ARMATUREN
free of cavities & maintenance

engineered.
fast.
dynamic.

Type VARIO
Sampling plug valves

Product leaflet

Type VARIO

Sampling System for freely definable sample volume

for liquid media
Sampling volume / operation: freely selectable
V_P 100 / 250 / 450 / 900 / 1800 ml

- **freely definable representative sample volume**

PN 10 - 100 / Class 150 - 600
Connection: DN 6 - 25 / NPS ¼ - 1
Tube fitting

Ventilation:
internally back to system

Design characteristics

- pressure-free sampling (positive overlap)
- closed system
- cavity-free
- spilling eliminated and free of contamination
- safe and simple operation
- absolutely tight
- compact design
- several samplers combinable
- couplings between valves free of clearance

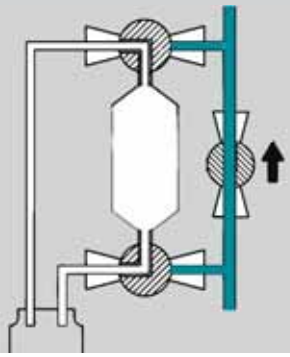
Options

- wall bracket
- materials of valves, pipeline and integrated sample container: Stainless steel, others on request
- flange connection or higher nominal sizes on request
- protection box
- needle system or clamping bottle holder with bayonet fixing
- with actuator

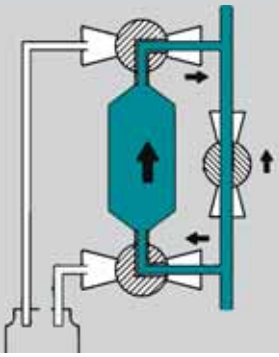
PT diagram, plug types, sealing systems, material selection: see catalogue part ENGINEERING

Safety first !

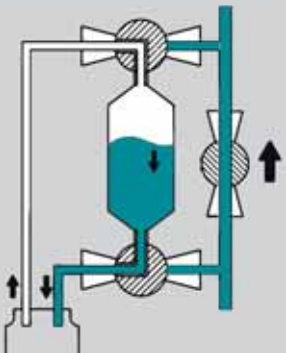
Basic position



Circulation



Sample drawing



Functionality

A pressure difference [Δ-p] of at least 0.5 bar must be created between VARIO flow and return for sufficient system flushing (AZ recommendation)

Due to the integrated stainless steel sample container it is possible to take larger and absolutely representative sample quantities.

Basic sample volumes:

- 100 ml
- 250 ml
- 450 ml
- 900 ml
- 1800 ml

Customized sample volumes on request

Protection box example:

- sampling system in isolated box
- sampling quantity 500 ml
- Nitrogen purge
- heating / cooling
- bottle holder with needle system

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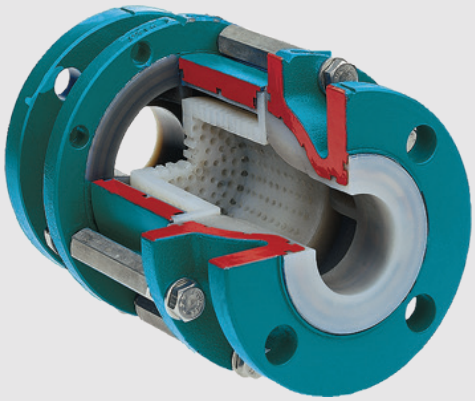
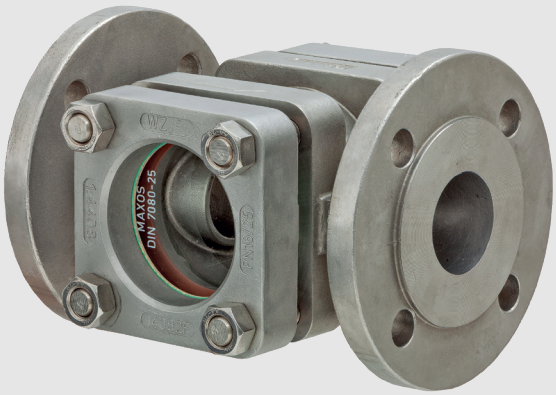
Piping accessories

Ball check valves, strainers and sight glasses

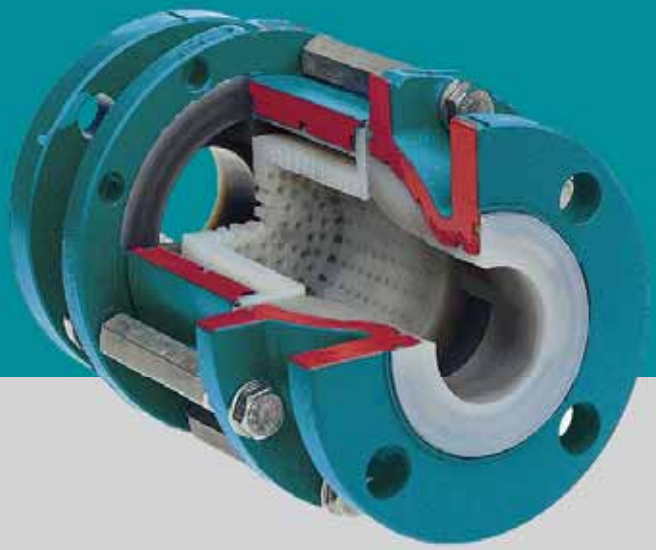




Product leaflet

Type BASKET & Type DELTA-SF

Strainer with lining



- **easy and quick exchange of filter basket**
- **high corrosion resistance**
- **minimum 3 mm PFA / FEP lining**

DN 15 - 250 / PN 10 - 40
NPS ½ - 4 / Class 150

Type BASKET

Design characteristics

- resistant to chemicals
- vacuum-capable
- mesh width 3 mm
- filter basket made of PFA / FEP / PTFE available as spare parts

Type DELTA-SF

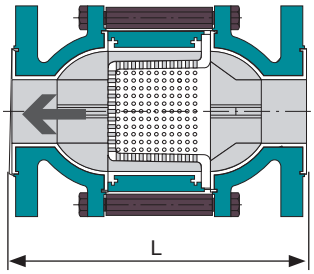
Options

- filter basket in other mesh width <> 3mm (BASKET)
- body in special materials
- other lining materials

Materials			
Body	**Lining**	**T_{max} [C°]**	**Basket**
Ductile Iron	PFA	210	PFA
	FEP	150	FEP
	PFA conductive	125	

Type BASKET & Type DELTA-SF
Technical information

Type **BASKET**

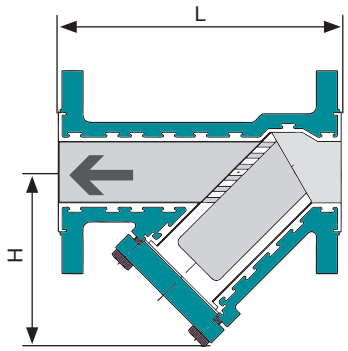


	DN	PN**	L [mm]
DIN EN 558	15	10-40	130
	20	10-40	150
	25	10-40	160
	32	10-40	180
	40	10-40	200
	50	10-40	230
	65	10-40	290
	80	10-40	310
	100	10/16	350
	150	10/16	350
	200	10/16/25	400
	250	10/16/25	450
	NPS	**Class****	**L [mm]**
ASME B16.5	1	150	160
	1½	150	*
	2	150	230
	3	150	310
	4	150	350

Features

- exchangeable filter basket
- low pressure drops, flow area corresponds to size of nominal bore

Type **DELTA-SF**



	DN	PN**	L [mm]	H [mm]
DIN EN 558	15	10-40	130	100
	20	10-40	150	100
	25	10-40	160	10
	32	10-40	180	*
	40	10-40	200	120
	50	10-40	230	160
	65	10-40	290	*
	80	10-40	310	185
	100	10-40	350	220
	150	10-40	350	380
	200	10-40	*	*
	250	10-40	*	*
	NPS	**Class****	**L [mm]**	**H [mm]**
ASME B16.5	1“	150	127	100
	1½“	150	*	*
	2“	150	178	150
	3“	150	203	200
	4“	150	229	230

Features

- easy and quick exchange of filter basket

*) on request

**) higher pressure load on request

Type DELTA & Type GLOBUS
Ball check valve with lining

- **robust, tight execution**
- **high corrosion resistance**
- **minimum 3 mm PFA / FEP lining**

DN 15 - 250 / PN 10 - 40
NPS ½ - 4 / Class 150

Type DELTA-SG
with sightglass
(lining: PFA)

Design characteristics
- resistant to chemicals
- vacuum-capable
- standard design with solid ball

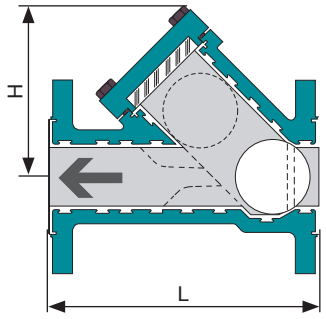
Options
- sightglass (borosilicate) for visual function control
- heating jacket (DELTA)
- with hollow ball which allows the valve to function as an air relief valve in vertical pipeline 90°
- body in special materials
- other lining materials

Type GLOBUS-SG
with sightglass
(lining: conductive PFA)

Materials			
Body	**Lining**	**T_{max} [C°]**	**Ball**
Ductile Iron	PFA	210	PTFE
	FEP	150	
	PFA conductive	125	

Type DELTA & Type GLOBUS
Technical information

Type **DELTA** (without sightglass)
Type **DELTA-SG** (with sightglass)



DIN EN 558

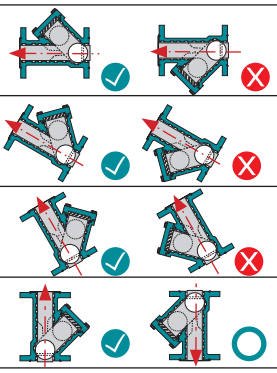
DN	PN**	L [mm]	H [mm]
15	10-40	130	100
20	10-40	150	100
25	10-40	160	100
32	10-40	180	*
40	10-40	200	120
50	10-40	230	160
65	10-40	290	*
80	10-40	310	185
100	10-40	350	220
150	10-40	350	380

ASME B16.5

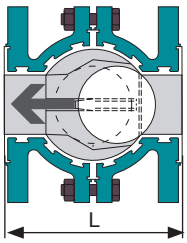
NPS	Class**	L [mm]	H
1“	150	127	100
1½“	150	*	*
2“	150	178	150
3“	150	203	200
4“	150	229	230

Installation instruction

Ball riser must point upwards when valve is installed horizontally. When installed in vertical position, the riser must point diagonally upwards.



Type **GLOBUS**
(without sightglass)



DIN EN 558

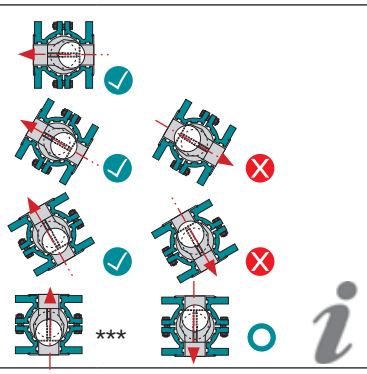
DN	PN**	L [mm]
15	10-40	115
20	10-40	120
25	10-40	125
32	10-40	130
40	10-40	140
50	10-40	150
65	10-40	170
80	10-40	180
100	10-40	190
150	10-40	267
200	10-25	292
250	10-25	330

ASME B16.5

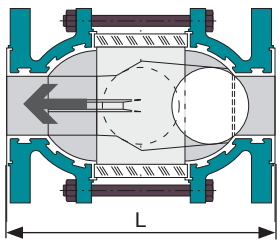
NPS	Class**	L [mm]
1“	150	125
1½“	150	*
2“	150	150
3“	150	180
4“	150	190

Condition

- The pipe diameter must not be reduced after the check valve (in flow direction).
- For vertical installation, the check valve type DELTA is recommended
- Automatically closing in vertical or almost vertical (60 ° - 90 °) installation. When installed horizontally (0°) resp. (up to 30°) the valve closes automatically if the backflow velocity is 1,5 m/sec. (basis = water).



