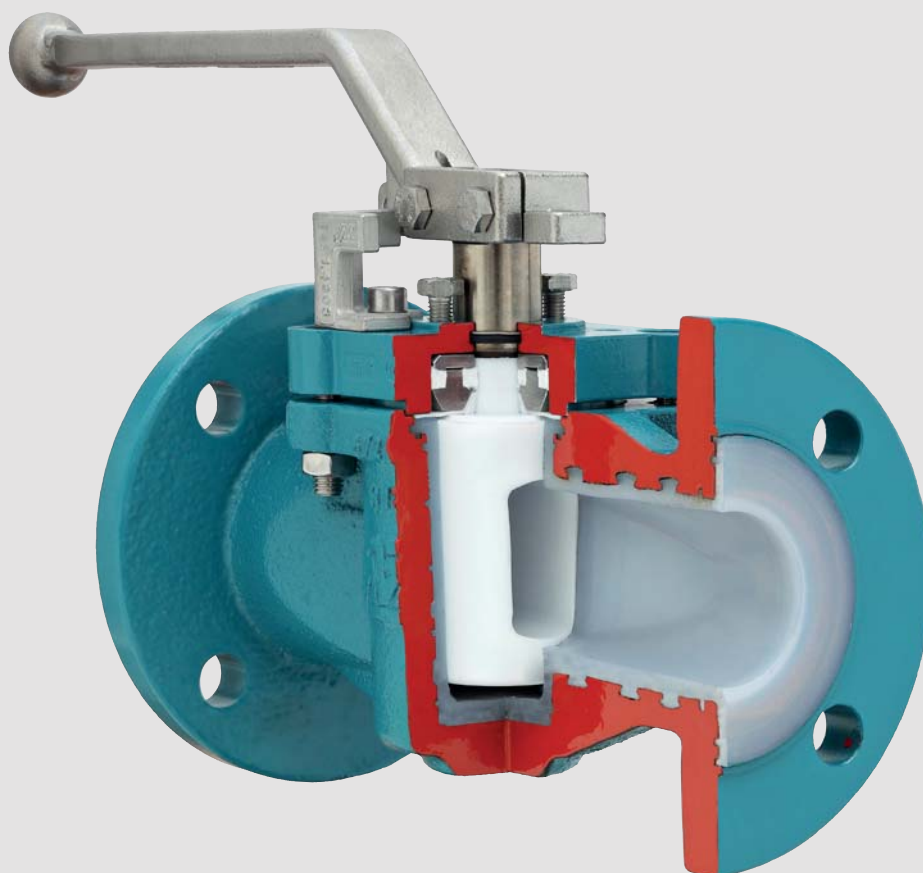


PFA Lined Plug Valves



AZ lined plug valves

Design overview and options

chemically resistant lining

- minimum 3mm FEP/PFA lining
- anchorage of lining in body
- vacuum-capable



Type SAFE-LINED

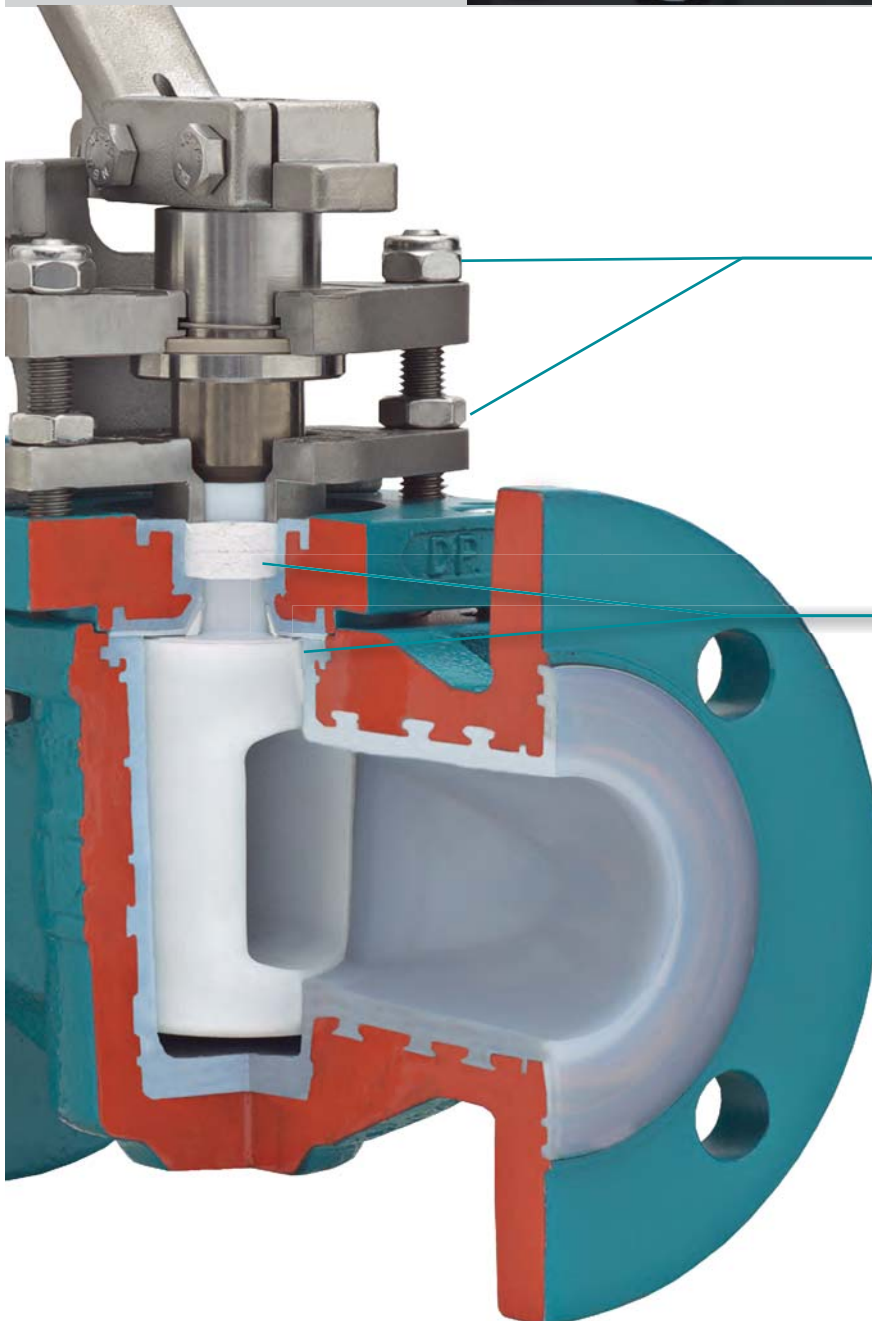
for chemical applications with increased requirements

adjustable

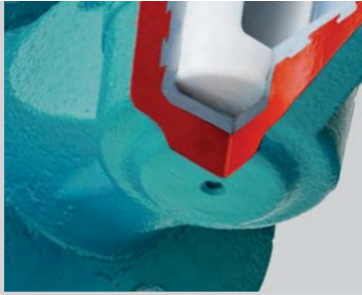
- plug and stuffing box individually adjustable
- permanent accessibility guaranteed, also with mounted actuator / gearbox
- adjustable even under extreme operating conditions

Improved sealing

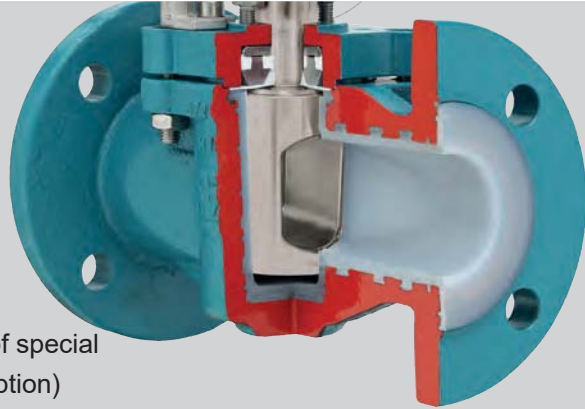
- cover fully PFA lined
- triple safety stem packing



*engineered.
fast.
dynamic.*



- weep holes for early leakage detection



- plug made of special materials (option)

