

Electric Control Valve Type 241-2 Globe Valve Type 241

Electric Control Valve Type 244-2 Three-way Valve Type 244

In accordance with U.S. standards

Application

Versatile control valves designed for use in process engineering and plants with industrial requirements.

Type 241 Globe Valve

Nominal sizes 1/2" to 10" · Nominal pressure ANSI Class 125 to 300

Temperatures from -325 °F to +800 °F (-198 °C to +427 °C)

Conversion of valve sizing coefficients:

$$C_v \text{ (in U.S.-gallons/min)} = 1.17 \cdot \text{(in m}^3\text{/h)}$$

$$K_{vs} \text{ (in m}^3\text{/h)} = 0.86 \cdot C_v \text{ (in U.S.-gallons/min)}$$

Type 244 Three-way Valve

used for mixing or flow-diverting service

Nominal sizes 1/2" to 6" · Nominal pressure ANSI Class 150 and 300 · Temperatures from -325 °F to +800 °F (-198 °C to +427 °C)



The electric control valves essentially consist of either a Type 241 Globe Valve or Type 244 Three-way Valve plus a Type SAM Electric Actuator. These control valves, designed according to the modular principle, can be combined with various accessories and feature the following special properties:

- Valve body manufactured of cast iron (Type 241 Globe Valve only), cast steel or stainless cast steel according to the ASTM (American Society for Testing and Materials) specification
- Undivided valve bonnet up to nominal size 6"
- Extension bonnet or bellows seal bonnet option
- Type 241 Globe Valve with valve plug – Metal sealing with leakage rate Class IV according to IEC 534 (= Class IV according to ANSI B16.104), soft sealing with leakage rate Class VI or lapped-in metal sealing with leakage rate up to nominal size 3" Class IV-S2 according to IEC 534 (= Class VI according to ANSI B16.104); nominal size DN 4" or above, Class IV-S1 (= Class IV)
- Low-noise standard plug. Also special version with flow divider for further noise reduction
- Type 244 Three-way Valve designed for mixing or flow-diverting service. Flow rate across port AB independent of valve stem position

Versions

Standard version for temperatures from +15 °F to +430 °F (-10 °C to +220 °C).

Type 241-2 (Figs. 1 and 2) · With Type 241 Globe Valve and Type SAM Electric Actuator

Type 244-2 (Fig. 3) · With Type 244 Three-way Valve and Type SAM Electric Actuator.

Version with extension bonnet (refer to Pressure-Temperature Diagram for permissible temperatures)

Version with bellows seal bonnet consisting of a double-walled, stainless steel bellows with a backup safety stuffing box and intermediary test connection

For Type 241-2 Electric Control Valve, also available:

Version with heating jacket or heating jacket and bellows heating for nominal sizes 1", 1 1/2", 2", 3" and 4".

Version with micro-flow valve insert, nominal sizes 1/2" to 1", for C_v values from 0.00012 to 0.074 US GPM (Gallons Per Minute) (K_{vs} values from 0.0001 to 0.063 m³/h) (see Data Sheet T 8018 E for details)



Fig. 1 · Type 241-2 Electric Control Valve with Type SAM Electric Actuator on Type 241 Globe Valve (nominal sizes 1/2" to 6")



Fig. 2 · Type 244-2 Electric Control Valve with Type SAM Electric Actuator on Type 244 Three-way Valve (nominal sizes 1/2" to 6")

Type SAM Electric Actuator

The Type SAM Linear Actuators essentially consist of a driving motor and gear containing a handwheel. Actuator thrusts in the range from 2 to 25 kN. Optionally available with a.c. current or three-phase a.c. motor; standard versions with two torque-dependent limit switch modules and three stroke-dependent limit contacts (see Data Sheet T 8330 E for details).

Also available are:

Type 241-2 and Type 244-2 Electric Control Valves with Type 5802 Electric Actuator (see Data Sheet T 5870 E for details)

Type 241-4 and Type 244-4 Electric Control Valves with Type 3274 Electrohydraulic Actuator (see Data Sheet T 5874 E for details).

Type 241-1 Pneumatic Control Valves (see Data Sheet T 8012 E for details) and **Type 244-1** (see Data Sheet T 8027 E for details)

Principle of operation (Figs. 3 and 4)

The process medium flows through the globe valve in the direction indicated by the arrow. The valve plug position determines the cross-sectional area of flow between the valve plug (3) and the valve seat (2).

Depending on the plug arrangement, the three-way valve operates as a mixing or flow-diverting valve. With mixing valves, the process media to be mixed flows through valve ports A and B. The combined (joint) stream leaves at common valve port AB. The flow from valve port A or B to common valve port AB depends on the free area between the seats (2) and valve plugs (3), and also on the position of the plug stem (6). With flow-diverting valves, however, the process medium flows through common valve port AB, and the split streams flow leave through valve ports A and B. The flow from common valve port AB to valve port A or B corresponds to the plug stem position.

The plug stem (6), with attached plug, is connected to the stem (8.1) of the actuator (8) via the stem connector (7) and sealed by means of a spring-loaded PTFE V-ring packing (4.2). Adjustable packing, free of pockets, is also available for valves containing medium which crystallizes or polymerizes (details on request).

The additional metal bellows seal (9) is suitable, for instance, for vacuum under 0.022 psi (1.5 mbar), for toxic fluids and other media which should not escape to the outside. This version is equipped with a test connection at the top flange for checking the exchangeable stainless steel bellows (10).

The Type 241 Globe Valves are available with St I or St III Flow Dividers. When consequently installed, the seat must be replaced (see Data Sheet T 8081 E for details).

The motion of the reversible motor is transmitted to the actuator stem (8.1) of the linear actuator via a wormgear. The actuators are equipped with a handwheel which is stationary when the motor is being operated. When the double-throw switch is actuated, the motor is disengaged, and the handwheel is connected to the gear.

The control valves can optionally be fitted with the accessories listed in section "Technical data". The limit switches issue a corresponding alarm signal whenever the set limit value is exceeded in all directions. The potentiometers are preferably used for remote indication of the valve position. The electrical position transmitters convert the actuator travel (0...100 %) into a 20 mA d.c. current signal and determine the position of the linear actuator. The position is proportional to the input signal.

- | | |
|-------------------------|---------------------------------|
| 1 Valve body | 6 Plug stem |
| 2 Valve seat | 6.1 Coupling and locknut |
| 3 Valve plug | 7 Stem connector (coupling) |
| 4 Stuffing box | (also travel indicator) |
| 4.1 Packing spring | 8 Electric actuator |
| 4.2 PTFE V-ring packing | 8.1 Actuator stem |
| 5 Valve bonnet | 8.2 Clamp nut for actuator |
| 5.1 Guide bushing | 9 Additional metal bellows seal |
| 5.2 Threaded bushing | 10 Metal bellows seal |

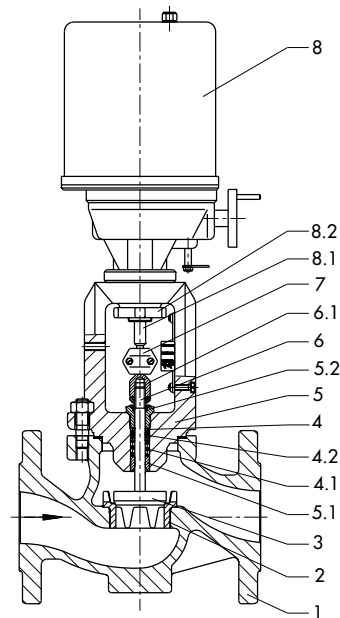


Fig. 3 · Type 241-2 Electric Control Valve with Type SAM Electric Actuator on Type 241 Type Globe Valve (nominal sizes 1/2" to 10")

