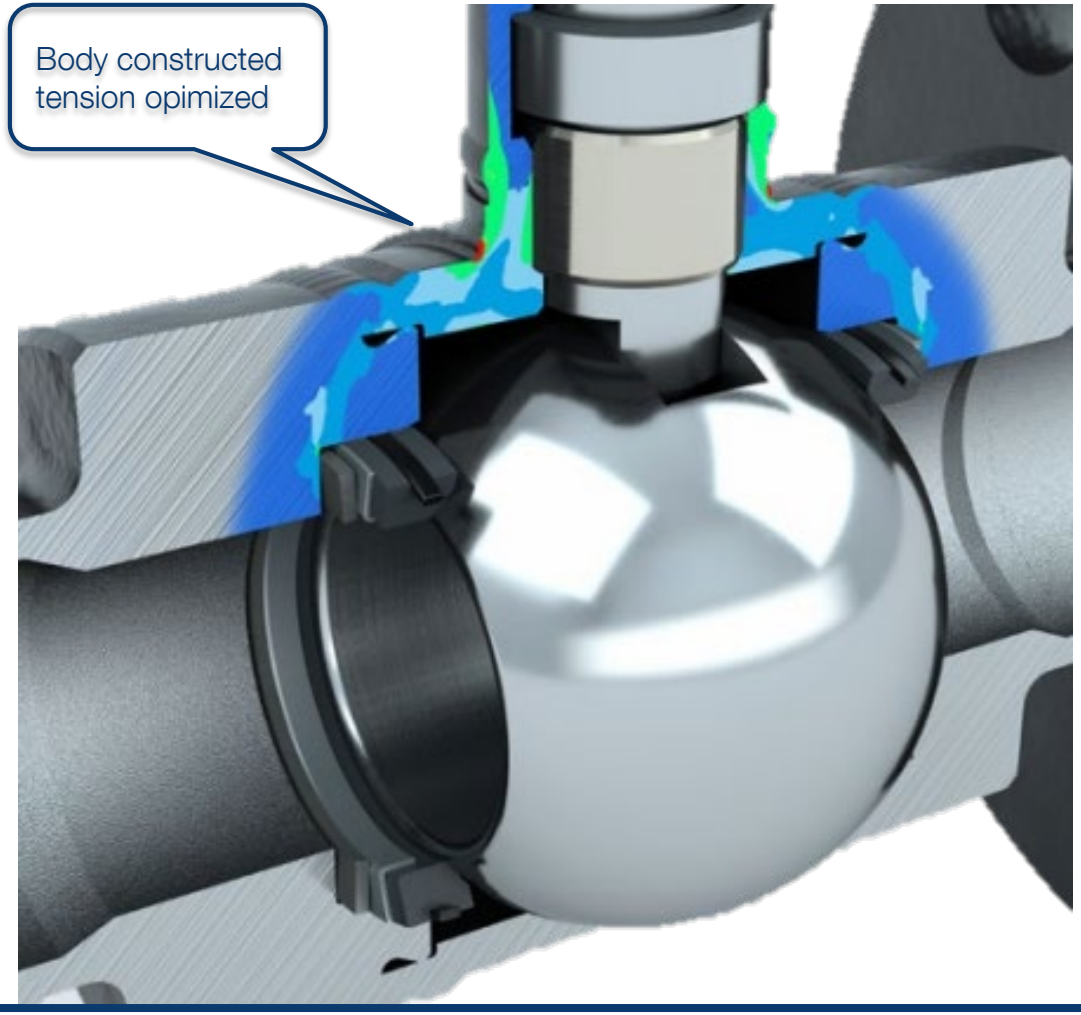
Pressure and temperature range KHO-U





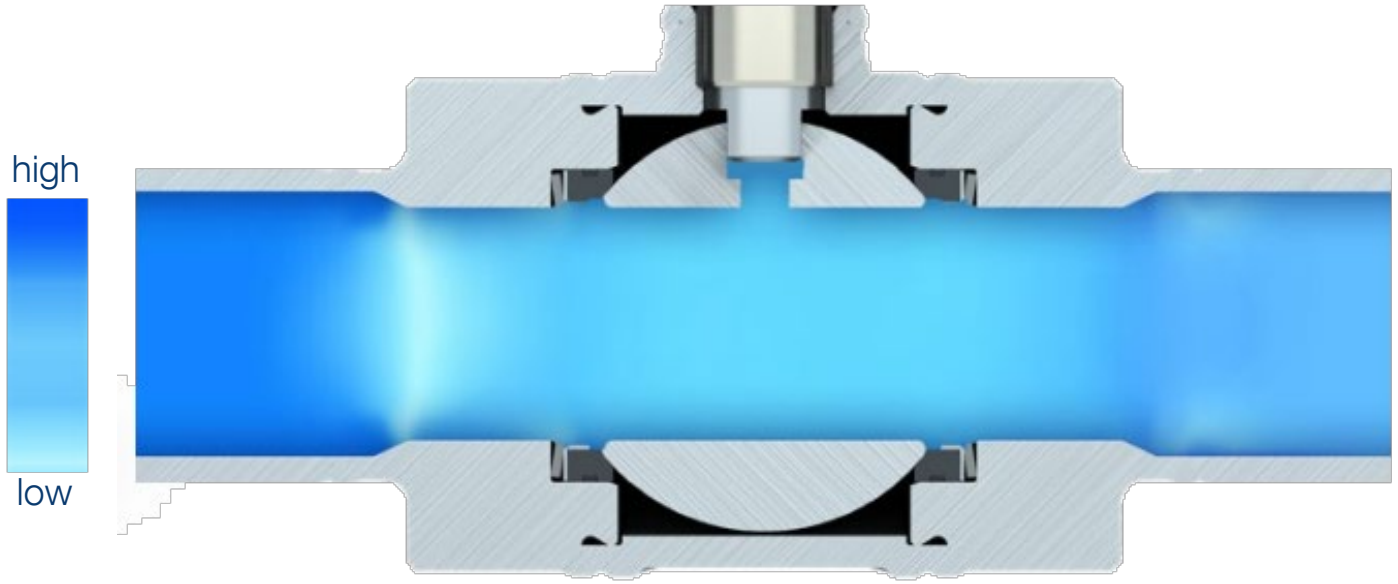
WELDING SEAMS & TENSION





(1) Each body weld seam is completely welded through the entire cross-section which minimizes the possibility of crack corrosion

