SY.. Large Torque Multi-function Actuators

- **General Large Torque Actuators for operation of:** **DN50...600 Butterfly Valves**
- **Torque:** **35...3500Nm**
- **Open/Close or 3-point control:** **SY...24-3-T, SY...230-3-T**
- **Modulating control:** **SY1U24-SR-T, SY1U230-SR-T**
  SY...U24-MF-T, SY...U230-MF-T

Technical data

Nominal voltage	AC 24V ± 10%
SY...-3-T, SY...-SR-T	AC 230V ± 10%
Nominal voltage range	AC 21.6...26.4V
SY...-3-T, SY...-SR-T	207...253V
Connecting cable	½" cable connector, screw terminals
Motor protection	H class insulation (SY1), F class insulation (SY2...12)
Gear train	High alloy steel gear sets
Control signal Y	DC (0)2...10V
Sensitivity	200mV
Position feedback signal U	DC (0)2...10V
Angle of rotation	Electrically limited to 90°, Max. 95° for manual operation
Position indicator	Top mounted domed indication
Auxiliary switches	2xSPDT 3A, AC 230V(SY1); 2xSPDT 5A, AC 230V(SY2...12)
Ambient temp.	-20...+60°C
Humidity	5...95% RH, non-condensing
Degree of protection	IP67
Housing material	Die Cast Aluminium Alloy
EMC	CE according to 2004/108/EC
Low voltage directive	CE according to 2006/95/EC

* MP-T models available on request

Open/Close or 3-point Control

Model No.	Nominal Torque (Nm)	Motor power (W)				Running time (s)				Running current (A)				Manual override	Weight (kg)	Mounting flange
		AC 24V		AC 230V		AC 24V		AC 230V		AC 24V		AC 230V				
		50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz			
SY1..	35	30	29	68	70	20	20	14	11	1.6	1.7	0.4	0.4	by 8mm Wrench	2	F05
SY2..	90	60	65	142	100	16	16	19	15	2.9	3.0	0.7	0.5	Handwheel	11	F07
SY3..	150	70	70	143	102	25	25	30	25	2.8	2.8	0.7	0.5	Handwheel	11	F07
SY4..	400	208	212	221	180	30	30	21	18	9.5	9.5	1.1	0.9	Handwheel	22	F10
SY5..	500	179	168	216	179	35	35	29	25	9.3	9.4	1.1	0.9	Handwheel	22	F10
SY6..	650	/	/	193	177	/	/	38	31	/	/	1	0.9	Handwheel	22	F10
SY7..	1000	/	/	381	290	/	/	58	48	/	/	1.8	1.4	Handwheel	36	F14
SY8..	1500	/	/	428	294	/	/	59	49	/	/	1.9	1.4	Handwheel	36	F14
SY9..	2000	/	/	356	509	/	/	68	57	/	/	1.6	2.4	Handwheel	72	F16
SY10..	2500	/	/	377	531	/	/	73	62	/	/	1.7	2.5	Handwheel	72	F16
SY11..	3000	/	/	397	547	/	/	73	64	/	/	1.8	2.5	Handwheel	72	F16
SY12..	3500	/	/	409	505	/	/	74	61	/	/	1.8	2.4	Handwheel	72	F16

UL marked actuators is optional, please contact your local Sales Representative for details.

