

T 8136 EN

Series V2001 Valves · Type 3535 Three-way Valve for Heat Transfer Oil with electropneumatic, pneumatic or electric actuator

ANSI version



Application

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

Valve size	NPS ½ to 3
Pressure rating	Class 150
Temperature range	14 to 660 °F (–10 to +350 °C)

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 with integrated i/p positioner for Type 3535-IP
- Pneumatic actuators for Type 3535-PP
- Electric actuators for Type 3535-E1 or Type 3535-E3

Valve body materials

- Cast steel or stainless steel for Class 150
- NPS ½ to 3

Special features

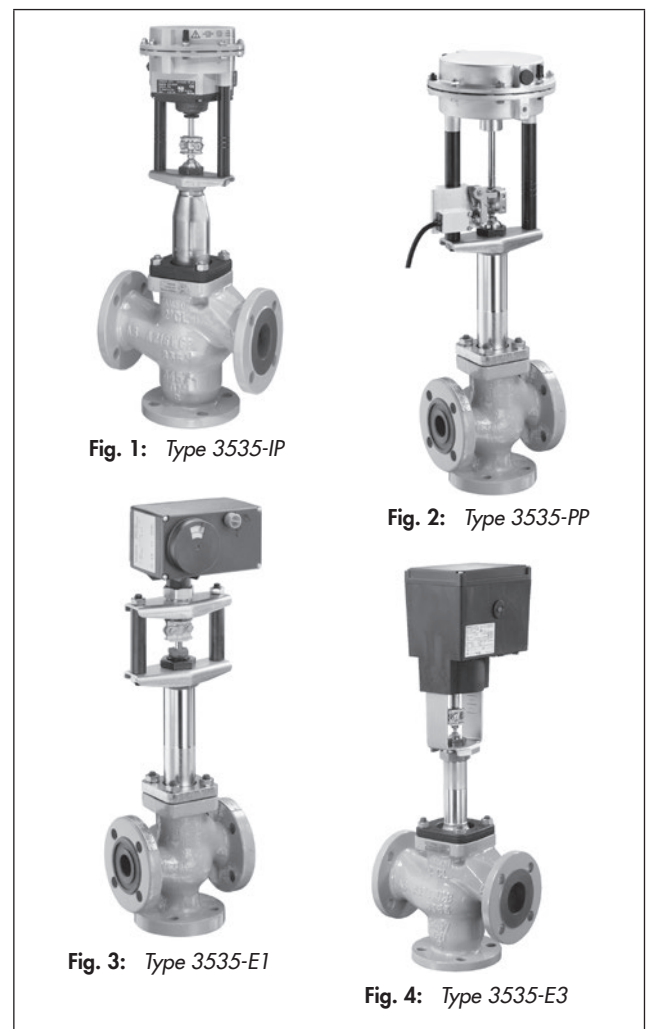
- Stem sealing with metal bellows and packing
- Metal-seated valve plug
- Mixing valves NPS ½ to 1 also suitable for diverting service

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

Versions

With Type 3535 Three-way Valve for Heat Transfer Oil

- **Type 3535-IP Electropneumatic Mixing/Diverting Valve for Heat Transfer Oil** (Fig. 1) · i/p positioner integrated into Type 3372 Electropneumatic Actuator, plug connector, tight-closing function for completely venting or filling the actuator with air, reference variable 4 to 20 mA, 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 Mixing/Diverting Valve** (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 Mixing/Diverting Valve for Heat Transfer Oil** (Fig. 3) · Type 5824-30 Electric Actuator, power supply 230 V/50 Hz or 230 V/60 Hz, 110 V/60 Hz and 24 V/50 Hz, optionally with limit contacts, resistance transmitters, positioner



- **Type 3535-E3 Electric Mixing/Diverting Valve for Heat Transfer Oil** (Fig. 4) · Type 3374 Electric Actuator, power supply 230 V/50 Hz or 230 V/60 Hz, 120 V/60 Hz and 24 V/50 Hz or 24 V/60 Hz, limit contacts, resistance transmitters, positioner

Further versions

- **Type 3535** · Temperature range down to $-94\text{ F } (-70\text{ }^{\circ}\text{C})$
On request
- **Explosion-protected** version with electric actuators · On request
- **Type 3535 according to DIN standards** · 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 (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. Mixing valves in sizes NPS $\frac{1}{2}$ to 1 are also suitable for diverting service.

