mg engineering Lurgi	**SAMSON AG** **Control Valves** **MECHANICAL CATALOGUE**	Owner: ZAGROS PETROCHEMICAL COMPANY (ZPC)

PRODUCT DATA SHEETS

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Series 240

Pneumatic Control Valves Type 241-1 and Type 241-7
Globe Valve Type 241

ANSI version

Application

Control valve for process engineering and plants with industrial requirements

Nominal sizes	**½" to 10"**
Nominal pressures	**ANSI Class 125 to 300**
Temperatures	**–320 °F to +800 °F (–196 °C to +427 °C)**
Standards	**ANSI, ASME and ASTM**

Conversion of valve sizing coefficients:
C_v (in US gallons/min) = 1.17 · K_{vs} (in m^3/h)
K_{vs} (in m^3/h) = 0.86 · C_v (in US gallons/min)

Type 241 Globe Valve with
- Type 3271 Pneumatic Actuator (Type 241-1 Control Valve)
- Type 3277 Pneumatic Actuator (Type 241-7 Control Valve) for integral positioner attachment

Valve body optionally made of
- Cast iron
- Carbon steel
- Stainless carbon steel according to ASTM specifications
- Forged steel or stainless forged steel
- Stainless carbon steel

Undivided valve bonnet up to nominal size 6"

Valve plug optionally with
- Metal sealing
- Soft sealing
- Lapped-in metal

Thanks to their modular design, the control valves can be equipped with different accessories:
Positioners, solenoid valves and other accessories according to (DIN) IEC 534-6 and NAMUR recommendation. Refer to Information Sheet T 8350 EN for details.

Versions

Standard version · For temperatures from 15 °F to 430 °F (–10 °C to +220 °C)
- **Type 241-1** (Fig. 1) · Nominal sizes ½" to 10" with Type 3271 Pneumatic Actuator (see Data Sheet T 8310 EN)
- **Type 241-7** (Figs. 2 and 4) · Nominal sizes ½" to 6", valve made of forged steel in size 3", with Type 3277 Pneumatic Actuator for integral positioner attachment (see T 8311 EN)

Additional versions with
- **NPT threaded connections** (Fig. 3) · ½" to 2", Class 250
- **Adjustable packing** · On request
- **Flow divider** for noise reduction · See T 8081 EN
- **Insulating section or bellows seal** · See "Technical data"
- **Heating jacket** · On request
- **Additional handwheel** · See Data Sheet T 8310 EN
- **Dimensions according to DIN** · See Data Sheet T 8015 EN
- **Dimensions acc. to Japanese standards** (JIS) · On request
- **Typetested version** · See Data Sheets T 8016 EN, T 8020 EN and T 8022 EN

Fig. 1 · Type 241-1, sizes ½" to 10"

Fig. 2 · Type 241-7, sizes ½" to 6"

Fig. 3 · Type 241-1 with NPT thread

Fig. 4 · Type 241-7, sizes ½" to 3", forged steel version

Fail-safe action

Depending on the arrangement of the compression springs in the actuator (details in Date Sheets T 8310 EN and T 8311 EN), the control valve offers two fail-safe actions which become effective upon a supply air failure.

"Actuator stem extends" (fail-close)
The actuator springs close the valve when the supply air fails.

"Actuator stem restracts" (fail-open)
The actuator springs open the valve when the supply air fails.

Notes on the differential pressure tables 4a to 5d

The differential pressure tables were prepared under the following conditions:

- For valves in nominal sizes ½" to 3" and actuators with an effective area of 700 cm^2, the max. permissible supply pressure is 4 bar.
- Process medium flow directed against the closing direction of the valve plug
- Version with PTFE stuffing box
- The leakage rates specified in Table 1 are not exceeded for the max. differential pressures listed.
- The specified differential pressure can be limited by the values given in the pressure-temperature diagram.

For versions with metal bellows seal and $p_2 \neq 0$ psi, the sizing of the actuator needs to be checked separately.

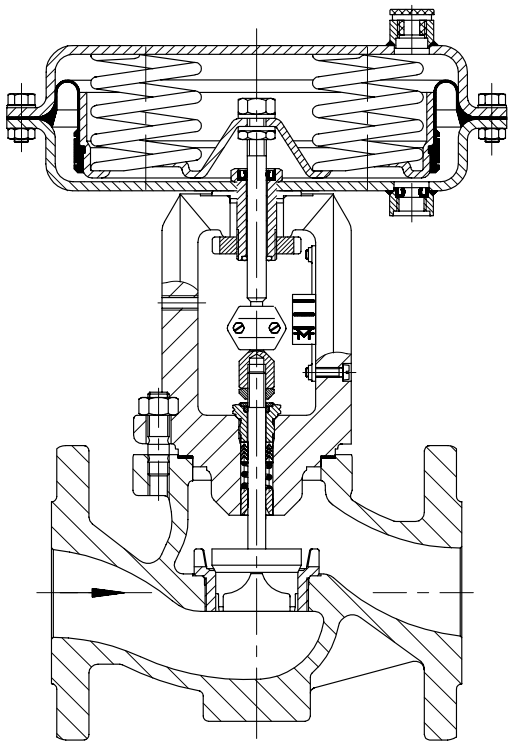


Fig. 4 · Type 241 Globe Valve, sizes ½" to 6" with Type 3271 Pneumatic Actuator

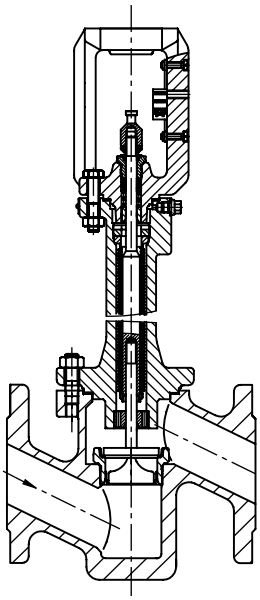


Fig. 5 · Type 241 Globe Valve, sizes ½" to 3" Forged steel version with metal bellows seal

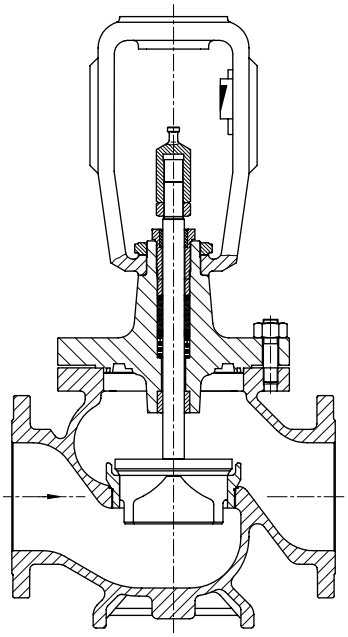


Fig. 6 · Type 241 Globe Valve, sizes 8" to 10"

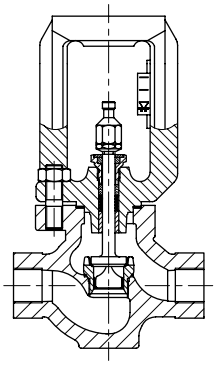


Fig. 7 · Type 241 Globe Valve, sizes ½" to 2" with NPT thread

Table 1 · Technical data

Nominal size in			1″ ... 6″	½″ ... 2″	½″ ... 10″	½, 1, 1½, 2, 3	½″ ... 10″	½, 1, 1½, 2, 3
ASTM material			A 126 B		A 216 WCC	A 105	A 351 CF8M	A 182 F316
Type of connection			Flange	Thread	Flange		Flange	
Form of connection			FF	NPT	RF [1]		RF [1]	
Nominal pressure ANSI Class			125	250	150/300	300	150/300	300
Seat/plug sealing			Metal sealing, soft sealing or lapped-in metal					
Characteristic			Equal percentage or linear					
Rangeability			50:1 for ½″ ... 2″ · 30:1 for 2½″ ... 10″					
Temperature ranges °C (°F) · Perm. operating pressures according to the pressure-temperature diagram (see Information Sheet T 8000-2 EN)								
Body without insulating section			–10 ... 220 °C (15 ... 430 °F)					
Body with	Insulating section	Short	–29 ... 230 °C (–20 ... 445 °F)		–29 ... 427 °C (–20 ... 800 °F)		–50 ... 427 °C (–58 ... 800 °F)	
		Long	–		–		–198 ... 427 °C (–325 ... 800 °F)	
	Bellows seal	Short	–29 ... 230 °C (–20 ... 445 °F)		–29 ... 427 °C (–20 ... 800 °F)		–50 ... 427 °C (–58 ... 800 °F)	
		Long	–		–		–198 ... 427 °C (–325 ... 800 °F)	
Valve plug	Standard	Metal sealing	–196 ... 450 °C (–325 ... 840 °F)					
		Soft sealing	–196 ... 220 °C (–325 ... 428 °F)					
	Balanced	With PTFE ring	–196 ... 220 °C (–325 ... 428 °F)					
		With graph. ring[2]	+220 ... 450 °C (+430 ... 800 °F)					
Leakage class according to DIN EN 1349								
Valve plug	Standard	Metal sealing	IV					
		Soft sealing	VI					
		Lapped-in metal	IV-S2 · For 4″ and larger: IV-S1					
	Balanced	Metal sealing	With PTFE ring: IV · With graphite ring: III					

1) Other versions on request

2) Special version, details on request

Table 2 · Materials (WN = material number according to DIN)

Standard version					
Valve body [1]	Cast iron A 126 B	Carbon steel A 216 WCC	Forged steel A 105	Stainless carbon steel A 351 CF8M	Stainless forged steel A 182 F316
Valve bonnet	A 105			A 182 F 316	
Seat and plug [2]	WN 1.4006			WN 1.4571	
	Sealing ring for soft sealing: PTFE with glass fiber				
	Sealing ring for balanced plug: PTFE with carbon				
Guide bushings	WN 1.4104			WN 1.4571	
Stuffing box packing [3]	PTFE V-ring packing with carbon · Spring: WN 1.4310				
Body gasket	Metal graphite				
Insulating section	A 105			A 182 F 316	
Metal bellows seal					
Intermediate piece	A 105			A 182 F 316	
Metal bellows	WN 1.4571				
Heating jacket	On request				

1) See pressure-temperature diagram, other materials on request

2) All seats and plugs with metal sealing also available with stellite facing; for nominal sizes ≤ 4″, plugs up to seat bore SB 48 are also available made of pure stellite.

3) Other packings available on request

Table 3 · C_v and K_{vs} values

Table 3a · **Overview** (with Flow Divider St I (C_v I, K_{vs} I) or St III (C_v III, K_{vs} III))

C_v		0.12	0.2	0.3	0.5	0.75	1.2	2	3	5	7.5	12	20	30	40	70	75	95	120	190	290	300	420	735
K_{vs}		0.1	0.16	0.25	0.4	0.63	1.0	1.6	2.5	4.0	6.3	10	16	25	35	60	63	80	100	160	250	260	360	630
C_v I		–						1.7	2.6	4.2	7	10.5	17	26	36	62	67	85	105	170	265	275	375	650
K_{vs} I		–						1.45	2.2	3.6	5.7	9	14.5	22	31	54	57	72	90	144	225	234	320	560
C_v III		–										9	–	23	30	–	55	–		140	220	–	315	–
K_{vs} III		–										7.5	–	20	26	–	47	–		120	190	–	270	–
Seat Ø D	in	0.12			0.24			0.47			0.945		1.22	1.5	1.9	2.48		3.15		3.94	4.92	5.12	5.91	7.87
	mm	3			6			12			24		31	38	48	63		80		100	125	130	150	200
Travel	in	0.59															1.18	0.59	1.18		2.36	1.18	2.36	
	mm	15															30	15	30		60	30	60	

Table 3b · **Versions without flow divider** · Versions in highlighted fields also available with balanced valve plugs

C_v		0.12	0.2	0.3	0.5	0.75	1.2	2	3	5	7.5	12	20	30	40	70	75	95	120	190	290	300	420	735
K_{vs}		0.1	0.16	0.25	0.4	0.63	1.0	1.6	2.5	4.0	6.3	10	16	25	35	60	63	80	100	160	250	260	360	630
in/mm																								
½	15	•	•	•	•	•	•	•	•	•														
¾	20	•	•	•	•	•	•	•	•	•	•													
1	25	•	•	•	•	•	•	•	•	•	•	•												
1½	40				•	•	•	•	•	•	•	•	•	•										
2	50				•	•	•	•	•	•	•	•	•	•	•									
2½	65													•	•	•								
3	80													•	•	•		•						
4	100																•		•	•				
6	150																•		•	•		•		
8	200																				•		•	•
10	250																				•		•	•

Table 3c · **Versions with Flow Divider St I (C_vI/K_{vs}I)** · Versions in highlighted fields also available with balanced valve plugs

C_vI		–						1.7	2.6	4.2	7	10.5	17	26	36	62	67	85	105	170	265	275	375	650
K_{vs}I		–						1.45	2.2	3.6	5.7	9	14.5	22	31	54	57	72	90	144	225	234	320	560
in/mm																								
½	15							•	•	•														
¾	20							•	•	•														
1	25							•	•	•														
1½	40										•	•	•	•										
2	50										•	•	•	•	•									
2½	65													•	•	•								
3	80													•	•	•		•						
4	100																•		•	•				
6	150																•			•		•		
8	200																				•		•	•
10	250																				•		•	•

Table 3d · **Versions with Flow Divider St III (C_vIII/K_{vs}III)** · Versions in highlighted fields also available with balanced valve plugs

C_vIII		–										9	–	23	30	–	55	–	–	140	220	–	315	–
K_{vs}III		–										7.5	–	20	26	–	47	–	–	120	190	–	270	–
in/mm																								
½	15																							
¾	20																							
1	25																							
1½	40																							
2	50											•												
2½	65													•	•									
3	80													•	•									
4	100																•							
6	150																•			•				
8	200																				•		•	
10	250																				•		•	

Terms for control valve sizing according to (DIN) IEC 534, Parts 2-1 and 2-2: $F_L = 0{,}95$, $x_T = 0{,}75$
Conversion of valve sizing coefficients: C_v (US gallons/min.) = 1.17 · K_{vs} (m^3/h); K_{vs} (in m^3/h) = 0.86 · C_v (in US gallons/min)

Table 4 · Differential pressure tables · Unbalanced valve plug

Values specified in the fields highlighted in gray correspond to the bench range, i.e. operation at rated travel · Differential pressures given in the white fields apply for maximally pretensioned springs · Values given in parenthesis apply for 50 % of travel

Observe the notes concerning the differential pressure tables in page 2.

Table 4a · Permissible differential pressures Δp · Pressures given in bar

For valve with fail-safe action "Actuator stem extends" · Valve closed at supply pressure 0 bar

Bench range (bar) for actuators (cm^2)												
		240	0.2...1.0	0.3...1.1	0.4...2.0 (1.2...2.0)	–	0.6...2.2	0.6...3.0[1] (1.8...3.0)	0.9...3.3	–	–	–
		120, 350, 700		0.4...1.2			0.8...2.4		1.2...3.6		1.4...2.3 (1.85...2.3)	2.1...3.3 (2.7...3.3)
		1400	–	–		0.5...2.5		–		1.0...3.0	–	–
		2800		0.8 ... 1.2	–	2.0 ... 3.0	1.6...2.4		2.4...3.6	–		
Required supply pressure (bar)			1.2	1.4	2.2	2.7	2.6	3.2	3.8	3.2	2.5	3.5
Size in	C_v	Actuator cm^2	Δp with p_2 = 0 bar									
½″ to 1″	0.12 to 0.3	120	22	–	49	–	–	–	–	–	–	–
		240	49	50	–	–	–	–	–	–	–	–
½″ to 2″	0.5 to 1.2	120	22	–	49	–	–	–	–	–	–	–
		240	49	50	50	–	–	–	–	–	–	–
	2	120	9	–	28	–	–	–	–	–	50	–
	3	240	28	47	50	–	50	50	50	–	–	–
	5	350	45	50	50	–	50	50	–	–	50	–
¾″ to 2″	7.5	120	–	–	5.5	–	–	–	–	–	30	46
		240	5.2	9.3	14.8	–	24	24	39	–	–	–
	12	350	10	24	24	–	38	38	50	–	50	50
		700	–	–	(50)	–	–	–	–	–	–	–
1½″ and 2″	20	120	–	–	3	–	–	–	–	–	18	28
		240	2.5	5.2	8.0	–	14	14	23	–	–	–
		350	5.2	13.5	13.5	–	30	22	47	–	50	50
		700	–	–	(50)	–	–	(50)	–	–	–	–
1½″ to 3″	30	120	–	–	1.5	–	–	–	–	–	12	19
		240	1.3	3.1	5.0	–	9.0	9.0	15	–	–	–
		350	3.1	8.5	8.5	–	20	14	31	–	37	50
		700	–	–	(50)	–	–	(50)	–	–	–	–
2″ to 3″	40	240	–	–	3.0	–	5.0	5.0	9.0	–	–	–
		350	1.6	5.0	5.0	–	12	8.5	19	–	23	35
		700	–	–	(40)	–	–	(50)	–	–	–	–
2½″ and 3″	70	240	–	–	1.4	–	2.8	2.8	5.0	–	–	–
		350	0.8	2.7	2.7	–	6.5	4.5	10.5	–	13	20
		700	–	–	(23)	–	–	(35)	–	–	(36)	(50)
3″	95	240	–	–	0.6	–	1.5	1.5	2.8	–	–	–
		350	–	1.4	1.4	–	4.0	2.7	6.5	–	8	12
		700	–	–	1.4	–	–	(21)	–	–	(22)	(33)
4″	75	700	2.6	6.5	6.5	–	15	10.5	23	–	27	41
4″	120	700	1.4	4.0	4.0	–	9.0	6.5	14	–	16.5	25
4″, 6″	190	700	0.7	2.3	2.3	–	5.5	4.0	8.5	–	10.5	15.5
6″	300	700	0.3	1.2	1.2	–	3.0	2.2	6.0	–	6.0	9.5
8″ and 10″	290	1400	–	3.4	3.4	4.4	7.5	–	–	9.6	–	–
		2800	–	15.8	–	40	32.4	–	48	–	–	–
	420	1400	–	2.3	2.3	3.0	5.1	–	–	6.6	–	–
		2800	–	10.8	–	28.2	22.4	–	33.9	–	–	–
	735	1400	–	–	–	1.6	2.8	–	–	3.6	–	–
		2800	–	6	–	15.8	12.5	–	19	–	–	–

[1] Not for actuators with an effective area of 120 cm^2

Table 4b · Permissible differential pressures Δp · Pressures given in psi
For valve with fail-safe action "Actuator stem extends" · Valve closed at supply pressure 0 psi

Bench range (psi) for actuators (cm^2)												
	240	3...15	4...17	6...30 (18...30)	–	9...32	9...44[1] (26...44)	13...48	–	–	–
	120, 350, 700		6...18			12...35		18...52		20...34 (26...34)	30...40 (39...50)
	1400	–	–		7...36		–		15...44	–	–
	2800		12 ... 18	–	30 ... 44	23...35	–	34...52	–		
Required supply pressure (psi)		18	21	33	39	38	47	55	47	38	55

Size in	C_v	Actuator cm^2	Δp with p_2 = 0 psi									
½" to 1"	0.12 to 0.3	120	320	–	710	–	–	–	–	–	–	–
		240	710	725	–	–	–	–	–	–	–	–
½" to 2"	0.5 to 1.2	120	320	–	710	–	–	–	–	–	–	–
		240	725	725	725	–	–	–	–	–	–	–
	2	120	130	–	405	–	–	–	–	–	725	–
	3	240	406	680	725	–	725	725	725	–	–	–
	5	350	650	725	725	–	725	725	–	–	725	–
¾" to 2"	7.5	120	–	–	80	–	–	–	–	–	435	665
		240	75	135	215	–	350	350	565	–	–	–
	12	350	145	350	350	–	550	550	725	–	725	725
		700	–	–	(725)	–	–	–	–	–	–	–
1½" and 2"	20	120	–	–	44	–	–	–	–	–	260	405
		240	36	75	115	–	200	200	335	–	–	–
		350	75	195	195	–	435	320	680	–	725	725
		700	–	–	(725)	–	–	(725)	–	–	–	–
1½" to 3"	30	120	–	–	22	–	–	–	–	–	175	275
		240	19	45	72	–	130	130	218	–	–	–
		350	45	125	125	–	290	200	450	–	535	725
		700	–	–	(725)	–	–	(725)	–	–	–	–
2" to 3"	40	240	–	–	43	–	72	72	130	–	–	–
		350	23	72	72	–	175	123	275	–	330	507
		700	–	–	(580)	–	–	(725)	–	–	–	–
2½" and 3"	70	240	–	–	20	–	40	40	72	–	–	–
		350	12	39	39	–	94	65	152	–	190	290
		700	–	–	(333)	–	–	(507)	–	–	(520)	(725)
3"	95	240	–	–	9	–	22	22	40	–	–	–
		350	–	20	20	–	58	339	94	–	115	174
		700	–	–	20	–	–	(305)	–	–	(320)	(475)
4"	75	700	38	94	94	–	217	152	333	–	390	595
4"	120	700	20	58	58	–	130	94	203	–	239	362
4", 6"	190	700	10	33	33	–	80	58	123	–	152	225
6"	300	700	4.4	17	17	–	43	32	85	–	85	135
8" and 10"	290	1400	–	49	49	64	110	–	–	139	–	–
		2800	–	230	–	580	470	–	695	–	–	–
	420	1400	–	33	33	43	74	–	–	95	–	–
		2800	–	157	–	410	325	–	490	–	–	–
	735	1400	–	–	–	23	41	–	–	52	–	–
		2800	–	87	–	229	181	–	276	–	–	–

[1] Not for actuators with an effective area of 120 cm^2 (18.6")

Tables 4c and 4d · Permissible differential pressures Δp
For valve with fail-safe action "Actuator stem retracts" · Valve closed at required differential pressure

Bench range (bar/psi) for actuator (cm^2)		**Table 4c** · Pressures in **bar**			**Table 4d** · Pressures in **psi**		
120 ... 2800		0.2 ... 1.0			3 ... 15		
1400		(0.4 ... 2.0)			(6 ... 30)		
2800		(0.3 ... 1.1)			(4 ... 17)		
Required supply pressure (bar/psi)		1.2	2.4	4	18	36	58
Size in	C_v / Actuator cm^2	Δp with p_2 = 0 bar			Δp with p_2 = 0 psi		
½″ to 1″	0.12 to 0.3 / 120	23	50	–	330	725	–
	240	49	–	–	710	–	–
½″ to 2″	0.3 to 1.2 / 120	23	50	–	330	725	–
	240	49	50	–	710	725	–
	2 / 120	9	50	–	130	725	–
	3 / 240	28	50	–	410	725	–
	5 / 350	45	50	–	650	725	–
¾″ to 2″	7.5 / 120	0.6	31	50	10	450	725
	240	5.2	50	50	80	725	725
	12 / 350	10	50	50	145	725	725
	700	24	50	–	350	725	–
1½″ and 2″	20 / 120	–	18	40	–	260	580
	240	2.5	37	50	35	540	725
	350	5.2	50	50	75	725	725
	700	13.5	50	–	200	725	–
1½″ to 3″	30 / 120	–	11	28	–	160	410
	240	1.3	24	50	20	350	725
	350	3.1	37	50	45	540	725
	700	8.7	50	50	130	725	725
2″ to 3″	40 / 240	0.5	15	34	10	220	490
	350	1.6	23	50	25	330	725
	700	5.0	46	50	75	665	725
2½″ and 3″	70 / 240	–	8.5	20	–	120	290
	350	0.6	13	29	10	190	420
	700	2.7	27	50	40	390	725
3″	95 / 240	–	5.0	12	–	75	170
	350	0.2	7.8	18	5	110	260
	700	1.4	16	37	20	230	540
4″	75 / 700	2.6	27	50	40	390	725
4″	120 / 700	1.4	16	36	20	230	520
4″ and 6″	190 / 700	0.7	10	23	10	145	330
6″	300 / 700	0.3	6.0	13.5	5	85	200
8″ and 10″	290 / 1400	1.3	13.7	30.3	20	200	440
	2800	3.4	28.3	50	50	410	725
	420 / 1400	–	9.5	21.0	–	140	300
	2800	2.3	19.5	42	35	280	610
	735 / 1400	–	5.2	11.7	–	75	170
	2800	–	10.9	23.9	–	160	350

Table 5 · Differential pressure tables · Balanced plugs with metal sealing and PTFE ring

Values specified in the fields highlighted in gray correspond to the bench range, i.e. operation at rated travel · Differential pressures given in the white fields apply for maximally pretensioned springs

Fail-safe action "Actuator stem extends" · Valve closed at supply pressure 0 bar (0 psi)
Fail-safe action "Actuator stem retracts" · Valve closed at required supply pressure

Tables 5a and 5b · Permissible differential pressures Δp · Pressures given in bar

Table 5a · "Actuator stem extends"							**Table 5b · "Actuator stem retracts"**		
Bench range in bar			0.2...1.0	0.4...1.2	0.4...2.0	0.8...2.4	0.2...1.0	0.2...1.0	0.4...2.0
Required supply pressure in bar			1.2	1.4	2.2	2.6	1.2	2.0	3.0
Size in	C_v	Actuator cm^2	Δp with p_2 = 0 bar						
2½″	70	350	–	50	50	50	–	50	50
3″		700	50	50	–	–	50	–	–
3″	95	350	–	50	50	50	–	50	50
		700	50	50	–	–	50	–	–
4″	75	700	30	50	50	50	30	50	50
4″ 6″	190	700	–	50	50	50	12	50	50
6″	300	700	–	50	50	50	–	50	50

Tables 5c and 5d · Permissible differential pressures Δp · Pressures given in psi

Table 5c · "Actuator stem extends"							**Table 5d · "Actuator stem retracts"**		
Bench range in psi			3...15	6...18	6...30	12...36	3...15	3...15	6...30
Required supply pressure in psi			18	21	33	39	18	18	33
Size in	C_v	Actuator cm^2	Δp with p_2 = 0 psi						
2½″	70	350	–	725	725	725	–	725	725
3″		700	725	725	–	–	725	–	–
3″	95	350	–	725	725	725	–	725	725
		700	725	725	–	–	725	–	–
4″	75	700	440	725	725	725	440	725	725
4″ 6″	190	700	–	725	725	725	170	725	725
6″	300	700	–	725	725	725	–	725	725

Table 6 · Differential pressure tables · Valves with metal bellows seal and balanced plug with metal sealing and PTFE ring

Values specified in the fields highlighted in gray correspond to the bench range, i.e. operation at rated travel · Differential pressures given in the white fields apply for maximally pretensioned springs · Values given in parenthesis apply for 50 % of travel

Fail-safe action "Actuator stem extends" · Valve closed at supply pressure 0 bar (0 psi)
Fail-safe action "Actuator stem retracts" · Valve closed at required supply pressure

Tables 6a and 6b · Permissible differential pressures Δp · Pressures given in bar

Table 6a · "Actuator stem extends"									**Table 6b · "Stem retracts"**		
Bench range in bar			0.2...1.0	0.4...1.2	0.4...2.0 (1.2...2)	0.8...2.4	0.6...3.0	1.2...3.6	0.2...1.0	0.4...2.0	0.6...3.0
Required supply pressure in bar			1.2	1.4	2.2	2.6	3.2	3.8	1.2	3.0	4.0
Size in	C_v	Actuator cm^2	Δp with p_2 = 0 bar								
2½″	70	350	–	17	17	50	36	50	–	–	50
3″		700	17	50	(50)	–	–	–	17	50	–
3″	95	350	–	12	12	50	31	50	–	–	50
		700	12	50	(50)	–	–	–	12	50	–
4″	75	700	5.0	17	17	50	30	50	5,0	–	50
4″ 6″	190	700	–	14	14	38	26	50	1,5	–	50
6″	300	700	–	11	11	35	23	50	–	–	50

Tables 6c and 6d · Permissible differential pressures Δp · Pressures given in psi

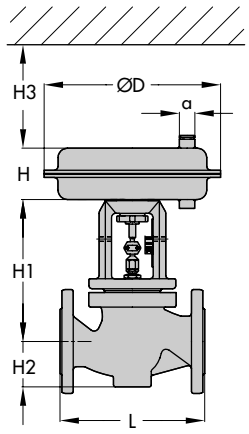
Table 6c · "Actuator stem extends"									**Table 6d · "Stem retracts"**		
Bench range in psi			3...15	6...18	6...30 (18...30)	12...36	9...44	18...52	3...15	6...30	9...44
Required supply pressure in psi			18	21	33	39	47	55	18	44	60
Size in	C_v	Actuator cm^2	Δp with p_2 = 0 psi								
2½″	70	350	–	250	250	725	520	725	–	–	725
3″		700	250	725	(725)	–	–	–	250	725	–
3″	95	350	–	170	174	725	450	725	–	–	725
		700	170	725	(725)	–	–	–	170	725	–
4″	75	700	75	250	250	725	440	725	75	–	725
4″ 6″	190	700	–	200	200	550	380	725	20	–	725
6″	300	700	–	160	160	510	330	725	–	–	725

Table 7 · Dimensions for standard version of Type 241-1 and Type 241-7

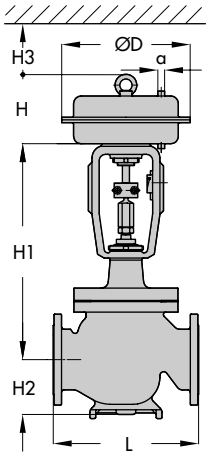
Valve		in	½″	¾″	1″	1½″	2″	2½″	3″	4″	6″	8″	10″
		mm	15	20	25	40	50	65	80	100	150	200	250
		NPT	½	¾	1	1½	2	–					
Length L	Class 125 and 150	in	7.25	7.25	7.25	8.75	10.0	10.87	11.75	13.87	17.75	21.38	26.49
		mm	184	184	184	222	254	276	298	352	451	543	673
	Class 300	in	7.50	7.62	7.75	9.25	10.50	11.50	12.50	14.50	18.62	22.36	27.87
		mm	191	194	197	235	267	292	318	368	473	568	708
Length L1	Class 250	in	6	6	6	8	9.25	–					
		mm	152.4	152.4	152.4	203.2	235	–					
H1 for actuator	≤ 700 cm²	in	8.66					10.24		13.78	15.34	–	
		mm	220					260		350	390	–	
	1400 cm²	in	–									31.7	
		mm	–									805	
	2800 cm²	in	–									41.73	
		mm	–									1060	
H2 (approx.)		in	1,77			2.84		3.86		4.45	6.89	9.25	10.24
		mm	45			72		98		113	175	235	260
H2 Forged steel version (approx.)		in	2.1	–	2.75	3.6	3.85	–	5.05	–			
		mm	53	–	70	92	98	–	128	–			

Actuator		cm^2	120	240	350	700	1400	2800
		in^2	18.6	37.2	54.25	108.5	217	434
Diaphragm ∅ D		in	6.6	9.45	11.02	15.35	20.87	30.31
		mm	168	240	280	390	530	770
H	(for 700 cm^2 and larger incl. lifting ring)	in	2.72	2.56	3.35	7.87	11.30	19.53
		mm	69	65	85	200	287	620
H3	(Type 3271 and Type 3277 Actuator) [1]	in	4.33			7.48	24.02	25.51
		mm	110			190	610	648
Thread			M 30 x 1.5				M 60 x 1.5	M 100 x 2
a	(for Type 3271 Actuator)		G ⅛ (⅛ NPT)	G ¼ (¼ NPT)	G ⅜ (⅜ NPT)		G ¾ (¾ NPT)	G 1 (1 NPT)
a2	(for Type 3277 Actuator)		–	G ⅜ (⅜ NPT)			–	

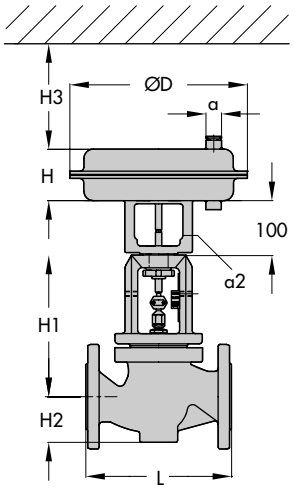
[1] Minimum clearance required to disassemble the actuator



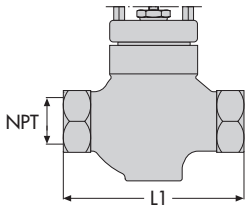
Type 241-1 · ½″ to 6″



Type 241-1 · 8″ and 10″



Type 241-7 · ½″ to 6″



Type 241 · ½ to 2 NPT

Table 8 · Weights for Type 241-1 and Type 241-7 Control Valves

Valve	in	½″	¾″	1″	1½″	2″	2½″	3″	4″	6″	8″	10″
	mm	15	20	25	40	50	65	80	100	150	200	250
Weight without actuator	lbs	11	13	15	26	33	53	66	92	264	728	840
	kg	5	6	7	12	15	24	30	42	120	330	380

Actuator	cm^2	120	240	350	700	1400	2800
	in^2	18.6	37.2	54.25	108.5	217	434
Weight Type 3271	lbs	6.6	11	18	48.5	154	772
	kg	3	5	8	22	70	450
Weight Type 3277	lbs	7.7	20	26.5	57.5	–	
	kg	3.5	9	12	26	–	

Table 9 · Dimensions and weights for special versions with insulating section or metal bellows · (without actuator)

Table 9a · Nominal sizes ½″ to 6″ and NPT thread ½″ to 2″

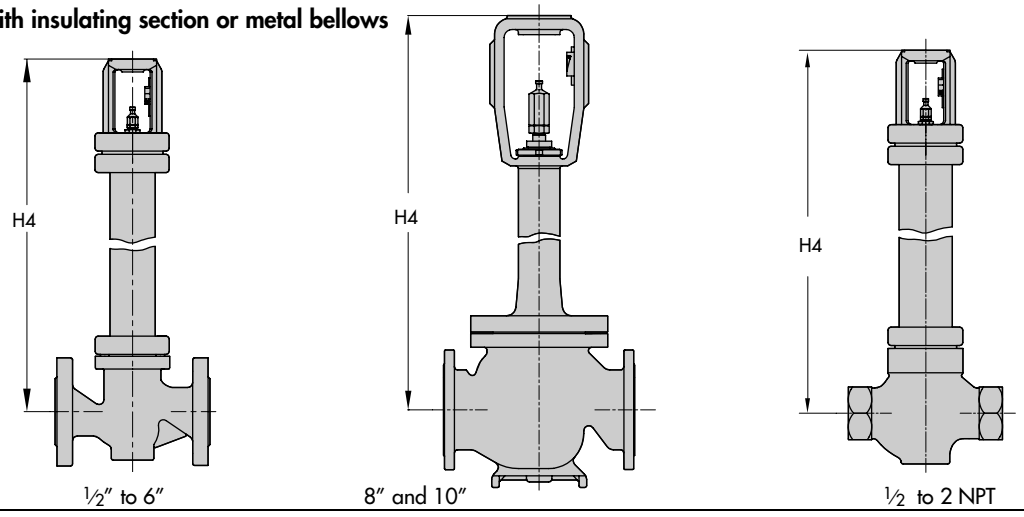
Valve		in	½″	¾″	1″	1½″	2″	2½″	3″	4″	6″
		mm	15	20	25	40	50	65	80	100	150
Height H4	Short insul. sect./bellows	in	15.95			15.95		17.13		25	25.79
		mm	405			405		435		635	655
	Long insul. sect./bellows	in	27.95			27.56		29.13		34.45	38.78
		mm	710			700		740		875	985
Weight (approx.)		lbs	18	20	22	40	46	71	84	132	330
		kg	8	9	10	18	21	32	38	60	150

Table 9b · Nominal sizes 8″ and 10″

Version with		Insulating section		Metal bellows	
Actuator	cm^2	1400	2800	1400	2800
	in^2	217	434	217	434
H4 in sizes 8″, 10″	in	49.21	52.56	57.21	60.63
	mm	1250	1335	1453	1540
Weight (approx. lbs) in	8″	840	885	860	905
	10″	950	995	970	1015
Weight (approx. kg) in	8″	380	400	390	410
	10″	430	450	440	460

Dimensions and weights for versions with heating jacket on request

Type 241 with insulating section or metal bellows



Ordering text:

Nominal size	... ″
Nominal pressure	ANSI Class ...
Body material	According to Table 2
Connection	Flanges (form FF or RF) or NPT thread
Plug	Standard, balanced, with metal sealing, soft sealing or lapped-in metal
Characteristic	Equal percentage or linear
Actuator	Type 3271 or Type 3277 as described in T 8310 EN or T 8311 EN
Fail-safe action	Valve CLOSED or valve OPEN
Process fluid	Density in lb/cu.ft or kg/m^3 and temperature in °F or °C
Flow rate	In lbs/h or kg/h or cu.ft/min or m^3/h at standard or operating conditions
Pressure	p_1 in bar (absolute pressure p_{abs}) p_2 in bar (p_{abs}) at minimum, standard and maximum flow rate
Accessories	Positioner and/or limit switch

Specifications subject to change without notice.

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Series 250

Pneumatic Control Valves Type 3251-1 and Type 3251-7
Globe Valve Type 3251

ANSI version

Application

Control valve for process engineering applications with high industrial requirements

Nominal sizes	**½" to 8"**
Nominal pressure	**ANSI Class 150 to Class 2500**
Temperatures	**–200 to 500 °C (–325 to 930 °F)**

Type 3251 Globe Valve optionally operated with a:

- Type 3271 Pneumatic Actuator (Type 3251-1 Control Valve)
- Type 3277 Pneumatic Actuator (Type 3251-7 Control Valve) for integrated positioner attachment

Valve body optionally made of:

- Carbon steel
- Stainless carbon steel or
- High-temperature (heat-treated) or cold-resisting carbon steel

Low-noise valve plugs optionally with:

- Metal sealing
- Soft sealing or
- Lapped-in metal sealing
- Balanced for handling large differential pressures

The control valves, designed according to the modular assembly principle, can be equipped with various accessories:

Positioners, limit switches, solenoid valves and other equipment according to IEC 60534-6 and NAMUR recommendation (see Information Sheet T 8350 EN for details).

Versions

Standard version with PTFE packing for temperatures from –10 to 220 °C (15 to 428 °F) or with adjustable high-temperature (HT) packing for temperatures for –10 to 350 °C (15 to 660 °F), nominal sizes ½" to 8", ANSI Class 150 to 900

Type 3251-1 (Fig. 1) · Type 3251 Valve and Type 3271 Actuator with 350 to 2800 cm^2 effective areas (see Data Sheet T 8310 EN)

Type 3251-7 · Type 3251 Valve with Type 3277 Actuator with 350 or 700 cm^2 effective areas (see Data Sheet T 8311 EN)

Further versions with

- **Class 1500 and 2500** · On request
- **Welding ends or welding-neck ends** acc. ANSI B16.25
- **Flow divider** · For noise level reduction, see T 8081 EN
- **AC Trim)** · See Data Sheets T 8082 EN and T 8083 EN
- **Insulating section or bellows seal** · See Technical data
- **Heating jacket** · Details on request
- **Additional handwheel** · See T 8310 EN and T 8311 EN
- **Version according to DIN standards** · DN 15 to 200, nominal pressure PN 16 to 400, see Data Sheet T 8051 EN

Fig. 1 · Type 3251-1 Pneumatic Control Valve with Type 3271 Pneumatic Actuator

- **Type 3251-3 Hand-operated Valve** · With Type 3273 Hand-operated Actuator, for valves with max. 30 mm rated travel, see Data Sheet T 8312 EN
- **Type 3251-2 Electric Control Valve** · Details on request

Associated Information Sheet	**T 8000 EN**	**Edition May 2003**	
Information Sheet for Actuators	**T 8300 EN**	**Data Sheet**	**T 8052 EN**

Principle of operation

The process medium flows through the valve in the direction indicated by the arrow. The valve plug position determines the cross-sectional area of flow.

The version with the metal bellows seal (Fig. 4) is equipped with a test connection to allow the monitoring of the stainless steel bellows.

A pressure-balanced plug (Fig. 3) can be used when high pressures or differential pressures act on the valve plug and the force produced by the actuator is insufficient.

The control valves can be equipped with a St I or St III Flow Divider (Fig. 4, see Data Sheet T 8081 EN for details).

Fail-safe positions

Depending on how the compression springs are arranged in the actuator (see Data Sheets T 8310 EN and T 8311 EN for details), the control valve offers two different fail-safe positions effective upon air supply failure:

"Actuator stem extends" (fail-close):
Upon air supply failure, the force of the compression springs causes the valve to close.

"Actuator stem retracts" (fail-open):
Upon air supply failure, the force of the compression springs causes the valve to open.

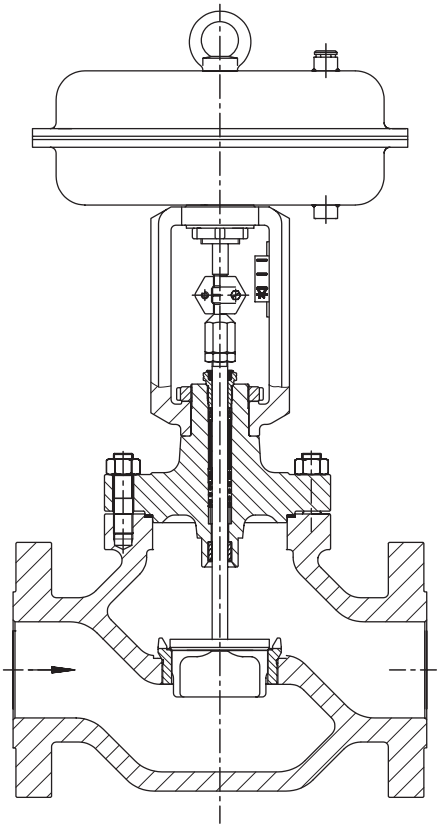


Fig. 2 · Type 3251-1 Control Valve with Type 3271 Pneumatic Actuator

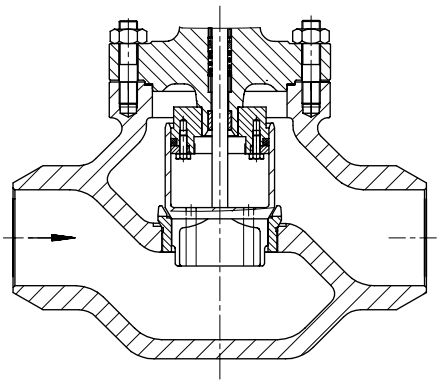


Fig. 3 · Type 3251 Globe Valve with welding ends and balanced valve plug

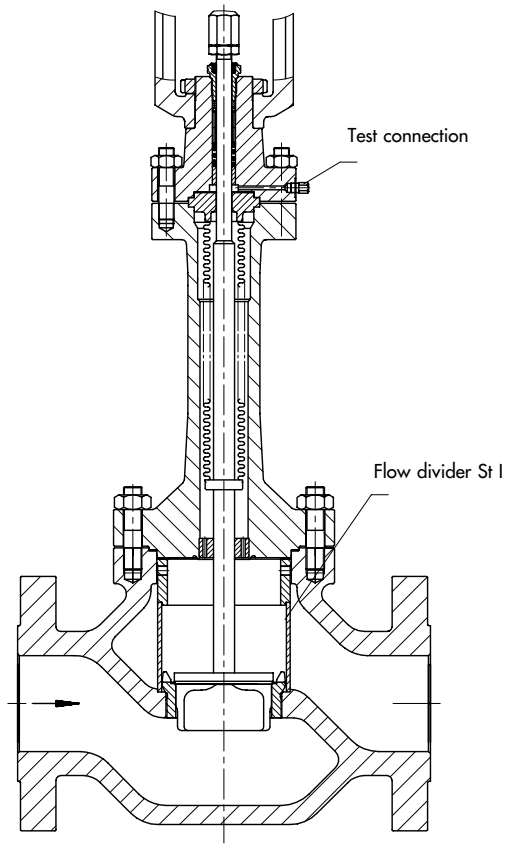


Fig. 4 · Type 3251 Globe Valve with St I Flow Divider and additional metal bellows seal with test connection

Table 1 · Technical Data for Type 3251 Globe Valve

Materials			Carbon steel A 216 WCC	Carbon steel A 217 WC6	Stainless carbon steel A 351 CF8M
Nominal sizes			½" ... 6" · 8" in Class 600		
Nominal pressure [1]		Class	150 ... 900		
End connection		Flanges	All ANSI versions		
		Welding ends	Acc. to ANSI B 16.25		
Plug sealing			Metal sealing, soft sealing or lapped-in metal sealing		
Characteristic			Equal percentage or linear		
Rangeability			50 : 1		
Temperature ranges in °C (°F) · Permissible operating pressures acc. to pressure-temperature diagrams (see Information Sheet T 8000-2 EN)					
Valve body without insulating section			–10 ... 220 °C (14 ... 428 °F) · Up to 350 °C (660 °F) with high-temperature packing		
Body with		Insulating section	–29...427 °C (–20...800 °F)	–29...500 °C (–20...930 °F)	–200...427 °C (–328...800 °F)
		Bellows seal	–29...427 °C (–20...800 °F)	–29...500 °C (–20...930 °F)	–200...427 °C (–328...800 °F)
Valve plug[2]	Standard	Metal sealing	–200...500 °C (–325...930 °F)		
		Soft sealing	–200...220 °C (–325...428 °F)		
	Balanced	PTFE ring	–200...220 °C (–325...428 °F)		
		Graphite ring	220...500 °C (428...930 °F)		
Leakage class according to DIN EN 1349: 2000 / ANSI/FCI 70-2-1991					
Valve plug	Standard	Metal sealing	IV		
		Soft sealing	VI		
		Lapped-in metal	IV-S2 · 4" and upwards: IV-S1		
	Balanced, metal sealing		With PTFE ring: IV · With graphite ring: III		

[1] Up to Class 2500 on request.

[2] Only in combination with a suitable body material.

Table 2 · Materials (WN = Material Number according to EN European standard)

Standard version Valve body and flanges [1]		Carbon steel A 216 WCC	Carbon steel A 217 WC6	Stainless carbon steel A 351 CF8M
Seat and plug [2]	Metal sealing	WN 1.4006/1.4008		WN 1.4571/1.4581
Seal ring with	Soft sealing	PTFE with 15 % glass fiber		
	Balanced	PTFE with carbon · Graphite		
Guide bushing		WN 1.4112		WN 2.4610
Stuffing box packing		V-ring packing, PTFE with carbon, spring of WN 1.4310 or high-temperature packing		
Body gaskets		Metal		
Insulating section [3]		A 217 WC6/A 182 F12		A 351 CF8M/A 182 F316
Metal bellows seal				
Intermediate piece [3]		A 217 WC6/A 182 F12		A 351 CF8M/A 182 F316
Metal bellows		WN 1.4571		
Heating jacket		WN 1.4541		

1) See also Pressure-Temperature Diagram (T 8000-2 EN); material for cryogenic service: A 352 LCC.
2) All seats and plugs with metal sealing also with Stellite facing or plug of pure Stellite available.
3) Depending on the valve bonnet material.

Table 3 · **C_v and K_{vs} values** · Versions in shaded areas also available with balanced plug

Table 3a · **Overview with St I (C_v I/K_{vs} I) and St III (Cv III/K_{vs} III) Flow Divider**

C_v	0.12	0.2	0.3	0.5	0.75	1.2	2	3	5	7.5	12	20	30	47	75	120	190	290	420	735
K_{vs}	0.1	0.16	0.25	0.4	0.63	1.0	1.6	2.5	4.0	6.3	10	16	25	40	63	100	160	250	360	630
C_v I	–						1.7	2.6	4.2	7	10.5	17	26	42	67	105	170	265	375	650
K_{vs} I							1.45	2.2	3.6	5.7	9	14.5	22	36	57	90	144	225	320	560
C_v III	–								3.5	5.6	9	14	23	35	55	90	140	220	315	–
K_{vs} III									3	4.8	7.5	12	20	30	47	75	120	190	270	–
Seat ∅ mm	6						12		24			31	38	50	63	80	100	125	150	200
Rated travel mm	15													30				60		
Rated travel in	0.5″													1.18″				2.36″		

Table 3b · **Versions without flow divider**

C_v		0.12	0.2	0.3	0.5	0.75	1.2	2	3	5	7.5	12	20	30	47	75	120	190	290	420	735
DN in/mm																					
½″	15	•	•	•	•	•	•	•	•	•											
1″	25	•	•	•	•	•	•	•	•	•	•	•									
1½″	40	•	•	•	•	•	•	•	•	•	•	•	•	•							
2″	50									•	•	•	•	•	•						
3″	80									•	•	•	•	•	•	•	•				
4″	100													•	•	•	•	•			
6″	150															•	•	•	•	•	
8″	200																	•	•	•	•

Table 3c · **Versions with St I Flow Divider**

C_v I		–	1.7	2.6	4.2	7	10.5	17	26	42	67	105	170	265	375	650
DN in/mm																
½″	15		•	•	•											
1″	25		•	•	•	•	•									
1½″	40		•	•	•	•	•	•	•							
2″	50				•	•	•	•	•	•						
3″	80				•	•	•	•	•	•	•	•				
4″	100								•	•	•	•	•			
6″	150										•	•	•	•	•	
8″	200												•	•	•	•

Table 3d · **Versions with St III Flow Divider**

C_v III		–	3.5	5.6	9	14	23	35	55	90	140	220	315	–
DN in/mm														
2″*	50		•	•	•									
3″	80		•	•	•	•	•	•						
4″	100						•	•	•					
6″	150								•	•	•	•		
8″	200											•	•	

* 2″ version (DN 50) and St III not available with metal bellows

Notes on differential pressure tables

The differential pressure tables were prepared under the following conditions:

- Process flow directed against the closing direction of the valve plug
- Valve plug version with metal sealing
- Version with PTFE packing
- Tables 4a and 4b apply to unbalanced valve plug with a downstream pressure p_2 = 0 bar (psi)
- For the maximum differential pressures listed and the previously mentioned conditions, the leakage rate stated in Table 1 is not exceeded
- All pressures mentioned are in bar and psi
- The differential pressure stated can be limited by the pressure-temperature diagram (see T 8000-2 EN).

Note on fail-safe position "Valve CLOSED": Always use pretensioned spring ranges for actuators with reduced travels.

Overview: Valve versions of the Δp tables

Table 4a and 4b: Valve with **unbalanced** plug without metal bellows seal; fail-safe position "Valve CLOSED"

Table 5a and 5b:Valve with **balanced** plug with PTFE ring, without metal bellows seal; fail-safe position "Valve CLOSED" or "Valve OPEN"

Table 6a and 6b: Valve with **unbalanced** plug without metal bellows seal; "Valve OPEN"

Note: Permissible differential pressures for special versions with soft sealing or lapped-in metal plugs, with metal bellows seal or balanced plug with graphite ring are available on request.

Table 4a · Permissible differential pressures Δp for valves with unbalanced plug with metal sealing and without metal bellows seal; fail-safe position "Valve CLOSED" · Pressures in bar

The bench ranges in the shaded areas indicate normal operation, i.e. operation at rated travel · Values in non-shaded areas apply to springs pre-tensioned to maximum · Values in parentheses apply to half travel

Fail-safe position "Valve CLOSED" (fail-close)												
Nominal bench range (bar) with actuator (cm^2)		350	0.2...1.0	0.4...1.2	0.4...2.0	0.8...2.4	0.6...3.0	1.2...3.6	1.4...2.3	2.1...3.3	–	–
		700		0.4...1.2 (0.8...1.2)		0.8...2.4 (1.6...2.4)		1.2...3.6 (2.4...3.6)	1.4...2.3 (1.85...2.3)	2.1...3.3 (2.7...3.3)	2.35...3.8 (3.05...3.8)	2.6...4.3 (3.45...4.3)
		1400					0.5...2.5	1.0...3.0 (2.0...3.0)	1.1...2.4	1.4...2.7 (2.05...2.7)	1.3...2.8	1.7...3.2 (2.45...3.2)
		2800	0.4...1.2 (0.8...1.2)	0.8...2.4 (1.6...2.4)	1.0...3.0 (2.0...3.0)	1.2...3.6 (2.4...3.6)	0.9...1.6	1.1...1.8 (1.25...1.6)	1.0...2.1	1.25...2.35 (1.55...2.1)	1.1...2.6	1.5...3.0 (1.85...2.6)
		2x2800										
Required supply pressure			Upper spring range value + 0.2 bar									
Nominal size	C_v	Actuator cm^2	Δp at p_2 = 0 bar									
½″ to 1½″	0.12 to 1.2	350	46.1	102	102	213	158	325	380	400	–	–
	2 to 3	350	46.1	102	102	213	158	325	380	400	–	–
	5 to 12	350	8.7	22.4	22.4	50.5	36.6	78.4	92.3	141	–	–
		700	–	(106)	–	(217)	–	(329)	(252)	(370)	(400)	–
2″		350	8.1	22	22	49.9	35.9	77.7	91.7	140	–	–
		700	–	(105)	–	(217)	–	(328)	(252)	(370)	(400)	–
1½″ to 3″	20	350	4.3	12.7	12.7	29.4	21	45.1	54.4	83.6	–	–
		700	–	(62.7)	–	(129)	–	(196)	(150)	(221)	(250)	(284)
1½″ to 4″	30	350	–	8.1	8.1	19.2	13.6	30.3	35.8	55.3	–	–
		700	–	(41.4)	–	(85.8)	–	(130)	(99.7)	(147)	(166)	(188)
2″ to 4″	47	700	4.3	10.7	10.7	23.6	17.1	36.4	42.8	65.3	73.3	81.3
		1400	–	(49.2)	–	(100)	–	(126)	–	(129)	–	(155)
3″ to 6″	75	700	–	6.3	6.3	14.4	10.4	22.5	26.5	40.7	45.7	50.8
		1400	–	(30.6)	–	(62.9)	–	(79.1)	–	(81.1)	–	(97.3)
3″ to 6″	120	700	–	–	–	8.7	6.2	13.7	16.3	25	28.2	31.3
		1400	–	(18.8)	–	(38.8)	–	(48.8)	–	(50.1)	–	(60.1)
4″ to 6″	190	700	–	–	–	5.4	–	8.7	10.3	15.9	17.9	19.9
		1400	–	(11.9)	–	(24.7)	–	(31.1)	–	(31.9)	–	(38.3)
8″	190	700	–	–	–	5.4	–	8.6	10.2	15.8	17.8	19.8
		1400	–	(11.8)	–	(24.6)	–	(31)	–	(31.8)	–	(38.2)
6″	290	1400	–	–	–	7.5	4.4	9.5	10.5	13.6	12.6	16.7
		2800	(15.7)	(32.1)	(40.3)	(48.5)	–	(24.9)	–	(31.1)	–	(37.2)
8″	290	1400	–	–	–	7.4	4.3	9.5	10.5	13.6	12.5	16.6
		2800	(15.6)	(32)	(40.3)	(48.5)	–	(24.9)	–	(31)	–	(37.2)
		2x2800	(31.2)	(64)	(80.6)	(97)	–	(49.8)	–	(62)	–	(74.4)
6″	420	1400	–	–	–	5.1	–	6.5	7.2	9.4	8.7	11.5
		2800	(10.8)	(22.2)	(27.9)	(33.6)	–	(17.2)	–	(21.5)	–	(25.8)
8″	420	1400	–	–	–	5.1	–	6.5	7.2	9.3	8.6	11.5
		2800	(10.7)	(22.2)	(27.9)	(33.6)	–	(17.2)	–	(21.5)	–	(25.7)
		2x2800	(21.4)	(44.4)	(55.8)	(67.2)	–	(34.4)	–	43	–	(51.4)
8″	735	1400	–	–	–	–	–	–	4	5.2	4.7	6.4
		2800	(6)	(12.4)	(15.6)	(18.8)	–	(9.6)	–	(12)	–	(14.4)
		2x2800	(12)	(24.8)	(31.2)	(37.6)	–	(19.2)	–	(24)	–	(28.8)

Table 4b · Permissible differential pressures Δp for valves with unbalanced plug with metal sealing and without metal bellows seal; fail-safe position "Valve CLOSED" · Pressures in psi

The bench ranges in the shaded areas indicate normal operation, i.e. operation at rated travel · Values in non-shaded areas apply to springs pre-tensioned to maximum · Values in parentheses apply to half travel

Fail-safe position "Valve CLOSED" (fail-close)												
Nominal bench range (psi) with actuator (cm^2)		350	3...15	6...18	6...30	12...36	9...45	18...52	20...34	30...48	–	–
		700		6...18 (12...18)		12...36 (23...36)		18...52 (35...52)	20...34 (27...34)	30...48 (39...48)	35...55 (44...55)	36...62 (50...62)
		1400					7...36	15...45 (30...45)	16...36	20...39 (30...39)	19...41	25...46 (36...46)
		2800	6...18 (12...18)	12...36 (23...36)	15...45 (30...45)	18...52 (35...52)	13...23	16...26 (18...23)	15...30	18...34 (22...30)	17...36	22...45 (27...36)
		2x2800										
Required supply pressure			Upper spring range value + 3 psi									
Nominal size	C_v	Actuator cm^2	Δp at p_2 = 0 psi									
½″ to 1½″	0.12 to 1.2	350	668	1479	1479	3088	2291	4712	5510	5800	–	–
	2 to 3	350	668	1479	1479	3088	2291	4712	5510	5800	–	–
	5 to 12	350	126	325	325	732	530	1137	1338	2044	–	–
		700	–	(1537)	–	(3146)	–	(4770)	(3654)	(5365)	(5800)	–
2″		350	117	319	319	723	520	1126	1329	2030	–	–
		700	–	(1522)	–	(3146)	–	(4756)	(3654)	(5365)	(5800)	–
1½″ to 3″	20	350	62	184	184	426	304	654	789	1212	–	–
		700	–	(909)	–	(1870)	–	(2842)	(2175)	(3204)	(3625)	(4118)
1½″ to 4″	30	350	–	117	117	278	197	439	519	801	–	–
		700	–	(600)	–	(1244)	–	(1885)	(1445)	(2131)	(2407)	(2726)
2″ to 4″	47	700	62	155	155	342	248	527	620	947	1063	1178
		1400	–	(713)	–	(145)	–	(1827)	–	(1870)	–	(2247)
3″ to 6″	75	700	–	91	91	209	151	326	384	590	662	736
		1400	–	(443)	–	(912)	–	(1147)	–	(1176)	–	(1411)
3″ to 6″	120	700	–	–	–	126	90	198	236	362	409	454
		1400	–	(272)	–	(562)	–	(707)	–	(726)	–	(871)
4″ to 6″	190	700	–	–	–	78	–	126	149	230	259	288
		1400	–	(172)	–	(358)	–	(451)	–	(462)	–	(555)
8″	190	700	–	–	–	78	–	124	148	224	258	287
		1400	–	(171)	–	(356)	–	(449)	–	(461)	–	(554)
6″	290	1400	–	–	–	108	64	137	152	197	183	242
		2800	(227)	(465)	(584)	(703)	–	(361)	–	(451)	–	(539)
8″	290	1400	–	–	–	107	62	137	152	197	181	240
		2800	(226)	(464)	(584)	(703)	–	(361)	–	(449)	–	(539)
		2x2800	(452)	(928)	(1168)	(1406)	–	(722)	–	(899)	–	(1079)
6″	420	1400	–	–	–	74	–	94	104	136	126	166
		2800	(156)	(322)	(404)	(487)	–	(249)	–	(312)	–	(374)
8″	420	1400	–	–	–	74	–	94	104	135	125	166
		2800	(155)	(322)	(404)	(487)	–	(249)	–	(312)	–	(372)
		2x2800	(310)	(644)	(809)	(974)	–	(499)	–	(623)	–	(745)
8″	735	1400	–	–	–	–	–	–	58	75	68	93
		2800	(87)	(180)	(226)	(272)	–	(139)	–	(174)	–	(209)
		2x2800	(174)	(359)	(452)	(545)	–	(278)	–	(348)	–	(417)

Table 5a · Permissible differential pressures Δp for valves with balanced plug with metal sealing and PTFE ring, without metal bellows seal · Pressures in bar

The bench ranges in the shaded areas indicate normal operation, i.e. operation at rated travel · Values in non-shaded areas apply to springs pre-tensioned to maximum · Values in parentheses apply to half travel

Fail-safe position			**"Valve CLOSED" (fail-close)**						**"Valve OPEN" (fail-open)**		
Nominal bench range (bar) with actuator (cm^2)		700	0.4...2.0	0.8...2.4 (1.6...2.4)	–	–	0.6...3.0	1.2...3.6	0.4 ... 2.0 (0.4 ... 1.2)		
		1400			0.5...2.5	1.0...3.0 (2.0...3.0)	–	–			
		2800					0.6...3.0	1.2...3.6 (2.4...3.6)			
		2x2800									
Required supply pressure			Upper spring range value + 0.2 bar						2.4	4.0	6.0
Nominal size	C_v	Actuator cm^2	Δp at p_2 = 0 bar								
3″ 4″	75	700	57.4	155	–	–	106	252	57.4	400	–
		1400	–	(400)	–	(400)	–	–	(400)	–	–
6″	75	700	22.2	62.1	–	–	42.2	102	22.2	182	382
		1400	–	(302)	–	(381)	–	–	(221)	(400)	–
3″ 4″	120	700	48.1	146	–	–	96.8	243	48.1	400	–
		1400	–	(400)	–	(400)	–	–	(400)	–	–
6″	120	700	18.4	58.3	–	–	38.4	98.3	18.4	178	378
		1400	–	(298)	–	(378)	–	–	(218)	(400)	–
4″	190	700	37.2	135	–	–	85.9	232	37.2	400	–
		1400	–	(400)	–	(400)	–	–	(400)	–	–
6″	190	700	13.9	53.8	–	–	33.9	93.8	13.9	174	373
		1400	–	(293)	–	(373)	–	–	(213)	(400)	–
8″	190	700	4.6	20.2	–	–	12.4	35.8	4.6	67	145
		1400	–	(114)	–	(145)	–	–	(82.6)	(207)	(363)
6″	290	1400	48.3	128	68.2	168	–	–	48.3	368	400
		2800	–	(400)	–	(400)	–	(400)	(400)	–	–
8″	290	1400	18	49.2	25.8	64.8	–	–	18	143	299
		2800	–	(236)	–	(298)	–	(361)	(174)	(400)	–
		2x2800	–	(400)	–	(400)	–	(400)	(348)	(400)	–
6″	420	1400	42.6	123	62.6	162	–	–	42.7	362	400
		2800	–	(400)	–	(400)	–	(400)	(400)	–	–
8″	420	1400	15.8	47	23.6	62.6	–	–	15.3	109	265
		2800	–	(234)	–	(296)	–	(359)	(172)	(400)	–
		2x2800	–	(400)	–	(400)	–	(400)	(344)	(400)	–
8″	735	1400	11.4	42.6	19.2	58.2	–	–	11.4	136	292
		2800	–	(230)	–	(292)	–	(354)	(167)	(400)	–
		2x2800	–	(400)	–	(400)	–	(400)	(334)	(400)	–

Table 5b · Permissible differential pressures Δp for valves with balanced plug with metal sealing and PTFE ring, without metal bellows seal · Pressures in psi

The bench ranges in the shaded areas indicate normal operation, i.e. operation at rated travel · Values in non-shaded areas apply to springs pre-tensioned to maximum · Values in parentheses apply to half travel

Fail-safe position			**"Valve CLOSED" (fail-close)**						**"Valve OPEN" (fail-open)**		
Nominal bench range (psi) with actuator (cm^2)		700	6...30	12...36 (23...36)	–	–	9...45	18...52	6 ... 30 (6 ... 18)		
		1400			7...36	15...44 (30...45)	–	–			
		2800					9...45	18...52 (36...52)			
		2x2800									
Required supply pressure			Upper spring range value + 3 psi						36	60	90
Nominal size	C_v	Actuator cm^2	Δp at p_2 = 0 psi								
3″ 4″	75	700	832	2247	–	–	1537	3654	832	5800	–
		1400	–	(5800)	–	(5800)	–	–	(5800)	–	–
6″	75	700	322	900	–	–	615	1479	322	2639	5539
		1400	–	(4379)	–	(5524)	–	–	(3204)	(5800)	–
3″ 4″	120	700	697	2117	–	–	1403	2523	697	5800	–
		1400	–	(5800)	–	(5800)	–	–	(5800)	–	–
6″	120	700	267	845	–	–	557	1425	267	2581	5481
		1400	–	(4321)	–	(5481)	–	–	(3161)	(5800)	–
4″	190	700	539	1957	–	–	1245	3364	539	5800	–
		1400	–	(5800)	–	(5800)	–	–	(5800)	–	–
6″	190	700	201	780	–	–	491	1360	201	2523	5408
		1400	–	(4248)	–	(5408)	–	–	(3088)	(5800)	–
8″	190	700	66	293	–	–	179	519	66	971	2102
		1400	–	(1653)	–	(2102)	–	–	(1197)	(3001)	(5263)
6″	290	1400	700	1856	989	2436	–	–	700	5336	5800
		2800	–	(5800)	–	(5800)	–	(5800)	(5800)	–	–
8″	290	1400	261	713	374	939	–	–	261	2073	4335
		2800	–	(3422)	–	(4321)	–	(5234)	(2523)	(5800)	–
		2x2800	–	(5800)	–	(5800)	–	(5800)	(5046)	(5800)	–
6″	420	1400	617	1783	907	2349	–	–	619	5249	5800
		2800	–	(5800)	–	(5800)	–	(5800)	(5800)	–	–
8″	420	1400	229	681	342	907	–	–	221	1580	3842
		2800	–	(3393)	–	(4292)	–	(5205)	(2494)	(5800)	–
		2x2800	–	(5800)	–	(5800)	–	(5800)	(4988)	(5800)	–
8″	735	1400	165	617	278	844	–	–	165	1972	4234
		2800	–	(3335)	–	(4234)	–	(5133)	(2421)	(5800)	–
		2x2800	–	(5800)	–	(5800)	–	(5800)	(4843)	(5800)	–

Table 6 · Permissible differential pressures Δp for valves with unbalanced plug with metal sealing and without metal bellows seal · Fail-safe position "Valve OPEN"

			Table 6a · Pressures in bar				Table 6b · Pressures in psi			
Nominal bench range in bar/psi with actuator (cm^2)		350	0.2 ... 1.0 (0.2 ... 0.6)				3 ... 15 (3 ... 9)			
		700								
		1400								
		2800								
		2x2800								
Required supply pressure			1.4	2.4	4.0	6.0	20	36	60	90
Nominal size	C_v	Actuator cm^2	Δp at p_2 = 0 bar				Δp at p_2 = 0 psi			
½″ to 1½″	0.12 to 1.2	350	102	380	400	–	1479	5510	5800	–
	2 to 3	350	101	380	400	–	1464	5510	5800	–
	5 to 12	350	22.4	92.1	203	343	325	1335	2943	4973
		700	(106)	(245)	(400)	–	(1537)	(3552)	(5800)	–
2″		350	21.6	91.3	203	342	313	1324	2943	4959
		700	(105)	(244)	(400)	–	(1522)	(3538)	(5800)	–
1½″ to 3″	20	350	12.4	54.2	121	204	180	786	1754	2958
		700	(62.5)	(146)	(280)	(400)	(906)	(2117)	(4060)	–
1½″ to 4″	30	350	7.9	35.7	80.1	136	114	517	1161	1972
		700	(41)	(97)	(185)	(297)	(594)	(2682)	(2682)	–
2″ to 4″	47	700	10.6	42.7	94.1	158	153	619	1364	2291
		1400	(49)	(113)	(216)	(344)	(710)	(1638)	(3132)	–
3″ to 6″	75	700	6.2	26.4	58.7	99.2	90	383	851	1438
		1400	(30.4)	(71)	(135)	(216)	(441)	(1029)	(1957)	–
3″ to 6″	120	700	–	16.2	36.2	61.3	–	235	525	889
		1400	(18.7)	(43.7)	(84)	(134)	(271)	(633)	(1218)	(1943)
4″ 6″	190	700	–	10.2	23	39.1	–	148	333	567
		1400	(11.8)	(27.8)	(53.5)	(85)	(171)	(403)	(775)	(1232)
8″	190	700	–	10.0	22.9	38.9	–	145	332	564
		1400	(11.6)	(27.7)	(53.3)	(85)	(168)	(401)	(773)	(1232)
6″	290	1400	–	13.6	30	50.6	–	197	435	733
		2800	(15.6)	(36.2)	(69)	(110)	(226)	(525)	(1000)	–
8″	290	1400	–	13.5	29.9	50.4	–	195	433	731
		2800	(15.5)	(36.1)	(69)	(110)	(224)	(523)	(1000)	–
		2x2800	(31)	(72)	(138)	(220)	(449)	(1044)	(2001)	–
6″	420	1400	–	9.4	20.8	35	–	136	301	507
		2800	(10.8)	(25)	(47.8)	(76.4)	(156)	(362)	(693)	–
8″	420	1400	–	9.3	20.7	34.9	–	135	300	506
		2800	(10.7)	(25)	(47.8)	(76.3)	(156)	(362)	(693)	
		2x2800	(21.4)	(50)	(95.6)	(152)	(310)	(725)	(1386)	–
8″	735	1400	–	5.1	11.5	19.5	–	74	166	282
		2800	(5.9)	(13.9)	(26.8)	(42.8)	(85)	(201)	(388)	(620)
		2x2800	(11.8)	(27.8)	(53.6)	(85.6)	(171)	(403)	(777)	–

Table 7 · Dimensions for Type 3251-1 and Type 3251-7 Pneumatic Control Valve as standard version

Valve				½″	1″	1½″	2″	3″	4″	6″	8″
Length L		Class 150	mm	184	184	222	254	298	352	451	543
			in	7.24	7.24	8.74	10	11.73	13.83	17.75	21.37
		Class 300	mm	191	197	235	267	318	368	473	568
			in	7.52	7.75	9.25	10.52	12.52	14.49	18.62	22.36
		Class 600	mm	203	210	251	286	337	394	508	609
			in	7.99	8.26	9.88	11.26	13.26	15.51	20	23.97
		Class 900	mm	216	254	305	368	381	457	609	737
			in	8.5	10	12	14.49	15	17.99	23.97	29.01
H1 for actuator	350 cm²	Class 150/600	mm	392	392	404	457	462	482	–	
			in	15.43	15.43	15.9	17.99	18.19	18.97		
		Class 900	mm	426	426	435	491	462	482		
			in	16.77	16.77	17.12	19.33	18.19	18.97		
	700 cm²	Class 150/600	mm	392	392	404	457	462	482	732	805
			in	15.43	15.43	15.9	17.99	18.19	18.97	29.01	31.69
		Class 900	mm	426	426	435	491	462	482	732	805
			in	16.77	16.77	17.12	19.33	18.19	18.97	29.01	31.69
	1400 cm²	Class 150/600	mm	–			512	517	537	732	805
			in				20.16	20.35	21.14	29.01	31.69
		Class 900	mm				546	517	537	732	805
			in				21.49	20.35	21.14	29.01	31.69
	2800 cm²	Class 150/600	mm	–					722	817	890
			in						28.42	32.16	35.04
		Class 900	mm						722	817	890
			in						28.42	32.16	35.04
H2		Class 150	mm	50	60	80	90	100	160	220	250
			in	1.97	2.36	3.15	3.54	3.93	6.29	8.66	9.84
		Class 300/600	mm	60	70	90	100	120	180	235	270
			in	2.34	2.75	3.54	3.93	4.72	7.02	9.25	10.63
		Class 900	mm	70	80	100	110	120	180	235	270
			in	2.75	3.15	3.93	4.33	4.72	7.08	9.25	10.63

Actuator	cm²	350	700	1400	2800	2 x 2800
Diaphragm ∅	mm	280	390	530	770	
	in	11.02	15.35	20.86	30.3	
H [1]	mm	82	196	287	620	1130
	in	3.23	7.71	11.3	24.41	44.49
H3 [2]	mm	110	190	610	650	
	in	4.33	7.48	24	25.5	
Thread		M 30 x 1.5		M 60 x 1.5	M 100 x 2	
a (with Type 3271 Actuator)		G ⅜ (NPT ⅜)		G ¾ (NPT ¾)	G 1 (NPT 1)	
a2 (with Type 3277 Actuator)		G ⅜ (NPT ⅜)		–		

[1] Actuator 350 cm² without lifting ring

[2] Minimum clearance for actuator disassembly

Table 8 · Weights for Type 3251 Globe Valve in standard version

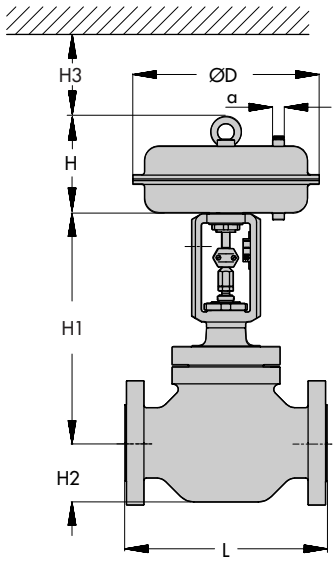
Valve			½″	1″	1½″	2″	3″	4″	6″	8″
Valve without actuator (approx.)	Cl 150/300	kg	15.5	17.5	21.5	38	59	78	201	427
		lbs	34.2	38.6	47.4	83.8	130	172	443	1191
	Class 600	kg	22	28	36	64	102	137	340	540
		lbs	49	62	80	141	225	302	750	1191
	Class 900	kg	35	41	60	97	120	160	380	650
		lbs	77	90	132	214	265	353	838	1433

Actuator		cm^2	350	700	1400	2800	2 x 2800
Type 3271 (approx.)	Without	kg	8	22	70	450	950
		lbs	17.6	48.5	154.5	992	2095
	With handwheel	kg	13	27	Only with side-mounted handwheel, see T 8310 EN		
		lbs	28.7	59.5			
Type 3277 (approx.)	Without	kg	12	26	–		
		lbs	26.5	57.6			
	With handwheel	kg	17	31			
		lbs	37.5	68.5			

1) Top row without handwheel, bottom row with handwheel

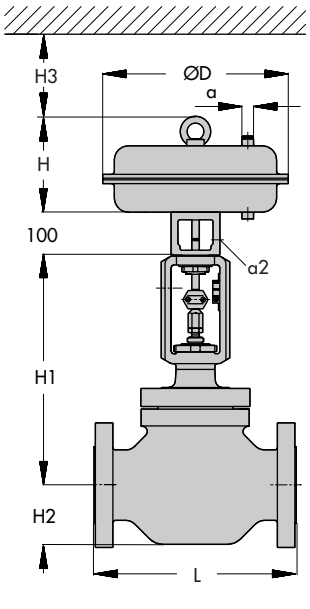
Pneumatic Actuators

Type 3271

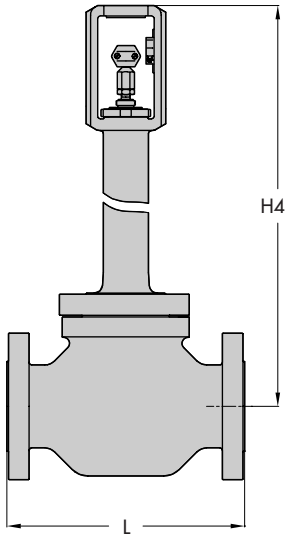


Type 3251-1

Type 3277



Type 3251-7



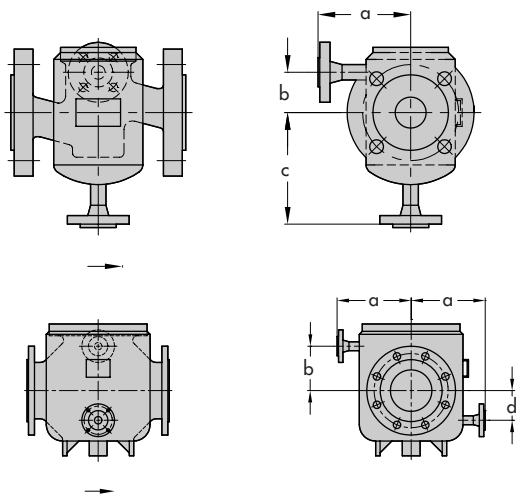
Type 3251 with bellows or insulating section

Table 9 · Dimensions and weights for Type 3251 Globe Valve in standard version with insulating section · Without actuator

Nominal size		in	½"	1"	1½"	2"	3"	4"	6"	8"
		mm	15	25	40	50	80	100	150	200
Class 150 ... 600 H4 for actuator	350 cm²	mm	593	593	605	727	732	752	–	
		in	23.34	23.34	23.82	28.62	28.82	29.6		
	700 cm²	mm	593	593	605	727	732	752	1083	1365
		in	23.34	23.34	23.82	28.62	28.82	29.6	42.64	53.74
	1400 cm²	mm	–			782	787	807	1083	1365
		in				30.78	30.98	31.77	42.62	53.74
	2800 cm²	mm	–					992	1168	1450
		in						39.05	45.98	57.08
Class 900 H4 for actuator	350 cm²	mm	622	622	631	756	732	752	–	
		in	24.48	24.48	24.84	29.76	28.82	29.6		
	700 cm²	mm	622	622	631	756	732	752	1083	1365
		in	24.48	24.48	24.84	29.76	28.82	29.6	42.64	53.74
	1400 cm²	mm	–			811	787	807	1083	1365
		in				31.93	30.98	31.77	42.64	53.76
	2800 cm²	mm	–					992	1168	1450
		in						39.05	45.98	57.08
Weight (kg) without actuator for	Cl 150...600	kg	30	36	44	72	110	156	360	640
		lbs	66.5	79.5	97	159	242.5	344	794	1411
	Class 900	kg	43	49	68	105	130	180	400	730
		lbs	95	108	150	231.5	287	397	882	1610

Table 10 · Dimensions and weights for Type 3251 Globe Valve in standard version with metal bellows · Without actuator

Nominal size		in	½"	1"	1½"	2"	3"	4"	6"	8"
		mm	15	25	40	50	80	100	150	200
Cl 150 H4 for actuator	350 cm²	mm	590	590	602	836	841	841	–	
		in	23.23	23.23	23.7	32.9	33.1	33.1		
	700 cm²	mm	590	590	602	836	841	841	1139	1455
		in	23.23	23.23	23.7	32.9	33.1	33.1	44.85	57.3
	1400 cm²	mm	–			891	896	896	1139	1455
		in				35.1	35.3	35.3	44.85	57.3
	2800 cm²	mm	–					1081	1224	1540
		in						42.56	48.2	60.63
Cl 300/600 H4 for actuator	350 cm²	mm	590	590	602	836	841	841	–	
		in	23.23	23.23	23.7	32.9	33.1	33.1		
	700 cm²	mm	590	590	602	836	841	841	1271	1855
		in	23.23	23.23	23.7	32.9	33.1	33.1	50.04	73.03
	1400 cm²	mm	–			891	896	896	1271	1855
		in				35.1	35.3	35.3	50.04	73.03
	2800 cm²	mm	–					1081	1356	1940
		in						42.56	53.4	76.4
Cl 900 H4 for actuator	350 cm²	mm	583	583	593	825	841	841	–	
		in	22.95	22.95	23.35	32.5	33.1	33.1		
	700 cm²	mm	583	583	593	825	841	841	1271	1990
		in	22.95	22.95	23.35	32.5	33.1	33.1	50.04	78.35
	1400 cm²	mm	–			880	896	896	1271	1990
		in				34.64	35.27	35.27	50.04	78.35
	2800 cm²	mm	–					1081	1356	2075
		in						42.56	53.4	81.7
Weight without actuator for	Class 150/300	kg	–						360	–
		lbs							794	
	Class 600	kg	30	36	44	72	110	156	360	640
		lbs	66.5	95	97	159	243	344	794	1411
	Class 900	kg	43	49	68	105	130	180	400	730
		lbs	95	108	150	232	287	297	882	1610



Type 3251 with heating jacket · Dimensions on request

Selection and sizing of the control valve

1. Calculate the C_v (K_v) value according to IEC 60534.
2. Select the nominal size and C_v (K_{vs}) value from Tables 3 to 5.
3. Determine the permissible differential pressure Δp from Tables 4 and 5.
4. Select the valve body material from Tables 1 and 2 as well as the pressure-temperature diagrams in the Information Sheet T 8000-2 EN.
5. Select additional equipment from Tables 1 and 2.

The following details are required on ordering

Nominal size	....
Nominal pressure	ANSI Class ....
Body material	According to Table 2
End connection	Flanges/welding ends
Plug	Standard/balanced Soft sealing, metal sealing or lapped-in metal
Characteristic	Equal percentage or linear
Actuator	Type 3271 or Type 3277 (see T 8310 EN or T 8311 EN)
Fail-safe position	Valve CLOSED or valve OPEN
Process medium	Density in lb/cu.ft or kg/m^3 and temperature in °C (°F)
Flow rate	lbs/h or kg/h or cu.ft/min or m^3/h in standard or operating condition
Pressure	p_1 and p_2 in bar (psi) (absolute pressure p_{abs}), both with minimum, standard and maximum flow
Accessories	Positioner and/or limit switches

Specifications subject to change without notice.

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Series 250

Pneumatic Control Valve Type 3254-1 and Type 3254-7
Globe Valve Type 3254

ANSI version

Application

Control valve for process engineering applications with high industrial requirements, in particular with high pressures and temperatures

Nominal sizes	**DN 3″ to 16″**
Nominal pressure	**ANSI Class 150 to 2500**
Temperatures	**–200 to +500 °C (–320 to 930 °F)**

Type 3254 Globe Valve with

- Type 3271 Pneumatic Actuator (Type 3254-1 Control Valve) or
- Type 3277 Pneumatic Actuator (Type 3254-7 Control Valve) for integrated positioner attachment

Valve body optionally made of

- Carbon steel
- Stainless carbon steel
- High-temperature or cold-resisting carbon steel

Low-noise valve plugs optionally with

- Metal sealing
- Soft sealing or
- Lapped-in metal sealing
- Balanced for handling high differential pressures
- Additional stem guide in the lower body flange

The control valves, designed according to the modular assembly principle, can be equipped with various accessories:

Positioners, limit switches, solenoid valves and other equipment according to IEC 60534-6 and NAMUR recommendation (see Information Sheet T 8350 EN for details).

Versions

Standard version with PTFE packing for temperatures from –10 to 220 °C (15 to 430 °F) or with adjustable high-temperature (HT) packing for temperatures from –10 to 350 °C (15 to 660 °F), nominal sizes 3″ to 16″, ANSI Class 150 to 900

– **Type 3254-1** (Fig. 1) · Type 3254 Valve and Type 3271 Actuator with 700 to 2800 cm^2 effective areas (see T 8310 EN)
– **Type 3254-7** · Type 3254 Valve and Type 3277 Actuator with 700 cm^2 effective area (see Data Sheet T 8311 EN)

Other versions with

– **Class 1500 and 2500** · On request
– **Welding or welding-neck ends** acc. to ANSI B16.25
– **Flow divider** · For noise level reduction, see Data Sheet T 8081 EN
– **AC-Trim** · See Data Sheets T 8082 EN and T 8083 EN
– **Insulating section or bellows seal** · See Technical Data
– **Heating jacket** · Details on request
– **Additional handwheel** · See Data Sheet T 8310 EN

Fig. 1 · Type 3254-1 Pneumatic Control Valve with Type 3271 Pneumatic Actuator

– **Version according to DIN standards** · DN 80 to DN 500, nominal pressure PN 16 to 160 (see T 8060 EN)
– **Type 3254-3 Hand-operated Valve** · With Type 3273 Hand-operated Actuator, for valves with max. 30 mm rated travel (see Data Sheet T 8312 EN)
– **Type 3254-2 Electric Control Valve** · Details on request

Associated Information Sheet	**T 8000 EN**	**Edition May 2003**	
Information Sheet for Actuators	**T 8300 EN**	**Data Sheet**	**T 8061 EN**

Principle of operation (Figs. 2 to 4)

The process medium flows through the valve in the direction indicated by the arrow. The valve plug position determines the cross-sectional area of flow. The additional stem guide is located in the lower body flange.

Should the force produced by the actuator not be sufficient when high pressures or differential pressures act on the valve plug, a pressure-balanced plug (Fig. 3) can be used.

Fig. 4 shows a version with metal bellows seal. It is equipped with a test connection to allow the monitoring of the stainless steel bellows.

To further reduce the noise level, the control valves can be equipped with a St I (Fig. 4) or St III Flow Divider (see Data Sheet T 8081 EN for details).

Fail-safe position

Depending on how the compression springs are arranged in the actuator (see Data Sheets T 8310 EN and T 8311 EN for details), the control valve has two different fail-safe positions effective upon air supply failure:

"Actuator stem extends" (fail-close):
Whenever the air supply fails, the valve closes.

"Actuator stem retracts" (fail-open):
Whenever the air supply fails, the valve opens.

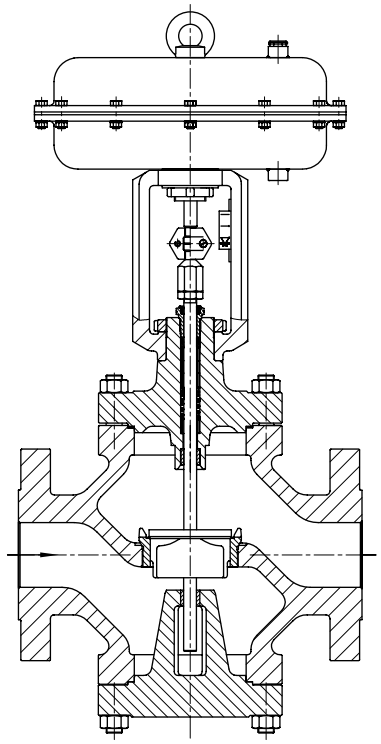


Fig. 2 · Type 3254-1 Control Valve with Type 3271 Pneumatic Actuator

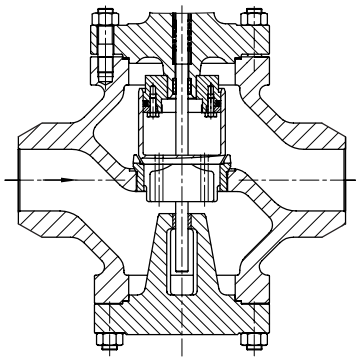


Fig. 3 · Type 3254 Globe Valve with welding ends and balanced valve plug

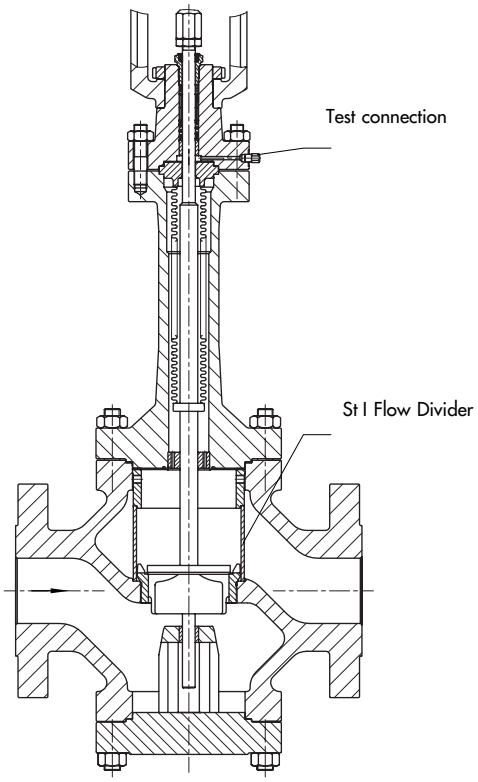


Fig. 4 · Type 3254 Globe Valve with St I Flow Divider and additional metal bellows seal with test connection

Table 1 · Technical Data for Type 3254 Globe Valve

Material			Carbon steel A 216 WCC	Carbon steel A 217 WC6	Stainless carbon steel A 351 CF8M
Nominal size [1]			3″ ... 16″		
Nominal pressure [2]		Class	150 ... 900		
Connection		Flanges	All ANSI versions		
		Welding ends	Acc. to ANSI B16.25		
Seat/plug sealing			Metal sealing, soft sealing or lapped-in metal sealing		
Characteristic			Equal percentage or linear		
Rangeability			50 : 1		
Temperature ranges in °C · Permissible operating pressures acc. to pressure-temperature diagrams (see Information Sheet T 8000-2 EN)					
Valve body without insulating section			–10 ... 220 ° (14 ... 428 °F) · up to 350 °C (660 °F) with HT packing		
Body with		Insulating section	–29...427 °C (–20...800 °F)	–29...500 °C (–20...930 °F)	–200...450 °C (–328...842 °F)
		Bellows seal	–29...427 °C (–20...800 °F)	–29...500 °C (–20...930 °F)	–200...450 °C (–328...842 °F)
Valve plug[3]	Standard	Metal sealing	–200...500 °C (–325...930 °F)		
		Soft sealing	–200...220 °C (–325...428 °F)		
	Balanced	PTFE ring	–200...220 °C (–325...428 °F)		
		Graphite ring	220...500 °C (428...930 °F)		
Leakage class according to DIN EN 1349: 2000 / ANSI/FCI 20-2-1991					
Valve plug	Standard	Metal sealing	IV		
		Soft sealing	VI		
		Lapped-in metal	IV-S2 · DN 100 and up: IV-S1		
	Balanced	Metal sealing	With PTFE ring: IV · With graphite ring: III		

[1] 16″ in Class 300 and 600
[2] Up to Class 2500 on request
[3] Only in connection with a suitable body material.

Table 2 · Materials (WN = Material Number according to EN European Standard)

Standard version Valve body and flanges [1]		Carbon steel A 216 WCC	Carbon steel A 217 WC6	Stainless carbon steel A 351 CF8M
Seat and plug [2]	Metal sealing	WN 1.4006/1.4008		WN 1.4571/1.4581
Seal ring with	Soft sealing	PTFE with 15 % glass fiber		
	Balanced	PTFE with carbon · Graphite		
Guide bushings		WN 1.4112		WN 2.4610
Stuffing box packing		V-ring packing PTFE with carbon, spring of WN 1.4310 or high-temperature packing		
Body gaskets		Metal		
Insulating section [3]		A 217 WC6/A 182 F12		A 351 CF8M/A 182 F316
Metal bellows seal				
Intermediate piece [3]		A 217 WC6/A 182 F12		A 217 WC6/A 182 F12
Metal bellows		WN 1.4571		
Heating jacket		WN 1.4541		

[1] See also pressure-temperature diagram in Information Sheet T 8000-2 EN
Material for cryogenic service: A 352 LCC.
[2] All seats and plugs with metal sealing also with Stellite facing or plug of pure Stellite.
[3] Depending on the valve bonnet material.