V7.3 05.2016•Subject to modification

Technical data

Modulating Control

Model No.	Nominal Torque (Nm)	Motor power (W)				Running time (s)				Running current (A)				Manual override	Weight (kg)	Mounting flange
		AC 24V		AC 230V		AC 24V		AC 230V		AC 24V		AC 230V				
		50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz			
SY1..	35	33	34	70	70	15	15	16	16	2	2	0.4	0.4	by 8mm Wrench	2	F05
SY2..	90	65	66	76	78	15	16	14	14	2.9	3.6	0.4	0.4	Handwheel	11	F07
SY3..	150	69	69	74	76	24	24	23	23	2.8	3.6	0.4	0.4	Handwheel	11	F07
SY4..	400	254	251	222	217	23	23	16	17	11	11	1.1	1.1	Handwheel	22	F10
SY5..	500	232	230	211	200	30	29	22	22	10.2	10.2	1.1	1	Handwheel	22	F10
SY6..	650	/	/	236	232	/	/	32	32	/	/	1.1	1.1	Handwheel	22	F10
SY7..	1000	/	/	167	157	/	/	44	44	/	/	0.9	0.8	Handwheel	36	F14
SY8..	1500	/	/	288	286	/	/	55	57	/	/	1.3	1.4	Handwheel	36	F14
SY9..	2000	/	/	240	233	/	/	61	61	/	/	1.1	1.1	Handwheel	72	F16
SY10..	2500	/	/	277	284	/	/	72	70	/	/	1.4	1.4	Handwheel	72	F16
SY11..	3000	/	/	376	363	/	/	44	48	/	/	2	1.9	Handwheel	72	F16
SY12..	3500	/	/	490	456	/	/	47	51	/	/	2.2	2	Handwheel	72	F16

Product Feature

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 name plate. After the terminal connections have been made, move the actuator manually to the half-open position and make a preliminary check of the wiring.

Overload protection If the real running torque exceeds the nominal torque, the overload protection will be functioned to prevent the motor overload.

Manual operation The manual operation is available by turning a handwheel of actuators (SY2...12) and using a 8mm wrench for SY1.

Ordering sample

SY4 U230 -MF -T

With terminal only
"-MF/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-MF-T
Open/Close, 3-point control
SY2-230-3-T

Ordering sample

SY4 U230 -MF -T

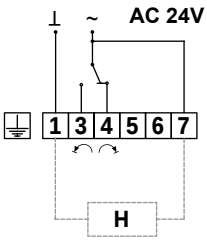
With terminal only
"-MF/SR": Modulating control
"-3": Open/Close or 3-point control
"U24": 24V nominal voltage (modulating)
"U230": 230V nominal voltage (modulating)
"-24": 24V nominal voltage (Open/Close, 3-point)
"-230": 230V nominal voltage (Open/Close, 3-point)
Model number

eg.Modulating control
SY2U230-MF-T
Open/Close, 3-point control
SY2-230-3-T

Wiring diagrams

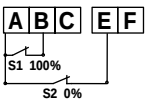
SY..-24-3-T Open/Close or 3-point control

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

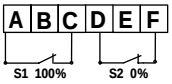


#1	Power supply Com/Neutral
#3	Power supply Hot line for Open
#4	Power supply Hot line for Close
#5	Connect to Com/Neutral for fully open indication
#6	Connect to Com/Neutral for fully close indication
#7	Heater

Auxiliary switch



SY1-24-3-T

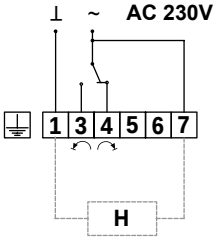


SY(2...4)-24-3-T

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

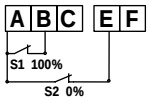
WARNING! Leakage current is possible (<3.5mA)!
Connect the earth first before applying any supply voltage!
Disconnect the supply voltage before the earth!

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

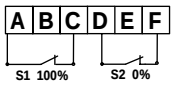


#1	Power supply Com/Neutral
#3	Power supply Hot line for Open
#4	Power supply Hot line for Close
#5	Connect to Com/Neutral for fully open indication
#6	Connect to Com/Neutral for fully close indication
#7	Heater

Auxiliary switch



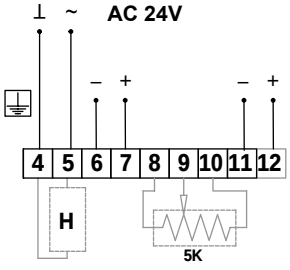
SY1-230-3-T



SY(2...12)-230-3-T

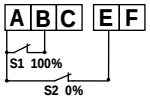
SY1U24-SR-T Modulating control

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.