In diverting valves, the process medium enters at the valve port AB and the partial flows exit at ports A and B (Fig. 5). The plug stem is sealed by a metal bellows and an additional packing.

Fail-safe position with pneumatic actuators

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

- **Actuator stem extends:** when the supply air fails, port B is closed in mixing valves and port A is closed in diverting valves.
- **Actuator stem retracts:** when the supply air fails, port A is closed in mixing valves and port B is closed in diverting valves.

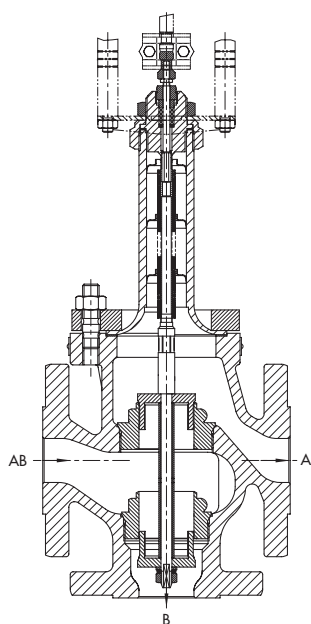


Fig. 5: Type 3535 Three-way Valve for Heat Transfer Oil · Plug arrangement for diverting service

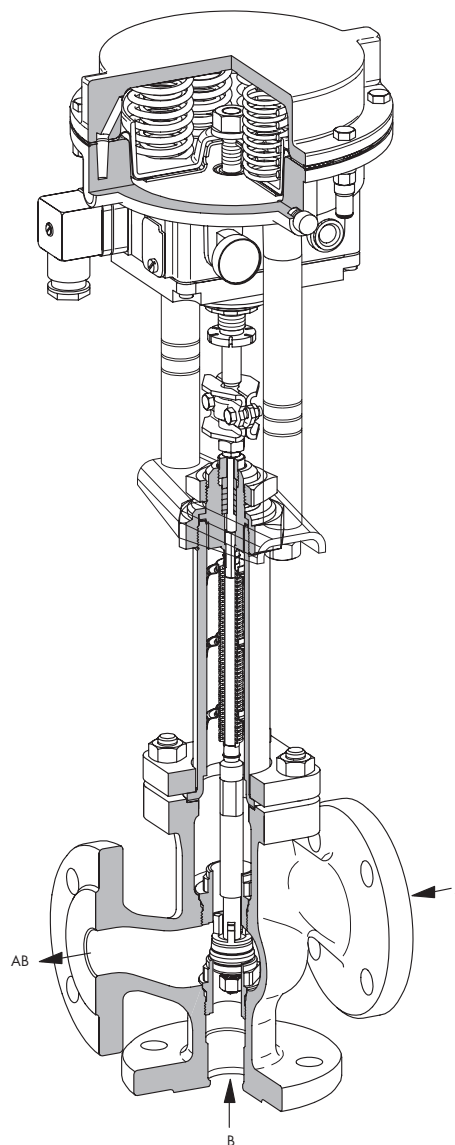


Fig. 6: Type 3535-IP Valve (mixing) for Heat Transfer Oil, pneumatic actuator with integrated electropneumatic positioner

Associated documentation

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

- ▶ EB 8135/6 Type 3535 Three-way Valve for Heat Transfer Oil
- ▶ EB 8313 Pneumatic actuator for Type 3535-PP (mixing/diverting valve)
- ▶ EB 5824 Electric actuator for Type 3535-E1
- ▶ EB 8331-1 Electric actuator for Type 3535-E3
- ▶ EB 8331-4 Electric actuator for Type 3535-E3

Table 1: Type 3535 Three-way Valve for Heat Transfer Oil**Table 1.1: Technical data**

Valve size	NPS	$\frac{1}{2} \cdot \frac{3}{4} \cdot 1 \cdot 1\frac{1}{2} \cdot 2 \cdot 2\frac{1}{2} \cdot 3$	
Material		Cast steel A216 WCC	Stainless steel A351 CF8M
Connection	Flanges	Raised face	
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	
Temperature range		14 to 660 °F (–10 to +350 °C) · Extended temperature range lower than –94 °F (–70 °C) on request	
Leakage class acc. to IEC 1349		Metal seal: I (0.05 % of C _v)	
Compliance		CE · EAC	