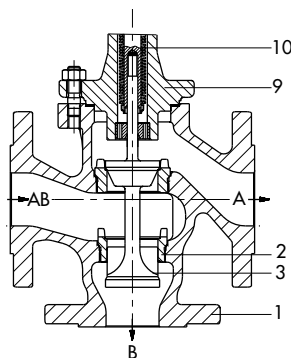
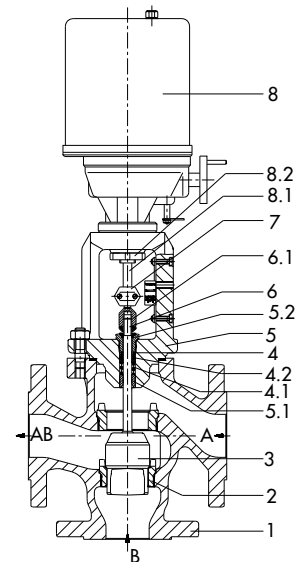


Fig. 4 · Type 244-2 Electric Control Valve with Type SAM Electric Actuator on Type 244 Three-way Valve

- 4.1 Plug arrangement for mixing service
- 4.2 Plug arrangement for flow-diverting service

Table 1 · Technical data

Valve Type	241			244	
Nominal size	1/2" to 6"	1/2" to 10"		1/2" to 6"	
ASTM material	A 126 B	A 216 WCB	A 351 CF8M	A 216 WCB	A 351 CF8M
Connection	FF	Flange, Raised Face (RF)			
Type of connection ²⁾	FF (Flat Face)	RF			
Nominal pressure ANSI CL	125	150 or 300		150 or 300	
Temperature ranges	Body, extension bonnet and bellows seal bonnet, see Pressure-Temperature Diagram				
Valve plug Standard	Metal sealing -325 °F to +800 °F -198 °C to +427 °C				
	Soft sealing -325 °F to +428 °F -198 °C to +220 °C				
Balanced	With PTFE ring -325 °F to +428 °F -198 °C to +220 °C				
	With graphite ring ³⁾ +428 °F to +800 °F +220 °C to +427 °C				
Characteristic	Equal-percentage/linear/on-off			Linear	
Plug sealing	Metal, soft or lapped-in metal			Metal	
Leakage rate according to (DIN) IEC 534 Class	Type of sealing	Shape of plug			
		Standard	Balanced with: PTFE ring Graphite ring		
Leakage rate according to (DIN) IEC 534 Class	Metal	IV	IV	III	
	Soft	VI	-	-	
	Lapped-in metal	IV-S2 ⁴⁾	-	-	
Rangeability	50 : 1 with 1/2" to 2"			30 : 1 with 2 1/2" to 10"	

¹⁾ Unbalanced valve plugs with soft sealing, seat $\varnothing \geq 3$ mm (1/8")
²⁾ Other versions on request
³⁾ Special version: Details on request
⁴⁾ Nominal size DN 4" or above; Leakage rate Class IV-S1

Table 2 · Materials (WN = Material Number according to DIN)

Standard version			
Valve body ¹⁾	Cast iron A 126 B	Cast carbon steel A 216 WCB	Stainless steel A 351 CF8M
Valve bonnet	A 105		A 182 F 316
Seat and plug ²⁾	WN 1.4006		WN 1.4571
	Soft sealing, PTFE with glass fiber 15 %		
	Sealing ring for soft sealing, PTFE with carbon or graphite		
Guide bushings	WN 1.4104	WN 1.4571	
Stuffing box packing ³⁾	V-ring packing of PTFE with carbon; packing spring WN 1.4310		
Body gaskets	Metal graphite		
Version with extension bonnet			
Intermediate piece	A 105		A 182 F 316
Version with bellows seal bonnet			
Intermediate piece	A 105		A 182 F 316
Metal bellows	WN 1.4571		
Version with heating jacket on request			

¹⁾ See Pressure-Temperature Diagram; other materials available on request
²⁾ All seats and valve plugs with metal sealing also available with Stellite facing or plug composed of pure Stellite
³⁾ Other packing materials on request