Type ISO-STANDARD-A

- suitable for general chemical applications



Type ISO-AB2000

- lined plug valve with exchangeable PTFE sleeve
- easy to repair



- large range of plug types for horizontal and vertical 3-way lined plug valves

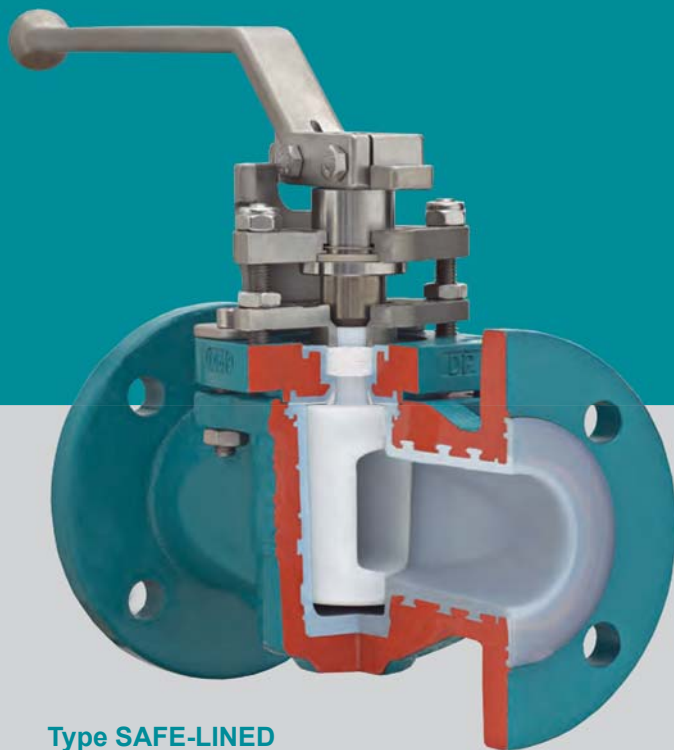
- heating jacket (full or partial jacket design)(option)(Option)

- two-way plug with flushing device (option)



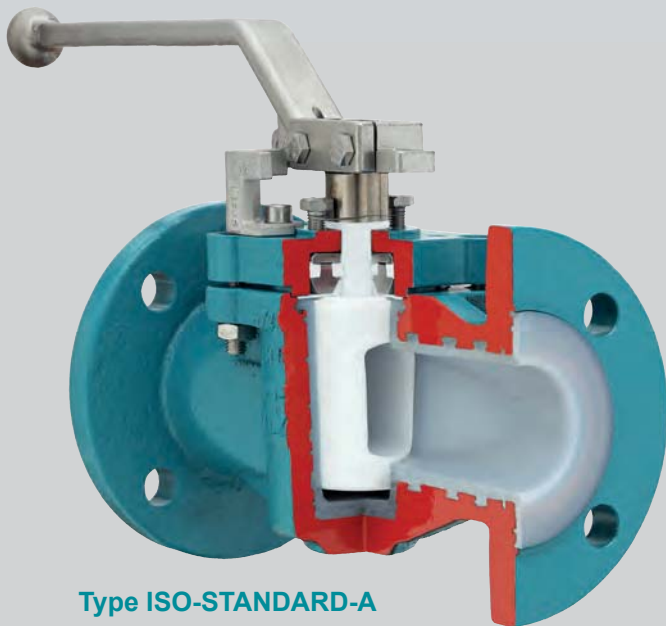
Type ISO-STANDARD-A / SAFE-LINED

Lined plug valve



Type SAFE-LINED

- cover fully PFA lined
- triple safety sealing system



Type ISO-STANDARD-A

- full safety to operator and environment
- highest corrosion protection

NPS ½ - 12 / class 150 - 300

Range of application:

14 < T < 302/410°F

vacuum-capable

Design characteristics

- chemical-resistance
- free of cavities
- easy accessible adjustment of the plug
- mounting-flange for actuators acc. to ISO 5211
- plug lining
 - two-way plugs
 - ≤DN100 = PTFE
 - >DN100 = FEP or PFA lining
- body: Ductile Iron 5.3103, ASTM A395 or Carbon Steel 1.0619, ASTM A216 WCB

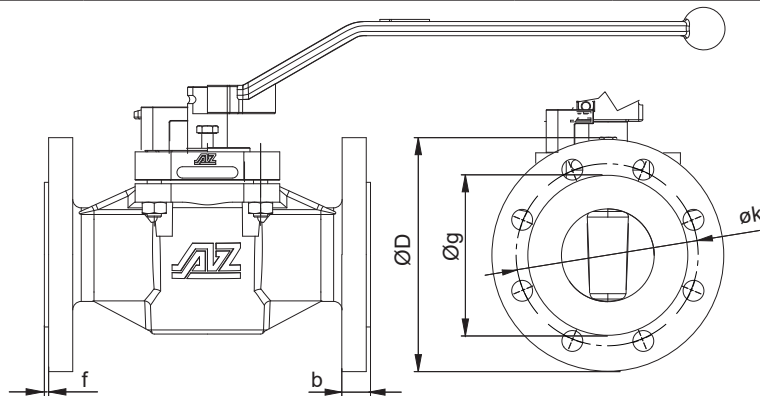
Options

- higher operating pressure
- heating jacket
- flushing device
- FDA compliant
- painting
- oil and grease-free assembly
- oversize design
- other materials
- oversize design
- other materials



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

Flange dimensions acc. to ASME



ASME B16.5	NPS Class		flange bore						
			ØD	Øk	no.	ø	Øg	b	f
			[mm] [Inch]	[mm] [Inch]		[mm] [Inch]	[mm] [Inch]	[mm] [Inch]	[mm] [Inch]
	1/2	150	90 3.54	60,3 2.37	4	15,7 5/8	34,9 1.37	10,0* 0.39	2
		300	95 4.60	66,7 2.63	4	15,7 5/8	34,9 1.37	14,7 0.58	0.079
	3/4	150	100 3.94	69,9 2.75	4	15,7 5/8	42,9 1.69	10,9* 0.43	2
		300	115 7.10	82,6 3.25	4	19,1 3/4	42,9 1.69	16,3 0.64	0.079
	1	150	110 7.90	79,4 3.13	4	15,7 5/8	50,8 2.00	11,6* 0.46	2
		300	125 4.92	88,9 3.50	4	19,1 3/4	50,8 2.00	17,9 0.52	0.079
	1 1/4	150	115 4.53	88,9 3.50	4	15,7 5/8	63,5 2.50	13,2* 0.52	2
		300	135 5.31	98,4 3.87	4	19,1 3/4	63,5 2.50	19,5 0.77	0.079
	1 1/2	150	125 4.92	98,4 3.87	4	15,7 5/8	73,0 2.87	14,7* 0.58	2
		300	155 6.10	114,3 4.50	4	22,3 7/8	73,0 2.87	21,1 0.89	0.079
	2	150	150 5.91	120,7 4.75	4	19,1 3/4	92,1 3.63	16,3* 0.64	2
		300	165 6.50	127,0 5.00	8	19,1 3/4	92,1 3.63	22,7 0.89	0.079
	2 1/2	150	180 7.09	139,7 5.50	4	19,1 3/4	104,8 4.13	17,9* 0.70	2
		300	190 7.48	149,3 5.88	8	22,3 7/8	104,8 4.13	25,9 1.02	0.079
	3	150	190 7.48	152,4 6.00	4	19,1 3/4	127,0 5.00	19,5* 0.77	2
		300	210 8.27	168,3 6.63	8	22,3 7/8	127,0 5.00	29,0 1.14	0.079
	4	150	230 9.06	190,5 7.50	8	19,1 3/4	157,2 6.19	24,3 0.96	2
		300	255 10.04	200,0 7.87	8	22,3 7/8	157,2 6.19	32,2 1.27	0.079
	5	150	255 10.04	215,9 8.50	8	22,3 7/8	185,7 7.31	24,3 0.96	2
		300	280 11.02	235,0 9.25	8	22,3 7/8	185,7 7.31	35,4 1.39	0.079
	6	150	280 11.04	241,3 9.50	8	22,3 7/8	215,9 8.50	25,9 1.02	2
		300	320 12.06	269,9 10.63	12	22,3 7/8	215,9 8.50	37,0 1.46	0.079
	10	150	405 15.94	362,0 14.25	12	25,4 1	323,8 12.75	30,6 1.20	2
		300	445 17.52	387,4 15.25	16	28,4 1 1/8	323,8 12.75	48,1 1.89	0.079
	12	150	485 19.09	431,8 17.00	12	25,4 1.00	381,0 15.00	32,2 1.27	2
		300	520 20.47	450,8 17.75	16	31,7 1 1/4	381,0 15.00	51,3 2.02	0.079

