

T 8132 EN

Series V2001 Valves · Type 3531 Globe Valve for Heat Transfer Oil with electropneumatic, pneumatic or electric actuator

ANSI version



Application

Control valves for heat transfer applications using organic media according to DIN 4754

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

The Type 3531 Globe Valve for Heat Transfer Oil can be equipped with either pneumatic or electric actuators:

- Electropneumatic actuator with integrated i/p positioner for Type 3531-IP
- Pneumatic actuators for Type 3531-PP
- Electric actuators for Type 3531-E1 or Type 3531-E3

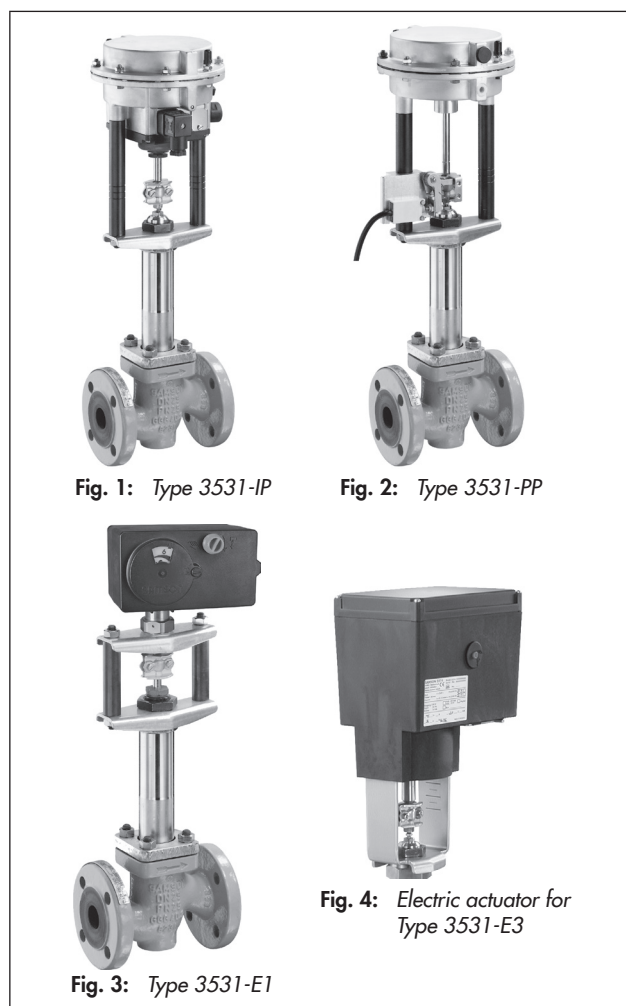
Valve body materials

- Cast steel or stainless steel for Class 150
- Nominal sizes NPS ½ to 3
- Stem sealed by metal bellows and additional packing
- Metal-seated valve plug

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

Versions

- **Type 3531-IP Electropneumatic Globe Valve for Heat Transfer Oil** with Type 3372 Electropneumatic Actuator (Fig. 1) · Plug connector, tight-closing function for completely venting or filling the actuator with air, 4 to 20 mA reference variable, max. 90 psi (6 bar) supply air, fail-close or fail-open, optionally with Type 4744-2 Limit Switch
- **Type 3531-PP Pneumatic Globe Valve for Heat Transfer Oil** with Type 3371 Pneumatic Actuator (Fig. 2), bench range 30 to 48 psi (2.1 to 3.3 bar) for fail-close version or 6 to 20 psi (0.4 to 1.4 bar) for fail-open version, optionally with Type 4744-2 Limit Switch
- **Type 3531-E1 Electric Globe Valve for Heat Transfer Oil** (Fig. 3) in NPS ½ to 2 with Type 5827-N3 Electric Actuator, supply voltage 230 V/50 Hz or 24 V/50 Hz, optionally with limit contacts, resistance transmitter, positioner



- **Type 3531-E3 Electric Globe Valve for Heat Transfer Oil** with Type 3374 Electric Actuator (Fig. 4), supply voltage 230 V/50 Hz or 230 V/60 Hz, 120 V/60 Hz, 24 V/50 Hz or 24 V/60 Hz, optionally with fail-safe action (typetested), limit contacts, resistance transmitters, positioner

Further versions

- **Type 3531** · Temperature range down to $-94\text{ F } (-70\text{ }^{\circ}\text{C})$ · On request
- **Explosion-protected version** with electric actuators · On request
- **Type 3531 according to DIN standards** · See Data Sheet
▶ T 8131

Principle of operation

The process medium flows through the valve in the direction indicated by the arrow in the flow-to-open direction (Fig. 5, Fig. 6). The valve plug position determines the cross-sectional area between the seat and plug. The plug stem is connected to the actuator stem by the stem connector and sealed by a metal bellows.

