



# KLINGER FLUID CONTROL

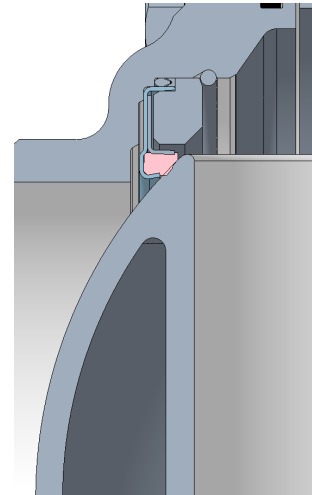
Ball valve model KHI-F, stainless steel & duplex „Advanced“



# KHI-F ADVANCED

## Agenda

- Construction
- Differences KHI vs KHI-F
- O-Ring construction
- Weight improvement
- Bearing
- Diversity
- Top flange ISO5211
- AUMA actuators
- AIR TORQUE actuators
- Application

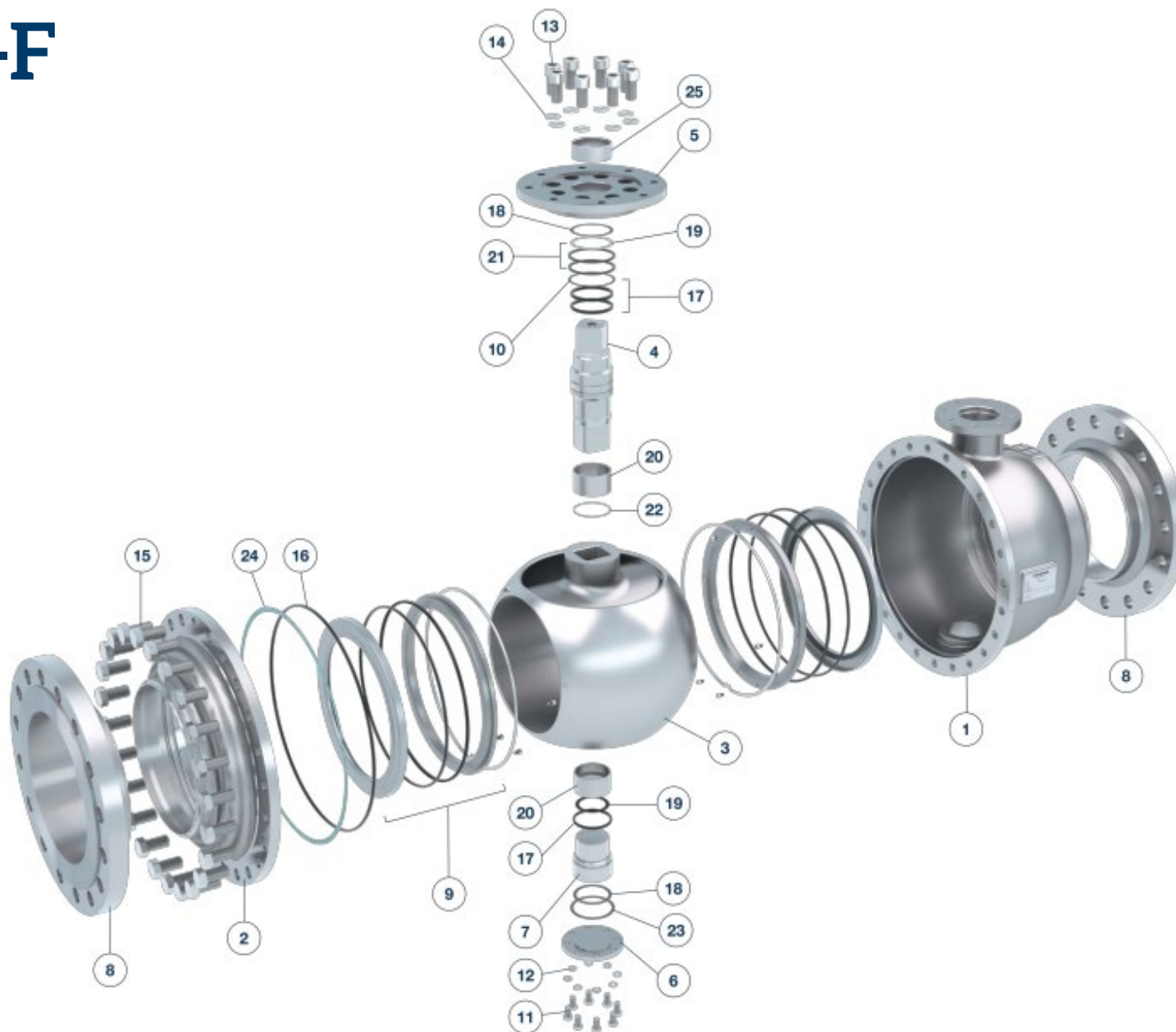


# BALL VALVE KHI-F

## Construction



| Pos | Qu          | Name                      | M2 (Xc)            | M3 (Xd)            |
|-----|-------------|---------------------------|--------------------|--------------------|
| 1   | 1           | housing                   | 1.4581 / 316Ti     | 1.4470 / 318LN     |
| 2   | 1           | cap                       | 1.4581 / 316Ti     | 1.4470 / 318LN     |
| 3   | 1           | ball                      | 1.4581 / 316Ti     | 1.4470 / 318LN     |
| 4   | 1           | shaft                     | 1.4404 / 316L      | 1.4462 / 318LN     |
| 5   | 1           | installation plate        | 1.4404 / 316L      | 1.4462 / 318LN     |
| 6   | 1           | bearing plug              | 1.4404 / 316L      | 1.4462 / 318LN     |
| 7   | 1           | bearing pin               | 1.4404 / 316L      | 1.4462 / 318LN     |
| 8   | 2           | weld neck flange          | 1.4571 / 316Ti     | 1.4462 / 318LN     |
| 9   | 2           | sealing element*          | variants available | variants available |
| 10  | 1           | Firesafe support washer** | 1.4571 / 316Ti     | 1.4462 / 318LN     |
| 11  | 6/8         | hex headscrew             | A4-70              | A4-70              |
| 12  | 6/8         | Wedge lock washer         | 1.4404 / 316L      | 1.4404 / 316L      |
| 13  | 8           | cylinder screw            | A4-70              | A4-70              |
| 14  | 8           | Wedge lock washer         | 1.4404 / 316L      | 1.4404 / 316L      |
| 15  | 16/18/20/24 | hex headscrew             | A4-70              | A4-70              |
| 16  | 1           | O-Ring *                  | variants available | variants available |
| 17  | 3           | O-Ring **                 | variants available | variants available |
| 18  | as needed   | tolerance washer          | 1.4404 / 316L      | 1.4404 / 316L      |
| 19  | 2           | friction washer **        | PEEK               | PEEK               |
| 20  | 2           | bearing bush **           | SS - PTFE          | 1.4462 - PTFE      |
| 21  | 2           | Firesafe packing ring **  | K35-C + Aramid     | K35-C + Aramid     |
| 22  | 1           | support ring **           | PTFE               | PTFE               |
| 23  | 1           | flat seal **              | C4430              | C4430              |
| 24  | 1           | flat seal *               | C4430              | C4430              |
| 25  | 1           | bearing bush              | BZ - PTFE          | BZ - PTFE          |