Type F-2 ISO-STANDARD-A / SAFE-LINED

Technical information NPS ½ - 4

NPS	Class	L [mm] [Inch]	L/2 [mm] [Inch]	A [mm] [Inch]	H [mm] [Inch]	R [mm] [Inch]	ISO 5211 bracket	SW [mm] [Inch]	torque* [Nm] [ft lb]	weight [kg] [lb]	K _{vs} value [m³/h]	C _v value [US.gal/min]
ASME B16.10	½	150	108	**	100	101	F05	11 0.433	40/-- 30/--	2,7 6.0	8	9
		300	140	**	100	101				3,8 8.4		
	¾	150	117	64	100	100	F05	11 0.433	40/-- 30/--	3,2 7.1	6	7
		300	152	83	100	10				4,3 9.5		
	1	150	127	**	106	108	F05	11 0.433	90/60 66/44	3,5 7.7	33	38
		300	165	**	106	108				6,0 13		
	1½	150	165	**	119	125	F07	14 0.551	160/80 118/59	9 20	87	101
		300	190	**	119	125				10 22		
	2	150	178	**	133	159	F07	19 0.748	250/120 184/89	13 29	140	162
		300	216	**	133	159				16 35		
	3	150	203	**	168	169	F10	22 0.866	400/260 295/191	18 40	259	299
		300	282	**	168	169				23 51		
	4	150	229	154	173	207	F10	22 0.866	400/260 295/191	26 57	209	242
		300	305	**	173	207				31 68		
			12.00	**	6.81	8.15					223	258

ISO flange instructions, weights and K_{vs} values for 2-way valves

*) Maximum breakaway torque Md_{breakaway} [Nm] for F-2 and F-3-S depending on material combinations (PFA+PFA / PFA+ PTFE)
Manufacturer recommended sizing torque (incl. 100% safety)

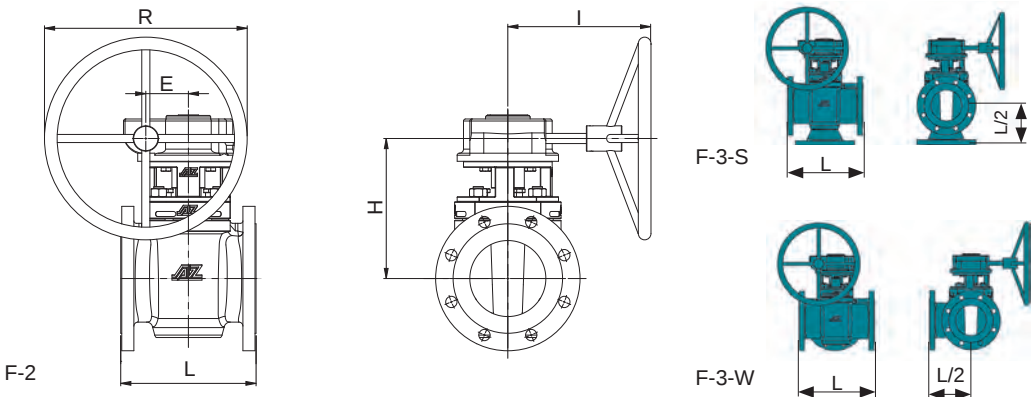
Breakaway torques for type F-3-W on request

**) on request

Some designs, sizes and/or configurations may be fitted with threaded flange holes.

Type F-2 ISO-STANDARD-A / SAFE-LINED

Technical information NPS 5 - 12

															
NPS	Class	L	L2	E	R	H	I	gear	AZ bracket	SW	torque*	weight	K _{vs} value	C _v value	
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]								
		[Inch]	[Inch]	[Inch]	[Inch]	[Inch]	[Inch]								
ASME B16.10	4S	150	254	154	84	500	230	Q1500-S	F16	36	600/350	27	492	569	
		300	325	**	84	500	230								
	6	150	267	**	118	500	276	Q1500-S	F16	36	1200/900	66	789	912	
		300	403	**	118	500	276								
	8	150	292	**	138	500	320	Q3000-S	F16	36	2600/--	103	1776	2053	
		300	419	**	138	500	320								
	10	150	330	**	138	500	352	Q5000-S	F16	36	3200/--	140	2257	2609	
		300	457	**	138	500	352								
	12	150	356	**	138	500	340	Q5000-S	F16	36	3900/--	168	1877	2170	
		300	502	*	138	500	340								
			19.75		5.43	19.69	13.86					412	2134	2467	

ISO flange instructions, weights and K_{vs} values for 2-way valves

*) Maximum breakaway torque $M_{d \text{ breakaway}}$ [Nm] for F-2 and F-3-S depending on material combinations (PFA+PFA / PFA+ PTFE)
Manufacturer recommended sizing torque (incl. 100% safety)

Breakaway torques for type F-3-W on request

**) on request

Some designs, sizes and/or configurations may be fitted with threaded flange holes.

Engineering

Design

- free of cavities, adjustability, modular concept options

Sealing systems

- STD, FS, CA, FSN (-SL), CASN (-SL), SAFE-LINED, special

Fugitive emission

- Low-Emission Valves acc. to TA-Luft, ISO 15848 & API 641

Materials

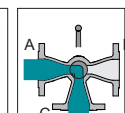
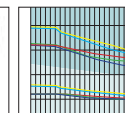
- casting materials, forged and bar material, lining materials

PT-diagrams

- pressure, temperature, materials

Plug types

- for two-way and multi-way valves



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

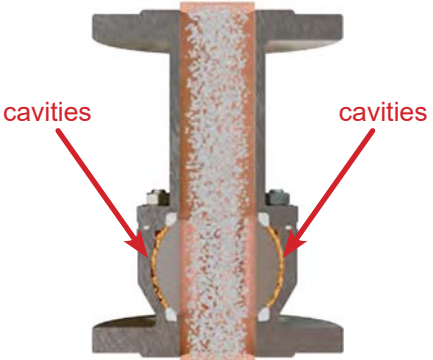
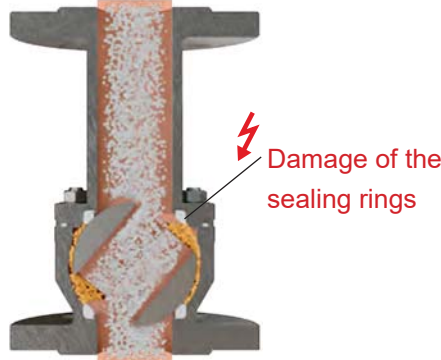
PTFE-sleeve

- 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 accessible with mounted actuator / gearbox

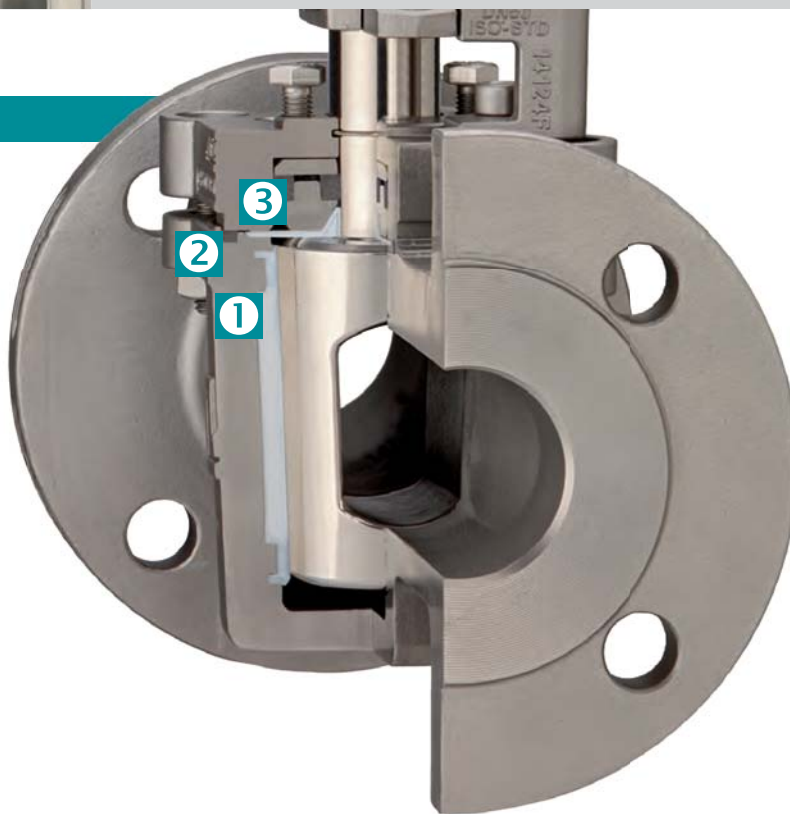
Several sealing steps to atmosphere

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

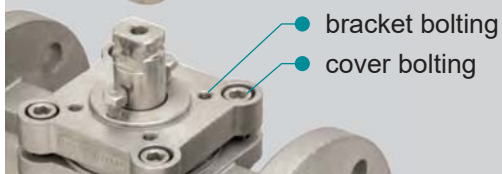


Detailed information about all certified AZ cover & stem sealing systems see chapter