Type **GLOBUS-SG**
(with sightglass)



DIN EN 558

DN	PN**	p_{max} ** [bar]	L [mm]
15	16	15,8	130
20	16	13,5	150
25	16	11,2	160
32	16	8,7	180
40	16	11,9	200
50	10	9,0	230
65	10	7,7	290
80	10	6,2	310
100	10	3,8	350
150	10	*	350
200	10	*	400
250	10	*	450

ASME B16.5

NPS	Class**	p_{max} ** [bar]	L [mm]
1“	150	11,2	160
1½“	150	*	*
2“	150	9,0	230
3“	150	6,2	310
4“	150	4,8	350

*) on request
**) higher pressure load on request
***) type DELTA recommended

possible installation
installation not possible
installation position to function as an air relief valve with hollow ball

Type OCULAR & Type ZIRKULAR

Sightglass and tubular sightglass

- **good visual control**
- **high corrosion resistance**

DN 15 - 250 / PN 10 - 25
NPS ½ - 4 / Class 150 - 300

Type OCULAR
with entry nozzle for turbulences

Design characteristics

- T_{max} 220°C / 280°C (OCULAR)
  T_{max} 180°C (ZIRKULAR)

Options (OCULAR)

- heating jacket
- connection for sightglass flushing
- glass-to-metal fused sightglass acc. to DIN 7079
- body in special materials

Materials	
Body	**Sightglass**
1.4408 / CF8M	borosilicate

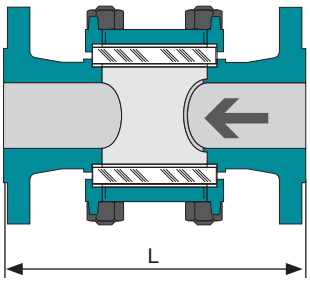
Type ZIRKULAR
with smooth full bore design

Type OCULAR & Type ZIRKULAR

Technical information

Type **OCULAR**

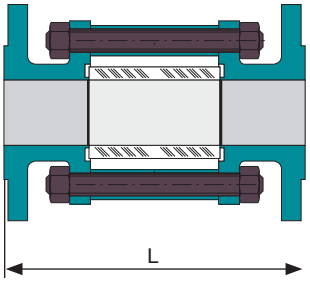
T_{max} 280°C



	DN	PN***	Standard p_{max} [bar]**	High Pressure p_{max} [bar]**	L [mm]
DIN 11869, DIN EN 558	15	10-40	40	40	130
	20	10-40	*	*	150
	25	10-40	25	40	160
	32	10-40	*	*	180
	40	10-40	16	40	200
	50	10-40	16	40	230
	65	10-40	*	*	290
	80	10-40	16	40	310
	100	10-40	16	25	350
	150	10-40	16	-	480
	200	10-40	*	*	600
	250	10-40	*	*	730
	NPS	**Class*** **	**Standard p_{max} [bar]****	**High Pressure p_{max} [bar]****	**L [mm]**
ASME B16.10	1	150 / 300	25	40	160
	1½	150 / 300	16	40	200
	2	150 / 300	16	40	230
	3	150 / 300	16	40	310
	4	150 / 300	16	25	350
	6	150 / 300	16	-	480
	8	150 / 300	*	*	600
	10	150 / 300	*	*	730

Type **ZIRKULAR**

T_{max} 180°C



	DN	PN***	Standard p_{max} [bar]**	L [mm]
DIN 11869, DIN EN 558	15	16	15,8	130
	20	16	13,5	150
	25	16	11,2	160
	32	16	8,7	180
	40	16	11,9	200
	50	10	9,0	230
	65	10	7,7	290
	80	10	6,2	310
	100	10	4,8	350
	150	10	4,8	350
	200	10	*	*
	250	10	*	*
	NPS	**Class*** **	**Standard p_{max} [bar]****	**L [mm]**
ASME B16.10	1	150 / 300	11,2	160
	1½	150 / 300	11,9	200
	2	150 / 300	9,0	230
	3	150 / 300	6,2	310
	4	150 / 300	4,8	350
	6	150 / 300	*	*
	8	150 / 300	*	*
	10	150 / 300	*	*

*) on request

**) maximal pressure for standard design / high pressure design

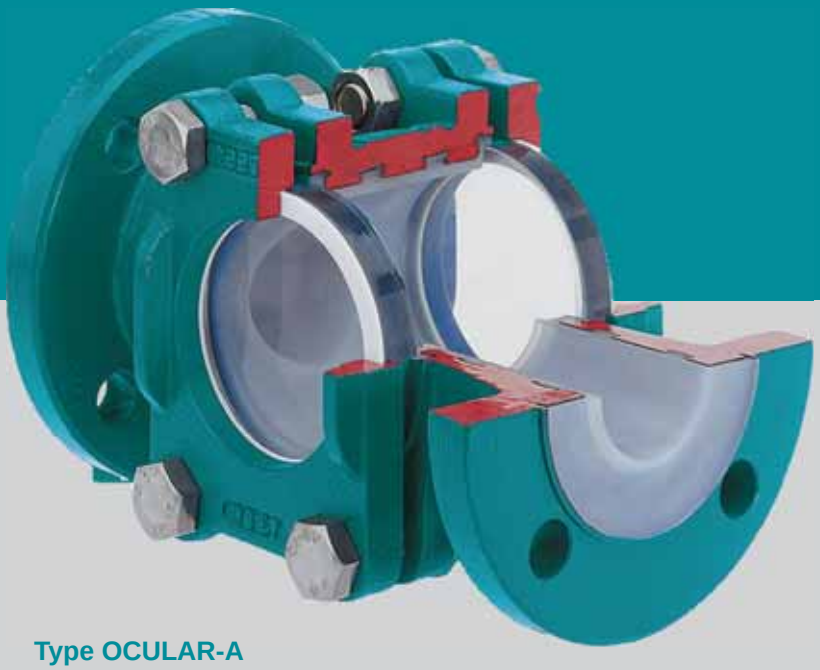
***) higher pressure load on request

Type OCULAR-A & Type ZIRKULAR-A

Sightglass and tubular sightglass with lining

- **very good visual control**
- **high corrosion resistance**
- **minimum 3 mm PFA / FEP lining**

DN 15 - 250 / PN 10 - 25
NPS ½ - 4 / Class 150



Type OCULAR-A
with entry nozzle for turbulences

Design characteristics

- resistant to chemicals
- vacuum-capable

Options

- heating jacket (OCULAR-A)
- connection for sightglass-flushing (OCULAR-A)
- body in special materials
- other lining materials

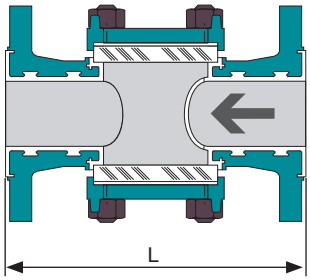
Materials			
Body	**Lining**	**T_{max} [C°]**	**Sightglass**
Ductile Iron	PFA	210	borosilicate
	FEP	150	
	PFA conductive	125	

Type ZIRKULAR-A
with smooth full bore design

Type OCULAR-A & Type ZIRKULAR-A

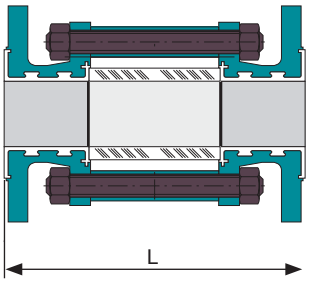
Technical information

Type **OCULAR-A**



	DN	PN	L [mm]
DIN EN 558-1	15	10-25	130
	20	10-25	150
	25	10-25	160
	32	10-25	180
	40	10-25	200
	50	10-25	230
	65	10-25	290
	80	10-25	310
	100	10-25	350
	150	10-25	480
	200	10-25	600
	250	10-25	730
	NPS	**PN**	**L [mm]**
ASME B16.5	1“	150	160
	1½“	150	200
	2“	150	230
	3“	150	310
	4“	150	350

Type **ZIRKULAR-A**



	DN	PN	p_{max}** [bar]	L [mm]
DIN EN 558-1	15	16	15,8	130
	20	16	13,5	150
	25	16	11,2	160
	32	16	8,7	180
	40	16	11,9	200
	50	10	9,0	230
	65	10	7,7	290
	80	10	6,2	310
	100	10	4,8	350
	150	10	4,8	350
	200	10	4,8	*
	250	*	*	*
	NPS	**PN**	**p_{max}** [bar]**	**L [mm]**
ASME B16.5	1“	150	11,2	160
	1½“	150	11,9	200
	2“	150	9,0	230
	3“	150	6,2	310
	4“	150	4,8	350

*) on request

**) higher pressure load on request

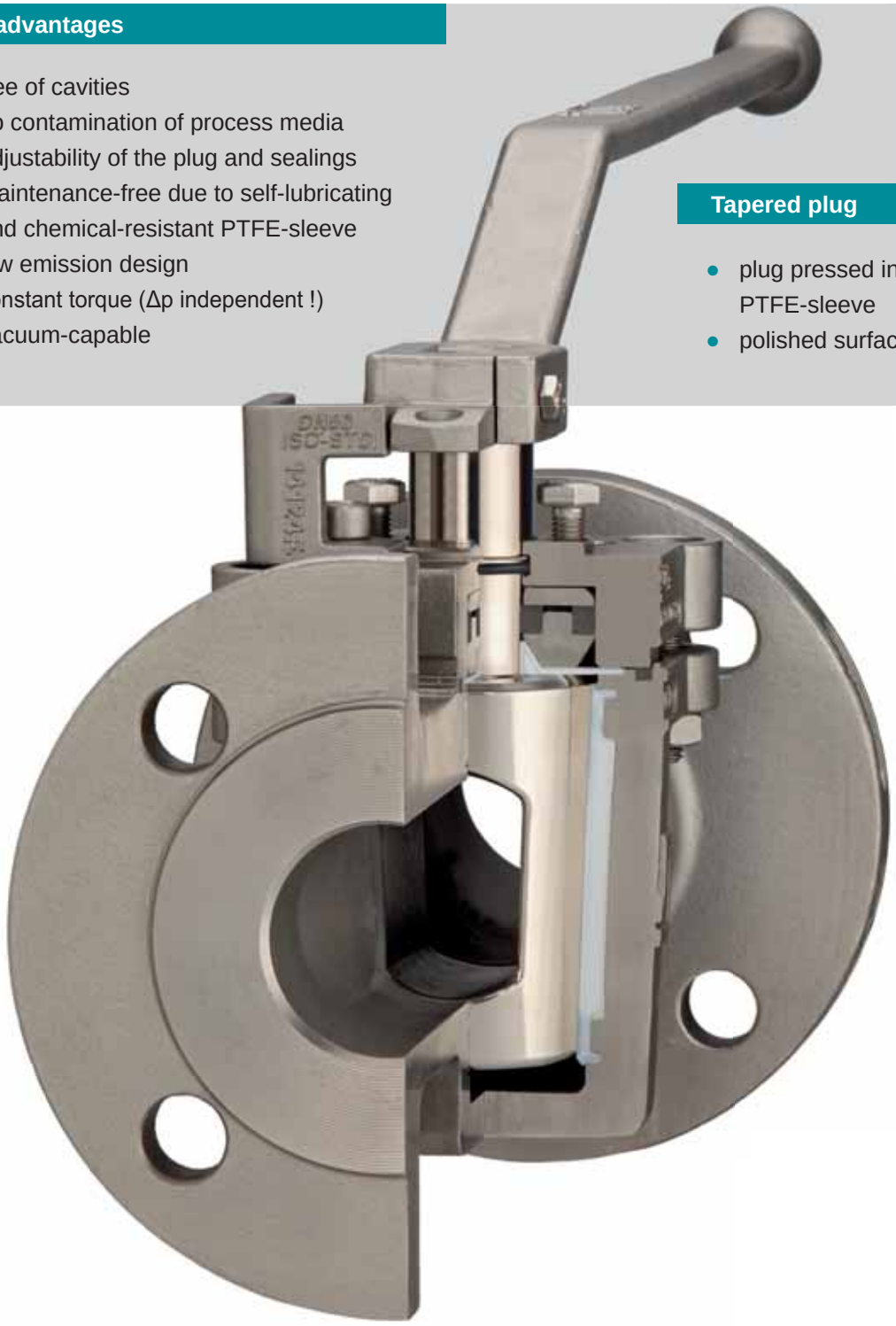
AZ-plug valve: the design principle

Key advantages

- free of cavities
- no contamination of process media
- adjustability of the plug and sealings
- maintenance-free due to self-lubricating and chemical-resistant PTFE-sleeve
- low emission design
- constant torque (Δp independent !)
- vacuum-capable

