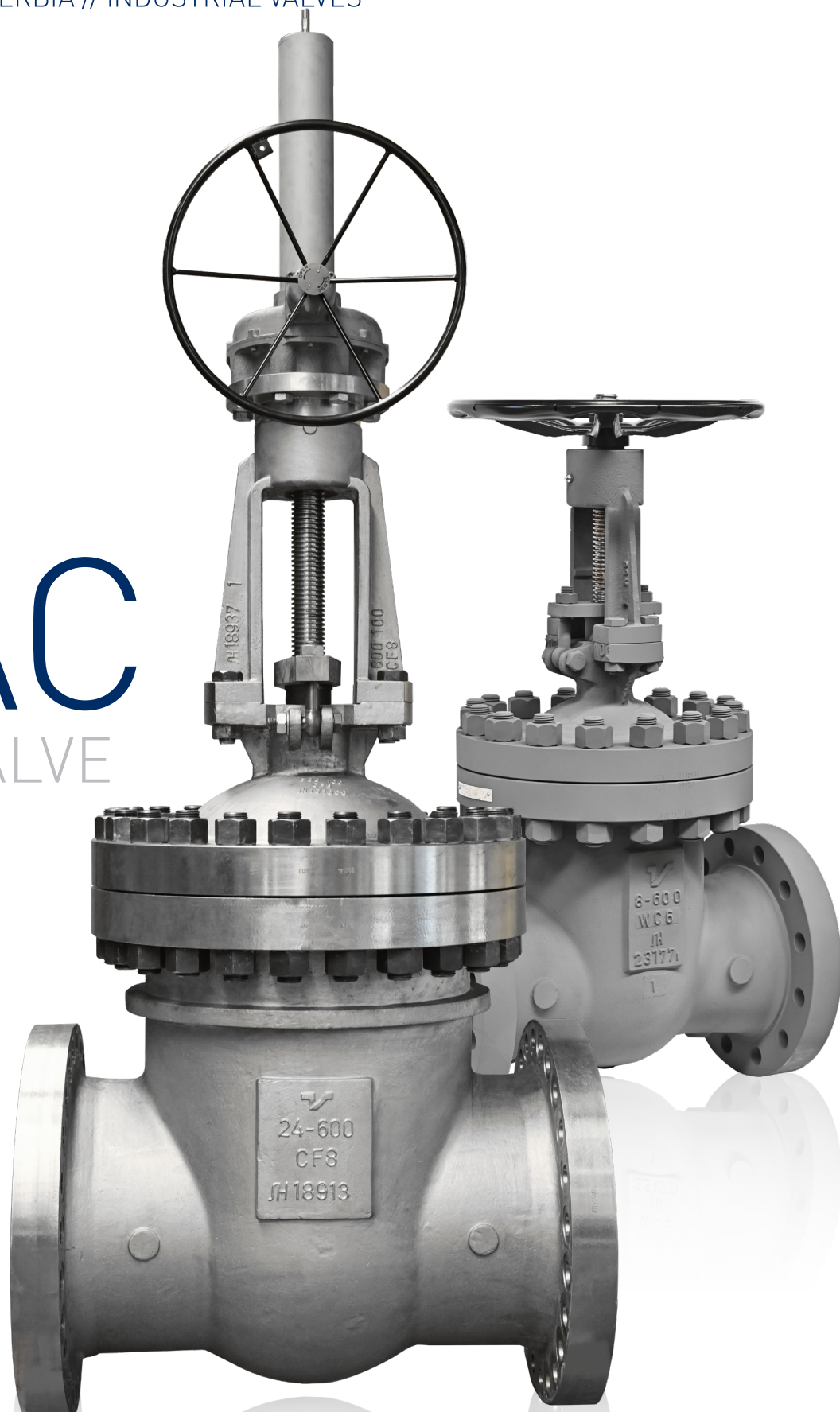


TERMOVENT SC SERBIA // INDUSTRIAL VALVES

GAC

GATE VALVE
API 600



TERMOVENT
since 1963 SC

CONTENTS

Page

I Technical Data Sheets

1. General Features	5
2. Parts & Materials	6
3. Standards & Dimensions	8
4. Flanged Ends Design & Dimensions	10
5. Butt Welding Ends Design	12
6. Wedge Designs	13
7. Optional Executions	14
8. Over Pressurization, Pressure Locking & Thermal Binding Process Conditions	15
8.1 Solutions for Over-Pressurization & Pressure Locking	15
8.2 Solutions for Thermal Binding	16
8.3 Combined Effects of Over-Pressurization, Pressure Locking & Thermal Binding	16
8.4 By-pass Valve Size Selection	16
9. Pressure & Temperature Ratings	17
10. Marking & Labeling	18
10.1 Marking	18
10.1.1 Additional Marking	18
10.2 Labeling	19
11. Surface Protection	19
12. Packaging	19

II Instructions for Installation, Operation & Maintenance

13. Instructions for Installation, Operation & Maintenance	21
13.1 General Safety Information	21
13.2 Storage & Handling	21
13.2.1 Recommended Storage Conditions	21
13.2.2 Storage Inspection	21
13.2.3 Handling Requirements	22
13.3 Installation & Start-up	23
13.4 Usage & Maintenance	24
13.5 Service & Repair	25
13.5.1 Stem Packing Rings Replacement	26
13.5.2 Bonnet Gasket Replacement	27
13.6 Possible Malfunctions & Solutions	28
13.7 Guarantee	29

III Purchase Guidance

14. RFQ Form	33
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I TECHNICAL DATA SHEETS

1. GENERAL FEATURES

Gate Valves [GAC] acc. to API 600

NPS 2" ÷ DN 26"

Class 150 ÷ Class 1500

Design

- Cast body and bonnet
- Bolted bonnet (BB)
- Rising stem (RS), outside screw and yoke (OS&Y)
- Flexible, split, solid or parallel slide wedge
- Hard-faced seats

Applications

- The main purpose of the GAC is to isolate fluid flow through the pipeline for Power plant, Chemical, Petrochemical, Refining, Water supply and other

Media

- Water, steam, gas, oil and other non-aggressive media

Pressure and temperature ratings

- Class 150 ÷ Class 1500
- Temperatures up to 600°C
- p/T according to ASME B16.34

Materials

- Carbon, low temperature and heat-resistant alloys and stainless steels

Advantages

- Long service life
- Respect for emission standards
- Easy handling and maintenance

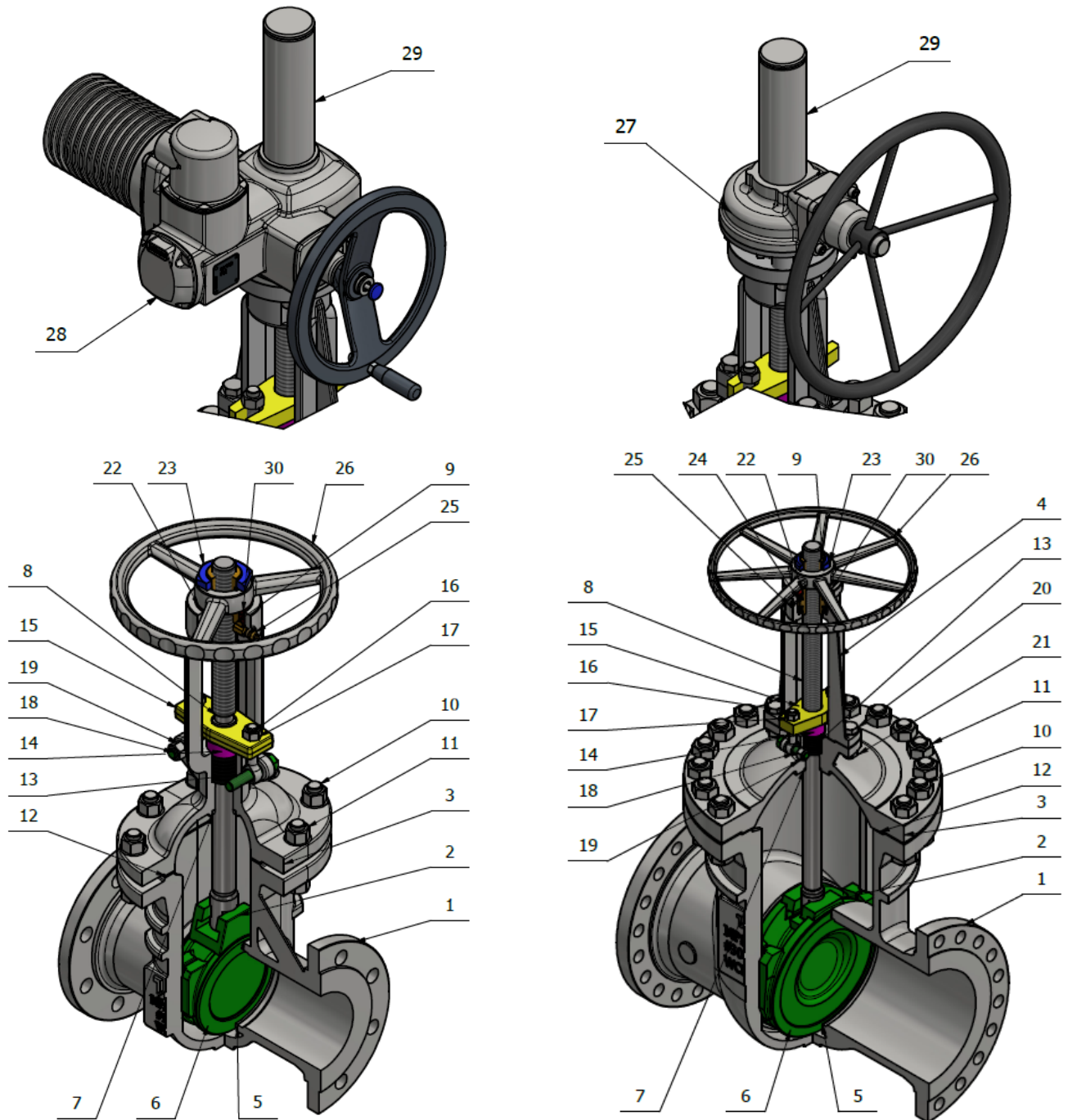
Options

- Electric actuator
- Pneumatic actuator
- Spring loaded stuffing box (SLSB)
- Lantern ring
- Position indicator
- Limit switches
- Locking device
- Over pressure safety devices
- Flanged or welded ends according to other Standards and Norms.

