Flowrite™ 599 Series

SKD6xU Electronic Valve Actuators

24 Vac Proportional Control

Description
The Flowrite 599 Series SKD6xU Electronic Valve Actuators require a 24 Vac supply and receive a 0 to 10 Vdc or a 4 to 20 mA control signal to proportionally control a valve. These actuators are designed to work with Flowrite 599 Series valves with a 3/4-inch (20 mm) stroke.

Features
- Direct-coupled installation requires no special tools or adjustments
- Visual and electronic stroke indication
- Die-cast aluminum housing
- Manual override
- Spring return to fail-safe position or non-spring return fail-in-place
- Automatic stroke calibration
- Maintenance-free

Application
These electronic actuators are designed to be used with Flowrite 599 Series valves with a 3/4-inch (20 mm) stroke in liquid and steam service applications.

Product Number
SKD62U, Spring Return  (Actuator Prefix Code 274)
SKD60U, Non-Spring Return (Actuator Prefix Code 267)

Warning/Caution Notations

<table>
<thead>
<tr>
<th>WARNING:</th>
<th>Personal injury or loss of life may occur if you do not perform a procedure as specified.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAUTION:</td>
<td>Equipment damage or loss of data may occur if you do not perform a procedure as specified.</td>
</tr>
</tbody>
</table>
## Specifications

### Power supply
- **Operating voltage**: 24 Vac -20%/+30%
- **Frequency**: 50/60 Hz
- **Power consumption**: 17 VA/12W

### Control signals
<table>
<thead>
<tr>
<th>Control input (Y)</th>
<th>Voltage</th>
<th>0 to 10 Vdc or 4 to 20 mA (DIP switch selectable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Impedance</td>
<td>0 to 10 Vdc 100K ohms 4 to 20 mA; 240 ohm</td>
<td></td>
</tr>
<tr>
<td>Signal resolution</td>
<td>&lt;1%</td>
<td></td>
</tr>
<tr>
<td>Hysteresis</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>Control input (Z)</td>
<td>Resistance</td>
<td>0 to 1000 ohms</td>
</tr>
<tr>
<td>Voltage</td>
<td>0 to 1.6V</td>
<td></td>
</tr>
</tbody>
</table>

### Control output (U) – position feedback
| Voltage | 0 to 9.8 Vdc ± 2% |
| Load Impedance | >10K ohm |
| Current | 4 to 19.6 mA ± 2% |
| Load impedance | < 500 ohms |

### Function
- **Nominal stroke**: 3/4-inch (20 mm)
- **Run time with control operation (full stroke)**
  - Pushing stroke, 0 to 100%: 30 seconds
  - Pulling and Spring return stroke, 100 to 0%: 15 seconds

### Nominal Force
- **NC and 3-way upper**: 0% - 225 lbs (1000 N)
- **NO and 3-way by-pass**: 100% - 258 lbs (1150 N)

### Agency Certification
- **UL approval**: UL873
- **cUL Certified to Canadian standard**: C22.2 No. 24-93
- **CE conformity per the EMC directive**: 89/336/EEC
- **Low voltage directive**: 73/23/EEC

### Ambient conditions
- **Ambient temperature (Operation)**: 5°F to 122°F (-15°C to 50°C)
- **Media temperature**: -13°F to 300°F (-25°C to 150°C)
- **<32°F (0°C) requires a Stem Heater**

### Housing
- **NEMA Rating**: NEMA 1 (interior only)
- **See Accessories.**

### Miscellaneous
- **Dimensions**: See Figure 17
- **Conduit opening**: 1/2-inch NPSM
- **Weight**
  - SKD60U: 7.9 lbs (3.6 kg)
  - SKD62U: 8.5 lbs (3.85 kg)
**Accessories**

**NOTE:** Installation instructions are included with each accessory.

**ASC1.6 Auxiliary switch.**

Sends a signal to indicate the valve is in the 0% stroke position. Switching point is fixed at the 0% stroke position.

- Switching capacity: 24 Vac
  - 4A resistive
  - 2A inductive
- Lowest recommended current: 10 mA

**Figure 1. Auxiliary Switch.**

**ASZ6.6** The stem heating element prevents the formation of ice on the stem when the medium temperature drops below 32°F (0°C). It is suited for universal use with valves having a stem or spindle diameter of 10 or 14 mm.

