BELIMO

Technical data sheet SY3-24-MF-T

Multifunctional rotary actuator for butterfly valves
- **Torque 150 Nm**
- **Nominal voltage 24 V**
- **Control: configurable**
- **Position feedback: configurable**
- **2 Auxiliary switches**
- **State at loss of signal: closed**

Technical data

Electrical data				
Nominal voltage		AC 24 V, 50/60 Hz AC/DC 24 V, 50/60 Hz	For 3-lead connection For 4-lead connection	
Power supply range		AC/DC 21.6 ... 26.4 V		
Power consumption		70 W @ nominal torque		
Current consumption		3.0 A		
Auxiliary switch		2 x EPU, 5 A, AC 230 V II ⏚ Switching points: 90°∢		
Connection		Terminals, 2 x 1.5 mm² or 1 x 2.5 mm²		
Parallel connection	Supply voltage	Not possible		
	Controller signals	Only for 4-lead connection possible		
Functional data			**Variable**	**Settings**
Torque (nominal torque)		Min. 150 Nm @ nominal voltage		
Control	Control signal Y	DC 0 ... 10 V, input impedance 100 kΩ	Starting point DC 0.5 ... 30 V	
	Operating range	DC 0.5 ... 10 V	End point DC 2.5 ... 32 V	.....
Control	Control signal Y	4 mA ... 20 mA	Non-variable	
Position feedback	Measuring voltage U_5	DC 0 ... 10 V, max. 0.5 mA	Starting point DC 0.5 ... 8 V	
		DC 2 ... 10 V, max. 0.5 mA	End point DC 2.5 ... 10 V	.....
		4 mA ... 20 mA	Non-variable	
Position accuracy		±5% absolute		
Manual override		Temporary with handwheel (not revolving)		
Angle of rotation		90°∢ (internal limit switch)		
Angle of rotation limiting		MAX (maximum position) = 100% MIN (minimum position) = 0% ZS (intermediate position) = 50%	MAX = (MIN + 32°∢) ... 100% MIN = 0% ... (MAX – 32°∢) ZS = MIN ... MAX	.....
Running time		22 s		
Duty cycle		75% (e.g. 22s / 7s)		
Sound power level		Max. 70 dB (A)		
Position indication		Mechanical (integrated)		
Safety				
Protection class		III Safety extra-low voltage		
Degree of protection		IP67		
EMC		CE according to 2004/108/EC		
Low-voltage directive		CE according to 2006/95/EC		
Certification		Tested in accordance with EN 61000-6-2 : 2005 EN 61000-6-4 : 2007		
Mode of operation		Type 1 (EN 60730-1)		
Rated impulse voltage		500 V (EN 60730-1)		
Control pollution degree		4 (EN 60730-1)		
Ambient temperature		–20 ... +60°C		
Medium temperature		–20 ... +120°C (in the butterfly valve) max. 130°C / 1 h		
Non-operating temperature		–30 ... +80°C		
Ambient humidity		95% r.H., non-condensating (EN 60730-1)		
Maintenance		Maintenance-free		

Technical data *(continued)*

Mechanical data	
Connection flange	ISO 5211 / F07
Housing material	Cast aluminium
Dimensions / Weight	
Dimensions	See «Dimensions» on page 6
Weight	Approx. 11 kg

Safety notes

- **The actuator has been designed for use in stationary heating, ventilation and air conditioning systems and is not allowed to be used outside the specified field of application, especially in aircraft or in any other airborne means of transport.**
- **It may only be installed by suitably trained personnel.**
  Any legal regulations or regulations issued by government agency authorities must be observed during assembly.
- **The device does not contain any parts that can be replaced or repaired by the user.**
- **The device contains electrical and electronic components and is not allowed to be disposed of as household refuse. All locally valid regulations and requirements must be observed.**

Product features

Mode of operation
The actuator is controlled with a standard modulating signal and travels to the position defined by the control signal. The measuring voltage U serves for the electrical display of the actuator position 0 ... 100% and as slave control signal for other actuators.

Parameterisable actuators
Input and output signals and other parameters can be altered with the BELIMO Service Tool, MFT-P.

Simple direct mounting
Simple direct mounting on the butterfly valve. The mounting position in relation to the butterfly valve can be selected in 90° steps.

Manual override
The butterfly valve can be closed (turn clockwise) and opened (turn counterclockwise) with the handwheel. The handwheel does not move while the motor is running.

Internal heating
An internal heater prevents condensation buildup.

High functional reliability
Mechanical stops limit the actuator to –2° and 92°. The internal limit switches interrupt the voltage supply to the motor. In addition, a motor thermostat provides overload protection because at 135°C it interrupts the voltage supply.

Combination butterfly valve actuators
For suitable butterfly valves, their permitted media temperatures and closing pressures are refered to the butterfly valve documentation.

Accessories

	Description
Electrical accessories	PC-Tool MFT-P, beginning with v3.3
Cable	ZK6-GEN
Cable	ZK2-GEN