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

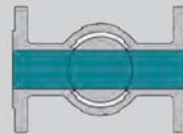
- compact valve (FF / weight)
- optimal torques for economic automation



Full round bore

Type EXTRA

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

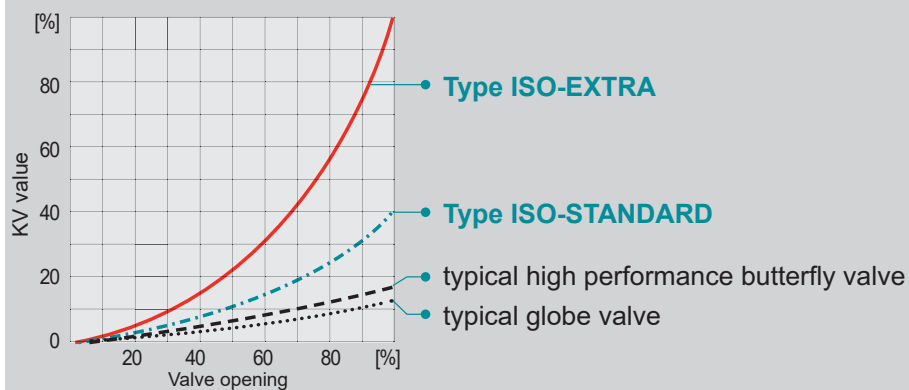


Type ISO-EXTRA

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



Maximum flow rate

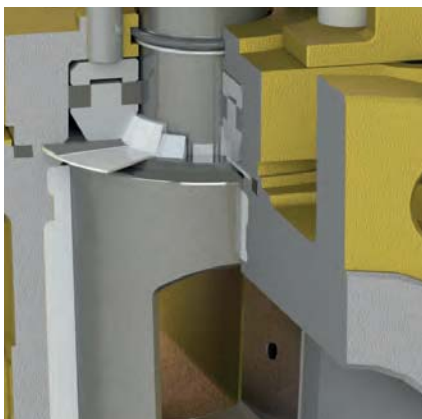


Options



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 $<0.8 \text{ Ra } \mu\text{m}$ ($<32 \text{ Ra } \mu\text{in}$)
- oil and grease free
- water-free



All connections possible

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



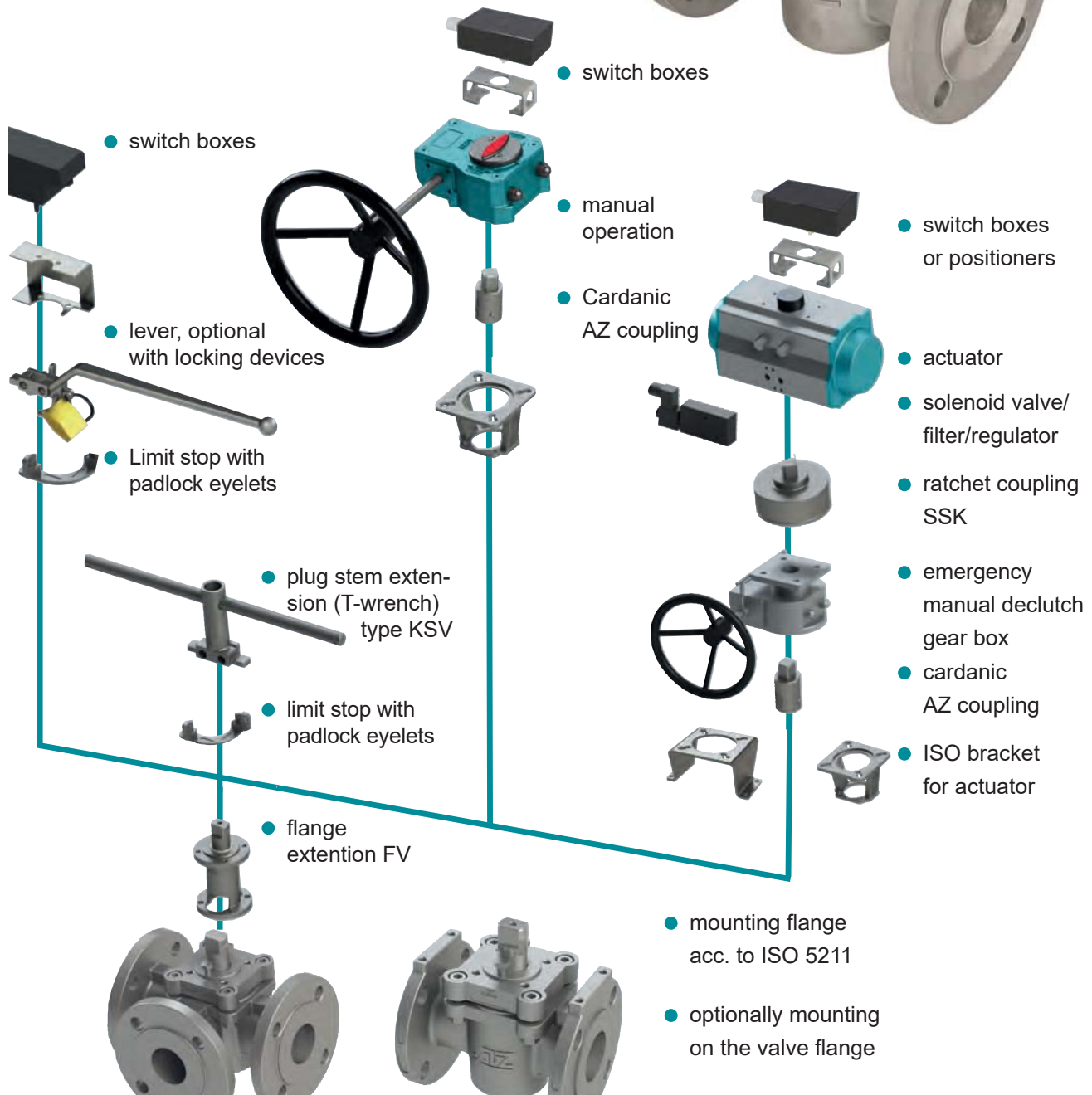
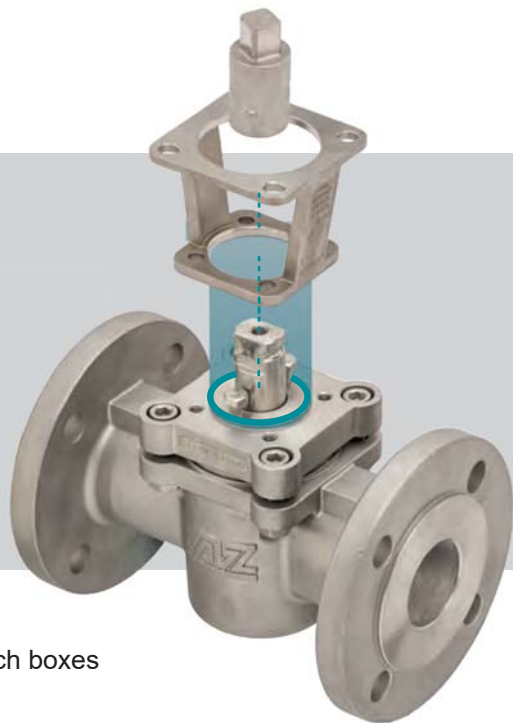
High and low temperature

