ARMATUREN
free of cavities & maintenance

engineered.
fast.
dynamic.

Type F-2 ISO-STANDARD

2-way plug valves with reduced bore



Product leaflet

Type ISO-STANDARD

2-way plug valves with reduced bore



Type F-2 ISO-STANDARD

- **Flange connections**
- **2-way**

DN 15 - 600 / PN 10 - 40
NPS ½ - 24 / Class 150 - 300
(higher pressure: type HDS)

Range of application:
-60 < T < 230/320°C
vacuum-capable

STANDARD design

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

Design characteristics

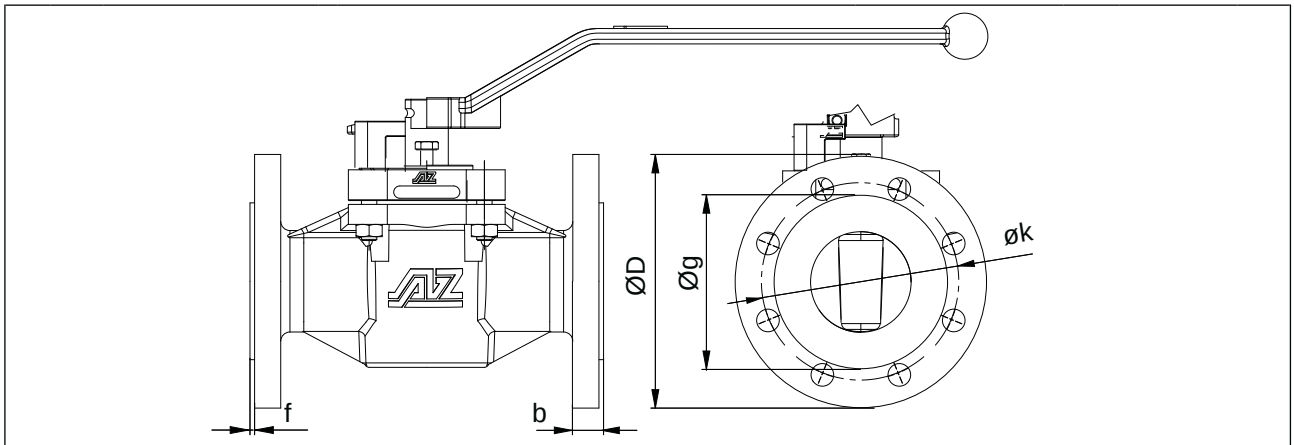
- mounting-flange for actuators acc. to ISO 5211
- easy accessible adjustment of the plug
- low fugitive emission in line with TA LUFT, ISO 15848 & API 641 requirements
- Fire-Safe - API 607 / ISO 10497
- SIL 3 certified

Options

- heating jacket
- oversize design
- flushing device
- FDA compliant
- painting
- oil and grease-free assembly

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

Flange dimensions acc. to DIN EN / ASME



DIN EN 1092-1

DN	PN	øD [mm]	flange bore [mm] øk	no.	ø	øg [mm]	b [mm]	f [mm]
15	10-40	95	65	4	14	45	16	2
20	10-40	105	75	4	14	58	18	2
25	10-40	115	85	4	14	68	18	2
32	10-40	140	100	4	18	78	18	2
40	10-40	150	110	4	18	88	18	3
50	10-40	165	125	4	18	102	20	3
65	10-16	185	145	8	18	122	18	3
	25-40						22	
80	10-40	200	160	8	18	138	20	3
80S	10-40	200	160	8	18	138	20	3
100	10-16	220	180	8	18	158	20	3
	25-40	235	190		22	162	24	
100S	10-16	220	180	8	18	158	20	3
	25-40	235	190		22	162	24	

DIN EN 1092-1

DN	PN	øD [mm]	flange bore [mm] øk	no.	ø	øg [mm]	b [mm]	f [mm]
125	10-16	250	210	8	18	188	22	3
	25-40	270	220		26	188	26	
150	10-16	285	240	8	22	212	22	3
	25-40	300	250		26	218	28	
200	10-16	340	295	8 | 12	22	268	24	3
	25 40	360 375	310 320	12	26 30	278 285	30 34	
250	10 16	395 405	350 355	12	22 26	320	26	3
	25 40	425 450	370 385		30 33	335 345	32 38	
300	10 16	445 460	400 410	12	22 26	370 378	26 28	4
	25 40	485 515	430 450	16	30 33	395 410	34 42	
350	10 16	505 520	460 470	12	22 26	430 438	26 30	4
	25 40	555 580	490 510	16	33 36	450 465	38 46	
400	10 16	565 580	515 525	16	26 30	482 490	26 32	4
	25 40	620 660	550 585		36 39	505 535	40 50	
450	10 16	615 640	565 585	20	26 30	532 550	28 36	4
	25 40	670 685	600 610		36 39	555 560	46 57	
500	10 16	670 715	620 650	20	26 33	585 610	28 38	4
	25 40	730 755	660 670		36 42	615 615	48 57	
600	10 16	780 840	725 770	20	30 36	685 725	30 47	5
	25 40	845 890	770 795		39 48	720 735	58 72	

ASME B16.5

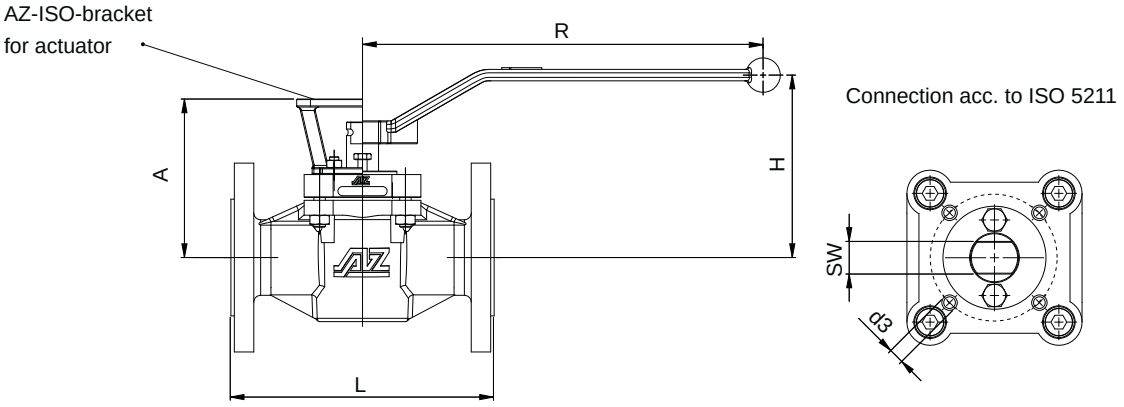
NPS	Class	øD [mm]	flange bore [mm] øk	no.	ø	øg [mm]	b [mm]	f [mm]
½	150	90	60,3	4	15,7	34,9	10,0*	2
	300	95	66,7				14,7	
¾	150	100	69,9	4	15,7	42,9	10,9*	2
	300	115	82,6		19,1		16,3	
1	150	110	79,4	4	15,7	50,8	11,6*	2
	300	125	88,9		19,1		17,9	
1¼	150	115	88,9	4	15,7	63,5	13,2*	2
	300	135	98,4		19,1		19,5	
1½	150	125	98,4	4	15,7	73,0	14,7*	2
	300	155	114,3		22,3		21,1	
2	150	150	120,7	4	19,1	92,1	16,3*	2
	300	165	127,0	8	19,1		22,7	
2½	150	180	139,7	4	19,1	104,8	17,9*	2
	300	190	149,3	8	22,3		25,9	
3	150	190	152,4	4	19,1	127,0	19,5*	2
	300	210	168,3	8	22,3		29,0	
4	150	230	190,5	8	19,1	157,2	24,3	2
	300	255	200,0		22,3		32,2	
4S	150	230	190,5	8	19,1	157,2	24,3	2
	300	255	200,0		22,3		32,2	

