

Characterized control valves and rotary actuators for modulating control

	Flow characteristics of characterized control valves Characteristic: equal percentage		Rated pressure: 3 way, 4140 kPa (DN15...32), 2760 kPa (DN32...50) 2 way, 2500 kPa (DN15...50), 1600 kPa (DN65...150)

Connection	Internal thread															Flange PN 16				
Kvs [m ³ /h]	0.63	1.0	1.6	2.5	4.0	4.0	6.3	6.3	10.0	10.0	16.0	16.0	25.0	25.0	40.0	63	100	140	230	320
DN [mm]	15	15	15	15	15	20	20	25	25	32	32	40	40	50	50	65	80	100	125	150
2-way	R209AC	R210AC	R211AC	R212AC	R213AC	R217AC	R218AC	R222AC	R223AC	R229AC	R231AC	R238AC	R239AC	R248AC	R249AC	R664AC	R679AC	R6099AC	R6124AC	R6149AC

Modulating DC 2...10 V

	TR24-SR	LRU24-SR	NRU24-SR	SRU24-SR	GRU24-SR	AC/DC 24 V
Spring return	TRF24-SR	LF24-SR	AFR24-SR, ARF24-SR-S			

3-point

	TR24	LRU24(-S)	NRU24(-S)	SRU24(-S)	GRU24	AC/DC 24 V
	TR230-3	LRU230(-S)	NRU230(-S)	SRU230(-S)	GRU230	AC 100...240 V
Spring return	TRF24-2	LF24-3	AFR24-3(-S) US			

Connection	Internal thread												
Kvs [m ³ /h]	0.63	1	1.6	2.5	4	4	6.3	6.3	10	10	16	16	25
DN [mm]	15	15	15	15	15	20	20	25	25	32	32	40	50
3-way	R309	R310	R311	R312	R313	R317	R318	R322	R323	R329	R331	R338	R348

Modulating DC 2...10 V

	TR24-SR	LRU24-SR	NRU24-SR
Spring return	TRF24-SR	LF24-SR	AFR24-SR, ARF24-SR-S

3-point

	TR24	LRU24(-S)	NRU24(-S)
	TR230-3	LRU230(-S)	NRU230(-S)
Spring return	TRF24-2	LF24-3	AFR24-3(-S) US

Open-close ball valves and rotary actuators for shut-off or change-over functions

	Flow characteristics of open-close ball valves	Rated pressure: 3 way, 4140 kPa (DN15...32), 2760 kPa (DN32...50) 2 way, 2500 kPa (DN15...50), 1600 kPa (DN65...150)

Connection	Internal thread							Flange PN 16				
Kvs [m ³ /h]	8.6	13	18	31	40	65	120	180	230	390	570	
DN [mm]	15	20	25	32	40	50	65	80	100	125	150	
2-way	R215AC	R220AC	R225AC	R232AC	R240AC	R250AC	R665AC	R680AC	R6100AC	R6125AC	R6150AC	

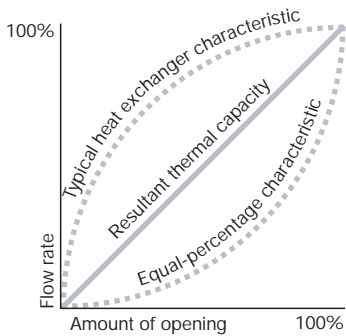
Open/Close

	TR24	LRU24(-S)	NRU24(-S)	SRU24(-S)	GRU24
	TR230-3	LRU230(-S)	NRU230(-S)	SRU230(-S)	GRU230
Spring return	TRF24(-S)	LRF24(-S)	AFR24(-S), ARF24-S		
	TRF230(-S)	LRF230(-S)	AFR230(-S), ARF230-S		

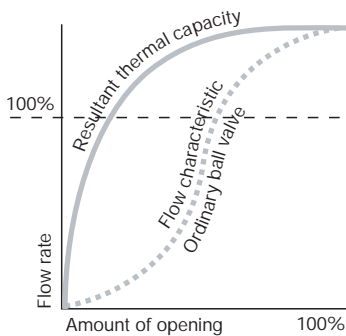
Connection	Internal thread						
Kvs [m ³ /h]	8.6	21	26	16	32	32	49
DN [mm]	15	20	25	32	32	40	50
3-way	R315	R320	R325	R330	R332	R340	R350

	TR24	LRU24(-S)	NRU24(-S)	SRU24(-S)
	TR230-3	LRU230(-S)	NRU230(-S)	SRU230(-S)
Spring return	TRF24(-S)	LRF24(-S)	AFR24(-S), ARF24-S	
	TRF230(-S)	LRF230(-S)	AFR230(-S), ARF230-S	

An ordinary ball valve is unsuitable as a control device



Characteristic of an ideal control valve



Characteristic of an ordinary ball valve

In order to ensure good stability of control, a control valve must have a flow characteristic that complements the nonlinear characteristic of the heat exchanger in the HVAC system.

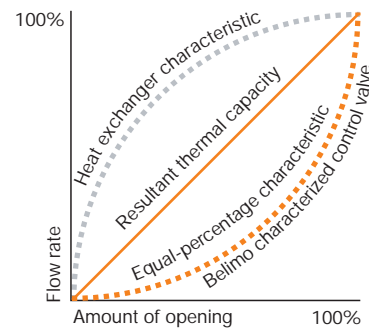
An equal-percentage valve characteristic is desirable in order to produce a linear relationship between the thermal output and the amount of opening of the control device. This means that the flow rate increases slowly as the valve begins to open. Characteristic in ordinary ball valves is severely distorted.

The reason for this is that an ordinary ball valve has an extremely high flow coefficient (Kvs value) compared with its nominal size, several times that of a comparable globe valve.

Therefore, an ordinary ball valve is not very suitable for performing control functions:

- Quick-opening flow characteristic
- Flow coefficient excessive due to the design
- Flow control inadequate in the part-load range

Belimo has added "control" to the ball valve

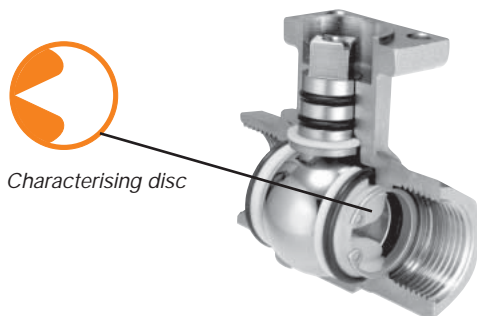


Characteristic of the Belimo CCV

Belimo has succeeded in solving the problem of the distorted flow characteristic of ordinary ball valves. A so-called "characterising disc" in the inlet of the characterized control valve converts the valve's characteristic to the equal-percentage kind. The side of the characterizing disc facing the ball is concave and is in contact with the surface of the ball. Thus, the actual flow is regulated by the hole in the ball and by the V-shaped aperture in the characterizing disc.

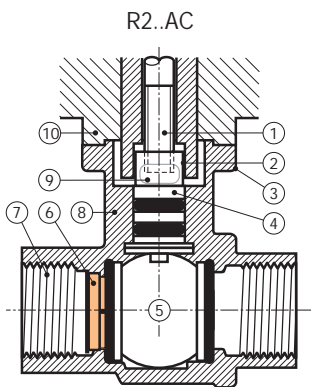
The Kvs value is reduced and corresponds approximately to that of a globe valve of comparable size. In order to avoid having to fit pipe reducers in the majority of cases, each size of valve is also available with wide choices of different Kvs values.

Advantages of the Belimo Characterized Control Valve

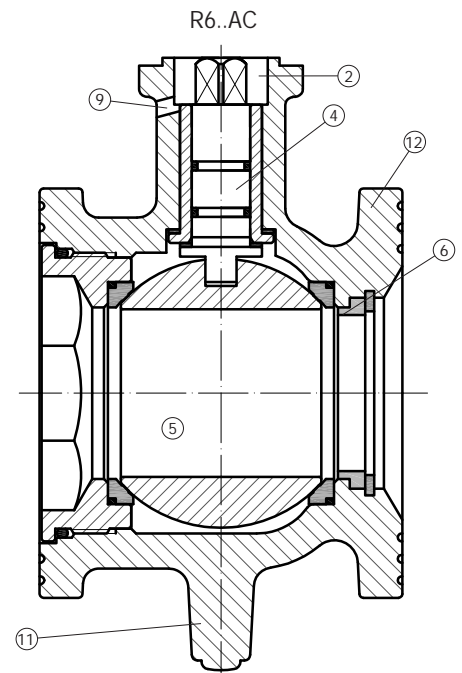


- Equal-percentage characteristic
- No initial jump in flow on opening
- Excellent stability of control thanks to the characterizing disc
- Kvs values comparable with those of globe valves of comparable size
- Fewer pipe reducers needed
- High rangeability
- High close-off pressure
- Tight-sealing

The elements of the Characterized Control Valve



- ① Simple direct attachment with a central screw
- ② Square spindle head for form-fit attachment of the rotary actuator
- ③ Identical mounting flange for all sizes
- ④ Spindle with two O-rings for long service life
- ⑤ Ball and spindle made of stainless steel
- ⑥ Characterizing disc produces equal-percentage flow characteristic
- ⑦ Internal screw connection (ISO7/1)
- ⑧ Forged fitting, nickel-plated brass body
- ⑨ Vent part to prevent the accumulation of condensation
- ⑩ Thermal decoupling of actuator from valve
- ⑪ Flange (ISO7005-2)
- ⑫ GG25, polyester coated body



Optimum choice of kvs valves of identical size

- Better controllability
- Lower installation costs

The Belimo range of characterized control valves includes 2-way and 3-way types that are available in a variety of sizes and with a choice of Kvs value. A characterized control valve is normally supplied as a unit complete with a suitable Belimo rotary actuator

Notes

- The control devices described in this publication are intended for use in the closed water circuits of heating, ventilating and air-conditioning system. Use of the control devices in conjunction with other liquid or gaseous fluids is on request
- Select the characterized control valve according to the valve sizing diagram: page 6
- Please pay attention to the notes on operation, mounting, commissioning, maintenance and project design: page 36,37

Ordering

Ordering example* (with LRU24)

- a) LRU24 rotary actuator with R..valve fitted* *
-Order code: R..+LRU24
- b) LRU24 rotary actuator and R.. valve supplied separately
-Order code: R../LRU24
- c) LRU24 rotary actuator packed loose
-Order code: LRU24

* An order for a R..valve usually includes an actuator

** Except for the DN65 and above sizes

Sizing diagram for characterized control valves

Legend

Δp_{max}
 Maximum permitted pressure difference for long service life across control path A-AB referred to the whole range of opening
 Δp_{max} for low-noise operation
 Δp_{v100}
 Pressure difference with ball valve fully open
 \dot{V}_{100} Nominal flow rate at Δp_{v100}

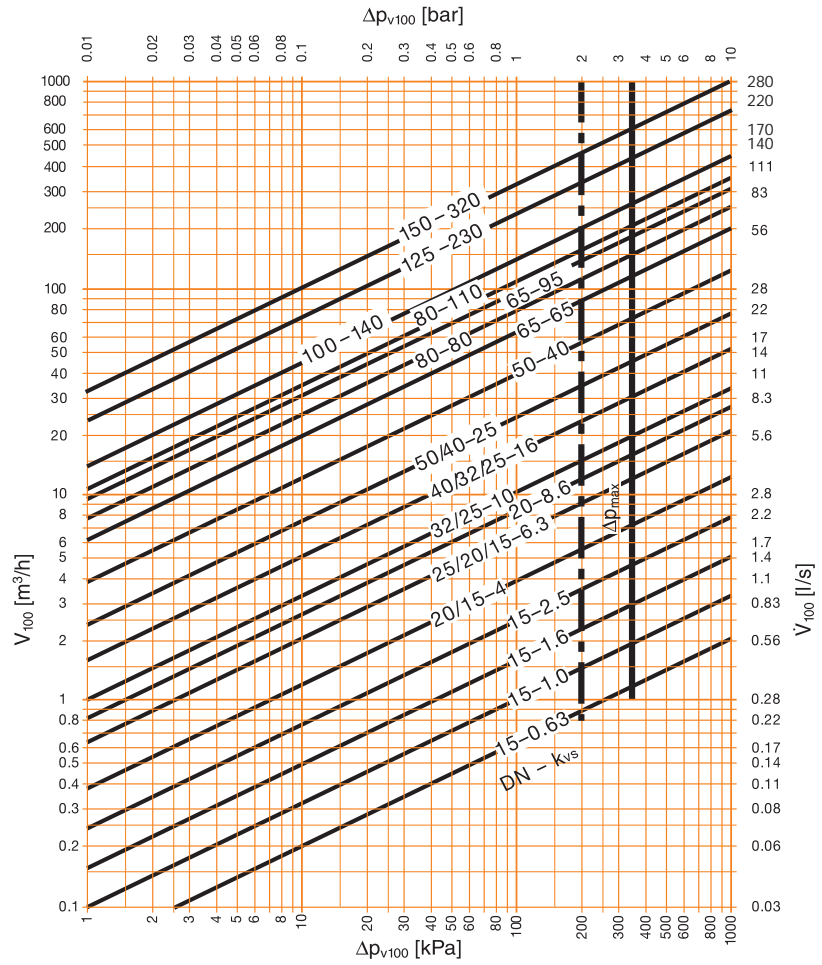
Formula for k_{vs}

$$k_{vs} = \sqrt{\frac{\dot{V}_{100}}{\Delta p_{v100} / 100}}$$

\dot{V}_{100} [m³/h]
 Δp_{v100} [kPa]

Definition of Δps (Pg. 6...9)

Differential pressure at which the actuator can still seal the valve tightly allowing for the appropriate leakage rate