Pressure-Temperature Diagram according to ASME/ANSI B16.1 and B16.34

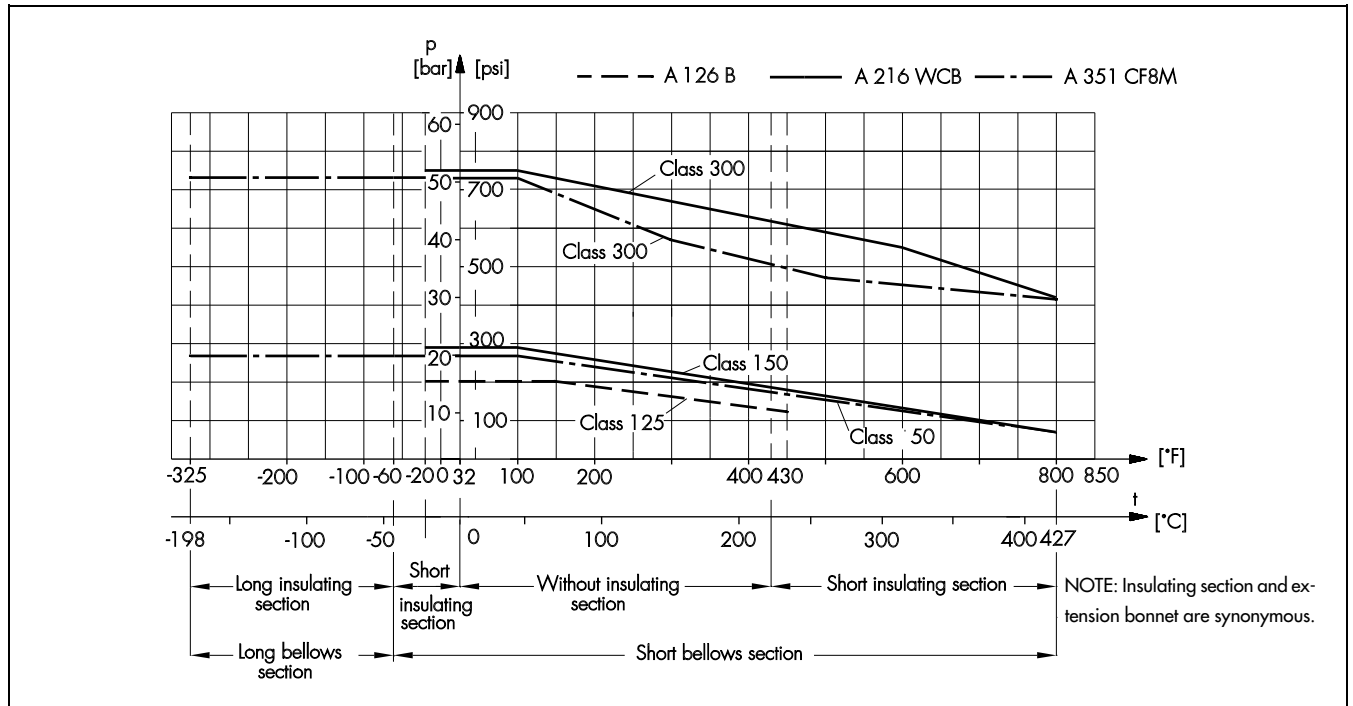


Table 3 · Technical data relating to the electric actuators

SAMSON designation	SAM-10	SAM-11	SAM-20	SAM-21	SAM-22	SAM-30	SAM-31	SAM-32	SAM-40	SAM-41	SAM-42
Nominal thrust, predetermined, kN	2	4.5	6	8	12	6	8	12	15	20	25
Motor for ¹⁾ (with handwheel)	230 V/50 Hz	With mechanical brake		Without brakes (with electromechanical brakes on request,) with Temperature Monitor TM							
	380 V/50 Hz	With anti-rotation device		With anti-rotation device							
Power consumption W	230 V/50 Hz, Stroking speed 25/50 mm/min	28/32		60/130				145/165			
		35/32		75/120				150/300			
Transit time 25/50 mm/min ²⁾ for travel, mm	15	36 sec./18 sec.									
	30	72 sec./36 sec.									
	60	-				144 sec./72 sec.					
Attachment to control valve	Connection M30 x 1.5 (1/2" to 6")					Connection M60 x 1.5 (8" to 10")					
Electrical connection optionally via: (see also terminal assignments)	Terminal strip inside (standard), terminal strip with terminal boxes or compact connector, silver-plated sockets and pins ³⁾										
Switching mechanism (DE = torque-dependent switch, WE = stroke-dependent switch)	2 DE, 3 WE with silver contacts ³⁾		2 DE, 3 WE (standard) with silver contacts ³⁾ 2 DE, 4 WE with silver contacts ³⁾								
Signalizing device (option)	Potentiometer	1 x 110/200/1000 ohm 2 x 110/200/1000 ohm ⁴⁾									
	Electronic position transmitter	-	0 to 20 mA 4 to 20 mA								
Positioner (option)	Input signal: 0 to 10 V / 0 to 20 mA / 4 to 20 mA (for motors with a.c. current 230 V/50 Hz ⁵⁾⁷⁾										
Heating resistance with Temperature Monitor TM	Supply voltage: AC 230 V / AC 110 V / AC 24 V										
Degree of protection ⁶⁾	IP 65										
Permissible ambient temperature	-4 to 140 °F (-20 to 60 °C)										

¹⁾ Other voltage and/or frequency on request

²⁾ Type SAM-10/11 Actuator available with nominal speed 17 mm/min

Type SAM-20/21/22 Actuator and SAM-30/31/32 available with speed 13.5 mm/min (without temperature monitor)

³⁾ Switching mechanism available with gold-plated contacts

⁴⁾ Version with potentiometers 2 x 200/2 x 1000 ohm only available for actuators without positioner

⁵⁾ For motors with three-phase a.c. current 380 V/50 Hz on request

⁶⁾ Special type of protection (e.g., for tropics, oxygen, etc.) and special enameling on request

⁷⁾ Version with positioner for three-phase motor only available with brake motors

Type 241-2 Control Valves

Table 4a · C_v, K_{vs} values and z values for versions without flow dividers

All values apply to versions with unbalanced valve plugs. The versions in the bold-edged, shadowed fields also apply to versions 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	
Seat ∅	mm	3			6			12			24			31	38	48	63		80	100	125	130	150	200
	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
Travel	mm	15														30	15	30		60	30	60		
	in	0.59														1.18	0.59	1.18		2.36	1.18	2.36		
Nom. size in inch (mm)	z · Acoustically determined valve coefficient																							
1/2" (15)	0.8	0.8	0.8	0.8	0.75	0.65	0.65	0.6	0.55															
3/4" (20)	0.8	0.8	0.8	0.8	0.75	0.65	0.65	0.6	0.55	0.45														
1" (25)	0.8	0.8	0.8	0.8	0.75	0.65	0.65	0.6	0.55	0.45	0.4													
1 1/2" (40)				0.8	0.75	0.7	0.7	0.6	0.55	0.5	0.45	0.4	0.35											
2" (50)				0.8	0.75	0.7	0.7	0.6	0.55	0.5	0.45	0.4	0.35	0.35										
2 1/2" (65)														0.35	0.35	0.25								
3" (80)														0.35	0.35	0.25	-	0.25						
4" (100)																	0.25	-	0.25	0.2				
6" (150)																	0.2		0.2	0.2	-	0.2		
8" (200)																					0.2		0.2	0.2
10" (250)																					0.2		0.2	0.2

Table 4b · C_v, K_{vs} and z values for versions with flow dividers

All values apply to versions with St I Flow Dividers. Versions marked with an asterisk are available with St III Flow Dividers. Versions in bold-edged, shadowed fields also available with balanced valve plugs.

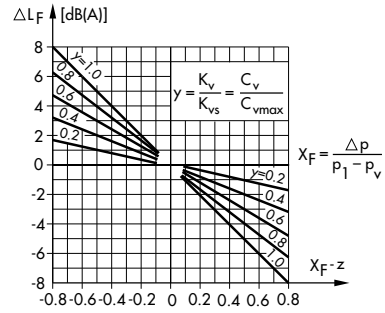
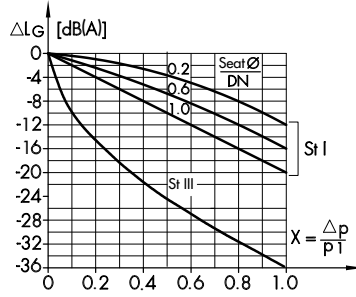
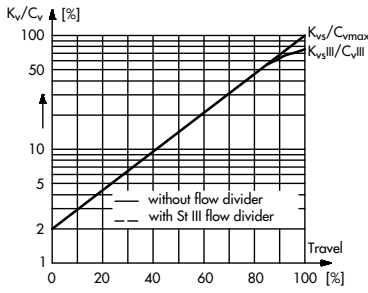
C _v I	-					1.7	2.6	4.2	7	10.5	17	26	36	62	67	85	105	170	265	275	375	650	
K _{vs} I	-					1.45	2.2	3.6	5.7	9	14.5	22	31	54	57	72	90	144	225	234	320	560	
C _v III	-									9	-	23	30	-	55	-	90	140	220	-	315	-	
K _{vs} III	-									7.5	-	20	26	-	47	-	75	120	190	-	270	-	
Seat [mm	-					12			24			31	38	48	63		80	100	125	130	150	200
	in	-					0.47			0.945			1.27	1.5	1.9	2.48		3.15	3.94	4.92	5.12	5.91	7.87
Travel	mm	15														30	15	30		60	30	60	
	in	0.59														1.18	0.59	1.18		2.36	1.18	2.36	
Size in inch (mm)	z · Acoustically determined valve coefficient																						
1/2" (15)						0.65	0.6	0.55															
3/4" (20)						0.65	0.6	0.55															
1" (25)						0.65	0.6	0.55															
1 1/2" (40)									0.5	0.45	0.4*	0.35											
2" (50)									0.5	0.45	0.4	0.35	0.35										
2 1/2" (65)													0.35*	0.35*	0.25								
3" (80)													0.35*	0.35*	0.25	-	0.25						
4" (100)																0.25	-	0.25	0.2				
6" (150)																	0.2	0.2*	-	0.2			
8" (200)																				0.2*		0.2*	0.2
10" (250)																				0.2*		0.2*	0.2

Terms for noise calculation according to VDMA 24 422 (edition May 1979) and correction terms

$K_{Vs I}/C_v I$, $K_{Vs III}/C_v III \cdot K_{Vs}$ or C_v values when an St I or St III Flow Divider is installed. Flow characteristic difference of valves without flow dividers and with St III Flow Dividers as depicted in the diagram below.

ΔL_G · For gases and steams
 For valves without flow dividers: $\Delta L_G = 0$
 For valves with flow dividers:
 Values as depicted in the diagram below.

ΔL_F · For liquids
 For valves without flow dividers: $\Delta L_F = 0$
 For valves with St I Flow Dividers:
 Values as depicted in the diagram below.