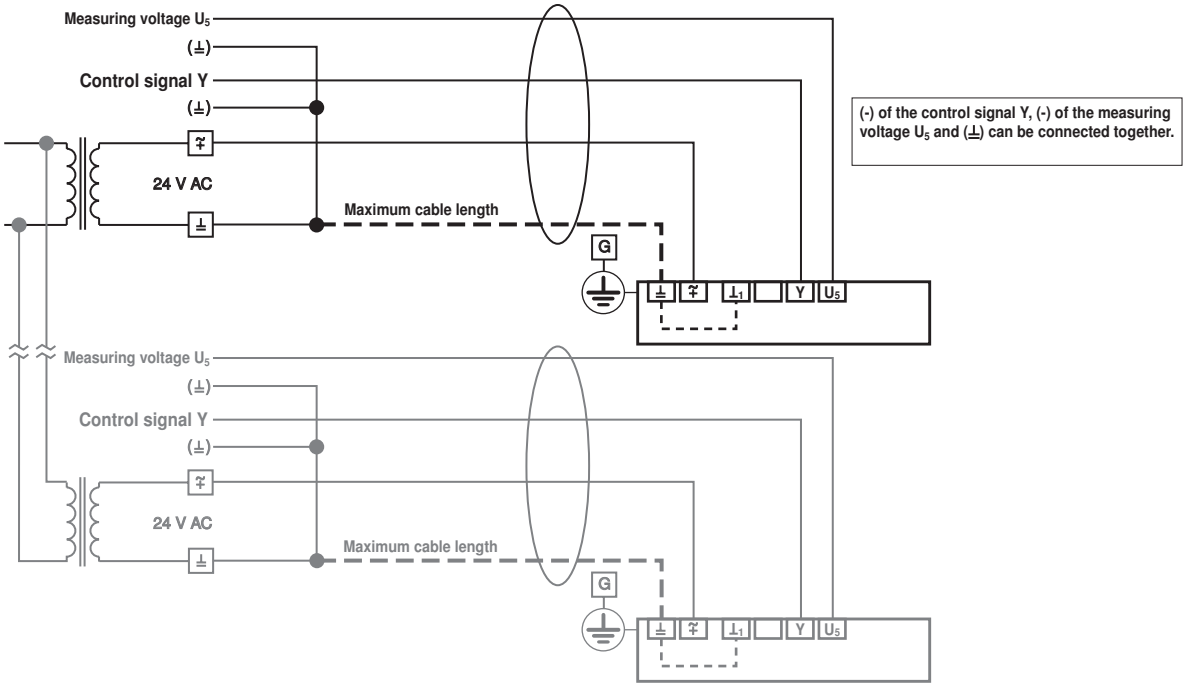
Restrictions for 3-lead (and 4-lead) connector technologies

The following overview shows the differences between the 24 V actuator wiring options.
The same PCB (Print) can be used for both wirings.

	3-lead connection				4-lead connection
Description	Signal and connection to power supply have the same ground connection				Signal and connection to power supply have different ground connections
Supply voltage	AC only				AC / DC
Maximum cable length*	The maximum cable length is defined in the following connection diagram:				
Wire cross-section	0.75 mm²	1.00 mm²	1.50 mm²	2.50 mm²	No limitation
SY 2	12 m	17 m	24 m	43 m	No limitation
SY 3	12 m	17 m	24 m	43 m	No limitation
SY 4	5 m	7 m	10 m	17 m	No limitation
SY 5	5 m	7 m	10 m	17 m	No limitation
Measuring voltage U5	U5 is stable as soon as the actuator stops				No limitation
Control signal mA	Not possible				The ground connection ⏚ must be wired to the actuator with mA control signal

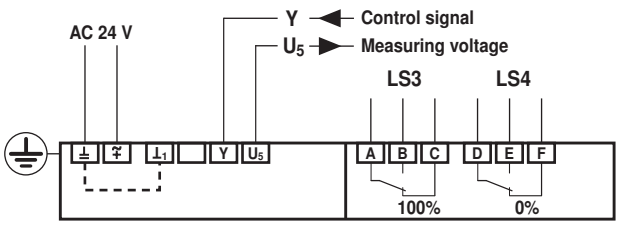
* The limitation regarding cable length is because of the large amounts of current required by the SY actuator.
A high level of current will in turn have an influence on the signals.

3-lead system connection



Electrical installation for 3-lead connection

Wiring diagrams

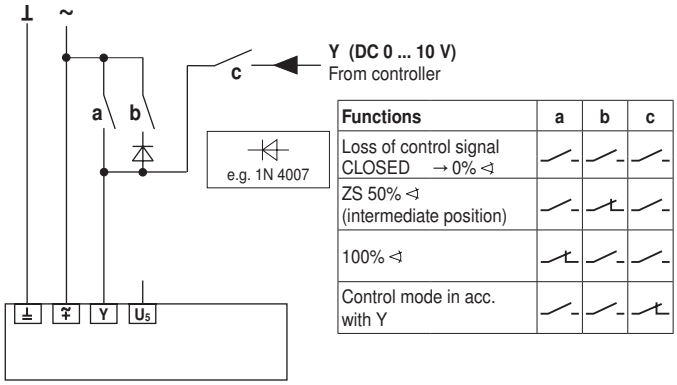


Actuator	Butterfly valve
Y1	A – AB = 100%
Y2	A – AB = 0%

Auxiliary switch	Position	Butterfly valve
LS3	100%	open
LS4	0%	closed

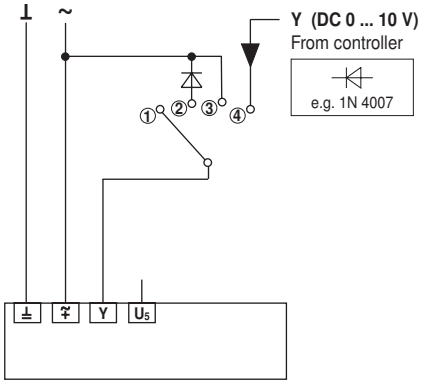
Functions with basic values - 3-lead connection technology

Override control with AC 24 V with relay contacts



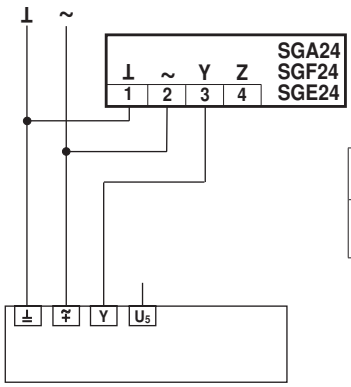
Functions	a	b	c
Loss of control signal CLOSED → 0% ◁			
ZS 50% ◁ (intermediate position)			
100% ◁			
Control mode in acc. with Y			

