

- Non-spring return large torque actuators, for operation of DN50...500 Butterfly valves
- Torque 35...2000 Nm
- Open/Close or 3-point control:
SY...24-3-T, SY...230-3-T
- Modulating control: SY...U24-SR-T, SY...U230-SR-T
- MF/MP-T models also available on request



Technical data

Electric data	Nominal voltage	AC 24 V
	SY... -3-T, SY... -SR-T	AC 230 V
	Power supply range	AC 21.6... 26.4 V
	SY... -3-T, SY... -SR-T	207... 253 V
	Electrical connection	½" cable connector, screw terminals
	Thermal protection	Thermally protected 135°C cut-out
	Motor protection	H class insulation (SY1-..), F class insulation (SY2... 9)
	Gear train	High alloy steel gear sets
	Control signal	Open/close, 3-point control
	SY... -3-T, SY... -SR-T	2(0)...10 VDC
	Sensitivity	200 mV (for SY... -SR-T only)
	Feedback	2(0)...10 VDC (for SY.. -SR-T only)
	Angle of rotation range	Electrically limited to 90°, Max. 95° for manual operation
	Position indication	Top mounted domed indication
	Internal humidity control	Up to 95%, resistive heating element
	Auxiliary switches	(2)SPDT, 3 A, AC 250 V (SY1); 5 A, AC250 V (SY2...9)
	Ambient temperature	- 20°C ... 60°C
	Housing type	IP67 / NEMA 4
	Housing material	Die cast aluminium alloy
	EMC	CE according to 89/336/EEC
	Low voltage directive	CE according to 73/23/EEC, 93/68/EEC

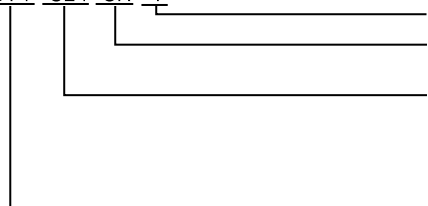
Model No.	Torque (Nm)	Motorpower		Running time			Running current		Manual Override	Weight (Kg)	Mounting flange (ISO 5211)
		24V AC	230V AC	24V AC	230 V AC 60Hz	50Hz	24V AC	230V AC			
SY1-..	35	10W	10W	15s	12s	13s	0.6A	0.3A	by 8mm Wrench	2.0	F05
SY2-..	90	70W	40W	15s	15s	17s	3.0A	0.5A	Handwheel	11	F07
SY3-..	150	70W	40W	22s	22s	26s	3.0A	0.5A	Handwheel	11	F07
SY4-..	400	180W	120W	16s	16s	18s	6.0A	0.6A	Handwheel	22	F10
SY5-..	500	180W	120W	22s	22s	25s	6.5A	0.7A	Handwheel	22	F10
SY6-..	650	/	120W	/	28s	31s	/	0.8A	Handwheel	22	F10
SY7-..	1000	/	180W	/	46s	55s	/	1.6A	Handwheel	36	F14
SY8-..	1500	/	220W	/	46s	55s	/	2.0A	Handwheel	36	F14
SY9-..	2000	/	180W	/	58s	70s	/	1.6A	Handwheel	56	F16

Product features

- Electrical connections** All actuator control elements are wired to a terminal strip under the main cover. Remove the cover and insert the cables through the cable connector in order to reach the terminal strip. The connectors should be made according to the diagram. Before beginning this procedure, make sure that the power supply voltage is in accordance with the actuator's nameplate. After the terminal connections have been made, move the actuator manually to the half-open position and make a preliminary check of the wiring.
- Manual operation** Turn the handwheel clockwise to close the actuator and counterclockwise to open. This provides a temporary manual operation. For a permanent manual operation, remove the power from the actuator. (Note: Need a 8mm wrench for SY1..)
- Overload protection** If the running torque exceeds the normal torque requirement, then the overload protection will be functioned to prevent the motor overload.