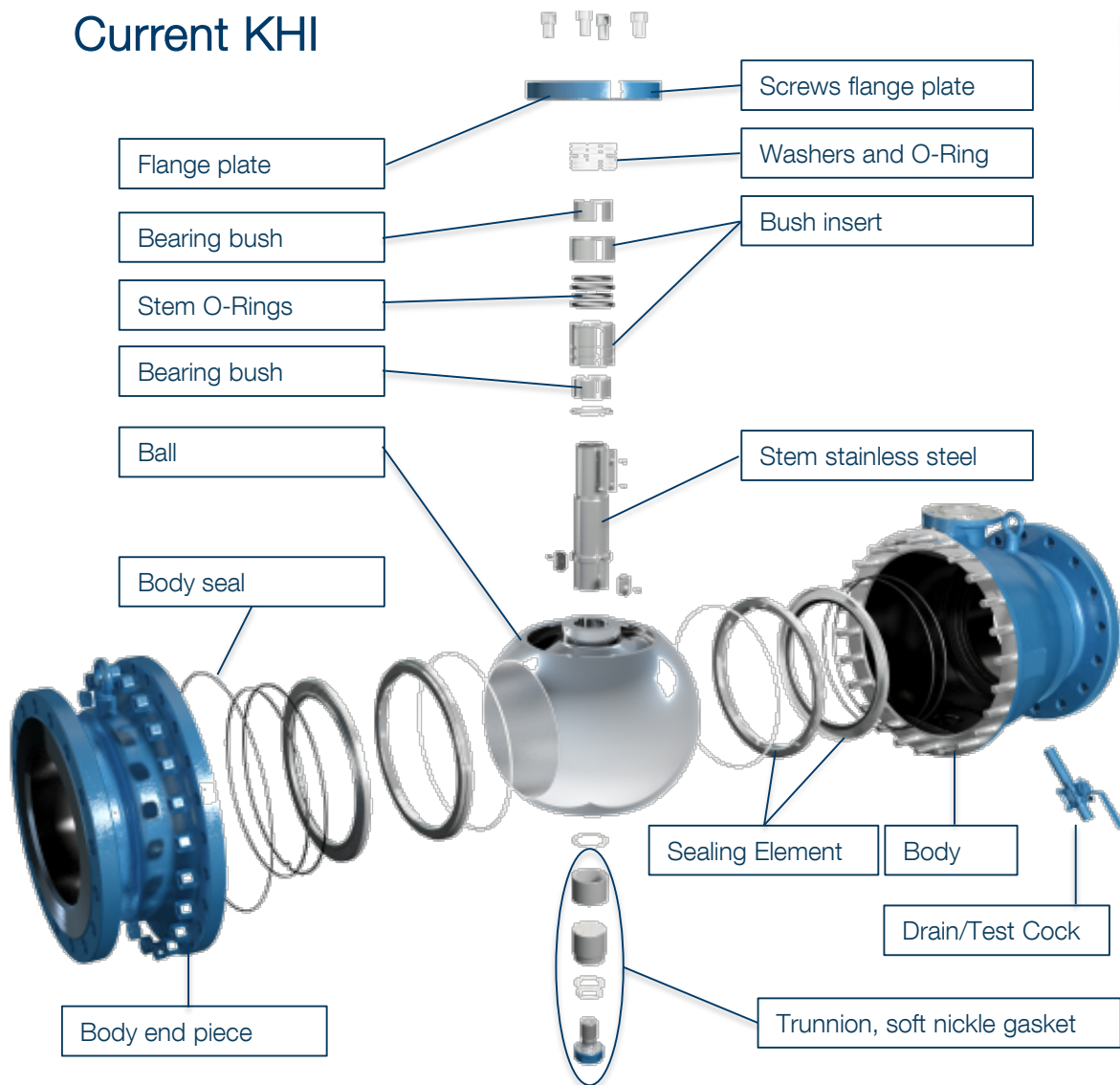
\* full spare part kit (including \*\*)

\*\* shaft + bearing spare part kit

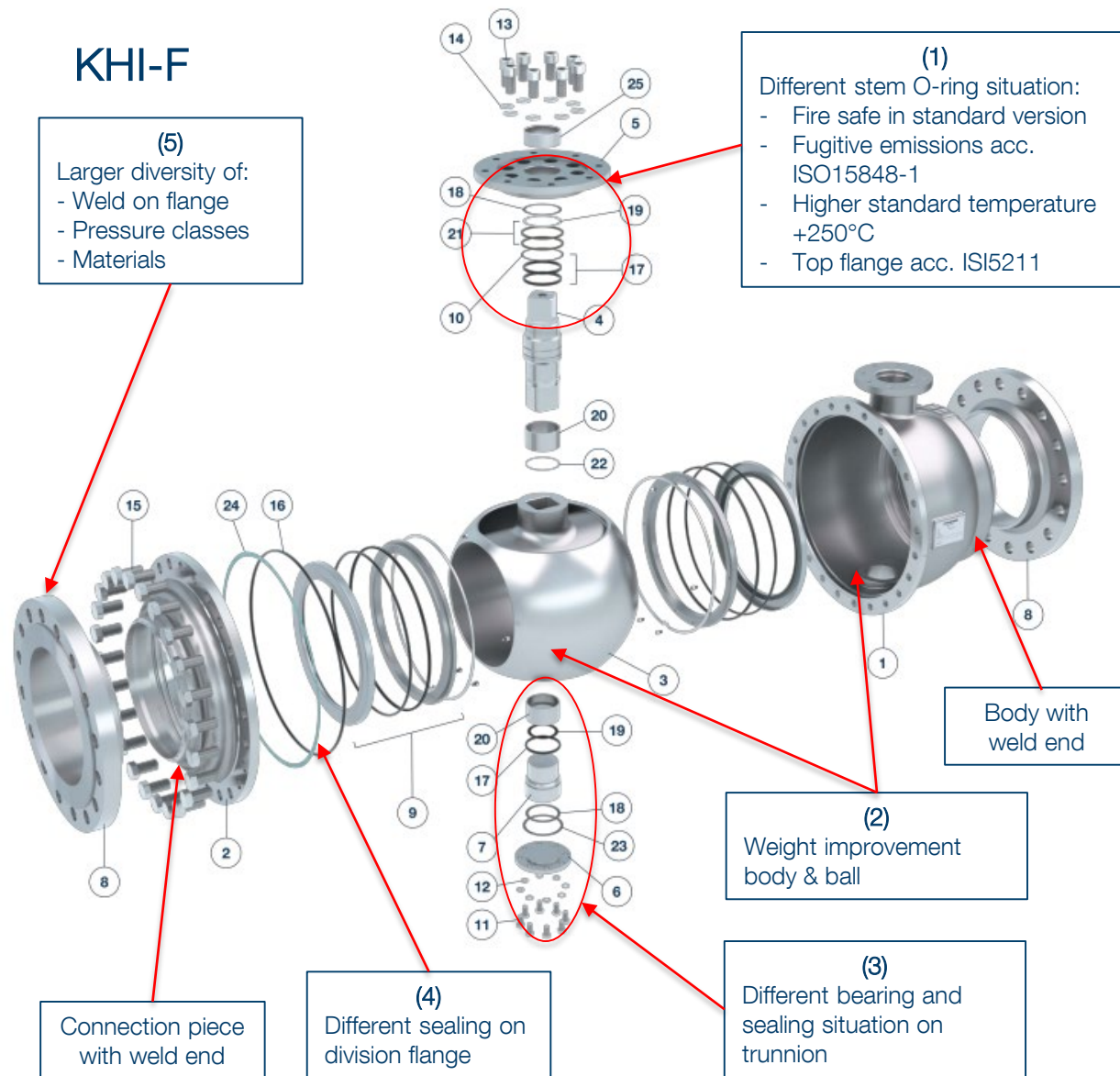
# DIFFERENCES CONSTRUCTION



## Current KHI



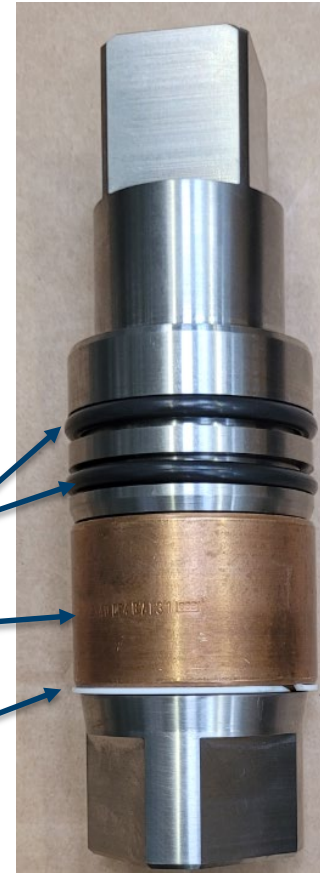
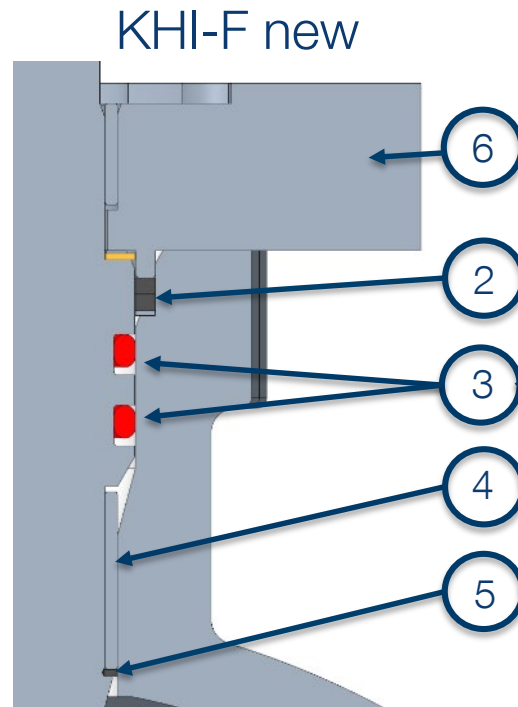
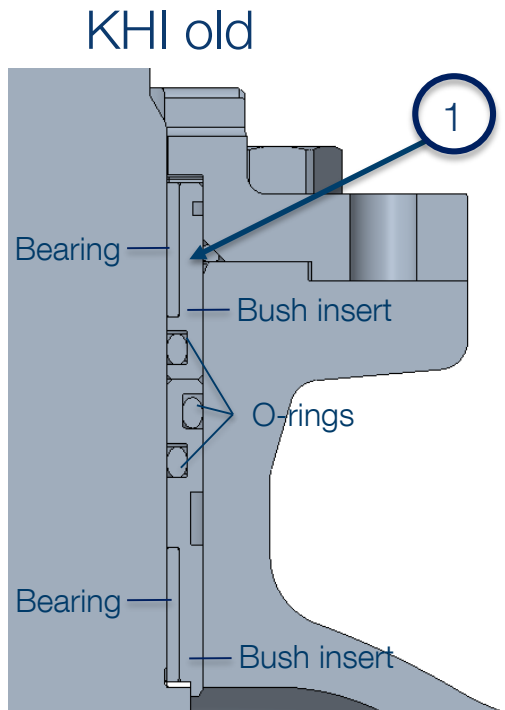
## KHI-F