Table 1.2: Materials · (previous material designation written in parentheses)

Valve size	NPS	$\frac{1}{2} \cdot \frac{3}{4} \cdot 1 \cdot 1\frac{1}{2} \cdot 2 \cdot 2\frac{1}{2} \cdot 3$	
Valve body		Cast steel A216 WCC	Stainless steel A351 CF8M
Valve bonnet		A105	A351 CF8M
Seat and plug	Bottom seat	NPS ½ to 2: A582 430F NPS 2½ to 3: A276 410 T	NPS ½ to 2: A582 430F NPS 2½ to 3: A479 316/A479 316L
	Top seat	NPS ½ to 1: 1.4305 NPS 1½ to 2: A582 430F NPS 2½ to 3: A276 410 T	NPS ½ to 1: 1.4305 NPS 1½ to 2: A582 430F NPS 2½ to 3: A479 316/A479 316L
	Plug	Up to NPS 2: 1.4305 NPS 2½ and larger: A276 410 T	Up to NPS 2: 1.4305 NPS 2½ and larger: A479 316/A479 316L
Bellows seal		A479 316 Ti	
Packing		PTFE	
Body gasket		Graphite on metal core	

Table 1.3: Nominal sizes, C_v (K_{vs}) coefficients and seat diameters

Valve size	NPS	½	¾	1	1½	2	2½	3
	DN	15	20	25	40	50	65	80
Flow rate	C _v	5	7.5	9.4	23	37	60	94
	K _{vs}	4	6.3	8	20	32	50	80
Seat Ø	in	0.94			1.57		2.56	
	mm	24			40		65	
Rated travel	in	0.59						
	mm	15						

Table 1.4: K_{vs} and C_v coefficients with associated valve sizes

C _v		5	7.5	9.4	23	37	60	94
K _{vs}		4	6.3	8	20	32	50	80
NPS	DN							
½	15	•						
¾	20		•					
1	25			•				
1½	40				•			
2	50					•		
2½	65						•	
3	80							•

Table 2: Pneumatic actuators**Table 2.1: Technical data**

Actuator	Electropneumatic actuator for Type 3535-IP	Pneumatic actuator for Type 3535-PP
Actuator area	120 cm ²	120 cm ²
Fail-safe position	Actuator stem extends or retracts	
Set point/bench range with fail-safe action	Stem extends Stem retracts	Bench range: 20 to 34 psi (1.4 to 2.3 bar)
Characteristic	Linear · Deviation from terminal-based conformity ≤2 %	-
Hysteresis	≤1 %	
Variable position	≤7 %	
Transit time for rated travel p _{perm} = 60 psi (4 bar)	Approx. 3 s	
Air consumption in steady state	≤160 l _n /h at p _{perm} = 60 psi (4 bar)	-
Degree of protection	IP 54 ²⁾	-
Permissible ambient temperature	-22 to +160 °F (-30 to +70 °C)	-31 to +194 °F (-35 to +90 °C)
Additional electrical equipment	1 or 2 changeover contacts (IP 65, Ex d, 3 m cable) Nominal voltage/current: 250 V~/5 A~ or 250 V-/0.4 A-	

Table 2.2: Materials

Actuator housing	GD-Al Si 12		
Diaphragm	NBR		
Actuator stem	1.4305		
Positioner housing	POM-GF	-	Polyamide
Yoke	Stem	9SMn28K zinc-coated, matt black finish	-
	Bracket	1.4301	

Table 2.3: Permissible differential pressures for metal-seated plug · All pressures in psi and bar

Fail-safe position		Actuator stem extends			Actuator stem retracts		
Bench range	psi (bar)	20 to 34 (1.4 to 2.3)			20 to 34 (1.4 to 2.3)		
Min./max. supply pressure	psi (bar)	55 to 60 (3.7 to 4.0)			55 to 60 (3.7 to 4.0)		
C _v	K _{vs}	Δp when p ₂ = 0 psi (bar)					
5 to 9.4	4 to 8	230 (16)	-	-	230 (16)	-	-
23 and 37	20 and 32	-	145 (10)	-	-	145 (10)	-
60 and 94	50 and 80	-	-	50 (3.5)	-	-	50 (3.5)