#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



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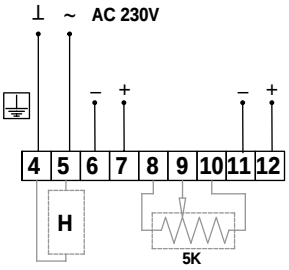
Wiring diagrams (continued)

SY1U230-SR-T

Modulating control

⚠ WARNING! Leakage current is possible (<3.5mA)! Connect the earth first before applying any supply voltage! Disconnect the supply voltage before the earth!

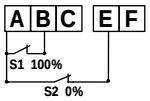
Notes:
- Caution: Power supply voltage! ⚠
- Power supply Com/Neutral and control signal "-" wiring to a common is prohibited.
- The control signal has to be separated from the others and shielded.
- 75% duty cycle.



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 +

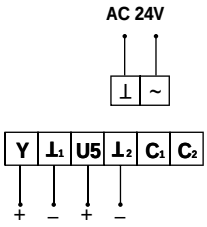
Auxiliary switch



SY..U24-MF-T

Modulating control

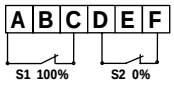
Notes:
- Connection via safety isolating transformer. ⚠
- Power supply Com/Neutral and control signal "-" wiring to a common is prohibited.
- The control signal has to be separated from the others and shielded.
- 75% duty cycle.



Terminal

⊥	Power supply Com/Neutral
~	Power supply Hot line
Y	Control signal +
⊥1	Control signal -
U5	Feedback signal +
⊥2	Feedback signal -
C1	leave unconnected
C2	

Auxiliary switch



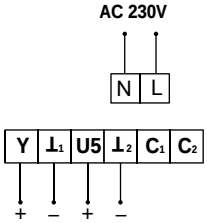
SY(2...4)U24-MF-T

SY..U230-MF-T

Modulating control

⚠ WARNING! Leakage current is possible (<3.5mA)! Connect the earth first before applying any supply voltage! Disconnect the supply voltage before the earth!

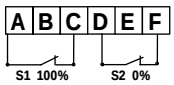
Notes:
- Caution: Power supply voltage! ⚠
- Power supply Com/Neutral and control signal "-" wiring to a common is prohibited.
- The control signal has to be separated from the others and shielded.
- 75% duty cycle.



Terminal

⊥	Power supply Com/Neutral
~	Power supply Hot line
Y	Control signal +
⊥1	Control signal -
U5	Feedback signal +
⊥2	Feedback signal -
C1	leave unconnected
C2	

Auxiliary switch

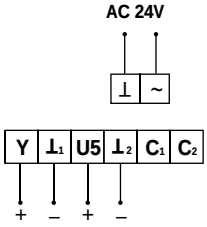


SY(2...12)U230-MF-T

SY..U24-MP-T

Modulating control

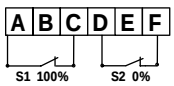
Notes:
- Connection via safety isolating transformer. ⚠
- Power supply Com/Neutral and control signal "-" wiring to a common is prohibited.
- The control signal has to be separated from the others and shielded.
- 75% duty cycle.