THE BALL



District heating systems require a minimisation of pressure losses in order to prevent additional pump performance in piping systems.

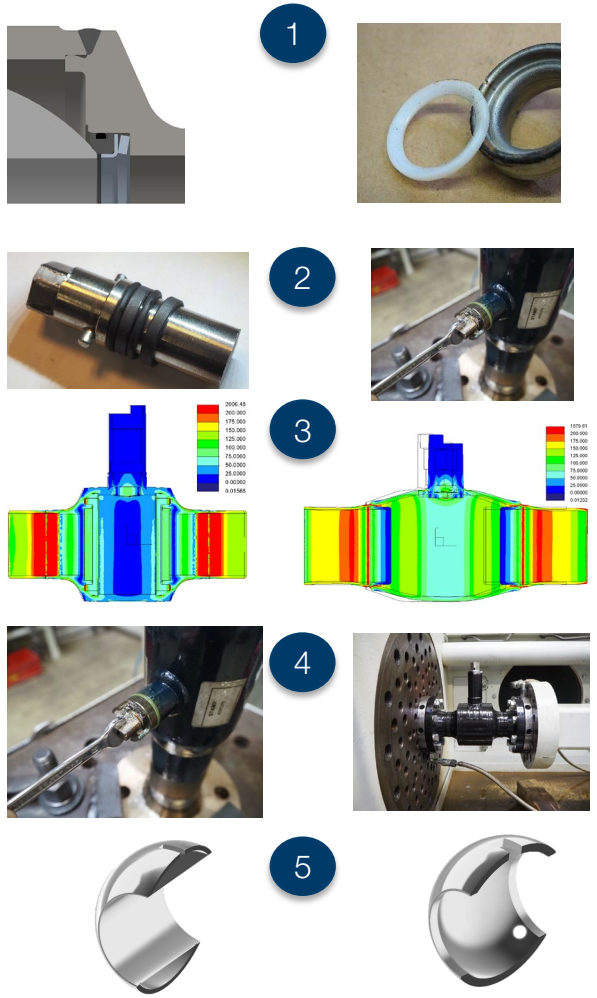
Full bore valves with a straight inner geometry shows the lowest pressure losses.