Table 3 · **Available C_V values** · All versions also available with balanced plug

Table 3a · **Overview with St I ($K_{VS}I$) and St III ($K_{VS}III$) Flow Divider**

C_V		75	120	190	290	420	735	1150	1730	2300	2900
K_{VS}		63	100	160	250	360	630	1000	1500	2000	2500
C_VI		67	105	170	265	375	650	1040	1560	2080	2600
$K_{VS}I$		57	90	144	225	320	560	900	1350	1800	2250
C_VIII		55	90	140	220	315	560	880	1280	1730	–
$K_{VS}III$		47	75	120	190	270	480	750	1100	1500	–
Seat ∅	mm	63	80	100	125	150	200	250	300	350	400
Rated travel	mm	30			60			120			
	in	1.18″			2.36″			4.72″			

Table 3b · **Versions without flow divider**

C_V		75	120	190	290	420	735	1150	1730	2300	2900
DN in/mm											
3″	80	•	•								
4″	100	•	•	•							
6″	150	•	•	•	•	•					
8″	200		• [1]	•	•	•	•				
10″	250		• [1]	•	•	•	•	•			
12″	300			•	•	•	•	•	•		
16″	400					•	•	•	•	•	•

Table 3c · **Versions with St I Flow Divider**

C_VI		67	105	170	265	375	650	1040	1560	2080	2600
DN in/mm											
3″	80	•	•								
4″	100	•	•	•							
6″	150	•	•	•	•	•					
8″	200		• [1]	•	•	•	•				
10″	250		• [1]	•	•	•	•	•			
12″	300			•	•	•	•	•	•		
16″	400					•	•	•	•	•	•

Table 3d · **Versions with St III Flow Divider**

C_VIII		55	90	140	220	315	560	880	1280	1730	–
DN in/mm											
4″	100	•									
6″	150	•	•	•	•						
8″	200		• [1]	•	•	•					
10″	250		• [1]	•	•	•	•				
12″	300			•	•	•	•	•			
16″	400					•	•	•	•	•	

[1] Only available with unbalanced valve plug.

Notes on the differential pressure tables

The differential pressure tables were generated under the following conditions:

- Process flow directed against the closing direction of the valve plug
- Valve plug version with metal or soft sealing
- Version with PTFE packing
- Tables 4a and 4b for unbalanced plug with downstream pressure $p_2 = 0$
- For the maximum differential pressures listed and the previously mentioned conditions, the leakage rate stated in Table 1 is not exceeded.
- All pressures mentioned are in bar or psi (gauge)
- The differential pressure stated can be limited by the pressure-temperature diagram.

Note on fail-safe position "Valve CLOSED": For actuators with reduced travels, pre-tensioned spring ranges must be used.

Note: Permissible differential pressures for special versions with soft sealing or lapped-in metal plugs, with metal bellows seal or balanced plug with graphite ring are available on request.

Selecting and sizing the control valve

1. Calculation of the C_v (K_v) value according to IEC 60534.
2. To select the nominal size and the C_v (K_{vs}) value, refer to Tables 3 to 5.
3. To determine the permissible differential pressure Δp, refer to Tables 4 and 5.
4. For the selection of the body material, refer to Tables 1 and 2, and for the pressure-temperature diagrams, refer to Information Sheet T 8000-2 EN.
5. For additional equipment, refer to Tables 1 and 2.

Table 4a · Permissible differential pressures Δp for valves with unbalanced plugs with metal sealing and without metal bellows seal; fail-safe position "Valve CLOSED" · Pressures in bar

The bench ranges in the shaded areas indicate standard operation, i.e. operation at rated travel · Non-shaded areas apply to springs pre-tensioned to maximum · Values in parantheses apply to half travel

Table 4a · Fail-safe position "Valve CLOSED" (fail-close)												
Bench range (bar) with actuator (cm^2)		700	0.2...1.0	0.4...1.2 (0.8...1.2)	0.4...2.0	0.8...2.4 (1.6...2.4)	0.6...3.0	1.2...3.6 (2.4...3.6)	1.4...2.3 (1.85...2.3)	2.1...3.3 (2.7...3.3)	2.35...3.8 (3.05...3.8)	2.6...4.3 (3.45...4.3)
		1400					0.5...2.5	1.0...3.0 (2.0...3.0)	1.1...2.4	1.4...2.7 (2.05...2.7)	1.3...2.8	1.7...3.2 (2.45...3.2)
		2800	0.4...1.2 (0.8...1.2)	0.8...2.4 (1.6...2.4)	1.0...3.0 (2.0...3.0)	1.2...3.6 (2.4...3.6)	0.9...1.6	1.1...1.8 (1.25...1.6)	1.0...2.1	1.25...2.35 (1.55...2.1)	1.1...2.6	1.5...3.0 (1.85...2.6)
		2x2800										
Required supply pressure			Final spring value + 0.2 bar									
Nominal size	C_v	Actuator cm^2	Δp with $p_2 = 0$									
3″ 4″	75	700	–	6.5	6.5	14.5	10.5	22.6	26.7	40.8	45.9	50.9
		1400	–	(30.7)	–	(63)	–	(79.2)	–	(81.2)	–	(97.4)
6″	75	700	–	6.2	6.2	14.3	10.2	22.4	26.4	40.6	45.6	50.7
		1400	–	(30.4)	–	(62.8)	–	(78.9)	–	(81)	–	(97.1)
3 4″	120	700	–	–	–	8.8	6.3	13.8	16.4	25.1	28.2	31.4
		1400	–	(18.8)	–	(38.9)	–	(48.9)	–	(50.2)	–	(60.2)
6″	120	700	–	–	–	8.6	6.2	13.7	16.2	24.9	28.1	31.2
		1400	–	(18.7)	–	(38.7)	–	(48.8)	–	(50)	–	(60)
8″ 10″	120	700	–	–	–	8.4	5.9	13.4	15.9	24.7	27.8	30.9
		1400	–	(18.4)	–	(38.5)	–	(48.5)	–	(49.7)	–	(59.8)
4″	190	700	–	–	–	5.5	–	8.7	10.3	15.9	17.9	19.9
		1400	–	(11.9)	–	(24.7)	–	(31.2)	–	(32)	–	(38.4)
6″	190	700	–	–	–	5.4	–	8.6	10.2	15.8	17.8	19.8
		1400	–	(11.8)	–	(24.6)	–	(31)	–	(31.9)	–	(38.3)
8″ to 12″	190	700	–	–	–	5.2	–	8.4	10	15.6	17.7	19.7
		1400	–	(11.6)	–	(24.5)	–	(30.9)	–	(31.7)	–	(38.1)
6″	290	1400	–	–	–	7.4	4.4	9.5	10.5	13.6	12.6	16.7
		2800	(15.6)	(32.1)	(40.3)	(48.5)	–	(24.9)	–	(31)	–	(37.2)
8″ to 12″	290	1400	–	–	–	7.3	4.2	9.4	10.4	13.5	12.5	16.6
		2800	(15.5)	(32)	(40.2)	(48.4)	–	(24.7)	–	(30.9)	–	(37.1)
		2x2800	(33)	(64)	(80.2)	(96.8)	–	(49.4)	–	(61.8)	–	(74.2)
6″	420	1400	–	–	–	5.1	–	6.5	7.2	9.4	8.6	11.5
		2800	(10.8)	(22.2)	(27.9)	(33.6)	–	(17.2)	–	(21.5)	–	(25.7)
8″ to 16″	420	1400	–	–	–	5	–	6.4	7.1	9.3	8.6	11.4
		2800	(10.7)	(22.1)	(27.8)	(33.5)	–	(17.1)	–	(21.4)	–	(25.7)
		2x2800	(21.4)	(44.2)	(55.6)	(67)	–	(34.2)	–	(42.8)	–	(51.4)
8″ to 16″	735	1400	–	–	–	–	–	–	–	5.1	4.7	6.3
		2800	(5.9)	(12.3)	(15.5)	(18.8)	–	(9.5)	–	(11.9)	–	(14.3)
		2x2800	(11.8)	(24.6)	(31)	(37.6)	–	(19)	–	(23.8)	–	(28.6)
10″ to 16″	1150	2800	–	–	4.8	5.8	4.2	5.3	4.8	6	5.3	7.3
		2x2800	–	7.4	9.6	11.6	8.4	10.6	9.6	12	10.6	14.6
12″ 16″	1730	2800	–	–	–	4	–	–	–	4.1	–	5
		2x2800	–	5	6.6	8	5.8	7.2	6.6	8.2	7.2	10
16″	2300	2800	–	–	–	–	–	–	–	–	–	–
		2x2800	–	–	4.8	5.8	4.2	5.2	4.8	6	5.2	7.4
16″	2900	2800	–	–	–	–	–	–	–	–	–	–
		2x2800	–	–	–	4.4	–	4	–	4.6	4	5.6

Table 4b · Permissible differential pressures Δp for valves with unbalanced plugs with metal sealing and without metal bellows; fail-safe position "Valve CLOSED" · Pressures in psi

The bench ranges in the shaded areas indicate standard operation, i.e. operation at rated travel · Non-shaded areas apply to springs pre-tensioned to maximum · Values in parantheses apply to half travel

Table 4a · Fail-safe position "Valve CLOSED" (fail-close)

Bench range (psi) with actuator (cm^2)												
	700	3...15	6...18 (12...18)	6...30	12...36 (23...36)	9...45	18...52 (35...52)	20...34 (27...34)	30...48 (39...48)	35...55 (44...55)	36...62 (50...62)
	1400					7...36	15...45 (30...45)	16...36	20...39 (30...39)	19...21	25...46 (36...46)
	2800	6...18 (12...18)	12...36 (23...36)	15...45 (30...45)	18...52 (35...52)	12...23	16...26 (18...34)	15...30	18...34 (22...30)	17...36	22...45 (27...36)
	2x2800										
Required supply pressure		Final spring value + 3 psi									

Nominal size	C_v	Actuator cm^2	Δp with p_2 = 0 psi									
3″ 4″	75	700	–	94	94	210	152	327	387	591	46	738
		1400	–	(445)	–	(913)	–	(1148)	–	(1177)	–	(1412)
6″	75	700	–	89.9	89	207	147	324	382	588	661	735
		1400	–	(440)	–	(910.6)	–	(1144)	–	(1174)	–	(1408)
3″ 4″	120	700	–	–	–	127	91	200	237	364	409	455.3
		1400	–	(272)	–	(564)	–	(709)	–	(727)	–	(873)
6″	120	700	–	–	–	124	85.5	1972	1655	361	407	452
		1400	–	(271)	–	(561)	–	(707)	–	(725)	–	(870)
8″ 10″	120	700	–	–	–	121	85	194	230	358	403	448
		1400	–	(266)	–	(558)	–	(703)	–	(720)	–	(867)
4″	190	700	–	–	–	79	–	126	149	230	259	288
		1400	–	(172)	–	(358)	–	(452)	–	(464)	–	(556)
6″	190	700	–	–	–	78	–	124	148	229	258	287
		1400	–	(171)	–	(356)	–	(449)	–	(462)	–	(555)
8″ to 12″	190	700	–	–	–	75	–	121	145	226	256	285
		1400	–	(168)	–	(355)	–	(448)	–	(459)	–	(552)
6″	290	1400	–	–	–	107	63	137	152	197	182	242
		2800	(226)	(465)	(584)	(703)	–	(361)	–	(449)	–	(539)
8″ to 12″	290	1400	–	–	–	105	61	136	150	195	181	240
		2800	(224)	(464)	(583)	(707)	–	(358)	–	(448)	–	(537)
		2x2800	(478)	(928)	(1163)	(1403)	–	(716)	–	(896)	–	(1075)
6″	420	1400	–	–	–	73	–	94	104	136	124	166
		2800	(156)	(322)	(404)	(487)	–	(249)	–	(311)	–	(372)
8″ to 16″	420	1400	–	–	–	72	–	92	103	134	124	165
		2800	(155)	(320)	(403)	(485)	–	(248)	–	(310)	–	(372)
		2x2800	(310)	(461)	(806)	(971)	–	(495)	–	(620)	–	(745)
8″ to 16″	735	1400	–	–	–	–	–	–	–	73	68	91
		2800	(85)	(178)	(224)	(272)	–	(137)	–	(172)	–	(207)
		2x2800	(171)	(356)	(449)	(545)	–	(275)	–	(345)	–	(414)
10″ to 16″	1150	2800	–	–	69	84	61	76	69	87	76	105
		2x2800	–	107	139	168	121	153	139	174	153	211
12″ 16″	1730	2800	–	–	–	58	–	–	–	59	–	72
		2x2800	–	72	95	116	84	104	95	118	104	145
16″	2300	2800	–	–	–	–	–	–	–	–	–	–
		2x2800	–	–	69	84	61	75	69	87	75	107
16″	2900	2800	–	–	–	–	–	–	–	–	–	–
		2x2800	–	–	–	63	–	58	–	66	58	81

Table 5a · Permissible differential pressure Δp for valves with balanced plug with PTFE ring and with metal sealing, without metal bellows seal · Pressures in bar

The bench ranges in the shaded areas indicate standard operation, i.e. operation at rated travel · Non-shaded areas apply to springs pre-tensioned to maximum · Values in parantheses apply to half travel

Fail-safe position "Valve CLOSED" (fail-close)									**"Valve OPEN" (fail-open)**		
Bench range (bar) with actuator (cm^2)		700	0.4...2.0	0.8...2.4	–	–	0.6...3.0	1.2...3.6	0.4...2.0 (0.4 ... 1.2)		
		1400		0.8...2.4 (1.6...2.4)	0.5...2.7	1.0...3.0 (2.0...3.0)	–	–			
		2800					0.6...3.0	1.2...3.6 (2.4...3.6)			
		2x2800									
Required supply pressure			Final spring value + 0.2 bar						2.4	4.0	6.0
Nominal size	C_V	Actuator cm^2	Δp with $p_2 = 0$								
3″ 4″	75	700	57.4	155	–	–	106	252	57.4	400	400
		1400	–	(400)	–	(400)	–	–	(400)	(400)	(400)
3″ 4″	120	700	48.1	144	–	–	96.9	243	48.1	400	400
		1400	–	(400)		(400)	–	–	(400)	(400)	(400)
6″	120	700	18.4	58.3	–	–	38.4	98.3	18.4	178	378
		1400	–	(297)	–	(378)	–	–	(218)	(400)	(400)
4″	190	700	37.2	135	–	–	85.9	232	37.2	400	400
		1400	–	(400)	–	(400)	–	–	(400)	(400)	(400)
6″	190	700	13.9	53.9	–	–	33.9	93.8	13.9	173	373
		1400	–	(293)	–	(373)	–	–	(213)	(400)	(400)
8″ to 12″	190	700	4.6	20.2	–	–	12.4	35.8	4.6	67	145
		1400	–	(113)	–	(145)	–	–	(82.6)	(207)	(363)
6″	290	1400	48.3	128	68.2	168	–	–	48.3	367	400
		2800	–	(236)	–	(298)	–	(361)	(400)	(400)	(400)
8″ 10″	290	1400	18	49.2	25.8	64.8	–	–	18	143	298
		2800	–	(236)	–	(298)	–	(361)	(174)	(400)	(400)
6″	420	1400	42.6	122	62.6	162	–	–	42.7	362	400
		2800	–	(400)	–	(400)	–	(400)	(400)	(400)	(400)
8″ to 16″	420	1400	15.8	47	23.6	62.6	–	–	15.8	140	296
		2800	–	(234)	–	(296)	–	(359)	(172)	(400)	(400)
		2x2800	–	(400)	–	(400)	–	(400)	(344)	(400)	(400)
8″ to 16″	735	1400	11.4	42.6	19.2	58.2	–	–	11.4	136	292
		2800	–	(230)	–	(292)	–	(355)	(167)	(400)	(400)
		2x2800	–	(400)	–	(400)	–	(400)	(334)	(400)	(400)
10″ to 16″	1150	2800	38.3	100	53.9	132	69.4	163	38.3	288	400
		2x2800	76.6	200	107.8	264	138.8	326	76.6	400	400
12″ 16″	1730	2800	33.9	96.3	49.5	127	65.1	158	33.9	283	400
		2x2800	67.8	192	99	254	130	316	67.8	400	400
16″	2300	2800	29.5	91.9	45.1	123	60.7	154	29.5	279	400
		2x2800	59	184	90.2	246	121	308	59	400	400
16″	2900	2800	25.1	87.5	40.7	118	56.3	150	25.1	274	400
		2x2800	50.2	175	81.4	236	112	300	50.2	549	400

Table 5b · Permissible differential pressures Δp for valves with balanced plugs with metal sealing and PTFE ring, without metal bellows seal · Pressures in psi

The bench ranges in the shaded areas indicate standard operation, i.e. operation at rated travel · Non-shaded areas apply to springs pre-tensioned to maximum · Values in parantheses apply to half travel

Fail-safe position "Valve CLOSED" (fail-close)									**"Valve OPEN" (fail-open)**		
Bench range (psi) with actuator (cm^2)		700	6...30	12...36	–	–	9...45	18...52	6...30 (6 ... 18)		
		1400		12...36 (23...36)	7...36	15...45 (30...45)	–	–			
		2800					9...45	18...52 (35...52)			
		2x2800									
Required supply pressure			Final spring value + 3 psi						36	60	90
Nominal size	C_V	Actuator cm^2	Δp with p_2 = 0 psi								
3″ 4″	75	700	832	2247	–	–	1537	3654	832	5800	5800
		1400	–	(5800)	–	(5800)	–	–	(5800)	(5800)	(5800)
3″ 4″	120	700	697	209	–	–	1405	3524	697	5800	5800
		1400	–	(5800)		(5800)	–	–	(5800)	(5800)	(5800)
6″	120	700	267	845	–	–	557	1425	267	2581	5481
		1400	–	(4307)	–	(5481)	–	–	(3161)	(5800)	(5800)
4″	190	700	539	1958	–	–	1246	3364	539	5800	5800
		1400	–	(5800)	–	(5800)	–	–	(5800)	(5800)	(5800)
6″	190	700	202	782	–	–	492	1360	202	2509	5409
		1400	–	(4249)	–	(5409)	–	–	(3089)	(5800)	(5800)
8″ to 12″	190	700	67	293	–	–	180	519	67	972	2103
		1400	–	(1639)	–	(2103)	–	–	(1198)	(3002)	(5264)
6″	290	1400	700	1856	989	2436	–	–	700	5322	5800
		2800	–	(3422)	–	(4321)	–	(5235)	(5800)	(5800)	(5800)
8″ 10″	290	1400	261	713	374	940	–	–	261	2074	4321
		2800	–	(3422)	–	(4321)	–	(5235)	(2523)	(5800)	(5800)
6″	420	1400	618	1769	908	2349	–	–	618	5249	5800
		2800	–	(5800)	–	(5800)	–	(5800)	(5800)	(5800)	(5800)
8″ to 16″	420	1400	229	682	342	908	–	–	229	2030	4292
		2800	–	(3393)	–	(4292)	–	(5206)	(2494)	(5800)	(5800)
		2x2800	–	(5800)	–	(5800)	–	(5800)	(4988)	(5800)	(5800)
8″ to 16″	735	1400	165	618	278	844	–	–	165	1972	4234
		2800	–	(3335)	–	(4234)	–	(5148)	(2422)	(5800)	(5800)
		2x2800	–	(5800)	–	(5800)	–	(5800)	(4843)	(5800)	(5800)
10″ to 16″	1150	2800	555	1450	782	1914	1006	2364	555	4176	5800
		2x2800	1111	2900	1563	3828	2013	4727	1111	5800	5800
12″ 16″	1730	2800	492	1396	718	1842	944	2291	492	4104	5800
		2x2800	983	2784	1436	3683	1885	4582	983	5800	5800
16″	2000	2800	428	1333	654	1784	880	2233	428	4046	5800
		2x2800	856	2668	1308	3567	1755	4466	856	5800	5800
16″	2900	2800	364	1269	590	1711	816	2175	364	3973	5800
		2x2800	728	2538	1180	3422	1624	4350	728	5800	5800

Table 6 · Permissible differential pressures Δp for valves with unbalanced plug with metal sealing, without metal bellows seal; fail-safe position "Valve OPEN" · Pressure in bar and psi

			Table 6a · Pressures in bar				Table 6b · Pressures in psi			
Bench range (bar/psi) with actuator (cm^2)		700	0.2 ... 1.0 (0.2 ... 0.6)				3 ... 15 (3 ... 9)			
		1400								
		2800								
		2x2800								
Required supply pressure			1.4	2.4	4.0	6.0	18	36	60	90
Nominal size	C_V	Actuator (cm^2)	Δp with p_2 = 0 bar				Δp with p_2 = 0 psi			
3″ 4″	75	700	6.5	26.7	59	99.4	94	387	855	1442
		1400	(30.7)	(71)	(136)	–	(445)	(1029)	(1972)	–
6″	75	700	6.2	26.4	58.7	99.2	90	382	851	1438
		1400	(30.6)	(71)	(136)	–	(443)	(1029)	(1972)	–
3″ 4″	120	700	–	16.3	36.4	61.5	–	236	527	891
		1400	(18.8)	(43.9)	(84)	(134)	(272)	(636)	(1218)	(1943)
6″	120	700	–	16.2	36.2	61.3	–	234	524	888
		1400	(18.7)	(43.7)	(83.8)	(134)	(271)	(633)	(1215)	(1943)
8″ 10″	120	700	–	15.9	35	61.1	–	230	507	886
		1400	(18.4)	(43.5)	(83)	(134)	(266)	(630)	(1348)	(1943)
4″	190	700	–	10.2	23.1	39.1	–	148	335	567
		1400	(11.8)	(27.8)	(53.5)	(85.6)	(171)	(403)	(775)	(1241)
6″	190	700	–	10.2	23	39.1	–	148	333	567
		1400	(11.8)	(27.8)	(53.5)	(85.6)	(171)	(403)	(775)	(1241)
8″ to 12″	190	700	–	10.1	22.9	38.9	–	146	332	564
		1400	(11.6)	(27.7)	(53.4)	(85.5)	(168)	(401)	(774)	(1239)
6″	290	1400	–	13.6	30	50.6	–	197	435	733
		2800	(15.6)	(36.2)	(69)	–	(226)	(525)	(1000)	–
8″ to 12″	290	1400	–	13.5	29.9	50.4	–	195	433	730
		2800	(15.5)	(36.1)	(68.9)	–	(224)	(523)	(999)	–
		2x2800	(31)	(72)	(138)	–	(449)	(1044)	(2001)	–
6″	420	1400	–	9.4	20.8	35	–	136	301	507
		2800	(10.8)	(25)	(47.8)	–	(156)	(362)	(693)	–
8″ to 16″	420	1400	–	9.3	20.7	34.9	–	134	300	506
		2800	(10.7)	(25)	(47.8)	–	(155)	(362)	(693)	–
		2x2800	(21.4)	(50)	(95.6)	–	(310)	(725)	(1386)	–
8″ to 16″	735	1400	–	5.1	11.5	19.6	–	74	166	284
		2800	(5.9)	(13.9)	(26.8)	(42.8)	(85)	(201)	(388)	(620)
		2x2800	(11.8)	(27.8)	(53.6)	–	(171)	(403)	(777)	–
10″ to 16″	1150	2800	–	6.8	15	25.3	–	98	217	266
		2x2800	–	13.6	30	50.6	–	197	435	733
12″ 16″	1730	2800	–	4.7	10.4	17.5	–	26	150	253
		2x2800	–	9.4	20.8	35	–	136	301	407
16″	2300	2800	–	–	7.6	12.8	–	–	110	185
		2x2800	–	6.8	15.2	25.6	–	98	220	271
16″	2900	2800	–	–	5.8	9.8	–	–	84	142
		2x2800	–	5.2	11.6	19.6	–	75	168	284

Table 7 · Dimensions for Type 3254-1 and Type 3254-7 in standard version

Valve				3″	4″	6″	8″	10″	12″	16″
Length L		Class 150	mm	298	352	451	543	673	736	1025
			in	11.73	13.83	17.75	21.37	26.49	28.97	40.35
		Class 300	mm	318	368	473	568	708	775	1067
			in	12.52	14.49	18.62	22.36	27.87	30.51	42.01
		Class 600	mm	337	394	508	609	752	819	1117
			in	13.26	15.51	20	23.97	29.6	32.24	43.97
		Class 900	mm	381	457	609	737	838	965	1130
			in	15	17.99	23.97	29.01	32.99	37.99	44.48
H1 for actuator	700 cm^2	Class 150/600	mm	462	482	732	805	–		
			in	18.18	18.97	29.01	31.69			
		Class 900	mm	462	482	732	805	–		
			in	18.18	18.97	29.01	31.69			
	1400 cm^2	Class 150/600	mm	517	537	732	805	860	–	
			in	20.35	21.14	29.01	31.69	33.85		
		Class 900	mm	517	537	732	805	860	–	
			in	20.35	21.14	29.01	31.69	33.85		
	2800 cm^2	Class 150/600	mm	702	722	817	890	1094	1290	1290
			in	27.63	28.42	32.16	35.04	43.07	50.78	50.78
		Class 900	mm	702	722	817	890	1094	1290	–
			in	27.63	28.42	32.16	35.04	43.07	50.78	
H2		Class 150	mm	175	207	288	390	410	480	560
			in	6.89	8.15	11.33	15.35	16.14	18.89	22.04
		Class 300/600	mm	222	249	338	390	410	480	650
			in	8.74	9.8	13.3	15.35	16.14	18.89	25.59
		Class 900	mm	222	249	338	390	410	480	–
			in	8.74	9.8	13.3	15.35	16.14	18.89	

Actuator	cm^2	700	1400	2800	2 x 2800
Diaphragm ∅	mm	390	530	770	
	in	15.35	20.86	30.3	
H	mm	200	287	620	1130
	in	7.87	11.3	24.41	44.49
H3 [1]	mm	190	610	650	
	in	7.48	24	25.6	
Thread		M 30 x 1.5	M 60 x 1.5	M 100 x 2	
a (with Type 3271 Actuator)		G ⅜ (NPT ⅜)	G ¾ (NPT ¾)	G 1 (NPT 1)	
a2 (with Type 3277 Actuator)		G ⅜ (NPT ⅜)	–		

[1] Minimum clearance for actuator disassembly

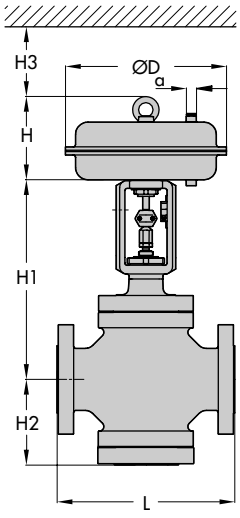
Table 8 · Weights for Type 3254-1 and Type 3254-7 in standard version

Valve			3″	4″	6″	8″	10″	12″	16″
Valve without actuator (appr.)	Cl 150/300	kg	On request	150	380	380	On request		
		lbs		331	838	838			
	Class 600	kg		150	380	580			
		lbs		331	838	1278			
	Class 900	kg		175	420	700			
		lbs		386	926	1543			

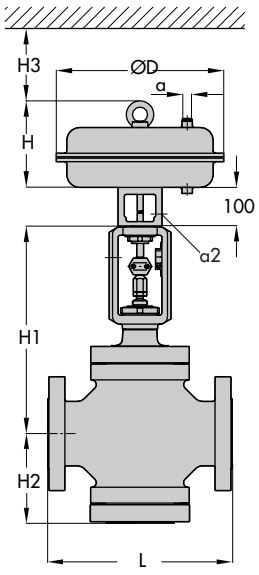
Actuator		cm^2	700	1400	2800	2 x 2800
Type 3271 (appr.)	Without -	kg	22	70	450	950
		lbs	48.5	154.5	992	2095
	With hand wheel	kg	27	Only with side-mounted handwheel, see T 8310 EN		
		lbs	59.5			
Type 3277 (appr.)	Without -	kg	26	–		
		lbs	57.6			
	With hand wheel	kg	31			
		lbs	68.5			

Pneumatic actuators

Type 3271 Type 3277



Type 3254-1



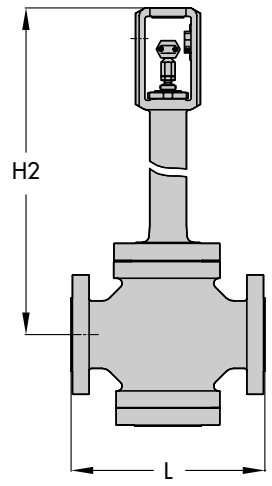
Type 3254-7

Table 9 · Dimensions and weights for Type 3254 Globe Valve in standard version with insulating section · Without actuator

Nominal size		in	3″	4″	6″	8″	10″	12″	16″
Class 150 ... 600 H4 for actuator	700 cm²	mm	732	752	1083	1365	–		
		in	28.82	29.6	42.64	53.74			
	1400 cm²	mm	787	807	1083	1365	1485	–	
		in	30.98	31.77	42.62	53.74	58.46		
	2800 cm²	mm	972	992	1168	1450	1719	1810	1870
		in	38.26	39.05	45.98	57.08	67.67	71.26	73.62
Class 900 H4 for actuator	700 cm²	mm	732	752	1083	1365	–		
		in	28.82	29.6	42.64	53.74			
	1400 cm²	mm	787	807	1083	1365	1485	–	
		in	30.98	31.77	42.64	53.76	58.46		
	2800 cm²	mm	972	992	1168	1450	1719		–
		in	38.26	39.05	45.98	57.08	67.67	71.26	
Weight (kg) without actuator for	Cl 150/300	kg	On request	169	400	480	On request		
		lbs		373	882	1058			
	Class 600	kg		169	400	680			
		lbs		373	882	1500			
	Class 900	kg		195	440	800			
		lbs		430	970	1764			

Table 10 · Dimensions and weights for Type 3254 in standard version with metal bellows · Without actuator

Nominal size		in	3″	4″	6″	8″	10″	12″	16″
Cl 150 H4 for actuator	700 cm²	mm	841	841	1139	1455	–		
		in	33.1	33.1	44.85	57.3			
	1400 cm²	mm	896	896	1139	1455	1905	–	
		in	35.3	35.3	44.85	57.3	75		
	2800 cm²	mm	1081	1081	1224	1540	2139	2150	2180
		in	42.56	42.56	48.2	60.63	84.21	84.64	85.82
Cl 300/600 H4 for actuator	700 cm²	mm	841	841	1271	1855	–		
		in	33.1	33.1	50.04	73.03			
	1400 cm²	mm	896	896	1271	1855			
		in	35.3	35.3	50.04	73.03			
	2800 cm²	mm	1081	1081	1356	1940			
		in	42.56	42.56	53.4	76.4			
Cl 900 H4 for actuator	700 cm²	mm	841	841	1271	1990	–		
		in	33.1	33.1	50.04	78.35			
	1400 cm²	mm	896	896	1271	1990			
		in	35.27	35.27	50.04	78.35			
	2800 cm²	mm	1081	1081	1356	2075			
		in	42.56	42.56	53.4	81.7			
Weight without actuator for	Class 150/300	kg	On request	169	400	480	On request		
		lbs		373	882	1058			
	Class 600	kg		169	400	680			
		lbs		373	882	1500			
	Class 900	kg		195	440	800			
		lbs		430	970	1764			



Type 3254 Globe Valve with insulating section or metal bellows

Please indicate the following details on ordering

Nominal size	....
Nominal pressure	ANSI Class ....
Body material	Acc. to Table 2
Connection	Flanges/welding ends
Plug	Standard/balanced; soft sealing, metal sealing or lapped-in metal sealing
Characteristic	Equal percentage or linear
Actuator	Type 3271 or Type 3277 (see T 8310 EN or T 8311 EN)
Fail-safe position	"Valve CLOSED" or "Valve OPEN"
Process medium	Density in lb/cu.ft or kg/m^3 and temperature in °C (°F)
Flow rate	lbs/h or kg/h or cu.ft/min or m^3/h under standard or operating conditions
Pressure	p_1 and p_2 in bar (psi) (absolute pressure $p_{abs)}$, both with minimum, standard and maximum flow
Accessories	Positioner and/or limit switches

Specifications subject to change without notice.

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Series 250

Pneumatic Control Valves Type 3256-1 and Type 3256-7
Angle Valve Type 3256

ANSI version

Application

Control valve for process engineering applications with high industrial requirements

Nominal sizes	**½" to 8"**
Nominal pressures	**ANSI Class 300 to 2500**
Temperatures	**–200 °C to 500 °C (–325 to 930 °F)**

Type 3256 Angle Valve optionally operated with

- Type 3271 Pneumatic Actuator (Type 3256-1 Control Valve) or
- Type 3277 Pneumatic Actuator (Type 3256-7 Control Valve) for integral positioner attachment.

Valve body optionally made of

- High-temperature (heat-treated),
- Cold-resisting or
- Stainless carbon steel.

Valve plug optionally with

- Metal sealing,
- Soft sealing up to Class 300 or
- Lapped-in metal sealing,
- Balanced to handle large differential pressures.

Stuffing boxes optionally with

- Spring-loaded PTFE V-ring packings or
- Two adjustable high-temperature (HT) packings, optionally available with a test connection between the two packings.

The control valves, designed according to the modular assembly principle, can be combined with various accessories:

Positioners, solenoid valves and other accessories according to IEC 60534-6 and NAMUR recommendation. See Information Sheet T 8350 EN for details.

Versions

Standard version (Fig. 1) · ½" to 6", ANSI Class 300 to 900, 8" up to Class 600, with PTFE packing for temperatures from –10 to 220 °C (15 to 430 °F) or with adjustable high-temperature packing for –10 to 350 °C (15 to 660 °F).

– **Type 3256-1** (Fig. 1) · With Type 3271 Actuator (effective area 350 to 2800 cm^2).
– **Type 3256-7** · With Type 3277 Actuator (350 and 700 cm^2) for integral positioner attachment (see Data Sheet T 8311 EN for details).

Additional versions with

– **ANSI Class 1500 and 2500** · On request
– **Welding ends or welding neck ends** acc. to ANSI B16.25
– **Flow divider** · For noise level reduction · See T 8081 EN
– **AC-Trim** · See T 8082 EN, T 8083 EN
– **Insulating or bellows section** · See Technical Data

Fig. 1 · Type 3256-1 Pneumatic Control Valve with Type 3271 Actuator, positioner and solenoid valve

– **Heating jacket** · Details on request
– **Additional handwheel** · See T 8310 EN and T 8311 EN
– **Version according to DIN standards** · DN 15 to 200, PN 10 to 160 · See Data Sheet T 8065 EN
– **Type 3256-3 Hand-operated Control Valve** · With Type 3273 Manual Actuator for valves with a max. travel of 30 mm · See T 8312 EN
– **Type 3256-2 Electric Control Valve** · On request

Edition May 2003

Associated Information Sheet	**T 8000 EN**
Information Sheet for Actuators	**T 8300 EN**

Data Sheet **T 8066 EN**

Principle of operation (Figs. 2 to 4)

The process medium flows through the valve in the direction indicated by the arrow. The position of the valve plug determines the cross-sectional area of flow between the valve seat and plug.

The version with metal bellows seal (Fig. 3) is equipped with a test connection to allow the monitoring of the stainless steel bellows.

A pressure-balanced plug (Fig. 4) needs to be used when high pressures or differential pressures act on the plug and the force produced by the actuator is insufficient.

The control valves can be equipped with St I or St III flow dividers (see Data Sheet T 8081 EN for details).

Fail-safe action

Depending on how the compression springs are arranged in the actuator (see Data Sheets T 8310 EN and T 8311 EN for details), the control valve offers two different fail-safe actions which become effective upon a supply air failure.

"Actuator stem extends":
Whenever the air supply fails, the valve is closed (fail-close).

"Actuator stem retracts":
Whenever the air supply fails, the valve is opened (fail-open).

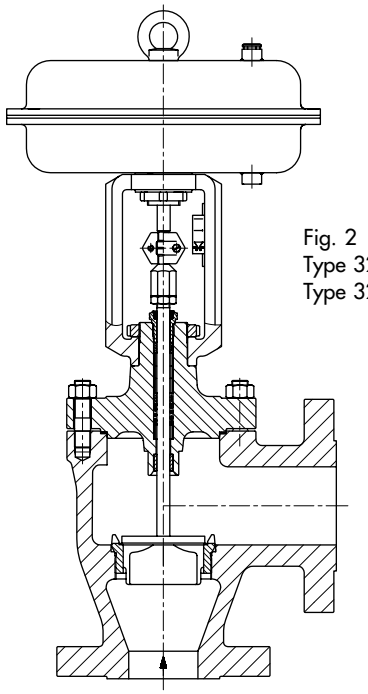

Fig. 2
Type 3256-1 Valve with Type 3271 Actuator

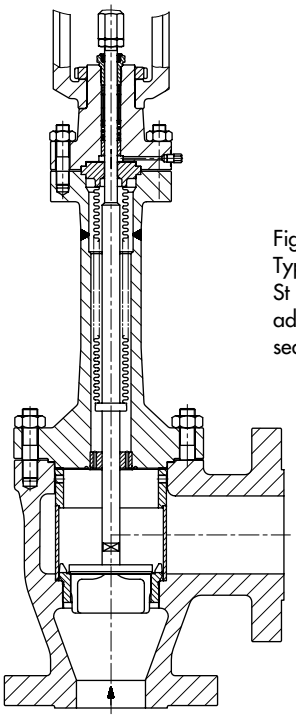

Fig. 3
Type 3256 Valve with St I flow divider and additional metal bellows seal with test connection

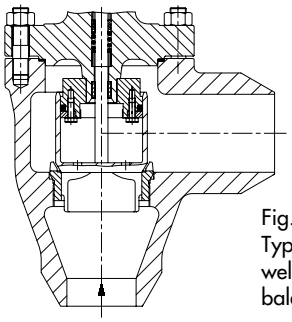

Fig. 4
Type 3256 Valve with welding ends and balanced valve plug

Table 1 · Technical Data for Type 3256 Angle Valve

Material			Carbon steel A 216 WCC	Carbon steel A 217 WC6	Stainless carbon steel A 351 CF8M
Nominal sizes			½" ... 6" · 8" up to Class 900		
Nominal pressure [1]		Class	150 ... 900		
End connection		Flanges	All ANSI versions		
		Welding ends	According to ANSI B16.25		
Seat/plug sealing			Metal sealing, soft sealing or lapped-in metal sealing		
Characteristic			Equal percentage · Linear		
Rangeability			50 : 1		
Temperature ranges in °C (°F) · Permissible operating pressures according to pressure-temperature diagram (see Information Sheet T 8000-2 EN)					
Valve body without insulating section			–10 ... 220 °C (14 ... 428 °F) · Up to 350 °C (660 °F) with HT packing		
Body with		Insulating section	–29...427 °C (–20...800 °F)	–29...500 °C (–20...930 °F)	–200...450 °C (–325...842 °F)
		Bellows section	–29...427 °C (–20...800 °F)	–29...500 °C (–20...930 °F)	–200...450 °C (–325...842 °F)
Valve plug [2]	Standard	Metal sealing	–200...500 °C (–325...930 °F)		
		Soft sealing	–200...220 °C (–325...428 °F)		
	Balanced	PTFE ring	–200...220 °C (–325...428 °F)		
		Graphite ring	220...500 °C (428...930 °F)		
Leakage class according to DIN EN 1349: 2000 / ANSI/FCI 70-2-1991					
Valve plug	Standard	Metal sealing	IV		
		Soft sealing	VI		
		Lapped-in metal	IV-S2 · 4" and larger: IV-S1		
		Balanced, metal sealing	With PTFE ring: IV · With graphite ring: III		

[1] Up to Class 2500 on request

[2] Only when suitable body material is used

Table 2 · Materials (material numbers according to EN)

Standard version Body and flanges [1]		Carbon steel A 216 WCC	Carbon steel A 217 WC6	Stainless carbon steel A 351 CF8M
Seat and plug [2]	Metal sealing	1.4006/1.4008		1.4571/1.4581
Seal ring for	Soft sealing	PTFE with 15 % glass fiber		
	Balanced plug	PTFE with carbon · Graphite		
Guide bushings		1.4112		2.4610
Stuffing box packing		V-ring packing of PTFE with carbon, spring of 1.4310 or high-temperature packing		
Body gaskets		Metal		
Insulating section [3]		A 217 WC6/A 182 F12		A 351 CF8M/A 182 F316
Metal bellows seal				
Intermediate piece [3]		A 217 WC6/A 182 F12		A 351 CF8M/A 182 F316
Metal bellows		1.4571		
Heating jacket		1.4541		

[1] Also see pressure-temperature diagram (T 8000-2 EN)
Material for cryogenic service: A 352 LCC

[2] Also available: seats and plugs with metal sealing with Stellite facing or plugs of pure Stellite

[3] Depending on the valve bonnet material

Table 3 · K_{VS} values

Table 3a · **Overview** with St I (Cv I/K_{VS} I) flow divider or St III (Cv III/K_{VS} III) flow divider

Cv		0.12 · 0.2 0.3 · 0.5	0.75	1.2	2	3	5	7.5	12	20	30	47	75	120	190	290	420	735
Kvs		0.1 · 0.16 0.25 · 0.4	0.63	1.0	1.6	2.5	4	6.3	10	16	25	40	63	100	160	250	360	630
Cv I					1.7	2.6	4.2	7	10.5	17	26	42	67	105	170	265	375	650
Kvs I		–			1.45	2.2	3.6	5.7	9	14.5	22	36	57	90	144	225	320	560
Cv III							3.5	5.6	9	14	23	35	55	90	140	220	315	–
Kvs III		–					3.0	4.8	7.5	12	20	30	47	75	120	190	270	–
Seat ∅	mm	6			12		24			31	38	50	63	80	100	125	150	200
Rated travel	mm	15										30				60		
	in	0.5″										1.18″				2.36″		

Table 3b · **Versions without flow dividers** · Versions in highlighted fields also available with balanced valve plug

Cv		0.12 · 0.2 0.3 · 0.5	0.75	1.2	2	3	5	7.5	12	20	30	47	75	120	190	290	420	735
DN	in/mm																	
½″	15	•	•	•	•	•	•											
1″	25	•	•	•	•	•	•	•	•									
1½″	40	•	•	•	•	•	•	•	•	•	•							
2″	50						•	•	•	•	•	•						
3″	80						•	•	•	•	•	•	•	•				
4″	100										•	•	•	•	•			
6″	150												•	•	•	•	•	
8″	200														•	•	•	•

Table 3c · **Versions with St I flow divider** · Versions in highlighted fields also available with balanced valve plug

C_v I		–			1.7	2.6	4.2	7	10.5	17	26	42	67	105	170	265	375	650
DN	in/mm																	
½″	15				•	•	•											
1″	25				•	•	•	•	•									
1½″	40				•	•	•	•	•	•	•							
2″	50						•	•	•	•	•	•						
3″	80						•	•	•	•	•	•	•	•				
4″	100										•	•	•	•	•			
6″	150												•	•	•	•	•	
8″	200														•	•	•	•

Table 3d · **Versions with St III flow divider** · Versions in highlighted fields also available with balanced valve plug

C_v III		–			3.5	5.6	9	14	23	35	55	90	140	220	315	–
DN	in/mm															
2″ *	50 *				•	•	•									
3″	80				•	•	•	•	•	•						
4″	100								•	•	•					
6″	150										•	•	•	•		
8″	200												•	•	•	

* 2" version (DN 50) with St III flow divider not possible with bellows seal

Notes on differential pressure tables

The differential pressure tables were prepared under the following conditions:

- Medium flow directed against the closing direction of the valve plug
- Version with valve plug with metal sealing
- Version with PTFE stuffing box
- Tables 4a and 4b for unbalanced valve plug with downstream pressure p_2 = 0 bar (psi)
- For the listed maximum differential pressures and the previously mentioned conditions, the leakage rate stated in Table 1 is not exceeded.
- All pressures in bar (gauge) and psi
- The stated differential pressures can be limited by the pressure-temperature diagram (see T 8000-2 EN).

Overview: valve versions of the Δp tables

Tables 4a and 4b: valve with **unbalanced** valve plug without metal bellows seal; fail-safe action "valve CLOSED"

Tables 5a and 5b: valve with **balanced** valve plug with PTFE ring without metal bellows seal; fail-safe action "valve CLOSED" or "valve OPEN"

Tables 6a and 6b: valve with **unbalanced** valve plug without metal bellows seal; fail-safe action "valve OPEN"

Note on fail-safe action "valve CLOSED":

Always use pretensioned spring ranges for actuators with reduced travels.

Note! Permissible differential pressures are available on request for special versions with:

- Soft sealing or
- Lapped-in metal plug,
- Metal bellows seal or
- Balanced valve plug with graphite ring.

Selection and sizing of the control valve

1. Calculate the appropriate K_v value according to DIN IEC 60534.
2. Select the nominal size and K_{vs} value according to Table 3.
3. Determine the permissible differential pressure Δp. Select the suitable actuator according to Tables 4a to 6.
4. Select materials, pressure and temperature according to Tables 1 and 2 and the pressure-temperature diagram (see T 8000-2 EN)
5. Select accessories according to Tables 1 and 2.

Table 4a · Permissible differential pressures Δp for valves with unbalanced plug with metal sealing, without metal bellows seal; fail-safe action "valve CLOSED" · Pressures in bar

Values specified in the fields highlighted in gray correspond to the standard bench range, i.e. applied at rated travel · Values specified in the other fields apply to maximally pretensioned springs · Values in parentheses apply to 50 % travel

Table 4a · Fail-safe action "valve CLOSED" (fail-close)												
Nominal bench range (bar) with actuator (cm^2)		350	0.2...1.0	0.4...1.2	0.4...2.0	0.8...2.4	0.6...3.0	1.2...3.6	1.4...2.3	2.1...3.3	–	–
		700		0.4...1.2 (0.8...1.2)		0.8...2.4 (1.6...2.4)		1.2...3.6 (2.4...3.6)	1.4...2.3 (1.85...2.3)	2.1...3.3 (2.7...3.3)	2.35...3.8 (3.05...3.8)	2.6...4.3 (3.45...4.3)
		1400					0.5...2.5	1.0...3.0 (2.0...3.0)	1.1...2.4	1.4...2.7 (2.05...2.7)	1.3...2.8	1.7...3.2 (2.45...3.2)
		2800	0.4...1.2 (0.8...1.2)	0.8...2.4 (1.6...2.4)	1.0...3.0 (2.0...3.0)	1.2...3.6 (2.4...3.6)	0.9...1.6	1.1...1.8 (1.25...1.6)	1.0...2.1	1.25...2.35 (1.55...2.1)	1.1...2.6	1.5...3.0 (1.85...2.6)
		2x2800										
Required supply pressure			Final spring value + 0.2 bar									
Nom. size	C_v	Actuator cm^2	Δp with p_2 = 0 bar									
½″ to 1½″	0.12 to 1.2	350	46.1	102	102	213	158	325	380	400	–	–
	2 to 3	350	46.1	102	102	213	158	325	380	400	–	–
	5 to 12	350	8.5	22.4	22.4	50.5	36.6	78.1	92.1	141	–	–
		700	–	(106)	–	(217)	–	(329)	(252)	(370)	(400)	–
2″		350	7.7	22	22	49.5	35.5	77.3	91.3	140	–	–
		700	–	(105)	–	(217)	–	(328)	(252)	(370)	(400)	–
1½″ to 3″	20	350	4.1	12.4	12.4	29.1	21	45.8	54.2	83.4	–	–
		700	–	(62.5)	–	(129)	–	(196)	(150)	(221)	(250)	(284)
1½″ to 4″	30	350	–	7.9	7.9	19	13.4	30.1	35.7	55.1	–	–
		700	–	(41.2)	–	(85.7)	–	(130)	(99.6)	(147)	(166)	(188)
2″ to 4″	47	700	4.3	10.7	10.7	23.6	17.1	36.4	42.8	65.3	73.3	81.3
		1400	–	(49.2)	–	(100)	–	(126)	–	(129)	–	(155)
3″ to 6″	75	700	–	6.3	6.3	14.4	10.4	22.5	26.5	40.7	45.7	50.8
		1400	–	(30.6)	–	(62.9)	–	(79.1)	–	(81.1)	–	(97.3)
3″ to 6″	120	700	–	–	–	8.7	6.2	13.7	16.3	25	28.2	31.3
		1400	–	(18.8)	–	(38.8)	–	(48.8)	–	(50.1)	–	(60.1)
4″ to 6″	190	700	–	–	–	5.4	–	8.7	10.3	15.9	17.9	19.9
		1400	–	(11.9)	–	(24.7)	–	(31.1)	–	(31.9)	–	(38.3)
8″	190	700	–	–	–	5.4	–	8.6	10.2	15.8	17.8	19.8
		1400	–	(11.8)	–	(24.6)	–	(31)	–	(31.8)	–	(38.2)
6″	290	1400	–	–	–	7.5	4.4	9.5	10.5	13.6	12.6	16.7
		2800	(15.7)	(32.1)	(40.3)	(48.5)	–	(24.9)	–	(31.1)	–	(37.2)
8″	290	1400	–	–	–	7.4	4.3	9.5	10.5	13.6	12.5	16.6
		2800	(15.6)	(32)	(40.3)	(48.5)	–	(24.9)	–	(31)	–	(37.2)
		2x2800	(31.2)	(64)	(80.6)	(97)	–	(49.8)	–	(62)	–	(74.4)
6″	420	1400	–	–	–	5.1	–	6.5	7.2	9.4	8.7	11.5
		2800	(10.8)	(22.2)	(27.9)	(33.6)	–	(17.2)	–	(21.5)	–	(25.8)
8″	420	1400	–	–	–	5.1	–	6.5	7.2	9.3	8.6	11.5
		2800	(10.7)	(22.2)	(27.9)	(33.6)	–	(17.2)	–	(21.5)	–	(25.7)
		2x2800	(21.4)	(44.4)	(55.8)	(67.2)	–	(34.4)	–	(43)	–	(51.4)
8″	735	1400	–	–	–	–	–	–	4	5.2	4.7	6.4
		2800	(6)	(12.4)	(15.6)	(18.8)	–	(9.6)	–	(12)	–	(14.4)
		2x2800	(12)	(24.8)	(31.2)	(37.6)	–	(19.2)	–	(24)	–	(28.8)

Table 4b · Permissible differential pressures Δp for valves with unbalanced plug with metal sealing, without metal bellows seal; fail-safe action "valve CLOSED" · Pressures in psi

Values specified in the fields highlighted in gray correspond to the standard bench range, i.e. applied at rated travel · Values specified in the other fields apply to maximally pretensioned springs · Values in parentheses apply to 50 % travel

Table 4b · Fail-safe action "valve CLOSED" (fail-close)												
Nominal bench range (psi) with actuator (cm^2)		350	3 ... 15	6 ... 18	6 ... 30	12 ... 36	9 ... 45	18 ... 52	20 ... 34	30 ... 48	–	–
		700		6 ... 18 (12 ... 18)		12 ... 36 (23 ... 36)		18 ... 52 (35 ... 52)	20 ... 34 (27 ... 34)	30 ... 48 (39 ... 48)	35 ... 55 (44 ... 55)	36 ... 6.2 (50 ... 52)
		1400					7 ... 36	15 ... 45 (30 ... 45)	16 ... 36	20 ... 39 (30 ... 39)	19 ... 41	25 ... 46 (36 ... 46)
		2800	6 ... 18 (12 ... 18)	12 ... 36 (23 ... 36)	15 ... 45 (30 ... 45)	18 ... 52 (35 ... 52)	15 ... 23	16 ... 26 (18 ... 23)	15 ... 30	18 ... 34 (22 ... 30)	11 ... 36	22 ... 45 (27 ... 36)
		2x2800										
Required supply pressure			Final spring value + 3 psi									
Nom. size	C_v	Actuator cm^2	Δp with p_2 = 0 psi									
½″ to 1½″	0.12 to 1.2	350	668	1479	1479	3088	2291	4712	5510	5800	–	–
	2 to 3	350	668	1479	1479	3088	2291	4712	5510	5800	–	–
	5 to 12	350	123	325	325	732	530	1132	1335	2044	–	–
		700	–	(1537)	–	(3146)	–	(4770)	(3654)	(5365)	(5800)	–
2″		350	111	319	319	717	514	1121	1324	2030	–	–
		700	–	(1522)	–	(3146)	–	(4756)	(3654)	(5365)	(5800)	–
1½″ to 3″	20	350	59	180	180	422	305	664	786	1209	–	–
		700	–	(906)	–	(1870)	–	(2842)	(2175)	(3204)	(3625)	(4118)
1½″ to 4″	30	350	–	114	114	275	194	436	517	799	–	–
		700	–	(597)	–	(1242)	–	(1885)	(1444)	(2131)	(2407)	(2726)
2″ to 4″	47	700	62	155	155	342	248	527	620	947	1063	1178
		1400	–	(713)	–	(145)	–	(1827)	–	(1870)	–	(2247)
3″ to 6″	75	700	–	91	91	209	151	326	384	590	662	736
		1400	–	(443)	–	(912)	–	(1147)	–	(1176)	–	(1411)
3″ to 6″	120	700	–	–	–	126	90	198	236	362	409	454
		1400	–	(272)	–	(562)	–	(707)	–	(726)	–	(871)
4″ to 6″	190	700	–	–	–	78	–	126	149	230	259	288
		1400	–	(172)	–	(358)	–	(451)	–	(462)	–	(555)
8″	190	700	–	–	–	78	–	124	148	224	258	287
		1400	–	(171)	–	(356)	–	(449)	–	(461)	–	(554)
6″	290	1400	–	–	–	108	64	137	152	197	183	242
		2800	(227)	(465)	(584)	(703)	–	(361)	–	(451)	–	(539)
8″	290	1400	–	–	–	107	62	137	152	197	181	240
		2800	(226)	(464)	(584)	(703)	–	(361)	–	(449)	–	(539)
		2x2800	(452)	(928)	(1168)	(1406)	–	(722)	–	(899)	–	(1079)
6″	420	1400	–	–	–	74	–	94	104	136	126	166
		2800	(156)	(322)	(404)	(487)	–	(249)	–	(312)	–	(374)
8″	420	1400	–	–	–	74	–	94	104	135	125	166
		2800	(155)	(322)	(404)	(487)	–	(249)	–	(312)	–	(372)
		2x2800	(310)	(644)	(809)	(974)	–	(499)	–	(623)	–	(745)
8″	735	1400	–	–	–	–	–	–	58	75	68	93
		2800	(87)	(180)	(226)	(272)	–	(139)	–	(174)	–	(209)
		2x2800	(174)	(359)	(452)	(545)		(278)	–	(348)	–	(417)

Table 5a · Permissible differential pressures Δp for valves with balanced plug with metal sealing and PTFE ring, without metal bellows seal · Pressures in bar

Values specified in the fields highlighted in gray correspond to the standard bench range, i.e. applied at rated travel · Values specified in the other fields apply to maximally pretensioned springs · Values in parentheses apply to 50 % travel

Fail-safe action			**"Valve CLOSED" (fail-close)**						**"Valve OPEN" (fail-open)**		
Nominal bench range (bar) with actuator (cm^2)		700	0.4...2.0	0.8...2.4 (1.6...2.4)	–	–	0.6...3.0	1.2...3.6	0.4 ... 2.0 (0.4 ... 1.2)		
		1400			0.5...2.5	1.0...3.0 (2.0...3.0)	–	–			
		2800					0.6...3.0	1.2...3.6 (2.4...3.6)			
		2x2800									
Required supply pressure			Final spring value + 0.2 bar						2.4	4.0	6.0
Nominal size	C_v	Actuator cm^2	Δp with p_2 = 0 bar								
3″ 4″	75	700	57.4	155	–	–	106	252	57.4	400	–
		1400	–	(400)	–	(400)	–	–	(400)	–	–
6″	75	700	22.2	62.1	–	–	42.2	102	22.2	182	382
		1400	–	(302)	–	(381)	–	–	(221)	(400)	–
3″ 4″	120	700	48.1	146	–	–	96.8	243	48.1	400	–
		1400	–	(400)	–	(400)	–	–	(400)	–	–
6″	120	700	18.4	58.3	–	–	38.4	98.3	18.4	178	378
		1400	–	(298)	–	(378)	–	–	(218)	(400)	–
4″	190	700	37.2	135	–	–	85.9	232	37.2	400	–
		1400	–	(400)	–	(400)	–	–	(400)	–	–
6″	190	700	13.9	53.8	–	–	33.9	93.8	13.9	174	373
		1400	–	(293)	–	(373)	–	–	(213)	(400)	–
8″	190	700	4.6	20.2	–	–	12.4	35.8	4.6	67	145
		1400	–	(114)	–	(145)	–	–	(82.6)	(207)	(363)
6″	290	1400	48.3	128	68.2	168	–	–	48.3	368	400
		2800	–	(400)	–	(400)	–	(400)	(400)	–	–
8″	290	1400	18	49.2	25.8	64.8	–	–	18	143	299
		2800	–	(236)	–	(298)	–	(361)	(174)	(400)	–
		2x2800	–	(400)	–	(400)	–	(400)	(348)	(400)	–
6″	420	1400	42.6	123	62.6	162	–	–	42.7	362	400
		2800	–	(400)	–	(400)	–	(400)	(400)	–	–
8″	420	1400	15.8	47	23.6	62.6	–	–	15.3	109	265
		2800	–	(234)	–	(296)	–	(359)	(172)	(400)	–
		2x2800	–	(400)	–	(400)	–	(400)	(344)	(400)	–
8″	735	1400	11.4	42.6	19.2	58.2	–	–	11.4	136	292
		2800	–	(230)	–	(292)	–	(354)	(167)	(400)	–
		2x2800	–	(400)	–	(400)	–	(400)	(334)	(400)	–

Table 5b · Permissible differential pressures Δp for valves with balanced plug with metal sealing and PTFE ring, without metal bellows seal · Pressures in psi

Values specified in the fields highlighted in gray correspond to the standard bench range, i.e. applied at rated travel · Values specified in the other fields apply to maximally pretensioned springs · Values in parentheses apply to 50 % travel

Fail-safe action			**"Valve CLOSED" (fail-close)**						**"Valve OPEN" (fail-open)**		
Nominal bench range (psi) with actuator (cm^2)		700	6...30	12...36 (23...36)	–	–	9...45	18...52	6 ... 30 (6 ... 18)		
		1400			7...36	15...44 (30...44)	–	–			
		2800					9...45	18...52 (36...52)			
		2x2800									
Required supply pressure			Final spring value + 3 psi						36	60	90
Nominal size	C_v	Actuator cm^2	Δp with p_2 = 0 psi								
3″ 4″	75	700	832	2247	–	–	1537	3654	832	5800	–
		1400	–	(5800)	–	(5800)	–	–	(5800)	–	–
6″	75	700	322	900	–	–	615	1479	322	2639	5539
		1400	–	(4379)	–	(5524)	–	–	(3204)	(5800)	–
3″ 4″	120	700	697	2117	–	–	1403	2523	697	5800	–
		1400	–	(5800)	–	(5800)	–	–	(5800)	–	–
6″	120	700	267	845	–	–	557	1425	267	2581	5481
		1400	–	(4321)	–	(5481)	–	–	(3161)	(5800)	–
4″	190	700	539	1957	–	–	1245	3364	539	5800	–
		1400	–	(5800)	–	(5800)	–	–	(5800)	–	–
6″	190	700	201	780	–	–	491	1360	201	2523	5408
		1400	–	(4248)	–	(5409)	–	–	(3088)	(5800)	–
8″	190	700	66	293	–	–	179	519	66	971	2102
		1400	–	(1653)	–	(2102)	–	–	(1197)	(3001)	(5263)
6″	290	1400	700	1856	989	2436	–	–	700	5336	5800
		2800	–	(5800)	–	(5800)	–	(5800)	(5800)	–	–
8″	290	1400	261	713	374	939	–	–	261	2073	4335
		2800	–	(3422)	–	(4321)	–	(5234)	(2523)	(5800)	–
		2x2800	–	(5800)	–	(5800)	–	(5800)	(5046)	(5800)	–
6″	420	1400	617	1783	907	2349	–	–	619	5249	5800
		2800	–	(5800)	–	(5800)	–	(5800)	(5800)	–	–
8″	420	1400	229	681	342	907	–	–	221	1580	3842
		2800	–	(3393)	–	(4292)	–	(5205)	(2494)	(5800)	–
		2x2800	–	(5800)	–	(5800)	–	(5800)	(4988)	(5800)	–
8″	735	1400	165	617	278	844	–	–	165	1972	4234
		2800	–	(3335)	–	(4234)	–	(5133)	(2421)	(5800)	–
		2x2800	–	(5800)	–	(5800)	–	(5800)	(4843)	(5800)	–

Table 6 · Permissible differential pressures Δp for valves with unbalanced plug with metal sealing, without metal bellows seal · Fail-safe action "valve OPEN"

			Table 6a · Pressures in bar				Table 6b · Pressures in psi			
Nominal bench range (bar/psi) with actuator (cm^2)		350	0.2 ... 1.0 (0.2 ... 0.6)				3 ... 15 (3 ... 9)			
		700								
		1400								
		2800								
		2x2800								
Required supply pressure			1.4	2.4	4.0	6.0	20	36	60	90
Nom. size	C_v	Actuator cm^2	Δp with p_2 = 0 bar				Δp with p_2 = 0 psi			
½" to 1½"	0.12 to 1.2	350	102	380	400	–	1479	5510	5800	–
	2 to 3	350	101	380	400	–	1464	5510	5800	–
	5 to 12	350	22.4	92.1	203	343	325	1335	2943	4973
		700	(106)	(245)	(400)	–	(1537)	(3552)	(5800)	–
2"		350	21.6	91.3	203	342	313	1324	2943	4959
		700	(105)	(244)	(400)	–	(1522)	(3538)	(5800)	–
1½" to 3"	20	350	12.4	54.2	121	204	180	786	1754	2958
		700	(62.5)	(146)	(280)	(400)	(906)	(2117)	(4060)	(5800)
1½" to 4"	30	350	7.9	35.7	80.1	136	114	517	1161	1972
		700	(41)	(97)	(185)	(297)	594	2682	2682	4306
2" to 4"	47	700	10.6	42.7	94.1	158	153	619	1364	2291
		1400	(49)	(113)	(216)	(344)	(710)	(1638)	(3123)	4988
3" to 6"	75	700	6.2	26.4	58.7	99.2	90	383	851	1438
		1400	(30.4)	(71)	(135)	(216)	(441)	(1023)	(1957)	(3132)
3" to 6"	120	700	–	16.2	36.2	61.3	–	235	525	889
		1400	(18.7)	(43.7)	(84)	(134)	(271)	(633)	(1218)	(1943)
4" to 6"	190	700	–	10.2	23	39.1	–	148	333	567
		1400	(11.8)	(27.8)	(53.5)	(85)	(171)	(403)	(775)	(1232)
8"	190	700	–	10.0	22.9	38.9	–	145	332	564
		1400	(11.6)	(27.7)	(53.3)	(85)	(168)	(401)	(773)	(1232)
6"	290	1400	–	13.6	30	50.6	–	197	435	731
		2800	(15.6)	(36.2)	(69)	(110)	(226)	(525)	(1000)	(1595)
8"	290	1400	–	13.5	29.9	50.4	–	195	433	731
		2800	(15.5)	(36.1)	(69)	(110)	(224)	(523)	(1000)	(1595)
		2x2800	(31)	(72)	(138)	(220)	(449)	(1044)	(2001)	(3190)
6"	420	1400	–	9.4	20.8	35	–	136	301	507
		2800	(10.8)	(25)	(47.8)	(76.4)	(156)	(362)	(693)	(1108)
8"	420	1400	–	9.3	20.7	34.9	–	135	300	506
		2800	(10.7)	(25)	(47.8)	(76.3)	(156)	(362)	(693)	(1108)
		2x2800	(21.4)	(50)	(95.6)	(152)	(310)	(725)	(1386)	(2204)
8"	735	1400	–	5.1	11.5	19.5	–	74	166	282
		2800	(5.9)	(13.9)	(26.8)	(42.8)	(85)	(201)	(388)	(620)
		2x2800	(11.8)	(27.8)	(53.6)	(85.6)	(171)	(403)	(777)	(1241)

Table 7 · Dimensions in mm for Type 3256-1 and Type 3256-7 Control Valve in standard version

Valve				½″	1″	1½″	2″	3″	4″	6″	8″
Length L		Class 150	mm	92	92	111	127	149	176	225	271
			in	3.6	3.6	4.37	5	5.86	6.93	8.86	10.67
		Class 300	mm	95	98	117	133	159	184	236	284
			in	3.75	3.86	4.6	5.23	6.26	7.24	9.29	11.18
		Class 600	mm	101	105	125	143	168	197	254	304
			in	3.97	4.13	4.92	5.63	6.6	7.75	10	11.97
		Class 900	mm	108	127	152	184	190	228	305	369
			in	4.25	5	5.98	7.24	7.48	8.97	12	14.53
H1 for actuator	350 cm²	Cl 150/600	mm	374	369	369	415	400	410	–	
			in	14.72	14.52	14.52	16.34	15.75	16.14		
		Class 900	mm	415	410	410	461	400	410	–	
			in	16.34	16.14	16.14	18.15	15.75	16.14		
	700 cm²	Cl 150/600	mm	374	369	369	415	400	410	628	On request
			in	14.72	14.52	14.52	16.34	15.75	16.14	24.72	
		Class 900	mm	415	410	410	461	400	410	628	
			in	16.34	16.14	16.14	18.15	15.75	16.14	24.72	
	1400 cm²	Cl 150/600	mm	–			470	455	465	628	
			in				18.5	17.9	18.3	24.72	
		Class 900	mm				516	455	465	628	
			in				20.3	17.9	18.3	24.72	
	2800 cm²	Cl 150/600	mm	–					650	713	
			in						25.6	28.1	
		Class 900	mm						650	713	
			in						25.6	28.1	

Actuator	cm²	350	700	1400	2800	2 x 2800
Diaphragm ∅	mm	280	390	530	770	
	in	11.02	15.35	20.86	30.3	
H [1]	mm	82	200	287	620	1130
	in	3.23	7.87	11.3	24.41	44.49
H3 [2]	mm	110	190	610	650	
	in	4.33	7.48	24	25.6	
Thread		M 30 x 1.5		M 60 x 1.5	M 100 x 2	
a (with Type 3271 Actuator)		G ⅜ (⅜ NPT)		G ¾ (¾ NPT)	G 1 (1 NPT)	
a2 (with Type 3277 Actuator)		G ⅜ (⅜ NPT)		–		

[1] Actuator 350 cm² without lifting ring

[2] Minimum clearance to disassemble the actuator

Table 8 · Weights for Type 3256-1and Type 3256-7 Control Valve in standard version

Valve	Nominal size		½″	1″	1½″	2″	3″	4″	6″	8″
Valve without actuator (approx.)	Class 150/300	kg	12	On request		35	58	75	190	On request
		lbs	26			77	128	165	419	
	Class 600	kg	On request			58	92	On request		
		lbs				128	203			
	Class 900	kg	On request	38	57	91	110			
		lbs		84	126	200	242			

Actuator	cm^2		350	700	1400	2800	2 x 2800
Type 3271 (approx. kg) [1]	Without –	kg	8	22	70	450	950
		lbs	17.6	48.5	154.5	992	2095
	With handwheel	kg	13	27	Only with side-mounted handwheel, see T 8310 EN		
		lbs	28.7	59.5			
Type 3277 (approx. kg) [1]	Without –	kg	12	26	–		
		lbs	26.5	57.6			
	With handwheel	kg	17	31			
		lbs	37.5	68.5			

[1] Top row without handwheel, bottom row with handwheel

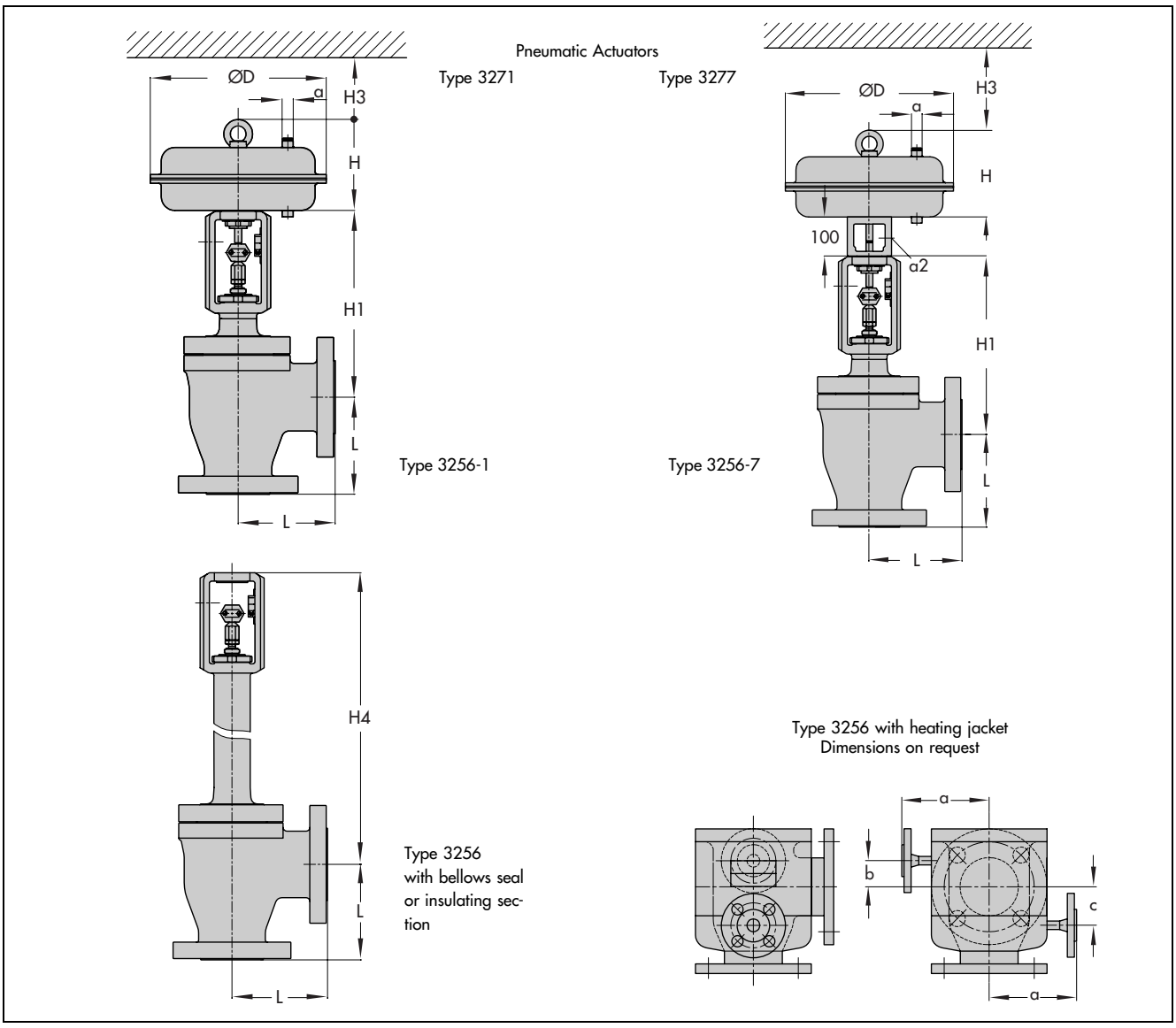

Table 9 · Dimensions and weights for Type 3256 Angle Valve in standard version with insulating section · Without actuator

Nominal sizes		in	½"	1"	1½"	2"	3"	4"	6"	8"
Class 150 ... 600 H4 for actuator	350 cm²	mm	575	570	571	685	670	680	–	On request
		in	22.63	22.44	22.48	26.97	26.37	26.77		
	700 cm²	mm	575	570	571	685	670	680	–	
		in	22.63	22.44	22.48	26.97	26.37	26.77		
	1400 cm²	mm	–			740	725	735	978	
		in				29.13	28.54	28.93	38.5	
	2800 cm²	mm	–					920	1063	
		in						36.22	41.85	
Class 900 H4 for actuator	350 cm²	mm	606	606	606	727	670	680	–	
		in	23.85	23.85	23.85	28.62	26.37	26.77		
	700 cm²	mm	606	606	606	727	670	680	978	
		in	23.85	23.85	23.85	28.62	26.37	26.77	38.5	
	1400 cm²	mm	–			782	725	735	978	
		in				30.78	28.54	28.93	38.5	
	2800 cm²	mm	–					920	1063	
		in						36.22	41.85	
Weight without actuator for	Class 150/300	kg	20	On request		43	66	94	210	
		lbs	44			95	146	207	463	
	Class 600	kg	On request			66	100	On request		
		lbs				146	220			
	Class 900	kg		46	65	99	120			
		lbs		101	143	218	264			

Table 10 · Dimensions and weights for Type 3256 Angle Valve in standard version with metal bellows · Without actuator

Nominal sizes		in	½"	1"	1½"	2"	3"	4"	6"	8"
Class 150 H4 for actuator	350 cm²	mm	572	567	568	794	779	769	–	
		in	22.52	22.32	22.36	31.26	30.67	30.27		
	700 cm²	mm	572	567	568	794	779	769	1036	On request
		in	22.52	22.32	22.36	31.26	30.67	30.27	40.78	
	1400 cm²	mm	–			849	841	824	1036	
		in				33.42	33.1	32.44	40.78	
	2800 cm²	mm	–					1009	1121	
		in						39.72	44.13	
Class 300/600 H4 for actuator	350 cm²	mm	572	567	568	794	779	769	–	
		in	22.52	22.32	22.36	31.26	30.67	30.27		
	700 cm²	mm	572	567	568	794	779	769	1168	1445
		in	22.52	22.32	22.36	31.26	30.67	30.27	45.98	56.89
	1400 cm²	mm	–			849	841	824	1168	1445
		in				33.42	33.1	32.44	45.98	56.89
	2800 cm²	mm	–					1009	1253	1530
		in						39.72	49.33	60.24
Class 900 H4 for actuator	350 cm²	mm	845	845	On request		779	769	–	
		in	33.26	33.26			30.67	30.27		
	700 cm²	mm	845	845			779	769	1168	On request
		in	33.26	33.26			30.67	30.27	45.98	
	1400 cm²	mm	–			On request	834	824	1068	
		in					32.83	32.44	45.98	
	2800 cm²	mm	–					1009	1253	
		in						39.72	49.33	
Weight without actuator for	Class 150/300	kg	20	On request		43	66	94	210	
		lbs	44			95	146	207	463	
	Class 600	kg	On request			66	100	On request		
		lbs				146	220			
	Class 900	kg		46	65	99	120			
		lbs		101	143	218	264			

The following details are required on ordering

Nominal size	....
Nominal pressure	ANSI Class ...
Body material	According to Table 2
Connection	Flanges/welding ends
Plug	Standard/balanced Soft sealing, metal sealing or lapped-in metal sealing
Characteristic	Equal percentage or linear
Actuator	Type 3271 or Type 3277 (see T 8310 EN or T 8311 EN)
Fail-safe action	Valve CLOSED or valve OPEN
Process medium	Density in lb/cu.ft or kg/m^3 and temperature in °C (°F)
Flow rate	lbs/h or kg/h or cu.ft/min or m^3/h in standard or operating conditions
Pressure	p_1 and p_2 in bar (psi) (absolute pressure p_{abs}) with minimum, standard and maximum flow rate
Accessories	Positioner and/or limit switches

Specifications subject to change without notice.

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Flow Dividers for Control Valves

St I · St III

Application

These valve components serve to reduce noise emission. They are designed for installation in globe and angle valves used to control vapors or gases.

The noise emission of control valves controlling gases or vapors as well as the connected pipeline is determined by the free jet leaving the restriction and by the downstream turbulent mixing zone. A particularly effective and low-cost solution to reduce noise is achieved by using flow dividers which shorten the free jet of gas or vapor and accelerate the exchange of energy in the mixing zone.

Special features

- Effective, reliable and cost-effective components for noise reduction
- Noticeable deviation from the characteristic only in the travel range beyond 80%
- The valve's K_{vs} value is reduced to the K_{vsI} and K_{vsIII} values specified in the Data Sheets
- Installation in Types 3241, 3251 and 3254 Globe Valves, Type 3256 Angle Valves as well as globe valves as part of self-operated regulators
- In Series 280 Steam-converting Valves, the St III Flow Divider is also used to split up and vaporize cooling water (see Information Sheet T 8250 EN).

Versions

St I Flow Divider (Figs. 1 and 4) made of perforated sheet steel with perforation diameters of 2.5 mm; suitable for gases and vapors.

St III Flow Divider (Fig. 2) made of stainless wire mesh; suitable for gases and vapors containing small-sized suspended matter. It additionally has an internal and external perforated sheet steel (Fig. 3) and is designed for Series 250 and 280 Valves.

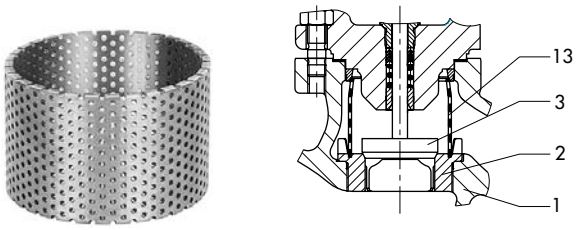

Fig. 1 · St I Flow Divider, installed in Type 3241 Valve

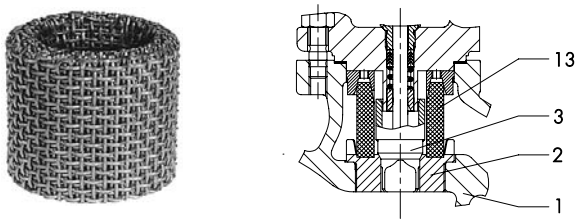

Fig. 2 · St III Flow Divider, installed in Type 3241 Valve

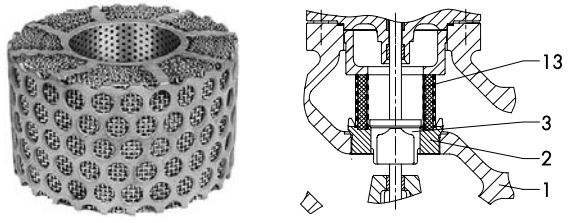

Fig. 3 · St III Flow Divider, installed in Type 3254 Valve

1 Valve body
2 Seat
3 Plug
13 Flow divider

Principle of operation (Fig. 4)

After having passed the cross-sectional area of the restriction located between the valve seat (2) and the plug (3), the process medium reaches its maximum velocity. Before a noisy turbulent mixing zone can be created, the medium hits the inner wall of the flow divider (13) which splits up the jet into numerous smaller jets, thus ensuring low-noise energy transfer to the surrounding medium.

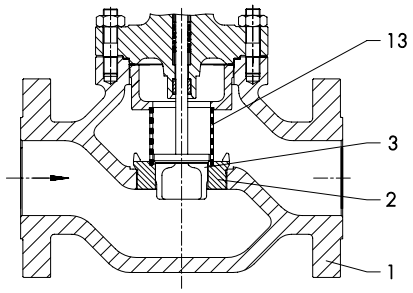

Fig. 4 · Type 3251 Valve with St I Flow Divider

Calculation of noise emission

Gases and vapors

The noise emitted by gases in single- and multi-stage control valves is determined according to DIN EN 60 534, Part 8-3. This calculation method, however, does not apply to control valves containing noise-reducing elements, such as St I and St III Flow Dividers. In this case, calculation is performed according to VDMA 24 422, Edition 89.

The calculation is based on the jet power reached during expansion. An acoustical conversion ratio η_G is used to determine the noise emission. Diagram 1 illustrates the difference between the conversion ratios depending on the differential pressure ratio. This difference immediately shows the level difference of the internal sound power. The difference between the sound pressure levels to be expected at one meter distance from the pipe is also sufficiently accurate.

Assuming a differential pressure ratio of x = 0.5, the difference in sound pressure level amounts to –10 dB between a valve without a flow divider and a valve with a St I Flow Divider and –20 dB with a St III Flow Divider.

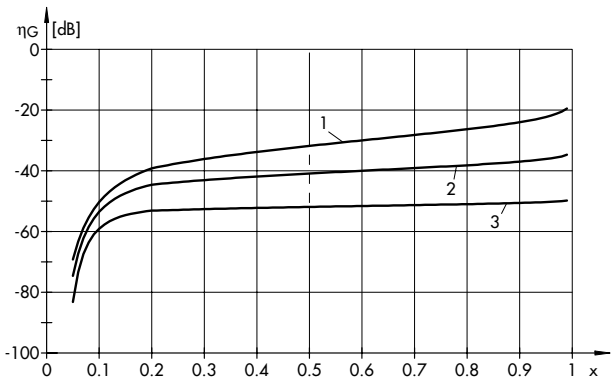

Diagram 1

1 Without flow divider
2 With St I Flow Divider
3 With St III Flow Divider

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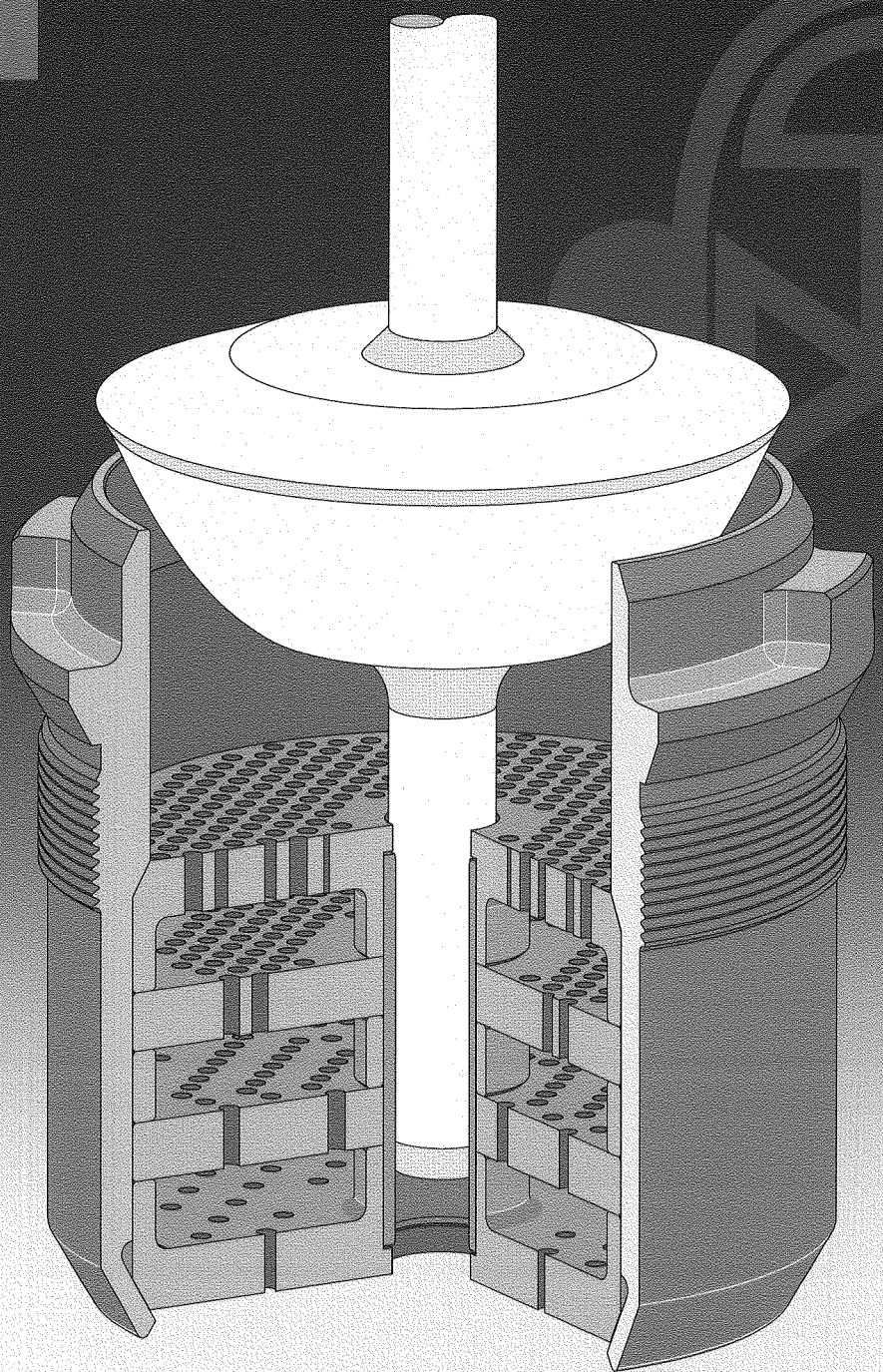
AC-Trim

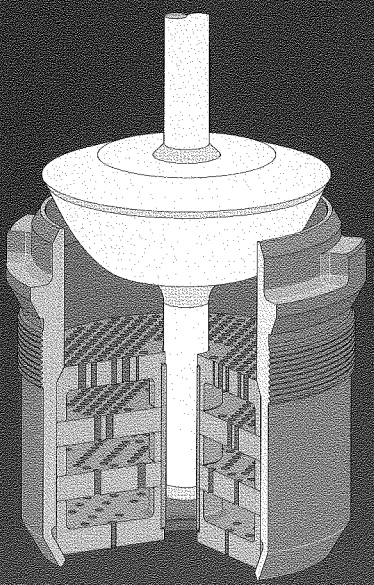
Our weapon against cavitation

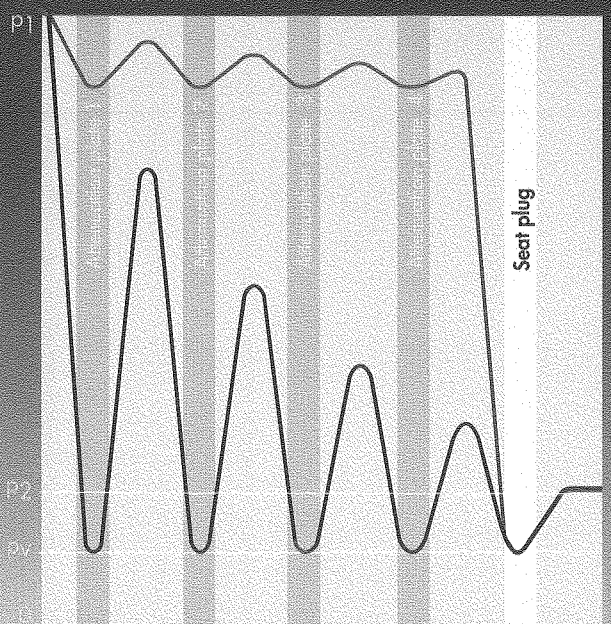


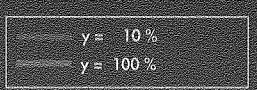
SAMSON

Optionally, control valves of the Series 250 can be equipped with anti-cavitation systems which eliminate cavitation and its effects, like oscillation, noise emission and erosion, while guaranteeing trouble-free operation even with dirty media.

How it works

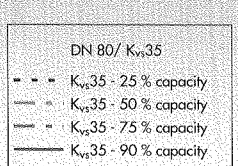


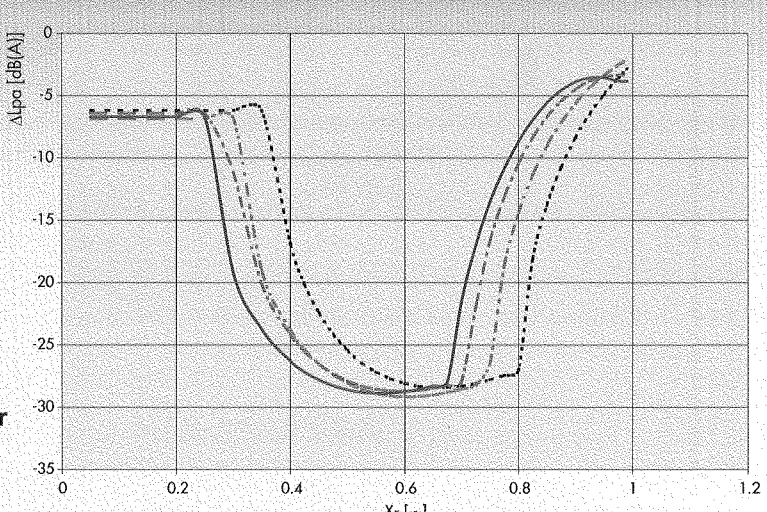




The AC-Trim consists of up to 4 attenuation plates and a seat-guided, oscillation-free parabolic plug with a high X_{Fz} value (differential pressure ratio for incipient cavitation). The high X_{Fz} value is achieved by the optimized design of the seat/plug trim. Special flow contours provide an effective energy conversion downstream of the vena contracta. As a result, pressure recovery is minimized and the throttling capacity is improved significantly.

As illustrated in the diagram, most of the pressure drop is caused by the seat/plug trim when the valve is working at low capacity. When working at high capacity, cavitation-free pressure reduction is ensured by the attenuation plates together with the plug.





The excellent features of the AC throttle trim are backed by the ΔL_{pa} values. Related to capacity, they demonstrate how the noise emission is reduced compared to a standard valve with identical K_{VS} value.

Interested? We will size the AC-Trim to meet your specifications. We guarantee you will notice the difference.

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2002-06 DR · WA 108 EN

Series 3381

Types 3381-1.x, 3381-2, 3381-3-x Silencers

Application:

Noise attenuation, velocity reduction at the valve outlet, for gases and vapor.

Nominal sizes DN 50 to DN 500 - Nominal pressures PN 10 to PN 160

Principle of operation

The Type 3381 Silencer provides noise attenuation by acting as a fixed restriction. The silencer increases the pressure of the flow medium at the valve outlet and decreases the pressure downstream of the silencer to the required downstream pressure p_2. Consequently, the silencer reduces the sound pressure level. And in applications using compressible media, it additionally lowers the flow velocity at the valve outlet.

A silencer consists of either one or two individual perforated attenuation plates (Type 3381-1.x or 3381-2) or one body equipped with two, three, four or five perforated attenuation plates (Type 3381-3-x).

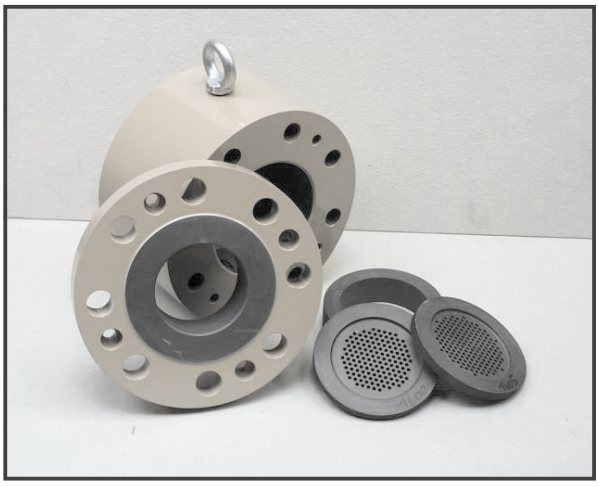


Fig. 1: Type 3381-3-3

Each perforated attenuation plate usually reduces the pressure by 5 to 7 bar depending on the particular operating temperature. This means that a five-stage silencer (Type 3381-3-5) normally provides a maximum pressure drop of 35 bar.

Versions allowing for higher pressure differences are available on request.

The Type 3381 Silencers can be combined with a Series 240 or 250 Valve.

Type 3381-1.x

The Type 3381-1.x Silencer consists of one flangeless perforated attenuation plate, which is installed into the pipeline downstream of the valve and mounted between flanges. The Type 3381-1.x Silencer may either be installed between the valve outlet and the diffuser duct inlet (Type 3381-1.1) or between the diffuser duct outlet and the pipeline inlet (Type 3381-1.2). Depending on the silencer type, the nominal size of the silencer is therefore either equal to the nominal size of the valve (Type 3381-1.1) or to that of the diffuser duct outlet (Type 3381-1.2).

