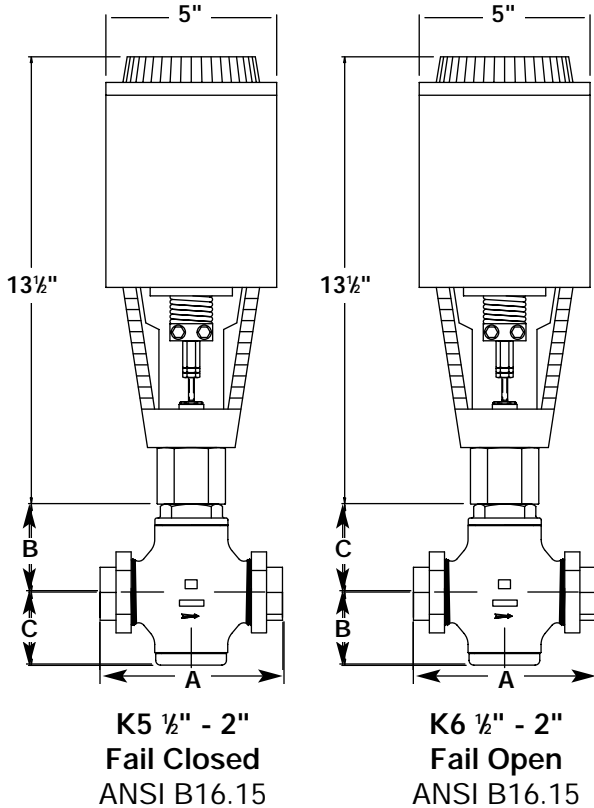




A division of CIRCOR International, Inc.

SPENCE ENGINEERING COMPANY, INC. 150 COLDENHAM ROAD, WALDEN, NY 12586-2035

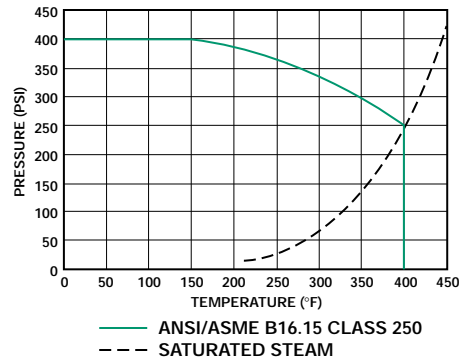
SD 8012/0112



## KOMBAT K5 & K6 Control Valve Sizes 1/2" through 2" ANSI CLASS 250

The Kombat K5 & K6 Control Valve is designed for economical control of steam, water, gas and process applications in typical institutional, commercial and industrial processes. The Kombat K5 is fail closed and the Kombat K6 is fail open. The electric actuator accepts a variety of input signals to meet most application requirements.

### PRESSURE/TEMPERATURE CHART



### DIMENSIONS inches (mm) AND WEIGHTS pounds (kg)

Size	A	B	C	Weight
1/2-3/4 (15)-(20)	5 1/2 (140)	1 11/16 (43)	1 3/16 (30)	13 (6)
1 (25)	7 7/16 (183)	2 7/8 (74)	2 5/16 (58)	17 1/2 (8)
1 1/4-1 1/2 (32)-(40)	8 7/8 (226)	3 3/8 (79)	2 7/8 (74)	23 1/2 (11)
2 (50)	8 7/8 (226)	3 3/8 (79)	2 7/8 (74)	25 1/2 (12)