Designation

SY4 U24 -SR -T



With terminal only
 "-SR": Modulating control
 "-3": Open/close or 3-point control
 "U24": 24V nominal voltage (modulating)
 "U230": 230V nominal voltage (modulating)
 "-24": 24V nominal voltage (open/close, 3-point)
 "-230": 230V nominal voltage (open/close, 3-point)
 Model number

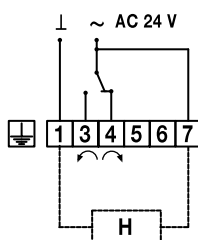
eg. Modulating control
 SY2U230-SR-T
 Open/close, 3-point control
 SY2-24-3-T

Wiring diagrams

SY..-24-3-T Open/Close or 3-point control

Notes

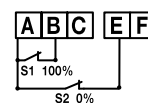
- Connection via safety isolating transformer
- Relays are needed in parallel connection of several actuators
- "L1" cannot be connected to terminal #3 and #4 simultaneously.
- 30% duty cycle.



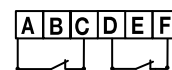
Terminal

#1	Power supply Com/Neutral
#3	Power supply Hot line for Open
#4	Power supply Hot line for Close
#5	Connect to Com/Neutral for fully open indication
#6	Connect to Com/Neutral for fully close indication
#7	Heater

Auxiliary switch



SY1-24-3-T

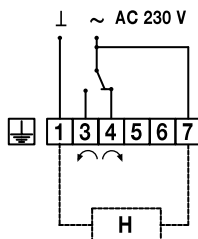


SY(2...5)-24-3-T

SY..-230-3-T Open/Close or 3-point control

Notes

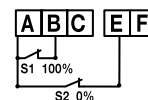
- Caution: Power supply voltage !
- Relays are needed in parallel connection of several actuators
- "L1" cannot be connected to terminal #3 and #4 simultaneously.
- 30% duty cycle.



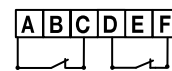
Terminal

#1	Power supply Com/Neutral
#3	Power supply Hot line for Open
#4	Power supply Hot line for Close
#5	Connect to Com/Neutral for fully open indication
#6	Connect to Com/Neutral for fully close indication
#7	Heater

Auxiliary switch



SY1-230-3-T

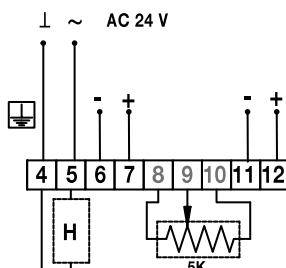


SY(2...9)-230-3-T

SY1U24-SR-T Modulating control

Notes

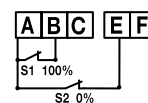
- Connection via safety isolating transformer
- Power supply Com / Neutral and control signal "-" wiring to a common is prohibited.
- The control signal has to be separated from the others and shielded.
- 75% duty cycle.



Terminal

#4	Power supply Com / Neutral
#5	Power supply Hot line
#6	Control signal -
#7	Control signal +
#8	For actuator internal use
#9	For actuator internal use
#10	For actuator internal use
#11	Feedback signal -
#12	Feedback signal +

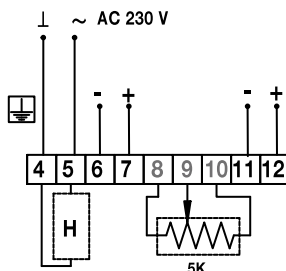
Auxiliary switch



SY1U230-SR-T Modulating control

Notes

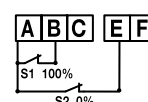
- Caution: Power supply voltage !
- Power supply Com / Neutral and control signal "-" wiring to a common is prohibited.
- The control signal has to be separated from the others and shielded.
- 75% duty cycle.



Terminal

#4	Power supply Com / Neutral
#5	Power supply Hot line
#6	Control signal -
#7	Control signal +
#8	For actuator internal use
#9	For actuator internal use
#10	For actuator internal use
#11	Feedback signal -
#12	Feedback signal +

Auxiliary switch



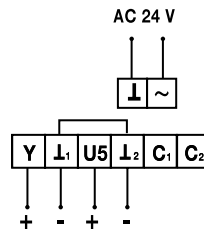
SY..U24-SR-T
SY..U24-MF-T

Modulating control

Terminal

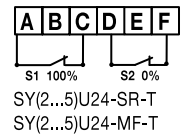
Notes

- Connection via safety isolating transformer
- Power supply Com / Neutral and control signal "-" wiring to a common is prohibited.
- The control signal has to be separated from the others and shielded.
- 75% duty cycle.