Depending on the required K_v value of the perforated attenuation plate, either Type 3381-1.1 or Type 3381-1.2 is suitable.

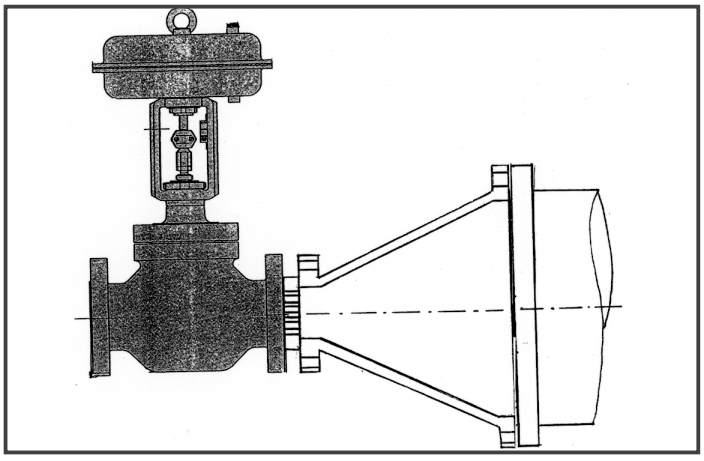


Fig. 2: Type 3381-1.1

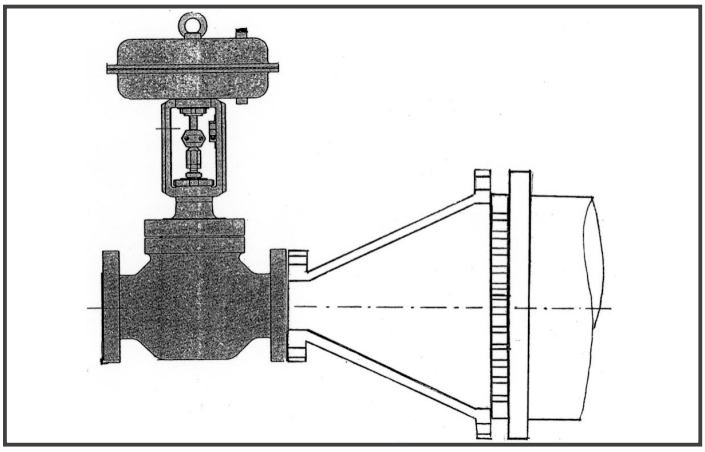


Fig. 3: Type 3381-1.2

Type 3381-2

The Type 3381-2 Silencer, which always consists of two perforated attenuation plates, combines the installation characteristics of the Type 3381-1.1 Silencer (installation upstream of the diffuser duct) and of the Type 3381-1.2 Silencer (installation downstream of the diffuser duct). The Type 3381-2 Silencer is only suitable for certain overall K_V values. As the attenuation plates are mounted between flanges in the pipeline, the need for a separate body is eliminated.

For both Types 3381-1.x and 3381-2 the diffuser duct is not included in the delivery.

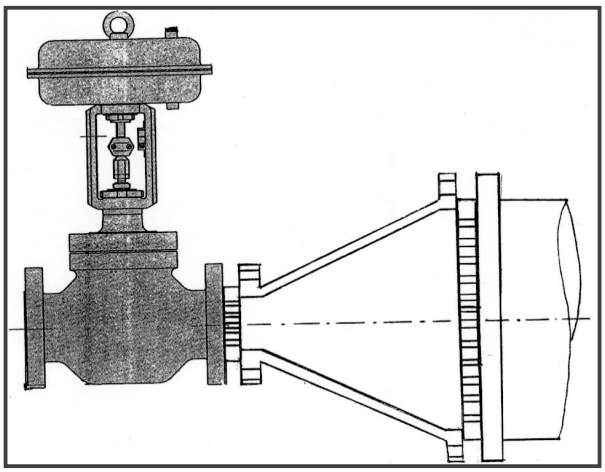


Fig. 4: Type 3381-2

Type 3381-3-x

The Type 3381-3-x Silencer system consists of a body equipped with two up to five individual perforated attenuation plates. The x sign of the type number indicates the number of attenuation plates integrated in the body.

Unlike the Types 3381-1.x and 3381-2, the Type 3381-3-x does not require a diffuser duct because of the divergent shape of its body. The silencer system is delivered ready for installation, i.e. the necessary bolts are included in the delivery.

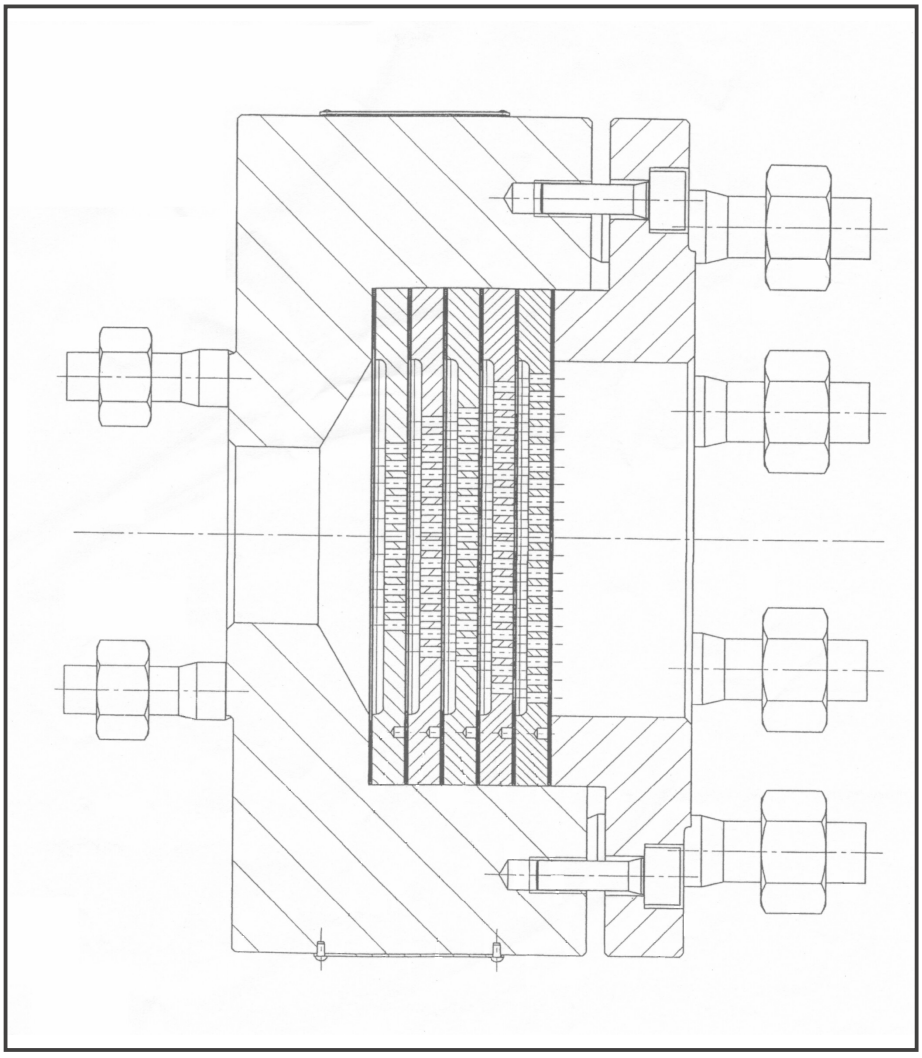


Fig. 5: Sectional drawing of Type 3381-3-5

Table 1: Technical data of Type 3381 Silencer

Type	3381-1.x, 3381-2, 3381-3-x Silencers	
Nominal size [1]	50...500	
Material [2]	Forged steel P 250 GH, 1.0460	Stainless forged steel 1.4571
End connection	Flange (all DIN versions)	
Nominal pressure [3]	10, 16, 25, 40, 63, 100, 160	
Temperature range [4]	-50... 400°C	

1) For information on nominal sizes available and possible combinations refer to Table 2. Larger nominal sizes are available on request.
2) Further materials are available on request.
3) Different inlet and outlet pressure ratings for Type 3381-3-x are available on request.
4) Further temperature ranges for Types 3381-1.x and 3381-2 are available on request.

Table 2: Nominal size combinations available

Nominal size of the valve (DN)	Nominal size of the outlet pipe								
	50	80	100	150	200	250	300	400	500
50	•	•	•	•	•	(•)	(•)	(•)	(•)
80		•	•	•	•	•	(•)	(•)	(•)
100			•	•	•	•	•	•	(•)
150				•	•	•	•	•	•
200					•	•	•	•	•
250						•	•	•	•
300							•	•	•
400								•	•

(•): Special version.

Selection and sizing of the silencer and the upstream control valve:

In order to provide optimum noise attenuation, the silencer must always be sized in conjunction with the upstream control valve.

1. Calculation of the appropriate K_v value acc. to DIN EN 60534.

2. Selection of the nominal sizes (acc. to Table 2).

3. Selection of the materials, pressure and temperature acc. to Table 1 and the associated pressure-temperature diagram (refer to T 8000-2 EN).

The nominal size and the number of the attenuation plates are selected according to the operating data.

Dimensions:

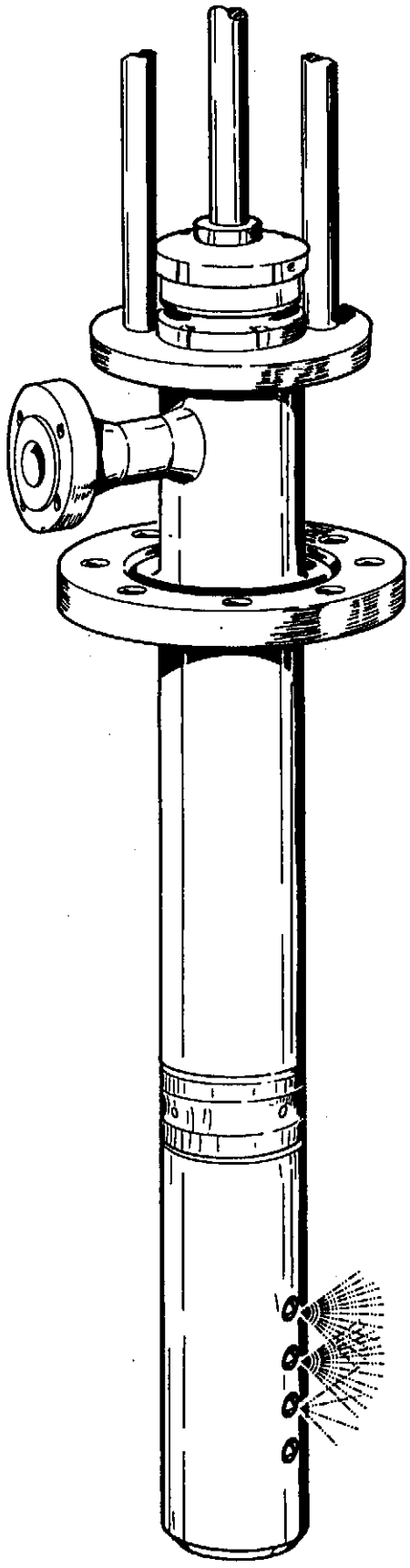
The dimensions of Type 3381-3-x depend on the number of attenuation plates installed and the nominal pressure ratings selected. Further pieces of information are available on request.

Please submit the following details on ordering:

Operating pressure:	in bar(a), bar(g), psi(a), psi(g) for min., standard and max. flow rates
Flow rate:	in kg/h m^3/h in standard or operating status for min., standard and max. flow rates
Flow medium:	density in kg/m^3 and temperature in °C
Pipe diameter:	in DN upstream and downstream of the silencer
PN...	acc. to DIN, ANSI or JIS
Material:	acc. to Table 1
Other details:	All further details required to size the control valve.

Controllable Desuperheater
Type 3994-0006-DK

with pneumatic or electric actuator



DAMKO
DESUPERHEATER

TYPE DK/DKV

D K V

APPLICATION

DAMKO Desuperheaters are used to control the temperature of superheated steam (or gas). By injecting condensate or demineralised feedwater into the steam flow, the steam temperature is reduced. Control of the temperature within 8 °C (14 °F) above the saturation temperature is possible.

- **Characteristic: linear/modified parabolic**
- **Large delta P water/steam possible (max 100 bar/1450 psi)**
- **Large rangeability**
- **Tight shut-off**
- **No additional control valve required**

Edition: August 2000

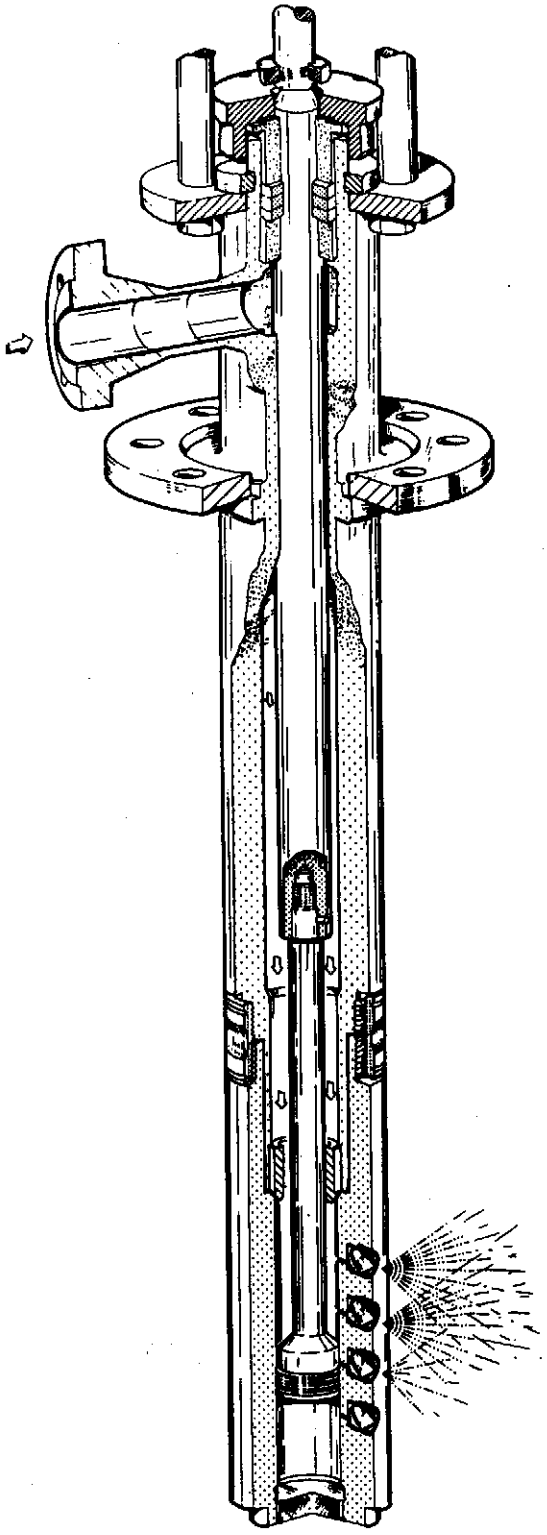


Fig. 1

INTRODUCTION

Desuperheating (cooling) of steam can simply be achieved by Injection of water into the steam flow. When injected, the water is evaporated by means of the desuperheater nozzles. Thereby the water absorbs heat and consequently lowers the temperature of steam.

The desuperheater type DKV is designed so, that even at low injection water quantities an efficient spray of very fine droplets (mist) is obtained. When increasing the stroke, the waterinjection will increase with a modified parabolic flow characteristic (see fig. 3)

The nozzles in the sprayhead are designed to give the injection water a high velocity under all conditions and at the same time to give the water a radial rotating movement, resulting in fine atomisation and very quick evaporation. (see fig. 2).

The DKV Desuperheater offers many features:

- 3 Types of control characteristics, for accurate temperature control.
- Large delta p water/steam pressure drop of 100 bar (1450 psi) can be applied without an external control valve.
- Excellent atomising characteristies at a delta p water/steam of min. 10 bar (145 psi) and at a min. steam velocity of 10 m/s.
- Tight shut-off. No leakage in closed position.
- No additional control valves required.
- High reliability due to simple parts, minimal wear.
- Excellent control accuracy for the whole control range

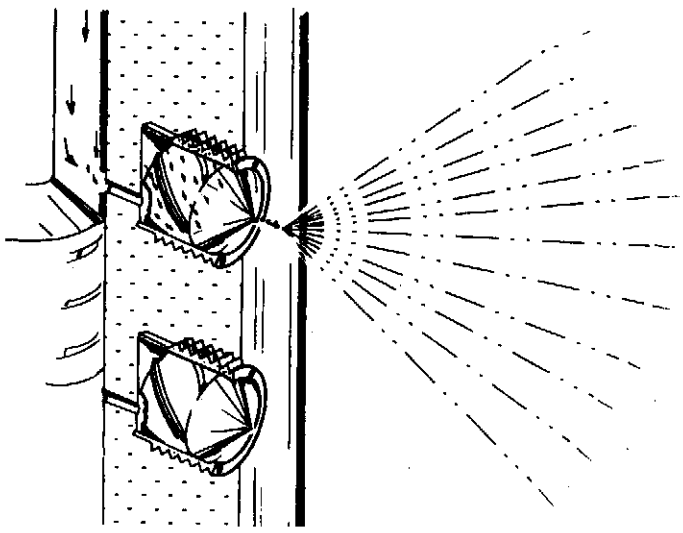


Fig. 2

PRINCIPAL OF OPERATION

The temperature sensor (Fig. 5) transmits a signal through the control systems to the actuator (positioner) and positions the control piston according to the valve characteristic. (Fig. 3)
The cooling fluid is now admitted to the Injection nozzle, and is accelerated by the nozzle Insert.

The cooling fluid is injected as a very fine water spray cone; the small droplets are quickly evaporated and absorbed by the independent steam (hot gas). The quality of the atomisation of the cooling liquid is of the quantity of cooling fluid injected, so that good mixing of cooling fluid and steam (hot gas) is achieved at all loads.

The position of the valve seat, just before the spray head, provides a tight shut-off in the closed position, so that dripping is prevented (the piston is lapped into the seat!)
The small number of moving parts results in a reliable operation of the valve.

Flow characteristics of DAMKO

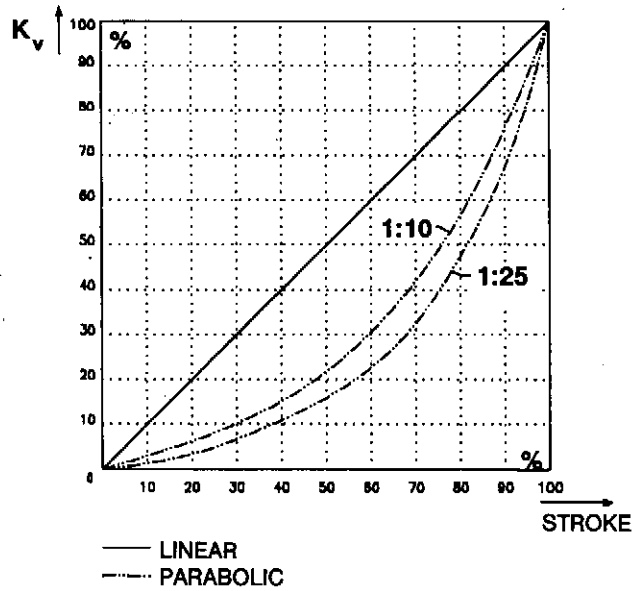


Fig. 3

MATERIALS

Standard housing materials
15 Mo 3 (DIN 1.5415) eq. to ASTM A 182F1
13 CrMo44 (DIN 1.7335) eq. to ASTM A 182 F12
The body material is selected according to temperature and pressure conditions of steam and water.

Internal parts are of various stainless steels.

DKV DETAILS

The DAMKO desuperheater is available in a standard body size with a max. pressure rating of PN 160 (900 lbs). Higher pressure ratings upon request.

Connections:

Inlet flange DN 25 (1") or DN 40 (1,5")
Mounting flange DN 80 (3")DIN/ANSI with an internal pipediameter of min. 76 mm, DIN PN 160/ANSI 900 lbs.

CAPACITIES

$K_v(C_v)$-values of standard sprayheads:

Rangeability			stroke mm
1:25*	1:10*	Linear min. – max.	
0,8 (0.92)	1,0 (1,16)	0,25 (0,29) – 1,5 (1,75)	32
1,5 (1,75)	2,5 (2,9)	0,80 (0,92) – 4,5 (5,20)	32
4,0 (1,75)	2,5 (5,8)	0,90 (1,00) – 7,0 (8,10)	55
6.5 (7.5)	7,0 (8,1)	1,00 (1,16) – 10,0 (11,6)	80

Table 1

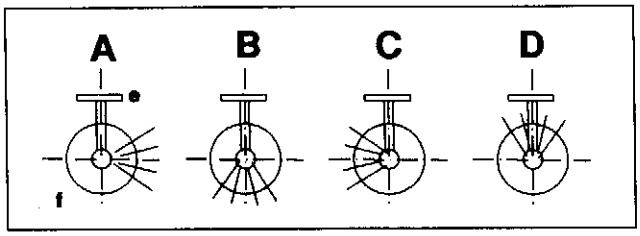
*Max. $K_v(C_v)$ Value

INSTALLATION

The DAMKO can be installed on a stub (min. 150 mm or 6" height) on the steam pipe (see fig. 10).
Water is injected in the same direction as the steam flow. The desuperheater can be installed in any position.
The spray nozzle orientation, in regard to the waterflange position, can be selected according fig. 4.

At a stroke of 32 mm the minimum pipe size is DN 150 (6"). At a stroke of 55 or 80 mm, minimum pipe size is DN 200 (8"). The minimum distance -Ls - (see Fig. 5) required between the desuperheater and the sensing element depends on service conditions. (See fig. 6).

Water connection flange options



e = water flange f = mounting flange

Fig. 4

INSTRUMENTATION

A temperature sensing element, fitted on the steam piping (downstream of the desuperheater) transmits changes of the steam temperature to a temperature controller.
This controller sends a signal (electric or pneumatic) to the actuator, which results in an upward or downward repositioning of the desuperheater stem and control piston. Thus the injection water quantity and subsequently the steam temperature are controlled.

ACTUATION

The DAMKO desuperheater can be fitted with all electric, pneumatic or electric/hydraulic actuators.
For manual operation the valve can be fitted with a handwheel.

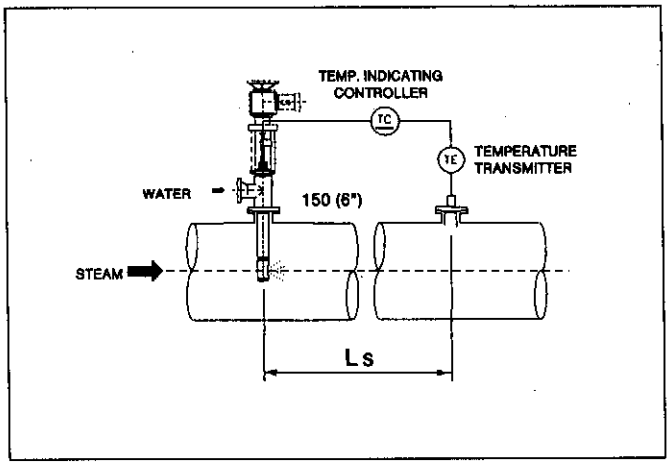
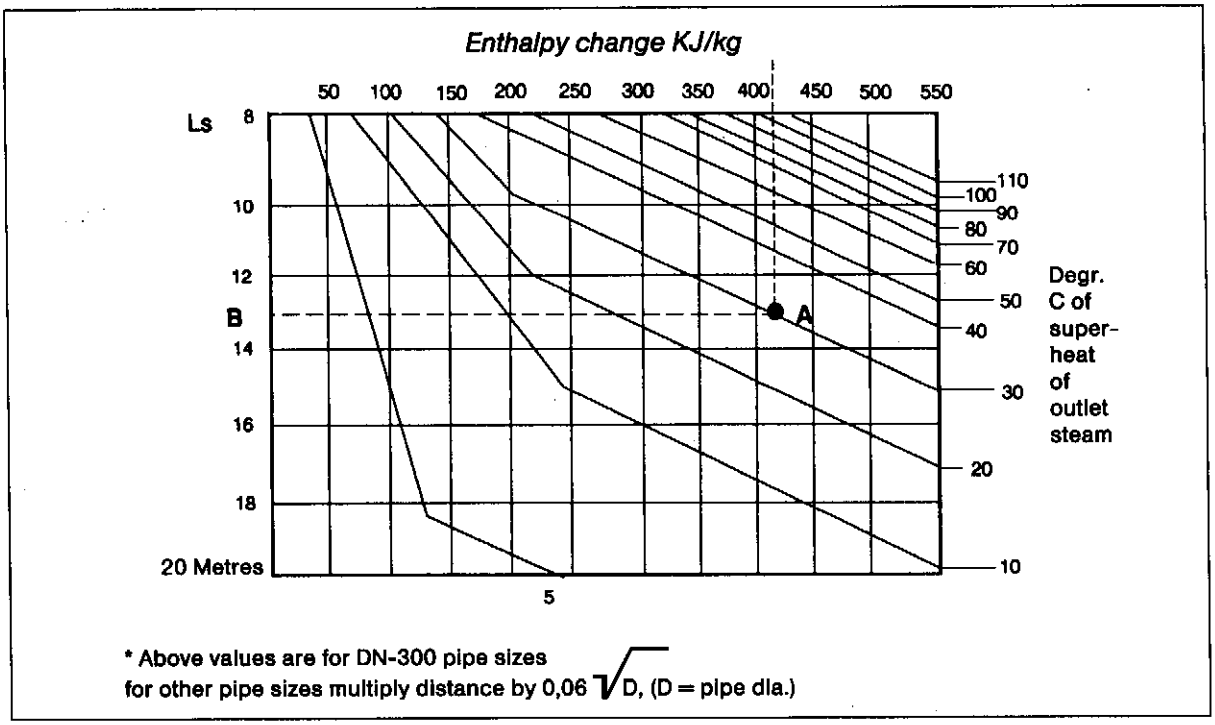


Fig. 5

Distance between desuperheater and temperature sensor *(Fig. 6)*



Example: Enthalpy change between inlet-and outlet steam = 420 kJ/kg. Temperature of outlet steam is 30 °C above saturation temperature. Draw a vertical line from 430 kJ/kg until it intersects with the 30 °C superheat line graph (point A). Draw a horizontal line from point A and read required distance of 13 m at B. (Ls = 13 m).

SIZING AND SELECTION

Data required for sizing and selection:

G_S = steam flow (kg/hr or lbs/hr)
P = steam pressure (bar/psi)
T_1 = temperature inlet steam (° C/°F)
T_2 = temperature outlet steam (° C/°F)
p_w = cooling water pressure (bar/psi)
T_w = cooling water temperature (° C/°F)
D_S = diameter of steam piping

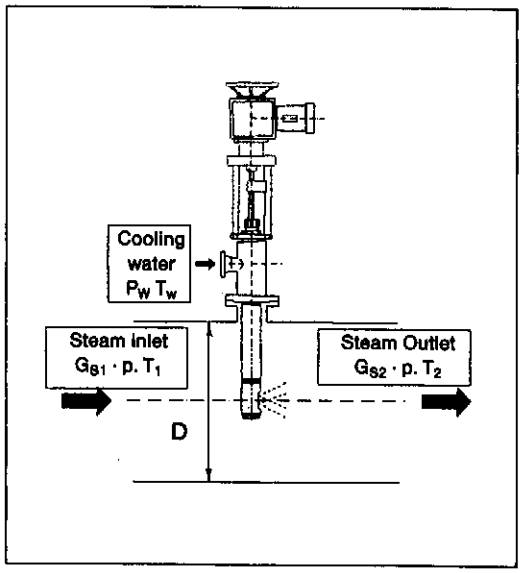


Fig. 7

■ **Calculate injection water quantity:**

$$G_w = G_s \times \frac{h_1 - h_2}{h_2 - h_w} \quad [kg/hr]$$

$$Q_w = \frac{G_w}{S.G. \times 1000}$$

■ Calculate $K_v(C_v)$

$$K_v = Q_w \sqrt{\frac{S.G.}{\Delta p}}$$

$$C_v = 1{,}16 \times K_v$$

■ Select Kv(Cv) and corresponding stroke from table 1

■ Check min. required steampipe diameter for selected stroke in table 4

NOMENCLATURE

$K_v(C_v)$ = valve flow coefficient
S.G. = Specific Gravity injection water (kg/dm³)
Q_w = Injection water quantity (m³/hr. or gpm)
G_w = Injection water quantity (kg/hr. or lbs/hr)
h_1 = enthalpy inlet steam (kJ/kg)
h_2 = enthalpy outlet steam (kJ/kg)
h_w = enthalpy injection water (kJ/kg)
Δp = $p_w - p$

EXAMPLE:

G_s = 100.000 kg/hr. p = 50 Bar (a)
T_1 = 430° C T_w = 190° C
T_2 = 330° C p_w = 140 Bar(a)
S.G. = 0,885

From steamtable find enthalpy at inlet (h1) and outlet (h2) conditions

$$G_w = 100.000 \times \frac{3270.4 - 3016.1}{3016.1 - 813.6} = 11546 \text{ kg/hr}$$

$$Q_w = \frac{11546}{0.885 \times 1000} = 13 \text{ m}^3/\text{hr}$$

$$\Delta_P = 140 - 50 = 90 \text{ bar.}$$

$$K_v = 13\sqrt{\frac{0.885}{90}} = 1.29 \; ; \; K_v \text{ (selected)} = 1.5$$

Selected kv and corresponding stroke of the valve from table 1.

Check max. stroke versus steam pipe diameter in table 4.

VALVE CODE

Table 3

Actuator code P = Pneumatic R = Electric O = Hydraulic M = Manual drive	**Water connection Size code** DN 25/1" = 05 DN 40/1½ = 06	**Pressure rating code** PN 25/150 lbs = 3 PN 40/ – = 4 PN 64/300 lbs = 5 PN 100/600 lbs = 6 PN 160/900 lbs = 7
Connection code F = DIN Flanges U = ANSI Flanges	**Mounting flance size code** DN 80/3" = 10	**Characteristic code** Parabolic 1: 10 = PL Parabolic 1:25 = PH Linear = LH
	Material code DIN 1.5415 (A 182F1) = 1 DIN 1.7335 (1 182F12) = 2	

Example:

DKVP057/107U-PL-1 = Valve type DKV; suitable for pneumatic actuator; water connection 1"/900lbs; mounting flange 3"/900 lbs; flanges ANSI; parabolic 1:10 characteristic; body material acc. DIN 1.5415.

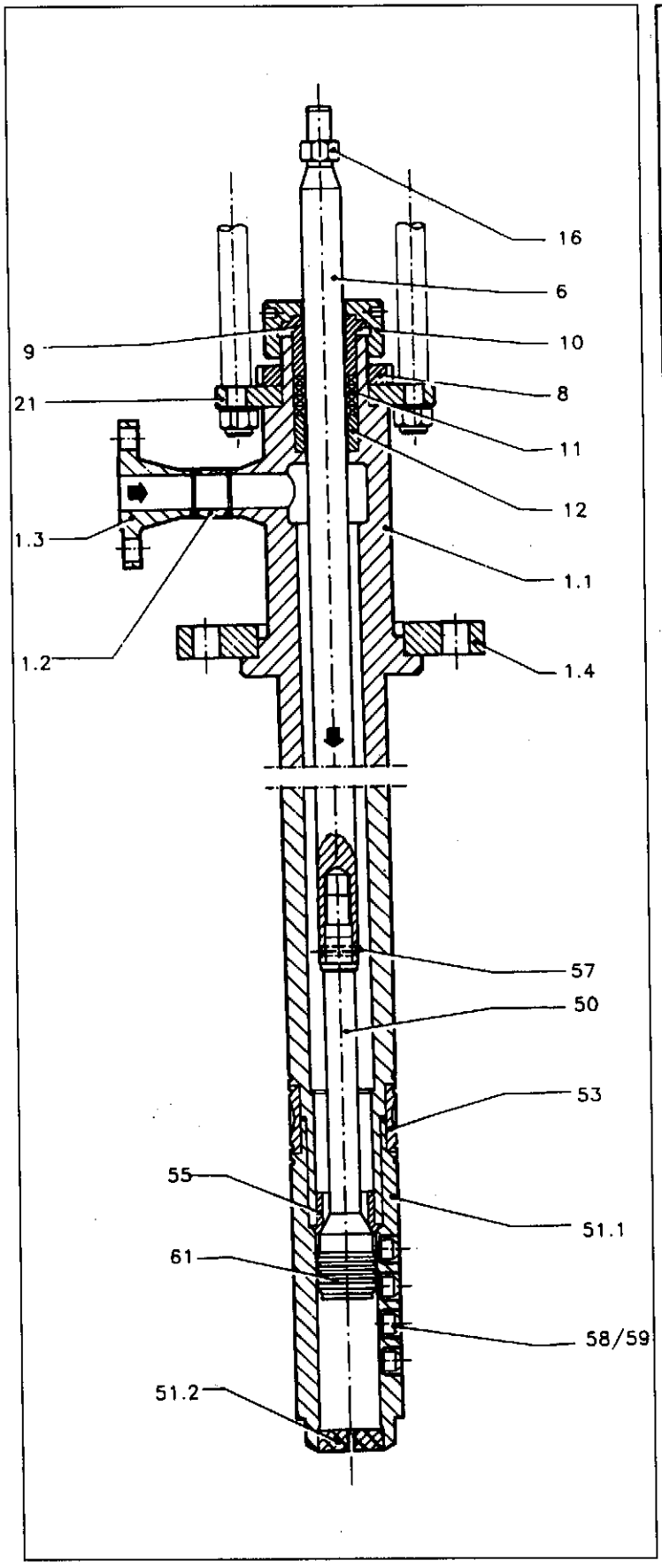


Fig. 8

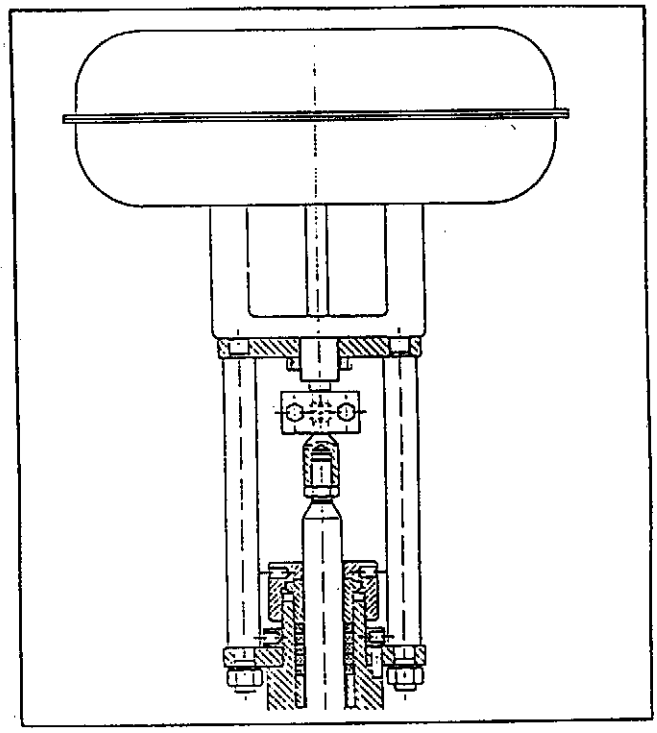


Fig. 9

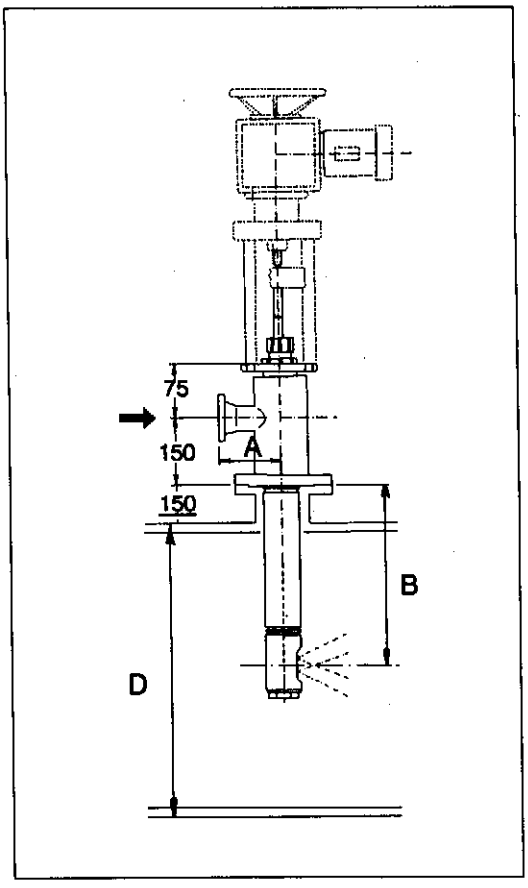


Fig. 10

PARTS AND MATERIALS (see fig. 8)

POS.	DESCRIPTION	Q.TY	MATERIAL **		
			DIN code	MAT. Nr.	ASTM/ANSI
1	Housing (assy.)	1	15 Mo3/13Cr.Mo44	1.5415/1.7335	A182F1/A
1.1	Body	1	15 Mo3/13Cr.Mo44	1.5415/1.7335	A182F1/A
1.2	Extension pipe	1	15 Mo3/13Cr.Mo44	1.5415/1.7335	A182F1/A
1.3	Flange	1	15 Mo3/13Cr.Mo44	1.5415/1.7335	A182F1/A
1.4	Flange	1	15 Mo3/13Cr.Mo44	1.5415/1.7335	A182F1/A
6	Stem	1	X20CrNI 72	1.4057	A473-431
8	Nut (slotted)	1	Steel		
9	Packing gland	1	X20Cr13	.4021	A473-420
10	Gland nut	1	X20Cr13	1.4021	S473-420
11	Packing ring	5	Carbosteam S		Carbosteam S
12	Bottom ring	1	X6CrNINb1810	1.4550	A182F347
16	Hexagon nut	1	Steel		
21	Act. bracket	1	C 22.8	1.0460	A 105
50	Control piston	1*	X36 CrMo17	1.4122	422
51.1	Spray head	1	X10CCr13	1.4006	A182F429
51.2	Bottom plate	1	X10Cr13	1.4006	A182F429
53	Tighten.ring nut	1	X10Cr13	1.4006	A182F429
55	Seat bushing	1	X5CrNi134	1.4313	A182F304
57	Pin	1	X5CrNi189	1.4301	A182F304
58	Nozzle insert	*	X5CrNi189	1.4301	A182F304
59	Nozzle	*	X5CrNi134	1.4313	A182F6NM
61	Piston ring	3	X22CrMoV121	1.4923	

* Number of nozzles varies with required Kv (Cv) value and injection characteristic.

** Depending on service conditions (pressures, temperatures).

ADDITIONAL PARTS AND MATERIALS (see fig. 9)

POS.	DESCRIPTION	QUANTITY	MATERIAL
21/38	Gearbox (assy.)	1	various

DIMENSIONS (see fig. 10):

Dimensions B:

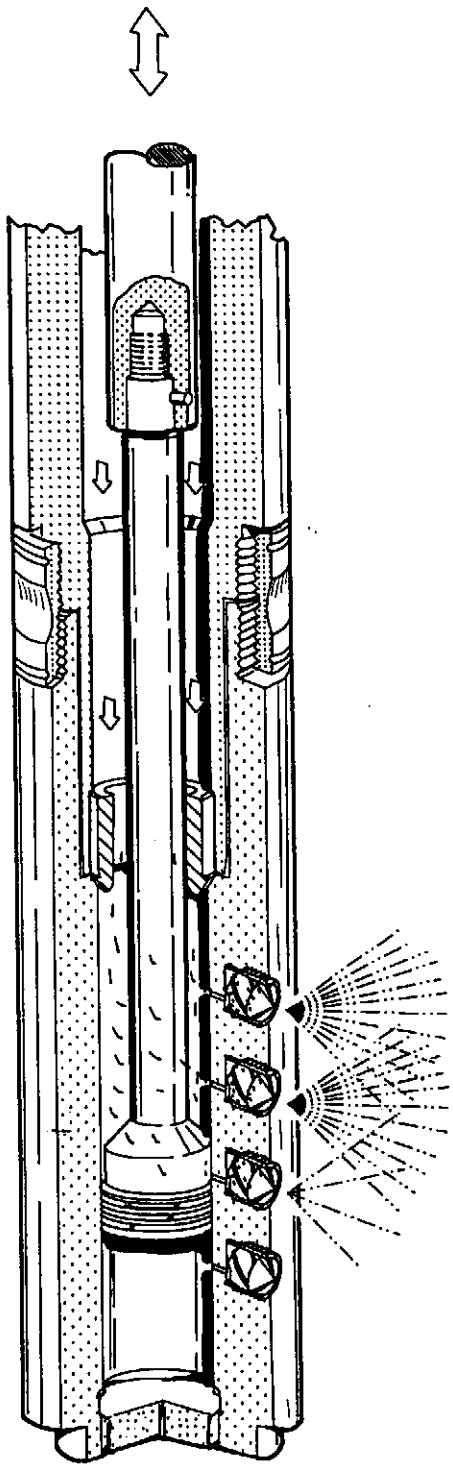
Table 4

Ds	B	stroke		
(mm)	(mm)	32	55	80
150	225	■		
200	250	■	■	■
250	275	■	■	■
300	300	■	■	■

For larger steampipe size (max. 700 mm):
B (mm) = 225 + 1/2 (D-150)

Dimension A:

For pressure ratings < PN 100 (600 lbs)
Dimension A = 150 (mm)
For pressure ratings PN 160 (900 lbs)
Dimension A = 175 (mm)



Following data are required to prepare a quotation:

- **Valve operating – and design data (as per page 4)**
- **Type of actuator and required accessories: e.g. pneumatic actuator, make ...; air opens; incl. electro/pneumatic positioner + air filter/ reducer station + limitswitches. e.g. electric actuator make ...**
- **Installation position: standard: valve stem vertical upward, option: valve stem horizontal.**
- **Which inspections / certificates / non-standard tests are required.**

Standard tests are:

- **Dimensional check**
- **Visual inspection**
- **Hydraulic pressure test**
- **Seat leakage test**
- **Hydraulic Cv/Kv-value test**
- **Functional test (mechanical)**

(Subject to modification)

SAMSOMATIC

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Pneumatic Actuator

Type 3271

Application
Linear actuators for attachment to final control elements, especially suitable for attachment to Series 240, 250, 280 and Type 3510 Micro-flow Valve as well as to butterfly valves.

Effective diaphragm areas from 60 to 2800 cm^2
Rated travel from 7.5 to 120 mm

The Type 3271 Pneumatic Actuators are diaphragm actuators equipped with a rolling diaphragm and internal springs.
Special features include:

- Low overall height,
- Powerful thrusts, high speeds of response,
- Low friction.

Various bench ranges can be adjusted by varying the number (3 to 24) and compression of the installed springs.

No special tools required to modify the bench range and reverse the actuator action (also for tandem actuators and version with handwheel).

Designed for supply pressures up to 6 bar and for continuous service at temperatures from –35 to +120 °C.

Versions

Type 3271 · **Pneumatic Actuator** (Fig. 3), eff. diaphragm areas 80, 240, 350, 700, 1400 and 2800 cm^2. Diaphragm cases made of plastic coated steel, for diaphragm area 2800 cm^2 of GGG-40 (Fig. 5).

Type 3271-5 · **Pneumatic Actuator** (Fig. 2), eff. diaphragm area 120 cm^2. Diaphragm cases made of die-cast aluminum.

Type 3271-52 · **Pneumatic Actuator** (Fig. 1), effective diaphragm area 60 cm^2 especially designed for Type 3510 Micro-flow Control Valve (see T 8091 EN).

Type 3271 · **Stainless Steel Pneumatic Actuator** (Fig. 3), exterior parts made of stainless steel. Effective diaphragm areas 80, 240, 350 and 700 cm^2.

Type 3271 · **Pneumatic Actuator with handwheel**. Top-mounted handwheel for actuators with effective diaphragm areas 240 to 700 cm^2 (Fig. 4). Side-mounted handwheel for actuators with effective diaphragm areas 1400 or 2800 cm^2 (Figs. 11, 19, 20).

Type 3271 · **Pneumatic Tandem Actuator** (Fig. 8), effective diaphragm area 2 x 2800 cm^2.

Type 3271 · **Pneumatic Actuator with mechanical travel stop** (Fig. 10) · Mechanically adjustable minimum or maximum travel for actuators with eff. diaphragm areas 240, 350, 700 or 1400 cm^2.

Type 3271 · **Pneumatic Actuator in Fire-Lock version** (Fig. 13) · Fail-safe action in case of fire, effective diaphragm areas 240, 350 and 700 cm^2.

Versions for other control media (e.g. water, oil or oxygen) are available. Details on request.

Fig. 1 · Type 3271-52 and Type 3510-1 Micro-flow Valve

Fig. 2 · Type 3271-5 and Type 241 Globe Valve

Fig. 3 · Type 3271 and Type 3244 Three-way Valve

Fig. 4 · Type 3271 with handwheel and Type 241 Globe Valve

Fig. 5 · Type 3271 (2800 cm^2) and Type 256 Angle Valve

Principle of operation

The signal pressure p_{st} exerts a force $F = p_{st} \cdot A$ on the diaphragm area A (2). This force is balanced by the springs (4) installed in the actuator. The number of springs and their compression determine the bench range with consideration to the rated travel. The rated travel H is proportional to the signal pressure p_{st}. The operating direction of the actuator stem (7) depends on how the springs are arranged and where the signal pressure is connected.

The stem connector (8) connects the actuator stem (7) with the plug stem (V6) of the control valve or the reversing gear of another final control element. After the actuator has been properly attached to the final control element, additional compression (see Table 2) can be adjusted using the coupling nut (V 6.1).

Fig. 9 schematically illustrates the sectional view of an actuator with a **top-mounted handwheel**, suitable for actuators with effective diaphragm areas of 240 to 700 cm^2. In standard operation, the actuator stems (7 and 12) are not coupled with the threaded spindle (10). The valve can be manually adjusted after the lock nut (11) has been loosened.

Fig. 11 shows the operating principle of the **side-mounted handwheel** for actuators with effective diaphragm areas from 1400 and 2800 cm^2 and a maximum travel of 60 mm. The handwheel (23) is fixed to the worm-geared shaft (20) and fastened by a notch. The actuator stem is adjusted via the worm-geared wheel (21) and the threaded bushing (22).

For valves with 120 mm travel and actuators with effective area of 2800 cm^2, a side-mounted handwheel (Fig. 20) is available.

The mechanically adjustable **travel stop** (Fig. 10) is suitable for actuators with effective diaphragm areas 240 to 1400 cm^2. Using this stop, the actuator travel can be limited by up to 50 % in both directions (actuator stem "extends" or "retracts") and permanently adjusted.

The **tandem actuator** (Fig. 8) contains two coupled diaphragms which produce a force twice as powerful as the force of the single-acting actuator (Fig. 6).

Fire-Lock version (Fig. 13): In the case of fire, the valve assumes its fail-safe position and is kept there by expansion cartridges installed in the actuator.

The actuators are available with the following **fail-safe positions**:

Actuator stem "extends": Whenever the pressure acting on the diaphragm is reduced or the air supply fails, the spring force "extends" the actuator stem to its lower end position (shown on the right in the following sectional drawings).

Actuator stem "retracts": Whenever the pressure acting on the diaphragm is reduced or the air supply fails, the spring force "retracts" the actuator stem (shown on the left in the following sectional drawings).

Legend to Figs. 6 to 11

1	Signal pressure connection	14	Cap
2	Diaphragm	15	Nut
3	Vent	16	Spindle
4	Actuator springs	17	Thrust bearing
5	Diaphragm cases	18	Lock nut
6	Annular nut	20	Worm-geared shaft
7	Actuator stem	21	Worm-geared wheel
8	Stem connector (coupling) with travel indicator scale	22	Threaded bushing
10	Handwheel with threaded spindle	23	Handwheel
11	Lock nut	V6	Plug stem of the valve
12	Actuator stem for manual adjustment	V6.1	Coupling and lock nut

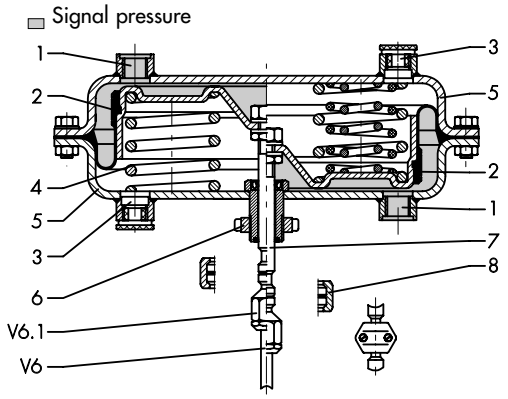

Fig. 6 · Sectional drawing of the Type 3271 Pneumatic Actuator (right half of diaphragm with additional springs)

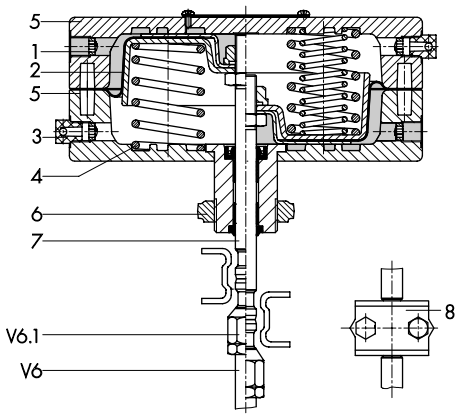

Fig. 7 · Sectional drawing of the Type 3271-5 Pneumatic Actuator (right half of diaphragm with additional springs)

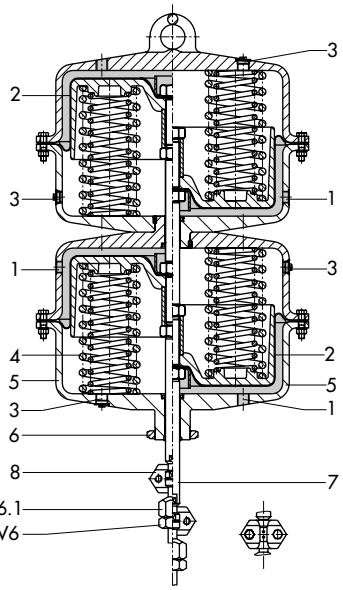

Fig. 8 · Sectional drawing of the tandem actuator

Throttling or flow-switching service

The Type 3271 Pneumatic Actuators are designed for a supply pressure of maximum 6 bar.

In flow-switching (ON/OFF) service, the fast stroking speed causes an increase in pressure which depends on the supply pressure applied. If the pressure increase is too high, the actuator version with the fail-safe position "actuator stem retracts" may be damaged due to the additional load.

In flow-switching service, the permissible supply pressure may not exceed the upper bench range value by more than 3 bar.

Example

Bench range	Fail-safe position	Max. supply pressure
0.2 ... 1.0 bar	Actuator stem retracts	4 bar
0.4 ... 2.0 bar		5 bar
0.6 ... 3.0 bar		6 bar

Actuators used for throttling service are suitable for a supply pressure of up to 6 bar irrespective of the fail-safe position and the bench range.

Actuators with a reduced supply pressure are marked with a special label.

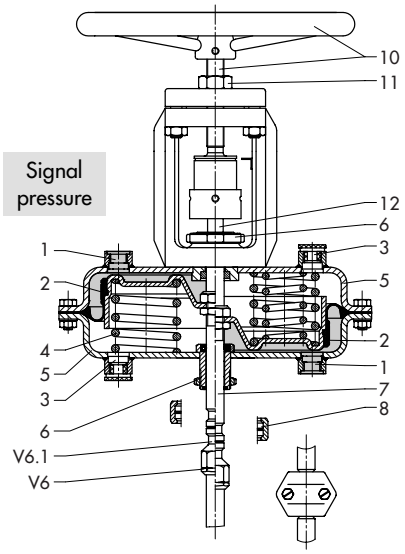

Fig. 9 · Actuator with effective diaphragm areas 240 to 700 cm^2 and top-mounted handwheel

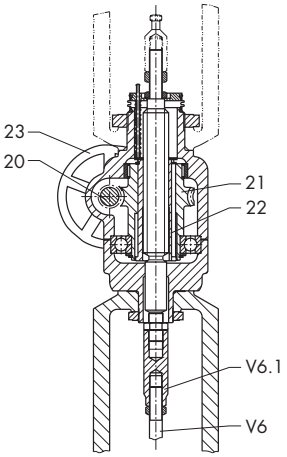

Fig. 11 · Manual override with a side-mounted handwheel for max. 60 mm travel, up to 80 kN

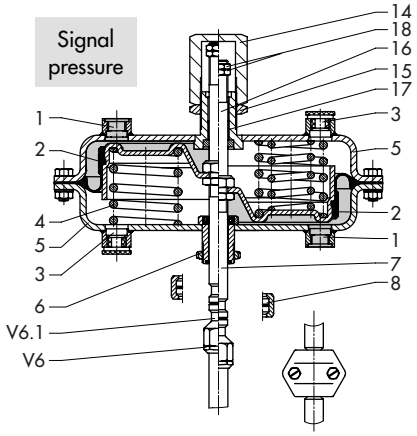

Fig. 10 · Type 3271 Pneumatic Actuator with adjustable travel stop

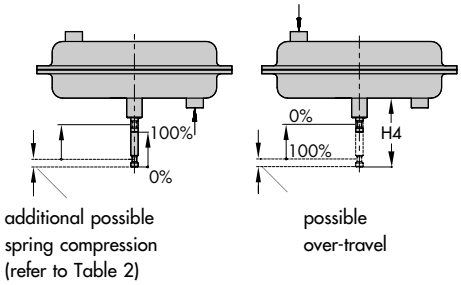

Fig. 12 · Spring compression and travel

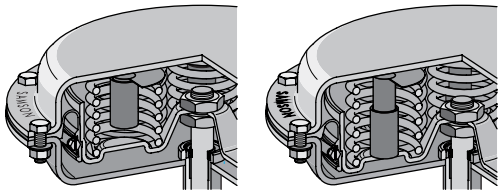

Fig. 13 · Fire-Lock version, in fail-safe position (right)

Table 1 · Technical data

Actuator version	Standard version 350 to 1400 cm²	Stainless steel version	Type 3271-52 60 cm²	Type 3271-5 120 cm²	2800 cm²
Max. supply pressure	6 bar[1)]		6 bar[1)]		
Permissible temperatures in continuous operation	Standard material NBR: –35 to +90 °C		–35 to +80 °C	–35 to +90 °C	
	Special material EPDM (for air free of oil and grease) –35 to +120 °C				
	Fire-Lock version: up to 80 °C				
Materials (WN = Material Number according to DIN)					
Rolling diaphragm	NBR (nitrile rubber) with fabric insert		NBR	NBR with fabric insert	
	EPDM with fabric insert				
Actuator stem	WN 1.4305		WN 1.4305/1.4571	WN 1.4305	WN 1.4571
Sealing of the actuator stem	NBR (nitrile rubber)			NBR	
	EPDM				
Diaphragm cases	Sheet steel, plastic coated	Stainless steel WN 1.4301	Aluminum, powder-varnish coated	Die-cast aluminum, plastic coated	GGG-40

[1)] Limitations for flow-switching service, refer to page 3 for further details.

Table 2a · Bench ranges for pneumatic actuators up to 240 cm² · All pressures in bar (gauge)

Values specified in the shadowed fields correspond to the standard bench range, i.e. at rated travel. Maximum travel can be used when the supply pressure is increased.

When pre-tensioned springs are used, the signal pressure ranges are applicable for both the rated and the reduced travel. Actuator springs of actuators employing fail-safe position *Actuator stem "retracts"* cannot be pre-tensioned.

Effective diaphragm area [cm²]	Rated travel [mm]	Travel volume at rated travel [dm³]	Dead volume [dm³]	Max. travel [mm] [1) 2)]	Bench range (signal pressure range at rated travel) [bar]	Additional possible spring compression [%]	Operating range with spring compression [bar]	Number of springs	Spring force at 0 mm travel [kN]	Spring force at rated travel [kN]	Nominal thrust at rated travel [kN] and supply pressure of					
											1.4 bar	2 bar	3 bar	4 bar	5 bar	6 bar
60	7.5	0.09	0.1	10.5	0.2...1.0	0	–	2	0.12	0.6	0.24	0.6	1.2	1.8	2.4	3
					0.4...2.0	0	–	4	0.24	1.2	–		0.6	1.2	1.8	2.4
					1.4...2.3 [3)]	0	–	4	0.84	1.38	–			1.02	1.62	2.22
					2.1...3.3 [3)]	0	–	8	1.26	1.98	–			0.42	1.02	1.62
80	15	0.12	0.13	16	0.2...1.0	12.5	0.3...1.1	3	0.16	0.8	0.32	0.8	1.6	2.4	3.2	4
					0.4...2.0		0.6...2.2	6	0.32	1.6	–		0.8	1.6	2.4	3.2
					0.6...3.0		0.9...3.3	12	0.48	2.4	–			0.8	1.6	2.4
120	15	0.2	0.10	16	0.2...1.0	12.5	0.3...1.1	3	0.24	1.2	–	1.2	2.4	3.6	4.8	6
					0.4...2.0		0.6...2.2	6	0.48	2.4	–		1.2	2.4	3.6	4.8
				15	1.4...2.3[3)]	0	1.4...2.3	6	1.68	2.76	–		0.84	2.04	3.24	4.44
					2.1...3.3[3)]		2.1...3.3	12	2.52	3.96	–			0.84	2.04	3.24
240	15	0.36	0.38	17	0.2...1.0	12.5	0.3...1.1	3	0.48	2.4	0.96	2.4	4.8	7.2	9.6	12
					0.4...2.0		0.6...2.2	6	0.96	4.8	–		2.4	4.8	7.2	9.6
					0.6...3.0		0.9...3.3	12	1.44	7.2	–			2.4	4.8	7.2

[1)] Based on the lower bench range value, taking zero travel (to unseat the plug) into consideration.
[2)] Zero travel as in Table 3a depending on fail-safe position.
[3)] Pre-tensioned springs

Table 2b · Bench ranges for pneumatic actuators from 350 cm² onward · All pressures in bar (gauge)

Values specified in the shadowed fields correspond to the standard bench range, i.e. at rated travel. Maximum travel can be used when the supply pressure is increased.

When pre-tensioned springs are used, the signal pressure ranges are applicable for both the rated and the reduced travel. Actuator springs of actuators employing fail-safe position *Actuator stem "retracts"* cannot be pre-tensioned.

Effective diaphragm area [cm²]	Rated travel [mm]	Travel volume at rated travel [dm³]	Dead volume [dm³]	Max. travel [mm] [1) 2)]	Bench range (signal pressure range at rated travel) [bar]	Additional possible spring compression [%]	Operating range with spring compression [bar]	Number of springs	Spring force at 0 mm travel [kN]	Spring force at rated travel [kN]	Nominal thrust at rated travel [kN] and supply pressure of					
											1.4 bar	2 bar	3 bar	4 bar	5 bar	6 bar
350	15	0.53	0.6	22	0.2...1.0	25	0.4...1.2	3	0.7	3.5	1.4	3.5	7	10.5	14	17.5
					0.4...2.0		0.8...2.4	6	1.4	7	–	0	3.5	7	10.5	14
					0.6...3.0		1.2...3.6	12	2.1	10.5	–		0	3.5	7	10.5
				15	1.4...2.3[3)]	0	1.4...2.3	6	4.9	8.05	–		2.45	5.95	9.45	13
					2.1...3.3[3)]		2.1...3.3	12	7.35	11.6	–			2.45	5.95	9.45
700	30	2.1	2.4	38	0.2...1.0	25	0.4...1.2	3	1.4	7	2.8	7	14	21	28	35
					0.4...2.0		0.8...2.4	6	2.8	14	–		7	14	21	28
					0.6...3.0		1.2...3.6	12	4.2	21	–			7	14	21
				30	1.4...2.3[3)]	0	1.4...2.3	8	9.8	16.1	–		4.9	11.9	18.9	25.9
					2.1...3.3[3)]		2.1...3.3	12	14.7	23.1	–			4.9	11.9	18.9
					2.35...3.8[3)]		2.35...3.8	15	16.5	26.6	–			1.4	8.4	15.4
					2.6...4.3[3)]		2.6...4.3	18	18.2	30.1	–				4.9	11.9
1400	60	8.3	5.7	80	0.2...1.0	25	0.4...1.2	6	2.8	14	5.6	14	28	42	56	70
					0.4...2.0		0.8...2.4	12	5.6	28	–		14	28	42	56
					0.5...2.5		1.0...3.0	18	7	35	–		7	21	35	49
					1.1...2.4		1.4...2.7	18	15.4	33.6	–		8.4	22.4	36.4	50.4
					1.3...2.8		1.7...3.2	24	18.2	39.2	–		2.8	16.8	30.8	44.8
2800 [5) 6)]	120	33	16.5	160	0.2...1.0	25	0.4...1.2	3	5.6	28	11.2	28	56	84	112	140
					0.4...2.0		0.8...2.4	6	11.2	56	–		28	56	84	112
					0.5...2.5		1.0...3.0	9	14	70	–		14	42	70	98
					0.6...3.0		1.2...3.6	12	16.8	84	–			28	56	84
					0.9...1.6	25[4)]	1.1...1.8	6	25.2	44.8	–	11.2	39.2	67.2	95.2	123
					1.0...2.1		1.25...2.35	9	28	58.8	–		25.2	53.2	81.2	109
					1.1...2.6		1.5...3.0	12	30.8	72.8	–		11.2	39.2	67.2	95.2
					1.1...2.3	25	1.4...2.6	6	30.8	64.4	–		19.6	47.6	75.6	104
					1.2...2.8		1.6...3.2	9	33.6	78.4	–		5.6	33.6	61.6	89.6
					1.3...3.3		1.8...3.8	12	36.4	92.4	–			19.6	47.6	75.6

1) Based on the lower bench range value, taking zero travel (to unseat the plug) into consideration.
2) Zero travel as in Table 3a depending on fail-safe position.
3) Pre-tensioned springs.
4) At half of the rated travel, maximum spring compression is 50 %.
5) Tandem actuator 2 x 2800 cm²
For version: Actuator stem "extends", the lower bench range value is maximum 2.5 bar. For version: Actuator stem "retracts", the maximum supply pressure is 2.5 bar above the upper bench range value, however, maximum 6 bar.
The bench ranges correspond with those of the single-acting version with an effective diaphragm area of 2800 cm².
6) The positioning force must be limited to 80 kN with actuators featuring a side-mounted handwheel for a maximum travel of 80 mm.

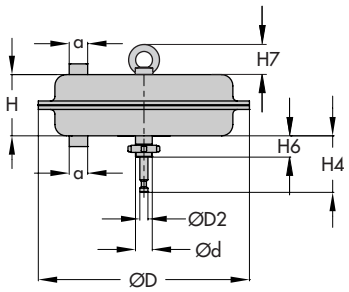

Fig. 14 · Type 3271, 350 up to 1400 cm^2
Actuators from 700 cm^2 onward with lifting ring (H7)

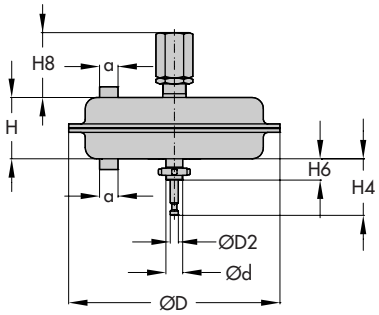

Fig. 16 · Version with mechanical travel stop

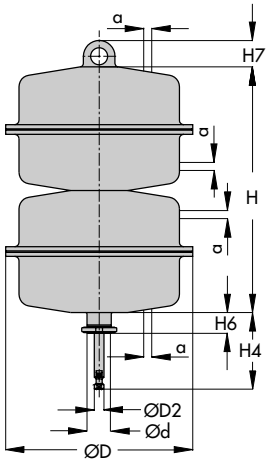

Fig. 17 · Tandem actuator

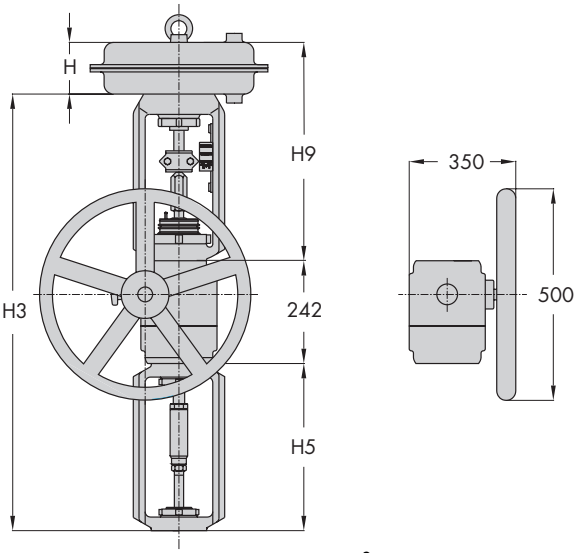

Fig.19 · Version for 1400 and 2800 cm^2 and
a max. of 60 mm of travel with side-mounted handwheel

a
Signal pressure
connection or vent

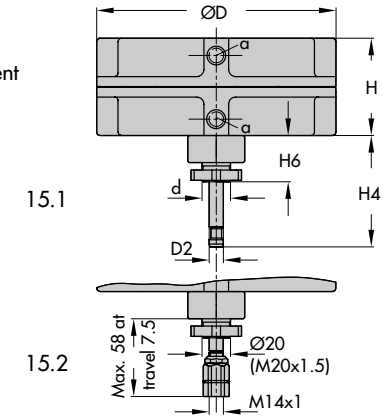

Fig. 15 · Type 3271-5
15.1 Mating dimensions for attachment to Series 240
15.2 Mating dimensions for attachment to a Type 3510
Micro-flow Valve

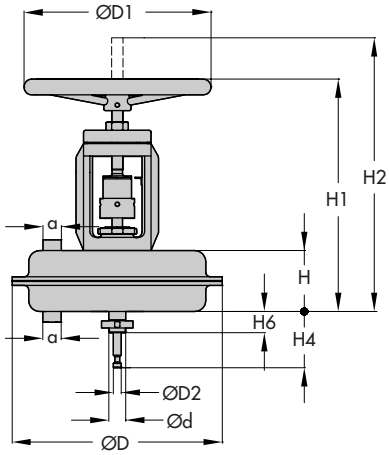

Fig. 18 · Type 3271 from 240 to 700 cm^2 with
top-mounted handwheel

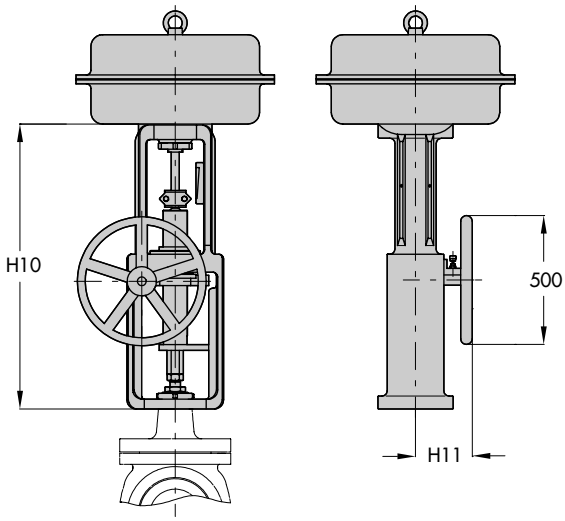

Fig. 20 · Version for 1400 and 2800 cm^2,
Travel >60 to 120 mm with side-mounted handwheel

Table 3 · Dimensions and weights
Table 3a · Versions with and without top-mounted handwheel

Actuator	cm^2	**60** [1] [2]	**80** [1]	**120** [3]	**240**	**350**	**700**	**1400**	**2800**	**2 x 2800**
Height	H	63	62	69	62	82	134	197	520	1020
	H1	–	–	–	300	320	430	–	–	–
	$H2_{max}$	–	–	208	345	365	515	–	–	–
	$H4_{rated}$ [5]	51	75	75	75	75	90	165	315	
	$H4_{max}$ [5]	52.5	78	78	78	78	95	169	325	
	$H4_{max}$ [6]	52.5	78	78	78	85	104	185	355	
	H6	23.8	34	34	34	34	34	54	85	
	H7	–	–	–	–	–	62	90	110	
	H8	–	–	–	75	85	115	180	–	–
Diameter	∅ D	120	150	168	240	280	390	530	770	
	∅ D1	–	–	80	180	250		–	–	–
	∅ D2	10	10			16		22	40	
∅ d (thread)		20 (M20 x 1.5)	30 (M 30 x 1.5)					60 (M 60 x 1.5)	100 (M 100 x 2)	
a (optionally)		G ¼	G ¼	G ⅛	G ¼	G ⅜		G ¾	G 1	
		NPT ¼	NPT ¼	NPT ⅛	NPT ¼	NPT ⅜		NPT ¾	NPT 1	
Weight with/wo. handwheel	Without	1.3	2	2	5	8	22	70	450	950
	With	–	–	4	9	13	27	[4]		

[1] Without handwheel
[2] Only for Type 3510 Micro-flow Valve
[3] Version for max. permissible positioning force of 40 kN
[4] Only with side-mounted handwheel, see Tables 3b and 3c
[5] Actuator stem "extends"
[6] Actuator stem "retracts"

Table 3b · Side-mounted handwheel for actuators with effective areas 1400 and 2800 cm^2 · Rated travel ≤ 60 mm

Control valve	DN	50 ... 100		125 ... 150		200 ... 250		300 ... 400	
Seat bore		≤100		≤150		≤200		≤200	
Travel		30		60		60		60	
Actuator	cm^2	1400	2800	1400	2800	1400	2800	1400	2800
H3		930	1200	1030	1200	1030	1200	1140	1225
H5		295	480	395	480	395	480	480	480
H9		395	480	395	480	395	480	395	–
Weight incl. actuator	appr. kg	150	405	155	575	155	575	175	575

Table 3c · Side-mounted handwheel for actuators · Rated travel up to 120 mm

Actuator	cm^2	2800	2 x 2800
H10		1105	1105
H11		220	220
Additional weight	appr. kg	250	250

Please indicate the following data when ordering:

Actuator	Type 3271/3271-5/3271-52
	With handwheel
	With mechanical travel stop
	Stainless steel actuator
	Fire-Lock version (240 to 700 cm^2)
Tandem actuator	
Effective diaphragm area	... cm^2
Travel	... mm
Bench range	... bar
Operating direction	Actuator stem "extends"/"retracts"
Signal pressure connection	G ... /NPT...
Rolling diaphragm	NBR/EPDM

Specifications subject to change without notice.

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Pneumatic Actuators up to 700 cm²

Type 3271 and Type 3277 for integral positioner attachment

Application

Linear actuator for attachment to final control elements, particularly suitable for Series 240, 250, 280 Control Valves and Type 3510 Micro-flow Valves

Diaphragm area **60 to 700 cm²**

Rated travel **7.5 to 30 mm**

The Type 3271 and Type 3277 Pneumatic Actuators are diaphragm actuators equipped with a rolling diaphragm and internal springs.

Special features

- Low overall height
- Powerful thrust at high response speed
- Low friction
- Various bench ranges by varying the number of springs and their compression
- No special tools required to change the bench range and to reverse the actuator action (also in version with handwheel)
- Designed for supply pressures up to 6 bar
- Continuous operation at temperatures from –35 to +90 °C
- Direct attachment of accessories on additional yoke for Type 3277 Actuator with concealed travel pick-off (Fig. 2)

Versions

– **Type 3271** · **Diaphragm areas 80, 240, 350, 700 cm²** (Fig. 1), optional stainless steel version (1.4301)

– **Type 3277** · **Diaphragm area 240, 350, or 700 cm²** for direct attachment of accessories (Fig. 2), optional stainless steel version (1.4301)

– **Type 3271-52** · **Diaphragm area 60 cm²**, die-cast aluminum body, particularly for Type 3510 Micro-flow Valve (Fig. 3 and Data Sheet T 8091 EN)

– **Type 3271-5** · **Diaphragm area 120 cm²**, die-cast aluminum body (Fig. 4)

– **Type 3277-5** · **Diaphragm area 120 cm²**, die-cast aluminum body for direct attachment of accessories (Fig. 8)

– **Type 3271 or 3277** · **Additional handwheel** for pneumatic actuators with diaphragm areas of 240, 350, or 700 cm² (Fig. 5 and Data Sheet T 8312 EN)

– **Type 3271** · **Mechanical travel stop** (sectional drawing 10), minimum or maximum travel mechanically adjustable in version with 240, 350, or 700 cm²

– **Type 3271/7** · **Fire-Lock version** (Fig. 11) fail-safe action in case of fire, diaphragm areas of 240, 350, 700 cm²

Further versions

– For other process media (e.g. water or oxygen) · Details available on request

– For high temperatures up to 120 °C · On request

Fig. 1 · Type 3271

Fig. 2 · Type 3277

Fig. 3 · Type 3271-52

Fig. 4 · Type 3271-5

Fig. 5 · Type 3271
with additional handwheel

– For low temperatures down to – 40 °C · On request

Associated Mounting and Operating Instructions

Type 3271 Pneumatic Actuator	**EB 8310 EN**
Type 3277 Pneumatic Actuator	**EB 8311 EN**

Edition June 2004

Data Sheet **T 8310-1 EN**

Principle of operation

The signal pressure p_{st} generates a force $F = p_{st} \cdot A$ on the diaphragm area A (2). This force is balanced by the actuator springs (4). Taking into account the rated travel, the number of springs and their compression determine the bench range. The travel H is proportional to the signal pressure p_{st}. The operating direction of the actuator stem (7) depends on the arrangement of the springs and the signal pressure connection (1).

The stem connector (8) connects the actuator stem (7) with the plug stem (10) of the valve.

The adjustable **mechanical travel stop** (Fig. 10) is suitable for actuators made of sheet steel with effective diaphragm areas of 240, 350, or 700 cm^2. Using the limit stop, the actuator travel can be limited by up to 50 % in both directions (actuator stem "extends" or "retracts") and permanently adjusted. A special version with one-sided travel stop for actuators with an effective diaphragm area of 120 cm^2 is available.

Actuators are available with the following fail-safe actions:

"Actuator stem extends (FA)"

The springs cause the actuator stem to move to the lower end position (sectional drawings, right) when the diaphragm is relieved of pressure or when the supply air fails.

"Actuator stem retracts (FE)"

The springs cause the actuator stem to retract (sectional drawings, left) when the diaphragm is relieved of pressure or when the supply air fails.

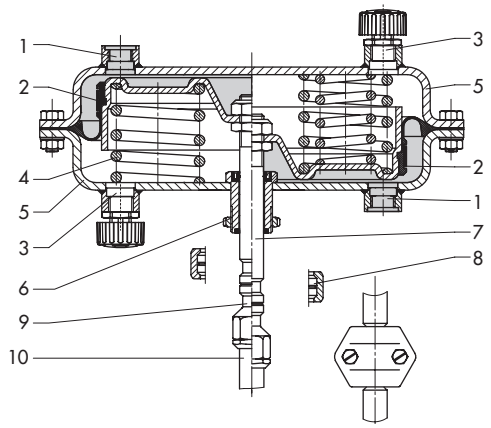

Fig. 6 · Type 3271 (right: with additional springs)

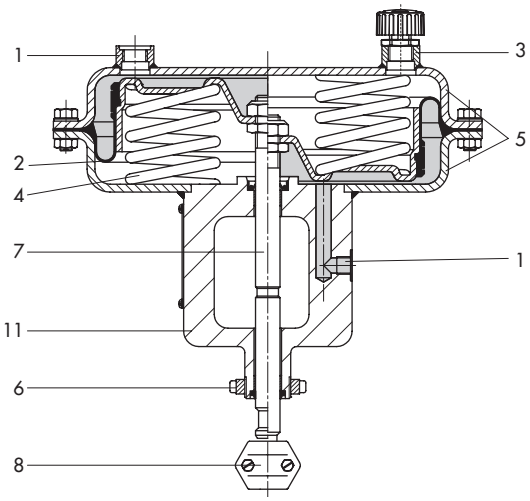

Fig. 7 · Type 3277

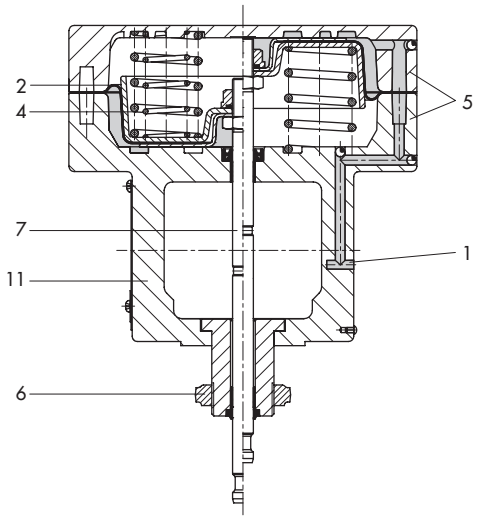

Fig. 8 · Type 3277-5

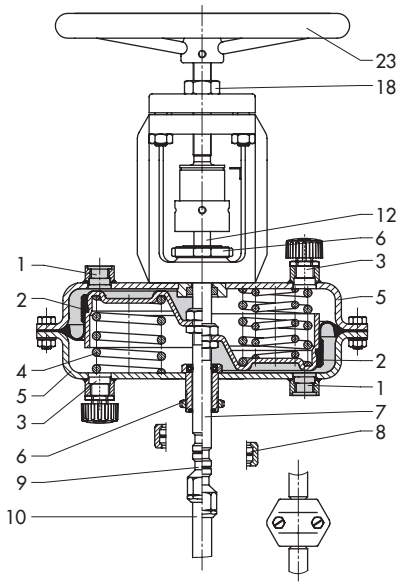

Fig. 9 · Type 3271 with handwheel

Legend

1	Signal pressure connection	11	Yoke
2	Diaphragm	12	Actuator stem to handwheel
3	Vent	14	Cap
4	Springs	15	Nut
5	Diaphragm cases	16	Spindle
6	Annular nut	17	Plain bearing
7	Actuator stem	18	Lock nut
8	Stem connector	23	Handwheel
9	Coupling nut		
10	Plug stem		

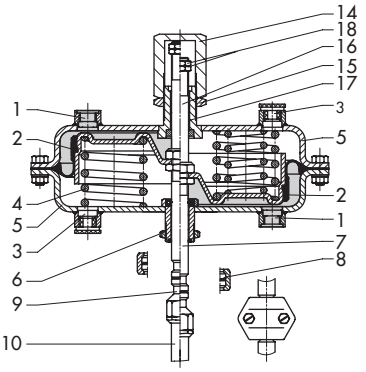

Fig. 10 · Type 3271 with adjustable travel stop

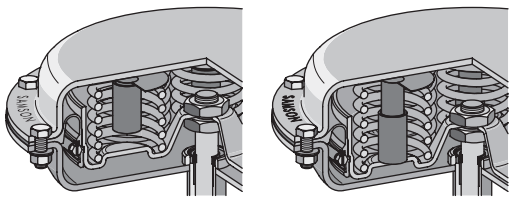

Fig. 11 · Fire-Lock version, in fail-safe position (right)

Table 1a · Technical data for Type 3271 Pneumatic Actuator

Version	**Type 3271**	**Type 3271** Stainless steel	**Type 3277**	**Type 3277** Stainless steel	**Type 3271-52** for micro valve	**Type 3271-5** **Type 3277-5**
Diaphragm area cm^2	80 · 240 · 350 · 700[1)]		240 · 350 · 700[1)]		60	120
Max. supply pressure	6 bar · See restrictions in on/off service on page 6					
Permissible temperatures in continuous operation	–35 to 90 °C made of standard material NBR				–35 to 80 °C	–35 to 90 °C
	–40 to 120 °C made of special material EPDM, for air free of oil and grease and actuator versions with 240, 350, and 700 cm^2					
	Up to 80 °C in Fire-Lock version (for 240, 350, and 700 cm^2)					
Materials						
Rolling diaphragm	NBR (nitrile rubber) with fabric insert				NBR with fabric insert	
	EPDM with fabric insert					
Actuator stem	1.4305				1.4305/1.4571	1.4305
Actuator stem sealing	NBR				NBR	NBR
	EPDM					
Diaphragm cases	Sheet steel, powder-varnish coated	Stainless steel 1.4301	Sheet steel, powder-varnish coated	Stainless steel 1.4301	Die-cast aluminum, powder-varnish coated	

[1)] Only for initial spring value ≤ 2.1 bar

Table 1b · Technical data for additional handwheel

Version for actuator		**Type 3271-5** **Type 3277-5**	**Type 3271** **Type 3277**
Diaphragm area		120 cm^2	240 cm^2, 350 cm^2 700 cm^2 (only for initial spring value ≤ 2.1 bar)
Materials	Body	Die-cast aluminum, powder-varnish coated	St 37-2, powder-varnish coated
	Spindle	1.4305	Stainless steel 1.4104
	Handwheel	Aluminum, powder-varnish coated	Aluminum

Table 2 Bench ranges for pneumatic actuators up to 700 cm²

Effective diaphragm area [cm²]	Rated travel [mm]	Travel volume at rated travel [dm³]	Dead volume [dm³]	Max. travel [mm][1) 2)]	Bench range [bar] (signal pressure range at rated travel)	Additionally possible spring compression [%]	Operating range with spring compression [bar]	Number of springs	Spring force at 0 mm travel [kN][1)]	Spring force at rated travel [kN]	Thrust [kN] at rated travel and a supply pressure [bar] of					
											1.4	2.0	3.0	4.0	5.0	6.0
60	7.5	0.09	0.1	10.5	0.2...1.0	0	–	2	0.12	0.6	0.24	0.6	1.2	1.8	2.4	3
					0.4...2.0		–	4	0.24	1.2	–		0.6	1.2	1.8	2.4
					1.4...2.3[3)]		–	4	0.84	1.38	–			1.02	1.62	2.22
					2.1...3.3[3)]		–	8	1.26	1.98	–			0.42	1.02	1.62
80	15	0.12	0.13	16	0.2...1.0	12.5	0.3...1.1	3	0.16	0.8	0.32	0.8	1.6	2.4	3.2	4
					0.4...2.0		0.6...2.2	6	0.32	1.6	–		0.8	1.6	2.4	3.2
					0.6...3.0		0.9...3.3	12	0.48	2.4	–			0.8	1.6	2.4
120	7.5	0.09	0.12	9	0.4...0.8	0	–	3	0.48	0.96	0.72	1.44	2.64	3.84	5.04	6.24
					0.8...1.6		–	6	0.96	1.92	–	0.48	1.68	2.88	4.08	5.28
Version for Type 3510 Micro-flow Valve					1.7...2.1[3)]		1.7...2.1	6	2.04	2.52	–		1.08	2.28	3.48	4.68
					2.4...3.0[3)]		2.4...3.0	12	2.88	3.6	–			1.2	2.4	3.6
120	15	0.2	0.10	16 (17)	0.2...1.0	12.5	0.3...1.1	3	0.24	1.2	–	1.2	2.4	3.6	4.8	6
					0.4...2.0		0.6...2.2	6	0.48	2.4	–		1.2	2.4	3.6	4.8
				15 (17)	1.4...2.3[3)]	0	1.4...2.3	6	1.68	2.76	–		0.84	2.04	3.24	4.44
					2.1...3.3[3)]		2.1...3.3	12	2.52	3.96	–			0.84	2.04	3.24
240	15	0.36	0.38	17	0.2...1.0	12.5	0.3...1.1	3	0.48	2.4	0.96	2.4	4.8	7.2	9.6	12
					0.4...2.0		0.6...2.2	6	0.96	4.8	–		2.4	4.8	7.2	9.6
					0.6...3.0		0.9...3.3	12	1.44	7.2	–			2.4	4.8	7.2
350	15	0.53	0.6	22	0.2...1.0	25	0.4...1.2	3	0.7	3.5	1.4	3.5	7	10.5	14	17.5
					0.4...2.0		0.8...2.4	6	1.4	7	–		3.5	7	10.5	14
					0.6...3.0		1.2...3.6	12	2.1	10.5	–			3.5	7	10.5
				15	1.4...2.3[3)]	0	1.4...2.3	6	4.9	8.05	–		2.45	5.95	9.45	13
					2.1...3.3[3)]		2.1...3.3	12	7.35	11.6	–			2.45	5.95	9.45
700	30	2.1	2.4	38	2.1...1.0	25	0.4...1.2	3	1.4	7	2.8	7	14	21	28	35
					0.4...2.0		0.8...2.4	6	2.8	14	–		7	14	21	28
					0.6...3.0		1.2...3.6	12	4.2	21	–			7	14	21
				30	1.4...2.3[3)]	0	1.4...2.3	8	9.8	16.1	–		4.9	11.9	18.9	25.9
					2.1...3.3[3)]		2.1...3.3	12	14.7	23.1	–			4.9	11.9	18.9
					2.35...3.8[3) 4)]		2.35...3.8	15	16.5	26.6	–			1.4	8.4	15.4
					2.6 ...4.3[3) 4)]		2.6...4.3	18	18.2	30.1	–				4.9	11.9

1) Based on lower bench range value, taking zero travel (to unseat the plug) into account
2) Zero travel as in Table 3 depending on fail-safe action
3) Pretensioned springs
4) Version not available with additional handwheel

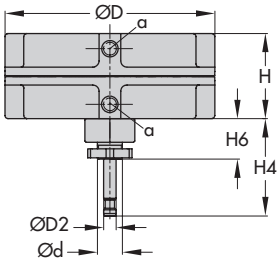

Fig. 12 · Type 3271-5

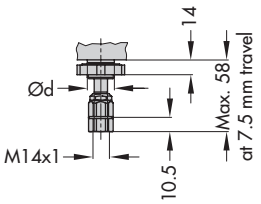

Fig. 12a · Types 3271-5/3277-5 with 7.5 mm travel for Type 3510 Micro Valve

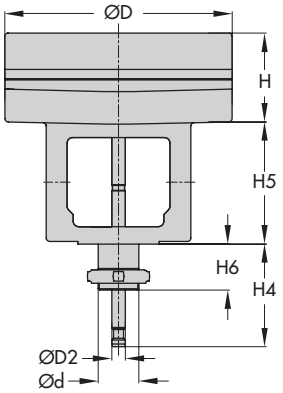

Fig. 13 · Type 3277-5

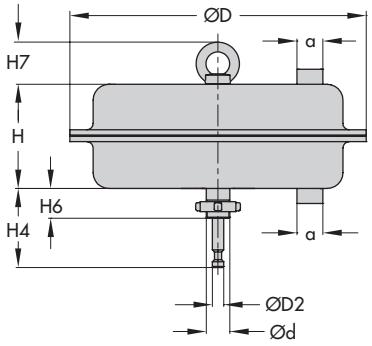

Fig. 14 · Type 3271 (700 cm^2 version with lifting ring)

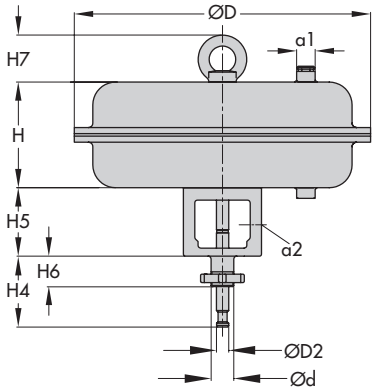

Fig. 15 · Type 3277 (700 cm^2 version with lifting ring)

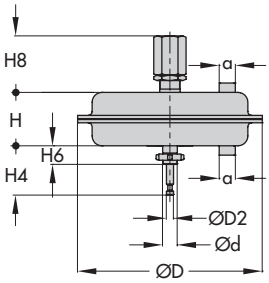

Fig. 16 · Type 3271 with adjustable travel stop

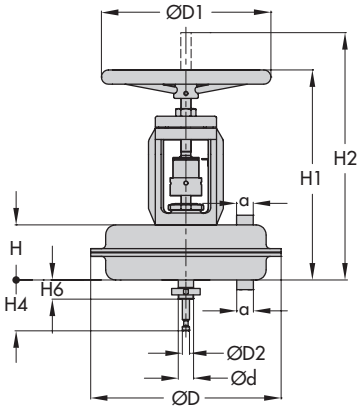

Fig. 17 · Type 3271 with additional handwheel

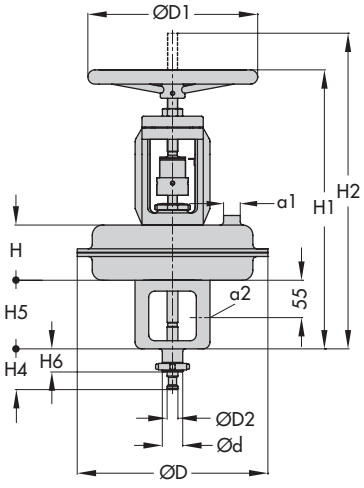

Fig. 18 · Type 3277 with additional handwheel

Table 3 · Dimensions and weights

Actuator	Type	3271	3271	3271	3271			3277	3277		
Version		-52		-5				-5			
Diaphragm area	cm^2	60	80	120	240	350	700	120	240	350	700
Height	H	63	62	69	62	82	134	70	65	85	135
	H1	–			300	320	430	–	400	420	530
	$H2_{max}$	–		208	345	365	515	–	445	465	615
	H4ratedFA	51	75	75	75	75	90	78	75	75	90
	$H4_{max}$FA	52.5	78	78	78	78	95	78	78	78	90
	$H4_{max}$FE	52.5	78	78	78	85	104	78	78	85	104
	H5	–						84	101	101	101
	H6	23.8	34	34	34	34	34	14	34		
	H7	–					62	–			65
	H8	–			75	85	115	–			
Diameter	∅ D	120	150	168	240	280	390	168	240	280	390
	∅ D1	–	–	80	180	250	250	–	180	250	250
	∅ D2	10	10	10	10	16	16	10	16		
∅ d (thread)		20	30					20	30		
a (optional)		G 1/4		G 1/8	G 1/4	G 3/8		G 1/8	G 1/4	G 3/8	
		1/4 NPT		1/8 NPT	1/4 NPT	3/8 NPT					
	a2	–						–	G 3/8		
Weight in kg											
Without handwheel		1.3	2	2	5	8	22	3.2	9	12	26
With handwheel		–		4	9	13	27	–	13	17	31

Throttling or on/off service

In throttling service, the pneumatic actuators can be used for supply pressures up to max. 6 bar.

In on/off service, the supply pressure must be reduced.

For fail-safe action "Actuator stem retracts (FE)", the permissible supply pressure must not exceed the upper bench range value by more than 3 bar.

Actuators to be used with reduced supply pressures are labeled accordingly.

Example

Bench range	Fail-safe action	Max. supply pressure
0.2 … 1.0 bar	Actuator stem retracts	4 bar
0.4 … 2.0 bar		5 bar
0.6 … 3.0 bar		6 bar

For fail-safe action "Actuator stem extends (FA)" and travel stop, the supply pressure must not exceed the upper bench range value by more than 1.5 bar.