### ACTUATOR SHUTOFF TABLE

VALVE SIZE	ORIFICE	SHUTOFF (PSI)
1/2	A, B, C, E, T	400
3/4	T	375
1	T	300
1-1/4	T	190
1-1/2	T	145
2	T	110

### MAXIMUM RATED FLOW COEFFICIENTS\* (Cv)

VALVE SIZE					
1/2	3/4	1	1 1/4	1 1/2	2
5.2	7	11	20	25	30

### Cv TABLE

PERCENT OF TRAVEL			5	10	20	30	40	50	60	70	80	90	100
Valve Size	Travel	Orifice	Cv										
1/2	1/4	C	0.1	0.2	0.3	0.36	0.41	0.46	0.51	0.56	0.6	0.65	0.7
		E	0.3	0.5	0.7	0.9	1.1	1.3	1.5	1.7	1.9	2	2.1
		A	0.3	0.6	1.2	1.7	2.2	2.6	2.9	3.1	3.2	3.25	3.3
		B	0.15	0.25	0.65	1.5	2.7	3.3	3.7	3.9	4.1	4.2	4.3
		T	0.7	1.2	2.0	2.7	3.2	3.8	4.3	4.7	4.9	5.1	5.2
3/4	5/16	T	0.7	1.3	2.4	3.3	4.2	4.9	5.5	6.0	6.4	6.8	7.0
1	1/4	T	0.7	1.3	2.4	3.8	5.5	7.4	9.0	10.0	10.6	10.9	11.0
1-1/4	5/16	T	0.8	1.7	4.0	6.5	9.3	12.6	15.3	17.0	18.1	19.1	20.0
1-1/2	5/16	T	1.0	2.0	4.5	7.2	9.9	12.4	15.2	18.2	20.9	23.4	25.0
2	5/16	T	1.0	2.0	4.5	7.4	10.6	15.1	18.8	22.8	26.1	28.3	30.0

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## OPERATING PRINCIPLE

The Kombat K5 & K6 Valves are a flow to open, globe style, electric actuated control valves. On loss of signal, Kombat K5 is fail closed and Kombat K6 is fail open. A controller sensing the

controlled variable provides a signal to the actuator to obtain the desired control.