Table 3: *Electric actuators***Table 3.1:** *Technical data*

Actuator	For	Type 3535-E1	Type 3535-E3
Thrust		0.7 kN	2.5 kN Type 3374-11
Transit time for rated travel		90 s	120 s · Shorter transit times on request
Power supply	230 V/50 Hz	•	•
	230 V/60 Hz	–	•
	120 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		IP 54 when installed upright	IP 54 · IP 65 with cable gland
	Mounting position	Suspended mounting not permitted (see ► EB 5824-1, ► EB 5824-2, ► EB 8331-1 and ► EB 8331-4)	
Permissible ambient temperature		32 to 122 °F (0 to 50 °C)	41 to 140 °F (5 to 60 °C)
Additional electrical equipment			
Limit contacts		2	2
Resistance transmitters (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 3.2: *Permissible differential pressures for metal-seated plug · All pressures in psi and bar*

Actuator	For	Type 3535-E1	Type 3535-E3
Thrust		0.7 kN	2.5 kN
C_v	K_{vs}	Δp when $p_2 = 0$ psi (bar)	
5 to 9.4	4 to 8	145 (10)	230 (16)
23 and 37	20 and 32	50 (3.5)	175 (12)
60 and 94	50 and 80	–	58 (4)

Table 4: Dimensions and weights**Table 4.1:** Type 3535 Three-way Valve for Heat Transfer Oil

Valve size	NPS	½	¾	1	1½	2	2½	3
	DN	15	20	25	40	50	65	80
Face-to-face dimension L	in	7.25	7.25	7.25	8.75	10	10.87	11.75
	mm	184	184	184	222	254	276	298
H2	in	3.62	3.62	3.62	4.37	5	5.43	5.87
	mm	92	92	92	111	127	138	149

Table 4.2: Type 3535-IP Electropneumatic Control Valve · Dimensions for version with actuator stem extends or retracts

Valve size	NPS	½	¾	1	1½	2	2½	3
	DN	15	20	25	40	50	65	80
H1 (stem extends)	in	18.54			18.94		23.07	
	mm	471			481		586	
H1 (stem retracts)	in	21.89			22.28		26.41	
	mm	556			566		671	
H3 (stem extends)	in	4.33			4.33		4.33	
	mm	110			110		110	
H3 (stem retracts)	in	8.27			8.27		8.27	
	mm	210			210		210	
Weight	lbs	19.2	20.3	22.5	37.9	43.4	67.7	78.7
	kg	8.7	9.2	10.2	17.2	19.7	30.7	35.7

Table 4.3: Type 3535-PP Pneumatic Control Valve · Dimensions apply to both fail-safe positions

Valve size	NPS	½	¾	1	1½	2	2½	3
	DN	15	20	25	40	50	65	80
H1	in	18.54			18.94		23.07	
	mm	471			481		586	
H3 (minimum distance)	in	4.33			4.33		4.33	
	mm	110			110		110	
Weight	lbs	18.3	19.4	21.6	37.1	42.5	66.8	77.8
	kg	8.3	8.8	9.8	16.8	19.3	30.3	35.3