ASME B16.5

NPS	Class	øD [mm]	flange bore [mm] øk	no.	ø	øg [mm]	b [mm]	f [mm]
5	150	255	215,9	8	22,3	185,7	24,3	2
	300	280	235,0				35,4	
6	150	280	241,3	8	22,3	215,9	25,9	2
	300	320	269,9	12			37,0	
8	150	345	298,5	8	22,4	269,9	29,0	2
	300	380	330,2	12	25,4		41,7	
10	150	405	362,0	12	25,4	323,8	30,6	2
	300	445	387,4	16	28,4		48,1	
12	150	485	431,8	12	25,4	381,0	32,2	2
	300	520	450,8	16	31,7		51,3	
14	150	535	476,3	12	28,4	412,8	35,4	2
	300	585	514,4	20	31,7		54,4	
16	150	595	539,8	16	28,4	469,9	37,0	2
	300	650	571,5	20	35,0		57,6	
18	150	635	577,9	16	31,8	533,4	40,1	2
	300	710	628,6	24	35,0		60,8	
20	150	700	635	20	31,8	584,2	43,3	2
	300	775	685,8	24	35,0		64	
24	150	815	749,3	20	35,0	692,2	48,1	2
	300	915	812,8	24	41,1		70,3	

Type F-2 ISO-STANDARD

Technical information DN 15 - 100 / NPS ½ - 4



DIN EN 558 / ISO 5211

DN	PN	L [mm]	A [mm]	H [mm]	R [mm]	ISO 5211 type	ISO 5211 d3	UNC d3**	SW [mm]	torque [Nm]* M_{Bt}	torque [Nm]* $M_{1,3}$	torque [Nm]* $M_{1,5}$	weight [kg]	K_{VS} [m³/h]	C_V [US.gal/min]
15	10-40	130	101	103	200	F05	M6		11	28	36	42	3,8	12	14
20	10-40	150	101	103	200	F05	M6		11	28	36	42	4,3	13	15
25	10-40	160	107	109	200	F05	M6		11	28	36	42	4,9	25	29
32	10-40	180	111	117	320	F07	M8		14	50	65	75	8,6	46	53
40	10-40	200	119	125	320	F07	M8		14	70	91	105	9,6	85	98
50	10-40	230	153	159	420	F07	M8		19	105	137	158	13,9	160	185
65	10-16 25-40	290	168	165	600	F10	M10		22	152	198	228	19,3	262	302
80	10-40	310	168	165	600	F10	M10		22	152	198	228	21,4	275	317
100	10-16 25-40	350	168	165	600	F10	M10		22	152	198	228	25,5 29,0	197	228

ASME B16.10 / ISO 5211

NPS	Class	L [mm]	A [mm]	H [mm]	R [mm]	ISO 5211 Typ	ISO 5211 d3	UNC d3**	SW [mm]	torque [Nm]* M_{Bt}	torque [Nm]* $M_{1,3}$	torque [Nm]* $M_{1,5}$	weight [kg]	K_{VS} [m³/h]	C_V [US.gal/min]
½	150 300	108 140	101	103	200	F05	M6	½“	11	28	36	42	2,7 3,8	14 13	16 15
¾	150 300	117 152	101	103	200	F05	M6	½“	11	28	36	42	3,2 4,3	13 13	16 15
1	150 300	127 165	107	109	200	F05	M6	½“	11	28	36	42	3,5 4,9	24 26	28 31
1¼	150 300	140 178	111	117	320	F07	M8	5/16“	14	50	65	75	5,4 8,6	46	53
1½	150 300	165 190	119	125	320	F07	M8	5/16“	14	70	91	105	7,0 9,6	78 79	90 92
2	150 300	178 216	153	159	420	F07	M8	5/16“	19	105	137	158	11,8 13,9	145 156	167 180
2½	150 300	190 241	168	165	600	F10	M10	⅜“	22	152	198	228	15,5 19,3	236	273
3	150 300	203 282	168	165	600	F10	M10	⅜“	22	152	198	228	18,2 21,4	225 228	260 264
4	150 300	229 305	168	165	600	F10	M10	⅜“	22	152	198	228	23,5 34,0	169 198	195 229

*) M_{BT} breakaway torque for actuator sizing, without safety.

$M_{1.3}$ values include a manufacturer recommended safety factor of 1.3 applied to the breakaway torque for actuator sizing.

$M_{1,5}$ values include a manufacturer recommended safety factor of 1,5 applied to the breakaway torque for actuator sizing, for example, for safety-related applications (SIS/SIL).

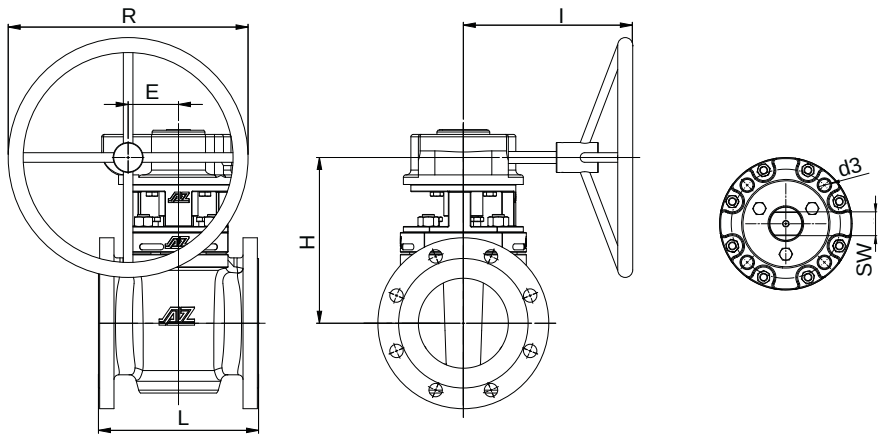
Valid for PTFE sleeves and the sealing systems STANDARD, FS2 and CA2. For other configurations see **catalogue part ENGINEERING, page 37**

**) US -DESIGN: Boltings / Nuts acc. to ASTM / UNC ANSI B1.1

In accordance with the standard, we reserve the right to provide threaded holes in flanges in case of space constraints.

Type F-2 ISO-STANDARD

Technical information DN 100S - 600 / NPS 4S - 24



DIN EN 558 / ISO 5211

DN	PN	L [mm]	E [mm]	R [mm]	H [mm]	I [mm]	gear (Pro-Gear)	ISO 5211 Typ	ISO 5211 d3	UNC d3**	SW [mm]	torque [Nm]* M_{BT}	torque [Nm]* $M_{1,3}$	torque [Nm]* $M_{1,5}$	weight [kg]	K_{VS} [m³/h]	C_V [US.gal/min]
100S	10-16 25-40	350	69	300	202	315	Q800-S	F12	M12		22	230	299	345	31	582	673
125	10-16 25-40	325	84	400	275	290	Q1500-S	F16	M20		36	700	910	1050	67 71	865	1000
150	10-16 25-40	350	84	400	275	290	Q1500-S	F16	M20		36	700	910	1050	77 79	875	1011
200	10-16 25 40	400	117,5	500	321	365	Q3000-S	F16	M20		36	920	1196	1380	108 119	1770	2047
250	10 16 25 40	450	117,5	600	356	465	Q5000-S	F16	M20		36	1540	2002	2310	177 235	2788	3223
300	10 16 25 40	500	117,5	600	356	465	Q5000-S	F16	M20		36	2000	2600	3000	230 249	2618	3027
350	10 16 25 40	550	137,5	600	460	465	Q6500-S	F25	M16		46		5500		395 468	5070	5861
400	10 16 25 40	600	137,5	600	460	465	Q6500-S	F25	M16		46		5500		411 525	4694	5426
450	10 16 25 40	650	180	600	485	520	Q12000-S	F30	M20		55		8000		611 730	8065	9323
500	10 16 25 40	700	180	600	510	520	***	F30	M16		55		***		655 744	10260	11862
600	10 16 25 40	800	180	600	510	520	***	F30	M20		55		***		681 863	7980	9226