- Ball with full, cylindrical bore
- Until DN65 solid ball stainless steel 1.4401 or 1.4408
- DN80 upwards hollow ball with guided tube stainless steel AISI304L

COMPARISON

KHO ball valve vs sheet metal valve

KHO	Sheet metal valve
(1) Pre-stressed sealing system: Construction with belleville washer – this leads to a constant surface pressure of the sealing ring Unsusceptible to variation in temperature and pressure surge Back up sealing ring protects the cavity	(1) Other sealing system Construction with seal ring – this leads to plastic deformation at temperature changes Vulnerable to temperature and pressure changes No back up sealing for cavity protection
(2) Stem sealing Multiple stem sealing Exchangable on site Reliable at +200°C	(2) Stem sealing Simple stem sealing Not exchangable on site Leakage at higher temperatures
(3) Solid valve body design More robust one-piece cast steel housing with molded ball valve stem No welding seam at the flux of forces Based on the full penetration welding no media or dirt can enter the cracks – no crack corrosion possible	(3) Valve body design The weak stem construction at sheet metal ball valves lead to high forces where the welding's are placed -> risk of cracks No full penetration welding Critical welding seam at shaft area
(4) Easy operation 100% operational availability - 365 days Valve must be ready even with limited actuations Tested forces not only according to EN488, but as well according to the higher demand of the FW401	(4) Operation 100% availability not given due to weak sealing system At limited operations tend to block Partially fulfill EN488 Construction shows leakage after pressure and temperature tests
(5) Ball Cylindrical passage Lower pressure loss Less pumping energy	(5) Ball Hollow ball → no cylindrical passage Higher pressure loss No cost savings due to higher pumping energy



COMPARISON

KHO ball valve vs forged carbon steel valve

Böhmer

BBF/KSF-V-HE

DN25 – DN250 → PN25
Full & reduced bore

Floating ball, Trunnion mounted ≥ DN 125

Body forged carbon steel
Certified EN488
Temperature range up to +150°C

KLINGER

KHO-U

DN25 – DN125 → PN40, full & reduced bore
DN150 – DN250 → PN25, only full bore

Floating ball

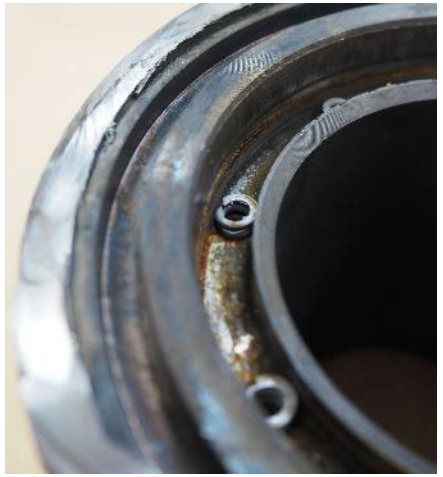
Body carbon steel casting
Certified EN488:2019, EHP003
Temperature range -5°C to +200°C