Fail-safe position with pneumatic actuators

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

- **Actuator stem extends (fail-close):** The valve closes when the supply air fails.
- **Actuator stem retracts (fail-open):** The valve opens when the supply air fails.

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 8111 Type 3531 Globe Valve
- ▶ EB 8313-1 Actuator for Type 3531-IP
- ▶ EB 8313-3
- ▶ EB 5827-1 Electric actuator for Type 3531-E1
- ▶ EB 8331-3 Electric actuator for Type 3531-E3

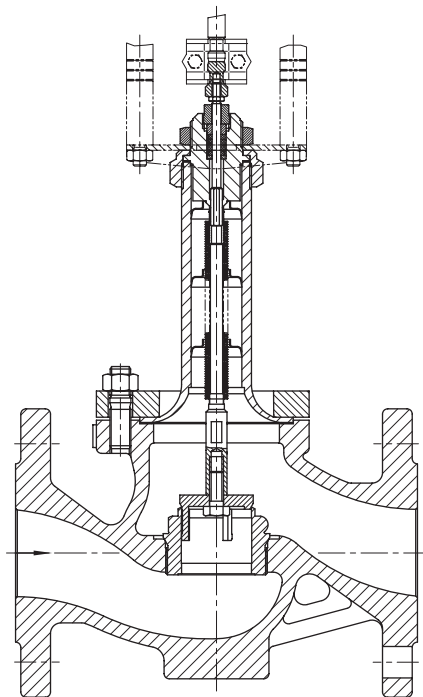


Fig. 5: Type 3531-IP Globe Valve for Heat Transfer Oil in NPS $\frac{1}{2}$ to 2

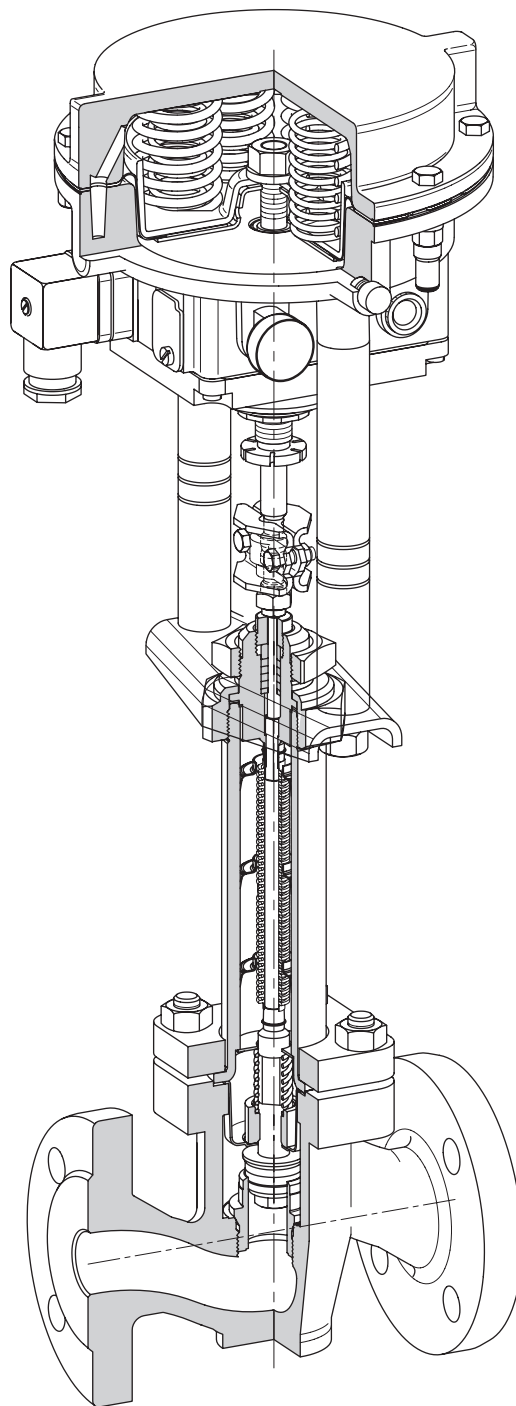


Fig. 6: Type 3531-IP Globe Valve for Heat Transfer Oil, actuator with integrated electropneumatic positioner