Notes on Tables 5a to 6d

The differential pressure tables were prepared under the following conditions:

- Process flow directed against the closing direction of the valve plug (flow-to-open valve) (Type 241 Globe Valve)
- Valve plug with metal or soft sealing (for soft sealing, note remarks below)
- Version with PTFE stuffing box
- For balanced valve plugs with PTFE sealing ring
- Tables 5a to 5b for unbalanced valve plugs with downstream pressure $p_2 = 0$
- The leakage rate stated in Table 1 must not be exceeded in concern to the maximum differential pressures listed and the previously mentioned conditions.
- All pressures in bar (gauge) and psig
- The differential pressures specified are limited by the Pressure-Temperature Diagram and the nominal pressure rating.

Note the following sections if versions or operating conditions are different than those stated above.

Permissible differential pressure Δp_w for valve plugs with soft sealing

Since force required for tight valve sealing is less for valve plugs with soft sealing than for valve plugs with metal sealing, the permissible differential pressure Δp in Tables 5a to 5f is increased by the value Δf_w .

$$\Delta p_w = \Delta p + \Delta f_w \quad (1)$$

Permissible differential pressure Δp_m for valve plugs with lapped-in metal sealing

In order to achieve a low leakage rate (see Table 1) for valve plugs with lapped-in metal sealing, the surface pressure between the seat and plug must be increased. The permissible differential pressure Δp_m is calculated according to the following equation:

$$\Delta p_m = \Delta p - (\Delta f_w \cdot 4.8) \quad (2)$$

If Δp_m becomes to small or assumes a negative value, a larger actuator is recommended.

Permissible differential pressure for $p_2 > 0$ and permissible operating pressure for $\Delta p = 0$

Versions with unbalanced valve plugs (Tables 5a and 5b)

The permissible differential pressures Δp in Tables 5a and 5b apply to $p_2 = 0$. If $p_1 \geq p_2$ and $p_2 > 0$, then p_2 acts on the top side of the valve plug and also on the effective surface of the bellows for versions with metal bellows.

Therefore, check whether the actuator is sized appropriately to safely close and open the valve. The permissible differential pressure Δp_b in the operating state is calculated according to the following equation:

$$\Delta p_b = \Delta p - K \cdot \frac{p_2}{D^2} \quad (3)$$

The following applies especially for vales with small seat diameters D and/or with metal bellows: For valves where $K > 0.5 \cdot D^2$, the maximum permissible pressures are to be checked when $\Delta p = 0$. The maximum permissible operating pressure p_{max} is then calculated as follows:

$$p_{max} = \Delta p \cdot \frac{D^2}{K} \quad (4)$$

In equations (3) and (4), Δp is the permissible differential pressure according to Tables 5a and 5b, D is the seat \varnothing in mm and K is a value from the following table.

For valves	K without bellows	K with bellows
1/2" to 3" (DN 15 to 80)	100	435
4" to 6" (DN 100 to 150)	256	1325
8" to 10" (DN 200 to 250)	1600	2695

For valve plugs with soft or metal sealing, Δp_w (equation 1) or Δp_m (equation 2) replaces Δp . If Δp_b or p_{max} become too small or Δp_b assumes a negative value, either a larger actuator or a balanced valve plug must be selected.

Versions with balanced valve plugs (Tables 5c to 5f)

The differential pressures Δp listed in these tables also apply for $p_1 \geq p_2$, since the balanced valve plug is independent of p_2 . The maximum operating pressure p_{max} is equal to the maximum permissible differential pressure.

$$p_{max} = p_{1max} = p_{2max} = \Delta p \quad (5)$$

In equation (5), Δp is the permissible differential pressure according to Tables 5c to 5f.

The values for maximum permissible operating pressure p_{max} stated in equations (4) and (5) can be limited by the Pressure-Temperature Diagram.

Type 241-2 Control Valves

Table 5a · Permissible differential pressures Δp for unbalanced valve plugs · Pressures in bar

Correlation between C_v , K_{vs} values and nominal size only according to Table 4

Type 241 Globe Valve																		
Electric actuator							SAM-10	SAM-11	SAM-20	SAM-21	SAM-22	SAM-30	SAM-31	SAM-32	SAM-40	SAM-41	SAM-42	
Nominal thrust							kN	2	4.5	6	8	12	6	8	12	15	20	25
Nominal size		C_v	K_{vs}	Seat \varnothing		Δf_w	Δp with $p_2 = 0$											
in	mm			in	mm													
1/2" to 1"	15 to 25	0.12 to 0.3	0.1 to 0.25	0.118	3	22.6	40											
1/2" to 2"	15 to 50	0.5 to 1.2	0.4 to 1.0	0.236	6	11.3	40											
		2 to 5	1.6 to 4.0	0.472	12	5.6	40											
3/4" to 2"	20 to 50	7.5 to 12	6.3 to 10.0	0.944	24	2.8	40											
1 1/2" to 2"	40 to 50	20	16	1.22	31	2.2	20	40										
1 1/2" to 3"	40 to 80	30	25	1.496	38	1.8	13	33	40									
2" to 3"	50 to 80	40	35	1.890	48	1.4	8	20	28	38	40							
2 1/2" to 3"	65 to 80	70	60	2.48	63	1.1	4.2	11.5	16	21.5	33							
3"	80	95	80	3.149	80	0.9	2.5	7	9.5	13.5	20							
4"	100	75	63	2.48	63	1.1	4	11	15.5	21	33							
4" to 6"	100 to 150	120	100	3.149	80	0.9	2	6.5	9	13	20							
	100 to 150	190	160	3.937	100	0.7		4.2	6	8	12.5							
6"	150	300	260	5.118	130	0.5		2.4	3.4	4.8	7.5							
8" and 10"	200 to 250	290	250	4.921	125	0.5						3.5	5	8	10.2	14	18.5	
		420	360	5.906	150	0.4							2.4	3.4	5.5	7	9.5	12
		735	630	7.874	200	0.3								1.2	1.8	3	3.8	5.3

Type 241-2 Control Valves

Table 5b · Permissible differential pressures Δp for unbalanced valve plugs · Pressures in psi

Correlation between C_v , K_{vs} values and nominal size only according to Table 4

Type 241 Globe Valve																		
Electric actuator							SAM-10	SAM-11	SAM-20	SAM-21	SAM-22	SAM-30	SAM-31	SAM-32	SAM-40	SAM-41	SAM-42	
Nominal thrust							kN											
							2	4.5	6	8	12	6	8	12	15	20	25	
Nominal size		C_v	K_{vs}	Seat \varnothing		Δf_w	Δp with $p_2 = 0$											
in	mm			in	mm													
1/2" to 1"	15 to 25	0.12 to 0.3	0.1 to 0.25	0.118	3	22.6	580											
1/2" to 2"	15 to 50	0.5 to 1.2	0.4 to 1.0	0.236	6	11.3	580											
		2 to 5	1 to 4	0.472	12	5.6	580											
3/4" to 2"	20 to 50	7.5 to 12	6.3 to 10.0	0.944	24	2.8	580											
1 1/2" to 2"	40 to 50	20	16	1.22	31	2.2	290	580										
1 1/2" to 3"	40 to 80	30	25	1.496	38	1.8	189	479	580									
2" to 3"	50 to 80	40	35	1.890	48	1.4	116	290	406	551	580							
2 1/2" to 3"	65 to 80	70	60	2.48	63	1.1	61	167	232	312	479							
3"	80	95	80	3.149	80	0.9	36	102	138	196	290							
4"	100	75	63	2.48	63	1.1	58	160	225	305	479							
4" to 6"	100 to 150	120	100	3.149	80	0.9	29	94	130	189	290							
4" to 6"	100 to 150	190	160	3.937	100	0.7		61	87	116	181							
6"	150	300	260	5.118	130	0.5		35	49	70	109							
8" and 10"	200 to 250	290	250	4.921	125	0.5						51	72	116	148	203	268	
		420	360	5.906	150	0.4						35	49	80	101	138	174	
		735	630	7.874	200	0.3						17	16	43	55	77	97	

