**General Large Torque Actuators for operation of:**
- Torque: 35...3500Nm
- Open/Close or 3-point control:
- Modulating control:

**Nominal voltage**
- AC 24V ± 10% for SY...-3-T, SY...-SR-T
- AC 230V ± 10% for SY...-3-T, SY...-SR-T

**Nominal voltage range**
- AC 21.6...26.4V for SY...-3-T, SY...-SR-T
- 207...253V for SY...-3-T, SY...-SR-T

**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 2(0)...10V

**Sensitivity**
- 200mV

**Position feedback signal U**
- DC 2(0)...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 89/336/EEC

**Low voltage directive**
- CE according to 73/23/EEC, 93/68/EEC

---

**Technical data**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>SY1..</td>
<td>35</td>
<td>10W</td>
<td>15s</td>
<td>13s</td>
<td>0.6A</td>
<td>by 8mm Wrench</td>
<td>2</td>
<td>F05</td>
</tr>
<tr>
<td>SY2..</td>
<td>90</td>
<td>70W</td>
<td>40W</td>
<td>15s</td>
<td>3.0A</td>
<td>Handwheel</td>
<td>11</td>
<td>F07</td>
</tr>
<tr>
<td>SY3..</td>
<td>150</td>
<td>70W</td>
<td>40W</td>
<td>15s</td>
<td>3.0A</td>
<td>Handwheel</td>
<td>11</td>
<td>F07</td>
</tr>
<tr>
<td>SY4..</td>
<td>400</td>
<td>180W</td>
<td>120W</td>
<td>15s</td>
<td>6.0A</td>
<td>Handwheel</td>
<td>22</td>
<td>F10</td>
</tr>
<tr>
<td>SY5..</td>
<td>500</td>
<td>180W</td>
<td>120W</td>
<td>15s</td>
<td>6.5A</td>
<td>Handwheel</td>
<td>22</td>
<td>F10</td>
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<td>SY6..</td>
<td>650</td>
<td>120W</td>
<td>120W</td>
<td>15s</td>
<td>0.8A</td>
<td>Handwheel</td>
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<td>F10</td>
</tr>
<tr>
<td>SY7..</td>
<td>1000</td>
<td>180W</td>
<td>120W</td>
<td>15s</td>
<td>1.6A</td>
<td>Handwheel</td>
<td>36</td>
<td>F14</td>
</tr>
<tr>
<td>SY8..</td>
<td>1500</td>
<td>220W</td>
<td>120W</td>
<td>15s</td>
<td>2.0A</td>
<td>Handwheel</td>
<td>36</td>
<td>F14</td>
</tr>
<tr>
<td>SY9..</td>
<td>2000</td>
<td>180W</td>
<td>120W</td>
<td>15s</td>
<td>1.6A</td>
<td>Handwheel</td>
<td>56</td>
<td>F16</td>
</tr>
<tr>
<td>SY10..</td>
<td>2500</td>
<td>220W</td>
<td>120W</td>
<td>15s</td>
<td>2.0A</td>
<td>Handwheel</td>
<td>56</td>
<td>F16</td>
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<tr>
<td>SY11..</td>
<td>3000</td>
<td>250W</td>
<td>120W</td>
<td>15s</td>
<td>1.6A</td>
<td>Handwheel</td>
<td>56</td>
<td>F16</td>
</tr>
<tr>
<td>SY12..</td>
<td>3500</td>
<td>300W</td>
<td>120W</td>
<td>15s</td>
<td>2.2A</td>
<td>Handwheel</td>
<td>56</td>
<td>F16</td>
</tr>
</tbody>
</table>

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**General Large Torque Actuators**

- for operation of:
  - DN50...600 Butterfly Valves
  - SY...24-3-T, SY...230-3-T
  - SY1U24-SR-T, SY1U230-SR-T
  - SY..U24-MF-T, SY..U230-MF-T

---

**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.
**SY.. Large Torque Multi-function Actuators**

**Ordering sample**

<table>
<thead>
<tr>
<th>Model number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SY4 U230 -MF -T</td>
<td>With terminal only</td>
</tr>
<tr>
<td>SY4 U24 -MF -SR</td>
<td>Modulating control</td>
</tr>
<tr>
<td>SY4 U230 -3</td>
<td>Open/Close or 3-point control</td>
</tr>
<tr>
<td>SY4 U24 -3</td>
<td>24V nominal voltage (modulating)</td>
</tr>
<tr>
<td>SY4 U230 -3</td>
<td>230V nominal voltage (modulating)</td>
</tr>
<tr>
<td>SY4 U24 -24</td>
<td>24V nominal voltage (Open/Close, 3-point)</td>
</tr>
<tr>
<td>SY4 U230 -230</td>
<td>230V nominal voltage (Open/Close, 3-point)</td>
</tr>
</tbody>
</table>

**Wiring diagrams**

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

- **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.

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

- **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.