ASME B16.10 / ISO 5211

NPS	Class	L [mm]	E [mm]	R [mm]	H [mm]	I [mm]	gear (Pro-Gear)	ISO 5211 Typ	ISO 5211 d3	UNC d3**	SW [mm]	torque [Nm]* M_{BT}	torque [Nm]* $M_{1,3}$	torque [Nm]* $M_{1,5}$	weight [kg]	K_{VS} [m³/h]	C_V [US.gal/min]
4S	150 300	229 305	69	300	202	315	Q800-S	F12	M12	½“	22	230	299	345	24,3 36,9	523 542	604 627
5	150 300	254 325	84	400	275	290	Q1500-S	F16	M20	¾“	36	700	910	1050	55 71		
6	150 300	267 403	84	400	275	290	Q1500-S	F16	M20	¾“	36	700	910	1050	60 70	738 775	853 896
8	150 300	292 419	96,5	600	321	350	Q3000-S	F16	M20	¾“	36	920	1196	1380	94 125	1517 1978	1754 2286
10	150 300	330 457	117,5	600	356	465	Q5000-S	F16	M20	¾“	36	1540	2002	2310	127 160	2239 2382	2589 2754
12	150 300	356 502	117,5	600	356	465	Q5000-S	F16	M20	¾“	36	2000	2600	3000	185 265	1904 1925	2202 2225
14	150 300	686 762	137,5	600	460	465	Q6500-S	F25	M16	⅝"	46		5500		410 445	2448 2394	2830 2768
16	150 300	406 838	137,5	600	460	465	Q6500-S	F25	M16	⅝"	46		5500		330 572	3061 4618	3539 5339
18	150 300	864 914	180	600	485	520	Q12000-S	F30	M20	¾“	55		8000		627 763	9135	10561
20	150 300	914 991	252,5	700	460	600	***	F30	M16	¾“	55		***		698 860	11728 11841	13559 13689
24	150 300	1067 1143	180	600	510	520	***	F30	M20	¾“	55		***		825 1070	9863 9509	11402 10993

*) M_{BT} breakaway torque for actuator sizing, without safety.

$M_{1.3}$ values include a manufacturer recommended safety factor of 1.3 applied to the breakaway torque for actuator sizing.

$M_{1,5}$ values include a manufacturer recommended safety factor of 1,5 applied to the breakaway torque for actuator sizing, for example, for safety-related applications (SIS/SIL).

Valid for PTFE sleeves and the sealing systems STANDARD, FS2 and CA2. For other configurations see **catalogue part ENGINEERING, page 37**

**) US -DESIGN: Boltings / Nuts acc. to ASTM / UNC ANSI B1.1

In accordance with the standard, we reserve the right to provide threaded holes in flanges in case of space constraints.

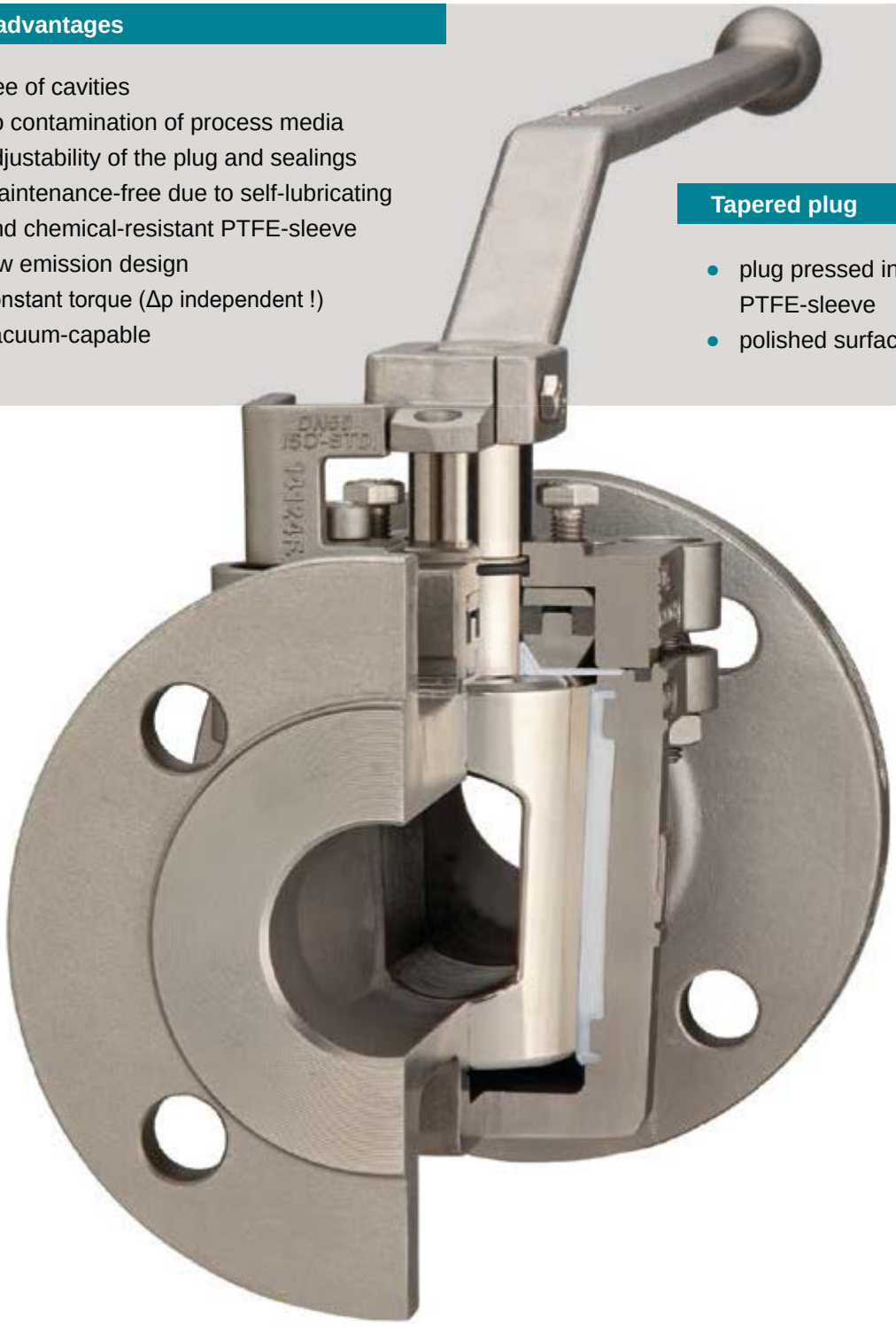
AZ-plug valve: the design principle

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

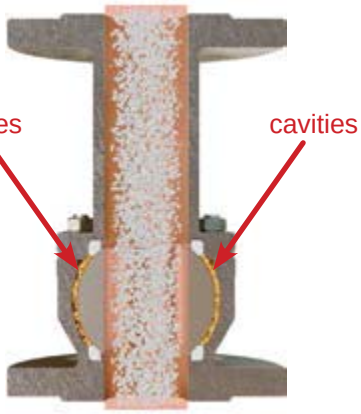
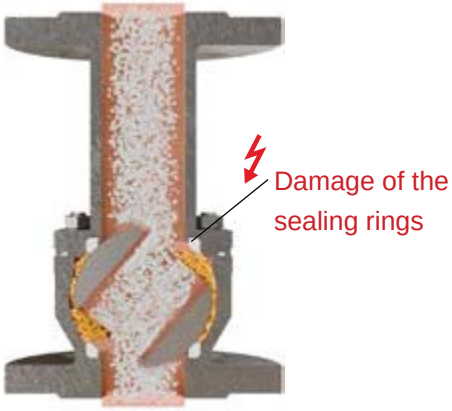
- tapered body interior
- integrated supporting ribs avoid rotation and coldflow of the sleeve
- large sealing surface