# (1) DIFFERENT O-RING SITUATION

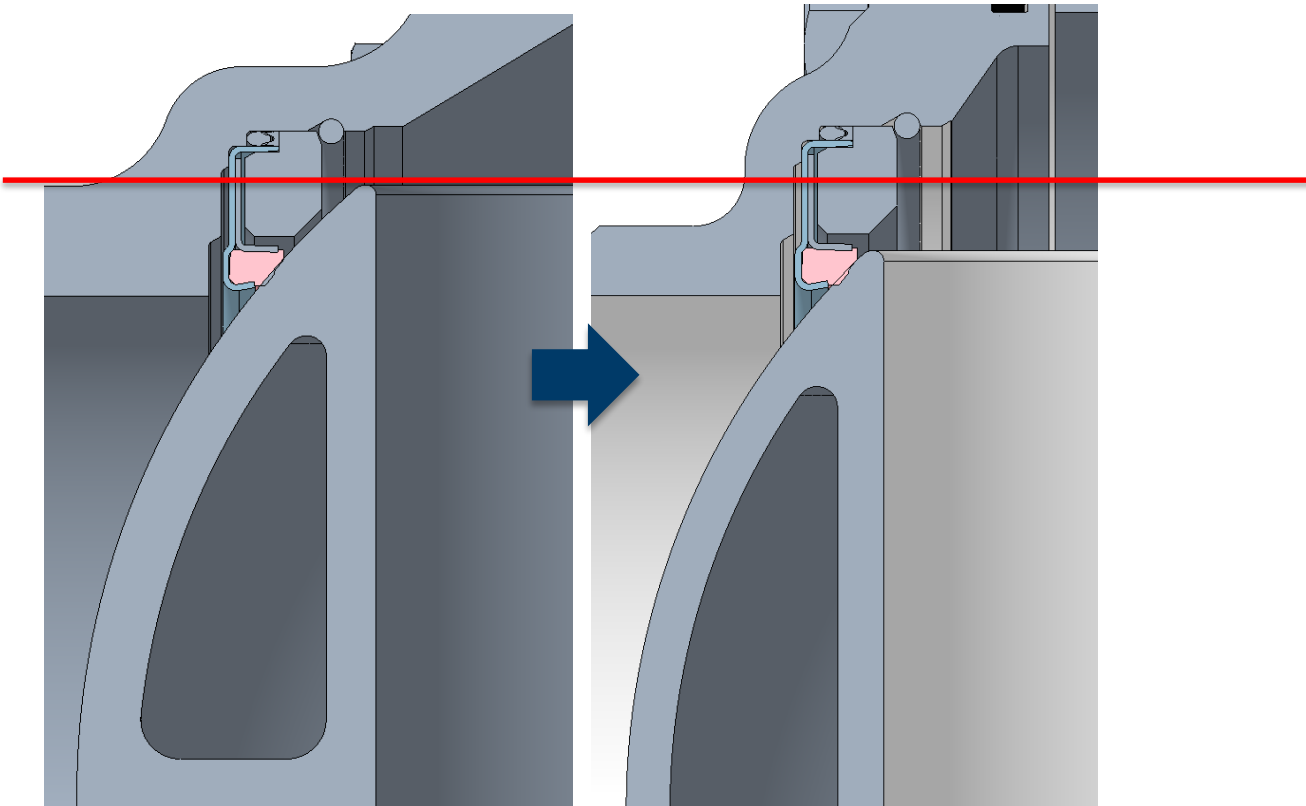
Stem



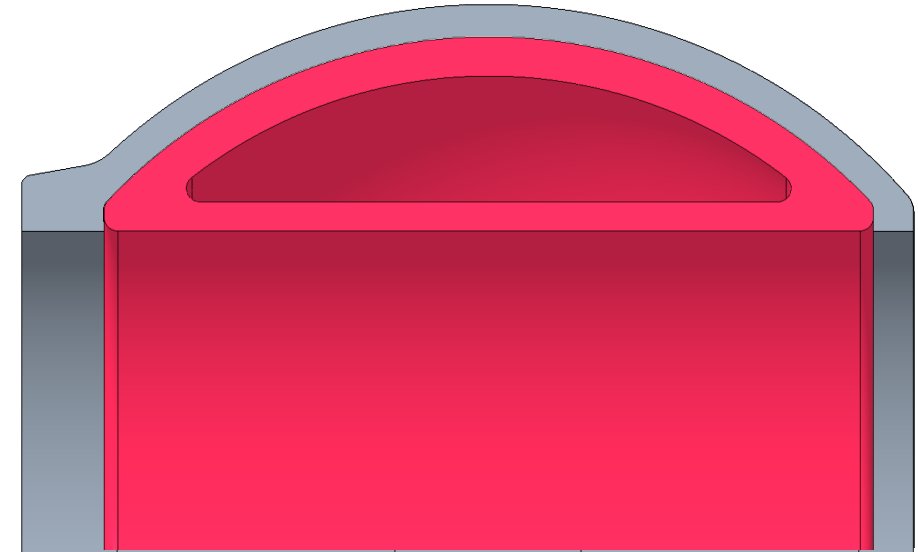
- (1) Removing of bush insert
  - (2) Graphite sealing → Fire Safe acc.  
ISO10497 & API607 in standard version
  - (3) Reduce the number of O-rings
  - (4) One bigger bearing bush
  - (5) Back u ring KFC added
  - (6) Top Flange acc. to ISO 5211: for direct  
connection to gearbox or bridge
- Higher standard temperature range up to  
+250°C
- Fulfillment of fugitive emissions acc.  
ISO15848-1

## (2) WEIGHT IMPROVEMENT

### Ball



Smaller balls for some sizes (e.g. DN200) => smaller housing too BUT: Identical sealing element



Thinner Walls on casted ball:

- » Calculated with Math Cad acc. to EN12516-2
- » Example for wall thickness DN200 ball at pass through: reduction from 13,5mm to 8,5mm due to improvement of tolerance
- » Total weight reduction ball 43%: 42,3kg => 24,1kg



## (2) WEIGHT IMPROVEMENT

Body: New casting methods

### Investment Casting (Wax)

- » Better tolerance class than sand casting: DCTG 12 => 9
- » Less material add on, which needs to be removed during process
- » Con: wax will bend on its own weight at bigger sizes

### Replicast (polystyrene foam instead of wax)

- » Stable at bigger mould
- » Even smaller tolerance class: DCTG8
- » Con: only economical at higher sizes and stainless/duplex

