

TERMOVENT SC SERBIA // INDUSTRIAL VALVES

VENR

CONTROL VALVE



TERMOVENT
since 1963 **SC**

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I TECHNICAL DATA SHEETS

1. GENERAL FEATURES

Control Valves [VENR]

DN 15 ÷ DN 400

PN 16 ÷ PN 160

Design

- Casted or forged body and bonnet
- Bolted bonnet (BB)
- Rising stem (RS), outside screw and yoke (OS&Y)
- Parabolic or perforated plug
- Seats are integral or welded on

Applications

- The main purpose of the control valves is to manage fluid flow/pressure drop in 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

- PN 16 ÷ PN 160
- Temperatures up to 600°C
- p/t according to EN 12516-1

Materials

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

Advantages

- Long service life
- Respect to emission standards
- Easy handling and maintenance
- Stem packing replacement in working conditions

Options

- Electric actuator
- Pneumatic actuator
- Multistage design
- Throttling plug
- Balanced plug
- Valve characteristic linear, equal-percentage or quick open
- Spring loaded stuffing box (SLSB)
- Locking devices
- Limit switches
- Flanged or weld ends according to other Standards and Norms.

Testing

- Every produced control valve shall be tested according to EN 12266, ANSI/FCI 70-2 and EN 60534

2. PARTS & MATERIALS

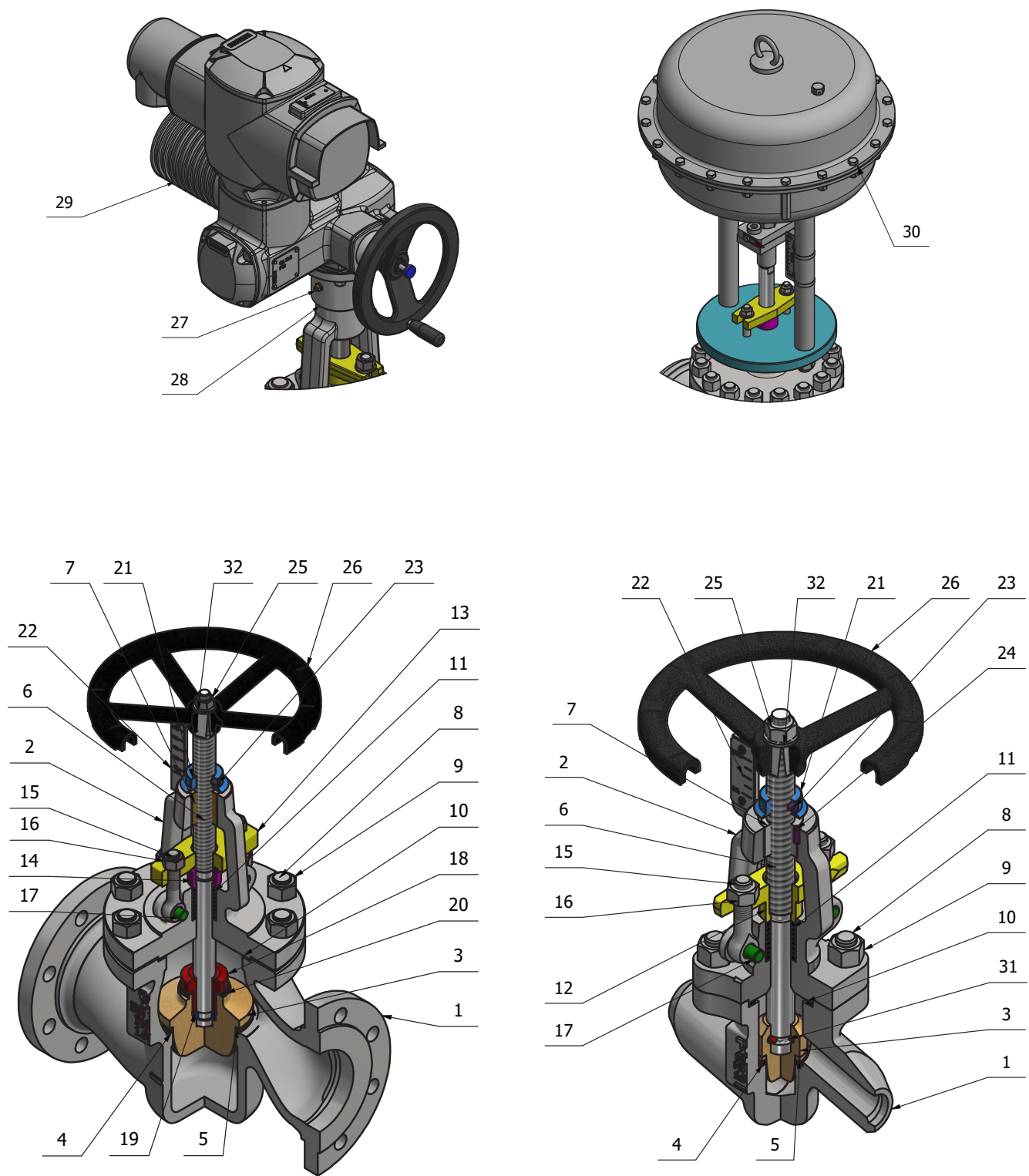


Figure C.1 – Parts

List of materials

Table C.1

Parts	Name		Material Group acc. to EN 12516-1						
1	Body ⁽¹⁾		1.0619	1.5419	1.7357	1.7379	1.4955	1.4308	1.4408
2	Bonnet ⁽¹⁾								
1	Body ⁽¹⁾	DN 15 ÷ DN 50 ⁽²⁾	1.0460	1.5415	1.7335	1.7383	1.4903	1.4301	1.4401
2	Bonnet ⁽¹⁾								
3	Plug		1.4021	1.5415	1.7335	1.7383	1.4903	1.4301	1.4401
4	Body seat ⁽³⁾		Hard-Faced 13Cr or Stellite™					Basic material or Stellite™	
5	Plug seat ⁽³⁾								
6	Stem		1.4021 / 1.4122 / 1.4923 ⁽⁴⁾					1.4301	1.4401
7	Stem nut		1.0715 / Cu-Alloy						
8	Stud bolts		A193 B7 or 1.7225	A193 B16 or 1.7709 / 1.4913 ⁽⁵⁾				A193 B8 or 1.4301	A193 B8M or 1.4401
9	Nuts		A194 2H or 1.1191	A194 7 or 1.7709				A194 8 or 1.4301	A194 8M or 1.4401
10	Bonnet gasket		spiral-wound or reinforced graphite						
11	Stem packing rings		graphite with corrosion inhibitor						
12	Gland		1.0460 or 1.0619					1.4301	
13	Gland flange		1.0425					1.4301	
14	Packing gland		1.4021					1.4301	
15	Gland bolts		1.1181					1.4301	
16	Gland nuts		A194 2H or 1.1191					A194 B8 or 1.4301	
17	Pin		1.1191					1.4301	
18	Plug nut		1.4021 / 1.4122					1.4301	
19	Ring		1.1191					1.4301	
20	Plug gasket		1.0333						
21	Position indicator		1.1191					1.4301	
22	Scale		1.4301						
23	Set screw		steel						
24	Spring type pin		steel						
25	Handwheel nut		1.1191					1.4301	
26	Handwheel		epoxy coated steel						
27	Grease injector		Cu-Alloy / steel						
28	Carrier		1.1191				1.4301		
29	Electric actuator		commercial						
30	Pneumatic actuator		commercial						
31	Balls		1.4021						
32	Nameplate		stainless steel						

TM trademark materials

(1) Other materials available acc. to EN standard

(2) DN 15 ÷ DN 50 only for butt welding ends

(3) Hardness differential between the body and plug seating surfaces shall be min. 50 HB

(4) Over 500°C

(5) Over 500°C

3. STANDARDS & DIMENSIONS

Standards	Table C.2
VENR	PN 16 ÷ PN 160
General design	EN 1349 and EN 60534
Wall thickness	EN 12516
Pressure / temperature rating	EN 12516
FTF and ETE according to	EN 558 and EN 12982
Flanged Ends according to	EN 1092-1
Welding Ends according to	EN 12627
Testing according to	EN 12266, ANSI/FCI 70-2 and EN 60534