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## RECOMMENDED INSTALLATION

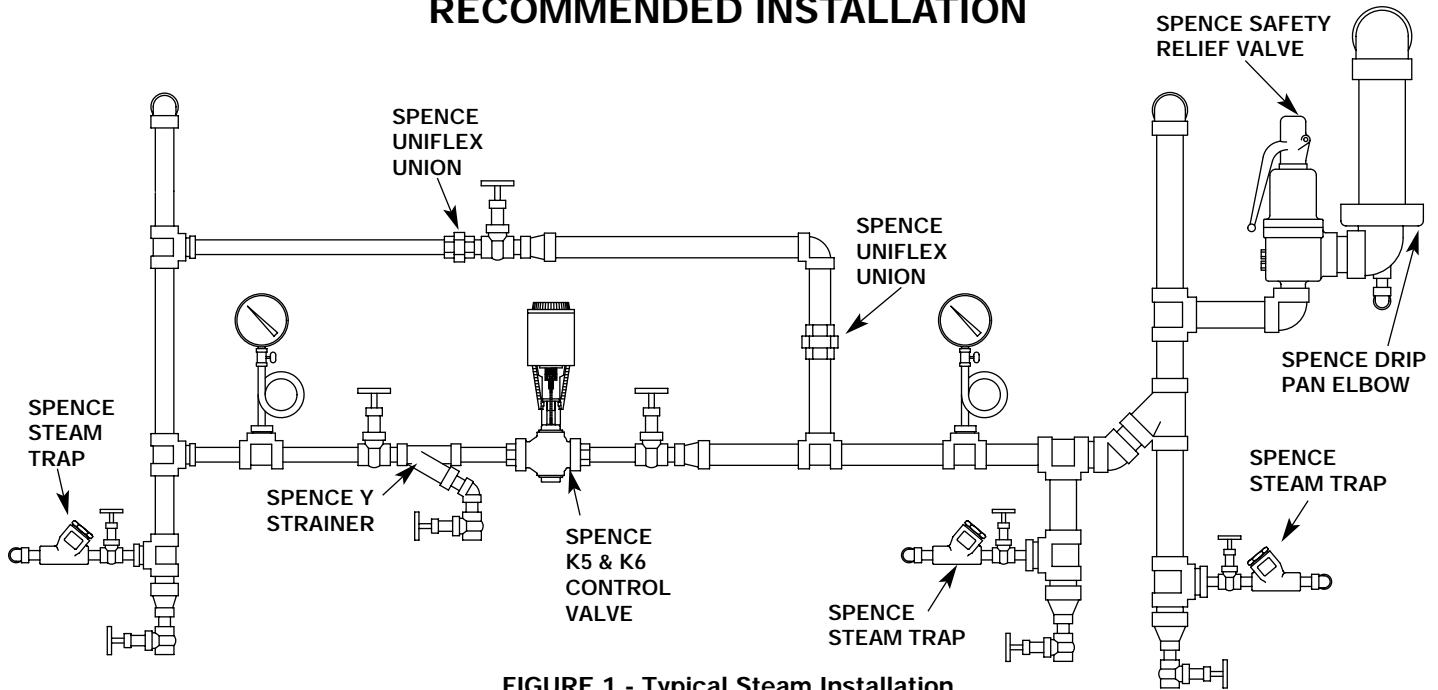


FIGURE 1 - Typical Steam Installation

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## INSTALLATION

Locate the valve in a straight run of horizontal pipe as shown in Figure 1. The valve should be mounted with the actuator in the upright position. Allow room for removal of the actuator. Prevent pipeline hammering in compressible fluid service by providing proper drainage before and after the valve. Avoid damaging effects of scale and dirt in pipelines by using a strainer. A 3-valve by-pass to facilitate inspection and maintenance without interrupting service is recommended. To eliminate excessive

noise with steam and other compressible fluids, enlarge the delivery pipe size to effect a reasonable flow velocity at the reduced pressure. A concentric transition is recommended. If possible, avoid sharp turns close to the valve bullheaded tee connections to a low pressure main. Install initial and delivery pressure gauges to indicate performance. If the rating of the delivery system or connected equipment is less than the initial pressure, provide a safety relief valve.

---

## START-UP

Flush the piping system thoroughly to clear it of welding beads, scale, sand, etc. Install the valve with the arrow on the side of the valve body pointing in the direction of fluid flow. Install controller and accessories in accordance with instructions furnished by the manufacturer of these items. Connect necessary electrical connections to the actuator. Insulation, if

desired, may be applied to the valve body only. Do not insulate the bonnet. Caution: Hazardous fluids may be handled by this valve. Only qualified personnel, who are familiar with your installation, should be permitted to install, readjust, inspect or maintain the valve.

---

## TROUBLESHOOTING

For troubleshooting of the controlling device and accessories, see the instruction furnished by the manufacturer of these items. To troubleshoot the valve and actuator, check for the following:

change in operating conditions; signal failure; power failure; foreign matter lodged between seat ring and plug; packing leakage.

# PRODUCT IDENTIFICATION

## ORDERING CODE

MODEL NUMBER (Must be 2 Digits)	ORIFICE	SIZE	CONNECTIONS	TRIM	PACKING — ACTUATOR (Must be 2 Digits)	SPRING (Must be 2 Digits)
<b>example: K 1</b>	<b>T</b>	<b>E</b>	<b>8</b>	<b>1</b>	<b>1 — 3 6</b>	<b>R B</b>
K1 - Bronze, Direct	A	C - ½	2 - 125 Flg	1 - Metal	1 - V-ring	<b>K1 &amp; K4 only</b> AA - None
K4 - Cast Iron	B	D - ¾	8 - Unions			<b>K1 only</b> 01 - None
K5 - Bronze, Reverse	C	E - 1				<b>K4 only</b> DA - 3-12 Dir 36
K6 - Bronze, Direct	E	F - 1¼				DH - 3 - 8 Dir 60
	T	G - 1½				RH - 10-15 Rev 60
		H - 2"				RQ - 12-15 Rev 60
		J - 2½				RT - 22-30 Rev 60
		K - 3				<b>K5 &amp; K6 only*</b> RB - 9-15 Rev 36
		M - 4				RC - 12-15 Rev 36
						RD - 13-15 Rev 36
						DF - 3-10 Dir 60
						DG - 3-7 Dir 60
						RG - 12-15 Rev 60
						RH - 13-15 Rev 60

\* With electric actuator, use K6 for fail open, K5 for fail closed.