Sizing table for characterized control valves

Kvs [m ³ /h]	0.63	1	1.6	2.5	4	4	6.3	6.3	10	10	16	16	25	25	40
DN [mm]	15	15	15	15	15	20	20	25	25	32	32	40	40	50	50
	R209AC	R210AC	R211AC	R212AC	R213AC	R217AC	R218AC	R222AC	R223AC	R229AC	R231AC	R238AC	R239AC	R248AC	R249AC
	R309	R310	R311	R312	R313	R317	R318	R322	R323	R329	R331	R338	-	R348	-
Kvs [m ³ /h]	63	100	140	230	320										
DN [mm]	65	80	100	125	150										
	R664AC	R679AC	R6099AC	R6124AC	R6149AC										

Sizing table for Open/Close ball valves

Differential pressure Δp_{v100} [kPa]	0.1	1	3	10	Kvs [m ³ /h]	DN [mm]	2-way
Flow \dot{V}_{100} [m ³ /h]	0.27	0.86	1.49	2.72	8.6	15	R215AC
	0.41	1.3	2.3	4.1	13	20	R220AC
	0.57	1.8	3.1	5.7	18	25	R225AC
	0.51	1.6	2.77	5.06	16	32	-
	0.98	3.1	5.4	9.8	31	32	R232AC
	1.26	4.0	6.9	12.6	40	40	R240AC
	2.06	6.5	11.3	20.6	65	50	R250AC
	3.79	12	20.8	37.9	120	65	R665AC
	5.70	18	31.2	56.9	180	80	R680AC
	7.27	23	39.8	72.7	230	100	R6100AC
	12.3	39	67.5	123.3	390	125	R6125AC
	18.0	57	98.7	180.2	570	150	R6150AC



2-way low torque characterized control valves
DN 15...50



Equal-percentage characteristics for modulating control of cold and hot water

- Applications**
- Water-side control of air handling unit in air conditioning systems
 - Water-side control in heating systems



Technical data

Flow medium	Cold and hot water, water with max. 50% volume of glycol	
Temperature of medium	-5°C...100°C	
Rated pressure Ps	2500 kPa	
Flow characteristic	equal percentage	
Rangeability	DN15*	Sv > 50
	DN15...50**	Sv > 100
Leakage rate	0-0.01% kvs (ANSI Class IV) (No leakage when ex-factory)	
Pipe connector	Internal thread to ISO7/1	
Differential pressure Δp_{max}	350 kPa (200 kPa for low-noise operation)	
Closing pressure Δp_s	1400 kPa	
Angle of rotation	90°	
Installation position	Upright to horizontal (in relation to the stem)	
Maintenance	Maintenance-free	
Materials		
Body	Forged, nickel-plated brass body	
Ball	Stainless steel	
Seat	RPTFE	
Stem	Stainless steel	
O-ring	EPDM	
Characterizing disk	PPA	

*= Kvs up to 2.5 ;

**= DN15 Kvs \geq 4

Product features

Mode of operation	The characterized control valve is operated by a rotary actuator. The actuator is controlled by a standard modulating or 3-point control system and drives the ball of the valve - the throttling device - to the opening position dictated by the control signal.
Equal-percentage characteristic	Equal-percentage characteristic of the flow rate ensured by the integral characterizing disc
Manual operation	Please refer to page 13...35.



2-way characterized control valves
DN 65...150



Equal-percentage characteristics for modulating control of cold and hot water

- Applications**
- Water-side control of air handling unit in air conditioning systems
 - Water-side control in heating systems



Technical data

Flow medium	Cold and hot water, water with max. 50% volume of glycol	
Temperature of medium	-5°C...100°C	
Rated pressure Ps	1600 kPa	
Flow characteristic	equal percentage	
Rangeability	DN65...80 DN100...150	Sv > 100 Sv > 150
Leakage rate	0-0.01% of Kvs (ANSI Class IV) (No leakage when ex-factory)	
Pipe connector	Flanged ISO7005-2 PN16	
Differential pressure Δp_{max}	350 kPa (200 kPa for low-noise operation)	
Closing pressure Δp_s	DN65...125 DN150	700 kPa 400 kPa
Angle of rotation	90°	
Installation position	Upright to horizontal (in relation to the stem)	
Maintenance	Maintenance-free	
Materials		
Body	GG25, Polyester coated	
Ball	Stainless steel	
Seat	RPTFE	
Stem	Stainless steel	
O-ring	EPDM	
Characterizing disk	Stainless steel	

Product features

- Simplified installation procedure
- Light weight comparing with same DN size valves
- Anti-corrosion treatment inside of the valve
- Solid linkage in insulation design

Mode of operation The characterized control valve is operated by a rotary actuator. The actuator is controlled by a standard modulating or 3-point control system and drives the ball of the valve - the throttling device - to the opening position dictated by the control signal.

Equal-percentage characteristic Equal-percentage characteristic of the flow rate ensured by the integral characterizing disc

Manual operation Please refer to page 13...35.

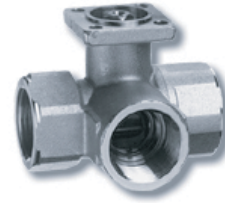


3-way mixing characterized control valves
DN 15...50



Equal-percentage characteristics for modulating control of cold and hot water

- Applications**
- Water-side control of air handling unit in air conditioning systems
 - Water-side control in heating systems



Technical data

Flow medium	Cold and hot water, water with max. 50% volume of glycol	
Temperature of medium	-5°C...100°C	
Rated pressure Ps	DN15...32	4140 kPa
	DN32...50	2760 kPa
Flow characteristic	Control path A-AB	equal percentage
	Bypass B-AB	Linear, flow rate is 70% of Kvs value
Rangeability	DN15*	Sv>50
	DN15...50**	Sv>100
Leakage rate	Control path A-AB	Air bubble-tight (DIN 3230 Part 3)
	Bypass B-AB	Approx. 1...2% of Kvs value
Pipe connector	Internal thread to ISO7/1	
Differential pressure Δp_{max}	350 kPa (200 kPa for low-noise operation)	
Closing pressure Δps	1400 kPa	
Angle of rotation	90°	
Installation position	Upright to horizontal (in relation to the stem)	
Maintenance	Maintenance-free	
Materials		
Body	Forged, nickel-plated brass body	
Ball	Stainless steel	
Seat	PTFE	
Stem	Stainless steel	
Stem seal	EPDM	
Characterizing disk	TEFZEL	

*= Kvs up to 2.5;
**= DN15 Kvs \geq 4

Product features

Mode of operation The characterized control valve is operated by a rotary actuator. The actuator is controlled by a standard modulating or 3-point control system and drives the ball of the valve - the throttling device - to the opening position dictated by the control signal.

Equal-percentage characteristic Equal-percentage characteristic of the flow rate ensured by the integral characterizing disc

Manual operation Please refer to page 13...35.

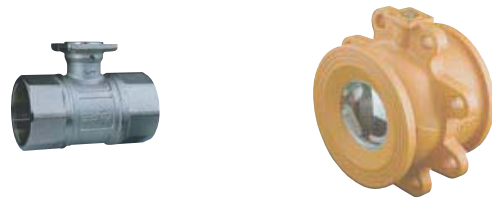


2-way open-close ball valves
DN 15...150

Shut-off function and 2-point control
in cold and hot water circuits

Applications

For shutting off cold and hot water circuits in heating and ventilation systems on the water side or for 2-point control of these circuits



R2.. AC Technical data (for DN15... 50)

Flow medium	Cold and hot water, water with max. 50% volume of glycol
Temperature of medium	-5°C...100°C
Rated pressure Ps	2500kPa
Leakage rate	0~0.01% of kvs (ANSI Class IV) (No leakage when ex-factory)
Pipe connector	Internal thread to ISO7/1
Differential pressure Δp_{max}	1000 kPa (200 kPa for low-noise operation)
Closing pressure Δps	1400 kPa
Angle of rotation	90°
Installation position	Upright to horizontal (in relation to the stem)
Maintenance	Maintenance-free
Materials	
Body	Forged, nickel-plated brass body
Ball	Stainless steel
Seat	RPTFE
Stem	Stainless steel
O-ring	EPDM

R6..AC Technical data (for DN65...150)

Flow medium	Cold and hot water, water with max. 50% volume of glycol
Temperature of medium	-5°C...100°C
Rated pressure Ps	1600 kPa
Leakage rate	0-0.01% of Kvs (ANSI Class IV) (No leakage when ex-factory)
Pipe connector	Flanged ISO7005-2 PN16
Differential pressure Δp_{max}	1000 kPa(200 kPa for low-noise operation)
Closing pressure Δps	700 kPa (DN65-DN125) 400 kPa (DN150)
Angle of rotation	90°
Installation position	Upright to horizontal (in relation to the stem)
Maintenance	Maintenance-free
Materials	
Body	GG25, Polyester coated
Ball	Stainless steel
Seat	RPTFE
Stem	Stainless steel
O-ring	EPDM

Product features

- Mode of operation** The open-close ball valve is operated by a rotary actuator. The rotary actuator is controlled by an open-close signal.
- Manual operation** Please refer to page 13...35.


**3-way open-close mixing ball valves
DN 15...50**

**Change-over function and 2-point controls
in cold and hot water circuits**

Applications

For changing over cold and hot water circuits in heating and ventilation systems on the water side or for 2-point control of these circuits.


Technical data

Flow medium	Cold and hot water, water with max. 50% volume of glycol	
Temperature of medium	-5°C...100°C	
Rated pressure Ps	DN15...32	4140 kPa
	DN32...50	2760 kPa
Flow rate	Bypass B-AB	Approx. 50% of Kvs
Leakage rate	Control path A-AB	Air bubble-tight (DIN 3230 Part 3)
	Bypath B-AB	1% of Kvs
Pipe connector	Internal thread to ISO7/1	
Differential pressure Δp_{max}	1000 kPa (200 kPa for low-noise operation)	
Closing pressure Δps	1400 kPa	
Angle of rotation	90°	
Installation position	Upright to horizontal (in relation to the stem)	
Maintenance	Maintenance-free	
Materials		
Body	Forged, nickel-plated brass body	
Ball	Stainless steel	
Seat	PTFE	
Stem	Stainless steel	
Stem seal	EPDM	

Product features

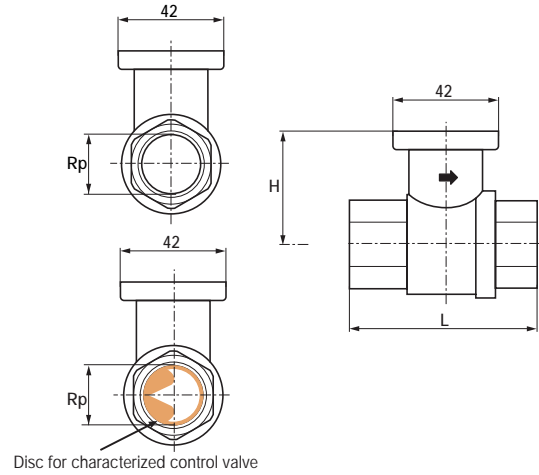
Mode of operation The open-close ball valve is operated by a rotary actuator. The rotary actuator is controlled by an open-close signal.

Manual operation Please refer to page 13...35.

Dimensions

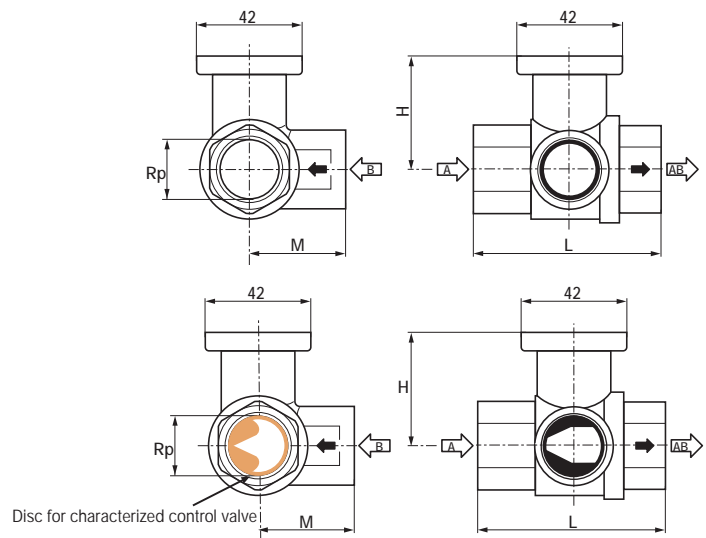
R2.. AC 2-way ball valves

	DN		Thread	Dimensions [mm]		Weight [Kg]
	mm	Imp.	Rp	L	H	
R209AC/R210AC/R211AC R212AC/R213AC/R215AC	15	1/2"	1/2"	70	43.5	0.38
R217AC/R218AC/R220AC	20	3/4"	3/4"	77	46	0.48
R222AC/R223AC/R225AC	25	1"	1"	85	47.6	0.63
R229AC/R231AC/R232AC	32	1 1/4"	1 1/4"	94	51	0.84
R238AC/R239AC/R240AC	40	1 1/2"	1 1/2"	104	53.5	1.1
R248AC/R249AC/R250AC	50	2"	2"	116.5	58.1	1.6