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

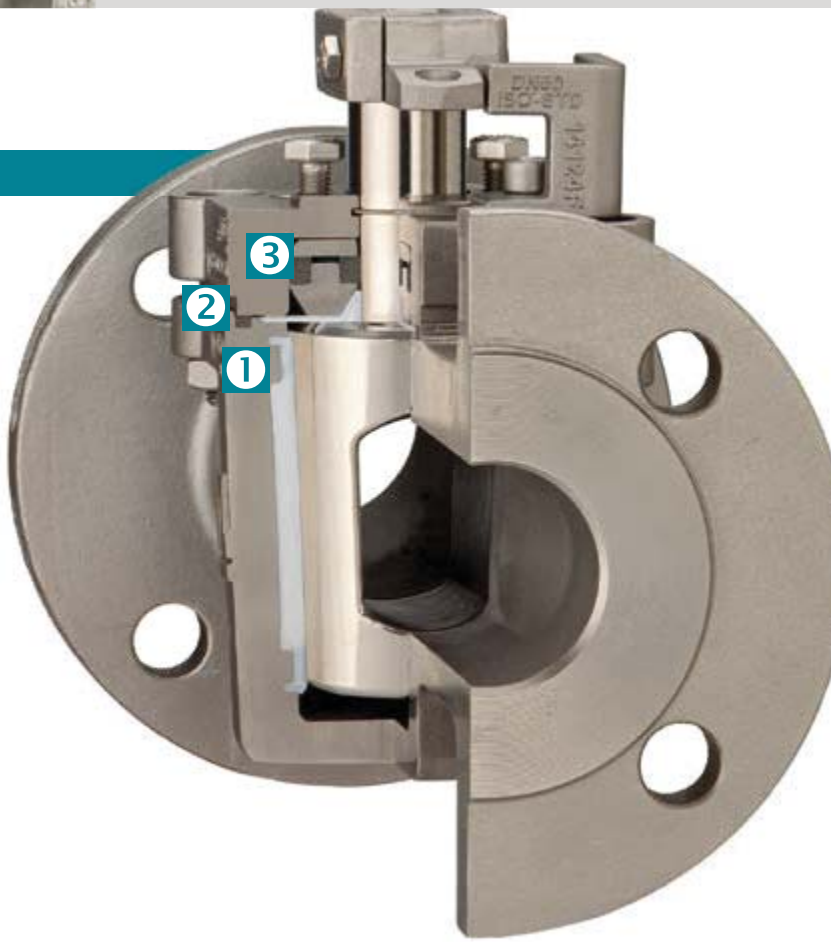
Safe and reliable tightness for years

Adjustable



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

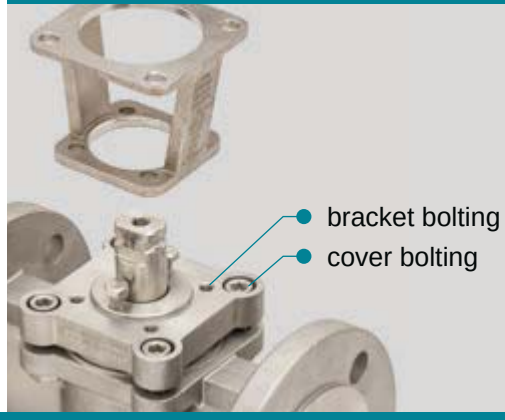
Several sealings to atmosphere



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



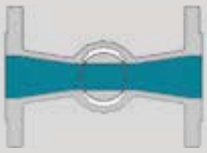
- pressure containing cover bolts separated from bracket boltings
- cover and bracket acc. to ISO 5211 for efficient actuator / gearbox assembly

Reduced and full bore design

Execution

Reduced bore
Type STANDARD

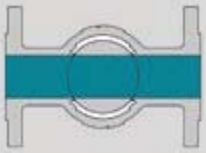
- compact valve (FF / weight)
- optimal torques for economic automation





