DATA SHEET

T 8136 EN

Series V2001 Valves · Type 3535 Three-way Valve for Heat Transfer Oil

With electropneumatic, pneumatic or electric actuator

ANSI version

Ex certified

Application

Mixing or diverting valve for heat transfer applications using organic media according to DIN 4754

Nominal size	**NPS ½ to 3**
Pressure rating	**Class 150**
Temperatures	**14 to 660 °F (-10 to +350 °C)**

Fig. 1: *Type 3535-IP*

Fig. 2: *Type 3535-PP*

Fig. 3: *Type 3535-E1*

Fig. 4: *Type 3535-E3*

Special features

The Type 3535 Three-way Valve for Heat Transfer Oil (mixing or diverting valve) can be combined with either electric or pneumatic actuators:

- Electropneumatic actuator for Type 3535-IP
- Pneumatic actuators for Type 3535-PP
- Electric actuators for Type 3535-E1 or Type 3535-E3

Valve body

- Material: Cast steel or stainless steel for Class 150
- Nominal sizes NPS ½ to 3

Mixing valves in NPS ½ to 1 can also be used for diverting service.

Other special features

- Stem sealed by metal bellows and packing
- Metal-seated valve plug

The control valves can optionally be equipped with positioners, limit switches and resistance transmitters.

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Edition April 2026

Versions

- **Type 3535-IP Electropneumatic Valve (mixing or diverting valve) for Heat Transfer Oil** (Fig. 1) · With Type 3372 Pneumatic Actuator, with Type 3725 Positioner · Tight-closing function for completely venting or filling the actuator with air · 4 to 20 mA set point · Max. 60 psi (4 bar) supply air · Fail-safe position actuator stem extends or retracts · Optionally with Type 4744-2 Limit Switch
- **Type 3535-PP Pneumatic Control Valve (mixing or diverting valve) for Heat Transfer Oil** (Fig. 2) · With Type 3371 Pneumatic Actuator · Bench range 20 to 34 psi (1.4 to 2.3 bar) · Optionally with Type 4744-2 Limit Switch
- **Type 3535-E1 Electric Control Valve (mixing or diverting valve) for Heat Transfer Oil** (Fig. 3) · With Type 5827-N3 Electric Actuator for 230 V/50 Hz or 24 V/50 Hz · Optionally with limit contacts, resistance transmitter, positioner
- **Type 3535-E3 Electric Control Valve (mixing/diverting valve) for Heat Transfer Oil** (Fig. 4) · With Type 3374 Electric Actuator for 230 V/50 Hz, 230 V/60 Hz or 24 V/50 Hz or 24 V/60 Hz · Limit contacts, resistance transmitter, positioner

Further versions

- **Type 3535** · Temperature range down to -94 °F (-70 °C) · On request
- **Explosion-protected version** with electric actuators · On request
- **DIN version of Type 3535** · See Data Sheet ▶ T 8135

Principle of operation

Depending on the version, the three-way valve for heat transfer oil can be used either as a mixing or diverting valve.

In mixing valves, the process media to be mixed enter at valve ports **A** and **B**. The combined flow exits the valve at port **AB** (see Fig. 6). The flow rate from ports A or B to AB depends on the cross-sectional area of flow between the seats and plugs.

In diverting valves, the process medium enters at the valve port **AB** and the partial flows exit at ports **A** and **B** (see Fig. 5).

The plug stem is sealed by a metal bellows and an additional packing.