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

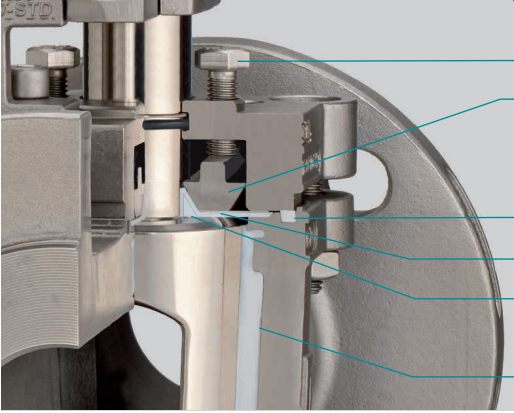
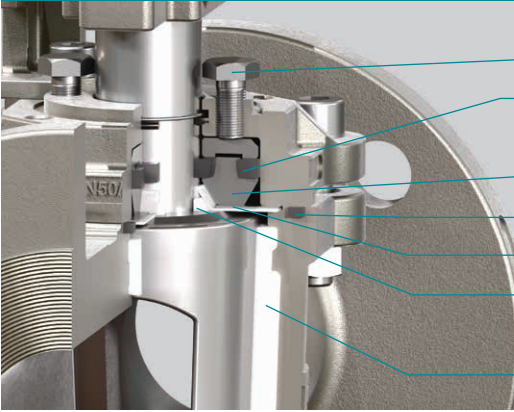
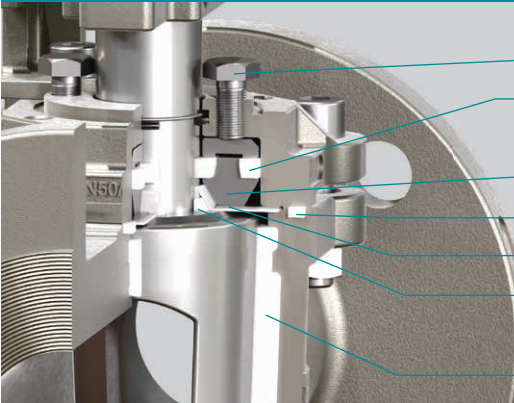
Modular operation concept

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



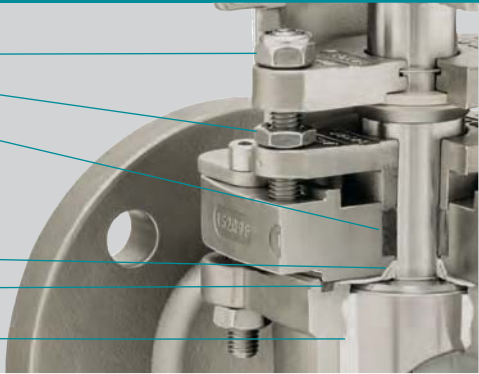
Cover and stem sealing systems suitable for general applications

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*

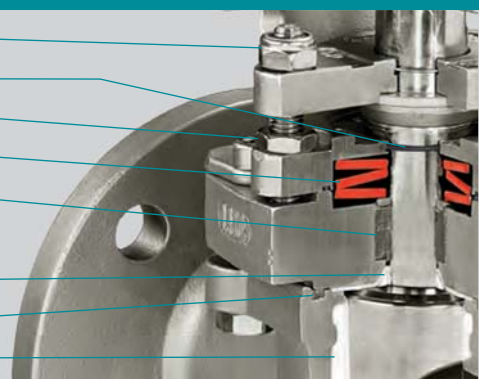
*) The sleeve material has a decisive influence on the maximum operating temperature
Material selection acc. to PT-diagram

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)
Emission Free	NEW!  - 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 stem)
- for toxic and fugitive media
- high wear resistance



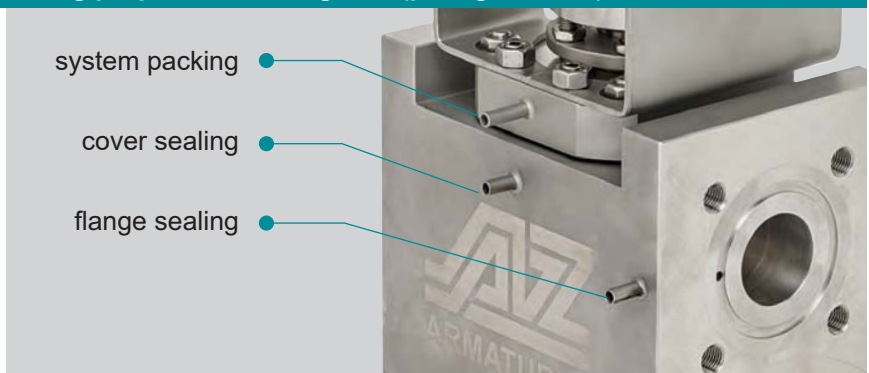
Type CL Chlorine / gas applications

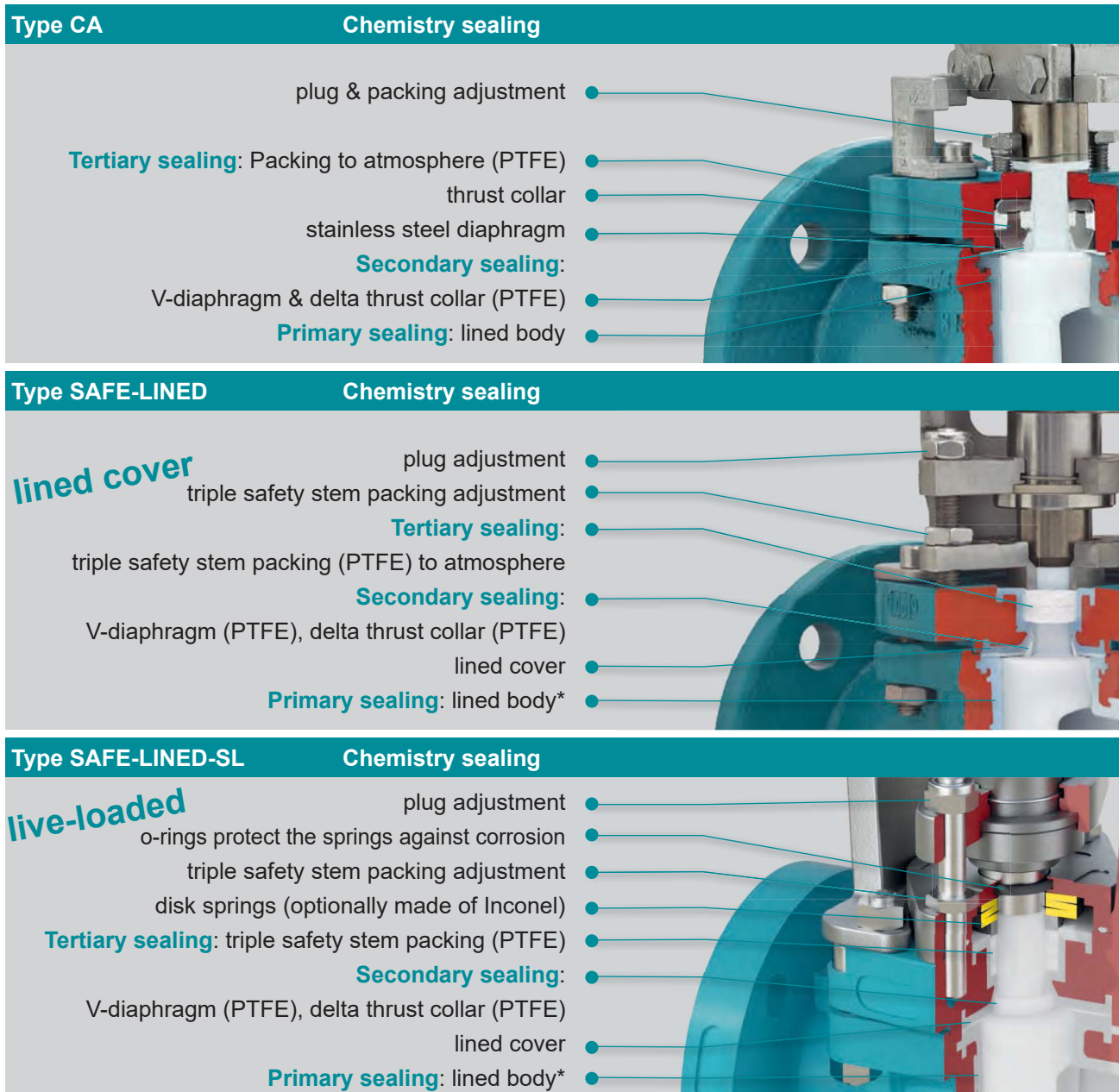
- approved for chlorine applications
- ideal for media with changing state of aggregate (e.g. liquid to gas, vice versa)
- vacuum capable