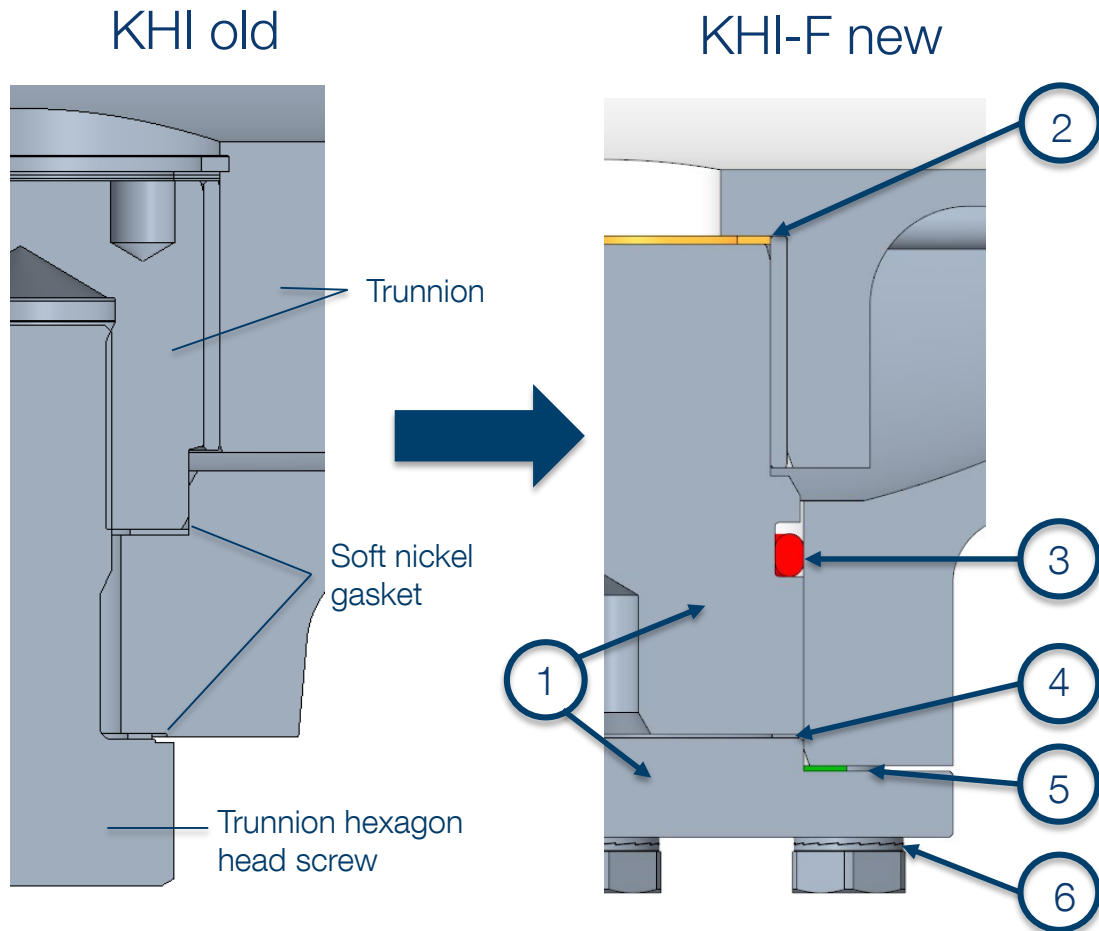
| DN  | Carbon Steel             | Stainless Steel            | Duplex |
|-----|--------------------------|----------------------------|--------|
| 150 | WAX casting raw          | WAX casting fully machined |        |
| 200 |                          |                            |        |
| 250 |                          |                            |        |
| 300 | Replicast fully machined | Replicast fully machined   |        |
| 350 |                          |                            |        |
| 400 |                          |                            |        |
| 450 |                          |                            |        |
| 500 |                          |                            |        |
| 600 |                          |                            |        |

| Housing  | PN40 old | PN40 new + flange | Reduction | PN25 old | PN25 new + flange | Reduction |
|----------|----------|-------------------|-----------|----------|-------------------|-----------|
| DN200 Xc | 88kg     | 61kg              | -31%      | 56,8kg   | 47kg              | -36%      |
| DN400 Xc | 374kg    | 239kg             | -36%      | n.a.     | 182kg             | -51%      |



# (3) DIFFERENT BEARING

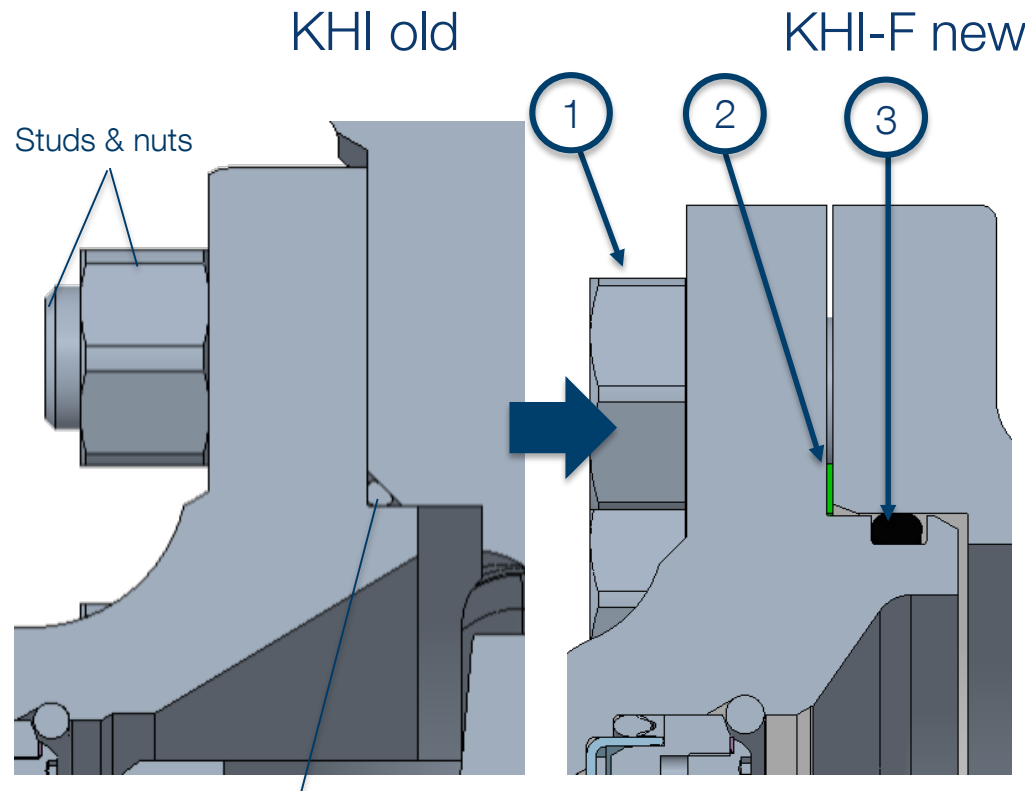
## Trunnion



1. Simpler parts
2. Friction washer
3. O-Ring for better leak proof
4. Distance washer
5. Added C4430 sealing
  - » Fire safe acc. ISO10497 & API607 and fugitive emission acc. ISO15848-1
6. Lock washer (Nordlock)
  - » no loosen because of vibration

# (4) DIFFERENT SEALING

Division flange



O-ring AFLAS or spiral wound for high temperature

- (1) Screws instead of stud & nut
- (2) Added C4430 sealing
  - » Firesafe acc. ISO10497 & API607 and fugitive emission acc. ISO15848-1
- (3) O-Ring as radial sealing
  - » better handling & leak proofness



