ARMATUREN
free of cavities & maintenance

engineered.
fast.
dynamic.

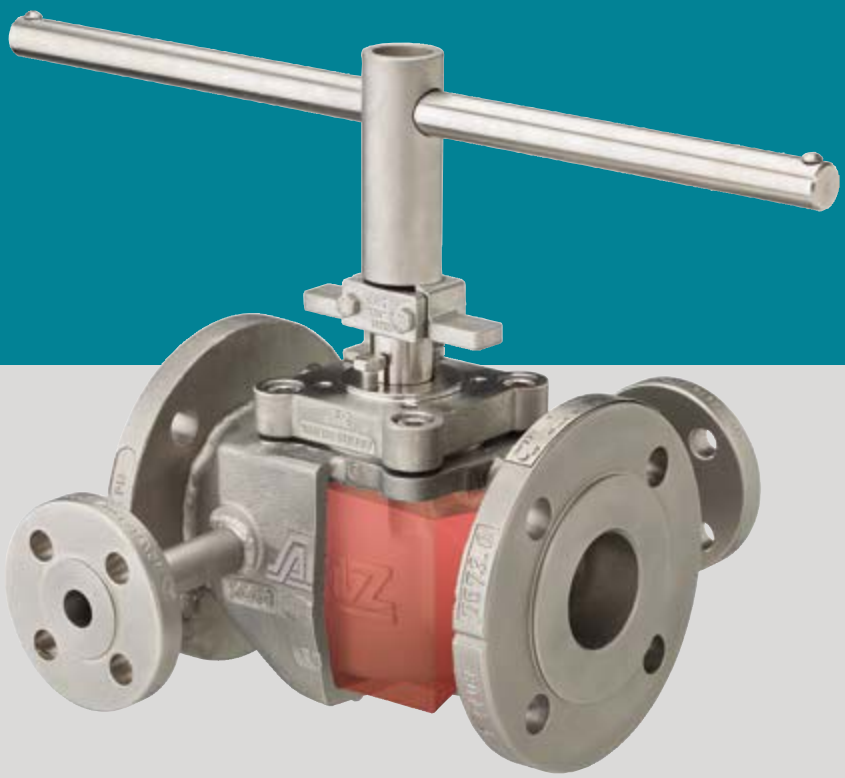
Type HM / TM

Plug valves with heating jacket



Product leaflet

Type HM
Heating jacketed plug valves (cast design)



- **fully jacketed design for complete heating of the valve**
- **suitable for all AZ valves**
- **massive cast heating jackets**
- **massive cast heating medium connections, for threads and weld-ends**

Design characteristics

- fully jacketed or partially jacketed design with massive cast connection for heating medium
- enough thread lengths
- no cracking caused by vibration
- different jacket connection types possible
- face to face dimensions acc. to EN and ASME

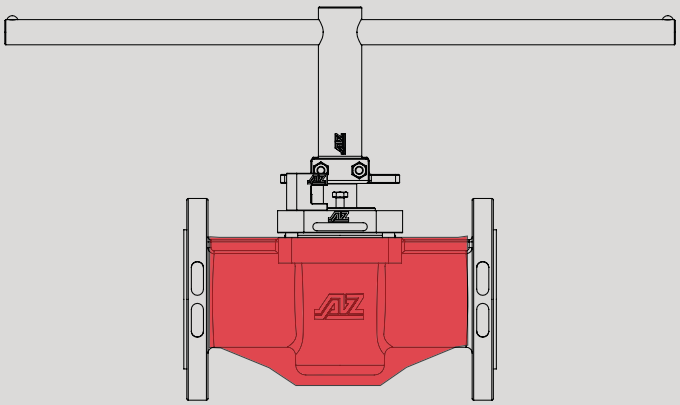
Standard material (jacket)

- Stainless Steel 1.4408, ASTM A351 CF8M
- Carbon Steel 1.0619, ASTM A216 WCB
- special material on request

Options

- oversize flange
- drain of steam condensate
- customized connection
- multiport

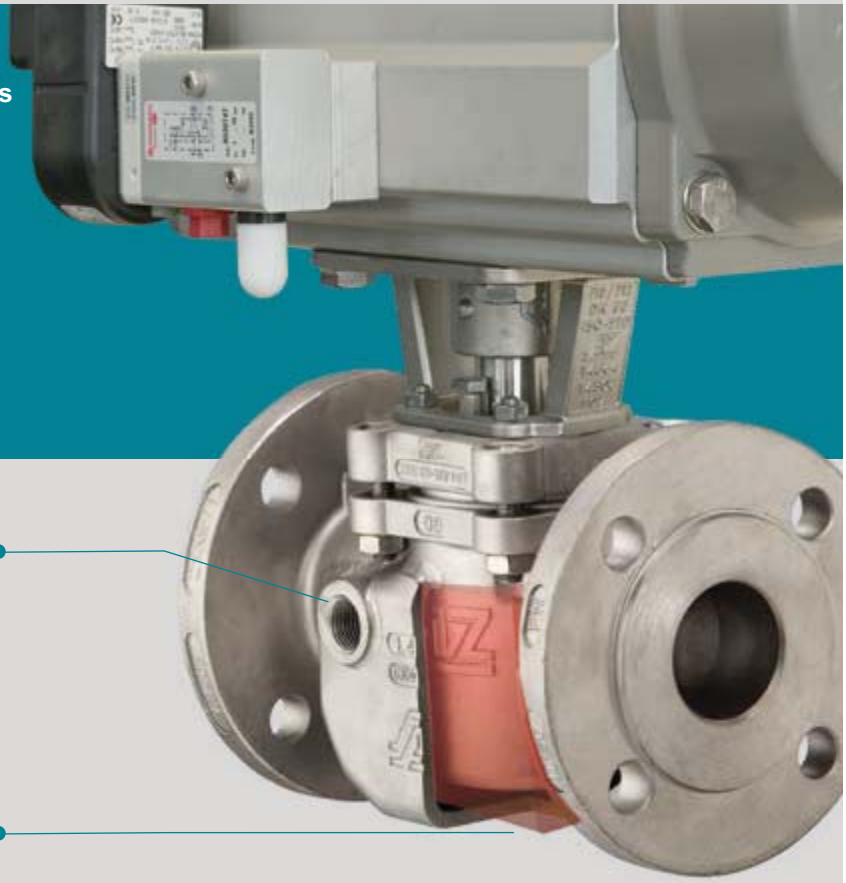
Type HM (fully heating design)
heating from flange to flange, up to the cover seat



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

Type TM
with partial jacket

- **partial heating of the valve**
- **holes in standard flange drillings always accessible**
- **cast, thick-walled version**

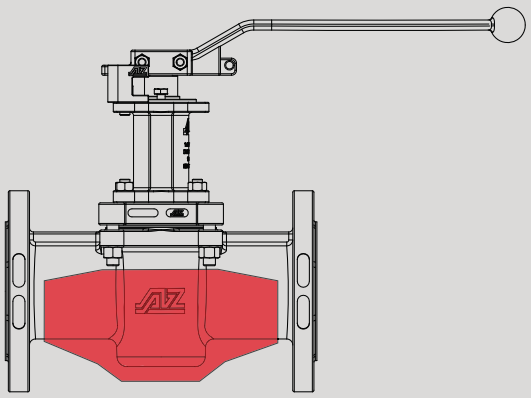


Various connections for heating medium
- thread with sufficient threads in the heating jacket
- weld-ends
- flange

Drain of steam condensate (optional)

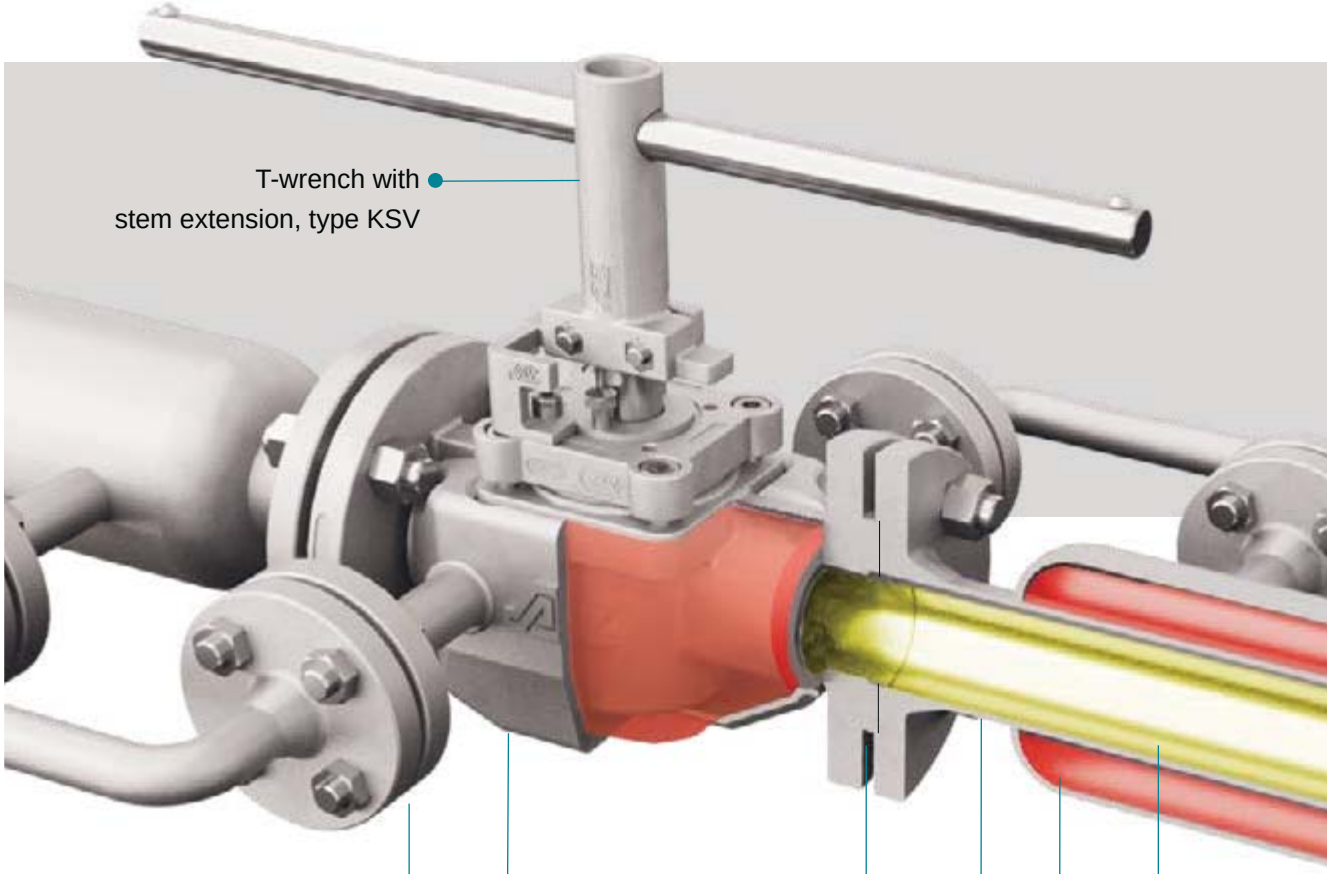
Operation
- lever
- actuator
- stem extension with sliding T-lever for isolated valves and pipes
- flange extension