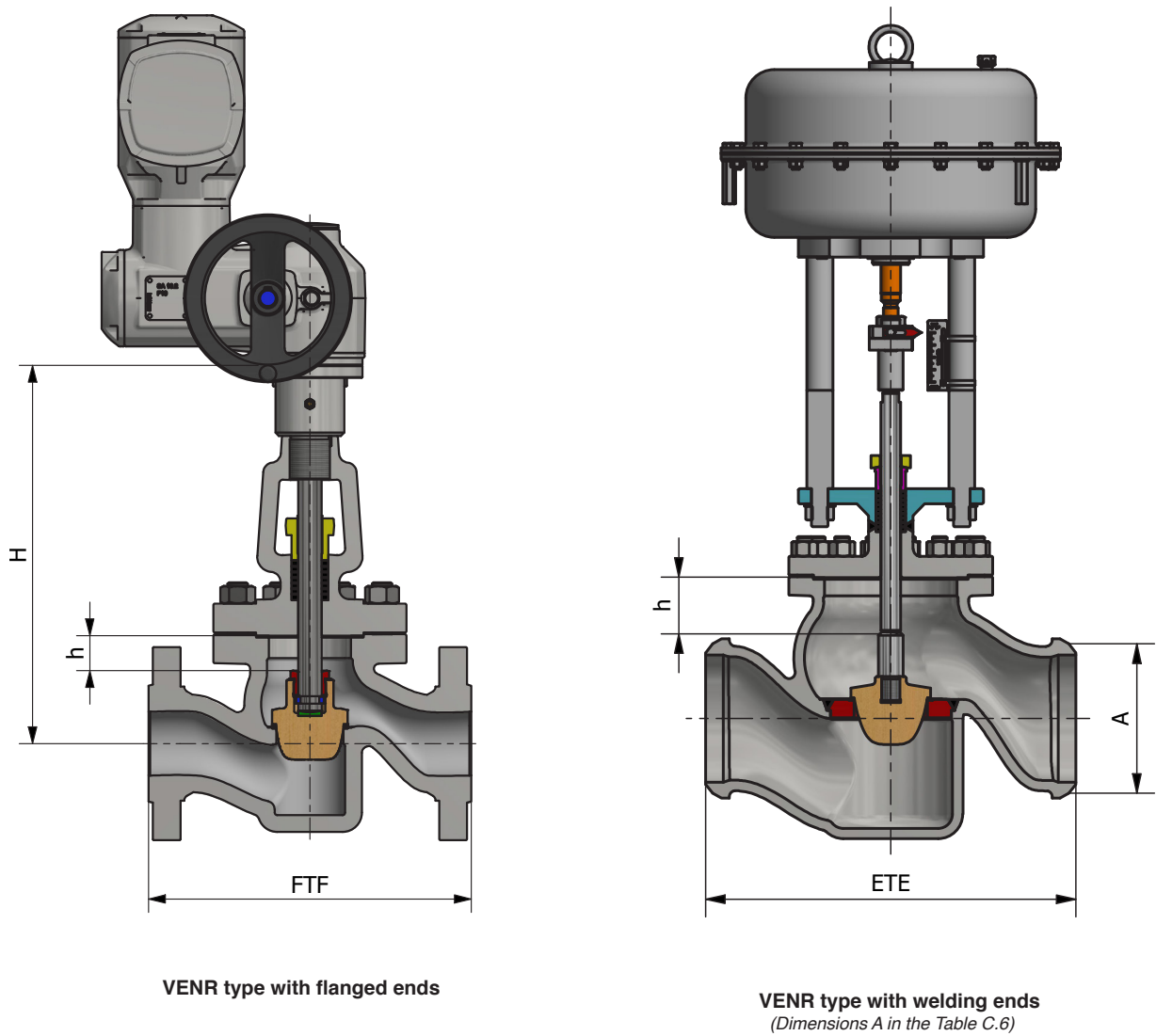


Figure C.2 – Dimensions

Nominal Pressure	Diameter Nominal	Face - To - Face	End - To - End	Centre-to - connection flange ISO 5210	Stroke	Connection flange ISO 5210	Kvs	Mass ⁽¹⁾	
PN	DN	FTF	ETE	H	h		m³/h	ETE	FTF
		mm						kg	
PN 16	15	130	130	251	24	F10-B1	10	4,3	5
	20	150	130	251	24	F10-B1	10	4,3	6
	25	160	130	251	24	F10-B1	10	4,5	7
	32	180	160	290	30	F10-B1	20	7	11
	40	200	180	305	25	F10-B1	25	11	14
	50	230	210	325	28	F10-B1	40	14	18
	65	290	290	338	36	F10-B1	75	18	25
	80	310	310	373	40	F10-B1	100	26	36
	100	350	350	425	48	F10-B1	160	43	50
	125	400	400	519	70	F10-B1	290	60	74
	150	480	480	544	78	F10-B1	400	85	99
	200	600	600	645	105	F14-B1	735	151	160
	250	730	730	840	122	F14-B1	1150	260	305
	300	850	850	847	111	F16-B1	1600	295	367
PN 25 ÷ PN 40	350	980	980	1226	162	F16-B1	2150	785	822
	400	1100	1100	1392	170	F25-B1	3000	1305	1363
	15	130	130	251	24	F10-B1	10	4,3	5
	20	150	130	251	24	F10-B1	10	4,3	6
	25	160	130	251	24	F10-B1	10	4,5	7
	32	180	160	290	30	F10-B1	20	7	11
	40	200	180	305	25	F10-B1	25	11	14
	50	230	210	325	28	F10-B1	40	14	19
	65	290	290	338	36	F10-B1	75	18	26
	80	310	310	373	40	F10-B1	100	26	37
	100	350	350	425	48	F10-B1	160	43	52
	125	400	400	519	70	F14-B1	290	60	77
	150	480	480	544	78	F14-B1	400	85	103
	200	600	600	645	105	F14-B1	735	151	177
PN 63	250	730	730	840	122	F16-B1	1150	260	337
	300	850	850	847	111	F25-B1	1600	295	392
	350	980	980	1226	162	F30-B1	2150	785	868
	400	1100	1100	1392	170	F30-B1	3000	1305	1423
	15	210	150	255	24	F10-B1	10	4,8	7
	20	230	150	255	24	F10-B1	10	4,8	9
	25	230	160	255	24	F10-B1	10	5	11
	32	260	180	305	28	F10-B1	20	12	18
	40	260	210	310	28	F10-B1	25	14	21
	50	300	250	382	44	F10-B1	40	24	32
	65	340	340	403	42	F10-B1	75	39	47
	80	380	380	474	52	F14-B1	100	60	73
	100	430	430	583	64	F14-B1	160	100	112
	125	500	500	626	70	F14-B1	290	155	175
PN 100 ÷ PN 160	150	550	550	719	90	F16-B1	400	238	268
	200	650	650	923	128	F16-B1	735	446	480
	250	775	775	1121	156	F25-B1	1150	770	865
	15	210	150	255	24	F10-B1	10	4,8	7
	20	230	150	255	24	F10-B1	10	4,8	9
	25	230	160	255	24	F10-B1	10	5	11
	32	260	180	305	28	F10-B1	20	12	18
	40	260	210	310	28	F10-B1	25	14	21
	50	300	250	382	44	F10-B1	40	24	35
	65	340	340	403	42	F14-B1	75	39	50
	80	380	380	474	52	F14-B1	100	60	79
	100	430	430	583	64	F16-B1	160	100	124
	125	500	500	626	70	F16-B1	290	155	192
	150	550	550	719	90	F25-B1	400	238	288
	200	650	650	923	128	F30-B1	735	446	510
	250 ⁽²⁾	775	775	1121	156	F30-B1	1150	770	865