Table 1: Type 3531 Globe Valve for Heat Transfer Oil**Table 1.1:** Technical data

Nominal size	NPS	$\frac{1}{2}$ · $\frac{3}{4}$ · 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		Equal percentage	
Rangeability		50:1	
Temperature range		14 to 660 °F (–10 to +350 °C) · Extended temperature range lower than –94 °F (–70 °C) on request	
Leakage class according to DIN EN 1349		Metal seal: IV	
Conformity			

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

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

Table 1.3: Nominal sizes, flow coefficients, seat diameters and travel

Nominal size	NPS	½		¾		1		1½	2	2½	3
	DN	15		20		25		40	50	65	80
C _v coefficient		2	5	3	7.5	5	12	30	40	60	94
K _{vs}		1.6	4	2.5	6.3	4	10	25	35	50	80
Seat Ø	in	0.37	0.75	0.55	0.86	0.75	0.94	1.25	1.57	2.56	
	mm	9.5	19	14	22	19	24	40	40	65	
Rated travel	in	0.59									
	mm	15									

Table 1.4: K_{VS} and C_v coefficients with associated nominal sizes

C_v		2	3	5	7.5	12	30	40	60	94
K_{VS}		1.6	2.5	4	6.3	10	25	35	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 3531-IP	Pneumatic actuator for Type 3531-PP
Actuator area		120 cm ²	120 cm ²
Fail-safe position		Fail-close or fail-open	
Reference variable/bench range with fail-safe action	CLOSED	4 to 20 mA · Minimum current 3.6 mA Load impedance <6 V (300 Ω/20 mA) Operating direction increasing/increasing >>, fixed	30 to 48 psi (2.1 to 3.3 bar)
	OPEN		6 to 20 psi (0.4 to 1.4 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) ≤200 l _n /h at p _{perm} = 90 psi (6 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-AI Si 12		
Diaphragm		NBR		
Actuator stem		1.4305		
Positioner housing		POM-GF	–	Polyamide
Yoke	Stem	9SMn28K zinc-plated, matt black finish		–
	Crossbeam	1.4301		

Table 2.3: *Permissible differential pressures*

Fail-safe position		Fail-close		Fail-open	
Bench range		psi (bar)		psi (bar)	
Min./max. supply pressure		psi (bar)		psi (bar)	
C _V coefficients	K _{VS} coefficients	Δp when p ₂ = 0 psi (bar)			
2 to 12	1.6 to 10	230 (16)	–	230 (16)	–
30 and 40	25 and 35	145 (10)	–	145 (10)	–
60 and 94	50 and 80	50 (3.5)	72 (5)	50 (3.5)	72 (5)

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

Actuator		for	Type 3531-E1	Type 3531-E3	
Positioning force			0.7 kN	2.5 kN (Type 3374-11)	2.0 kN (Type 3374-21/31) ¹⁾
Transit time for rated travel			90 s	120 s · Other transit times on request	
Supply voltage	230 V/50 Hz		•	•	
	230 V/60 Hz		Special version	•	
	120 V/60 Hz		•	•	
	24 V/50 Hz		•	•	
	24 V/60 Hz		–	•	
Power consumption	Motor		3 VA	7.5 VA	10.5 VA
	With positioner		–	9.5 VA	12.5 VA
Manual override			•	•	
Degree of protection			IP 54 when installed upright	IP 54 · IP 65 with cable gland	
		Mounting orientation	Suspended mounting not permitted (see ► EB 5827-1 and ► EB 8331-3)		
Permissible ambient temperature			0 to 50 °C	5 to 60 °C	
Additional electrical equipment					
Limit contact			2	2	
Resistance transmitters (not for version with positioner)			1 0 to 1000 Ω	2 0 to 1000 Ω	
Positioner			Digital ²⁾	Digital	
Input signal			0/4 to 20 mA · 0/2 to 10 V		
Output signal			0/2 to 10 V		

¹⁾ Actuators with fail-safe action: Type 3374-21 with stem extends, Type 3374-31 with stem retracts