Terminal

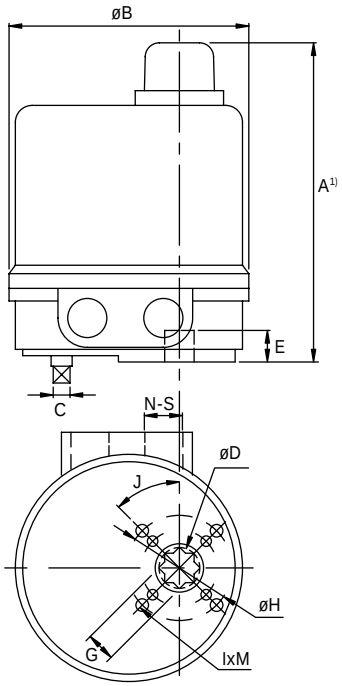
⊥	Power supply Com/Neutral
~	Power supply Hot line
Y	Sensor signal +
⊥1	Sensor signal -
U5	MP-Bus signal +
⊥2	MP-Bus signal -
C1	leave unconnected
C2	

Auxiliary switch

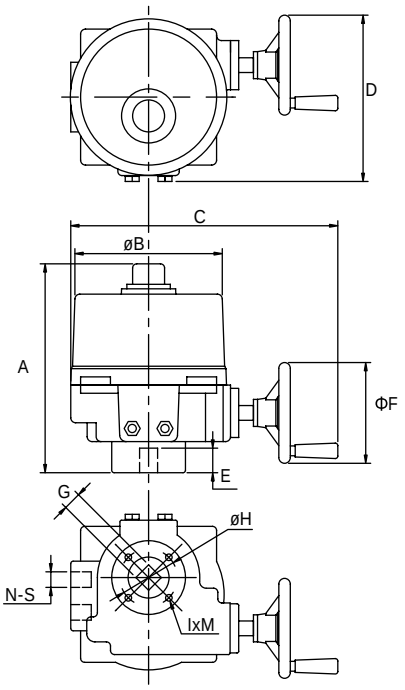


SY(2...4)U24-MP-T

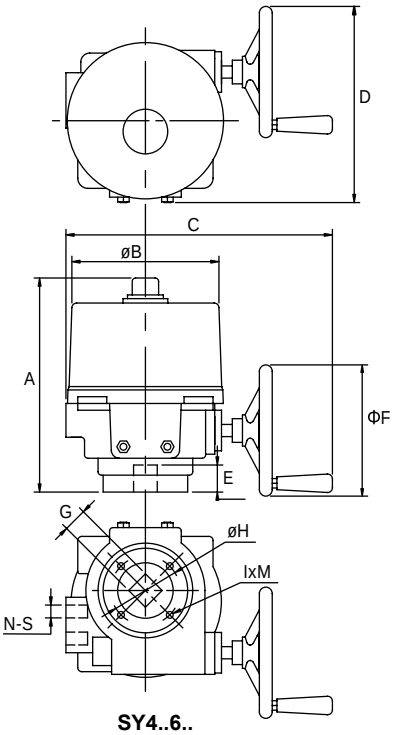
Dimensions [mm]



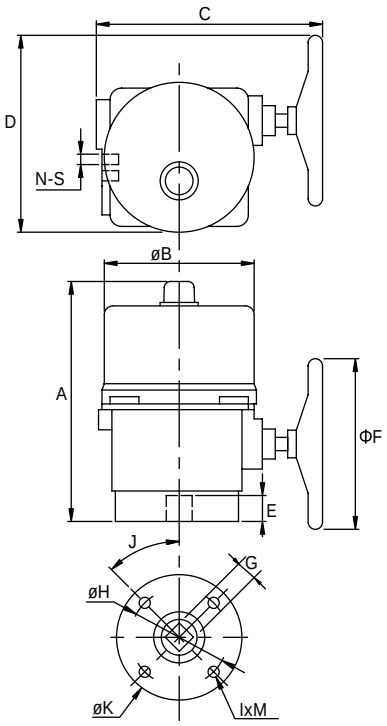
SY1..