Type TM (partially heating design)
heating of the valve body
(cost saving option)

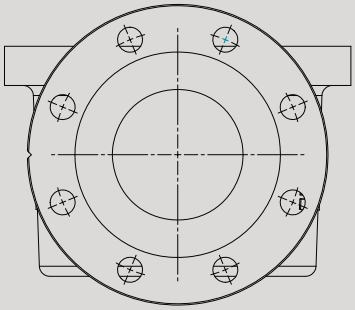


Type HM

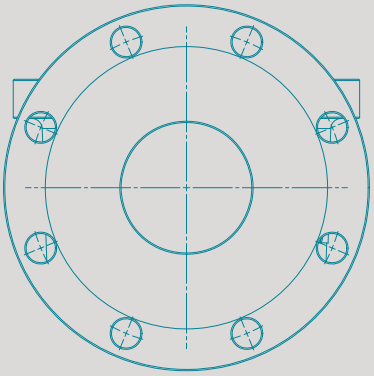
Heating jacket plug valve with standard flanges



Standard flange

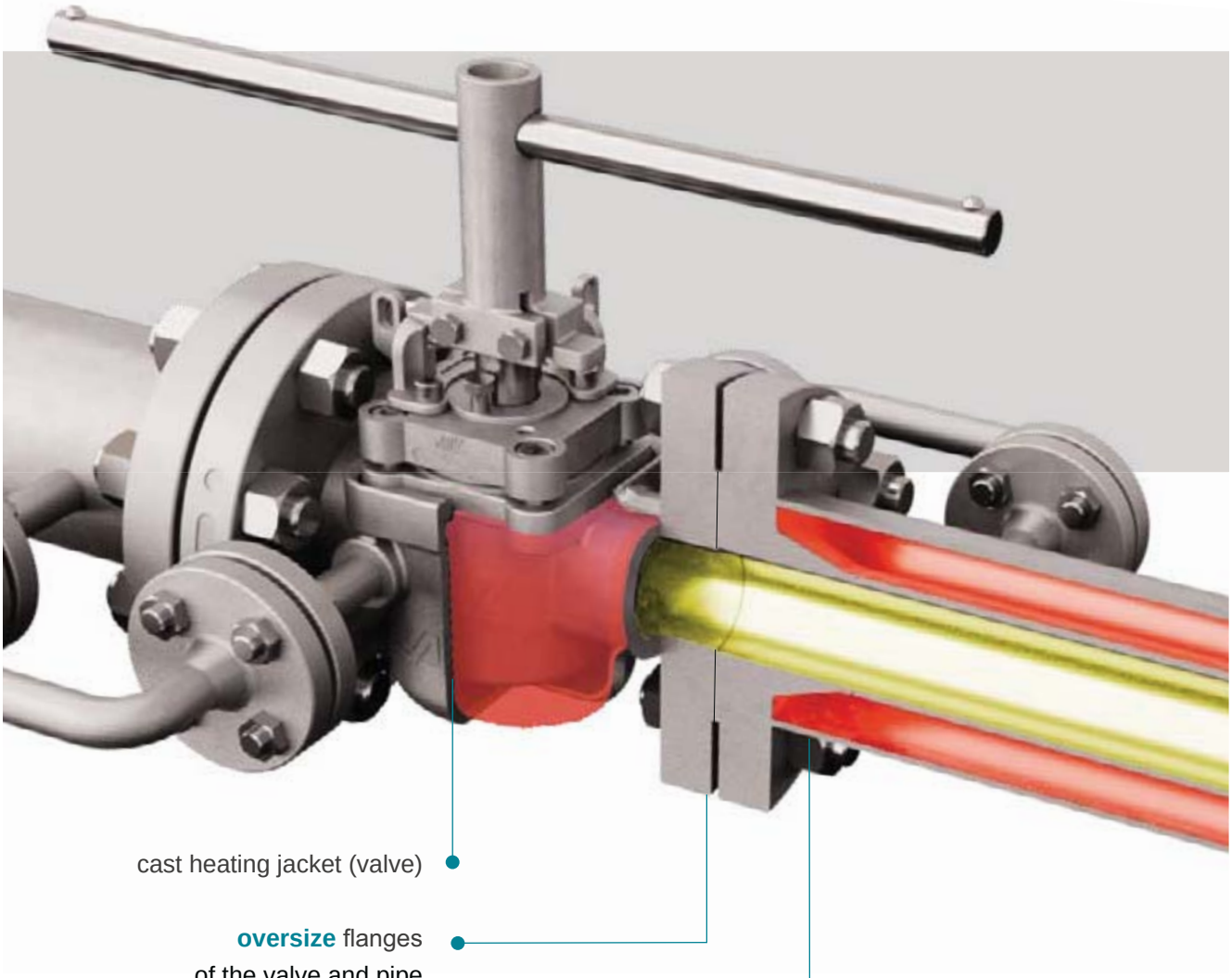


Oversize flange



Type HM-OS

Heating jacket plug valve with **Oversize Flanges**



cast heating jacket (valve)

oversize flanges
of the valve and pipe

heating jacket of the pipeline
goes up to the pipeline flange
(without thermal bridge)

Type ISO-EXTRA-HM-OS 18"/24"
with oversize flange and
jacket connection #1A



Benefits of oversize flanges

- uninterrupted heating of pipeline and valve up to the flanges, without thermal bridge

Examples of heating jacket executions and accessories



OS + plug stem extension

Type F-2-ISO-STD-OS-HM-FV

- Oversize flange
- fully jacketed design
- connection type #3 (thread)
- locking option outside the insulation



3-way plug valve

Type F-3-S-ISO-STD-TM

- plug valve F-3-S vertical
- partial jacketed design
- connection type #1 (thread)



Plug valve AF/BWF

Type AF-2-BWF-HM

- valve with weld and flange ends
- heating jacked and T-wrench
- fully jacketed design
- connection type #3 (thread)



with weld-ends

Type BW-2-ISO-STD-HM

- fully jacketed design
- special heating connection directly to the pipeline



Sampling systems

Type CONTIFLOW-HM

- fully jacketed design
- connection type #1A (flange)



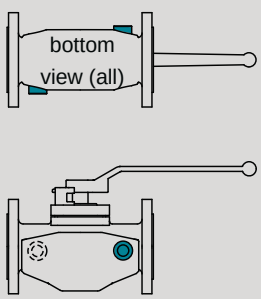
Plug valve with lining

Type F-2-SAFE-LINED-HM

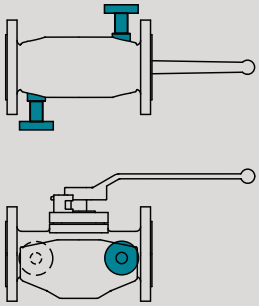
- fully jacketed design
- connection type #1A (flange)

Standard heating connections

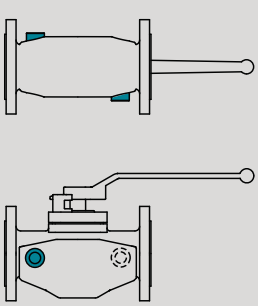
1



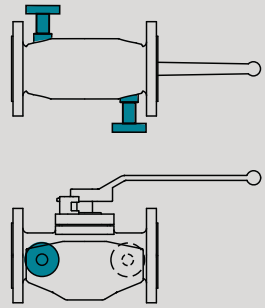
1A



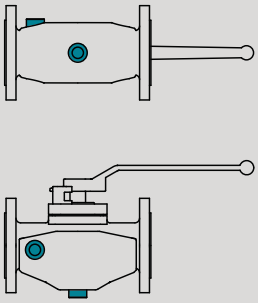
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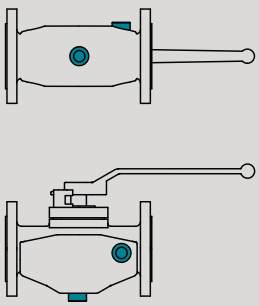
2A



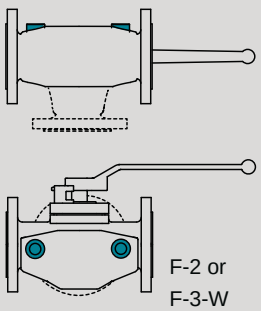
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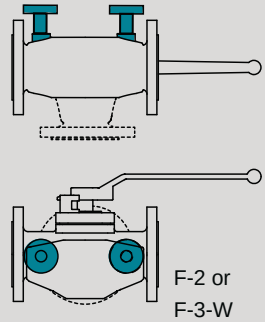
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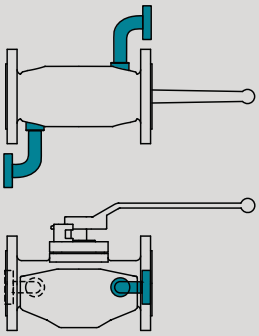
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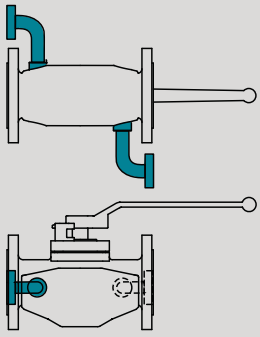
5A