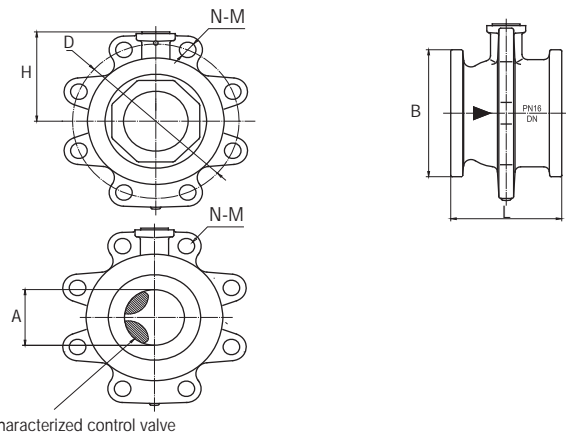
R3.. 3-way ball valves

Valve type	DN		Dimensions [mm]			Thread	Weight [kg]
	mm	Imp.	L	H	M	Rp	
R309...R315	15	1/2"	67	45	34	1/2"	0.45
R317...R320	20	3/4"	76	47.5	38.5	3/4"	0.6
R322...R325	25	1"	87	47.5	43.5	1"	0.9
R329, R330	32	1 1/4"	102	47.5	51	1 1/4"	1.2
R331, R332	32	1 1/4"	113	52	56.5	1 1/4"	1.5
R338, R340	40	1 1/2"	113	52	56.5	1 1/2"	1.5
R348, R350	50	2"	127	58	63.5	2"	2.4



R6.. AC 2-way ball valves

Valve type	DN		Dimensions [mm]						Weight [kg]	
	mm	Imp.	A	B	D	L	H	N		M
R664AC/R665AC	65	2.5"	ø44	ø101	ø145	93	86	4	ø18	4.3
R679AC/R680AC	80	3"	ø55	ø125	ø160	108	94.5	8	ø18	6.5
R6099AC/R6100AC	100	4"	ø64	ø148	ø180	120	104	8	ø18	10.5
R6124AC/R6125AC	125	5"	ø77	ø174	ø210	142	118	8	ø18	13.0
R6149AC/R6150AC	150	6"	ø96	ø204	ø240	170	136.5	8	ø22	19.5



- Non-spring return rotary actuators: for 2 way ball valves DN 15...25
3 way ball valves DN 15...20
- Torque: 2 Nm
- Modulating control TR24-SR (AC/DC 24 V)
- Open/Close and floating control TR24 (AC/DC 24 V)
TR230-3 (AC 230 V)



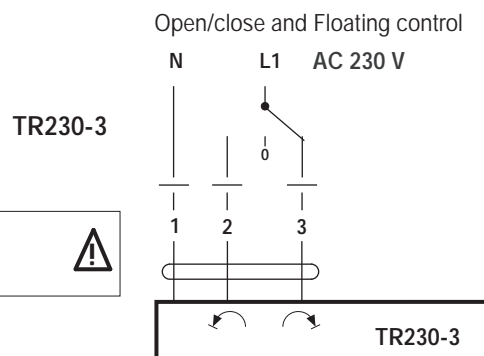
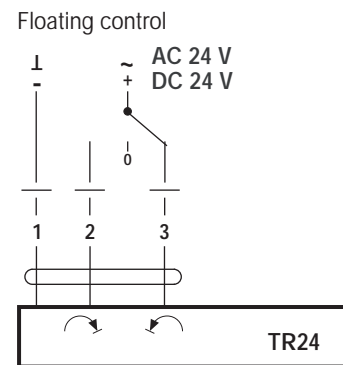
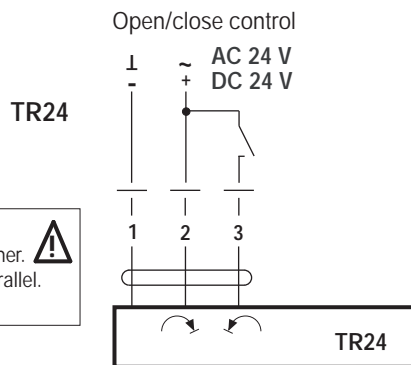
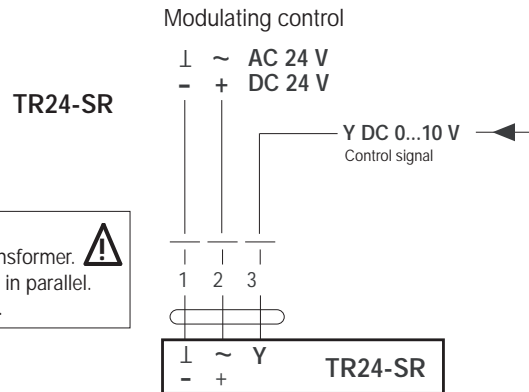
Technical data

Basic technical data	Connection cable	1 m, 0.75 mm ²
	Torque	2 Nm
	Angle of rotation	95°
	Sound power level	35 dB (A)
	Degree of protection	IP40
	EMC	CE according to 89/336/EEC
	Ambient temperature	-5 ... +50°C
	Non-operating temperature	-5 ... +80°C
	Temperature of medium	-5 ... +100°C
	Humidity test	To EN 60730-1
	Maintenance	Maintenance-free
TR24-SR	Power supply range	AC 19.2... 28.8 V; DC 21.6... 28.8 V
	Power consumption	1.0 W
	Transformer sizing	1.0 VA
	Control signal	0...10 VDC @ 100 kΩ input impedance
	Operating range	2...10 VDC
	Protection class	III (safety low voltage)
	Running time	90 s
Weight	0.3 Kg	
TR24	Power supply range	AC 19.2... 22.8 V / DC 21.6...22.8 V
	Power consumption	0.5 W
	Transformer sizing	0.5 VA
	Protection class	III (safety low voltage)
	Running time	100 s
Weight	0.3 Kg	
TR230-3	Power supply range	AC 198 ... 264 V
	Power consumption	1.0 W
	Transformer sizing	1.0 VA
	Low voltage directive	CE according to 73/23/EEC
	Protection class	II (Totally insulated) <input type="checkbox"/>
	Running time	105 s
	Weight	0.3 Kg

Product features

- Simple direct mounting** Simple direct mounting on the ball valve using only one screw.
- Manual operation** Manual operation by lever (the gearing latch remains disengaged as long as the self-resetting lever is pressed).




Wirings



- Non-spring return rotary actuators: for 2 way ball valves DN32...40
3 way ball valves DN25...32
- Torque 5 Nm
- Modulating control LRU24-SR (AC/DC 24 V)
- Open/Close and floating control LRU24(-S) (AC/DC 24 V)
LRU230(-S) (AC 100...240 V)



Technical data

Basic Technical data	Connection cable	1 m, 0.75 mm ²
	Torque	5 Nm
	Angle of rotation	90°
	Running time	90 s
	Sound power level	Max. 35 dB (A)
	Position indication	Mechanical
	Direction of rotation	Selectable by switch (covered): Factory preset  change to  to reverse the direction of rotation
	Degree of protection	IP54 in any direction
	EMC	CE according to 89/336/EEC
	Ambient temperature range	-5 ... +50°C
	Non-operation temperature	-5 ... +80°C
	Temperature of medium	-5 ... +100°C
	Humidity test	EN 60730-1
	Maintenance	Maintenance free
LRU24-SR	Nominal voltage range	AC/DC 19.2... 28.8 V
	Power consumption	1.5 W @running / 0.4 W @ holding
	Transformer sizing	3 VA
	Control Signal	0...10 VDC (input impedance 100kΩ)
	Operating range	2...10 VDC
	Measurement Voltage	2...10 VDC, Max. 1mA
	Protection class	III (safety low voltage)
	Weight	0.55 kg
LRU24(-S)	Nominal voltage range	AC/DC 19.2... 28.8 V
	Power consumption	1.5 W @running / 0.2 W @ holding
	Transformer sizing	2 VA
	Protection class	III (safety low voltage)
	Auxiliary switch (LRU24-S)	1 X SPDT, 1 mA ...3(0.5) A, AC 250 V 0... 100% adjustable
	Weight	0.55 kg
LRU230(-S)	Nominal voltage range	AC 85 ... 265 V
	Power consumption	2.0 W @ running / 0.5 W @ holding
	Transformer sizing	4 VA
	Low voltage directive	CE according to 73/23/EEC
	Protection class	II (Totally insulated) 
	Auxiliary switch (LRU230-S)	1 X SPDT, 1 mA ...3(0.5) A, AC 250 V 0... 100% adjustable
	Weight	0.60 kg

Product features

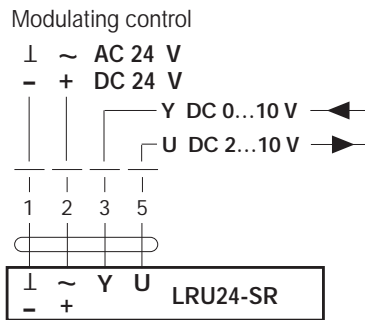
- Simple direct mounting** Simple direct mounting on the ball valve using only one screw.
- Manual operation** Manual operation by pushbutton when necessary.
- High function reliability** The actuator is overload-proof, needs no limit switches, stops automatically at the end stops.

Wirings

LRU24-SR

Notes:

- Connection via safety isolating transformer.
- Other actuators can be connected in parallel. Please note the performance data.

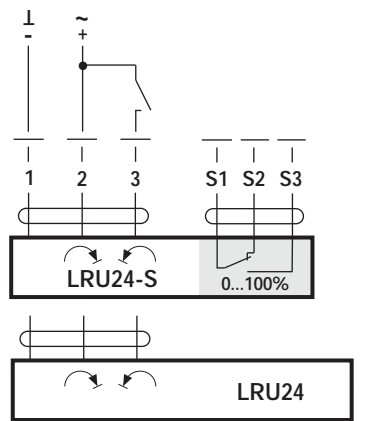


LRU24(-S)

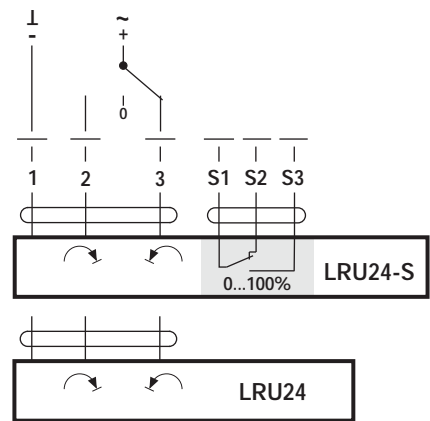
Notes:

- Connection via safety isolating transformer.
- Other actuators can be connected in parallel. Please note the performance data.

Open/close control



Floating control



Auxiliary switch

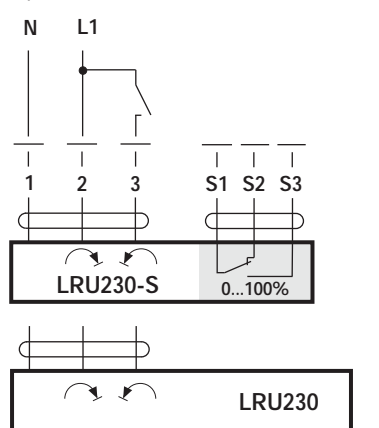


LRU230(-S)

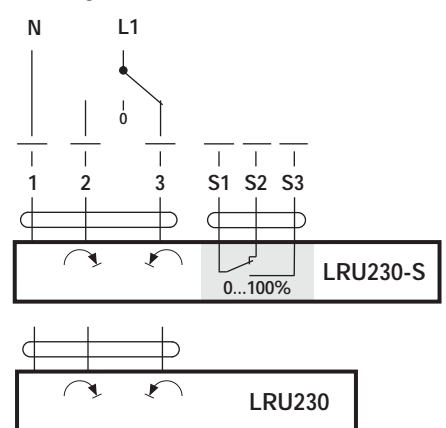
Notes:

- Caution: Power supply voltage.
- Other actuators can be connected in parallel. Please note the performance data.

Open/close control



Floating control






Auxiliary switch



- Non-spring return rotary actuators: for 2 way ball valves DN50
3 way ball valves DN32...50
- Torque 10 Nm
- Modulating control NRU24-SR (AC/DC 24 V)
- Open/Close and floating control NRU24(-S) (AC/DC 24 V)
NRU230(-S) (AC 100...240 V)



Technical data

Basic Technical data	Connection cable	1 m, 0.75 mm ²
	Torque	10 Nm
	Angle of rotation	90°
	Running time	90 s
	Sound power level	Max. 45 dB (A)
	Position indication	Mechanical
	Direction of rotation	Selectable by switch (covered): Factory preset  change to  to reverse the direction of rotation
	Degree of protection	IP54 in any direction
	EMC	CE according to 89/336/EEC
	Ambient temperature range	-5 ... +50°C
	Non-operation temperature	-5 ... +80°C
	Temperature of medium	-5 ... +100°C
	Humidity test	EN 60730-1
Maintenance	Maintenance free	
NRU24-SR	Nominal voltage range	AC/DC 19.2... 28.8 V
	Power consumption	2.5 W @ running / 0.4 W @ holding
	Transformer sizing	5 VA
	Control Signal	0...10 VDC (input impedance 100kΩ)
	Operating range	2...10 VDC
	Measurement Voltage	2...10 VDC, Max. 1mA
	Protection class	III (safety low voltage)
	Weight	0.85 kg
NRU24(-S)	Nominal voltage range	AC/DC 19.2... 28.8 V
	Power consumption	2.0 W @ running / 0.2 W @ holding
	Transformer sizing	4 VA
	Protection class	III (safety low voltage)
	Auxiliary switch (NRU24-S)	1 X SPDT, 1 mA ...3(0.5) A, AC 250 V 0... 100% adjustable
	Weight	0.85 kg
NRU230(-S)	Nominal voltage range	AC 85 ... 265 V
	Power consumption	3.0 W @ running / 0.6 W @ holding
	Transformer sizing	7 VA
	Low voltage directive	CE according to 73/23/EEC
	Protection class	II (Totally insulated) 
	Auxiliary switch (NRU230-S)	1 X SPDT, 1 mA ...3(0.5) A, AC 250 V 0... 100% adjustable
	Weight	0.90 kg

Product features

- Simple direct mounting** Simple direct mounting on the ball valve using only one screw.
- Manual operation** Manual operation pushbutton when necessary.
- High function reliability** The actuator is overload-proof, needs no limit switches, stops automatically at the end stops.