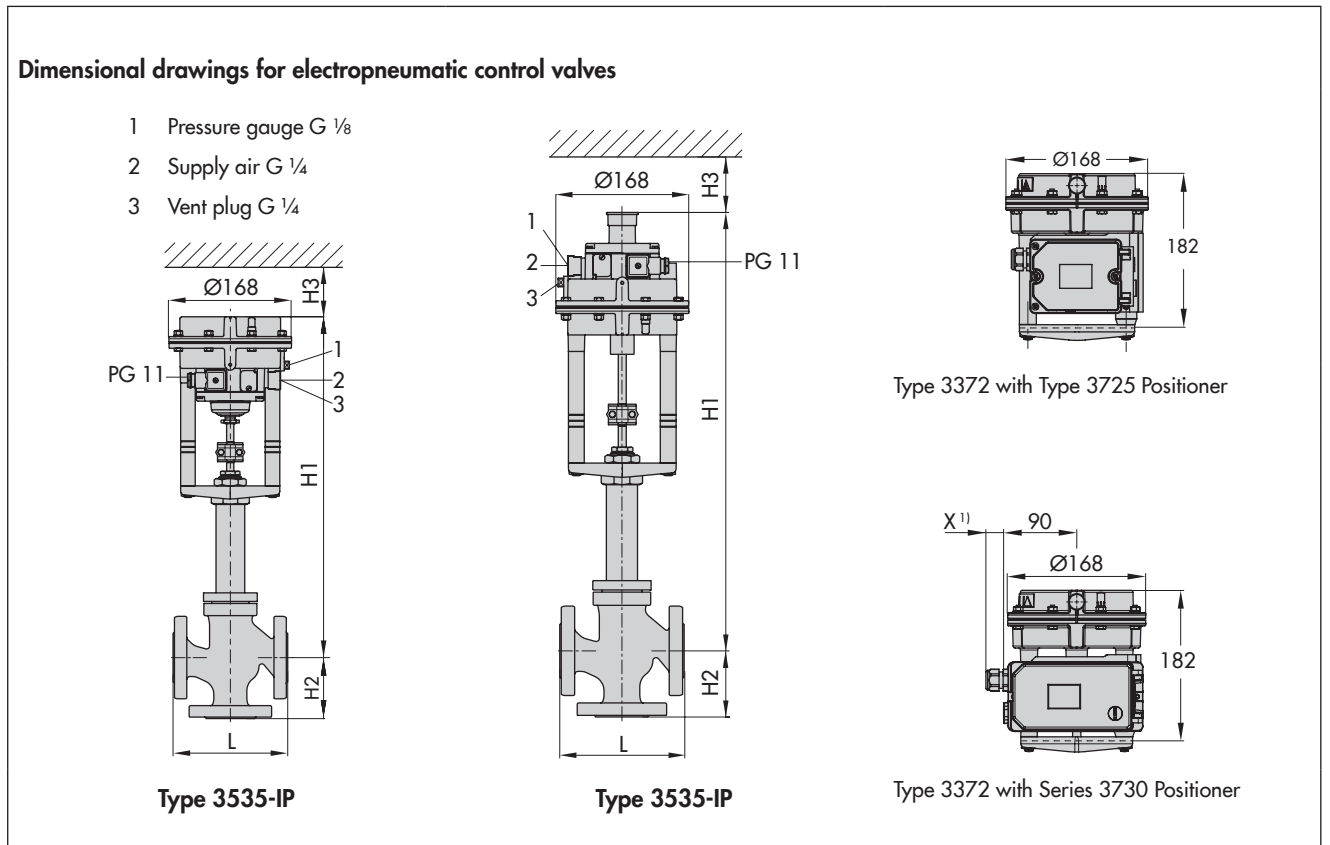
Table 4.4: Type 3535-E1 Electric Control Valve

Valve size	NPS	½	¾	1	1½	2	2½	3
	DN	15	20	25	40	50	65	80
H1	in	16.89			17.28		-	
	mm	429			439			
H3 (minimum distance)	in	4.33			4.33			
	mm	110			110			
Weight	lbs	15	16.1	18.3	33.7	39.3		
	kg	6.8	7.3	8.3	15.3	17.8		

Table 4.5: Type 3535-E3 Electric Control Valve

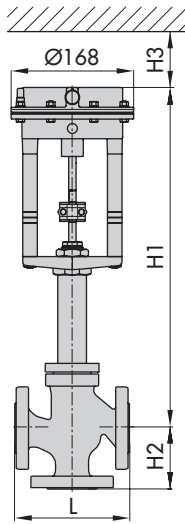
Valve size	NPS	½	¾	1	1½	2	2½	3
	DN	15	20	25	40	50	65	80
H1	in	20.83			21.22		25.35	
	mm	529			539		644	
H3 ¹⁾ (minimum distance)	in	4.33			4.33		4.33	
	mm	110			110		110	
Weight	lb	23.15	24.3	26.5	41.9	47.4	71.7	82.7
	kg	10.5	11	12	19	21.5	32.5	37.5

¹⁾ Cover screws are mounted from the top.