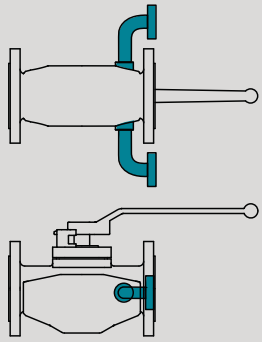
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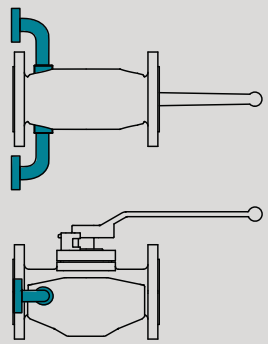
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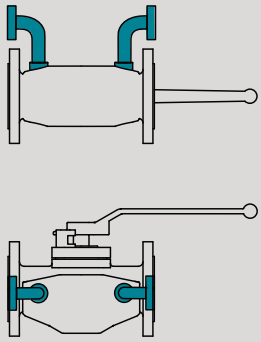
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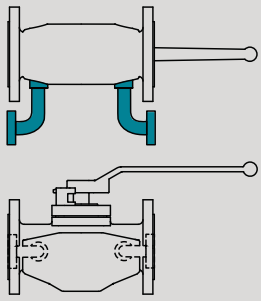
9



10



11



Temperature/pressure limitation for the heating jacket

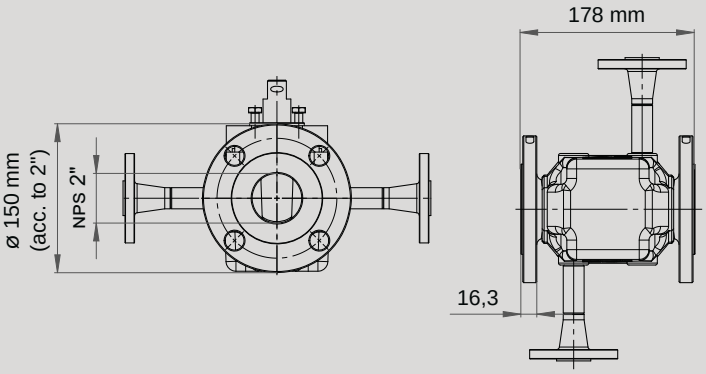
P_{max}: 16 bar

T_{max}: acc. to the valves PT diagram for body material and sealing components.

Examples for flange and Face to Face options 2" CL 150 with and without oversize flanges

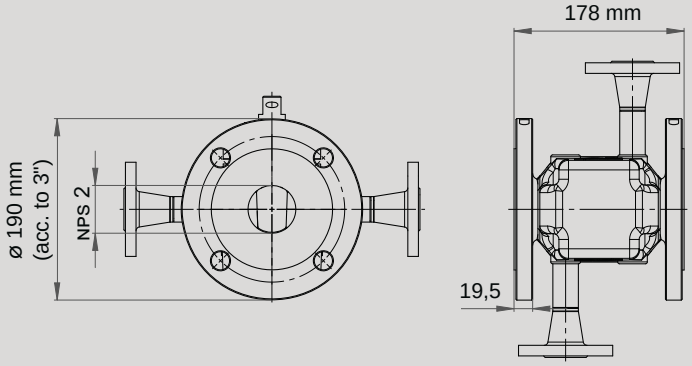
Option 1

- type HM
- nominal size: **2"**
- flange size acc. to **2"**
- oversize: **no**
- Face to Face acc. to **2"**



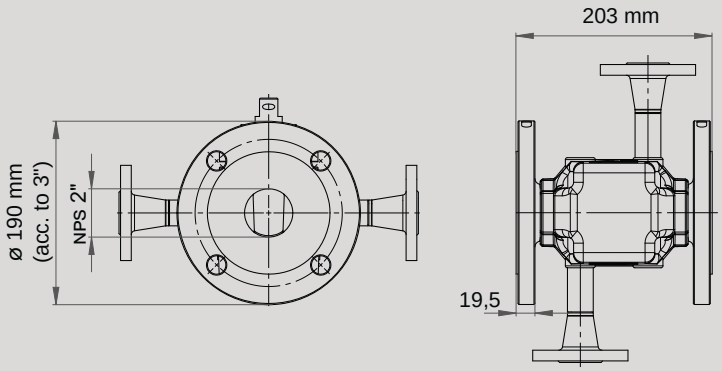
Option 2

- type HM-OS
- nominal size: **2"**
- flange size acc. to **3"**
- oversize: **yes**
- Face to Face acc. to **2"**



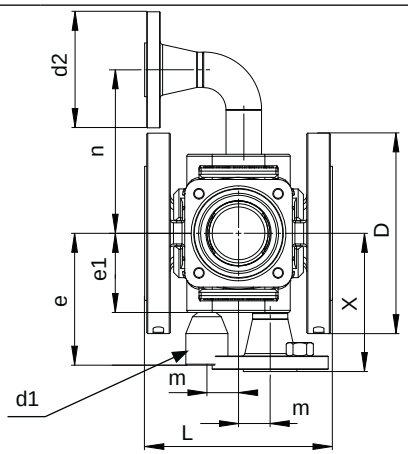
Option 3

- type HM-OS
- nominal size: **2"**
- flange size acc. to **3"**
- oversize: **yes**
- Face to Face acc. to **3"**



Type HM / HM-OS

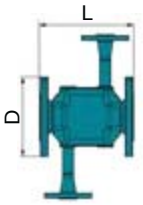
Technical information ISO-STANDARD-HM



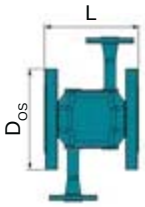
Important note:

For heating jacket valves with oversize flanges two face to face options are available.

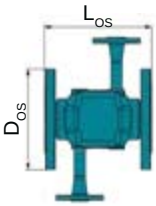
Type HM
Option 1



Type HM-OS
Option 2 "L"



Type HM-OS
Option 3 "L_{OS}"



ISO-STANDARD: EN 1092-1

							Option 1		Type HM-OS (Oversize)					Option 2	Option 3
DN	PN	m [mm]	X [mm]	e/e1 [mm]	d1 [Zoll]	d2 ** [mm]	L [mm]	D [mm]	OS [DN]	X [mm]	n [mm]	e/e1 [mm]	D_{OS} [mm]	L [mm]	L_{OS} [mm]
15	10-40	0	100	90/–	G ⅜	95 (DN15)	130	95	*	*	*	*	*	*	*
20	10-40	0	100	90/–	G ⅜	95 (DN15)	150	105	OS 40	110	128	90/–	165	**150**	*
25	10-40	0	100	90/–	G ⅜	95 (DN15)	160	115	OS 50	120	135	90/–	165	**160**	*
32	10-40	*	*	*	G ½	95 (DN15)	180	140	*				*	*	*
40	10-40	45	120	–/50	G ½	95 (DN15)	200	150	OS 65	145	145	–/100	185	**200**	**290**
50	10-40	50	125	–/62	G ½	95 (DN15)	230	165	OS 80	155	153	–/112	200	**230**	**310**
65	10-40	*	*	*	G ½	95 (DN15)	290	185	*	*	*	*	*	*	*
80	10-40	90	150	–/75	G ¾	95 (DN15)	310	200	OS 100	165	170	–/125	220	**310**	*
100	10-40	110	165	127/–	G ¾	95 (DN15)	350	220	OS 150	180	195	127/–	290	**350**	*
125	10-40	*	*	*	G 1	95 (DN15)	325	290	*	*	*	*	*	*	*
150	10-40	90	200	–/163	G 1	95 (DN15)	350	300	*	*	*	*	*	*	*
200	10-40	90	244	–/206	G 1	95 (DN15)	400	375	*	*	*	*	*	*	*
250	10-40	*	*	*	G 1	95 (DN15)	450	*	*	*	*	*	*	*	*
300	10-40	90	256	–/218	G 1	95 (DN15)	500	515	*	*	*	*	*	*	*

ISO-STANDARD: ASME B16.5

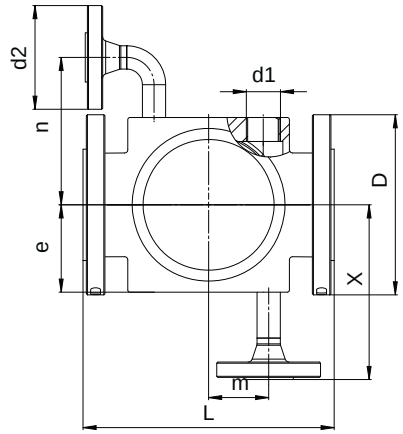
							Option 1		Type HM-OS (Oversize)					Option 2	Option 3
NPS	Class	m [mm]	X [mm]	e / e1 [mm]	d1 [Zoll]	d2** [mm]	L [mm]	D [mm]	OS [NPS]	X [mm]	n [mm]	e/e1 [mm]	D_{OS} [mm]	L [mm]	L_{OS} [mm]
½	150	0	100	100/–	G ⅜	90 (NPS ½)	108	90	OS 1½	100	*	100/–	127	**108**	**165**
	300	0	90	90/–			140	95		120	128	90/–	165	**140**	**190**
¾	150	0	100	90/–	G ⅜	90 (NPS ½)	117	100	OS 1½	120	113	90/–	127	**117**	**165**
	300	0	90	90/–			152	115		120	128	90/–	155	**152**	**190**
1	150	0	95	95/–	G ⅜	90 (NPS ½)	127	110	OS 2	125	125	95/–	150	**127**	**178**
	300	0	120	90/–			165	125		125	133	90/–	165	**165**	**216**
1½	150	30	100	105/–	G ⅜	90 (NPS ½)	165	125	OS 3	150	145	105/–	190	**165**	**203**
	300	30	130	53			190	155		150	155	105/–	210	**190**	**283**
2	150	35	150	107/–	G ½	90 (NPS ½)	178	150	OS 3	150	145	107/–	190	**178**	**203**
	300	40	150	110/–			216	165		150	155	–/110	210	**216**	**283**
3	150	40	150	–/125	G ½	90 (NPS ½)	203	190	OS 4	160	165	–/125	230	**203**	**229**
	300	50	160	–/130			283	210		160	178	–/130	254	**283**	**305**
4	150	45	160	–/122	G ½	90 (NPS ½)	229	230	OS 6	180	190	–/122	280	**229**	**267**
	300	70	180	–/142			305	255		200	210	–/142	320	**305**	**403**
6	150	50	207	–/50	G 1	90 (NPS ½)	267	280	OS 8	*	*	*	345	**267**	**292**
	300	50	210	–/50			403	320					380	**403**	**419**
8	150	45	226	–/45	G 1	90 (NPS ½)	292	345	OS 10	*	*	*	405	**292**	**330**
	300	45	225	–/45			419	380					445	**419**	**457**
10	150	65	165	–/65	G 1	90 (NPS ½)	330	405	OS 12	*	*	*	485	**330**	**356**
	300	65	256	–/65			457	445					520	**457**	**502**
12	150	90	266	–/90	G 1	90 (NPS ½)	356	485	OS 14	*	*	*	535	**356**	**686**
	300	90	400	–/90			502	520					585	**502**	**762**