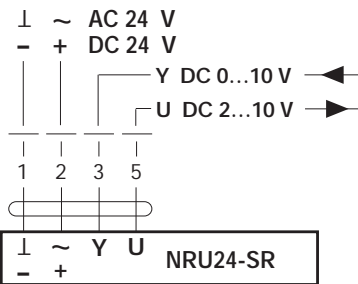
Wirings

NRU24-SR

Notes:

- Connection via safety isolating transformer.
- Other actuators can be connected in parallel. Please note the performance data.

Modulating control

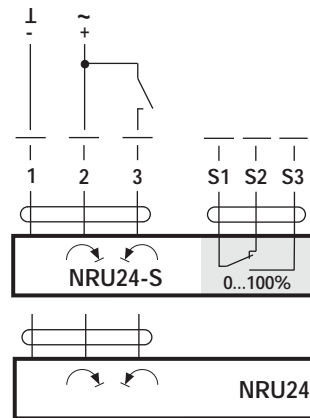


NRU24(-S)

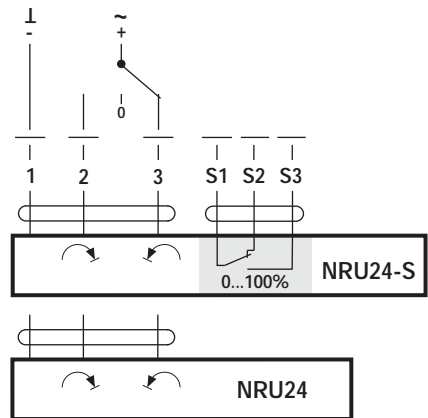
Notes:

- Connection via safety isolating transformer.
- Other actuators can be connected in parallel. Please note the performance data.

Open/close control



Floating control



Auxiliary switch

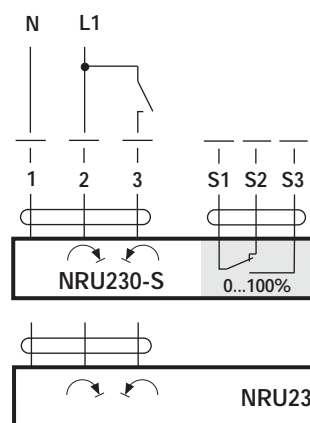


NRU230(-S)

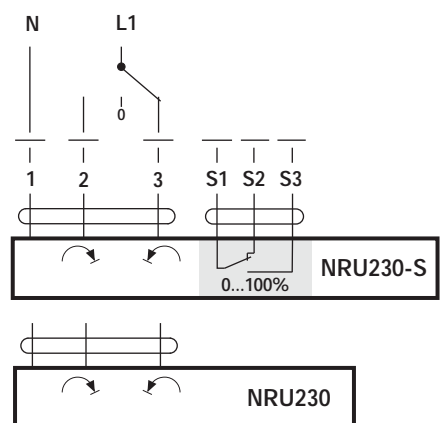
Notes:

- Caution: Power supply voltage.
- Other actuators can be connected in parallel. Please note the performance data.

Open/close control



Floating control



Auxiliary switch



- Non-spring return rotary actuators: for 2 way ball valves DN65...80
3 way ball valves DN50
- Torque 20 Nm
- Modulating control SRU24-SR (AC/DC 24 V)
- Open/Close and floating control SRU24(-S) (AC/DC 24 V)
SRU230(-S) (AC 100...240 V)


Technical data

Basic Technical data	Connection cable	1 m, 0.75 mm ²
	Torque	20 Nm
	Angle of rotation	90°
	Running time	90 s
	Sound power level	Max. 45 dB (A)
	Position indication	Mechanical
	Direction of rotation	Selectable by switch (covered): Factory preset change to to reverse the direction of rotation
	Degree of protection	IP54 in any direction
	EMC	CE according to 89/336/EEC
	Ambient temperature range	-5 ... +50°C
	Non-operation temperature	-5 ... +80°C
	Temperature of medium	-5 ... +100°C
	Humidity test	EN 60730-1
	Maintenance	Maintenance free
SRU24-SR	Nominal voltage range	AC/DC 19.2... 28.8 V
	Power consumption	2.5 W @ running / 0.4 W @ holding
	Transformer sizing	5 VA
	Control Signal	0...10 VDC (input impedance 100kΩ)
	Operating range	2...10 VDC
	Measurement Voltage	2...10 VDC, Max. 1mA
	Protection class	III (safety low voltage)
	Weight	1.0 kg
SRU24(-S)	Nominal voltage range	AC/DC 19.2... 28.8 V
	Power consumption	2.5 W @ running / 0.2 W @ holding
	Transformer sizing	5.5 VA
	Protection class	III (safety low voltage)
	Auxiliary switch (SRU24-S)	1 X SPDT, 1 mA ...3(0.5) A, AC 250 V 0... 100% adjustable
	Weight	1.0 kg
SRU230(-S)	Nominal voltage range	AC 85 ... 265 V
	Power consumption	3.0 W @ running / 0.6 W @ holding
	Transformer sizing	7 VA
	Low voltage directive	CE according to 73/23/EEC
	Protection class	II (Totally insulated)
	Auxiliary switch (SRU230-S)	1 X SPDT, 1 mA ...3(0.5) A, AC 250 V 0... 100% adjustable
	Weight	1.05 kg

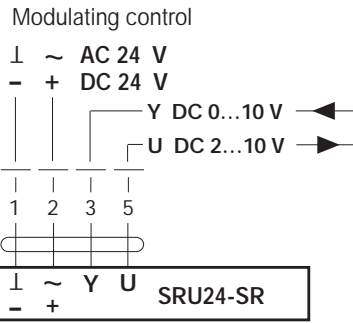
Product features

- Simple direct mounting** Simple direct mounting on the ball valve using only one screw.
- Manual operation** Manual operation by pushbutton when necessary.
- High function reliability** The actuator is overload-proof, needs no limit switches, stops automatically at the end stops.

Wirings

SRU24-SR

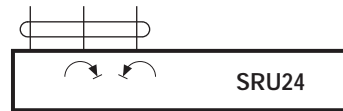
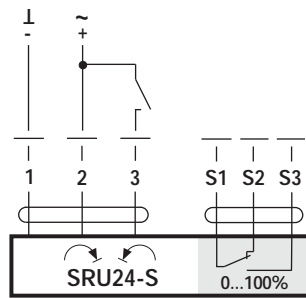
- Notes:**
- Connection via safety isolating transformer.
 - Other actuators can be connected in parallel. Please note the performance data.



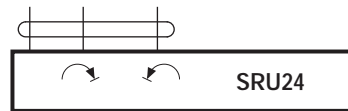
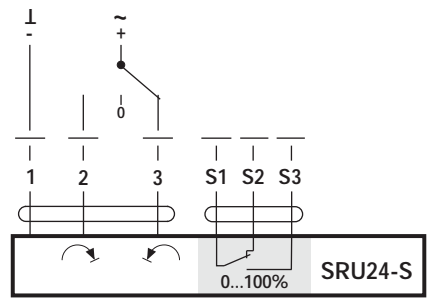
SRU24(-S)

- Notes:**
- Connection via safety isolating transformer.
 - Other actuators can be connected in parallel. Please note the performance data.

Open/close control



Floating control



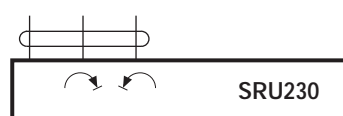
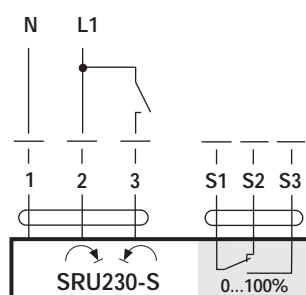
Auxiliary switch



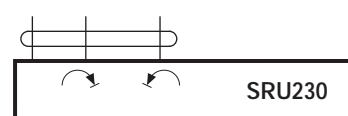
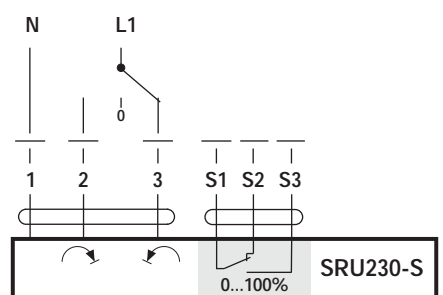
SRU230(-S)

- Notes:**
- Caution: Power supply voltage.
 - Other actuators can be connected in parallel. Please note the performance data.

Open/close control



Floating control



Auxiliary switch



- Non-spring return rotary actuators: for ball valves DN100...150
- Torque 40 Nm
- Modulating control
- Open/Close control

GRU24-SR (AC/DC 24 V)
 GRU24 (AC/DC 24 V)
 GRU230 (AC 100...240 V)



Technical data

Basic Technical data	Connection cable	1 m, 0.75 mm ²
	Torque	40 Nm
	Angle of rotation	90°
	Running time	150 s
	Sound power level	Max. 45 dB (A)
	Position indication	Mechanical
	Direction of rotation	Selectable by switch (covered): Factory preset change to to reverse the direction of rotation
	Degree of protection	IP54 in any direction
	EMC	CE according to 89/336/EEC
	Ambient temperature range	-5 ... +50°C
	Non-operation temperature	-5 ... +80°C
	Temperature of medium	-5 ... +100°C
	Humidity test	EN 60730-1
	Maintenance	Maintenance free
GRU24-SR	Nominal voltage range	AC/DC 19.2... 28.8 V
	Power consumption	4.5 W @ running / 2 W @ holding
	Transformer sizing	6.5 VA
	Control Signal	0...10 VDC (input impedance 100kΩ)
	Operating range	2...10 VDC
	Measurement Voltage	2...10 VDC, Max. 1mA
	Protection class	III (safety low voltage)
	Weight	2.0 kg
GRU24	Nominal voltage range	AC/DC 19.2... 28.8 V
	Power consumption	4 W @ running / 2 W @ holding
	Transformer sizing	6 VA
	Protection class	III (safety low voltage)
	Weight	2.0 kg
GRU230	Nominal voltage range	AC 85 ... 265 V
	Power consumption	5 W @ running / 2.5 W @ holding
	Transformer sizing	9 VA
	Low voltage directive	CE according to 73/23/EEC
	Protection class	II (Totally insulated)
	Weight	2.05 kg

Product features

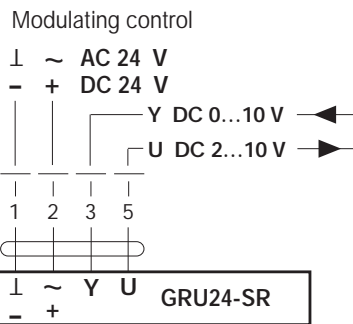
- Simple direct mounting** Simple direct mounting on the ball valve using only one screw.
- Manual operation** Manual operation by pushbutton when necessary.
- High function reliability** The actuator is overload-proof, needs no limit switches, stops automatically at the end stops.

Wirings

GRU24-SR

Notes:

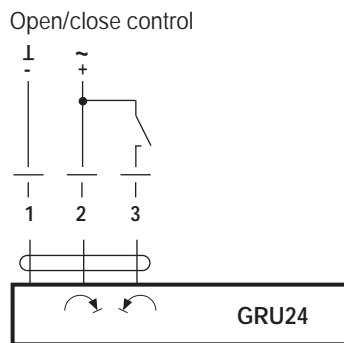
- Connection via safety isolating transformer.
- Other actuators can be connected in parallel. Please note the performance data.



GRU24

Notes:

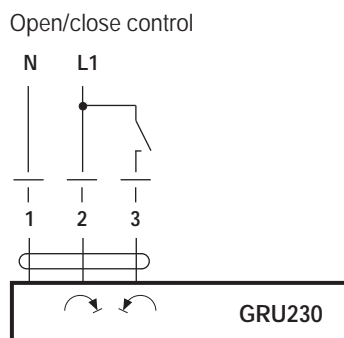
- Connection via safety isolating transformer.
- Other actuators can be connected in parallel. Please note the performance data.



GRU230

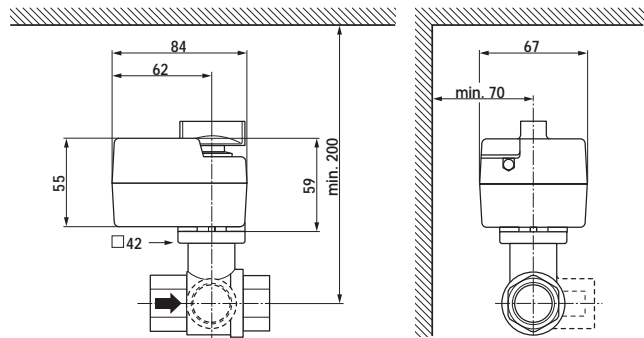
Notes:

- Caution: Power supply voltage.
- Other actuators can be connected in parallel. Please note the performance data.



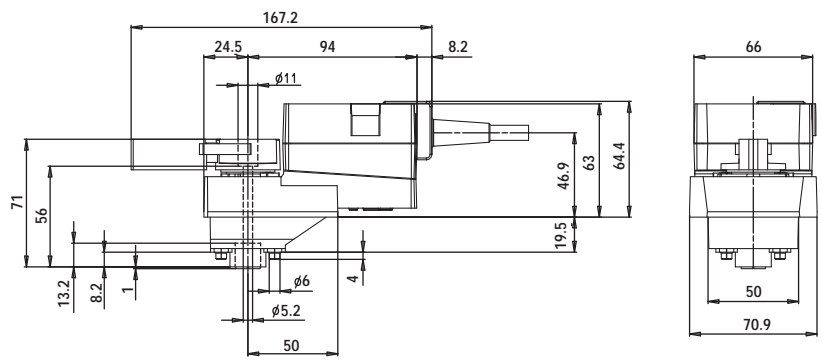
Dimensions: TR..