Type 241-2 Control Valves

Table 5c · Permissible differential pressures Δp with $p_2 = 0$ (in bar)

Correlation between C_v , K_{vs} values and nominal size only according to Table 4

Type 241 Globe Valve							With balanced valve plug Without metal bellows Plug with PTFE ring				
Electric actuator							SAM -10	SAM -11	SAM -30	SAM -31	
Nominal thrust							kN	2	4.5	6	8
Nominal size		C_v	K_{vs}	Seat \varnothing		Δf_w	Δp with $p_2 = 0$				
in	mm			in	mm						
2½"	65	70	60	2.480	63	1.1	40				
3"	80	95	80	3.149	80	0.9	40				
4"	100	74	63	2.480	63	1.1	40				
4"	100	120	100	3.149	80	0.9	40				
4"	100	150	190	3.937	100	0.7	40				
6"	150	300	260	5.118	130	0.5		40			
8" 10"	200 250	290	250	4.921	125	0.5			33	40	
		420	360	5.906	150	0.4			31	40	
		735	630	7.874	200	0.3			27	40	

Table 5e · Permissible differential pressures Δp with $p_2 = 0$ (in bar)

Correlation between C_v , K_{vs} values and nominal size only according to Table 4

Type 241 Globe Valve							With balanced valve plug Without metal bellows Plug with PTFE ring					
Electric actuator							SAM -10	SAM -11	SAM -20	SAM -30	SAM -31	
Nominal thrust							kN	2	4.5	6	6	8
Nominal size		C_v	K_{vs}	Seat \varnothing		Δf_w	Δp with $p_2 = 0$					
in	mm			in	mm							
2½"	65	70	60	2.480	63	1.1	32	40				
3"	80	95	80	3.149	80	0.9	26	40				
4"	100	74	63	2.480	63	1.1	10	32	40			
4"	100	120	100	3.149	80	0.9	8.5	30	40			
4"	100	150	190	3.937	100	0.7	7	29	40			
6"	150	300	260	5.118	130	0.5		26	40			
8" 10"	200 250	290	250	4.921	125	0.5				39	40	
		420	360	5.906	150	0.4				37	40	
		735	630	7.874	200	0.3				32	40	

Table 5d · Permissible differential pressures Δp with $p_2 = 0$ (in psi)

Correlation between C_v , K_{vs} values and nominal size only according to Table 4

Type 241 Globe Valve							With balanced valve plug Without metal bellows Plug with PTFE ring				
Electric actuator							SAM -10	SAM -11	SAM -30	SAM -31	
Nominal thrust							kN	2	4.5	6	8
Nominal size		C_v	K_{vs}	Seat \varnothing		Δf_w	Δp with $p_2 = 0$				
in	mm			in	mm						
2½"	65	70	60	2.480	63	1.1	580				
3"	80	95	80	3.149	80	0.9	580				
4"	100	74	63	2.480	63	1.1	580				
4"	100	120	100	3.149	80	0.9	580				
4"	100	150	190	3.937	100	0.7	580				
6"	150	300	260	5.118	130	0.5		580			
8" 10"	200 250	290	250	4.921	125	0.5				479	580
		420	360	5.906	150	0.4				450	580
		735	630	7.874	200	0.3				392	580

Table 5f · Permissible differential pressures Δp with $p_2 = 0$ (in psi)

Correlation between C_v , K_{vs} values and nominal size only according to Table 4

Type 241 Globe Valve							With balanced valve plug Without metal bellows Plug with PTFE ring					
Electric actuator							SAM -10	SAM -11	SAM -20	SAM -30	SAM -31	
Nominal thrust							kN	2	4.5	6	6	8
Nominal size		C_v	K_{vs}	Seat \varnothing		Δf_w	Δp with $p_2 = 0$					
in	mm			in	mm							
2½"	65	70	60	2.480	63	1.1	464	580				
3"	80	95	80	3.149	80	0.9	377	580				
4"	100	74	63	2.480	63	1.1	145	464	580			
4"	100	120	100	3.149	80	0.9	123	435	580			
4"	100	150	190	3.937	100	0.7	101	420	580			
6"	150	300	260	5.118	130	0.5		377	580			
8" 10"	200 250	290	250	4.921	125	0.5				565	580	
		420	360	5.906	150	0.4				536	580	
		735	630	7.874	200	0.3				464	580	

Type 244-2 Control Valves

Table 6a · Type 3244 Mixing Valve

K_{vs} values and permissible differential pressures Δp with $p_2 = 0$ (in bar)

Electric actuator								SAM-10	SAM-11	SAM-20	SAM-21	SAM-22
Nominal thrust								kN				
Nominal size		K_{vs} Mixing valve	Seat \varnothing		Travel		Δp with $p_2 = 0$					
in	mm		mm	in	mm	in						
1/2"	15	2 4	24	0.944	15	0.59	40					
3/4"	20	2 4 6.3										
1"	25	2 4 6.3 10										
1 1/2" to 2"	40 to 50	6.3 10 16	31	1.22			20	40				
1 1/2" and 2"	40 and 50	25	38	1.496			13	33	40			
2" to 3"	50 to 80	25* 40	48	1.890			8	20	28	38	40	
2 1/2" and 3"	65 and 80	60	63	2.48			4.2	11.5	16	21.5	33	
3"	80	80	75	2.953	2.8	8	11	15	23			
4"	100	100	80	3.149	30	1.18	2.5	7	9.5	13.5	20	
		160	100	3.937			1.3	4.2	6	8	12.5	
6"	150	200	110	4.331			1	3.5	4.8	6.8	10.5	
		300	130	5.118			0.6	2.4	3.4	4.8	7.5	

Table 6b · Type 3244 Mixing Valve

C_v values and permissible differential pressures Δp with $p_2 = 0$ (in psi)

Electric actuator								SAM-10	SAM-11	SAM-20	SAM-21	SAM-22
Nominal thrust								kN				
Nominal size		C_v Mixing valve	Seat \varnothing		Travel		Δp with $p_2 = 0$					
in	mm		mm	in	mm	in						
1/2"	15	2.34 5	24	0.944	15	0.59	580					
3/4"	20	2.34 5 7.5										
1"	25	2.34 5 7.5 12										
1 1/2" to 2"	40 to 50	7.5 12 20	31	1.22			290	580				
1 1/2" and 2"	40 and 50	30	38	1.496			189	478	580			
2" to 3"	50 to 80	30 47	48	1.890			116	290	406	551	580	
2 1/2" and 3"	65 and 80	70	63	2.48			61	167	232	312	478	
3"	80	95	75	2.953	41	116	160	217	333			
4"	100	120	80	3.149	30	1.18	36	101	138	196	290	
		190	100	3.937			189	61	43	116	181	
6"	150	230	110	4.331			15	51	70	99	152	
		350	130	5.118			9	35	49	70	109	

Table 6c · Type 3244 Flow-diverting Valve

K_{vs} values and permissible differential pressures Δp with $p_2 = 0$ (in bar)