⊥	Power supply Com / Neutral
~	Power supply Hot line
Y	Control signal +
L1	Control signal -
U5	Feedback signal +
L2	Feedback signal -
C1	leave unconnected
C2	leave unconnected

Auxiliary switch

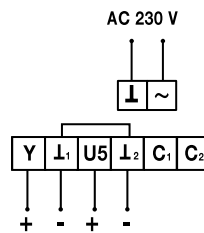

SY..U230-SR-T
SY..U230-MF-T

Modulating control

Terminal

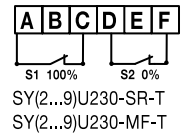
Notes

- Caution: Power supply voltage !
- Power supply Com / Neutral and control signal "-" wiring to a common is prohibited.
- The control signal has to be separated from the others and shielded.
- 75% duty cycle.



⊥	Power supply Com / Neutral
~	Power supply Hot line
Y	Control signal +
L1	Control signal -
U5	Feedback signal +
L2	Feedback signal -
C1	leave unconnected
C2	leave unconnected

Auxiliary switch

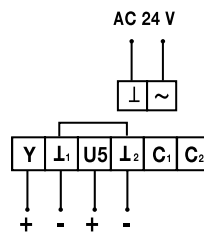

SY..U24-MP-T

Modulating control

Terminal

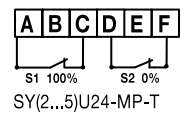
Notes

- Connection via safety isolating transformer
- Power supply Com / Neutral and sensor/MP-Bus signal "-" wiring to a common is prohibited.
- The control signal has to be separated from the others and shielded.
- 75% duty cycle.



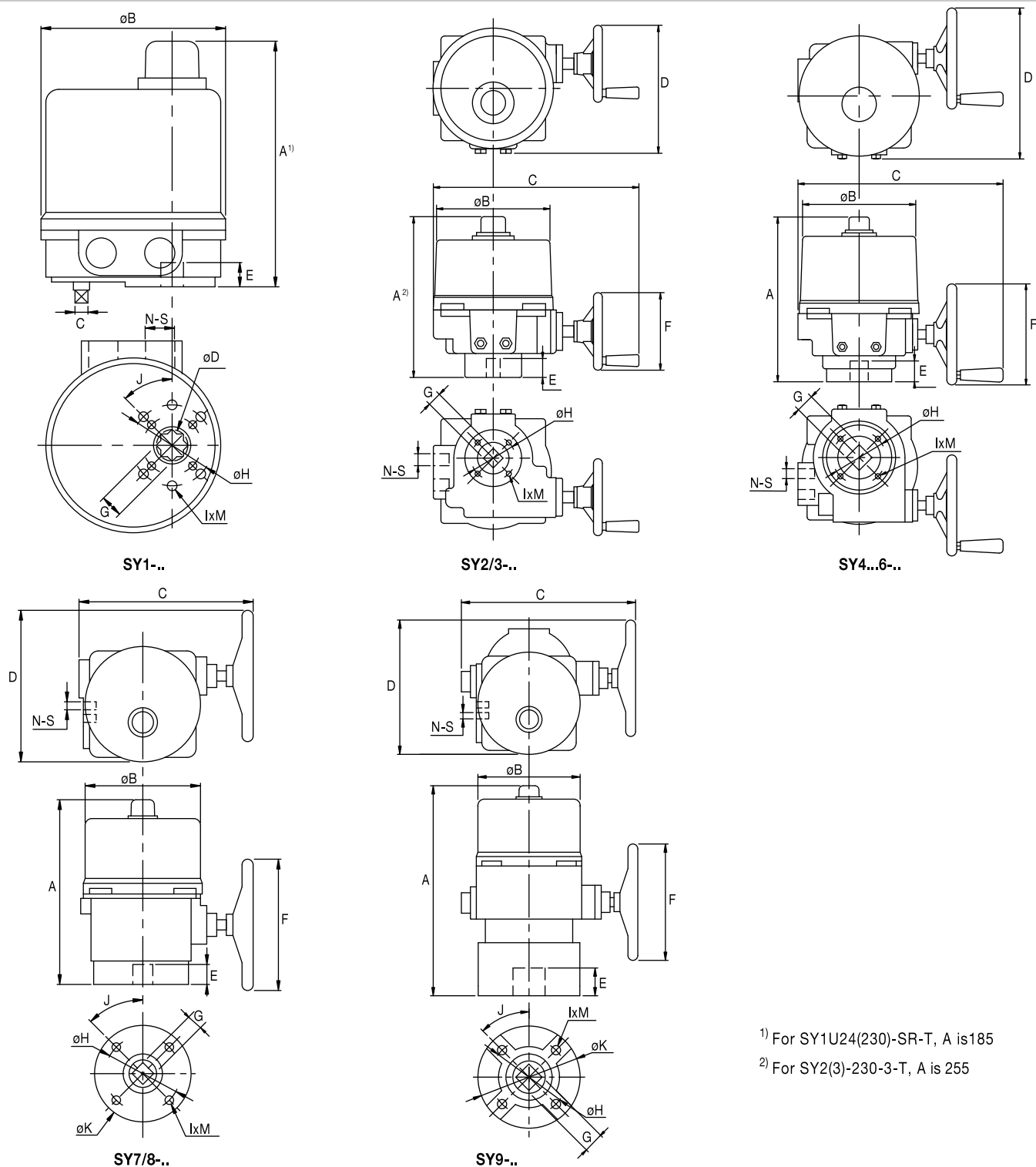
⊥	Power supply Com / Neutral
~	Power supply Hot line
Y	Sensor signal +
L1	Sensor signal -
U5	MP-Bus signal +
L2	MP-Bus signal -
C1	leave unconnected
C2	leave unconnected