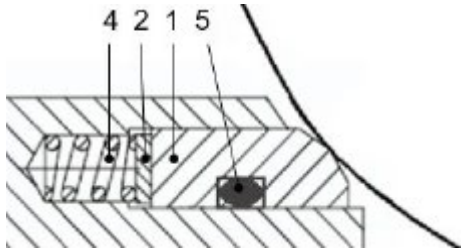
SEALING

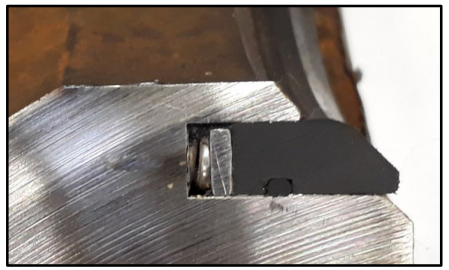
Böhmer

Pocket holes for springs are vulnerable to solids/impurities

Possibility of clogging/blocking → limited lifetime





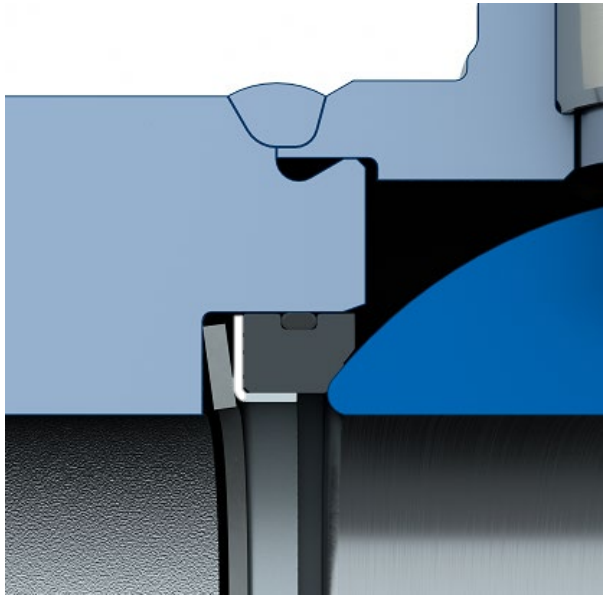


KLINGER

Open pre stressed sealing element is “self cleaning”.

No clogging or blocking

Tight up to 200°C for higher safety



WELDING

Böhmer

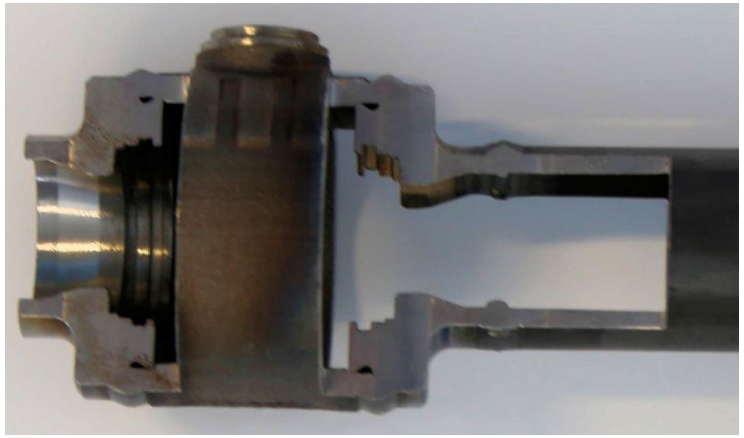
Stem on body

not properly welded → potential for stress corrosion cracking in area of high bending moment