Full round bore
Type EXTRA

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



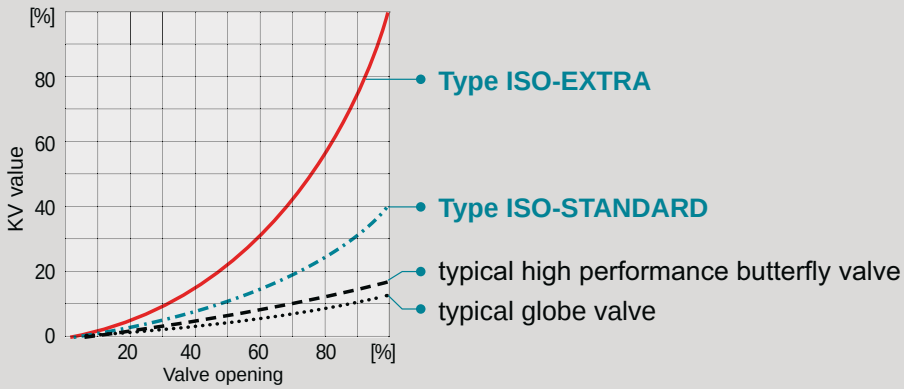


Type ISO-EXTRA

- 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



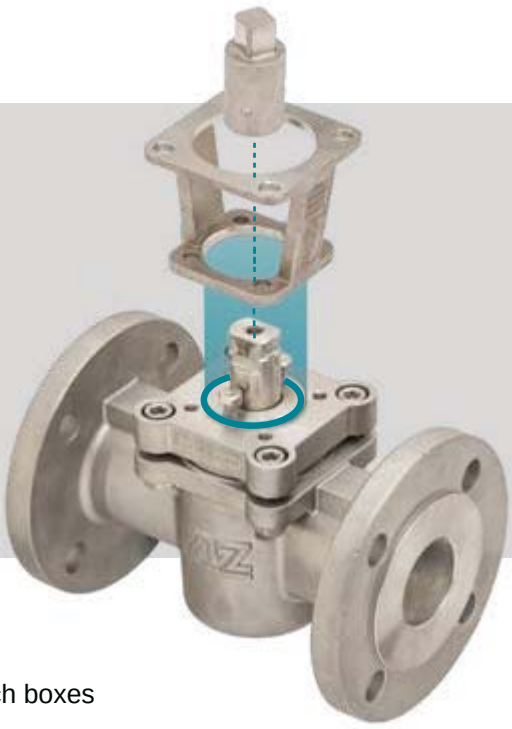
High and low temperature

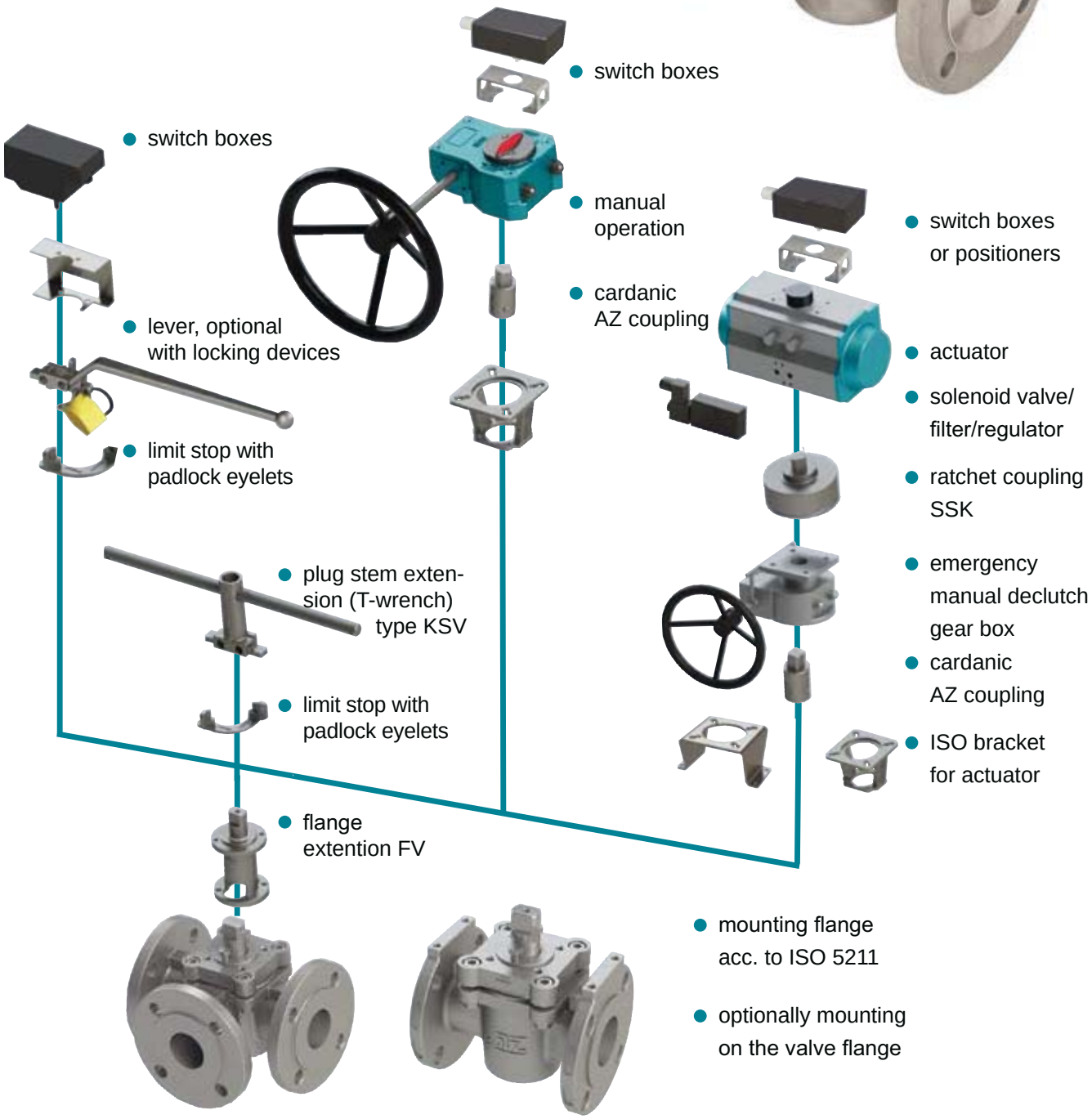
- extended bonnet with sealing at the top
- stem extension for insulated valves

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





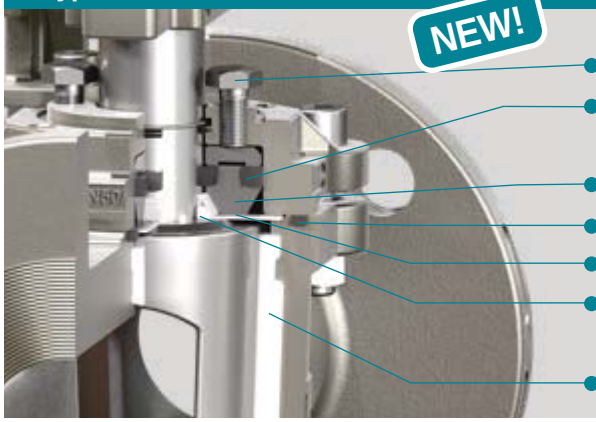
Cover and stem sealing systems suitable for general applications

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

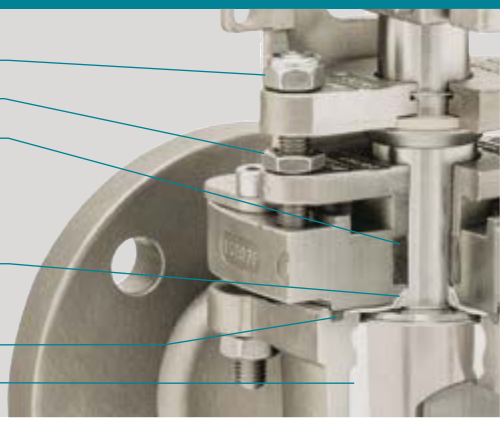
engineered.
fast.
dynamic.

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

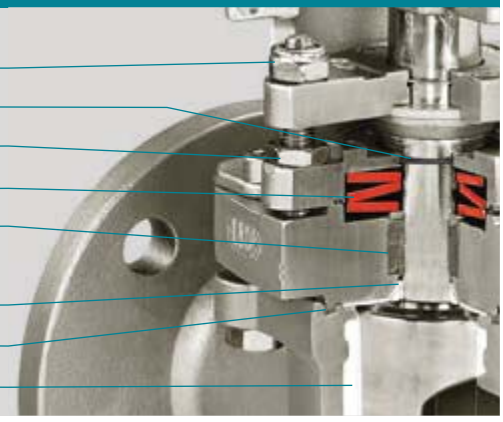
plug adjustment
triple safety stem packing adjustment
Quaternary sealing: three o-rings at the stem
Tertiary sealing:
triple safety stem packing
Secondary sealing:
V-diaphragm (PTFE) and delta thrust collar (PTFE)
cover sealing (graphite)
Primary sealing: sleeve*



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



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

NEW!



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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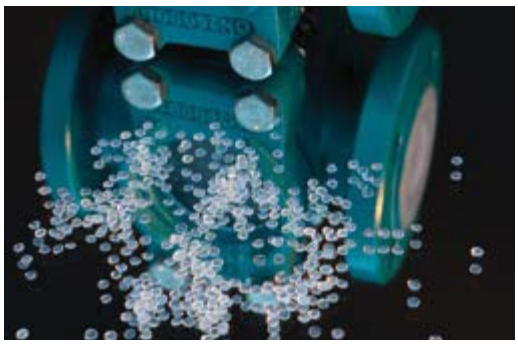
Other materials on request.

Sleeve materials / Lining 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	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 resistent, abrasive application	80°C / 176°F



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 conductive	PFA conductive	125°C / 256°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 200°C / 392°F (sleeved valve) respectively 150°C / 302°F (lined valve), valve size, media phase, plug position & temperature (constant or fluctuating) may have an impact on the lifetime. Consult factory for proper selection of material and sealing system.

Torques: Factors for different material combinations and sealing systems

Torque for actuator sizing

- Torque values for actuator sizing can be found in the tables of each valve model. These values apply for the sealing systems STANDARD, CA2 as well as FS2 and are based on virgin PTFE sleeve material.
- For other sealing systems, sleeve materials and material combinations, different factors apply as per charts below.
- The given torque values are based on long term records and experimental results. Please consult manufacturer for process media with degreasing effect.

	Sealing system			
sleeve materials for plug valves	STANDARD, FS2, CA2	STANDARD, FS2, CA2 oil and grease-free	CASN, FSN, -SL, -EF	CASN, FSN, -SL, -EF oil and grease-free
PTFE, virgin	1,0	1,3	1,3	1,6
TFM / NXT / M111	1,1	1,4	1,4	1,7
PTFE-"P" / NFCE / NCS	1,5	1,8	1,8	2,1
PTFE-Glass	1,7	2,0	2,0	2,3
PTFE-Graphite	1,7	2,0	2,0	2,3
PFA	2,0	2,3	2,3	2,6
UHMW-PE	2,5	2,8	2,8	3,1

material combinations for linded plug valves		Sealing system	
Body	plug	CA2A / SAFE-LINED / -SL	CA2A / SAFE-LINED / -SL oil and grease-free
PFA	PTFE	according product table (M_{BT} / $M_{1,3}$ / $M_{1,5}$)	1,3
PFA	PFA		1,3
PFA-conductive	PFA-conductive	on request	on request
PFA	special material	on request	on request