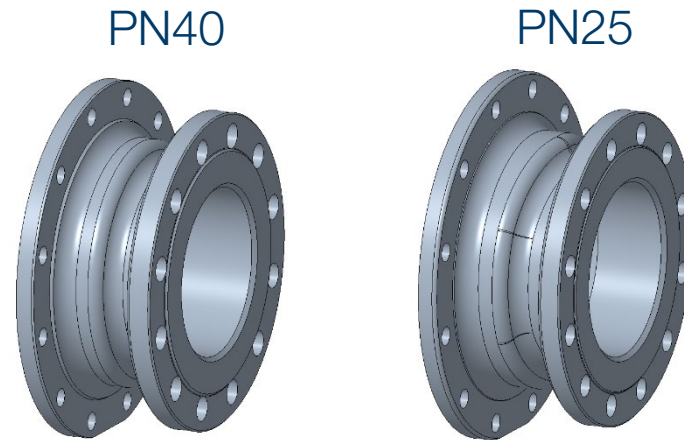


## (5) LARGER DIVERSITY

Weld neck flange, pressure classes, body material

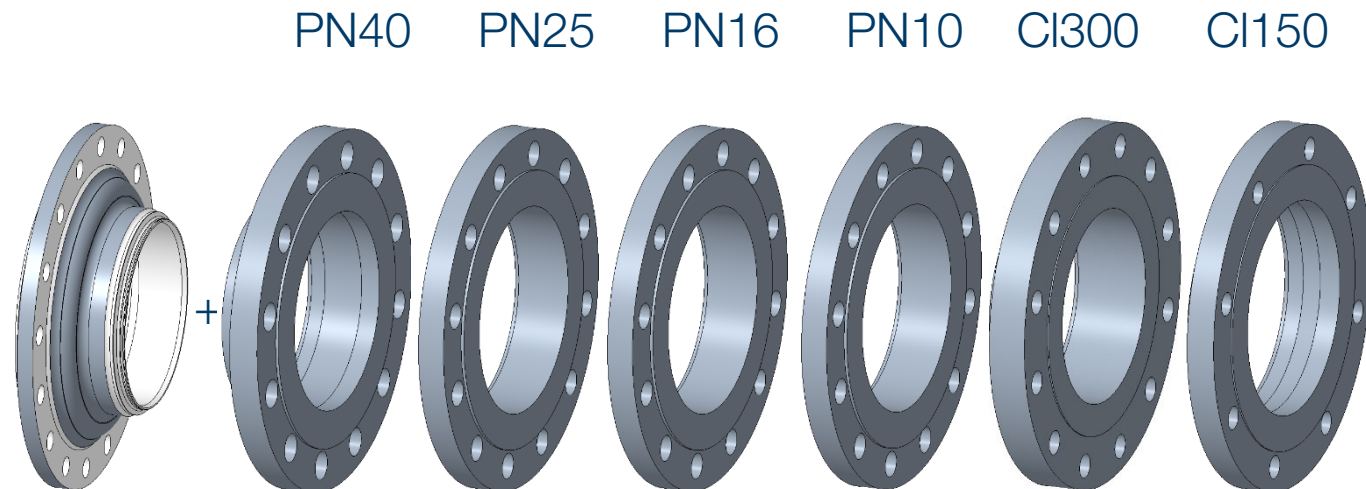
**Current:** one cast for every pressure class

- » Few pressure classes
- » Partially not machined acc. Standard, just drilled



**New:** One cast for all pressure classes

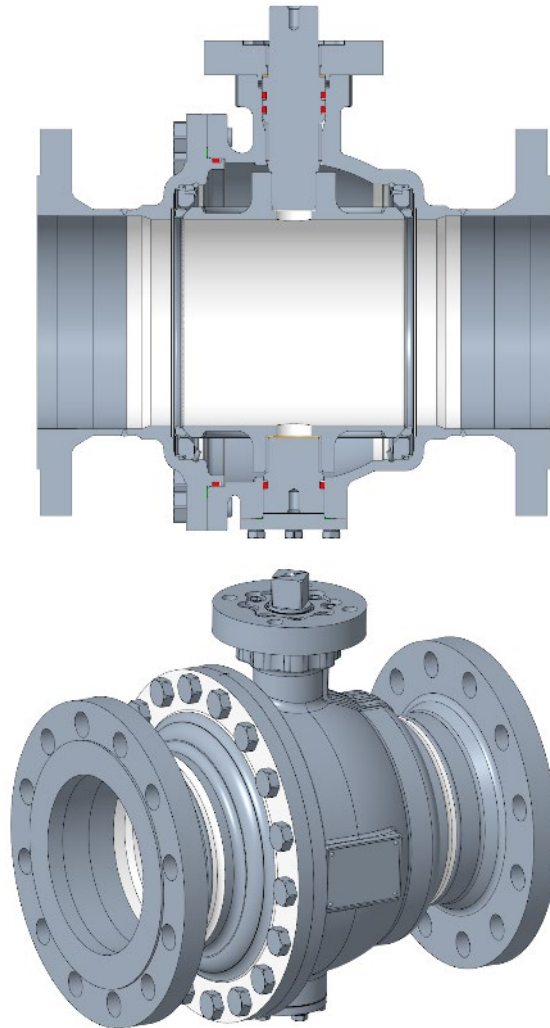
- » Always the right part on stock
- » all pressure classes incl. PN 10 and PN 16 possible
- » Body material stainless steel or duplex





# SUMMARY

## Improvements



- » Fugitive emissions acc. to ISO 15848-1
- » Fire safe in standard version
- » Max. temperature: 250°C (current design 200°C standard and 260°C hot water version)
- » EN12266-1 (ISO5208) P12 leakage rate IV-S1 acc. to EN 60534-4. for metal seat
- » Weight optimized ball and body casting (investment, replicast)
- » Body material stainless steel 1.4581 or duplex 1.4470
- » Larger flange diversity
- » Top Flange acc. to ISO 5211: for direct connection to gearbox or bridge
- » Optimized stem O-ring construction
- » Optimized sealing construction at division flange
- » Optimized trunnion and sealing

# TOP FLANGE

ISO 5211

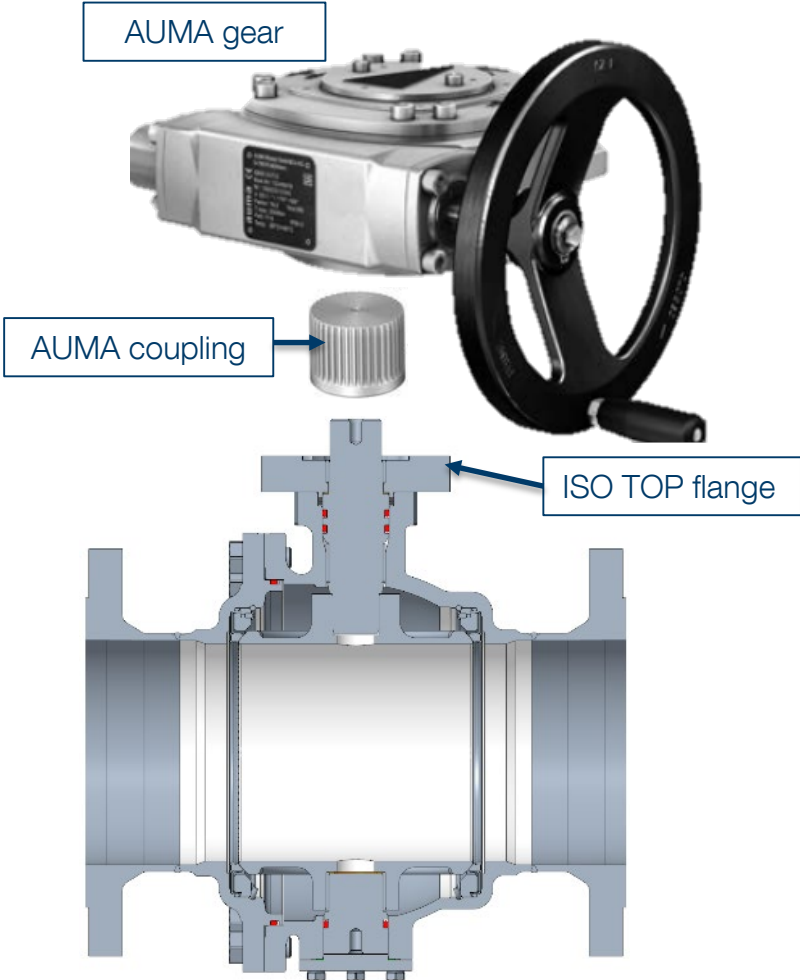


| Size  | PN             | Square | Feather key | ISO5211 soft seat | ISO5211 metal seat |
|-------|----------------|--------|-------------|-------------------|--------------------|
| DN150 | 10/16/25/CL150 | SW36   | 48          | F14               | F14                |
| DN200 |                | SW36   | 48          | F14               | F14                |
| DN250 |                | SW46   | 60          | F16               | F16                |
| DN300 |                | SW55   | 72          | F25               | F25                |
| DN350 |                | SW55   | 72          | F25               | F30                |
| DN400 |                | SW55   | 72          | F25               | F30                |

| Size  | PN       | Square | Feather key | ISO5211 soft seat | ISO5211 metal seat |
|-------|----------|--------|-------------|-------------------|--------------------|
| DN150 | 40/CL300 | SW36   | 48          | F14               | F14                |
| DN200 |          | SW36   | 48          | F14               | F16                |
| DN250 |          | SW46   | 60          | F16               | 25                 |
| DN300 |          | SW55   | 72          | F25               | F25                |
| DN350 |          | SW55   | 72          | F25               | F30                |
| DN400 |          | SW55   | 72          | F25               | F30                |