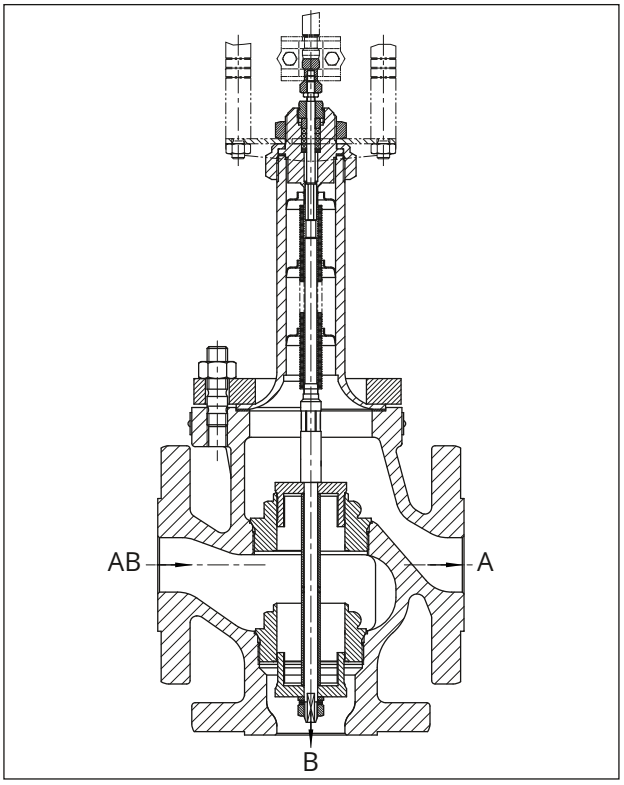

Fig. 5: *Type 3535 Three-way Valve for Heat Transfer Oil · Plug arrangement for diverting service*

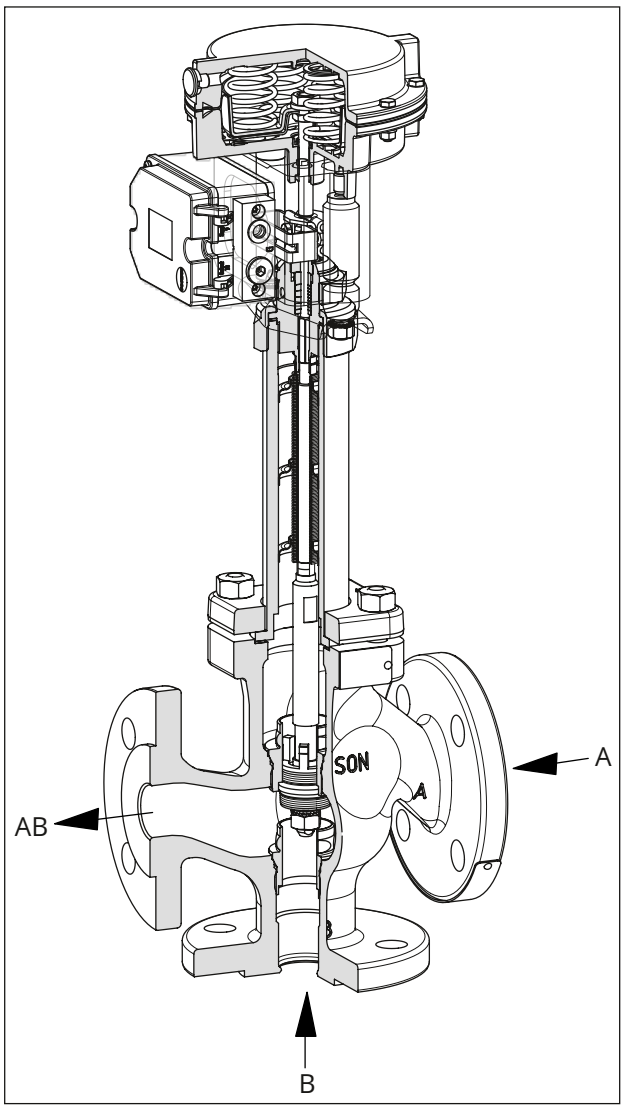

Fig. 6: *Type 3531-IP Control Valve (mixing valve) for Heat Transfer Oil · Actuator with Type 3725 Positioner*

Fail-safe position with pneumatic actuators

Depending on how the springs are arranged in the electropneumatic or pneumatic actuator, the control valve has two different fail-safe positions that become effective when the supply air fails:

– **Actuator stem extends:**
  Port **B** in mixing valves is closed and port **A** in diverting valves is closed when the supply air fails.
  Port **B** of diverting valves in DN 15 to 25 (NPS ½ to 1) is closed since these valves have the same construction as mixing valves.