Testing

- Every produced gate valve shall be tested according to API 598

2. PARTS & MATERIALS



- Class 150: Bonnet < NPS 10" ≥ Bonnet + Yoke
- Class 300: Bonnet < NPS 6" ≥ Bonnet + Yoke
- Class 600: Bonnet < NPS 6" ≥ Bonnet + Yoke
- Class 900: Bonnet < NPS 6" ≥ Bonnet + Yoke
- Class 1500: Bonnet < NPS 6" ≥ Bonnet + Yoke

Figure D.2.1 Parts

List of materials

Table D.2.1

Pos.	Name	Material Group acc. to ASME B16.34						
1	Body ⁽¹⁾	A216 WCB	A352 LCB	A217 WC6	A217 WC9	A217 C12A	A351 CF8	A351 CF8M
2	Wedge ⁽¹⁾							
3	Bonnet ⁽¹⁾							
4	Yoke	A216 WCB	A352 LCB	A217 WC6			A351 CF8	
5	Body overlay ⁽²⁾	Trim No. acc. to API 600 (table below D.2.1.1)						
6	Wedge overlay ⁽²⁾							
7	Backseat overlay ⁽²⁾							
8	Stem							
9	Stem nut	Cu-Alloy						
10	Stud bolts	A193 B7		A193 B16			A193 B8	A193 B8M
11	Nuts	A194 2H		A194 7			A194 8	A194 8M
12	Bonnet gasket	reinforced graphite (Class 150) / spiral wound / oval metal ring						
13	Stem packing rings	graphite with corrosion inhibitor						
14	Packing gland	SS420					SS304	
15	Gland flange	A516 Gr.60					SS304	
16	Gland bolts	AISI 1035					SS304	
17	Gland nuts	A194 2H					A194 8	
18	Head bolts	steel					stainless steel	
19	Nuts	steel					stainless steel	
20	Head bolts	steel					stainless steel	
21	Nuts	steel					stainless steel	
22	Cover bearing	AISI 1045					SS304	
23	Handwheel nut	AISI 1045					SS304	
24	Bearings	axial						
25	Grease injector	Cu-Alloy / steel						
26	Handwheel	steel						
27	Gearbox	commercial						
28	Electric actuator	commercial						
29	Protect tube	steel						
30	Slotted set screw	steel						

TM trademark materials

⁽¹⁾ Other materials available acc. to ASTM Specification⁽²⁾ Hardness differential between the body and wedge seating surfaces shall be min. 50 HB

Materials for Trim No.

Table D.2.1.1

Trim No.	Body overlay	Wedge overlay	Backseat overlay	Stem
1	13Cr	13Cr	13Cr	SS420
2	304	304	304	SS304
5	Stellite™	Stellite™	Stellite™	SS420
8	Stellite™	13Cr	13Cr	SS420
10	316	316	316	SS316
12	Stellite™	316	316	SS316
15	Stellite™	Stellite™	Stellite™	SS304
16	Stellite™	Stellite™	Stellite™	SS316

3. STANDARDS & DIMENSIONS

Standards	Table D.2.2
GAC	Class 150 ÷ Class 1500
General design	API 600
Wall thickness	API 600
Pressure / temperature rating	ASME B16.34
FTF according to	ASME B16.10
ETE according to	ASME B16.10
Flanged Ends according to	ASME B16.5 and ASME B16.47
Welding Ends according to	ASME B16.25
Testing according to	API 598

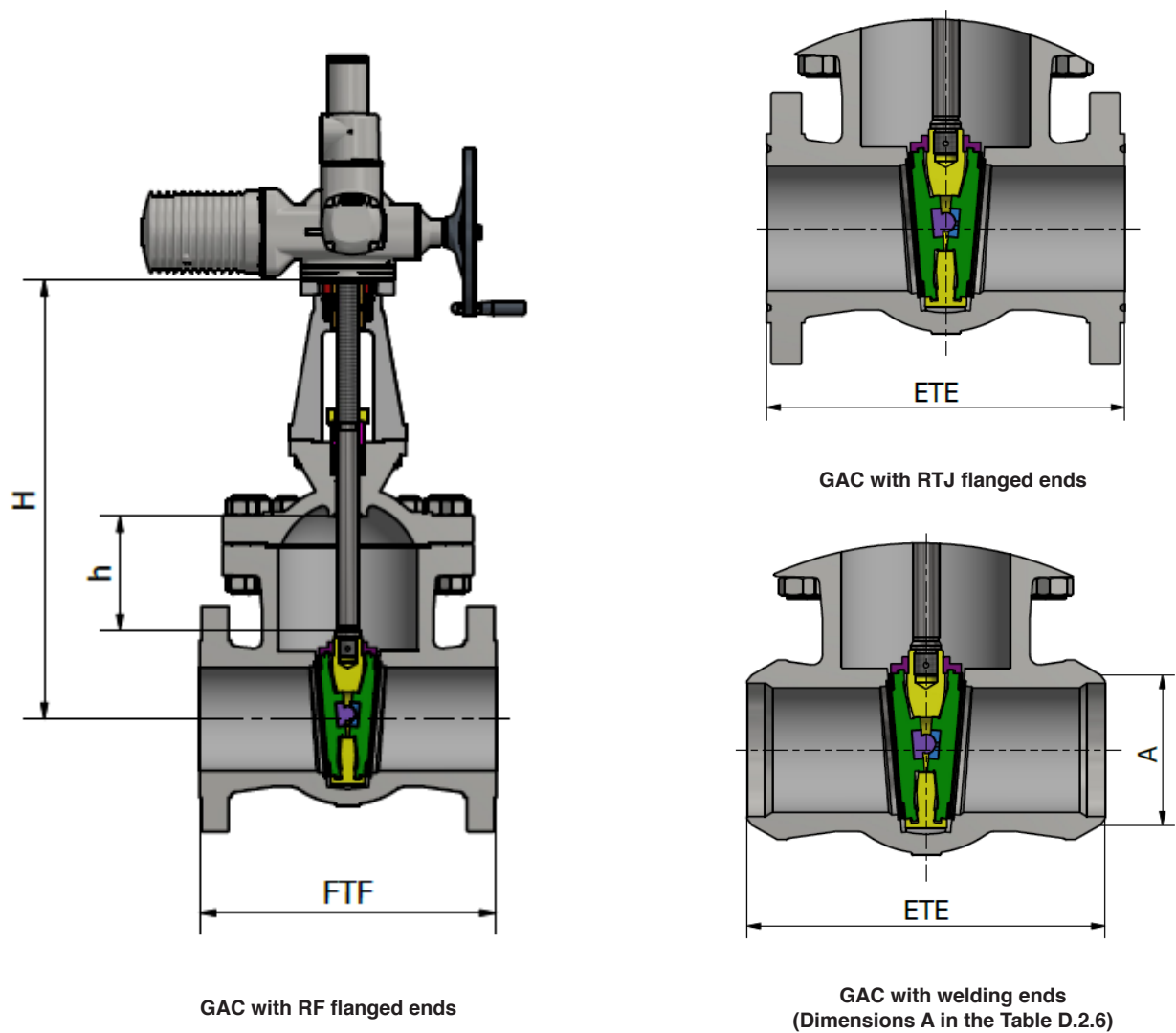


Figure D.2.2 – Dimensions



GAC Dimensions

Table D.2.3

Pressure Class	Nominal pipe size	Face-To-Face (RF)	End-To-End (RTJ)	End-To-End	Centre-to-Connection Flange	Stroke	Connection Flange ISO 5210	Kvs	Weight ⁽¹⁾	
Class	NPS	FTF	ETE		H	h		m³/h	FTF	ETE ⁽²⁾
		mm							kg	
Class 150	2"	178	191	216	334	70	F10-B1	332	23	19
	2 1/2"	190	203	241	420	83	F10-B1	518	30	26
	3"	203	216	282	442	91	F10-B1	747	37	34
	4"	229	242	305	553	116	F10-B1	1327	49	43
	5"	254	267	381	607	145	F10-B1	2074	74	61
	6"	267	280	403	707	168	F10-C	2986	86	80
	8"	292	305	419	791	223	F10-C	5309	144	130
	10"	330	343	457	908	276	F14-B1	8296	220	210
	12"	356	369	502	1085	332	F14-B1	11946	323	300
	14"	381	394	572	1171	365	F14-C	14568	410	396
	16"	406	419	610	1447	426	F14-C	19298	605	575
	18"	432	445	660	1558	462	F16-B1	24690	740	690
	20"	457	470	711	1710	526	F16-B1	30747	910	868
24"	508	521	813	2103	646	F14-B3	44851	1600	1505	
26"	559	572	864	2400	700	F14-B3	52898	2010	1926	
Class 300	2"	216	232	216	384	74	F10-B1	332	33	26
	2 1/2"	241	257	241	431	86	F10-B1	518	44	35
	3"	282	298	282	463	90	F10-B1	747	53	42
	4"	305	321	305	540	118	F10-B1	1327	81	63
	5"	381	397	381	625	144	F10-B1	2074	153	125
	6"	403	419	403	671	164	F14-B1	2986	181	150
	8"	419	435	419	830	225	F14-B1	5309	254	216
	10"	457	473	457	1066	311	F14-B1	8296	386	328
	12"	502	518	502	1236	331	F16-B1	11946	587	490
	14"	562	576	562	1296	370	F16-B1	14568	880	730
	16"	610	624	610	1396	408	F14-B3	19298	1100	944
	18"	660	674	660	1547	475	F14-B3	23974	1415	1266
	20"	711	725	711	1651	517	F14-B3	29947	1855	1594
24"	813	827	813	2051	621	F16-B3	43884	2786	2497	
Class 600	2"	292	295	292	388	74	F10-B1	332	42	34
	2 1/2"	330	333	330	431	85	F10-B1	518	54	44
	3"	356	359	356	490	94	F10-B1	747	63	54
	4"	432	435	432	597	120	F10-C	1327	125	90
	5"	508	511	508	625	144	F14-B1	2000	187	137
	6"	559	562	559	691	160	F14-B1	2986	250	205
	8"	660	663	660	830	216	F14-B1	5138	424	363
	10"	787	790	787	1041	312	F16-B1	7889	685	545
	12"	838	841	838	1235	340	F14-B3	11457	970	856
	14"	889	892	889	1293	370	F14-B3	13741	1280	1173
	16"	991	994	991	1450	425	F16-B3	18053	1848	1619
	18"	1092	1095	1092	1609	478	F16-B3	22585	2249	1897
	20"	1194	1200	1194	1732	505	F16-B3	26846	2953	2635
24"	1397	1407	1397	2071	617	F16-B3	40151	4478	3856	
Class 900	2"	368	371	368	458	69	F10-B1	290	73	57
	2 1/2"	419	422	419	511	75	F10-B1	4212	130	107
	3"	381	384	381	508	88	F10-B1	628	107	83
	4"	457	460	457	571	120	F14-B1	1086	170	137
	5"	559	562	559	667	152	F14-B1	1873	285	238
	6"	610	613	610	835	171	F14-B1	2745	350	272
	8"	737	740	737	837	210	F16-B1	4666	620	490
	10"	838	841	838	1081	275	F14-B3	7283	960	789
	12"	965	968	965	1182	318	F14-B3	10254	1367	990
	16"	1130	1140	1130	1505	426	F16-B3	16259	2545	2110
Class 1500	2"	368	371	368	458	69	F10-B1	290	73	57
	2 1/2"	419	422	419	511	75	F10-B1	421	130	107
	3"	470	473	470	592	88	F14-B1	628	170	124
	4"	546	549	546	650	117	F14-B1	1086	285	158
	6"	705	711	705	930	179	F14-B1	2392	690	426