Override control with AC 24 V with rotary control switch



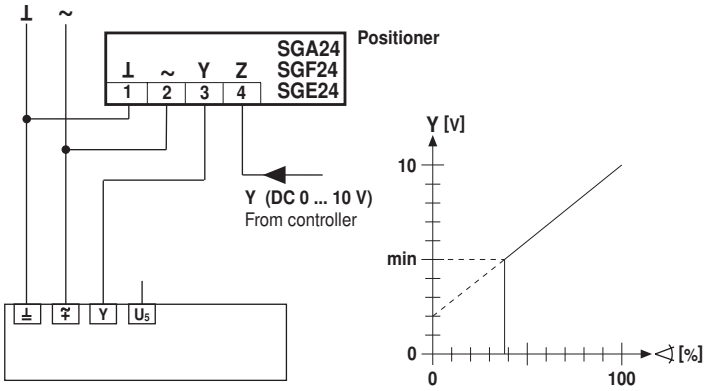
Pos	Functions
1	Loss of control signal CLOSED → 0% ◁
2	ZS 50% ◁ (intermediate position)
3	100% ◁
4	Control mode in acc. with Y

Remote control 0 ... 100%

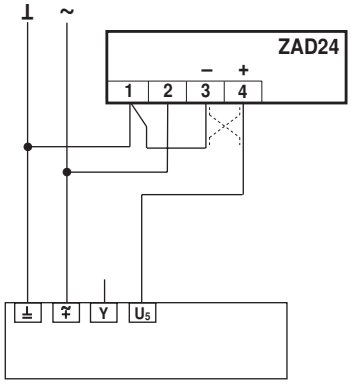


DIP switch on Y2	DIP switch on Y1
Y = 2 V	Y = 2 V

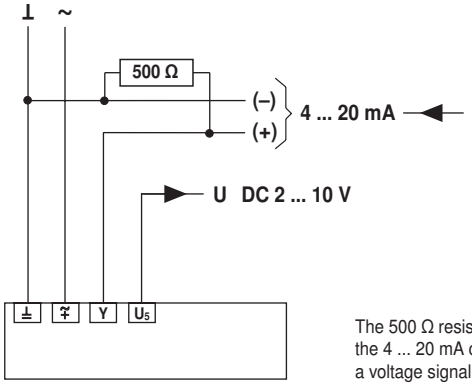
Minimum limit



Master/Slave control (position-dependent)



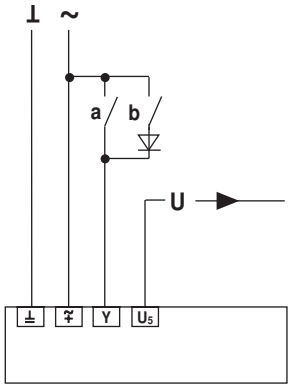
Control with 4 ... 20 mA via external resistance

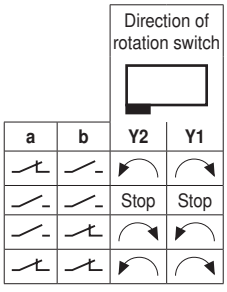


The 500 Ω resistor converts the 4 ... 20 mA current signal to a voltage signal DC 2 ... 10 V

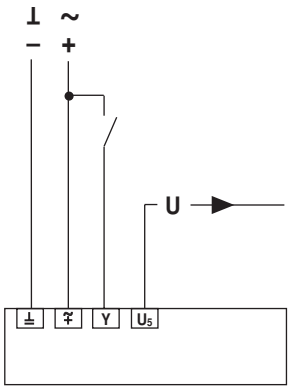
Functions for MF actuators with specific parameters - 3-lead connection technology

3-point control





Open-close control



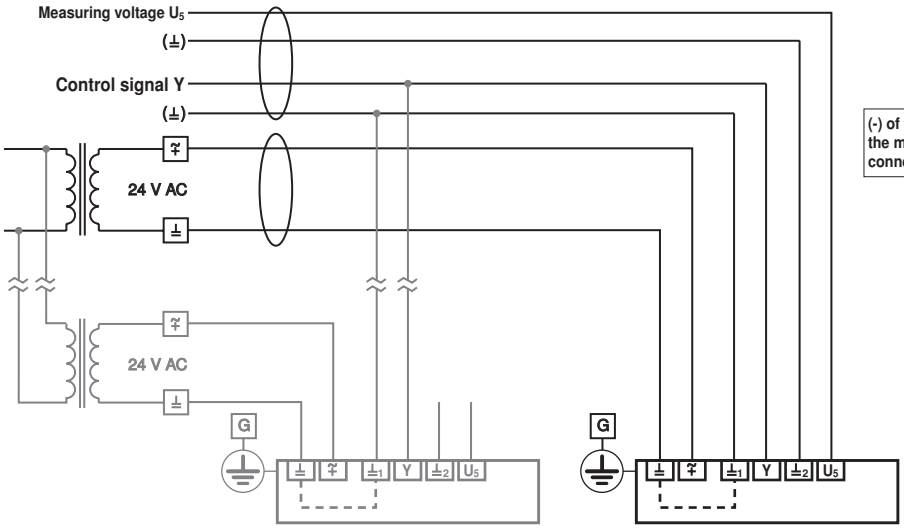
Restrictions for 4-lead (and 3-lead) connector technologies

The following overview shows the differences between the 24 V actuator wiring options.
The same PCB (Print) can be used for both wirings.