Tapered plug

- plug pressed into the PTFE-sleeve
- polished surface



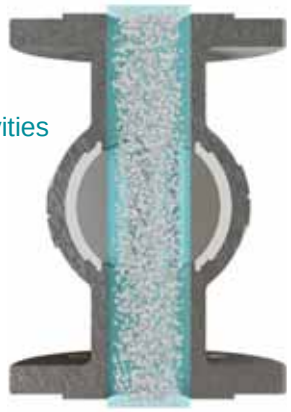
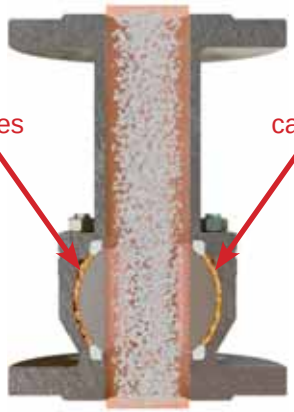
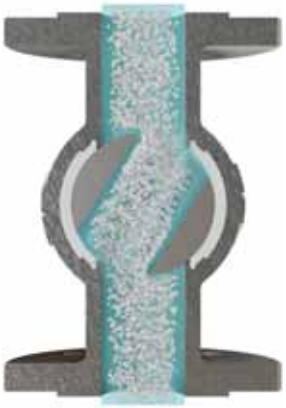
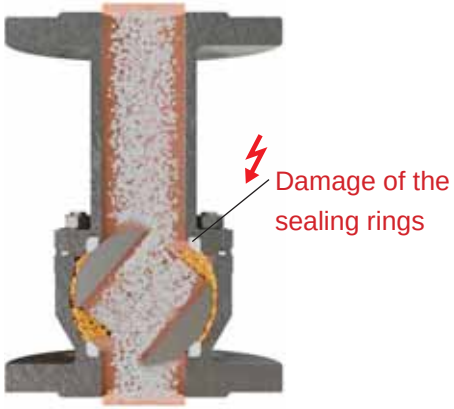
Body

- tapered body interior
- integrated supporting ribs avoid rotation and coldflow of the sleeve
- large sealing surface

PTFE-sleeve

- mechanically locked into the valve body
- complete PTFE chambering
- robust, one-piece sleeve covers and protects the entire plug

Cavity-free: suitable for all media
Technical comparison

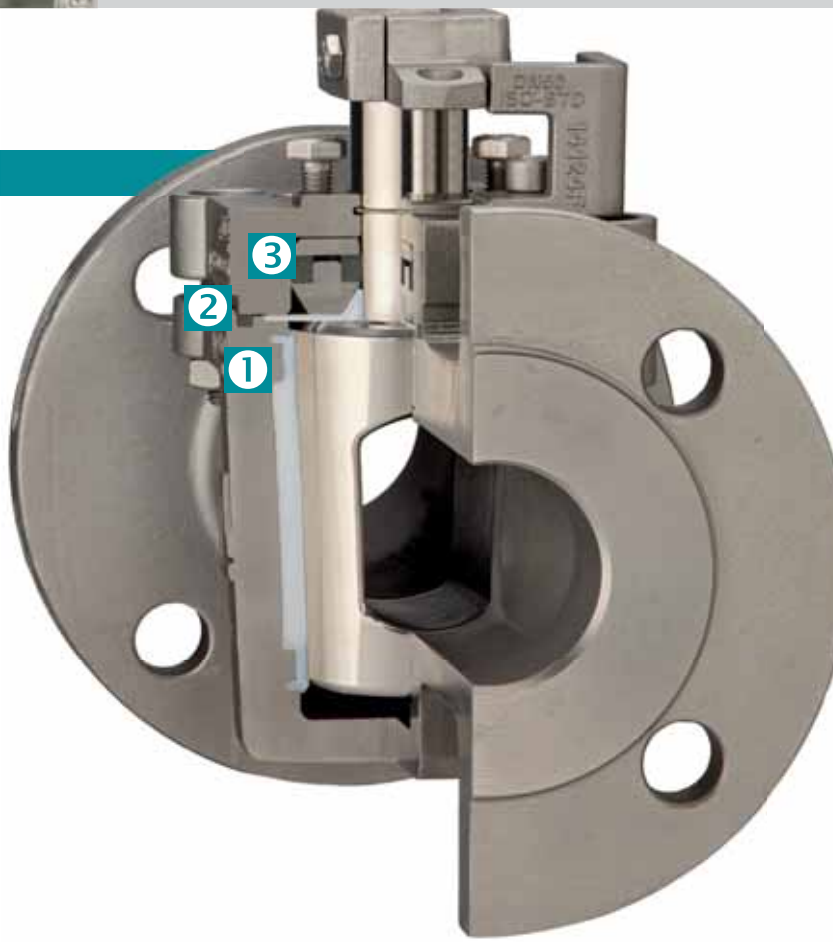
AZ-plug valve	Ball valve
Soft seated plug valve with PTFE-sleeve **Main sealing components** • metallic plug • sleeve 	**Soft seated ball valve with PTFE sealing rings, floating ball** **Main sealing components** • metallic ball • sealing rings 
OPEN position	
• suitable for all media due to cavity-free design • sealing surfaces are completely protected free of cavities 	• critical for the following media due to design with cavities ○ corrosives: crevice corrosion ○ polymerizing: clogging ○ crystallizing: abrasion / clogging cavities cavities 
During operation	
• free of cavities, media cannot settle or be trapped • solids are pushed away • no contamination with old media 	• with cavities, media can settle or be trapped • solids cause abrasion of the sealing rings • contamination of process media  Damage of the sealing rings

Safe and reliable tightness for years

Adjustable

- tapered plug design allows retightening of the sealing on site - if needed
- adjusting bolt even accesible with mounted actuator / gearbox

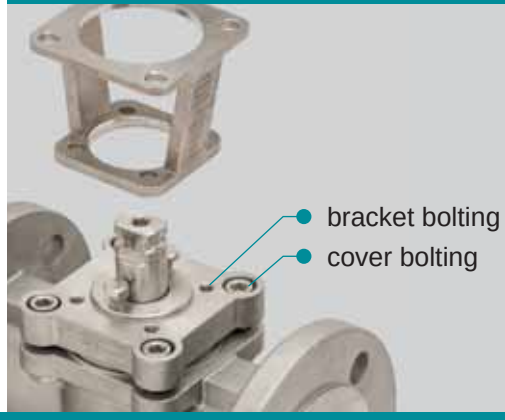
Several sealings to atmosphere



1. Primary: sleeve
2. Secondary: V-diaphragm / cover seal
3. Tertiary: stem packing (optional)

Detailed information about all certified AZ cover & stem sealing systems see chapter SEALING SYSTEMS

ISO cover



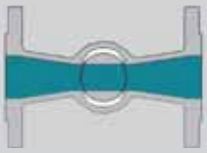
- pressure containing cover bolts separated from bracket boltings
- cover and bracket acc. to ISO 5211 for efficient actuator / gearbox assembly

Reduced and full bore design

Execution

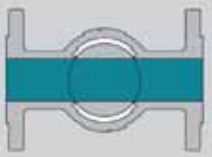
Reduced bore
Type STANDARD

- compact valve (FF / weight)
- optimal torques for economic automation



Full round bore
Type EXTRA

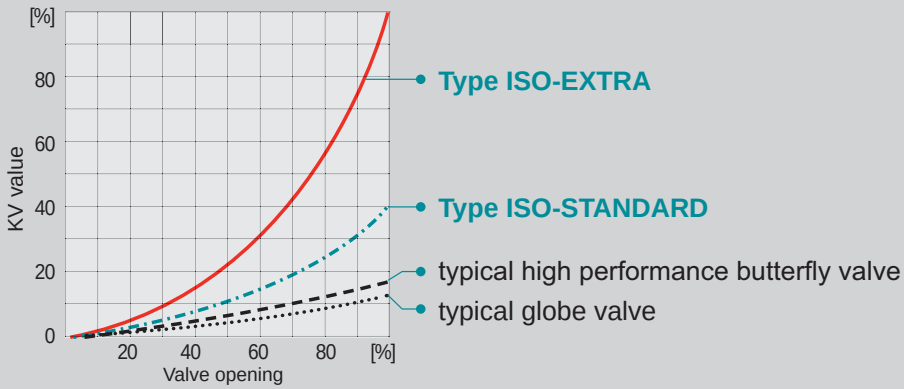
- maximum flow rate
- minimal pressure drop
- piggable (optional)



Type ISO-EXTRA

- excellent for abrasive, slurry and solid-containing applications
- maximum flow rate compared to other valve types with the same nominal size

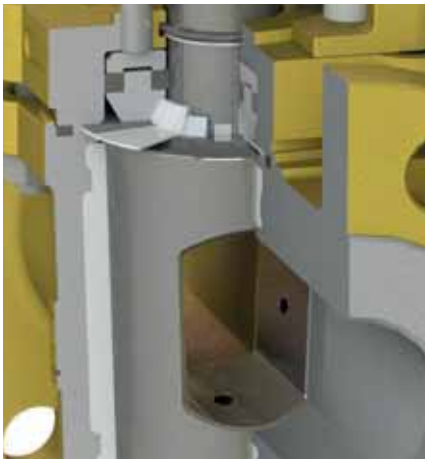
Maximum flow rate



Options

Multi-port

- whole range of multi-port plugs for all configurations (up to 7-way)
- horizontal and vertical installation



Vented options

- plug bottom
- plug upstream / downstream

automatic pressure balance in case of thermal media expansion

System requirements

- **FDA** = Food and Drug Administration certifications and compliant materials
- **GMP** = Good-Manufacturing-Practice
- **CIP** = Clean-in-Place
- Polished internal surfaces, surface finish <0.8 Ra µm (<32 Ra µin)
- oil and grease free
- water-free

All connections possible

- flanges acc. to DIN, ASME, JIS etc.
- welded ends
- screwed and threaded ends
- combinations of connections
- oversize flanges
- compression fittings and ferrule ring couplings
- special connections