²⁾ Power supply for version with positioner: 24 V DC, 24 V/50 and 60 Hz as well as 85 to 264 V/50 and 60 Hz

Table 3.2: *Permissible differential pressures for metal-seated plug · All pressures in psi (bar)*

Actuator		for	Type 3531-E1	Type 3531-E3
Positioning force			0.7 kN	2.5 kN
C _v coefficients	K _{v5} coefficients		Δp when p ₂ = 0 psi (bar)	
2 to 12	1.6...10		145 (10)	230 (16)
30 and 40	25 and 35		50 (3.5)	175 (12)
60 and 94	50 and 80		–	58 (4)

Table 4: Dimensions and weights · Type 3531 Globe Valve

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

Table 4.1: Type 3531-IP Electropneumatic Control Valve · Dimensions for fail-open or fail-close version

Nominal size	NPS	½	¾	1	1½	2	2½	3
	DN	15	20	25	40	50	65	80
L (face-to-face dimension) Class 150	in	7.25	7.25	7.25	8.75	10	10.87	11.75
	mm	184	184	184	222	254	276	298
H1 (valve CLOSED)	in	18.54			18.94		23.07	
	mm	471			481		586	
H1 (valve OPEN)	in	21.89			22.28		26.41	
	mm	556			566		671	
H2	in	1.57			2.83		3.86	
	mm	40			72		98	
H3 (valve CLOSED)	in	4.33			4.33		4.33	
	mm	110			110		110	
H3 (valve OPEN)	in	8.27			8.27		8.27	
	mm	210			210		210	
Weight	lbs	17	19.2	22	33.7	40.1	56.7	76.1
	kg	7.7	8.7	10	15.3	18.2	25.7	34.5

Table 4.2: Type 3531-PP Pneumatic Control Valve · Dimensions apply to both fail-safe positions

Nominal size	NPS	½	¾	1	1½	2	2½	3
	DN	15	20	25	40	50	65	80
L (face-to-face dimension) Class 150	in	7.25	7.25	7.25	8.75	10	10.87	11.75
	mm	184	184	184	222	254	276	298
H1 (fail-close or fail-open)	in	18.54			18.94		23.07	
	mm	471			481		586	
H2	in	1.57			2.83		3.86	
	mm	40			72		98	
H3 (minimum distance)	in	4.33			4.33		4.33	
	mm	110			110		110	
Weight	lbs	16.1	18.3	21.2	32.8	39.2	55.8	68.6
	kg	7.3	8.3	9.6	14.9	17.8	25.3	31.1

Table 4.3: Type 3531-E1 Electric Control Valve

Nominal size	NPS	½	¾	1	1½	2	2½	3
	DN	15	20	25	40	50	65	80
L (face-to-face dimension) Class 150	in	7.25	7.25	7.25	8.75	10	10.87	11.75
	mm	184	184	184	222	254	276	298
H1	in	17.01			17.40		—	
	mm	432			442			
H2	in	1.57			2.83			
	mm	40			72			
H3	in	4.33			4.33			
	mm	110			110			
Weight	lbs	12.8	15	17.9	29.5	35.9		
	kg	5.8	6.8	8.1	13.4	16.3		

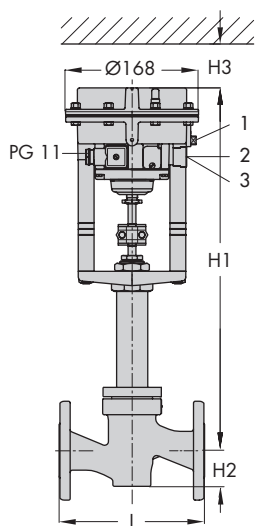
Table 4.4: Type 3531-E3 Electric Control Valve

Nominal size	NPS	½	¾	1	1½	2	2½	3
	DN	15	20	25	40	50	65	80
L (face-to-face dimension) Class 150	in	7.25	7.25	7.25	8.75	10	10.87	11.75
	mm	184	184	184	222	254	276	298
H1	in	20.83			21.22		25.35	
	mm	529			539		644	
H2	in	1.57			2.83		3.86	
	mm	40			72		98	
H3 ¹⁾ (minimum distance)	in	4.33			4.33		4.33	
	mm	110			110		110	
Weight	lbs	20.9	23.1	26	37.7	44.1	60.6	80
	kg	9.5	10.5	11.8	17.1	20	27.5	36.3