– **Actuator stem retracts:**
  Port **A** in mixing valves is closed and port **B** in diverting valves is closed when the supply air fails.
  Port **A** of diverting valves in DN 15 to 25 (NPS ½ to 1) is closed since these valves have the same construction as mixing valves.

Associated documentation

Instructions on how to mount the valve on the actuator can be found in the mounting and operating instructions:

- EB 8135/8136 Type 3535 Three-way Valve for Heat Transfer Oil
- EB 8313-3 Pneumatic actuator for Type 3535-IP
- EB 5827-1 Electric actuator (three-step version) for Type 3535-E1
- EB 5827-2 Electric actuator (with positioner) for Type 3535-E1
- EB 8331-3 Electric actuator (three-step version) for Type 3535-E3
- EB 8331-4 Electric actuator (with positioner) for Type 3535-E3

Table 1: *Technical data for Type 3535 · ANSI version*

Nominal size	**NPS**	**½ · ¾ · 1 · 1½ · 2 · 2½ · 3**	
Material		**Cast steel A216 WCC**	**Stainless steel A351 CF8M**
Connection	Flanges	RF	
Pressure rating	Class	150	
Seat-plug seal		Metal seal	
Characteristic		Linear	
Rangeability		30:1 up to NPS 1 · 50:1 for NPS 1½ and larger	
Conformity		CE	
Temperature range		14 to 660 °F (-10 to +350 °C) · Extended temperature range down to -94 °F (-70 °C) on request	
Leakage class according to DIN EN 1349		Metal seal: I (0.05 % of C_V)	

Table 2: *Materials for Type 3535 · ANSI version*

Valve body	**Cast steel A216 WCC**	**Stainless steel A351 CF8M**
Valve bonnet	A105	A351 CF8M
Bottom seat	NPS 1½ to 2: A582 430F NPS 2½ and larger: A276 410T	NPS ½ to 2: A582 430F NPS 2½ and larger: A479 316/A479 316L
Top seat	NPS ½ to 1: 1.4305 NPS 1½ to 2: A582 430F NPS 2½ and larger: A276 410T	NPS ½ to 1: 1.4305 NPS 1½ to 2: A582 430F NPS 2½ and larger: A479 316/A479 316L
Plug	Up to NPS 2: 1.4305 NPS 2½ and larger: A276 410T	Up to NPS 2: 1.4305 NPS 2½ and larger: A479 316/A479 316L
Bellows seal	A479 316Ti	
Packing	PTFE	
Body gasket	Graphite on metal core	

Flow coefficients and seat diameters

Table 3: *Overview of Type 3535*

Nominal size	**DN**	**15**	**20**	**25**	**40**	**50**	**65**	**80**
	NPS	**½**	**¾**	**1**	**1½**	**2**	**2½**	**3**
Flow coefficient	K_{VS}	4	6.3	8	20	32	50	80
	C_V	5	7.5	9.4	23	37	60	94
Seat Ø	mm	24	24	24	40	40	65	65
	in	0.94	0.94	0.94	1.57	1.57	2.56	2.56
Rated travel	mm	15	15	15	15	15	15	15
	in	0.59	0.59	0.59	0.59	0.59	0.59	0.59

Table 4: *C_V and K_{VS} coefficients with associated nominal sizes*

K_{VS}		**4**	**6.3**	**8**	**20**	**32**	**50**	**80**
C_V		**5**	**7.5**	**9.4**	**23**	**37**	**60**	**94**
DN	NPS							
15	½	•						
20	¾		•					
25	1			•				
40	1½				•			
50	2					•		
65	2½						•	
80	3							•