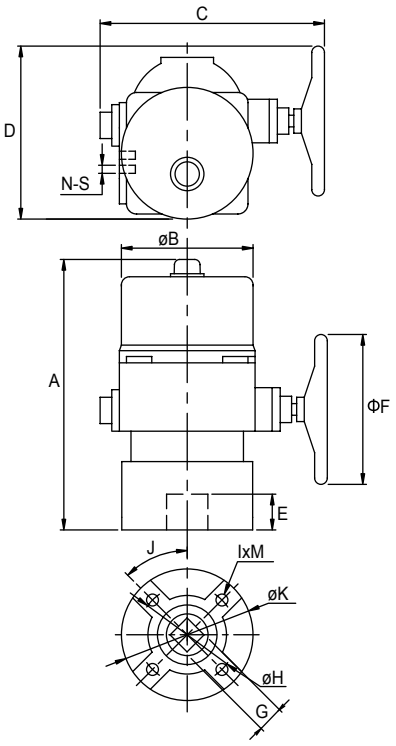
SY2/3..



SY4..6..



SY7/8..



SY9..12..

1) For SY1U24(230)-SR-T, A is 183.
2) For SY2(3)-230-3-T, A is 255.

Model No / Dim	A	B	C	D	E	Φ F	G	H	I	J	K	M	N	S	Flange type
SY1..	150 [1)]	106	8	19	15	-	14	50	4	45°	-	M6	2	1/2 PS	F05
SY2/3..	255 [2)]	181	326	208	30	123	17/22	70	4	-	90	M8	2	1/2 PS	F07
SY4..6..	317	217	394	294	40	194	22/35	102	4	-	125	M10	2	1/2 PS	F10
SY7/8..	406	217	347	336	45	295	36	140	4	45°	180	M16	2	1/2 PS	F14
SY9...12..	564	256	455	392	57	395	36	165	4	45°	221	M20	2	1/2 PS	F16

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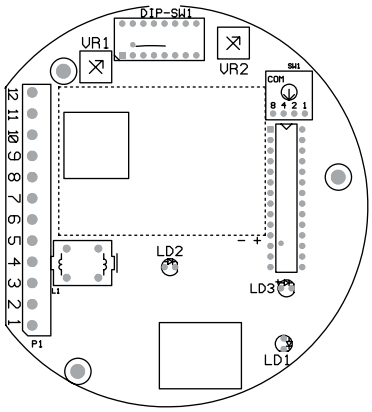
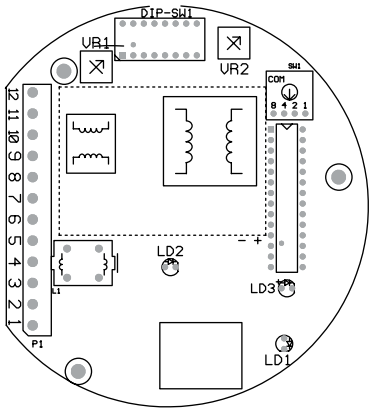
Circuit board set up



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

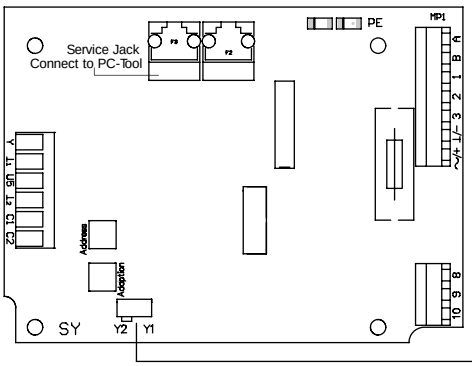
S1, S2 - for Input signal			S3, S4, S5 - for Output signal				S6 - Direction of Travel in response to the control		S7 and S8 - Actuator response to the control signal failure		
Input signal	**S1**	**S2**	**Output signal**	**S3**	**S4**	**S5**	**Symbol**	**S6**	**When signal fails**	**S7**	**S8**
(0)2...10V	**Off**	**On**	**(0)2...10V**	**On**	**Off**	**On**	90° Y	Off	Fully closed	Off	On
4...20mA	On	Off	4...20mA	Off	On	Off			Fully open	On	Off
1...5V	Off	Off					90° Y	On	**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.
Prior to switch-on, make sure the input signal and voltage wiring are in accordance with the actuator name plate and Dip-switch setting.