(1) Weight without actuators

(2) Weight for butt welding ends

- Depending on the executions weights are subject to modification

4. FLANGED ENDS DESIGN & DIMENSIONS

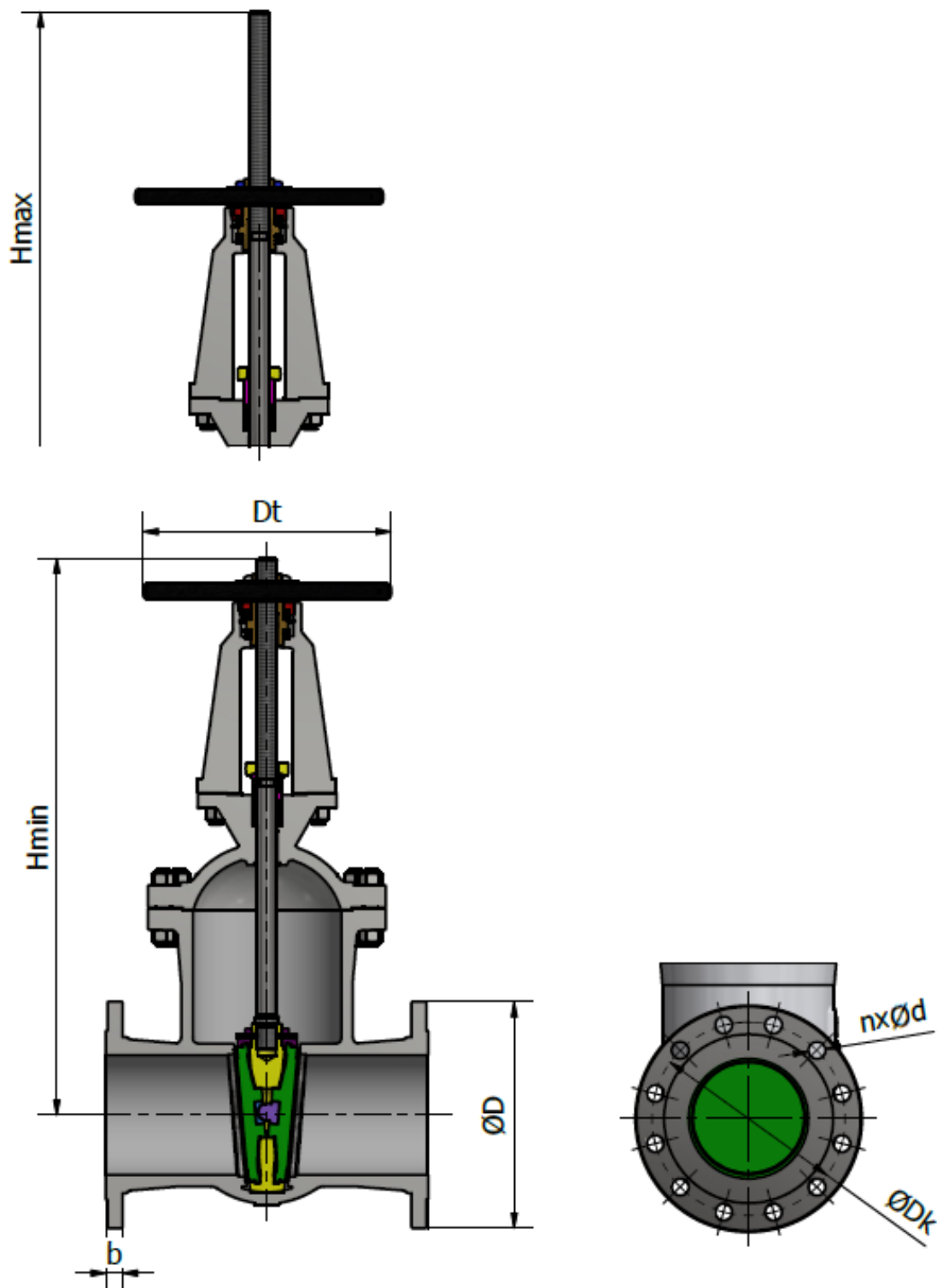


Figure D.2.3 – GAC with flanged ends - dimensions

Flanged ends dimensions

Table D.2.4

NPS		2"	2 1/2"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"	26"
Class 150																
mm	øD	152	178	190	229	254	279	343	406	483	533	597	635	693	813	870
	øDk	120,6	139,7	152,4	190,5	215,9	241,3	298,4	362,0	431,8	476,2	539,8	577,8	635,0	749,3	806,4
	nxød	4x19,0	4x19,0	4x19,0	8x19,0	8x22,2	8x22,2	8x22,2	12x25,4	12x25,4	12x28,6	16x28,6	16x31,8	20x31,8	20x34,9	24x34,9
	b (RF)	15,7	17,2	19,0	23,9	24,0	25,4	28,4	29,9	31,7	34,8	36,6	39,6	42,6	47,5	68,2
	b (RTJ)	20,5	22,0	23,8	28,7	28,8	30,2	33,2	34,7	36,5	39,6	41,4	44,4	47,5	52,3	79,4
	Hmax	429	492	534	669	769	851	1026	1267	1482	1584	1907	2104	2321	2873	3632
	Hmin	359	409	443	553	624	683	803	991	1150	1219	1481	1642	1795	2227	2932
	Dt	250	250	250	250	300	300	400	500	500	500	630	730	730	730	GB ⁽¹⁾
Class 300																
mm	øD	165	190	210	254	279	318	381	444	521	584	648	711	775	914	-
	øDk	127,0	149,4	168,1	200,2	235,0	269,7	330,2	387,4	450,8	514,4	571,5	628,6	685,8	812,8	-
	nxød	8x19,0	8x22,2	8x22,2	8x22,2	8x22,2	12x22,2	12x25,4	16x28,6	16x31,7	20x31,7	20x34,9	24x34,9	24x34,9	24x41,3	-
	b (RF)	22,1	25,4	28,4	31,7	34,8	36,6	41,1	47,5	50,8	53,8	57,1	60,2	63,5	69,8	-
	b (RTJ)	28,5	91,8	34,8	38,1	41,2	43,0	47,5	53,9	57,2	60,2	62,5	66,6	71,5	79,4	-
	Hmax	468	522	555	671	784	919	1130	1439	1623	1742	1889	2159	2901	3563	-
	Hmin	394	436	465	553	640	755	905	1128	1292	1372	1481	1684	2384	2942	-
	Dt	250	250	250	300	400	400	500	500	500	630	730	730	GB ⁽¹⁾	GB ⁽¹⁾	-
Class 600																
mm	øD	165	190	210	273	330	356	419	508	559	603	686	743	813	940	-
	øDk	127,0	149,4	168,1	215,9	266,7	292,1	349,2	431,8	489,0	527,0	603,2	654,0	723,9	838,2	-
	nxød	8x19,0	8x22,2	8x22,2	8x25,4	8x28,6	12x28,6	12x31,7	16x34,9	20x34,9	20x38,1	20x41,3	20x44,4	24x44,4	24x50,8	-
	b (RF)	31,8	34,8	38,2	44,5	50,8	54,2	52,0	69,9	72,9	76,2	82,6	89,0	15,3	108,0	-
	b (RTJ)	33,3	36,3	39,7	46,0	52,3	55,7	63,5	71,4	74,4	77,7	84,1	90,5	98,4	112,7	-
	Hmax	468	521	569	671	784	925	1129	1460	1647	2225	2516	2828	3034	3549	-
	Hmin	394	436	475	551	640	765	913	1148	1307	1855	2091	2350	2529	2932	-
	Dt	250	250	250	300	400	500	500	630	730	GB ⁽¹⁾	GB ⁽¹⁾	GB ⁽¹⁾	GB ⁽¹⁾	GB ⁽¹⁾	-
Class 900																
mm	øD	216	244	241	292	349	381	470	546	610	-	705	-	-	-	-
	øDk	165,1	190,5	190,5	235,0	279,4	317,5	393,7	469,9	533,4	-	616,0	-	-	-	-
	nxød	8x25,4	8x28,6	8x25,4	8x31,7	8x34,9	12x31,7	12x38,1	16x38,1	20x38,1	-	20x44,4	-	-	-	-
	b (RF)	44,5	47,5	44,5	50,9	57,2	62,0	69,9	76,2	85,6	-	95,3	-	-	-	-
	b (RTJ)	46,0	49,0	46,0	52,4	58,7	63,5	71,4	77,7	87,1	-	100,0	-	-	-	-
	Hmax	535	651	596	736	925	956	1158	1492	1626	-	2117	-	-	-	-
	Hmin	466	576	508	616	773	785	948	1217	1308	-	1691	-	-	-	-
	Dt	300	400	400	400	500	500	630	GB ⁽¹⁾	GB ⁽¹⁾	-	GB ⁽¹⁾	-	-	-	-
Class 1500																
mm	øD	216	244	267	311	-	394	-	-	-	-	-	-	-	-	-
	øDk	165,1	190,5	203,2	241,3	-	317,5	-	-	-	-	-	-	-	-	-
	nxød	8x25,4	8x28,6	8x31,7	8x34,9	-	12x38,1	-	-	-	-	-	-	-	-	-
	b (RF)	44,5	47,5	54,2	60,2	-	89,0	-	-	-	-	-	-	-	-	-
	b (RTJ)	46,0	49,0	55,7	61,7	-	92,1	-	-	-	-	-	-	-	-	-
	Hmax	535	651	701	843	-	1210	-	-	-	-	-	-	-	-	-
	Hmin	466	576	613	726	-	1031	-	-	-	-	-	-	-	-	-
	Dt	300	400	400	500	-	630	-	-	-	-	-	-	-	-	-