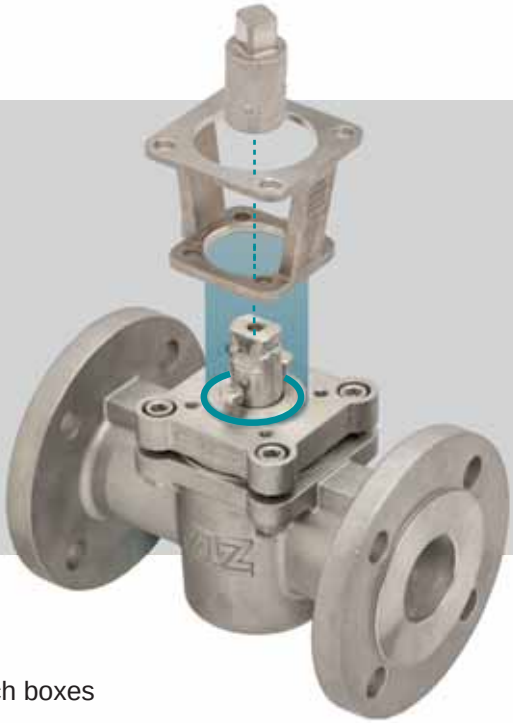
High and low temperature

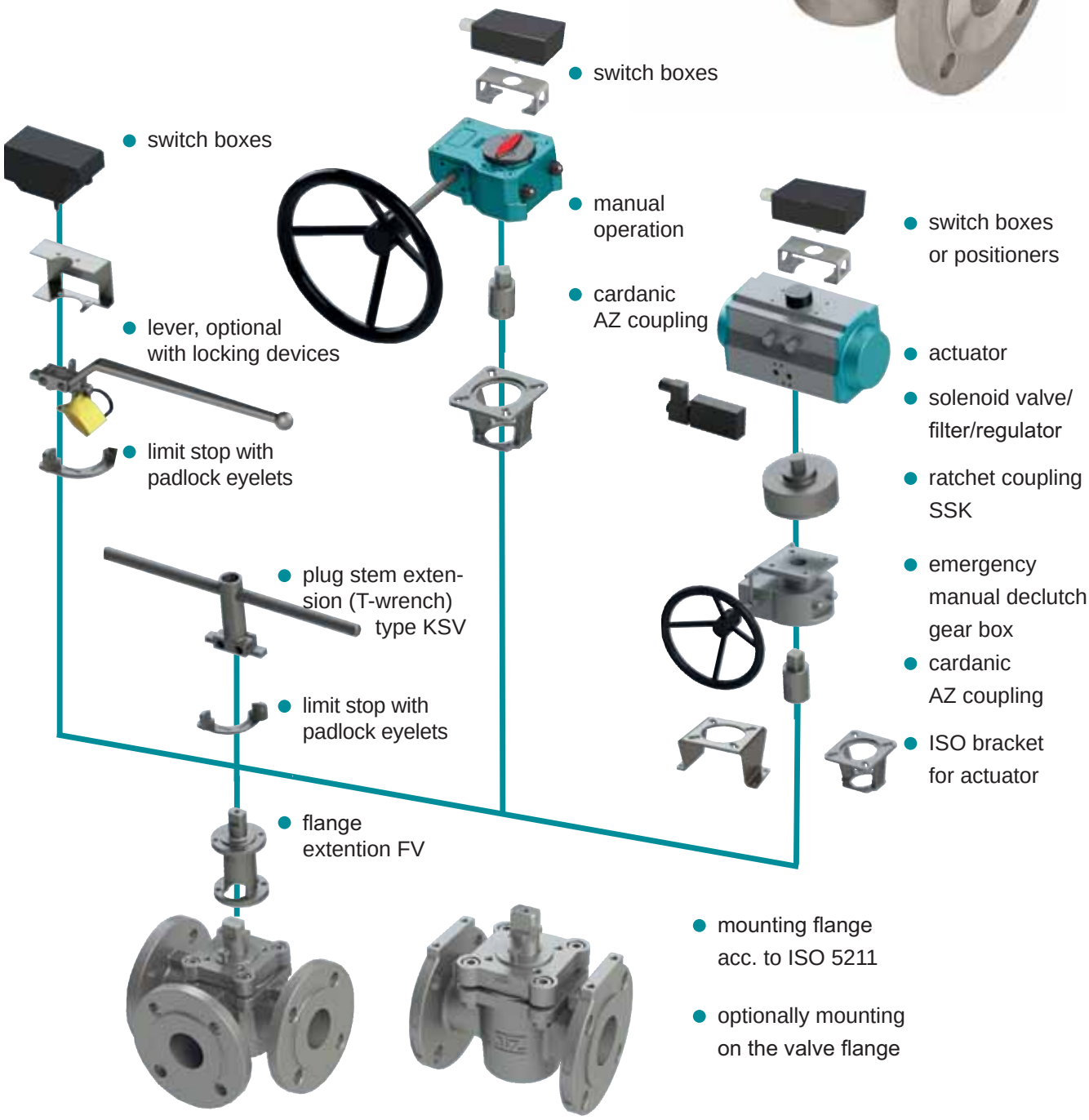
- extended bonnet with sealing at the top
- stem extension for insulated valves

Modular operation concept

Bracket according to ISO 5211

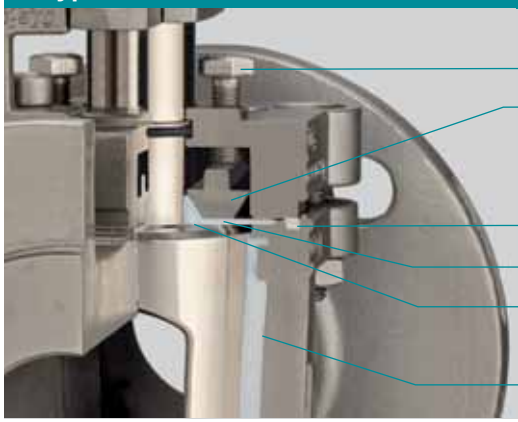
- standard installation of gearbox and actuator
- safe due to independent mounting of cover and bracket
- covering bonnet bolts to prevent opening of valve in service
- precise centering of the bracket to the plug stem due to adjusting ring
- easy inline plug adjustment during the process, screws are always accessible





Cover and stem sealing systems suitable for general applications

Type STANDARD



- plug adjustment
- thrust collar
- cover sealing (PTFE)
- stainless steel diaphragm
- **Secondary sealing**: V-diaphragm (PTFE), delta thrust collar (PTFE)
- **Primary sealing**: sleeve*

Type FS2 — Fire-Safe-sealing (API 607)

- plug & packing adjustment
- **Tertiary sealing**: Packing to atmosphere (graphite)
- thrust collar
- cover sealing (graphite)
- stainless steel diaphragm
- **Secondary sealing**: V-diaphragm (PTFE) and delta thrust collar (PTFE)
- **Primary sealing**: sleeve*

Type CA2 — Chemistry sealing

- plug & packing adjustment
- **Tertiary sealing**: Packing to atmosphere (PTFE)
- thrust collar
- cover sealing (PTFE)
- stainless steel diaphragm
- **Secondary sealing**: V-diaphragm, delta thrust collar (PTFE)
- **Primary sealing**: sleeve*

*) The sleeve material has a decisive influence on the maximum operating temperature
Material selection acc. to PT-diagram

More safety
for severe applications

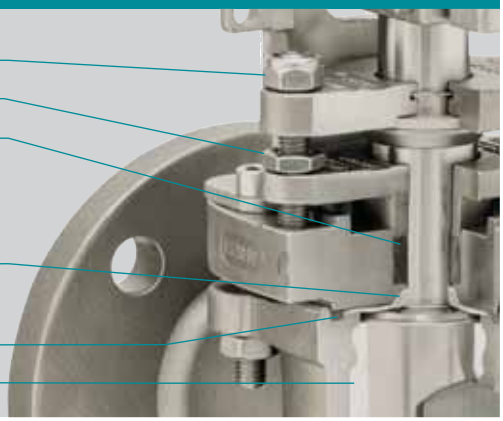
engineered.
fast.
dynamic.

Type FSN — Fire-Safe-sealing (API 607)

plug adjustment
triple safety stem packing adjustment
Tertiary sealing: triple safety stem packing (graphite)

Secondary sealing:
V-diaphragm (PTFE) and delta thrust collar (PTFE)

cover sealing (graphite)
Primary sealing: sleeve*



Type FSN-EF — Fire-Safe-sealing (API 607)

NEW!

Emission Free

plug adjustment
triple safety stem packing adjustment
Quaternary sealing: three o-rings at the stem
Tertiary sealing:
triple safety stem packing
Secondary sealing:
V-diaphragm (PTFE) and delta thrust collar (PTFE)
cover sealing (graphite)
Primary sealing: sleeve*

Type FSN-SL — Fire-Safe-sealing (API 607)

live-loaded

plug adjustment
o-rings protect the springs against corrosion
triple safety stem packing adjustment
disk springs (optionally made of Inconel)
Tertiary sealing: triple safety stem packing (graphite)
Secondary sealing:
V-diaphragm (PTFE) and delta thrust collar (PTFE)
cover sealing (graphite)
Primary sealing: sleeve*

*) The sleeve material has a decisive influence on the maximum operating temperature
Material selection acc. to PT-diagram

Material for **type CASN** and **CASN-SL** chemistry safety sealing: packing and cover sealing in PTFE

Special sealing systems

Chevron packing

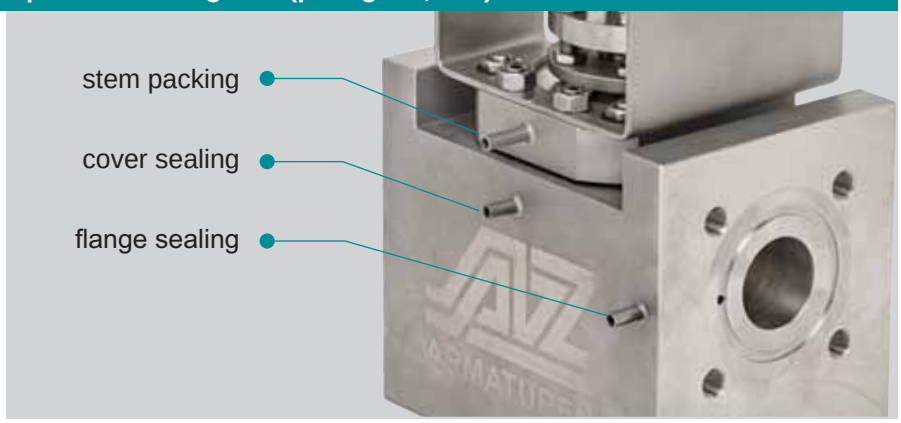
- increases the contact pressure (when pressure builds up on the safety stem packing towards plug stem)
- for toxic and fugitive media
- high wear resistance

Type CL Chlorine / gas applications

- approved for chlorine applications and other toxic gases
- ideal for media with changing state of aggregate (e.g. liquid to gas, vice versa)
- vacuum capable

Detection ports for monitoring purpose of lethal gases (phosgene, etc.)

- detection ports for early recognition of potential leakages
- sniffing at sealing surfaces to atmosphere



Cover and stem sealing systems for lined plug valves

engineered.
fast.
dynamic.

Type CA 2A — Chemistry sealing

plug & packing adjustment
stem O-ring
Tertiary sealing: O-ring (FKM / FFKM)
thrust collar
stainless steel diaphragm

Secondary sealing:
V-diaphragm & delta thrust collar (PTFE)
Primary sealing: lined body

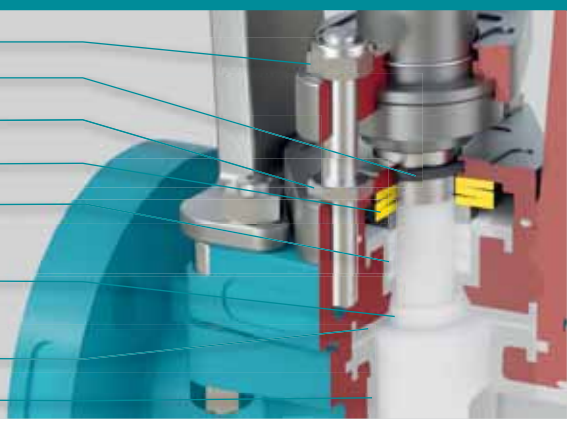
Type SAFE-LINED — Chemistry sealing

lined cover

plug adjustment
triple safety stem packing adjustment
Tertiary sealing:
triple safety stem packing (PTFE) to atmosphere
Secondary sealing:
V-diaphragm (PTFE), delta thrust collar (PTFE)

lined cover
Primary sealing: lined body*

Type SAFE-LINED-SL — Chemistry sealing



live-loaded

plug adjustment
o-rings protect the springs against corrosion
triple safety stem packing adjustment
disk springs (optionally made of Inconel)
Tertiary sealing:
triple safety stem packing (PTFE) to atmosphere
Secondary sealing:
V-diaphragm (PTFE), delta thrust collar (PTFE)
lined cover
Primary sealing: lined body*

*) Lining and plug material have a decisive influence on the maximum operating temperature
Material selection according to PT-diagram.

WORLD'S FIRST EMISSION FREE plug valve certified acc. to **ISO 15848-1 /** AH **Type FSN-EF**

NEW!