Pneumatic actuators with Type 3535

Table 5: *Technical data for pneumatic actuators*

Valve/actuator		Type 3535-IP with Type 3372 Actuator	Type 3535-PP with Type 3371 Actuator
Actuator area		120 cm²	120 cm²
Fail-safe action		Actuator stem extends (FA) or actuator stem retracts (FE)	
Set point		4 to 20 mA	–
Set point/bench range with fail-safe action	Stem extends (FA)	4 to 20 mA · Minimum current 3.6 mA Load impedance <6 V (300 Ω/20 mA) Direction of action >>, fixed	Bench range: 1.4 to 2.3 bar 20 to 35 psi
	Stem retracts (FE)		
Characteristic		Linear · Deviation from terminal-based conformity: ≤2 %	–
Hysteresis		≤1 %	–
Variable position		≤7 %	–
Transit time for rated travel	p_{perm} = 4 bar	Approx. 3 s	
Air consumption in steady state		≤160 l_n/h when p_{perm} = 60 psi (4 bar)	–
Degree of protection		IP66 with Type 3725	–
Permissible ambient temperature		-30 to +70 °C -22 to +160 °F	-35 to +90 °C -31 to +194 °F
Additional electrical equipment		1 or 2 changeover contacts (IP65, Ex d, 3 m cable) Nominal voltage/current: 250 V~/5 A~ or 250 V-/0.4 A-	

Table 6: *Materials for pneumatic actuators*

Actuator		Type 3372	Type 3371
Actuator area		120 cm²	120 cm²
Actuator housing		GD-AlSi12	GD-AlSi12
Diaphragm		NBR	NBR
Actuator stem		1.4305	1.4571
Positioner housing		Type 3725: Polyphthalamide (PPA)	Polyamide
Yoke	Stem	9SMn28K zinc-plated, matt black finish	–
	Crossbeam	1.4301	–

Table 7: *Permissible differential pressures for metal-seated plug*

Fail-safe action		Actuator stem extends	Actuator stem retracts
Bench range		**20 to 34 psi 1.4 to 2.3 bar**	**20 to 34 psi 1.4 to 2.3 bar**
Min./max. supply pressure		**55 to 60 psi 3.7 to 4.0 bar**	**55 to 60 psi 3.7 to 4.0 bar**
C_V coefficients	K_{VS} coefficients	Δp when p_2 = 0 psi (bar)	Δp when p_2 = 0 psi (bar)
5 to 9.4	4.0 to 8	230 (16)	230 (16)
23 to 37	20 to 32	145 (10)	145 (10)
60 to 94	50 to 80	50 (3.5)	50 (3.5)

Electric actuators with Type 3535

Table 8: *Technical data for electric actuators*

Three-way valve		**Type 3535-E1**	**Type 3535-E3**
Type ... Actuator		**5827-N3**	**3374-11**
Thrust		**0.7 kN**	**2.5 kN**
Transit time for rated travel		90 s	120 s · Other transit times on request
Supply voltage	230 V/50 Hz	•	•
	230 V/60 Hz	–	•
	24 V/50 Hz	•	•
	24 V/60 Hz	–	•
Power consumption	Motor	3 VA	7.5 VA
	With positioner	3 VA · 8 VA	12.5 VA · 20 VA
Manual override		•	•
Degree of protection		IP54 when installed upright	IP54 · IP65 with cable gland
	Mounting position	Suspended mounting not permitted (▶ EB 5827-1, ▶ EB 5827-2, ▶ EB 8331-3 and ▶ EB 8331-4)	
Permissible ambient temperature		0 to 50 °C 32 to 122 °F	5 to 60 °C 41 to 140 °F
Additional electrical equipment			
Limit contacts		2	2
Resistance transmitter (not for version with positioner)		1 0 to 1000 Ω	2 0 to 1000 Ω
Positioner		Digital	
Input signal		0/4 to 20 mA · 0/2 to 10 V	
Output signal		0/2 to 10 V	0/2 to 10 V · 0/4 to 20 mA

Table 9: *Permissible differential pressures for metal-seated plug*

Three-way valve		**Type 3535-E1**	**Type 3535-E3**
Type ... Actuator		**5827-N3**	**3374-11**
Thrust		**0.7 kN**	**2.5 kN**
C_V coefficients	K_{VS} coefficients	Δp when p_2 = 0 psi (bar)	Δp when p_2 = 0 psi (bar)
5 to 9.4	4.0 to 8	145 (10)	230 (16)
23 to 37	20 to 32	50 (3.5)	175 (12)
60 to 94	50 to 80	–	58 (4)