Electric actuator								SAM-10	SAM-11	SAM-20	SAM-21	SAM-22
Nominal thrust								kN				
Nominal size		K_{vs}	Flow-diverting valve	Seat \varnothing		Travel		Δp with $p_2 = 0$				
in	mm			mm	in	mm	in					
1/2"	15	2 4	24	0.944	15	0.59	40					
3/4"	20											2 4 6.3
1"	25											
1 1/2"	40 to 50	6.3 10 16	31	1.22			20	40				
1 1/2" and 2"	40 and 50											
2"	50 to 80	25 40	48	1.890			8	20	28	38	40	
2 1/2"	65											60/40
3"	80	60	63	2.48			4.2	11.5	16	21.5	33	
		80/60	75/63	2.953/2.48								2.8
4"	100	100	80	3.149			2.5	7	9.5	13.5	20	
		160/100	100/80	3.937/3.149	1.3	4.2						6
6"	150	200	110	4.331	1	3.5	4.8	6.8	10.5			
		300/200	130/110	5.118/4.331						0.6	2.4	3.4

Table 6d · Type 3244 Flow-diverting Valve

C_v values and permissible differential pressures Δp with $p_2 = 0$ (in psi)

Electric actuator								SAM-10	SAM-11	SAM-20	SAM-21	SAM-22
Nominal thrust								kN				
Nominal size		C_v	Flow-diverting valve	Seat \varnothing		Travel		Δp with $p_2 = 0$				
in	mm			mm	in	mm	in					
1/2"	15	2.34 5	24	0.944	15	0.59	580					
3/4"	20											2.34 5 7.5
1"	25											2.34 5 7.5 12
1 1/2"	40 to 50	7.5 12 20	31	1.22			290	580				
1 1/2" and 2"	40 and 50											30
2"	50 to 80	30 47	48	1.890			116	290	406	551	580	
2 1/2"	65											70/47
3"	80	70	63	2.48			61	167	232	312	478	
		95/70	75/63	2.953/2.48								41
4"	100	120	80	3.149			36	101	138	196	290	
		190/120	100/80	3.937/3.149	19	61						43
6"	150	230	110	4.331	15	51	70	99	152			
		350/230	130/110	5.118/4.331						9	35	49

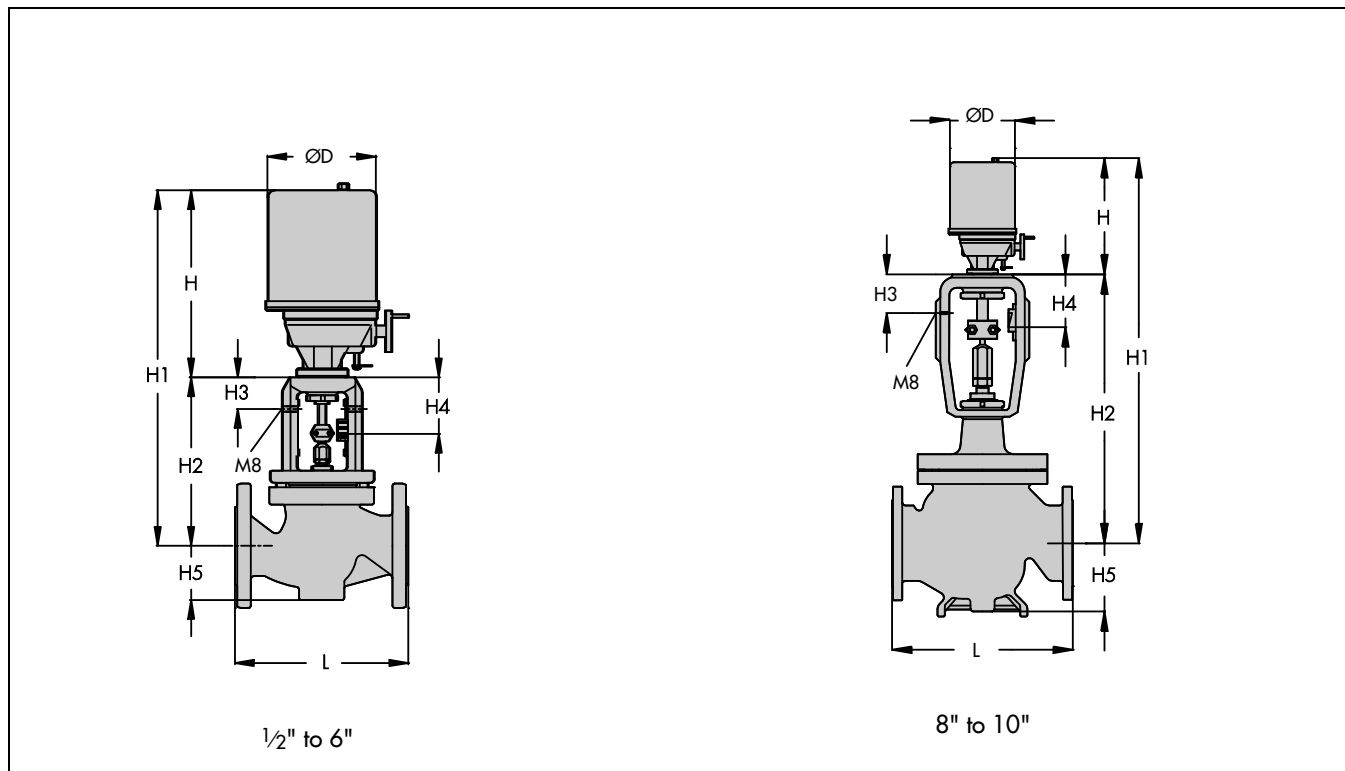
Dimensions in mm and weights for the Type 241-2 Control Valve
Standard version

Nominal size	in	1/2"	3/4"	1"	1 1/2"	2"	2 1/2"	3"	4"	6"	8"	10"	
	mm	15	20	25	40	50	65	80	100	150	200	250	
Length L	in	5.12	5.30	6.30	7.87	9.05	11.42	12.20	13.78	18.90	23.62	28.74	
	mm	130	150	160	200	230	290	310	350	480	600	730	
H1	H2 + H												
H2	in	8.66					10.23		13.78	15.35 16.34 ¹⁾		31.70	
	mm	200					260		350	390 415 ¹⁾		805	
H3	in	2.40					2.95			5.04			
	mm	61					75			128			
H4, valve fully closed	in	2.95					3.54			6.50			
	mm	75					90			165			
H5 (approx.)	in	1.57			2.83		3.86		4.64	6.90	9.25	10.23	
	mm	40			72		98		118	175	235	260	
Approximate weight of actuator without valve	lbs	11	13	15	26	33	53	66	92	264	728	838	
	kg	5	6	7	12	15	24	30	42	120	330	380	
Electric actuator	SAM-10/-11			SAM-20/-21/-22			SAM-30/-31/-32			SAM-40/-41/-42			
Ø D	in	5.71					7.24				8.50		
	mm	145					184				216		
Height H ²⁾	in	10.31 (10.91)					11.81 (12.71)				14.84 (16.42)		
	mm	262 (277)					300 (323)				377 (417)		
Ø d (thread)	30 mm (1.18")						60 mm (2.36")						
	M30 x 1.5 (DN 15 to 150 / 1/2" to 6")						M60 x 1.5 (DN 200 to 250 / 8" to 10")						
Approximate weight	lbs	11			13		15		33				
	kg	5			6		7		15				

¹⁾ For body made of cast iron material A 126 B

²⁾ Dimensions enclosed in parentheses apply to linear actuators with positioners

Type 241-2 Control Valve with SAM Electric Actuator



Version with extension bonnet/bellows seal bonnet for nominal sizes 1/2" to 6"