# AUMA GEAR „GS“

Hand operated



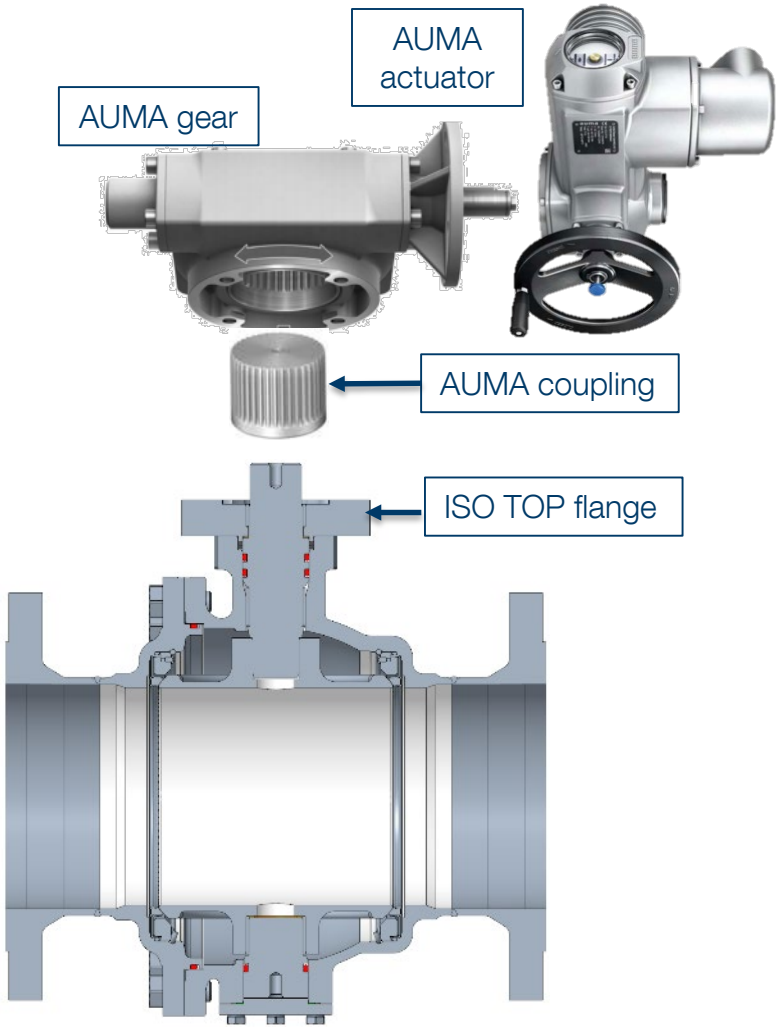
| Size  | PN             | ISO5211 soft seat | Gear type soft seat | ISO5211 metal seat | Gear type metal seat |
|-------|----------------|-------------------|---------------------|--------------------|----------------------|
| DN150 | 10/16/25/CL150 | F14               | GS 80.3-53:1        | F14                | GS 80.3-53:1         |
| DN200 |                | F14               | GS 80.3-53:1        | F14                | GS 80.3-53:1         |
| DN250 |                | F16               | GS 100.3-208:1      | F16                | GS 100.3-208:1       |
| DN300 |                | F25               | GS 125.3-208:1      | F25                | GS 125.3-208:1       |
| DN350 |                | F25               | GS 125.3-208:1      | F30                | GS160.3-(442:1)      |
| DN400 |                | F25               | GS 125.3-208:1      | F30                | GS160.3-(442:1)      |

| Size  | PN       | ISO5211 soft seat | Gear type soft seat | ISO5211 metal seat | Gear type metal seat |
|-------|----------|-------------------|---------------------|--------------------|----------------------|
| DN150 | 40/CL300 | F14               | GS 80.3-53:1        | F14                | GS 80.3-53:1         |
| DN200 |          | F14               | GS 80.3-53:1        | F16                | GS 100.3-208:1       |
| DN250 |          | F16               | GS 100.3-208:1      | 25                 | GS 125.3-208:1       |
| DN300 |          | F25               | GS 125.3-208:1      | F25                | GS 125.3-208:1       |
| DN350 |          | F25               | GS 125.3-208:1      | F30                | GS160.3-(442:1)      |
| DN400 |          | F25               | GS 125.3-208:1      | F30                | GS160.3-(442:1)      |



# AUMA AUTOMATION

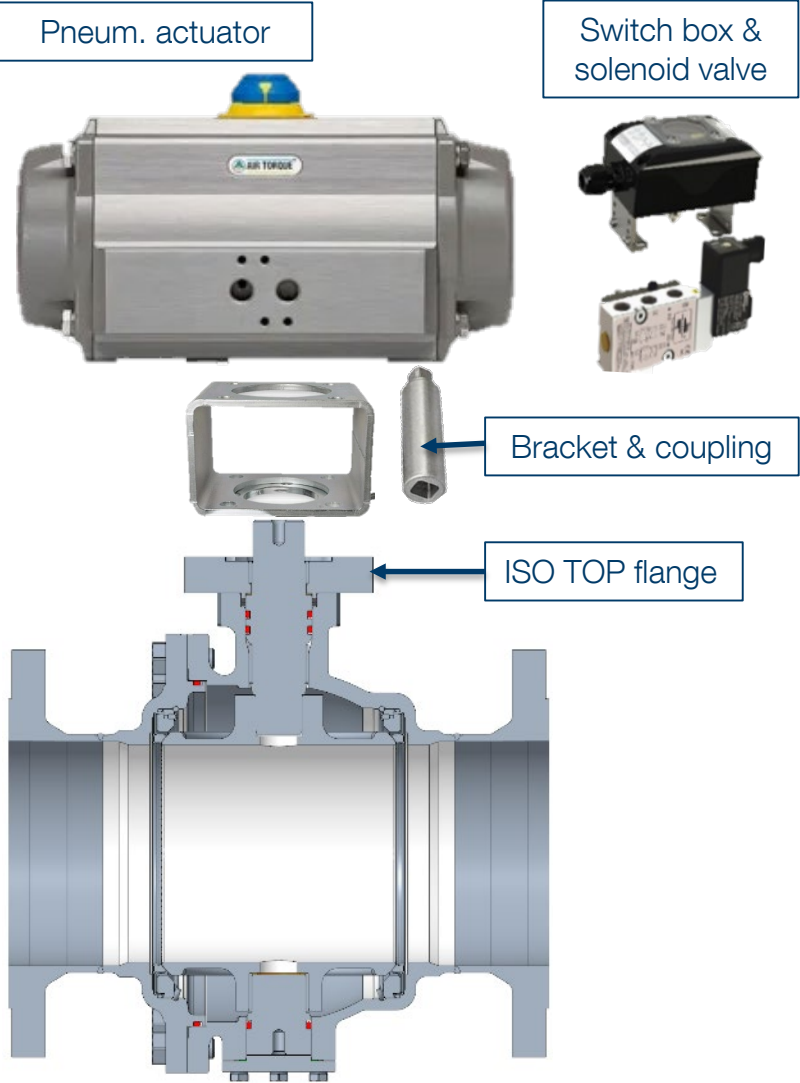
“SA” actuators



| Size  | PN             | ISO5211<br>soft seat | Gear/actuator type soft<br>seat | ISO5211<br>metal seat | Gear/actuator type metal<br>seat |
|-------|----------------|----------------------|---------------------------------|-----------------------|----------------------------------|
| DN150 | 10/16/25/CL150 | F14                  | GS 80.3-F14 (53:1) SA07.6       | F14                   | GS 80.3-F14 (53:1) SA10.2        |
| DN200 |                | F14                  | GS 80.3-F14 (53:1) SA07.6       | F14                   | GS 80.3-F14 (53:1) SA10.2        |
| DN250 |                | F16                  | GS 100.3-F16 (208:1)<br>SA07.6  | F16                   | GS 100.3-F16 (208:1) SA07.6      |
| DN300 |                | F25                  | GS 125.3-F25 (208:1)<br>SA07.6  | F25                   | GS 125.3-F25 (208:1) SA10.2      |
| DN350 |                | F25                  | GS 125.3-F25 (208:1)<br>SA10.2  | F30                   | GS160.3-F30 (442:1) SA07.6       |
| DN400 |                | F25                  | GS 125.3-F25 (208:1)<br>SA10.2  | F30                   | GS160.3-F30 (442:1) SA10.2       |
| Size  | PN             | ISO5211<br>soft seat | Gear/actuator type soft<br>seat | ISO5211<br>metal seat | Gear/actuator type metal<br>seat |
| DN150 | 40/CL300       | F14                  | GS 80.3-F14 (53:1) SA10.2       | F14                   | GS 80.3-F14 (53:1) SA10.2        |
| DN200 |                | F14                  | GS 80.3-F14 (53:1) SA10.2       | F16                   | GS 100.3-F16(208:1) SA07.6       |
| DN250 |                | F16                  | GS 100.3-F16 (208:1)<br>SA07.6  | F25                   | GS 125.3-F25 (208:1) SA10.2      |
| DN300 |                | F25                  | GS 125.3-F25 (208:1)<br>SA10.2  | F25                   | GS160.3-F25 (442:1) SA07.6       |
| DN350 |                | F25                  | GS 125.3-F25 (208:1)<br>SA10.2  | F30                   | GS160.3-F30 (442:1) SA10.2       |
| DN400 |                | F25                  | GS 125.3-F25 (208:1)<br>SA10.2  | F30                   | GS160.3-F30 (442:1) SA10.2       |