⁽¹⁾ with Gearbox

5. BUTT WELDING ENDS DESIGN

Symbols

Table D.2.5

A	- outside diameter of the Valve butt welding end in mm
B	- outside diameter of the Pipe butt welding end in mm
T	- wall thickness of the pipe in mm

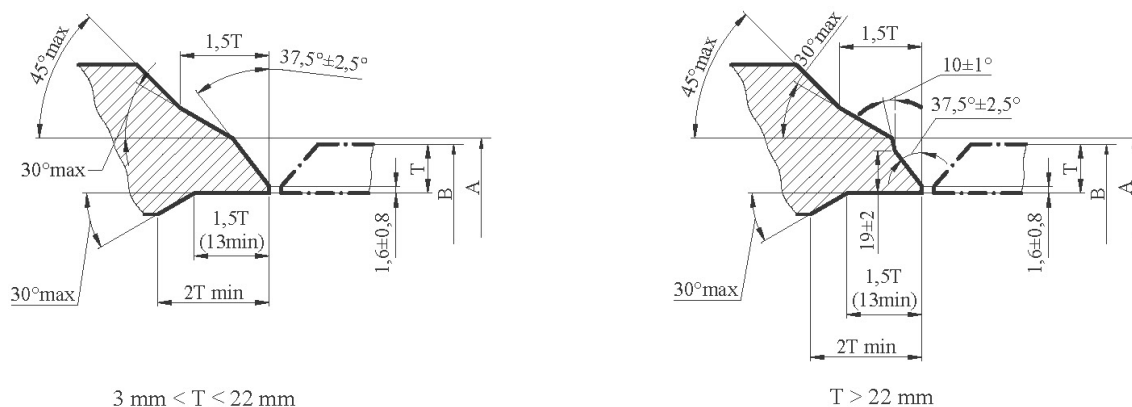


Figure D.2.4 - Form of the butt welding ends ASME B16.25

Dimensions of outside diameter and wall thickness

Table D.2.6

NPS	B	A	T											
			Sch. 20	Sch. 30	Sch. Std	Sch. 40	Sch. 60	Sch. XS	Sch. 80	Sch. 100	Sch. 120	Sch. 140	Sch. 160	Sch. XXS
2"	60,3	---	---	3,18	3,91	3,91	---	5,54	5,53	---	---	---	8,74	11,07
2 1/2"	73,0	75	---	4,78	5,16	5,16	---	7,01	7,01	---	---	---	9,53	14,02
3"	88,9	91	---	4,78	5,49	5,49	---	7,62	7,62	---	---	---	11,13	15,24
4"	114,3	117	---	4,78	6,02	6,02	---	8,56	8,55	---	11,13	---	13,49	17,12
5"	141,3	144	---	---	6,55	6,55	---	9,52	9,52	---	12,7	---	15,88	19,05
6"	168,3	172	---	---	7,11	7,11	---	10,97	10,97	---	14,27	---	18,26	21,95
8"	219,1	223	6,35	7,04	8,18	8,18	10,31	12,70	12,7	15,09	18,26	20,62	23,01	22,22
10"	273,0	278	6,35	7,8	9,27	9,27	12,7	12,70	15,08	18,26	21,44	25,4	28,58	25,40
12"	323,8	329	6,35	8,38	9,52	10,31	14,27	12,70	17,47	21,44	25,4	28,57	33,32	---
14"	355,6	362	7,92	9,52	9,52	11,12	15,08	12,70	19,05	23,83	27,76	31,75	35,71	---
16"	406,4	413	7,92	9,52	9,52	12,7	16,66	12,70	21,43	26,19	30,94	36,52	40,46	---
18"	457,2	464	7,92	11,13	9,52	14,27	19,05	12,7	23,82	29,36	34,92	39,67	45,24	---
20"	508,0	516	9,52	12,7	9,52	15,08	20,62	12,7	26,18	32,54	38,1	44,45	49,99	---
24"	609,6	619	9,52	14,27	9,52	17,47	24,61	12,7	30,96	38,89	46,02	52,37	59,51	---
26"	660,45	670	12,7	---	9,53	---	---	---	---	---	---	---	---	---

6. WEDGE DESIGNS

6.1 Flexible wedge

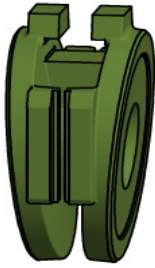


Figure D.2.5 - Flexible wedge

The flexible wedge can bend and better conform to the valve seats, ensuring reliable sealing even under temperature and pressure fluctuations.

This design reduces the risk of sticking and wear, extending the valve's service life and making maintenance easier.

6.2 Split wedge

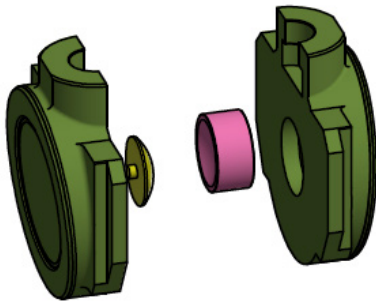


Figure D.2.6 - Split wedge

The split wedge allows each half of the gate to adjust independently to the valve seats, improving sealing even when the surfaces are misaligned or worn.

It also reduces friction and stress during valve operation, extending its service life and increasing reliability.

6.3 Solid wedge



Figure D.2.7 - Solid wedge

This type of wedge is suitable for small DN.

This type of wedge is not suitable for high pressure and temperature.

If the gate valve is closed while hot, the wedge can become stuck.

6.4 Parallel Slides Wedge

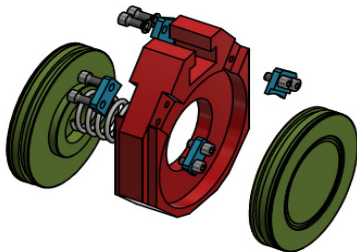


Figure D.2.8 - Parallel slide wedge

This type of valve is designed with two parallel discs, each sliding over its own seat.

It relies on upstream pressure to act on the downstream disc, ensuring a good seal.

There is no wedging or additional load on the seats, which allows for a smaller actuator torque. However, a drawback is the wear on the seat caused by the sliding disc during operation.

7. OPTIONAL EXECUTIONS

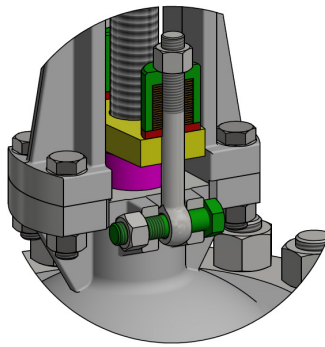
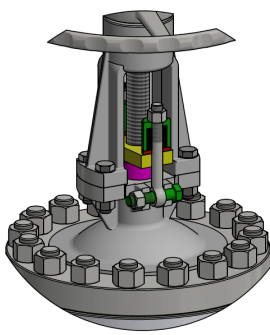


Figure D.2.9 –
Spring loaded stuffing box

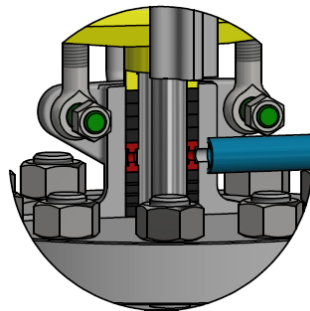
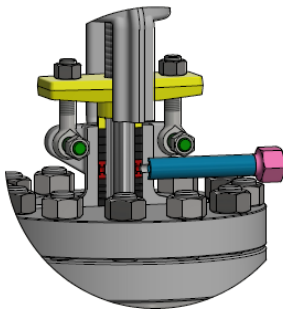


Figure D.2.10 - Lantern ring

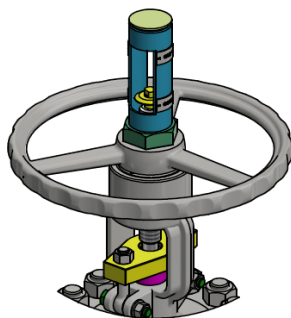


Figure D.2.11 – Position indicator

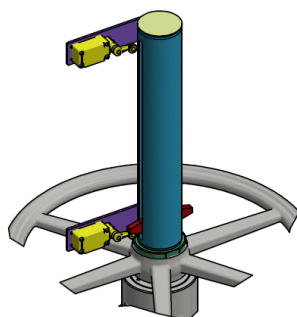


Figure D.2.12 – Limit switches

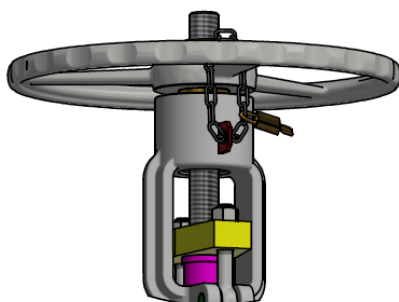


Figure D.2.13 - Locking devices

8. OVER PRESSURIZATION, PRESSURE LOCKING & THERMAL BINDING PROCESS CONDITIONS

In case when GAC in the closed position the temperature of the fluid (mainly water) increase in the chamber above the wedge impermissibly high pressure can occur.