Measurement [mm]



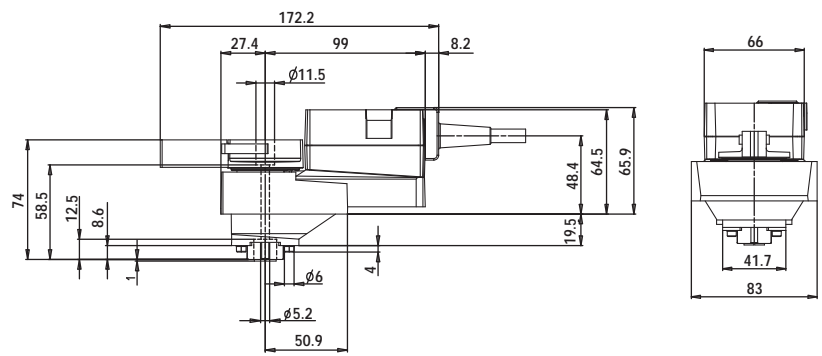
Dimensions: LRU..

Measurement [mm]



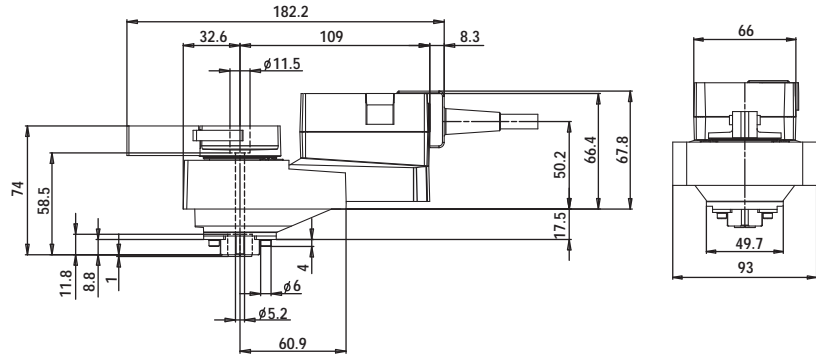
Dimensions: NRU..

Measurement [mm]



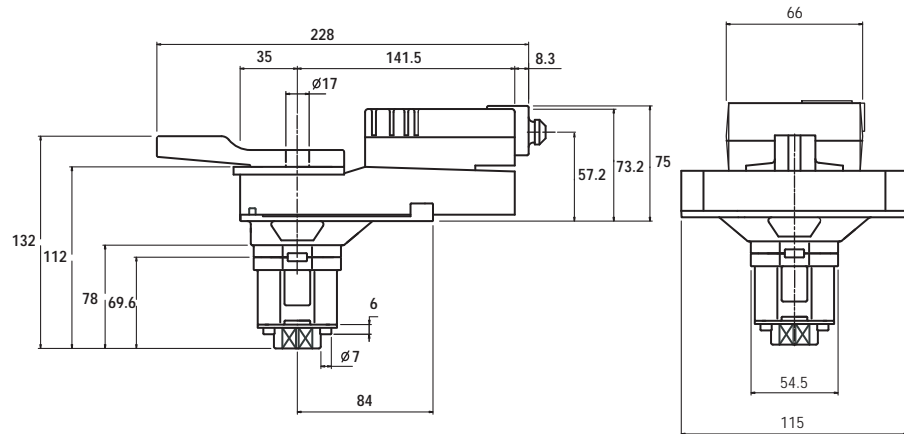
Dimensions: SRU..

Measurement [mm]



Dimensions: GRU..

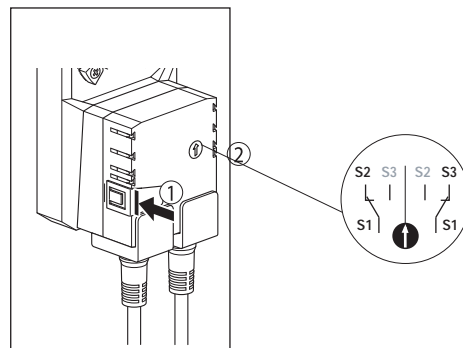
Measurement [mm]



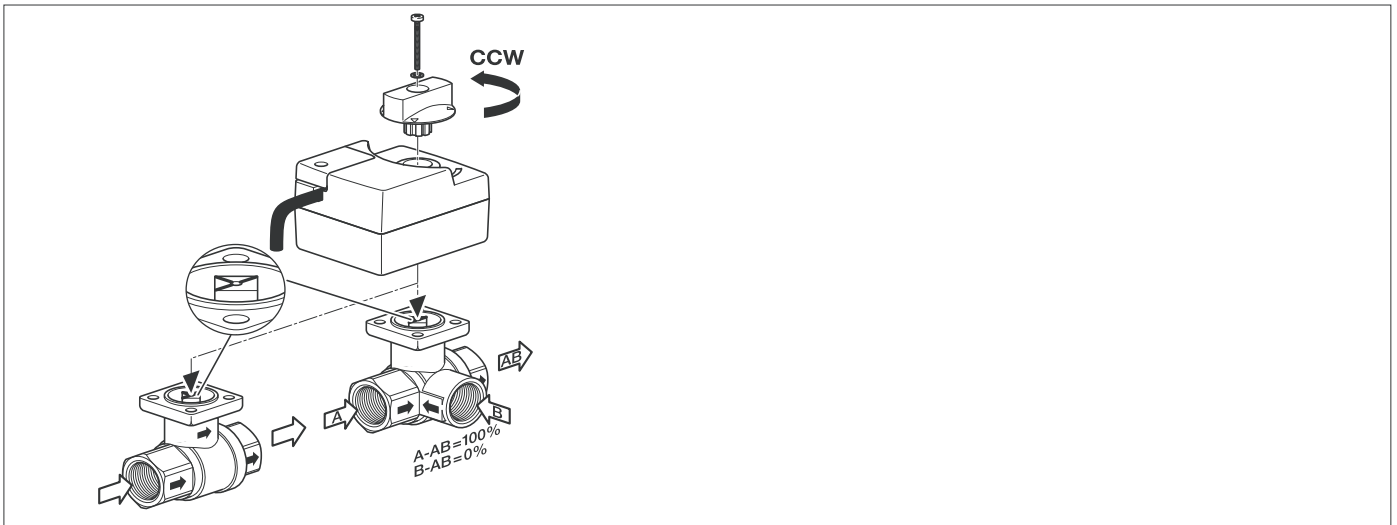
Auxiliary switch adjustment: LRU.. -S/NRU.. -S/SRU.. -S

1. Press the pushbutton, manually operate the universal clamp to desired switch position.
2. Turn switch pointer to the middle line.
3. When actuator moves clockwise(counter-clockwise) to switch position, switch indicator passes counter-clockwise(clockwise) the middle line, the contact between S1 and S3 is broken (made) and the contact between S1 and S2 is made (broken).

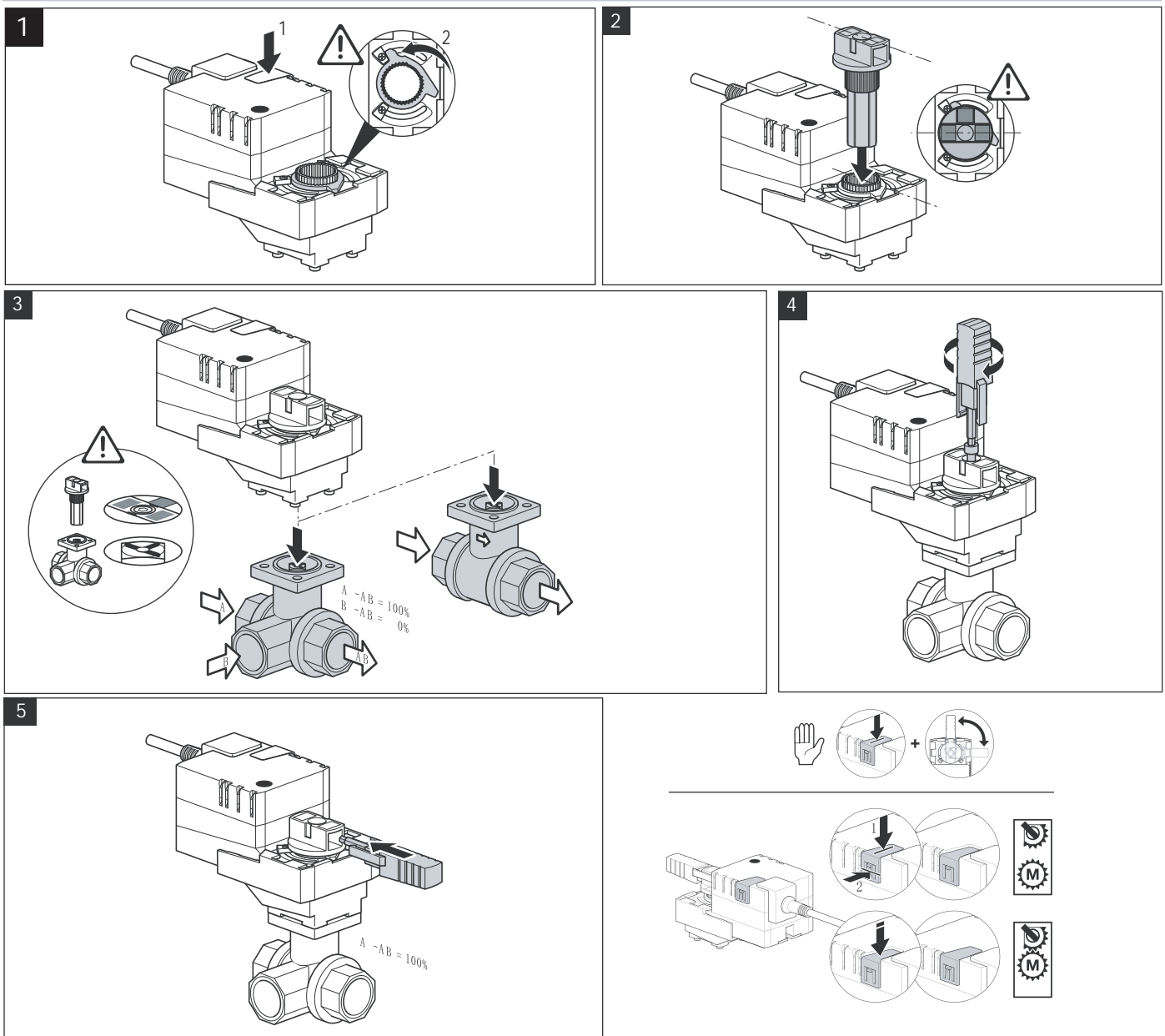
Note: The switching point should be about 5° from the mechanical end stops (1 short step on the scale).



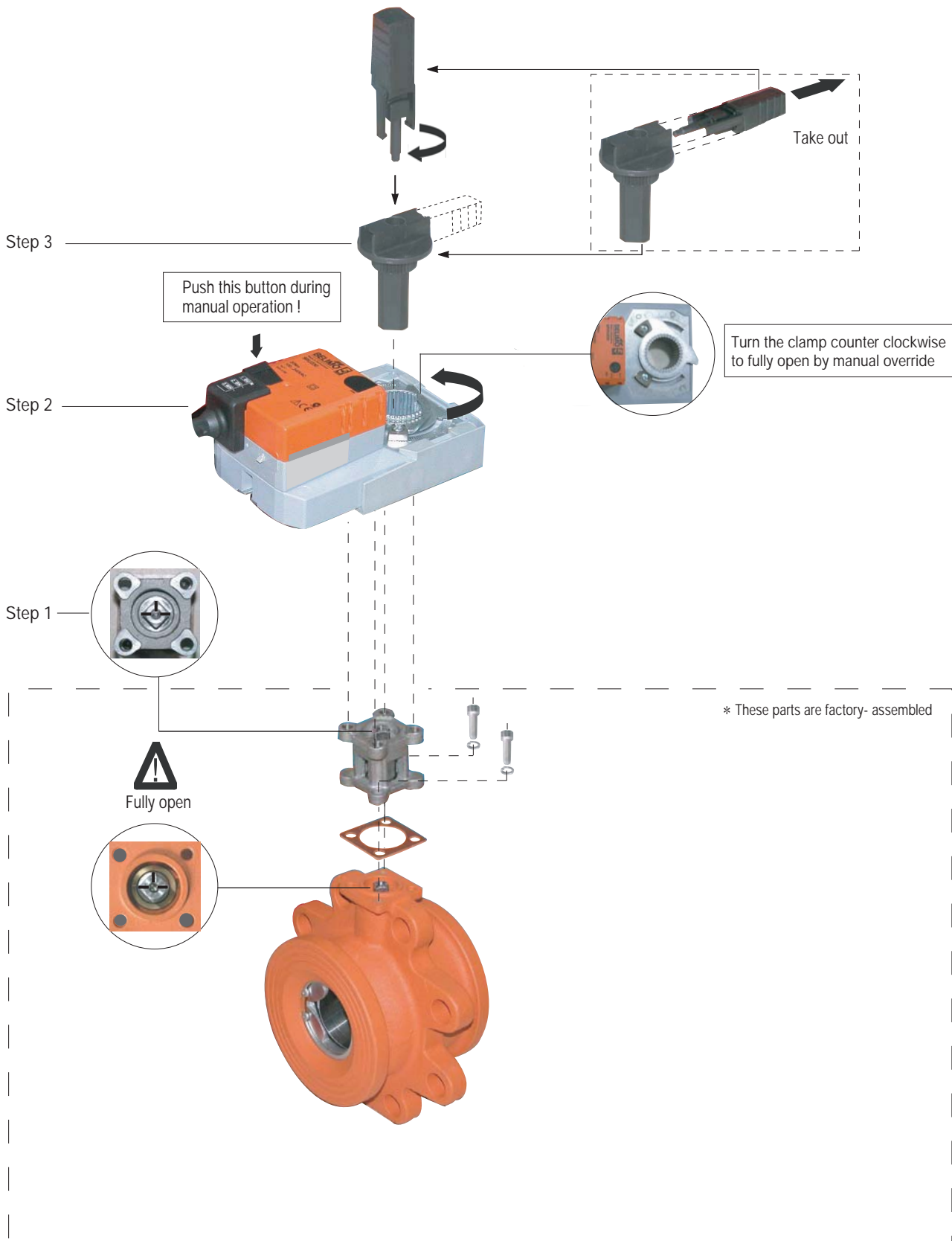
Installation procedures: TR..