Ordering text

Actuator	Type 3271 or Type 3277 for direct attachment of accessories
Optionally	Handwheel Travel stop Fire-Lock version
Diaphragm area	... cm^2
Travel	... mm
Bench range	... bar
Fail-safe action	Actuator stem extends (FA) or Actuator stem retracts (FE)
Signal pressure connection	G ... / ... NPT
Rolling diaphragm	NBR/EPDM

Specifications subject to change without notice.

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Pneumatic Actuators 1400, 2800, and 2 x 2800 cm²

Type 3271

Hand-operated Actuator Type 3273

Application

Linear actuator for attachment to final control elements, particularly suitable for Series 240, 250, and 280 Control Valves

Diaphragm area **1400 and 2800 cm²**

Travel **Up to 160 mm**

The Type 3271 Pneumatic Actuators are diaphragm actuators equipped with a rolling diaphragm and internal springs.

Special features

- Low overall height
- Low friction
- Various bench ranges by varying the number of springs and their compression
- No special tools required to change the bench range and to reverse the actuator action (also for tandem actuator and version with handwheel)
- Continuous operation at temperatures from –35 to +90 °C
- Type 3273 Hand-operated Actuator for travels up to 80 mm

Versions

– **Type 3271 Pneumatic Actuator** (Fig. 1) · Effective diaphragm area of 1400 cm² with 60 mm travel (1400-60) or effective diaphragm area of 2800 cm² with 160 mm travel

– **Type 3271 Pneumatic Tandem Actuator** (Fig. 2) · Effective diaphragm area of 2 x 2800 cm²

– **Type 3271 Pneumatic Actuator with Type 3273 Hand-operated Actuator** · For travels up to 80 mm using side-mounted handwheel (Fig. 10), effective diaphragm area of 1400 or 2800 cm²

– **Type 3271 Pneumatic Actuator with Handwheel** · Using side-mounted handwheel (Fig. 11) for travels up to 160 mm, effective diaphragm areas of 2800 or 2 x 2800 cm²

– **Type 3271 Actuator with Travel Stop** (sectional drawing 5) Minimum or maximum travel mechanically adjustable for 1400 cm² versions with 60 mm travel and 2800 cm² versions as well as 2 x 2800 cm² tandem actuators

Further versions

For other process media (e.g. water)

For high temperatures up to 120 °C or low temperatures down to –40 °C · On request

Type 3273 · **Hand-operated Actuator** without pneumatic actuator, operated using side-mounted handwheel for travels up to 80 mm · On request

Fig. 1 · Type 3271 (1400-60) with Type 3251 Control Valve

Fig. 2 · Type 3271 Tandem Actuator with 2 x 2800 cm²

Principle of operation

The signal pressure p_{st} generates a force $F = p_{st} \cdot A$ on the diaphragm area A (2). This force is balanced by the actuator springs (4). Taking into account the rated travel, the number of springs and their compression determine the bench range. The travel H is proportional to the signal pressure p_{st}. The operating direction of the actuator stem (7) depends on the arrangement of the springs.

The stem connector (8) connects the actuator stem (7) with the plug stem (10) of the valve.

Fig. 10 shows the side-mounted **Type 3273 Hand-operated Actuator** for actuators with effective diaphragm areas of 1400 and 2800 cm² and a maximum **travel of up to 80 mm**. The handwheel (23) is fixed to the worm-geared shaft (20) and moves the actuator stem over the worm-geared wheel (21) and the threaded bushing (22).

A side-mounted handwheel as illustrated in Fig. 11 is available for valves with **120 mm travel**.

The adjustable **mechanical travel stop** (Fig. 5) is suitable for actuator version 1400-60 as well as 2800 cm² and tandem actuators. The actuator travel can be limited by up to 50 % in both directions (actuator stem "extends" or "retracts") and permanently adjusted.

The tandem actuator (Fig. 6) contains two coupled diaphragms; they produce a positioning force that is twice as high as the force of a single-acting actuator.

Actuators are available with the following fail-safe actions:

"Actuator stem extends (FA)"

The springs cause the actuator stem to move to the lower end position (sectional drawings, right) when the diaphragm is relieved of pressure or when the supply air fails.

"Actuator stem retracts (FE)"

The springs cause the actuator stem to retract (sectional drawings, left) when the diaphragm is relieved of pressure or when the supply air fails.

Legend

1 Signal pressure connection
2 Diaphragm
3 Vent
4 Springs
5 Diaphragm cases
6 Annular nut
7 Actuator stem
8 Stem connector
9 Coupling nut
10 Plug stem
14 Cap
15 Nut
16 Spindle
17 Plain bearing
18 Lock nut
20 Worm-geared shaft
21 Worm-geared wheel
22 Threaded bushing
23 Handwheel

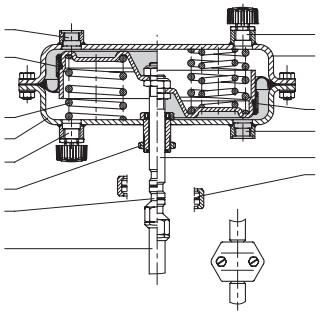


Fig. 3 · Sectional drawing of Type 3271Pneumatic Actuator (right diaphragm half with additional springs)

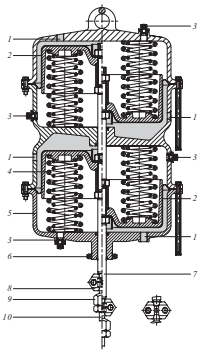


Fig. 4 · Tandem actuator with 2 x 2800 cm²

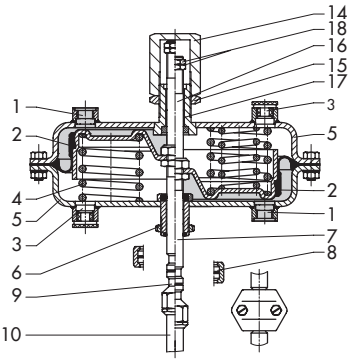


Fig. 5 · Type 3271 Actuator with adjustable travel stop

Throttling or on/off service

In throttling service, the Type 3271 Pneumatic Actuators can be used for supply pressures up to max. 6 bar.

In on/off service, the supply pressure must be reduced.

For fail-safe action "Actuator stem retracts (FE)", the permissible supply pressure must not exceed the upper bench range value by more than 3 bar.

Actuators to be used with reduced supply pressures are labeled accordingly.

Example

Bench range	Fail-safe action	Max. supply pressure
0.2 ... 1.0 bar	Actuator stem retracts	4 bar
0.4 ... 2.0 bar		5 bar
0.6 ... 3.0 bar		6 bar

For fail-safe action "Actuator stem extends (FA)" and travel stop, the supply pressure must not exceed the upper bench range value by more than 1.5 bar.

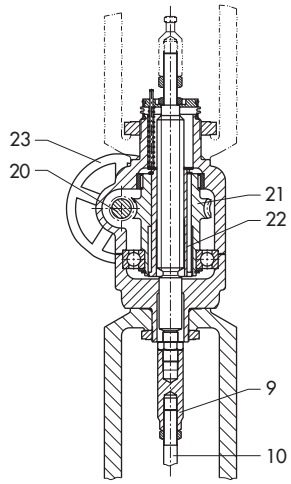


Fig. 6 · Type 3273 Hand-operated Actuator with side-mounted handwheel for max. 80 mm travel, up to 80 kN

Table 1a · Technical data for Type 3271 Pneumatic Actuator

Version cm²	**1400-60**	**2800**	**2 x 2800**
Maximum supply pressure	6 bar[1)]	6 bar[1)]	
Permissible temperatures in continuous operation	Standard material NBR –35 to 90 °C	Standard material NBR –35 to 90 °C	
	Special material EPDM (for air free of oil and grease) –35 to 120 °C		
Materials			
Rolling diaphragm	NBR (nitrile rubber) Butyl with fabric insert	NBR with fabric insert	
	EPDM with fabric insert		
Actuator stem	1.4571	1.4548.4	
Actuator stem sealing	NBR (nitrile rubber	NBR	
	EPDM		
Diaphragm cases	Sheet steel, powder-varnish coated	EN-JS1030 (GGG-40), powder-varnish coated	

1) Observe restrictions in on/off service as specified above

Table 1b · Technical data for Type 3273 Hand-operated Actuator

Version	**3273** (Fig. 10)	**3273** (Fig. 11)
Max. travel range	80 mm	160 mm
Permissible force	84 kN	210 kN
Permissible temperature	100 °C	100 °C
Materials		
Body	EN-JS1030 (GGG-40)	EN-JS1030 (GGG-40)
Spindle and threaded nut	1.4104/G-CuSn12Pb	EN-GJS-500-7 (GGG-50)/1.0503
Handwheel	Aluminum	EN-JL1040 (GG-25)

Table 1c · Available versions

Version	**1400-60**	**2800 cm²**	**2 x 2800 cm²**
Travel stop, on both sides	•	•	•
Type 3273 Hand-operated Actuator, max. 80 mm travel	•	• (max. 3 bar)	–
Side-mounted Type 3271 Hand-operated Actuator, max. 120 mm travel	–	•	•

Table 2 · Bench ranges for 1400 and 2800 cm² Pneumatic Actuators · All pressures in bar (gauge)

Values highlighted in gray apply to standard operation, i.e. operation at rated travel. The maximum travel can be achieved by increasing the signal pressure. Pretensioned springs cannot be used with fail-safe action "Actuator stem retracts" for Series 240, 250, and 280 Control Valves.

Effective diaphragm area [cm²]	Rated travel [mm]	Travel volume at rated travel [dm³]	Dead volume [dm³]	Max. travel [mm][1]	Bench range [bar] (signal pressure range at rated travel)	Additionally possible spring compression [%]	Operating range with spring compression [bar]	Number of springs	Spring force at 0 mm travel [kN][2]	Spring force at rated travel [kN][2]	Thrust [kN][2] at rated travel and a supply pressure [bar] of					
											1.4	2.0	3.0	4.0	5.0	6.0
1400	60	8.3	5.7	80	0.2...1.0	25	0.4...1.2	6	2.8	14	5.6	14	28	42	56	70
					0.4...2.0		0.8...2.4	12	5.6	28	–		14	28	42	56
					0.5...2.5		1.0...3.0	18	7	35	–		7	21	35	49
					1.1...2.4		1.4...2.7	18	15.4	33.6	–		8.4	22.4	36.4	50.4
					1.3...2.8		1.7...3.2	24	18.2	39.2	–		2.8	16.8	30.8	44.8
2800	120	33	16.5	160	0.2...1.0	25	0.4...1.2	3	5.6	28	11.2	28	56	84	112	140
					0.4...2.0		0.8...2.4	6	11.2	5.6	–		28	56	84	112
					0.5...2.5		1.0...3.0	9	14	70	–		14	42	70	98
					0.6...3.0		1.2...3.6	12	16.8	84	–			28	56	84
					0.9...1.6	25[4]	1.1...1.8	6	25.2	44.8	–	11.2	39.2	67.2	95.2	123
					1.0...2.1		1.25...2.35	9	28	58.8	–		25.2	53.2	81.2	109
					1.1...2.6		1.5...3.0	12	30.8	72.8	–		11.2	39.2	67.2	95.2
					1.1...2.3	25	1.4...2.6	6	30.8	64.4	–		19.6	47.6	75.6	104
					1.2...2.8		1.6...3.2	9	33.6	78.4	–		5.6	33.6	61.6	89.6
					1.3...3.3		1.8...3.8	12	36.4	92.4	–			19.6	47.6	75.6
2 x 2800	120	66	33	160	0.2...1.0	25	0.4...1.2	6	11.2	56	22.4	56	112	168	224	280
					0.4...2.0		0.8...2.4	12	22.4	11.2	–		56	112	168	224
					0.5...2.5		1.0...3.0	18	28	140	–		28	84	140	196
					0.6...3.0		1.2...3.6	24	33.6	168	–			56	112	168
					0.9...1.6	25[4]	1.1...1.8	12	50.4	89.6	–	22.4	78.4	134.4	190.4	246
					1.0...2.1		1.25...2.35	18	56	117.6	–		50.4	106.4	162.4	218
					1.1...2.6		1.5...3.0	24	61.6	145.6	–		22.4	78.4	134.4	190.4
					1.1...2.3	25	1.4...2.6	12	61.6	128.8	–		39.2	95.2	151.2	208
					1.2...2.8		1.6...3.2	18	67.2	156.8	–		11.2	67.2	123.2	179.2
					1.3...3.3		1.8...3.8	24	72.8	184.8	–			39.2	95.2	151.2

1) Based on lower bench range value, not taking zero travel (to unseat the plug) into account (see Table 3a)
2) Specified forces refer to the bench range
3) Springs are already pretensioned
4) The maximum compression at 50 % rated travel is 50 %

Table 3 · Dimensions and weights

Table 3a · Versions without handwheel

Actuator	cm^2	1400-60	2800	2 x 2800
Height	H	197	520	1020
	$H4_{Rated}FA$	165	315	
	$H4_{max}FA$	169	325	
	$H4_{max}FE$	185	355	
	H6	54	85	
	H7	90	110	
	H8	180	500	
Diameter	∅ D	530	770	
	∅ D2	22	40	
∅ d (thread)		60 x 1.5	100 x 2	100 x 2
a (optional)		G ¾	G 1	
		¾ NPT	1 NPT	
Weight in kg				
Without handwheel		70	450	950

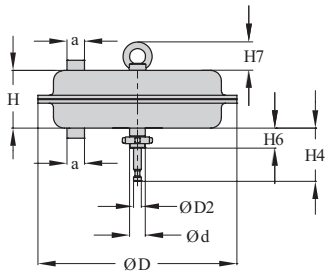
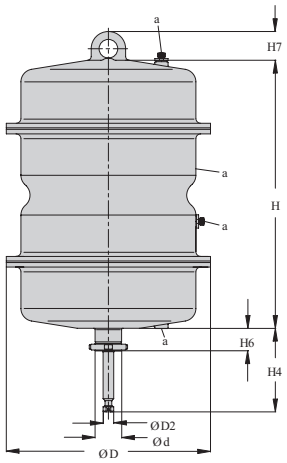


Fig. 7 · Type 3271 Actuator, version 1400-60



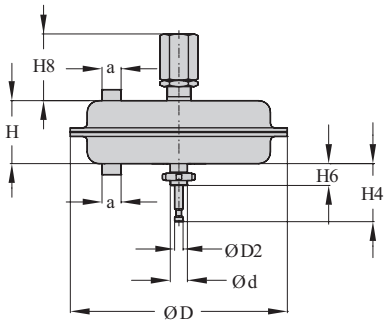


Fig. 8 · Version with mechanical travel stop

Fig. 9 · Type 3271 as tandem actuator

Table 3b · Type 3273 Hand-operated Actuator with side-mounted handwheel · Travel ≤ 80 mm

Control valve	DN	50 ... 100		125 ... 150		200 ... 250		300 ... 400	
Seat bore	mm	≤ 100		≤ 150		≤ 200		≤ 200	
Travel	mm	30		60		60		60	
Actuator	cm^2	1400-60	2800	1400-60	2800	1400-60	2800	1400-60	2800
H3	mm	932	1202	1032	1202	1032	1202	1117	1222
H5	mm	295	480	395	480	395	480	480	500
H9	mm	395	480	395	480	395	480	395	480
Weight with actuator	kg	140	575	155	575	155	575	175	575
Weight w/o actuator	kg	70		70		70		70	

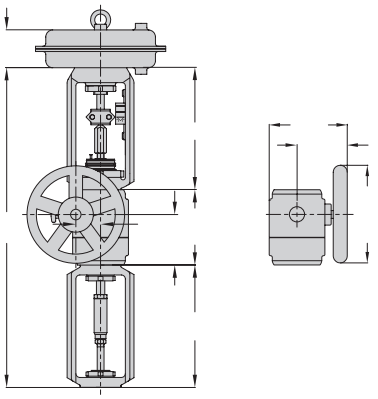


Fig. 10 · 1400 and 2800 cm^2 version
for max. 80 mm travel, up to 80 kN

Table 3c · Pneumatic actuator and hand-operated actuator with side-mounted handwheel · Travel up to 160 mm

Actuator	cm^2	2800	2 x 2800
H10	mm	1105	1105
H11	mm	220	220
Weight w/o actuator	kg	250	250

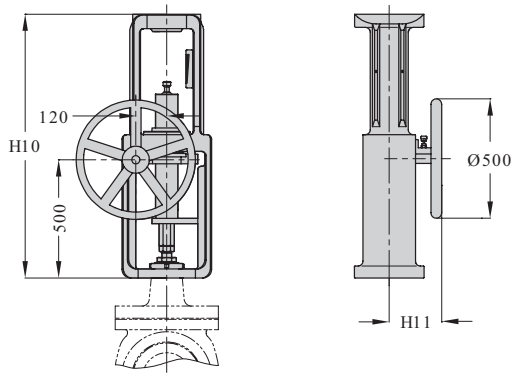


Fig. 11 · 1400 and 2800 cm^2 version
for travel >60 to 120 mm

Ordering text

Actuator	Type 3271 Handwheel Travel stop Tandem actuator
Diaphragm area	... cm^2
Travel	... mm
Bench range	... bar
Fail-safe action	Actuator stem extends/retracts
Signal pressure connection	G ... / ... NPT
Rolling diaphragm	NBR/EPDM

Specifications subject to change without notice.

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Maxifluss Rotary Plug Valves
VETEC Types 72.3/R and 72.4/R

VETEC Ventiltechnik GmbH

SAMSON

Application

Double-eccentric control valve for process engineering and industrial applications

Nominal sizes	**DN 25 to 400 · 1″ to 16″**
Nominal pressures	**PN 10 to 40 · ANSI Class 150 and 300**
Temperatures	**–100 to 400 °C** · –148 to 752 °F

Type 72.3 and Type 72.4 Maxifluss Rotary Plug Valves with

- Single-acting VETEC Type R Diaphragm Actuator

Valve body made of

- Cast steel or
- Stainless cast steel

Seat versions

- Metal sealing or soft sealing

The control valves can be equipped with various accessories such as positioners, solenoid valves, and other devices conforming to VDI/VDE 3845.

Versions

Standard version

Rotary plug valves with single-acting Type R Rotary Actuator for temperatures from –100 to 400 °C (–148 to 752 °F)

- **Type 72.3/R** · DN 25 to DN 400 in flanged design, face-to-face dimensions according to DIN 3202 F1/EN 558 Series 1
- **Type 72.3/R** · 1″ to 16″ in flanged design, face-to-face dimensions according to ANSI B16.10/ EN 558-2 Series 37 and 38
- **Type 72.4/R** · DN 25 to DN 300 in wafer-style design, face-to-face dimensions according to EN 558-1/2 Series 36
- **Type 72.4/R** · 1″ to 12″ in wafer-style design, face-to-face dimensions according to EN 558-1/2 Series 36

Further versions with

- Double packing
- TA-Luft (German clean air act) packing
- Noise-reducing features
- Heating jacket for flanged valves
- Special body and trim materials
- Wafer-style version with ceramic trim and protective sleeve for the valve body
- Version with grooved flange DIN 2512/RTJ
- Electric actuator or handwheel
- Version typetested by DVGW (German Technical and Scientific Association on Gas and Water) according to EN 161, DN 25 to 200, PN 16/40
- Basis weight control valve for paper machines

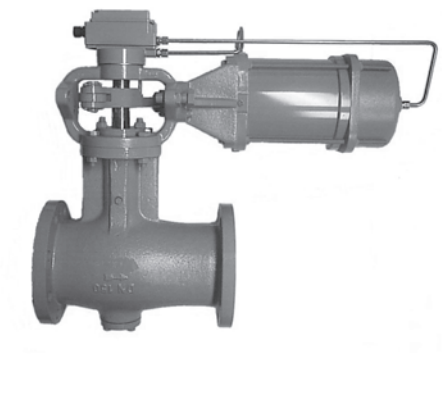


Fig. 1 · VETEC Type 72.3/R Maxifluss Rotary Plug Valve according to DIN, flanged design with Type R Pneumatic Actuator

Fig. 2 · VETEC Type 72.4/R Maxifluss Rotary Plug Valve with through holes in the flange and Type R Pneumatic Actuator

Principle of operation

The shaft and the plug are arranged eccentrically, thus implementing the double-eccentric design of the Maxifluss rotary plug valve together with the offset fulcrum (Fig. 3). This double-eccentric design ensures that the plug clears the seat immediately without any initial breakaway torque or friction when the plug shaft is turned from closed to open position. The valve opens smoothly, providing a stable control response at small opening angles.

The process medium can flow through the Maxifluss rotary plug valve in either direction.

The standard direction of flow for

- Liquids = flow to open **FTO**
  direction of flow "V"
- Gases and vapors = flow to close **FTC**
  direction of flow "H"

The flow coefficient is determined by the opening angle of the plug.

The inherent characteristic of the Maxifluss rotary plug valves can be converted into a linear or equal percentage characteristic using positioners and cam discs.

Fail-safe position

The control valve offers two possible fail-safe positions in combination with the VETEC Type R Diaphragm Actuator in case the supply air fails:

Valve CLOSED without supply air; the Maxifluss rotary plug valve is closed when the supply air fails.

Valve OPEN without supply air; the Maxifluss rotary plug valve is opened when the supply air fails.

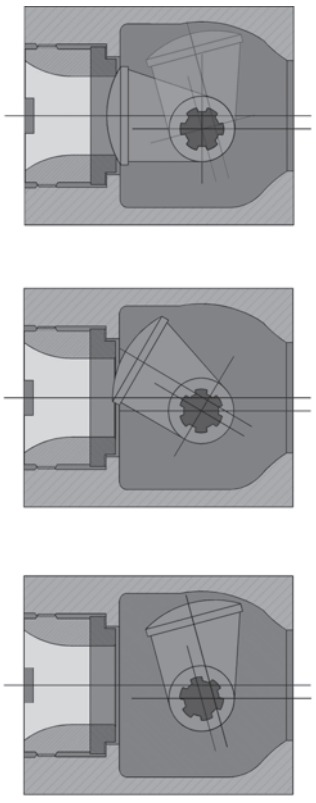
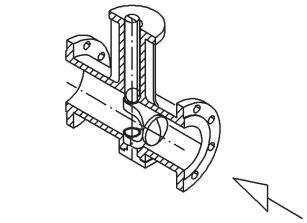
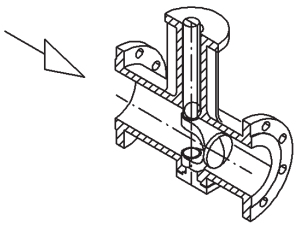


Fig. 3 · Plug movement with double-eccentric bearing



Direction of flow "V"
Medium opens

FTO



Direction of flow "H"
Medium closes

FTC

Fig. 4 and 5 · Directions of flow V and H

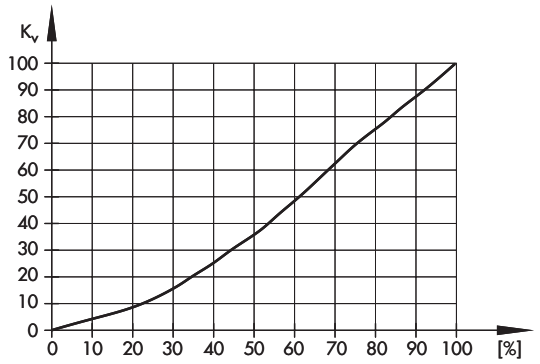


Fig. 6 · Inherent characteristic

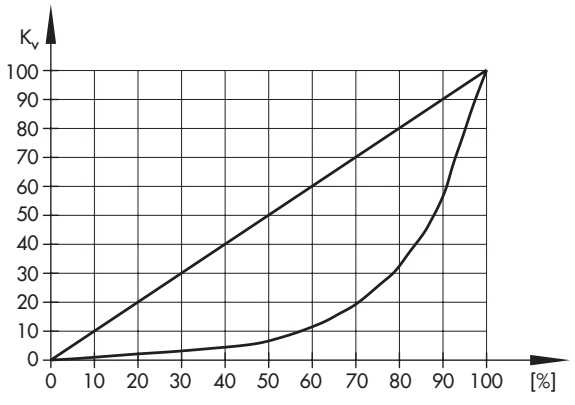


Fig. 7 · Linear and logarithmic characteristics achieved with the help of a positioner

Table 1 • Technical data

Table 1a • VETEC Types 72.3 and 72.4 Rotary Plug Valves

Maxifluss Type	**72.3**		**72.4**	
Design	**Flanged**		**Wafer style**	
Nominal sizes	**DN 25 to 400**	**1″ to 16″**	**DN 25 to 300**	**1″ to 12″**
Nominal pressures	PN 10 to 40	Class 150 and 300	PN 10 to 40	Class 150 and 300
Face-to-face dimensions	DIN 3202 F1 EN 558-1 Series 1	ANSI B16.10 EN 558-2 Series 37 for Class 150 Series 38 for Class 300	IEC 534-3-2 EN 558-1/2 Series 36	
Flange bores according to	PN 10, 16, 25 or 40	ANSI Cl. 150 or 300	PN 10, 16, 25 or 40	ANSI Cl. 150 or 300
Seat ring	Metal sealing · PTFE soft sealing (flow direction: FTC)			
Characteristic	Equal percentage			
Rangeability	200 : 1			
Temperature range · Other ranges available on request				
With metal sealing	–100 to 400 °C · –148 to 752 °F			
With soft sealing	–100 to 220 °C · –148 to 428 °F			
Leakage class according to DIN EN 1349				
With metal sealing	IV-L1			
With soft sealing	VI-G1			

Table 1b • Type R Actuator

Actuator	Type	R110	R150	R200	R250	R250V
Travel at max. opening angle	mm	128	184	200	200	200
Bench range	bar	0.4 to 1.2	0.4 to 1.2	0.4 to 1.2	0.4 to 1.2	1.3 to 2.4
Supply pressure		Min. 3 bar · Max. 6 bar				
Max. spring torque	Nm	32	84	160	249	810
Permissible ambient temperature		–20 to 70 °C · –4 to 158 °F				

Table 2 • Materials

Table 2a • VETEC Types 72.3 and 72.7 Rotary Plug Valves

Body	1.0619	1.4581
Seat	1.4571 Optionally with stellited seating surface	
Plug	1.4581 Optionally with stellited seating surface or seating surface of Stellite 6	
Shaft	1.4571	
Packing	PTFE/graphite	
Seals	Graphite/stainless steel	

Table 2b • Type R Actuator

Housing	Steel/aluminum
Diaphragms	NBR
Piston	Aluminum
Springs	Spring steel

Table 3 • Control valve sizing and noise level calculation

Table 3a • K_{VS}, C_V, and x_{Fz} coefficients · Seat with metal sealing · Direction of flow "V", FTO
For direction of flow "H", FTC, K_{VS} is reduced by 20 %

Size	DN/in	25/1"	40/1½"	50/2"	80/3"	100/4"	150/6"	200/8"	250/10"	300/12"	400/16"
100 % K_{VS}	K_{VS}	16	40	80	245	370	685	950	1925	2680	4200
	C_V	19	47	94	286	430	800	1110	2252	3135	4914
	Seat ∅	18	26	36	60	76	105	135	170	210	290
	$x_{Fz\ 0.75}$	0.3	0.3	0.25	0.2	0.2	0.2	0.2	0.2	0.2	0.18
60 % K_{VS}	K_{VS}	10	24	48	147	220	410	570	1230	1640	2520
	C_V	12	28	56	171	256	477	663	1439	1918	2948
	Seat ∅	16	21.5	29.5	50	60	86	106	146	163	225
	$x_{Fz\ 0.75}$	0.34	0.34	0.3	0.25	0.25	0.25	0.22	0.22	0.22	0.19
40 % K_{VS}	K_{VS}	6	16	33	105	150	275	380	770	1070	1680
	C_V	7	19	38	122	174	320	442	900	1252	1965
	Seat ∅	14	18.5	25.5	44	53	73	88	126	133	184
	$x_{Fz\ 0.75}$	0.39	0.39	0.34	0.30	0.30	0.30	0.24	0.24	0.24	0.20
25 % K_{VS}	K_{VS}	4	12	20	63	93	179	240	480	670	1070
	C_V	5	14	23	73	108	208	279	561	784	1252
	Seat ∅	10	16	21	37	45	62	73	102	116	160
	$x_{Fz\ 0.75}$	0.43	0.43	0.38	0.35	0.35	0.35	0.26	0.26	0.26	0.21

Table 3b • K_{VS}, C_V, and x_{Fz} coefficients · Seat with soft sealing · Direction of flow "H", FTC

Size	DN/in	25/1"	40/1½"	50/2"	80/3"	100/4"	150/6"	200/8"	250/10"	300/12"	400/16"
100 % K_{VS}	K_{VS}	10	40	68	162	252	510	726	1450	2010	3150
	C_V	12	47	79	189	295	593	849	1696	2351	3685
	Seat ∅	16	26	35	54	70	99	129	160	204	270
	$x_{Fz\ 0.75}$	0.3	0.3	0.25	0.2	0.2	0.2	0.2	0.2	0.2	0.18
60 % K_{VS}	K_{VS}	6	21	41	135	164	270	460	990	1320	2020
	C_V	7	24	50	158	191	314	535	1158	1535	2363
	Seat ∅	15	21.5	29.5	50	60	86	106	146	163	225
	$x_{Fz\ 0.75}$	0.34	0.34	0.3	0.25	0.25	0.25	0.22	0.22	0.22	0.19
40 % K_{VS}	K_{VS}	4	15	28	105	121	182	300	620	860	1345
	C_V	5	17	33	123	141	212	349	725	1006	1573
	Seat ∅	14	18.5	25.5	46	53	73	88	126	133	184
	$x_{Fz\ 0.75}$	0.39	0.39	0.34	0.30	0.30	0.30	0.24	0.24	0.24	0.20
25 % K_{VS}	K_{VS}	2	11	17	56	72	132	200	410	560	860
	C_V	3	13	20	65	84	153	233	479	655	1006
	Seat ∅	10	16	21	37	45	62	73	102	116	160
	$x_{Fz\ 0.75}$	0.43	0.43	0.38	0.35	0.35	0.35	0.26	0.26	0.26	0.21

Table 3c • F_L and x_T coefficients

Size	DN/in	25/1"	40/1½"	50/2"	80/3"	100/4"	150/6"	200/8"	250/10"	300/12"	400/16"
100 % K_{VS}	F_L	0.76	0.76	0.70	0.64	0.64	0.64	0.64	0.64	0.64	0.61
	x_T	0.5	0.5	0.5	0.35	0.35	0.35	0.30	0.30	0.30	0.30
60 % K_{VS}	F_L	0.81	0.81	0.76	0.70	0.70	0.66	0.66	0.66	0.66	0.62
	x_T	0.6	0.6	0.6	0.5	0.5	0.50	0.35	0.35	0.35	0.35
40 % K_{VS}	F_L	0.86	0.86	0.81	0.76	0.76	0.76	0.69	0.69	0.69	0.64
	x_T	0.70	0.70	0.70	0.60	0.60	0.60	0.50	0.50	0.50	0.45
25 % K_{VS}	F_L	0.89	0.89	0.85	0.82	0.82	0.82	0.72	0.72	0.72	0.65
	x_T	0.75	0.75	0.75	0.65	0.65	0.65	0.55	0.55	0.55	0.50

Table 4 • Permissible differential pressures

Table 4a • Fail-safe position: valve CLOSED · Pressures in bar

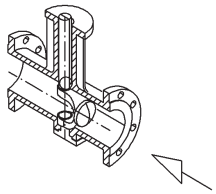
Size DN/in	Shaft ∅ in mm	Max. shaft torque [Nm] at 20 °C	Actuator Type	Bench range in bar	Required supply pressure	Perm. diff. pressure for CLOSED position		Max. perm. supply pressure
						Standard flow FTO Metal sealing	Reverse flow FTC Metal or soft sealing	
25/1″	16	58	R110	0.4 ... 1.2	3	40	40	6
40/1½″	20	131	R110	0.4 ... 1.2	3	30	40	6
			R150	0.4 ... 1.2	3	40	40	
50/2″	20	131	R110	0.4 ... 1.2	3	15	40	6
			R150	0.4 ... 1.2	3	40	40	
80/3″	28	325	R150	0.4 ... 1.2	3	15	40	6
			R200	0.4 ... 1.2	3	29	40	
			R250	0.4 ... 1.2	3	40	40	
100/4″	35	586	R150	0.4 ... 1.2	3	8	40	6
			R200	0.4 ... 1.2	3	15	40	
			R250	0.4 ... 1.2	3	24	40	
150/6″	42	1246	R200	0.4 ... 1.2	3	7	40	6
			R250	0.4 ... 1.2	3	11	40	
			R250V	1.3 ... 2.4	3	40	23	
200/8″	42	1246	R200	0.4 ... 1.2	3	4	26	6
			R250	0.4 ... 1.2	3	6	40	
			R250V	1.3 ... 2.4	3	27	12	
250/10″	48	1709	R200	0.4 ... 1.2	3	2	15	6
			R250	0.4 ... 1.2	3	3	24	
			R250V	1.3 ... 2.4	3	15	7	
300/12″	48	1709	R200	0.4 ... 1.2	3	1	9	6
			250	0.4 ... 1.2	3	2	15	
			R250V	1.3 ... 2.4	3	9	4	
400/16″	72	6366	R250	0.4 ... 1.2	4	–	5	6
			R250V	1.7 ... 3.2	4	3	–	

Valves for higher pressure drops on request

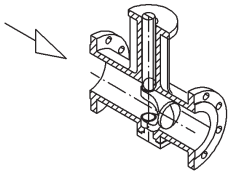
Table 4b • Fail-safe position: valve OPEN · Pressures in bar

Size DN/in	Shaft ∅ in mm	Max. shaft torque [Nm] at 20 °C	Actuator Type	Bench range in bar	Required supply pressure	Perm. diff. pressure in OPEN position		Max. perm. supply pressure
						Standard flow FTO Metal sealing	Reverse flow FTC Metal or soft sealing	
25/1″	16	58	R110	0.4 ... 1.2	3	40	40	6
40/1½″	20	131	R110	0.4 ... 1.2	3	40	30	6
			R150	0.4 ... 1.2	3	40	40	
50/2″	20	131	R110	0.4 ... 1.2	3	40	15	6
			R150	0.4 ... 1.2	3	40	40	
80/3″	28	325	R150	0.4 ... 1.2	3	40	15	6
			R200	0.4 ... 1.2	3	40	29	
			R250	0.4 ... 1.2	3	40	40	
100/4″	35	586	R150	0.4 ... 1.2	3	40	8	6
			R200	0.4 ... 1.2	3	40	15	
			R250	0.4 ... 1.2	3	40	24	
150/6″	42	1246	R200	0.4 ... 1.2	3	40	7	6
			R250	0.4 ... 1.2	3	40	11	
			R250V	1.3 ... 2.4	3	23	40	
200/8″	42	1246	R200	0.4 ... 1.2	3	26	4	6
			R250	0.4 ... 1.2	3	40	6	
			R250V	1.3 ... 2.4	3	12	27	
250/10″	48	1709	R200	0.4 ... 1.2	3	15	2	6
			R250	0.4 ... 1.2	3	24	3	
			R250V	1.3 ... 2.4	3	7	15	
300/12″	48	1709	R200	0.4 ... 1.2	3	9	1	6
			250	0.4 ... 1.2	3	15	2	
			R250V	1.3 ... 2.4	3	4	9	
400/16″	72	6366	R250	0.4 ... 1.2	4	5	–	6
			R250V	1.7 ... 3.2	4	–	3	

Table 5 • Mounting positions for Type R Actuator

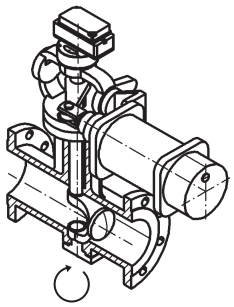


Medium opens
Direction of flow "V"
FTO

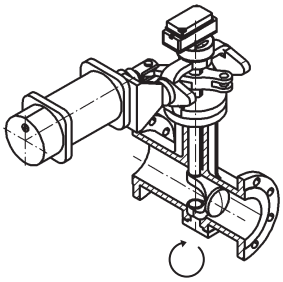


Medium closes
Direction of flow "H"
FTC

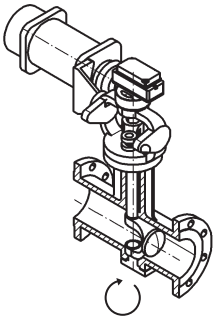
Mounting Po · Valve CLOSED without supply air
Air to open - Spring closes



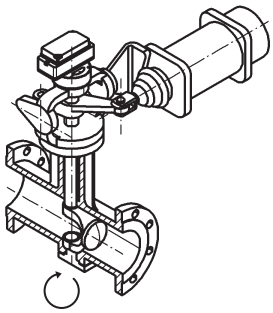
Mounting **A-Po**



Mounting **B-Po**

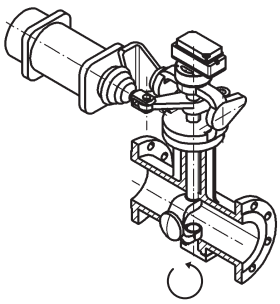


Mounting **C-Po**

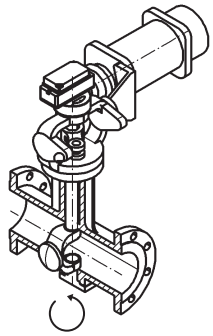


Mounting **D-Po**

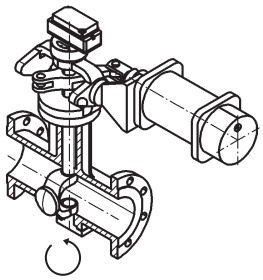
Mounting Ps · Valve OPEN without supply air
Air to close - Spring opens



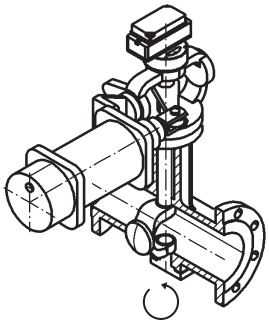
Mounting **A-Ps**



Mounting **B-Ps**



Mounting **C-Ps**



Mounting **D-Ps**

Table 6 • Dimensions in mm

Table 6a · Type 72.3/R · DN 25 to 400 · PN 10 to 40

Valve DN	25	40	50	80	100	150	200	250	300	400	
A	160	200	230	310	350	480	600	730	500	600	
B	83	103	113	143	173	210	233	245	260	308	
E	56	80	87	114	130	156	175	211	232	349	
R	115										
Actuator R110											
C	242	282	292	–							
K	454	478									
N	75	100									
L	83										
P	149										
Actuator R150											
C	–	277	287	337	357	–					
K		593									
N		100									
L		119									
P		187									
Actuator R200											
C	–			400	420	477	492	539	561		Only use Type MN Actuator, Type R is not suitable.
K				671							
N				130							
L				126							
P				240							
Actuator R250											
C	–			400	420	477	492	539	561		
K				711							
N				130							
L				126							
P				296							
Actuator R250V											
C	–			400	420	477	492	539	561		
K				790							
N				130							
L				126							
P				296							

Table 6b · Type 72.3/R · 1" to 16" · ANSI Class 150

Valve in	1"	1 ½"	2"	3"	4"	6"	8"	10"	12"	16"
A	184	222	254	298	352	451	543	673	500	600
B	83	103	113	143	173	210	233	245	260	308
E	56	80	87	114	130	156	175	211	232	349
R	115									
Actuator R110										
C	242	282	292	–						
K	454	478								
N	75	100								
L	83									
P	149									
Actuator R150										
C	–	277	287	337	357	–				
K		593								
N		100								
L		119								
P		187								
Actuator R200										
C	–	400	420	477	492	539	561	Only use Type MN Actuator, Type R is not suitable.		
K		671								
N		130								
L		126								
P		240								
Actuator R250										
C	–	400	420	477	492	539	561			
K		711								
N		130								
L		126								
P		296								
Actuator R250V										
C	–	400	420	477	492	539	561			
K		790								
N		130								
L		126								
P		296								

Table 6c · Type 72.3/R · 1" to 16" · ANSI Class 300

Valve in	1"	1 ½"	2"	3"	4"	6"	8"	10"	12"	16"
A	196	235	267	317	368	473	568	708	500	600
B	83	103	113	143	173	210	233	245	260	308
E	56	80	87	114	130	156	175	211	232	349
R	115									
Actuator R110										
C	242	282	292	–						
K	454	478								
N	75	100								
L	83									
P	149									
Actuator R150										
C	–	277	287	337	357	–				
K		593								
N		100								
L		119								
P		187								
Actuator R200										
C	–			400	420	477	492	539	561	Only use Type MN Actuator, Type R is not suitable.
K				671						
N				130						
L				126						
P				240						
Actuator R250										
C	–			400	420	477	492	539	561	
K				711						
N				130						
L				126						
P				296						
Actuator R250V										
C	–			400	420	477	492	539	561	
K				790						
N				130						
L				126						
P				296						

Table 6d · Type 72.4/R · DN 25 to 300 and 1″ to 12″ · PN 10 to 40 and ANSI Class 150/300

Valve DN/in	25/1″	40/1½″	50/2″	80/3″	100/4″	150/6″	200/8″	250/10″	300/12″
A	102	114	125	165	194	229	243	297	338
B	83	103	113	143	173	210	233	245	260
E	56	80	87	114	130	156	175	211	232
R	115								
Actuator R110									
C	242	282	292	–					
K	454	478							
N	75	100							
L	83								
P	149								
Actuator R150									
C	–	277	287	337	357	–			
K		593							
N		100							
L		119							
P		187							
Actuator R200									
C	–			400	420	477	492	539	561
K				671					
N				130					
L				126					
P				240					
Actuator R250									
C	–			400	420	477	492	539	561
K				711					
N				130					
L				126					
P				296					
Actuator R250V									
C	–			400	420	477	492	539	561
K				790					
N				130					
L				126					
P				296					

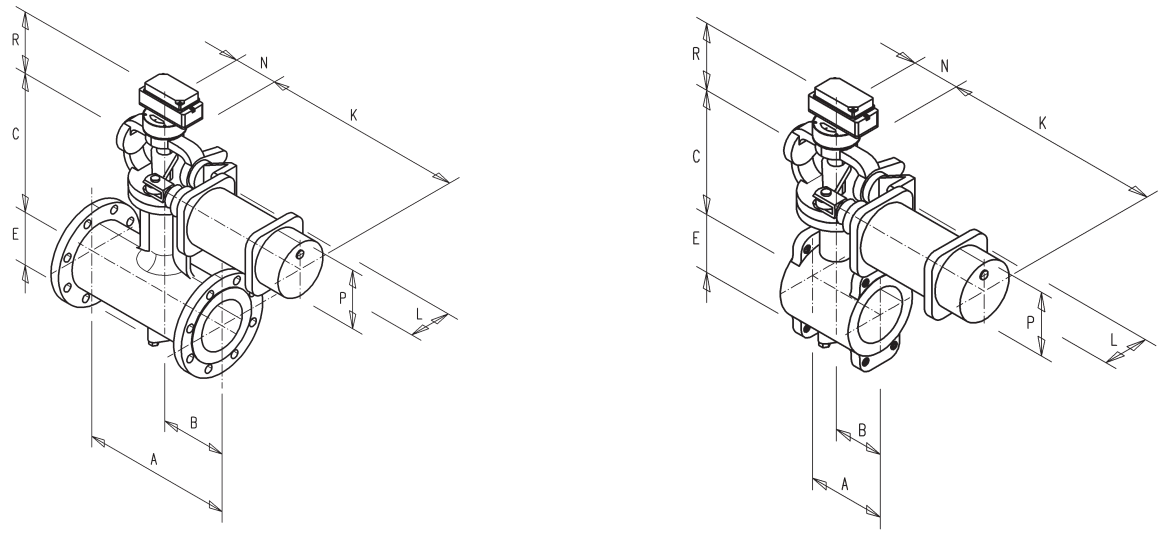


Fig. 8 · Dimensional drawings for VETEC rotary plug valves: Type 72.3 R (flanged design) and Type 72.4 R (wafer-style design)

Table 7 • Weights in kg

Valve		DN/in	25/1″	40/1½″	50/2″	80/3″	100/4″	150/6″	200/8″	250/10″	300/12″	400/16″
Type	72.3	kg	8	15	20	40	50	100	160	220	250	450
	72.4	kg	5	8	10	20	30	60	80	140	170	–

Actuator	Type	R110	R150	R200	R250	R250V
	kg	16	27	47	72	95

Ordering text

Type	According to Table 1
Nominal size	DN/in ....
Nominal pressure	PN/Class ....
Body material	According to Table 2
Seat version	With metal sealing or soft sealing
Characteristic	Equal percentage or linear
K_{VS}/C_V coefficient	Acc. to Tables 3a or 3b
Direction of flow	Standard: Flow to open = V (FTC) Reverse: Flow to close = H (FTO)
Actuator	Type R ....
Mounting	According to Table 5
Fail-safe position upon supply air failure	Valve CLOSED or Valve OPEN
Max. differential pressure for actuator	.... bar
Supply pressure	.... bar
Bench range	.... bar
Accessories	Positioner, limit switch, solenoid valve
Optionally	Special versions, certificates, inspections, etc.

Specifications subject to change without notice.

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Pfeiffer AT Actuator

Pneumatic Rotary Actuator Type SRP and Type DAP

Application

Single or double acting piston actuator for butterfly valves and other final control elements with turning throttling elements

Maximum opening angle $\varphi = 90°$

The Types SRP and DAP Pneumatic Rotary Actuators are piston actuators for throttling or on-off services.

Special features

- Travel stops externally adjustable (±4 %)
- Square-end position either diagonal (European standard) or parallel
- Freely adjustable position indicator (in 45° steps)
- No special tools needed for mounting and conversion
- Variety of spring cartridges
- Power transmission without clearance due to involute serrations
- Direction of rotation reversible without using additional components
- Surface treatment using a special method

Attachment of positioners, limit switches, solenoid valves and other accessories according to VDI/VDE 3845.

Designed for signal pressures of up to 8 bar and for continuous operation at temperatures between –20 and +80 °C

Versions

- **Type SRP** (Fig. 1) · Pneumatic Rotary Actuator, single acting with spring-return mechanism in sizes 15 to 5000
- **Type DAP** · Pneumatic Rotary actuator, double acting without spring-return mechanism in sizes 15 to 5000

Further versions

- With manual override
- For continuous operation at **temperatures from –20 to 150 °C** using Viton O-rings or
- For continuous operation at **temperatures from –40 to 80 °C** with silicone gaskets

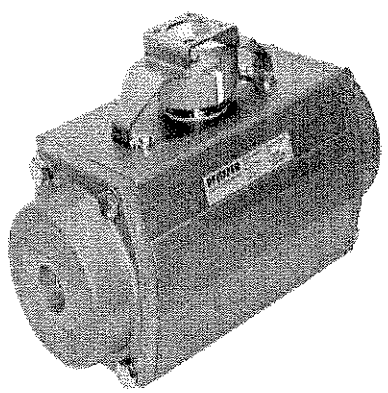


Fig. 1 · Pfeiffer Type AT Pneumatic Rotary Actuator

Edition April 2000

Data Sheet **T 9929 EN**

Principle of operation

The signal pressure p_{st} exerts a force at the piston surface which is balanced by the springs arranged in the actuator in the single-acting version and by a corresponding counterpressure in the double-acting version.

The pinion shaft converts the force created at the pistons into a rotary motion. Adjustable travel stops for the OPEN and CLOSED position allow a fine adjustment of the final position by ±4°.

In the single-acting version, the number of springs determine the return spring torque and the loading pressure required.

Fig. 3 shows the useable air-driving torques

- M_{dLE} for single-acting version
- M_{dLD} for double-acting version

as well the useful spring-driving torque M_{dF} dependent on the angle of rotation φ.

Fail-safe position

There are two different rotary motions in the Type SRP Actuator which become effective when the pistons are relieved of pressure or when the supply air fails. The following applies when looking at the valve from the actuator.

"Springs turn clockwise",
A clockwise motion is made when the pressure is reduced.

"Springs turn counterclockwise",
A counterclockwise motion is made when the pressure is reduced.

The Type DAP Actuator is designed without springs. A defined final position is not achieved when the supply air fails.

The following details are required on ordering:

Actuator type	DAP .... or SRP ....
Nominal size	15, 30, 60, 100, 150, 220, 300, 450, 600, 900, 1200, 2000, 3000 or 5000
Number of springs	Only applies to single-acting Type SRP
Fail-safe position	Springs turn clockwise or counterclockwise (only applies to single-acting Type SRP)
Supply air	.... bar
Operating range	Number of springs or bench range
VDI/VDE bracket	For attachment of positioner or signaling devices

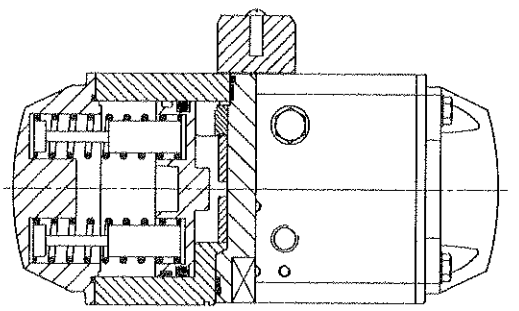


Fig. 2 · Sectional view of Type AT Pfeiffer

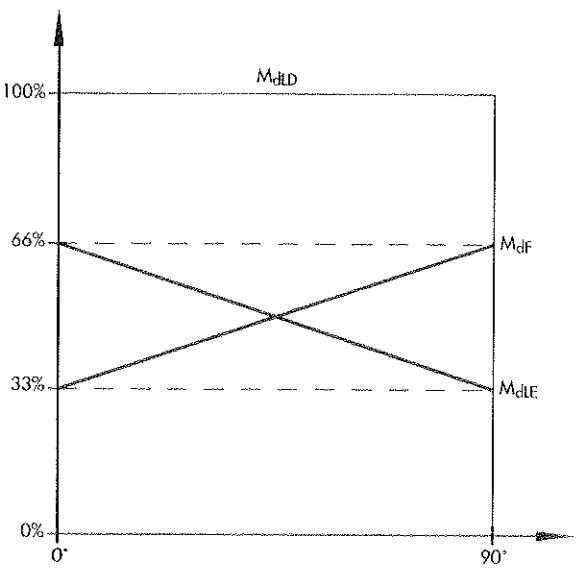


Fig. 3 · Torque curve at recommended supply pressure

Table 1 · Technical data

Actuator version		Single acting	Double acting
Max perm. signal pressure		8 bar	
Sizes		15 · 30 · 60 · 100 · 150 · 220 · 300 · 450 600 · 900 · 1200 · 2000 · 3000 · 5000	
Perm. temperatures		In continuous operation –20 to 80 °C	
Connection point to valve		EN 12116/DIN 3337	
Connection point for positioner or signaling devices	Type 15 to 150	VDI/VDE 3845, size 1	
	Type 220 to 450	VDI/VDE 3845, size 3	
	Type 600 to 5000	VDI/VDE 3845, size 4	
Connection point for pilot valves		VDI/VDE 3845	

Table 2 · Materials

Body	WN 3.3206 · AlMgSi0.5 F25
Cover	WN 3.2162 · GD-AlSi8 Cu3
Shaft	WN 1.0402 · C22/stainless steel
Compression spring cartridge	ASTM A 401 · 54 Si Cr6
Piston	WN 3.2162 · GD-AlSi8 Cu3

Table 3 · Torque for double acting Type DAP Actuators

Type DAP	Torque in Nm at a supply pressure of												
	1.5 bar	3 bar	3.5 bar	4 bar	4.2 bar	4.5 bar	5 bar	5.5 bar	6 bar	6.5 bar	7 bar	7.5 bar	8 bar
15	8.3	10	11.6	13.3	14	15	16.6	18.3	19.9	21.6	23.3	24.9	26.6
30	14.7	17.6	20.5	23.5	24.6	26.4	29.3	32	35.2	38.1	41	44	46.9
60	29.1	34.9	40.7	46.5	48.9	52.4	58.2	64	69.8	75.6	81.4	87.3	93.1
100	45.8	54.9	64.1	73.2	76.9	82.4	91.5	101	110	120	128	138	146
150	66.5	79.8	93.1	106	112	120	133	146	160	173	186	199	213
220	107	129	150	172	181	193	215	236	258	279	301	322	344
300	138	166	194	222	233	249	277	305	332	360	388	415	443
450	217	261	304	348	365	391	435	478	522	565	609	652	696
600	284	340	397	454	477	511	567	624	681	737	794	851	908
900	383	459	536	613	643	689	766	842	919	996	1072	1149	1225
1200	532	638	745	851	893	957	1064	1170	1276	1383	1489	1595	1702
2000	915	1096	1281	1464	1537	1648	1829	2012	2195	2378	2561	2744	2927
3000	1297	1556	1815	2075	2179	2334	2594	2853	3112	3372	3631	3890	4150
5000	2269	2723	3177	3631	3812	4084	4538	4992	5446	5900	6353	6807	7261

Table 4a · Torque in Nm for single acting Type SRP Actuators · Supply pressure 2.5 to 4.2 bar

Type SRP	Springs /side	Torque in Nm at a supply pressure of 2.5 bar		3 bar		3.5 bar		4 bar		4.2 bar		Spring torque	
		0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	90°	0°
15	2	5.6	4.4	7.3	6.1	8.9	7.7	10.6	9.4	–		3.9	2.7
	2/3	4.9	3.4	6.6	5.1	8.3	6.8	9.9	8.4	10.6	9.1	4.9	3
	3	4.3	2.5	5.9	4.1	7.6	5.8	9.3	7.4	9.9	8.1	5.8	4
	3/4	3.6	1.5	5.3	3.1	6.9	4.8	8.6	6.5	9.2	7.1	6.8	4.7
	4	–		4.6	2.2	6.2	3.8	7.9	5.5	8.6	6.2	7.8	5.4
30	2	10.2	7.9	13.1	10.8	16.1	13.8	19	16.7	–		6.7	4
	2/3	9.1	6.2	12	9.2	15	12.1	17.9	15	19.1	16.2	8.4	6
	3	8	4.5	10.9	7.5	13.9	10.4	16.8	13.3	18	14.5	10.1	7
	3/4	6.9	2.8	9.8	5.8	12.8	8.7	15.7	11.6	16.9	12.8	11.8	7.8
	4			8.7	4.1	11.6	7	14.6	10	15.7	11.1	13.5	9
60	2	20.2	15.2	26.1	21.1	31.9	26.9	37.7	32.7	–		13.8	8.8
	2/3	18	11.8	23.8	17.6	29.7	23.4	35.5	29.2	37.8	31.6	17.3	11.1
	3	15.8	8.3	21.6	14.1	27.5	19.9	33.3	25.8	35.6	28.1	20.8	13.3
	3/4	13.6	10.7	19.4	10.7	25.2	16.5	31.1	22.3	33.4	24.6	24.2	15.5
	4	11.4	7.2	17.2	7.2	23	13	28.8	18.8	31.2	21.2	27.7	17.7
100	2	–		–		–		–		–		–	
	2/3	27.4	16.9	36.6	26	45.7	35.2	54.9	44.3	58.5	48	28.9	18.3
	3	23.8	11.1	32.9	20.3	42.1	29.4	51.2	38.6	54.9	42.2	34.7	22
	3/4	–		29.2	14.5	38.4	23.6	47.5	32.8	51.2	36.4	40.4	25.7
	4	–		–		34.7	17.9	43.9	27	47.5	30.7	46.2	29.3
150	2	46.2	35	59.5	48.3	72.8	61.6	86.1	74.9	–		31.5	20.3
	2/3	41.1	27.1	54.4	40.4	67.7	53.7	81	67	86.3	72.3	39.4	25.3
	3	36.1	19.2	49.4	32.5	62.7	45.8	76	59.1	81.3	64.4	47.3	30.4
	3/4	31	11.3	44.3	24.6	57.6	37.9	70.9	51.2	76.2	56.5	55.1	35.5
	4	25.9	3.5	39.2	16.7	52.5	30	65.8	43.3	71.1	48.7	63	40.5
220	2	74.7	55	96.1	76.5	118	98	139	120	148	128	52.4	32.8
	2/3	66.5	41.9	87.9	63.4	109	84.9	131	106	140	115	65.5	41
	3	58.3	28.8	79.9	50.3	101	71.8	123	93.3	131	102	78.6	49.2
	3/4	50.1	15.7	71.5	37.2	93	59	115	80.2	123	88.8	91.7	57.4
	4	41.9	2.6	63.3	24.1	84.8	45.6	106	67.1	115	75.7	105	65.6
300	2	96	73	124	100	152	128	180	156	191	167	65.9	42
	2/3	86	56.1	114	83.8	141	111	169	139	180	150	82.4	52.5
	3	75.5	39.6	103	67.3	131	95	159	123	170	134	98.9	63
	3/4	65	23.1	93	50.8	120	78.5	148	106	159	117	115	73.5
	4	54.5	6.6	82	34.3	110	62	138	89.7	149	101	132	84
450	2	152	114	195	158	238	201	282	245	299	262	103	66
	2/3	135	88.6	179	132	222	176	265	219	283	236	129	82.4
	3	119	63	162	106	206	150	249	193	266	211	155	99
	3/4	102	37	146	80	189	124	233	167	250	185	180	115
	4	86	11	129	55	173	98	216	142	233	159	206	132
600	2	194	151	251	207	307	264	364	321	387	344	133	90
	2/3	171	118	228	174	285	231	342	288	364	310	166	112
	3	149	84	206	141	262	198	319	255	342	277	199	135
	3/4	127	51	183	108	240	165	297	221	319	244	233	157
	4	104	18	161	75	218	131	274	188	297	211	266	180
900	2	256	193	333	270	410	347	486	423	–		189	126
	2/3	225	146	301	223	378	299	455	376	485	406	237	158
	3	193	99	270	175	346	252	423	329	454	359	284	190
	3/4	–		238	128	315	205	391	281	422	312	332	221
	4	–		–		283	157	360	234	390	264	379	253
1200	2	362	280	468	386	574	493	681	599	723	641	252	170
	2/3	319	217	426	323	532	430	638	536	681	578	315	213
	3	277	154	383	260	489	367	596	473	638	515	378	255
	3/4	234	91	341	197	447	304	553	410	596	453	441	298
	4	192	28	298	134	404	241	511	347	553	390	504	340
2000	2	635	488	818	671	1001	854	1184	1037	1257	1110	427	279
	2/3	565	381	748	564	931	747	1114	930	1187	1003	534	349
	3	496	274	679	457	862	640	1044	823	1118	896	640	419
	3/4	426	168	609	351	792	534	975	717	1048	790	747	489
	4	356	61	539	244	722	427	905	610	978	683	854	559
3000	2	861	656	1120	915	1380	1175	1639	1434	1742	1538	641	436
	2/3	751	496	1011	755	1270	1015	1529	1274	1633	1378	801	546
	3	642	336	902	595	1161	854	1420	1114	1524	1217	961	655
	3/4	534	176	793	435	1053	694	1312	954	1415	1057	1121	764
	4	424	15	683	275	943	534	1202	793	1306	897	1281	873
5000	2	1511	1089	1965	1543	2419	1996	2872	2450	3054	2632	1180	758
	2/3	1322	794	1775	1247	2229	1701	2683	2155	2865	2337	1475	948
	3	1132	499	1586	952	2040	1406	2493	1860	2675	2042	1771	1137
	3/4	943	203	1396	657	1850	1111	2304	1565	2486	1746	2066	1327
	4	753	92	1207	362	1661	816	2114	1270	2296	1451	2361	1516

▒ - indicates recommended symmetrical sizing

Table 4b · Torque in Nm for single acting Type SRP Actuators · Supply pressure 4.2 to 8 bar

Type SRP	Springs /sides	Torque in Nm at a supply pressure of 4.2 bar		4.5 bar		5 bar		5.5 bar		6 bar		8 bar		Spring torque	
		0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	90°	0°
15	4	8.6	6.2	9.6	7.2	11.2	8.8	12.9	10.5	14.6	12.1	21.2	18.8	7.8	5.4
	4/5	7.9	5.2	8.9	6.2	10.6	7.8	12.2	9.5	13.9	10.3	18.7	16.2	8.8	6.1
	5	–		3.3	5	8.7	6.5	10.2	7.9	11.7	11.2	20.5	17.8	9.7	6.7
	5/6	–		7.5	4.2	9.2	5.9	10.9	7.6	12.5	9.2	19.2	15.9	10.7	7.4
	6	–		6.9	3.3	8.54	4.9	10.2	6.6	11.9	8.2	18.5	14.9	11.7	8.1
30	4	15.7	11.1	17.5	12.9	20.4	15.8	23.4	18.7	26.3	21.7	38	33.4	13.5	9
	4/5	15	9.4	16.4	11.2	19.3	14.1	22.3	17.1	25.2	20	36.9	31.7	15.2	10
	5	–		15.3	9.5	18.2	12.4	21.1	15.4	24.1	18.3	35.8	30	16.9	11.1
	5/6	–		14.2	7.8	17.1	10.8	20	13.7	23	16.6	34.7	28.3	18.6	12
	6	–		13.1	6.1	16	9.1	18.9	12	21.9	14.9	33.6	26.7	20.2	13.3
60	4	31.2	21.2	34.7	24.7	40.5	30.5	46.3	36.3	52.1	42.1	75.4	65.4	27.7	17.7
	4/5	29	17.7	32.5	21.2	38.3	27	44.1	32.8	49.9	38.6	73.2	61.9	31.2	19.9
	5	–		30.2	17.7	36.1	23.6	41.9	29.4	47.7	35.2	71	58.5	34.6	22.1
	5/6	–		28	14.3	33.8	20.1	39.7	25.9	45.5	31.7	68.7	55	38.1	24.3
	6	–		25.8	10.8	31.6	16.6	37.5	22.4	43.3	28.3	66.5	51.5	41.5	26.5
100	4	47.5	30.7	53	36.2	62.2	45.3	71.3	54.5	80.5	63.6	–		46.2	29.3
	4/5	43.9	24.9	49.4	30.4	58.5	39.5	67.7	48.7	76.8	57.8	113	94.5	52	33
	5	–		45.7	24.6	54.8	33.8	64	42.9	73.1	52.1	110	88.7	57.8	36.7
	5/6	–		–		51.2	28	60.3	37.1	69.5	46.3	106	82.9	63.5	40.3
	6	–		–		–		56.7	31.4	65.8	40.5	102	77.1	69.3	44
150	4	71.1	48.7	79.1	56.6	92.4	69.9	106	83.2	119	96.5	172	150	63	40.5
	4/5	66	40.8	74	48.8	87.3	62.1	101	75.3	113.9	88.6	167	142	70.9	45.6
	5	–		69	40.9	82.3	54.2	95.6	67.5	109	80.8	162	134	78.8	50.7
	5/6	–		63.9	33	77.2	46.3	90.5	59.6	104	72.9	157	126	86.7	55.7
	6	–		58.8	25.1	72.1	38.4	85.4	51.7	99	65	152	118	94.5	60.8
220	4	115	75.7	128	88.6	149	110	171	132	192	153	278	239	105	65.6
	4/5	107	62.6	120	75.5	141	97	163	118	184	140	270	226	118	73.8
	5	98.5	49.5	111	62	133	83.9	154	105	176	127	262	213	131	82
	5/6	90.3	36.4	103	49	125	71	146	92.3	168	114	254	200	144	90.2
	6	–		95	36	117	58	138	79	159	101	245	187	157	98.4
300	4	149	101	165	117	193	145	221	173	248	201	359	311	132	84
	4/5	138	87.3	155	101	182	129	210	156	238	184	349	295	148	94.5
	5	128	68	144	84	172	112	200	140	227	168	338	278	165	105
	5/6	117	51	134	68	161	96	189	123	217	151	328	262	181	116
	6	–		123	52	151	79	179	107	206	135	317	245	198	126
450	4	233	159	260	185	303	229	347	272	390	316	564	490	206	132
	4/5	217	133	243	159	287	203	330	246	374	290	547	464	232	148
	5	201	108	227	134	270	177	314	221	357	264	531	438	258	165
	5/6	184	82	210	108	254	151	297	195	341	238	515	412	283	181
	6	–		194	82	237	126	281	169	324	213	498	386	309	198
600	4	297	211	331	245	388	302	444	358	501	415	728	642	266	180
	4/5	275	178	309	212	365	268	422	325	479	382	706	609	299	202
	5	252	244	286	178	343	235	400	292	456	349	683	575	332	224
	5/6	230	211	309	212	320	202	377	259	434	315	661	542	365	247
	6	–		241	112	298	169	355	225	411	282	638	509	399	269
900	4	390	264	436	310	513	387	589	464	666	540	972	846	379	253
	4/5	359	217	442	324	519	400	596	477	672	554	978	860	426	285
	5	–		373	216	450	292	526	369	603	445	909	752	474	316
	5/6	–		–		418	245	495	321	571	398	877	704	521	348
	6	–		–		–		463	274	540	351	846	657	568	379
1200	4	553	390	617	453	723	560	830	666	936	772	1362	1198	504	340
	4/5	511	327	575	390	681	497	787	603	894	709	1319	1135	567	383
	5	468	264	532	327	638	434	745	540	851	646	1277	1072	630	425
	5/6	426	201	489	264	596	371	702	477	809	583	1234	1009	693	468
	6	–		447	201	553	308	660	414	766	520	1192	946	756	510
2000	4	978	683	1088	793	1271	976	1454	1159	1637	1342	2368	2073	854	559
	4/5	908	576	1018	686	1201	869	1384	1052	1567	1235	2298	1967	960	629
	5	838	470	948	579	1131	762	1314	945	1497	1128	2229	1860	1067	698
	5/6	768	363	878	473	1061	656	1244	839	1427	1022	2159	1753	1174	768
	6	–		808	366	991	549	1174	732	1357	915	2089	1647	1281	838
3000	4	1306	897	1461	1053	1721	1312	1980	1571	2239	1831	–		1281	873
	4/5	1197	737	1352	893	1612	1152	1871	1411	2130	1671	3168	2708	1442	982
	5	1088	577	1245	732	1504	992	1763	1251	2023	1510	3060	2548	1602	1091
	5/6	979	417	1136	572	1395	832	1654	1091	1914	1350	2951	2388	1762	1200
	6	–		1027	412	1286	671	1545	931	1805	1190	2842	2228	1922	1309
5000	4	2296	1451	2568	1724	3022	2177	3476	2631	3930	3085	5745	4900	2361	1516
	4/5	2106	1156	2379	1429	2833	1882	3286	2336	3740	2790	5555	4605	2656	1706
	5	1917	861	2189	1133	2643	1587	3097	2041	3551	2495	5366	4310	2951	1895
	5/6	1717	566	2000	838	2454	1292	2907	1746	3361	2200	5176	4015	3246	2085
	6	–		1810	543	2264	997	2718	1451	3172	1905	4987	3720	3541	2274

▒ - indicates recommended symmetrical sizing

Table 5 · Dimensions in mm and weights for Type SRP and Type DAP Actuators

Type	15	30	60	100	150	220	300	450	600	900	1200	2000	3000	5000
ISO flange	F04	F05	F05	F07	F07	F10	F10	F12	F12	F14	F14	F16	F16	
Square end	11	14	14	17	17	22	22	27	27	36	36	46	46	
T-ISO 228	⅛"	⅛"	⅛"	⅛"	¼"	¼"	¼"	¼"	¼"	¼"	¼"	⅜"	½"	
A	140.5	158.5	210.5	247.5	268.5	315	345	408.5	437.5	487	543	621	684	
B	69	85	102	115	127	145	157	177	196	220.5	245	298.5	330	
C	59	72	74.5	97.5	111	127	136	156.5	169	190.7	213	251	298.5	
D	M 5x8	M 5x8	M 5x8	M 5x8	M 5x8	M 5x8	M 5x8	M 5x8	M 5x8	M 5x8	M 5x8	M 6x10	M 6x10	
E	4	8	8	8	8	8	8	8	8	8	8	8	8	
F	80	80	80	80	80	80	80	80	80	130	130	130	130	
G	30	30	30	30	30	30	30	30	30	30	30	30	30	
H	20	20	20	20	20	30	30	30	30	50	50	50	50	
I	30	35	35	55	55	70	70	85	85	100	100	130	130	On request
l_{min}	12	16	16	19	19	24	24	29	29	38	38	48	48	
M	29	36	42.5	49.5	56	64	69.5	80	88	99	110	131	163.5	
N	41.5	47	52	56.8	67	77	82	91.5	99	105	112	131	166	
O	11	11	19	19	19	27	27	27	27	42	42	42	42	
P	26.5	30	30.5	32.5	37.5	42.5	45	47	52	58	62	78.5	165	
Q [1]	36	42	50	50	70	70	102	102	102	140	140	165	165	
Q1 [1]	42	50	70	70	102	102	125	125	125	_ [1]				
R	32	32	32	32	32	32	32	32	32	32	32	45	45	
S	24	24	24	24	24	24	24	24	24	24	24	40	40	
W [1]	M 5	M 5	M 6	M 6	M 8	M 8	M 10	M 10	M 10	M 16	M 16	M 20	M 20	
W1 [1]	M 5	M 6	M 8	M 8	M 10	M 10	M 12	M 12	M 12	_ [1]				
Ø-d f8 [2]	30	35	35	55	55	70	70	85	85	100	100	130	130	
h_{max} [2]	2	3	3	3	3	3	3	3	3	4	4	5	5	
h1 min	0.5	0.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2.5	2.5	
Ø-Z	40	40	40	40	40	56/65	56/65	65	65	80/115	80/115	115	115	
Weight in kg	1.5	2	3.5	4.5	6.5	10	13	18.5	24	32	46	65	103	On req.

[1] Versions C, D, E, P only have one flange [2] On request

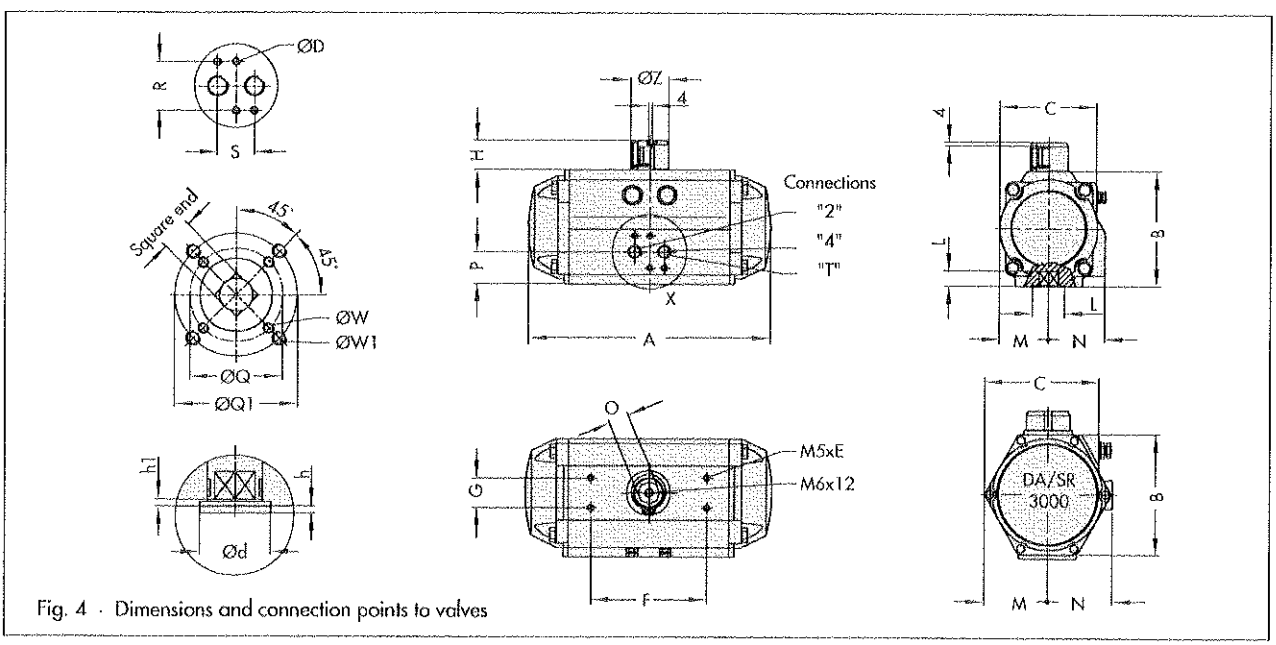


Fig. 4 · Dimensions and connection points to valves

SAMSON AG · MESS- UND REGELTECHNIK
Weismüllerstraße 3 · D - 60314 Frankfurt am Main
Telefon (0 69) 4 00 90 · Telefax (0 69) 4 00 95 07
Internet: http://www.samson.de

Pfeiffer
Chemie-Armaturenbau GmbH

High - Performance Butterfly valve

Series 14c - Type MTD

metal sealed with live-loadet PTFE V-ring packing

Application:

Tight-closing, double-eccentric butterfly control valve produced from anti-corrossive material especially for the chemical industry where aggressive media´s are used, for example in steam pipelines

- Nominal sizes DN 100 to DN 500 and DN 4“ to DN 20“,
- Nominal presure PN10 to PN40 and ANSI 150 to 300 lbs,
- Temperatures -10°C to 250°C

Our newly developed high performance shut-off and control butterfly valve, which has its own patent, can also be modified and combined in many ways. Some of it´s special features are as follows:

- Lug-Type and Wafer-Type versions,
- Valve body made of ASTM A240 Gr. 316L,
- Valve shaft made of WN 1.4462,
- Valve disc made of WN 1.4581,
- „Long neck“ versions which allows an easier installation in pipelines with insulation,
- A continuous raised face is assured through our patent protected screwless fastening ring,
- Low breakaway torque and low amount of wear due to the double eccentric bearing design of the shaft,
- Valve shaft sealing through live-loadet PTFE V-ring packing
- Blow out safe valve shaft,
- Tighter sealing through various replaceable seat rings,
- Attachment options acc. to DIN/ISO 5211,
- Face-to face dimensions,series Reihe 20, 25 and 16 acc. to EN 558-1 (K1, K2 and K3 acc. to DIN 3202).

Versions:

High-performance butterfly control valve, DN 100 to DN 500, PN 10 to PN 40, optionally available in the following versions:

- Hand lever / grid plate,
- Manual gear actuator,
- Pneumatic rotary actuator,
- Pneumatic diaphragm rotary actuator

Special versions:

- Valve body made of ASTM A516 Gr. 70
- Nominal size > DN 500 on request,
- Adjustable stuffing box flange,
- Double stuffing box,
- Primary seal,
- Groove in raised face acc. to DIN 2512,
- PTFE - seat rings,
- Low temperature version,
- High temperature version.

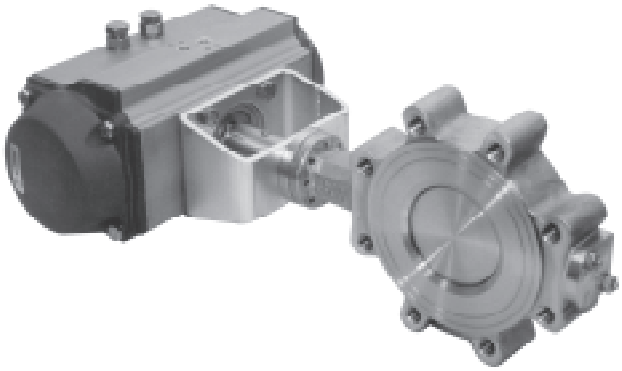


Fig. 1 - Butterfly valve with pneumatic rotary actuator

Fig. 2 - Butterfly valve with hand lever

Additional accessories:

The control valves are also available without any accessories or in combination with the following parts:

- Positioner
- Limit switch
- Solenoid valve
- Air sets
- Gauge block

Other special accessories are available on request.
ANSI connections are also available on request.

Principle of operation:

The process medium can flow through the butterfly valve in either direction. The butterfly disc (3) determines the flow through the free area between disc and seat. The shaft (2) is sealed by a V-ring packing (9).
Butterfly valves are sealed between the butterfly disc (3) and the seat. The direction of flow and the differential pressure determine the breakaway torque to open the butterfly valve. The double eccentric bearing design of the shaft causes the disc on opening and closing to remain in contact with the seat only over a very small angle of rotation (Fig. 5). This reduces wear and increases the service life of the valve. In addition, it reduces the breakaway torque.
When the process medium flows through the valve in direction **A** (Fig. 4), the butterfly disc is slightly lifted out of the seat from a certain differential pressure onwards. This reduces the breakaway torque.
When the process medium flows through the valve in direction **B**, the butterfly disc is pressed firmly into the seat as the differential pressure rises. This results in a better tightness is achieved, however, the breakaway torque increases as well.

General technical data:

Nominal size	DN100 to DN500 and DN4" to DN20"
Nominal pressure	PN10 bis PN40 and ANSI 150 and 300lbs
End connection	can be mounted between PN 10, ANSI 150 lbs or 300 lbs
Temperature range	see Pressure-Temperature diagram
Rangeability	50 : 1
Seat sealing ability acc. to IEC 534	IV (V on request)
Sealing effectiveness	< 10^{-6} mbar l / sec

Table 1 - technical data

Materials:

Valve body	ASTM A240 Gr. 316L
Valve disc	WN 1.4581
Valve shaft	WN 1.4462
Fastening ring	WN 1.4571 / WN 1.4581
Packing box flange	WN 1.4571
Metallic seat ring	Nickel
Stuffing box packing	Live-loadet PTFE V-ring packing

Table 2 - Materials (WN = Material Number acc. to DIN)

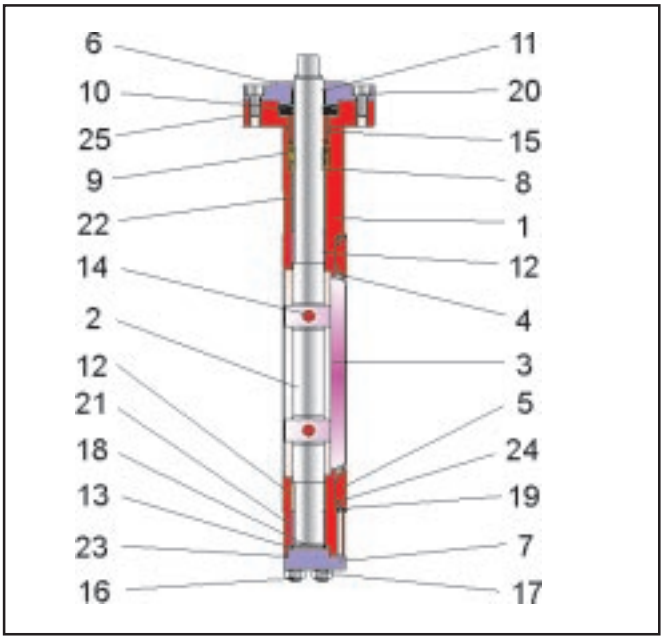


Fig. 3 - Butterfly valve Series 14c Type MTD

Pos.	Description	Pos.	Description
1	Valve body	14	Grooved pin
2	Valve shaft	15	Spacer bushing
3	Valve disc	16	Stud bolt
4	Metallic seat ring	17	Nut
5	Fastening ring	18	Lower disc
6	Packing box flange	19	Tension spring
7	Bonnet	20	Screw
8	Washer	21	Bushing
9	V-ring packing	22	Bushing
10	Belleville spring washer	23	Bonnet seal
11	Bushing	24	O-ring
12	Bushing	25	Intermediate flange
13	Body seal	26	Screw

Table 3 - Parts list

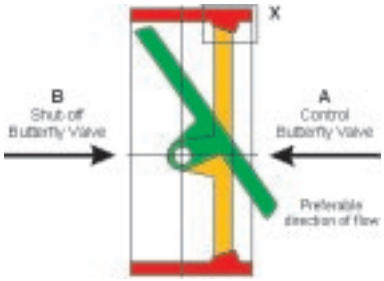


Fig. 4 - Direction of flow

Fig. 5 - Detail **X**, opening phase of the butterfly disc

Terms for noise level calculation:
z-values for noise level calculation according to VDMA 24422

φ	10°	20°	30°	40°	50°	60°	70°	80°	90°
Z	0,35	0,30	0,25	0,20	0,17	0,14	0,12	0,11	0,10

Table 4 - noise-dependet control valve „z“ according to VDMA 24422

Correction terms:
with liquids ΔLF = 0,
with gases and vapors ΔLG = 0

Terms for control valve sizing:
for control valve sizing acc. to DIN / IEC 534 opening angle.

	10°	20°	30°	40°	50°	60°	70°	80°	90°
F_L	0,95	0,95	0,92	0,82	0,74	0,67	0,61	0,57	0,54
x_T	0,75	0,75	0,73	0,57	0,47	0,38	0,31	0,28	0,25

Table 5 – Terms for control valve sizing

Torque and breakaway torques:

Differencial pressure Δp in bar		0	5	10	15	20	25	30	40
DN	max. perm. torque Mdmax. zul. in Nm	Breakaway torque Mdl in Nm							
100	805	43	51	73	89	116	126	164	199
150	1450	60	127	183	222	290	316	410	500
200	2260	82	241	348	422	551	600	779	950
250	2260	189	473	683	857	1224			
300	4584	357	609	893	1301				
400	9265	523	1024	1638					
500	auf Anfrage								

Table 6 - max. permissible torque Mdmax., required torque Md and breakaway torque Mdl

The breakaway torques specified are average values which were measured with air at 20°C with the corresponding differential pressures. Operating temperature, process medium and long operating times may affect the permissible torques and breakaway torques considerably.

Pressure-Temperature diagram:

The area of application is determined by the pressure-temperature diagram. Process data and the process medium can affect the values in the diagram. Operating data exceeding the limit ranges are possible on agreement.

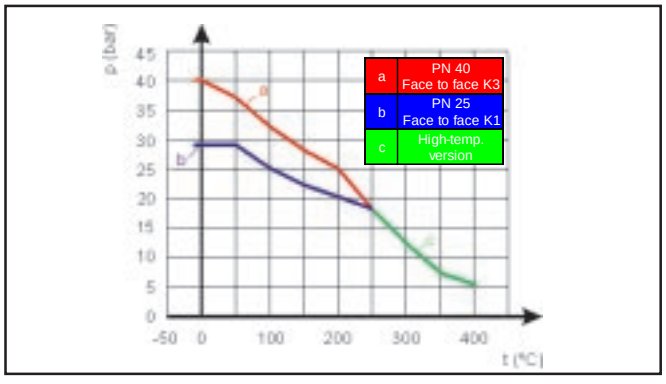


Fig. 6 - Pressure-Temperature diagram

Functional diagram with opening angles:

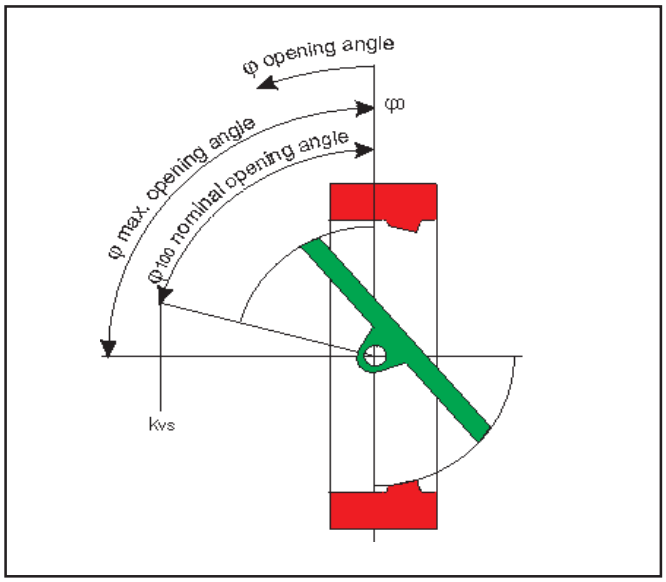


Fig. 7 – Functional diagram with opening angles

kv values and associated opening angles:

DN	Opening angle φ								
	10°	20°	30°	40°	50°	60°	70°	80°	90°
100	7	36	72	108	149	190	214	235	240
150	21	105	210	315	434	553	623	686	700
200	42	208	417	625	862	1098	1237	1362	1390
250	68	341	681	1022	1407	1793	2020	2224	2270
300	100	501	1002	1503	2071	2639	2973	3273	3340
400	183	915	1830	2745	3782	4819	5429	5978	6100
500	289	1443	2886	4329	5964	7600	8562	9427	9620

Table 7 – kv values

Characteristic curve:

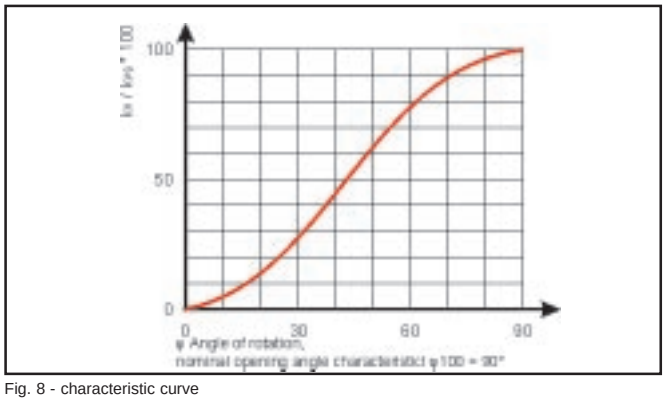


Fig. 8 - characteristic curve

Dimensions and weights:

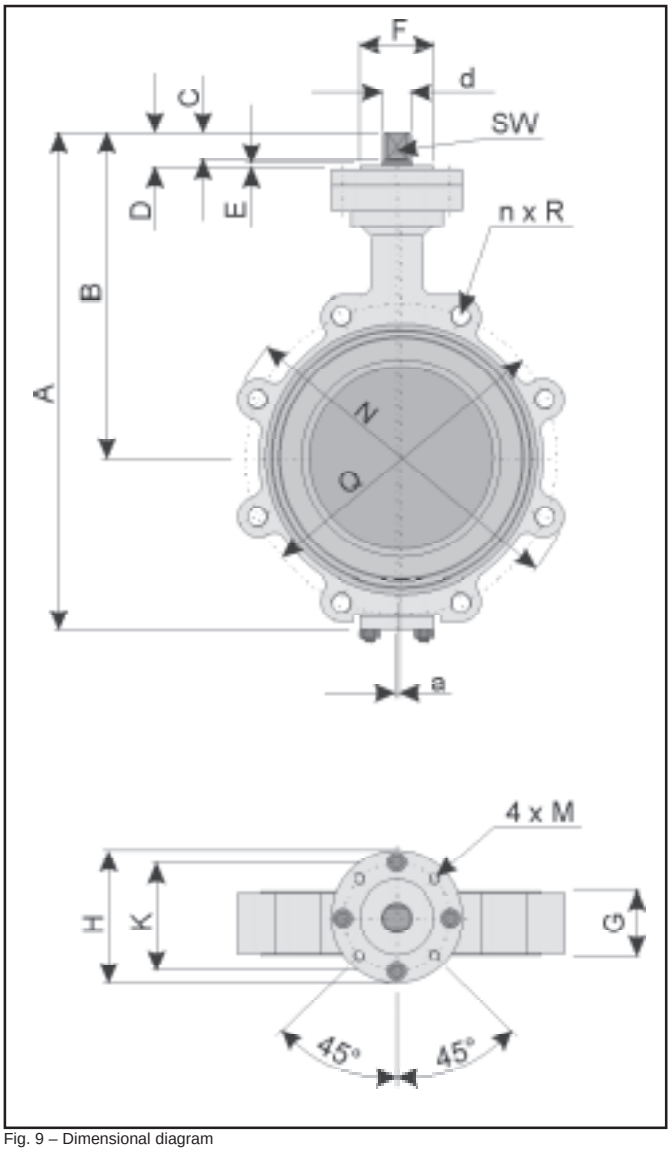


Fig. 9 – Dimensional diagram

DN		Lug - Type with Long neck			Lug -Type with Short neck			
		100	150	200	250	300	400	500
A		297	388	466	495	586	714	866
B		189,5	247	302	288	331	414	487
C		14	17	19	19	24	30	35
D		20,5	22	25	26	32	36	42
E		3	3	3	3	3	3	3
Ø F		35	55	70	70	85	100	130
G	Serie 20	52	56	60	68	78	102	127
	Serie 25	56	70	71	76	83	102	127
	Serie 16	64	76	89	114	114	140	152
Ø H		65	90	125	125	150	175	210
Ø K		50	70	102	102	125	140	165
4x Ø M		6,6	9	11	11	13,5	18	17,5
Ø N		229	272	335	397	470	581	685
SW		14	17	19	19	24	30	34
a		2	3	4	5	6	8	10
Ø d		18	22	26	26	33	42	54
Connection to DIN								
Ø Q		180	240	295	350	400	515	620
n		8	8	8	12	12	16	20
R		M 16	M 20	M 20	M 20	M 20	M 24	M 24
Connection to ANSI								
Ø Q		190,5	241,3	298,4	361,9	431,8	539,7	635
n		8	8	8	12	12	16	20
R		5/8"	3/4"	3/4"	7/8"	7/8"	1"	1 1/8"

Table 8 - Dimensions in mm

Selecting and sizing the butterfly valve:

1. Calculate the appropriate kv value.
2. Select the nominal size and the kvs value from Table 7.
3. Comparing the operation conditions in accordance to the pressure-temperature diagram.
4. Select a suitable actuator.

Ordering text:

High-Performance butterfly valve Series 14c - Type MTD,
DN . . . . / PN . . . . , optional special version
Manual gear actuator or actuator (brand name): . . . .
Supply pressure: . . . . bar, fail-safe position: . . . .
Limit switch (brand name): . . . .
Solenoid valve (brand name): . . . .
Positioner: . . . .
Others: . . . .

For your special requirements please contact our technical sales department.