Nominal size	in	1/2"	3/4"	1"	1 1/2"	2"	2 1/2"	3"	4"	6"	
	mm	15	20	25	40	50	65	80	100	150	
Height H12	Short/with bellows	in	15.95			15.55		17.13		25.00	25.79 26.77
		mm	405			395		435		635	655 680 ³⁾
	Long/long with bellows	in	27.95			27.56		29.13		34.45	38.78
		mm	710			700		740		875	985
Approx. weight	Short/with bellows	lbs	18	20	22	40	46	70	84	132	330
		kg	8	9	10	18	21	32	38	60	150
	Long/long with bellows	lbs	26	29	31	48	55	79	92	150	350
		kg	12	13	14	22	25	36	42	68	158

³⁾ For body made of cast iron material GG-25

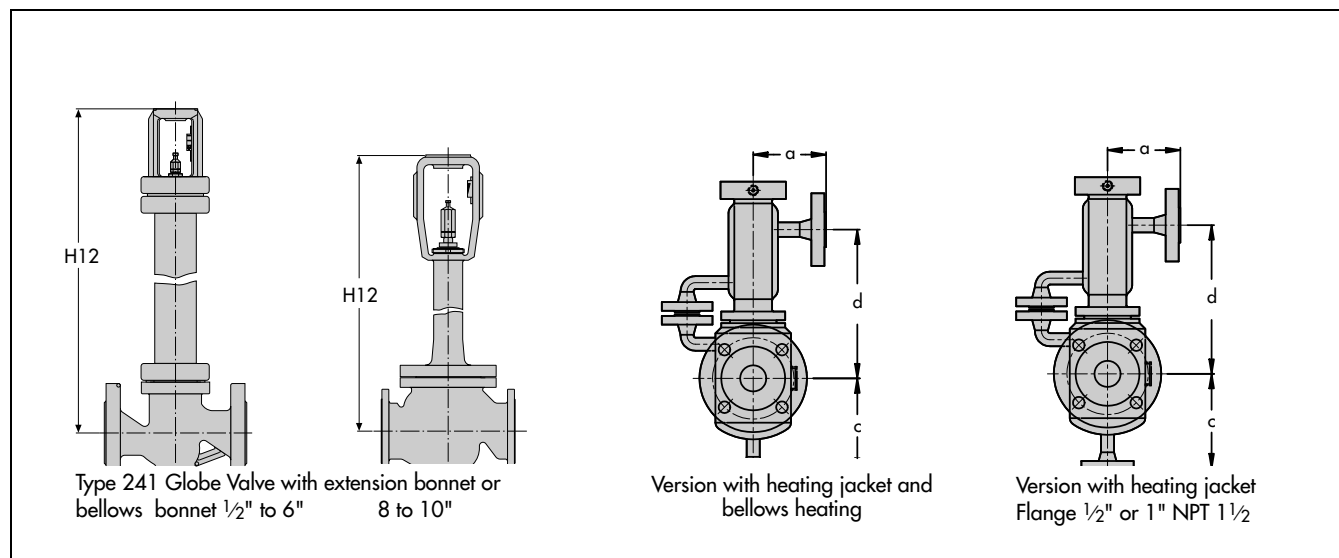
Version with extension bonnet/bellows seal bonnet for nominal sizes 8" and 10"

Version with		Extension bonnet			Bellows bonnet			
Electric actuator	in ²	217	325	434	217	325	434	
	cm ²	1400	2100	2800	1400	2100	2800	
Height H12 for	8"	in	49.21	58.27	58.27	57.20	66.42	66.42
	DN 200	mm	1250	1480	1480	1453	1687	1687
	10"	in	49.21	58.27	58.27	57.20	66.42	66.42
	DN 250	mm	1250	1480	1480	1453	1687	1687
Approx. weight for	8"	lbs	838	882	882	860	904	904
	DN 200	kg	380	400	400	390	410	410
	10"	lbs	948	992	992	970	1014	1014
	DN 250	kg	430	450	450	440	460	460

Version with heating jacket/with heating jacket and bellows heating

Nominal size	in	1"	1 1/2" / 2"	3"	4"
	mm	25	40/50	80	100
a	in	4.33	5.51	7.09	7.87
	mm	110	140	180	200
b	in	0.59	0.79	1.38	1.97
	mm	15	20	35	50
c	in	5.51	6.69	8.46	10.04
	mm	140	170	215	255
d	in	7.48	7.48	9.06	13.39
	mm	190	190	230	340

(not for valves with body made of cast iron material A 126 B)



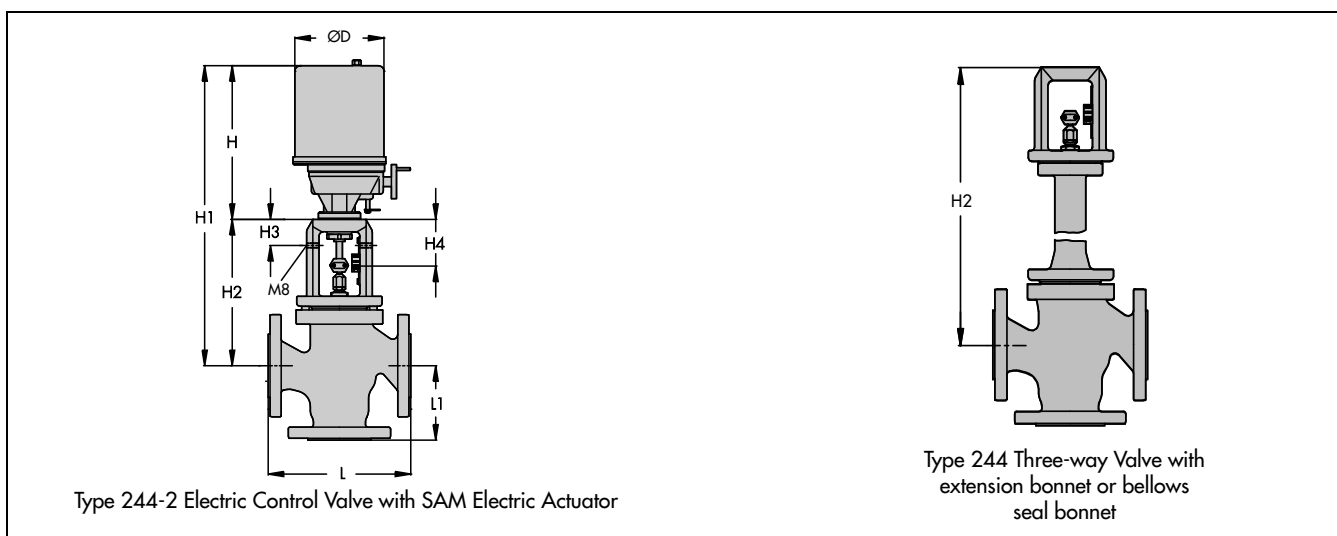
Dimensions in mm and weights for Type 244-2 Electric Control Valve

Nominal size	in	1/2"	3/4"	1"	1 1/2"	2"	2 1/2"	3"	4"	6"	
	mm	15	20	25	40	50	65	80	100	150	
Length L	in	5.12	5.90	6.30	7.87	9.05	11.42	12.20	13.78	18.90	
	mm	130	150	160	200	230	290	310	350	480	
L1	in	2.76	3.15	3.35	4.14	4.72	5.12	5.51	5.91	8.27	
	mm	70	80	85	105	120	130	140	150	210	
H1	H2 + H										
H2	in	9.25					10.23		13.78	13.98	
	mm	235					260		350	355	
H3	in	2.40							2.95		
	mm	61							75		
H4, valve fully closed	in	2.95							3.54		
	mm	75							90		
Approximate weight without actuator	lbs	13	15	18	33	37	68	81	108	297	
	kg	6	7	8	15	17	31	37	49	135	
Electric actuator	SAM-10/-11					SAM-20/-21/-22					
Ø D	in	5.71					7.24				
	mm	145					184				
Height H ¹)	in	10.31 (10.91)					11.81 (12.71)				
	mm	262 (277)					300 (323)				
Ø d (thread)	in	30 mm (1.18")									
	mm	M30 x 1.5									
Approximate weight	lbs	11					13				
	kg	5					6				

¹) Dimensions enclosed in parentheses apply to linear actuators with positioners.