(1) Mass without actuators

(2) Dimensions only for PN 100

- Depending on the execution's weights are subject to modification

4. FLANGED ENDS DESIGN & DIMENSIONS

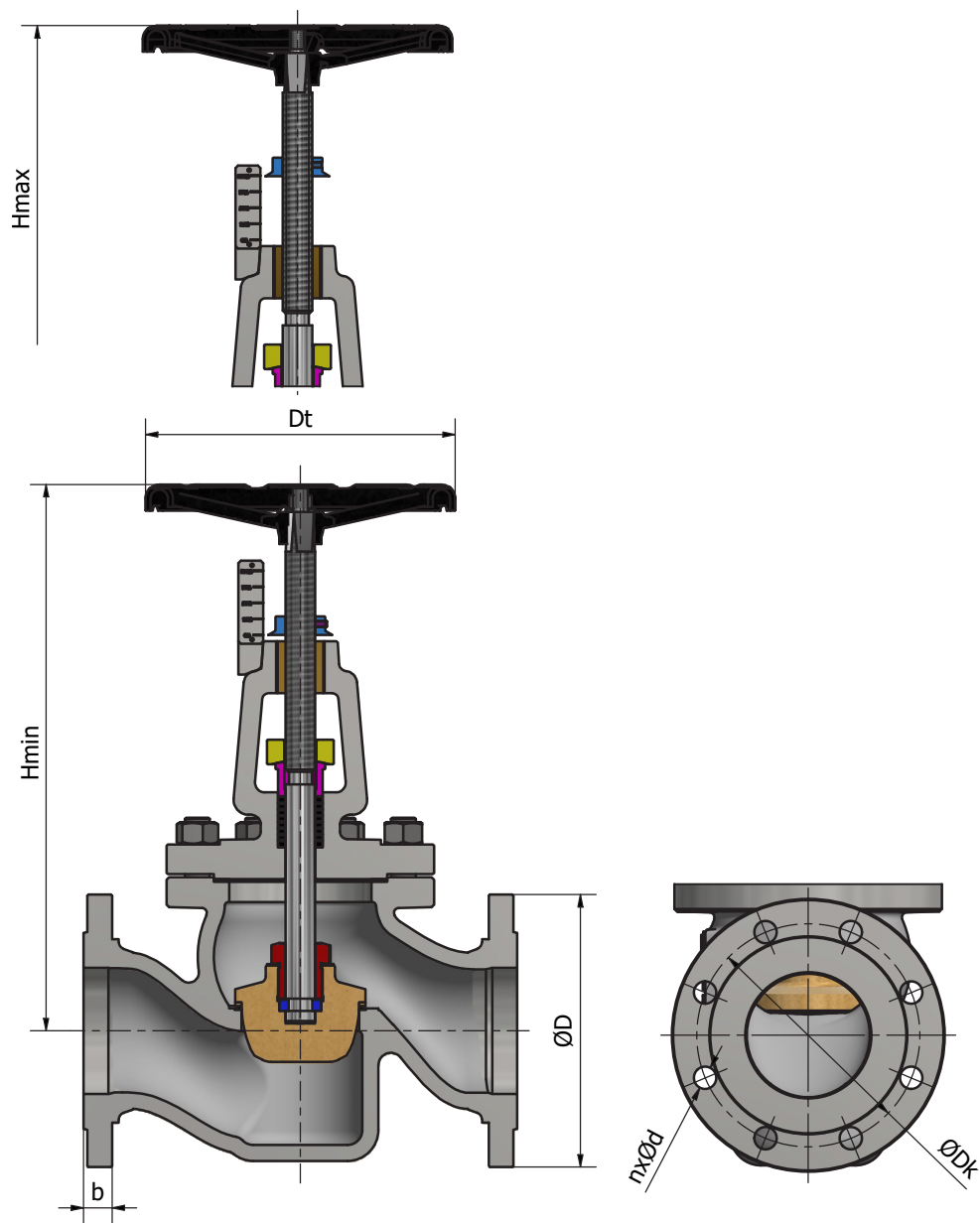


Figure C.3 – VENR with flanged ends - dimensions

Flanged ends dimensions

Table C.4

DN		15	20	25	32	40	50	65	80	100	125	150	200	250	300	350	400
PN 16																	
mm	øD	95	105	115	140	150	165	185	200	220	250	285	340	405	460	520	580
	øDk	65	75	85	100	110	125	145	160	180	210	240	295	355	410	470	525
	nxød	4x14	4x14	4x14	4x18	4x18	4x18	8 ⁽¹⁾ x18	8x18	8x18	8x18	8x22	12x22	12x26	12x26	16x26	16x30
	b	16	18	18	18	18	18	18	20	20	22	22	24	26	28	30	32
	Hmax	267	267	267	321	357	368	384	437	490	632	662	807	1004	1159	1643	1842
	Hmin	243	243	243	291	332	340	348	397	442	562	584	702	882	1048	1481	1672
	Dt	125	125	125	150	150	150	200	250	250	300	300	400	400	500	630	630
PN 25																	
mm	øD	95	105	115	140	150	165	185	200	235	270	300	360	425	485	555	620
	øDk	65	75	85	100	110	125	145	160	190	220	250	310	370	430	490	550
	nxød	4x14	4x14	4x14	4x18	4x18	4x18	8x18	8x18	8x22	8x26	8x26	12x26	12x30	16x30	16x33	16x36
	b	16	18	18	18	18	20	22	24	24	26	28	30	32	34	38	40
	Hmax	267	267	267	321	357	368	384	437	490	632	662	807	1004	1159	1643	1842
	Hmin	243	243	243	291	332	340	348	397	442	562	584	702	882	1048	1481	1672
	Dt	125	125	125	150	150	150	200	250	250	300	300	400	400	500	630	630
PN 40																	
mm	øD	95	105	115	140	150	165	185	200	235	270	300	375	450	515	580	660
	øDk	65	75	85	100	110	125	145	160	190	220	250	320	385	450	510	585
	nxød	4x14	4x14	4x14	4x18	4x18	4x18	8x18	8x18	8x22	8x26	8x26	12x30	12x33	16x33	16x36	16x39
	b	16	18	18	18	18	20	22	24	24	26	28	34	38	42	46	50
	Hmax	267	267	267	321	357	368	384	437	490	632	662	807	1004	1159	1643	1842
	Hmin	243	243	243	291	332	340	348	397	442	562	584	702	882	1048	1481	1672
	Dt	125	125	125	150	150	150	200	250	250	300	300	400	400	500	630	630
PN 63																	
mm	øD	105	130	140	155	170	180	205	215	250	295	345	415	470			
	øDk	75	90	100	110	125	135	160	170	200	240	280	345	400			
	nxød	4x14	4x18	4x18	4x22	4x22	4x22	8x22	8x22	8x26	8x30	8x33	12x36	12x36			
	b	20	22	24	26	28	26	26	28	30	34	36	42	46			
	Hmax	272	272	272	358	358	454	487	562	689	733	868	1079	1509			
	Hmin	248	248	248	330	330	410	445	510	625	663	778	951	1353			
	Dt	150	150	150	200	200	250	300	300	400	400	500	500	630			
PN 100																	
mm	øD	105	130	140	155	170	195	220	230	265	315	355	430	505			
	øDk	75	90	100	110	125	145	170	180	210	250	290	360	430			
	nxød	4x14	4x18	4x18	4x22	4x22	4x26	8x26	8x26	8x30	8x33	12x33	12x36	12x39			
	b	20	22	24	26	28	30	34	36	40	40	44	52	60			
	Hmax	272	272	272	358	358	454	487	562	689	733	868	1079	1509			
	Hmin	248	248	248	330	330	410	445	510	625	663	778	951	1353			
	Dt	150	150	150	200	200	250	300	300	400	400	500	500	630			
PN 160																	
mm	øD	105	130	140	155	170	195	220	230	265	315	355	430				
	øDk	75	90	100	110	125	145	170	180	210	250	290	360				
	nxød	4x14	4x18	4x18	4x22	4x22	4x26	8x26	8x26	8x30	8x33	12x33	12x36				
	b	20	22	24	26	28	30	34	36	40	44	50	60				
	Hmax	272	272	272	358	358	454	487	562	689	733	868	1079				
	Hmin	248	248	248	330	330	410	445	510	625	663	778	951				
	Dt	150	150	150	200	200	250	300	300	400	400	500	500				

(1) 8 holes is preferred however 4 holes may be supplied upon special request by the Customer.