Auxiliary switch



Dimensions

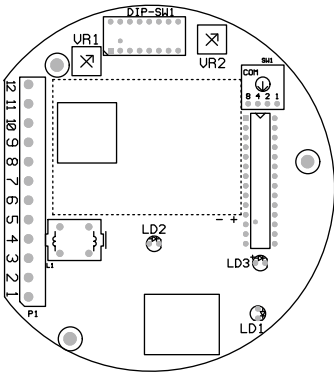
Unit [mm]


¹⁾ For SY1U24(230)-SR-T, A is 185

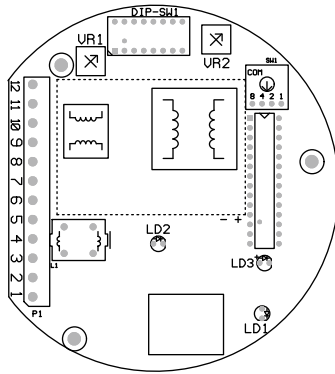
²⁾ For SY2(3)-230-3-T, A is 255

Dim.	A	B	C	D	E	F	G	H	I	J	K	M	N	S	Flange type
Model No.															
SY1-..	155 ¹⁾	114	8	19	15	-	14	50	6	45°	-	m6	2	1/2 PS	F05
SY2/3-..	289 ²⁾	180	326	203	30	123	17/22	70	4	-	-	m8	2	1/2 PS	F07
SY4...6-..	317	217	394	290	40	194	22/35	102	4	-	-	m10	2	1/2 PS	F10
SY7/8-..	406	217	348	336	60	297	36	140	4	45°	180	m16	2	1/2 PS	F14
SY9-..	564	256	455	392	100	395	36	165	4	45°	221	m20	2	1/2 PS	F16

Circuit board set up



SY1U24-SR-T



SY1U230-SR-T





Disconnect power supply before changing the following settings.
The words in Bold are default settings.