STOP **Fugitive Emissions**

Low-Emission
according ISO 15848, TA-Luft & API 641

For all important information about ISO 15848, TA-Luft & API 641, as well as the current certificates, please refer to the "AZ Fugitive Emission" brochure

Latest information about ISO 15848 / API 641 / TA Luft see AZ Fugitive Emissions leaflet

Casting materials

		Casting Material					
Material Group	**Common Name**	**EN / DIN**	**Short name**	**Material-No.**	**ASTM**	**Grade**	**UNS**
Carbon Steel / Ductile Iron							
Ductile Iron	SG Iron	EN 1563	EN-GJS-400-18-LT	5.3103	A395	-	F32800
Carbon Steel	CS	EN 10213	GP240GH	1.0619	A216	WCB	J03002
Low Temp. Carbon Steel	LTCS	EN 10213	G17Mn5	1.1131	A352	LCB	J03003
Low Temp. Carbon Steel	LTCS	EN 10213	G21Mn5	1.1138	A352	LCC	J02505
Stainless Steel							
Stainless Steel	Duplex 2205	EN 10213	GX2CrNiMoN22-5-3(4A)	1.4470	A995	4A-CD3MN	J92205
Stainless Steel	Duplex 1B	EN 10213	GX3NiCrMoCuN26-6-3-3	1.4517	A995	1B-CD4MCuN	J93372
Austenitic	SS	EN 10213	GX5CrNi19-10	1.4308	A351	CF8	J92600
Austenitic	SS	EN 10213	GX2CrNi19-11	1.4309	A351L	CF3	J92700
Austenitic	SS	EN 10213	GX5CrNiMo19-11-2	1.4408	A351	CF8M	J92900
Austenitic	SS	EN 10213	GX2CrNiMo19-11-2	1.4409	A351	CF3M	J92800
Super Austenitic	Alloy 20	EN 10213	NiC420CuMo	1.4500	A351	CN7M	N08007
Super Austenitic	Alloy 20 mod.	EN 10213	GX2NiCrMoCuN25-20	1.4536	A743	CN7MS	J94650
Super Austenitic	AL6XN	-	-	-	A351	CN3MN	J94651
Superduplex	Superduplex 5A	EN 10213	25Cr-7Ni-Mo-N	1.4469	A995	CE3MN	J93404
Nickel Alloy							
	Monel/Alloy400	DIN 17730	G-NiCu30 Nb	2.4365	A494	M35-1	N24135
	Hastelloy C mod.	-	-	-	A494	CW6M	N30107
	Hastelloy C	-	-	2.4537	A494	CW12MW	N30002
	Hastelloy C-276	-	-	2.4883	-	-	-
	Hastelloy B-3	-	-	-	-	-	-
	Inconel 600	-	-	-	A494	CY40	N06040
	Inconel 625	-	-	-	A494	CW6MC	N26625
	Inconel 825	-	-	-	A494	CU5MCuC	N08826
	Nickel	DIN 17730	G-Ni 95	2.4170	A494	CZ100	N02100
Other Material Groups							
Tantalum	Tantalum	-	-	-	-	-	-
Titanium	Ti 2	DIN 17865	G-Ti 2	3.7031	B367	C-2	R52550
Zirconium	Zirconium 702	-	-	-	B752	702C	-
Zirconium	Zirconium 705	-	-	-		705C	-

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The use of these equivalents has to be evaluated on a case-by-case basis.

Other materials on request.

Equivalent forged and bar-stock materials

			Similar Forged Material						Bar Material	
Common Name	**Mat.Nr.**	**Grade**	**EN / DIN**	**Short Name**	**Mat.Nr.**	**ASTM**	**Grade**	**UNS**	**ASTM**	**Short**
Carbon Steel / Ductile Iron										
SG Iron	5.3103	-	EN 1563	EN-GJS-400-18-LT	5.3103	A395-99	60-40-18	-	-	-
CS	1.0619	WCB	EN 10213	GP240GH	1.0619	A105	A105	-	-	-
LTCS	1.1131	LCB	-	-	-	A350	LF2-Class1	G10300	-	-
LTCS	1.1138	LCC	-	-	1.0566	A350	LF2-Class1	G10250	-	-
Stainless Steel										
Duplex 2205	1.4470	4A-CD3MN	EN 10028-7	X2CrNiMoN22-5-3	1.4462	A182	F51	S32205	A479	S31803
Duplex 1B	1.4517	1B-CD4MCuN	EN 10028-7	X2CrNiMoCuN25-5-3	1.4507	A182	F59	S32520	A479	S32550
SS	1.4308	CF8	EN 10028-7	X5CrNi18-10	1.4301	A182	F304	S30400	A276	304
SS	1.4309	CF3	EN 10028-7	X2CrNi19-11	1.4306	A182	F304L	S30403	A276	304L
SS	1.4408	CF8M	EN 10028-7	X5C4NiMo17-12-2	1.4401	A182	F316	S31600	A276	316
SS	1.4409	CF3M	EN 10028-7	X2CrNiMo 17-12	1.4404	A182	316L	S31603	A276	316L
Alloy 20	1.4500	CN7M	-	-	2.4660	B462	N08020	N08020	B473	N08020
Alloy 20 mod.	1.4536	CN7MS	-	-	-	-	-	-	-	-
AL6XN	-	CN3MN	EN 10028-7	X1NiCrMoCuN25-20-7	1.4529	A182	F62	N08367	B462	N08367
Superduplex 5A	1.4469	CE3MN	EN 10028-7	X2CrNiMoN25-7-4	1.4410	A182	F63	S32615	-	-
Nickel Alloy										
Monel/Alloy400	2.4365	M35-1	DN 17744	NiCu30Fe	2.4360	B165	Alloy 400	N04400	B164	N04400
Hastelloy C mod.	-	CW6M	-	-	-	A494	-	-	-	-
Hastelloy C		CW12MW	-	NiMo16CrW	-	A494	-	-	-	-
Hastelloy C-276		-	DIN 17744	NiMo16Cr15W	2.4819	B565	N10675	N10276	B574	N10276
Hastelloy B-3	-	-	DIN 17744	NiMo29Cr	2.4600	B565	N10675	N10675	B335	N10675
Inconel 600	-	CY40	DIN 17742	NiCr15Fe	2.4816	B565	N06600	N06600	B166	N06600
Inconel 625	-	CW6MC	DIN 17744	NiCr22Mo9Nb	2.4856	B565	N06625	N06625	B446	N06625
Inconel 825	-	CU5MCuC	DIN 17744	NiCr21Mo	2.4858	B564	N08825	N08825	B425	N08825
Nickel	2.4170	CZ100	-	-	-	-	-	-	B160	N02200
Other Material Groups										
Tantalum	-	-				B365	TaW2,5	R05252	-	-
Ti 2	3.7031	C-2	DIN 17864	Grade 2	3.7035	B381	F2	R50400	B348	Grade 2
Zirconium 702	-	702C	-	-	6.0702	B493	R60702	R60702	B550	R60702
Zirconium 705	-	705C	-	-	-	B493	R60705	R60705	B550	R60705

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The use of these equivalents has to be evaluated on a case-by-case basis.

Other materials on request.

Lining materials

Lining materials

The high density, extremely resistant lining is at least 3 mm thick. New granulate is used exclusively, no refurbished regenerates or similar materials.

Fluoropolymer lining materials

- Body: PFA, PFA conductive and FEP
- Plug: PTFE, PFA, PFA conductive and FEP

Combination of linings		
body lining	plug lining	T_{max}
PFA	PTFE [1]) or special materials	210°C / 410°F
PFA	PFA	200°C / 392°F
PFA	FEP	150°C / 302°F
PFA conductive	PFA conductive	125°C / 257°F
FEP	FEP	150°C / 302°F
FEP	PFA	150°C / 302°F

1) Plugs with PTFE lining only for two-way valves up to DN 100.
Plugs for multi-way valves not with PTFE lining available.

IMPORTANT NOTE

For demanding conditions, such as process temperatures exceeding 150°C / 302°F:
Valve size, media phase, plug position & temperature (constant or fluctuating) may have an impact on the lifetime. Consult factory for proper selection of lining material, cover sealing type and special features.

Sleeve materials

Type	UHMW-PE	PFA	PTFE, virgin	PTFE, glass	PTFE, graphite	TFM	PTFE-P
T_{max}	80°C / 176°F	200°C / 392°F	230°C / 446°F	230°C / 446°F	250°C / 482°F	250°C / 482°F	320°C / 608°F

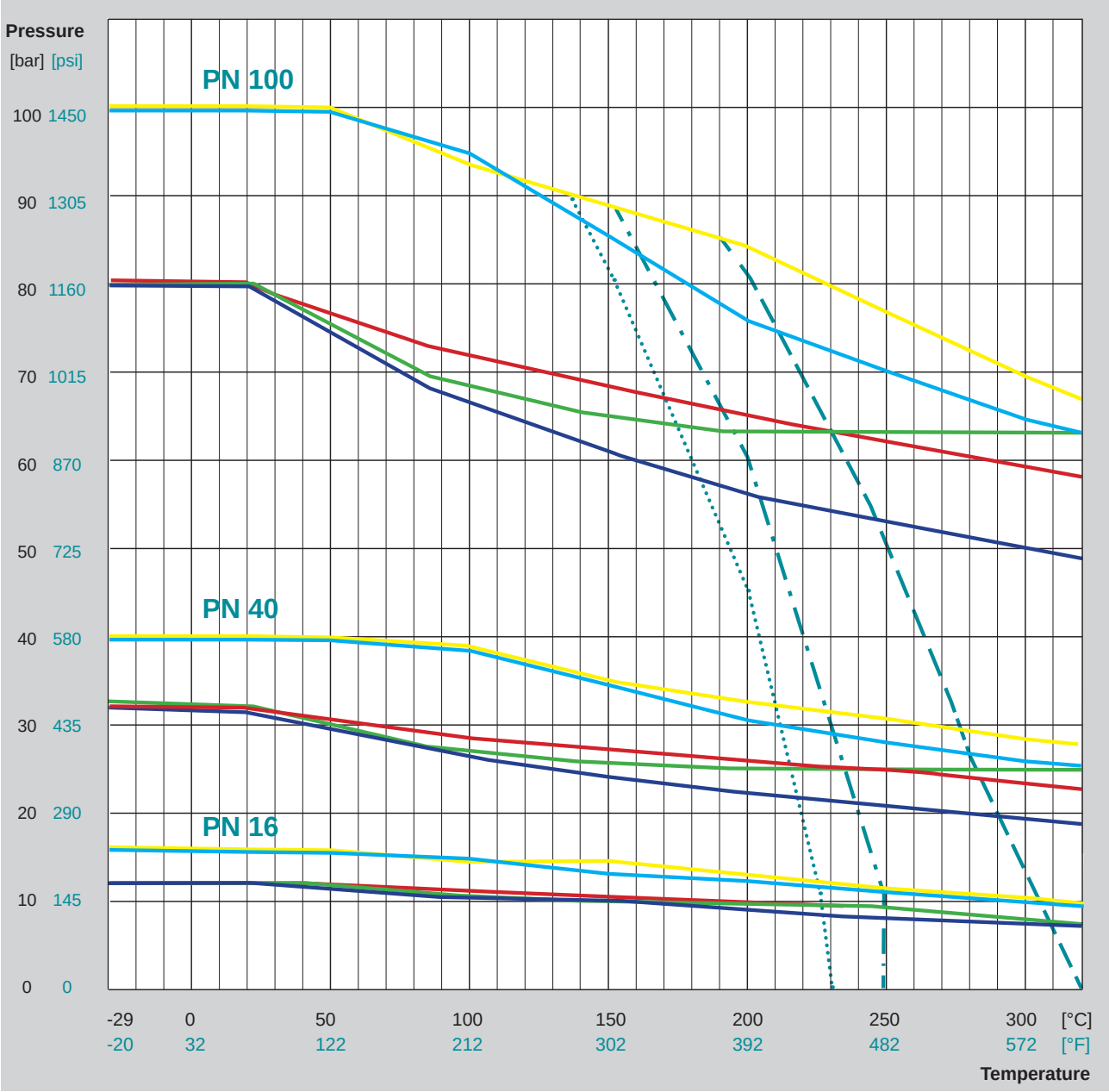
Category	Sleev Material	Characteristics	Typical applications	T_{MAX}
PTFE	PTFE, virgin	low friction, very good sealing characteristic	standard sleeve material for most applications	230°C / 446°F
RPTFE	PTFE-Glass	reinforced PTFE	additional stability for multiway valves with horizontal ports	230°C / 446°F
	PTFE-Graphite	reinforced PTFE	high temperature applications	250°C / 482°F
modified PTFE	TFM 1600* NXT 75* M 111*	chemically modified PTFE, reduced permeation, low friction	chemical applications where reduced permeability compared to PTFE is required	250°C / 482°F
Special Sleeves	PTFE-P* NFCE* NCS*	high performance sleeve materials	severe service highest temperatures, high pressure, abrasive applications	320°C / 608°F
PFA	PFA	reduced permeation	chemical applications where reduced permeability compared to PTFE is required	200°C / 392°F
UHMW-PE	UHMW-PE	Ultra High Molecular Weight Polyethylene	radiation resistent, abrasive application	80°C / 176°F

*) sleeve material selection depending on availability at AZ manufacturing site

IMPORTANT NOTE

for demanding conditions, such as process temperatures exceeding 200°C / 392°F:
Valve size, media phase, plug position & temperature (constant or fluctuating) may have an impact on the lifetime. Consult factory for proper selection of sleeve material, cover sealing type and special features. For other sleeve materials not listed above: please contact your AZ sales representative.