*) on request

**) other nominal size and pressure rating on request

Type HM / HM OS

Technical information ISO-EXTRA-HM, full bore



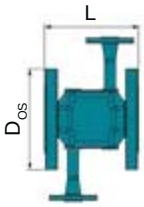
Important note:

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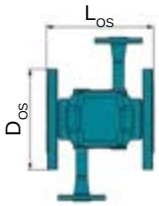
Type HM
Option 1



Type HM-OS
Option 2 "L"



Type HM-OS
Option 3 "L_{OS}"



ISO-EXTRA: EN 1092-1

							Option 1		Type HM-OS Oversize		Option 2	Option 3
DN	PN	X [mm]	m [mm]	e [mm]	d1 [Zoll]	d2 ** [mm]	L [mm]	D [mm]	OS [DN]	D_{OS} [mm]	L [mm]	L_{OS} [mm]
15	10-40	140	0	90	G ⅜	95 (DN15)	130	95	*	*	*	*
20	10-40	130	0	90	G ⅜	95 (DN15)	150	105	OS 50	165	**150**	**230**
25	10-40	128	0	90	G ⅜	95 (DN15)	160	115	OS 50	165	**150**	**230**
32	10-40	*	*	*	G ½	95 (DN15)	*	*	*	*	*	*
40	10-40	140	30	100	G ½	95 (DN15)	200	150	OS 65	185	**200**	**290**
50	10-40	150	50	112	G ½	95 (DN15)	230	165	OS 80	200	**230**	**310**
65	10-40	165	87	127	G ½	95 (DN15)	290	185	*	*	*	*
80	10-40	162	90	124	G ¾	95 (DN15)	310	200	OS 100	220	**310**	**350**
100	10-40	165	110	127	G ¾	95 (DN15)	350	220	*	*	*	*
125	10-40	*	*	*	G 1	95 (DN15)	*	*	*	*	*	*
150	10-40	200	90	163	G 1	95 (DN15)	480	285	*	*	*	*
200	10-40	244	90	206	G 1	95 (DN15)	600	375	*	*	*	*
250	10-40	*	*	*	G 1	95 (DN15)	730	450	*	*	*	*
300	10-40	256	90	218	G 1	95 (DN15)	850	450	*	*	*	*

ISO-EXTRA: ASME B16.5

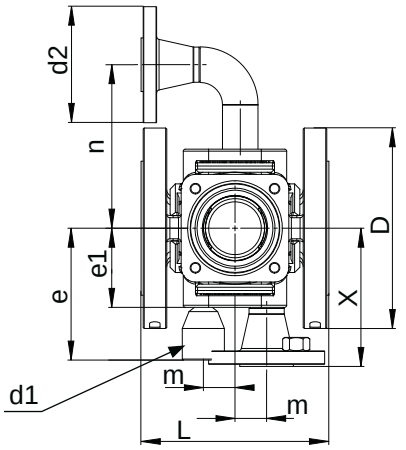
							Option 1		Type HM-OS Oversize		Option 2	Option 3
NPS	Class	X [mm]	m [mm]	e [mm]	d1 [Zoll]	d2 [mm]	L [mm]	D [mm]	OS [NPS]	D_{OS} [mm]	L [mm]	L_{OS} [mm]
½	150 300	100 100	0 0	100 100	G ⅜	90 (NPS ½)	108 140	90 95	OS 1½	127	**108**	**140**
¾	150 300	100 *	0 0	100 100	G ⅜	90 (NPS ½)	117 152	100 115	OS 1½	125 155	**117** **152**	**165** **191**
1	150 300	93 138	0 0	100 100	G ⅜	90 (NPS ½)	160 230	110 125	OS 2	150 165	**160** **230**	**165** **260**
1½	150 300	100 *	30 30	53 53	G ⅜	90 (NPS ½)	200 260	125 155	OS 3	190 210	**200** **260**	**310** **310**
2	150 300	155 160	35 35	107 107	G ½	90 (NPS ½)	230 300	150 165	OS 3	190 210	**200** **260**	**310** **310**
3	150 300	172 176	40 40	125 125	G ½	90 (NPS ½)	310 310	190 210	OS 4	230 255	**310** **310**	**350** **430**
4	150 300	170 170	45 45	45 45	G ½	90 (NPS ½)	350 430	230 255	OS 6	280 320	**350** **430**	**480** **550**
6	150 300	207 210	50 50	50 50	G 1	90 (NPS ½)	480 550	280 320	OS 8	345 380	**480** **550**	**600** **650**
8	150 300	226 225	45 45	45 45	G 1	90 (NPS ½)	600 650	345 380	OS 10	405 445	**600** **650**	**730** **775**
10	150 300	165 256	65 65	65 65	G 1	90 (NPS ½)	730 775	405 445	OS 12	485 520	**730** **775**	**850** **850**
12	150 300	266 400	90 90	90 90	G 1	90 (NPS ½)	850 850	485 520	OS 14	535 585	**850** **850**	**980** **980**

*) on request

**) other nominal size and pressure rating on request

Type TM / TM-OS

Technical information for ISO-STANDARD-TM



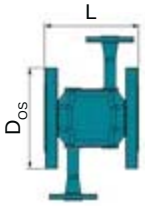
Important note:

For heating jacket valves with oversize flanges two face to face options are available.

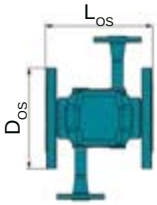
Type TM
Version 1



Type TM-OS
Version 2 "L"



Type TM-OS
Version 3 "L_{OS}"



ISO-STANDARD: EN 1092-1

							Option 1		Type TM-OS Oversize					Opt. 2	Opt. 3
DN	PN	m [mm]	X [mm]	e/e1 [mm]	d1 [Zoll]	d2 ** [mm]	L [mm]	D [mm]	OS [DN]	X [mm]	n [mm]	e/e1 [mm]	D_{OS} [mm]	L [mm]	L_{OS} [mm]
15	10-40	0	100	90/–	G ⅜	95 (DN15)	130	95	*	*	*	*	*	*	*
20***	10-40	0	100	90/–	G ⅜	95 (DN15)	150	105	OS 40	110	128	90/–	165	**150**	*
25	10-40	0	100	90/–	G ⅜	95 (DN15)	160	115	OS 50	120	135	90/–	165	**160**	*
40	10-40	45	120	–/50	G ½	95 (DN15)	200	150	OS 65	145	145	–/100	185	**200**	**290**
50	10-40	50	125	–/62	G ½	95 (DN15)	230	165	OS 80	155	153	–/112	200	**230**	**310**
65	10-40	*	*	*	G ½	95 (DN15)	290	185	*	*	*	*	*	*	*
80	10-40	90	150	–/75	G ¾	95 (DN15)	310	200	OS 100	165	170	–/125	220	**310**	**350**
100	10-40	110	165	127/–	G ¾	95 (DN15)	350	220	OS 150	180	195	127/–	290	**350**	**325**
150	10-40	90	200	–/163	G 1	95 (DN15)	350	300	*	*	*	*	*	*	*
200	10-40	90	244	–/206	G 1	95 (DN15)	400	375	*	*	*	*	*	*	*
300	10-40	90	256	–/218	G 1	95 (DN15)	500	515	*	*	*	*	*	*	*

ISO-STANDARD: ASME B16.5

							Option 1		Type TM-OS Oversize					Opt. 2	Opt. 3
NPS	Class	m [mm]	X [mm]	e / e1 [mm]	d1 [Zoll]	d2** [mm]	L [mm]	D [mm]	OS [NPS]	X [mm]	n [mm]	e/e1 [mm]	D_{OS} [mm]	L [mm]	L_{OS} [mm]
½	150 300	0 0	100 90	100/– 90/–	G ⅜	90 (NPS ½)	108 140	90 95	OS 1½	100 120	* 128	100/– 90/–	127 165	**108** **140**	**165** **190**
¾	150 300	0 0	100 90	90/– 90/–	G ⅜	90 (NPS ½)	117 152	100 115	OS 1½	120 120	113 128	90/– 90/–	127 155	**117** **152**	**165** **190**
1***	150 300	0 0	95 120	95/– 90/–	G ⅜	90 (NPS ½)	127 165	110 125	OS 2	125 125	125 133	95/– 90/–	150 165	**127** **165**	**178** **216**
1½	150 300	30 30	100 130	105/– 53	G ⅜	90 (NPS ½)	165 190	125 155	OS 3	150 150	145 155	105/– 105/–	190 210	**165** **190**	**203** **283**
2	150 300	35 40	150 150	107/– 110/–	G ½	90 (NPS ½)	178 216	150 165	OS 3	150 150	145 155	107/– –/110	190 210	**178** **216**	**203** **283**
3	150 300	40 50	150 160	–/125 –/130	G ½	90 (NPS ½)	203 283	190 210	OS 4	160 160	165 178	–/125 –/130	230 254	**203** **283**	**229** **305**
4	150 300	45 70	160 180	–/122 –/142	G ½	90 (NPS ½)	229 305	230 255	OS 6	180 200	190 210	–/122 –/142	280 320	**229** **305**	**267** **403**
6	150 300	50 50	207 210	–/50 –/50	G 1	90 (NPS ½)	267 403	280 320	OS 8	*	*	*	345 380	**267** **403**	**292** **419**
8	150 300	45 45	226 225	–/45 –/45	G 1	90 (NPS ½)	292 419	345 380	OS 10	*	*	*	405 445	**292** **419**	**330** **457**
10	150 300	65 65	165 256	–/65 –/65	G 1	90 (NPS ½)	330 457	405 445	OS 12	*	*	*	485 520	**330** **457**	**356** **502**