5. BUTT WELDING ENDS DESIGN

Symbols		Table C.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	

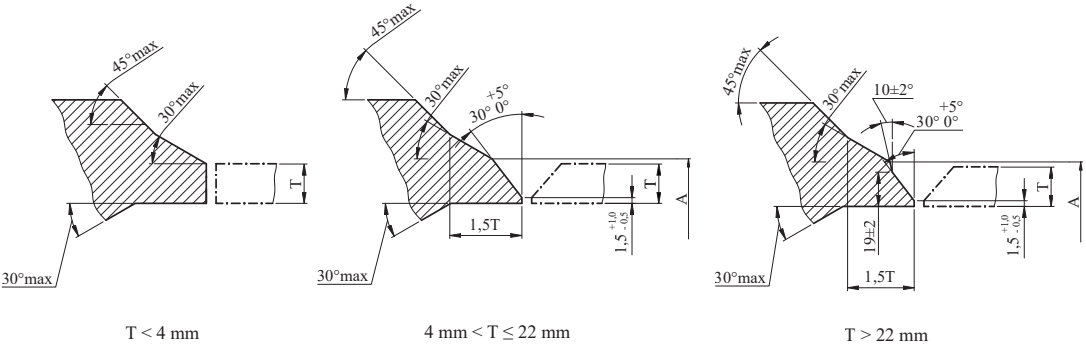


Figure C.4 - Form of the butt welding ends EN 12627

Dimensions and tolerance of outside diameter																Table C.6
DN	15	20	25	32	40	50	65	80	100	125	150	200	250	300	350	400
A (mm)	22	28	35	44	5	62	78	91	117	144	172	223	278	329	362	413
Tolerance (mm)	+2,5 -1	+2,5 -1,5	+2,5 -2			+2,5 -2,5			+4 -2,5							



6. TYPES of CONTROL VALVE TRIM

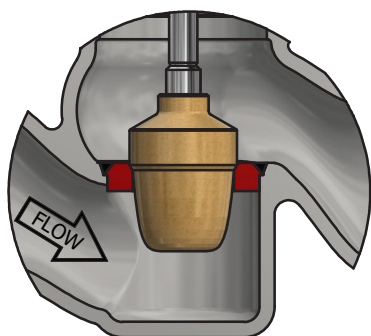


Figure C.5 – Parabolic plug

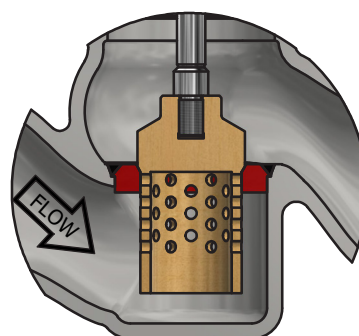


Figure C.6 – Perforated plug

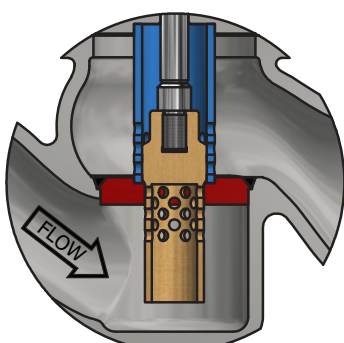


Figure C.7 – Perforated plug and cage

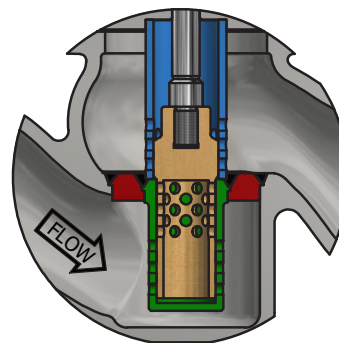


Figure C.8 – Perforated plug, perforated seat and cage

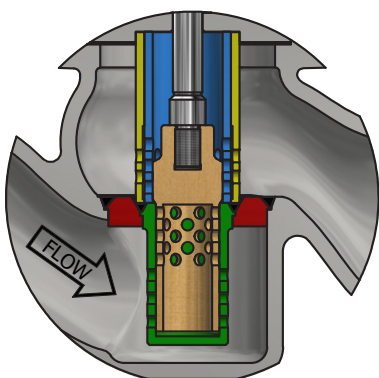


Figure C.9 – Perforated plug, perforated seat and two cages

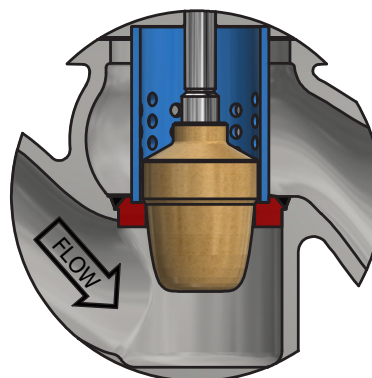


Figure C.10 – Cage for noise reduction

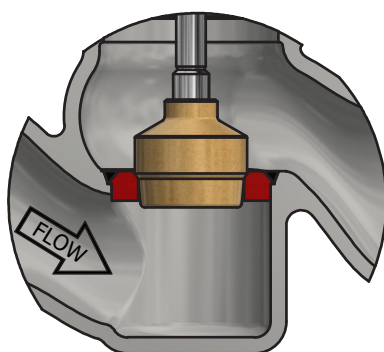


Figure C.11 – Throttling plug

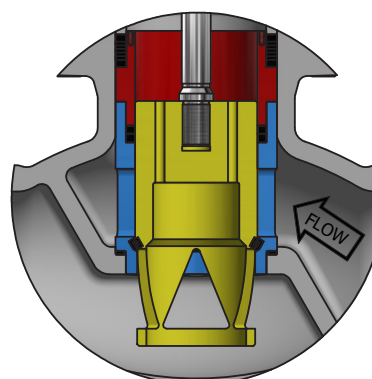


Figure C.12 – Balanced plug

7. FLOW CHARACTERISTIC

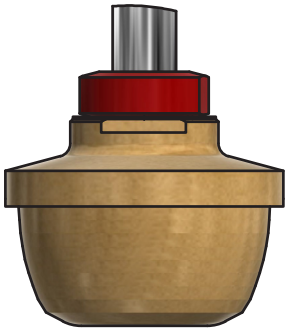


Figure C.13 – Equal Percentage

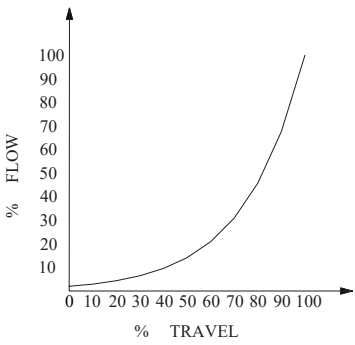


Figure C.14 – Equal Percentage curve

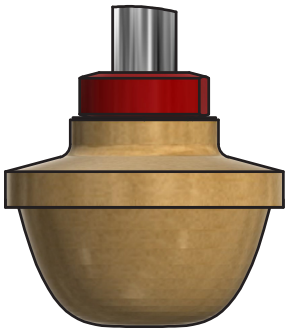


Figure C.15 – Linear characteristic

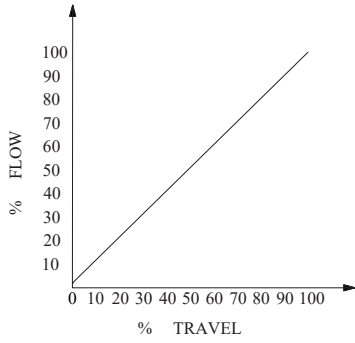


Figure C.16 – Linear curve

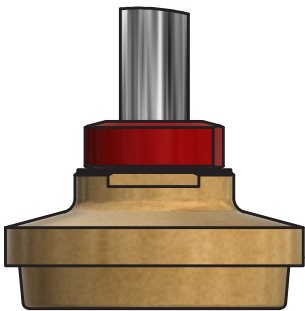


Figure C.17 – Quick opening

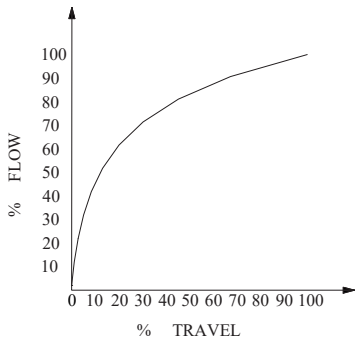


Figure C.18 – Quick opening curve

8. Kvs VALUES

The K_v s value expresses the amount of flow in a control valve at a fully-open valve position and a differential pressure (Δp) of 1 bar.