	3-lead connection				4-lead connection
Description	Signal and connection to power supply have the same ground connection				Signal and connection to power supply have different ground connections
Supply voltage	AC only				AC / DC
Maximum cable length*	The maximum cable length is defined in the following connection diagram:				
Wire cross-section	0.75 mm²	1.00 mm²	1.50 mm²	2.50 mm²	No limitation
SY 2	12 m	17 m	24 m	43 m	No limitation
SY 3	12 m	17 m	24 m	43 m	No limitation
SY 4	5 m	7 m	10 m	17 m	No limitation
SY 5	5 m	7 m	10 m	17 m	No limitation
Measuring voltage U5	U5 is stable as soon as the actuator stops				No limitation
Control signal mA	Not possible				The ground connection ⏚ must be wired to the actuator with mA control signal

* The limitation regarding cable length is because of the large amounts of current required by the SY actuator.
A high level of current will in turn have an influence on the signals.

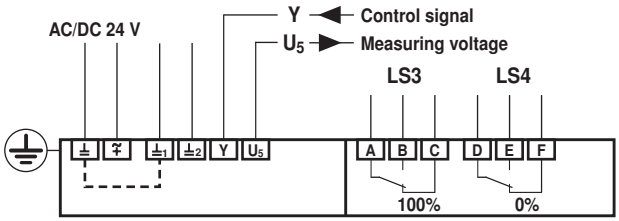
4-lead system connection



(-) of the control signal Y and (-) of the measuring voltage U_5 can also be connected together.

Electrical installation for 4-lead connection

Wiring diagrams

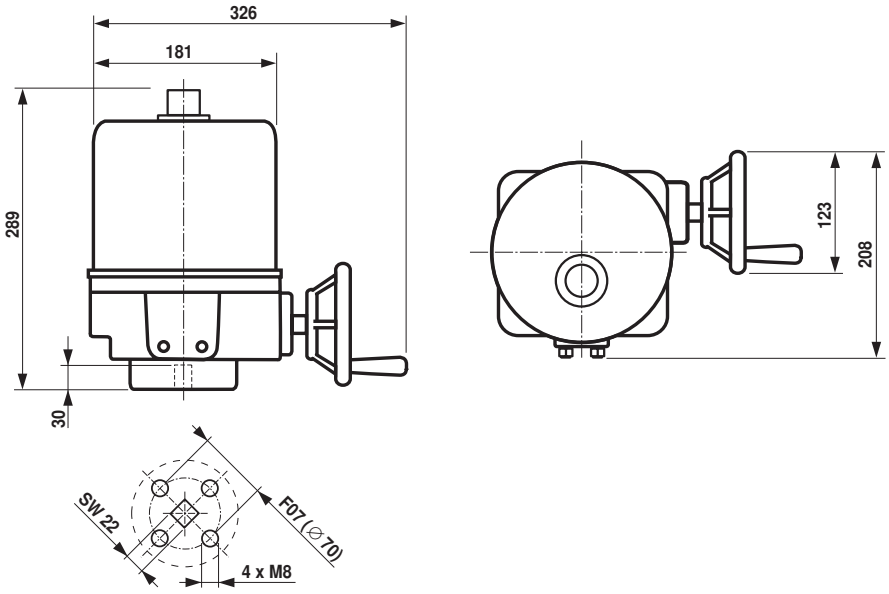


Actuator	Butterfly valve
Y1	A – AB = 100%
Y2	A – AB = 0%

Auxiliary switch	Position	Butterfly valve
LS3	100%	open
LS4	0%	closed

Dimensions [mm]

Dimensional drawings

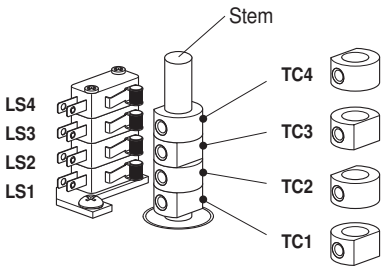


Settings

Setting cam

The setting cams for limit and auxiliary switches can be accessed by removing the housing cover.
Optionally, auxiliary switches LS4/LS3 can be connected for signaling.
Limit switches LS2/LS1 interrupt the voltage to the motor and are controlled by setting cams TC...
The setting cams turn with the spindle. The butterfly valve closes when the stem is turning clockwise (cw) and opens when the stem is turning counterclockwise (ccw).

Important!
Settings are only allowed to be made by authorised specialist personnel.

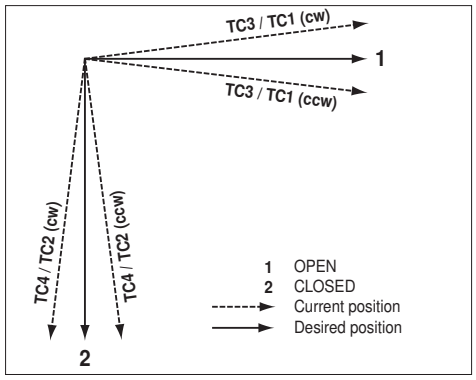


Settings of setting cams TC..

- TC4 for auxiliary switch position closed (factory setting 3°∢).
- TC3 for auxiliary switch position open (factory setting 87°∢).
- TC2 for limit switch closed (factory setting 0°∢).
- TC1 for limit switch open (factory setting 90°∢).

Adjusting setting cams

1 Use a 2.5 mm Allen key to unscrew the corresponding setting cams TC..
2 Turn the setting cam using the Allen key
3 Set as shown in the illustration below
4 Use the Allen key to tighten the setting cams



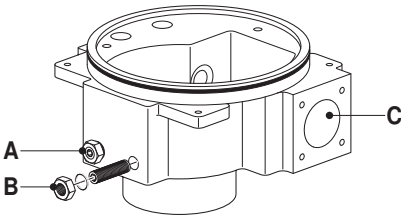
Adaptation

An adaptation must take place after the TC1 and TC2 have been adjusted.