Dimensions

Table 10: *Dimensions for Type 3535 Valve · ANSI version*

Valve	NPS	½	¾	1	1½	2	2½	3
	DN	15	20	25	40	50	65	80
Height H	in	9.25	9.25	9.25	9.65	9.65	13.78	13.78
	mm	235	235	235	245	245	350	350
Class 150								
Length L	in	7.25	7.25	7.25	8.75	10	10.87	11.73
	mm	184	184	184	222	254	276	298
Height H2	in	3.62	3.62	3.62	4.37	5	5.43	5.87
	mm	92	92	92	111	127	138	149
Class 300								
Length L	in	7.5	7.62	7.75	9.25	10.5	11.5	12.5
	mm	190	194	197	235	267	292	318
Height H2	in	3.76	3.82	3.88	4.63	5.26	5.75	6.26
	mm	95	97	98.5	117.5	133.5	146	159

Table 11: *Type 3535-IP Electropneumatic Control Valve*

Valve	DN	15	20	25	40	50	65	80
	NPS	½	¾	1	1½	2	2½	3
H1	mm	417	417	417	427	427	532	532
	in	16.42	16.42	16.42	16.81	16.81	20.94	20.94
H3 (minimum distance)	mm	110	110	110	110	110	110	110
	in	4.33	4.33	4.33	4.33	4.33	4.33	4.33

Table 12: *Type 3535-PP Pneumatic Control Valve*

Valve	DN	15	20	25	40	50	65	80
	NPS	½	¾	1	1½	2	2½	3
H1	mm	471	471	471	481	481	586	586
	in	18.54	18.54	18.54	18.94	18.94	23.07	23.07
H3 (minimum distance)	mm	110	110	110	110	110	110	110
	in	4.33	4.33	4.33	4.33	4.33	4.33	4.33

Table 13: *Type 3535-E1 Electric Control Valve*

Valve	DN	15	20	25	40	50	65	80
	NPS	½	¾	1	1½	2	2½	3
H1 (Type 5827 Actuator)	mm	432	432	432	442	442	–	–
	in	17.01	17.01	17.01	17.40	17.40	–	–
H3 (minimum distance)	mm	110	110	110	110	110	–	–
	in	4.33	4.33	4.33	4.33	4.33	–	–

Table 14: *Type 3535-E3 Electric Control Valve*

Valve	DN	15	20	25	40	50	65	80
	NPS	½	¾	1	1½	2	2½	3
H1	mm	529	529	529	539	539	644	644
	in	20.83	20.83	20.83	21.22	21.22	25.35	25.35
H3[1)] (minimum distance)	mm	110	110	110	110	110	110	110
	in	4.33	4.33	4.33	4.33	4.33	4.33	4.33

1) Cover screws are mounted from the top.