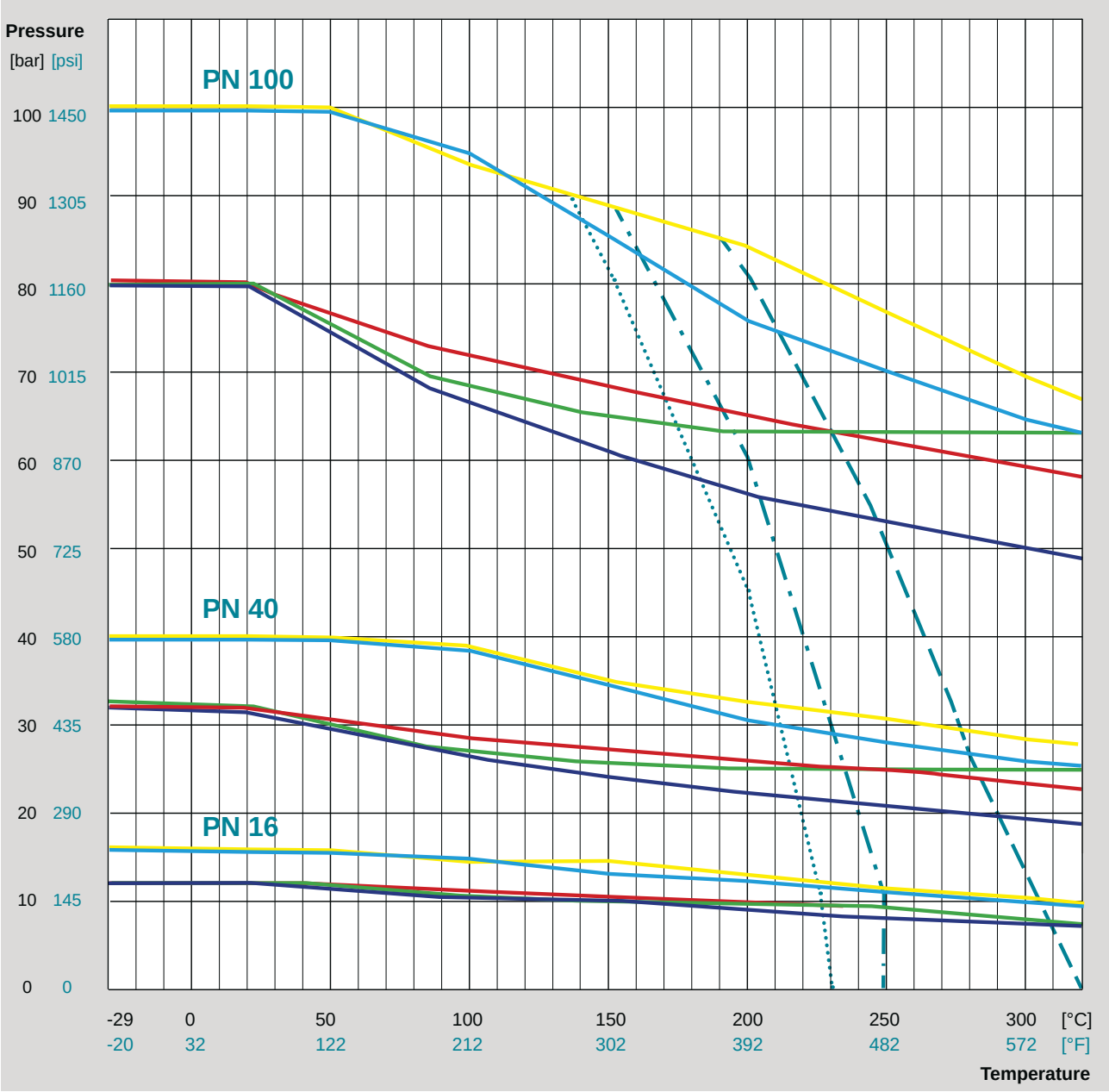
Sample calculation

Model F-2 ISO-FS2 - DN50

- breakaway torque (table column $M_{1,3}$ with 30 % safety on breakaway torque)
- cover and stem sealing system FS2
- sleeve material PTFE-Glass

Torque table column $M_{1,3}$	137 Nm
Factor as per table above	1,7
Torque for actuator sizing	137 * 1,7 = **233 Nm**

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.

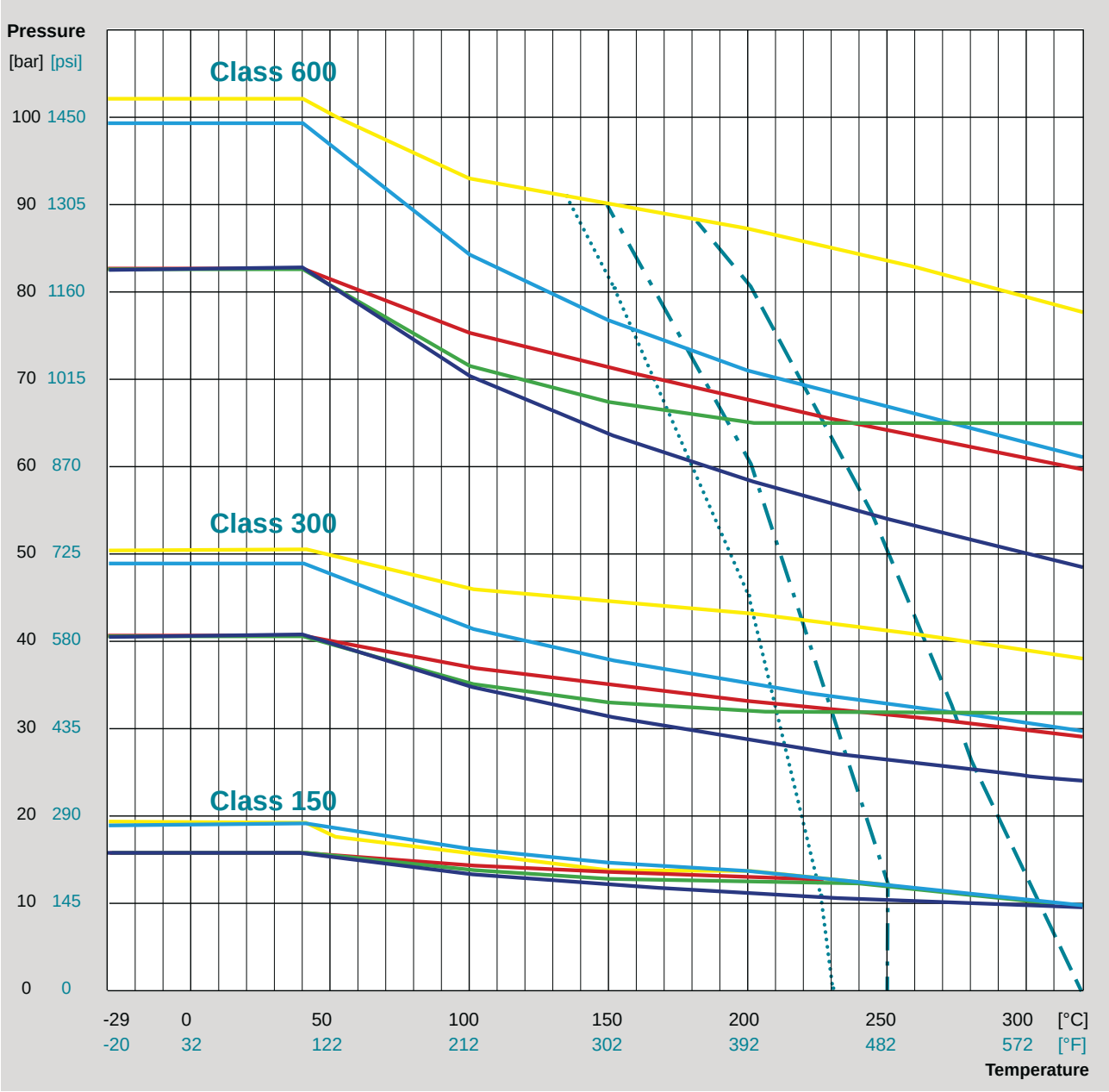
The data given are max. values according to EN 12516-1 and EN 1092-1.

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.