Medium	Liquid	Gases	Steam
Pressure drop	m³/h		kg/h
$p_2 > \frac{p_1}{2}$	$K_v = Q \cdot \sqrt{\frac{\rho}{1000 \cdot \Delta p}}$	$K_v = \frac{G}{519} \cdot \sqrt{\frac{\rho_G \cdot T_1}{\Delta p \cdot p_2}}$	$K_v = \frac{W}{31,62} \cdot \sqrt{\frac{v_2}{\Delta p}}$
$\Delta p < \frac{p_1}{2}$			
$p_2 < \frac{p_1}{2}$		$K_v = \frac{G}{259,5 \cdot p_1} \cdot \sqrt{\rho_G \cdot T_1}$	$K_v = \frac{W}{31,62} \cdot \sqrt{\frac{2 \cdot v^*}{p_1}}$
$\Delta p > \frac{p_1}{2}$			

p_1 (bar) – input pressure

p_2 (bar) – output pressure

Δp (bar) – differential pressure $p_1 - p_2$

Q (m³/h) – volume flow rate

G (m³/h) – flow rate of gases related to 0°C and 1013 mbar

W (kg/h) – Mass flow rate

ρ (kg/m³) – density of liquids

ρ_G (kg/m³) – density of gases at 0°C and 1013 mbar

T_1 (K) – 273 + μ_1 where is μ_1 – temperature in °C upstream of the valve

v_2 (m³/kg) – specific volume for p_2 and μ_1

v^* (m³/kg) – specific volume for $p_1/2$ and μ_1

K_v s (m³/h) = $1,3 \cdot K_v$

Kvs values

Table C.7

Kvs [m³/h]	SD ⁽¹⁾ [mm]	DN (Diameter Nominal)															
		15	20	25	32	40	50	65	80	100	125	150	200	250	300	350	400
0,25	4	•	•	•													
0,32	4	•	•	•													
0,4	5	•	•	•	•	•	•										
0,5	5	•	•	•	•	•	•										
0,63	6	•	•	•	•	•	•										
0,8	7	•	•	•	•	•	•										
1	7	•	•	•	•	•	•										
1,25	8	•	•	•	•	•	•										
1,6	10	•	•	•	•	•	•	•									
2	11	•	•	•	•	•	•	•									
2,5	12	•	•	•	•	•	•	•									
3,2	13	•	•	•	•	•	•	•									
4	15	•	•	•	•	•	•	•	•								
5	17	•	•	•	•	•	•	•	•								
6,3	19	•	•	•	•	•	•	•	•	•							
8	21	•	•	•	•	•	•	•	•	•							
10	23	•	•	•	•	•	•	•	•	•							
12,5	25				•	•	•	•	•	•							
16	29				•	•	•	•	•	•							
20	32				•	•	•	•	•	•	•						
25	38					•	•	•	•	•	•						
32	42						•	•	•	•	•						
40	48						•	•	•	•	•	•					
50	52							•	•	•	•	•					
63	59							•	•	•	•	•	•				
75	64							•	•	•	•	•	•	•			
80	66								•	•	•	•	•	•			
100	74								•	•	•	•	•	•			
125	83									•	•	•	•	•			
160	94										•	•	•	•	•		
200	105											•	•	•	•		
250	115												•	•	•		
290	125													•	•		
320	132														•		
360	140															•	
400	148																•
500	165																
570	176																
630	185																
735	200																
800	210																
1000	235																
1150	250																
1250	260																
1600	295																
2000	330																
2250	350																
2500	370																
3000	400																