Dimensional drawing of valve

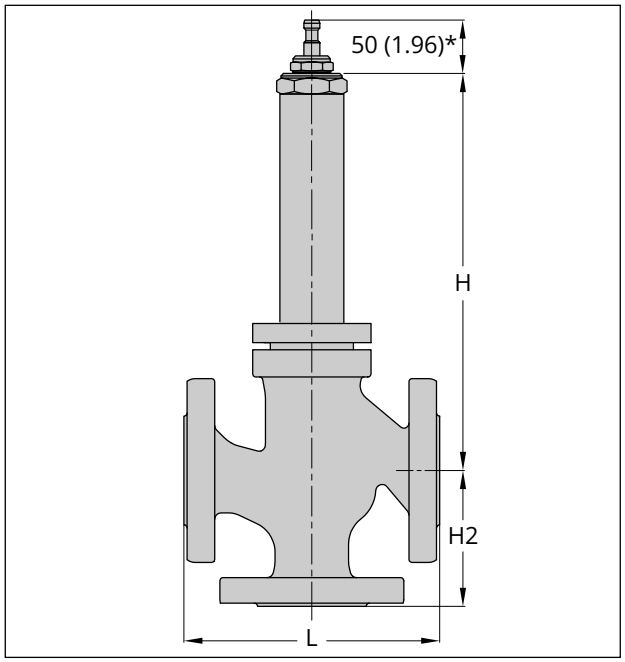

Fig. 7: *Dimensional drawing of Type 3535*

* Dimension applies to plug stem pushed into the valve body

Dimensional drawings for electropneumatic control valves

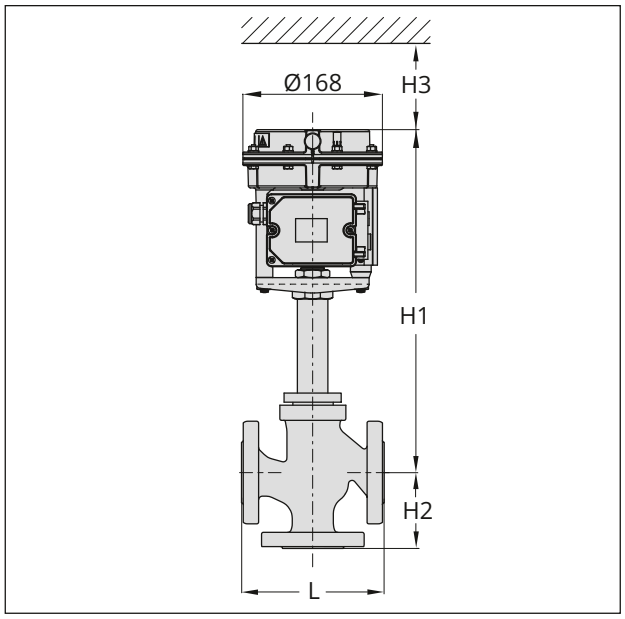

Fig. 8: *Type 3535-IP Electropneumatic Control Valve*

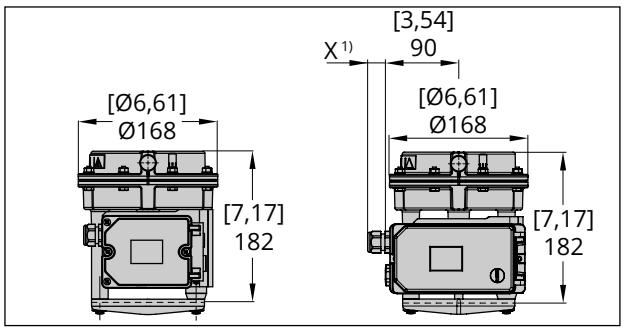

Fig. 9: *Specifications in mm [inches]*
Left: Type 3372/120 cm² with Type 3725 Positioner
Right: Type 3372/120 cm² with Series 3730 Positioner

1) The dimension X depends on the cable gland used.