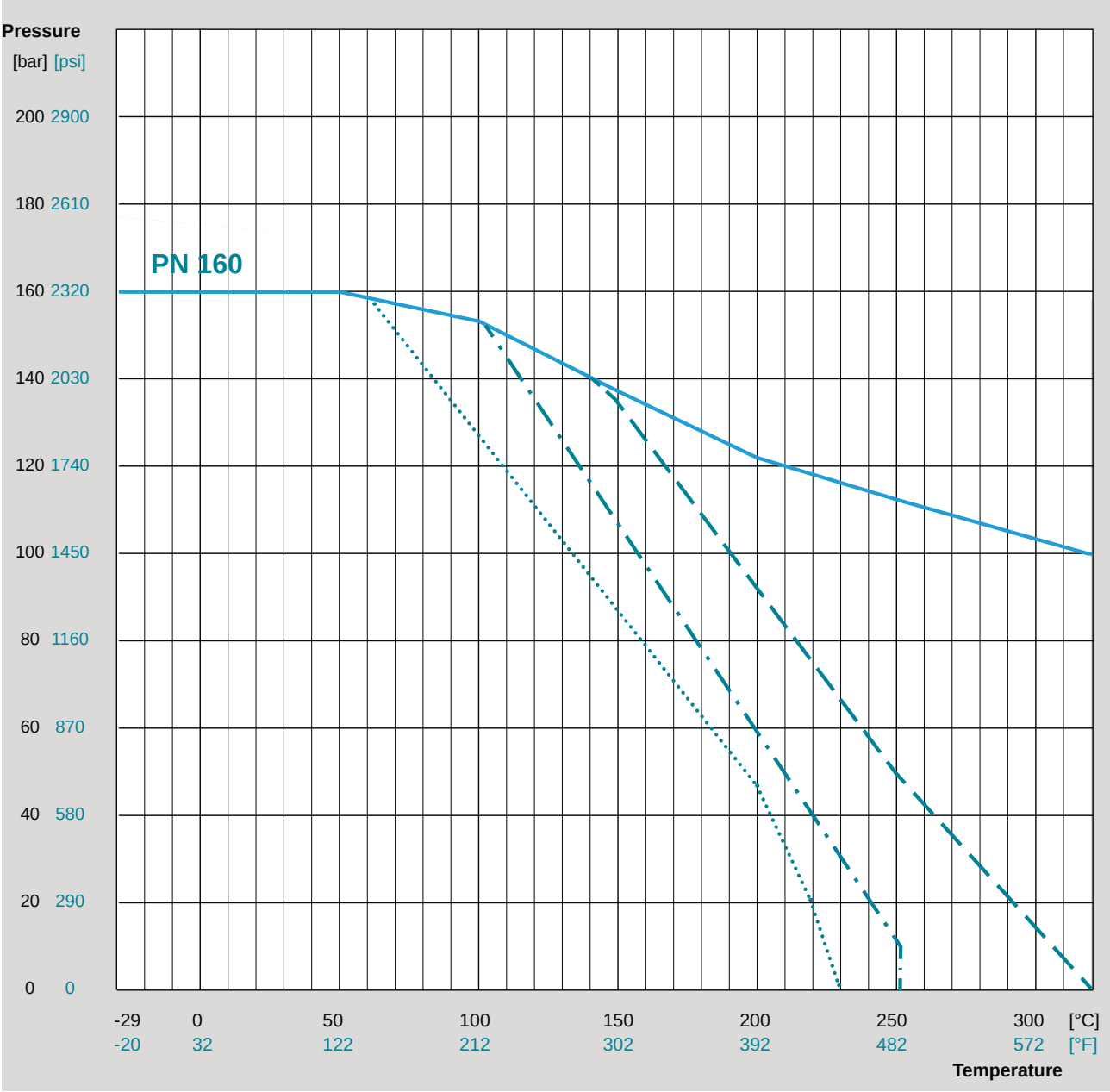
The data given are max. values according to ASME B16.34.

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.

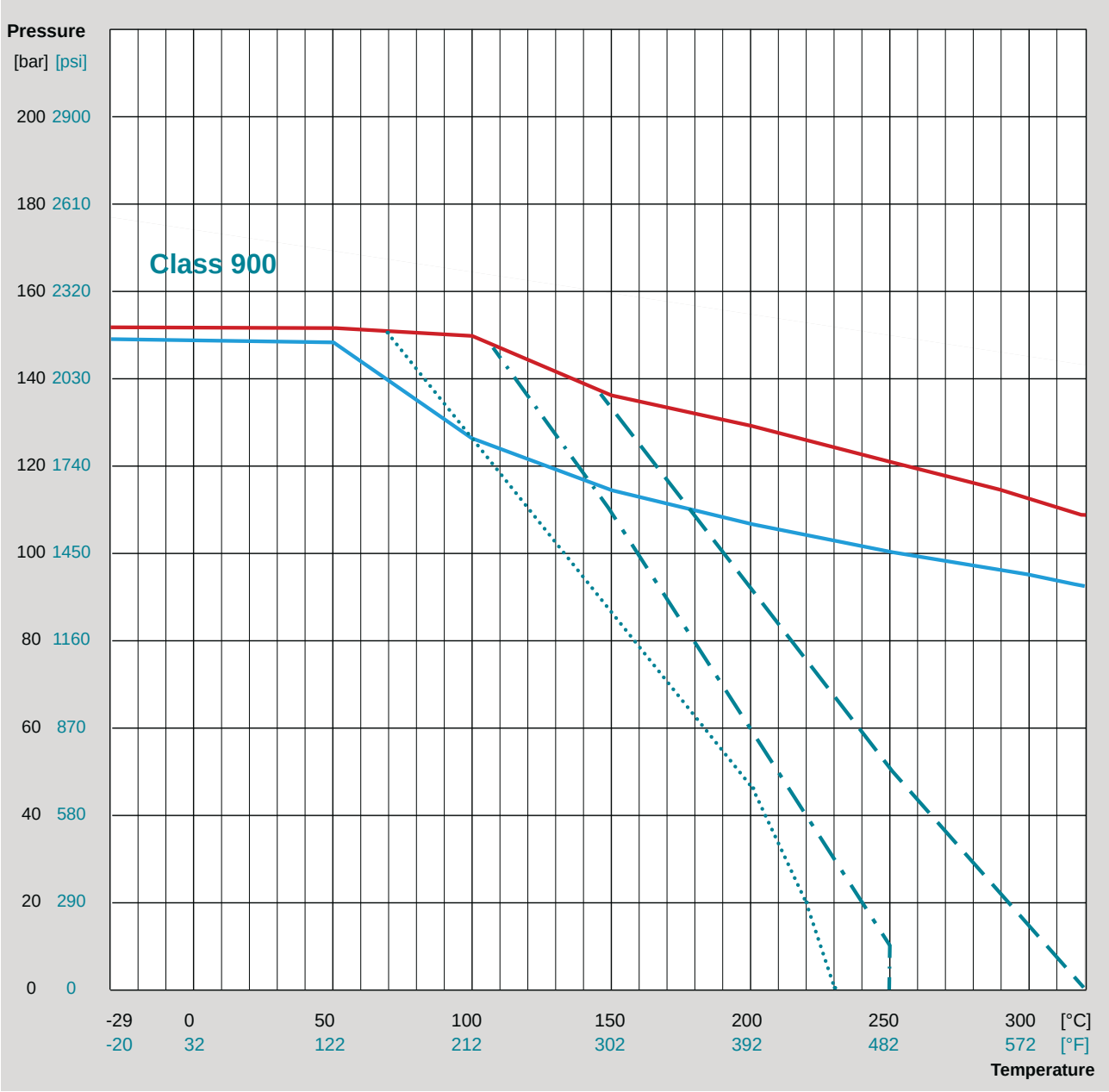
The data given are max. values according to EN 12516-1 and EN 1092-1.

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.