Versions with extension bonnet/bellows seal bonnet (without actuator)

Nominal size	in	1/2"	3/4"	1"	1 1/2"	2"	2 1/2"	3"	4"	6"	
	mm	15	20	25	40	50	65	80	100	150	
Height H2	Short/with bellows	in	16.53			16.14		17.12		25	24.21
		mm	420			410		435		635	615
	Medium	in	22.44			22.05		23.23		25	24.21
		mm	570			560		590		635	615
	Long/long with bellows	in	28.54			28.15		29.13		34.35	33.66
		mm	725			715		740		875	855
Approximate weight	Short/with bellows	lbs	20	22	24	46	51	86	99	148	364
		kg	9	10	11	21	23	39	45	67	165
	Medium	lbs	24	26	29	51	55	90	104	157	372
		kg	11	12	13	23	25	41	47	71	169
	Long/long with bellows	lbs	26	31	35	55	60	95	108	209	381
		kg	12	14	16	25	27	43	49	95	173



Electrical connection

Motor

With mechanical sustained-action brake, without temperature monitor	Without brake, with Temperature Monitor TM	With brake and Temperature Monitor TM	Rectifier incorporated in brake	Rectifier outside
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Linear actuator

SAM-1	SAM-2 to SAM-4	SAM-2, SAM-3	SAM-4
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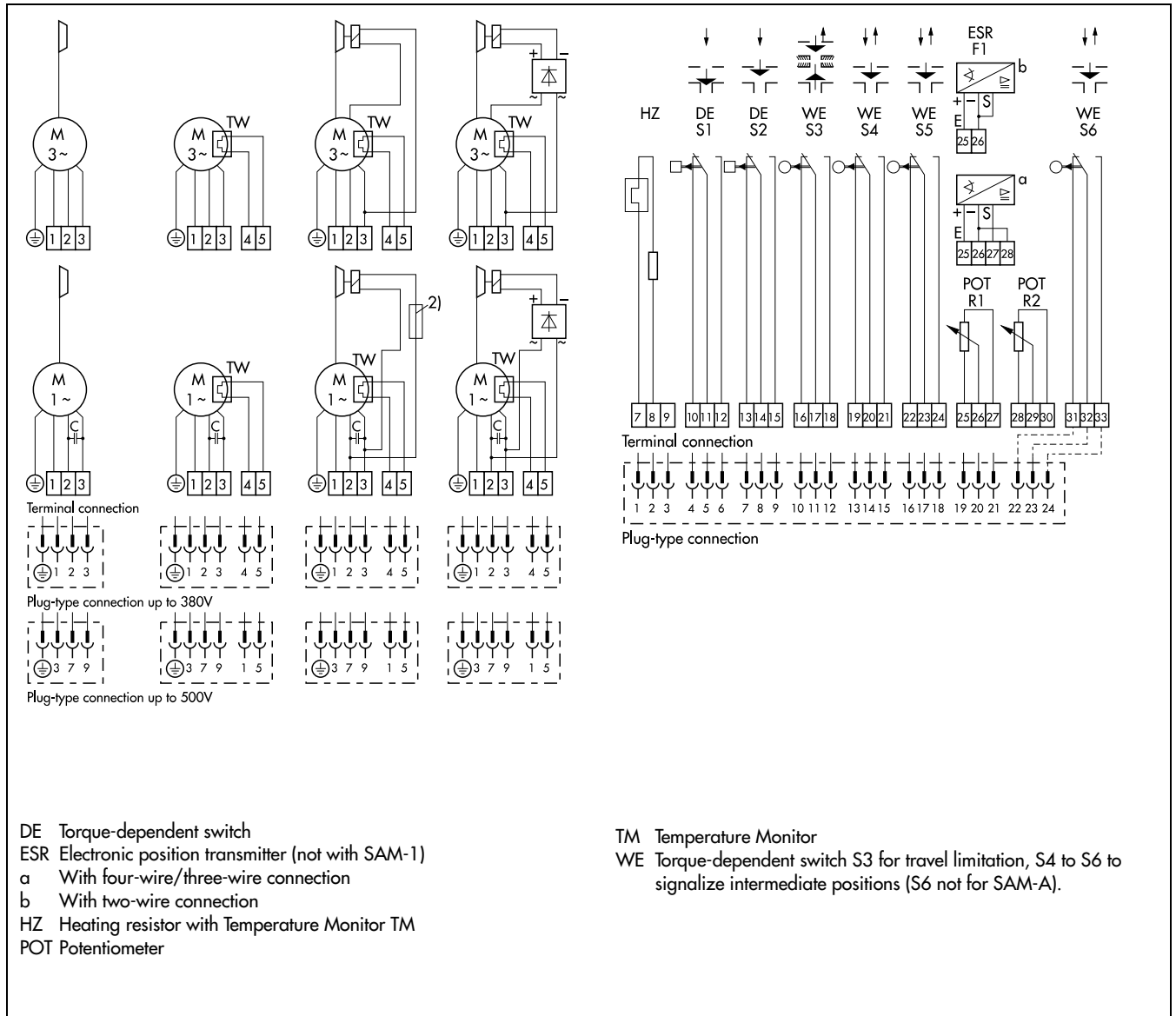
Shut-off force

2 and 4.5 kN	6 to 25 kN	6, 8 and 12 kN	15, 20 and 25 kN
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Switch and signaling facility

Equipped with electronic position transmitter and/or forth stroke-dependent switch WE (S 6) only permitted for linear actuators SAM-2 to SAM-4. Only 1 potentiometer POT (R 1) permitted for plug connection if a forth stroke-dependent switch WE (S 6) is required.

The stroke-dependent switch S 3 is to be set such that it limits the travel of the final control element by disengaging the motor.



See obliging terminal plan glued on the inside cover of the linear actuator!

Selection and sizing of the control valve

1. Calculate the appropriate C_v or K_{vs} values according to (DIN) IEC 534.
2. Select the nominal size DN and C_v or K_{vs} value according to Table 4 or 6.
3. Determine the permissible differential pressure Δp as indicated in Table 5 or 6.
4. Select the appropriate actuator as indicated in Table 3 with consideration of nominal thrust, travel and transit time (transit time ≥ 30 s when connected to three-step controller).
5. Selection of materials, pressure and temperature according to Tables 1 and 2 and the Pressure-Temperature Diagram
6. Accessories according to Tables 1, 2 and 3

Ordering text

Type	Nominal size DN	ANSI Class
Valve plug (Type 241 Globe Valve):		Standard or balanced Metal sealing, soft sealing or lapped-in metal sealing
Function (Type 244 Three-way Valve):		Mixing or flow-diverting valve
Characteristic:		Equal-percentage ¹⁾ , linear or on-off
Body material:		According to Table 2
Process fluid and associated density in lb/cu.ft or kg/m ³		
Maximum flow rate in lbs/hr or kg/h or cu.ft/min or m ³ /h under normal or operating conditions		
Upstream pressure	p_1 in psi or bar	} (absolute pressure p_{abs})
Downstream pressure	p_2 in psi or bar	
Temperature of process medium in °F, °C or K		
Actuator: Type and version, additional equipment such as limit switches, potentiometers, electric position transmitters		

¹⁾ Type 241 Globe Valve only

Specifications subject to change without notice.



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