DIP switches setting
Factory setting

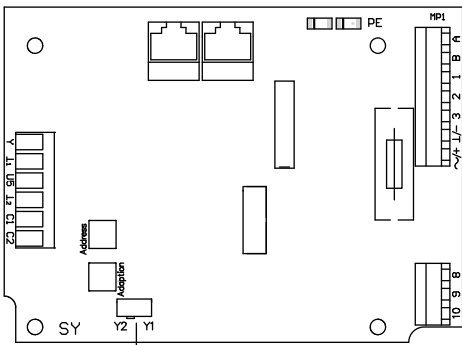


Off
On

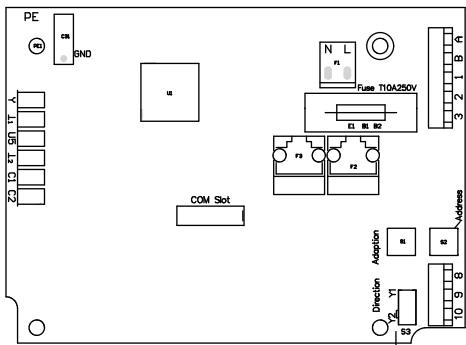
S1, S2 - for Input signal			S3, S4, S5 - for Output signal				S6 - Direction of Travel in response to the control		S7 & S8 - Actuator response to the control signal failure		
Input signal	S1	S2	Output signal	S3	S4	S5	Symbol	S6	When signal fails	S7	S8
2-10V	Off	On	2-10V	On	Off	On		Off	Fully closed	Off	On
4-20mA	On	Off	4-20mA	Off	On	Off		On	Fully open	On	Off
1-5V	Off	Off							Stop	On	On

SW1 sensitive switch

Position "0": Lowest sensitive, 0-90° divided into 17 steps.
Position "1": Highest sensitive, 0-90° divided into 80 steps.
Before power on, make sure the input signal and voltage wiring are in accordance with the actuator nameplate and Dip-switch setting.
(only available for SY1U24/230-SR-T)



SY(2...5)U24-SR/MF/MP-T

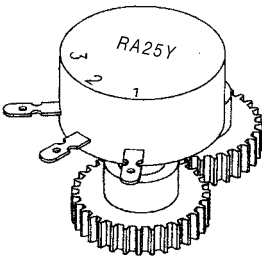


SY(2...9)U230-SR/MF-T

Direction switch
Y2 standard

Position feedback

It is possible to add a potentiometer to provide feedback signal.



Potentiometer

For open/close actuators with 1k feedback option
Potentiometer points 1, 2, 3 are wired to terminal blocks 10, 9, 8.
When a actuator is close: 8, 9 1k Ohm
9, 10 0k Ohm
When a actuator is open: 8, 9 0k Ohm
9, 10 1k Ohm

For Modulating actuator, the potentiometer is a standard part and for actuator internal use only.

Accessories

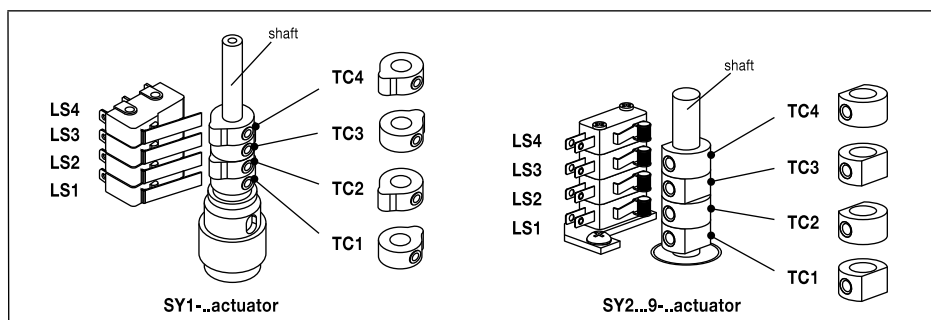
Description

Electrical accessories Feedback potentiometer SY-1000-FB (for SY...-3-T actuator)

Travel cams TC..

Only authorized and trained persons are allowed to change the settings.

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



The cams for adjusting the limit and auxiliary switches are accessible if the cover is removed. The LS2/LS1 limit switches interrupt the power supply to the motor and are controlled by means of the TC.. cams which rotate with the shaft. The LS4/LS3 auxiliary switches can optionally be connected for signalization purposes. The actuator closes the valve when the shaft turns clockwise (CW) and opens the valve when the shaft turns counter clockwise (CCW).