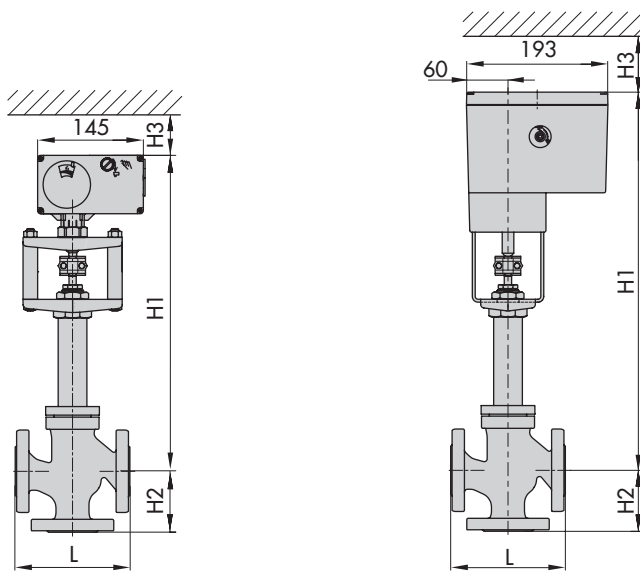
¹⁾ The dimension X depends on the cable gland used.

Dimensional drawings for pneumatic control valves



Type 3535-PP

Dimensional drawings for electric control valves

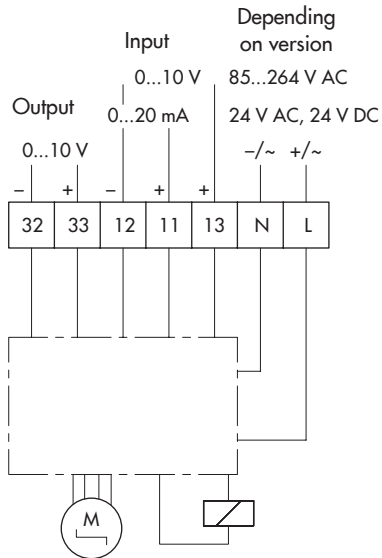


Type 3535-E1

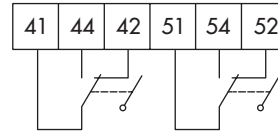
Type 3535-E3

Wiring plans

Type 5824/5825 with positioner (► EB 5824-2)



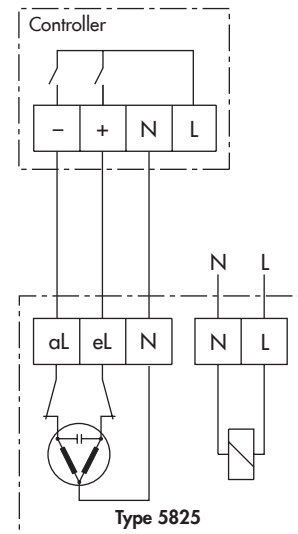
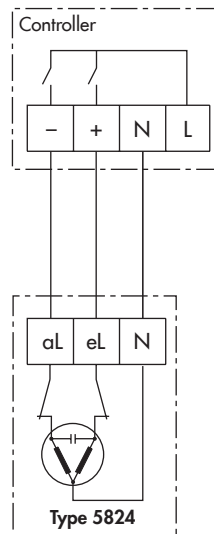
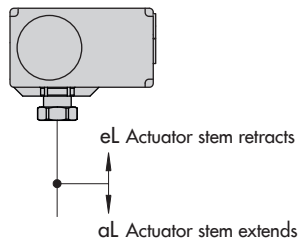
Limit contacts as additional function (in 24 V version only)



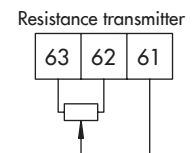
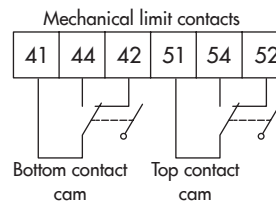
i Note

The 24 V version can be used either with a power supply of 24 V AC or 24 V DC.