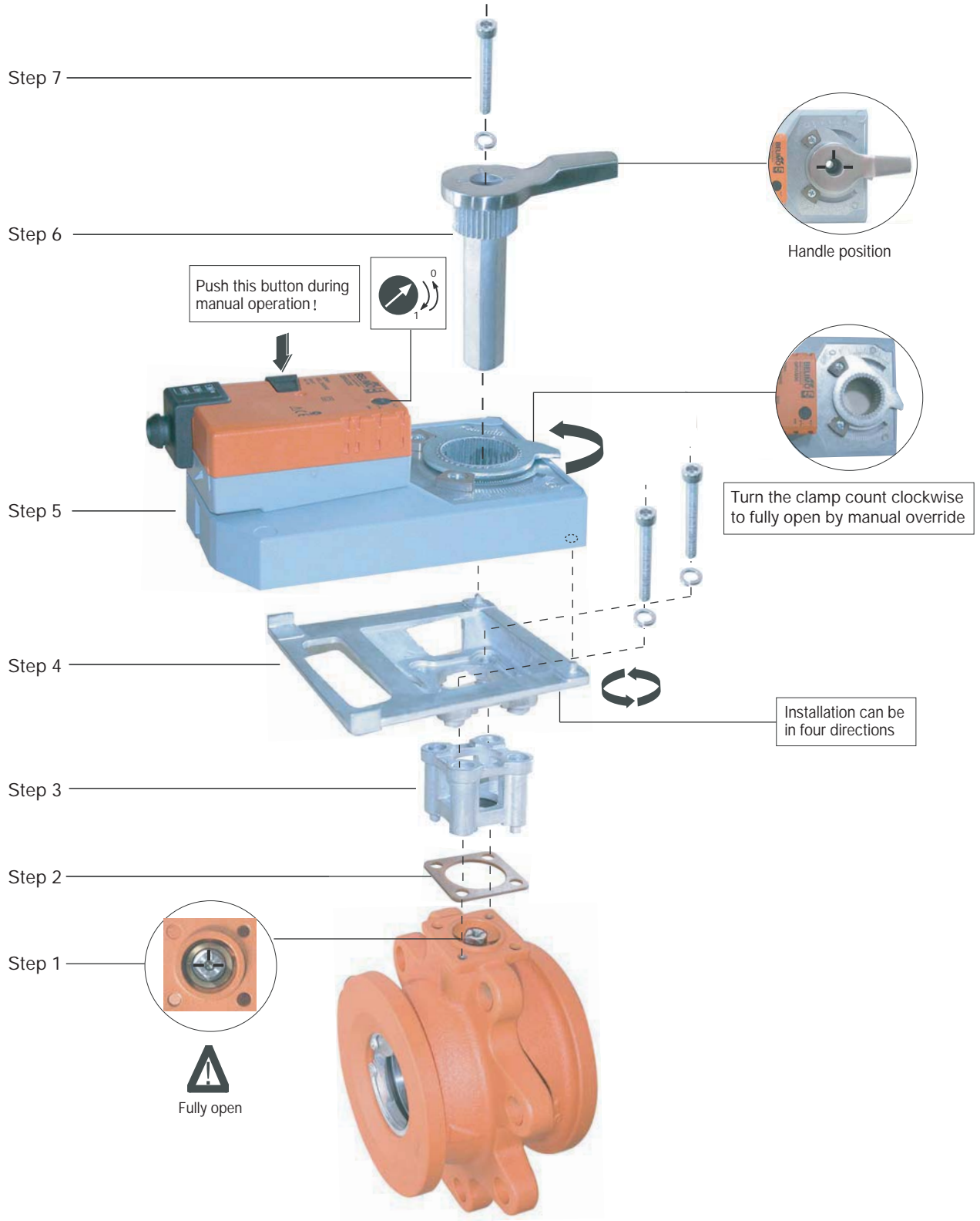
Installation procedures: LRU../NRU/SRU.. (DN15...50)



Installation procedure: SRU.. + DN65...80 CCV



Installation procedure: GRU.. + DN100...150 CCV



Subject to technical changes

- Spring return rotary actuators: for 2 way ball valves DN 15...25
for 3 way ball valves DN 15...20
- Torque: 2 Nm
- Modulating control TRF24-SR (AC/DC 24 V)
- Floating (3-point) control TRF24-2 (AC/DC 24 V)
- Open/Close control TRF24(-S) (AC/DC 24 V)
TRF230(-S) (AC 100...240V)



Technical data

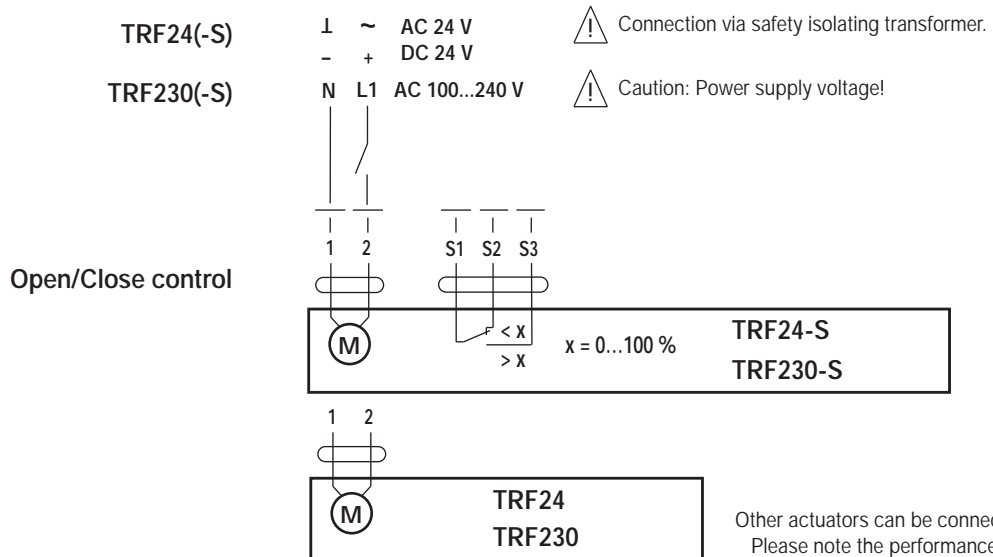
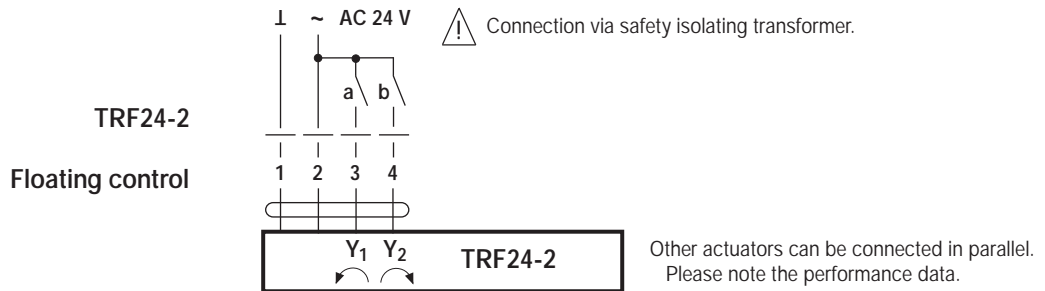
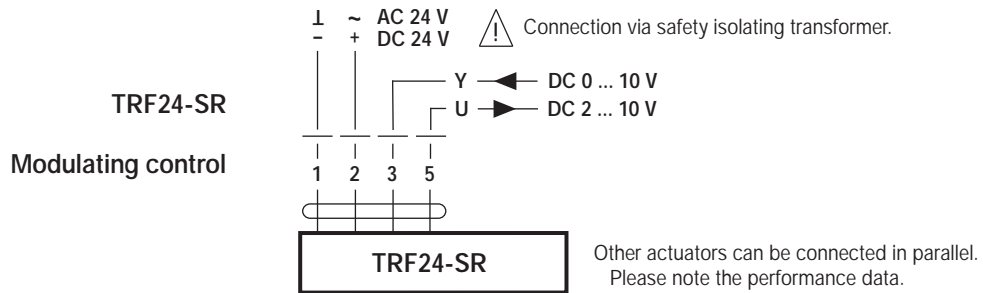
Basic technical data		Connection	1m, 0.75mm ²
		Torque	Motor: 2 Nm; Spring return: 2 Nm
		Angle of rotation	95°
		Position indication	Mechanical
		Degree of protection	IP42
		EMC	CE according to 89/336/EEC
		Ambient temperature	-5... +50°C
		Non-operating temperature	-5... +80°C
		Temperature of medium	-5... +100°C
		Humidity test	To EN 60730-1
		Maintenance	Maintenance-free
TRF24-SR	Power supply range	AC 19.2... 28.8 V; DC 21.6... 28.8 V	
	Power consumption	2.5 W @ running / 1 W @ holding	
	Sound power level	Motor: Max. 45 dB (A), Spring return: 62 dB (A)	
	Transformer sizing	4 VA	
	Control signal	DC2(0)...10 V @ 100 kΩ input impedance	
	Feedback signal	DC2...10 V	
	Direction of rotation	Motor: Reversible with L/R switch; Spring return: reversible by mounting L/R	
	Protection class	III (safety low voltage)	
	Running time	Motor: 90s; spring return: < 25s (-5... +50°C) / Max. 60s (-30°C)	
	Weight	0.6 Kg	
TRF24-2	Power supply range	AC 19.2... 28.8 V; DC 21.6... 28.8 V	
	Power consumption	2.5 W @ running / 1 W @ holding	
	Sound power level	Motor: Max. 45 dB (A), Spring return: 62 dB (A)	
	Transformer sizing	4 VA	
	Direction of rotation	Motor: Reversible with L/R switch; Spring return: reversible by mounting L/R	
	Protection class	III (safety low voltage)	
	Running time	Motor: 90s; spring return: < 25s (-5... +50°C) / Max. 60s (-30°C)	
TRF24(-S)	Weight	0.6 Kg	
	Power supply range	AC 19.2... 28.8 V; DC 21.6... 28.8 V	
	Power consumption	2.5 W @ running / 1.5 W @ holding	
	Sound power level	Max. 45 dB (A)*	
	Transformer sizing	5 VA	
	Direction of rotation	Spring return reversible by mounting L/R	
	Auxiliary switch (TRF24-S)	1 X SPDT, 1 mA ...3(0.5) A, AC 250 V <input type="checkbox"/> , 0... 100% adjustable	
	Protection class	III (safety low voltage)	
	Running time	Motor: 40... 75s; spring return: < 75s*	
	Weight	0.6 Kg	
TRF230(-S)	Power supply range	AC 85 ... 265 V	
	Power consumption	2.5 W @ running / 1.5 W @ holding	
	Sound power level	Max. 45 dB (A)*	
	Transformer sizing	5 VA	
	Direction of rotation	Spring return reversible by mounting L/R	
	Low voltage directive	CE according to 73/23/EEC	
	Auxiliary switch (TRF230-S)	1 X SPDT, 1 mA ...3(0.5) A, AC 250 V <input type="checkbox"/> , 0... 100% adjustable	
	Protection class	II (Totally insulated) <input type="checkbox"/>	
	Running time	Motor: 40... 75s; spring return: < 75s*	
	Weight	0.6 Kg	

* Change to low noise version since 01. Mar. 2008

Product features

- | | |
|----------------------------------|--|
| Simple direct mounting | Simple direct mounting on the ball valve using only one screw. |
| Manual operation | No manual operation. |
| High function reliability | The actuator is overload-proof, needs no limit switches, stops automatically at the end stops. |

Wiring



- Spring return rotary actuators: for 2 way ball valves DN 32...40
for 3 way ball valves DN 25...32
- Torque: 4 Nm
- Modulating control LF24-SR (AC/DC 24 V)
- Floating control LF24-3 (AC/DC 24 V)
- Open/Close control LRF24, LRF24-S (AC/DC 24 V)
LRF230, LRF230-S (AC 230 V)