Adjusting the travel cam

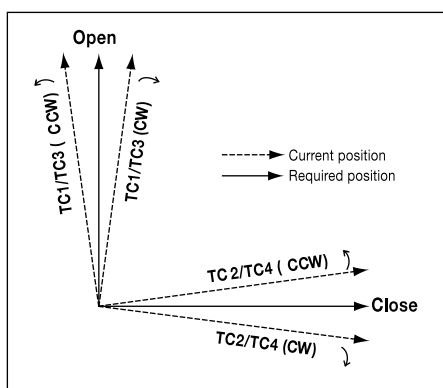
1. Loosen the travel cam to be adjusted with a 2.5mm hexagonal key;
2. Turn the cam with the hexagonal key;
3. Adjust the cam as shown in the diagram and initial tighten the cam;
4. Check the operation of the switch with power on
5. Tighten the cams after successful adjustment.

(Only available for SY(2-9)U24/230-SR-T)

Perform an adaption after changing the position of the travel cam



Adaption button



(Only available for SY1U24/230-SR-T)

When you need to adjust the signal of modulating board, please adjust the VR1 & VR2:

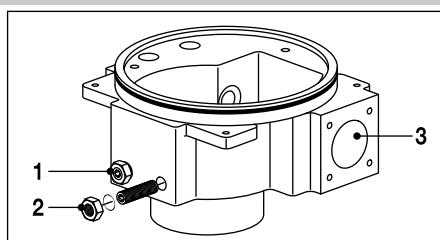
- VR2 adjusts 4 mA, 2 V, 1 V (Fully-close)
- VR1 adjusts 20 mA, 10 V, 5 V (Fully-open)

Please turn the VR2 to the end by clockwise direction and input 4 mA to modulating board.

Then please slightly turn the VR2 by counter-clockwise direction about 3-6 times until the RED light keeps ON.

Please turn the VR1 to the end by counter-clockwise direction and input 20 mA to modulating board. Then please slightly turn the VR1 by clockwise direction about 3-6 times until the GREEN light keeps ON.

Limiting of manual rotation angle



1. Stop screw for OPEN limiting
2. Stop screw for CLOSED limiting
3. Handwheel connection, for manual operation

Note: SY1 without the stop screws

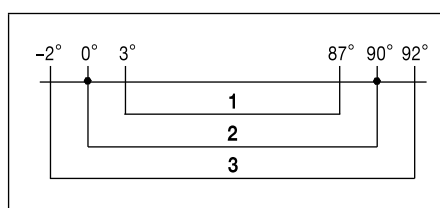
The limiting of manual rotation angle is set at -2...92° in the factory. The handwheel turns the planetary gear by means of a worm wheel. The gear is stopped mechanically by the two stop screws 1 and 2 (1 turn of the stop screw correspond to a 2° angle of rotation). When the moto stops at fully closed or open position, tighten the corresponding screw untill it touches the gearbox, turn the screw 1 cycle back and lock by an allen key and a wrench.

Note:

The two limit switches LS2/LS1 are set at 0...90° angle. The LS2/LS1 switches must always switch off the moto **before** the effect of manual stop screws.

It is emphasized that the stop screws are only a safety feature to prevent overtravel when the actuator is being operated manually.