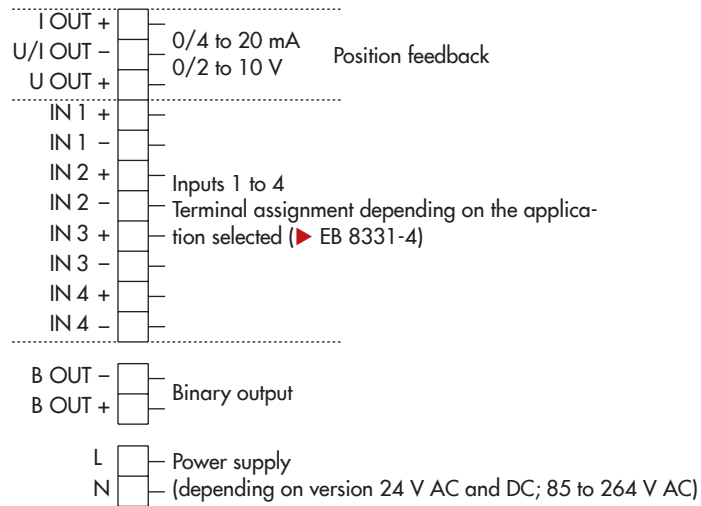
Type 5824/5825 with three-step version (► EB 5824-1)



Additional electrical equipment

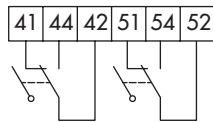


Type 3374 with positioner (► EB 8331-4)

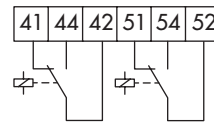


Options:

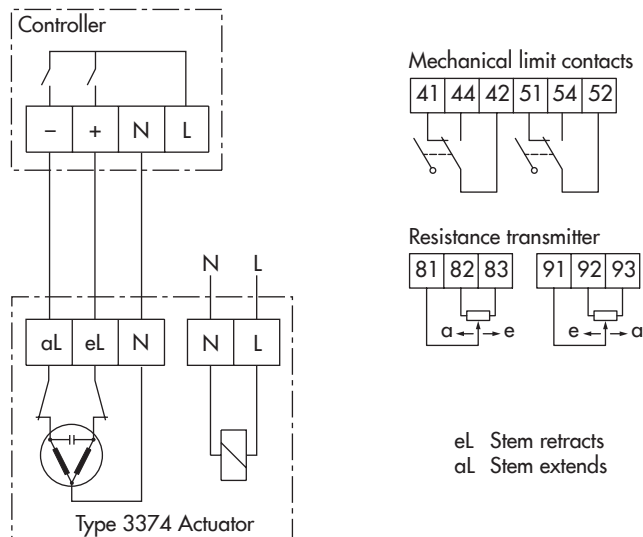
Mechanical limit contacts



Electronic limit contacts



Type 3374 with three-step version (► EB 8331-3)



Ordering text

The following specifications are required on ordering:

Type 3535 Three-way Valve for Heat Transfer Oil

	Mixing or diverting valve
Valve size	NPS ...
Flow coefficient	C_v ...
Pressure rating	Class ...
Body material	Cast steel or stainless steel
Seat-plug seal	Metal seal

Actuators

For **Type 3535-IP**: Electropneumatic actuator with integrated positioner, 4 to 20 mA,
or with Type 3725/Series 3730 Positioner

Optional Intrinsically safe Ex ia IIC T6
 according to ATEX

Additional equipment Limit switch 1 or 2

for **Type 3535-PP**: Pneumatic actuator

Fail-safe position Actuator stem extends or retracts
Bench range 20 to 34 psi (1.4 to 2.3 bar)
Additional equipment Limit switch 1 or 2

For **Type 3535-E1**: Electric actuator

Voltage supply

- Three-step version – 230 V/50 Hz
- 230 V/60 Hz
- 24 V/50 Hz
- Version with – 24 V/50 and 60 Hz and DC
- positioner – 85 to 264 V/50 and 60 Hz

Additional equipment – Two limit contacts
 – Resistance transmitter 0 to
 1000 Ω
 – Positioner
 input
 0/4 to 20 mA or 0/2 to 10 V
 – Output
 0/2 to 10 V

For **Type 3535-E3**: Electric actuator

Actuator thrust 2.5 kN
(without fail-safe ac-
tion only)

Power supply – 230 V/50 Hz

- 230 V/60 Hz
- 120 V/60 Hz
- 24 V/50 Hz
- 24 V/60 Hz

Additional equipment – Two 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