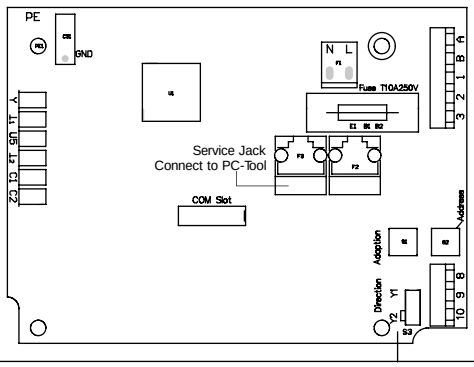
(Only available for SY1U24/230-SR-T)
When you need to adjust the signal of modulating board, please adjust the VR1 and VR2:
- VR2 adjusts 4mA, 2V, 1V (Fully-closed)
- VR1 adjusts 20mA, 10V, 5V (Fully-open)

Please turn the VR2 to the end by clockwise direction and input 4mA 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 20mA to modulating board. Then please slightly turn the VR1 by clockwise direction about 3...6 times until the GREEN light keeps ON.



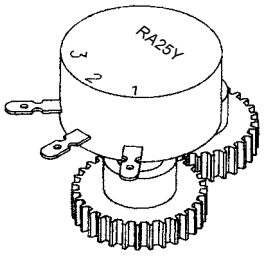
SY(2...4)U24-MF/MP-T



SY(2...12)U230-MF-T

Direction switch
Y2 standard
Factory setting

Position feedback potentiometer



Potentiometer

For modulating actuators, the potentiometer is a standard part.

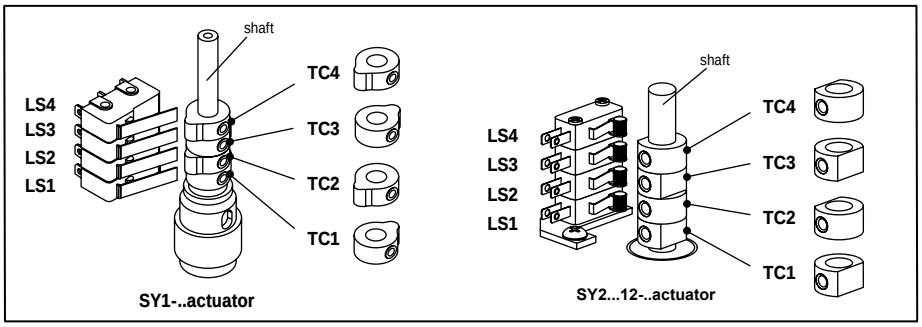
Potentiometer points 1, 2, 3 are wired to terminal blocks 10, 9, 8.

When the actuator is closed:	8, 9	5kΩ
	9, 10	0kΩ
When the actuator is open:	8, 9	0kΩ
	9, 10	5kΩ

Travel cams TC..

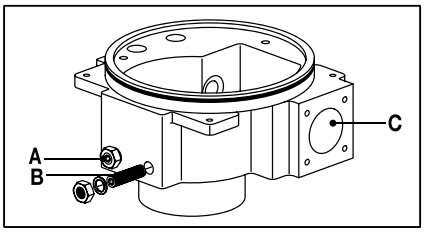
Only authorised and trained persons are allowed to change the settings.

- 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°).