Relationship between the switches and travels



1. Auxiliary switches setting
2. Limit switches setting
3. Stop screws setting for manual operation

Open/Close position setting

- Closed position (0%) setting**
- 1) For Open/close actuator, wiring on terminal#1, #4. (see Wiring diagram)
 - 2) Power on. The actuator will drive CW to fully closed position.
 - 3) Adjust travel cam TC2 in the closed position. (see page 23) For modulating actuator, firstly loose a fanshaped cam which connected with the potentiometer; retighten it after the successful setting of TC2.
 - 4) Check whether LS2 switch trips prior to manual operation stop. (So when motor stops at fully closed position, it should be possible for further operating the hand wheel CW 1/2...3/4 turn. Otherwise the stops crew for close need to be adjusted, see page 23)
- Open position (100%) setting**
- 1) For Open/close actuator, wiring on terminal#1, #3. (see Wiring diagram)
 - 2) Power on. The actuator will drive CCW to fully open position.
 - 3) Adjust travel cam TC1 in the open position. (see page 23) For modulating actuator, firstly Check loose a fanshaped cam which connected with the potentiometer; retighten it after the successful setting of TC1.
 - 4) Check whether LS1 switch trips prior to manual operation stop. (So when motor stops at fully open position, it should be possible for further operating the hand wheel CCW 1/2...3/4 turn. Otherwise the stop screw for open need to be adjusted, see page 23)

General

- Cautions of installation** Make sure if the voltage is correct before wiring.
Re-place cover immediately after start-up and make sure that the seals are clean. Never fail to replace the protection cover. If water never enter, dry thoroughly before re-placing cover. Don't reverse the motor head or install it upside down. Be sure to keep it away from gas, do not use in the explosive and chemical district. Power off before maintenance purpose. The Open/Close frequency of the electric actuator is restricted according to the duty cycle, to avoid over heated.
- Maintenance** All actuators are lubricated with anti-high temperature lubricant for long life and therefore require no special maintenance. The condition of the valve stem and its nut must be checked periodically to make sure they are clean and well lubricated. We recommend that a program of periodic maintenance should be drawn up for actuators that are operated infrequently.
- Storage** The actuator includes electrical equipment as well as grease lubricated gear stages. In spite of the weather proof enclosure, oxidation, jamming and other alterations are possible if actuator is not correctly stored. The actuators should be stored under a shelter in a clean, dry place, and protected from frequent changes in temperature. Avoid placing the actuators directly on the floor. The actuators are equipped with heat resistance, it is recommended that connect and give power supply to the actuator especially if the place of the storage is humid. Check that the temporary sealing plug of the cable entries are well in place. Make sure that the covers and boxes are well closed to ensure weather proof sealing.

Trouble shooting

Conditions	Possibilities	Solutions
Motor overheat	Voltage abnormal	Check by multimeter.
	High working frequency	Limit the working frequency.
	Motor spindle is stuck or valve is too tight to move	Replace the stuck assemblies or the valve.
	The gearbox stuck by stop screw	Check and correct travel cam for evidence of loosening; inspect the stop screw setting by operating the handwheel manually.
No operation	Power supply or voltage abnormal	Check the power supply voltage with the identification plate.
	Fuse blown	Check and replace the fuse as required. (except for HW-CB PCB)
	Tripping of motor thermal protective device	Check if the motor is hot. The actuator will be available again after the motor is cooled down. Solve the motor overheat problem.
Running motor stops	Power supply is short circuit	Check wiring.
	Alienative object stuck in the pipe	Take off the valve for cleaning.
Unable fully open/closed	The fixing screw for travel cam release	Re-adjust and tighten the travel cam.
The actuator couldn't stop at the right position and hunting	The sensitivity setting is incorrect	Adjust the sensitivity switch SW1 to increase the number.
Occasional fail in motor switched on or off	Power input of "open" and "close" simultaneously	Check if the external control switch is normal; relays are needed in parallel connection of several actuators.

Installation and maintenance instructions

Pre-installation procedure

- 1) Be certain the adjoining pipeline is free from any foreign material such as rust and pipe scale or welding slag that could damage the seat and disc sealing surfaces.
- 2) Any actuator should be mounted on the valve prior to installation to facilitate proper alignment of the disc in the valve seat.
- 3) Check the valve identification tag for materials, and operating pressure to ensure they are correct for the application.
- 4) Check the flange bolts or studs for proper size, threading and length.

Valve installation procedure

Position the connecting pipe flanges in the line to insure proper alignment prior to valve installation. Spread the pipe flanges apart enough to allow the valve body to be located between the flanges without actually contacting the flange surfaces (See Figure 1). Exercise particular care in handling the valve so as to prevent possible damage to the disc or seat faces.



WARNING! Personal injury or property damage may result if the valve is installed where service conditions could exceed the valve ratings.