To prevent failure or damage of pressure-relating parts gate valves should be equipped with some of the presented constructive solutions:

8.1 Solutions for Over-Pressurization & Pressure Locking

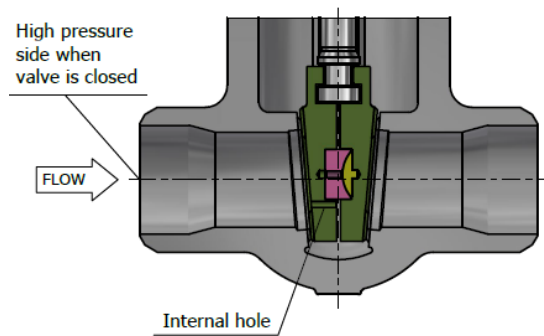


Figure D.2.14 - With a hole in the wedge

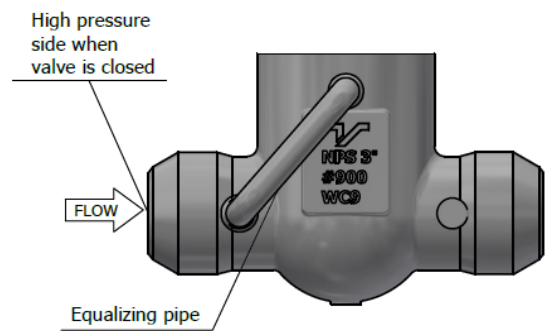


Figure D.2.15 - With equalizing pipe

- **One side wedge hole** connecting the body cavity to the high-pressure side of the valve.
- **Equalizing pipe** connecting the body cavity to the high-pressure side of the valve.

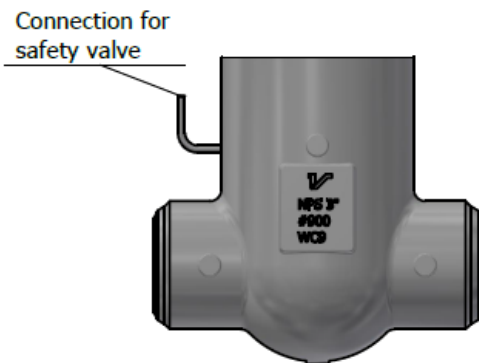


Figure D.2.16 - With closed nozzle for safety valve

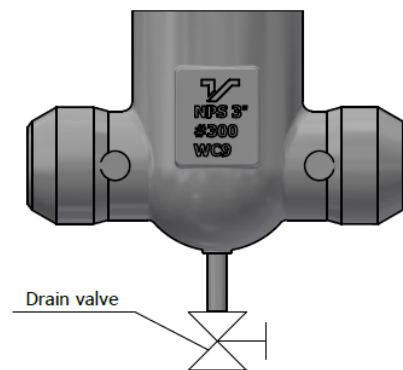


Figure D.2.17 - With drain valve

- **With closed nozzle for safety valve.**
Safety valve connecting the body cavity to the atmosphere.
The discharge of this valve must be made to a safe location (safety valve is not scope of delivery).
- **With a drain valve** connecting the body cavity to the atmosphere.
The discharge of this valve must be made to a safe location.

8.2 Solutions for Thermal Biding

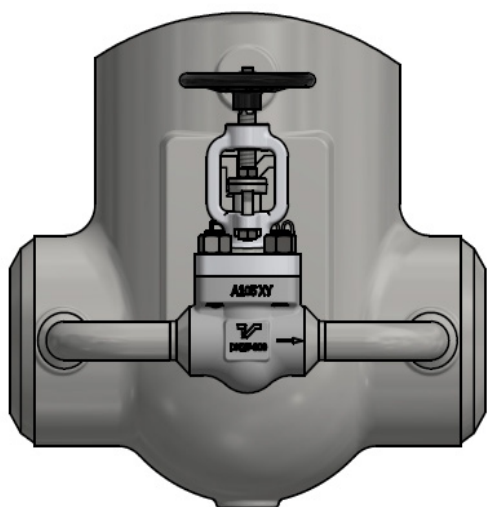


Figure D.2.18 – With By-pass valve

- **By-pass valve** in addition to equalizing pressure differential across the wedge, will allow warm up of both sides of the wedge.
- After reaching the operating parameters By-pass valve on opened GAC, should be closed.
- After closing a GAC, back up the stem (1/8 turn). This will give room for dimensional changes due to temperature variation. This is only applicable for manually operated valves or on electric actuator- operated valves (by handwheel).
- Adequate supports can reduce the thermal binding problem by reducing pipe stresses
- Parallel slide GAC is not subjected to thermal binding. If parallel slide GAC is selected as a possible solution for thermal binding, it is very important to know that such a valve: subject to pressure lock, higher seat wear and poor sealing under low pressure.

8.3 Combined Effects of Over-Pressurization, Pressure Locking & Thermal Binding

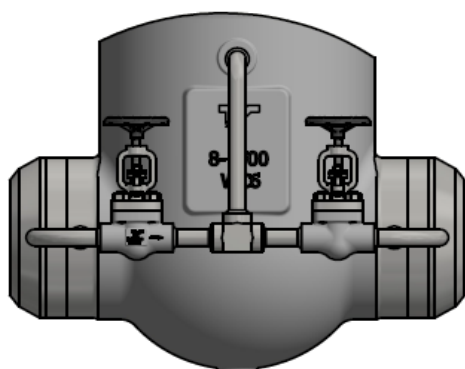


Figure D.2.19 – With double by-pass & equalizing pipe

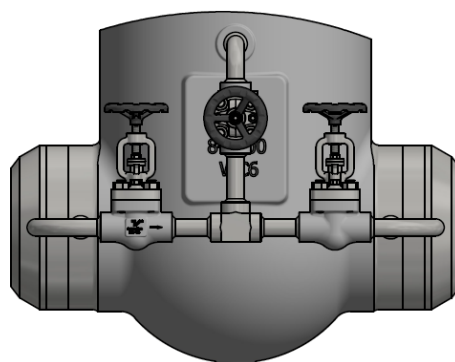


Figure D.2.20 – With double by-pass & equalizing pipe with a valve

- After reaching the operating parameters By-pass valves on the pressurized side of closed GAC should be in open position. When GAC is opened By-pass valves should be closed.

8.4 By-pass Valve Size Selection

When by-pass valves are required, they shall be in accordance with Table D.2.7

Table D.2.7

Valve nominal size	By-pass nominal size
NPS	NPS
2" ≤ 4"	1/2"
5" ≤ 8"	3/4"
8" ≤ 26"	1"