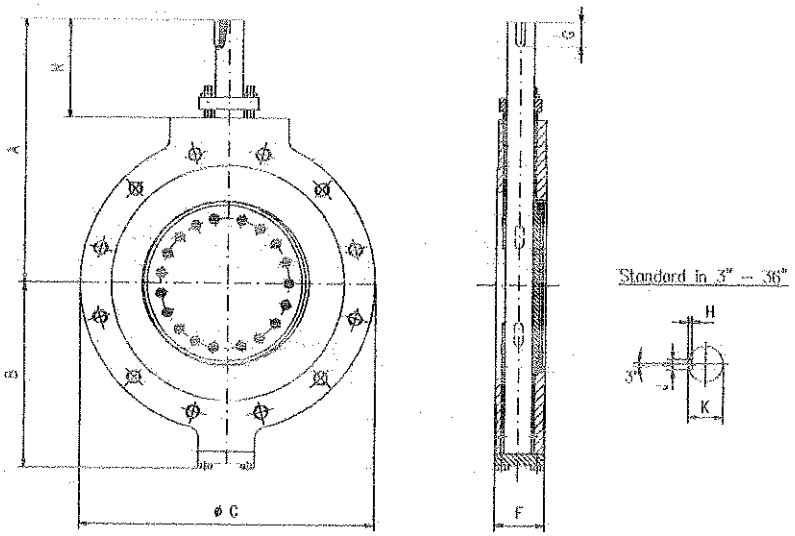
Pfeiffer Chemie-Armaturenbau GmbH
Hooghe Weg 41 • 47906 Kempen
Telefon: 02152 / 2005-0 • Telefax: 02152 / 1580
E-Mail: vertrieb@pfeiffer-armaturen.com • Internet: www.pfeiffer-armaturen.com

Values subject to change

600429 / PDF= 149

TRI-CON Butterfly Valve Type 14t

MODELL / MODEL A1 (ANFLANSCH / LUG TYP API 609 T.2)
ABMESSUNGEN UND GEWICHTE / DIMENSIONS AND WEIGHT 3" – 36" / ANSI 150 + ANSI 300
FREIES WELLENENDE / BARE SHAFT



Abmessungen / Dimensions in mm

DN / Size	80 3"	100 4"	150 6"	200 8"	250 10"	300 12"	350 14"	400 16"	450 18"	500 20"	600 24"	700 28"	750 30"	800 32"	900 36"
A	225	240	282	368	408	432	527	578	628	670	742	899	961	961	993
B	135	151	186	213	246	300	332	393	445	477	553	634	712	712	729
C (ANSI150)	190	240	295	343	405	482	530	597	635	700	810	927	985	1061	1169
C (ANSI300)	210	240	318	380	445	520	585	648	710	775	915	1035	1093	1150	1270
F (ANSI150)	48	54	57	64	71	81	92	102	114	127	154	165	190	190	203
F (ANSI300)	48	54	59	73	83	92	117	133	149	159	181	*	*	*	*
G	25	25	32	40	40	45	80	80	80	90	90	120	120	120	120
H	3,5	3,5	5	5	5	5,5	6	7	7,5	7,5	9	10	10	10	10
J	6	6	10	10	12	14	16	18	20	20	25	28	28	28	28
K	20	22	32	38	40	45	55	65	70	75	90	110	110	110	110
N	105	105	112	160	160	165	230	230	230	240	240	320	320	320	320

* = Abmaße nach Vereinbarung mit Kunden / Dimensions per customer specification

Gewichte / Weight in kg

DN / Size	80 3"	100 4"	150 6"	200 8"	250 10"	300 12"	350 14"	400 16"	450 18"	500 20"	600 24"	700 28"	750 30"	800 32"	900 36"
ANSI150	15	19	30	45	64	95	140	200	253	327	630	1280	**	**	**
ANSI300	16	27	40	56	84	122	200	285	377	470	720	**	**	**	**

** = in Abhängigkeit von der Spezifikation / in accordance to specification

Zwick Armaturen GmbH · Egerstraße 25 · D-58256 Ennepetal · Germany · Tel.: +49 (0)2333 / 9856-50 · Fax: +49 (0)2333 / 9856-60
E-Mail: info@zwick-gmbh.de · Internet: www.zwick-gmbh.de

Butterfly Valve

Type LDE

LEUSCH GmbH
Industriearmaturen

Application
Double eccentric, tight shut off butterfly valve for
process engineering and plants with industrial requirements

Nominal size	**3" to 100" / DN 80 - DN 2500**
Nominal pressure	**ANSI Class 150 - 1500 / PN 10 - PN 250**
Temperatures	**-196°C to +550°C**

Leusch butterfly valves, type LDE, are control, on/off and shut-off valves. These valves are designed to handle a wide range of liquids, gases and steam within broad temperature range.

Valve body material
- Carbon steel
- Stainless steel
- Special materials

Body design
- Wafer
- Lug-Type (threaded holes)
- Double flanged
- Welding ends

Seat:
- 1.4462 duplex
- stellited
- PTFE-filled
- Special materials

The valves can be equipped with positioners, solenoid valves or others accessories in accordance with VDI/VDE 3845.

Versions:

Standard version:
- **Typ LDE** · Wafer design according to DIN or API 609

Other versions:
- Lug-Type-body according to DIN or API 609
- Double flanged body according to BS 5155/ISO 5752
- Face to face according to DIN and ANSI B16.10
- Fire-safe design according to BS 6755 Part 2, API 607 and API 6FA
- Double packing according to TA-Luft
- Version for cryogenic applications up to -196 °C
- Version for high temperatures up to +1000 °C
- Chlorine-service
- Low Noise
- Body materials: Duplex, Bronze, Monel, Incoloy, Hastelloy B and C, Titanium, Zirconium etc.

Fig. 1 · Control Butterfly Valve Type LDE (with LN and Diffuser) with diaphragm Actuator and E/P Positioner

Fig. 2 · Butterfly Valve Type LDE, Wafer type (metal seated) Bare shaft

Mode of operation
The valves are double eccentric. The unique shape of the disc allows the use of a solid seat of stainless steel. The solid seat remains un-unaffected by high flow velocities and temperatures. A good valve function is achieved even on difficult applications. Friction is minimised by the double eccentric design. The seat is replaceable in alternative materials.

Fail-safe position
The pneumatic rotary actuators are available with two fail- safe positions which become effective either when there is a pressure load on the actuator or when the air supply fails.
"Valve CLOSED without supply air"
The butterfly valve is closed when the air supply fails.
"Valve OPEN without supply air "
The butterfly valve is opened when the air supply fails.

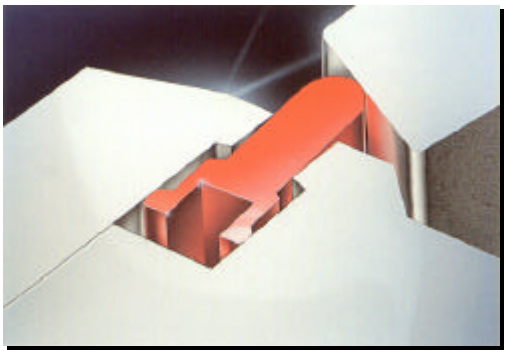


Fig. 3 · Metal seat, type Y

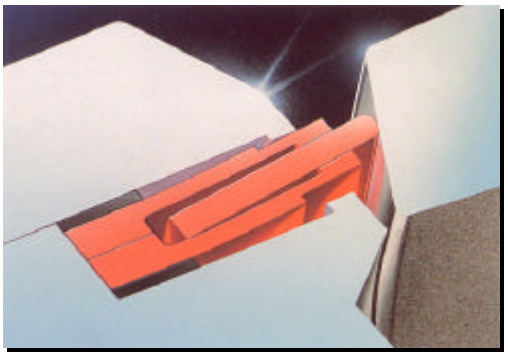


Fig. 4 · Metal seat, 3-pieces

Table 1 · Technical data

Nominal size	3" to 100" / DN 80 to DN 2500		
Nominal pressure	ANSI Class 150 to 1500 / PN 10 to PN 250		
Body design	Wafer type · Lug type · Double flanged		
Face to face	Acc. to DIN		
Installation between flanges	ANSI Class 150 to 1500 / PN 10 to PN 250		
Seat	1.4462 Duplex	stellited	PTFE
Characteristic			
Max. opening angle	80° (90°)		
Rangeability	> 50:1		
Perm. Operating pressures	See Pressure-Temperature-Table		
Temperature range	-196 to 550 °C	-196 to 550 °C	-196 to 220 °C
Leakage class acc. to IEC 534-4	V		VI

Table 2 · Materials

Version	ANSI		DIN
Body	ASTM A 216 WCB · A 351 CF8M*		WN 1.0619 · WN 1.4408*
Disc	A 351 CF8M*		
Shaft	1.4460 hardchromed		
Seat	1.4462 Duplex	Stellited	PTFE
Cover (Plug) und Cover plate	C-Steel or 316 SS		
Gland	316 SS		
Bearing (Option)	Bronze · 316 SS coated · Stellite		
Packing	Graphite		PTFE

* or equivalent

Table 3a · K_V-Values ANSI 150 / PN 25

Size		**ANSI 150 / PN 25**							
		Opening angle							
in	**mm**	10°	20°	30°	40°	50°	60°	70°	80°
3	**80**	13	29	46	69	103	157	193	223
4	**100**	24	49	67	102	154	206	283	330
6	**150**	60	118	170	243	370	500	680	800
8	**200**	93	202	305	434	670	885	1225	1415
10	**250**	135	292	452	691	1022	1568	2100	2427
12	**300**	197	424	657	1005	1488	2280	3058	3534
14	**350**	265	572	887	1356	2005	3069	4124	4770
16	**400**	352	760	1180	1803	2669	4085	5486	6341
18	**450**	458	987	1537	2348	3478	5349	7177	8295
20	**500**	555	1195	1853	2832	4192	6422	8617	9961
24	**600**	810	1747	2708	4139	6126	9386	12593	14559
28	**700**	1099	2369	3674	5614	8309	12730	17082	19741
32	**800**	1449	3125	4845	7403	10957	16787	22525	26035
36	**900**	1848	3981	6170	9429	13956	21375	28685	33155
40	**1000**	2275	4902	7605	11619	17195	25175	35345	40850
48	**1200**	3278	7068	10963	17148	24790	36043	50963	58900

Relation between K_V and C_V: $C_V = K_V * 1{,}17$

Table 3b · K_V-Values ANSI 300 / PN 50

Size		**ANSI 300 / PN 50**							
		Opening angle							
in	**mm**	10°	20°	30°	40°	50°	60°	70°	80°
3	**80**	12	27	43	64	96	146	179	208
4	**100**	19	40	62	95	140	212	286	331
6	**150**	45	96	149	226	335	512	689	800
8	**200**	79	170	264	404	596	910	1229	1422
10	**250**	126	272	420	643	950	1458	1953	2257
12	**300**	183	394	611	935	1384	2120	2844	3287
14	**350**	246	532	825	1261	1865	2854	3835	4436
16	**400**	327	707	1097	1677	2482	3799	5102	5897
20	**500**	516	1111	1723	2634	3899	5972	8014	9264
24	**600**	753	1625	2518	3849	5697	8729	11711	13540
28	**700**	ON REQUEST							
32	**800**								
36	**900**								
40	**1000**								
48	**1200**								

Relation between K_V and C_V: $C_V = K_V * 1{,}17$

Table 3c · K_V-Values ANSI 600 / PN 100

Size		ANSI 600 / PN 100							
		Opening angle							
in	mm	10°	20°	30°	40°	50°	60°	70°	80°
3	80	11	23	37	56	83	127	156	181
4	100	16	35	54	83	122	185	249	289
6	150	39	83	130	197	292	446	600	696
8	200	69	148	230	352	519	793	1070	1239
10	250	109	237	366	560	828	1270	1701	1966
12	300	160	343	532	814	1205	1847	2477	2863
14	350	215	463	718	1098	1624	2486	3340	3864
16	400	285	616	956	1460	2162	3309	4444	5136
18	450	371	799	1245	1902	2817	4333	5813	6719
20	500	450	968	1501	2294	3396	5202	6980	8068
24	600	656	1415	2193	3353	4962	7603	10200	11793

Relation between K_V and C_V: $C_V = K_V * 1,17$

Table 3d · K_V-Values ANSI 900 / PN 160

Size		ANSI 900 / PN 160							
		Opening angle							
in	mm	10°	20°	30°	40°	50°	60°	70°	80°
3	80	8	19	29	44	66	100	124	143
4	100	13	28	43	65	96	146	197	228
6	150	31	66	102	156	230	353	474	550
8	200	54	117	182	278	410	627	845	979
10	250	86	187	289	442	654	1004	1344	1553
12	300	126	271	420	643	952	1459	1957	2262
14	350	170	366	568	868	1283	1964	2639	3053
16	400	225	486	755	1154	1708	2614	3511	4058
18	450	293	632	984	1503	2226	3423	4593	5309
20	500	355	765	1186	1812	2683	4110	5515	6375
24	600	518	1118	1733	2649	3921	6007	8060	9318
Other sizes and ratings on request									

Relation between K_V and C_V: $C_V = K_V * 1,17$

Diagram 3e · Flow characteristics

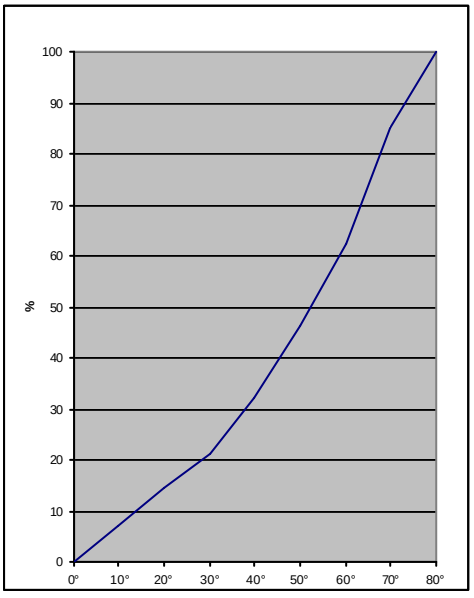


Table 4a · Characteristic data for capacity calculation

Opening angle	30°	40°	50°	60°	70°	80°	90°
FL	0,82	0,80	0,74	0,68	0,61	0,60	0,59

Table 4b · Pressure and temperature rating (1.4408)

ANSI	Temperature °C																			
	0-20	30	40	50	60	70	80	90	100	120	140	160	180	200	250	300	350	400	450	500
150	20	20	20	20	20	20	20	20	20	20	19	19	18	18	17	16	16	15	15	15
300	50	49	48	47	46	45	44	43	42	41	40	38	37	36	35	33	32	31	30	30
600	100	97	95	93	91	89	87	85	83	81	79	77	75	73	70	67	65	63	62	61
ANSI 900 - 2500, other materials and temperature > 500° on request																				

Table 5 · Torque in Nm

Size		dp in Bar		
in	**Mm**	**10**	**20**	**50**
3	**80**	100	120	180
4	**100**	120	165	250
5	**125**	180	230	320
6	**150**	200	250	350
8	**200**	250	290	460
10	**250**	400	480	680
12	**300**	500	600	900
14	**350**	800	950	1350
16	**400**	1100	1300	1750
18	**450**	1550	1800	2600
20	**500**	2100	2600	3000
24	**600**	2900	4750	5800
30	**750**	4200	ON REQUEST	
32	**800**	5000		
36	**900**	5800		
40	**1000**	6000		
48	**1200**	7500		

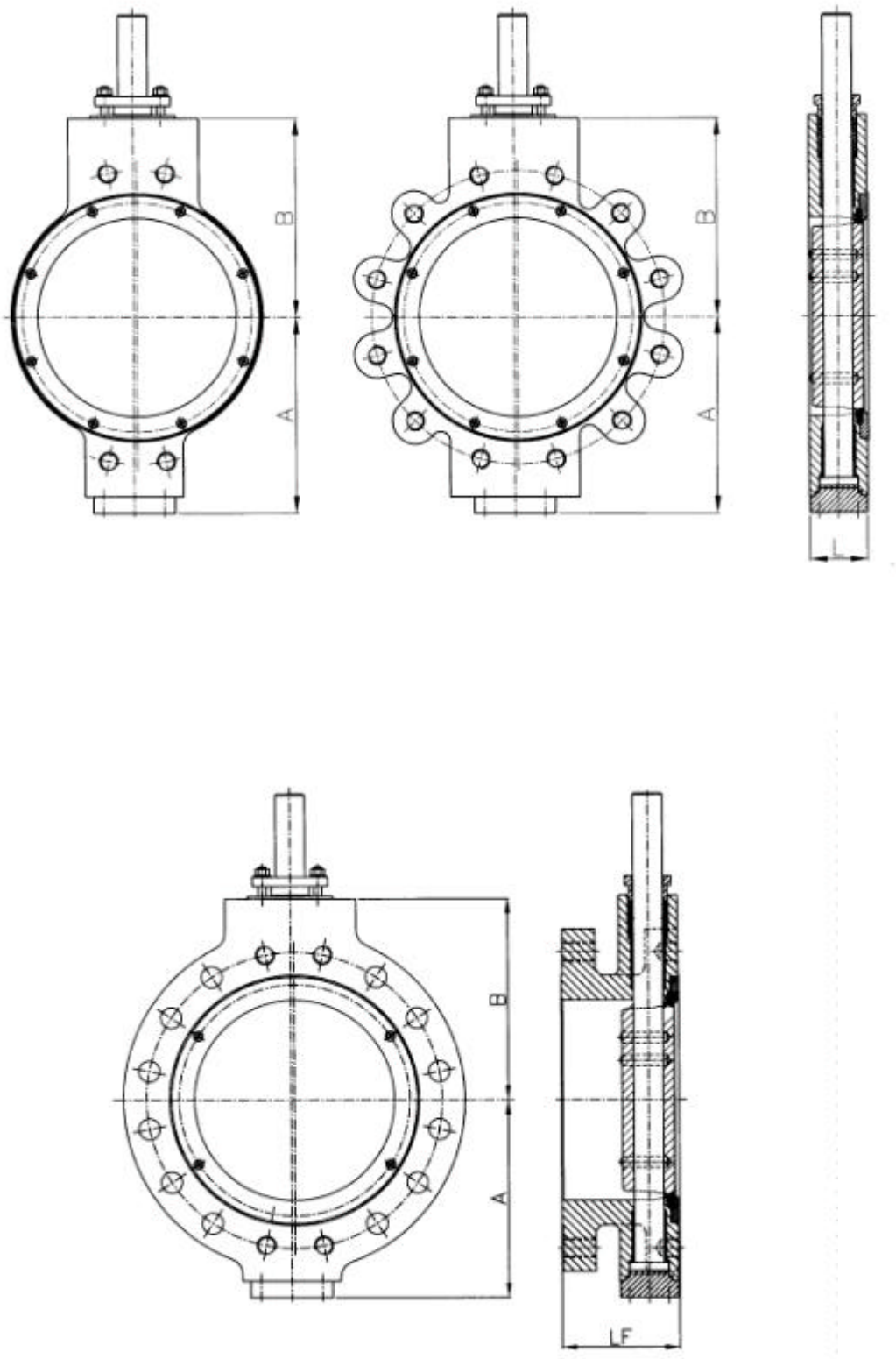


Fig 5 · Dimension drawing for LDE

Table 6a · Dimensions in mm for LDE · ANSI Class 150 - ANSI 300

Size		ANSI 150 / PN 25				ANSI 300 / PN 50			
in	Mm	A	B	L	LF	A	B	L	LF
3	80	120	125	48	114	125	135	48	114
4	100	150	160	54	127	160	165	54	127
6	150	190	200	57	140	200	210	59	140
8	200	220	235	64	152	235	240	73	152
10	250	250	265	71	165	260	270	83	165
12	300	290	305	81	178	300	310	92	178
14	350	320	330	92	190	325	335	117	190
16	400	350	360	102	216	365	370	133	216
18	450	375	400	114	222	400	410	149	222
20	500	415	450	127	229	450	460	159	229
24	600	450	480	154	267	520	540	181	267
28	700	515	535	165	292	580	610	209	292
30	750	580	610	165	318	600	630	241	318
32	800	590	620	190	318	630	660	241	318
36	900	640	670	200	330	700	730	260	330
40	1000	700	730	216	410	720	740	300	410
48	1200	800	840	276	470	820	860	320	470

Table 6b · Dimensions in mm for LDE · ANSI Class 600 - ANSI 900

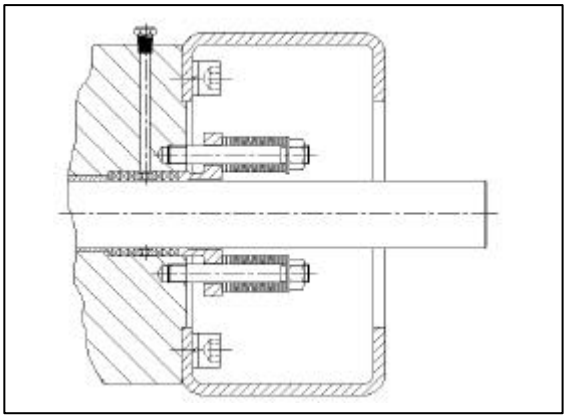
Size		ANSI 600 / PN 100				ANSI 900 / PN 160			
In	mm	A	B	L	LF	A	B	L	LF
3	80	130	135	54	180	135	140	64	210
4	100	175	180	64	190	215	225	80	235
6	150	225	235	78	210	265	280	104	250
8	200	265	275	102	230	300	310	112	310
10	250	310	320	117	250	350	375	135	350
12	300	335	340	140	270	380	400	170	380
14	350	375	385	155	290	395	415	190	400
16	400	410	420	178	310	425	440	202	430
18	450	440	450	200	330	460	480	230	460
20	500	485	490	216	350	500	530	252	490
24	600	550	610	232	390	590	630	312	530
28	700	580	640	292	450	On request			
30	750	620	670	318	480				
32	800	660	700	318	510				
36	900	720	740	330	540				

Table 6c · Dimensions in mm for LDE · ANSI Class 1500

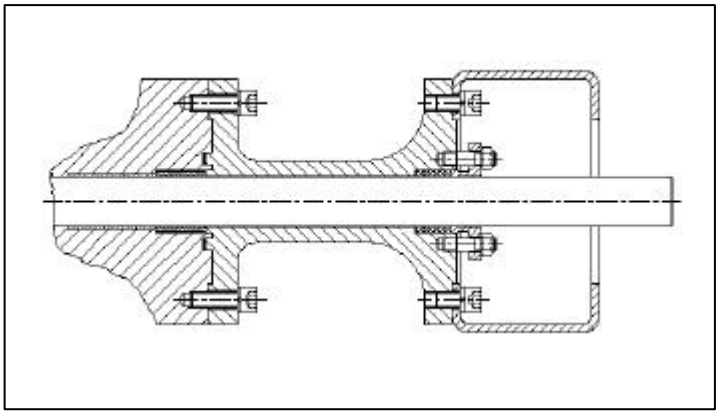
Nennweite		ANSI 1500 / PN 250			
In	mm	A	B	L	LF
8	200	310	320	130	420
10	250	360	385	160	460
12	300	390	430	190	500
14	350	430	470	220	570
16	400	480	510	260	610
18	450	490	530	300	660
20	500	540	580	330	710
24	600	650	680	385	790

Other sizes and ANSI 2500 on request

Option:



TA-Luft Packing



Extension for Cryogenic and High temperature

Ordering example

Valve Type $\underset{1}{\text{LDE}}$ - $\underset{2}{\text{W}}$ - $\underset{3}{2}$ $\underset{4}{2}$ $\underset{5}{4}$ - $\underset{6}{3}$ $\underset{7}{4}$ $\underset{8}{1}$ - $\underset{9}{\text{DN...}}$ - $\underset{10}{\text{PN...}}$

Valve specification system

1 Valve type
LDE = standard
LDE LN = with Low Noise

2 Valve body design
W = Wafer type
L = Lug type
F = Flanged design

3 Material - valve body
1 = A 216 WCB / 1.0619*
2 = A 351 CF8M / 1.4408*

4 Material - disc
2 = A 351 CF8M / 1.4408*

5 Material - seat
2 = stellited
3 = PTFE
4 = 1.4462

6 Material - shaft
1 = 17-4PH*
2 = 1.4571/1.4460 *
3 = 1.4571/1.4460 hard chromed*
4 = 1.4571 stellited*

7 Bearing - valve body/shaft
1 = Bronze
2 = 316 SS coated
3 = Stellite
4 = without bearings

8 Packing
1 = Graphite
2 = PTFE
3 = Graphite/Graphite (spring loaded with purge connection)
4 = PTFE/PTFE (spring loaded with purge connection)

9 Valve Size, DN

10 Nominal pressure, PN or ANSI (counter flange)

*or equivalent

Actuator	double acting or spring return
Air failure	Valve open or close (only for spring return)
Air supply	... bar
Differantial pressure	... bar
Temperature	... °C
Accessories	for exp. pneum. oder electropneum. Positioner, Limit switch, Solenoid valve etc.

Leusch reserve the right to make improvements without prior notice.

Edition: 2002-07

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Phone +49 2131 7699-0 • Fax 7699-29 • e-mail: sales@leusch.de / www.leusch.de

Ball valves

Type SE

LEUSCH GmbH
Industriearmaturen

Nominal size	**1" to 72" / DN 25 - DN 1800**
Nominal pressure	**ANSI Class 150 - 2500 / PN 10 - PN 420**
Temperatures	**-196°C to +700°C**

DESIGN

Side Entry Ball Valves
- Soft & Metal seated
  - Standard service
  - Cryogenic
  - High temperature
  - Sub sea
  - Abrasive fluids
  - Underground installation

Welded Body Valves
- Soft seated
  - Standard service
  - Sub sea
  - Underground installation

Multi-Ways Ball valves
- 3 & 4 ways – T or L port
- Soft & Metal seated
  - Standard service
  - High temperature
  - Abrasive fluids

SIZE-PRESSURE RANGE

Side Entry
- 2” to 72” – ANSI 150# to ANSI 600#
- 2” to 40” – ANSI 900#
- 2” to 36” – ANSI 1500#
- 2” to 24” – ANSI 2500#
- 1” to 18” – API 2000 to API 10000
- 1” to 4” – API 15000

Welded Body
- 2” to 56” – ANSI 150# to ANSI 600#
- 2” to 36” – ANSI 900#

Top Entry Ball Valves
- Soft & Metal seated
  - Standard service
  - Cryogenic
  - High temperature
  - Sub sea
  - Abrasive fluids

(For Top Entry Ball Valves see data sheet type TE)

Fig. 1 · High pressure Ball Valve Type SE 16" ANSI 900, with pneum. spring return Actuator and E/P Positioner

Bild 2 · Tight Shut Off Ball Valve Type SE,

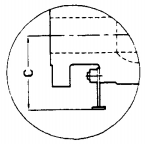
Side entry ball valves
Soft seated

- Trunnion mounted
- 2 piece body (2” to 4”)
- 3 piece body (6” and larger)
- Design and construction to API 6D or API 6A
- Minimum wall thickness to ANSI B16.34
- Face to face to API 6D and ANSI B16.10
- Fire safe design to API 6FA and API 607
- Full, reduced or venturi port
- Flanged, Butt Welding or Hub ends
- Hand or motor operated
- Anti static
- Anti blow-out stem
- Bi-directional
- Independent floating self relieving seats
- Primary soft seat
- Secondary metal seat
- Double body seals
- Triple stem seals
- Field replaceable stem seals
- Emergency sealant injection on stem seals area
- Drain plug
- Vent plug (6” and larger)
- Lifting lugs and supporting feet on 6” and larger

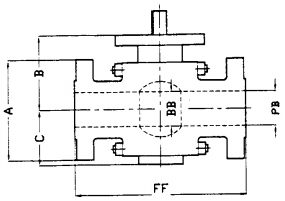
Side entry ball valves
Metal seated

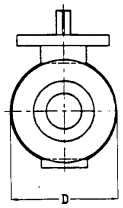
- Trunnion mounted
- 2 piece body (2” to 4”)
- 3 piece body (6” and larger)
- Design and construction to API 6D or API 6A
- Minimum wall thickness to ANSI B16.34
- Face to face to API 6D and ANSI B16.10
- Fire safe design to API 6FA and API 607
- Full, reduced or venturi port
- Flanged, Butt Welding or Hub ends
- Hand or motor operated
- Anti static
- Anti blow-out stem
- Bi-directional
- Independent floating self relieving seats
- Metal to metal seating
- Double body seals
- Triple stem seals
- Field replaceable stem seals
- Emergency sealant injection on stem seals area
- Drain plug
- Vent plug (6” and larger)
- Lifting lugs and supporting feet on 6” and larger

SIDE ENTRY – ANSI 150#



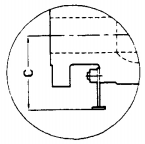
FOR 6" AND LARGER



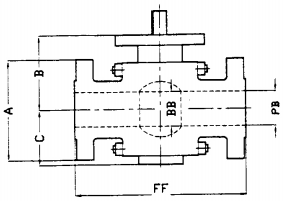


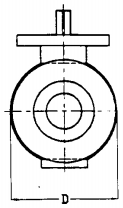
SIZE		FF		BB	PB	A	B	C	D	WEIGHT
	RF	RTJ	WE							KG
2x1.1/2	178	190	216	38	51	152	95	100	145	26
2	178	190	216	51	51	152	105	100	153	28
3x2	203	216	283	51	77	191	105	100	153	31
3	203	216	283	77	77	191	155	125	187	53
4x3	229	241	305	77	102	229	155	125	187	63
4	229	241	305	102	102	229	200	160	230	90
6x4	394	406	47	102	152	279	200	160	230	102
6	394	406	457	152	152	279	250	185	305	163
8x6	457	470	521	152	203	343	250	186	305	188
8	457	470	521	203	203	343	278	222	390	250
10x8	533	546	559	203	254	406	278	222	390	290
10	533	546	559	254	254	406	323	280	467	385
12x10	610	622	635	254	305	483	323	280	467	465
14x10	686	698	762	254	337	535	323	280	467	523
12	610	622	635	305	305	483	340	303	540	562
14x12	685	698	762	305	337	535	340	303	540	622
16x12	762	775	838	305	387	595	340	303	540	707
14	686	698	762	337	337	535	375	330	607	765
16x14	762	775	838	337	387	595	375	330	607	830
16	762	775	838	387	387	595	410	355	675	1030
18x16	864	876	914	387	438	635	410	355	675	1080
20x16	914	927	991	387	489	700	410	355	675	1170
18	864	876	914	438	438	635	440	390	753	1218
20x18	914	927	991	438	489	700	440	390	753	1298
20	914	927	991	489	489	700	495	430	845	1798
24x20	1067	1079	1143	489	591	815	495	430	845	2048
22	991	-	1092	540	540	750	525	475	930	2367
24	1067	1079	1143	591	591	815	585	520	1010	3097
30x24	1295	-	1397	591	737	985	585	520	1010	3347
26	1143	-	1245	635	635	870	630	560	1070	3687
28	1244	-	1347	686	686	925	645	650	1140	4495
30	1295	-	1397	736	736	985	690	700	1220	5230
36x30	1524	-	1728	736	876	1170	690	700	1220	6310
32	1371	-	1524	781	781	1060	740	745	1310	6820
34	1473	-	1626	832	832	1110	760	775	1380	7810
36	1524	-	1728	876	876	1170	810	805	1440	8810
40	1753	-	1956	978	978	1290	895	900	1610	12590
42	1855	-	2083	1022	1022	1345	950	935	1683	14310
48	2134	-	2388	1168	1168	1510	1095	1070	1930	21930
56	2489	-	2489	1384	1384	1735	1300	1250	2273	34120

SIDE ENTRY – ANSI 300#



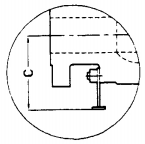
FOR 6" AND LARGER



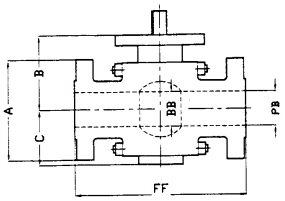


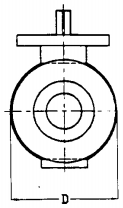
SIZE		FF		BB	PB	A	B	C	D	WEIGHT
	RF	RTJ	WE							KG
2x1.1/2	216	232	216	38	51	165	95	100	145	27
2	216	232	216	51	51	165	105	100	153	29
3x2	283	298	283	51	77	210	105	100	153	34
3	283	298	283	77	77	210	155	125	187	57
4x3	305	321	305	77	102	254	155	125	187	65
4	305	321	305	102	102	254	200	160	230	95
6x4	403	419	457	102	152	318	200	160	230	118
6	403	419	457	152	152	318	250	203	305	185
8x6	502	517	521	152	203	381	250	203	305	222
8	502	517	521	203	203	381	278	232	390	287
10x8	568	584	559	203	254	445	278	232	390	297
10	568	584	559	254	254	455	333	298	477	507
12x10	648	664	635	254	305	520	333	298	477	597
14x10	762	778	762	254	337	58	333	298	477	648
12	648	664	635	305	305	520	360	333	540	740
14x12	762	768	762	305	337	585	360	333	540	820
16x12	838	854	838	305	387	650	360	333	540	970
14	762	778	762	337	337	585	395	350	630	1038
16x14	838	854	838	337	387	650	395	350	630	1130
16	838	854	838	387	387	650	433	398	698	1428
18x16	914	930	914	387	438	710	433	398	698	1598
20x16	991	1010	991	387	489	775	433	398	698	1668
18	914	930	914	438	438	710	460	410	770	1602
20x18	991	1010	991	438	489	775	460	410	770	1797
20	991	1010	991	489	489	775	505	470	855	2207
24x20	1143	1165	1143	489	591	915	505	470	855	2667
22	1092	1114	1092	540	540	840	530	485	940	2797
24	1143	1165	1143	591	591	915	590	550	1025	3470
30x24	1397	1422	1397	591	736	1090	590	550	1025	4490
26	1245	1270	1245	635	635	970	635	585	1085	4670
28	1346	1372	1346	686	686	1035	645	670	1150	5780
30	1397	1422	1397	736	736	1090	700	730	1240	6600
36x30	1727	1756	1727	736	876	1270	700	730	1240	8190
32	1524	1553	1524	781	781	1150	750	770	1320	7940
34	1626	1654	1626	832	832	1205	765	800	1393	9050
36	1727	1756	1727	876	876	1270	810	825	1450	10100
40	1956	-	1956	978	978	1240	905	920	1620	13790
42	2083	-	2083	1022	1022	1290	960	955	1690	16120
48	2170	-	2170	1168	1168	1465	1100	1105	1943	24070
56	2743	-	2743	1384	1384	1710	1300	1275	2280	38710

SIDE ENTRY – ANSI 600#



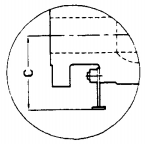
FOR 6" AND LARGER



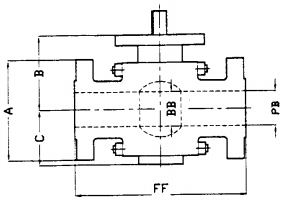


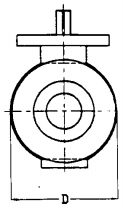
SIZE		FF		BB	PB	A	B	C	D	WEIGHT
	RF	RTJ	WE							KG
2x1.1/2	292	295	292	38	51	165	95	100	145	30
2	292	295	292	51	51	165	105	100	160	33
3x2	356	359	356	51	77	210	105	100	160	40
3	356	359	356	77	77	210	165	130	190	64
4x3	432	435	432	77	102	273	165	130	190	80
4	432	435	432	102	102	273	210	162	234	114
6x4	559	562	559	102	152	356	210	162	234	153
6	559	562	559	152	152	356	253	203	305	255
8x6	660	664	660	152	203	419	253	203	305	290
8	660	664	660	203	203	419	290	257	405	487
10x8	787	791	787	203	254	510	290	257	405	547
10	787	791	787	254	254	510	333	310	490	760
12x10	838	841	838	254	305	560	333	310	490	810
14x10	889	892	889	254	337	605	333	310	490	915
12	838	841	838	305	305	560	380	350	580	1070
14x12	889	892	889	305	337	605	380	350	580	1140
16x12	991	994	991	305	387	685	380	350	580	1350
14	889	892	889	337	337	605	395	360	630	1085
16x14	991	994	991	337	387	685	395	360	630	1308
16	991	994	991	387	387	685	433	413	702	1527
18x16	1092	1095	1092	387	438	745	433	413	702	1682
20x16	1194	1200	1194	387	489	815	433	413	702	2087
18	1092	1095	1092	438	438	745	470	430	775	2097
20x18	1194	1200	1194	438	489	815	470	430	775	2377
20	1194	1200	1194	489	489	815	505	490	863	2640
24x20	1397	1406	1397	489	591	940	505	490	863	3250
22	1296	1305	1296	540	540	870	545	510	950	3790
24	1397	1406	1397	591	591	940	595	570	1030	4740
30x24	1651	1664	1651	591	736	1130	595	570	1030	5770
26	1448	1460	1448	635	635	1015	635	620	1093	5650
28	1549	1562	1549	686	686	1075	665	690	1170	6760
30	1651	1664	1651	736	736	1130	710	750	1255	8380
36x30	2083	2098	2083	736	876	1315	710	750	1255	10380
32	1778	1794	1778	781	781	1195	755	780	1327	9740
34	1930	1746	1930	832	832	1245	780	815	1405	11340
36	2083	2098	2083	876	876	1315	815	840	1465	13300
40	2337	2337	2337	978	978	1320	915	940	1640	18340
42	2437	2437	2437	1022	1022	1405	970	980	1720	21360
48	2540	2540	2540	1168	1168	1595	1105	1120	1970	31200
56	2949	2949	2949	1384	1384	1855	1300	1290	2305	47490

SIDE ENTRY – ANSI 900#



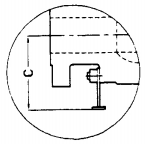
FOR 6" AND LARGER



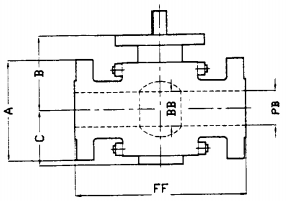


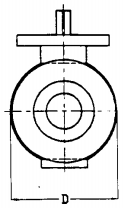
SIZE		FF		BB	PB	A	B	C	D	WEIGHT
	RF	RTJ	WE							KG
2x1.1/2	368	371	368	38	51	216	105	105	150	40
2	368	371	368	51	51	216	105	105	160	50
3x2	381	384	381	51	77	241	105	105	160	53
3	381	384	381	77	77	241	165	130	190	76
4x3	457	460	457	77	102	292	165	130	190	97
4	457	460	457	102	102	292	210	167	237	150
6x4	610	613	610	102	152	381	210	167	237	210
6	610	613	610	152	152	381	260	210	320	367
8x6	737	740	737	152	203	470	260	210	320	447
8	737	740	737	203	203	470	295	266	420	600
10x8	838	841	838	203	254	545	295	266	420	700
10	838	841	838	254	254	545	345	330	515	1027
12x10	965	968	965	254	305	610	345	330	515	1148
14x10	1029	1038	1029	254	324	640	345	330	515	1235
12	965	968	965	305	305	610	390	380	605	1558
14x12	1029	1038	1029	305	324	640	390	380	605	1643
16x12	1130	1140	1130	305	375	705	390	380	605	1738
14	1029	1038	1029	324	324	640	400	370	640	1477
16x14	1130	1140	1130	324	375	705	400	370	640	1717
16	1130	1140	1130	375	375	705	440	435	715	2157
18x16	1219	1232	1219	375	425	785	440	435	715	2437
20x16	1321	1333	1321	375	473	855	440	435	715	2887
18	1219	1232	1219	425	425	785	482	500	800	2860
20x18	1321	1333	1321	425	473	855	482	500	800	3260
20	1321	1333	1321	473	473	855	530	500	900	4220
24x20	1549	1568	1549	473	571	1040	530	500	900	5400
24	1549	1568	1549	571	571	1040	615	630	1060	6850
30x24	1880	1902	1880	571	714	1230	615	630	1060	8750
26	1651	1674	1651	619	619	1085	650	650	1120	8040
28	1753	1775	1753	667	667	1170	670	710	1230	9970
30	1880	1902	1880	714	714	1230	725	780	1300	12210
36x30	2286	2315	2286	857	857	1460	725	780	1300	15420
32	2032	2054	2032	762	762	1315	785	810	11360	11870
34	2159	2188	2159	810	810	1395	805	850	1470	17230
36	2286	2315	2286	857	857	1460	845	900	1530	19920

SIDE ENTRY – ANSI 1500#



FOR 6" AND LARGER



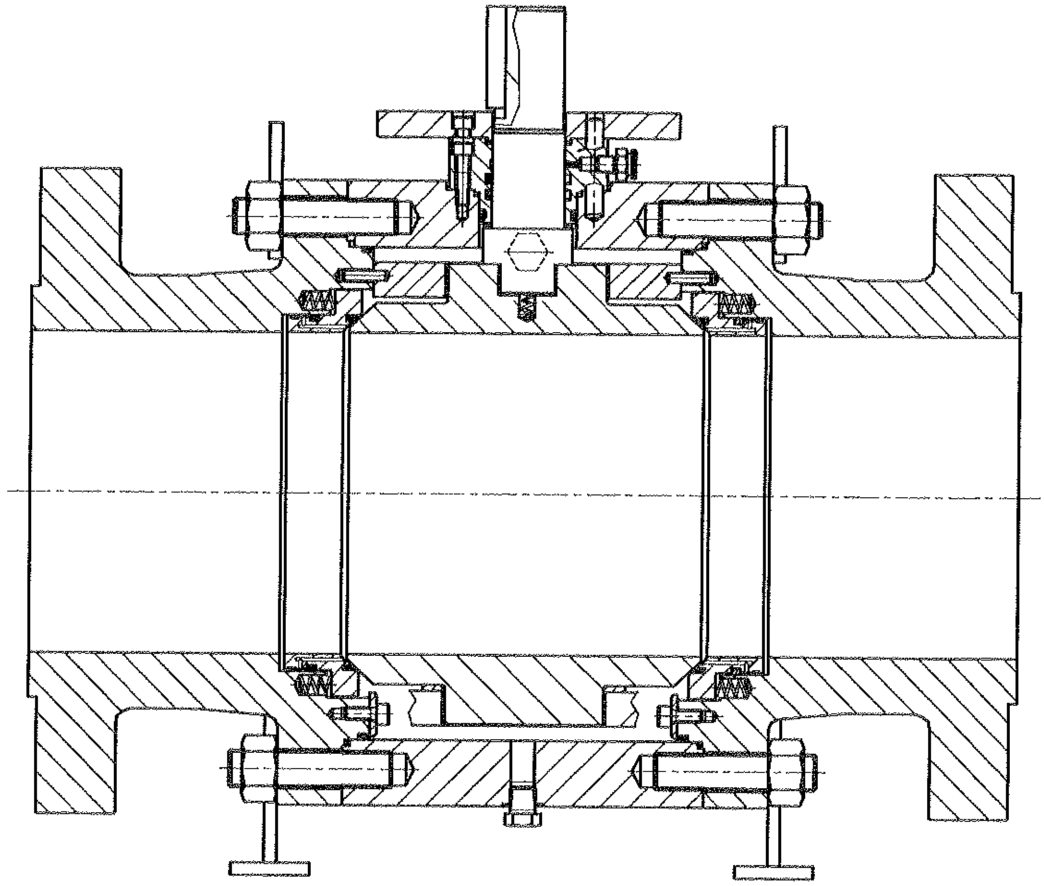


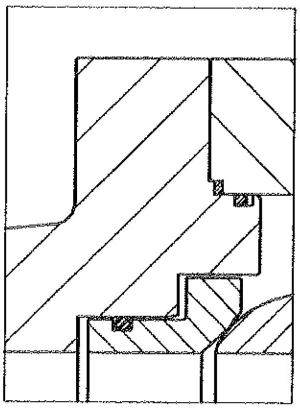
SIZE		FF		BB	PB	A	B	C	D	WEIGHT
	RF	RTJ	WE							KG
2x1.1/2	368	371	38	38	51	216	105	105	150	45
2	368	371	51	51	51	216	105	105	150	53
3x2	470	473	51	51	77	267	105	105	160	66
3	470	473	77	77	77	267	165	130	190	98
4x3	546	549	77	77	102	311	165	130	190	126
4	546	549	102	102	102	311	215	167	245	200
6x4	705	711	102	102	146	394	215	167	245	290
6	705	711	146	146	146	394	260	230	345	485
8x6	832	841	146	146	194	483	260	230	345	575
8	832	841	194	194	194	483	300	285	450	827
10x8	991	1000	194	194	241	585	300	285	450	1032
10	991	1000	241	241	241	585	365	350	555	1507
12x10	1130	1146	241	241	289	675	365	350	555	1767
14x10	1257	1276	241	241	317	750	365	350	555	2152
12	1130	1146	289	289	289	675	420	423	710	2272
14x12	1257	1276	289	289	317	750	420	423	710	2537
16x12	1384	1406	289	289	362	825	420	423	710	2807
14	1257	1276	317	317	317	750	440	430	770	2880
16x14	1384	1406	317	317	362	825	440	430	770	3280
16	1384	1406	362	362	362	825	480	500	850	4120
18x16	1537	1559	362	362	407	916	480	500	850	4980
20x16	1664	1686	362	362	457	985	480	500	850	5150
18	1537	1559	407	407	407	916	550	600	980	6260
20x18	1664	1686	407	407	457	985	550	600	980	7540
20	1664	1686	457	457	457	985	620	650	1020	9120
24x20	2043	2071	457	457	534	1170	620	650	1020	10950
24	2043	2071	543	534	534	1170	700	720	1290	14320

Leusch reserve the right to make improvements without prior notice.

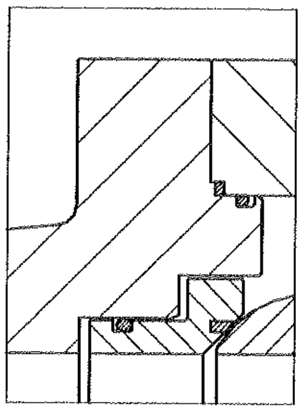
Edition: 2002-08

LEUSCH GMBH INDUSTRIEARMATUREN • Ziegeleistraße 10 • D-41472 Neuss
Phone +49 2131 7699-0 • Fax 7699-29 • e-mail: sales@leusch.de / www.leusch.de

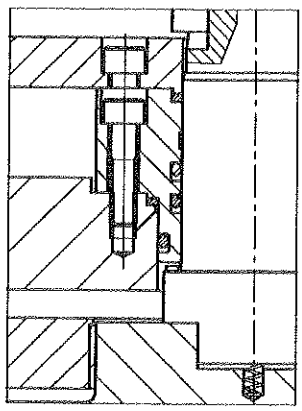




SEAT DETAIL METAL SEATED



SEAT DETAIL SOFT SEATED



STEM DETAIL

Side Entry Three Pieces Body

Size:6"& larger Class 150-2500

(Verwendungsbereich)	Freimaßtoleranzen DIN 7168 Teil1 (mittel)	Oberflächen n.DIN ISO 1302 Reihe 3	Maßstab —	(Gewicht)
— —			L-981125-a	

	Datum	Name
Bearb.	16.1.01	F.Nolte
Gepr.	16.1.01	J.Leusch
Norm		

Truinnion Mounted Ball Valve

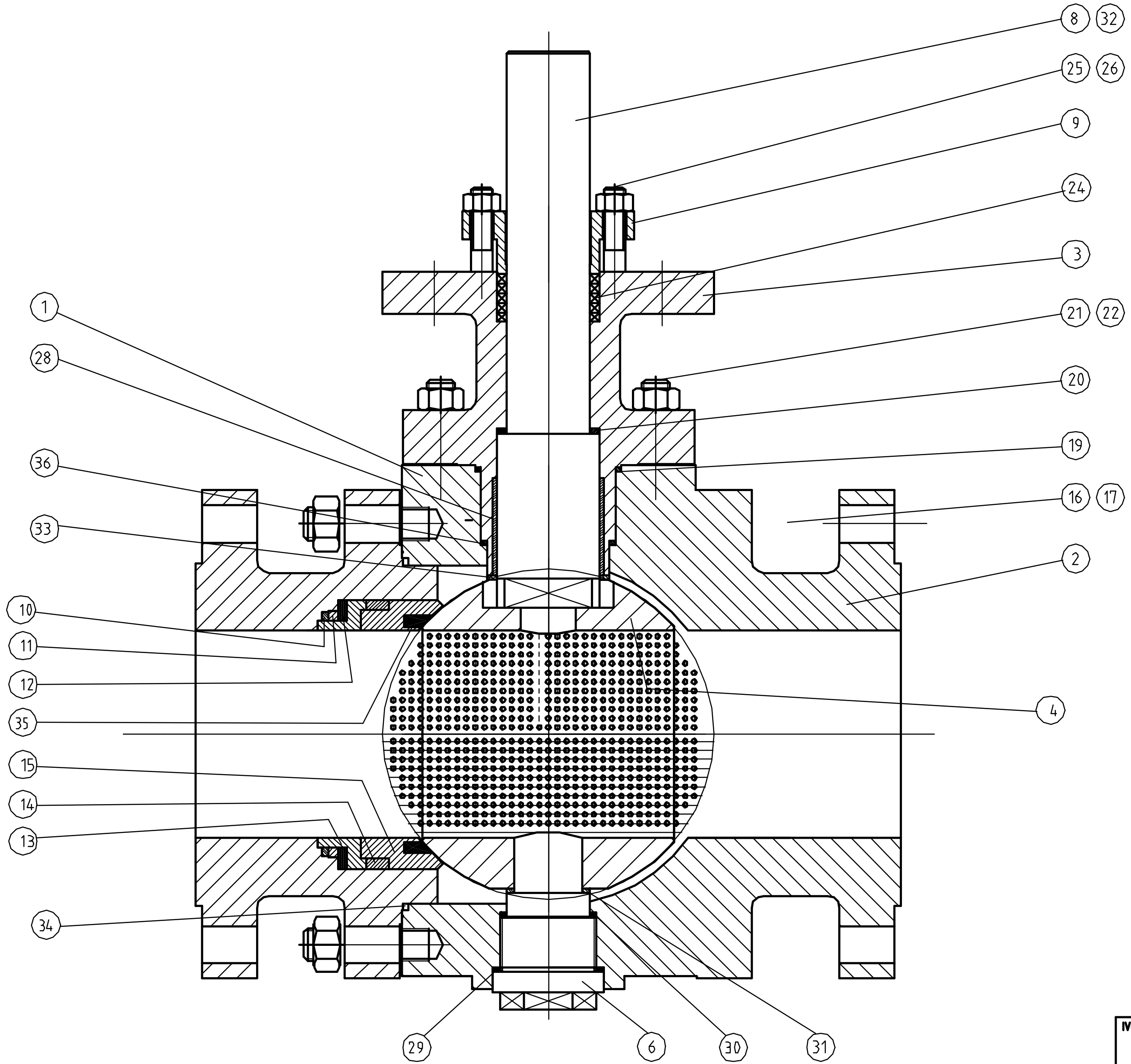
Werkstoff:
—
—

LEUSCH GmbH Industriearmaturen
Ziegleistr. 10
41472 Neuss

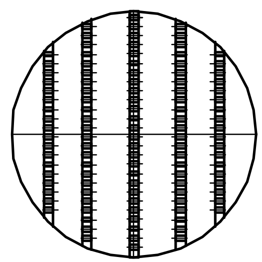
Blatt

Blätter

Zust	Änderung	Datum	Name	Ursprung	Ersatz für:	Ersatz durch:

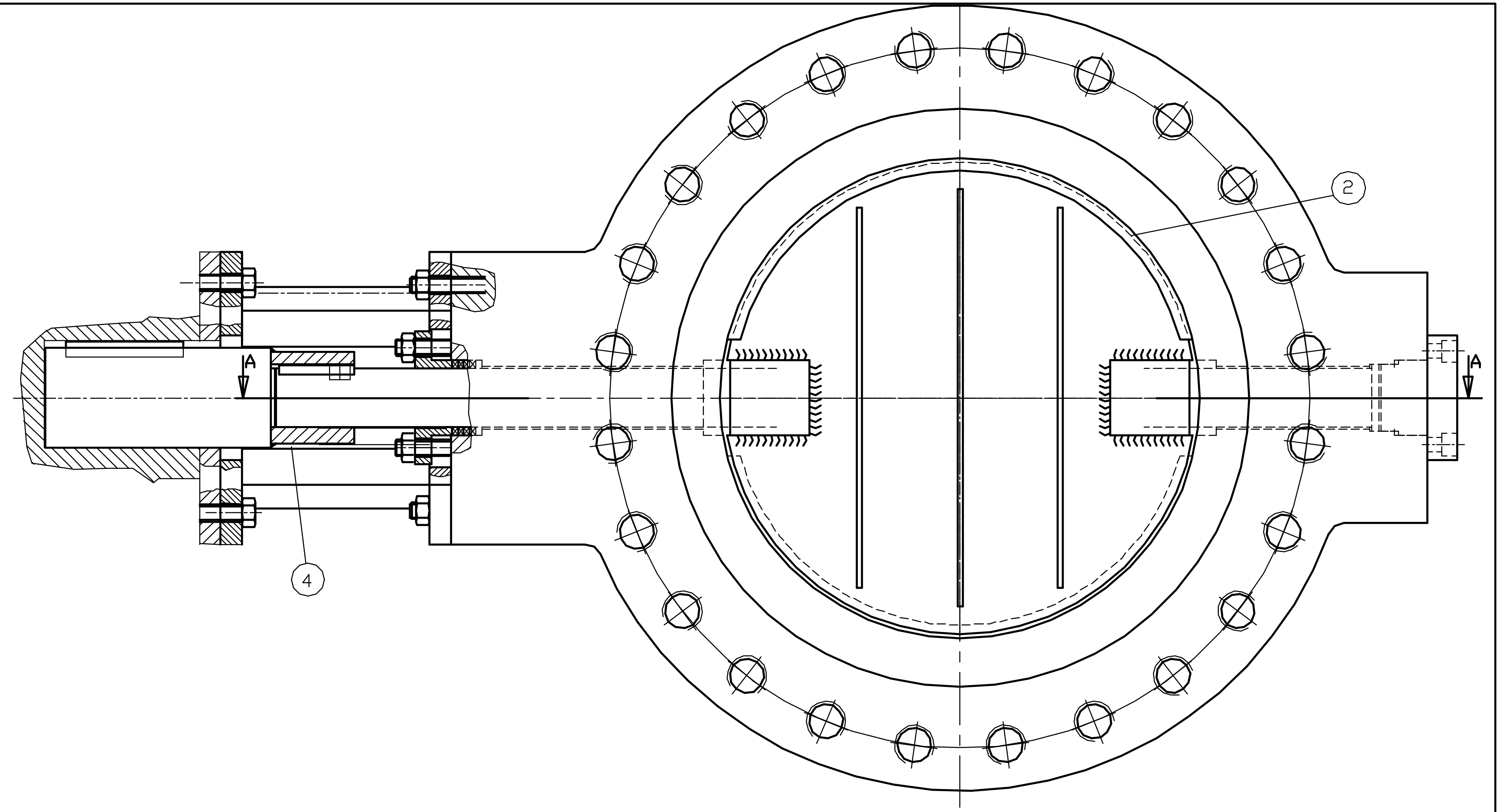


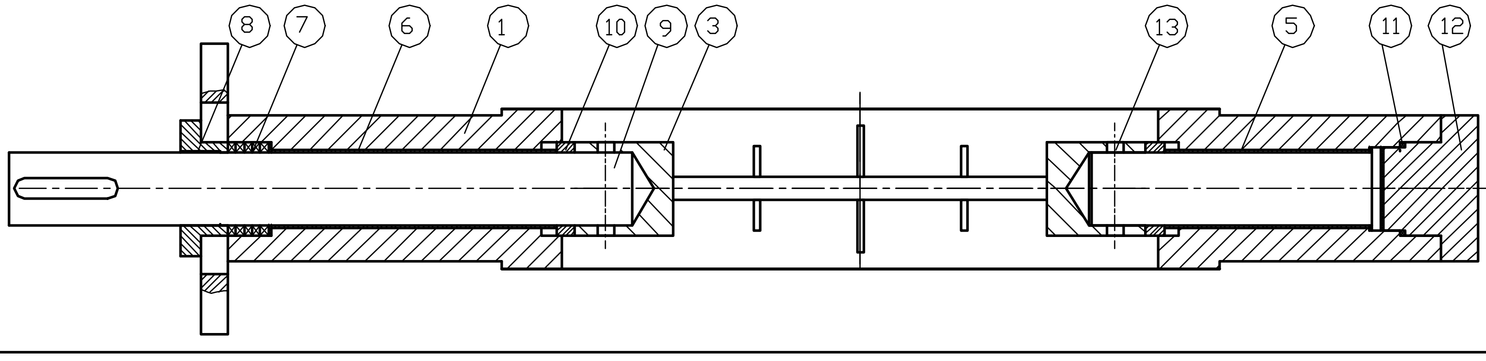
with Low Noise



for further information,see our datasheet type SE

Verwendungsbereich	Freimaßtoleranzen	Oberflächen	Maßstab ----	Gewicht
Methanol	DIN 7168 Teil1 mittel	nDIN ISO 1312 Reihe 3	L - 982221	
		Datum / Name		
	Bearb.	18.11.13 / We	Ball Valve QB with Low Noise	
	Gepr.	18.11.13 / T.Leusch		
	Norm			
	Werkstoff:		LEUSCH GmbH Industriearmaturen Bruchweg 97-99 41564 Kaarst	Blatt / Blätter
Zust / Änderung / Datum / Name	Ursprung		Ersatz für:	Ersatz durch:





Pos.	Quant.	Description/Beschreibung	Drw.-Nr. Zeichn.-Nr.	Material	Spare parts E-Teile	
01	1	Body/Gehäuse 24" PN160		A217WC6		
02	2	Strip of Valve/Anschlagleiste		A217WC6		
03	1	Disc/Scheibe 24" PN160 Anschlagend		316SS		
04	1	Bridge/Brücke u.Kupplung (3 Pos.)		Carbon Steel		
05	1	Down Bearing/Lager unten		HFSS Hard Faced	X	
06	1	Up Bearing/Lager oben		HFSS Hard Faced	X	
07	5	Packing/Packung (oben) [illegible]	—	Grafit	X	
08	1	Stuffing Box/Stopfbuchse (oben)		A217WC6		
09	1	Shaft/Welle (2 Pos.)		SS		
10	1	Disc Bearing/Scheibenlager		HFSS Hard Faced	X	
11	1	Body Gasket/Gehäusedichtung		Grafit	X	
12	1	Plate/Deckel (unten)		A217WC6		
13	2	Pin / Zyl.-Stift Ø16x[illegible] gehärtet		SS	X	

Verwendungsbereich	Freimaßtoleranzen DIN 7168 Teil 1 mittel	Oberflächen n.DIN ISO 1302 Reihe 3	Maßstab 1:2,5	Gewicht
			L-982220	

	Datum	Name
Bearb.	31.8.11	F.Nolte
Gepr.	31.8.11	T.Lausch
Norm		

Butterfly Valve Typ WVTB ANSI 900RF

Werkstoff:

[illegible] GmbH Industriearmaturen
Ziegeleistr. 10
41472 Neuss

Blatt
Blätter

Zust.	Änderung	Datum	Name	Ursprung	Ersatz für:	Ersatz durch:

rotork
fluid system

GP AND GH RANGE FLUID POWER ACTUATORS

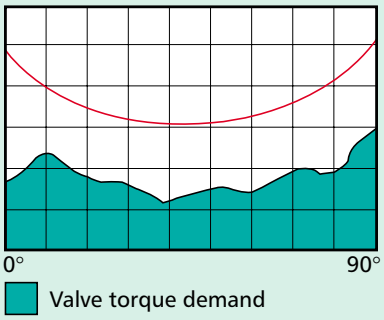
PNEUMATIC AND HYDRAULIC ACTUATORS FOR QUARTER TURN VALVES

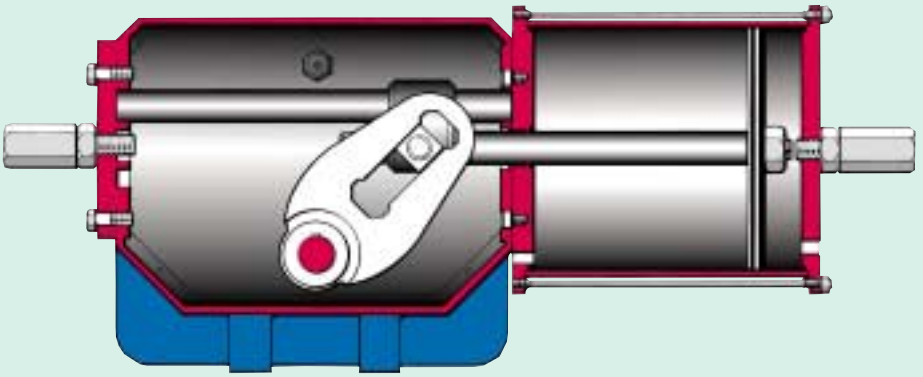
date of issue 01/01

Publication F100

GP and GH SCOTCH YOKE 90° ACTUATORS

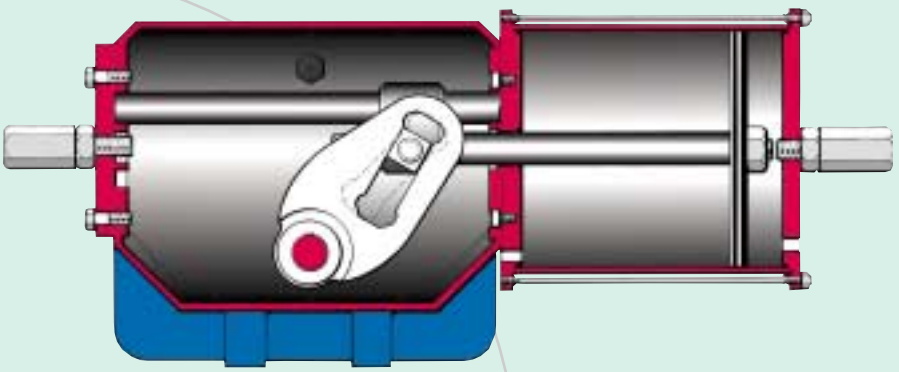
Symmetrical Scotch Yoke



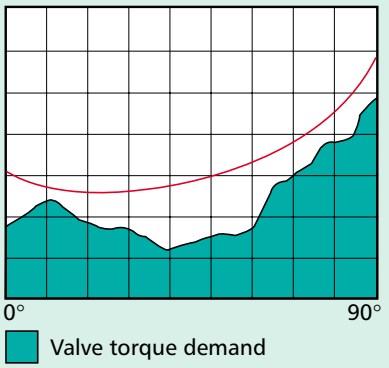


GP and GH Scotch Yoke Actuators are designed to operate ball, butterfly and plug valves requiring a quarter turn movement for either on/off or modulating duty. This classic design in its symmetrical form delivers torque in a manner shown in this diagram. It affords a rugged yet compact design for operating valves that require higher peak torque near the open or closed extremities of valve stroke.

GP and GH Actuators are alternatively supplied with canted torque arms, where the machine is biased to deliver more torque at one extremity of stroke. Use of canted torque arms can further reduce the cost, weight and size of actuation where the torque demand of the valve is highest at one end of stroke - normally at the close position.

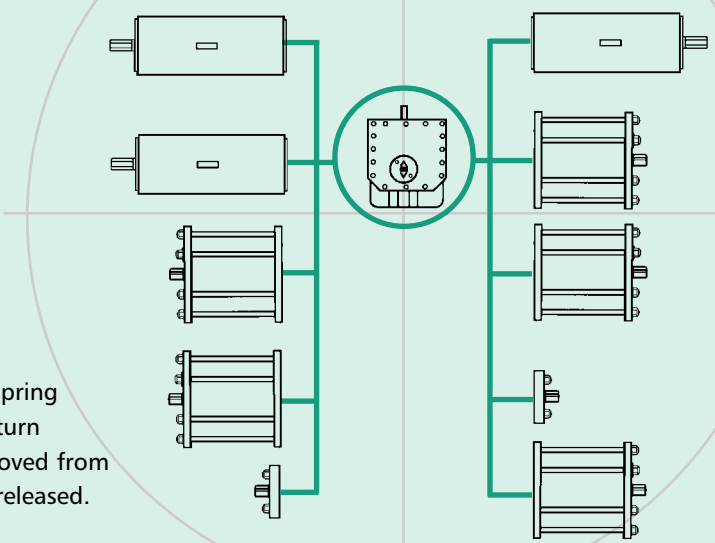


Canted Scotch Yoke



ROTORK ACTUATORS - MODULAR CONSTRUCTION

Rotork GP and GH Range actuators share a modular construction design. The centre body is available in five sizes. A pneumatic cylinder can be attached to either or both sides. A spring can cylinder can also be fitted to either side for Emergency Shut Down (ESD) applications. Modular construction and stocking of components by Rotork Fluid System Centres and a worldwide network of distributors facilitates quick delivery times.

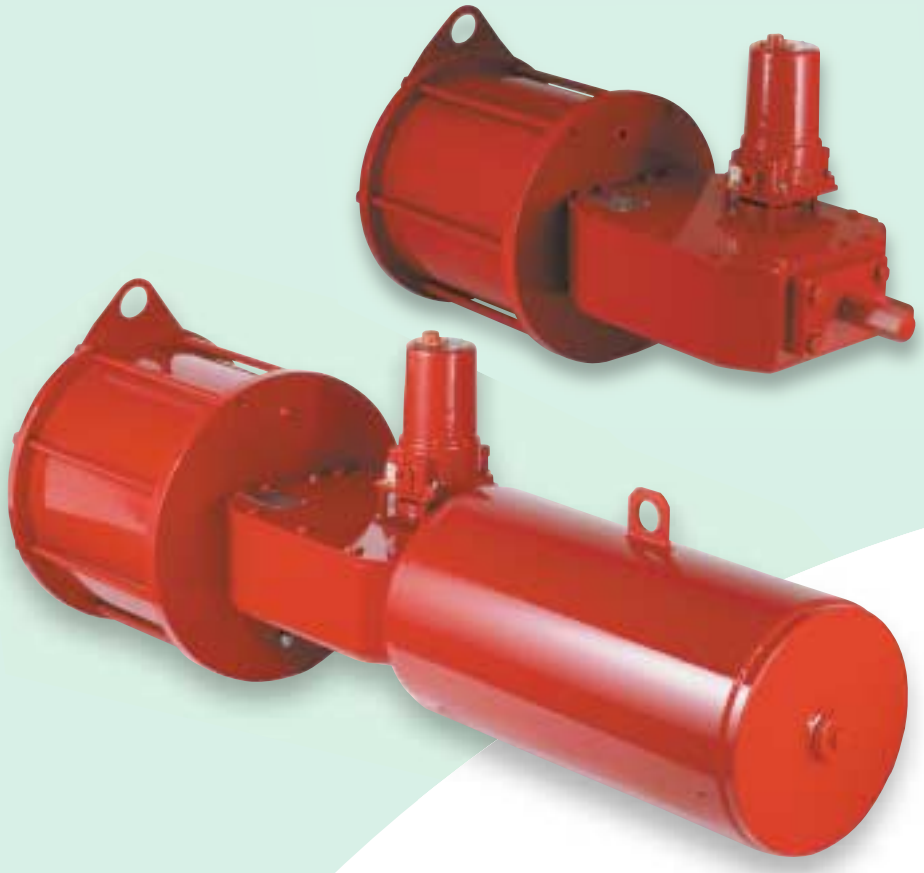


Safe and versatile

Spring return units can be assembled to provide spring return operation in either direction. The spring return module is inherently safe since it can only be removed from the centre body after all spring forces have been released.

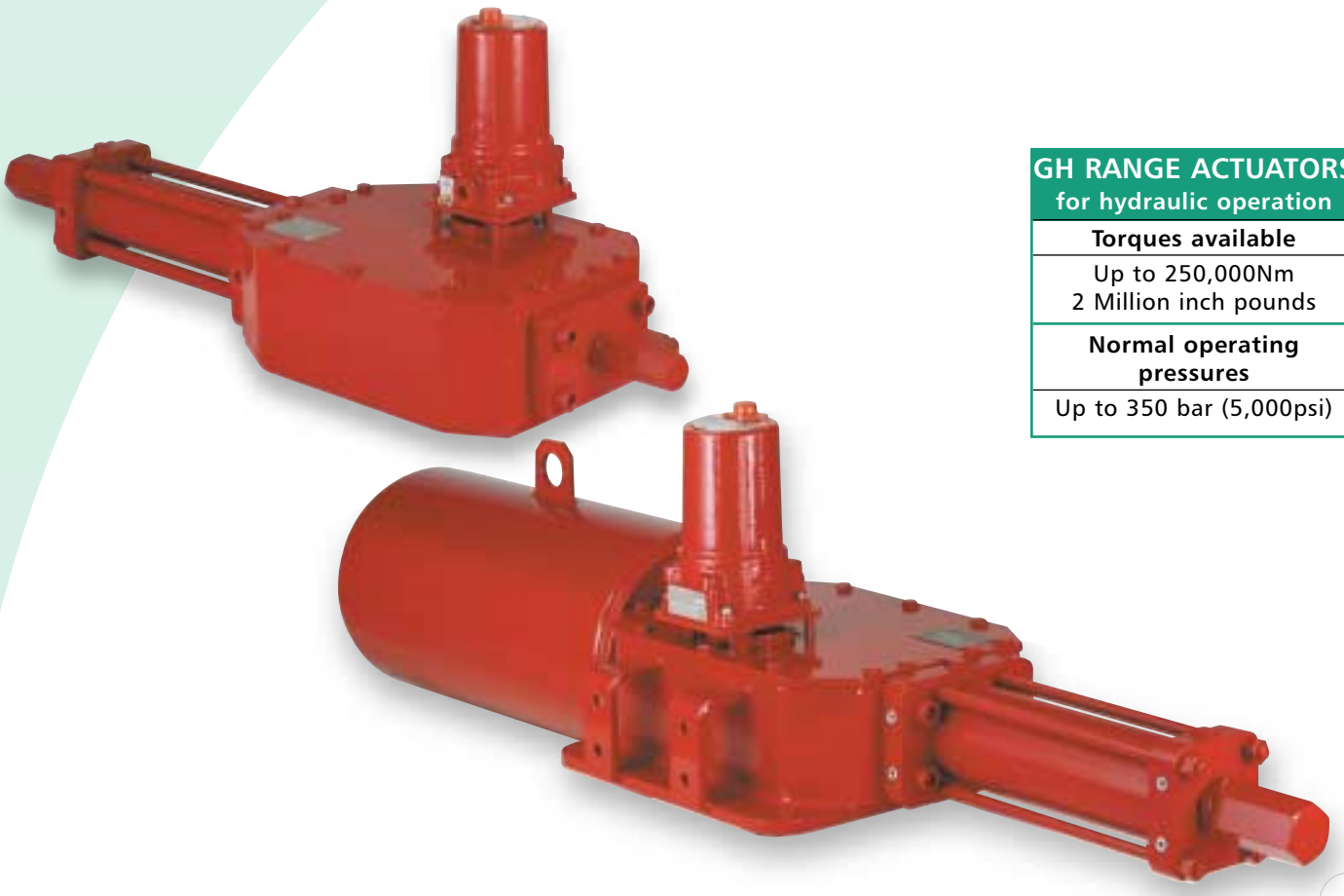
GP RANGE QUARTER-TURN PNEUMATIC ACTUATORS

rotork fluid system



GP RANGE ACTUATORS for pneumatic operation
Torques available
Up to 250,000Nm 2 Million inch pounds
Normal operating pressures
Up to 12 bar (174 psi) GG Range for high pressure gas also available

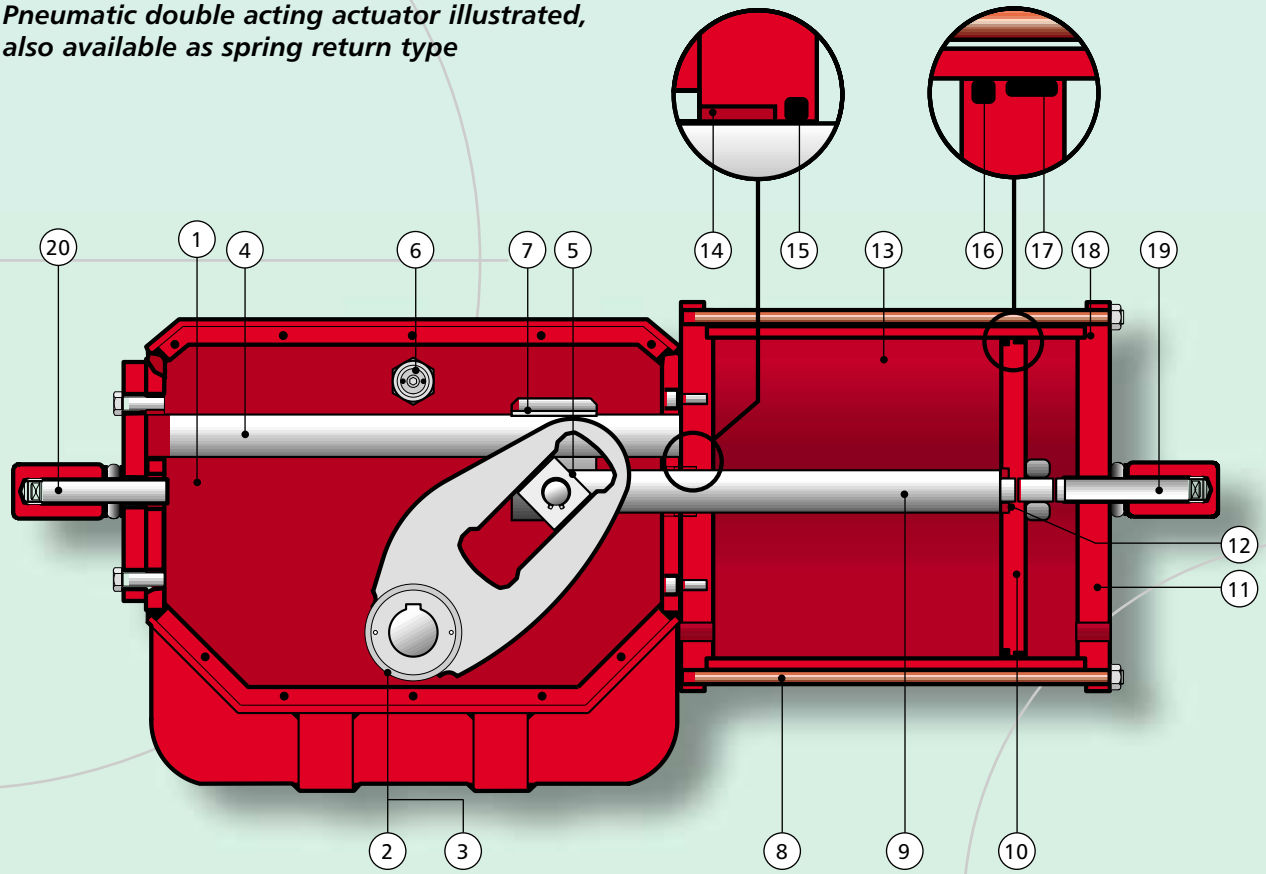
GH RANGE QUARTER-TURN HYDRAULIC ACTUATORS



GH RANGE ACTUATORS for hydraulic operation
Torques available
Up to 250,000Nm 2 Million inch pounds
Normal operating pressures
Up to 350 bar (5,000psi)

INSIDE THE GP RANGE ACTUATOR

Pneumatic double acting actuator illustrated, also available as spring return type



ITEM	DESCRIPTION	MATERIAL	U.S. STANDARD EQUIVALENCE
1	Housing	Carbon Steel	ASTM A 283 gr.D
2	Yoke	Carbon Steel	API 5LX gr.X 52+ASTM A%£& CL1
3	Yoke Bushing	Bronze	ASTM B427 ALLOY UNS N. C90800
4	Thrust Bar	Alloy Steel (Chromium plated)	AISI SAE 9840
5	Sliding Block	Bronze	ASTM B427 ALLOY UNS N. C90800
6	Vent Valve	Stainless Steel	AISI 304
7	Bushing	Steel, Bronze, PTFE	
8	Tie Rod	Alloy Steel	AISI SAE 9840
9	Piston Rod	Alloy Steel (Chromium plated)	AISI SAE 9840
10	Piston	Carbon Steel	ASTM A 283 gr.D
11	End Flange	Carbon Steel	ASTM A 283 gr.D
12	O-Ring*	NBR	
13	Cylinder Tube	Carbon Steel (ENP)	API 5LX gr.X52
14	Bushing	Steel + Bronze + PTFE	
15	Seals*	NBR + PTFE + Graphite	
16	O-Ring*	NBR	
17	Sliding Ring	PTFE + Graphite	
18	O-Ring*	NBR	
19	Stop Setting Screw	Alloy Steel	AISI SAE 9840
20	Stop Setting Screw	Alloy Steel	AISI SAE 9840

Full specification on CD ROM

Rotork Fluid System has available a CD ROM with an overview of our extensive line of fluid power products. It also contains an interactive sizing guide, downloadable dimension drawings, schematics, specifications and assorted technical information sheets.
To obtain a copy for your PC, contact the Rotork Fluid System office nearest you.

Paint specification

Offshore service application to protect against severe weathering, chemical atmospheres, salt spray and petroleum products.

Surface preparation
Sandblasting to grade SA 2.1/2

Prime coat
Inorganic zinc 75 microns DFT

Intermediate coat
epoxy 110 microns DFT

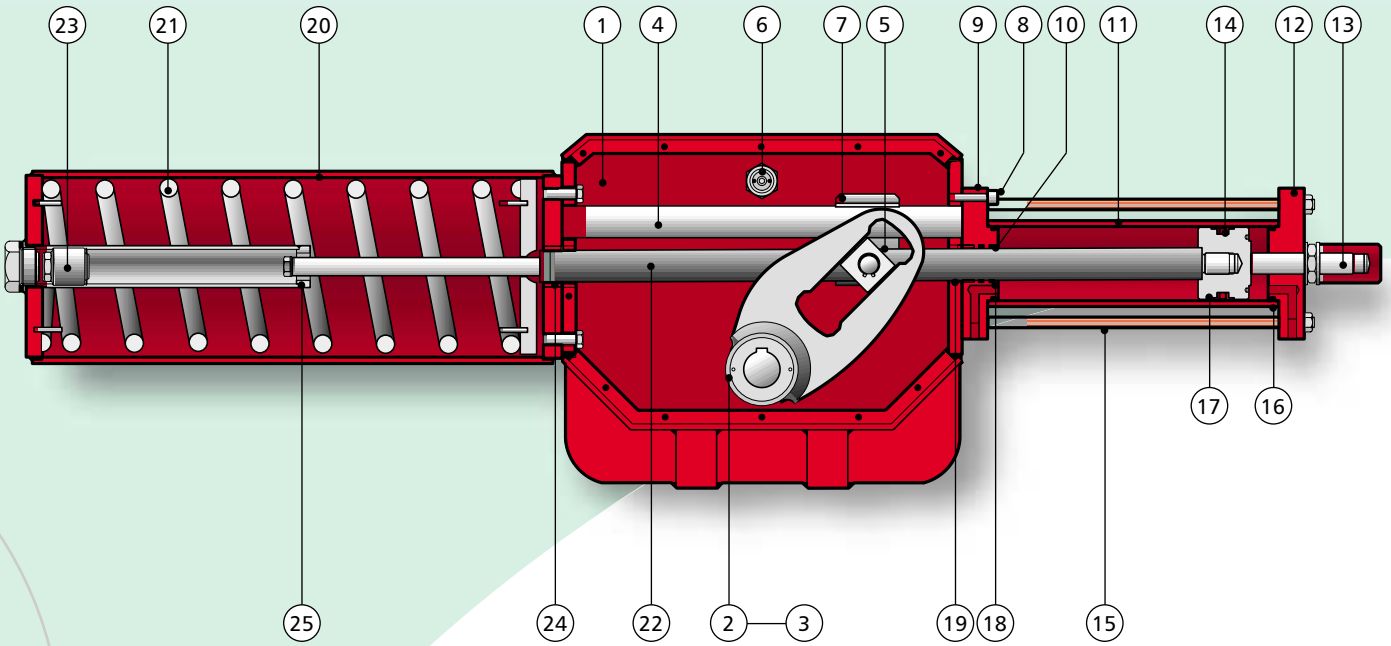
Final coat
Polyurethane 40 microns DFT

Colour
RAL 3011 Dark red 225 microns total DFT

INSIDE THE GH RANGE ACTUATOR

rotork fluid system

Hydraulic spring return actuator illustrated, also available as double acting type



ITEM	DESCRIPTION	MATERIAL	US STANDARD EQUIVALENCE
1	Housing	Carbon Steel	ASTM A 283 gr.D
2	Yoke	Carbon Steel	API 5LX grX 52 + ASTM A537 CL1
3	Yoke Bushing	Bronze	ASTM B427 Alloy UNS N. C90800
4	Thrust Bar	Alloy Steel (Chromium plated)	AISI SAE 9840
5	Sliding Block	Bronze	ASTM B427 Alloy UNS N. C 90800
6	Vent Valve	Stainless Steel	AISI 304
7	Bushing	Steel, Bronze, PTFE	
8	Screw	Alloy Steel	AISI SAE 9840
9	Head Flange	Carbon Steel	ASTM A 283 gr.D
10	O-Ring*	NBR	
11	Cylinder	Carbon Steel (ENP)	ASTM A 283 gr.D
12	Bottom Flange	Carbon Steel	ASTM A 283 gr.D
13	Stop Setting Screw	Alloy Steel	AISI SAE 9840
14	Seals*	NBR + PTFE	
15	Tie Rod	Alloy Steel	AISI SAE 9840
16	O-Ring*	NBR	
17	Piston	Carbon Steel	ASTM A283 gr.D
18	Seal*	NBR + PTFE + Bronze	
19	Bushing	Steel + Bronze + PTFE	
20	Spring Cartridge	Carbon Steel	ASTM A 283 gr.D
21	Spring	Alloy Steel	ASTM A 29 gr.9254
22	Spring Cartridge Stem	Alloy Steel (Chromium Plated)	AISI SAE 9840
23	Stop Setting Screw	Alloy Steel	AISI SAE 9840
24	Bushing	Steel, Bronze, PTFE	
25	Bushing	Steel, Bronze, PTFE	

Rotork Fluid System - Approvals and Industry Standards

All hydraulic actuators are flushed as standard. Flushing to NAS1638 class 6 is available on request.
EN 10204 3.1b Certification for critical components.

Actuators and controls in accordance with UK health and safety requirements for pipeline safety regulations SI 825 (1996).

Actuator Design calculation procedure approval by Lloyds (report no. 094/5152).

Rotork ensure that where applicable actuators offered will be in full compliance with EU pressure equipment directive PED SI-2001.

Actuators are to IP66 standards.

Hydrostatic valve and actuator testing facilities available.

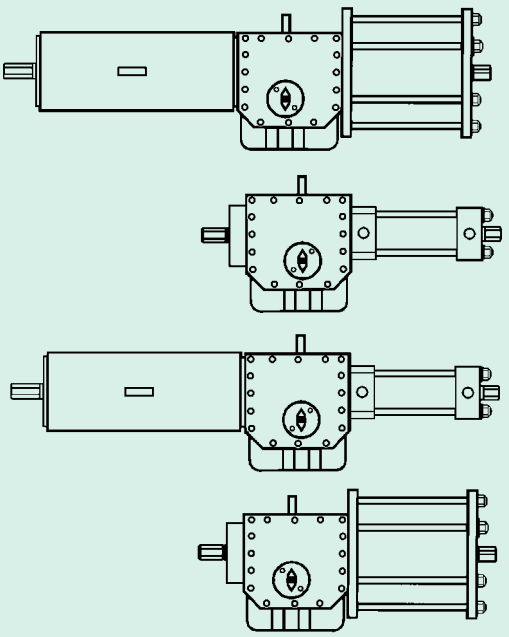
*** Actuator Seals**

Standard **NBR** -20°C to 60°C (-4°F to 140°F)
High Temp **Viton** >60°C (>140°F)
Low Temp **Fluorosilicone** <-20°C (<-4°F)

KEY DESIGN FEATURES

Every Rotork Fluid System actuator is built to provide long and efficient service with minimum maintenance. The design, engineering and materials used in construction ensure optimum performance even in the harshest environments. Listed here are some of the most important features that enable Rotork GP and GH actuators to achieve and maintain this high level of service.

The GP and GH actuators are of a rugged, efficient and compact design incorporating an internal chromium plated guide bar to absorb side loads during operation of the scotch yoke mechanism.



GP/GH Range Quarter-turn operation:

- Standard range covers torque requirements up to 250,000 Nm (2 million inch pounds) - higher output torques are available on request.
- Double acting and single acting (spring return) versions are available.
- Carbon steel scotch yoke mechanism - available in either symmetric or canted form, to follow application-specific valve requirements with minimum cost and weight.
- Totally enclosed weatherproof housing in fabricated carbon steel and complete with bottom relief valve to avoid any undesired over-pressurisation.
- Bronze sliding blocks on the torque arm to ensure minimum friction and long service life.
- Alloy steel chromium plated thrust bar to support the transverse loads of the scotch yoke.
- Carbon steel, electroless nickel plated cylinders fitted with mechanical end stop to ensure accurate angular stroke adjustment +/-5°
- Carbon steel piston with dynamic floating seal to reduce friction and avoid stick-slip effect even after prolonged periods without operation.
- Chromium plated piston rod.
- For spring return versions the spring is totally enclosed in a carbon steel enclosure cartridge.
- Scotch yoke centre body designed so that the spring can only be removed in the fully relaxed state - thus avoiding the possibility of injury during disassembly.
- Standard valve position indicator.
- Double acting actuators can be supplied with emergency tanks to allow operation during supply failure.

CONTROLS

rotork fluid system

Control component packages are a part of any actuator/valve installation. Rotork has extensive experience in the design and assembly of all types of fluid power control systems to satisfy any customer requirement for on/off, modulating or ESD service. Packages can be mounted on a panel or in a cabinet and mounted either on the actuator or at a remote location.

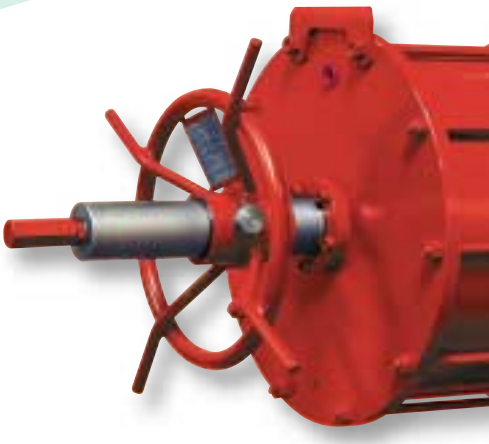
Emergency and Manual override

Emergency manual operating is guaranteed using the optional jackscrew with handwheel. Reduction gearing for large actuators, declutchable and removable handwheels are also available.

For larger, high torque actuators, hydraulic manual override units are also available.

Limit switch

Specially designed for use in extreme environments, the MB1 limit switch has a mechanical position indicator, weather proof protection class IP 67 and is explosion proof to CENELEC EN 50014 and EN 50018 EEx-d-IIC T6 (see publication F600).



Optional emergency handwheel (above) and limit switch (left)

FLOWPAK INTEGRATED CONTROL SYSTEMS

In addition to the conventional control solutions generally associated with pneumatic and hydraulic systems, Rotork offers a versatile, integral control package called Flowpak. All control components are placed within a single enclosure mounted on the actuator. This has many advantages including greatly simplified commissioning. Flowpak also integrates pneumatic and hydraulic controls with digital supervisory systems. For more information on Flowpak request publication F610E.

KEY DESIGN FEATURES

- Manifold block integrates all pneumatic or hydraulic piping.
- Certified explosion proof assembly covered by a single certificate.
- Certified submersible for 72 hours at 50 metres.
- Rotatable terminal compartment simplifies conduit connections.
- Digital communication networks are available for Profibus, Foundation Fieldbus and Rotork Pakscan.

Rotork Fluid System Centres of Excellence

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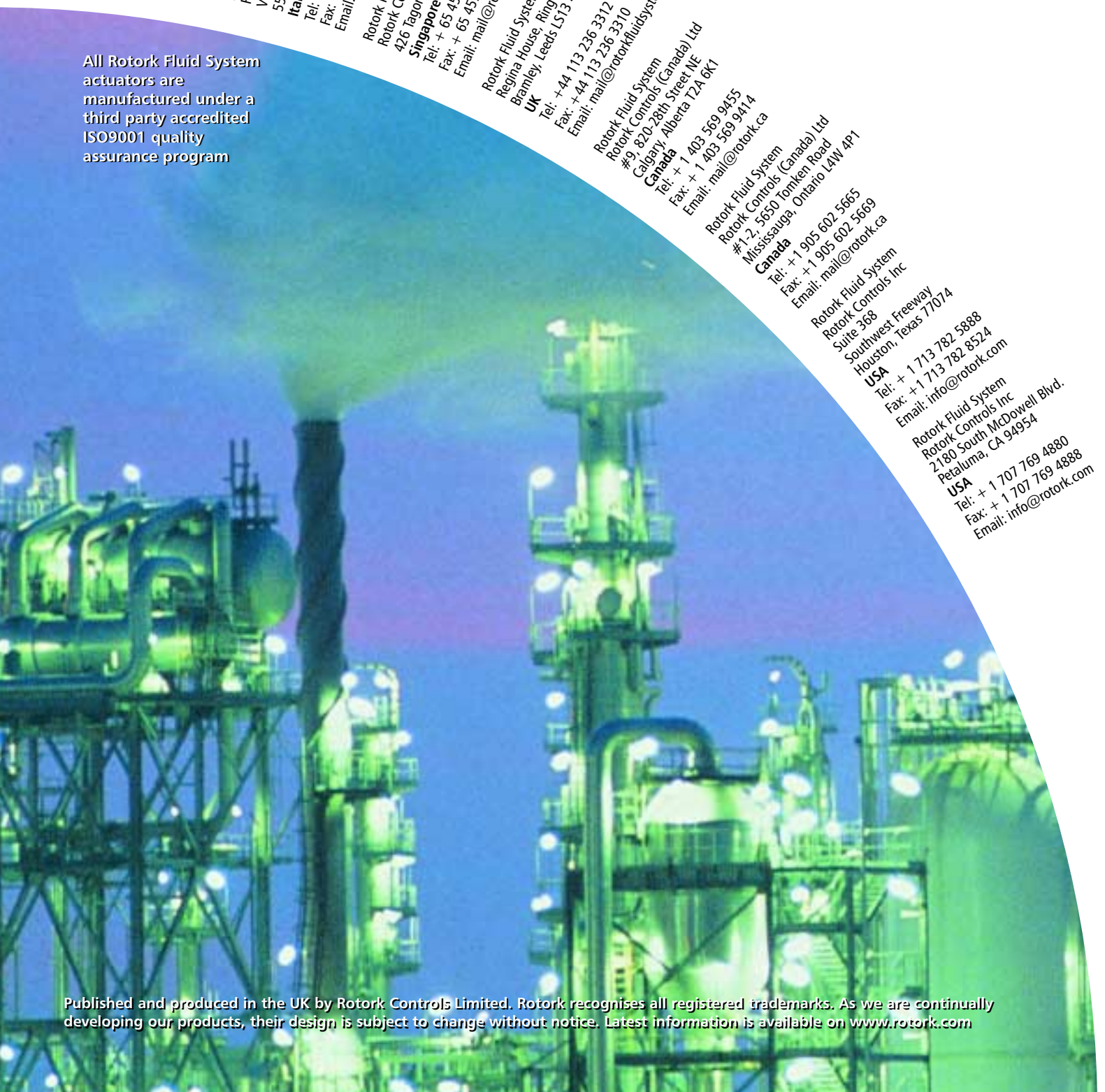
All Rotork Fluid System actuators are manufactured under a third party accredited ISO9001 quality assurance program



RC200

Pneumatic Actuators
DA – Double acting

TORQUE Nm

4 bar

Type	0°	50°	90°
RC210-DA	25	12	18
RC220-DA	51	25	36
RC230-DA	96	47	69
RC240-DA	195	97	140
RC250-DA	300	150	215
RC260-DA	610	300	440
RC270-DA	1260	630	910
RC280-DA	2540	1270	1830

5,5 bar

Type	0°	50°	90°
RC210-DA	34	17	25
RC220-DA	70	35	50
RC230-DA	130	66	95
RC240-DA	270	135	190
RC250-DA	410	210	300
RC260-DA	840	420	600
RC270-DA	1730	860	1250
RC280-DA	3500	1750	2500

TORQUE Nm

6 bar

Type	0°	50°	90°
RC210-DA	38	19	27
RC220-DA	76	38	54
RC230-DA	145	72	105
RC240-DA	290	145	210
RC250-DA	450	225	320
RC260-DA	910	460	650
RC270-DA	1890	940	1360
RC280-DA	3800	1900	2740

7 bar

Type	0°	50°	90°
RC210-DA	44	22	32
RC220-DA	88	44	63
RC230-DA	165	83	120
RC240-DA	340	170	240
RC250-DA	530	260	380
RC260-DA	1070	530	770
RC270-DA	2200	1100	1590
RC280-DA	4450	2220	3190

AIR CONSUMPTION RC200-DA

Free air at 6 bar air pressure

Type	Anticlockwise rotation dm^3	Clockwise rotation dm^3
RC210-DA	0,6	1,1
RC220-DA	1,1	1,3
RC230-DA	2,2	4,0
RC240-DA	4,4	5
RC250-DA	6,9	13
RC260-DA	13,8	16
RC270-DA	33	54
RC280-DA	66	67

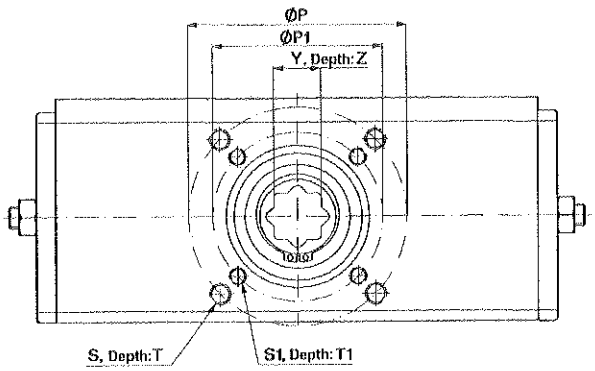
OPERATION TIME RC200-DA

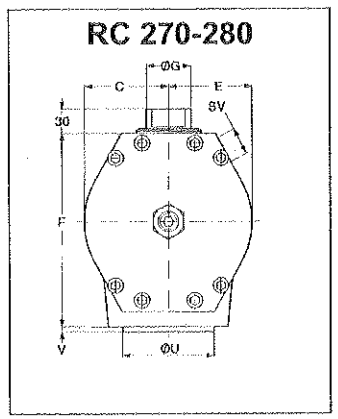
At 6 bar air pressure

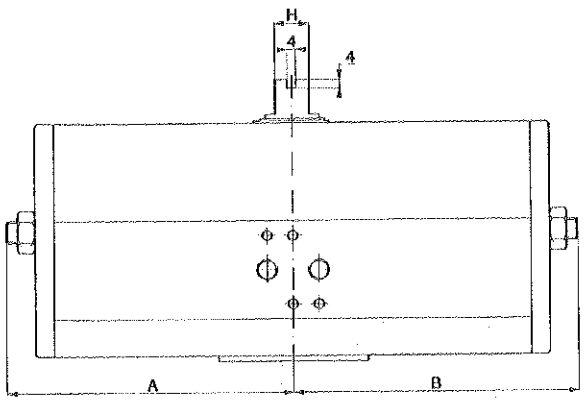
Type	Anticlockwise rotation sec.	Clockwise rotation sec.
RC210	<0,25	<0,5
RC220	<0,25	<0,3
RC230	<1	<0,25
RC240	<1	<1
RC250	<1,5	<2,5
RC260	<2	<2,5
RC270	<4	<6
RC280	<5	<5

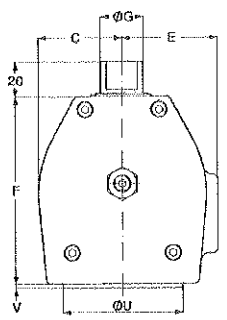
The times relate to full air flow and may increase depending on solenoid valves and the dimensions of connecting pipes.