End piece on body

No protection of ball during welding → ingress of welding drops

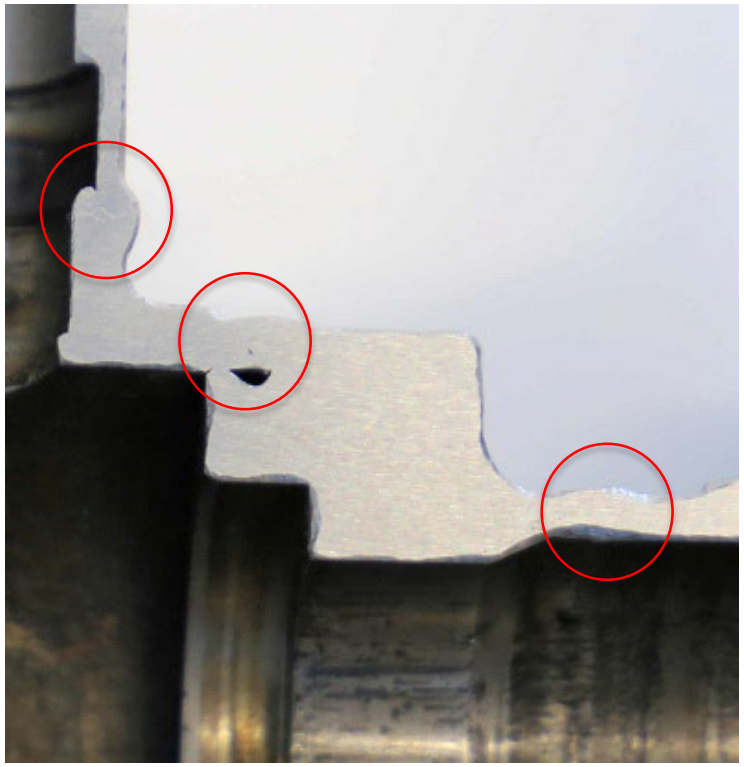
KLINGER



Casted housing allows for:

- » cleanly welded seam
- » Stress-optimized connection between shaft and housing

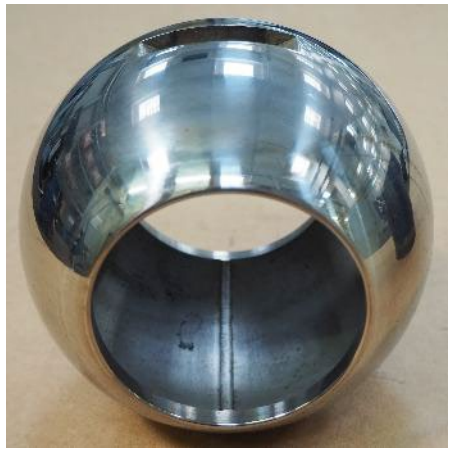
Protection of the ball during welding → special body design



BALL & STEM

Böhmer

- Hollow ball causes turbulences and energy losses
- Carbon steel shaft will corrode if not properly isolated

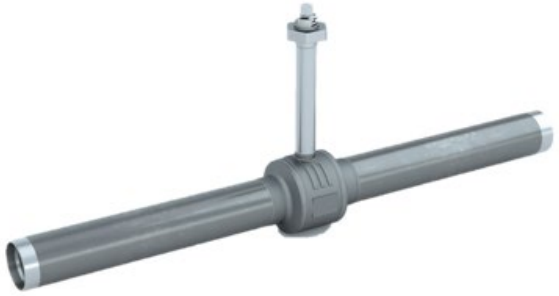


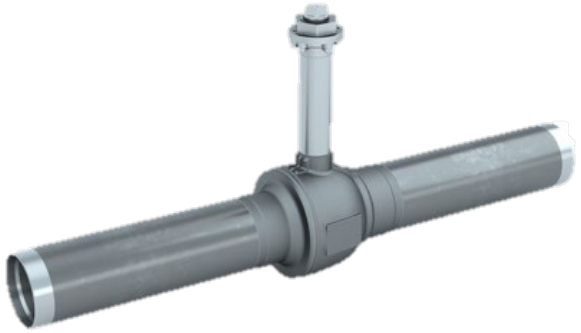
KLINGER

- Full passage ball → no losses
- Stainless steel shaft → no corrosion

EN488.2019 TEST

KHO-U & KHSVI-VVS





Test with compressive forces	EN488:2019	Applied test forces
Water temperature	90+-5°C	Depend on line size. Range 41kN to 4761 kN
Water pressure	PN of valve	
Test duration	48h	
Actuations	24x in 48h	