PT Diagram, PN 16 - PN 100
PTFE sleeved plug valves



Body material

- EN 10213 - 1.0619 / Carbon Steel
- EN 10213 - 1.4408 / Stainless Steel
- EN 17744 - 2.4819 / Hastelloy
- EN 17730 - 2.4365 / Monel 400
- UNS N08007 - 1.4500 / Alloy 20

other body materials on request

Sleeve material

- PTFE (virgin) / PTFE (glass) — T_{max} 230°C / 446°F
- TFM / NXT / M111 / PTFE graphite — T_{max} 250°C / 482°F
- PTFE-P / NFCE / NCS — T_{max} 320°C / 608°F

other sleeve materials on request

Subject to technical change without notice.

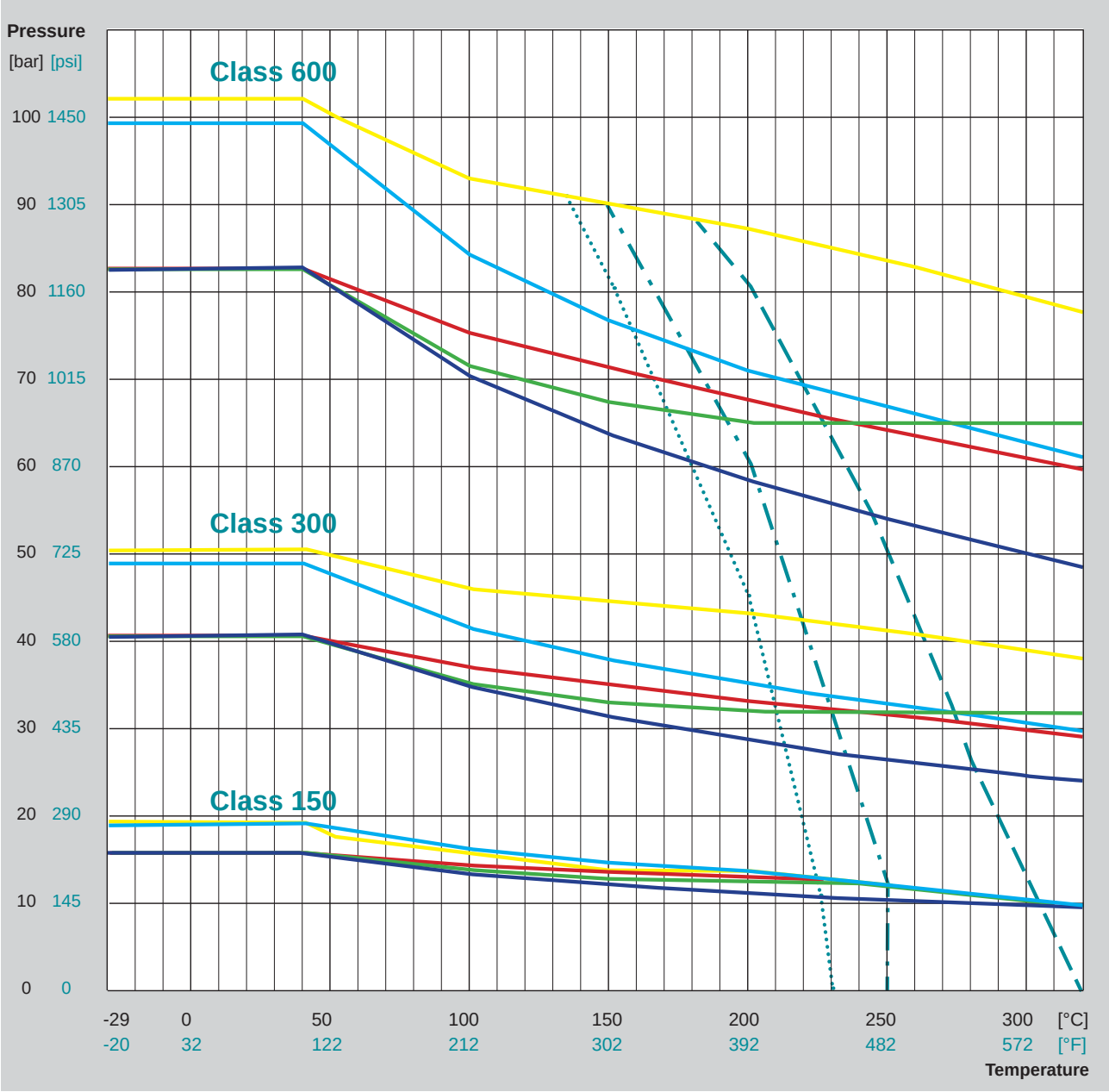
The data given are max. values according to EN 12516-1 and EN 1092-1.

IMPORTANT NOTE

for demanding conditions, such as process temperatures exceeding 200°C / 392°F: Valve size, media phase, plug position & temperature (constant or fluctuating) may have an impact on the lifetime. Consult factory for proper selection of sleeve material, cover sealing type and special features.

For temperatures < -29°C / -20°F, (T_{limit} = -60°C / -76°F) operating temperature, low-temperature carbon steel or austenitic stainless steels are required.

PT Diagram, Class 150 - Class 600
PTFE sleeved plug valves



Body material

- ASTM A216 - WCB
- ASTM A351 - CF8M
- ASTM A494 - CW12MW / Hastelloy
- ASTM A494 - M35.1 / Monel 400
- ASTM A351 - CN7M Alloy 20

other body materials on request

Sleeve material

PTFE (virgin) / PTFE (glass)	T_{max} 230°C / 446°F
TFM / NXT / M111 / PTFE graphite	T_{max} 250°C / 482°F
PTFE-P / NFCE / NCS	T_{max} 320°C / 608°F

other sleeve materials on request

Subject to technical change without notice.

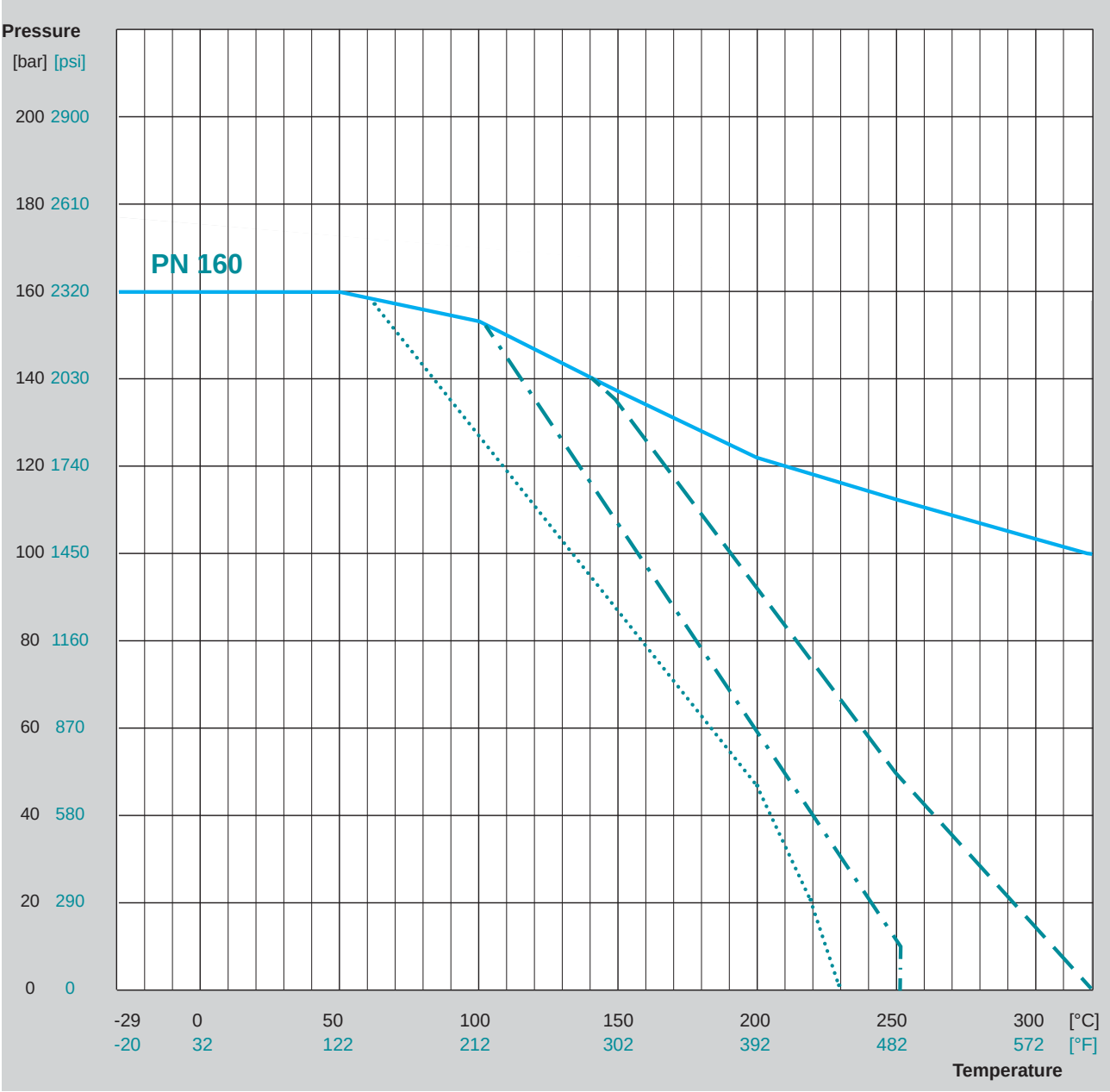
The data given are max. values according to ASME B16.34.

IMPORTANT NOTE

for demanding conditions, such as process temperatures exceeding 200°C / 392°F: Valve size, media phase, plug position & temperature (constant or fluctuating) may have an impact on the lifetime. Consult factory for proper selection of sleeve material, cover sealing type and special features.

For temperatures < -29°C / -20°F, (T_{limit} = -60°C / -76°F) operating temperature, low-temperature carbon steel or austenitic stainless steels are required.

PT Diagram High Pressure, PN 160
PTFE sleeved plug valves with trunnion mounted design



Body material (in line with EN 12516-1 and EN 1092-1)

EN 10213 - 1.4408 / Stainless Steel
other body materials on request

Sleeve material

.....	PTFE (virgin) / PTFE (glass)	T_{max} 230°C / 446°F
-.-.-	TFM / NXT / M111 / PTFE graphite	T_{max} 250°C / 482°F
— —	PTFE-P / NFCE / NCS	T_{max} 320°C / 608°F

other sleeve materials on request

Subject to technical change without notice.