Settings *(continued)*

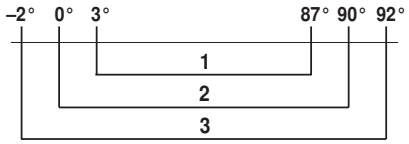
Mechanical angle of rotation limitation

The mechanical angle of rotation is set at the factory to 92°◁ and cannot be changed.
The handwheel is rotated by means of a worm gear in a planetary gear unit. The gearing is stopped mechanically by means of two setscrews **1** and **2** (1½ rotations of the setscrews correspond to 2°◁).
Both limit switches LS2 /LS1 are set to 90°◁ and must always switch off the motor before the mechanical angle of rotation limitation.



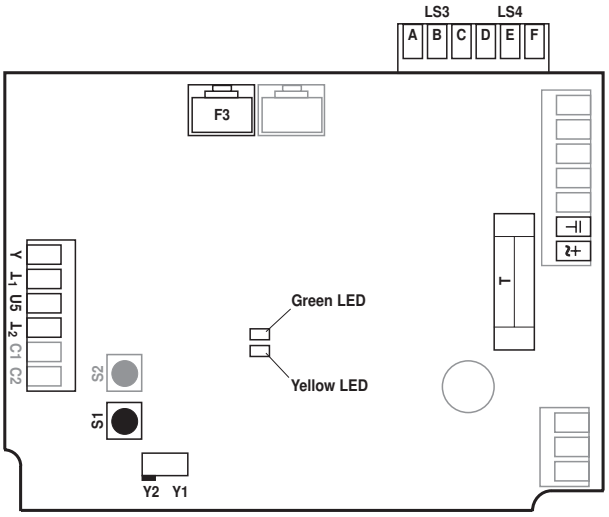
A Angle of rotation limiting OPEN (90°◁)
B **Angle of rotation limiting CLOSED (0°◁)**
C Connection of handwheel for angle of rotation limiting

Relationship between mechanical angle of rotation limiting, limit and auxiliary switches



1 Auxiliary switch TC3 / TC4
2 Limit switch TC1 / TC2
3 Mechanical angle of rotation limitation (A + B)

Connection and function elements

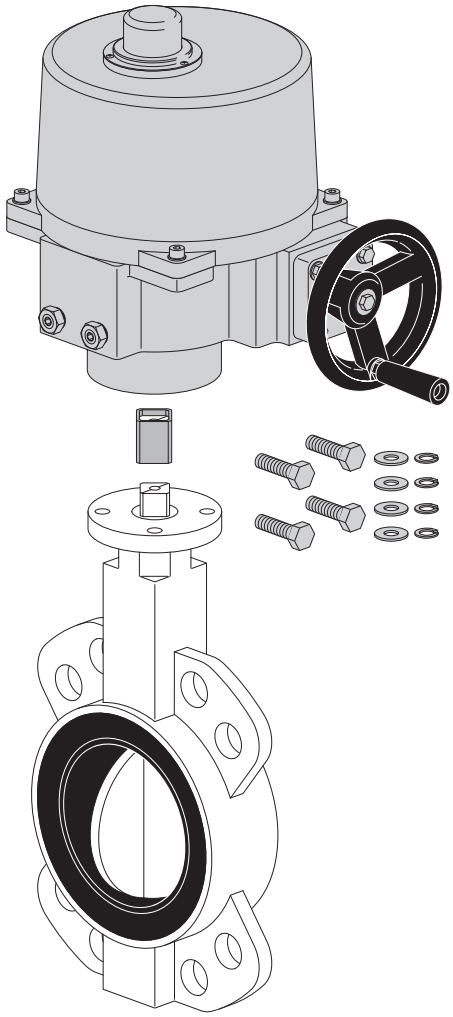


⊥ / ∓	Power supply voltage	
Y1	Direction of rotation switch	Actuator rotates counterclockwise (ccw), valve opens
Y2	Direction of rotation switch	Actuator rotates clockwise (cw) valve closes
Y	Control signal	
U5	Position feedback	
$\perp_1$ / $\perp_2$	0-lead (ground)	
F3	PC-tool connection	
S1	Adaptation button	Adaptation procedures is started (press S1 for 3 s) Adaptation must take place after the TC1 and TC2 have been adjusted.
Yellow LED	On	Adaptation procedure activated
	Off	Standard operation
Green LED	On	In operation
	Off	No voltage supply or fault
T	Plug-in fuse	Type T10A250V
LS3	Auxiliary switch	Factory setting 87°◁
LS4	Auxiliary switch	Factory setting 3°◁
C1 / C2	Not used	
S2	Not used	

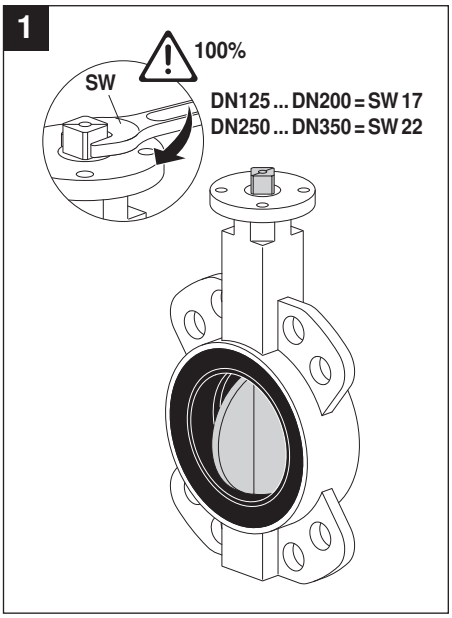
Further documentation

- Complete overview «The complete range of water solutions»
- Data sheets, butterfly valves
- Installation instructions for actuators and/or butterfly valves, respectively
- Notes for project planning (hydraulic characteristic curves and circuits, installation regulations, commissioning, maintenance. etc.)