9. PRESSURE & TEMPERATURE RATINGS

Pressure (bar) / Temperature (°C) ratings according to ASME B16.34

Table D.2.8

Materials	Class	-29÷38	50	100	150	200	250	300	325	345	375	400	425	450	475	500	538	550	595	600
WCB	150	19,6	19,2	17,7	15,8	13,8	12,1	10,2	8,6	8,4	7,4	6,5	5,5							
	300	51,1	50,1	46,6	45,1	43,8	41,9	39,8	37,8	37,6	36,4	34,7	28,8							
	600	102,1	100,3	93,2	90,1	87,6	83,9	79,6	75,6	75,1	72,7	69,4	57,5							
	900	153,2	150,4	139,8	135,2	131,4	125,8	119,5	113,4	112,7	109,1	104,2	86,3							
	1500	255,3	250,6	233,0	225,4	219,0	209,7	199,1	189,0	187,8	181,8	173,6	143,8							
LCB	150	19,8	19,5	17,7	15,8	13,8	12,1	10,2	9,3	8,6										
	300	51,7	51,7	51,5	50,2	48,6	46,3	42,8	41,3	40,3										
	600	103,4	103,4	103,1	100,3	97,3	92,6	85,7	82,6	80,6										
	900	155,1	155,1	154,6	150,5	145,9	139,0	128,5	123,9	120,8										
	1500	258,6	258,6	257,7	250,9	243,2	231,6	214,2	206,5	201,4										
WC6	150	19,8	19,5	17,7	15,8	13,8	12,1	10,2	9,3	8,6	8,4	7,4	6,5	5,5	4,6	3,7	2,8	1,4 ⁽¹⁾	1,4 ⁽¹⁾	1,4 ⁽¹⁾
	300	51,7	51,7	51,5	49,7	48,0	46,3	42,8	41,3	40,4	40,2	38,8	36,6	35,0	33,8	31,7	25,7	14,9	12,7	6,6
	600	103,4	103,4	103,0	99,5	95,9	92,6	85,7	82,6	80,9	80,4	77,6	73,1	70,0	67,6	63,3	51,5	29,8	25,4	13,3
	900	155,1	155,1	154,4	149,2	143,9	139,0	128,5	123,9	121,3	120,7	116,4	109,7	104,9	101,4	95,0	77,2	44,7	38,1	19,9
	1500	258,6	258,6	257,4	248,7	239,8	231,6	214,2	206,5	202,2	201,1	193,9	182,8	174,9	169,0	158,3	128,6	74,5	63,5	33,2
WC9	150	19,8	19,5	17,7	15,8	13,8	12,1	10,2	9,3	8,6	7,4	6,5	5,5	4,6	3,7	2,8	1,4	1,4 ⁽¹⁾	1,4 ⁽¹⁾	1,4 ⁽¹⁾
	300	51,78	51,7	51,5	50,2	48,7	46,3	42,8	41,3	40,4	38,8	36,6	35,0	33,8	31,7	28,2	18,4	15,6	7,6	6,9
	600	103,4	103,4	103,1	100,4	97,3	92,6	85,7	82,6	80,9	77,6	73,1	70,0	67,6	63,3	56,4	36,9	31,3	15,2	13,8
	900	155,1	155,1	154,6	150,6	146,0	139,0	128,5	123,9	121,3	116,4	109,7	104,9	101,4	95,0	84,6	55,3	46,9	22,8	20,7
	1500	258,6	258,6	257,7	250,9	243,3	231,6	214,2	206,5	202,2	193,9	182,8	174,9	169,0	158,3	141,0	92,2	78,2	38,1	34,4
C12A	150	20,0	19,5	17,7	15,8	13,8	12,1	10,2	9,3	8,6	7,4	6,5	5,5	4,6	3,7	2,8	1,4	1,4 ⁽¹⁾	1,4 ⁽¹⁾	1,4 ⁽¹⁾
	300	51,7	51,7	51,5	50,2	48,7	46,3	42,8	41,3	40,4	38,8	36,6	35,0	33,8	31,7	28,2	25,1	24,9	19,9	19,5
	600	103,4	103,4	103,1	100,4	97,3	92,6	85,7	82,6	80,9	77,6	73,1	70,0	67,6	63,3	56,4	50,1	49,9	39,7	39,0
	900	155,1	155,1	154,6	150,6	146,0	139,0	128,5	123,9	121,3	116,4	109,7	104,9	101,4	95,0	84,6	75,2	74,8	59,6	58,5
	1500	258,6	258,6	257,7	250,9	243,3	231,6	214,2	206,5	202,2	193,9	182,8	174,9	169,0	158,3	141,0	125,3	124,7	99,3	97,5
CF8	150	19,0	18,3	15,7	14,2	13,2	12,1	10,2	9,3	8,6	7,4	6,5	5,5	4,6	3,7	2,8	1,4	1,4 ⁽¹⁾	1,4 ⁽¹⁾	1,4 ⁽¹⁾
	300	49,6	47,8	40,9	37,0	34,5	32,5	30,9	30,2	29,7	29,0	28,4	28,0	27,4	26,9	26,5	24,4	23,6	17,7	16,9
	600	99,3	95,6	81,7	74,0	69,0	65,0	61,8	60,4	59,5	58,1	56,9	56,0	54,8	53,9	53,0	48,9	47,1	35,3	33,8
	900	148,9	143,5	122,6	111,0	103,4	97,5	92,7	90,7	89,2	87,1	85,3	84,0	82,2	80,8	79,5	73,3	70,7	53,0	50,6
	1500	248,2	239,1	204,3	185,0	172,4	162,4	154,6	151,1	148,7	145,2	142,2	140,0	137,0	134,7	132,4	122,1	117,8	88,4	84,4
CF8M	150	19,0	18,4	16,2	14,8	13,7	12,1	10,2	9,3	8,6	7,4	6,5	5,5	4,6	3,7	2,8	1,4	1,4 ⁽¹⁾	1,4 ⁽¹⁾	1,4 ⁽¹⁾
	300	49,6	48,1	42,2	38,5	35,7	33,4	31,6	30,9	30,4	29,9	29,4	29,1	28,8	28,7	28,2	25,1	24,9	20,7	19,9
	600	99,3	96,2	84,4	77,0	71,3	66,7	63,2	61,8	60,9	59,8	58,9	58,3	57,7	57,3	56,4	50,1	49,9	41,4	39,8
	900	148,9	144,3	126,6	115,5	107,0	100,1	94,9	92,7	91,3	89,6	88,3	87,4	86,5	86,0	84,6	75,2	74,8	62,1	59,7
	1500	248,2	240,6	211,0	192,5	178,3	166,9	158,1	154,4	152,2	149,4	147,2	145,7	144,2	143,4	141,0	125,3	124,7	103,6	99,5

Note: Presented values belong to Standard Rating. For Special class contact Tervovent SC.

(1) For welding-end valves only. Class 150 flanged end valves terminate at 538°C.

10. MARKING & LABELING

Gate valve shall be marked in accordance with general design specification and the requirements of standard API 600, ASME B16.34 or ANSI/MSS SP-25-2018.

10.1 Marking

General marking of the valve

Table D.2.9

Item ^a	Subject Class designed valves		Marking
1	Product identification	Type	GAC
		Serial number	xxxx.xx.xx/xx
2	Nominal size		NPS xxx
3	Class designation		Class xxx
4	Body Material		xxx
5	Cast (heat) identification		xxx
6	Allowable flow direction arrow		
7	Manufacturer's name and registered trade details		Termovent SC Serbia
8	Ring joint number		-
9	Maximum allowable temperature, T_{Smax}		xx °C or xx C
	Minimum allowable temperature, T_{Smin}		xx °C or xx C
10	Maximum allowable pressure PS		xx bar
11	Trim identification		xxx
12	Month / year of manufacturing		mm/yy

^a Other (additional) markings may be requested by the user or recommended by the manufacturer.

10.1.1 Additional Marking

Equipment that meets specific requirements for safety and operation in potentially explosive atmospheres should be marked with an additional mark as follows:



The valves satisfy the requirements of API Standard 600.



The valves satisfy the safety requirements of Annex I of the European Pressure Equipment Directive 2014/68/EU (PED) for fluids in Groups 1 and 2.



The valves do not have a potential internal source of ignition and can be used in potentially explosive atmospheres, Group II, category 2 (zones 1+21) and category 3 (zone 2+22) to ATEX 2014/34/EU.

10.2 Labeling

Valve information can be found on the valve body, and the typical valve nameplate is shown on Figure D.2.21.

 Additional marking	TYPE		DN/NPS		PN/Class	
	Body		PS/TS			
	Trim					
	S/N No.		Date			

TYPE	Type of valve
DN / NPS	Nominal valve size
Rating designation	Pressure Class
Body	Material
PS / TS	Pressure-temperature rating
Trim Identification	Material of stem and sealing faces
S / N No.	Serial Number
Date	Date of manufacture
Additional marking	As per 10.1.1

Figure D.2.21

11. SURFACE PROTECTION *

The supplied valves are already protected against corrosion with a manufacturer-standard paint system. The protective paint system meets the requirements of ISO 12944 for corrosion category C3-M.

** Note: At the customer's request, a special surface protection and color different from the standard can be applied.*

12. PACKAGING

Termovent SC products are packed in standard boxes to ensure safe transport by truck to their destination. The standard packaging includes boxes made of OSB-3 panels fixed on a heat-treated wooden pallet and further protected by outer nylon foil.

It's important to note that standard crates are not stackable.

However, upon request, the packaging can be customized to meet specific customer requirements, such as stackable or sea-worthy packaging.

II INSTRUCTIONS for INSTALLATION, OPERATION & MAINTENANCE

13. INSTRUCTIONS for INSTALLATION, OPERATION & MAINTENANCE

13.1 General safety information

- Instructions for installation, start-up and maintenance during the period of exploitation of valves manufactured by TERMOVENT SC should be used as a manual intended for all personnel directly or indirectly involved in dealing with the products.
- Operators in charge of installation, operation and maintenance of GAC during the period of use should be fully trained for the correct/optimal performance of these tasks. If GAC is equipped with mechanical actuators, the operator should be trained for the adequate operation of such valves.
- Information about temperatures and allowable working pressures are shown in Table D.2.8 according to ASME B16.34. Under no circumstances should the valves be operated under conditions outside these tables.
- Before the service or reinstallation of the GAC, the plant or installation should be taken out of operation (zero pressure, temperature of valves should be the same temperature as the environment).
- Because valves in working conditions have hot parts (handwheel, body and bonnet) and may cause burns, the operator is required to undertake all necessary precautions to avoid this by using protective equipment.
- These products are recyclable. No ecological hazard is anticipated with the disposal of these products providing due care is taken.

13.2 Storage & Handling

GAC are delivered in their wedge in the closed position with protective covers on their ends. During the storage period, protective covers shall not be removed.

13.2.1 Recommended storage conditions

- Storage conditions shall be: ambient temperature between +10°C and +35°C and the humidity is up to 85%
- The valves must be stored in closed, clean, dry and ventilated storage facilities.
- Do not store the valves outside.
- Store the valves in their original shipped packaging.
- Protect the valve from contact with solvents, lubricants, fuels or other chemicals.
- Store the valve in vibration-free conditions.
- Valve should be taken out of crates or removed from the covering of a pallet just before installation.
- Spare parts such as soft sealing elements, plastic or lubricants should be stored in a dry place at room temperature protected from light.

13.2.2 Storage inspection

- Periodical inspection should be performed on all stored valves. At the minimum, all valves should be inspected every 3-4 months for dirt, moisture or any other type of contamination. If any of this is found the valves are to be thoroughly cleaned and dried.
- Slight external rusting may occur on valves. This will not affect their performance.
- If valves are stored for more than 6 months we recommend the following:
 - ➔ Valves should be cycled open to close 2-3 times every 6 months to keep packing from adhering to the stem and help lubricate the stem and stem nut.
 - ➔ Preservation of inner surfaces, inner parts, stem, flange facing, butt welding ends and threads shall be repeated every 6 months with appropriate corrosion preventive coating

13.2.3 Handling requirements

- For valve handling and/or lifting the lifting equipment must be sized and selected while taking into consideration the valve weight indicated on the packing list.
- Do not use the lifting points located on the actuator (Figure D.2.22).
- Do not lift GAC via the handwheel (Figure D.2.23).
- If possible, lift GAC via the lifting lugs or yoke (Figure D.2.24 or Figure D.2.25).
- Caution must be taken during the handling to avoid that this equipment passing over the workers' heads.
- For valve handling or lifting, the lifting equipment must be sized and selected while taking or over any other place where a possible fall could cause damage.