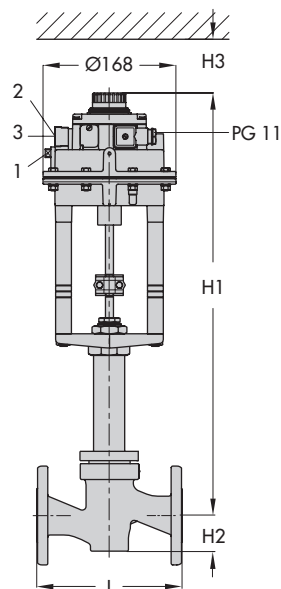
¹⁾ Cover screws are mounted from the top.

Dimension diagrams for electropneumatic control valves

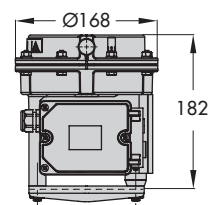
- 1 Pressure gauge G ⅛
- 2 Supply air G ¼
- 3 Vent plug G ¼



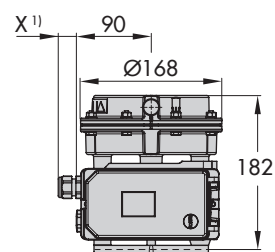
Type 3531-IP, fail-close



Type 3531-IP, fail-open



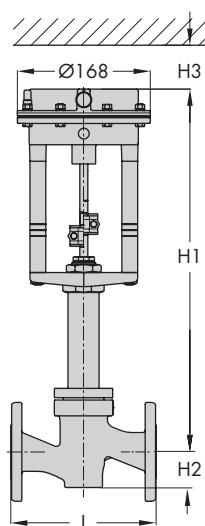
Type 3372 with Type 3725 Positioner



Type 3372 with Series 3730 Positioner

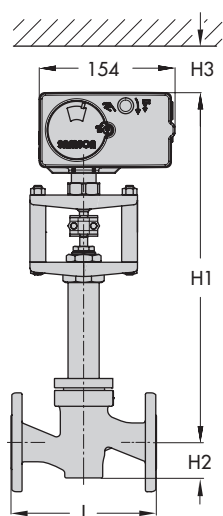
¹⁾ The dimension X depends on the cable gland used.