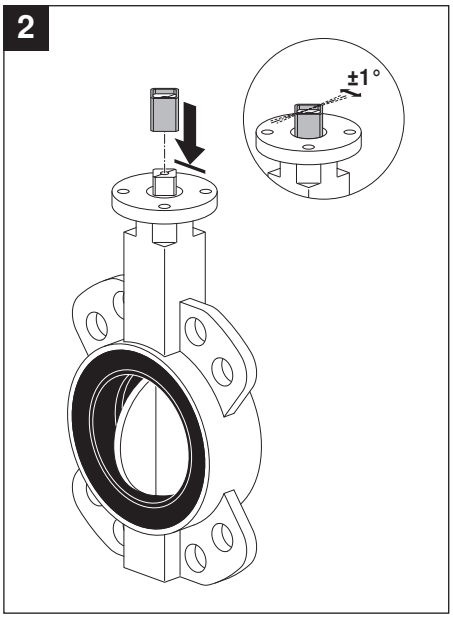
70984-00001.A



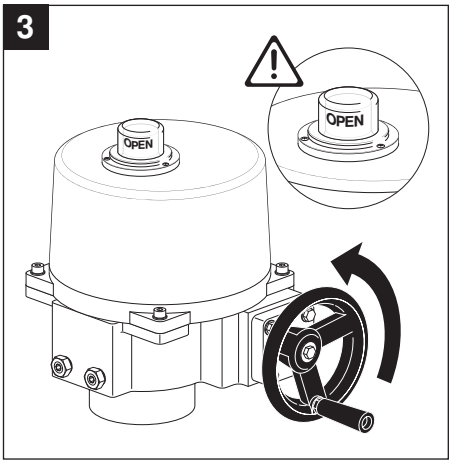
1



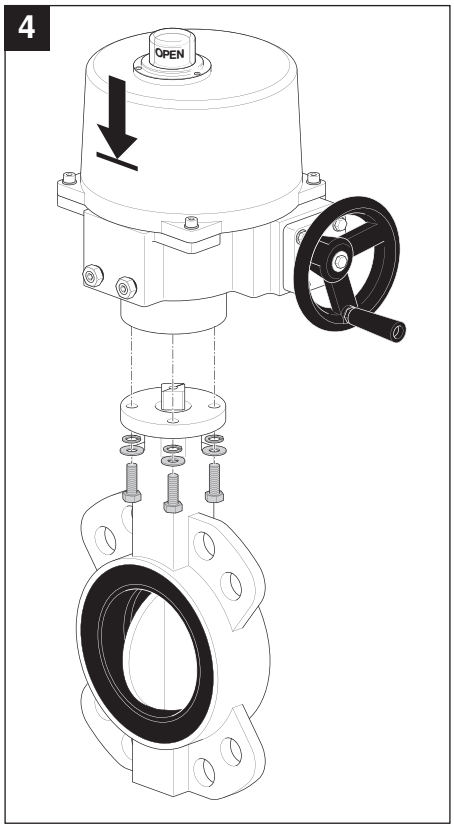
2



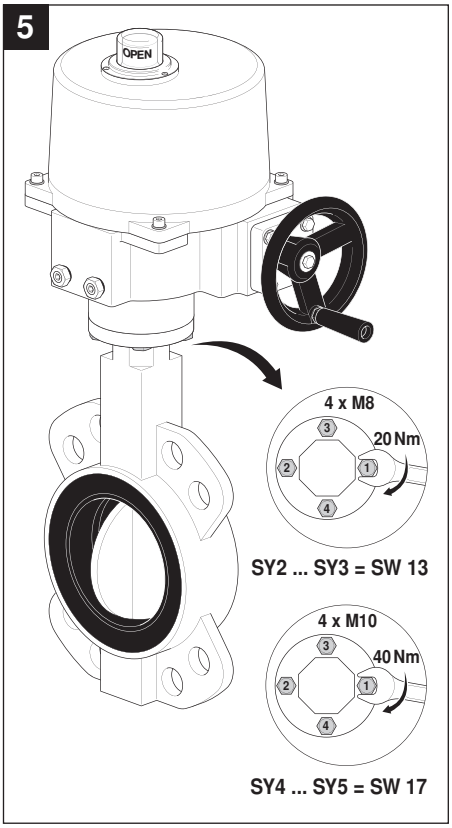
3



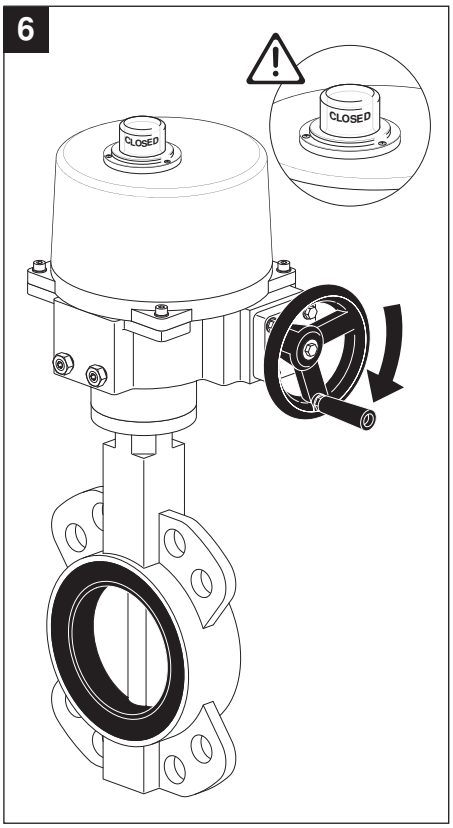