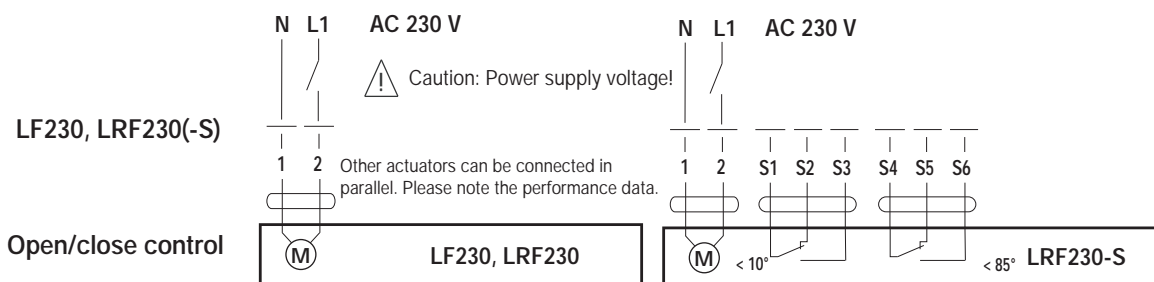
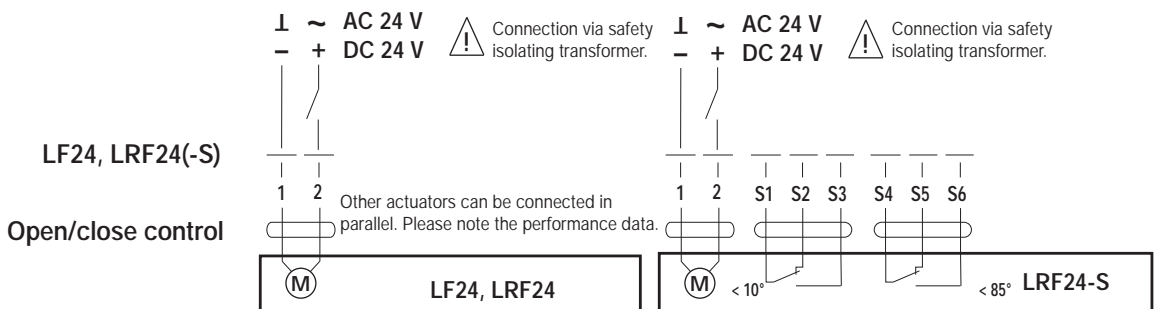
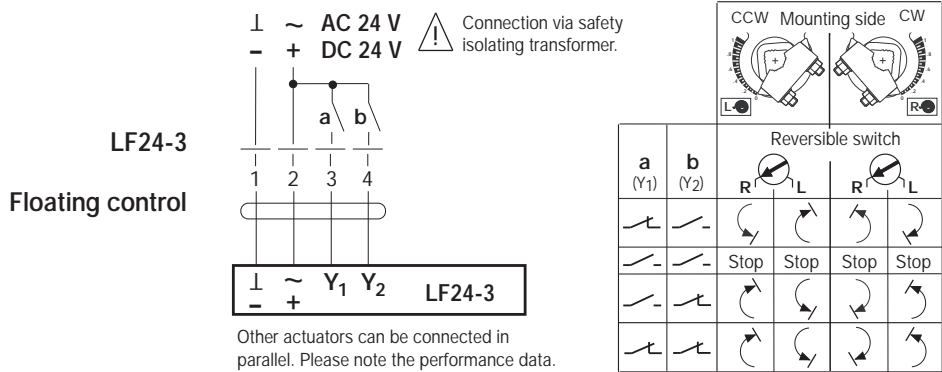
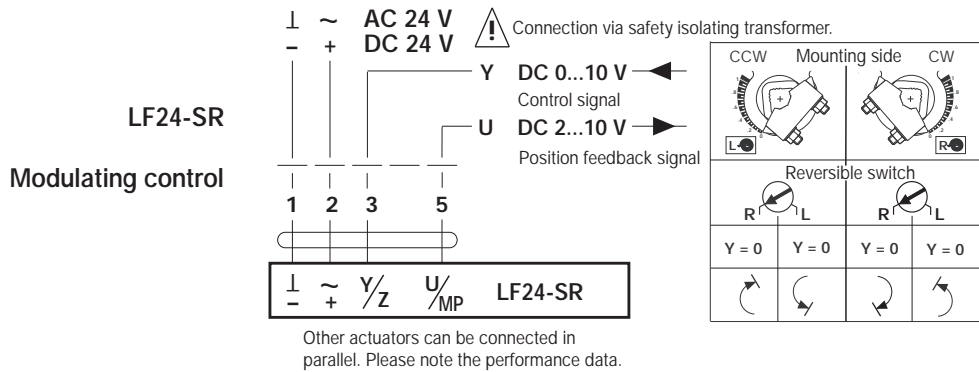
Technical data

Basic technical data	Connection cable	1 m, 0.75 mm ²
	Torque	Motor: 4 Nm; Spring return: 4 Nm
	Angle of rotation	95°
	Sound power level	Motor: Max. 50 dB (A), Spring return: 62 dB (A)
	Position indication	Mechanical
	Degree of protection	IP54
	EMC	CE according to 89/336/EEC
	Ambient temperature	-5 ... +50°C
	Non-operating temperature	-5 ... +80°C
	Temperature of medium	-5 ... +100°C
	Humidity test	To EN 60730-1
	Maintenance	Maintenance-free
	Manual operation LRF24(-S), LRF230(-S)	By manual override key
	Lingkage	Lingkage included in LRF..
LF24-SR	Power supply range	AC 19.2... 28.8 V; DC 21.6... 28.8 V
	Power consumption	2.5 W @ running / 1 W @ holding
	Transformer sizing	5 VA
	Control signal	0...10 VDC @ 100kΩ input impedance
	Operating range	2...10 VDC
	Position feedback	2...10 VDC
	Direction of rotation	Motor: Reversible by L/R switch; Spring return: reversible by mounting L/R
	Protection class	III (safety low voltage)
	Running time	Motor: < 150 s; spring return: ~ 20 s (-5... +50°C) / Max. 60 s (-30°C)
	Weight	1.4 Kg
LF24-3	Power supply range	AC 19.2... 28.8 V; DC 21.6... 28.8 V
	Power consumption	2.5 W @ running / 1 W @ holding
	Transformer sizing	5 VA
	Direction of rotation	Motor: Reversible by L/R switch; Spring return: reversible by mounting L/R
	Protection class	III (safety low voltage)
	Running time	Motor: 40... 75 s; Spring return: ~ 20 s (-5... +50°C) / Max. 60 s (-30°C)
LRF24(-S)	Power supply range	AC 19.2... 28.8 V; DC 21.6... 28.8 V
	Power consumption	5 W @ running / 2.5 W @ holding
	Transformer sizing	7 VA
	Direction of rotation	Spring return: reversible by mounting L/R
	Auxiliary switch (LRF24-S)	2 X SPDT, 1 mA ...3(0.5) A, AC 250 V, fixed at 10° ↙, 85° ↘
	Protection class	III (safety low voltage)
	Running time	Motor: 40... 75 s; Spring return: ~ 20 s (-5... +50°C) / Max. 60 s (-30°C)
LRF230(-S)	Power supply range	AC 198 ... 264 V
	Power consumption	5 W @ running / 3 W @ holding
	Transformer sizing	7 VA
	Direction of rotation	Spring return: reversible by mounting L/R
	Auxiliary switch (LRF230-S)	2 X SPDT, 1 mA ...3(0.5) A, AC 250 V, fixed at 10° ↙, 85° ↘
	Low voltage directive	CE according to 73/23/EEC
	Protection class	II (Totally insulated) <input type="checkbox"/>
	Running time	Motor: 40... 75 s; Spring return: ~ 20 s (-5... +50°C) / Max. 60 s (-30°C)
	Weight	1.55 ... 1.68 Kg

Product features

- Simple direct mounting** Simple direct mounting on the ball valve using only one screw.
- Manual operation** Only LRF24-S and LRF230-S have manual operation with integral position stop.
- High function reliability** The actuator is overload-proof, needs no limit switches, stops automatically at the end stops.

Wiring



- Spring return rotary actuators: for 2 way ball valves DN 50... 80*
for 3 way ball valves DN 32... 50
- Torque: 15 Nm
- Modulating control **AFR24-SR , ARF24-SR-S(AC/DC 24 V)**
- Floating control **AFR24-3(-S) US (AC/DC 24 V)**
- Open/Close control **AFR24(-S), ARF24-S (AC/DC 24 V)**
 AFR230(-S), ARF230-S (AC 230 V)



* DN80(Differential Pressure 400 kPa)

Technical data

Basic technical data	Connection cable	1 m, 0.75mm ²
	Torque	Motor: 15 Nm; Spring return: 15 Nm
	Angle of rotation	95°
	Sound power level	Motor: Max. 45 dB (A), Spring return: 62 dB (A)
	Position indication	Mechanical
	Degree of protection	IP54
	EMC	CE according to 89/336/EEC
	Ambient temperature	-5... +50°C
	Non-operating temperature	-5... +80°C
	Temperature of medium	-5... +100°C
	Humidity test	To EN 60730-1
	Maintenance	Maintenance-free
	Manual operation	By manual override key
	ARF...	
Linkage	Linkage included in ARF...	
AFR24-SR ARF24-SR-S	Power supply range	AC 19.2... 28.8 V; DC 21.6... 28.8 V
	Power consumption	6 W @ running / 2.5 W @ holding
	Transformer sizing	10 VA
	Control signal	DC2(0)...10 V @ 100kΩ input impedance
	Position feedback	DC2...10 V
	Direction of rotation	Motor: Reversible by L/R switch; Spring return: reversible by mounting L/R
	Auxiliary ARF24-SR-S	2 x SPDT, 6 (3) A, AC 250 V <input type="checkbox"/> Switching points: 10% \leftarrow fixed, 28 ... 94% \leftarrow adjustable
	Protection class	III (safety low voltage)
	Running time	Motor: ~150s; spring return: ~ 20s (-5... +50°C) / Max. 60s (-30°C)
	Power supply range	2.7 Kg
AFR24-3(-S) US	Power consumption	AC 19.2... 28.8 V; DC 21.6... 28.8 V
	Weight	6 W @ running / 2 W @ holding
	Transformer sizing	10 VA
	Direction of rotation	Motor: Reversible by L/R switch; Spring return: reversible by mounting L/R
	Auxiliary switch AFR24-3-S US	1 X SPDT, 1 mA ...3(0.5) A, AC 250 V <input type="checkbox"/> , 0... 100% adjustable
	Protection class	III (safety low voltage)
	Running time	Motor: 150s; Spring return: ~20s (-5... +50°C) / Max. 60s (-30°C)
	Weight	3 Kg
AFR24(-S) ARF24-S	Power supply range	AC 19.2... 28.8 V; DC 21.6... 28.8 V
	Power consumption	5 W @ running / 1.5 W @ holding
	Transformer sizing	10 VA
	Direction of rotation	Spring return: reversible by mounting L/R
	Auxiliary switch AFR24-S	1 x SPDT, 1 mA ...3(0.5) A, AC 250 V <input type="checkbox"/> , 0... 89% adjustable
	Auxiliary switch ARF24-S	2 x SPDT, 6 (3) A, AC 250 V <input type="checkbox"/> Switching points: 10% \leftarrow fixed, 28 ... 94% \leftarrow adjustable
	Protection class	III (safety low voltage)
	Running time	Motor: 150s; Spring return: ~ 20s (5... +50°C) / Max. 60 s (-30°C)
AFR230(-S) ARF230-S	Power supply range	AC 198 ... 264 V
	Power consumption	6.5 W @ running / 2.5 W @ holding
	Transformer sizing	11 VA
	Direction of rotation	Spring return: reversible by mounting L/R
	Auxiliary switch AFR230-S	1 X SPDT, 1 mA ...3(0.5) A, AC 250 V <input type="checkbox"/> , 0... 89% adjustable
	Auxiliary switch ARF230-S	2 X SPDT, 6 (3) A, AC 250 V <input type="checkbox"/> Switching points: 10% \leftarrow fixed, 28 ... 94% \leftarrow adjustable
	Low voltage directive	CE according to 73/23/EEC
	Protection class	II (Totally insulated) <input type="checkbox"/>
Running time	Motor: 150s; Spring return: ~ 20s (-5... +50°C) / Max. 60s (-30°C)	
Weight	3 Kg	

Product features

- Simple direct mounting** Simple direct mounting on the ball valve using only one screw.
- Manual operation** ARF.. with manual operation.
- High function reliability** The actuator is overload-proof, needs no limit switches, stops automatically at the end stops.

Wiring

AFR24-SR
Modulating control

\perp \sim AC 24 V
 $-$ $+$ DC 24 V

\triangle Connection via safety isolating transformer.

Y DC 0...10 V ←
 Control signal

U DC 2...10 V →
 Position feedback signal

Other actuators can be connected in parallel. Please note the performance data.

AFR24-SR

Reversible switch			
R	L	R	L
Y = 0	Y = 0	Y = 0	Y = 0

AFR24-3(-S) US
Floating control

\perp \sim AC 24 V
 $-$ $+$ DC 24 V

\triangle Connection via safety isolating transformer.

AF24-3-S US
 Auxiliary switch

a, b

S1 S2 S3

Other actuators can be connected in parallel. Please note the performance data.

AFR24-3(-S) US S = 0° ... 85°

Switch				Reversible switch			
a (3)	b (4)	R	L	R	L	R	L
		Stop	Stop	Stop	Stop	Stop	Stop

AFR24(-S)
Open/close control

\perp \sim AC 24 V
 $-$ $+$ DC 24 V

\triangle Connection via safety isolating transformer.

S1 S2 S3

Other actuators can be connected in parallel. Please note the performance data.

AFR24-S S = 0...89% \triangleleft

ARF24-S
Open/close control

S1 S2 S3 S4 S5 S6

Other actuators can be connected in parallel. Please note the performance data.

ARF24-S A = 10% \triangleleft > A > B B = 28...94% \triangleleft

AFR230(-S)
Open/close control

N L1 AC 230 V

\triangle Caution: Power supply voltage!

S1 S2 S3

Other actuators can be connected in parallel. Please note the performance data.

AFR230-S S = 0...89% \triangleleft

ARF230-S
Open/close control

S1 S2 S3 S4 S5 S6

Other actuators can be connected in parallel. Please note the performance data.