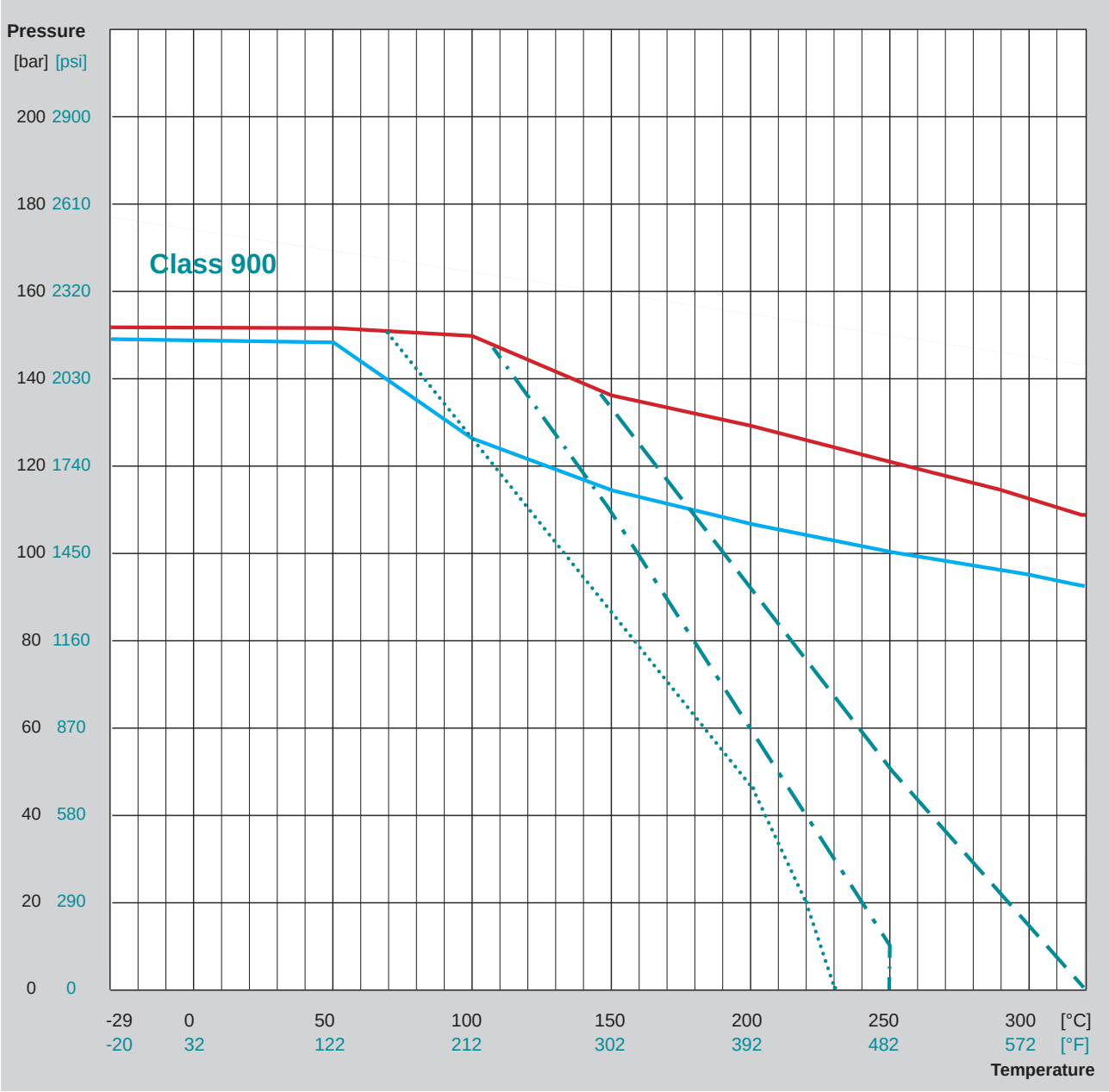
The data given are max. values according to EN 12516-1 and EN 1092-1.

IMPORTANT NOTE

for demanding conditions, such as process temperatures exceeding 200°C / 392°F: Valve size, media phase, plug position & temperature (constant or fluctuating) may have an impact on the lifetime. Consult factory for proper selection of sleeve material, cover sealing type and special features.

For temperatures < -29°C / -20°F, (T_{limit} = -60°C / -76°F) operating temperature, low-temperature carbon steel or austenitic stainless steels are required.

PT Diagram High Pressure, Class 900
PTFE sleeved plug valves with trunnion mounted design



Body material (in line with ASME B16.34)

- ASTM A351 - CF8M / Stainless Steel
- ASTM A995 - CD3MN / Superduplex

other body materials on request

Sleeve material

.....	PTFE (virgin) / PTFE (glass)	T_{max} 230°C / 446°F
-.-.-	TFM / NXT / M111 / PTFE graphite	T_{max} 250°C / 482°F
– – –	PTFE-P / NFCE / NCS	T_{max} 320°C / 608°F

other sleeve materials on request

Subject to technical change without notice.

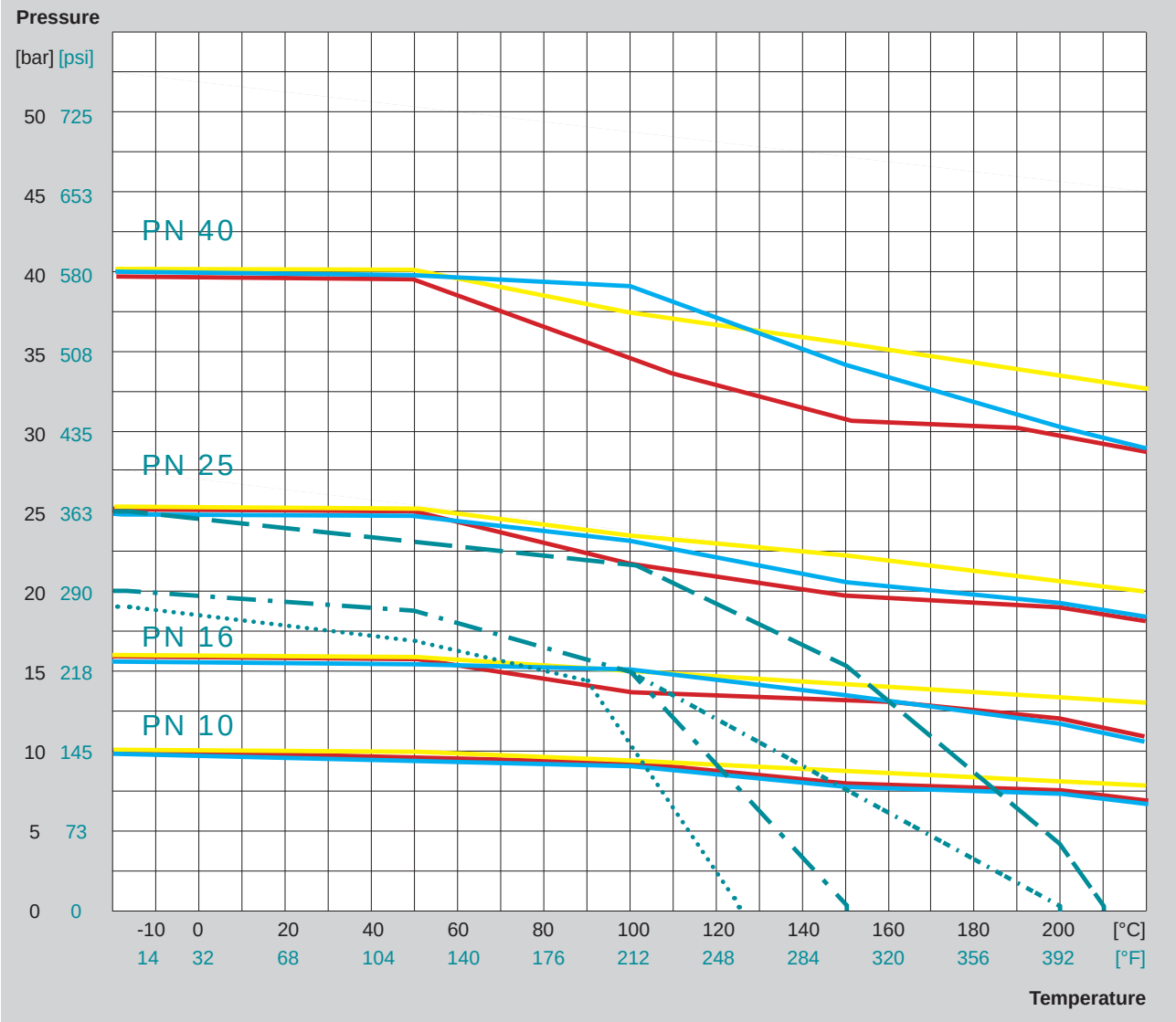
The data given are max. values according to ASME B16.34.

IMPORTANT NOTE

for demanding conditions, such as process temperatures exceeding 200°C / 392°F: Valve size, media phase, plug position & temperature (constant or fluctuating) may have an impact on the lifetime. Consult factory for proper selection of sleeve material, cover sealing type and special features.

For temperatures < -29°C / -20°F, (T_{limit} = -60°C / -76°F) operating temperature, low-temperature carbon steel or austenitic stainless steels are required.

PT Diagram, PN 10 - PN 40
lined valves



Body material

EN 10213 - 1.0619 / Carbon Steel
EN 10213 - 1.4408 / Stainless Steel
EN 1563 - EN-GJS-400-18-LT / Ductile Iron
other body materials on request

Lining combination

	Body	Plug / Ball	T_{MAX}
– –	PFA	PTFE or special*	210°C / 410°F
– · –	PFA	PFA	200°C / 392°F
– · · –	all combinations with PFA and FEP		150°C / 302°F
· · · · ·	PFA conductive	PFA conductive**	125°C / 257°F

*) Special materials (metallic) for plugs without lining on request
**) Material combination PFA / FEP possible

Maximum breakaway torque depending on material combinations according to the technical data sheets of the plug valve.

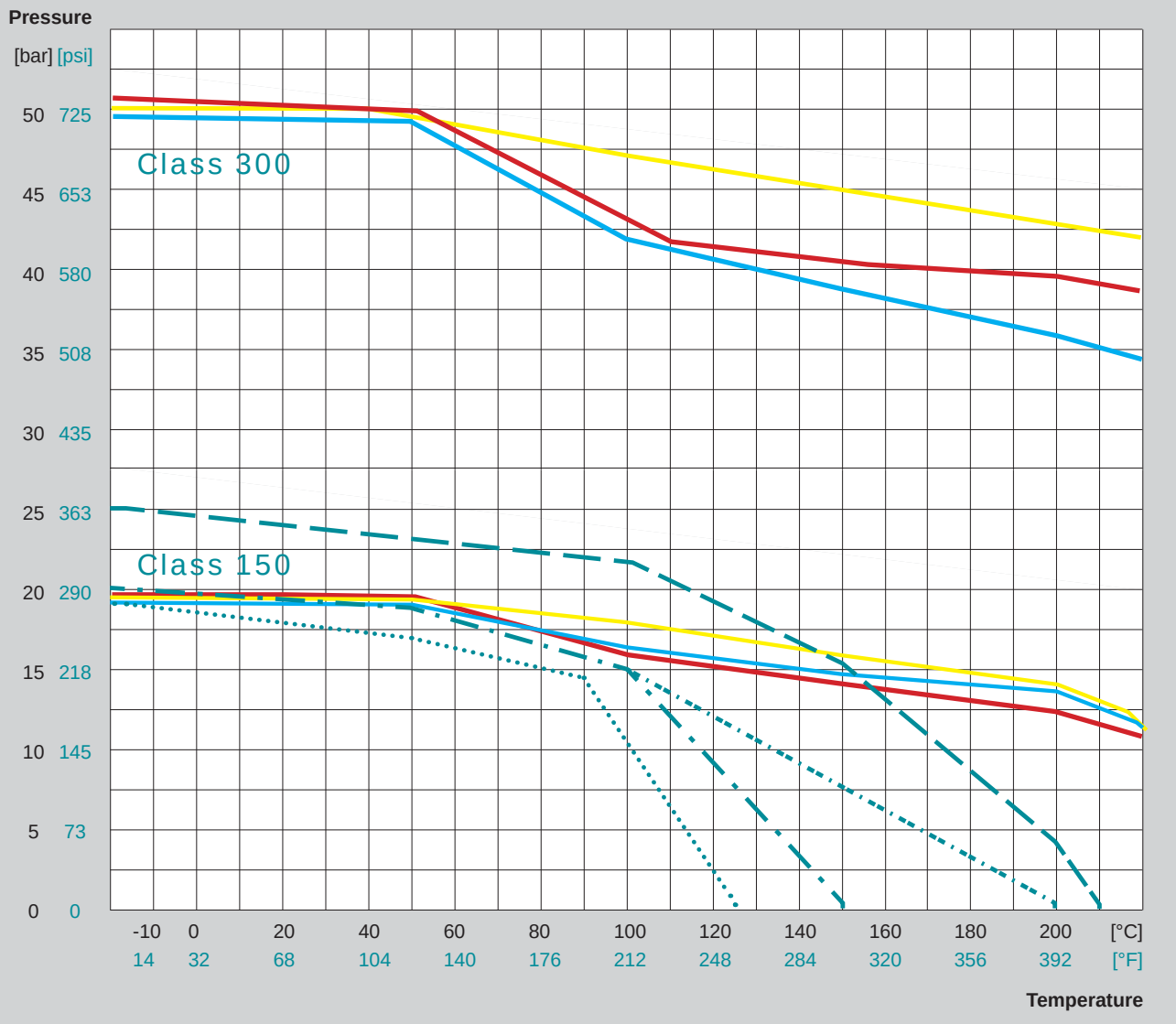
Subject to technical change without notice.