4

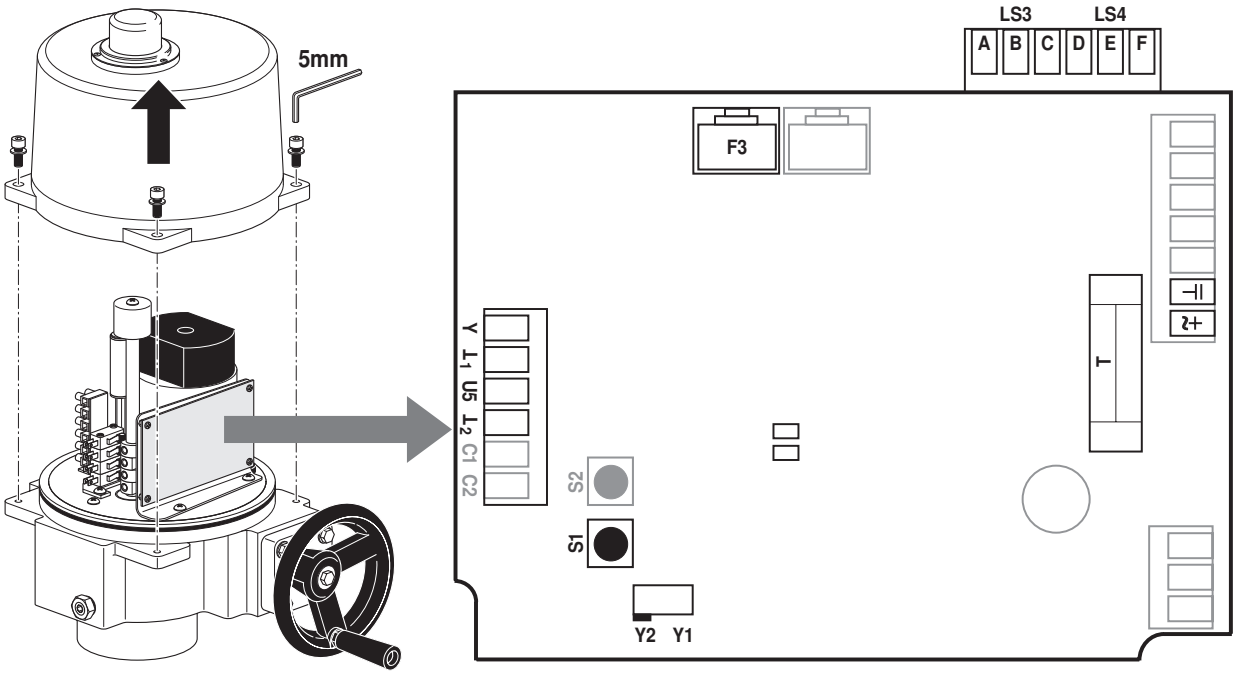


5

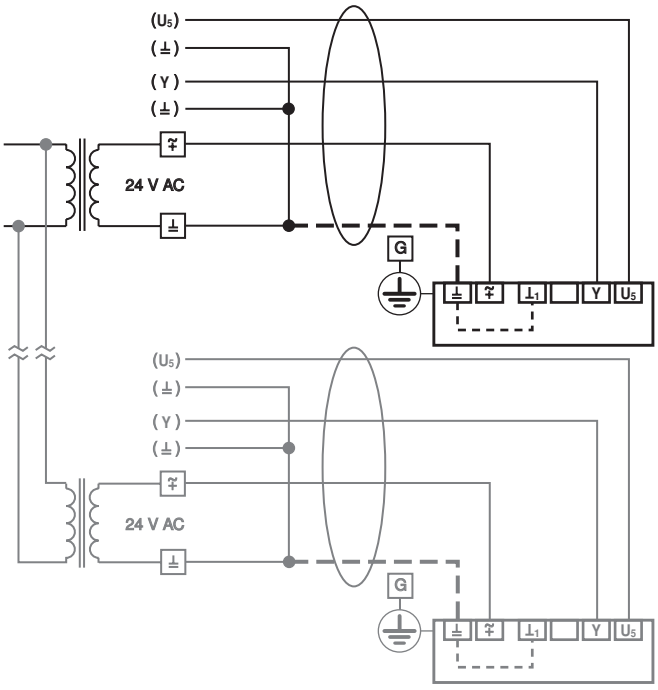


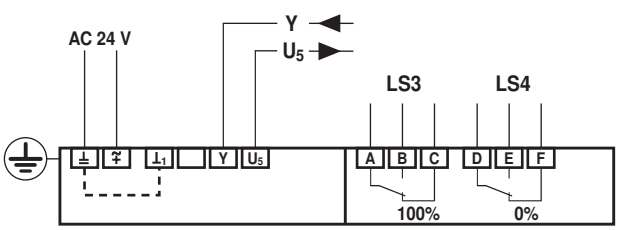
6





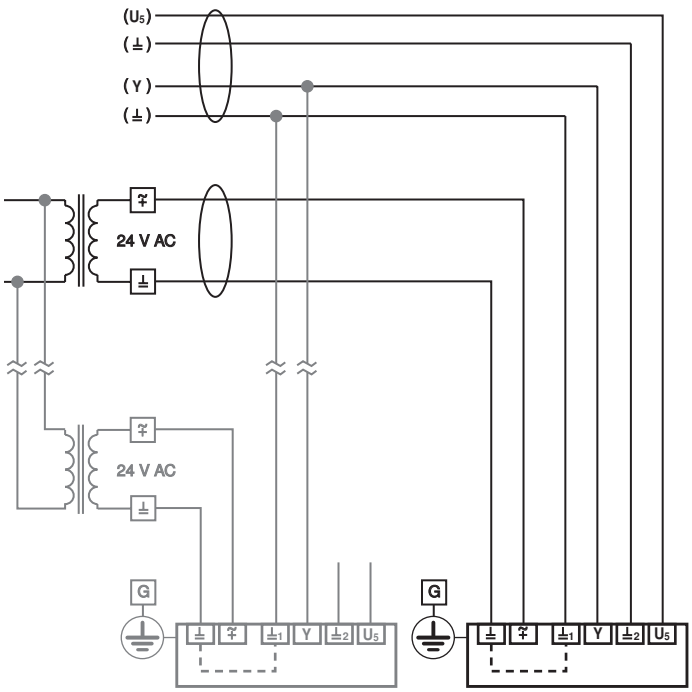
SY..-24-SR-T / SY..-24-MF-T / SY..-24-MP-T