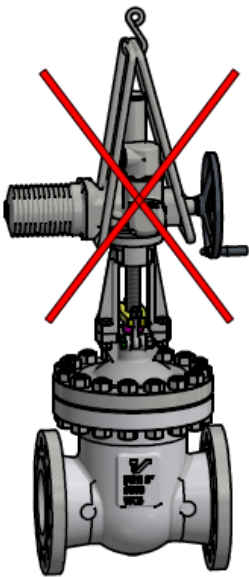


Figure – D.2.22

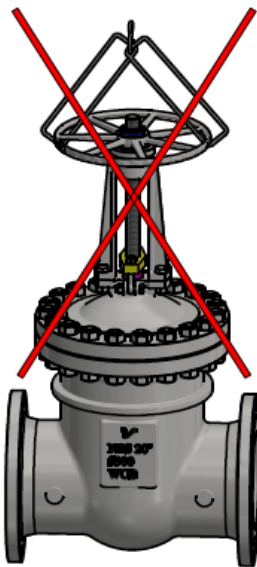


Figure – D.2.23

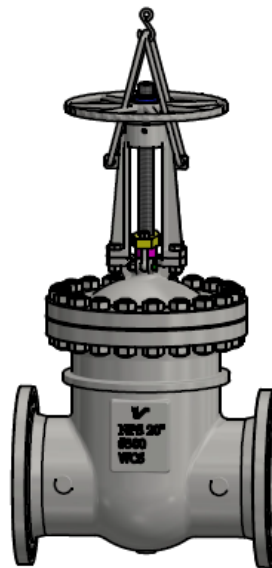


Figure – D.2.24

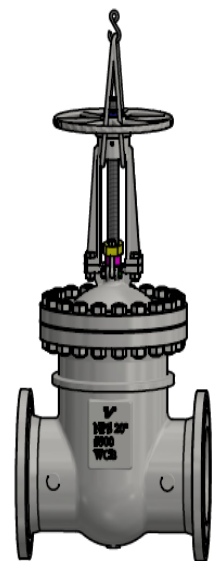


Figure – D.2.25



WARNING!!!

- ➔ Lifting and handling must be performed by qualified personnel only.
 - ➔ You must not remove the protection covers from the valve connection ends.
 - ➔ Store the valves in the 'closed' position.
 - ➔ You must not lift the valves using the connection flange holes, handwheel or actuators.
-

13.3 Installation & Start-up

- GAC are delivered with their wedge in the closed position, and they are ready for use. After the removal of the protection covers it is necessary to thoroughly clean inside the valve with compressed air without first opening the valve.
- Do not disassemble or modify a valve in any way prior to installation. This will void the factory warranty if it occurs.
- Closure of the valve is performed by turning the handwheel in a CW (clockwise) direction. On the handwheel there is an arrow and the letter "C" indicating the closing direction, and another arrow and the letter "O" indicating the opening direction.
- When installing valves with flanged ends it is necessary to take into consideration the selection of adequate bolt material and the appropriate type of gasket depending on the type of working fluid, pressure, temperature, and the type of flange facing. It is necessary to install gaskets strictly in accordance with instructions given by the manufacturer of the gaskets.
- GAC with flanged ends shall be installed in a slightly open to fully open position.
- GAC with welding ends up to NPS 4" should be welded on the pipeline in the CLOSED position.
- GAC with welding ends over NPS 4" shall be welded on pipeline in OPEN position.
- Welding must be performed by an expert and with appropriate WPS.
- After welding, if necessary, local normalization should be performed and the inside of the pipeline should be cleaned to remove possible welding remains.
- At the moment of installation, the influence of pipeline load on the valve should be reduced. The same also applies to temperature oscillation, hydraulic impact and similar. The valve should not be used as a support for a pipeline.
- When installing the GAC equipped with an overpressure safety device (described in Section 8) you must take into consideration the permitted flow direction. Allowed flow direction is defined by the arrow located on the GAC body.
- Manually operated gate valves should be relieved of maximum seating force when the gate valve wedge is closed. Relieving of the force shall be provided by moving the handwheel CCW (counterclockwise) to the open position by ¼ of a turn. Regarding this action, contact between the stem and wedge will be disengaged. The action described will prevent damage to the seating surfaces caused by excessive thermal stem expansion.
- We recommend installation of GAC with stem in vertical position. GAC could be installed with the stem in a horizontal position but for vertical pipelines. We do not recommend the installation of GAC over NPS 6" with a horizontal stem on the horizontal pipelines.
- After the installation, start-up and operating parameters are set, it is possible to detect a leakage on the stem packing. In this case, it is necessary to tighten the gland nuts equally. The tightness should not go beyond more than necessary to allow comfortable manipulation of GAC (opening/closing).
- Recommendation: GAC should be installed with a minimum of 5x nominal diameter of straight pipeline in front of and behind the GAC.



WARNING!!!

-
- ➔ Do not disassemble or modify a valve in any way prior to installation. This will void the factory warranty if it occurs.
 - ➔ Before installation, the impurities should be removed from the pipeline or from the appliance.
 - ➔ Remove protecting covers from the valve ends, degrease and clean the inside of the valve, and in case of a flanged connection, carefully clean the sealing surfaces.
 - ➔ During the installation, check if there is enough space for normal and safe manipulation.
 - ➔ Installation of valves with an overpressure safety device (Section 8 - with a hole in the wedge and with equalizing pipe) must be in accordance with the allowed flow direction.
 - ➔ The valve should not be used as support for a pipeline.
-

13.4 Usage & Maintenance

- The gate-stem packing should be the subject of particular attention as it is important for the qualitative maintenance of tightness and shall be checked every 3 months. If leakage at the stem packing is detected, the gland nuts should be tightened slowly (Figure D.2.26). Torque for tightness gland nuts shown in Table D.2.10. When gland nuts are tightened, if the gland falls down more than twice the packing ring height, new packing rings should be added to the stem packing.

Table D.2.10

	M10	M12	M14	M16	M18	M20	M24	M27	M30	M33	M36
Torque /Nm/	15÷40	26÷65	42÷100	64÷150	100÷175	125÷300	210÷500	305÷730	410÷1000	550÷1350	710÷1720

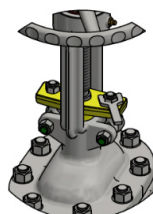


Figure D.2.26 – Stem packing gland tightening

- Stem packing must be replaced, depending on the working conditions and maintenance level, during packing replacement, special care must be taken to remove all old packing from the packing chamber. The preparation of new packing rings is shown in Figure D.2.27. Packing rings replacement is shown in Figure D.2.28 with a general note that every next packing ring must be rotated relative to the previous one (not less than 90°).



Figure D.2.27 – Stem packing ring



Figure D.2.28

- Lubrication of thread between stem (Pos.8 – Figure D.2.1) / stem nut (Pos.9 – Figure D.2.1) is highly important. To lubricate the bearings (Pos.24 – Figure D.2.1) on manual, gearbox or electric-operated valves, we suggest using quality-level grease, as shown in the following Table D.2.11. Lubrication shall be performed every month, or twice a year if they are rarely used. Valves used in high-temperature applications, use appropriate lubricants to support the temperature range. Lubrication is performed with lubrication nipples (Pos.25 – Figure D.2.1) on the yoke or bonnet (Pos.4 and Pos.3 – Figure D.2.1).
- It is recommended to replace the grease in bushes during every general overhaul or during the pipeline revision. The type of grease depends on the temperature in the plant. Remote controls, bushings and gearboxes should be lubricated depending on how frequently they are used, every 3 months. For the lubrication of the actuator (Pos.27 – Figure D.2.1) and (Pos.28 – Figure D.2.1) it is necessary to remove the protective tube (Pos.29 – Figure D.2.1) then grease the stem (Pos.8 – Figure D.2.1) and return the protective tube. Some of the lubricants we use for lubrication are in the Table D.2.11

Table D.2.11

Manufacturer	Quality level
AGIP, SHELL, MOBIL, TOTAL	ISO 6743-9: L-X CCHA 2 / DIN 51 502: K 2K-30

- GAC delivered with an actuator is adjusted for proper work. GAC delivered with connection for later build on it the electric actuator must be adjusted. The closing of GAC should be adjusted by the torque switch and the opening by the limit switch. The torque and limit switch settings must be in accordance with the instructions from “TERMOVENT SC”.



WARNING!!!

- ➔ During usage, GAC must be completely in an open or closed position.
- ➔ Valve opening and closing by handwheel should be done without the use of auxiliary means such as a rod or similar.
- ➔ GAC cannot be used for flow control.
- ➔ A Strainer being installed before the valve will increase its reliability and proper working.

13.5 Service & Repair

- Only authorized persons should perform service and repair with appropriate tools and, if possible, use original spare parts. Personal protection should be applied in accordance with valid regulations and legalizations.
- Using the wrong or defective spare parts may pose a hazard for personnel, or result in damage, malfunctions or even total failure.
- For GAC standard spare parts are Stem packing and Bonnet gasket.
- Contact “TERMOVENT SC” if You need other spare parts like a Stem, Wedge, Stem nut, etc.
- Every GAC serviced or repaired should be subject to all necessary tests usually performed for a newly produced valve.
- Bolts for connection between body and bonnet should be tightened evenly and crosswise applying appropriate torque when the valve is in the open position.
- Possible torques for tightening are listed in Table D.2.12 and the selection of torque depends on the material grade of bolts and nuts used, as well as the quality of the gasket of the bonnet.

Table D.2.12

Bolt diameter	Bolt materials			
	B7	B16	B8	B8M
	Torque [Nm]			
M10	51	51	15	46
M12	89	89	25	81
M14	143	143	41	129
M16	223	224	64	203
M18	305	307	87	278
M20	436	439	124	396
M22	600	605	171	546
M24	755	760	215	687
M27	1116	1123	318	1015
M30	1507	1517	429	1371
M33	2066	2080	588	1880
M36	2644	2663	753	2405
M39	3446	3470	981	3135
M42	4247	4277	1209	3864

- For high temperature and high-pressure applications after 24 hours of operation, all nuts shall be re-tightened diametrically opposite to design stress Figure D.2.29. This action compensates for any relaxation or creep. Periodic inspection is recommended, thereafter.