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

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





*) 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

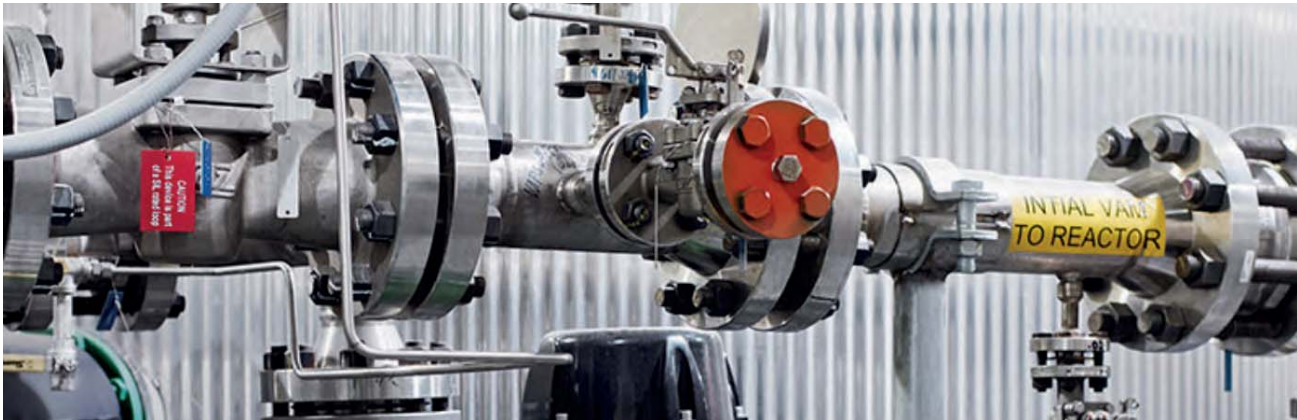
NEW!



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.

Similar forged and bar 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

body lining	Combination of linings 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



Category	Sleeve 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 resistant, abrasive application	80°C / 176°F

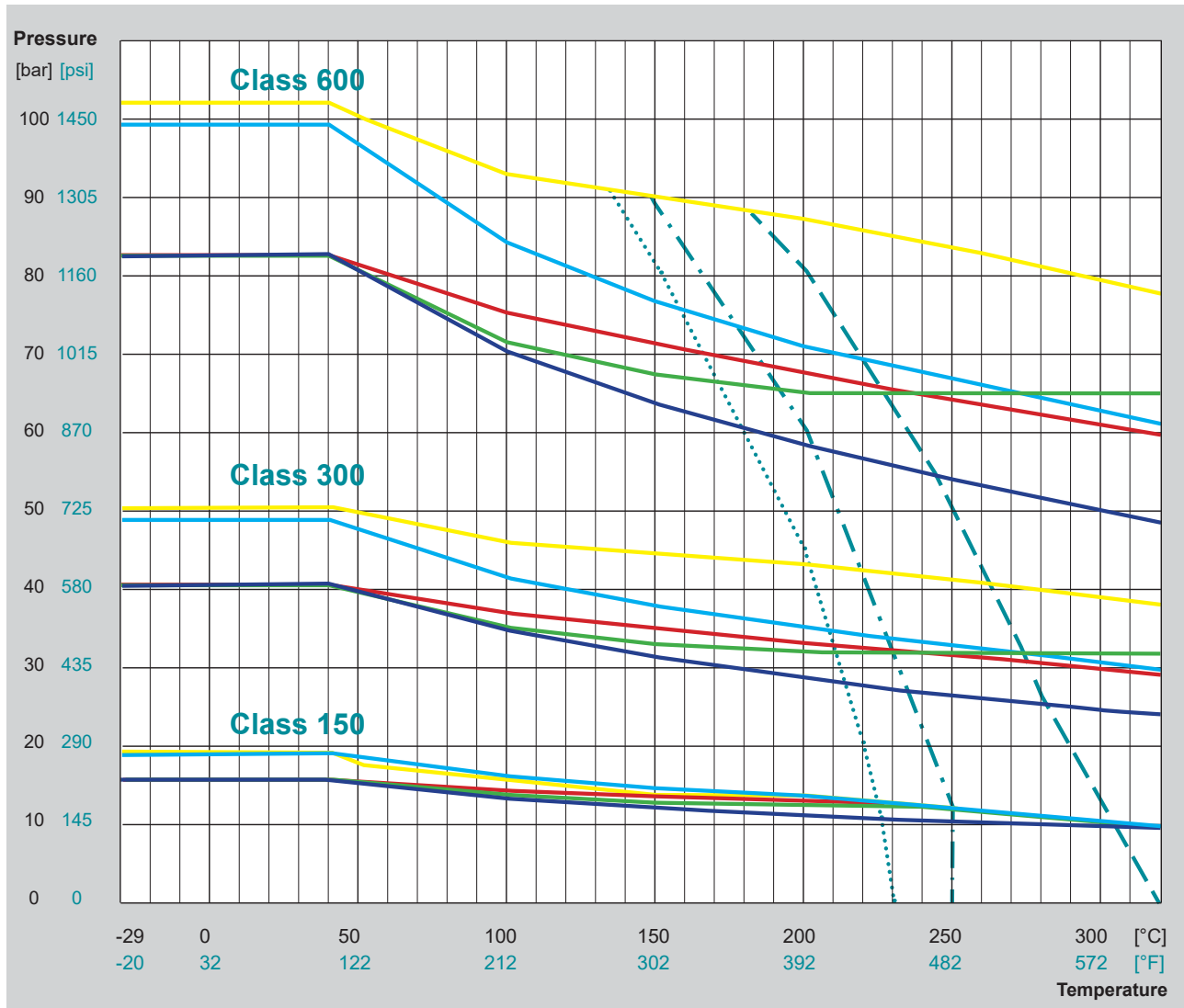
*) sleeve material selection depending on availability at AZ manufacturing site

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 - Class 150 - Class 600 for 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) $T_{max} 230^{\circ}\text{C} / 446^{\circ}\text{F}$
- - - TFM / NXT / M111 / PTFE graphite $T_{max} 250^{\circ}\text{C} / 482^{\circ}\text{F}$
- PTFE-P / NFCE / NCS $T_{max} 320^{\circ}\text{C} / 608^{\circ}\text{F}$
- other sleeve materials on request

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

IMPORTANT NOTE

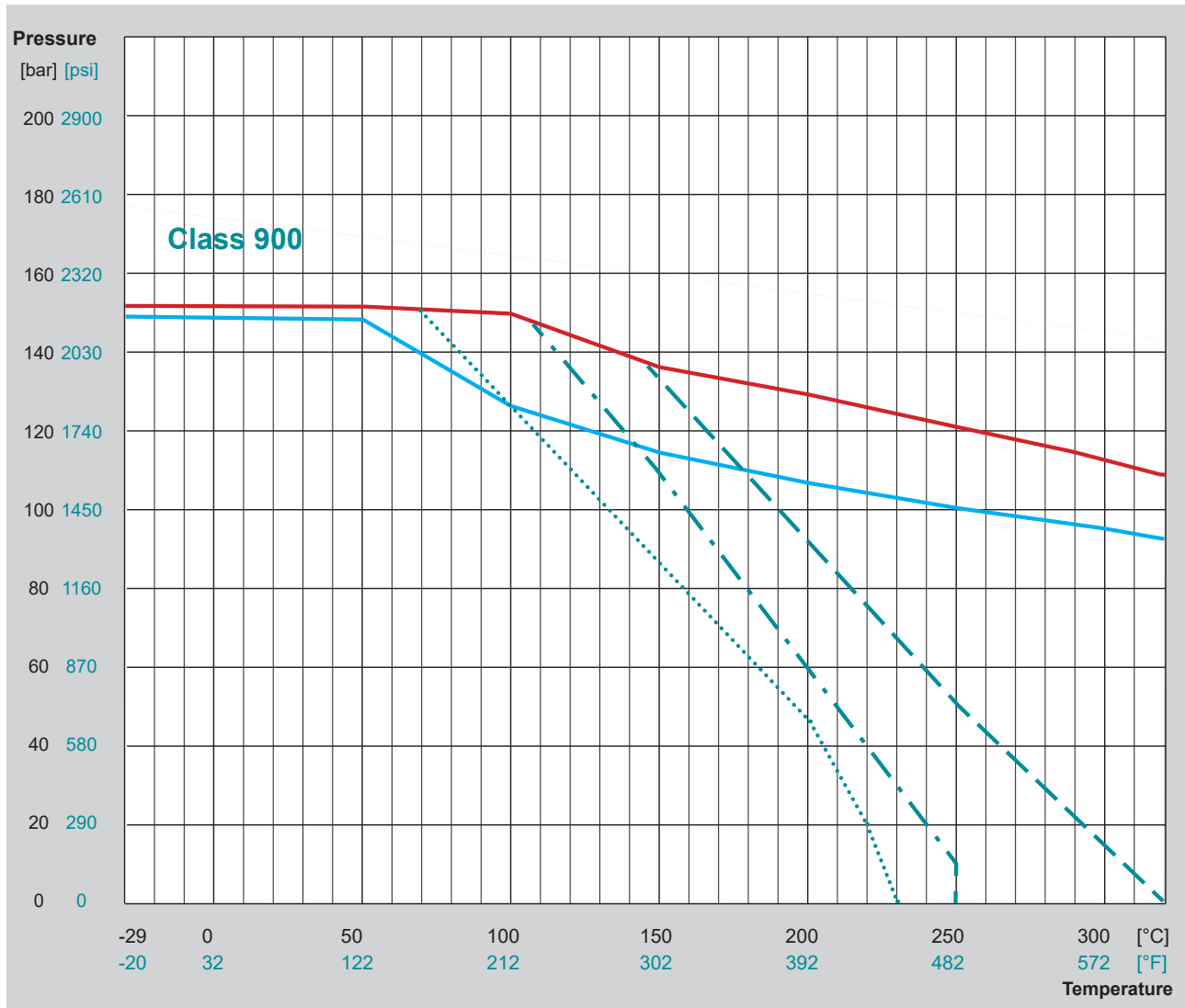
for demanding conditions, such as process temperatures exceeding $200^{\circ}\text{C} / 392^{\circ}\text{F}$: Valve size, media phase, plug position & temperature (constant or fluctuating) may have an impact on the lifetime. Consult factory for proper selection of sleeve material, cover sealing type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