- Operating voltage: 24 Vac/dc ± 20%
- Power consumption: ≤ 40 VA/30W

**Figure 2. Stem Heating Element.**

**599-10071 Weather Shield.**

See *Service Kits* for replacement ultraviolet resistant cable ties.

**Figure 3. Weather Shield.**

**Service Kits**

The only field serviceable part is the circuit board.

- Circuit board replacement: 4-668-5748-8
- Plastic wiring compartment cover: 4-104 5634-8
- Manual Override Kit for SKD: 4-268 5504-8
- Ultraviolet (UV) resistant cable ties (pkg. of 10): 538-996

**WARNING:**

This product contains a spring under high compression. Do not attempt to disassemble the actuator.
SKD Details

Legend

1. Pressure cylinder
2. Piston
3. Oscillating pump
4. Return spring
5. Bypass valve
6. Valve stem retainer
7. Manual override knob
8. Position indicator

Figure 4. SKD6xU Details.

Operation

The actuator accepts a 0 to 10 Vdc or a 4 to 20 mA control signal. The actuator mounted on a valve, produces a stroke proportional to the input signal. When power is turned off or in the event of a power failure, the SKD62U Actuator spring returns the valve to its normal position, and the SKD60U Actuator fails in place.

Spring return: When power is turned off or in the event of a power failure, the actuator spring returns the valve to its normal position.

Non-spring return: When power is turned off or in the event of a power failure, the actuator maintains its position.

Figure 5.

Figure 6.

Figure 7. Valve Stem Travel Indication.
Mounting and Installation

Figure 8. Acceptable Mounting Positions.

The vertical position is the recommended position for mounting. Other positions are allowed. When using the Weather Shield for NEMA 3R rating, the vertical position is required. See Weather Shield installation instructions and Figure 8.

Allow four inches (100 mm) around the sides and back of the actuator and eight inches (200 mm) above and to the front of the actuator.

See dimensions in Figure 16 and Figure 17.

Detailed installation instructions for field mounting are shipped with the actuator.

Start-up

Check the wiring for proper connections.

NOTE: The valve body assembly determines the complete assembly action.

Stroke Calibration

To determine the stroke positions 0% and 100% in the valve, calibration is required when the valve/actuator are commissioned for the first time.

The actuator must be mechanically connected to a valve and must have a 24 Vac power supply. The calibration procedure can be repeated as often as necessary.

CAUTION:

Before starting calibration, be sure the manual adjuster is set to Automatic to register the actual values.

There is a slot on the printed circuit boards of the actuators. To initiate the calibration procedure, the contacts inside this slot must be short-circuited, for example, with a screwdriver (see Figure 9).

Automatic calibration proceeds as follows (see Figure 10):

- Actuator runs to the 0 stroke position (1), green LED flashes.
- Actuator then runs to the 100 stroke position (2), green LED flashes.
- Measured values are stored in the EPROM.
- The actuator now moves to the position defined by control signal Y or Z (3), and the green LED now glows steadily (normal operation).
- Throughout this procedure, output U is inactive; meaning, the values only represent actual positions when the green LED stops flashing and remains on continuously.
Stroke Calibration, Continued

<table>
<thead>
<tr>
<th>LED</th>
<th>Display</th>
<th>Function</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>ON</td>
<td>Normal Operation</td>
<td>Automatic operation</td>
</tr>
<tr>
<td></td>
<td>Flashing</td>
<td>Stroke calibration In Progress</td>
<td>Wait for calibration to be completed (LED stops flashing)</td>
</tr>
</tbody>
</table>
| Red  | ON      | Faulty stroke calibration | - Check mounting  
                                | Internal Error | - Restart stroke calibration (by short-circuiting calibration slot)  
                                | Flashing | - Replace electronics |
|      | OFF     | Inner valve jammed    | Check the valve                                       |
|      |         | • No power supply     | - Check mains                                        |
|      |         | • Faulty electronics  | - Replace electronics                                 |

Override Control

The override control input (Z) has three modes of operation:

- **No Function**
  - Z-Contact not Wired
  - Valve Stroke Follows Control Signal Y

- **Override with 0 ... 1000 Ω**
  - Z-Contact Connected to M Via Resistor R
  - Linear or Equal-Percentage Characteristic
  - Starting Position at 50 / End Position at 900
  - Y-Input has No Effect