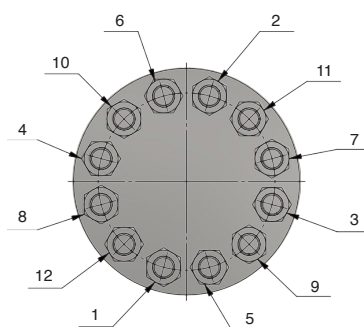


Figure D.2.29 - Recommended re-tighten order



WARNING!!!

- ➔ Before the service or reinstallation of the valves, the plant or installation should be taken out of operation (pressure 0 bar, temperature of valves should be the same temperature as the environment).
- ➔ Manipulation with body gasket and stem packing should be with high precautions because they could contain stainless steel wire which can cause severe injuries.

13.5.1 Stem packing rings replacement

Only authorized persons should perform service and repair with appropriate tools and, if possible, using original spare parts. Personal protection should be applied in accordance with valid regulations and legalizations.

Requirements before disassembling:

- ➔ The plant or installation should be taken out of operation (pressure 0 bar, temperature of valves should be the same temperature as the environment).
- ➔ GAC must be completely opened.

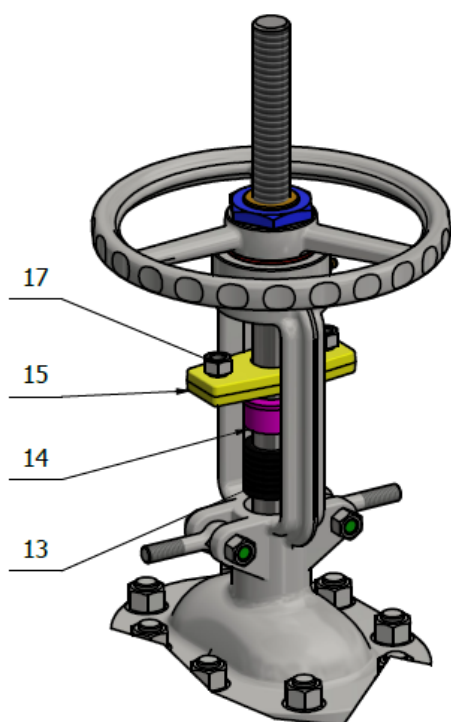


Figure D.2.30 –Stem packing rings replacement

Disassembling

- Step 1** › Unscrew gland nuts (Pos.17)
- Step 2** › Lift upwards gland flange (Pos.15)
- Step 3** › Lift upwards packing gland (Pos.14)
- Step 4** › Take out stem packing rings (Pos.13). All stem packing rings shall be removed (Pos.13)
- Step 5** › The packing chamber shall be cleaned.

Assembling

- Step 1** › The packing chamber shall be filled with new stem packing rings (Pos.13)
- Step 2** › Put down packing gland (Pos.14)
- Step 3** › Put down gland flange (Pos.15)
- Step 4** › Put back and tighten gland nuts (Pos.17)
- Step 5** › Tighten gland nuts (Pos.17) according to Table D.2.10

13.5.2 Bonnet gasket replacement

Only authorized persons should perform service and repair with appropriate tools and, if possible, use original spare parts. Personal protection should be applied in accordance with valid regulations and legalizations.

Requirements before disassembling:

- ➔ The plant or installation should be taken out of operation (pressure 0 bar, temperature of valves should be the same temperature as the environment).
- ➔ GAC must be opened.

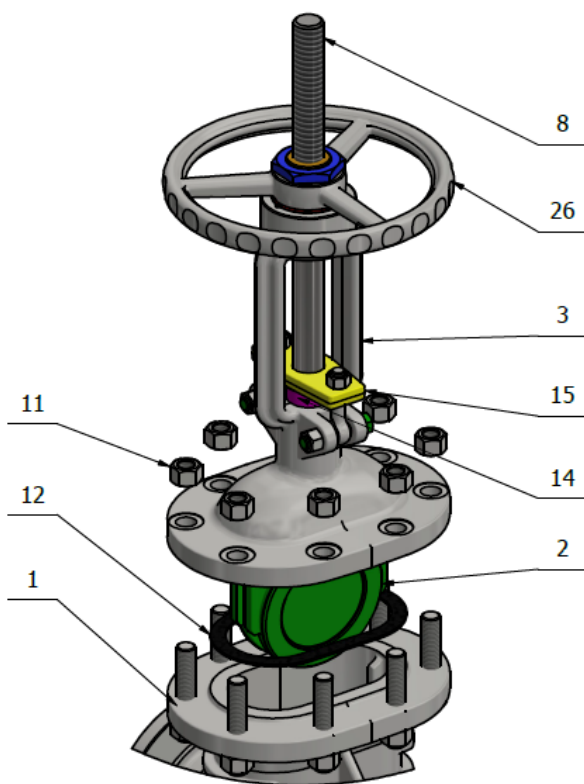


Figure D.2.31 – Bonnet gasket replacement

Disassembling

- Step 1** › Unscrew nuts (Pos.11)
- Step 2** › Lift upwards bonnet (Pos.3) together with following parts from the body (Pos.1)
 - › Stem (Pos.8)
 - › Handwheel (Pos.26)
 - › Gland flange (Pos.15)
 - › Packing gland (Pos.14)
 - › Wedge (Pos.2)
- Step 3** › Remove old bonnet gasket (Pos.12)
- Step 4** › The chamber for bonnet gasket shall be cleaned.

Assembling

- Step 1** › The chamber for bonnet gasket shall be filled with new bonnet gasket (Pos.12)
- Step 2** › Put down bonnet (Pos.3) to the body (Pos.1)
- Step 3** › Put back and screw nuts (Pos.11)
- Step 4** › Tighten nuts (Pos.11) according to Table D.2.12

13.6 Possible Malfunctions & Solutions

- During the period of usage of the installed gate valve, malfunctions may occur. Only experts in the premises of the user should undertake repairs. The most common cause of malfunctions and how to overcome such situations is listed in Table D.2.13

Table D.2.13

Failure	Possible cause	Troubleshooting
Absence of flow	GAC is in closed position	Open the GAC completely with the handwheel (Pos.26)
	Protection covers are not removed	Remove protection covers from connection ends
	GAC is not completely open	Open the GAC completely with the handwheel (Pos.26)
Difficult manipulation	Dry stem /stem nut	Grease stem (Pos.8) or stem nut (Pos.9)
	Gland nuts are too tight	Slightly loosen gland nuts (Pos.17) with precaution to preserve sealing of the stem packing rings (Pos.13)
Leakage on stem packing	Gland nuts are not tightened	Tighten gland nuts (Pos.17)
	Stem packing rings are damaged	Completely open the gate valve, remove the worn stem packing and clean the chamber of the stem packing and install the new stem packing rings, the same or similar quality (Pos.13)
Leakage on bonnet gasket	Nuts are not tightened	Tighten nuts (Pos.11)
	Bonnet gasket is damaged	Disassemble the bonnet (Pos. 2) and replace the bonnet gasket (Pos.12) with new one
Leaking on seat	GAC is not completely closed	Turn the handwheel (Pos.26) in the direction indicated for closing without auxiliary means
	Mechanical damage of the seat or wedge	Grind the seats and, if necessary, have damaged components replaced. Check the actuator setting
	The working medium contains solid dirt particles	Clean the Valve thoroughly. We recommend the installation of a Strainer before the Gate Valve
The valve does not function	The electric actuator does not function	Check the electric actuator as specified in the manufacturer's documentation.
	The pneumatic actuator does not function	Check the pneumatic actuator as specified in the manufacturer's documentation.
Malfunction of the valve	Limit switch (for optional electric or pneumatic) is defective	Have the limit switch checked. Prior to readjustment consult with Tervoent SC
	Torque switch (with optional electric or pneumatic) is defective	Have the torque switch checked. Prior to readjustment consult with Tervoent SC

13.7 Guarantee

- Termovent SC guarantee that each of its products free from defects and work properly for a period of eighteen (18) months from the date of installation or twenty-four (24) months from the date of shipment from the manufacturer, whichever comes first.
- Manufacturer agrees to repair or replace any product which is non-conforming to the Warranty due to defective workmanship or defective material of which the Warranty non-conformance customer notifies the manufacturer in writing during the Warranty Period.
- Warranty does not apply to products that have defects or failures resulting from
 - (a) accident, disaster, neglect, misuse, improper handling.
 - (b) application of excessive torque to the operating mechanism, presence of foreign matter.
 - (c) the products are not being installed or maintained as required by instructions
 - (d) modifications or repairs without manufacturer approval.
 - (e) natural tears and wear caused by material ageing.

III PURCHASE GUIDE

14. RFQ FORM

To better define the technical characteristics of the product, it is recommended to provide the following data and parameters when submitting an inquiry

RFQ - Form				GAC	
Service condition					
Fluid:					
Flow:	m³/h				
Operating and design pressure	Operating: bar		Design: bar		
Operating and design temperature	Operating °C		Design °C		
Max. Shut Off pressure	bar		Ambient temperature		°C
Pressure rating	Class 150	Class 300	Class 600	Class 900	Class 1500
Connection & Installation dimensions					
Installation dimension	ASME B16.10			mm	
Inlet and outlet pipe dimension	Inlet mm		Outlet mm		
Butt welding ends	ASME B16.25			Other	
Flanges	ASME B16.5			Other	
Materials & Trim designation					
Body material					
Internal parts					
Installation position					
Installation position	Vertical		Horizontal		Other
Overpressure devices					
With hole in the wedge					
With nozzle for safety valve					
With by-pass					
With double by-pass & equalizing pipe					
With double by-pass & equalizing pipe with valve					
With equalizing pipe					
Accessories					
With drain valve					
Spring loaded stuffing box					
Limit switches					

Other		
Actuation type		
Handwheel		
Gearbox		
Electric actuator		Closing time: sec
Pneumatic actuator		Closing time: sec
Accessories for actuator		
Testing		
Testing	Acc. to API 598	Other testing standard:
Surface protection		
Surface protection		
Marking		
Marking		
Additional requirements		





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