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

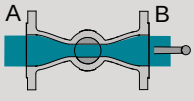
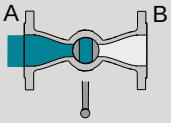
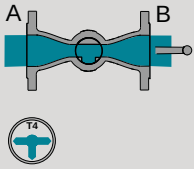
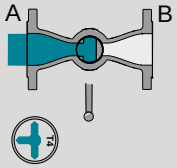
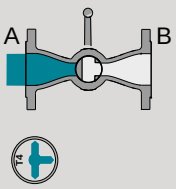


- position indicator for all multi-way valves welded on lever or stem extension
- Lined plug valves: multi-way plugs only with PFA plug lining or made of special materials. Two-way plugs with PTFE lining up to DN 100 / NPS 4 available

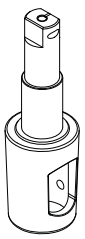
Recommendation for three-way valves type F-3-S with vertical outlet (longer life-time compared to type F-3-W with horizontal outlet)

Options

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

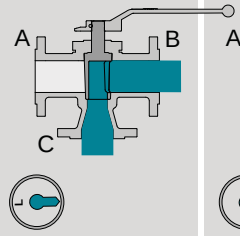
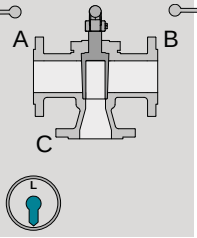
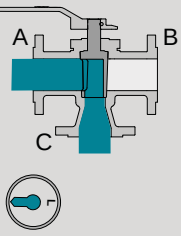
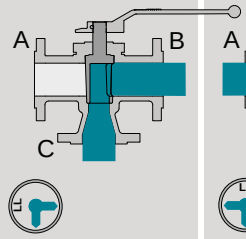
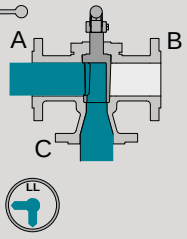
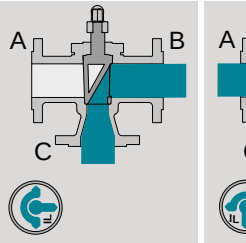
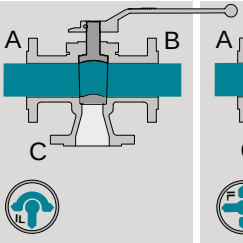
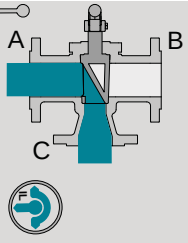
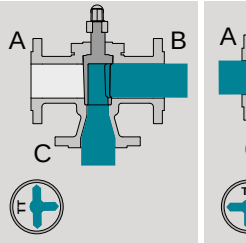
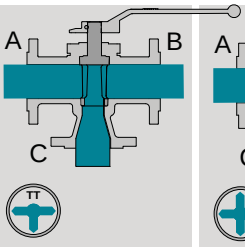
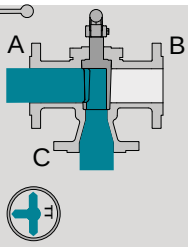
2-way	Plug type	Pos. I = 0°	Pos. II = 90°	Pos. III = 180°	Pos. IV = 270°
 Type F-2-ISO-STANDARD	D 				
 Type F-2-ISO-STANDARD-A	T4 * 				

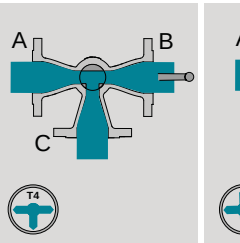
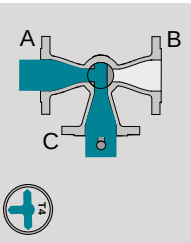
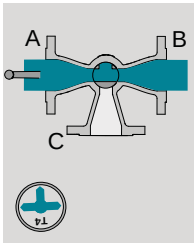
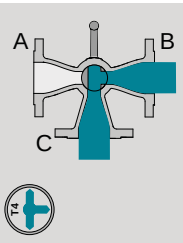
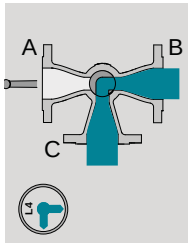
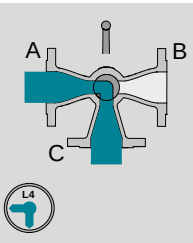
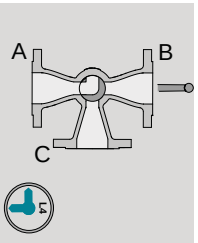
*) For highly expanding media AZ recommends the "i-plug" (relief hole and open plug buttom)



"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

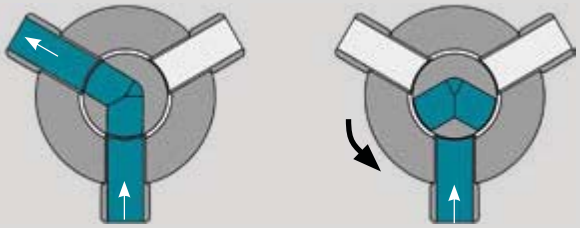
transflow design

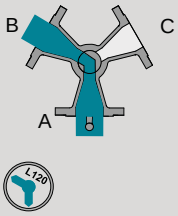
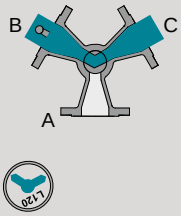
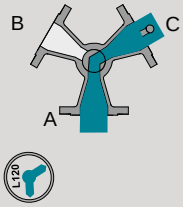


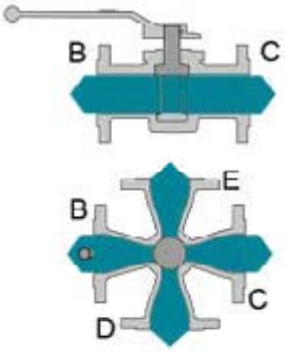
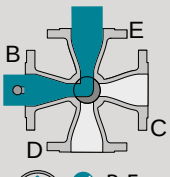
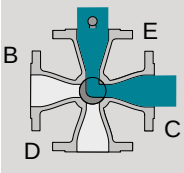
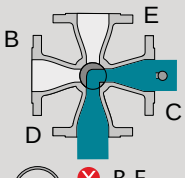
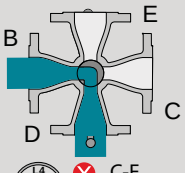
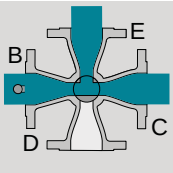
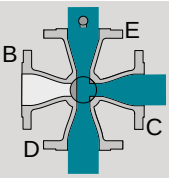
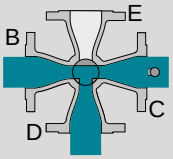
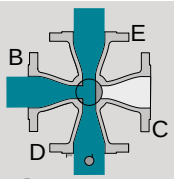
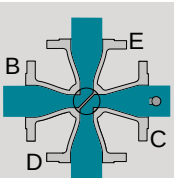
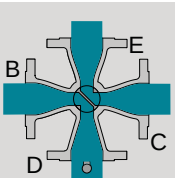
3-way (120°) type 3-WP-120

- 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		

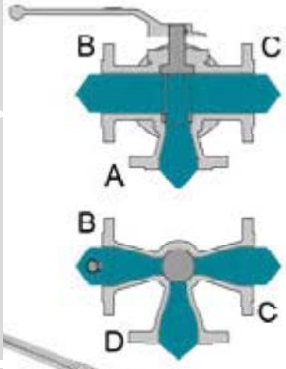
open
closed

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	

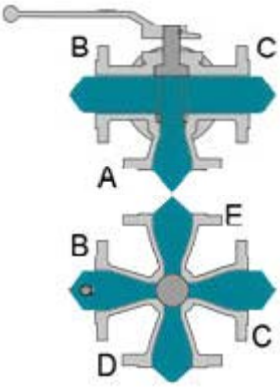


Type F-4-Special-ISO-STANDARD





Type F-5-ISO-STANDARD



✓ open
✗ closed

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