- 1) For both wafer and lug valves: a. Place the valve between the flanges. b. Install all bolts between the valve and the mating flanges. Hand tighten bolts as necessary.
- 2) Before completing the tightening of any bolts, the valve should be centered between the flanges and then carefully opened and closed to insure free, unobstructed disc movement (see Fig. 2).
- 3) Tighten the flange bolts evenly to assure uniform compression.
- 4) If an actuator is to be used, electricity should be connected to the unit as specified by the actuator manufacturer.
- 5) Cycle the valve to the fully open position, then back to the fully closed position, check the actuator travel stop settings for proper disc alignment. The valve should be operated to assure that no binding is taking place.
- 6) The valve is now ready for operation.

Safety precautions

Before removing the valve from the line or loosening any bolts, it is important to verify the following conditions:

- 1) Be sure the line is depressurized and drained.
- 2) Be sure of the pipeline media. Proper care should be taken for protection against toxic and/or flammable fluids.
- 3) Exercise caution if removing the actuator from the valve when the pipeline is under pressure. The valve disc may move suddenly due to the pressure.
- 4) Always be sure that the disc is in the close position before removing the valve.

General maintenance

The following periodic preventative maintenance practices are recommended for all butterfly valves:

- 1) Operate the valve from full open to full closed to assure operability.
- 2) Check flange bolting for evidence of loosening and correct.
- 3) Inspect the valve and surrounding area for previous or existing leakage at flange faces or shaft connections.
- 4) Check piping and/or wiring to actuators and related equipment for looseness and correct as needed.

Figure 1 Initial installation of valve

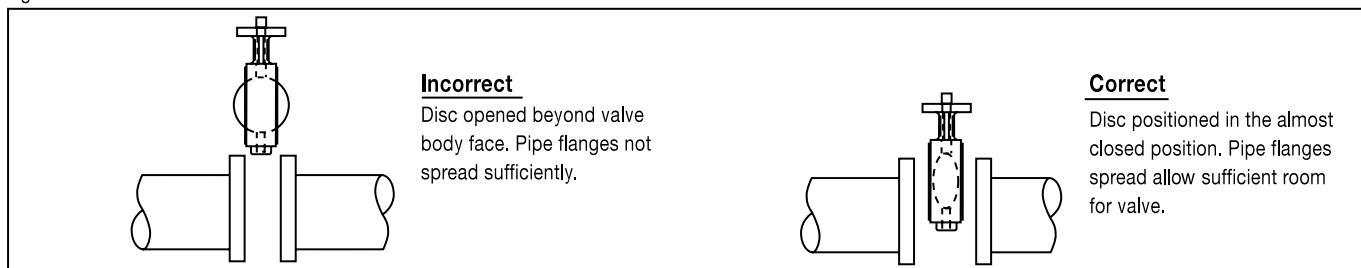


Figure 2 Centering and flanging of valve

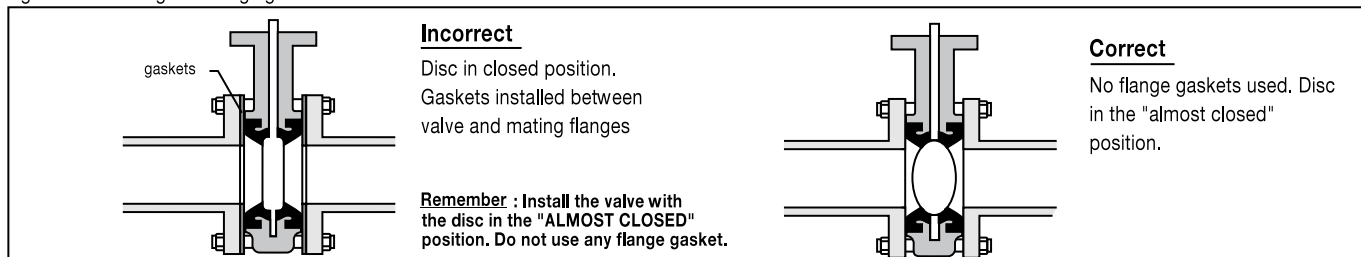


Figure 3 Final valve alignment and tightening of flange bolts