<table>
<thead>
<tr>
<th>Actuator Fully Extended</th>
<th>Actuator Fully Retracted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>Stroke</td>
</tr>
<tr>
<td>G0</td>
<td>G0</td>
</tr>
<tr>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>U</td>
<td>U</td>
</tr>
<tr>
<td>Z</td>
<td>Z</td>
</tr>
<tr>
<td>100 % Stroke</td>
<td>100 % Stroke</td>
</tr>
<tr>
<td>Hmax</td>
<td>Vmax</td>
</tr>
<tr>
<td>Hmin</td>
<td>0 %</td>
</tr>
</tbody>
</table>

The Z-modes have a "direct acting" factory setting.
Figure 11. SKD Electronic Features.

<table>
<thead>
<tr>
<th>DIP Switches (Left to right)</th>
<th>1 Selection of Control Signal</th>
<th>2 Selection of Flow Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>4 to 20 mA</td>
<td>Modified*</td>
</tr>
<tr>
<td>OFF Factory Setting</td>
<td>0 to 10 Vdc</td>
<td>Default</td>
</tr>
</tbody>
</table>

*Changing the default setting will modify an equal percentage valve to a linear flow characteristic. When set to default, the flow characteristic is determined by the valve body.

**Normally Closed Valve**
Actuator pressure cylinder moves:
- Outward (0 to 1): Valve opens.
- Inward (1 to 0): Valve closes.

**Normally Open Valve**
Actuator pressure cylinder moves:
- Outward (0 to 1): Valve closes.
- Inward (1 to 0): Valve opens.

**Three-Way Valve**
Actuator pressure cylinder moves
- Outward (0 to 1): Valve opens between port NC and C.
- Inward (1 to 0): Valve opens between ports NO and C.

The measuring voltage at terminal U provides valve stem position feedback to an indicating instrument or building automation system.
Manual Operation

- Turn the manual setting knob clockwise for manual operation.
- A red indicator becomes visible as you begin to crank. Each complete revolution (360°) is equal to 3/32-inch (2.5 mm) stroke.
- If a signal is sent to the actuator while it is in manual operation, the actuator will move but the control will not be accurate.
- The valve cannot be commanded to its 0% position while in manual operation.

Automatic operation

For automatic operation the manual override knob must be in the fully closed position.

Wiring

Do not use autotransformers. Use earth ground isolating step-down Class 2 power supplies.

Determine supply transformer rating by summing total VA of all actuators used.

The maximum rating for Class 2 step-down transformer is 100 VA.

- Since SKD6xU actuators require ≈20 VA, a maximum of four actuators can be powered by one transformer (80% of transformer VA).
- Operating more than four SKD6xU actuators requires additional transformers or separate 100 VA power supplies.
- The position output signal \( U \) will switch from 0 to 10 Vdc to 4 to 20 mA when a 4 to 20 mA input signal is selected and used on the Y terminal.
Wiring Diagrams

Figure 13. Connecting Terminals.

<table>
<thead>
<tr>
<th>24 Vac</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
</tr>
<tr>
<td>G0</td>
</tr>
<tr>
<td>Y</td>
</tr>
<tr>
<td>M</td>
</tr>
<tr>
<td>U</td>
</tr>
<tr>
<td>Z</td>
</tr>
</tbody>
</table>

Table 2.

<table>
<thead>
<tr>
<th>Actuator input signal</th>
<th>Receiving Impedance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low (&lt;500 Ohm)</td>
</tr>
<tr>
<td>0 to 10 Vdc</td>
<td>0 to 20 mA</td>
</tr>
<tr>
<td>4 to 20 mA</td>
<td>4 to 20 mA</td>
</tr>
</tbody>
</table>

Figure 14. Auxiliary Switch ASC1.6.

Figure 15. Heating Element ASZ6.6.

Troubleshooting

- Check that the wires are connected correctly and attached securely.
- Check for adequate power supply.
- Check that the actuator is set for automatic operation. See the Start-Up section.
Figure 16. Dimensions of 599-10071 Weather Shield in Inches (Millimeters).
**Dimensions, Continued**

**NOTE:** The top knockout position should be used when installing the Weather Shield.

![Diagram of SKD6xU Actuator Dimensions](image)

Figure 17. Dimensions of SKD6xU Actuators in Inches (Millimeters).

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