*) on request

**) other nominal size and pressure rating on request

***) jacket connection EN / ANSI 10 mm / 18 mm below valve centre line

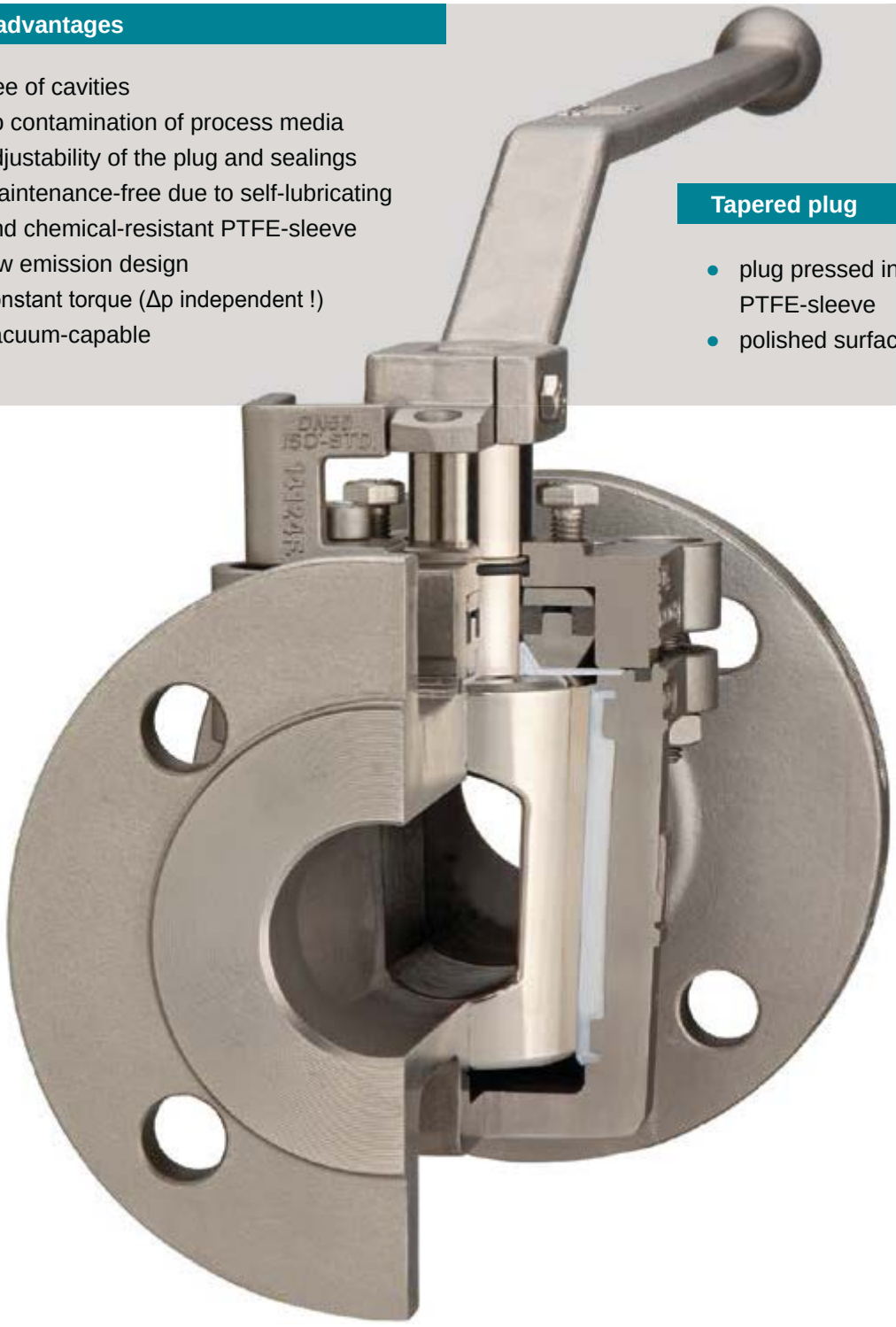
AZ-plug valve: the design principle

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

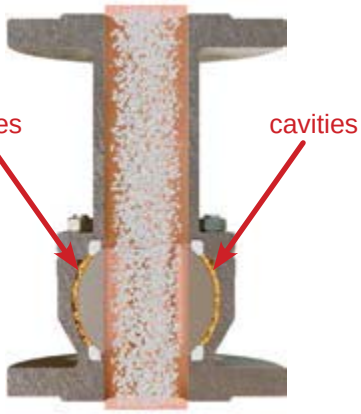
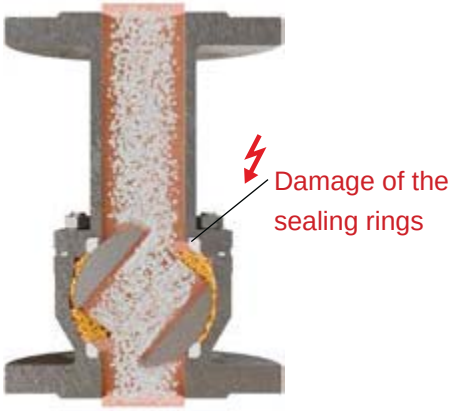
- tapered body interior
- integrated supporting ribs avoid rotation and coldflow of the sleeve
- large sealing surface

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

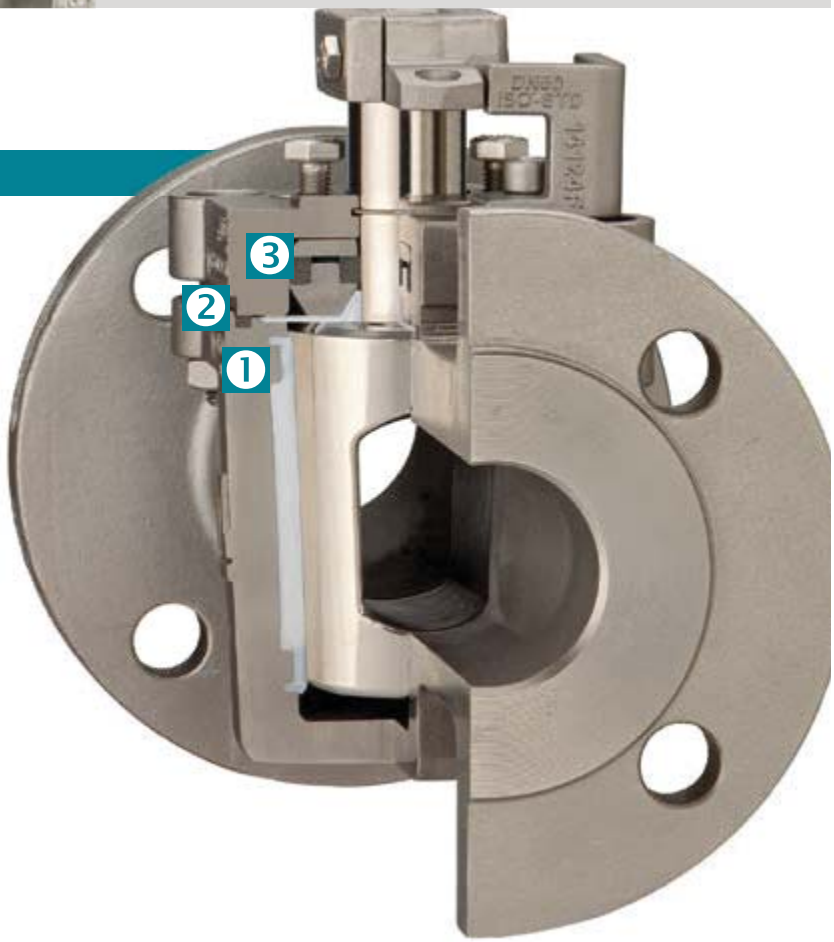
Safe and reliable tightness for years

Adjustable



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

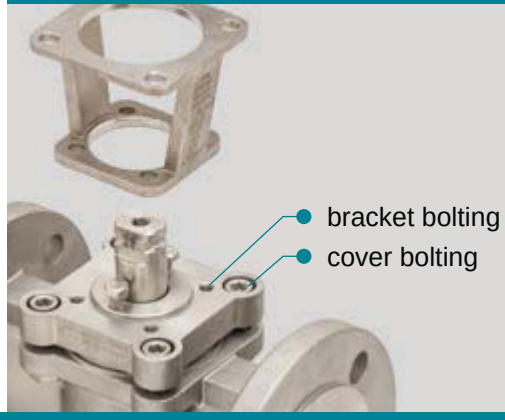
Several sealings to atmosphere



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



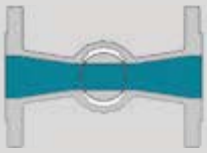
- pressure containing cover bolts separated from bracket boltings
- cover and bracket acc. to ISO 5211 for efficient actuator / gearbox assembly

Reduced and full bore design

Execution

Reduced bore
Type STANDARD

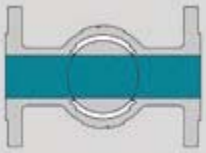
- compact valve (FF / weight)
- optimal torques for economic automation