Dimensional drawing for pneumatic control valve

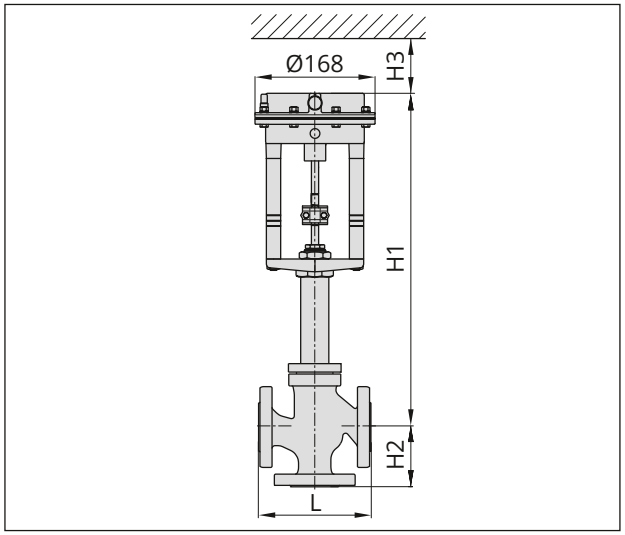

Fig. 10: *Type 3535-PP Pneumatic Control Valve*

Dimensional drawings · Actuators for electric control valves

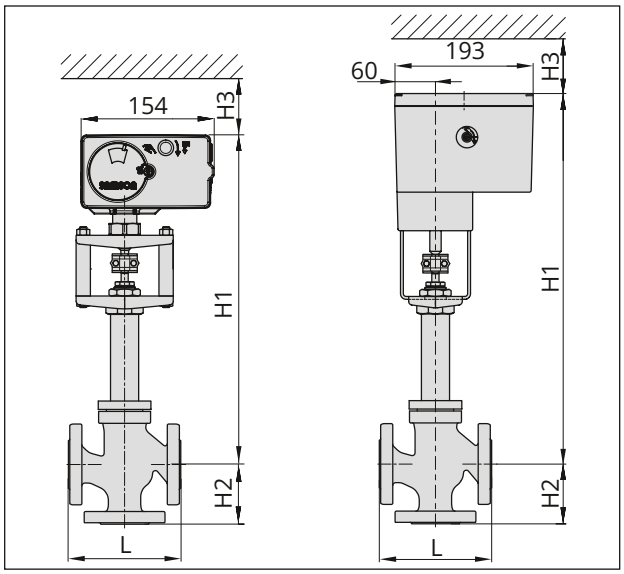

Fig. 11: *Left: Type 3535-E1 Electric Control Valve (Type 5827 Actuator)*
Right: Type 3535-E3 Electric Control Valve (Type 3374 Actuator)

Weights

Table 15: *Weights[1] for Type 3535 Valve*

Nominal size	**DN**	**15**	**20**	**25**	**40**	**50**	**65**	**80**
	NPS	**½**	**¾**	**1**	**1½**	**2**	**2½**	**3**
Type 3535-IP Control Valve	kg	8.7	9.2	10.2	17.2	19.7	30.7	35.7
	lbs	19.2	20.3	22.5	37.9	43.4	67.7	78.7
Type 3535-PP Control Valve	kg	8.3	8.8	9.8	16.8	19.3	30.3	35.3
	lbs	18.3	19.4	21.6	37.1	42.5	66.8	77.8
Type 3535-E1 Control Valve	kg	6.8	7.3	8.3	15.3	17.8	–	–
	lbs	15	16.1	18.3	33.7	39.3	–	–
Type 3535-E3 Control Valve	kg	10.5	11	12	19	21.5	32.5	37.5
	lbs	23.2	24.3	26.5	41.9	47.4	71.7	82.7

1) The weights specified apply to a specific standard device configuration. Weights of other valve configurations may differ depending on the version (material, trim etc.).

Ordering text

The following specifications are required on ordering:

Valve	
Type 3535 Three-way Valve for Heat Transfer Oil	Mixing or diverting valve
Nominal size	NPS ...
Pressure rating	Class ...
Flow rate	C_V ...
Body material	See Table 2
Seat-plug seal	Metal seal
Actuators	
for **Type 3535-IP:** Type 3372 Electropneumatic Actuator	
With positioner	Type 3725/Series 3730
Optional	Intrinsically safe Ex ia
Additional equipment	1 or 2 limit switches
for **Type 3535-PP:** Type 3371 Pneumatic Actuator	
Fail-safe action	Actuator stem extends or retracts
Bench range	20 to 34 psi (1.4 to 2.3 bar)
Additional equipment	1 or 2 limit switches
for **Type 3535-E1:** Type 5827-N3 Electric Actuator	
Supply voltage	Three-step version – 230 V/50 Hz – 24 V/50 Hz Version with positioner – 24 V/50 and 60 Hz and DC – 85 to 264 V/50 and 60 Hz
Additional equipment	– 2 limit contacts – Resistance transmitter 0 to 1000 Ω – Digital positioner – Input: 0/4 to 20 mA or 0/2 to 10 V – Output: 0/2 to 10 V
for **Type 3535-E3:** Type 3374 Electric Actuator	
Actuator thrust (without fail-safe action)	2.5 kN
Supply voltage	– 230 V/50 Hz – 230 V/60 Hz – 24 V/50 Hz – 24 V/60 Hz
Additional equipment	– 2 limit contacts – Resistance transmitter 0 to 1000 Ω – Digital positioner with input and output: 0/4 to 20 mA or 0/2 to 10 V

2026-05-05 | English | 4000301067 | 1.1