## MAINTENANCE

### REMOVAL OF THE ACTUATOR FROM THE VALVE BODY ASSEMBLY

Close the inlet and outlet stop valves. Be sure the valve body is not under pressure. Remove all the accessories from the control valve. Refer to Figure 3.

Loosen the stem nuts and move them down the valve stem. Retighten being careful not to move the valve stem. Apply 50% signal to energize the actuator. Loosen the actuator stem retainer nuts until the stem adapter groove is disengaged from the stem retainer. De-energize the actuator. The actuator stem retainer should move away from the valve stem. Loosen the actuator yoke nuts and lift the actuator off the locking nut. Care must be taken to prevent the disc from rotating on the seat.

### DISASSEMBLY OF THE VALVE BODY

Remove the stem adapter (p/n 4-17407-0), stem nuts (24), and locking nut (p/n 4-17338-0). To complete body disassembly, unscrew the bonnet (25) for K5 & K6 and the cap (31) with guide (38) for the K5. Turn the stem and plug assembly out of the bonnet through the packing. Replace the packing if necessary. All parts should be inspected for wear and cleaned thoroughly before re-assembling the valve body.

### LAPPING THE PLUG INTO THE SEAT

Seats and plugs should never require more than the lightest touch up with very fine (400 grit) grinding compound. Heavy lapping will produce galling, a wider seating surface and a groove in the plug, all of which tend to cause leakage. Reface a damaged surface before attempting to grind it in. Lap sparingly. Replace stem and plug (39) in the bonnet (25) through the packing. Apply lapping compound to the plug. Place the bonnet and the bonnet flange on the body. After lapping, disassemble and clean all parts thoroughly.

### PACKING REPLACEMENT

Check the stem for gouges if the packing leaks. Replacement packing cartridges can be installed.

### RE-ASSEMBLY OF THE VALVE BODY

Tighten the bonnet (25) to the body. Replace locking nut (p/n 4-17338-0) and stem nuts (24) over the stem (34). Replace the guide (38) and cap (31) for the K5.

### REPLACING THE ACTUATOR ON THE VALVE BODY (Figure 7)

Thread the stem adapter all the way onto the valve stem. Position the electric actuator on the actuator locking nut. Make sure the actuator yoke nuts are loose enough to allow the actuator to slip over the locking nut. Position the actuator so that the control box is facing the front of the valve (with Spence logo). Hold the actuator in place while tightening the yoke nuts. Care must be taken to prevent the disc from rotating on the seat. Turn the stem adapter upward until the groove engages with the actuator stem retainer. While making this adjustment, make sure that the valve stem is all the way up. Tighten the stem retainer nuts.

### ACTUATOR ADJUSTMENT

#### K5 Reverse Acting - Fail Closed

Before calibrating the actuator, check for valve seat leakage to assure conformity to the requirements of ANSI/FCI 70-2 of Class IV with metal-to-metal trim. Test media should be air with an upstream pressure of 50 psi and a downstream pressure of atmospheric. If seat leakage exceed class IV rating, turn the actuator manual override knob clockwise to lift the disc off the seat. Loosen the stem nuts and turn valve stem upward as required. Retighten the stem nuts against the stem adapter. Turn the actuator manual override knob counterclockwise until the red indicator disappears. Recheck the valve seat leakage. Repeat steps as required until the valve seat leakage is within class IV rating.