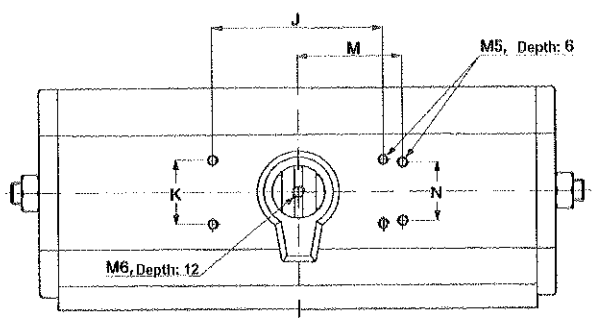
TECHNICAL DATA

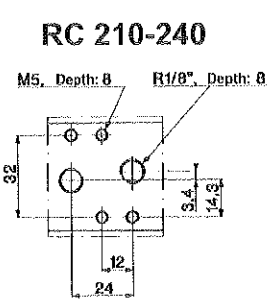


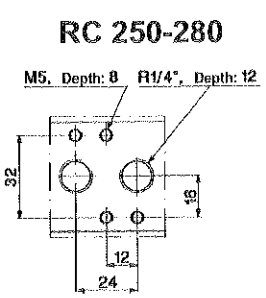












Technical data:
Max. working pressure 10 bar. Operating medium: air or inert gases. On request also low pressure hydraulics.
Ambient temperature: –20 to +80 °C. Actuators for other temperature ranges can be delivered on request.

MEASUREMENTS RC200-DA Standard design

Type	N.Fl	A	B	C	E	F	G	H	J	K	M	N	Fl	P	S	T	Fl	P1	S1	T1	U	V	Y**	Z	Weight kg
RC210-DA	F05	45	98	32	41	75	16	10	35,4	35,4	40	30	F05	50	M6	11	-	-	-	-	35	2	14	19	1,2
RC220-DA	F05	98	98										F05	50	M6	11					35		14	19	1,6
RC230-DA	F07	65	135	49	55	110	25	16	80	30	-	-	F10*	102*	M10*	17*	F07	70	M8	14	55	3	17	30	3,5
RC240-DA	F10	135	135										F10	102	M10	17	F07*	70*	M8*	14*	70		22	30	4,9
RC250-DA	F10	90	190	69	75	155	35	22					F12*	125*	M12*	21*	F10	102	M10	17	70			37	9,4
RC260-DA	F12	190	190										F12	125	M12	21	F10*	102*	M10*	17*	85		27	37	12,5
RC270-DA	F14	145	300	110	110	248	60	40	130				F14	140	M16	25	-	-	-	-	100	4	36	64	32,0
RC280-DA	F16	300	300										F16	165	M20	32	F12*	125*	M12*	25*	130	5	46	64	42,0

N.Fl = Nominal ISO/DIN flange. I.e. mounting hole circle to valve, guide ring diameter U and measure Y follow the same standard flange.
SV = Connection to solenoid valve on RC270–280.
* = Extra mounting holes on all RC230–260 and 280 for alternative ISO/DIN hole pattern.
** = Tolerance H9. The hole is octagonal and adapts to valve stems with squares both in 90° and 45° direction.
RC270 also has the following hole pattern on the bottom side: CC 170 x 110 mm placed alongside the actuator, 4 pcs M16, depth 25 mm.
RC280 also has the following hole pattern on the bottom side: CC 234,7 x 97,2 mm, 4 pcs M16, depth 25 mm, which corresponds to 4 pcs of 8 pcs F25-holes.
Regarding special designs: Please ask for a special brochure from Remote Control.

Pneumatic Actuators
SR – with spring return

TORQUE Nm

4,1 bar/60 psi*

	Air opens →			Spring closes →		
Type	0°	60°	90°	90°	30°	0°
RC210-SR	14	6	7,5	12	6	8,5
RC220-SR	29	12	15	25	12	17
RC230-SR	54	23	29	47	23	33
RC240-SR	110	47	58	96	47	66
RC250-SR	170	74	90	150	74	100
RC260-SR	345	150	180	305	150	210
RC270-SR	710	310	380	630	310	430
RC280-SR	1430	620	760	1270	620	870

Air 5,5 bar/80 psi - Springs for 87 psi

	Air opens →			Spring closes →		
Type	0°	60°	90°	90°	30°	0°
RC210-SR	18	7	8,5	18	9	12
RC220-SR	36	15	18	37	18	25
RC230-SR	68	28	33	69	33	47
RC240-SR	138	56	67	140	68	96
RC250-SR	210	88	105	215	105	150
RC260-SR	440	180	210	440	215	305
RC270-SR	910	370	440	910	440	620
RC280-SR	1820	740	880	1840	900	1260

* Springs adapted to air pressures above

TORQUE Nm

6 bar/87 psi*

	Air opens →			Spring closes →		
Type	0°	60°	90°	90°	30°	0°
RC210-SR	20	9	11	18	9	12
RC220-SR	41	18	22	37	18	25
RC230-SR	78	33	41	69	33	47
RC240-SR	158	68	84	140	68	96
RC250-SR	245	105	130	215	105	150
RC260-SR	500	215	265	440	215	305
RC270-SR	1030	440	550	910	440	620
RC280-SR	2080	900	1110	1840	900	1260

7 bar/100 psi*

	Air opens →			Spring closes →		
Type	0°	60°	90°	90°	30°	0°
RC210-SR	24	10	13	21	10	14
RC220-SR	48	21	26	43	21	29
RC230-SR	92	39	48	81	39	55
RC240-SR	185	80	98	163	80	115
RC250-SR	290	125	155	255	125	175
RC260-SR	580	250	310	515	250	350
RC270-SR	1210	520	640	1060	520	720
RC280-SR	2430	1050	1290	2150	1050	1470

AIR CONSUMPTION RC200-SR

Free air at 6 bar air pressure

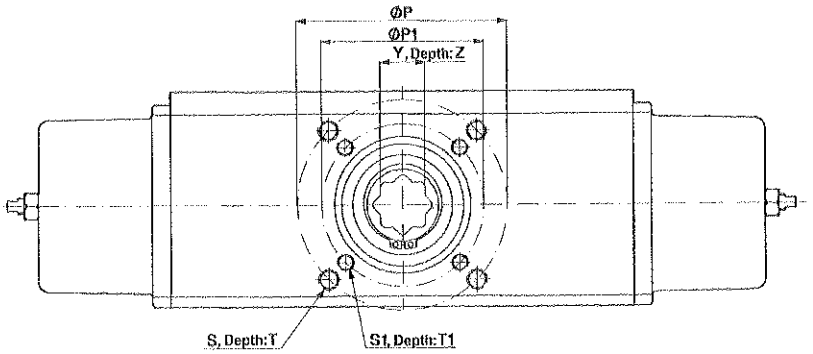
Type	dm³
RC210-SR	1,1
RC220-SR	1,3
RC230-SR	4,0
RC240-SR	5
RC250-SR	13
RC260-SR	16
RC270-SR	54
RC280-SR	67

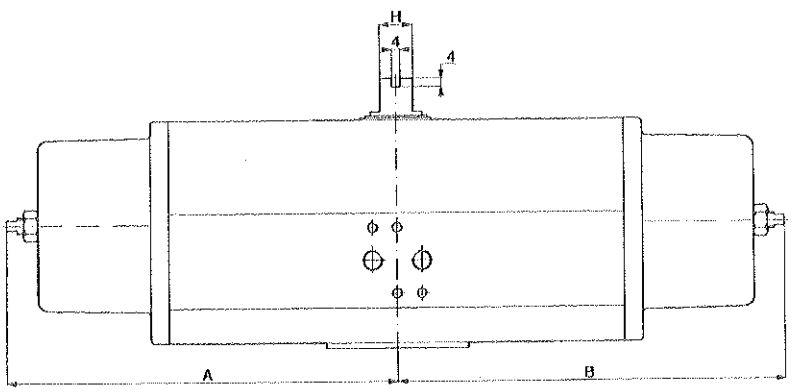
OPERATION TIME RC200-SR

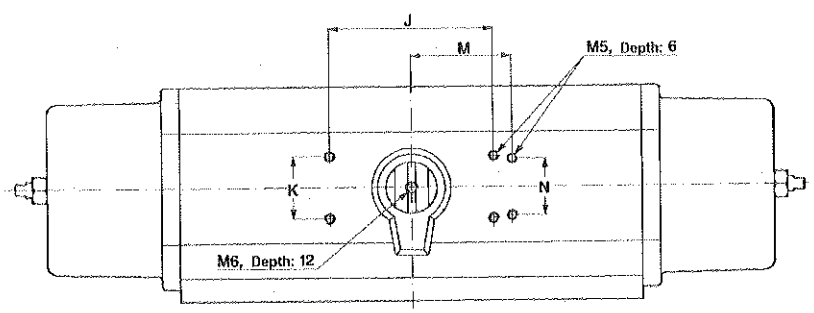
At 6 bar air pressure

Type	Anticlockwise and clockwise rotation sec.
RC210	<0,5
RC220	<0,3
RC230	<0,25
RC240	<1
RC250	<2,5
RC260	<2,5
RC270	<6
RC280	<5

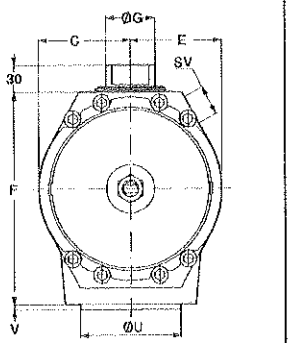
The times relate to full air flow and may increase depending on solenoid valves and the dimensions of connecting pipes.



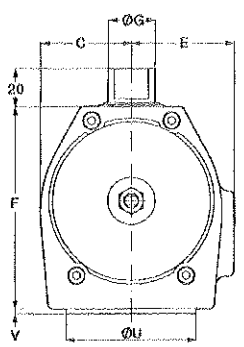




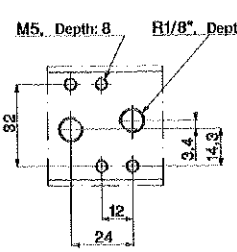
RC 270-280



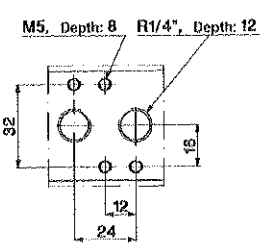
RC 210-260



RC 210-240



RC 250-280



Technical data:
Max. working pressure 10 bar. Operating medium: air or inert gases. On request also low pressure hydraulics.
Ambient temperature: –20 to +80 °C. Actuators for other temperature ranges can be delivered on request.

MEASUREMENTS RC200-SR Standard design

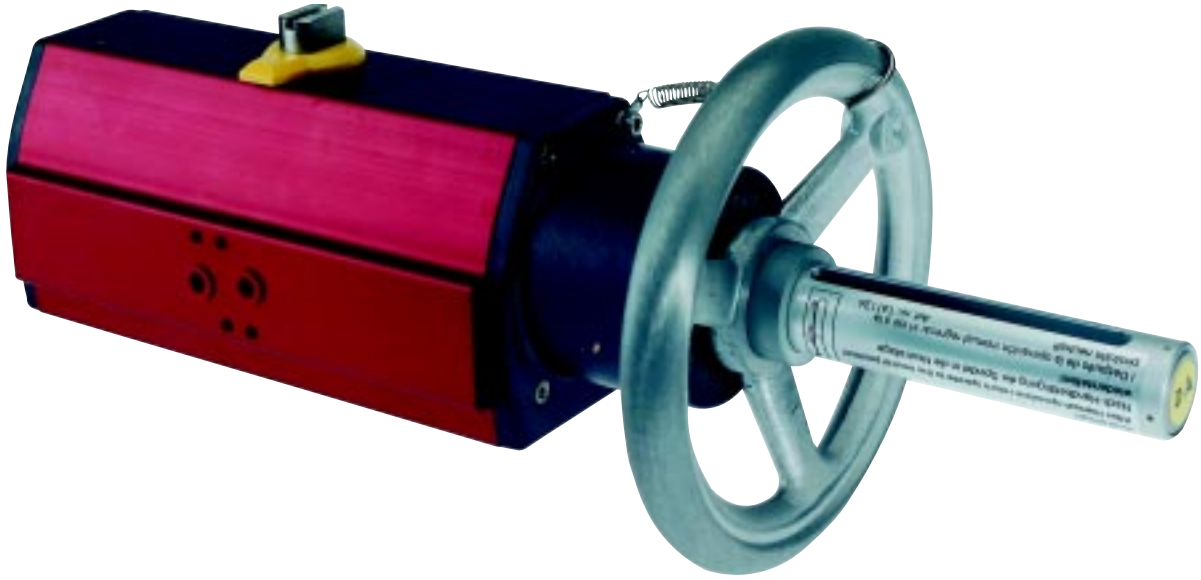
Type	N.FI	A	B	C	E	F	G	H	J	K	M	N	FI	P	S	T	FI	P1	S1	T1	U	V	Y**	Z	Weight kg
RC210-SR	F05	45	150	32	41	75	16	10	35,4	35,4	40	30	F05	50	M6	11	-	-	-	-	35	2	14	19	1,5
RC220-SR	F05	150	150										F05	50	M6	11					35		14	19	2,2
RC230-SR	F07	65	200	49	55	110	25	16	80	30	–	–	F10*	102*	M10*	17*	F07	70	M8	14	55	3	17	30	4,2
RC240-SR	F10	200	200										F10	102	M10	17	F07*	70*	M8*	14*	70		22	30	7,0
RC250-SR	F10	90	285	69	75	155	35	22					F12*	125*	M12*	21*	F10	102	M10	17	70			37	12,4
RC260-SR	F12	285	285										F12	125	M12	21	F10*	102*	M10*	17*	85		27	37	18,5
RC270-SR	F14	145	510	110	110	248	60	40	130				F14	140	M16	25	-	-	-	-	100	4	36	64	45,0
RC280-SR	F16	510	510										F16	165	M20	32	F12*	125*	M12*	25*	130	5	46	64	68,0

N.FI = Nominal ISO/DIN flange. I.e. mounting hole circle to valve, guide ring diameter U and measure Y follow the same standard flange.
SV = Connection to solenoid valve on RC270–280.
* = Extra mounting holes on all RC230–260 and 280 for alternative ISO/DIN hole pattern.
** = Tolerance H9. The hole is octagonal and adapts to valve stems with squares both in 90° and 45° direction.
RC270 also has the following hole pattern on the bottom side: CC 170 x 110 mm placed alongside the actuator, 4 pcs M16, depth 25 mm.
RC280 also has the following hole pattern on the bottom side: CC 234,7 x 97,2 mm, 4 pcs M16, depth 25 mm, which corresponds to 4 pcs of 8 pcs F25-holes.
Regarding special designs: Please ask for a special brochure from Remote Control.

Ref No 851 / Art No 990 851

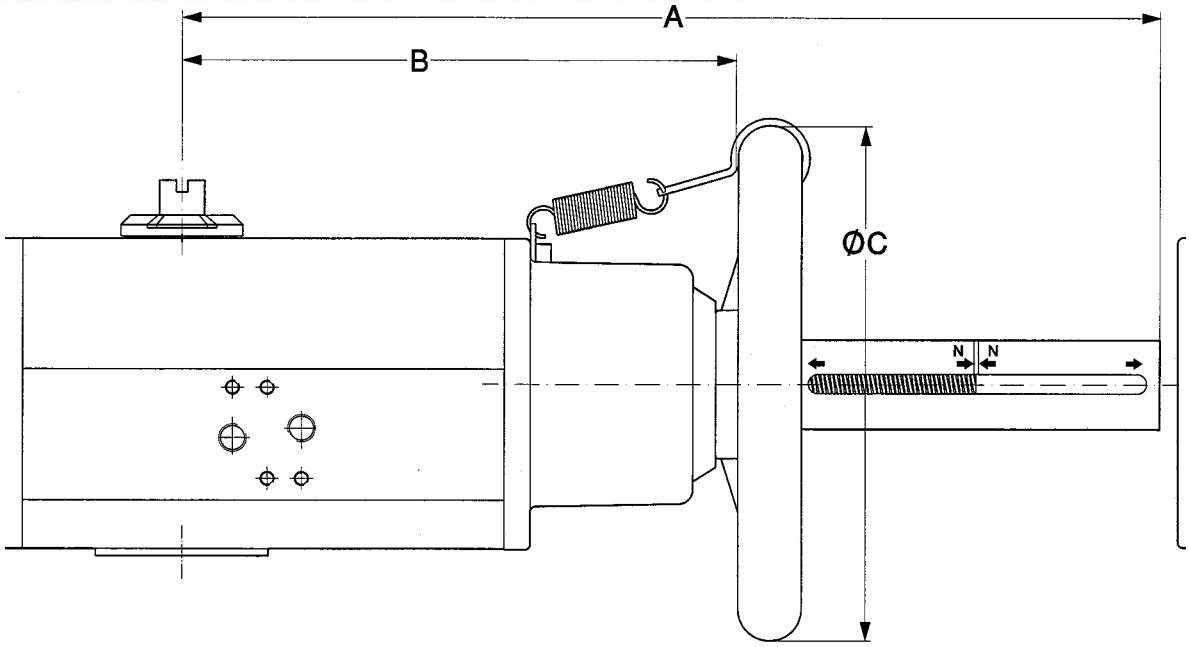
RC200

With manual override unit M1



- For DA and SR actuators, sizes RC210 to RC280.
- Leaves the top of the actuator free for the fitting of accessories.
- Enables locking of the actuator in open and closed position. Especially useful with spring return units SR.
- The handwheel is standing still during remote operation.
- Eliminates the need of dangerous levers / keys during manual operation.
- Simple and secure function.

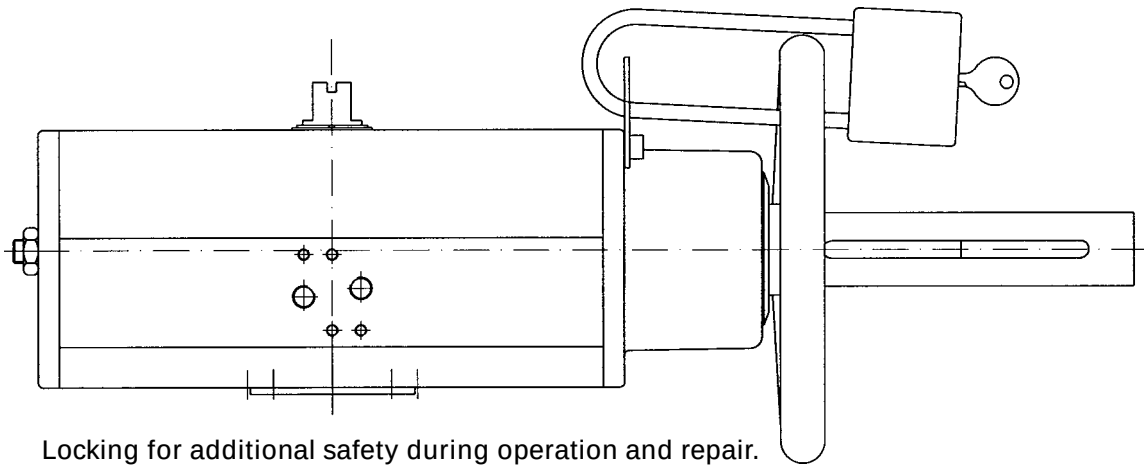
REMOTE CONTROL



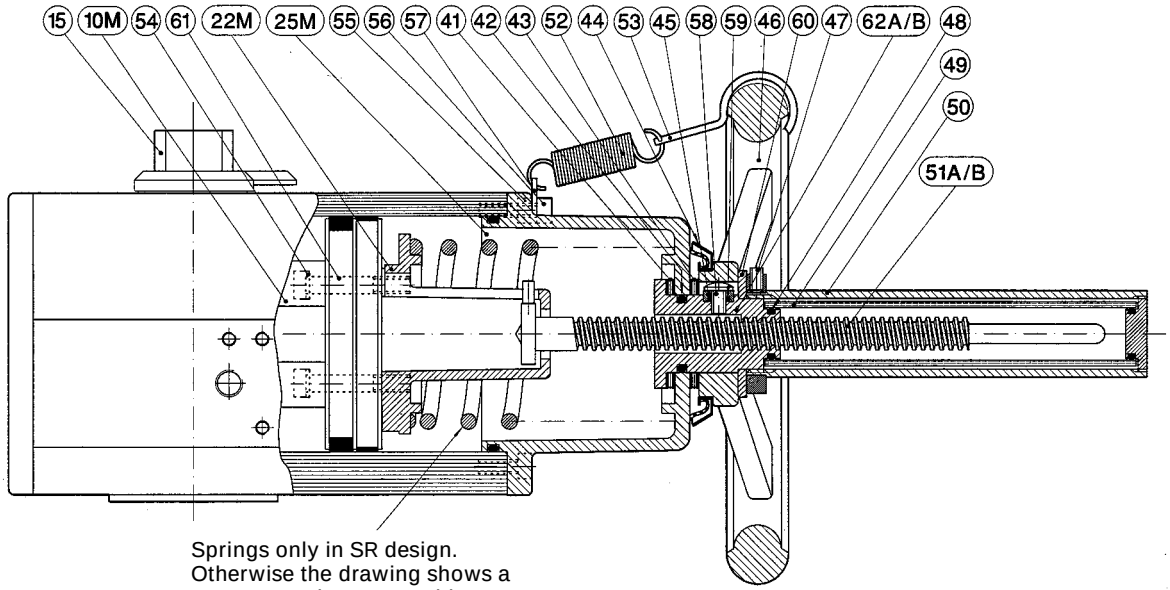
DIMENSIONS in mm			
DA/SR	**A**	**B**	**C**
RC210–220	290	145	180
RC230–240	340	190	180
RC250–260	500	295	320
RC270	800	515	400
RC280	800	490	600

Other measures according to Technical Data No 851.

SPECIAL DESIGN



Locking for additional safety during operation and repair.
Cut the flow and lock with a padlock.



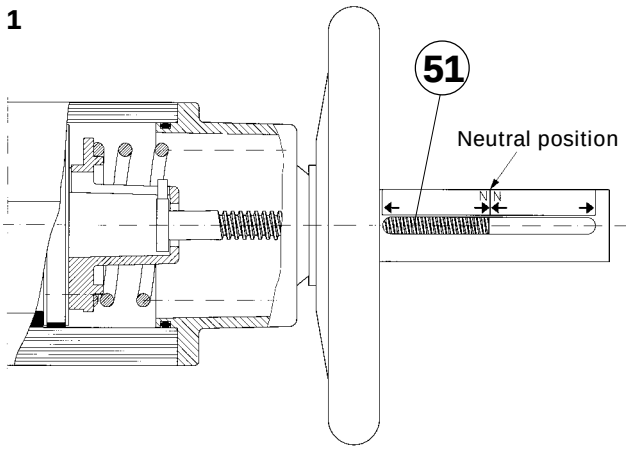
Material table

Detail No	Denomination	Number	Material	Surface treatment
10M	Piston M	1	Aluminium	—
22M	Spring guide M	1	RC210–260: Aluminium	—
			RC270–280: Ductile iron	Corrosion protection
25M	Spring housing M	1	Aluminium	Anodized
41	Needle roller bearing, RC250–280	1	Ball bearing steel	—
42	O-ring	1	Nitrile	—
43	Slide bearing, RC210–240	1	Tin bronze	—
	Needle roller bearing, RC250–280	1	Ball bearing steel	—
44	Cuff sealing	1	RC210–240: Nitrile	—
			RC250–280: Nitrile/steel	Zinc plated
45	Key	1	RC210–240: Brass	—
			RC250–280: Steel	—
46	Handwheel	1	Aluminium	Anodized
47	Set screw	1	Stainless steel	—
48	O-ring	2	Nitrile	—
49	Tube, transparent	1	Acrylic plastic	—
50	Protecting tube	1	Aluminium	Anodized
51A	Stem, DA (right-threaded)	1	Steel	—
51B	Stem, SR (left-threaded)	1	Steel	—
52	Spring	1	Stainless spring steel	—
53	Locking hook	1	Stainless steel	—
54	Tredo-sealing	2	Nitrile/steel	Zinc plated
55	Spacer, RC210–260	1	Stainless steel	—
56	Screw, RC210–260	1	Stainless steel	—
57	Spring holder	1	Stainless steel	—
58	Screw	1	Steel	Zinc plated
59	O-ring	1	Nitrile	—
60	Spacing washer, RC250–260	1	Aluminium	Anodized
61	Screw	2	Steel	Zinc plated
62A	Stem nut, DA (right-threaded)	1	RC210–240: Brass	—
			RC250–280: Ductile iron	Zinc plated
62B	Stem nut, SR (left-threaded)	1	RC210–240: Brass	—
			RC250–280: Ductile iron	Zinc plated

Other details according to Instruction No 836.

FUNCTIONAL DESCRIPTION

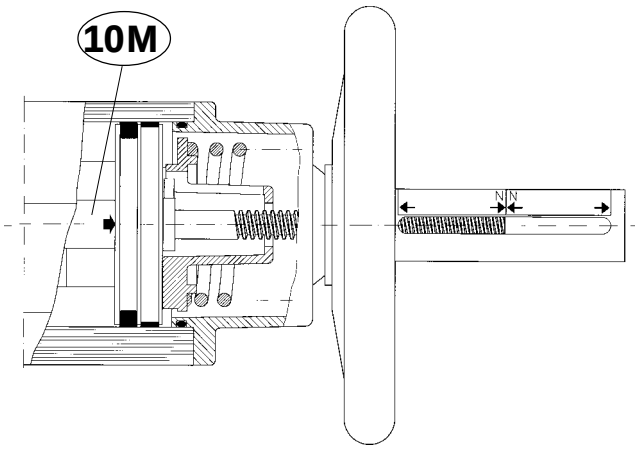
1



Neutral position

With the stem (51) in neutral position, the piston (10M) can move freely and the actuator can be operated pneumatically. The picture shows a double acting actuator, DA, in "open" position or a single acting actuator, SR, in "closed" position.

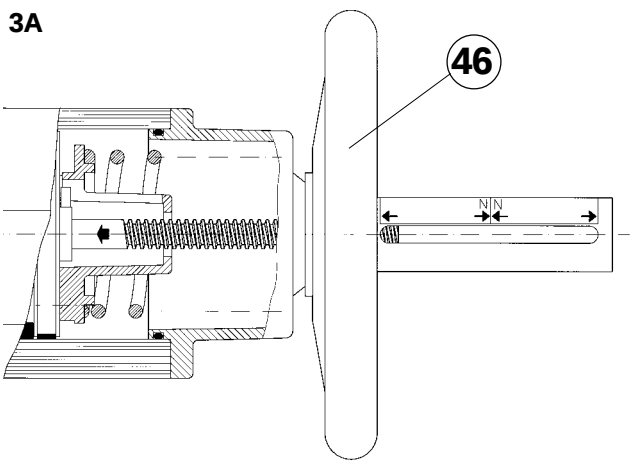
2



End position adjustment

M1 in neutral position works as an end position stop.
DA: Adjustment of closed valve position.
SR: Adjustment of open valve position.
Adjustment degree: +3° / –90° in relation to the end position.

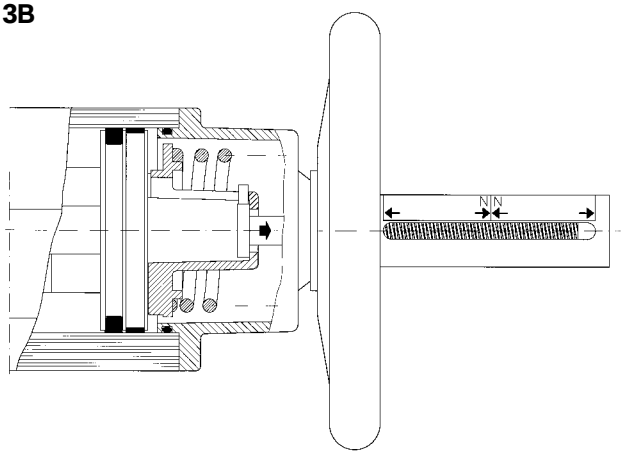
3A



Manual operation

DA: The handwheel (46) is turned anti-clockwise. The stem (51) and piston (10M) are pressed inwards. The valve opens.
SR: The handwheel is turned clockwise. The stem and piston are pressed inwards. The valve closes.

3B



Manual operation

DA: The handwheel is turned clockwise. The stem and piston are drawn outwards. The valve closes.
SR: The handwheel is turned anti-clockwise. The stem and piston are drawn outwards. The valve opens.

The actuator shaft (15) is thus turned in the same direction as the handwheel.
When the actuator has been operated manually, a return to the neutral position must take place before remote operation can be performed again.
On dismounting the manual operation housing (25M), the actuator **must** first be ventilated, for SR actuators the stem (51) **must** also be in neutral position.
See instruction No 836.

190 C / Art No 980190

Positioner with HART Communication

Type 3780

Application

Single-acting or double-acting positioner for attachment to pneumatic control valves. Supplied with a standardized electric input signal from 4 to 20 mA · For **rated travels from 5 to 255 mm and opening angles up to 120°**

Smart instrument according to the HART® Field Communication Protocol. Designed for types of protection **EEx ia, EEx n** or **EEx d**.

The microprocessor-controlled positioner ensures a preset assignment of the valve stem position to the electric input signal. It compares the 4 to 20 mA reference input signal received from the control device to the travel of the control valve and generates the corresponding pneumatic output signal pressure (output variable).

Suitable for attachment to both linear and rotary actuators

The Type 3780 Positioner is equipped with an interface which complies with the HART® Field Communication Protocol, enabling connection to a PC or HART®-compatible handheld communicator (configurator) for bidirectional data exchange.

SAMSON's TROVIS-VIEW software and the device-specific database module can be used to configure and parameterize the positioner. The positioner can, however, also be operated with other suitable software packages.

Version with type of protection "Intrinsic safety EEx ia IIC T6", "EEx n" for Zone 2 or in combination with Type 3770 Field Barrier with type of protection "Flameproof enclosure EEx d"

The digital data processing feature offers the following advantages over conventional positioners:

- Automatic adjustment of zero and span when initializing the positioner
- Automatic detection of errors in the actuator or pneumatic system
- Operating direction selectable using software functions, therefore independent of the mounting position
- Selectable characteristics
- Simple modification of control parameters even during operation
- Monitoring and diagnosis functions, e.g. self-test functions for fault alarm output, software limit switches and position transmitters; total valve travel (travel integral)
- Supports advanced valve diagnosis using SAMSON's TROVIS-EXPERT software
- Continuous monitoring and adjustment of zero
- Minimum air consumption
- Permanent storage of all parameters in the EEPROM
- Optionally available with forced fail-safe venting action to vent the actuator via the 2/2-way valve (Fig. 4, item 4) upon failure of the external signal. As a result, the control valve is forced to move to its fail-safe position. This function can be activated using a hardware switch.

Fig. 1 · Type 3780 Positioner with HART Communication

Fig. 2 · Ex d positioner with Type 3770 Field Barrier

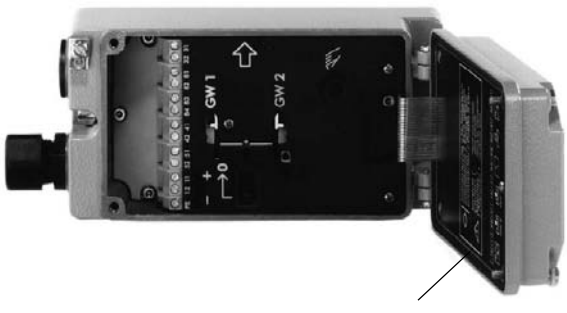


Fig. 3 · Type 3780 Positioner with opened case

Principle of operation

The travel of the final control element is detected using the non-contact inductive displacement sensor (1) and transmitted to the microcontroller (2) via a converter. In the microcontroller, the travel is compared to the set point, and the two pneumatic 2/2-way switching valves (3, 4) are activated whenever a deviation (i.e. error) occurs. Depending on the error, these valves either add air to (3) or vent air from (4) the pneumatic actuator using corresponding boosters.

A second microcontroller (5) manages the communication according to the HART® Field Communication Protocol. The frequency shift keying (FSK) signal used for communication is superimposed on the standardized electric current signal.

The TROVIS-VIEW software package can be used to adjust and select all required parameters and download these to the positioner. After that, the positioner can operate independently of the PC or handheld communicator.

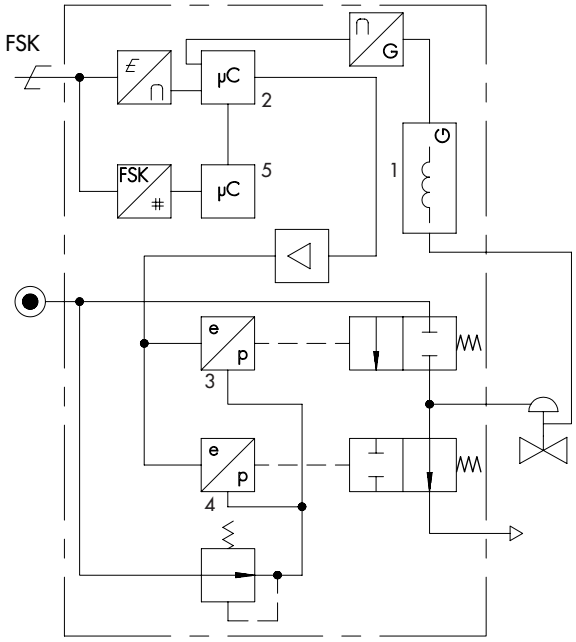
By default, the positioner is equipped with a fault alarm output used to signalize various errors and other relevant messages.

A write protection switch located on the inside of the cover prevents that saved configuration data are overwritten unintentionally.

Accessories

Options to extend the function range of the positioner include:

– Two inductive limit switches (proximity switches) or two software limit switches (to be configured via the program)
– One analog position transmitter which, independently of the reference input signal, converts the valve stem position into an analog output signal (operating direction can be configured via the software)



1 Inductive displacement sensor
2 Microcontroller
3 2/2-way valve
4 2/2-way valve
5 Microcontroller
FSK Frequency shift keying signal for communication

Fig. 4 · Functional diagram of Type 3780 Positioner

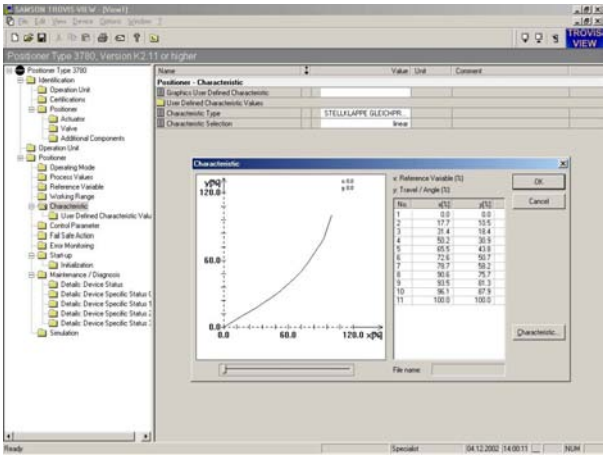


Fig. 5 · TROVIS-VIEW Configuration and Operator Interface, dialog box for user-defined characteristic

Table 1 · Technical Data

Travel Direct attachment to Type 3277: Attachment acc. to IEC 60534-6 (NAMUR):		**Adjustable** 5 to 30 mm 5 to 255 mm or 30° to 120° with rotary actuators
Reference input signal w Minimum current Load impedance		Signal range: 4 to 20 mA, span: 4 to 16 mA · Static destruction limit: 500 mA 3.6 mA ≤ 10.8 V (corresponds to 540 Ω at 20 mA)
Supply air		1.4 to 6 bar (20 to 90 psi)
Output signal pressure		0 bar up to capacity of supply air pressure
Characteristic		Adjustable: linear/equal percentage/reverse equal percentage/freely programmable Deviation from characteristic ≤1 %
Dead band		Adjustable from 0.1 to 10 %, default: 0.5 %
Resolution		≤ 0.05 %
Transit time		240 s separately adjustable for exhaust and supply air
Operating direction		Reversible, selection via software
Air consumption		Independent of supply air < 90 l_n/h
Air output capacity	Add air to actuator	At Δp = 6 bar: 9.3 m_n^3/h, at Δp = 1.4 bar: 3.5 m_n^3/h
	Vent air from actuator	At Δp = 6 bar: 15.5 m_n^3/h, at Δp = 1.4 bar: 5.8 m_n^3/h
Permissible ambient temperature		–20 to 80 °C · –40 to 80 °C with metal cable gland For devices equipped with position feedback indication only –20 to 80 °C The values of the EC type examination certificate specified in Table 3 additionally apply to Ex devices.
Temperature influence		≤ 0.15 %/10 K
Supply influence		None
Effect of vibration		None up to 250 Hz and 4 g
Explosion protection		EEx ia IIC T6 (see Table 3) or EEx nA II T6
Degree of protection		IP 54, (IP 65 special version)
Electromagnetic compatibility		Requirements met according to EN 50 081/50 082 and NAMUR Recommendation 21
Electrical connection		1 plastic cable gland M20x1.5, black Second additional tapped hole M20x1.5
Weight		Approx. 1.3 kg
Fault alarm output		For connection to signal converter according to EN 60 947-5-6 · Static destruction limit: 16 V
Communication		
Hardware and software requirements		TROVIS-VIEW Configuration and Operator Interface (see Data Sheet T 6661 EN) · Handheld communicator, e.g. Type 275 by Fisher Rosemount · DTM acc. to Specification 1.2 · Integration of other user interfaces possible
Data transmission		HART® Field Communication Protocol Impedance in HART frequency range: receive 350 to 450 Ω, send approx. 115 Ω
Software functions		Automatic start-up; adjustment of characteristic, operating direction, reference input signal range and transit time; limitation of the travel range; cross-over correction; automatic zero correction; fault alarms; total valve travel (travel integral); diagnosis messages; device information; non-volatile storage of data; test functions; logging via IBIS
Forced fail-safe venting action Input K_v value		To be activated via internal switch 6 to 24 V dc · R_i approx. 6 KΩ at 24 V dc (voltage-dependent) Switching point for 1-signal at values ≥ 3 V · Switching point for 0-signal only at 0 V 0.17
Accessories		
Inductive limit switches		For connection to signal converter according to EN 60 947-5-6, two Type SJ2-SN inductive proximity switches
Software limit switches		For connection to signal converter according to EN 60 947-5-6, two configurable limit values Hysteresis: 1 %
Analog position transmitter Output Characteristic Hysteresis Ripple content of dc signal Operating range Power supply Permissible load Resolution High-frequency influence Influence of power supply Temperature influence		Two-wire transmitter 4 to 20 mA ; operating direction reversible Linear (deviation ≤ 1%, incl. influence of mechanical deflection for NAMUR attachment) ≤ 0.3 % 0.6 % at 28 Hz/IEC 381 T1 –10 to +114 % 12 to 35 V dc $R_B = \frac{U_S - 12\ V}{20\ mA}$ ≤ 0.05 % < 2 % at 50 to 80 MHz None Same as positioner

Table 2 · Materials

Case	Die-cast aluminum, chromated and plastic-coated
External parts	Stainless steel WN 1.4571 and WN 1.4301

Table 3 · Data which additionally apply to explosion-protected Type 3780-1.... Positioner

Permissible maximum values for	Signal circuit	Position transmitter	Forced fail-safe venting action	Inductive limit switches Type 3780-12	Software limit switches Type 3780-13	Fault alarm output
U_i	28 V			15.5 V	20 V	
I_i	115 mA			52 mA	60 mA	
P_i	1 W		0.5 W	169 mW	250 mW	
C_i	5.3 nF		Negligibly small	40 nF	5.3 nF	
L_i	Negligibly small			60 µH	Negligibly small	

Ambient temperature ranges in °C			
Temperature class	**T6**	**T5**	**T4**
Signal circuit Forced fail-safe venting action Fault alarm output Software limit switches	–40 to 60 °C	–40 to 70 °C	–40 to 80 °C
Inductive limit switches at I_i = 52 mA	–40 to 45 °C	–40 to 60 °C	–40 to 75 °C
Inductive limit switches at I_i = 25 mA	–40 to 60 °C	–40 to 80 °C	–40 to 80 °C
Position transmitter	–20 to 60 °C	–20 to 70 °C	–20 to 80 °C

Summary of the approved explosion protection certificates for Type 3780

Certificate type	**Certificate number**	**Date**	**Comments**
Certificate of Conformity	PTB No. Ex-94.C.4069	1994-11-09	EEx ia IIC T6
First Addendum		1996-10-14	Changes in the construction
Second Addendum		1998-05-08	New initiators
EC Type Examination Certificate	PTB 00 ATEX 2038	2000-05-03	⟨Ex⟩ II 2G EEx ia IIC T6
First Addendum		2000-10-10	Changes in EMC
Statement of Conformity	PTB 02 ATEX 2033 X	2000-04-05	⟨Ex⟩ II 3G EEx nAa II T6
SEV Certificate	98.7.70563.01	1998-08-12	EEx ia IIC T4-T6
CZ Certificate	FTZÜ 99 Ex 0110	1999-06-23	Ex II 1G EEx ia IIC T6
BKI Certificate (first extension)	Ex-97.C.163	2000-05-10	EEx ia IIC T6
FMRC Certificate	J.I.OD6A3.AX	1998-02-25	Classes I, II, III; Div. 1, Groups A-G; Div. 2, Groups A, B, C, D; NEMA Type 4X
Revision		2002-02-20	3.3-volt version
CSA Certificate	LR 54227-29	1998-08-14	Class I; Div. 1; Groups A, B, C, D Type 4 Enclosure
	1181233	2002-04-15	Class 1, Zone 0, Ex ia IIC T6; 3.3-volt version
GOST Certicifate	A-0711	1997-07-25	1 Ex ia IIC T6
AUS Certificate	AUS Ex 3621 X	2000-07-18	Ex ia IIC T6, Class I, Zone 0 Ex n IIC T6, Class I, Zone 2
JIS Certficate	C 15863	May 2002	Ex ia IIC T6, 3.3-volt version

The test certificates are included in the mounting and operating instructions and are available on request.
For EEx d certificates concerning the Type 3770 Field Barrier, refer to Data Sheet T 8379 EN.

Electrical connection

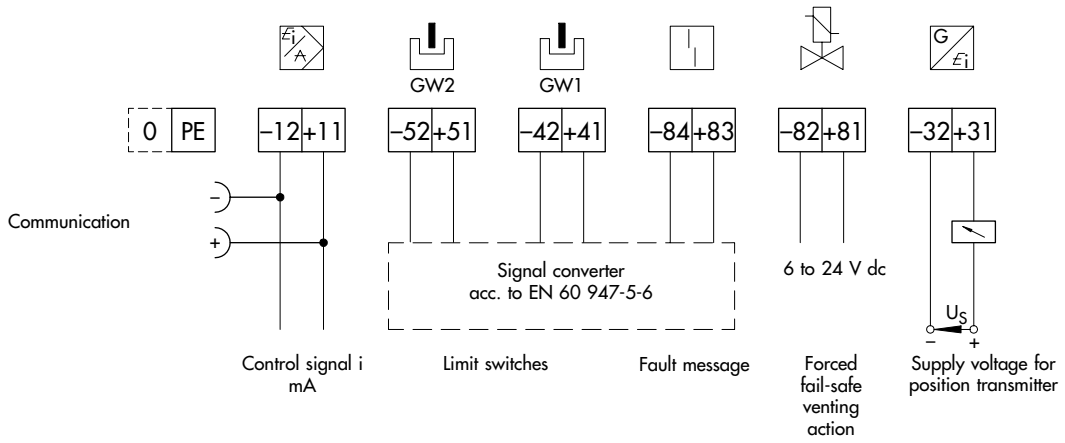


Fig. 6 · Electrical connection for Type 3780 Positioner including accessories

Connecting the positioner

The Type 3780 Positioner can be operated as a single unit (point-to-point communication), in multi-drop mode or over a multiplexer. Figs. 7 to 9 illustrate how the unit is to be connected.

The isolating amplifiers in the explosion-protected version (4) are only required when Type 3780 Positioner is used in hazardous areas.

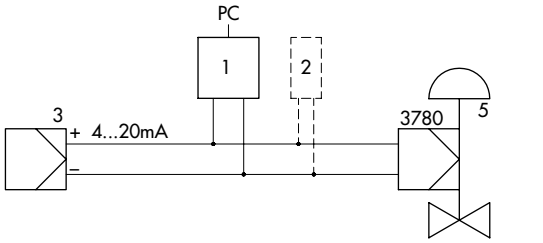


Fig. 7 · Point-to-point communication of Type 3780

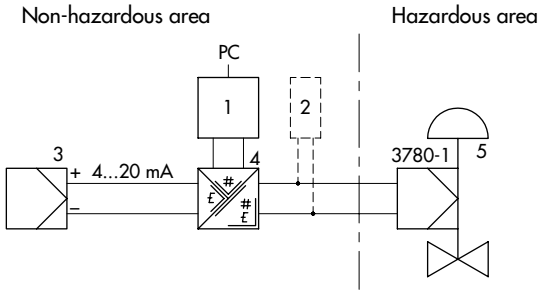


Fig. 8 · Point-to-point communication of Type 3780-1 Positioner in hazardous area

1 FSK modem
2 Handheld communicator (suitable for hazardous areas)
3 Controller / control station
4 Isolating amplifier version for hazardous areas
5 Control valve

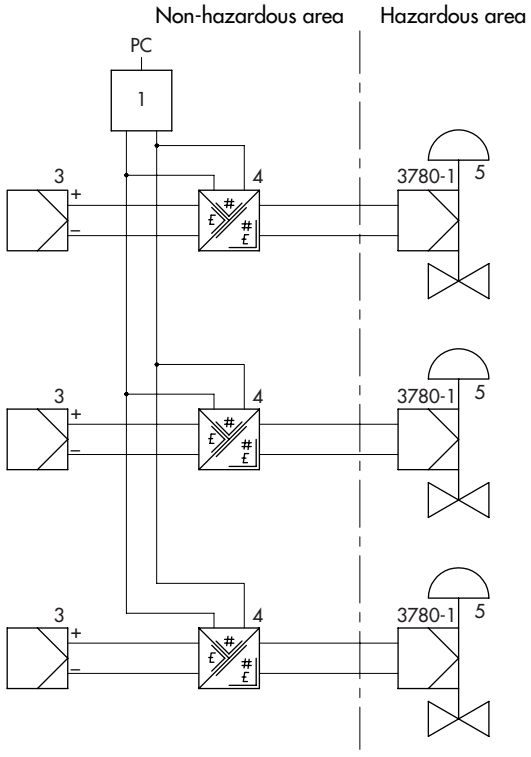


Fig. 9 · Communication over multiplexers illustrated here using a FSK bus

Attaching the positioner to the actuator

The Type 3780 Positioner can be mounted directly to the Type 3277 Linear Actuator using a connection block. For actuators with fail-safe action "Actuator stem extends" and for Type 3277-5 (effective area of 120 cm^2), the supply pressure is transferred to the diaphragm chamber through an internal bore in the actuator yoke. For actuators with fail-safe action "Actuator stem retracts" and effective areas of 240 cm^2 or larger, the supply pressure is transferred to the diaphragm chamber via a prefabricated external tube connection.

Using an adapter plate, the positioner can also be easily attached to either side of the actuator according to IEC 60534-6-1 (NAMUR recommendation).

Attachment to the Type 3278 Rotary Actuator or other rotary actuators according to VDI/VDE 3845 requires an intermediate piece. The rotary motion of the actuator is converted into a linear motion via a cam disc. The cam disc is designed for angles of either 0° to 90° or 0° to 120°. The characteristic can be selected using the software.

For double-acting springless actuators (without spring return), a reversing amplifier is required to generate the second opposed signal pressure.

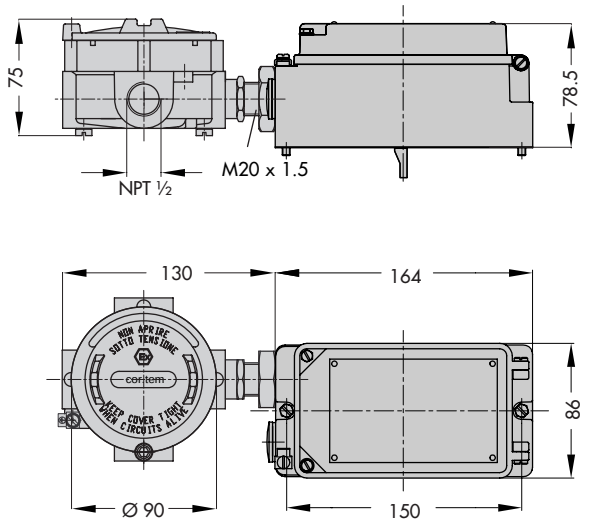
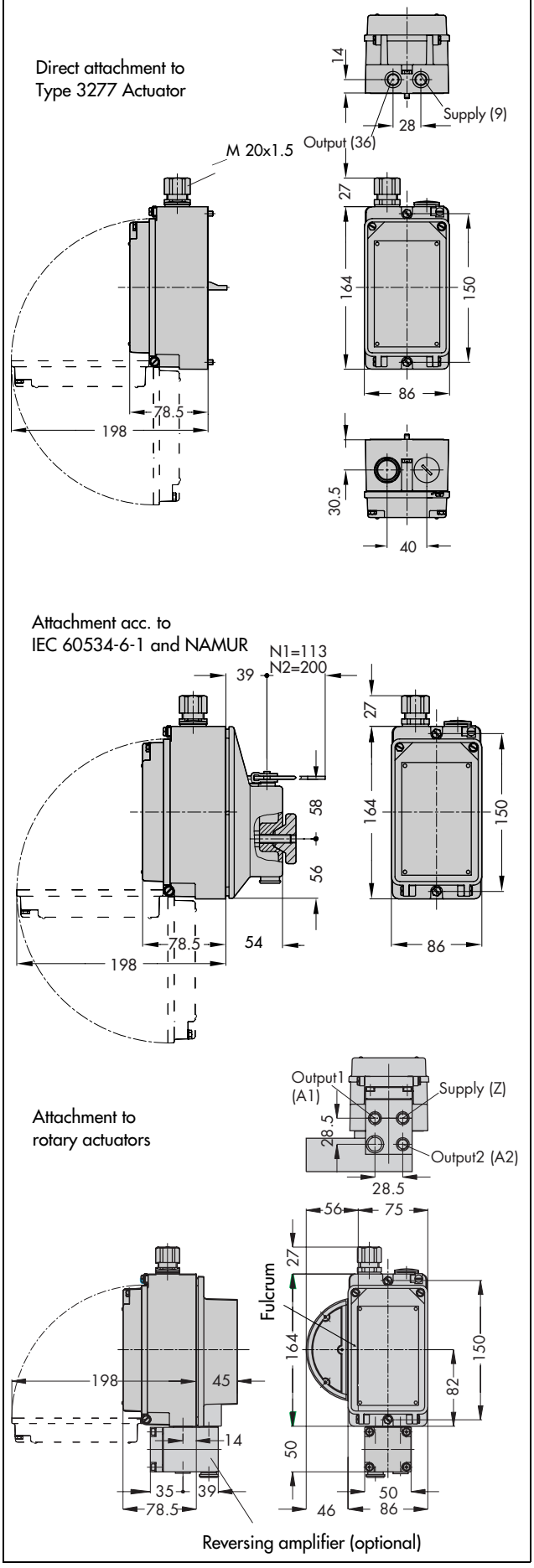


Fig. 10 · Type 3780 Ex d Positioner with Type 3770 Field Barrier

Dimensions in mm



Nomenclature for ordering

Type designation: Type 3780 -	□	□	□	□	□
Explosion protection					
Without	0				
⟨Ex⟩ II 2 G EEx ia IIC T6 acc. to ATEX	1				
CSA/FM, intrinsically safe	3				
⟨Ex⟩ II 3 G EEx nA II T6 acc. to ATEX	8				
Accessories					
Limit switches					
Without		0			
2 inductive		2			
2 software		3			
Forced fail-safe venting action					
Without (deactivated)			0		
With			1		
Position transmitter					
Without				0	
4 to 20 mA				1	
Pneumatic connections					
¼ - 18 NPT					1
ISO 228/1 - G¼					2

Accessories

M 20x1.5 to ½ NPT adapter

Metal cable gland

Ordering text

Positioner with HART Communication
Type 3780-... (see nomenclature)

Optional
TROVIS-VIEW operator interface
FSK modem

Pressure gauge to display the signal pressure:
Without
With

For positioners with limit switches:
Tag outside active zone Contact closed/
Tag inside active zone Contact opened

Attachment to Type 3277 Actuator:
Actuator sizes 120/ 240/ 350/ 700 cm^2

Fail-safe action:
Actuator stem "Extends"/"retracts"

Attachment according to IEC 60534-6-1 (NAMUR):
Travel: … mm
Stem diameter: … mm (if applicable)
If applicable, signal pressure throttling for actuators with small travel volume

Attachment to rotary actuators:
Type 3278, actuator sizes 160/ 320 cm^2

Attachment to single-acting or double-acting rotary actuators according to VDI/ VDE 3845:
If applicable, signal pressure throttling for actuators with small travel volume

Specifications subject to change without notice.

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Internet: http://www.samson.de

FOUNDATION™ Fieldbus Positioner

Type 3787

Application

Positioner for attachment to pneumatic control valves
Rated travel from 7.5 to 120 mm · Opening angle up to 120°
Bus-powered field device conforming to the FOUNDATION™ Fieldbus specification based on EN 61158-2 standard transmission technology. Integrated process controller and Link Master capability.

The microprocessor-controlled positioner compares the reference variable cyclically transmitted over the FOUNDATION™ Fieldbus network to the travel or opening angle of the control valve and produces the corresponding signal pressure output.

The positioner is suitable for attachment to both linear and rotary actuators.

The Type 3787 Positioner communicates according to FOUNDATION™ Fieldbus specification with field devices, programmable logic controllers and process control systems.

An integrated PID function block allows the control of process variables required directly in the field. The shift to distributed control reduces the number of control tasks to be performed by the higher-level automation system. As a result, fewer analog inputs and outputs as well as lines are required. Thanks to the Link Master capability, autonomous closed control loops can be set up in the field.

Further benefits of the microprocessor-controlled smart positioner include:

- Operation and monitoring using bidirectional data exchange
- Automatic start-up with a multitude of application-relevant configuration options
- Monitoring and diagnosis functions
- Control parameters can be changed online
- Automatic monitoring of zero point
- Permanent storage of all parameters in non-volatile EEPROM (protection against power failure)
- Temperature and supply air effects negligible

Accessories

The digital positioner's functions can be optionally extended through the following equipment:

– Two inductive limit switches (proximity switches) · Accessible over the terminal block

– Forced fail-safe venting action · Upon absence of an external signal, the 2/2-way on-off valve (Fig. 3, item no. 4) causes the air to be vented. Consequently, the control valve is forced to move to fail-safe position.
The venting function acts directly on the pneumatic block and remains unaffected by the output variable of the microcontroller.

A detailed nomenclature for ordering can be found on page 7.

Fig. 1 · Type 3787 FOUNDATION™ Fieldbus Positioner

Fig. 2 · Type 3787 Positioner with open cover

Principle of operation

The travel of the final control element is detected by the non-contact inductive displacement sensor (1) and transmitted to the microcontroller (2) by a converter. In the microcontroller, the travel is compared to the set point, and the two pneumatic 2/2-way on-off valves (3, 4) are activated whenever a deviation (i.e. error) occurs. Depending on the error, these valves either supply air to (3) or vent air from (4) the pneumatic actuator via corresponding amplifiers (boosters).

The positioner communicates and is powered via EN 61158-2 standard transmission technology corresponding to FOUNDATION™ Fieldbus specifications.

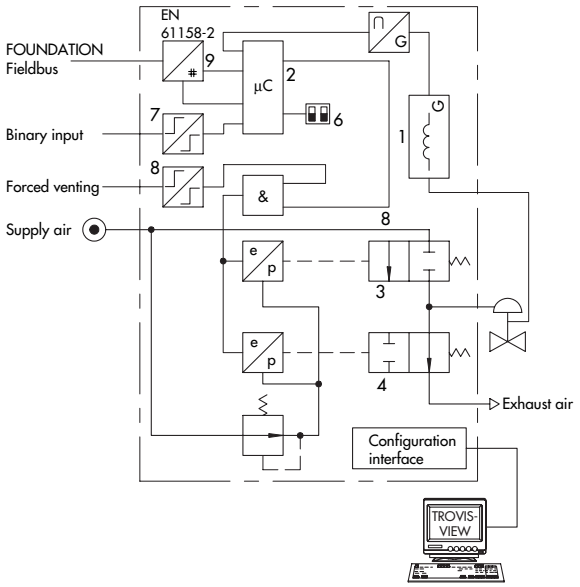
LEDs integrated into the inside of the positioner's cover signalize the operating mode.

As a standard feature, the positioner comes with a binary input used to signalize process information via the FOUNDATION™ Fieldbus.

A write protection switch located on the inside of the cover (6) prevents saved configurations from being overwritten unintentionally.

Configuration using TROVIS-VIEW (Fig. 4)

The SAMSON configuration software TROVIS-VIEW can be used to configure the positioner. For this purpose, the positioner is equipped with an additional digital interface to be connected to the RS-232 interface of a PC. TROVIS-VIEW adapts the positioner to any process requirements and allows the process to be checked online. The control valve is linked to the process over the FOUNDATION™ Fieldbus network.
The PID function block integrated in the positioner can likewise be configured using TROVIS-VIEW. The configuration of the network connections for the PID function block is made using the NI-FBUS Configurator or a corresponding digital process control system.



Legend
1 Inductive displacement sensor
2 Microcontroller
3 On-off valve for supply air
4 On-off valve for exhaust air
6 Microswitch for write protection and simulation mode
7 Binary input
8 Forced venting
9 EN 61158-2 interface module

Fig. 3 · Functional diagram of the Type 3787 Positioner

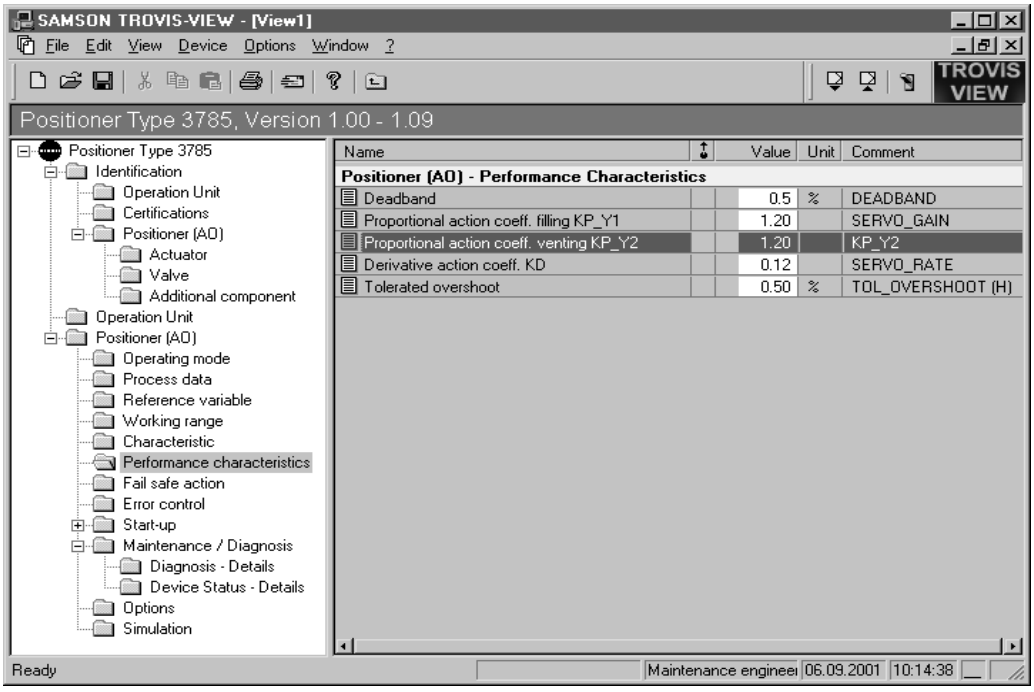


Fig. 4 · Display of parameters using TROVIS-VIEW

Table 1 · Technical data for Type 3787

Travel Direct attachment to Type 3277 Actuator Attachment acc. to DIN IEC 534 (NAMUR)		Adjustable 7.5 to 30 mm 7.5 to 120 mm or 30 to 120° for rotary actuators
Bus connection		Fieldbus interface as per EN 61158-2, bus-powered Physical Layer Class: 113 (not explosion-protected version) 111 (explosion-protected version) Field device according to FM 3610 Entity and FISCO
Permissible operating voltage		9 to 32 V dc[1] · Power supply over bus
Max. operating current		15 mA
Additional current in case of fault		0 mA
Auxiliary power		Supply air from 1.4 to 6 bar (20 to 90 psi)
Air quality according to ISO 8573-1		Max. particle size and density: Class 2 · Oil content: Class 3 The pressure dew point must be 10 °C below the lowest expectable temperature.
Signal pressure (output)		0 bar up to supply air pressure
Characteristic	Adjustable	Globe valve: linear · equal percentage · reverse equal percentage SAMSON butterfly valve: linear · equal percentage VETEC rotary plug valve: linear · equal percentage
	Deviation	< 1 %
Dead band (based on rated travel/angle)		Adjustable from 0.1 to 10.0 % · Cold start value: 0.5 %
Resolution (internal measurement)		< 0.05 %
Transit time		For valve transit time up to 240 sec · Set point ramp for supply and echaust air separately adjustable
Moving direction		Reversible · Set using software
Air consumption		Independent of supply air < 90 l_n/h
Air supply	Actuator filled	For Δp = 6 bar: 9.3 m_n^3/h · For Δp = 1.4 bar: 3.5 m_n^3/h
	Actuator vented	For Δp = 6 bar: 15.5 m_n^3/h · For Δp = 1.4 bar: 5.8 m_n^3/h
Permissible ambient temperature		–40 to 80 °C [1] · For expl.-proof versions, the values in the type examination certificate apply.
Effects	Temperature	≤ 0.15 %/10 K
	Supply air	None
	Vibration	None up to 250 Hz and 4 g
Degree of protection		IP 65 with the included filter check valve
Electromagnetic compatibility		EN 50 081 and EN 50 082 requirements are met
Binary input		Internal power supply 5 V dc · R_i approx. 100 kΩ for signaling function
Forced fail-safe venting		Activated/deactivated using internal switches Input: 6 to 24 V dc · R_i approx. 6 kΩ at 24 V dc (depending on voltage) Switching point: 1-signal at ≥ 3 V · 0-signal only at 0 V · Static destruction limit 45 V K_v value 0.17
Communication		
Data transmission		As per FOUNDATION™ Fieldbus specification · Communication Profile Class: 31 PS, 32, Interoperability tested according to Interoperability Test System (ITS) Revision 4.0
Accessories		
Inductive limit switches		Two Type SJ2-SN Proximity Switches For connection to a NAMUR switching amplifier according to DIN EN 60947-5-6

Table 2 · Materials and weights

Case	Die-cast aluminum, chromated and plastic coated
External parts	Stainless steel 1.4571 and 1.4301
Weight	Approx. 1.3 kg

Explosion protection data for Type 3787-1 · Data for Type 3787-8 according to associated type examination certificate
Device group and category: ⟨Ex⟩ II 2 G EEx ia IIC T6

Table 3 · Technical data for Type 3787-1...

Type	3787-1...
Type of protection For connection to fieldbus systems according to FISCO	EEx ia IIC/IIB T6 or EEx ib IIC/IIB T6 The positioner's type of protection depends on the protection of the intrinsically safe circuit.
FOUNDATION™ Fieldbus	
Connection	Terminals according to EN 61158-2
Operating values	According to EN 61158-2
Type of protection of the intrinsically safe circuit	EEx ia IIC/IIB or EEx ib IIC/IIB The type of protection for the installed FOUNDATION™ Fieldbus depends on the type of protection of the corresponding intrinsically safe circuit.
Maximum values EEx ia IIC/EEx ib IIC EEx ia IIB/EEx ib IIB Effective internal capacitance Effective internal inductance	For connection to certified intrinsically safe circuit with: $U_i \leq 20$ V · $I_i \leq 285$ mA $U_i \leq 24$ V · $I_i \leq 285$ mA $C_i \leq 5$ nF $L_i \approx 0$ µH
Inductive limit switches	
Connection	Terminals +41/–42 and +51/–52 · Maximum two limit switches
Type of protection of the intrinsically safe circuit	EEx ia IIC/IIB or EEx ib IIC/IIB The type of protection depends on the corresponding protection of the intrinsically safe circuit.
Maximum values Effective internal capacitance Effective internal inductance	For connection to certified intrinsically safe circuit with: $U_i \leq 16$ V · $I_i \leq 52$ mA · $P_i \leq 169$ mW $C_i \leq 60$ nF $L_i \leq 100$ µH
Forced fail-safe venting action	
Connection	Terminals +81/–82
Type of protection of the intrinsically safe circuit	EEx ia IIC/IIB or EEx ib IIC/IIB The type of protection depends on the corresponding protection of the intrinsically safe circuit.
Maximum values Effective internal capacitance Effective internal inductance	For connection to certified intrinsically safe circuit with: $U_i \leq 28$ V · $I_i \leq 115$ mA $C_i \leq 5$ nF $Li \approx 0$ µH
Binary input	
Connection	Terminals +85/–86
Type of protection of the intrinsically safe circuit	EEx ia IIC/IIB or EEx ib IIC/IIB The type of protection depends on the corresponding protection of the intrinsically safe circuit.
Maximum values Effective internal capacitance Effective internal inductance	Only for connection of a floating passive contact $U_0 \leq 5.88$ V · $I_0 \leq 1$ mA In Hazardous Area Group IIC: $C_0 \leq 43$ µF · In Hazardous Area Group IIB: $C_0 \leq 1000$ µF In Hazardous Area Group IIC: $L_0 \approx 1$ H · In Hazardous Area Group IIB: $L_0 \approx 1$ H
Permissible ambient temperatures	
EEx ia IIC/IIB T6 or EEx ib IIC/IIB T6	-20 °C $\leq T_a \leq +60$ °C · -40 °C $\leq T_a \leq +60$ °C with metal cable entry
EEx ia IIC/IIB T5 or EEx ib IIC/IIB T5	-20 °C $\leq T_a \leq +70$ °C · -40 °C $\leq T_a \leq +70$ °C with metal cable entry

Integrated PID process controller (Fig. 5)

Decentralized control can be achieved by using the PID function block as a master controller for the positioner.

- Freely selectable controller structure (P, PI, PID controller)
- Manual, automatic or cascade operating mode
- Rating and limitation of signals
- Rating and filtering of process data
- Feedforward control
- Detection and forwarding of alarms

Network and positioner configuration with NI-FBUS™ Configurator

The positioner can also be configured using the NI-FBUS™ Configurator from National Instruments.

An interface card is required for connection to the FOUNDATION™ Fieldbus.

Using the NI-FBUS™ Configurator, the whole FOUNDATION™ Fieldbus network can be configured. It also enables the use of the PID controller in the positioner which allows autonomous control in the field.

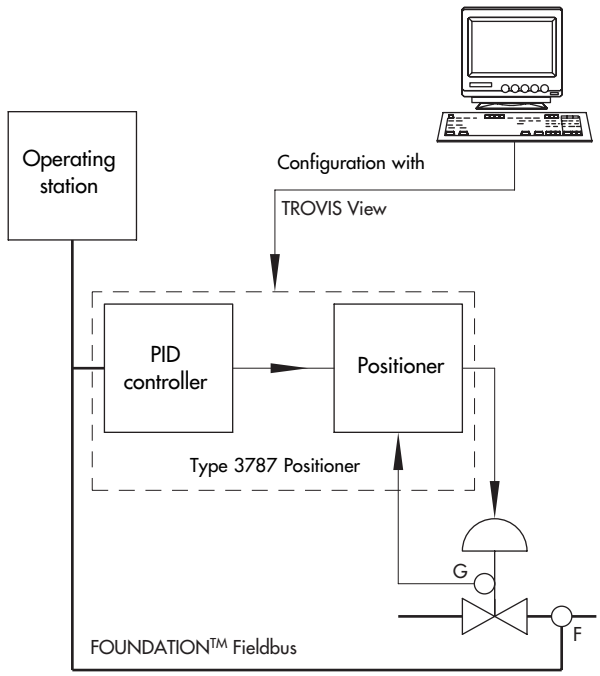


Fig. 5 · Integrated PID process controller

Approved explosion protection certificates

Certificate type	Certificate number	Date	Comments
Type 3787-1			
EC Type Examination Certificate	PTB 01 ATEX 2105	2001-08-06	⟨Ex⟩ II 2 G EEx ia IIC T6
Type 3787-8			
Statement of Conformity	PTB 01 ATEX 2117 X	2002-04-05	⟨Ex⟩ II 3 G EEx nA II T6
Type 3787-3			
CSA Certificate	1207872	2002-07-07	Cl. I, Div. 1; Groups A, B, C, D Cl. I, Zone 0, Ex ia IIC T6 Type 4 Enclosure
FM Certificate	ID 3010779	2002-09-19	Cl. I, II, III; Div. 1; Groups A, B, C, D, E, F, G; Cl. I, Zone 0, AEx ia IIC T6 Cl. I; Div. 2; Gr. A, B, C, D NEMA Type 4X

Electrical and bus connection (Figs. 6 to 8)

The Type 3787 FOUNDATION™ Fieldbus Positioner must be connected to bus segments conforming to EN 61158-2. Power supply as well as data communication use shielded two-wire cables.

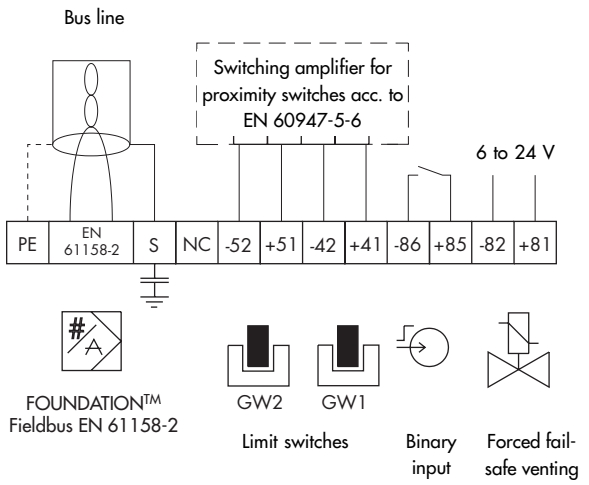


Fig. 6 · Electrical connection

Attaching the digital positioner

The Type 3787 Positioner can be attached directly to the Type 3277 Actuator using a mounting block. In actuators with the fail-safe position "Actuator stem extends" and Type 3277-5 Actuator (120 cm^2), the signal pressure is led internally to the actuator through a hole inside the actuator yoke. In actuators with fail-safe action "Actuator stem retracts" and actuators with an effective area of 240 cm^2 and larger, the signal pressure is led to the actuator through a ready-made external piping arrangement.

The positioner can be also attached using an adapter plate conforming to IEC 60534-6 (NAMUR recommendation). The positioner can be attached on either side of the control valve.

Attachment to the Type 3278 Actuator or other rotary actuators according to VDI/VDE 3845 requires an intermediate piece. The rotary motion of the actuator is converted into a linear motion via a cam disk. This cam disk is designed for an angle of either 0° to 90° or 0° to 120°. The characteristic can be selected via software.

For double-acting springless actuators, a reversing amplifier is required for the second opposing signal pressure.

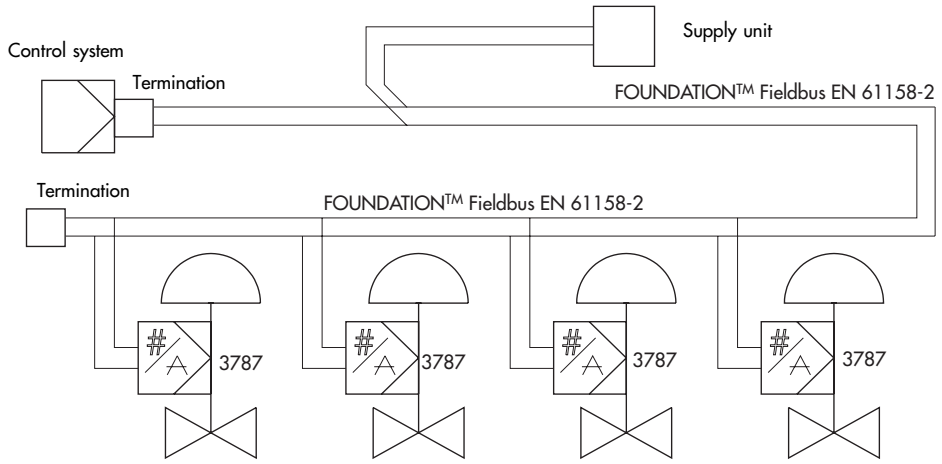


Fig. 7 · Fieldbus connection of the Type 3787 Positioner

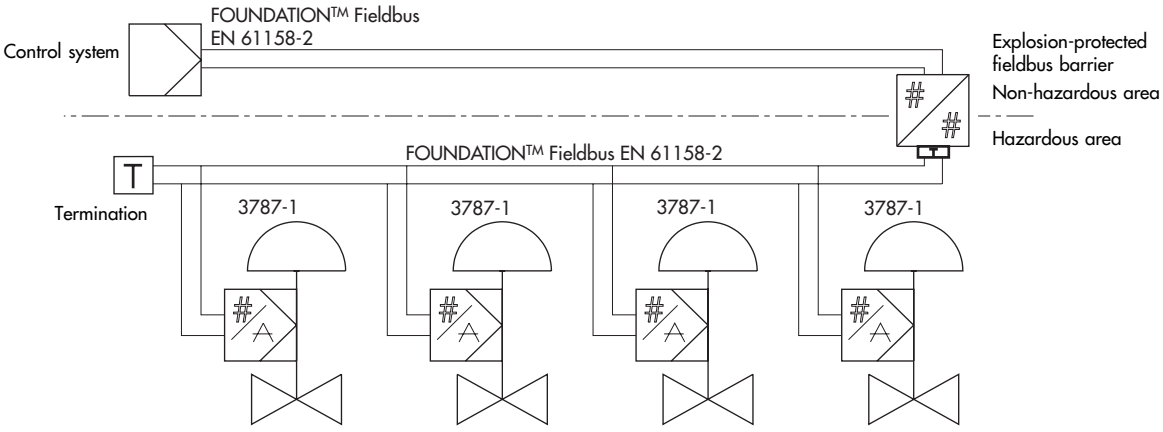


Fig. 8 · Connection of the Type 3787-1 Positioner in hazardous areas

Nomenclature for ordering

Positioner Type 3787 -	x	x	x	0	x	3	x
Explosion protection							
Without	0						
⟨Ex⟩ II 2G EEx ia IIC T6	1						
CSA/FM, intrinsically safe	3						
⟨Ex⟩ II 3G EEx nA II T6	8						
Accessories							
Limit switches							
Without		0					
2 inductive		2					2
Forced fail-safe venting							
Without (deactivated)			0				
With (activated)			1				2
Pneumatic connections							
¼–18 NPT					1		
ISO 228/1 - G ¼					2		
Electrical connections							
Cable gland M 20 x 1.5							
Brass, nickel-plated							
Quantity: 1							1
2							2

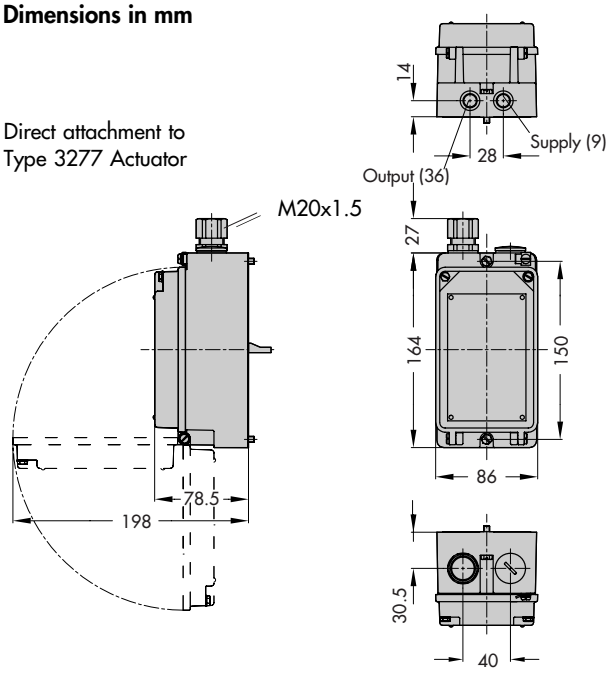
Ordering text

FOUNDATION™ Fieldbus Positioner
Type 3787- ..... (see above)
Without/with pressure gauge to indicate signal pressure
For positioners with limit switches:
Metal tag in final position of the valve outside of the active zone
Metal tag in final position of the valve inside of the active zone
Attachment to Type 3277 Actuator:
Actuator sizes 120/240/350/700 cm²
Fail-safe action:
Actuator stem extends or retracts
Attachment according to IEC 60534-6 (NAMUR)
Travel ... mm
Stem diameter, if applicable ... mm
Signal pressure restriction for actuators with small travel volume, if applicable
Attachment to Type 3278 Rotary Actuator,
Actuator sizes 160/320 cm²
Attachment to single-acting/double-acting rotary actuators according to VDI/VDE 3845
If applicable, signal pressure restriction for actuators with small travel volume

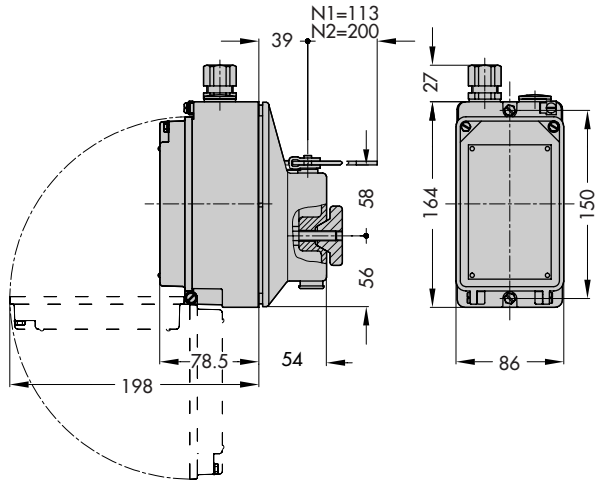
Specifications subject to change without notice.

Dimensions in mm

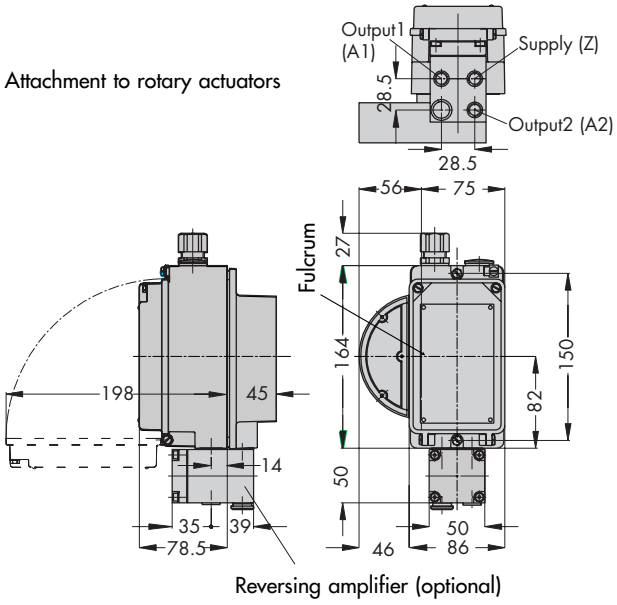
Direct attachment to Type 3277 Actuator



Attachment according to IEC 60534-6 and NAMUR



Attachment to rotary actuators



SAMSON AG · MESS- UND REGELTECHNIK
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Internet: http://www.samson.de

Solenoid Valve Type 3963

General notes

The Type 3963 Solenoid Valves ensure a high level of operational reliability and fast response times for controlling pneumatic actuators in hazardous areas.

Intrinsically safe, low-power binary signals issued by automation or fieldbus systems can be used for controlling purposes.

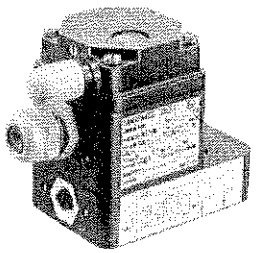
The Type 3963 Solenoid Valves offer a variety of switching functions, flow rates and connections for all desired applications (Fig. 1).