Full round bore
Type EXTRA

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



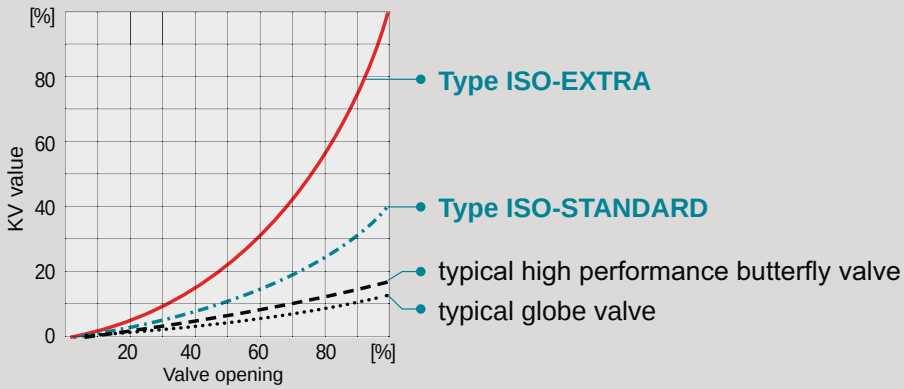


Type ISO-EXTRA

- 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



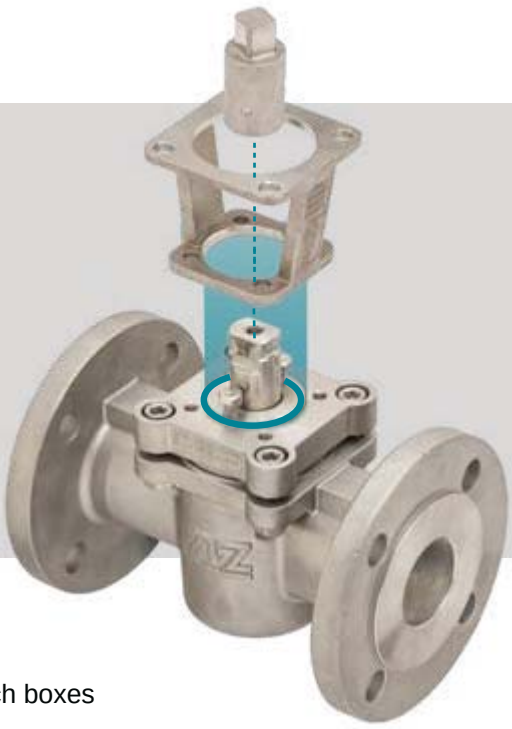
High and low temperature

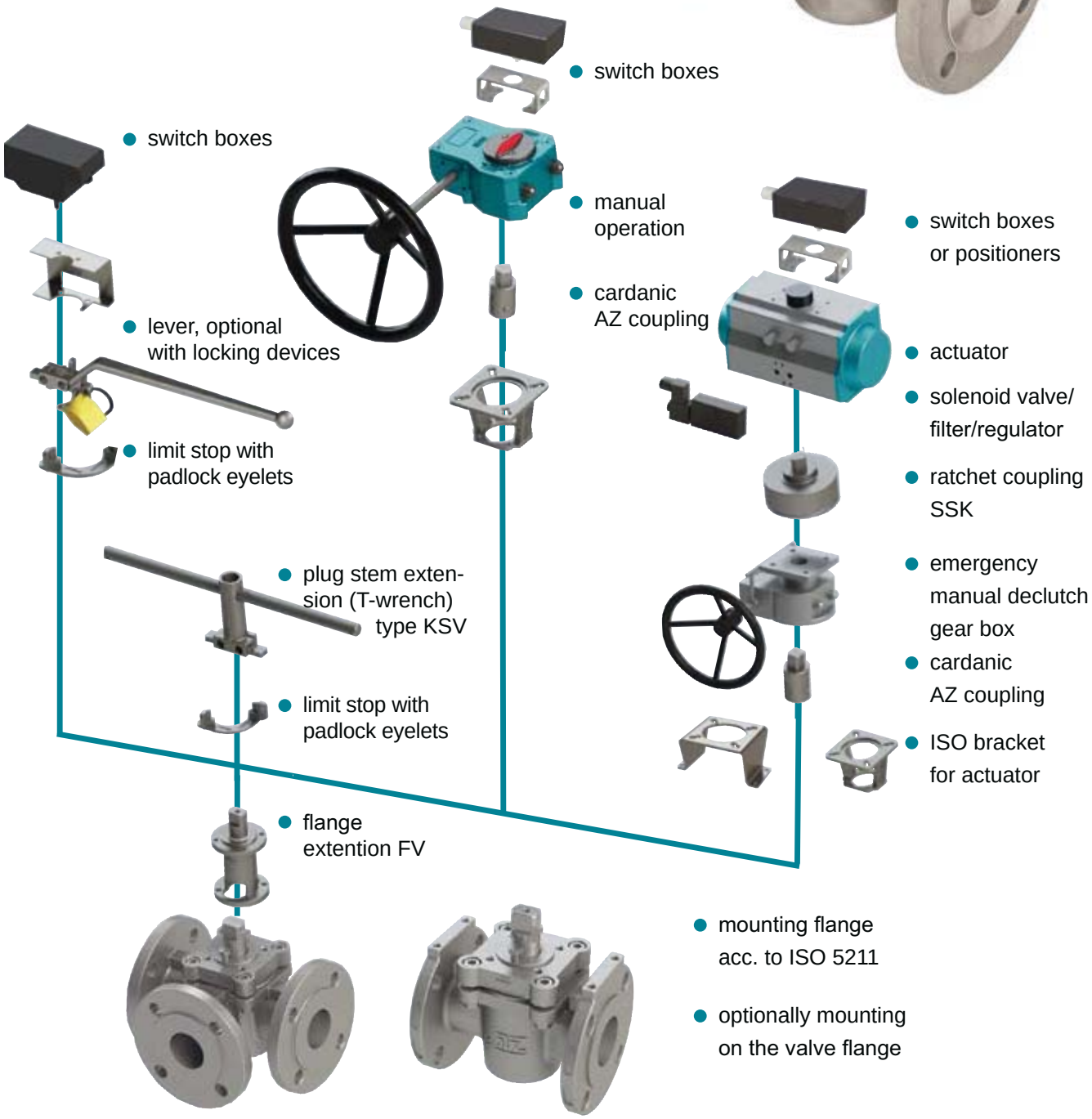
- extended bonnet with sealing at the top
- stem extension for insulated valves

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





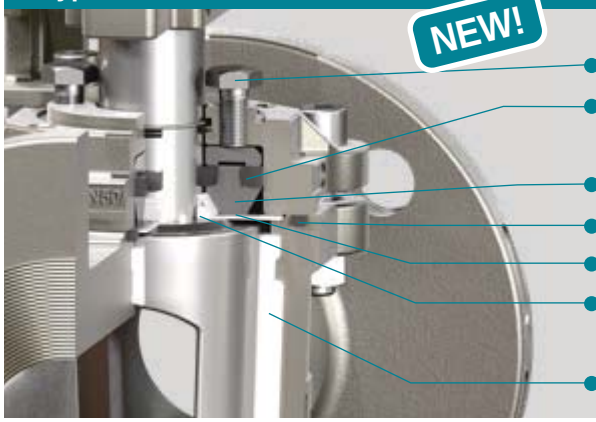
Cover and stem sealing systems suitable for general applications

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

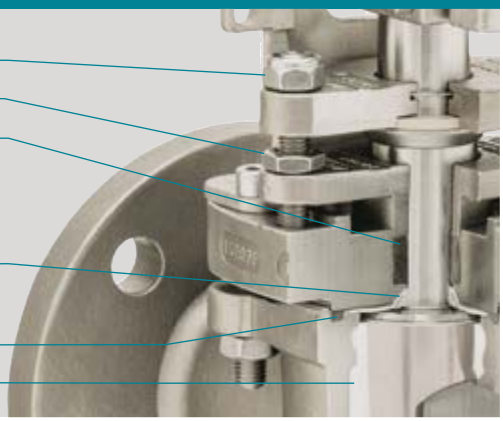
engineered.
fast.
dynamic.

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

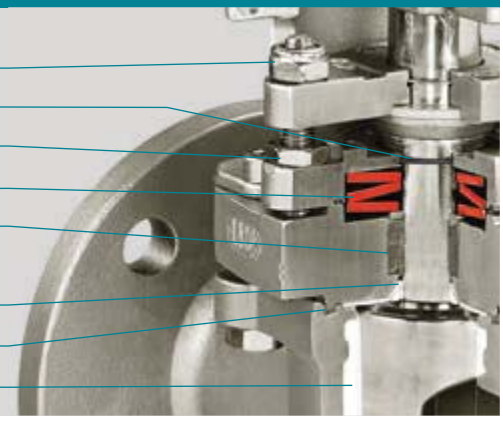
plug adjustment
triple safety stem packing adjustment
Quaternary sealing: three o-rings at the stem
Tertiary sealing:
triple safety stem packing
Secondary sealing:
V-diaphragm (PTFE) and delta thrust collar (PTFE)
cover sealing (graphite)
Primary sealing: sleeve*



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

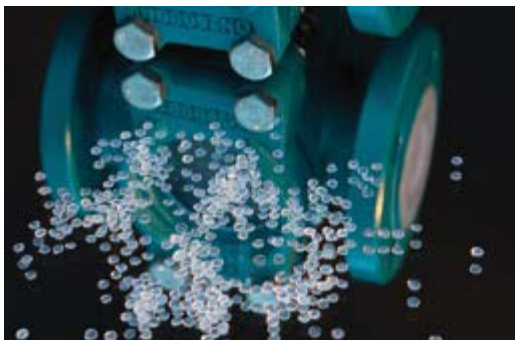
Other materials on request.

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

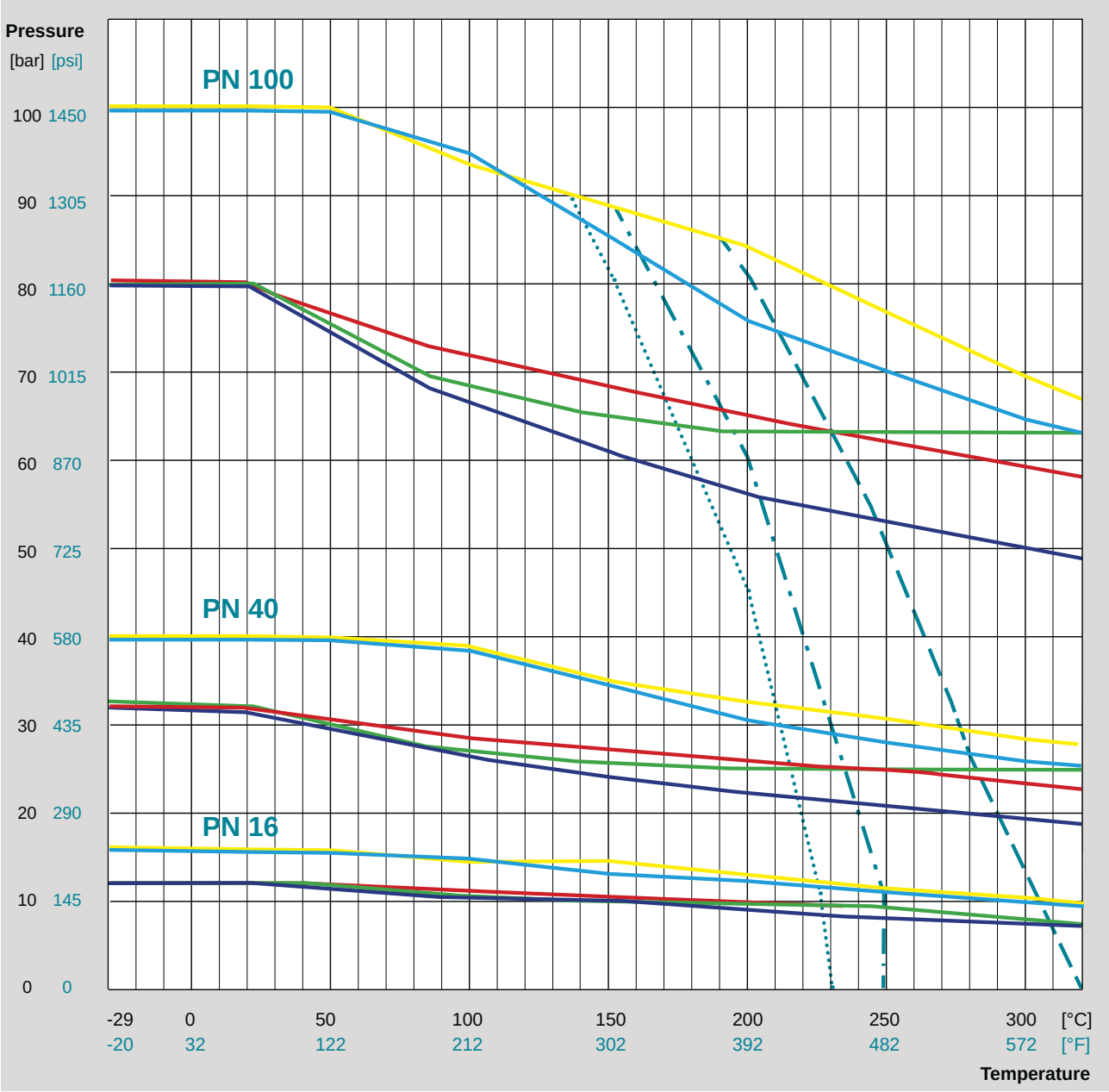
Sample calculation

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.