# PNEUM. ACTUATOR

Air Torque

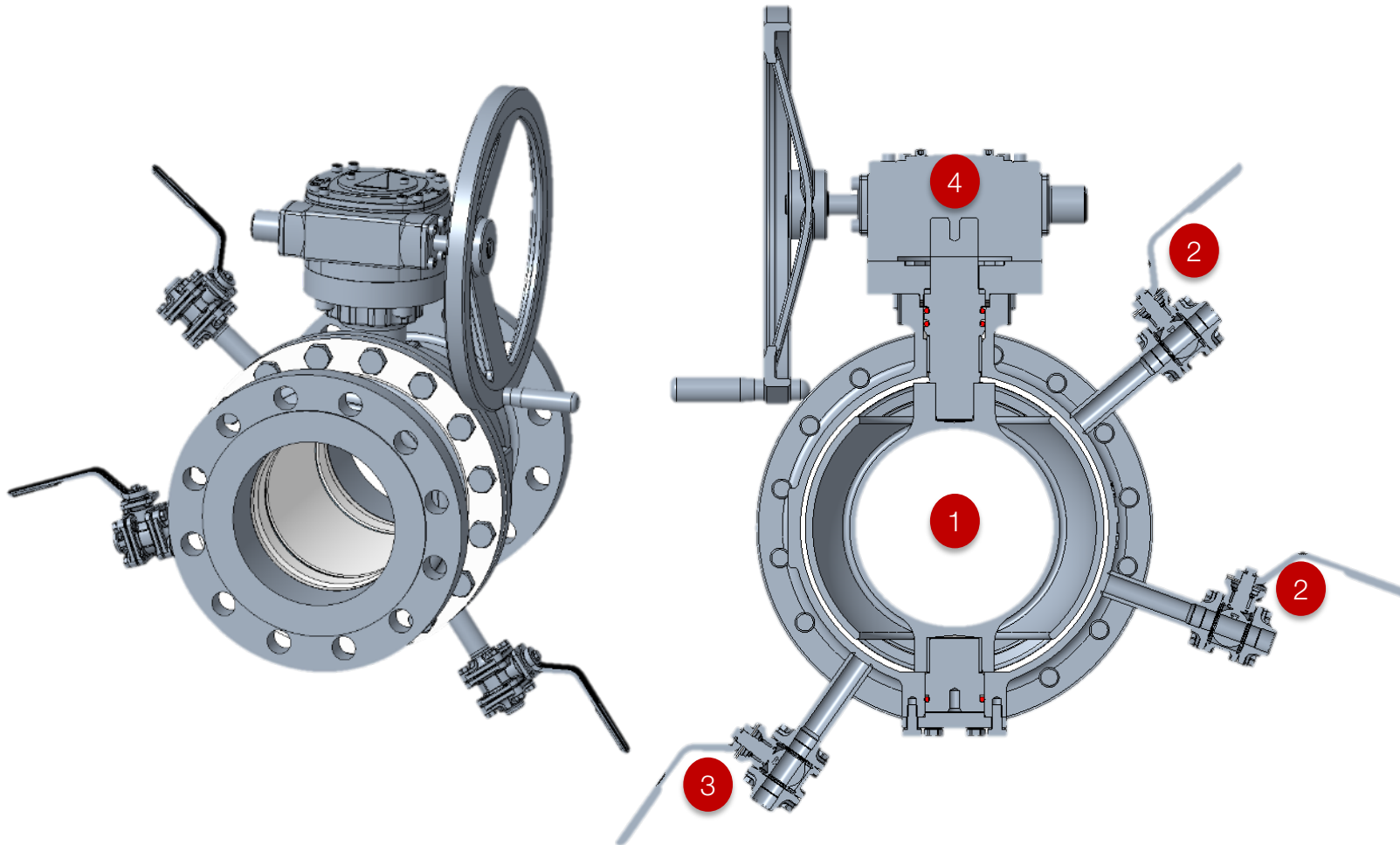


| Size  | PN             | Air supply for actuator min. 5 bar |                         |                          |                          |
|-------|----------------|------------------------------------|-------------------------|--------------------------|--------------------------|
|       |                | Single acting soft seat            | Double acting soft seat | Single acting metal seat | Double acting metal seat |
| DN150 | 10/16/25/CL150 | AT651U-S10-F16/SW46                | AT551U-DA-F14/SW36      | AT751U-S10-F16/SW46      | AT651U-DA-F16/SW46       |
| DN200 |                | AT701U-S10-F16/SW46                | AT651U-DA-F16/SW46      | AT751U-S10-F16/SW46      | AT651U-DA-F16/SW46       |
| DN250 |                | AT751U-S10-F16/SW46                | AT701U-DA-F16/SW46      | AT1001U-S10-F25/SW55     | AT751U-DA-F16/SW46       |
| DN300 |                | AT1001U-S10-F25/SW55               | AT801U-DA-F25/SW55      | n.a.                     | AT1001U-DA-F25/SW55      |
| DN350 |                | n.a.                               | AT1001U-DA-F25/SW55     | n.a.                     | n.a.                     |
| DN400 |                | n.a.                               | AT1001U-DA-F25/SW55     | n.a.                     | n.a.                     |

| Size  | PN       | Air supply for actuator min. 5 bar |                         |                          |                          |
|-------|----------|------------------------------------|-------------------------|--------------------------|--------------------------|
|       |          | Single acting soft seat            | Double acting soft seat | Single acting metal seat | Double acting metal seat |
| DN150 | 40/CL300 | AT751U-S10-F16/SW46                | AT651U-DA-F16/SW46      | AT751U-S10-F16/SW46      | AT651U-DA-F16/SW46       |
| DN200 |          | AT751U-S10-F16/SW46                | AT651U-DA-F16/SW46      | AT801U-S10-F16/SW46      | AT701U-DA-F16/SW36       |
| DN250 |          | AT1001U-S10-F25/SW55               | AT751U-DA-F16/SW46      | AT1001U-S10-F25/SW55     | AT1001U-DA-F25/SW46      |
| DN300 |          | n.a.                               | AT1001U-DA-F25/SW55     | n.a.                     | AT1001U-DA-F25/SW55      |
| DN350 |          | n.a.                               | AT1001U-DA-F25/SW55     | n.a.                     | n.a.                     |
| DN400 |          | n.a.                               | AT1001U-DA-F25/SW55     | n.a.                     | n.a.                     |