Special features of the Type 3963 Solenoid Valves include:

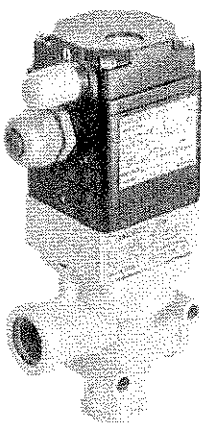
- Suitable for safety shut-off valves up to class AK 7 according to DIN V 19251 (optionally)
- Corrosion-resistant enclosure with degree of protection IP 54 or IP 65 for applications in humid, aggressive environments
- Versions free of silicone/compatible with paint (available on request)
- Service life $\geq 2 \times 10^7$ switching cycles
- Ambient temperature −45 to +80 °C, depending on the type of protection and temperature class
- Rail mounting or wall mounting
- Attachment to linear actuators with NAMUR rib according to DIN EN 60534-6-1 or to rotary actuators with NAMUR interface according to VDI/VDE 3845

- E/P binary converter with flapper/nozzle assembly
- Nominal signals 6 V DC, 12 V DC, 24 V DC, 24 V AC, 48 V AC, 115 V AC or 230 V AC
- Type of protection II 2 G EEx ia IIC T6, CSA, FM and II 3 G EEx nA II T6 for DC signals
- Power consumption 6 to 27 mW or 0.04 to 0.46 VA, depending on the nominal signal
- Manual override as pushbutton or pushbutton switch (optionally)
- Air supply 1.4 to 6 bar
- Electrical connection via cable gland M 20 × 1.5 to terminals or via a plug-type connector
- Cable break protection device (accessory)

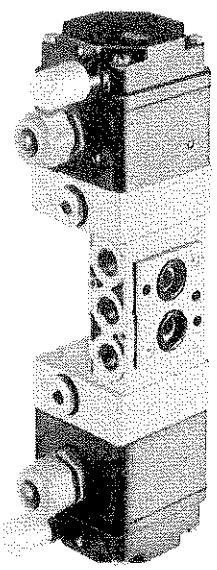
- Booster valve with diaphragm or piston, single or double actuated
- 3/2, 5/2, 5/3 or 6/2-way function
- Exhaust air return (optionally)
- K_{vs} value 0.16 to 4.3
- Supply air/exhaust air restrictors for adjusting different closing and opening times in a ratio of 1:15 (optionally)
- Threaded connection G (NPT) $^1/_4$ or $^1/_2$/NAMUR



Type 3963-XX11 5/2-way Solenoid Valve



Type 3963-XX25 3/2-way Pilot Valve
combined with
Type 3756-1203 3/2-way Booster Valve G $^1/_2$



Type 3963-XX76 3/2-way Pilot Valves
combined with
Type 3756-3327 5/2-way Booster Valve G $^1/_4$/NAMUR

Fig. 1

Versions with threaded connection

Type 3963 Solenoid Valves for on-off/continuous actuators

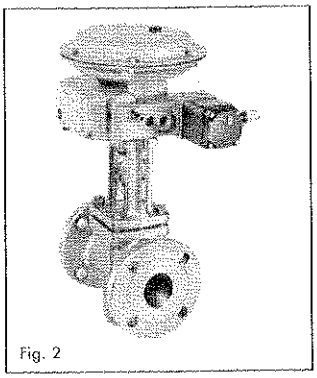
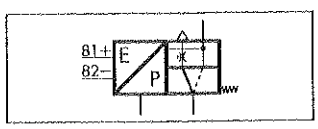


Fig. 2



Type 3963-XX29 Solenoid Valve
- 3/2-way function
- Adjustable exhaust air restrictor
- K_{vs} value 0.16
- Attachment via a connection block to SAMSON's Type 3277 Linear Actuator with SAMSON's Type 3730/3766/3767/378X Positioner (see Fig. 2)

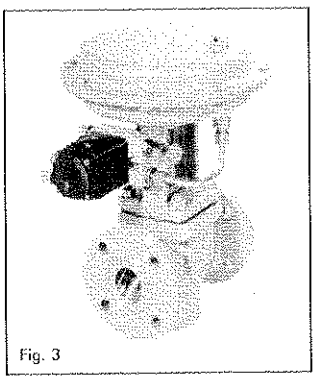
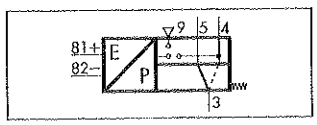


Fig. 3



Type 3963-XX53 Solenoid Valve
- 3/2-way function
- K_{vs} value 0.32
- Connection G (NPT) 1/4
- Safety function according to TÜV
- Attachment to linear actuators with NAMUR rib, e. g. SAMSON's Type 271 Actuator (see Fig. 3)

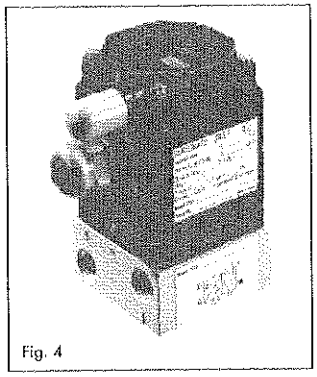
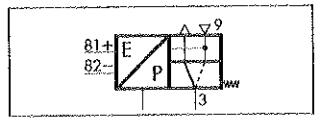


Fig. 4



Type 3963-XX27 Solenoid Valve
- 3/2-way function
- K_{vs} value 0.16
- Connection G (NPT) 1/4
- Safety function according to TÜV
- Rail mounting, wall mounting or mounting with pipe fittings to on-off linear actuators, e. g. SAMSON's Type 271/3277 Actuator

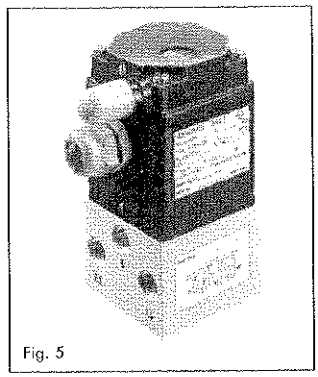
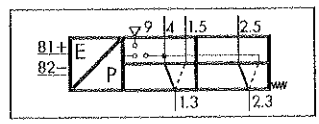
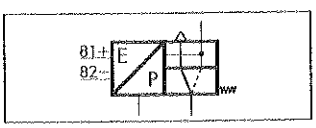


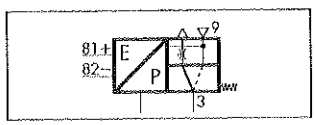
Fig. 5



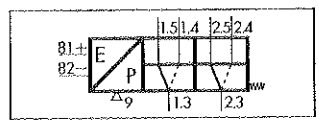
Type 3963-XX14 Solenoid Valve
- 5/2-way function
- K_{vs} value 0.16
- Connection G (NPT) 1/4
- Rail mounting or wall mounting



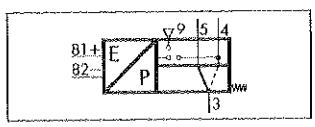
Type 3963-XX55 Solenoid Valve
- 3/2-way function
- K_{vs} value 0.32
- Safety function according to TÜV
- Attachment via a connection block to SAMSON's Type 3277 Linear Actuator with SAMSON's Type 3730/3766/3767/378X Positioner (see Fig. 2)



Type 3963-XX28 Solenoid Valve
- 3/2-way function
- Adjustable exhaust air restrictor
- K_{vs} value 0.16
- Connection G (NPT) 1/4
- Rail mounting, wall mounting or mounting with pipe fittings to on-off linear actuators, e. g. SAMSON's Type 271/3277 Actuator



Type 3963-XX64 Solenoid Valve
- 6/2-way function
- K_{vs} value 0.16
- Connection G (NPT) 1/4
- Rail mounting or wall mounting



Type 3963-XX54 Solenoid Valve
- 3/2-way function
- K_{vs} value 0.32
- Connection G (NPT) 1/4
- Safety function according to TÜV
- Rail mounting, wall mounting or mounting with pipe fittings to on-off linear actuators, e. g. SAMSON's Type 271/277 Actuator

Versions with threaded connection (continued from page 2)

Solenoid valves consisting of Type 3963 Pilot Valve ①/Type 3756 Booster Valve ②, for on-off/continuous actuators

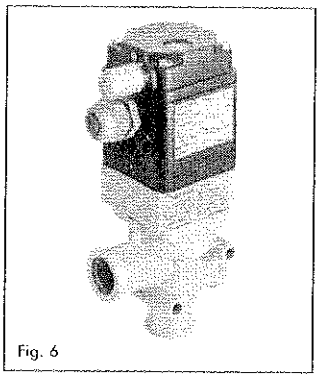
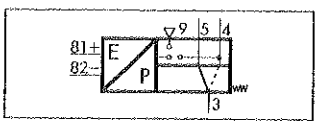


Fig. 6



Type 3963-XX25 Pilot Valve ①/
Type 3756-X2X3 Booster Valve ②
- 3/2-way function
- K_{vs} value 4.3
- Connection G (NPT) 1/2
- Safety function according to TÜV
- Wall mounting or mounting with pipe fittings to linear actuators, e. g. SAMSON's Type 271/3277 Actuator

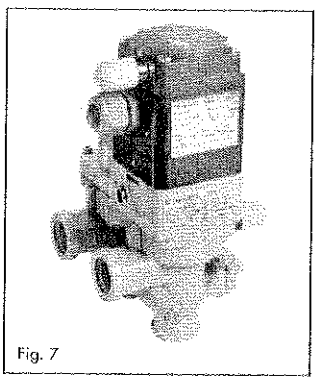
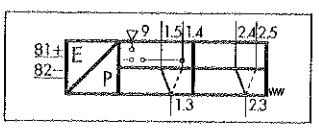


Fig. 7



Type 3963-XX25 Pilot Valve ①/
Type 3756-X209 Booster Valve ②
- 5/2-way function
- K_{vs} value 4.3
- Connection G (NPT) 1/2
- Wall mounting

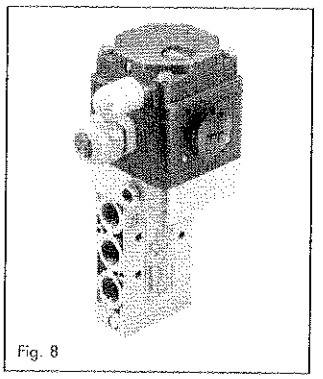
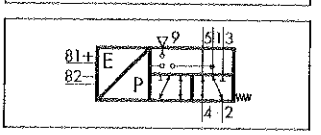


Fig. 8



Type 3963-XX76 Pilot Valve ①/
Type 3756-X205 Booster Valve ②
- 5/2-way function
- K_{vs} value 1.4
- Connection G (NPT) 1/4
- Wall mounting or mounting with pipe fittings to linear actuators, e. g. SAMSON's Type 271/3277 Actuator

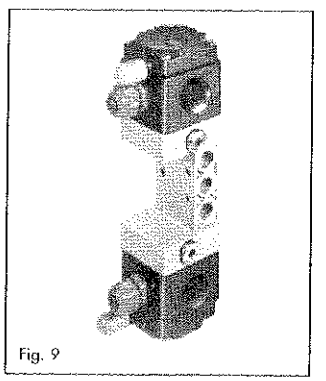
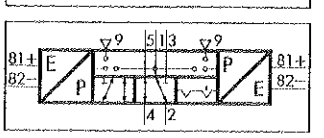
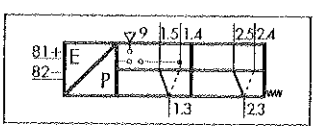


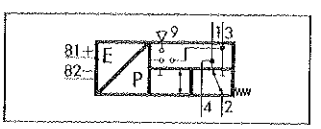
Fig. 9



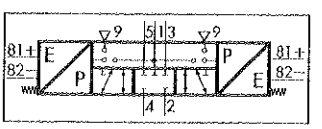
Type 3963-XX76 Pilot Valves ①/
Type 3756-X325 Booster Valve ②
- 5/2-way function, detented (two positions)
- K_{vs} value 1.4
- Connection G (NPT) 1/4
- Safety function according to TÜV
- Wall mounting



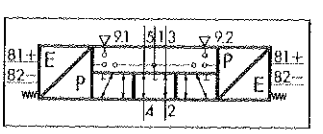
Type 3963-XX25 Pilot Valve ①/
Type 3756-X210 Booster Valve ②
- 6/2-way function
- K_{vs} value 4.3
- Connection G (NPT) 1/2
- Wall mounting



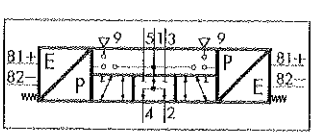
Type 3963-XX76 Pilot Valve ①/
Type 3756-X206 Booster Valve ②
- 3/2-way function
- Exhaust air return
- K_{vs} value 1.4
- Connection G (NPT) 1/4
- Safety function according to TÜV
- Wall mounting or mounting with pipe fittings to linear actuators, e. g. SAMSON's Type 271/3277 Actuator



Type 3963-XX76 Pilot Valves ①/
Type 3756-X335 Booster Valve ②
- 5/3-way function, spring centered (ports 2 and 4 closed)
- K_{vs} value 1.4
- Connection G (NPT) 1/4
- Wall mounting



Type 3963-XX76 Pilot Valves ①/
Type 3756-X345 Booster Valve ②
- 5/3-way function, spring centered (ports 2 and 4 vented)
- K_{vs} value 1.4
- Connection G (NPT) 1/4
- Safety function according to TÜV
- Wall mounting



Type 3963-XX76 Pilot Valves ①/
Type 3756-X355 Booster Valve ②
- 5/3-way function, spring centered (ports 2 and 4 to air supply)
- K_{vs} value 1.4
- Connection G (NPT) 1/4
- Wall mounting

Versions with NAMUR interface

Type 3963 Solenoid Valves for on-off/continuous actuators

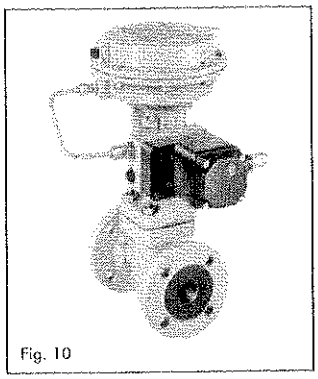


Fig. 10

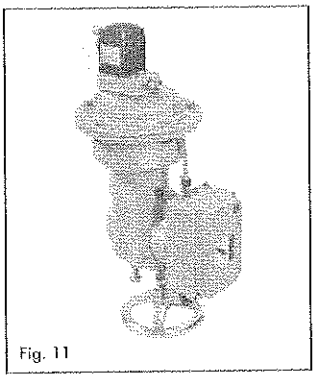


Fig. 11

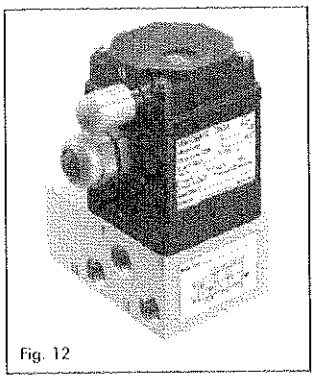
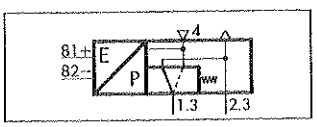
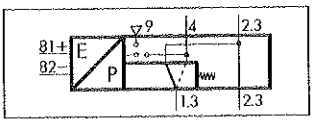


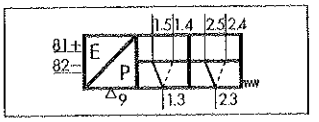
Fig. 12



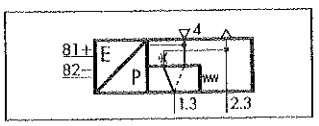
Type 3963-XX21 Solenoid Valve
- 3/2-way function
- K_{vs} value 0.16
- Connection G (NPT) $^1/_4$/NAMUR
- Safety function according to TÜV
- Attachment to on-off rotary actuators with NAMUR interface or via adapter plate (Order No. 1400-6751) to linear actuators with NAMUR rib, e. g. SAMSON's Type 241-1 (see Fig. 10)



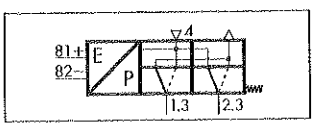
Type 3963-XX52 Solenoid Valve
- 3/2-way function
- K_{vs} value 0.32
- Connection G (NPT) $^1/_4$/NAMUR
- Safety function according to TÜV
- Attachment to rotary actuators with NAMUR interface, e. g. SAMSON's Type 3278 equipped with a SAMSON positioner (see Fig. 11)



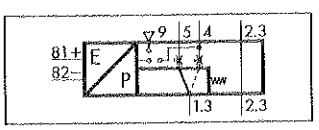
Type 3963-XX62 Solenoid Valve
- 6/2-way function
- K_{vs} value 0.16
- Connection G (NPT) $^1/_4$/NAMUR
- Attachment to rotary actuators with NAMUR interface or via adapter plate (Order No. 1400-6751) to linear actuators with NAMUR rib



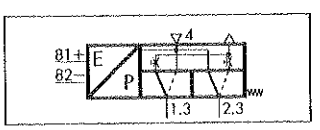
Type 3963-XX22 Solenoid Valve
- 3/2-way function
- Adjustable exhaust air restrictor
- K_{vs} value 0.16
- Connection G (NPT) $^1/_4$/NAMUR
- Attachment to on-off rotary actuators with NAMUR interface or via adapter plate (Order No. 1400-6751) to linear actuators with NAMUR rib, e. g. SAMSON's Type 241-1 (see Fig. 10)



Type 3963-XX11 Solenoid Valve
- 5/2-way function
- K_{vs} value 0.16
- Connection G (NPT) $^1/_4$/NAMUR
- Attachment to on-off rotary actuators with NAMUR interface, e. g. SAMSON's Type 3278 equipped with a SAMSON positioner (see Fig. 11)



Type 3963-XX23 Solenoid Valve
- 3/2-way function
- Adjustable supply air/exhaust air restrictors
- K_{vs} value 0.16
- Connection G (NPT) $^1/_4$/NAMUR
- Attachment to on-off rotary actuators with NAMUR interface or via adapter plate (Order No. 1400-6751) to linear actuators with NAMUR rib, e. g. SAMSON's Type 241-1 (see Fig. 10)



Type 3963-XX12 Solenoid Valve
- 5/2-way function
- Two adjustable exhaust air restrictors
- K_{vs} value 0.16
- Connection G (NPT) $^1/_4$/NAMUR
- Attachment to on-off rotary actuators with NAMUR interface, e. g. SAMSON's Type 3278 equipped with a SAMSON positioner (see Fig. 11)

Versions with NAMUR interface (continued from page 4)

Solenoid valves consisting of Type 3963 Pilot Valve ①/Type 3756 Booster Valve ②, for on-off/continuous actuators

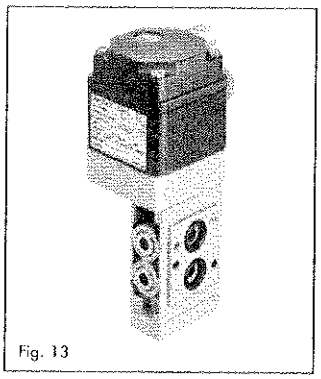


Fig. 13

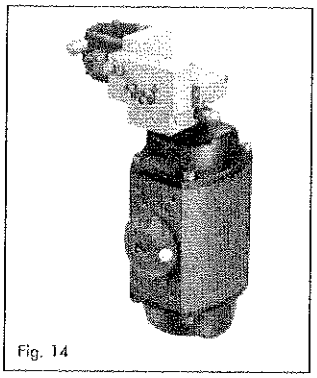


Fig. 14

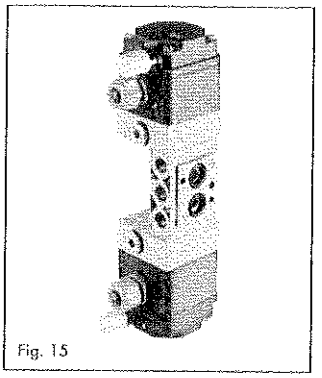
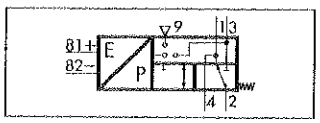
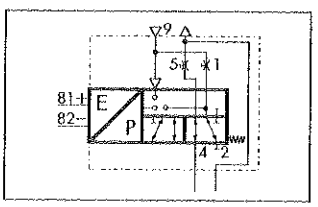


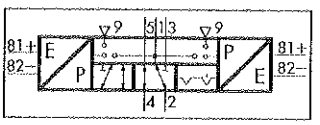
Fig. 15



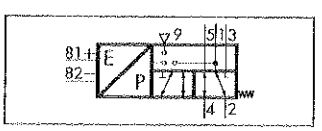
Type 3963-XX76 Pilot Valve ①/
Type 3756-X208 Booster Valve ②
- 3/2-way function
- Exhaust air return
- K_{vs} value 1.4
- Connection G (NPT) 1/4/NAMUR
- Safety function according to TÜV
- Attachment to rotary actuators with NAMUR interface or via adapter plate (Order No. 1400-6751) to linear actuators with NAMUR rib



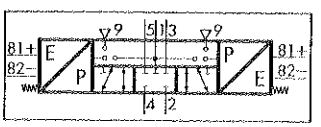
Type 3963-XX76 Pilot Valve ①/
Type 3756-X207 Booster Valve ②/
Restrictor block (Order No. 1400-6763)
- 5/2-way function
- K_{vs} value 1.4
- Connection G 1/4 (NPT)/NAMUR
- Attachment to single-acting on-off rotary actuators with NAMUR interface (see Fig. 14)



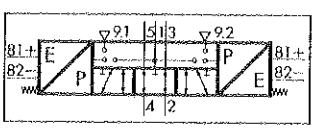
Type 3963-XX76 Pilot Valves ①/
Type 3756-X327 Booster Valve ②
- 5/2-way function, detented (two positions)
- K_{vs} value 1.4
- Connection G (NPT) 1/4/NAMUR
- Safety function according to TÜV
- Attachment to rotary actuators with NAMUR interface



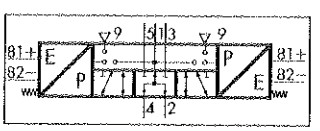
Type 3963-XX76 Pilot Valve ①/
Type 3756-X207 Booster Valve ②
- 5/2-way function
- K_{vs} value 1.4
- Connection G (NPT) 1/4/NAMUR
- Attachment to rotary actuators with NAMUR interface or via adapter plate (Order No. 1400-6751) to linear actuators with NAMUR rib



Type 3963-XX76 Pilot Valves ①/
Type 3756-X337 Booster Valve ②
- 5/3-way function, spring centered (ports 2 and 4 closed)
- K_{vs} value 1.4
- Connection G (NPT) 1/4/NAMUR
- Attachment to rotary actuators with NAMUR interface



Type 3963-XX76 Pilot Valves ①/
Type 3756-X347 Booster Valve ②
- 5/3-way function, spring centered (ports 2 and 4 vented)
- K_{vs} value 1.4
- Connection G (NPT) 1/4/NAMUR
- Safety function according to TÜV
- Attachment to rotary actuators with NAMUR interface



Type 3963-XX76 Pilot Valves ①/
Type 3756-X357 Booster Valve ②
- 5/3-way function, spring centered (ports 2 and 4 to air supply)
- K_{vs} value 1.4
- Connection G (NPT) 1/4/NAMUR
- Attachment to rotary actuators with NAMUR interface

Function

Solenoid valves with single actuation

The solenoid valves consist of an E/P binary converter Ⓐ with manual override Ⓑ (optionally) and a single-actuated booster valve Ⓒ with return spring (Fig. 16).

The booster valve Ⓒ supplies the E/P binary converter Ⓐ internally with the air supply (delivery state). Rotating the flat gasket allows the E/P binary converter Ⓐ to be supplied with external air supply via connection 9.

The pressure reducer ⑤ reduces the air supply pressure to 1.4 bar.

In the normal position, the flapper ② is lifted off the outlet nozzle ① by the spring ③. As a result, a pressure lower than the switch-off pressure of the booster valve Ⓒ builds up in the pressure divider that consists of a restriction ⑥ and an outlet nozzle ①.

When the solenoid ④ is energized by an electrical binary signal, the outlet nozzle ① is closed by the flapper ② against the force of the spring ③. As a result, the pressure in the pressure divider rises above the switch-on pressure of the booster valve Ⓒ, thus switching it to the operating position.

After de-energizing the electrical binary signal, the booster valve Ⓒ will be switched to the normal position by a return spring.

Solenoid valves with double actuation

The solenoid valves consist of two E/P binary converters Ⓐ with manual override Ⓑ (optionally) and a detented or spring-centered double-actuated booster valve Ⓒ.

The booster valve Ⓒ supplies the E/P binary converters Ⓐ internally with the air supply (delivery state). Rotating the two flat gaskets allow the E/P binary converters Ⓐ to be supplied with external air supply via connection 9.

The pressure reducer ⑤ reduces the air supply pressure to 1.4 bar.

In the normal position, the flapper ② is lifted off the outlet nozzle ① by the spring ③. As a result, a pressure lower than the switch-off pressure of the booster valve Ⓒ builds up in the pressure divider that consists of a restriction ⑥ and an outlet nozzle ①.

When the solenoid ④ is energized by an electrical binary signal, the outlet nozzle ① is closed by the flapper ② against the force of the spring ③. As a result, the pressure in the pressure divider rises above the switch-on pressure of the booster valve Ⓒ, thus switching it to the operating position.

After de-energizing the electrical binary signal, the operating position of the detented booster valve Ⓒ will be retained until a reverse signal is received. After de-energizing the electrical binary signal, the spring-centered booster valve Ⓒ will be switched to the mid-position by a return spring.

Energizing both E/P binary converters Ⓐ at the same time must be prevented by appropriate electrical control.

Functional diagram

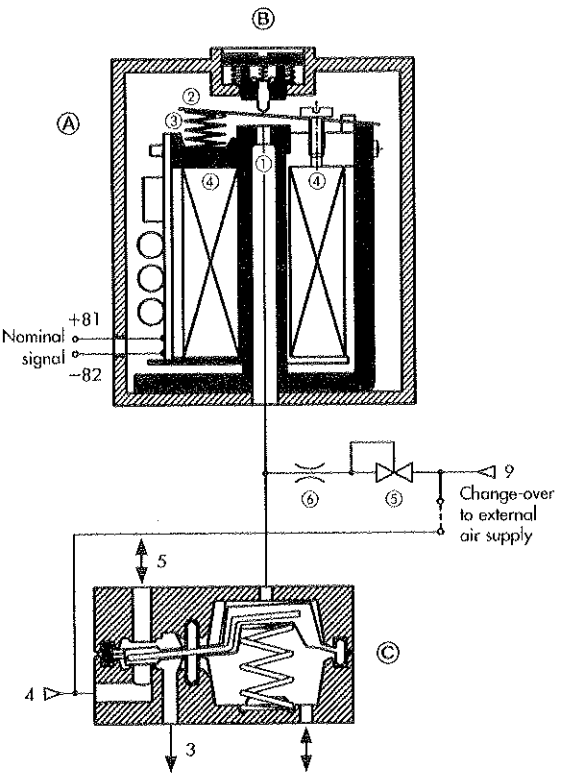


Fig. 16 · Solenoid valve with diaphragm element (K_{VS} value 0.16)

Technical data

Type 3963 Solenoid Valves								
General data								
Construction	Solenoid with flapper/nozzle assembly and diaphragm elements							
Degree of protection	IP 54 with filter, IP 65 with filter check valve							
Material Enclosure	Trogamid TG 35, glass-fiber reinforced, black							
Connection plate	Al Mg, powder-coated, grayish beige, RAL 1019, or stainless steel on request, Trogamid TG 35, glass-fiber reinforced, black (for Types 3963-XX11/-XX12/-XX21/-XX22)							
Screws	Stainless steel							
Springs	Stainless steel							
Gaskets	Silicone rubber, Perbunan							
Diaphragms	Chloroprene 57 Cr 868 (−25 to +80 °C), silicone rubber (−45 to +80 °C)							
Ambient temperature	See "Electrical data"							
Mounting position	As desired							
Weight approx.	570 g							
Electrical data								
Nominal signal U_n	**6 V DC** max. 27 V [1]	**12 V DC** max. 25 V [1]	**24 V DC** max. 32 V [1]	**24 V AC** max. 36 V [1]	**48 V AC** max. 80 V [1]	**115 V AC** max. 130 V [1]	**230 V AC** max. 255 V [1]	
f	–			48 to 62 Hz				
Switching point "On" $U_{+80\,°C}$	≥ 4.8 V	≥ 9.6 V	≥ 18 V	19 to 36 V	42 to 80 V	82 to 130 V	183 to 255 V	
$I_{+20\,°C}$	≥ 1.41 mA	≥ 1.52 mA	≥ 1.57 mA	≥ 1.9 mA	≥ 1.9 mA	≥ 2.2 mA	≥ 2.6 mA	
$P_{+20\,°C}$	≥ 5.47 mW	≥ 13.05 mW	≥ 26.71 mW	≥ 0.04 VA	≥ 0.07 VA	≥ 0.17 VA	≥ 0.46 VA	
"Off" $U_{-25\,°C}$	≤ 1.0 V	≤ 2.4 V	≤ 4.7 V	≤ 4.5 V	≤ 9 V	≤ 18 V	≤ 36 V	
Input impedance $R_{+20\,°C}$	2.6 kΩ	5.5 kΩ	10.7 kΩ	Approx. 10 kΩ	Approx. 24 kΩ	Approx. 40 kΩ	Approx. 80 kΩ	
Temperature effect	0.4 %/°C	0.2 %/°C	0.1 %/°C	0.1 %/°C	0.1 %/°C	0.05 %/°C	0.03 %/°C	
Type of protection [2]	II 2 G EEx ia IIC T6 or II 3 G EEx nA II T6			Without explosion protection				
Output voltage [3] U_i	25 V	27 V	28 V	30 V	32 V	–		
Output current [3] I_i	150 mA	125 mA	115 mA	100 mA	85 mA	–		
Power dissipation [3] P_i	250 mW	No limitation				–		
External inductance [3] L_i	Negligible					–		
External capacitance [3] C_i	Negligible					–		
Ambient temperature [4]	−25 to +60 °C (temperature class T6), −25 to +70 °C (temperature class T5), −25 to +80 °C (temperature class T4)			−25 to +80 °C				
Connection	Connection to a terminal or via a plug-type connector (see "Versions and ordering data", page 22)							
Pneumatic data								
Type 3963	**-XX20/-XX22 -XX23/-XX28 -XX29**	**-XX21 -XX27**	**-XX50**	**-XX52/-XX53 -XX54/-XX55**	**-XX10/-XX11 -XX12/-XX14**	**-XX60/-XX62 -XX64**		
Safety function	–	TÜV [5]	–	TÜV [5]	–	–		
Version	3/2-way function		3/2-way function		5/2-way function	6/2-way function		
K_{vs} value [6]	0.16		0.32		0.16	0.16		
Air supply Medium	Instrument air, free of corrosive particles, or nitrogen							
Pressure	1.4 to 6 bar							
Operating medium	Instrument air, free of corrosive particles [7], oil-containing air or noncorrosive gases [8]							
Operating pressure max.	6 bar							
Output signal	Operating pressure							
Air consumption	≤ 80 l/h at 1.4 bar air supply (normal position), ≤ 10 l/h at 1.4 bar air supply (operating position)							
Switching time [9]	≤ 65 ms							
Switching cycles	≥ 2×10^7 (−25 to +80 °C), ≥ 2×10^6 (−45 to +80 °C)							
Connection	G (NPT) 1/4							

[1] Permissible maximum value at continuous duty. For Ex versions, the permissible maximum value U_i applies.
[2] According to EC-type-examination Certificate PTB 01 ATEX 2085 or Statement of Conformity PTB 01 ATEX 2086X.
[3] Permissible maximum values when connected to a certified intrinsically safe circuit.
[4] Permissible ambient temperature −45 °C with diaphragms made of silicone rubber.
[5] Report No. S63/00 (used on control valves according to DIN 3394 Part 1, DIN EN 161, DIN 32725, DIN EN 264 and DIN 32730), Report No. S64/00 (safety function up to class AK 7 according to DIN V 19251).
[6] Air flow at $p_1 = 2.4$ bar and $p_2 = 1.0$ bar can be calculated according to the following equation: $Q = K_{vs} \times 36.22$, expressed in m^3/h.
[7] With internal air supply (delivery state).
[8] With external air supply (see mounting and operating instructions EB 3963 EN).
[9] For Types 3963-XX12/-XX22/-XX23/-XX29 with supply air/exhaust air restrictors different closing and opening times can be adjusted in a ratio of 1:15.

Technical data (continued from page 7)

Type 3963 Pilot Valves ① for Type 3756 Booster Valves ②								
General data								
Construction	Solenoid with flapper/nozzle assembly and diaphragm element							
Degree of protection	IP 54 with filter, IP 65 with filter check valve							
Material Enclosure	Trogamid TG 35, glass-fiber reinforced, black							
Connection plate	Al Mg, powder-coated, grayish beige RAL 1019, or stainless steel on request							
Screws	Stainless steel							
Springs	Stainless steel							
Gaskets	Silicone rubber, Perbunan							
Diaphragm	Chloroprene 57 Cr 868 (–25 to +80 °C), silicone rubber (–45 to +80 °C)							
Ambient temperature	See "Electrical data"							
Mounting position	As desired							
Weight approx.	250 g							
Electrical data								
Nominal signal U_n	**6 V DC** max. 27 V [1]	**12 V DC** max. 25 V [1]	**24 V DC** max. 32 V [1]	**24 V AC** max. 36 V [1]	**48 V AC** max. 80 V [1]	**115 V AC** max. 130 V [1]	**230 V AC** max. 255 V [1]	
f	–			48 to 62 Hz				
Switching point $U_{+80\,°C}$	≥ 4.8 V	≥ 9.6 V	≥ 18 V	19 to 36 V	42 to 80 V	82 to 130 V	183 to 255 V	
"On" $I_{+20\,°C}$	≥ 1.41 mA	≥ 1.52 mA	≥ 1.57 mA	≥ 1.9 mA	≥ 1.9 mA	≥ 2.2 mA	≥ 2.6 mA	
$P_{+20\,°C}$	≥ 5.47 mW	≥ 13.05 mW	≥ 26.71 mW	≥ 0.04 VA	≥ 0.07 VA	≥ 0.17 VA	≥ 0.46 VA	
"Off" $U_{-25\,°C}$	≤ 1.0 V	≤ 2.4 V	≤ 4.7 V	≤ 4.5 V	≤ 9 V	≤ 18 V	≤ 36 V	
Input impedance $R_{+20\,°C}$	2.6 kΩ	5.5 kΩ	10.7 kΩ	Approx. 10 kΩ	Approx. 24 kΩ	Approx. 40 kΩ	Approx. 80 kΩ	
Temperature effect	0.4 %/°C	0.2 %/°C	0.1 %/°C	0.1 %/°C	0.1 %/°C	0.05 %/°C	0.03 %/°C	
Type of protection [2]	II 2 G EEx ia IIC T6 or II 3 G EEx nA II T6			Without explosion protection				
Output voltage [3] U_i	25 V	27 V	28 V	30 V	32 V	–		
Output current [3] I_i	150 mA	125 mA	115 mA	100 mA	85 mA	–		
Power dissipation [3] P_i	250 mW	No limitation				–		
External inductance [3] L_i	Negligible					–		
External capacitance [3] C_i	Negligible					–		
Ambient temperature [4]	–25 to +60 °C (temperature class T6), –25 to +70 °C (temperature class T5), –25 to +80 °C (temperature class T4)			–25 to +80 °C				
Connection	Connection to a terminal or via a plug-type connector (see "Versions and ordering data", page 23)							
Pneumatic data								
Type 3963	**-XX25**			**-XX76**				
Safety function	TÜV [5]							
Version	3/2-way function							
K_{vs} value [6]	0.16			0.01				
Air supply Medium	Instrument air, free of corrosive particles, or nitrogen							
Pressure	1.4 to 6 bar							
Output signal	Air supply pressure			≥ 1.2 bar				
Air consumption	≤ 80 l/h at 1.4 bar air supply (normal position), ≤ 10 l/h at 1.4 bar air supply (operating position)							
Switching time	≤ 65 ms							
Switching cycles	≥ 2×10^7 (–25 to +80 °C), ≥ 2×10^6 (–45 to +80 °C)			≥ 2×10^7				
Connection	Without connection plate							

[1] Permissible maximum value at continuous duty. For Ex versions, the permissible maximum value U_i applies.
[2] According to EC-type-examination Certificate PTB 01 ATEX 2085 or Statement of Conformity PTB 01 ATEX 2086X.
[3] Permissible maximum values when connected to a certified intrinsically safe circuit.
[4] Permissible ambient temperature –45 °C with diaphragm made of silicone rubber.
[5] Report No. S63/00 (used on control valves according to DIN 3394 Part 1, DIN EN 161, DIN 32725, DIN EN 264 and DIN 32730), Report No. S64/00 (safety function up to class AK 7 according to DIN V 19251).
[6] Air flow at $p_1 = 2.4$ bar and $p_2 = 1.0$ bar can be calculated according to the following equation: $Q = K_{vs} \times 36.22$, expressed in m^3/h.

Technical data (continued from page 8)

Type 3756 Booster Valves ②, single-actuated by one Type 3963-XX25 Pilot Valve ①					
Type 3756		**-X203**	**-X213**	**-X209**	**-X210**
Safety function		TÜV [1]	TÜV [1]	–	–
Version		3/2-way function	3/2-way function	5/2-way function	6/2-way function
K_{vs} value [2] (in direction of flow)		1.9 (4 → 3), 1.5 (3 → 4) 4.3 (3 → 5), 4.7 (5 → 3)	1.9 (4 → 3), 1.5 (3 → 4) 4.3 (3 → 5), 4.7 (5 → 3)	1.9 (4 → 3), 1.5 (3 → 4) 4.3 (3 → 5), 4.7 (5 → 3)	1.9 (4 → 3), 1.5 (3 → 4) 4.3 (3 → 5), 4.7 (5 → 3)
Construction		Seat valve, soft-seated type, with return spring			
Material	Enclosure	GD AlSi 12, powder-coated, grayish beige RAL 1019, or stainless steel on request			
	Diaphragm	Chloroprene	Silicone rubber	Chloroprene	Chloroprene
	Gaskets	Chloroprene	Silicone rubber	Chloroprene	Chloroprene
	Screws	Stainless steel			
Actuation		Single-actuated by one Type 3963-XX25 Pilot Valve ① (see "Technical data", page 8)			
Operating medium		Instrument air, free of corrosive particles, or nitrogen [3], instrument air, free of corrosive particles, oil-containing air or noncorrosive gases [4]			
Operating pressure max. (in direction of flow)		10 bar (4 → 3, 3 → 5) 2 bar (as desired)	10 bar (4 → 3, 3 → 5) 2 bar (as desired)	10 bar (as desired) 2 bar (as desired)	10 bar (as desired) 2 bar (as desired)
Ambient temperature [5]		−25 to +80 °C	−40 to +80 °C	−25 to +80 °C	−25 to +80 °C
Switching cycles (operating pressure)		≥ 10^7 (6 bar) ≥ 10^6 (10 bar)	≥ 10^6 (6 bar) ≥ 10^5 (10 bar)	≥ 10^7 (6 bar) ≥ 10^6 (10 bar)	≥ 10^7 (6 bar) ≥ 10^6 (10 bar)
Connection		G (NPT) 1/2	G (NPT) 1/2	G (NPT) 1/2	G (NPT) 1/2
Mounting position		As desired			
Weight approx.		585 g	585 g	1100 g	1100 g

[1] Report No. S63/00 (used on control valves according to DIN 3394 Part 1, DIN EN 161, DIN 32725, DIN EN 264 and DIN 32730), Report No. S64/00 (safety function up to class AK 7 according to DIN V 19251).
[2] Air flow at $p_1 = 2.4$ bar and $p_2 = 1.0$ bar can be calculated according to the following equation: $Q = K_{vs} \times 36.22$, expressed in m^3/h.
[3] With internal air supply for pilot valve ① (delivery state).
[4] With external air supply for pilot valve ① (see mounting and operating instructions EB 3963 EN).
[5] The permissible ambient temperature can be limited by the pilot valve ① (see "Technical data", page 8).

Type 3756 Booster Valves ②, single-actuated by one Type 3963-XX76 Pilot Valve ①					
Type 3756		**-X205**	**-X206**	**-X207**	**-X208**
Safety function		–	TÜV [1]	–	TÜV [1]
Version		5/2-way function	3/2-way function with exhaust air return	5/2-way function	3/2-way function with exhaust air return
K_{vs} value [2]		1.4			
Construction		Piston, metal-to-metal seating, without overlap			
Material	Enclosure	GD AlSi 12, powder-coated, grayish beige RAL 1019, or stainless steel on request			
	Gaskets	Perbunan			
	Filter	Polyethylene			
	Screws	Stainless steel			
Actuation		Single-actuated by one Type 3963-XX76 Pilot Valve ① (see "Technical data", page 8)			
Operating medium		Instrument air, free of corrosive particles, or nitrogen [3], instrument air, free of corrosive particles, oil-containing air or noncorossive gases [4]			
Operating pressure max.		6 bar [3] or 10 bar [4]			
Ambient temperature [5]		−45 to +80 °C			
Switching cycles		≥ 2×10^7			
Connection		G (NPT) 1/4	G (NPT) 1/4	G (NPT) 1/4 NAMUR [6]	G (NPT) 1/4 NAMUR [6]
Mounting position		As desired			
Weight approx.		485 g			

[1] Report No. S63/00 (used on control valves according to DIN 3394 Part 1, DIN EN 161, DIN 32725, DIN EN 264 and DIN 32730), Report No. S64/00 (safety function up to class AK 7 according to DIN V 19251).
[2] Air flow at $p_1 = 2.4$ bar and $p_2 = 1.0$ bar can be calculated according to the following equation: $Q = K_{vs} \times 36.22$, expressed in m^3/h.
[3] With internal air supply for pilot valve ① (delivery state).
[4] With external air supply for pilot valve ① (see mounting and operating instructions EB 3963 EN).
[5] The permissible ambient temperature can be limited by the pilot valve ① (see "Technical data", page 8).
[6] NAMUR interface according to VDI/VDE 3845.

Technical data (continued from page 9)

Type 3756 Booster Valves ②, double-actuated by two Type 3963-XX76 Pilot Valves ①									
Type 3756		**-X325**	**-X327**	**-X335**	**-X337**	**-X345**	**-X347**	**-X355**	**-X357**
Safety function		TÜV [1]		–		TÜV [1]		–	
Version		5/2-way function, detented (two positions)		5/3-way function, spring-centered (ports 2 and 4 closed)		5/3-way function, spring-centered (ports 2 and 4 vented)		5/3-way function, spring-centered (ports 2 and 4 to air supply)	
K_{vs} value [2]		1.4							
Construction		Piston, metal-to-metal seating, without overlap							
Material	Enclosure	GD AlSi 12, powder-coated, grayish beige RAL 1019, or stainless steel on request							
	Gaskets	Perbunan							
	Filter	Polyethylene							
	Screws	Stainless steel							
Actuation		Double-actuated by two Type 3963-XX76 Pilot Valves ① (see "Technical data", page 8)							
Operating medium		Instrument air, free of corrosive particles, or nitrogen [3], instrument air, free of corrosive particles, oil-containing air or noncorrosive gases [4]							
Operating pressure max.		6 bar [3] or 10 bar [4]							
Ambient temperature [5]		–45 to +80 °C							
Switching cycles		$\geq 2 \times 10^7$							
Connection		G (NPT) 1/4	G (NPT) 1/4 NAMUR [6]	G (NPT) 1/4	G (NPT) 1/4 NAMUR [6]	G (NPT) 1/4	G (NPT) 1/4 NAMUR [6]	G (NPT) 1/4	G (NPT) 1/4 NAMUR [6]
Mounting position		As desired							
Weight approx.		685 g							

[1] Report No. S63/00 (used on control valves according to DIN 3394 Part 1, DIN EN 161, DIN 32725, DIN EN 264 and DIN 32730), Report No. S64/00 (safety function up to class AK 7 according to DIN V 19251).
[2] Air flow at $p_1 = 2.4$ bar and $p_2 = 1.0$ bar can be calculated according to the following equation: $Q = K_{vs} \times 36.22$, expressed in m^3/h.
[3] With internal air supply for pilot valves ① (delivery state).
[4] With external air supply for pilot valves ① (see mounting and operating instructions EB 3963 EN).
[5] The permissible ambient temperature can be limited by the pilot valves ① (see "Technical data", page 8).
[6] NAMUR interface according to VDI/VDE 3845.

Dimensions of devices without threaded connection

Type 3963-XX25 Pilot Valve
Types 3963-XX10/-XX20/-XX50/-XX60 Solenoid Valves

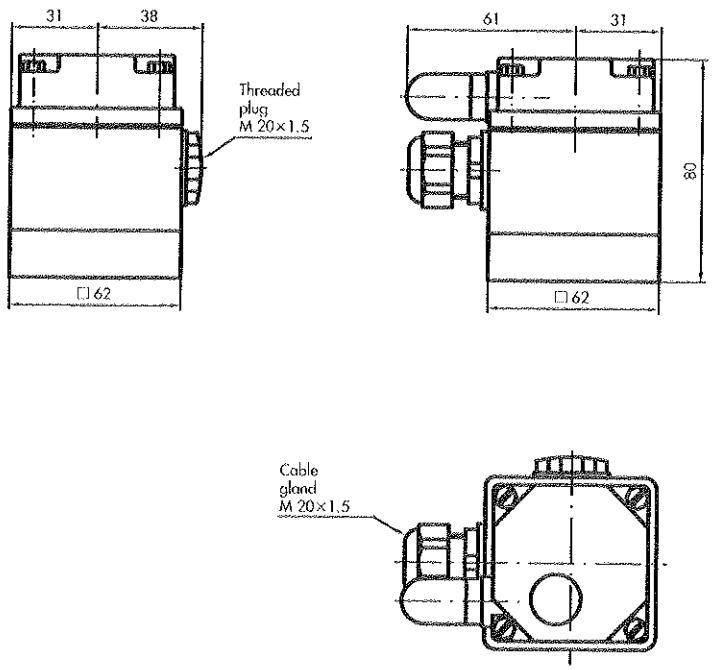


Fig. 17 · Dimensions in mm

Type 3963-XX76 Pilot Valve

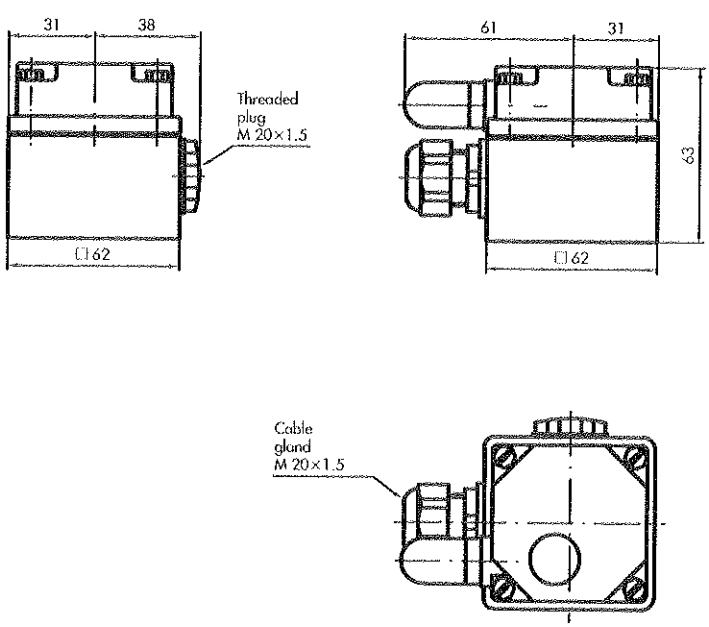


Fig. 18 · Dimensions in mm

Dimensions of devices with threaded connection

Type 3963-XX14 Solenoid Valve

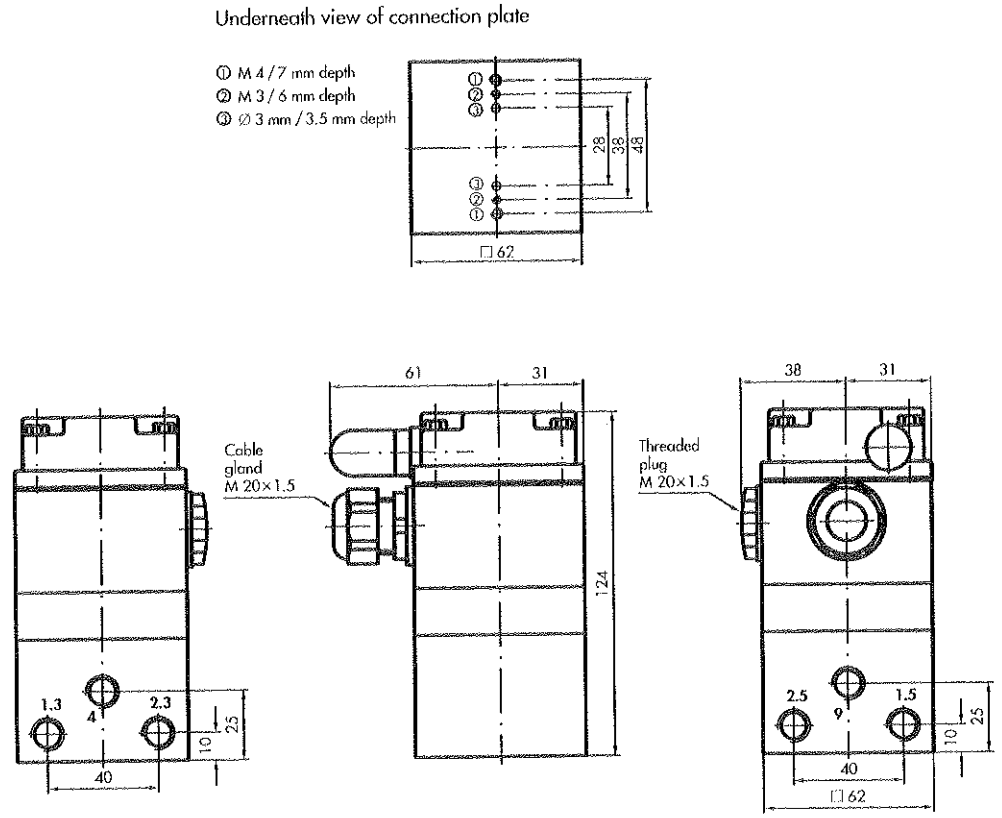
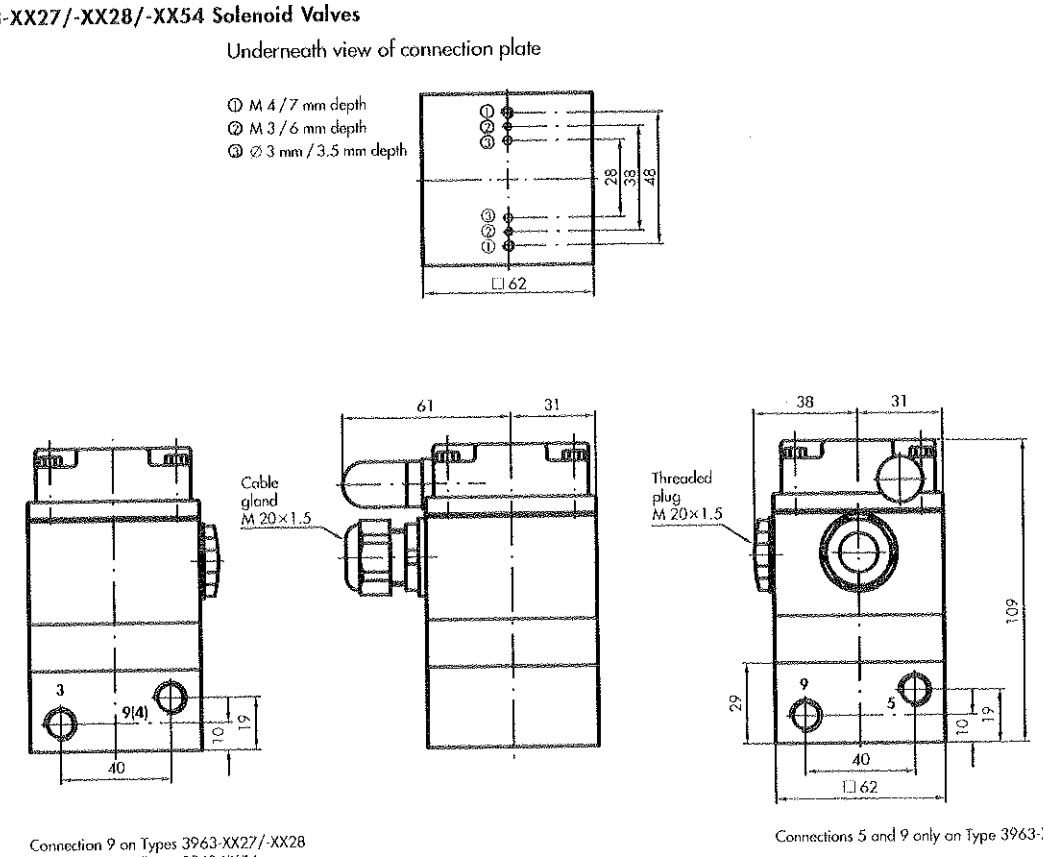


Fig. 19 · Dimensions in mm

Types 3963-XX27/-XX28/-XX54 Solenoid Valves



Connection 9 on Types 3963-XX27/-XX28
Connection 4 on Type 3963-XX54

Connections 5 and 9 only on Type 3963-XX54

Fig. 20 · Dimensions in mm

Dimensions of devices with threaded connection (continued from page 12)

Type 3963-XX64 Solenoid Valve

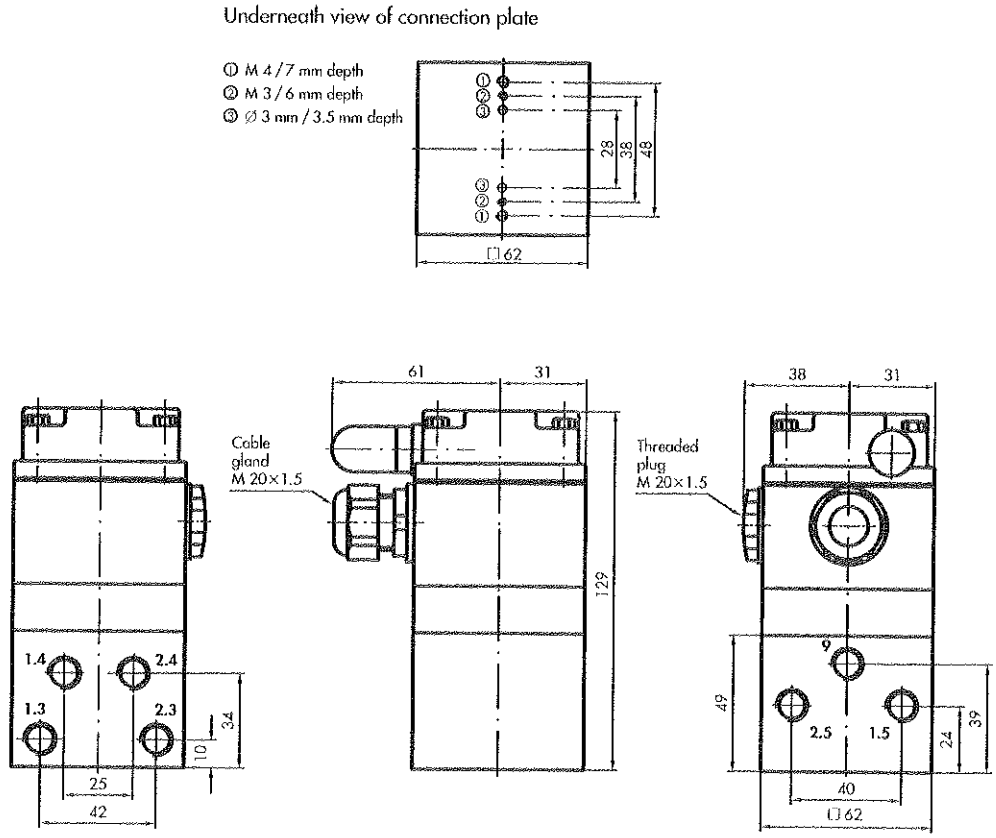


Fig. 21 · Dimensions in mm

Types 3963-XX29/-XX55 Solenoid Valves

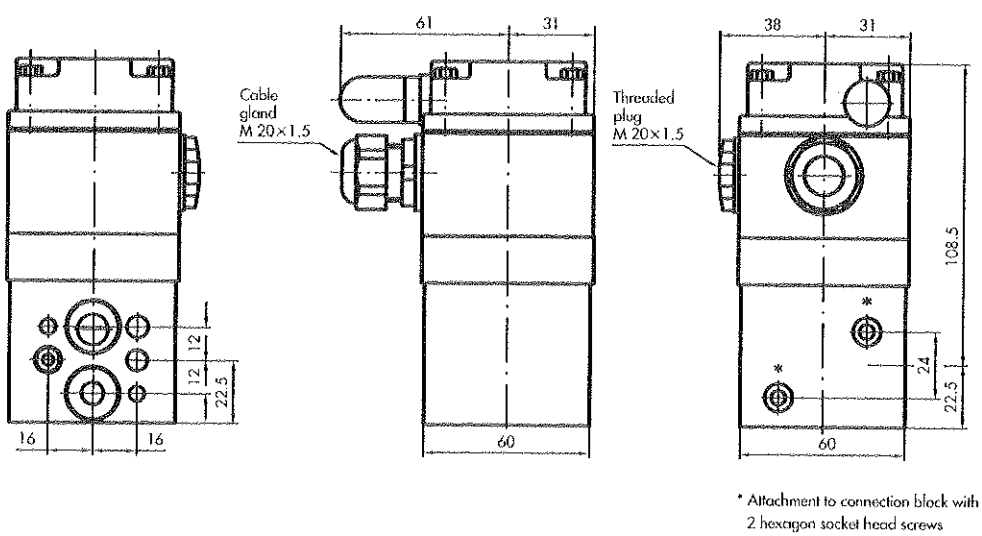


Fig. 22 · Dimensions in mm

Dimensions of devices with threaded connection (continued from page 13)

Type 3963-XX25 Pilot Valve ① combined with Type 3756-X203/-X213 Booster Valve ②

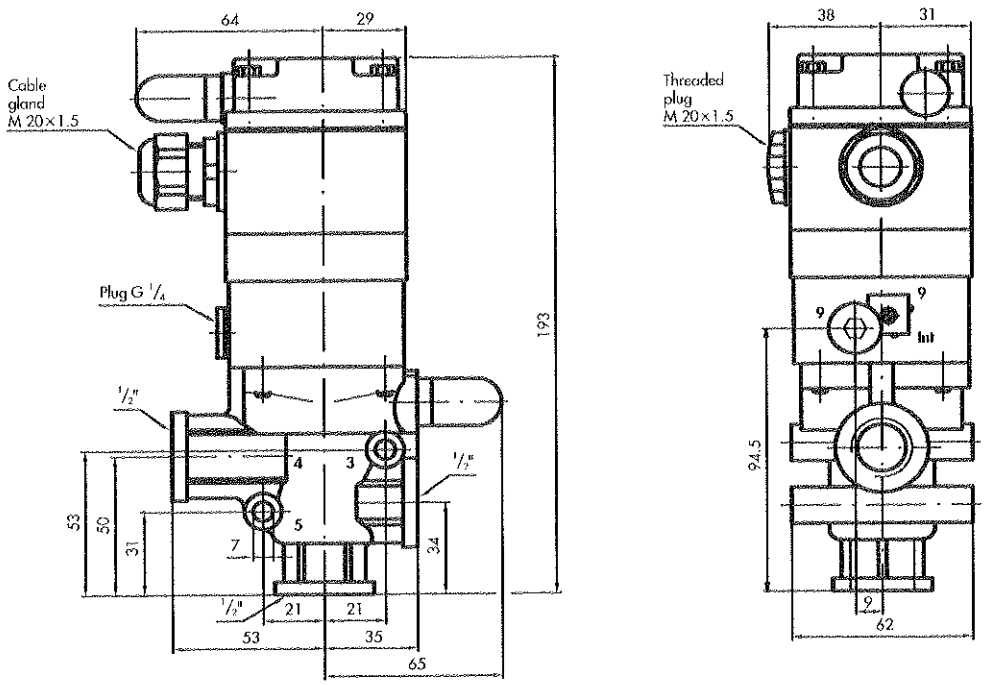


Fig. 23 · Dimensions in mm

Dimensions of devices with threaded connection (continued from page 14)

Type 3963-XX25 Pilot Valve ① combined with Type 3756-X209 Booster Valve ②

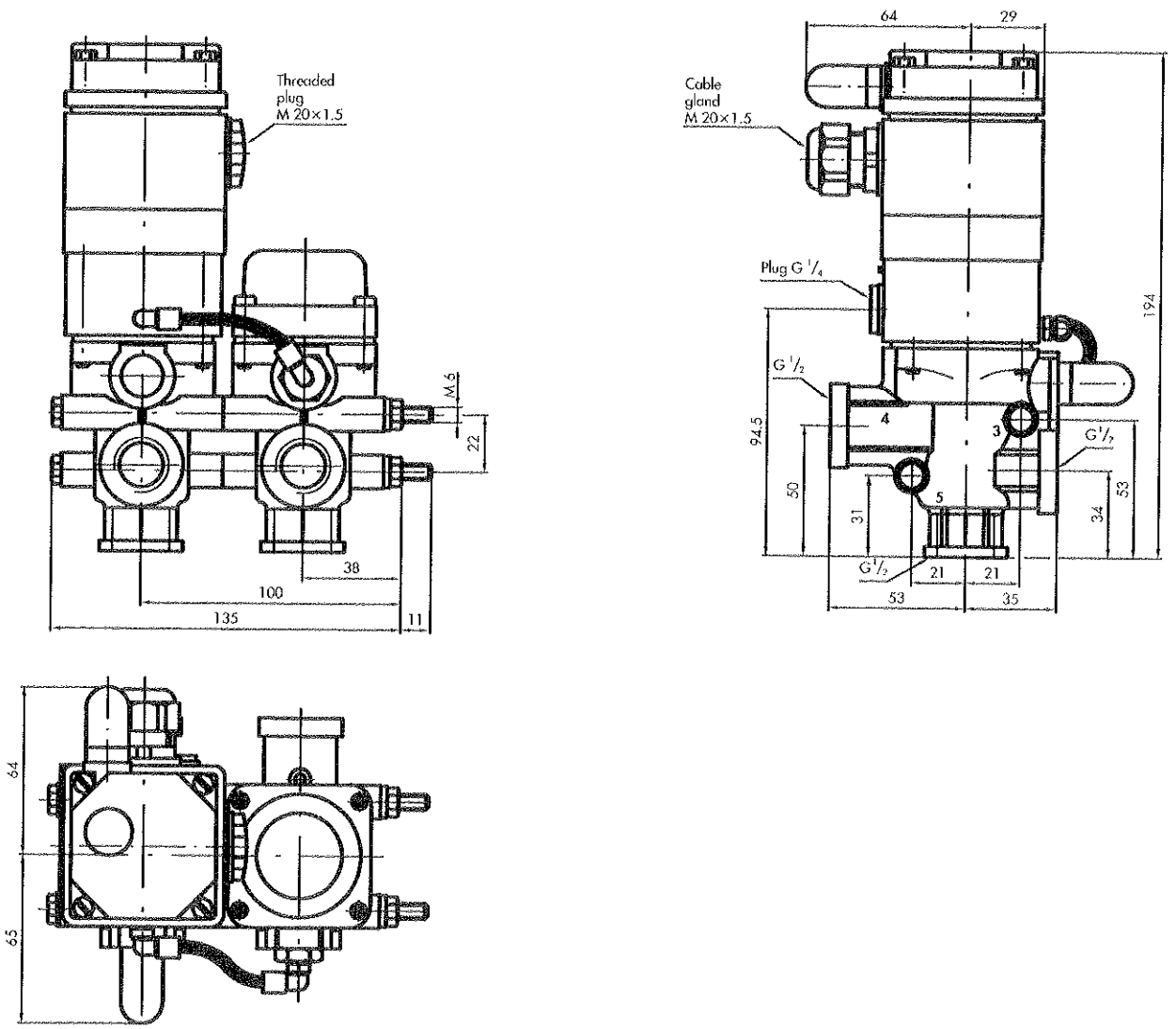
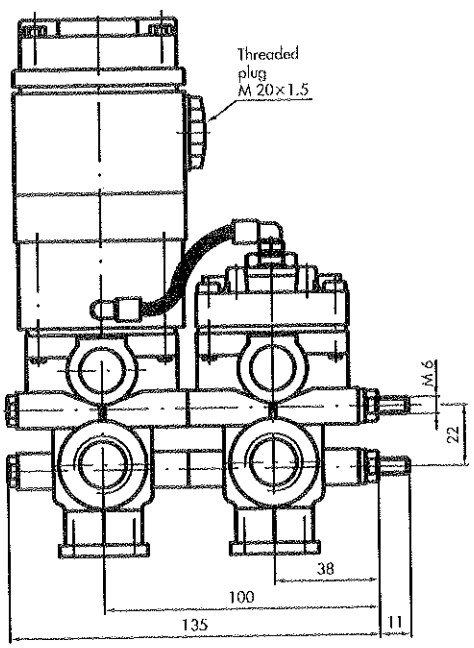
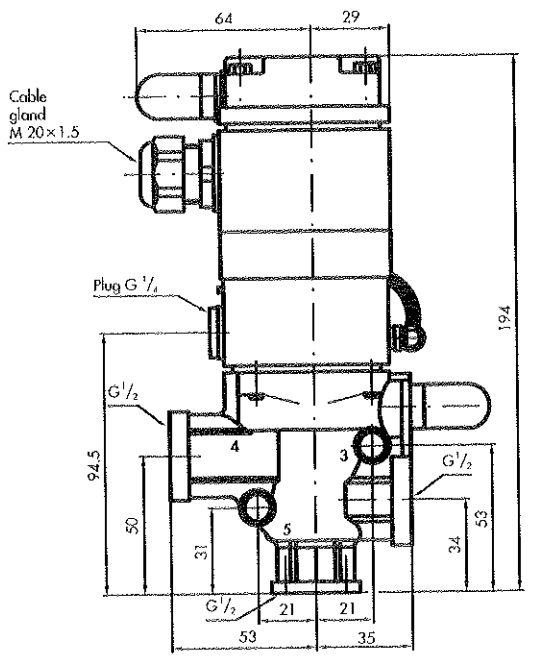


Fig. 24 · Dimensions in mm

Dimensions of devices with threaded connection (continued from page 15)

Type 3963-XX25 Pilot Valve ① combined with Type 3756-X210 Booster Valve ②





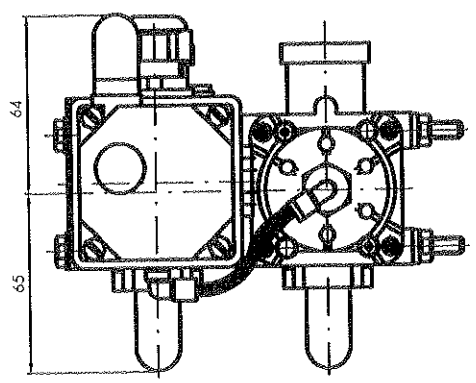
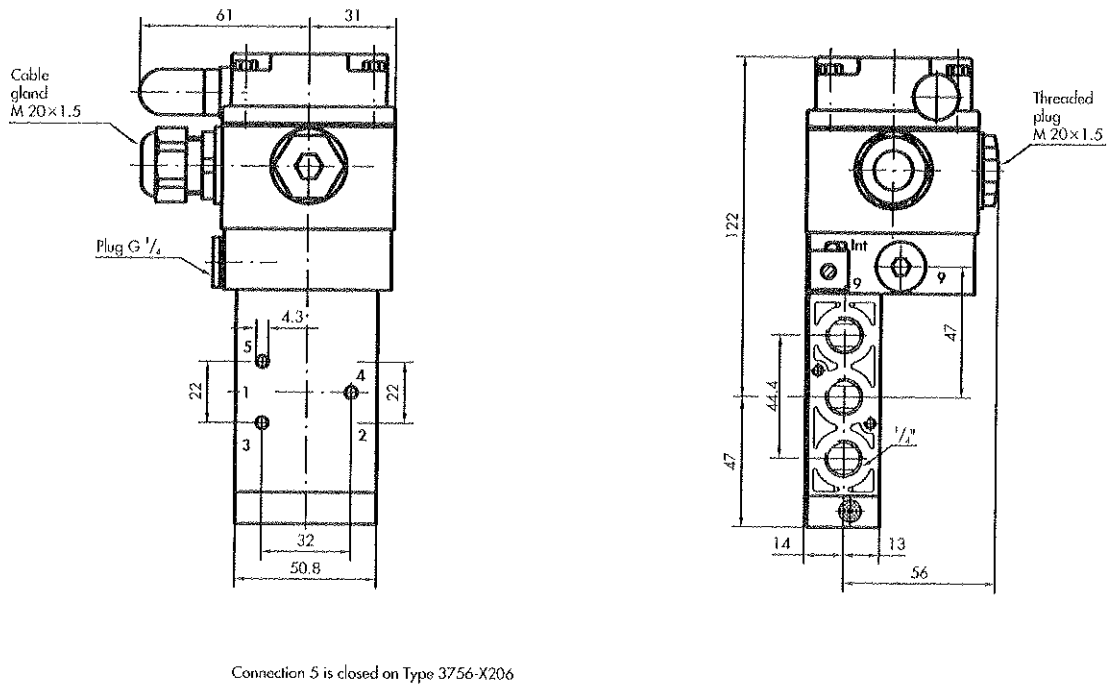


Fig. 25 · Dimensions in mm

Dimensions of devices with threaded connection (continued from page 16)

Type 3963-XX76 Pilot Valve ① combined with Type 3756-X205/-X206 Booster Valve ②



Connection 5 is closed on Type 3756-X206

Fig. 26 · Dimensions in mm

Type 3963-XX76 Pilot Valve ① combined with Type 3756-X325/-X335/-X345/-X355 Booster Valve ②

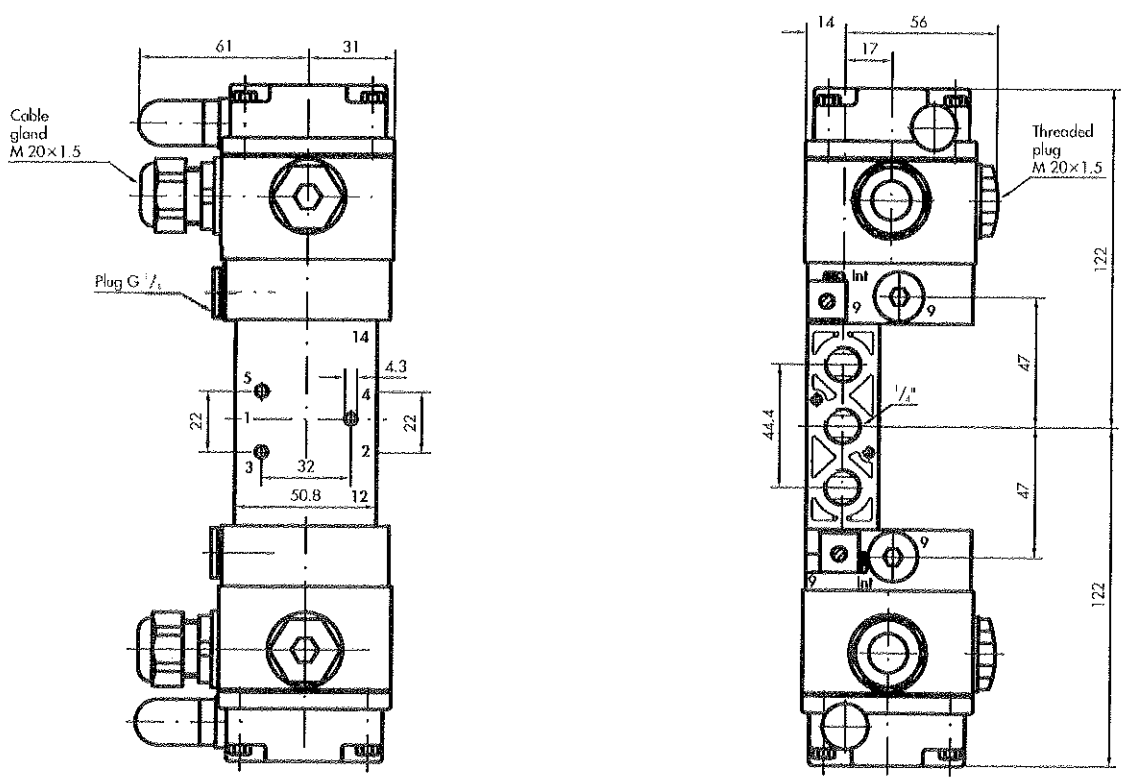


Fig. 27 · Dimensions in mm

Dimensions of devices with threaded connection for linear actuators with NAMUR rib

Type 3963-XX53 Solenoid Valve

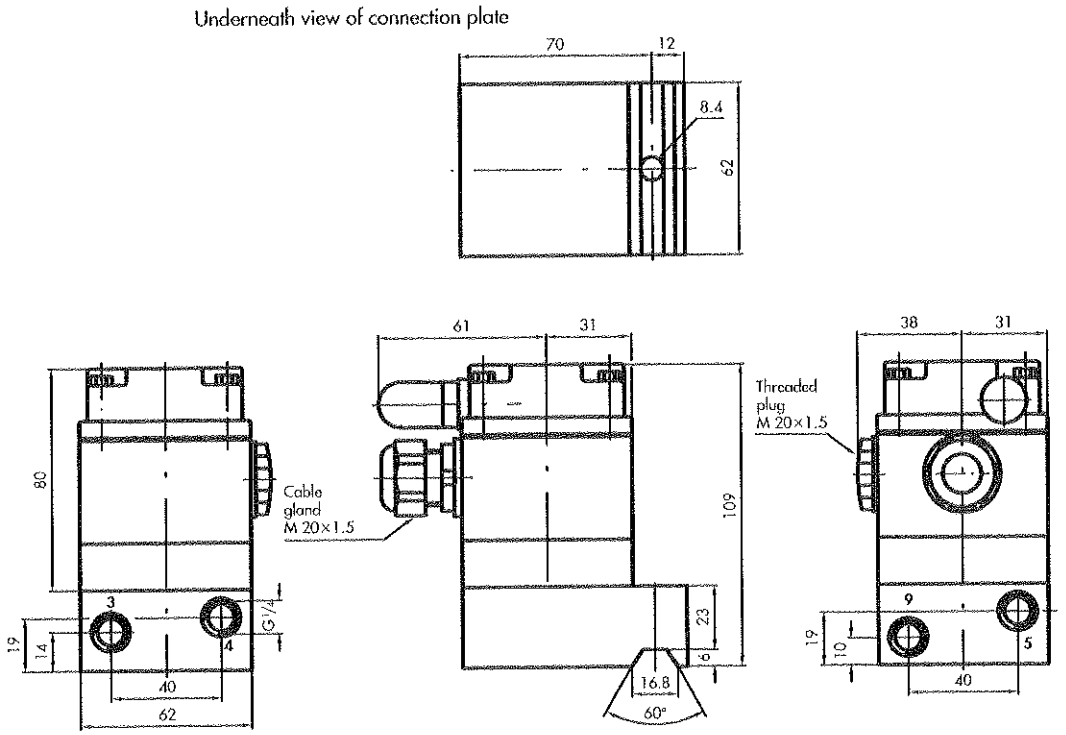


Fig. 28 · Dimensions in mm

Adapter plate NAMUR rib/NAMUR interface (Order No. 1400-6751)

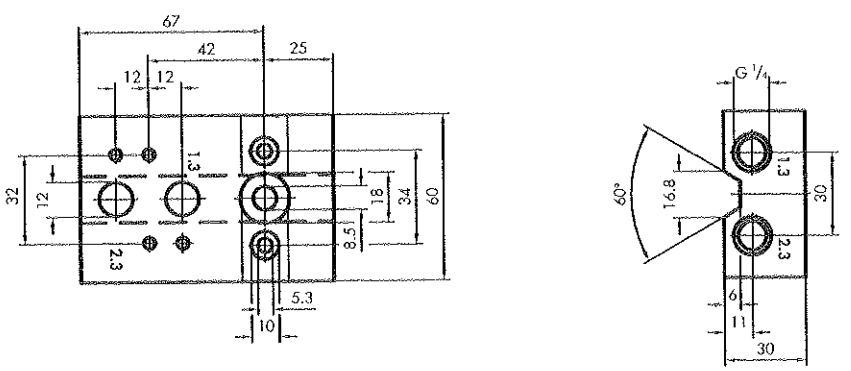


Fig. 29 · Dimensions in mm

Types 3963-XX11/-XX12/-XX21/-XX22 Solenoid Valves

171 – 198

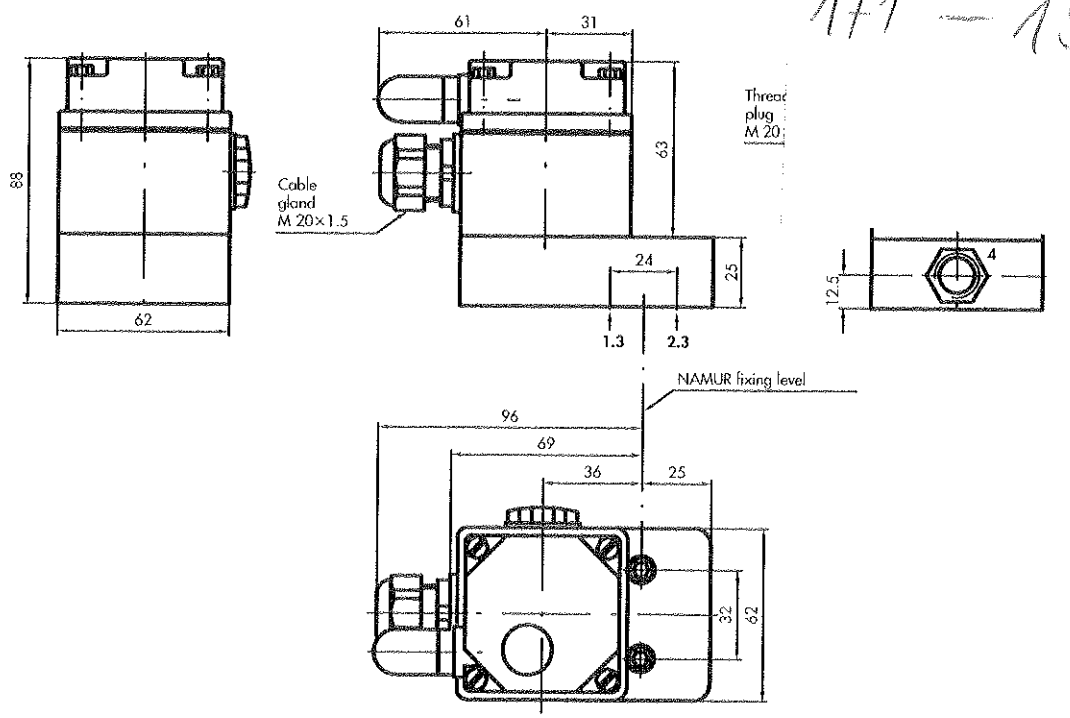


Fig. 30 · Dimensions in mm

Type 3963-XX52 Solenoid Valve

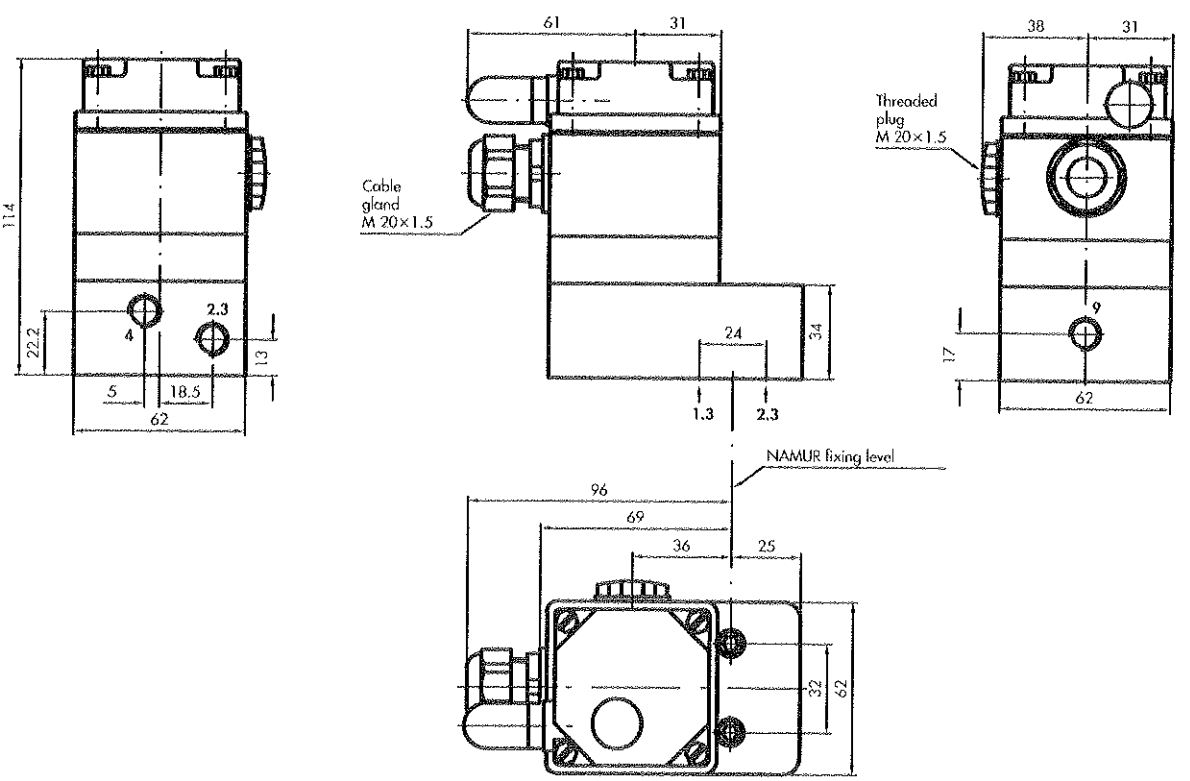


Fig. 31 · Dimensions in mm

Dimensions of devices with NAMUR interface for rotary actuators (continued from page 19)

Type 3963-XX62 Solenoid Valve

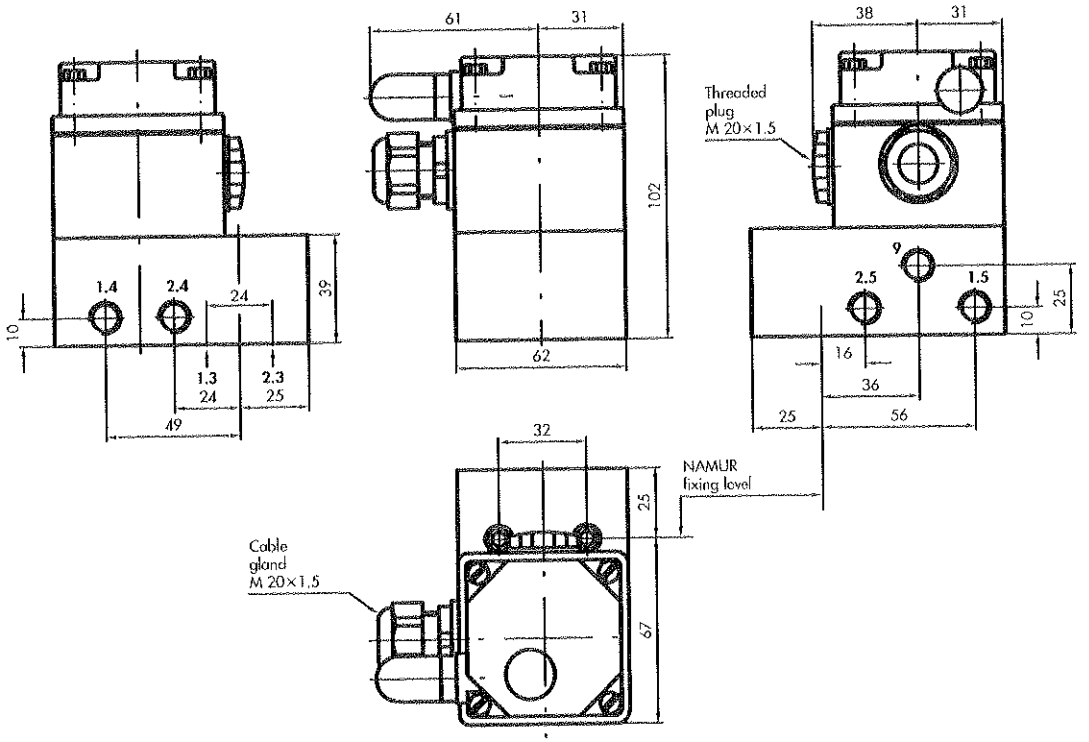
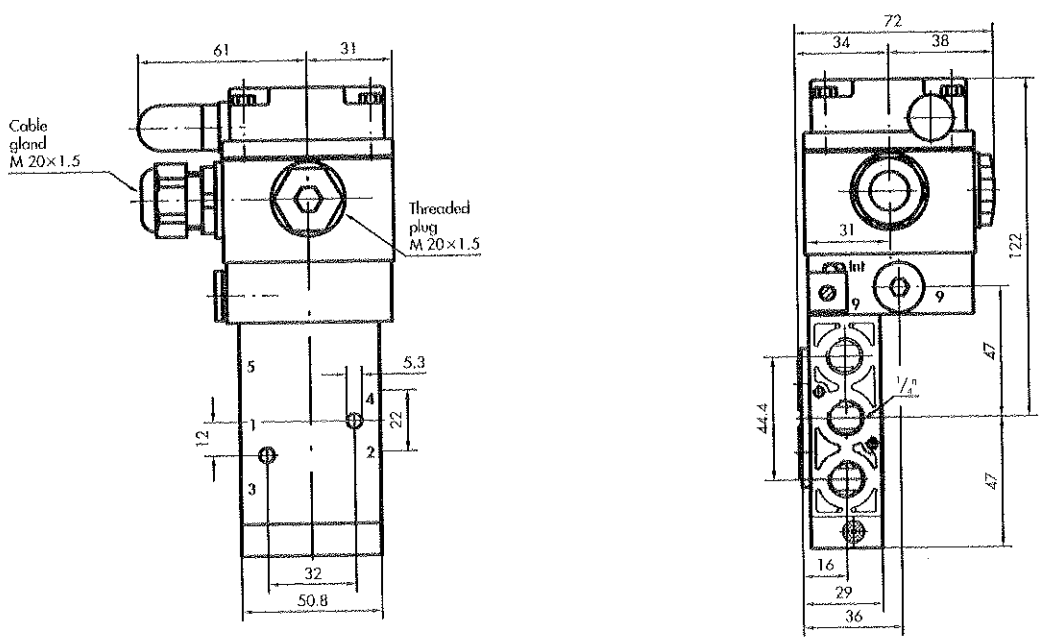


Fig. 32 · Dimensions in mm

Type 3963-XX76 Pilot Valve ① combined with Type 3756-X207/-X208 Booster Valve ②



Connection 5 is closed on Type 3756-X208

Fig. 33 · Dimensions in mm

Dimensions of devices with NAMUR interface for rotary actuators (continued from page 20)

Type 3963-XX76 Pilot Valve ① combined with Type 3756-X207 Booster Valve ② and restrictor block (Order No. 1400-6763) for single-acting rotary actuators with NAMUR interface

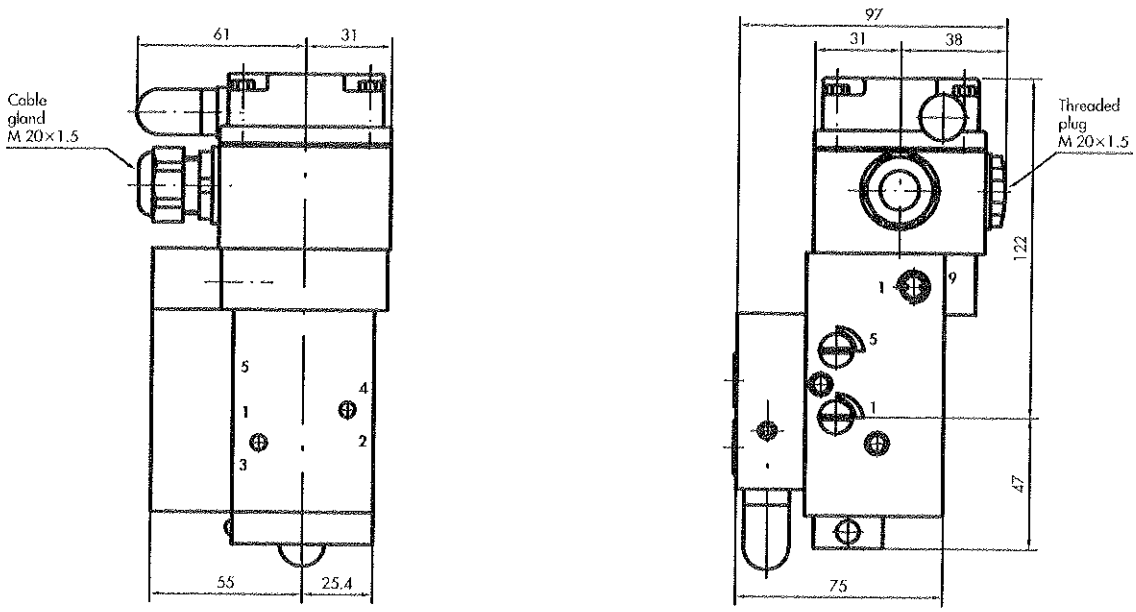


Fig. 34 · Dimensions in mm

Type 3963-XX76 Pilot Valve ① combined with Type 3756-X327/-X337/-X347/-X357 Booster Valve ②

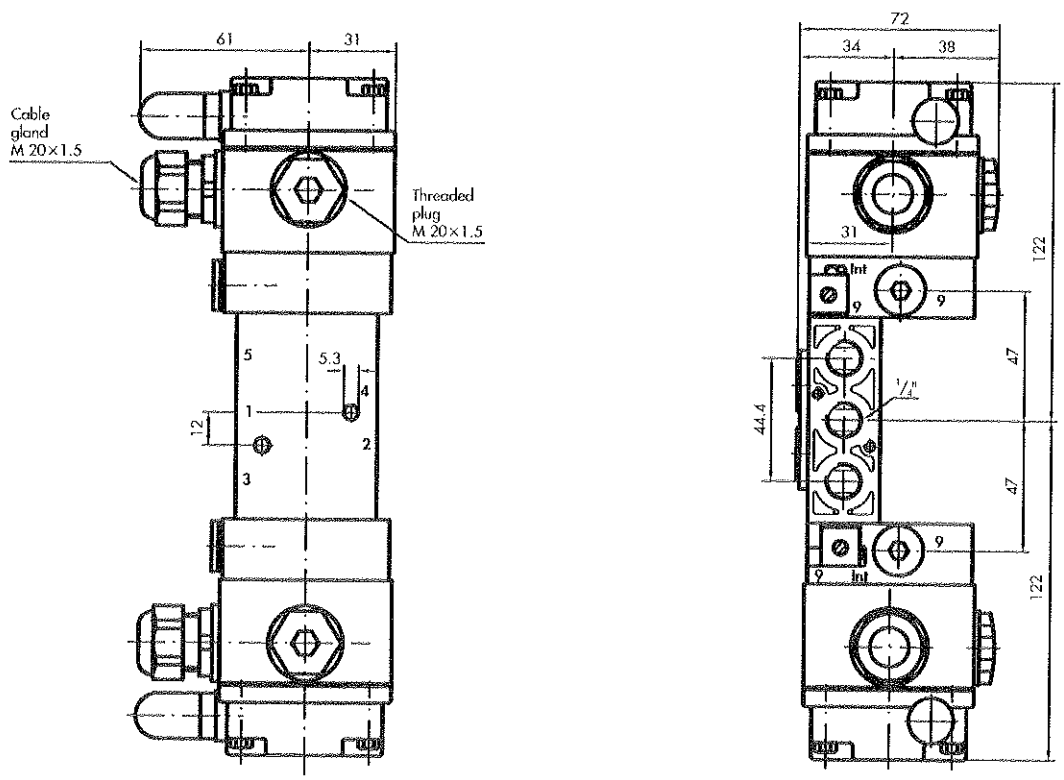


Fig. 35 · Dimensions in mm

Versions and ordering data

Type 3963 Solenoid Valve
(Connection G (NPT) 1/4, K_{vs} value 0.16 or 0.32)

Solenoid valve			Order No. 3963-	.	.	.	.	.	.	.
Type of protection	Without explosion protection (for DC nominal signal)			0	▲	▲	▲	▲	▲	▲
	II 2 G EEx ia IIC T6 [1]	(for DC nominal signal)		1						
	Without explosion protection (for AC nominal signal)			2						
	CSA/FM	(for DC nominal signal)		3						
	II 3 G EEx nA II T6 [2]	(for DC nominal signal)		8						
Nominal signal	6 V DC, power consumption 5.47 mW				1					
	12 V DC, power consumption 13.05 mW				2					
	24 V DC, power consumption 26.71 mW				3					
	230 V AC, power consumption 0.46 VA (without explosion protection)			2	1					
	115 V AC, power consumption 0.17 VA (without explosion protection)			2	2					
	48 V AC, power consumption 0.07 VA (without explosion protection)			2	3					
	24 V AC, power consumption 0.04 VA (without explosion protection)			2	4					
	Special version				9					
Version	**K_{vs} value [3]**	**Connection/attachment**				20				
3/2-way function	0.16	Without connection plate (as spare part for Type 3963-XX27)				20				
		NAMUR interface for on-off rotary actuators	TÜV [4]			21				
		NAMUR interface for on-off rotary actuators, with exhaust air restrictor				22				
		NAMUR interface for on-off/continuous rotary actuators, with supply air/exhaust air restrictors				23				
		Threaded connection (as E/P binary converter)	TÜV [4]			27				
		Threaded connection, with exhaust air restrictor (as E/P binary converter)				28				
		Connection block for Type 3277 Linear Actuator with Types 3766/3767/378X Positioner, with exhaust air restrictor				29				
3/2-way function	0.32	Without connection plate (as spare part for Types 3963-XX52/-XX53/-XX54/-XX55)				50				
		NAMUR interface for on-off/continuous rotary actuators	TÜV [4]			52				
		For linear actuators with NAMUR rib	TÜV [4]			53				
		Threaded connection, connection as desired	TÜV [4]			54				
		Connection block for Type 3277 Linear Actuator with Types 3766/3767/378X Positioner	TÜV [4]			55				
5/2-way function	0.16	Without connection plate (as spare part for Type 3963-XX14)				10				
		NAMUR interface for on-off rotary actuators				11				
		NAMUR interface for on-off rotary actuators, with 2 exhaust air restrictors				12				
		Threaded connection, connection as desired				14				
6/2-way function	0.16	Without connection plate (as spare part for Types 3963-XX62/-XX64)				60				
		NAMUR interface for on-off/continuous rotary actuators				62				
		Threaded connection, connection as desired				64				
Ambient temperature [5]	−25 to +80 °C [6]						0			
	−45 to +80 °C						1			
Electrical connection	Cable gland M 20 × 1.5 made of polyamide, black							0		
	Cable gland M 20 × 1.5 made of polyamide, blue							1		
	Adapter M 20 × 1.5/NPT 1/2 made of aluminum, powder-coated, grayish beige RAL 1019							2		
	Han 7 D male connector (manufactured by Harting), 7 poles, made of aluminum, silvery gray, IP 65 [7]							3		
	Round plug connector M 12 × 1, 4 poles, made of brass, nickel-plated, IP 65 [7]							4		
	Male connector according to EN 175301-803, type A, made of polyamide, black, IP 65 [7]							5		
	Round plug connector (manufactured by Binder), 7 poles, made of PBT GV, black, IP 67 [7]							6		
	EExe cable gland M 20 × 1.5 (manufactured by CEAG) made of polyamide, black							7		
	Cable gland M 20 × 1.5 made of brass, nickel-plated (required for Type 3963-8XXX1)							8		
	Special version							9		
Air connection	Without threaded connection (for Types 3963-XX10/-XX20/-XX29/-XX50/-XX55/-XX60)								0	
	G 1/4								1	
	NPT 1/4								2	
Manual override	None									0
Degree of protection IP 54 [6] with filter made of polyethylene	Pushbutton switch, screwdriver-actuated, accessible from outside									1
	Pushbutton, pin-actuated, accessible from outside									2
	Pushbutton underneath enclosure cover [8]									3
Degree of protection IP 65 with filter check valve made of polyamide [9]	None									4
	Pushbutton switch, screwdriver-actuated, accessible from outside									5
	Pushbutton, pin-actuated, accessible from outside									6
	Pushbutton underneath enclosure cover [8]									7

[1] According to EC-type-examination Certificate PTB 01 ATEX 2085.
[2] According to Statement of Conformity PTB 01 ATEX 2086X.
[3] Air flow at $p_1 = 2.4$ bar and $p_2 = 1.0$ bar can be calculated according to the following equation: $Q = K_{vs} \times 36.22$, expressed in m^3/h.
[4] Report No. S63/00 (used on control valves according to DIN 3394 Part 1, DIN EN 161, DIN 32725, DIN EN 264 and DIN 32730), Report No. S64/00 (safety function up to class AK 7 according to DIN V 19251).
[5] Permissible maximum ambient temperature for EExi versions according to temperature classes T4/T5/T6 (see EC-type-examination certificate).
[6] Silicone-free version with degree of protection IP 54 at permissible ambient temperature from −25 to +80 °C on request.
[7] The female connector is not delivered with the device (see "Accessories and spare parts").
[8] Manual override lever accessible from outside on request.
[9] Filter check valve made of stainless steel with degree of protection IP 65 or NEMA 4 on request.