(1) SD – seat diameter

9. OPTIONAL EXECUTIONS

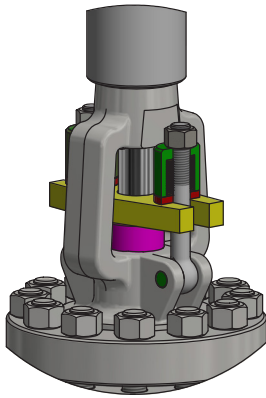


Figure C.19 - Spring Loaded Stuffing Box

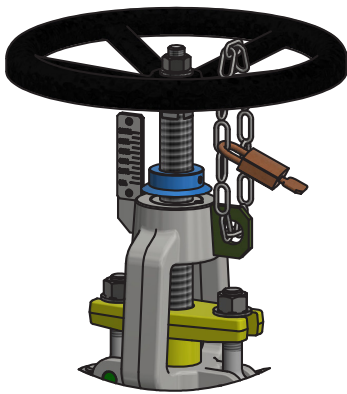


Figure C.20 – Locking Devices

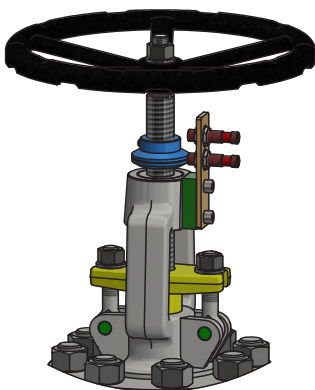


Figure C.21 – Limit Switches

10. PRESSURE & TEMPERATURE RATINGS

Pressure (bar)/Temperature (°C) ratings acc. to EN 12516-1 Table C.8

Materials	PN	-10	20	50	100	150	200	250	300	350	400	420	450	475	480	500	510	525	530	550	575	600
1.0460	16	16,0	16,0	16,0	15,0	14,2	13,4	12,3	11,1	10,4	9,6	8,8										
	25	25,0	25,0	25,0	23,4	22,2	21,0	19,2	17,4	16,2	15,0	13,7										
	40	40,0	40,0	40,0	37,4	35,5	33,6	30,7	27,8	25,9	24,0	22,2										
	63	63,0	63,0	63,0	59,0	55,9	52,9	48,4	43,8	40,8	37,8	34,6										
	100	100,0	100,0	100,0	93,6	88,8	84,0	76,8	69,6	64,8	60,0	54,9										
	160	160,0	160,0	160,0	149,8	142,1	134,5	122,9	111,4	103,7	96,0	87,9										
1.0619	16	16,0	16,0	16,0	15,0	14,2	13,4	12,3	11,1	10,4	9,6	8,8	5,9									
	25	25,0	25,0	25,0	23,4	22,2	21,0	19,2	17,4	16,2	15,0	13,7	9,2									
	40	40,0	40,0	40,0	37,4	35,5	33,6	30,7	27,8	25,9	24,0	22,2	14,7									
	63	63,0	63,0	63,0	59,0	55,9	52,9	48,4	43,8	40,8	37,8	34,6	23,2									
	100	100,0	100,0	100,0	93,6	88,8	84,0	76,8	69,6	64,8	60,0	54,9	36,8									
	160	160,0	160,0	160,0	149,8	142,1	134,5	122,9	111,4	103,7	96,0	87,9	58,9									
1.5419 1.5415	16	16,0	16,0	16,0	16,0	15,7	14,6	13,6	12,7	11,9	11,5	11,4	10,7	10,5	10,4	7,3	6,3	4,5	4,0			
	25	25,0	25,0	25,0	25,0	24,5	22,8	21,3	19,8	18,6	18,0	17,7	16,7	16,4	16,3	11,3	9,9	7,1	6,3			
	40	40,0	40,0	40,0	40,0	39,1	36,5	34,1	31,7	29,8	28,8	28,4	26,7	26,2	26,1	18,1	15,8	11,3	10,0			
	63	63,0	63,0	63,0	63,0	61,6	57,5	53,7	49,9	46,9	45,4	44,7	42,0	41,3	41,1	28,6	24,9	17,8	15,8			
	100	100,0	100,0	100,0	100,0	97,8	91,2	85,2	79,2	74,4	72,0	71,0	66,7	65,5	65,3	45,3	39,5	28,3	25,1			
	160	160,0	160,0	160,0	160,0	156,6	146,0	136,4	126,8	119,1	115,3	113,5	106,8	104,9	104,5	72,6	63,2	45,2	40,1			
1.7357 1.7335	16	16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0	14,9	13,7	13,7	12,6	11,8	11,6	10,0	8,9	7,3	6,7	4,2		
	25	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	23,3	21,3	21,3	19,7	18,5	18,1	15,6	13,9	11,5	10,5	6,5		
	40	40,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0	37,3	34,1	34,1	31,5	29,5	28,9	25,0	22,3	18,3	16,8	10,5		
	63	63,0	63,0	63,0	63,0	63,0	63,0	63,0	63,0	58,7	53,8	53,8	49,7	46,5	45,5	39,3	35,1	28,9	26,4	16,5		
	100	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	93,1	85,3	85,4	78,9	73,9	72,2	62,4	55,8	45,9	41,9	26,1		
	160	160,0	160,0	160,0	160,0	160,0	160,0	160,0	160,0	149,1	136,6	136,6	126,2	118,2	115,6	99,9	89,3	73,4	67,1	41,8		
1.7379 1.7383	16	16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0	15,0	13,7	13,2	12,6	11,8	11,6	10,5	10,2	8,6	8,0	5,6	4,4	2,4
	25	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	23,5	21,3	20,65	19,7	18,5	18,1	16,5	15,9	13,5	12,5	8,8	6,8	3,7
	40	40,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0	37,5	34,1	33,0	31,5	29,5	28,9	26,3	25,4	21,5	20,1	14,1	10,9	6,0
	63	63,0	63,0	63,0	63,0	63,0	63,0	63,0	63,0	59,1	53,8	51,9	49,7	46,5	45,5	41,5	40,0	33,9	31,6	22,2	17,1	9,4
	100	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	93,8	85,3	82,4	78,9	73,9	72,2	65,8	63,5	53,9	50,1	35,2	27,2	14,9
	160	160,0	160,0	160,0	160,0	160,0	160,0	160,0	160,0	150,2	136,6	131,8	126,2	118,2	115,6	105,3	101,7	86,2	80,2	56,3	43,5	23,9
1.4955 1.4903	16	16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0	15,0	13,7	13,2	12,6	11,8	11,6	10,5	10,2	9,6	9,6	9,3	8,9	8,0
	25	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	23,5	2,13	20,6	19,7	18,5	18,1	16,5	15,9	15,0	14,9	14,6	14,0	12,5
	40	40,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0	37,5	34,1	32,9	31,5	29,5	28,9	26,3	25,4	24,1	23,9	23,3	22,3	20,0
	63	63,0	63,0	63,0	63,0	63,0	63,0	63,0	63,0	59,1	53,8	51,9	49,7	46,5	45,5	41,5	40,0	37,9	37,7	36,7	35,2	31,5
	100	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	93,8	85,3	82,4	78,9	73,9	72,2	65,8	63,5	60,2	59,8	58,2	55,9	50,0
	160	160,0	160,0	160,0	160,0	160,0	160,0	160,0	160,0	150,2	136,6	131,8	126,2	118,2	115,6	105,3	101,7	96,3	95,7	93,2	89,4	80,0
1.4308 1.4301	16	16,0	16,0	16,0	14,8	13,0	11,2	10,5	9,9	9,1	8,7	8,5	8,2	8,1	8,0	7,9	7,8	7,3	7,3	7,1	6,4	5,0
	25	25,0	25,0	25,0	23,1	20,3	17,5	16,5	15,4	14,3	13,6	13,3	12,9	12,6	12,5	12,3	12,2	11,4	11,3	11,1	10,0	7,9
	40	40,0	40,0	40,0	37,0	32,5	28,0	26,3	24,6	22,8	21,7	21,3	20,6	20,2	20,1	19,7	19,5	18,2	18,1	17,7	16,0	12,6
	63	63,0	63,0	63,0	58,2	51,2	44,1	41,5	38,8	36,0	34,2	33,5	32,5	31,8	31,6	31,0	30,7	28,7	28,6	27,9	25,2	19,8
	100	100,0	100,0	100,0	92,4	81,2	70,0	65,8	61,6	57,1	54,3	53,2	51,5	50,4	50,2	49,3	48,7	45,6	45,4	44,3	40,0	31,5
	160	160,0	160,0	160,0	147,9	130,0	112,1	105,3	98,6	91,4	87,0	85,2	82,5	80,7	80,3	78,9	78,0	73,0	72,6	70,9	64,0	50,4
1.4408 1.4401	16	16,0	16,0	16,0	15,2	13,7	12,1	11,2	10,3	9,9	9,4	8,3	9,1	9,0	8,9	8,9	8,8	8,4	9,2	8,3	7,0	5,8
	25	25,0	25,0	25,0	23,8	21,4	18,9	17,5	16,1	15,4	14,7	13,0	14,1	14,0	14,0	13,9	13,8	13,1	14,4	12,9	10,9	9,1
	40	40,0	40,0	40,0	38,1	34,2	30,2	28,0	25,8	24,6	23,5	20,9	22,6	22,4	22,4	22,2	22,1	20,9	23,1	20,7	17,5	14,5
	63	63,0	63,0	63,0	60,0	53,8	47,6	44,1	40,6	38,8	37,0	32,9	35,6	35,3	35,2	34,9	34,8	32,9	36,3	32,6	27,6	22,8
	100	100,0	100,0	100,0	95,2	85,4	75,6	70,0	64,4	61,6	58,8	52,2	56,6	56,0	55,9	55,4	55,2	52,3	57,7	51,7	43,7	36,3
	160	160,0	160,0	160,0	152,4	136,7	121,0	112,1	103,1	98,6	94,1	83,5	90,5	89,6	89,5	88,7	88,4	83,7	92,3	82,8	70,0	58,1

Note: Presented values belong to Standard Rating. For Special Class contact Tervoent SC.

11. MARKING & LABELING

Control valve shall be marked in accordance with general design specification and the requirements of standard EN 19 or ANSI/MSS SP-25-2018.

11.1 Marking

General marking of the valve

Table C.9

Item ^a	Subject		Marking
			PN designed valves
1	Product identification	Type	VENR
		Serial number	xxxx.xx.xx/xx
2	Nominal size		DN xxx
3	PN designation		PN xxx
4	Material		xxx
5	Heat batch identification		xxx
6	Arrow for flow direction		→
7	Manufacturer's name and registered trade details		TermoventSC Serbia
8	Maximum allowable temperature, <i>TS</i>		xx °C or xx C
9	Maximum allowable pressure, <i>PS</i>		xx bar
10	Trim		xxx
11	Flow characteristic		xxx
12	Flow coefficient (Kvs)		xxx
13	Month / year of manufacturing		mm/yy

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

11.1.1 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 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.

11.2 Labeling

Valve information can be found on the valve body, and the typical valve nameplate is shown on Figure C.22.

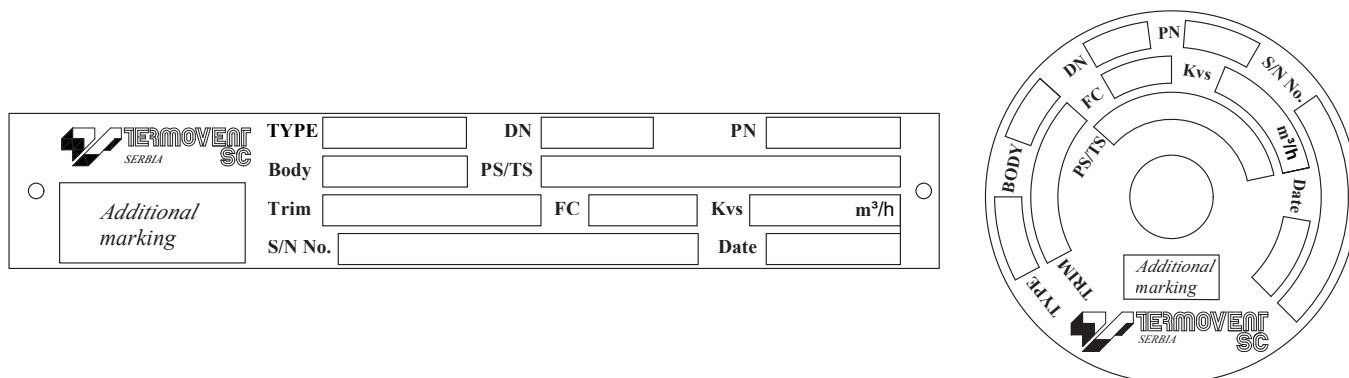


Figure C.22

TYPE	Type of valve
DN	Nominal valve size
PN	Pressure
Body	Material
PS / TS	Pressure-temperature rating
Trim	Material of stem and sealing faces
FC	Flow characteristic
Kvs	Rated flow coefficient
S / N No.	Series Number
Date	Manufacture Date
Additional marking	As per 11.1.1

12. 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.*

13. 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

14. INSTRUCTIONS for INSTALLATION, OPERATION & MAINTENANCE

14.1 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 VENR during the period of use should be fully trained for the correct/optimal performance of these tasks. If VENR 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 C.8 according to EN 12516-1. Under no circumstances should the valves be operated under conditions outside these tables.
- Before the service or reinstallation of the VENR, 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.