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

Subject to technical change without notice.

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

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

IMPORTANT NOTE

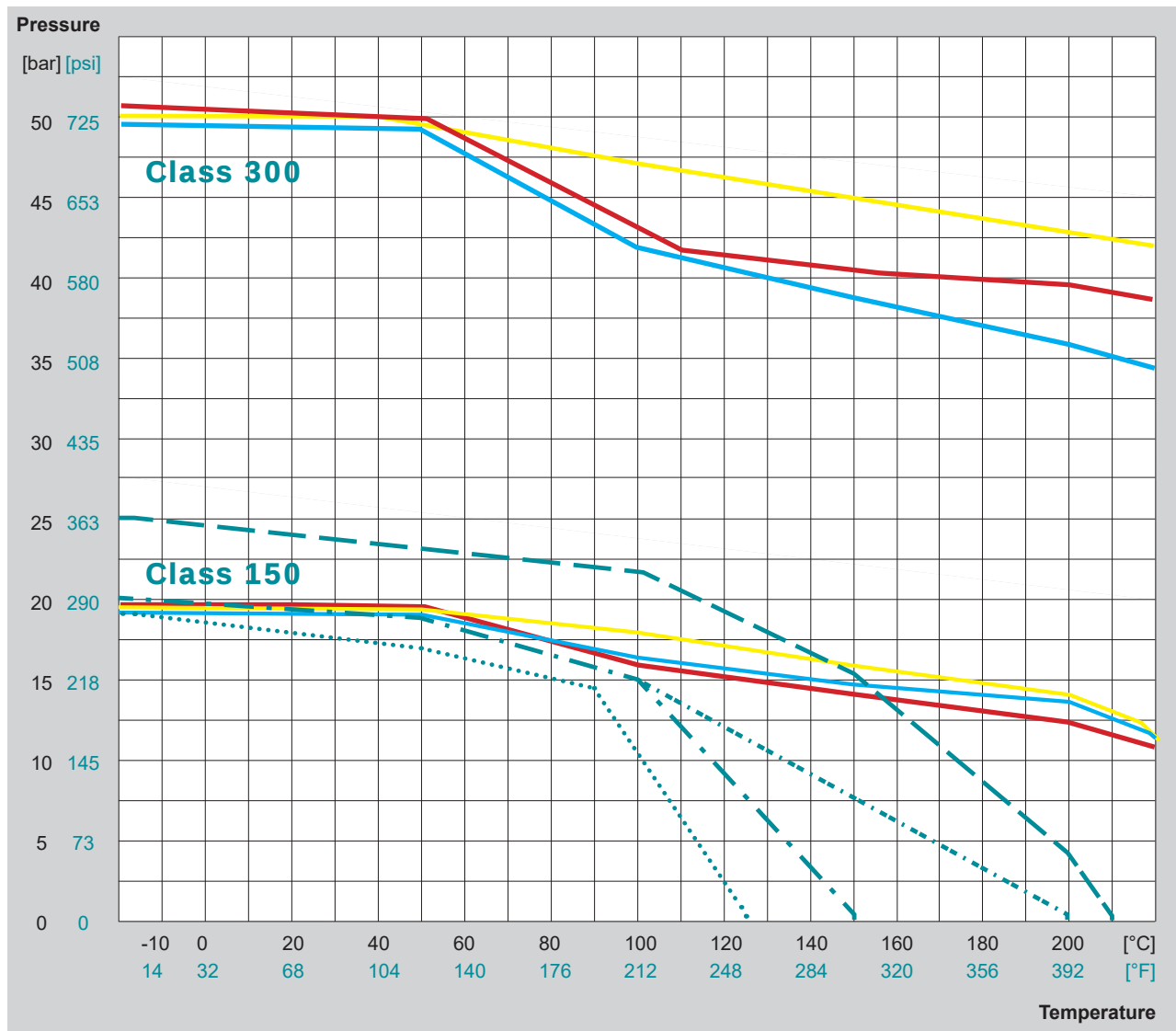
for demanding conditions, such as process temperatures exceeding 200°C / 392°F: Valve size, media phase, plug position & temperature (constant or fluctuating) may have an impact on the lifetime. Consult factory for proper selection of sleeve material, cover sealing type and special features.

Subject to technical change without notice.

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 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

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.

Maximum breakaway torque depending on material combinations according to the technical data sheets of the plug valve.
Subject to technical change without notice.



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

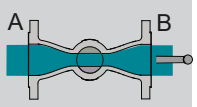
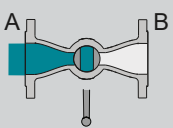
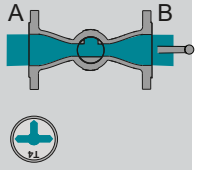
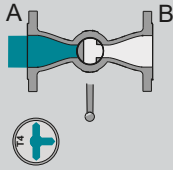
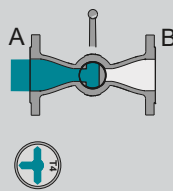


- position indicator for all multi-way valves welded on lever or stem extension
- Lined plug valves: multi-way plugs only with PFA / FEP plug lining or made of special materials. Two-way plugs with PTFE lining up to DN 100 / NPS 4 available

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

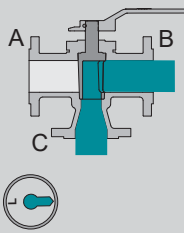
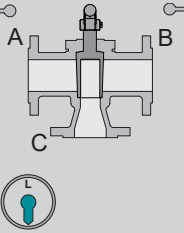
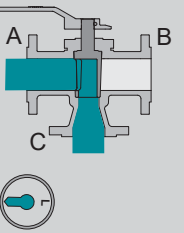
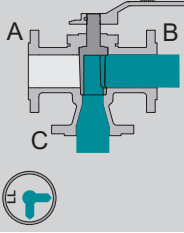
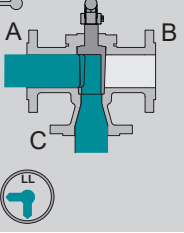
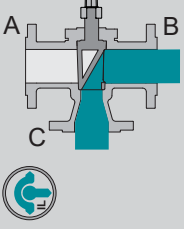
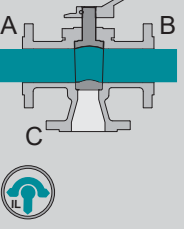
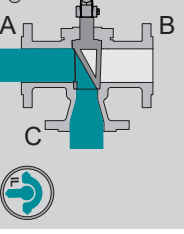
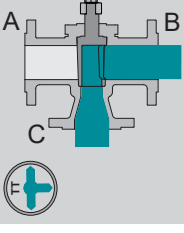
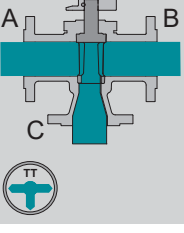
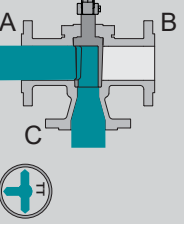
Plugs made of special materials or special designs, e.g. with flushing devices, vent holes in plug bottom or plug upstream / downstream side