# APPLICATION KHI-F

For geothermal water DN15 - DN400



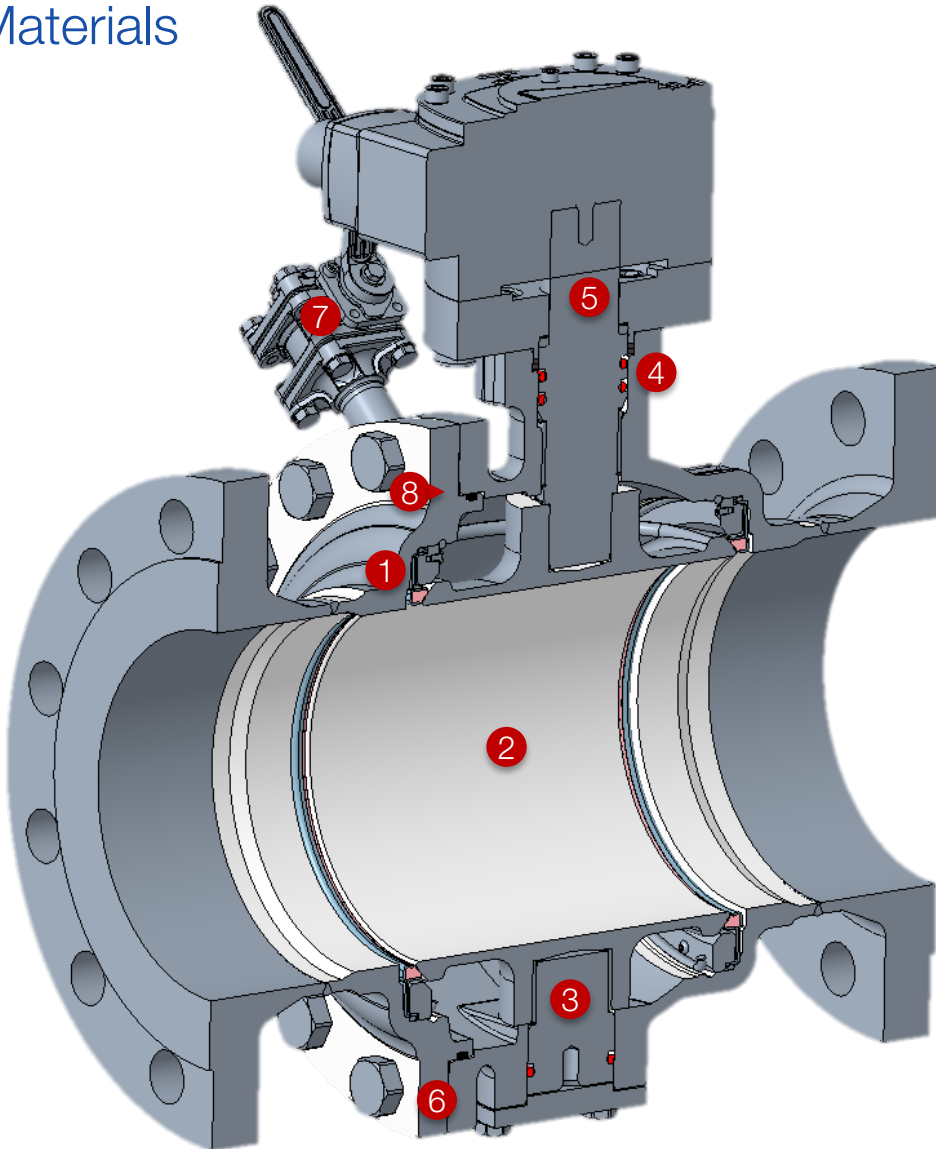
Ball valve design model KHI:

- » (1) Full, cylindrical bore.
- » (2) Two flushing valves model KHA-S for seat cleaning and flushing.
- » (3) One test/ drain valve model KHA-S for cavity draining.
- » (4) Actuation with mechanical gear from AUMA.
- » 2- piece body design Gehäuse screwed.
- » Trunnion mounted ball.
- » Line size range DN150 to DN400.
- » Pressure stage PN25 and PN40.
- » Temperature range -10°C to +200°C.
- » Flange version: Flanges EN1092-1, Form B1.
- » Body length flange version acc. EN558 GR12.
- » Bidirectional flow.
- » Installation in any position possible (horizontal, vertically etc.).



# APPLICATION KHI-F

## Materials



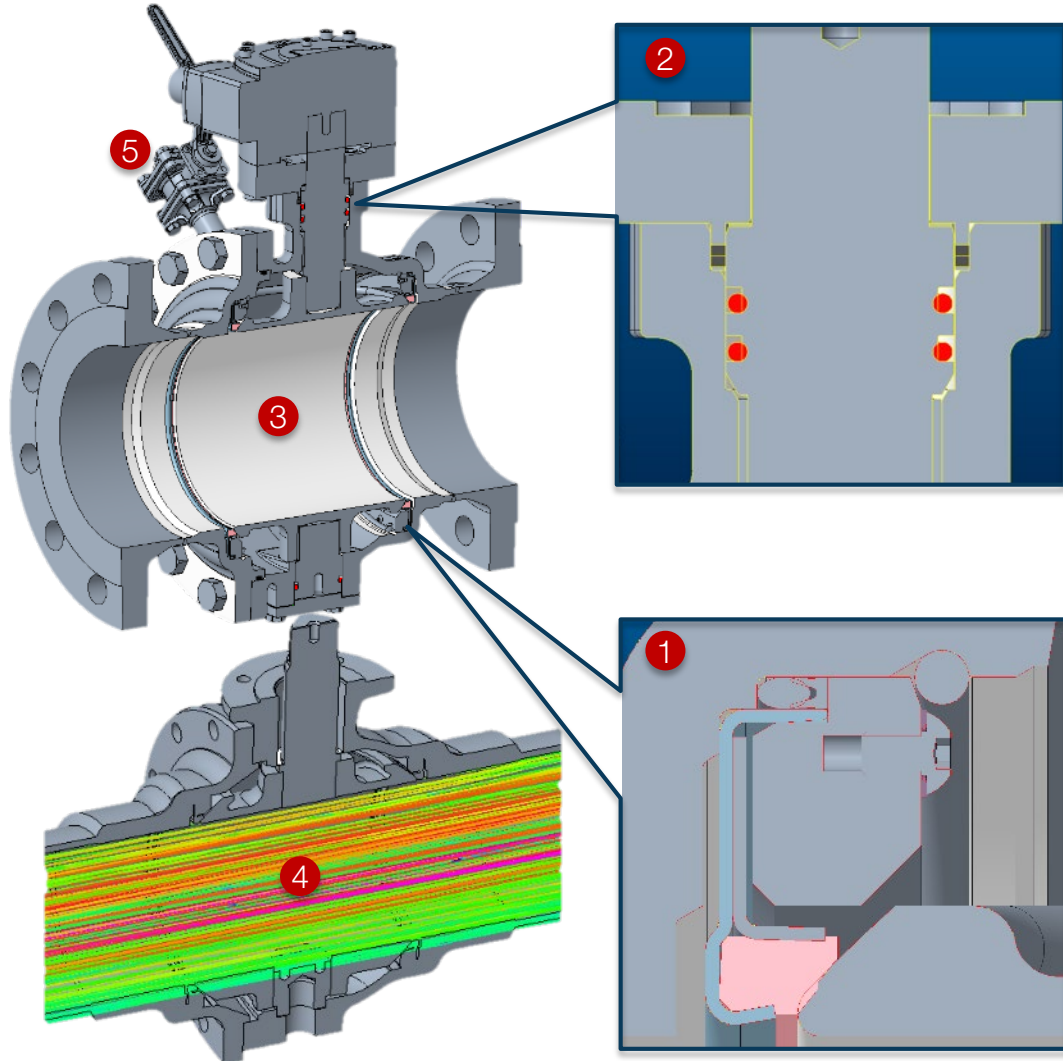
- » (1) Material sealing elements (seats): stainless steel or duplex (soft seated also available).
- » (2) Ball material 1.4581 stainless steel or duplex.
- » (3) Trunnion stainless steel or duplex with additional AFLAS (FEPM) O-ring.
- » (4) 4-fold stem sealing: two AFLAS (FEPM) O-rings and 2 graphite rings.
- » (5) Stem 1.4404 or duplex.
- » (6) Body stainless steel 1.4581 or duplex.
- » (7) Material drain/test and flushing valves: 1.4408 or Duplex.
- » (8) Material seal housing pitch : One AFLAS (FEPM) O-ring and one C4430 gasket.

In general, the choice of material for housings, wetted parts and usage of flushing valves depends mainly on the water composition.



# APPLICATION KHI-F

## Advantages



- » (1) The metallic seat is insensitive to solids in the water. This minimises wear on the sealing seat and increases the service life of the valve. The rear milling behind the sealing element allows solids to circulate, which prevents clogging or blocking. The 2-piece housing makes it possible to replace the sealing seats.
- » (2) The 4-fold seal on the stem can be replaced while the valve is installed.
- » (3) The ball is cast in one piece and therefore very robust and insensitive to pressure shocks. The chrome layer on the ball has the greatest possible surface hardness and the lowest roughness. → Scratch resistant to solids. Medium particles cannot adhere to the ball. The ball passage is cylindrical without obstacles, which prevents turbulence in the medium.
- » (4) Straight internal geometry (no sharp corners/edges/reductions) of the valve avoids "scaling" and allows laminar flow. The housing is made of cast material and is insensitive to pressure-temperature fluctuations and pipeline forces.
- » (5) Additional flushing connections allow cleaning of the sealing seats. Flushing is usually done with acid. The cavity of the valve can be emptied regularly via the test/drain valve.



# APPLICATION KHI-F

KHI-F ball valve in the Pulp & Paper industry



**For media:**

Black – green & white liquor

**(1) Stem sealing:**

Aflas O-Rings (200°C)

**(2) Sealing elements:**

Metal seated stainless steel

**(3) Body:**

Stainless steel 1.4581

Flanged ends

**(4) Ball:**

1.4581 stainless steel chrome coated

# THANKS FOR YOUR ATTENTION!

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