Test with tensile forces	EN488:2019	Applied test forces
Water temperature	25+-10°C	Depend on line size. Range 26kN to 3624 kN
Water pressure	PN of valve	
Test duration	48h	
Actuations	16x in 48h	

Test with bending forces	EN488:2019	Applied bending moments
Water temperature	25+-10°C	Depend on line size. Range 350Nm to 476400 Nm
Water pressure	PN of valve	
Test duration	2x8h	
Actuations	16x in 16h	

MONOBALL KHO

Gear sizing for KHO ISO TOP

KHO ISO TOP	DN	ISO TOP SIZE	Gear type ROTORK -20°C to +100°C 	Gear type AUMA -40°C to +80°C 	Gear type AUMA 0°C to +140°C 
	DN80	F10/F12	AB210N, F10	GS50, F10/F12	GS50/H, F10/F12
	DN100, 100R80	F10/F12	AB210N, F10	GS50, F10/F12	GS50/H, F10/F12
	DN125, 125R100	F10/F12	AB550N, F12	GS63, F12	GS63/H, F12
	DN150, 150R125	F12	AB550N, F12	-	GS63/H, F12
	DN200	F12	AB550N, F12	-	GS80/H, F12
	DN250	F12/F16	AB880N, F12	-	GS100/H, F16

APPLICATION DH: HEAT GENERATION

District heating water:

Media properties and effects on valves:

Hot water, softened, desalinated, deionised, with alkalising agents, high working temperature and pressure (range 120°C to 220°C, PN25), Temperature fluctuations, heat changes causes pipeline forces, very low operating cycles

- **Requirements for valves:**

Leakage rate A, robust valve body and reliable sealing system, long service life and easy handling, guaranteed function also at low operating cycles (no blocking) and stable torque, optional: Double Block & Bleed functionality (certified), SIL2, possibility to install mech. gears, electric or pneumatic actuators, line sizes DN15 to DN800

Suitable KLINGER products for district heating water:

- Ball valve Monoball KHO, DN20 to DN250/DN25R20 to 300R250, fully welded, soft seated KFC, leakage rate A, carbon steel body SIL 2

APPLICATION DH:
PRIMARY NETWORK, CHAMBER

District heating water:

Media properties and effects on valves:

Hot water, softened, desalinated, deionised, with alkalising agents, impurities and abrasive particles from the pipeline present in the district heating water, abrasive solids can clog the sealing system and cavity of a valve, high working temperature and pressure (range 120°C to 220°C, PN25), temperature fluctuations, heat changes causes pipeline forces, very low operating cycles, difficult installation location – hard to access due to installation in chambers, maintenance only at high costs possible, leakage to atmosphere

Requirements for valves:

Leakage rate A, no leakage to atmosphere, robust valve body and reliable sealing system (insensitive to pipe forces, temperature changes and impurities), long service life and easy handling, guaranteed function also at low operating cycles (no blocking) and stable torque, optional: Double Block & Bleed functionality (certified), SIL2, possibility to install mech. gears, electric or pneumatic actuators, flexible gear and shaft options, line sizes DN15 to DN800

Suitable KLINGER products for district heating water:

- Ball valve Monoball KHO, DN20 to DN250/DN25R20 to 300R250, fully welded, soft seated KFC, leakage rate A, carbon steel body SIL 2

APPLICATION DH : EXCHANGE STATION

District heating water:

Media properties and effects on valves:

Hot water, softened, desalinated, deionised, with alkalising agents, impurities and abrasive particles from the pipeline present in the district heating water, abrasive solids can clog the sealing system and cavity of a valve, high working temperature and pressure (range 120°C to 220°C, PN25), temperature fluctuations, heat changes causes pipeline forces, low operating cycles

Requirements for valves:

Leakage rate A

Robust valve body and reliable sealing system (insensitive to pipe forces, temperature changes and impurities), long service life and easy handling, function of the valve must be guaranteed also at low operating cycles (no blocking), optional: Double Block & Bleed functionality (certified), SIL2, possibility to install mech. gears, electric or pneumatic actuators, line sizes DN15 to DN800