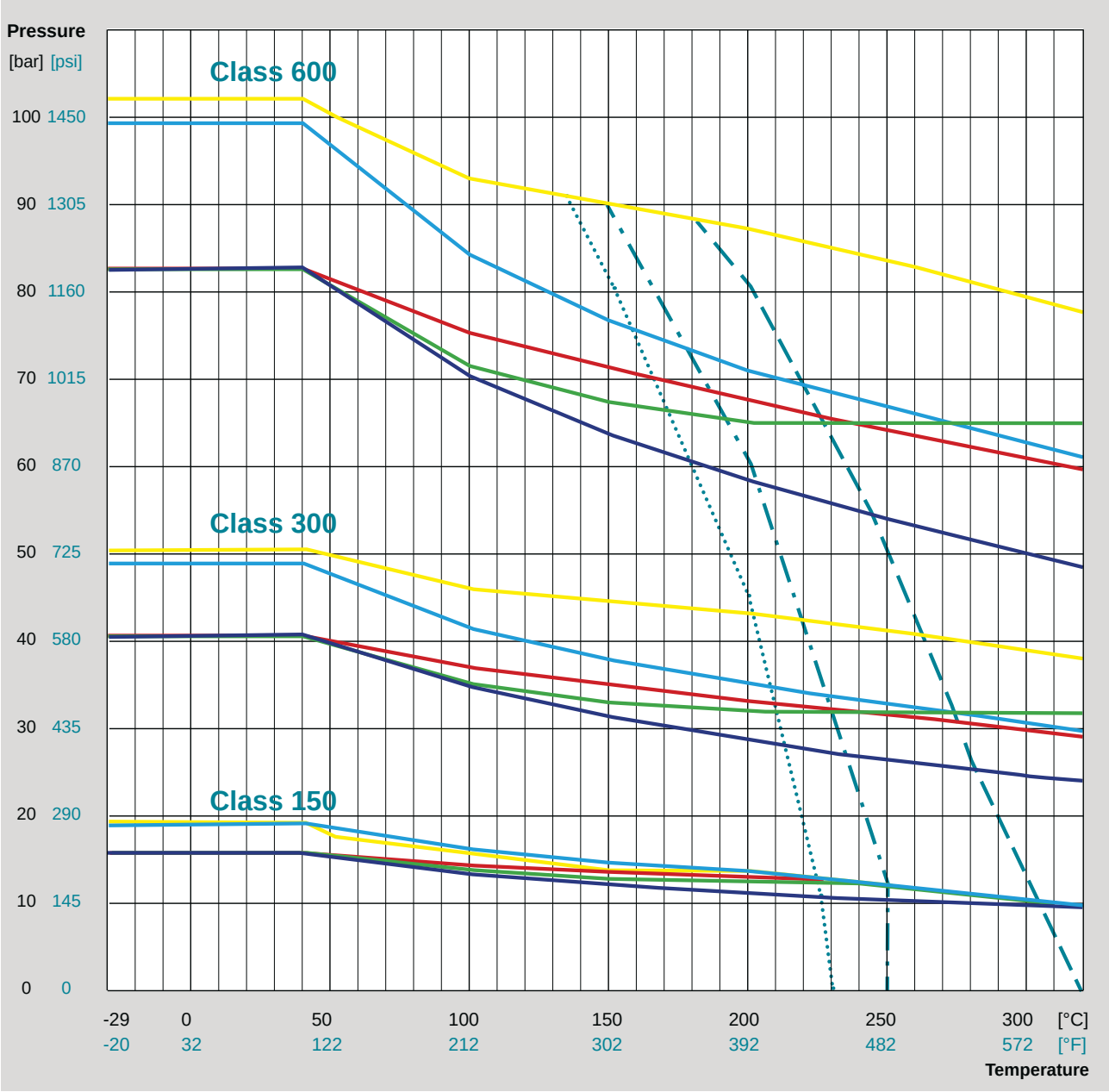
The data given are max. values according to EN 12516-1 and EN 1092-1.

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.

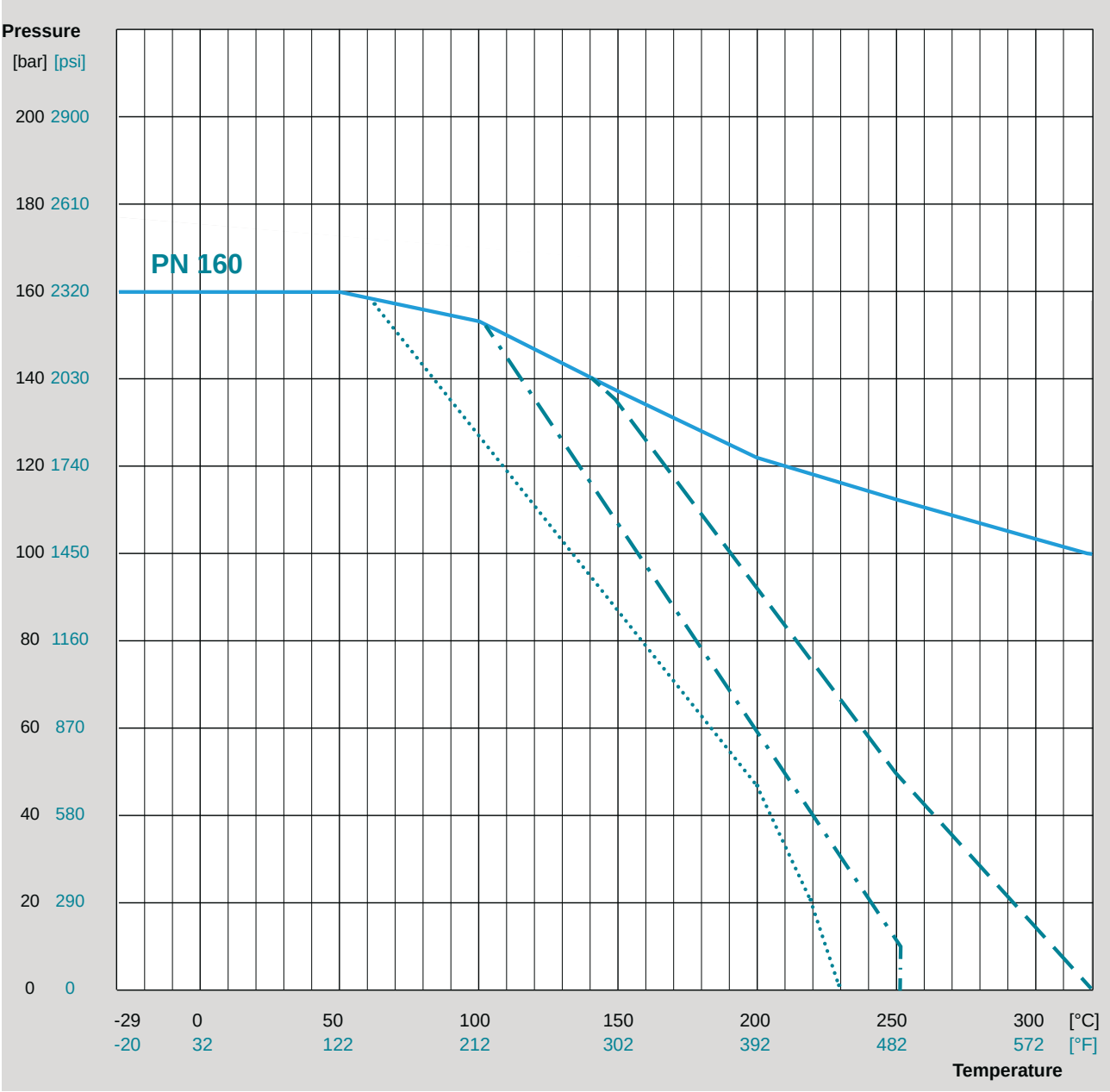
The data given are max. values according to ASME B16.34.

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.