**SY1U24-SR-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.

**Auxiliary switch**

- SY1-24-3-T  
- SY1-230-3-T  
- SY(2...4)-24-3-T  
- SY(2...12)-230-3-T

**Wiring diagrams**

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

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

**SY1U24-SR-T**  
Modulating control  
Terminal

**Auxiliary switch**

- SY1-24-3-T  
- SY1-230-3-T  
- SY(2...4)-24-3-T  
- SY(2...12)-230-3-T

**WARNING! Leakage current is possible (<3.5mA)!**  
Connect the earth first before applying any supply voltage!  
Disconnect the supply voltage before the earth!
**SY.. Large Torque Multi-function Actuators**

**Wiring diagrams** (continued)

**SY1U230-SR-T**

**Modulating control**

**Terminal**

- **Power supply Com/Neutral**
- **Power supply Hot line**
- **Control signal -**
- **Control signal +**
- **For actuator internal use**
- **Feedback signal -**
- **Feedback signal +**

**Auxiliary switch**

**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.

**SY..U24-MF-T**

**Modulating control**

**Terminal**

- **Power supply Com/Neutral**
- **Power supply Hot line**
- **Control signal -**
- **Control signal +**
- **Feedback signal -**
- **Feedback signal +**

**Auxiliary switch**

**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.

**SY..U230-MF-T**

**Modulating control**

**Terminal**

- **Power supply Com/Neutral**
- **Power supply Hot line**
- **Control signal -**
- **Control signal +**
- **Feedback signal -**
- **Feedback signal +**

**Auxiliary switch**

**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.

**SY..U24-MP-T**

**Modulating control**

**Terminal**

- **Power supply Com/Neutral**
- **Power supply Hot line**
- **Sensor signal +**
- **Sensor signal -**
- **MP-Bus signal +**
- **MP-Bus signal -**
- **Feedback signal -**
- **Feedback signal +**

**Auxiliary switch**

**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.
### SY.. Large Torque Multi-function Actuators

#### Dimensions [mm]

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

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

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

Position feedback potentiometer

Disconnect power supply before changing the following settings.

The words in bold are default settings.

**DIP switches setting**

<table>
<thead>
<tr>
<th>Input signal</th>
<th>S1</th>
<th>S2</th>
<th>Output signal</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>Symbol</th>
<th>S6</th>
<th>When signal fails</th>
<th>S7</th>
<th>S8</th>
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<tbody>
<tr>
<td>2...10V</td>
<td>Off</td>
<td>On</td>
<td>2...10V</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Fully closed</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>4...20mA</td>
<td>Off</td>
<td>Off</td>
<td>4...20mA</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Fully open</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>1...5V</td>
<td>Off</td>
<td>Off</td>
<td>1...5V</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Stop</td>
<td>On</td>
<td>On</td>
</tr>
</tbody>
</table>

• **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.

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.
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 counterclockwise (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”)
### 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

- **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.
- **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

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Possibilities</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
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<td>Motor overheat</td>
<td>Voltage abnormal</td>
<td>Check by multimeter</td>
</tr>
<tr>
<td></td>
<td>High working frequency</td>
<td>Limit the working frequency</td>
</tr>
<tr>
<td></td>
<td>Motor spindle is stuck or valve is too tight to move</td>
<td>Replace the stuck assemblies or the valve.</td>
</tr>
<tr>
<td></td>
<td>The gear box stuck by stop screw</td>
<td>Check and correct travel cam for evidence of loosening; inspect the stop screw setting by operating the hand-wheel manually.</td>
</tr>
<tr>
<td>No operation</td>
<td>Power supply or voltage abnormal</td>
<td>Check the power supply voltage with the identification plate.</td>
</tr>
<tr>
<td></td>
<td>Fuse blown</td>
<td>Check and replace the fuse as required (except for HW-CBPCB)</td>
</tr>
<tr>
<td></td>
<td>Tripping of motor thermal protective device</td>
<td>Check if the motor is hot. The actuator will be available again after the motor has cooled down. Solve the motor overheat problem.</td>
</tr>
<tr>
<td>Running motor stops</td>
<td>Power supply has short circuit</td>
<td>Check wiring</td>
</tr>
<tr>
<td></td>
<td>External object stuck in the pipe</td>
<td>Take off the valve for cleaning</td>
</tr>
<tr>
<td>Not fully opening/closing</td>
<td>The fixing screw for travel cam is loose</td>
<td>Re-adjust and tighten the travel cam</td>
</tr>
<tr>
<td></td>
<td>The sensitivity setting is incorrect</td>
<td>Adjust the sensitivity switch SW1 to increase the number (only for SY1..).</td>
</tr>
<tr>
<td>The actuator is continually hunting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occasional fail in motor</td>
<td>Power input of “open” and “close” simultaneously</td>
<td>Check if the external control switch is normal; relays are needed in parallel connection of several actuators</td>
</tr>
<tr>
<td>switched on or off</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>