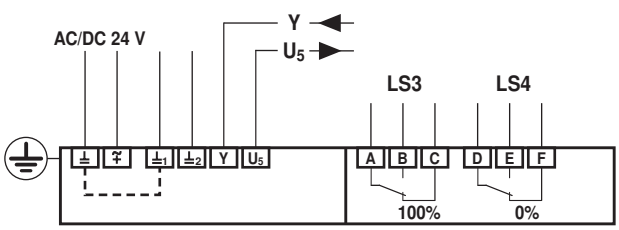




Y1	A – AB = 100%
Y2	A – AB = 0%

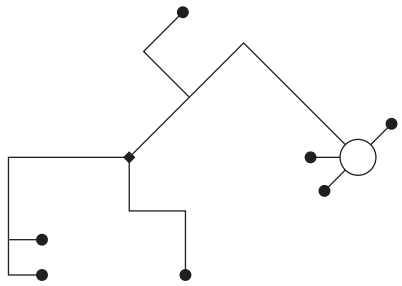
SY..-24-SR-T / SY..-24-MF-T

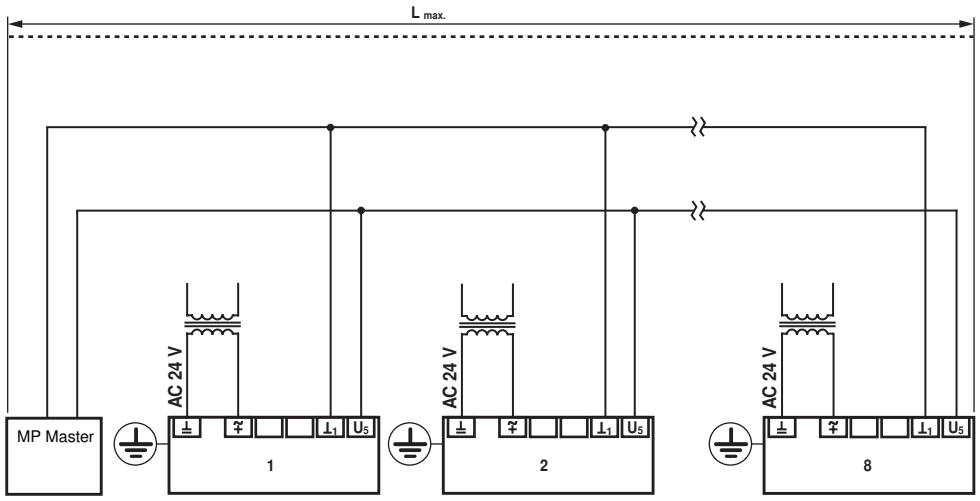


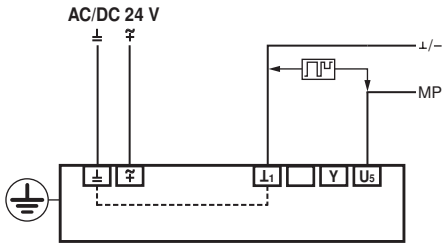


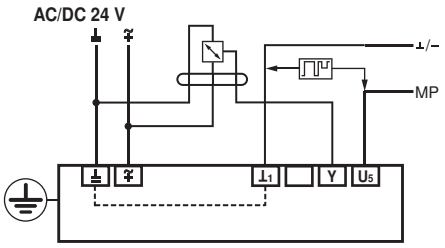
Y1	A – AB = 100%
Y2	A – AB = 0%

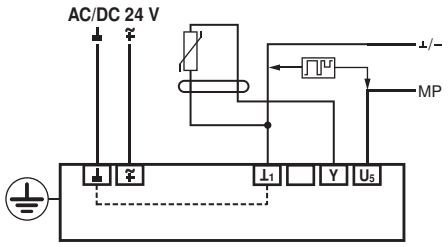
SY..-24-MP-T

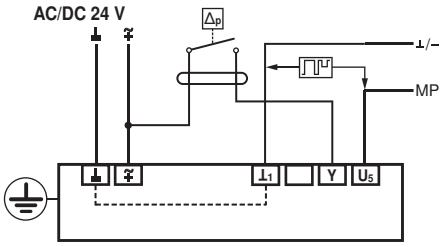


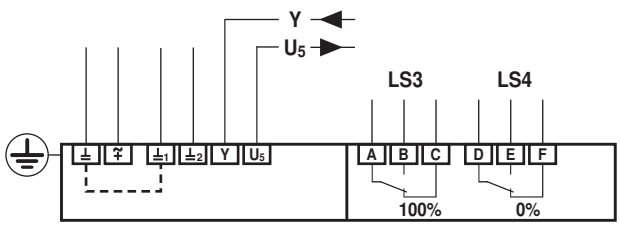

L max.
AC 24 V
AC 24 V
AC 24 V
MP Master
1
2
8


AC/DC 24 V
⊥/–
MP
Y
U5


AC/DC 24 V
⊥/–
MP
Y
U5


AC/DC 24 V
⊥/–
MP
Y
U5


AC/DC 24 V
Δp
⊥/–
MP
Y
U5


Y
U5
LS3
LS4
A
B
C
D
E
F
100%
0%