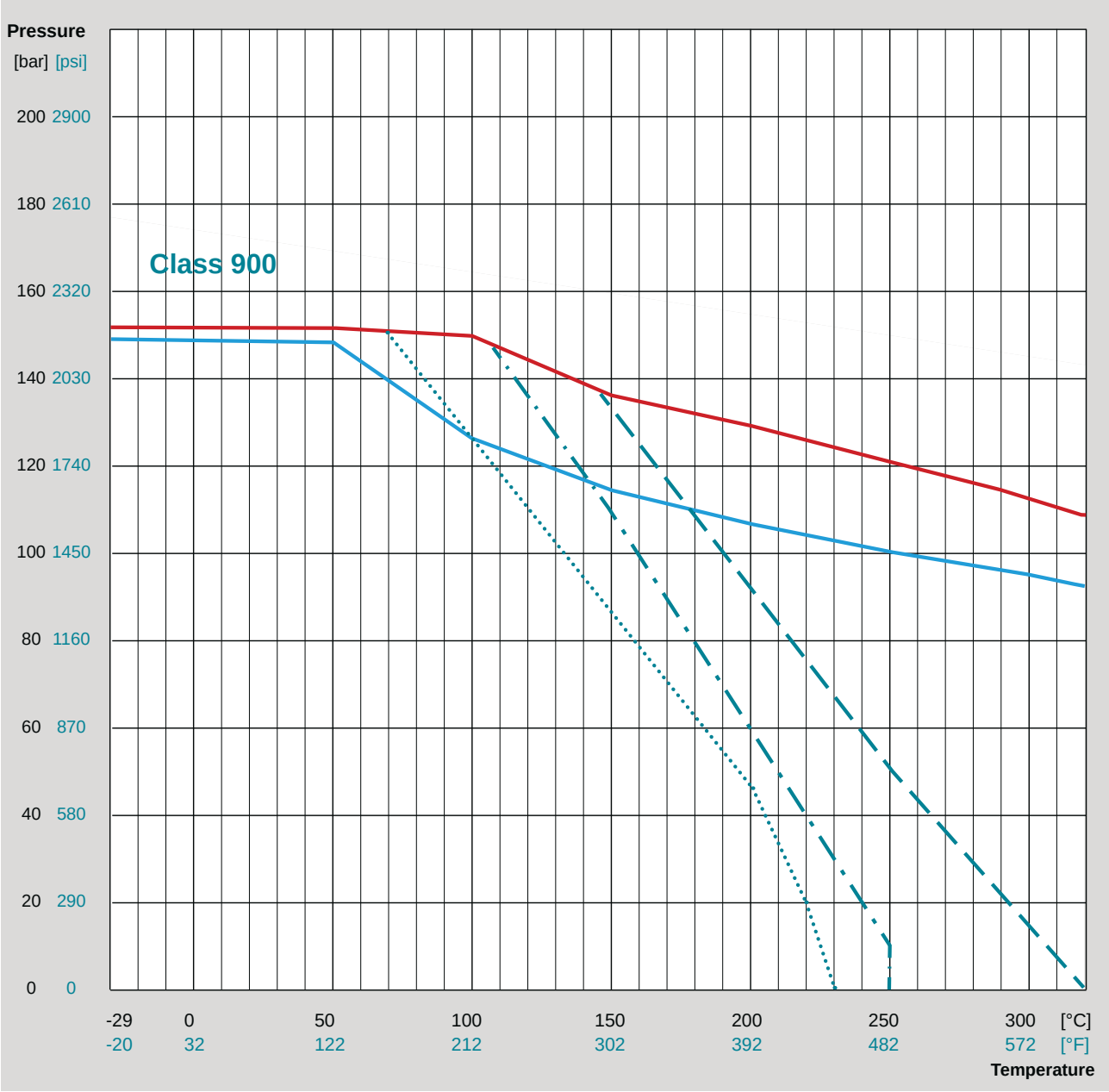
The data given are max. values according to EN 12516-1 and EN 1092-1.

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

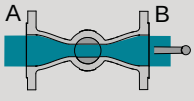
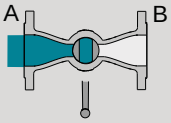
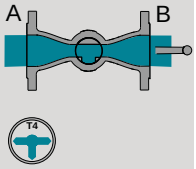
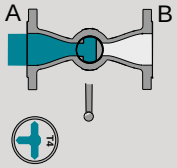
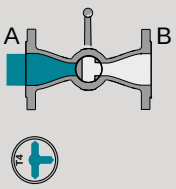


- position indicator for all multi-way valves welded on lever or stem extension
- Lined plug valves: multi-way plugs only with PFA plug lining or made of special materials. Two-way plugs with PTFE lining up to DN 100 / NPS 4 available

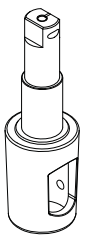
Recommendation for three-way valves type F-3-S with vertical outlet (longer life-time compared to type F-3-W with horizontal outlet)

Options

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

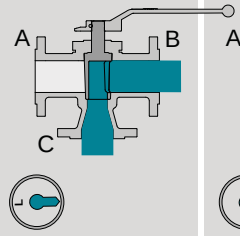
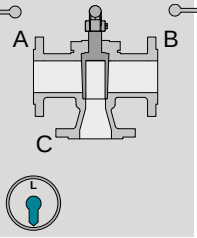
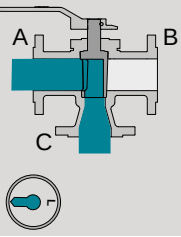
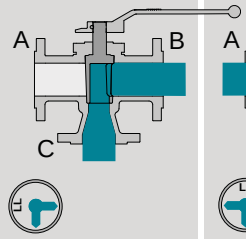
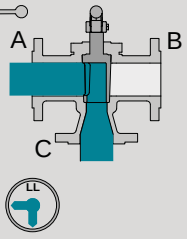
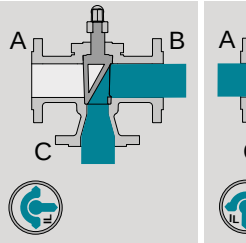
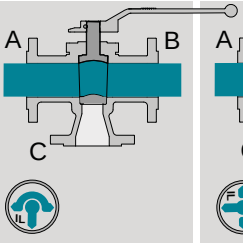
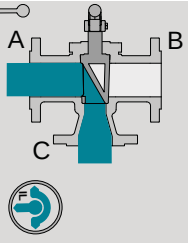
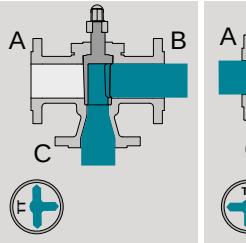
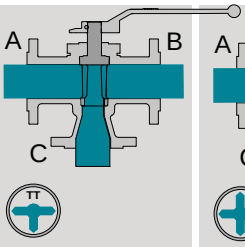
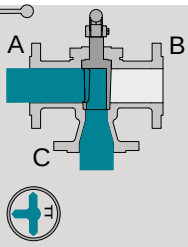
2-way	Plug type	Pos. I = 0°	Pos. II = 90°	Pos. III = 180°	Pos. IV = 270°
 Type F-2-ISO-STANDARD	D 				
 Type F-2-ISO-STANDARD-A	T4 * 				

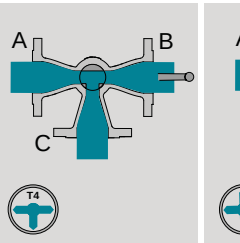
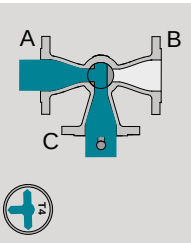
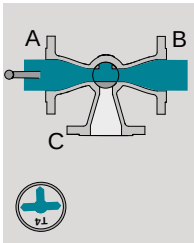
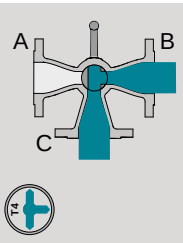
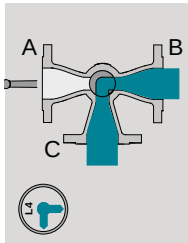
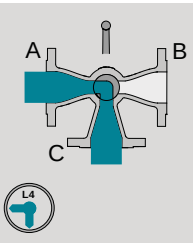
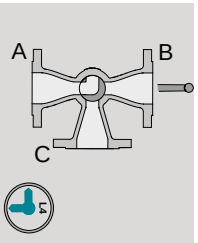
*) For highly expanding media AZ recommends the "i-plug" (relief hole and open plug buttom)



"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

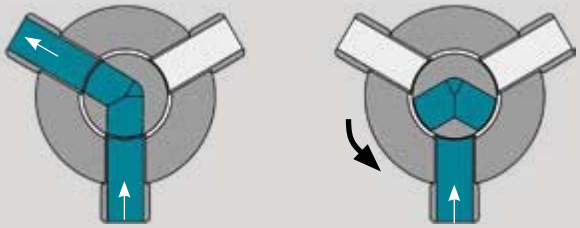
transflow design

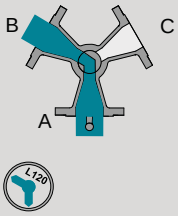
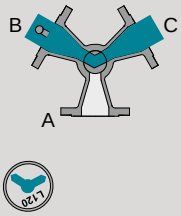
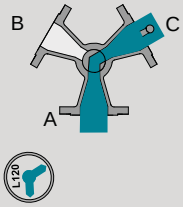


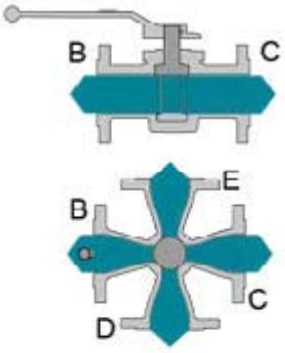
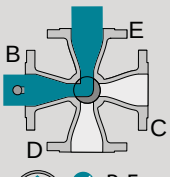
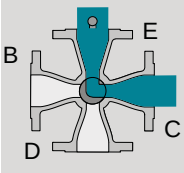
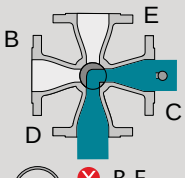
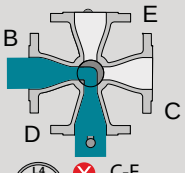
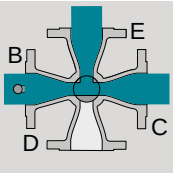
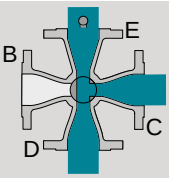
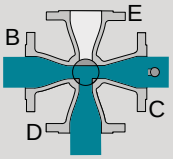
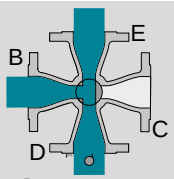
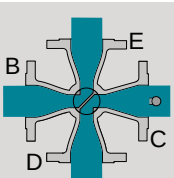
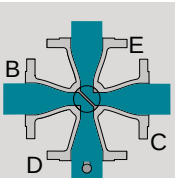
3-way (120°) type 3-WP-120

- 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		

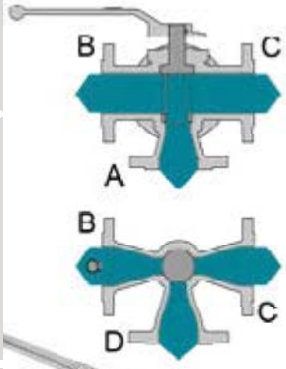
open
closed

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	

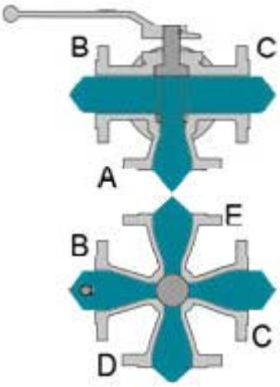


Type F-4-Special-ISO-STANDARD





Type F-5-ISO-STANDARD



✓ open
✗ closed

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