The data given are max. values according to EN 12516-4.

IMPORTANT NOTE

for demanding conditions, such as process temperatures exceeding 150°C / 302°F: Valve size, media phase, plug position & temperature (constant or fluctuating) may have an impact on the lifetime. Consult factory for proper selection of lining material, cover sealing type and special features.

PT Diagramm, Class 150 - Class 300 lined valves



Body material

- ASTM A216 - WCB
- ASTM A351 - CF8M / Stainless Steel
- ASTM A395 / Ductile Iron
- other body materials on request

Lining combination

	Body	Plug / Ball	T_{MAX}
— —	PFA	PTFE or special*	210°C / 410°F
— · —	PFA	PFA	200°C / 392°F
— · —	all combinations with PFA and FEP		150°C / 302°F
·····	PFA conductive	PFA conductive**	125°C / 257°F

*) Special materials (metallic) for plugs without lining on request

**) Material combination PFA / FEP possible

Maximum breakaway torque depending on material combinations according to the technical data sheets of the plug valve.

Subject to technical change without notice.

The data given are max. values according to ASME B16.34 / B16.42.

IMPORTANT NOTE

for demanding conditions, such as process temperatures exceeding 150°C / 302°F: Valve size, media phase, plug position & temperature (constant or fluctuating) may have an impact on the lifetime. Consult factory for proper selection of lining material, cover sealing type and special features.

Plug types: two-way and multi-port for standard reduced and full bore design

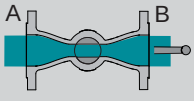
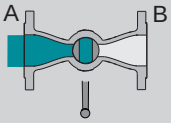
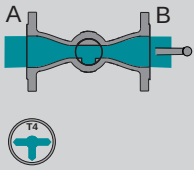
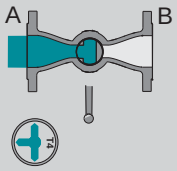
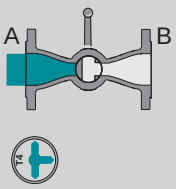
Design	STANDARD	EXTRA (full bore)	multiway
Plug type	two-way	two-way	e.g. T4

- position indicator for all multi-way valves welded on lever or stem extension
- Lined plug valves: multi-way plugs only with PFA / FEP plug lining or made of special materials. Two-way plugs with PTFE lining up to DN 100 / NPS 4 available

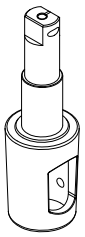
Recommendation for three-way valves type F-3-S with vertical outlet (longer life-time compared to type F-3-W with horizontal outlet)

Options

Plugs made of special materials or special designs, e.g. with flushing devices, vent holes in plug bottom or plug upstream / downstream side

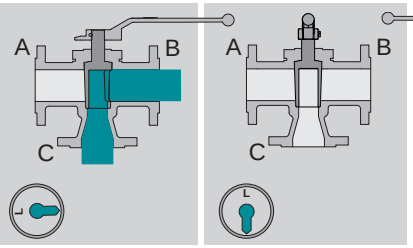
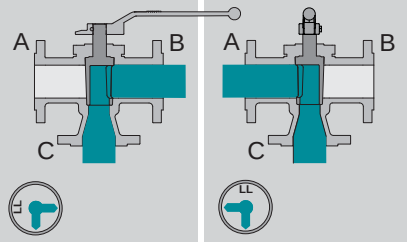
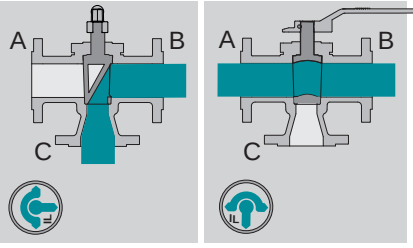
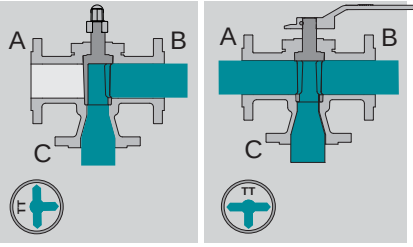
2-way	Plug type	Pos. I = 0°	Pos. II = 90°	Pos. III = 180°	Pos. IV = 270°
 Type F-2-ISO-STANDARD	D				
 Type F-2-ISO-STANDARD-A	T4 *				

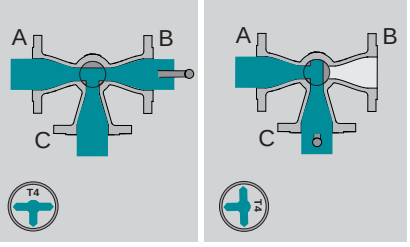
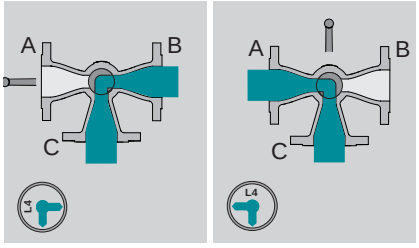
*) For highly expanding media AZ recommends the "i-plug" (relief hole and open plug buttom)



"i-plug"

Plug types: 3-way valve
for STANDARD and EXTRA design

Plug type	Pos. I = 0°	Pos. II = 90°	Pos. III = 180°	Pos. IV = 270°	3-way (vertical)
L					 Type F-3-S-ISO-STANDARD
LL					
IL*					 Type F-3-S-ISO-STANDARD-A
TT					

Plug type	Pos. I = 0°	Pos. II = 90°	Pos. III = 180°	Pos. IV = 270°	3-way (horizontal)
T4					 Type **F-3-W-ISO-STANDARD**
L4					 Type **F-3-W-ISO-STANDARD-A**

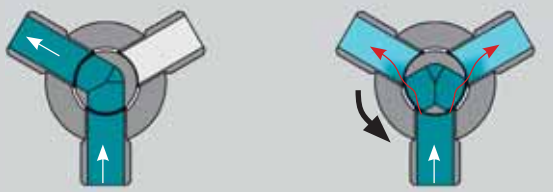
*) for EXTRA valves with IL-plug, F-3-W-EXTRA with T4-plug is recommended (higher flowrate)
Lined valves: the IL-plug is only available in special materials

Plug types 3-way (120°) valves and 4-way valves for STANDARD and EXTRA design

3-way (120°) type 3-W-120:

- min. cross section guaranteed (switching phase)
- piggable execution on request
- minimum flow guaranteed

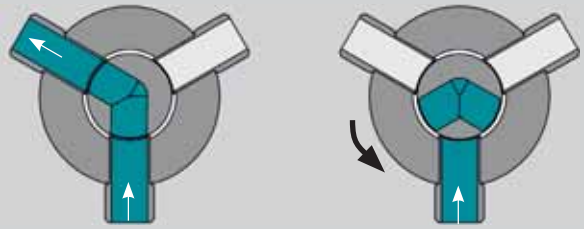
transflow design

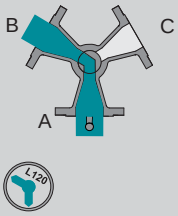
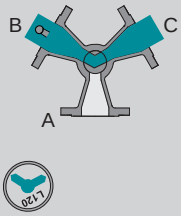
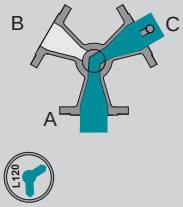


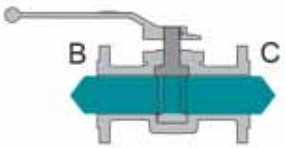
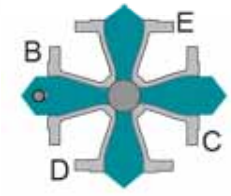
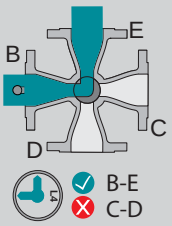
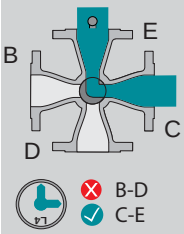
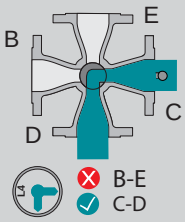
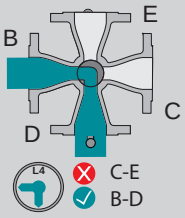
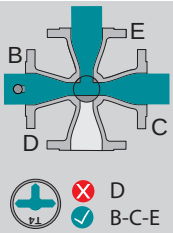
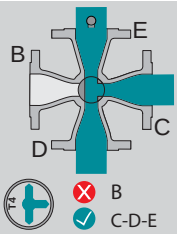
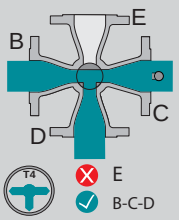
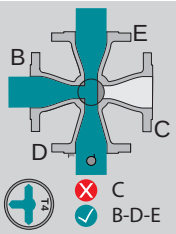
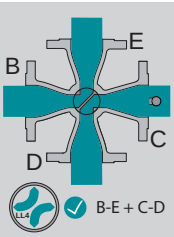
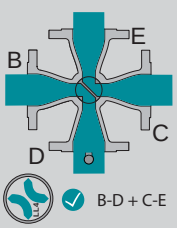
3-way (120°) type 3-WP-120

- with positive overlap
- flow interruption / isolation

positive overlap



3-way (120°)	Plug type	Pos. I = 0°	Pos. II = 120°	Pos. III = 240°	
	L120 				

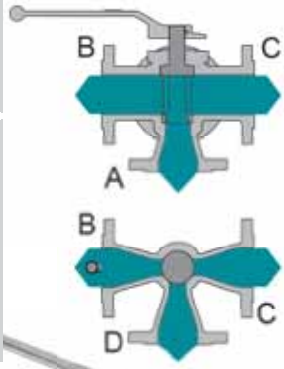
4-way	Plug type	Pos. I = 0°	Pos. II = 90°	Pos. III = 180°	Pos. IV = 270°
 Type F-4-ISO-STANDARD  	L4 	 B-E C-D	 B-D C-E	 B-E C-D	 C-E B-D
	T4 	 D B-C-E	 B C-D-E	 E B-C-D	 C B-D-E
	LL4 	 B-E + C-D	 B-D + C-E		

open
closed

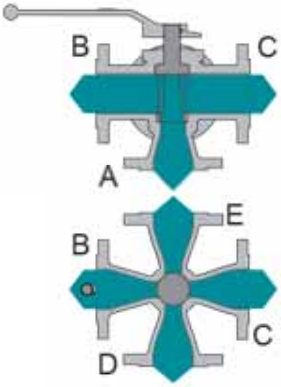
Plug types 4-way (special) and 5-way valves for STANDARD and EXTRA design

Plug type	Pos. I = 0°	Pos. II = 90°	Pos. III = 180°	Pos. IV = 270°	4-way (special) / 5-way
L	✗ C-D-E ✓ A-B	✗ B-C-D ✓ A-E	✗ B-D-E ✓ A-C	✗ B-C-E ✓ A-D	
LL	✗ C-D ✓ A-B-E	✗ B-D ✓ A-C-E	✗ B-E ✓ A-C-D	✗ C-E ✓ A-B-D	
IL	✗ D ✓ A-E + B-C	✗ B ✓ A-C + D-E	✗ E ✓ A-D + B-C	✗ C ✓ A-B + D-E	
T	✗ D-E ✓ A-B-C	✗ B-C ✓ A-D-E	✗ D-E ✓ A-B-C	✗ B-C ✓ A-D-E	
TT	✗ E ✓ A-B-C-D	✗ C ✓ A-B-D-E	✗ D ✓ A-B-C-E	✗ B ✓ A-C-D-E	

Type F-4-Special-ISO-STANDARD



Type F-5-ISO-STANDARD



✓ open
✗ closed

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