14.2 Storage & Handling

VENR is delivered in their plug in the closed position with protective covers on their ends. During the storage period, protective covers shall not be removed.

14.2.1 Recommended storage conditions

- Storage conditions shall be: ambient temperature between +10°C and +35°C and the humidity 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.

14.2.2 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

14.2.3 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 C.23 and Figure C.24).
- Do not lift VENR via the handwheel (Figure C.25).
- If possible, lift VENR via the lifting lugs or body (Figure C.26 or Figure C.27).
- 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.

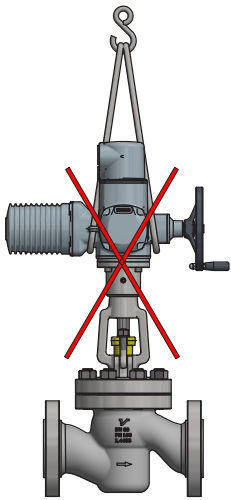


Figure C.23

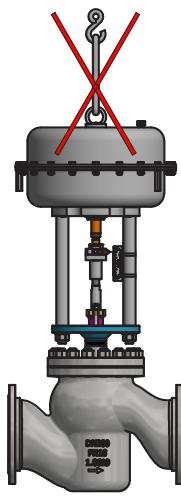


Figure C.24

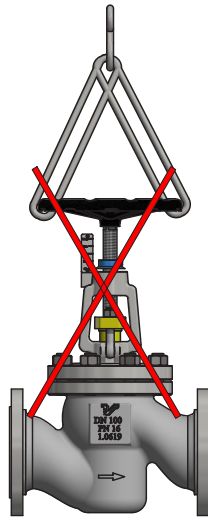


Figure C.25

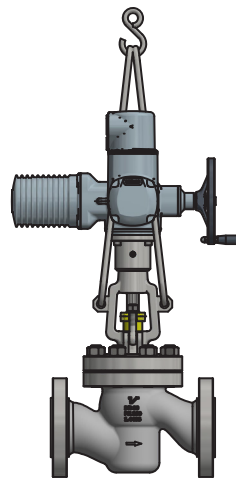


Figure C.26

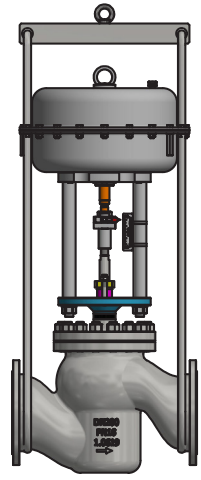


Figure C.27



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.

14.3 Installation & Start-up

- VENR are delivered with their plug 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.
- VENR with welding ends up to DN 100 (4") should be welded on the pipeline in the **CLOSED** position.
- VENR with welding ends over DN 100(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 VENR you must take into consideration the permitted flow direction. Allowed flow direction is defined by the arrow located on the VENR body.
- 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 VENR (opening/closing).
- Recommendation: VENR should be installed with a minimum of 5x nominal diameter of straight pipeline in front of and behind the VENR.



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.
 - ➔ During the installation take care about the flow direction.
 - ➔ The valve should not be used as support for a pipeline.
-

14.4 Usage & Maintenance

- The control valve 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 C.28). Torque for tightness gland nuts are shown in Table C.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 C.10

	M8	M10	M12	M14	M16	M18	M20	M24	M27	M30
Torque /Nm/	8÷20	15÷40	26÷65	42÷100	64÷150	100÷175	125÷300	210÷500	305÷730	410÷1000

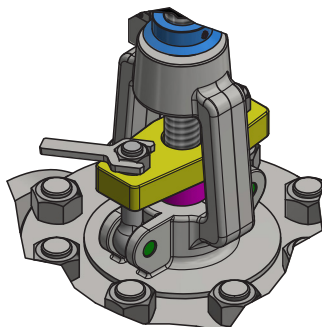


Figure C.28 – Stem packing gland tightening

- 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 C.29. Packing rings replacement is shown in Figure C.30 with a general note that every next packing ring must be rotated relative to the previous one (not less than 90°).



Figure C.29 – Stem packing ring



Figure C.30

- Lubrication of thread between stem (Pos.6 – Figure C.1) / stem nut (Pos.7 – Figure C.1) is highly important. To lubricate the bearings on electric-operated valves, we suggest using quality-level grease, as shown in the following Table C.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 grease injector (Pos.27 – Figure C.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 and bushings should be lubricated depending on how frequently they are used every 3 months. For the lubrication of the actuator (Pos. 29 – Figure C.1) it is necessary to remove the protective tube then grease the stem (Pos. 6 – Figure C.1) and return the protective tube. Some of the lubricants we use for lubrication are in Table C.11

Table C.11

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

- VENR delivered with an actuator is adjusted for proper work. VENR delivered with connection for later build on it the electric actuator must be adjusted. The closing of VENR 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!!!

- ➔ Valve opening and closing by handwheel should be done without the use of auxiliary means such as a rod or similar.
- ➔ A Strainer being installed before the valve will increase its reliability and proper working.

14.5 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 VENR standard spare parts are Bonnet gasket and Stem packing.
- Contact “TERMOVENT SC” if You need other spare parts like a Stem, Plug, Stem nut, etc.
- Every VENR 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 C.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 C.12

Bolt diameter	Bolt materials								
	1.7225	1.7709	1.4913	1.4301	1.4401	B7	B16	B8	B8M
	Torque [Nm]								
M10	52	39	53	14	14	51	51	15	46
M12	90	68	93	24	25	89	89	25	81
M14	145	109	149	38	40	143	143	41	129
M16	226	170	233	59	62	223	224	64	203
M18	309	233	318	81	85	305	307	87	278
M20	441	333	454	115	121	436	439	124	396
M22	609	459	626	159	167	600	605	171	546
M24	765	577	787	200	210	755	760	215	687
M27	1131	852	1163	295	310	1116	1123	318	1015
M30	1528	1151	1570	398	419	1507	1517	429	1371
M33	2095	1578	2153	525	574	2066	2080	588	1880
M36	2681	2020	2755	698	734	2644	2663	753	2405
M39	3494	2632	3590	910	957	3446	3470	981	3135
M42	4306	3244	4425	1121	1180	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 C.31. This action compensates any relaxation or creep. Periodic inspection is recommended, thereafter.

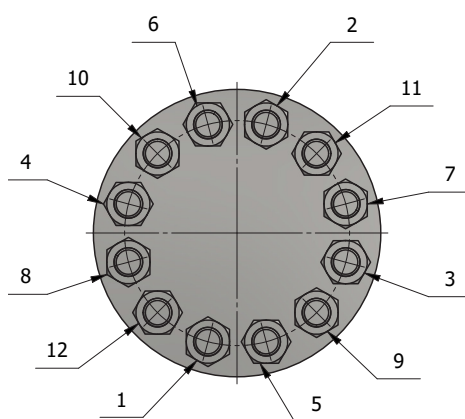


Figure C.31 - Recommended re-tighten order



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.

14.5.1 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).
- ➔ VENR must be completely opened.