Dimension diagrams for pneumatic control valves

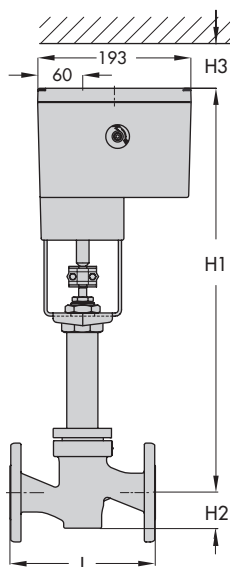


Type 3531-PP

Dimension diagrams for electric control valves

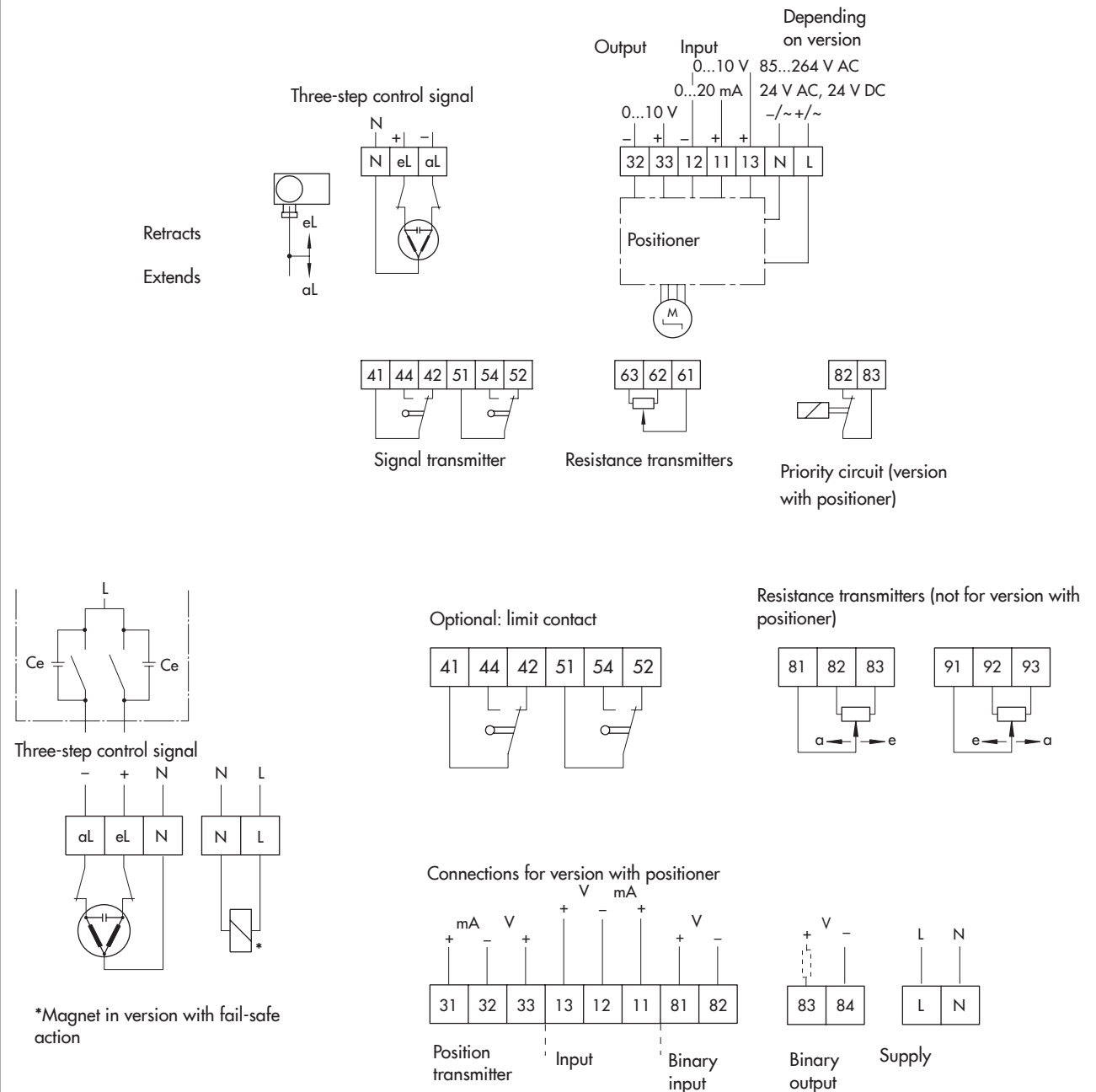


Type 3531-E1



Type 3531-E3

Wiring plans



Ordering text

The following specifications are required on ordering:

Globe valve for Type 3531

Nominal size	NPS ...
Flow coefficients	C _v ...
Pressure rating	Class ...
Body material	Cast steel or stainless steel
Seat-plug seal	Metal seal

Actuators

For **Type 3531-IP**: Electropneumatic actuator with integrated positioner, 4 to 20 mA or with Type 3725/Series 3730 Positioner

Optional Intrinsically safe  II 2G Ex ia IIC T6 according to ATEX

Additional equipment Limit switch 1 or 2

for Type 3531-PP: Pneumatic actuator

Fail-safe position	Fail-close or fail-open
Bench range	Fail-close: 30 to 48 psi (2.1 to 3.3 bar) Fail-open: 6 to 20 psi (0.4 to 1.4 bar)

Additional equipment Limit switch 1 or 2

For Type 3531-E1: Type 5827 Electric Actuator

Supply voltage

- | | |
|--------------------------------|--|
| Version with three-step signal | – 230 V/50 Hz
– 24 V/50 Hz |
| Version with positioner | – 24 V DC
– 24 V/50 and 60 Hz
– 85 to 264 V/50 and 60 Hz |

Additional equipment – Limit contact 2
– Resistance transmitter 0 to 1000 Ω
– Positioner input
0/4 to 20 mA or 0/2 to 10 V

For Type 3531-E3: Electric actuator

Fail-safe position	Fail-close or fail-open
Positioning force	With fail-safe action: 2 kN Without fail-safe action: 2.5 kN
Supply voltage	– 230 V/50 Hz – 230 V/60 Hz – 120 V/60 Hz – 24 V/50 Hz – 24 V/60 Hz
Additional equipment	– Limit contact 2 – Resistance transmitter 0 to 1000 Ω – Digital positioner with input and output 0/4 to 20 mA or 0/2 to 10 V