Suitable KLINGER products for district heating water:

- Ball valve Monoball KHO, DN20 to DN250/DN25R20 to 300R250, fully welded, soft seated KFC, leakage rate A, carbon steel body SIL 2

APPLICATION DH: UNDERGROUND

District heating water:

Media properties and effects on valves:

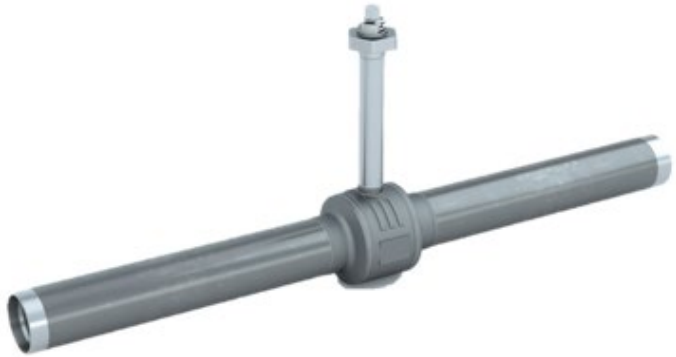
Hot water, softened, desalinated, deionised, with alkalising agents, high working temperature and pressure (range 120°C to 220°C, PN25), temperature fluctuations, abrasive solids can clog the sealing system and cavity of a valve, heat changes causes pipeline forces, installation underground, very low operating cycles, when installed underground, additional forces (compression, tensile or bending) will be applied on the valve due to movement of the ground, maintenance or valve exchange connected with high effort and costs

Requirements for valves:

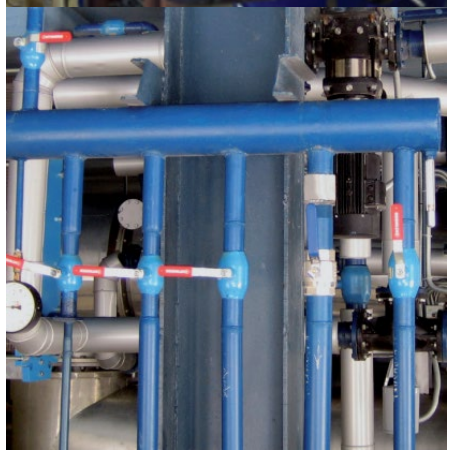
Tested and certified acc. EN488:2019 and EHP003, fully welded valve with isolation jacket – flexible solutions, leakage rate A, no leakage to atmosphere, robust valve body & reliable sealing system (resistant to pipe forces and temperature changes), long service life (maintenance free) and easy handling, guaranteed function also at low operating cycles (no blocking) and stable torque, SIL2, possibility to install mech. gears, electric or pneumatic actuators, line sizes DN150 to DN800

Suitable KLINGER products for district heating water:

- Ball valve Monoball KHO, DN20 to DN250/DN25R20 to 300R250, fully welded, as option pre-isolated, soft seated KFC, carbon steel body, EN488:2019 & EHP003 certificate



APPLICATION DH: SUBSTATION



District heating water:

Media properties and effects on valves:

Hot water, softened, desalinated, deionised, with alkalising agents, impurities and abrasive particles from the pipeline present in the district heating water, lower working temperature and pressure (60°C to 100°C, PN16)

Requirements for valves:

Leakage rate A, SIL 2, robust valve body and reliable sealing system (insensitive to impurities), long service life and easy handling, optional: Double Block & Bleed functionality (certified), low pressure drop, possibility to install mech. gears, electric or pneumatic actuators, line sizes DN15 to DN200

Suitable KLINGER products for district heating water:

- Ball valve Monoball KHO, DN20 to DN250/DN25R20 to 300R250, fully welded, soft seated KFC, carbon steel body

THANKS FOR YOUR ATTENTION!

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