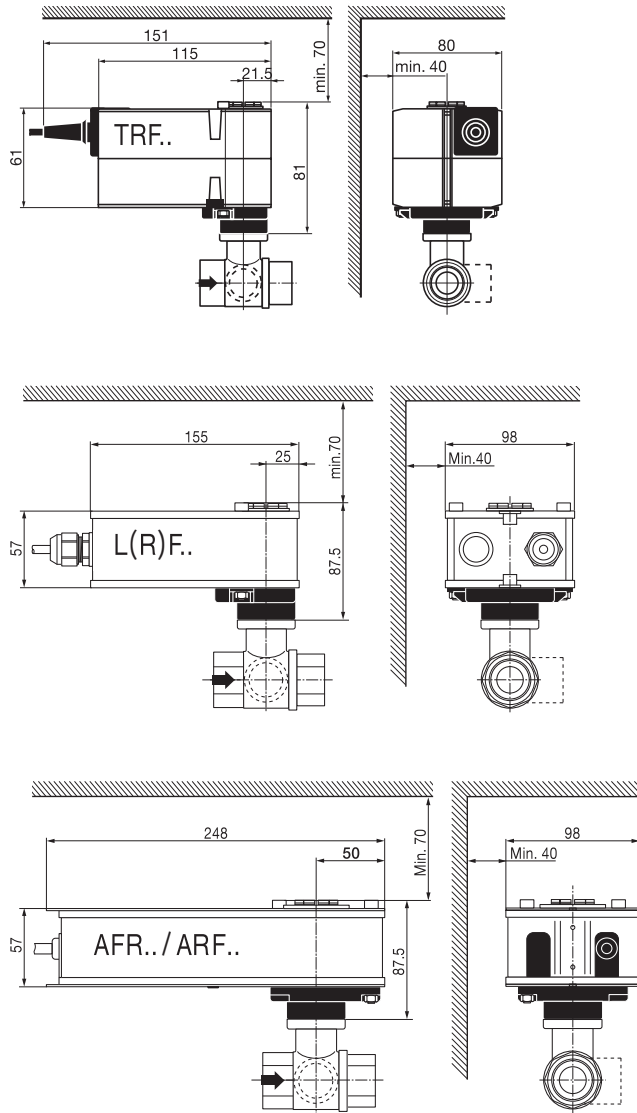
ARF230-S A = 10% \triangleleft > A > B B = 28...94% \triangleleft

AFR230

Other actuators can be connected in parallel. Please note the performance data.

Dimensions

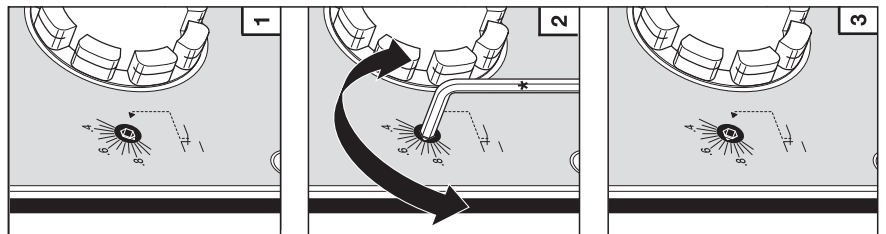
Measurement [mm]



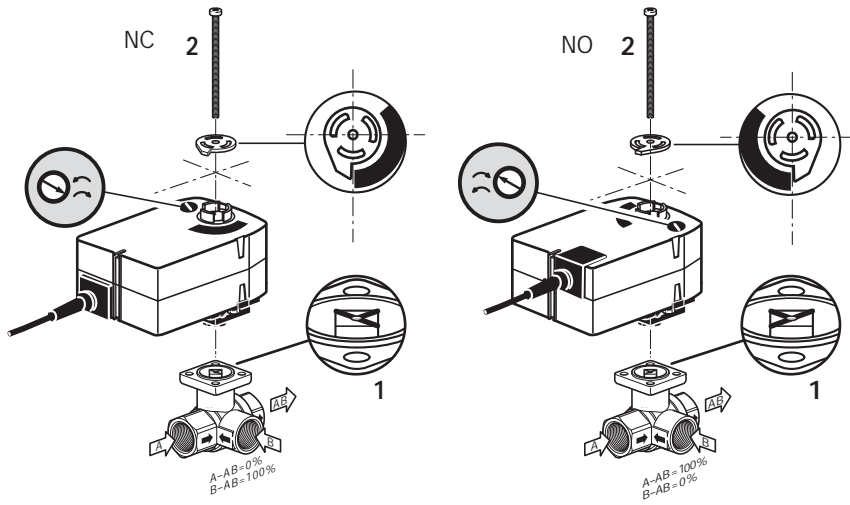
Adjusting A .. -S auxiliary switches

Initial situation: Actuator in safety position

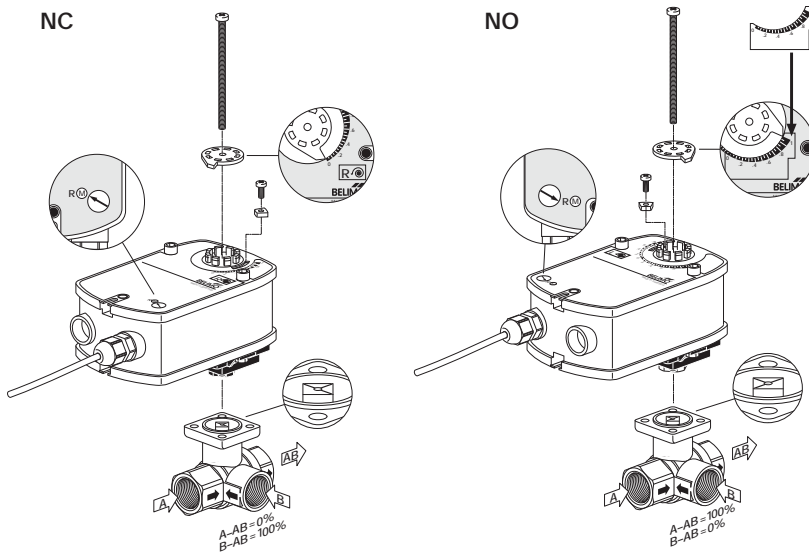
3 mm (1/8") hexagonal key not included with the actuator



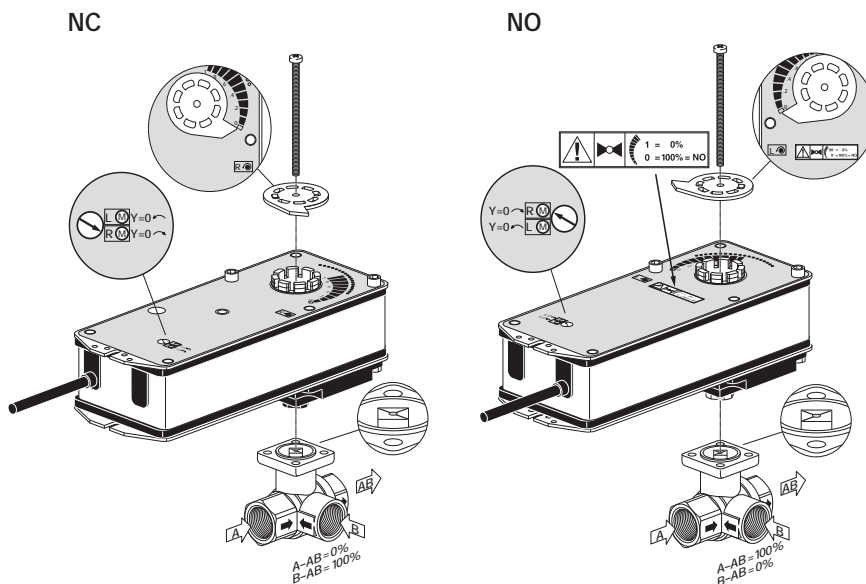
Installation procedures: TRF..



Installation procedures: LF.. /LRF..



Installation procedures: AFR.. /ARF..



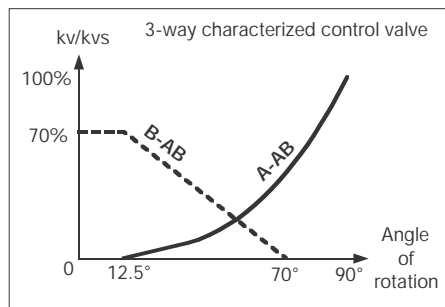
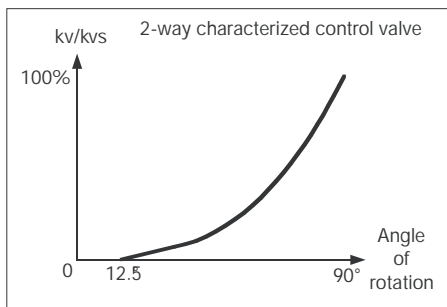
Standard directions of flow

 characterized control valves 	 Open	 Closed	2-way R2..AC, R6..AC
	 A-AB open	 A-AB closed	3-way R3..
 Open/Close ball valves 	 Open	 Closed	2-way R2..AC, R6..AC
	 A-AB open	 A-AB closed	3-way R3..
Spindle position for corresponding valve flow			For 2-way and 3-way ball valves
Actuator position corresponding to ball valve flow direction			

Flow characteristics of characterized control valves

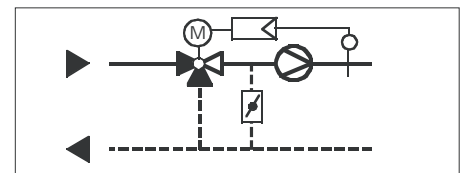
Between 0° and 12.5° angle of rotation, 2-way and 3-way characterized control valves function as **tight-sealing** shut-off devices. Between 12.5° and 90° angle of rotation, control ball valves

function as regulating devices. In the case of the 3-way characterized control valve, the bypass flow rate (B-AB) is 70% of the nominal flow rate (A-AB).



Note:

Due to its spherical design, the 3-way characterized control valve is of only limited application for conventional supply temperature control systems. Therefore, it is recommended that supply temperature control systems be of the double-mixing circuit type (see diagram below). There are no restrictions when using mixing-type circuits for air preheaters and for injection circuits.



Mounting, installation and commissioning

Separate supply

When ball valve and rotary actuator are supplied separately, they can be assembled on-site.

No special tools are needed for assembly, and instructions will be found packed with the valve and actuator.

Commissioning must not be carried out until the ball valve and rotary actuator have been assembled in accordance with the instructions.

Recommended mounting positions

The ball valves may be mounted either vertical (Fig. 1) or horizontal (Fig. 2). However, mounting the ball valves with the spindle pointing downwards, i.e. upside down (Fig.3), is not recommended.

Fig. 1

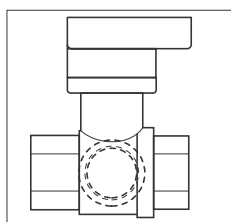


Fig. 2

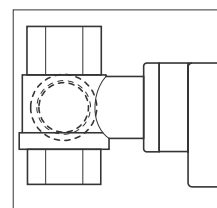
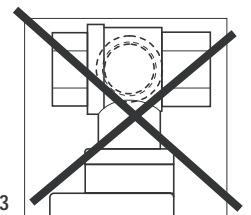


Fig. 3



Maintenance

- Ball valves and rotary actuators are both maintenance free.
- Before any kind of service work is carried out on control devices of this type, it is essential to isolate the actuator from the power supply (by unplugging the power lead). Any pumps in the particular part of the piping system concerned must also be switched off and the appropriate isolating fittings closed (also allow everything

to cool down first if necessary and reduce the pressure in the system to atmospheric).

- The systems must not be returned to service until the ball valve and the actuator have been properly re-installed and connected and the pipework has been refilled in the proper manner.

Subsequent removal

In the case of applications where subsequent removal of ball valve will be necessary, it is

advisable to make appropriate preparations before hand.

Disposal

When a control device (ball valve and actuator) has come to the end of its service life, the two parts must be dismantled and sorted into different materials before being disposed of.

Project design

Installing R2.. AC/R6.. AC CCV, 2-way

The R2.. characterized control valve is a throttling device, installed in the return line of systems in order to ensure less thermal stress on the seals of the device. The direction of flow specified must be adhered to.

Installing R3.. CCV, 3-way

The R3.. characterized control valve is a mixing device. Whatever type of installation is employed, it is essential to adhere to the directions of flow specified. Whether a valve is installed in the supply or the return of a

system depends on the type of hydraulic circuit being employed. No balancing valve is needed in the bypass line of a diverting circuit because of the reduced flow in the bypass.

Water quality requirements

The water quality requirements specified in VDI 2035 must be adhered to.

Dirt filters recommended

Characterized control valves are relatively sensitive control devices, and in order to ensure that they give long service life, the fitting of dirt filters is recommended.

Sufficient isolating valves

It is essential to ensure that sufficient isolating valves are provided.

Correct rating and sizing

In order to ensure that the control device (characterized control valve and rotary actuator) achieves a long service life, it is essential for the valve to be rated for the correct differential pressure Δp_{v100} across the valve, i.e. with adequate valve authority ($P_v > 0.5$). The differential pressure Δp_{v100} depends on the type of hydraulic circuit in which the valve is being used.

Differential pressures Δp_{v100} with characterized control valves full open

		Δp_{v100} R2.. AC/R6.. AC characterized control valves, 2-way	Δp_{v100} R3.. characterized control valves, 3-way			
		Throttling circuit $\Delta p_{v100} > \Delta p_{VR} / 2$ Typical values: 15 kPa < Δp_{v100} < 150 kPa	Injection circuit with throttling device $\Delta p_{v100} > \Delta p_{VR} / 2$ Typical values: 10 kPa < Δp_{v100} < 100 kPa	Diverter circuit $\Delta p_{v100} > \Delta p_{MV}$ Typical values: 5 kPa < Δp_{v100} < 50 kPa	Mixing circuit $\Delta p_{v100} > \Delta p_{MV}$ Typical values: $\Delta p_{v100} > 3$ kPa (unpressurised manifold). For other mixing circuits: 3 kPa < Δp_{v100} < 30 kPa	Injection circuit with 3-way characterized control valve $\Delta p_{MV1} + \Delta p_{MV2} \approx 0$ Typical values: $\Delta p_{v100} > 3$ kPa
Geographic presentation						
Synoptic presentation						

Legend

					VL — Supply RL — Return
Δp_{VR} Differential pressure across specified section at rated load		Δp_{MV} Differential pressure across variable-flow section at rated load (e.g. heat exchanger)		Note: Dirt traps and isolating fittings are not shown.	