Versions and ordering data (continued from page 22)

Type 3963 Pilot Valve ① with single-actuated Type 3756 Booster Valve ②
(Connection G (NPT) 1/4 or 1/4/NAMUR or 1/2, K_{vs} value 1.4 or 4.3)

Pilot valve ①		Order No. 3963-	.	.	.	.	.	.	/3756-	.	.	.	.
Type of protection	Without explosion protection (for DC nominal signal)		0	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
	II 2 G EEx ia IIC T6 [1] (for DC nominal signal)		1										
	Without explosion protection (for AC nominal signal)		2										
	CSA/FM (for DC nominal signal)		3										
	II 3 G EEx nA II T6 [2] (for DC nominal signal)		8										
Nominal signal	6 V DC, power consumption 5.47 mW			1									
	12 V DC, power consumption 13.05 mW			2									
	24 V DC, power consumption 26.71 mW			3									
	230 V AC, power consumption 0.46 VA (without explosion protection)			2	1								
	115 V AC, power consumption 0.17 VA (without explosion protection)			2	2								
	48 V AC, power consumption 0.07 VA (without explosion protection)			2	3								
	24 V AC, power consumption 0.04 VA (without explosion protection)			2	4								
	Special version				9								
Version 3/2-way function	**K_{vs} value [3]**	**Connection/attachment**											
	0.01	For Types 3756-X205/-X206/-X207/-X208 Booster Valves ② TÜV [4]				7	6						
	0.16	For Types 3756-X203/-X213/-X209/-X210 Booster Valves ② TÜV [4]				2	5						
Ambient temperature [5]	−25 to +80 °C [6]							0					
	−45 to +80 °C							1					
Electrical connection	Cable gland M 20 × 1.5 made of polyamide, black								0				
	Cable gland M 20 × 1.5 made of polyamide, blue								1				
	Adapter M 20 × 1.5/NPT 1/2 made of aluminum, powder-coated, grayish beige RAL 1019								2				
	Han 7 D male connector (manufactured by Harting), 7 poles, made of aluminum, silvery gray, IP 65 [7]								3				
	Round plug connector M 12 × 1, 4 poles, made of brass, nickel-plated, IP 65 [7]								4				
	Male connector according to EN 175301-803, type A, made of polyamide, black, IP 65 [7]								5				
	Round plug connector (manufactured by Binder), 7 poles, made of PBT GV, black, IP 67 [7]								6				
	EExe cable gland M 20 × 1.5 (manufactured by CEAG) made of polyamide, black								7				
	Cable gland M 20 × 1.5 made of brass, nickel-plated (required for Type 3963-8XXX1)								8				
	Special version								9				
Air connection	Without threaded connection									0			
Manual override **Degree of protection IP 54 [6]** with filter made of polyethylene	None										0		
	Pushbutton switch, screwdriver-actuated, accessible from outside										1		
	Pushbutton, pin-actuated, accessible from outside										2		
	Pushbutton underneath enclosure cover [8]										3		
Degree of protection IP 65 with filter check valve made of polyamide [9]	None										4		
	Pushbutton switch, screwdriver-actuated, accessible from outside										5		
	Pushbutton, pin-actuated, accessible from outside										6		
	Pushbutton underneath enclosure cover [8]										7		

Booster valve ②, single-actuated					Order No. 3756-	.	.	.	.
Actuation	**Version**	**Operating pressure** (in direction of flow)	**K_{vs} value [3]** (in direction of flow)	**Ambient temperature**	**Air connection**	↑	↑	↑	↑
Type 3963-XX25 Pilot Valve ①	3/2-way function	max. 10 bar (3 → 5, 4 → 3) max. 2 bar (as desired)	1.9 (4 → 3), 1.5 (3 → 4) 4.3 (3 → 5), 4.7 (5 → 3)	−25 to +80 °C	G 1/2 TÜV [4]	1	2	0	3
					NPT 1/2 TÜV [4]	6	2	0	3
				−40 to +80 °C	G 1/2 TÜV [4]	1	2	1	3
					NPT 1/2 TÜV [4]	6	2	1	3
	5/2-way function	max. 10 bar (at 4) max. 2 bar (as desired)	1.9 (4 → 3), 1.5 (3 → 4) 4.3 (3 → 5), 4.7 (5 → 3)	−25 to +80 °C	G 1/2	1	2	0	9
					NPT 1/2	6	2	0	9
	6/2-way function	max. 10 bar (at 4) max. 2 bar (as desired)	1.9 (4 → 3), 1.5 (3 → 4) 4.3 (3 → 5), 4.7 (5 → 3)	−25 to +80 °C	G 1/2	1	2	1	0
					NPT 1/2	6	2	1	0
Type 3963-XX76 Pilot Valve ①	5/2-way function	max. 10 bar (as desired)	1.4 (as desired)	−40 to +80 °C	G 1/4	3	2	0	5
					NPT 1/4	8	2	0	5
	3/2-way function with exhaust air return	max. 10 bar (as desired)	1.4 (as desired)	−40 to +80 °C	G 1/4 TÜV [4]	3	2	0	6
					NPT 1/4 TÜV [4]	8	2	0	6
	5/2-way function	max. 10 bar (as desired)	1.4 (as desired)	−40 to +80 °C	G 1/4/NAMUR	3	2	0	7
					NPT 1/4/NAMUR	8	2	0	7
	3/2-way function with exhaust air return	max. 10 bar (as desired)	1.4 (as desired)	−40 to +80 °C	G 1/4/NAMUR TÜV [4]	3	2	0	8
					NPT 1/4/NAMUR TÜV [4]	8	2	0	8

[1] According to EC-type-examination Certificate PTB 01 ATEX 2085.
[2] According to Statement of Conformity PTB 01 ATEX 2086X.
[3] Air flow at $p_1 = 2.4$ bar and $p_2 = 1.0$ bar can be calculated according to the following equation: $Q = K_{vs} \times 36.22$, expressed in m^3/h.
[4] Report No. S63/00 (used on control valves according to DIN 3394 Part 1, DIN EN 161, DIN 32725, DIN EN 264 and DIN 32730), Report No. S64/00 (safety function up to class AK 7 according to DIN V 19251).
[5] Permissible maximum ambient temperature for EExi versions according to temperature classes T4/T5/T6 (see EC-type-examination certificate).
[6] Silicone-free version with degree of protection IP 54 at permissible maximum ambient temperature from −25 to +80 °C on request.
[7] The female connector is not delivered with the device (see "Accessories and spare parts").
[8] Manual override lever accessible from outside on request.
[9] Filter check valve made of stainless steel with degree of protection IP 65 or NEMA 4 on request.

Versions and ordering data (continued from page 23)

Type 3963 Pilot Valves ① with double-actuated Type 3756 Booster Valve ②
(Connection G (NPT) 1/4 or 1/4/NAMUR, K_{vs} value 1.4)

Pilot valves ①		Order No. 3963-	.	.	76	.	.	.	.	/3756-	.	.	.	.
Type of protection	Without explosion protection (for DC nominal signal)		0											
	II 2 G EEx ia IIC T6 [1] (for DC nominal signal)		1											
	Without explosion protection (for AC nominal signal)		2											
	CSA/FM (for DC nominal signal)		3											
	II 3 G EEx nA II T6 [2] (for DC nominal signal)		8											
Nominal signal	6 V DC, power consumption 5.47 mW			1										
	12 V DC, power consumption 13.05 mW			2										
	24 V DC, power consumption 26.71 mW			3										
	230 V AC, power consumption 0.46 VA (without explosion protection)			2	1									
	115 V AC, power consumption 0.17 VA (without explosion protection)			2	2									
	48 V AC, power consumption 0.07 VA (without explosion protection)			2	3									
	24 V AC, power consumption 0.04 VA (without explosion protection)			2	4									
	Special version				9									
Version	**K_{vs} value [3]**	**Connection/attachment**												
3/2-way function	0.01	For booster valve ② TÜV [4]				76								
Ambient temperature [4]	−25 to +80 °C [6]						0							
	−45 to +80 °C						1							
Electrical connection	Cable gland M 20 × 1.5 made of polyamide, black							0						
	Cable gland M 20 × 1.5 made of polyamide, blue							1						
	Adapter M 20 × 1.5/NPT 1/2 made of aluminum, powder-coated, grayish beige RAL 1019							2						
	Han 7 D male connector (manufactured by Harting), 7 poles, made of aluminum, silvery gray, IP 65 [7]							3						
	Round plug connector M 12 × 1, 4 poles, made of brass, nickel-plated, IP 65 [7]							4						
	Male connector according to EN 175301-803, type A, made of polyamide, black, IP 65 [7]							5						
	Round plug connector (manufactured by Binder), 7 poles, made of PBT GV, black, IP 67 [7]							6						
	EExe cable gland M 20 × 1.5 (manufactured by CEAG) made of polyamide, black							7						
	Cable gland M 20 × 1.5 made of brass, nickel-plated (required for Type 3963-8XXX1)							8						
	Special version							9						
Air connection	Without threaded connection								0					
Manual override	None									0				
Degree of protection IP 54 [6] with filter made of polyethylene	Pushbutton switch, screwdriver-actuated, accessible from outside									1				
	Pushbutton, pin-actuated, accessible from outside									2				
	Pushbutton underneath enclosure cover [8]									3				
Degree of protection IP65 with filter check valve made of polyamide [9]	None									4				
	Pushbutton switch, screwdriver-actuated, accessible from outside									5				
	Pushbutton, pin-actuated, accessible from outside									6				
	Pushbutton underneath enclosure cover [8]									7				

Booster valve ②, double-actuated				Order No. 3756-	.	.	.	.
Version	**Operating pressure** (in direction of flow)	**K_{vs} value [3]** (in direction of flow)	**Ambient temperature**	**Air connection**				
5/2-way function, detented (two positions)	max. 10 bar (as desired)	1.4 (as desired)	−40 to +80 °C	G 1/4	TÜV [4]	3	3	2	5
				NPT 1/4	TÜV [4]	8	3	2	5
				G 1/4/NAMUR	TÜV [4]	3	3	2	7
				NPT 1/4/NAMUR	TÜV [4]	8	3	2	7
5/3-way function, spring-centered (ports 2 and 4 closed)	max. 10 bar (as desired)	1.4 (as desired)	−40 to +80 °C	G 1/4		3	3	3	5
				NPT 1/4		8	3	3	5
				G 1/4/NAMUR		3	3	3	7
				NPT 1/4/NAMUR		8	3	3	7
5/3-way function, spring-centered (ports 2 and 4 vented)	max. 10 bar (as desired)	1.4 (as desired)	−40 to +80 °C	G 1/4	TÜV [4]	3	3	4	5
				NPT 1/4	TÜV [4]	8	3	4	5
				G 1/4/NAMUR	TÜV [4]	3	3	4	7
				NPT 1/4/NAMUR	TÜV [4]	8	3	4	7
5/3-way function, spring-centered (ports 2 and 4 to air supply)	max. 10 bar (as desired)	1.4 (as desired)	−40 to +80 °C	G 1/4		3	3	5	5
				NPT 1/4		8	3	5	5
				G 1/4/NAMUR		3	3	5	7
				NPT 1/4/NAMUR		8	3	5	7

[1] According to EC-type-examination Certificate PTB 01 ATEX 2085.
[2] According to Statement of Conformity PTB 01 ATEX 2086X.
[3] Air flow at $p_1 = 2.4$ bar and $p_2 = 1.0$ bar can be calculated according to the following equation: $Q = K_{vs} \times 36.22$, expressed in m^3/h.
[4] Report No. S63/00 (used on control valves according to DIN 3394 Part 1, DIN EN 161, DIN 32725, DIN EN 264 and DIN 32730), Report No. S64/00 (safety function up to class AK 7 according to DIN V 19251).
[5] Permissible maximum ambient temperature for EExi versions according to temperature classes T4/T5/T6 (see EC-type-examination certificate).
[6] Silicone-free version with degree of protection IP 54 at permissible maximum ambient temperature from −25 to +80 °C on request.
[7] The female connector is not delivered with the device (see "Accessories and spare parts").
[8] Manual override lever accessible from outside on request.
[9] Filter check valve made of stainless steel with degree of protection IP 65 or NEMA 4 on request.

Spare parts and accessories

Spare parts for Type 3963 Solenoid Valves, Type 3963 Pilot Valves and Type 3756 Booster Valves	
Order No.	**Designation**
0439-0088	Flat gasket (for connection plate for Type 3963, not for Types 3963-XX11/-XX21)
8205-1090	Molded gasket (for air supply for Types 3756-X205/-X206/-X207/-X208)
0520-0620	Diaphragm made of chloroprene, −25 to +80 °C (for Types 3756-1203/-6203)
0520-0622	Diaphragm made of chloroprene, −25 to +80 °C (for Type 3963, not for Type 3963-XX76)
0520-1097	Diaphragm made of silicone rubber, −40 to +80 °C (for Type 3963, not for Type 3963-XX76)
0520-1128	Diaphragm made of silicone rubber, −40 to +80 °C (for Types 3756-1203/-6203)
1180-8311	Actuating element insert, −25 to +80 °C (for Types 3756-1203/-6203/-1213/-6213)
1180-8553	Actuating element insert, −40 to +80 °C (for Types 3756-1203/-6203/-1213/-6213)
8421-0021	O-ring 2 × 1 (for connection plate for Types 3756-XXX5/-XXX6/-XXX7/-XXX8)
8421-0308	O-ring 11 × 4,5 (for NAMUR interface for Types 3756-X207/-X208)
8421-9002	O-ring 16 × 2 (for NAMUR interface for Types 3963-XX11/-XX21/-XX52/-XX62)
8421-0085	O-ring 26 × 2, −25 to +80 °C (for Types 3756-1203/-6203/-1213/-6213)
8421-0418	O-ring 26 × 2, −40 to +80 °C (for Types 3756-1203/-6203/-1213/-6213)
8421-0102	O-ring 36 × 2, −25 to +80 °C (for Types 3756-1203/-6203/-1213/-6213)
8421-0101	O-ring 36 × 2, −40 to +80 °C (for Types 3756-1203/-6203/-1213/-6213)
	Enclosure cover without filter (for Type 3963)
1099-0673	without manual override
1099-0674	with pushbutton switch, screwdriver-actuated, accessible from outside
1099-0675	with pushbutton, pin-actuated, accessible from outside
1099-1194	with lever switch, accessible from outside
8323-0032	Plug G $^1/_4$ made of stainless steel (for connection 9 on Type 3963)
8414-0140	Seal ring (for plug G $^1/_4$)

Accessories for Type 3963 Solenoid Valves, Type 3963 Pilot Valves and Type 3756 Booster Valves	
Order No.	**Designation**
0790-6658	Female connector according to EN 175301-803, type A, made of polyamide, black, IP 65
1400-8298	Female connector (manufactured by Harting), 7 poles, made of aluminum, silvery gray, IP 65
8801-2810	Sensor connecting cable, 2 wires, length 3 m, blue, with angle connection M 12 × 1, 4 poles, IP 68
8831-0716	Female connector (manufactured by Binder), 7 poles, made of PBT GV, black, IP 67
8831-0865	Female connector M 12 × 1, 4 poles, angle type, made of polyamide, black, IP 67
3994-0158	Cable break protection device with enclosure for top hat rail 35, IP 20 (for Type 3963-X1 with 6 V DC solenoid)
1400-5268	Filter made of polyethylene, connection G 1/G $^1/_2$, IP 54 (required for actuator size > 1 400 cm²!)
8504-0066	Filter made of polyethylene, connection G $^1/_4$, IP 54
8504-0068	Filter made of polyethylene, connection G $^1/_2$, IP 54
	Filter check valves made of polyamide or stainless steel, IP 65 or NEMA 4, see Data Sheet Z 900-7 EN
1400-5930	Mounting base for G profile 32 according to EN 50035 (for Types 3963-XX14/-XX27/-XX28/-XX54/-XX64 – 2 pieces are required!)
1400-5931	Mounting base for top hat rail 35 according to EN 50022 (for Types 3963-XX14/-XX27/-XX28/-XX54/-XX64 – 2 pieces are required!)
1400-6726	Mounting plate for wall mounting (for Types 3963-XX14/-XX27/-XX28/-XX54/-XX64)
1400-6763	Restrictor block with 2 restrictors for supply air and exhaust air for adjusting different closing and opening times in a ratio of 1:15 (for Type 3963-X207) for single-acting rotary actuators with NAMUR interface

Connection blocks and accessories for attaching Types 3963-XX29/-XX55 Solenoid Valves to Type 3277 Linear Actuators	
Order No.	**Designation**
	Connection block for Type 3277 Linear Actuators with integral Type 3766/3767/3780 Positioner attachment
1400-6943	Actuator "Stem extends", connection G $^1/_4$
1400-6944	Actuator "Stem extends", connection NPT $^1/_4$
1400-6945	Actuator "Stem retracts", connection G $^1/_4$
1400-6946	Actuator "Stem retracts", connection NPT $^1/_4$
	Piping kit for "Stem retracts"
1400-6444	Actuator size 240 cm², made of steel, galvanised
1400-6445	Actuator size 240 cm², made of stainless steel
1400-6446	Actuator size 350 cm², made of steel, galvanised
1400-6447	Actuator size 350 cm², made of stainless steel
1400-6448	Actuator size 700 cm², made of steel, galvanised
1400-6449	Actuator size 700 cm², made of stainless steel
1400-6376	Pressure gauge, 0 to 6 bar/75 psi

Spare parts and accessories (continued from page 25)

Mounting kits for Type 3963 Solenoid Valves with threaded connection	
Order No.	**Designation**
1400-6759	Mounting kit for linear actuators (actuator size 80/240 cm², connection G 1/4) with screwed pipe connection G 1/4/G 1/4, made of stainless steel
1400-6735	Mounting kit for linear actuators (actuator size 350/700 cm², connection G 3/8) with screwed pipe connection G 1/2/G 3/8, made of stainless steel
1400-6761	with screwed pipe connection G 1/4/G 3/8, made of stainless steel
1400-6736	Mounting kit for linear actuators (actuator size 1 400 cm², connection G 3/4) with screwed pipe connection G 1/2/G 3/4, made of stainless steel
1400-6737	Mounting kit for linear actuators (actuator size 2 800 cm², connection G 1) with screwed pipe connection G 1/2/G 1, made of stainless steel
	Mounting kit for linear actuators (actuator size 80/240 cm², connection G 1/4) with angle bracket made of stainless steel
1400-6749	and screwed joints for pipe 8 × 1, connection G 1/4/G 1/4, made of steel, galvanised
1400-6750	and screwed joints for pipe 8 × 1, connection G 1/4/G 1/4, made of stainless steel
	Mounting kit for linear actuators (actuator size 350/700 cm², connection G 3/8) with angle bracket made of stainless steel
1400-6738	and screwed joints for pipe 8 × 1, connection G 1/4/G 3/8, made of steel, galvanised
1400-6739	and screwed joints for pipe 8 × 1, connection G 1/4/G 3/8, made of stainless steel
1400-6743	and screwed joints for pipe 12 × 1, connection G 1/4/G 3/8, made of stainless steel
1400-6744	and screwed joints for pipe 10 × 1, connection G 1/2/G 3/8, made of polyamide
1400-6745	and screwed joints for pipe 10 × 1, connection G 1/4/G 3/8, made of polyamide
	Mounting kit for linear actuators (actuator size 700 cm², connection G 3/8) with angle bracket made of stainless steel
1400-6740	and screwed joints for pipe 12 × 1, connection G 1/2/G 3/8, made of steel, galvanised
1400-6741	and screwed joints for pipe 12 × 1, connection G 1/4/G 3/8, made of steel, galvanised
1400-6742	and screwed joints for pipe 12 × 1, connection G 1/2/G 3/8, made of stainless steel

Mounting kits for Type 3963 Solenoid Valves with NAMUR interface	
Order No.	**Designation**
	Mounting kit for linear actuators (actuator size 350/700 cm², connection G 3/8) with NAMUR rib via adapter plate NAMUR rib/NAMUR interface (Order No. 1400-6751)
1400-6746	with screwed joints for pipe 12 × 1, connection G 1/4/G 3/8, made of steel, galvanised
1400-6747	with screwed joints for pipe 12 × 1, connection G 1/4/G 3/8, made of stainless steel
1400-6748	with screwed joints for pipe 10 × 1, connection G 1/4/G 3/8, made of polyamide
	Mounting kit for linear actuators (actuator size 80/240 cm², connection G 1/4) with NAMUR rib via adapter plate NAMUR rib/NAMUR interface (Order No. 1400-6751)
1400-6752	with screwed joints for pipe 6 × 1, connection G 1/4/G 1/4, made of steel, galvanised
1400-6753	with screwed joints for pipe 6 × 1, connection G 1/4/G 1/4, made of stainless steel
1400-6756	with screwed joints for hose 10 × 1, connection G 1/4/G 1/4, made of polyamide
	Mounting kit for linear actuators (actuator size 350/700 cm², connection G 3/8) with NAMUR rib via adapter plate NAMUR rib/NAMUR interface (Order No. 1400-6751)
1400-6754	with screwed joints for pipe 8 × 1, connection G 1/4/G 3/8, made of steel, galvanised
1400-6755	with screwed joints for pipe 8 × 1, connection G 1/4/G 3/8, made of stainless steel
1400-6757	with screwed joints for pipe 10 × 1, connection G 1/4/G 3/8, made of polyamide
1400-6759	Mounting kit for linear actuators (actuator size 80/240 cm², connection G 1/4) with screwed pipe connection G 1/4/G 1/4, made of stainless steel

Accessories for mounting kits	
Order No.	**Designation**
0320-1416	Bracket for NAMUR rib (required when a positioner or a limit switch is to be mounted to linear actuators with nominal size < DN 50 at the same time)
8320-0131	Hexagon socket head screw M 8 × 60 – A 4 DIN 931
1400-6751	Adapter plate NAMUR rib/NAMUR interface

(Specifications subject to change without notice.)

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– a subsidiary of SAMSON AG

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Internet: http://www.samsomatic.de

2003-06 A · T 3963 EN

Pneumatic Lock-Up Valve

Type 3709

Application

Pneumatic lock-up valve for shutting off the signal pressure line of pneumatic actuators

The pneumatic lock-up valve shuts off the signal pressure tube either when the air supply falls below an adjusted value or upon complete air supply failure. This causes the actuator to remain in its last position.

Versions

Type 3709-1 (Fig. 1) · Lock-up valve for direct attachment to Types 4765 or 3766 Pneumatic Positioners or Types 4763, 3767, 3780 or 3785 Electropneumatic Positioners when these are integrally attached to a Type 3277 Actuator, without connection block (not in connection with mounting block and Type 4708 Supply Pressure Regulator).

Type 3709-2 (Fig. 2) · Lock-up valve for arbitrary installation in the signal pressure line.

Principle of operation (Fig. 3)

The supply air produces a force on the diaphragm (4) which is balanced by the spring (6). When the force produced on the diaphragm is greater than the spring force, input and output are connected, i.e. the signal pressure supplied by the positioner is transmitted unobstructed to the actuator. When the supply air pressure falls below the adjusted value, the spring force dominates, and the spring (6) moves the plug (3) fully into the seat (9). As a result, the pressure in the actuator is locked up.

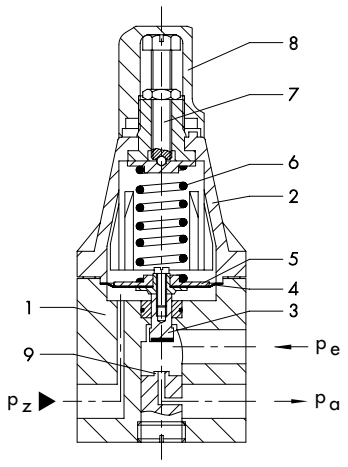


Fig. 3 · Sectional drawing of Type 3709-2

Fig. 1 · Type 3709-1 Pneumatic Lock-Up Valve

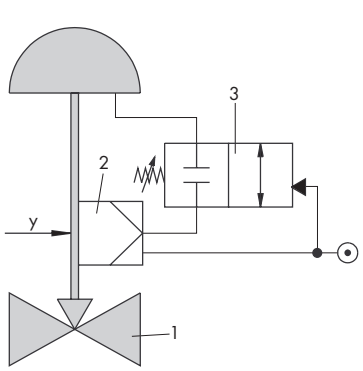
Fig. 2 · Type 3709-2 Pneumatic Lock-Up Valve

Legend to Fig. 3

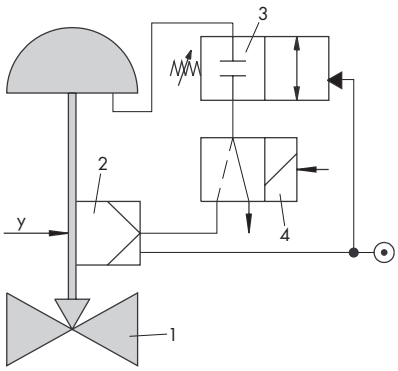
1	Housing	7	Spindle
2	Cover	8	Cap
3	Plug	9	Seat
4	Diaphragm	p_a	Signal pressure output
5	Diaphragm plate	p_e	Signal pressure input
6	Spring	p_z	Supply air

Examples of application

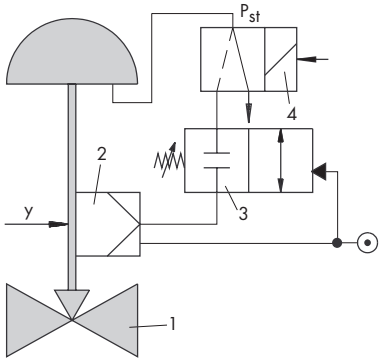
Closed loop controlling



Closed and open loop controlling



Closed loop controlling and safety interlocking



1 Pneumatic control valve
2 Positioner
3 Lock-up valve
4 Solenoid valve

Technical data

Connections	¼ NPT or G ¼
Supply air	Max. 12 bar
Signal pressure	Max. 6 bar
K_{vs} value	Approx. 0.2
Set point range	Continuously adjustable from 0... 6 bar
Recommended adjustment	≥ 0.2 bar above required signal pressure Min. 1.6 bar
Permissible ambient temperature	–25 ... +80 °C Extended temperature range on request
Weight approx.	0.4 kg
Materials	
Housing	Die-cast aluminum, plastic-coated, stainless steel on request
Cover	Ultramid
Diaphragm	CR (chloroprene rubber w. fabric)
Diaphragm plate	Al

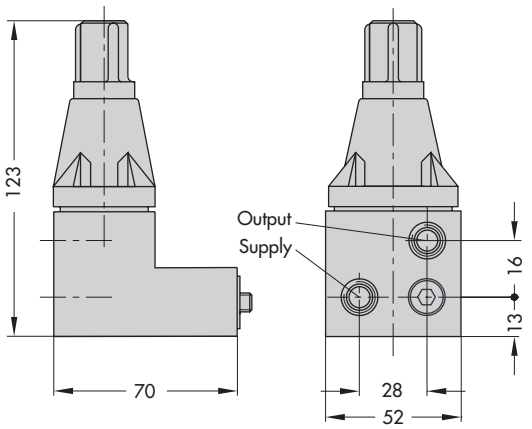
Ordering text

Pneumatic Lock-Up Valve Type 3709- ...
Attached to Positioner Type ...
Connections ¼ NPT or G ¼

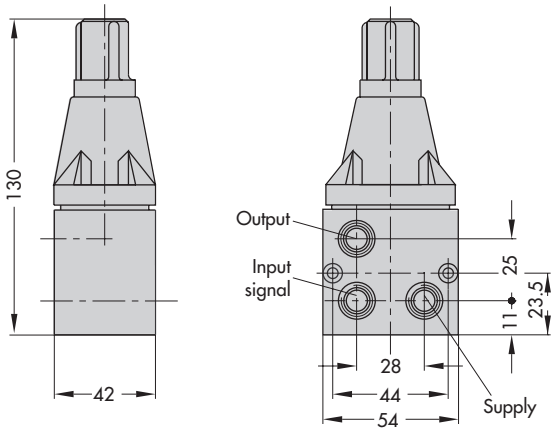
Specifications subject to change without notice.

Dimensions in mm

Type 3709-1



Type 3709-2



SAMSON AG · MESS- UND REGELTECHNIK
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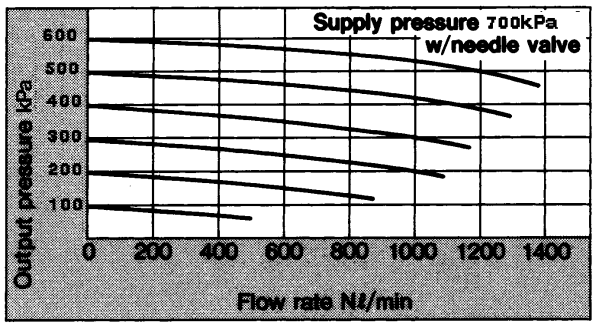
BOOSTER RELAY SERIES IL100

- This unit is used when a pneumatic signal which has the right pressure does not have the required flow to activate one or more pieces of equipment. The Booster Relay supplies an output pressure identical to the signal pressure but with a much larger flow capacity.
- Simultaneous pressure control of several units from a small signal flow is possible.
- When piping between signal instrumentation and operational area is long, pressure loss in signal piping is minimised by minimising signal flow demand.
- Can be used with electropneumatic regulator to give high flow E/P pressure control.
- Can be used where pressure control of lubricated air is required but signal control equipment must have non-lubricated instrument quality air.
- Can be fitted with positioners to increase actuator speed.

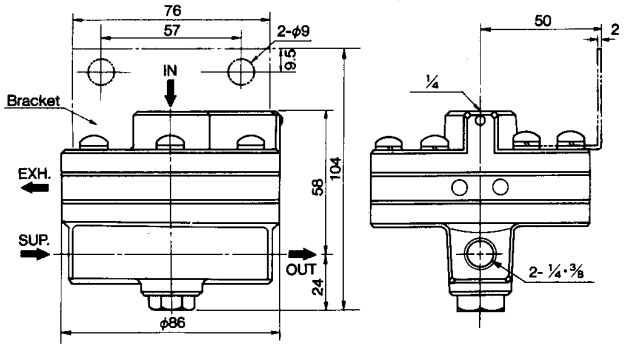
TECHNICAL SPECIFICATIONS

Supply Pressure	1000kPa
Signal Pressure max.	700kPa
Output Pressure max.	700kPa
Flow Rate	600 L/min at a supply pressure of 500kPa
Air Consumption	3 L/min or less at an output pressure of 100kPa
Linearity	Within ± 1%
Hysteresis	Within 1%
Effective orifice mm² (cv)	20 (1.1)
Pressure Ratio signal:output	1:1
Ambient and Fluid Temperature	-5 ~ 60ºC
Port Size	¼, ⅜

FLOW CHARACTERISTICS



DIMENSIONS BOOSTER RELAY IL100



HOW TO ORDER BOOSTER RELAY IL100

IL100-02 ¼"
IL100-03 ⅜"

ACCESSORIES BOOSTER RELAY IL100

261022 ..... Mounting Bracket

Type 2625 and 2625NS Volume Boosters

A Type 2625 or 2625NS volume booster (figure 1) is used in conjunction with a positioner on a throttling control valve to increase stroking speed. The Type 2625NS is a nuclear-service version and uses elastomeric components that better withstand high temperature and radiation environments.

The booster incorporates fixed deadband, soft seat construction, and an integral bypass restriction to eliminate positioner saturation problems that can occur with volume boosters that do not have these features. Adjustment of the integral bypass restriction is necessary for system stability. This adjustment does not affect the deadband of the volume booster, but does permit the control valve to respond to small input signal changes without sacrificing steady-state accuracy. It also allows the booster to deliver high-volume output for fast stroking when large, rapid input signal changes occur.

The volume booster, when used in conjunction with a positioner/actuator, is used only to improve stroking speed. It is not recommended for other applications requiring a high-accuracy, instrument-type volume booster. If the volume booster is to be used only with an actuator, for on-off control, the integral bypass restriction on the booster must be closed (turned fully clockwise).

Connectors and piping can be installed with either Type 2625 or Type 2625NS volume booster for diagnostic testing.

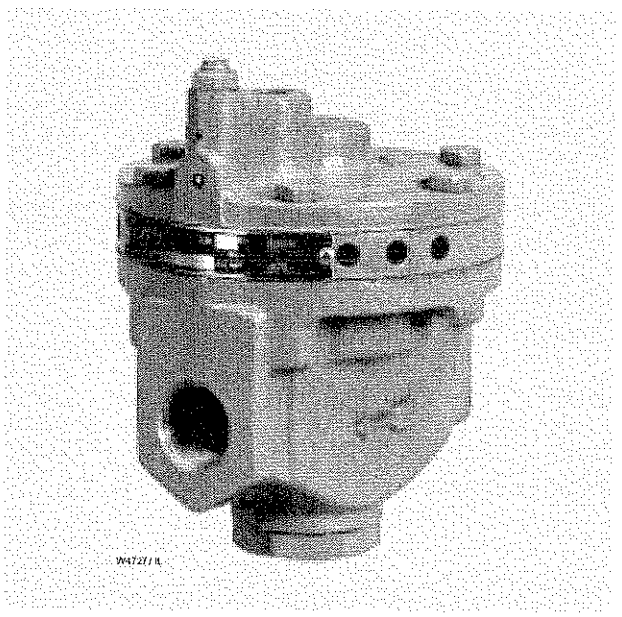


Figure 1. Type 2625 Volume Booster

Features

- **Fast Response**—Booster delivers the volume needed for rapid actuator stroking when large input changes suddenly occur.
- **Adjustable Response**—Integral bypass restriction tunes the booster response so that smooth actuator motion follows the slow signal changes.
- **Efficient Operation**—Soft seats provide tight shutoff to reduce unnecessary air consumption and eliminate saturation of positioner relays.
- **Maintains Accuracy**—Booster permits high actuator stroking speeds upon demand without degrading the positioner steady–state accuracy.

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Specifications

Supply Pressure Ranges

When used in conjunction with a positioner or other pneumatic accessory, always pipe the positioner and volume booster with one common supply through a Type 64 or 95H regulator (see figure 3). A high-capacity filter, such as the Type 262C, should be installed in the supply line to the regulator. Supply pressure also must not exceed the maximum pressure rating of the actuator. Constructions are available in two maximum supply ranges.
When Normally Used With Diaphragm Actuators: Up to 40 psig (2.8 bar)
When Normally Used With Piston Actuators: Up to 150 psig (10.3 bar)

Input Signal Pressure

Positioner output

Maximum Input Signal Pressure

150 psig (10.3 bar)

Fixed Input-to-Output Pressure Ratio

1 to 1

Nominal Deadband(1)

Percent of Positioner Output Span(2):
3/32 inch (2.4 mm) exhaust port: 2%
3/8 inch (9.5 mm) exhaust port: 3.5%
1/2 inch (12.7 mm) exhaust port: 5%

Construction Materials

Body: ■ Aluminum or ■ brass
Seat Ring: Brass
Diaphragms
Type 2625: Nitrile/nylon
Type 2625NS: EPDM/Nomex
Upper and Lower Valves
Type 2625: Nitrile-Hypalon rubber/aluminum/stainless steel
Type 2625NS: EPDM/aluminum/stainless steel
O-Rings
Type 2625: Nitrile
Type 2625NS: EPDM
Connectors for Diagnostic Testing: ■ Stainless steel or ■ brass

Operative Temperature Limits(1)

Type 2625: –40 to 160°F (–40 to 71°C)
Type 2625NS: –40 to 200°F (–40 to 93°C)

Connections

Input Signal: 1/4 inch NPT
Supply and Output: 3/4 inch NPT

Port Diameters(3)

Supply Port: ■ 3/8 inch (9.5 mm) or ■ 1/2 inch (12.7 mm)
Exhaust Port: ■ 3/32 inch (2.4 mm), ■ 3/8 inch (9.5 mm) or ■ 1/2 inch (12.7 mm)

Maximum Flow Coefficients

See table 1

Approximate Weight

Aluminum Body: 5 lb (2.3 kg)
Brass Body: 11 lb (5.0 kg)

1. This term defined in ISA Standard S51.1-1979.
2. Zero psig to maximum supply.
3. May be used in any combination.

Principle of Operation

Refer to figures 2 and 3. Because of the bypass restriction, large input signal changes register on the booster input diaphragm sooner than in the actuator. A large, sudden change in input signal causes a pressure differential to exist between the input signal and the output of the booster. When this occurs, the diaphragms move to open either the supply port or the exhaust port, whichever action is required to reduce the differential. The port remains open until the difference between the booster input and output pressures returns to within the deadband limit of the booster. With the bypass restriction adjusted for stable operation, a signal with small magnitude and rate changes passes through the bypass restriction and into the actuator without initiating booster operation.

Both supply and exhaust ports remain closed, preventing unnecessary air consumption and possible saturation of positioner relays.

Type 2625NS for Nuclear-Service Applications

The Type 2625NS uses EPDM (ethylene-propylene) elastomeric parts. These parts have superior resistance to degradation at elevated temperature and radiation levels. This version is suitable for nuclear service applications where oil-free supply air is available.

Both the Type 2625 and 2625NS are available as safety-related items when processed using the commercial grade dedication section of Fisher Control's

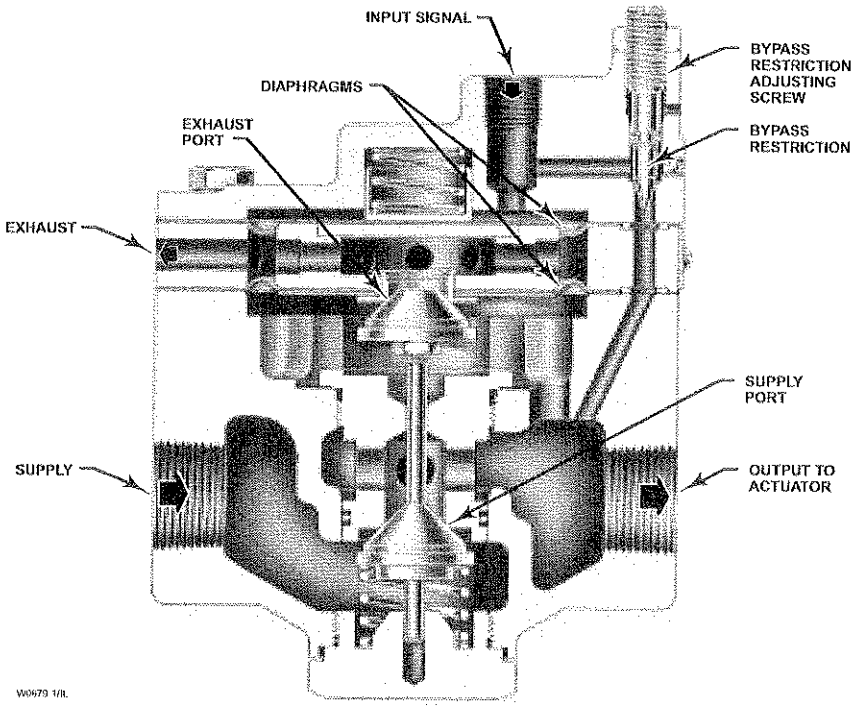

Figure 2. *Sectional View of Type 2625 Volume Booster*

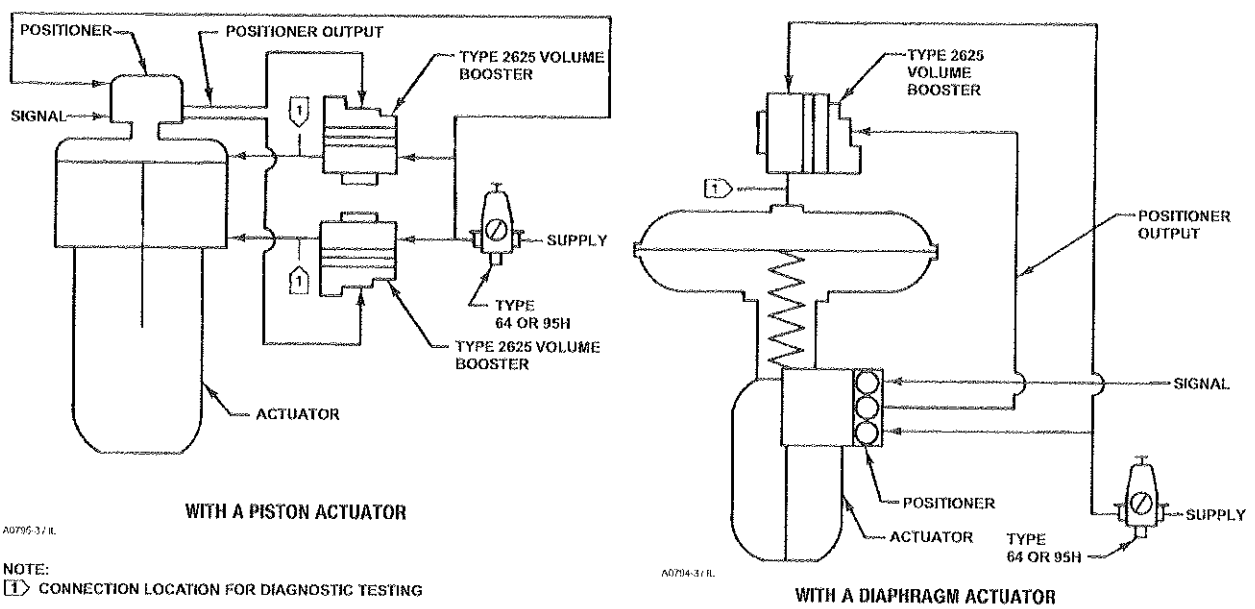

Figure 3. *Typical Installations*

Table 1. Maximum Flow Coefficients[1]

PORT SIZE COMBINATIONS				SUPPLY PORT COEFFICIENTS			EXHAUST PORT COEFFICIENTS		
Supply Port		Exhaust Port							
inch	mm	inch	mm	C_v	C_g	C_1	C_v	C_g	C_1
3/8	9.5	3/32	2.4	3.74	113	30.2	0.23	8.05	35.0
		3/8	9.5	3.74	113	30.2	2.29	80.2	35.0
		1/2	12.7	3.74	113	30.2	2.52	88.2	35.0
1/2	12.7	3/32	2.4	4.98	160	32.1	0.24	8.43	35.0
		3/8	9.5	4.98	160	32.1	2.30	80.7	35.0
		1/2	12.7	4.98	160	32.1	2.72	95.4	35.0
Type 3570 Valve Positioner				0.25	8.8	35.2	0.25	8.8	35.2
Type 3582 Valve Positioner				0.17	6.0	35.3	0.19	6.65	35.0
Type 3610J, 3610JP, 3611JP, 3620J, 3620JP, 3621JP				0.37	13.0	35.0	0.30	10.5	35.0

1. Consult your Fisher Controls sales office or sales representative for special stroking speed requirements.

10CFR50, Appendix B, quality assurance program. 10CFR21 reporting is also part of the safety related processing program. Seismic operability testing has been done to qualify both versions as rigid items at levels up to 9g's uniaxial (in each axis). Further nuclear service qualification data is available on request.

Installation

Figure 3 shows typical installations for the Type 2625 or 2625NS volume booster on piston and diaphragm actuators. A single regulator that supplies both the positioner and booster (or boosters) is recommended. The supply medium must be clean, dry, oil-free[1] air or non-corrosive gas. Keep in mind that many actuators require larger casing or cylinder connections to take full advantage of the booster's ability to deliver its high-volume output. Dimensions are shown in figure 4. Ensure that the supply pressure is connected to correspond with the flow arrow on the booster.

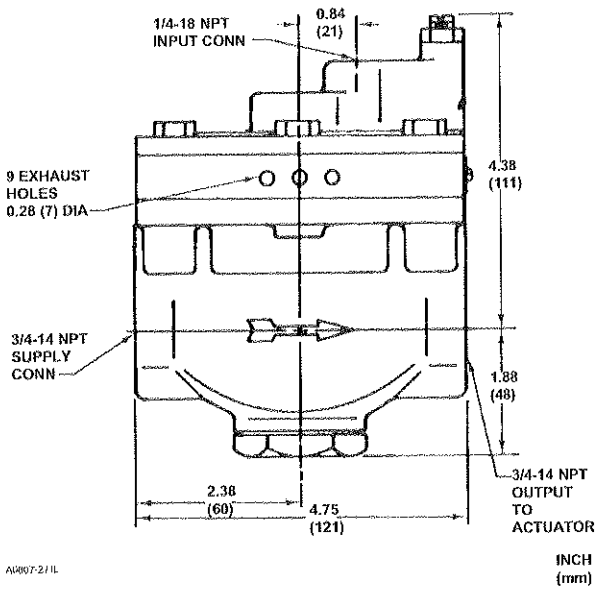

Figure 4. Dimensions

Ordering Information

When ordering, please specify:

1. Supply and exhaust port sizes. See table 1 for Cv and Cg values.

2. Supply pressure range of up to 40 psig (2.8 bar) or up to 150 psig (10.3 bar).

3. Nuclear service, if applicable. Consult factory for ordering assistance.

4. Aluminum or brass body.

1. Use a clean, dry, oil-free air supply with instruments containing EPDM components. EPDM is subject to degradation when exposed to petroleum-based lubricants.

For information, contact Fisher Controls:
Marshalltown, Iowa 50158 USA
Cernay 68700 France
Sao Paulo 05424 Brazil
Singapore 0512

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Type 122A Three-Way Switching Valve

Fisher Controls *April 1980* *Bulletin 71.7:122A*

The Type 122A valve (see figure 1) is a high–capacity, economical three-way pneumatic switching valve for on-off applications. This valve can be used for diverging or converging gaseous service, diverging liquid service with gas-loaded liquids, and converging liquid service. Six spring ranges are available for control pressures from 3 to 150 psig (0.2 to 10.3 bar).

Features

- **Convenient Installation—**Compact construction permits easy handling and installation

- **Easy Leak Detection—**Vent hole between body and actuator stem seals allows rapid detection of body or actuator leakage

- **Easy Maintenance—**With the bottom piping disconnected, the valve can be completely disassembled without removing it from the line

Figure 1. *Type 122A Three-Way Switching Valve*

Principle of Operation

Refer to figure 2. The flow through the Type 122A valve is normally from connection A to C, with the spring force holding the valve plug down on the connection B seat ring (diverging service).

As the pressure under the diaphragm is increased through control connection D, it acts against the force of the spring. When the control pressure overcomes the force of the spring, the valve begins to stroke, uncovering the connection B seat ring. As the pressure under the diaphragm increases to the set point, the valve completes its stroke and the connection C seat ring is covered.

The point at which the valve completes its stroke and the pressure change necessary to do this are dependent on the spring rate and the set point chosen. The set point is easily changed by adjusting the screw at the top of the valve.

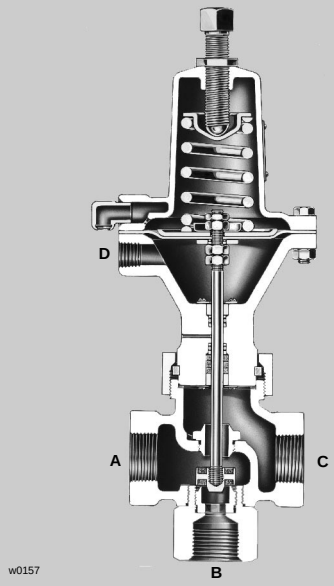


Figure 2. Sectional of Type 122A Valve

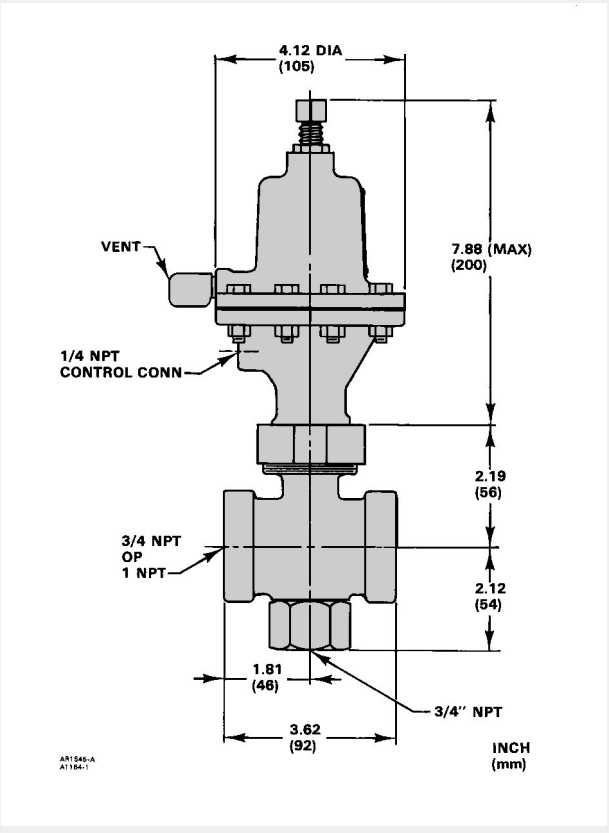
Specifications

BODY SIZES AND END CONNECTION STYLES	**Connections A and C:** Available in ■ 3/4 or ■ 1-inch body sizes with NPT screwed end connections **Connection B:** 3/4-inch NPT screwed
MAXIMUM INLET PRESSURE	150 psig (10.3 bar)
SPRING RANGES	See table 1
MAXIMUM CONTROL PRESSURE TO DIAPHRAGM	150 psig (10.3 bar)
MATERIAL TEMPERATURE CAPABILITIES	–20 to +150° F (–29 to +66°C)
CONSTRUCTION MATERIALS	**Valve Body:** Cast iron **Bottom Connector:** Steel **Spring Case:** Aluminum **Lower Diaphragm Case:** Cast iron **Disc and Disc Holder Assembly:** ■ Nitrile and aluminum or ■ nitrile and stainless steel **Seat Rings:** ■ Aluminum or ■ stainless steel **Diaphragm:** Neoprene **Gasket:** Asbestos **O-Rings:** Nitrile **Stem Washers:** Neoprene and felt **Spring:** Plated steel
FLOW COEFFICIENT	**Cg*** ***Connection A to B:*** 138 ***Connection A to C:*** 131 **C_1** ***Connection A to B:*** 28.0 ***Connection A to C:*** 32.5
CONTROL CONNECTION	1/4-inch NPT female
VENT CONNECTION	1/4-inch NPT female with screen
APPROXIMATE WEIGHT	5 pounds (2.3 kg)

* At an inlet pressure of 25 psig (1.7 bar) and with full pressure drop acoss the body.

Table 1. Spring Selection

SPRING RANGE		DIAPHRAGM PRESSURE CHANGE REQUIRED FOR FULL STROKE		SPRING PART NUMBER	SPRING COLOR CODE
Psig	Bar	Psi	Bar		
3-15	0.2-1.0	10	0.7	1D8923 27022	Red
5-20	0.3-1.4	13.5	0.9	1D7515 27022	Cadmium
5-35	0.3-2.4	22	1.5	1D6659 27022	Blue
30-60	2.1-4.1	30	2.1	1D7455 27142	Green
40-100	2.8-6.9	54	3.7	1E5436 27142	Yellow
60-150	4.1-10.3	66	4.6	1R9013 27022	Brown



Installation

The Type 122A valve may be installed in any position. Be certain the spring case vent opening is pointing down and is protected against the entrance of moisture and any other material that may plug the vent. The Type 122A valve should not be used in installations where water hammer can be experienced. Dimensions are shown in figure 3.

Ordering Information

Refer to the "Specifications" table. Review the description to the right of each specification and in the referenced table and specify the desired choice wherever there is a selection to be made. Also be sure to specify the desired set point.

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Fisher Controls

For information write:
P.O. Box 190, Marshalltown, Iowa 50158 U.S.A.
or Brenchley House, Maidstone, Kent ME 14 1UQ, England

Quick Venting Valves

Nominal sizes 4 to 25
Pneumatically actuated
Port sizes G 1/8 to G 1
Operating pressure 0.5 to 10 bar

Catalog Register
P 12

Publication 750**2189**.06.06.94

Description

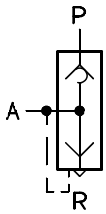
Quick venting valve for filtered, lubricated or non-lubricated air

Temperature range: –20 to +80°C
Material
– Body: Brass, nickel-plated
– Cover: Brass, nickel-plated
– Moulded part: PUR

Features

- High flow rate from A to R
- Low min. pressure
- Compact design
- Simple construction
- Also suitable as two-way valve or double check valve

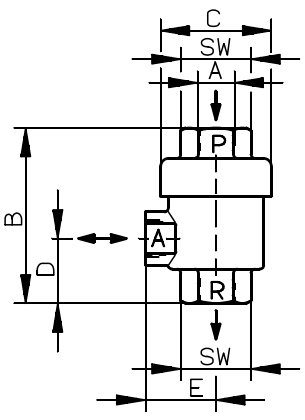
Parameters

Symbol	Nominal size	Port size	Operating pressure [bar] min.	max.	Flow rate Q_N [1] [l/min] P to A	A to R	Dimensional drawing No.	Weight [kg]	Cat. No.
	4	G 1/8	0.5	10	380	1100	01	0.10	**4050114**
	6	G 1/4	0.5	10	850	2160	01	0.18	**4050214**
	15	G 1/2	0.5	10	2160	5700	01	0.43	**4050314**
	20	G 3/4	0.5	10	1950	10600	01	0.44	**4050414**
	25	G 1	0.5	10	3400	12500	01	1.76	**4050514**

[1] at 6 bar $\Delta p = 1$

Dimensional drawing

01



Dimensional table [mm]

Cat. No.	A	B	Dia. C	D	E	SW
4050114	G 1/8	46	29	17	18.5	16
4050214	G 1/4	65	34	25.5	24	19
4050314	G 1/2	82	44	33	30	32
4050414	G 3/4	88	49	35	38	32
4050514	G 1	109	80	39	48	46

IMI Norgren-Herion Fluidtronic GmbH & Co. KG, D-70731 Fellbach
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EXCELON® 74
Filter/Regulator
3/8″, 1/2″, 3/4″ Port Sizes

- **EXCELON design allows in-line or modular installation**
- **Quick release bayonet bowl**
- **Highly visible, prismatic liquid level indicator lens**
- **Full flow gauge ports**
- **Balanced valve design minimizes effect of variation in the inlet pressure on the outlet pressure**
- **Modular installations with EXCELON 72, 73, and 74 series can be made to suit particular applications**

Technical Data

Fluid: Compressed air
Maximum pressure:
Transparent bowl: 10 bar (150 psig)
Metal bowl: 17 bar (250 psig)
Operating temperature*:
Transparent bowl: -20° to 50°C (0° to 125°F)
Metal bowl: -20° to 80°C (0° to 175°F)

* Air supply must be dry enough to avoid ice formation at temperatures below +2°C (+35°F).

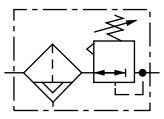
Particle removal: 5, 25 or 40 µm filter element
Air quality: Within ISO 8573-1, Class 3 and Class 5 (particulates)
Typical flow with 10 bar (150 psig) inlet pressure, 6,3 (90 psig) set pressure and a droop of 1 bar (15 psig) from set:
100 dm^3/s (212 scfm)
Manual drain connection: 1/8″
Automatic drain connection: 1/8″
Automatic drain operating conditions (float operated):
Bowl pressure required to close drain: Greater than 0,3 bar (5 psig)
Bowl pressure required to open drain: Less than 0,2 bar (3 psig)
Minimum air flow required to close drain: 1 dm^3/s (2 scfm)
Manual operation: Depress pin inside drain outlet to drain bowl
Nominal bowl size: 0,2 litre (7 fluid ounce)
Gauge ports:
1⁄4 PTF with PTF main ports
Rc1⁄4 with ISO Rc main ports
Rc1⁄8 with ISO G main ports

Materials:
Body: Aluminum
Bonnet: Aluminum
Valve: Brass
Bowl:
Transparent: Polycarbonate with steel bowl guard
Metal: Aluminum
Metal bowl liquid level indicator lens:
Transparent nylon
Element: Sintered plastic
Elastomers: Neoprene and Nitrile

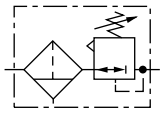
Ordering Information

See *Ordering Information* on the following pages.

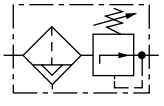
ISO Symbols



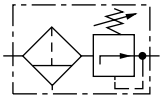
Automatic Drain, Relieving



Manual Drain, Relieving

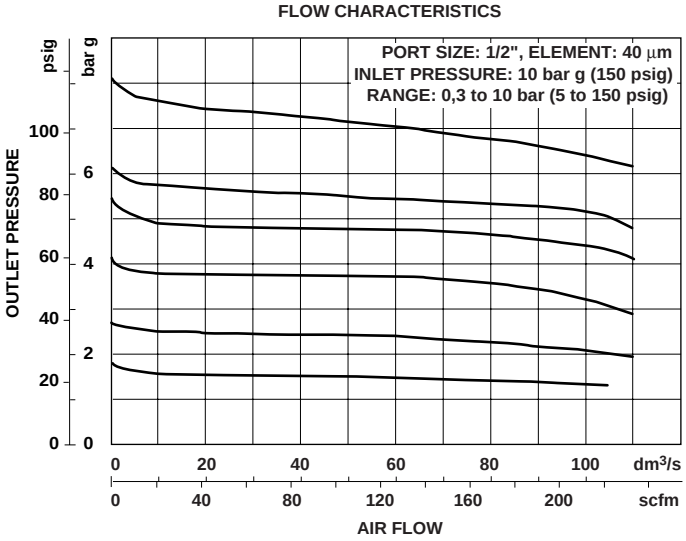


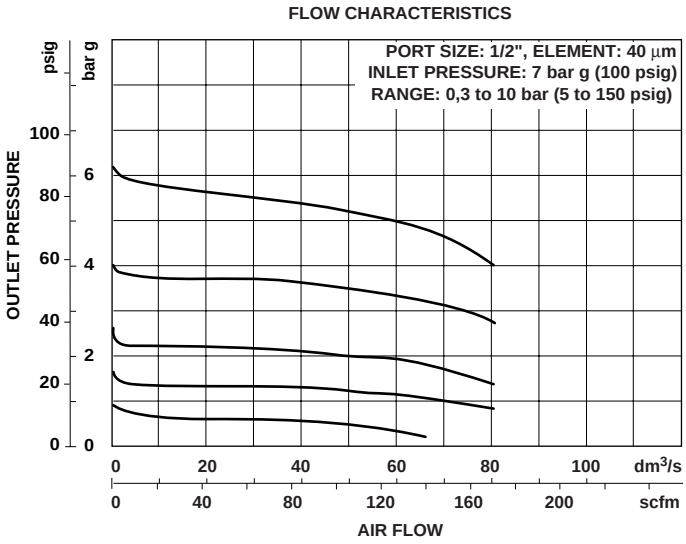
Automatic Drain, Non Relieving



Manual Drain, Non Relieving

Typical Performance Characteristics





Ordering Information. Models listed include ISO G parallel threads, knob adjustment, automatic drain, metal bowl with liquid level indicator, 40 µm element, relieving diaphragm and 0,3 to 10 bar (5 to 150 psig) outlet pressure adjustment range*.

Main Port Size	Model Number	Flow† dm³/s (scfm)	Weight kg (lb)
G3/8	B74G-3GK-AD3-RMN	77 (163)	1,19 (2.62)
G1/2	B74G-4GK-AD3-RMN	100 (212)	1,17 (2.59)
G3/4	B74G-6GK-AD3-RMN	100 (212)	1,16 (2.55)

† Typical flow with 10 bar (150 psig) inlet pressure, 6,3 bar (90 psig) set pressure and a 1 bar (15 psig) droop from set.

Alternative Models

B 7 4 G - ★ ★ ★ - ★ ★ ★ - ★ ★ ★

Port Size	Substitute
3/8″	3
1/2″	4
3/4″	6

Threads	Substitute
PTF	A
ISO Rc taper	B
ISO G parallel	G

Adjustment	Substitute
Knob	K
T-bar	T

Drain	Substitute
Automatic	A
Manual, 1/4 turn	Q

Gauge	Substitute
With	G
Without	N

Outlet Pressure Adjustment Range*	Substitute
0,3 to 4 bar (5 to 60 psig)	F
0,3 to 10 bar (5 to 150 psig)	M
0,7 to 17 bar (10 to 250 psig)**	S

Diaphragm	Substitute
Relieving	R
Non relieving	N

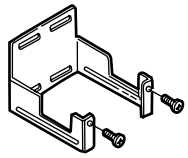
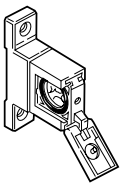
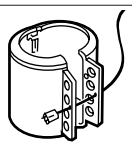
Element	Substitute
5 µm	1
25 µm	2
40 µm	3

Bowl	Substitute
Metal with liquid level indicator	D
Transparent with guard	P

* Outlet pressure can be adjusted to pressures in excess of, and less than, those specified. Do not use these units to control pressures outside of the specified ranges.

** Units with 17 bar (250 psig) outlet pressure range are available only with the T-bar adjustment; therefore substitute ***T*** at the 7th digit and ***S*** at the 12th position.

Accessories

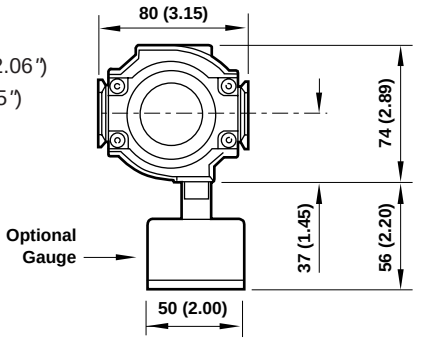
			
Wall Mounting Bracket	Quikclamp and Quikclamp Wall Bracket	Panel Nut	Tamper Resistant Cover & Seal Wire ††
4324-50	4314-52	4348-89	4355-51
			Seal Wire: 2117-01

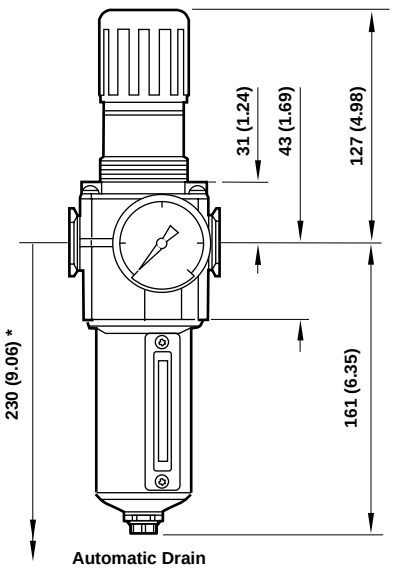
∅ 50 mm Pressure Gauge	R1/4 Connection	R1/8 Connection	1/4 PTF Connection
4 bar (60 psig)	18-013-266	18-013-011	18-013-208
10 bar (150 psig)	18-013-260	18-013-013	18-013-209
20 bar (300 psig)	18-013-267	18-013-014	18-013-210

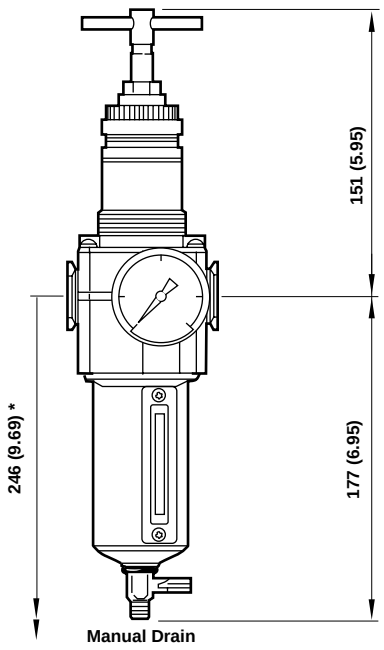
†† Use padlock with shackle up to 8 mm (0.3") in diameter.

Dimensions mm (inches)

Panel mounting hole diameter: 52 mm (2.06″)
Panel thickness: 2 to 6 mm (0.06″ to 0.25″)





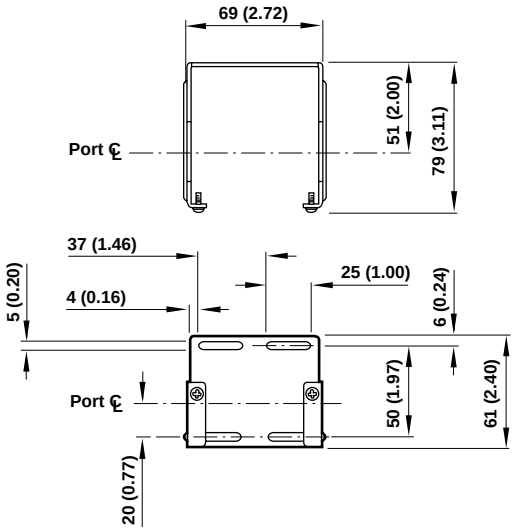


* Minimum clearance to remove bowl.

Bracket Mounting

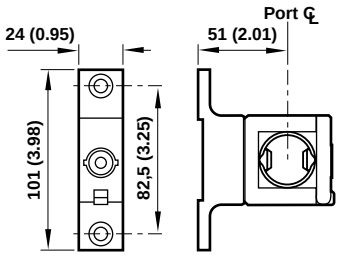
Mounting Bracket

Use 5 mm (3/16″) screws to mount bracket to wall.



Quikclamp and Quikclamp Wall Bracket

Use 6 mm (7/32″) screws to mount bracket to wall



Bracket Kit Reference

Item	Part Number
Wall Bracket	4324-50
Quikclamp and Quikclamp Wall Bracket	4314-52

Service Kits

Item	Type	Part Number
Service kit	Relieving	4383-700
	Non relieving	4383-701
Replacement elements	5 µm	4338-04
	25 µm	4338-07
	40 µm	4338-05
Liquid level lens kit	Prismatic	4380-050
Replacement drains	Automatic (1/8 NPT outlet)	3000-10
	Automatic (G 1/8 outlet)	3000-97
	Manual quarter turn	619-50

Service kit includes diaphragm assembly, valve assembly, valve spring, louvre o-ring, bowl o-ring, drain seal.

Warning

These products are intended for use in industrial compressed air systems only. Do not use these products where *pressures* and *temperatures* can exceed those listed under **'Technical Data'**.

Before using these products with fluids other than those specified, for non-industrial applications, life-support systems, or other applications not within published specifications, consult Norgren.

Through misuse, age, or malfunction, components used in fluid power systems can fail in various modes. The system designer is warned to consider the failure modes of all component parts used in fluid power systems and to provide adequate safeguards to prevent personal injury or damage to equipment in the event of such failure.

System designers must provide a warning to end users in the system instructional manual if protection against a failure mode cannot be adequately provided.

System designers and end users are cautioned to review specific warnings found in instruction sheets packed and shipped with these products.

Water vapor will pass through these units and will condense into liquid if air temperature drops in the downstream system. Install an air dryer if water condensation could have a detrimental effect on the application.

18-013, 5PG

Air Pressure Gauges
1/8" and 1/4" Port Sizes

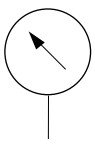
- **Monitor pressures in compressed air systems for optimum efficiency**
- **Triple calibrated scale indicates pressure in psi, bar, and Mpa (megapascal)**
- **Back or bottom connection**
- **Panel mount, stainless steel, and Underwriters Laboratories, Inc. listed gauges available**

Technical Data

Fluid: Compressed air and inert gasses
Maximum pressure: 100% of full scale on gauge
Operating temperature: -30° to 175°F (-34° to 80°C)*
* Air supply must be dry enough to avoid ice formation at temperatures below 35°F (2°C).
Accuracy:
- 2% of full scale at midrange
- 3% of full scale at other ranges

Materials
- Body
  - Standard: Gauges may have a steel or plastic body
  - Optional: Stainless steel
- Crystal:
  - Standard steel and plastic bodies have plastic crystal
  - Optional stainless steel body has glass crystal
- Connector:
  - Standard steel and plastic bodies have brass connector
  - Optional stainless steel body has stainless steel connector

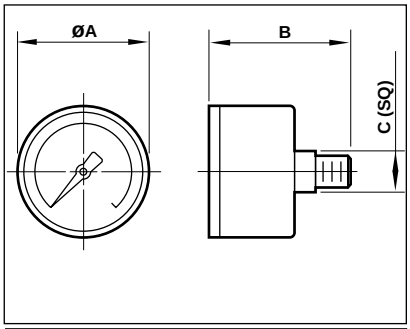
ISO Symbol



Ordering Information, Black Face Gauges - psi outer scale, bar middle scale, Mpa inner scale

Center Back Connection

Scale Range						
Outer Scale psig	Middle Scale bar	Inner Scale Mpa	1/8 NPT 1.5" (40mm) Diameter	1/8 NPT 2" (50mm) Diameter	1/4 NPT 2" (50mm) Diameter	R1/4 2" (50mm) Diameter
0 to 30	0 to 2	0 to 0.2	18-013-214	18-013-201	18-013-207	—
0 to 60	0 to 4	0 to 0.4	18-013-211	18-013-202	18-013-208	18-013-268
0 to 100	0 to 7	0 to 0.7	—	18-013-203	18-013-235	—
0 to 160	0 to 11	0 to 1.1	18-013-212	18-013-204	18-013-209	18-013-269
0 to 300	0 to 20	0 to 2.1	—	18-013-205	18-013-210	18-013-270
0 to 400	0 to 28	0 to 2.8	—	18-013-206	—	—

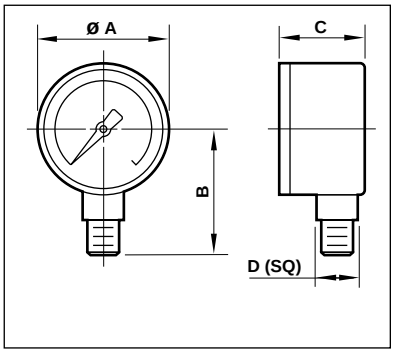


A	B	C
1.5 (40)	1.60 (41)	0.47 (12)
2.0 (50)	1.85 (47)	0.55 (14)

Bottom Connection - 2" (50 mm) diameter gauges do not have the Mpa scale

Scale Range				
Outer Scale psig	Middle Scale bar	Inner Scale Mpa	1/8 NPT 1.5" (40mm) Diameter	1/4 NPT 2" (50mm) Diameter
0 to 15	0 to 1	—	—	18-013-082
0 to 30	0 to 2	0 to 0.2	18-013-224	18-013-030 *
0 to 60	0 to 4	0 to 0.4	18-013-225	18-013-083 *
0 to 100	0 to 7	0 to 0.7	18-013-265	18-013-084 *
0 to 160	0 to 11	0 to 1.1	18-013-273	18-013-085 *
0 to 300	0 to 20	—	—	18-013-086 *
0 to 2000	0 to 135	—	—	18-013-244 *†
0 to 3000	0 to 205	—	—	18-013-087 *†

* Underwriters Laboratories Inc. Listed
† Shipped with pulsation dampener installed.

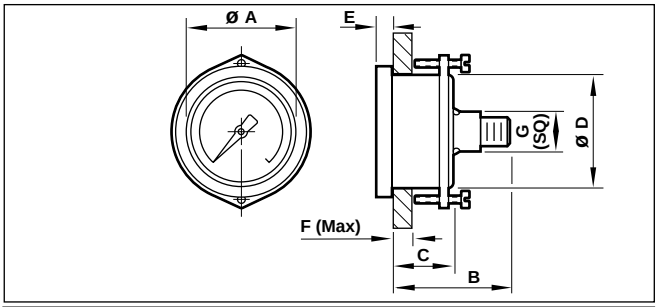


A	B	C	D
1.5 (40)	1.42 (36)	0.90 (23)	0.47 (12)
2.0 (50)	1.73 (44)	1.03 (26)	0.55 (14)

Center Back Connection, Panel Mounted

Scale Range			1/4 NPT Male and 10-32 Female
Outer Scale psig	Middle Scale bar	Inner Scale Mpa	1.5" (40mm) Diameter
0 to 30	0 to 2	0 to 0.2	5PG-306-000 **
0 to 60	0 to 4	0 to 0.4	5PG-312-000 **
0 to 100	0 to 7	0 to 0.7	5PG-320-000 **

** Requires 1.63" (41 mm) diameter panel hole.



A	B	C	D	E	F (Max)	G
1.5 (40)	1.51 (38)	0.86 (22)	1.61 (41)	0.18 (5)	0.5 (13)	0.55 (14)

Alternative Models

Pulsation Dampener: Add ***-9D*** to the end of the model number.

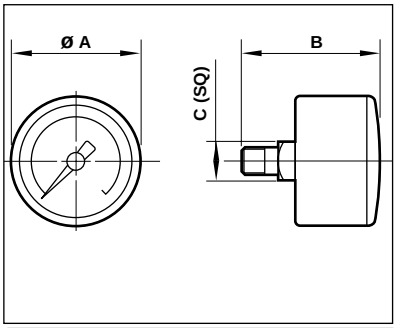
Air Pressure Gauges

All Dimensions in Inches (mm)

Ordering Information, White Face Gauges - bar outer scale, Mpa middle scale, psi inner scale

Center Back Connection

Scale Range					
Outer Scale bar	Middle Scale Mpa	Inner Scale psi	R1/8 1.5" (40mm) Diameter	R1/8 2" (50mm) Diameter	R1/8 2.5" (63mm) Diameter
0 to 1.6	0 to 0.16	0 to 23	18-013-991	18-013-010	—
0 to 4	0 to 0.4	0 to 56	18-013-990	18-013-011	—
0 to 6	0 to 0.6	0 to 84	—	18-013-012	—
0 to 10	0 to 1.0	0 to 140	18-013-989	18-013-013	18-013-856
0 to 16	0 to 1.6	0 to 240	—	—	18-013-855
0 to 25	0 to 2.5	0 to 360	18-013-908	18-013-014	—



A	B	C
1.5 (40)	1.77 (45)*	0.55 (14)
2.0 (50)	1.93 (49)	0.55 (14)
2.5 (63)	1.89 (48)	0.55 (14)

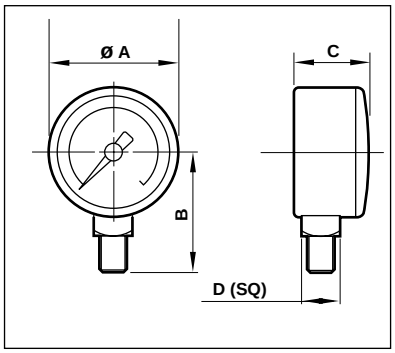
* 1.57 (40) on 1/8 PTF stainless steel gauges
1.85 (47) on 1/4 PTF stainless steel gauges

Stainless Steel Gauges - gauges do not have the Mpa scale

Scale Range			
Outer Scale bar	Inner Scale psi	1/8 PTF 1.5" (40mm) Diameter	1/4 PTF 1.5" (40mm) Diameter
0 to 6	0 to 84	—	18-013-913
0 to 10	0 to 140	18-013-844	18-013-909
0 to 25	0 to 360	—	18-013-905

Bottom Connection

Scale Range				
Outer Scale bar	Middle Scale Mpa	Inner Scale psi	R1/8 2" (50mm) Diameter	G1/4A 2.5" (63mm) Diameter
0 to 1.6	0 to 0.16	0 to 23	18-013-024	—
0 to 4	0 to 0.4	0 to 56	18-013-025	—
0 to 6	0 to 0.6	0 to 84	18-013-026	—
0 to 10	0 to 1.0	0 to 140	18-013-027	18-013-854
0 to 16	0 to 1.6	0 to 240	—	18-013-853
0 to 25	0 to 2.5	0 to 360	18-013-028	—

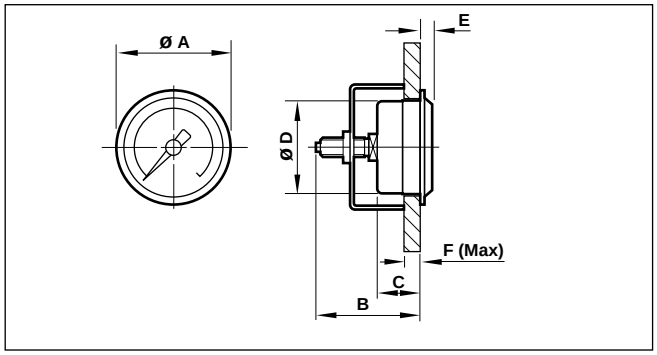


A	B	C	D
2.0 (50)	1.77 (45)	1.10 (28)	0.55 (14)
2.5 (63)	2.09 (53)	1.10 (28)	0.55 (14)

Center Back Connection, Panel Mount

Scale Range				
Outer Scale bar	Middle Scale Mpa	Inner Scale psi	G1/8A 2" (50mm) Diameter	G1/8A 2.5" (63mm) Diameter
0 to 6	0 to 0.6	0 to 84	18-013-858 *	—
0 to 10	0 to 1.0	0 to 140	18-013-857 *	18-013-852 †
0 to 16	0 to 1.6	0 to 240	—	18-013-851 †

* Requires 2.01" (51 mm) diameter panel hole.
† Requires 2.52" (64 mm) diameter panel hole.



A	B	C	D	E	F
2.0 (50)	2.17 (55)	1.02 (26)	1.93 (49)	0.20 (5)	0.37 (9.5)
2.5 (63)	2.20 (56)	1.06 (27)	2.44 (62)	0.24 (6)	0.37 (9.5)

PRESSURE REDUCING VALVES

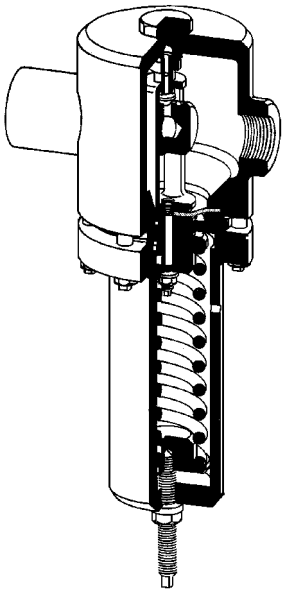
MANKENBERG ARMATURENFABRIK Lübeck
WIR REGELN DAS SCHON.

High pressure valves for liquids
and gases up to 80 / 130 / 400 °C

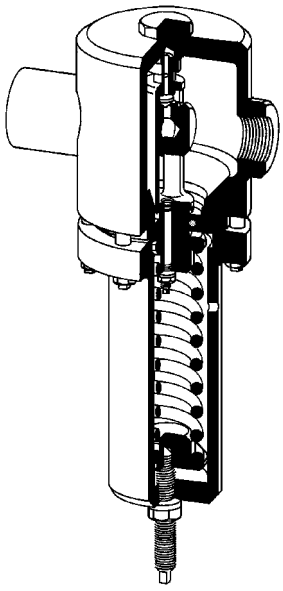
Type 510, 511, 514
515, 516, 518

EXAMPLES OF DESIGN

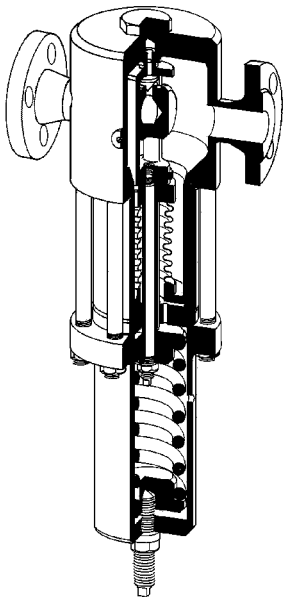
Type 510 (~ 514)
diaphragm control



Type 510 K (~ 514 K)
piston control



Type 511 B (~ 515 B)
bellow control



NOM. PRESS., KVS-VALUES, ADJUSTING RANGES
PERMISSIBLE REDUCTION RATIO
SEE SHEET NO. DM 510/2.1.021.2

TECHNICAL DATA

TYPE 510, 511, 516	adjusting ranges 2 - 100 bar
NOMINAL PRESSURE	PN 315 / 10 - 100
CONNECTION	Type 510 G 3/8 - 2
	Type 511 DN 15 - 50
	Type 516 welding ends DN 15 - 50
INLET PRESSURE P1	up to 315 bar
OUTLET PRESSURE P2	2* - 100 bar in 10 adjusting ranges
TEMPERATURE	up to 80 / 130 / 400 °C
KVS-VALUE	0,2 - 5,5 m^3/h
TYPE 514, 515, 518	adjusting ranges 40 - 160 bar
NOMINAL PRESSURE	PN 315 / 160
CONNECTION	Type 514 G 1/2 - 1
	Type 515 DN 15 - 25
	Type 518 welding ends DN 15 - 50
INLET PRESSURE P1	up to 315 bar
OUTLET PRESSURE P2	40 - 160 bar in 2 adjusting ranges
TEMPERATURE	up to 80 / 130 / 400 °C
KVS-VALUE	0,2 - 2,2 m^3/h
CONTROL	
DIAPHRAGM	T ≤ 80 / 130 °C, P2: 2 - 20 bar
PISTON	T ≤ 80 / 130 °C, P2: 2 - 160 bar
BELLOW	T up to 400 °C, P2: 2 - 160 bar
	and for aggressive mediums

* For set ranges < 2 bar see type 512, 513 and 517

DESCRIPTION

Pressure reducing valves control the pressure at the outlet side.

The pressure reducers type 510, 511, 514, 515, 516 and 518 are diaphragm, piston or bellow controlled, spring-loaded proportional regulators. Three different connections are available: female ends, flanges and welding ends. For each size three different seats are possible (see sheet DM 510/2.1.021.2). The valve cone is built either as soft seal or as metallic seal. The sealing quality is equal or better than VDI/VDE-guideline 2174.

With depressurized pipeline the spring keeps the valve cone in open position. Under pressure the medium flows from the inlet side through the valve seat into the body and acts on the diaphragm/spring system from the outlet side (outlet pressure).
The outlet pressure to be controlled balances the force of the valve spring (set point) via the diaphragm. As soon as the outlet pressure rises above the set point, the valve cone moves towards the seat causing the flow to be reduced. With decreasing outlet pressure the valve cross section increases. The valve is fully open when the pipeline is depressurized. Clockwise turning of the adjusting screw increases the outlet pressure.The maximum permitted outlet pressure is 1,5 times the set pressure, unless otherwise specified.

If toxic or hazardous media are used the valve must feature a sealed spring cover (including setting spindle seal) fitted with a leakage line connection. When the overflow valve is installed on site a leakage line must be fitted capable of safely draining the escaping medium in case the control valve should become defective.

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Special designs on request.

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PRESSURE REDUCING VALVES

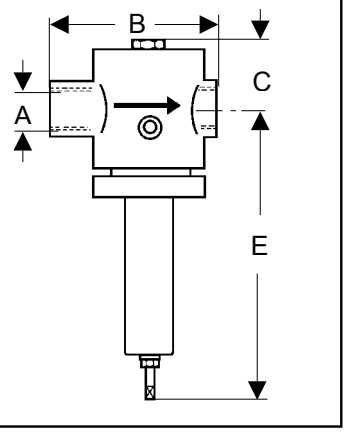
WIR REGELN DAS SCHON.

High pressure valves for liquids and gases up to 80 / 130 / 400 °C

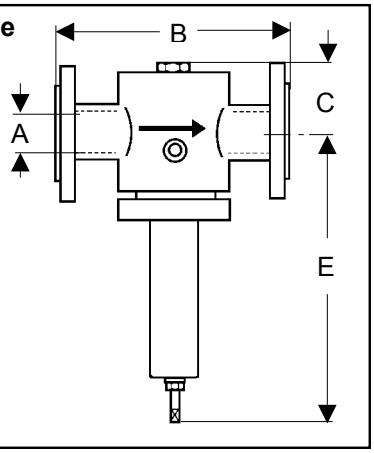
Type 510, 511, 514 515, 516, 518

MATERIALS						
NOMINAL DIAMETER	DN 15 - 25 , G 3/8 - 1			DN 32 - 50 , G 1 1/4 - 2		
TEMPERATURE	80 °C	130 °C	400 °C	80 °C	130 °C	400 °C
BODY	C 22.8			steel welded		
	CrNiMo-steel					
SPRING BONNET	steel welded					
INNER PARTS	brass/CrMo/CrNiMo-st		CrNiMo-st	CrMo / CrNiMo-steel		CrNiMo-st
VALVE SEAL	EU	FPM / EPDM / PTFE	CrNiMo-st	EU	FPM / EPDM / PTFE	CrNiMo-st
	CrNiMo-steel			CrNiMo-steel		
DIAPHRAGM	CR	FPM / EPDM	-	CR	FPM / EPDM	-
PROTECTION FILM	PTFE (if needed)					
PISTON with O-RING = K	NBR	FPM / EPDM / PTFE	-	NBR	FPM / EPDM / PTFE	-
BELLOW = B	CrNiMo-steel					

Type 510 514 516 518



Type 511 515



DIMENSIONS [mm] type 510, 511, 516					
		nominal diameter (size A)			
type	size	G 3/8 - 1/2 DN 15	G 3/4 - 1 DN 20 - 25	G 1 1/4 - 1 1/2 DN 32 - 40	G 2 DN 50
510	B	140	170	250	250
511	B	220	220	280*	300*
516	B	220	220	acc. to DIN 3202 - S14	
all	C	80	80	110	110
types	E	max. 520	max. 520	max. 800	max. 800

* with nominal pressure ≥ PN 63 on request

WEIGHTS type 510 [kg]						
nominal diameter G (size A)						
3/8	1/2	3/4	1	1 1/4	1 1/2	2
13	13	14	15	21	21	21

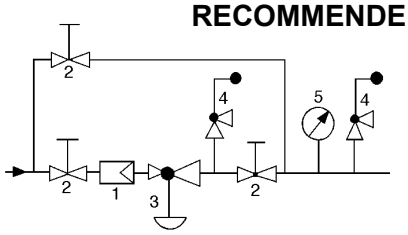
WEIGHTS type 511, 515 (weight of each flange + weight type 510, 514)						
weight of one flange [kg]						
nom. press.	nominal diameter DN (size A)					
PN	15	20	25	32	40	50
16 - 40	1,5	1,6	1,8	2,4	2,9	3,4
63	1,7	2,3	3,2		4,8	5,2
100	1,7	2,3	3,2		4,8	7,7
160	1,7	2,3	3,2		4,8	8
250	3		4		7,2	8,8
315	3,5		5,5		8,7	11,3

DIMENSIONS type 514, 515, 518	
size	mm
B	220
C	90
E	max. 530

WEIGHT type 514 [kg]		
nominal diameter G (size A)		
1/2	3/4	1
18	19	20

Weights of type 516 - 518 on request

RECOMMENDED INSTALLATION



1 strainer *
2 shutoff valves
3 pressure reducer
4 safety valves *
5 pressure gauge *

* use MANKENBERG-products

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Special designs on request.

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PRESSURE REDUCING VALVES

ARMATURENFABRIK MANKENBERG Lübeck

WIR REGELN DAS SCHON.

High pressure valves for liquids and gases up to 80 / 130 / 400 °C

Type 510 up to 518

KVS-VALUES									
Nominal diameter	G		3/8	1/2	3/4	1	1 1/4	1 1/2	2
	DN			15	20	25	32	40	50
Kvs-value	seat	I	0,2	0,2	0,25	0,25	0,4	0,4	1,0
		II	0,9	0,9	0,9	0,9	2,5	2,5	3,5
		III	1,7	1,8	2,0	2,2	3,9	3,9	5,5

Type 510, 511, 516

ADJUSTING RANGES [bar], NOMINAL PRESSURE				
2 - 4	4 - 7	7 - 10	5 - 16	10 - 20
PN 315/6	PN 315/16	PN 315/16	PN 315/25	PN 315/25
10 - 25	20 - 35	35 - 50	45 - 63	60 - 100
PN 315/40	PN 315/40	PN 315/63	PN 315/100	PN 315/100

REDUCTION RATIO P1/P2 max. inlet pressure 315 bar				
setting ranges bar	seat	nominal diameter G 3/8 - 1 DN 15 - 25	G 1 1/4 - 1 1/2 DN 32 - 40	G 2 DN 50
2 - 4	I	100	80	60
	II	30	29	18
	III	15	15	12
4 - 7	I	80	52	39
	II	30	19	12
	III	15	10	8
7 - 10	I	80	38	28
	II	30	14	8
	III	15	7	6
5 - 16	I	32	45	33
	II	21	16	10
	III	9	8	7
10 - 20	I	32	38	28
	II	21	14	8
	III	9	7	6
10 - 25	I	20	25	18
	II	17	9	6
	III	7	4,5	4
20 - 35	I	16	20	15
	II	13	7	4,5
	III	4	3,5	3
35 - 50	I	9	15	11
	II	9	5,5	3
	III	4	3	2,5
45 - 63	I	7	11	8
	II	7	4	2,5
	III	3	2	1,5
60 - 100	I	6	8	5,5
	II	6	2,5	1,5
	III	2,5	1,5	1,2
80 - 100	I	6	8	5,5
	II	6	2,5	1,5
	III	2,5	1,5	1,2

Type 514, 515, 518

ADJUSTING RANGES [bar] and REDUCTION RATIO P1/P2		
setting ranges bar	40 - 100	80 - 160
reduction ratio	4	

Type 512, 513, 517

ADJUSTING RANGES [bar], NOMINAL PRESSURE			
0,005 - 0,07	0,02 - 0,1	0,05 - 0,4	
PN 100/1	PN 100/1	PN 100/1	
0,1 - 0,4	0,4 - 0,8	0,3 -1	1 - 2
PN 100/1	PN 100/1,6	PN 100/1,6	PN 100/6

REDUCTION RATIO P1/P2 max. inlet pressure 100 bar				
setting ranges bar	seat	nominal diameter G 3/8 - 1 DN 15 - 25	G 1 1/4 - 1 1/2 DN 32 - 40	G 2 DN 50
0,005 - 0,07	I	4.000	6.570	4.865
	II	1.500	2.390	1.490
	III	600	1.200	1.010
0,02 - 0,1	I	2.000	1.950	1.445
	II	800	710	440
	III	300	355	300
0,05 - 0,4	I	1.000	1.020	755
	II	400	370	230
	III	150	185	155
0,1 - 0,4	I	700	510	375
	II	200	185	115
	III	90	90	75
0,4 - 0,8	I	700	510	375
	II	200	185	115
	III	90	90	75
0,3 - 1	I	300	280	205
	II	100	100	60
	III	40	50	40
1 - 2	I	300	280	205
	II	100	100	60
	III	40	50	40

Reduktion ratio in consideration of max. inlet pressure.

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Special designs on request.

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Index of Revisions

Rev.	Sheet	Prepared, revised		Checked	Approved			Remark, kind of revision
		Name	Date	Name	Name	Date	Status	
00	**1 to 223**	**V12/sro**	**2004-09-01**	**V12/lf**	**V12/di**	**2004-09-10**	**IFR**	**FIRST ISSUE / FINAL ISSUE**