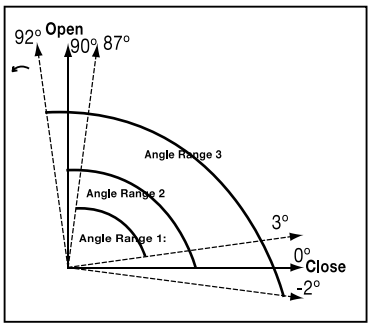
The cams for adjusting the limit and auxiliary switches are accessible if the cover is removed. The LS2/LS1 limit switches interrupt the power supply to the motor and are controlled by means of the TC.. cams which rotate with the shaft. The LS4/LS3 auxiliary switches can optionally be connected for signalisation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

Relationship of auxiliary switches, limiting switches and limits of manual rotation angle



- A stop screw for OPEN limiting
- B stop screw for CLOSED limiting
- C stop screw connection for manual operation

The limits of manual operation is set at -2°...92° in the factory. The override handwheel turns the planetary gear by means of a worm wheel. The gear is stopped mechanically by the two stop screws A and B.



Angle Range 1: Two auxiliary switches LS3 and LS4 are set at 3°...87° angle in the factory

Angle Range 2: The two limit switches LS2 and LS1 are set at 0°...90° angle in the factory

Angle Range 3: Two stop screws A and B are set at -2°...92° angle in the factory

Fully Open/Closed position setting

Fully Closed position (0%) setting

1) Power on. The actuator will drive CW to closed position.
2) Check whether disc of valve at fully closed position.
3) Adjust travel cams TC2 and stop screws for closed limiting (see “Adjusting travel cams and stop screws”)

Fully Open position (100%) setting

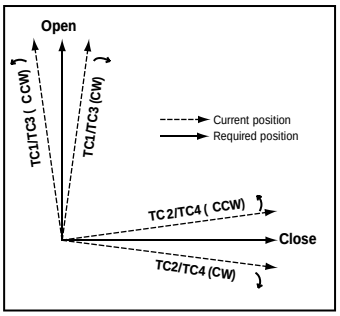
1) Power on. The actuator will drive CCW to open position.
2) Check whether disc of valve is at fully open position.
3) Adjust travel cams TC1 and stop screws for open limiting (see “Adjusting travel cams and stop screws”)

V7.3 09.2015•Subject to modification

Adjusting the TC and stop screws

1. Loosen the corresponding stop screw;
2. Loosen the travel cam to be re-adjusted with a 2.5mm hexagonal key;
3. Turn the travel cam clockwise or counter clockwise with the hexagonal key as shown in the right diagram and initially tighten the cam;
4. Check the full rotation of limit switch with power on;
5. Tighten the travel cam after successful re-adjustment, otherwise repeat to do point 3 and 4 until the travel cam is successfully re-adjusted.
6. When the motor stops at fully closed or open position, tighten the corresponding stop screw until it touches the gearbox, turn the stop screw cycle back and lock by a hexagonal key and a wrench (1 turn of the stop screw corresponding to 2° angle of rotation around).

- **The LS2/LS1 switches must always switch off the motor before the effect of stop screws.**
- **Perform an adaption after changing the position of the travel cam**



Adaption button

Installation guidelines

Cautions of installation

- Check power supply before wiring.
- Replace housing cover immediately after making adjustments and make sure seal is secure. If water or dust is present, thoroughly dry and clean before replacing housing.
- The motor cannot be reversed and the actuator cannot be installed upside down.
- Be sure to keep it away from gas; do not use in 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 overheating.

Maintenance

All actuators are lubricated with anti-high temperature lubricant for a 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 the actuator is not correctly stored. The actuator 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, but it's recommended to connect the actuators to the power supply, especially if storage area 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.

FAQ

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 gear box 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-CBPCB)
	Tripping of motor thermal protective device	Check if the motor is hot.The actuator will be available again after the motor has cooled down. Solve the motor overheat problem.
Running motor stops	Power supply has short circuit	Check wiring
	External object stuck in the pipe	Take off the valve for cleaning
Not fully opening/closing	The fixing screw for travel cam is loose	Re-adjust and tighten the travel cam
The actuator is continually hunting	The sensitivity setting is incorrect	Adjust the sensitivity switch SW1 to increase the number (only for SY1..).
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