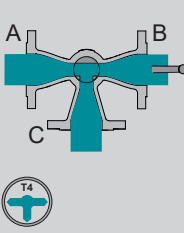
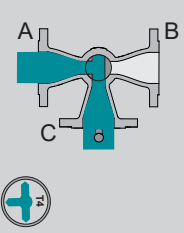
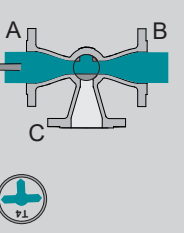
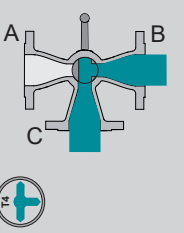
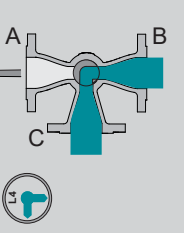
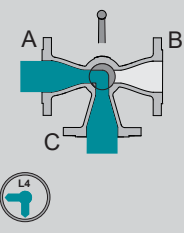
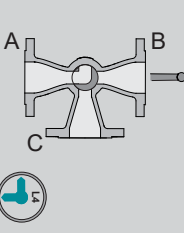
2-way	Plug type	Pos. I = 0°	Pos. II = 90°	Pos. III = 180°	Pos. IV = 270°
 Type F-2-ISO-STANDARD	 D				
	 T4*				

Type F-2-ISO-STANDARD-A

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

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 					
LL 					
IL* 					
TT 					

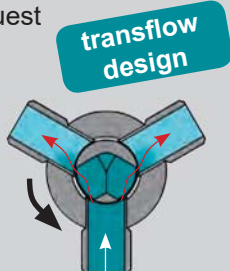
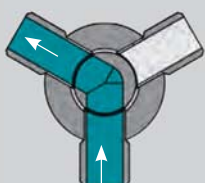
Plug type	Pos. I = 0°	Pos. II = 90°	Pos. III = 180°	Pos. IV = 270°	3-way (horizontal)
T4 					
L4 					

*) 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

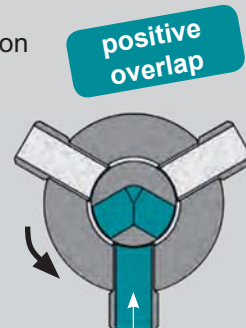
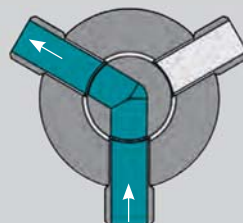
3-way (120°) type 3-W-120:

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



3-way (120°) type 3-WP-120

- with positive overlap
- flow interruption / isolation

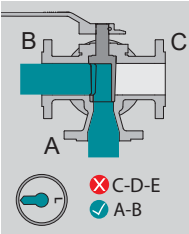
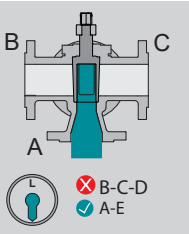
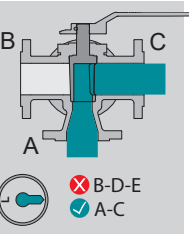
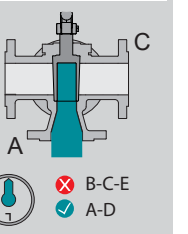
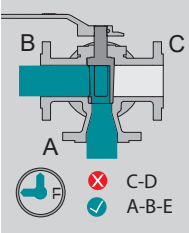
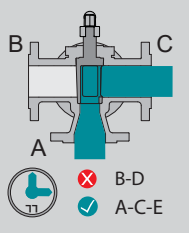
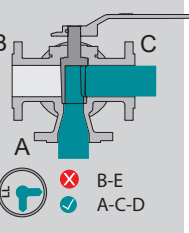
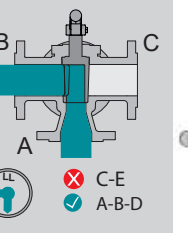
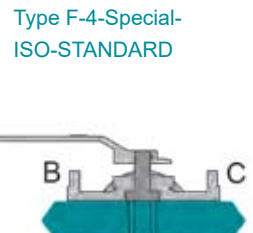
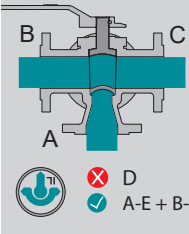
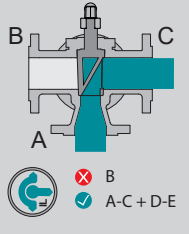
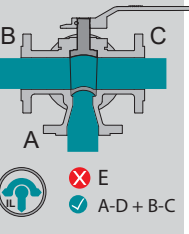
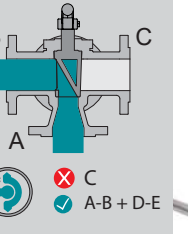
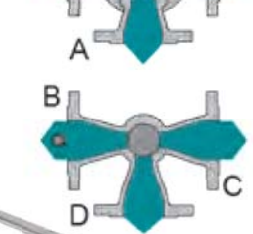
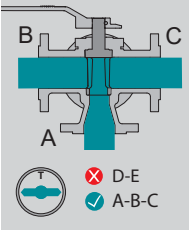
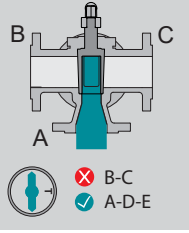
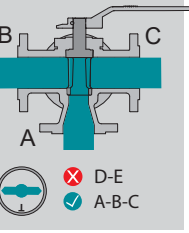
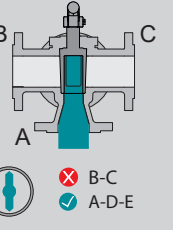
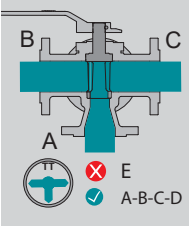
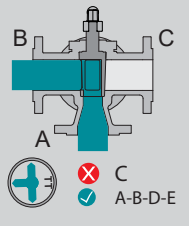
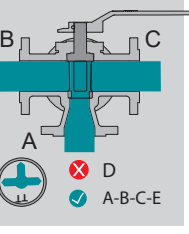
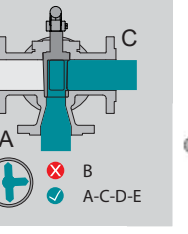
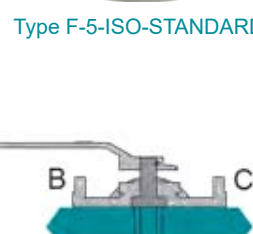


3-way (120°)	Plug type	Pos. I = 0°	Pos. II = 120°	Pos. III = 240°	
	L120 				

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

opened
 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 	 A B C ✓ A-B ✗ C-D-E	 A B C ✓ A-E ✗ B-C-D	 A B C ✓ A-C ✗ B-D-E	 A B C ✓ A-D ✗ B-C-E	
LL 	 A B C ✓ A-B-E ✗ C-D	 A B C ✓ A-C-E ✗ B-D	 A B C ✓ A-C-D ✗ B-E	 A B C ✓ A-B-D ✗ C-E	
IL 	 A B C ✓ A-E + B-C ✗ D	 A B C ✓ A-C + D-E ✗ B	 A B C ✓ A-D + B-C ✗ E	 A B C ✓ A-B + D-E ✗ C	
T 	 A B C ✓ A-B-C ✗ D-E	 A B C ✓ A-D-E ✗ B-C	 A B C ✓ A-B-C ✗ D-E	 A B C ✓ A-D-E ✗ B-C	
TT 	 A B C ✓ A-B-C-D ✗ E	 A B C ✓ A-B-D-E ✗ C	 A B C ✓ A-B-C-E ✗ D	 A B C ✓ A-C-D-E ✗ B	

 opened
 closed

Type F-4-Special-ISO-STANDARD

Type F-5-ISO-STANDARD



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- France (Lyon/ Bourg-lès-Valence)
- Great Britain (York/Roecliffe)
- Italy (Milan/Caltignaga)
- Poland (Warsaw/Opoczno)
- The Netherlands (Amsterdam)

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- Vietnam (Hanoi)

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