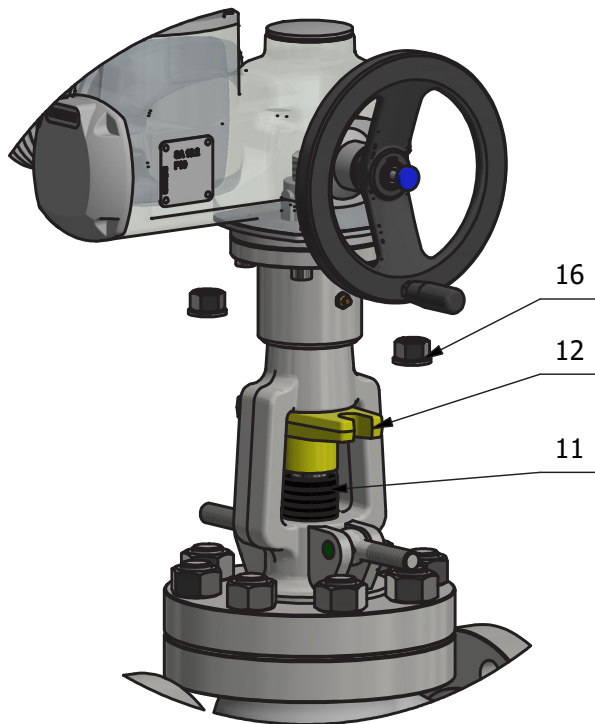


Figure C.32 – Stem packing rings replacement

Disassembling

-
- Step 1 ›** Unscrew gland nuts (Pos.16)
 - Step 2 ›** Lift upwards gland (Pos.12)
 - Step 3 ›** Take out stem packing rings (Pos.11).
All stem packing rings shall be removed.
 - Step 4 ›** The packing chamber shall be cleaned

Assembling

-
- Step 1 ›** The packing chamber shall be filled with new stem packing rings (Pos.11)
 - Step 2 ›** Put down gland (Pos.12)
 - Step 3 ›** Put back and tighten gland nuts (Pos.16)
 - Step 4 ›** Tighten gland nuts (Pos.16) according to Table C.10

14.5.2 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).
- ➔ VENR must be be opened.

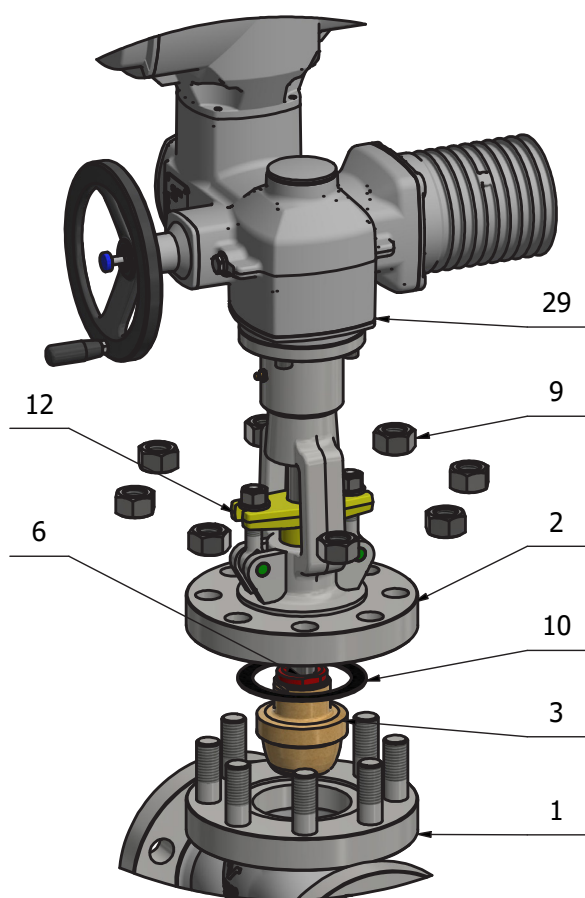


Figure C.33 – Bonnet gasket replacement

Disassembling

- Step 1** › Unscrew nuts (Pos.9)
- Step 2** › Lift upwards bonnet (Pos.2) together with following parts from the body (Pos.1)
 - › electric actuator (Pos.29)
 - › stem (Pos.6)
 - › gland (Pos.12)
 - › plug (Pos.3)
- Step 3** › Remove old bonnet gasket (Pos.10)
- 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.10)
- Step 2** › Put down bonnet (Pos.2) to the body (Pos.1)
- Step 3** › Put back and screw nuts (Pos.9)
- Step 4** › Tighten nuts (Pos.9) according to Table (C.12)

14.6 Possible Malfunctions & Solutions

- During the period of usage of the installed high-pressure 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 C.13

Table C.13

Failure	Possible cause	Troubleshooting
Absence of flow	VENR is in closed position	Open the VENR completely with the handwheel (Pos.26)
	Protection covers are not removed	Remove protection covers from connection ends
Difficult manipulation	Dry stem /stem nut	Grease stem (Pos.6) or stem nut (Pos.7)
	Gland nuts are too tight	Slightly loosen gland nuts (Pos.16) with precaution to preserve sealing of the stem packing rings (Pos.11)
Leakage on stem packing	Gland nuts are not tightened	Tighten gland nuts (Pos.16)
	Stem packing rings are damaged	Completely open the control 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.11)
Leakage on bonnet gasket	Nuts are not tightened	Tighten nuts (Pos.9)
	Bonnet gasket is damaged	Disassemble the bonnet (Pos. 2) and replace the bonnet gasket (Pos.10) with new one
Leaking on seat	VENR 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
	Differential pressure too high	Check installed control valve allowable flow direction
	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

14.7 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 GUIDANCE

15. RFQ FORM

Control valve data sheets according to EN 60534-7. To better define the technical characteristics of the product, it is recommended to provide the following data and parameters when submitting an inquiry:

					CONTROL VALVE DATA SHEET				Tag No.													
									Serial No.													
1	2	3	4	5					1	2	3	4	5									
SEL	ITEM	REV	MAIN	TERMS & DEFINITIONS					SEL	ITEM	REV	MAIN	TERMS & DEFINITIONS									
	1			Location						57			MFR									
	2			Service						58			Model									
	3			Haz. area class		IP Code					59			Pneumatic ☐ diaphragm ☐ piston ☐								
	4			Ambient temp. min.		max.					60			Style ☐ sprg. return ☐ double act. ☐								
	5			Allowable sound pressure level				dB(A)			61			Size eff area cm²								
	6			Upstr. pipe NPS/DN		SCH		t(mm)			62			Supply press. min. max. bar g								
	7			Downstr. pipe NPS/DN		SCH		t(mm)			63			Bench range bar g								
	8			Pipe class		Material					64			Stroking time min max s frequency /min								
	9			Pipe insulation ☐ thermal ☐ acoustic							65			Air connection								
	10			Design: Press. bar g		Temp. max min °C					66			Other actuator ☐ elect. ☐ hydraulic ☐ manual								
	11			Pipe connection upstr. downstr.							67			Act. force/torque min max unit								
	12			Process fluid								68			manual override ☐ no ☐ mechanical ☐ hydraulic							
	13			Upstream cond. ☐ liquid ☐ vapour ☐ gas ☐ 2phase								69			limit stops ☐ closed ☐ % travel ☐ open							
	14			Special fluid properties:								70			MFR							
	15			Flow rate		Min.		Norm.		Max.		Unit			71			Model				
	16			Inlet press. P1											72			Input signal ☐ pneum. ☐ electric analog ☐ digital				
	17			Outlet press. P2											73			Valve open at Valve closed at				
	18			Temperature T1											74			Style ☐ single act. ☐ double act.				
	19			Inlet density p1 or M											75			Characteristic ☐ linear ☐ eq% ☐ modified				
	20			Vapour pressure Pv											76			Air connection Electr.connection				
	21			Critical pressure Pc											77			Accessories ☐ bypass ☐ gauges				
	22			Viscosity											78			Protection mode				
	23			Specific heat ratio y								1			79			Digital comm. ☐ HART ☐ FF ☐ Profibus ☐				
	24			Comp.fact. Z1								1			80			MFR				
	25			Gas/vapour mass fract.								%			81			Switch type ☐ mech. ☐ proximity ☐				
	26			Shutoff press. P1		P2		Unit							82			Switching pos. ☐ closed ☐ % travel ☐ open				
	27			Air supply min.		max.		Unit							83			Switch acting ☐ N.O. ☐ N.C.				
	28			Power fail position ☐ open ☐ closed ☐ hold									84			Protection mode						
	29			Signal fail position ☐ open ☐ closed ☐ hold									85			Assembly ☐ external ☐ built-in						
	30			Calc. C ☐ Kv ☐ Cv											86			MFR				
	31			Valve ☐ XT ☐ FL								1			87			Valve type ☐ 2 way ☐ 3/2 way ☐ 5/2 way				
	32			Relative travel								%			88			De-energ.: control valve ☐ open ☐ closed ☐ hold				
	33			Predicted LpA								dB(A)			89			☐ digital operated				
	34									</												



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