#### K6 Direct Acting - Fail Open

After calibrating the actuator, check for valve seat leakage to assure conformity to the requirements of ANSI/FCI 70-2 of Class IV with metal-to-metal trim. Test media should be air with an upstream pressure of 50 psi and a downstream pressure of atmospheric. Apply full signal to the actuator to close the valve and measure the valve seat leakage. If the seat leakage exceeds class IV rating, apply 50% signal to lift the disc off the seat. Loosen the stem nuts and turn the valve stem downward as required. Retighten the stem nuts against the stem adapter. Apply full signal to the actuator to close the valve and recheck valve seat leakage. Repeat steps as required until the valve seat leakage is within Class IV rating.

## K1 & K5 SIGNAL CARD WIRING

### 0 - 10 vDC

For the 0 - 10 VDC option, remove the electric actuator control box cover and install the stroke limiter to terminals 'G', 'Y', and 'M' on the circuit board and tighten the terminal screws. Wiring to be according to Figure 9C. Set the input signal to 10 VDC. Turn the stroke limiter potentiometer counterclockwise to 0 % stroke. Gradually turn the potentiometer clockwise until the total valve travel is within 10% of rated travel.

### 4 - 20 mA

For 4 - 20 mA option, remove the electric actuator control box cover and wire electric actuator and analog scaling module according to Figure 9A. Set the input signal to 20 mA. Adjust the span potentiometer on the analog scaling module until the total valve travel is within 10% of rated travel. Set the input signal to 4 mA. Adjust the zero potentiometer on the analog scaling module until the voltage across the actuator terminals 'Y', and 'G0' measures zero. Set the input signal to 20 mA and recheck the valve travel. Readjust the Zero & Span potentiometers as required. Use (1) mounting screw to secure the analog scaling module to the actuator.

### 0 - 135 Ohm

For 0 - 135 ohm option, remove the electric actuator control box cover and wire electric actuator and analog scaling module according to Figure 9B. Set the signal potentiometer to 135 ohm. Adjust the span potentiometer on the analog scaling module until the total valve travel is within 10% of rated travel. Set the signal potentiometer to zero ohm. Adjust the zero potentiometer on the analog scaling module until the voltage across the actuator terminals 'Y', and 'G0' measures zero. Set the signal potentiometer to 135 ohm and recheck the valve travel. Readjust the Zero & Span potentiometers as required. Use (1) mounting screw to secure the analog scaling module to the actuator.

## CHANGING SIGNAL INPUT

### From 0-10 VDC to 4-20 mA or 0-135 ohm:

Remove the electric actuator control box cover. Loosen terminal screws for terminals 'G', 'Y', and 'M' on the circuit board and remove the stroke limiter card (P/N 05-17401-00). Follow the calibration procedure for the 4-20 mA option (signal card P/N 05-17402-00) or the 0-135 ohm option (signal card P/N 05-17382-00). Secure signal card to actuator using (1) mounting screw supplied with card.

### From 4-20 mA or 0-135 ohm to 0-10 VDC:

Remove the electric actuator control box cover and remove the signal card. Install the stroke limiter card (P/N 05-17401-00) to terminals 'G', 'Y', and 'M' on the circuit board and tighten the terminal screws. Follow the calibration procedure for the 0-10 VDC option.

### From 4-20 mA to 0-135 ohm or 0-135 ohm to 4-20 mA:

Remove the electric actuator control box cover and remove the signal card. Follow the calibration procedure for the 4-20 mA option (signal card P/N 05-17402-00) or the 0-135 ohm option (signal card P/N 05-17382-00). Secure signal card to actuator using (1) mounting screw.

After replacement of signal cards, recheck valve seat leakage according to procedure given in the actuator adjustment section for K5 and K6.

When ordering parts, it is essential that the valve type, size, service and serial number be stated.

Select part by item number, but order by part number.

Specify complete part number when ordering.

K5 and K6 are designed and manufactured in accordance with Article 3, Section 3 of the Pressure Equipment Directive.

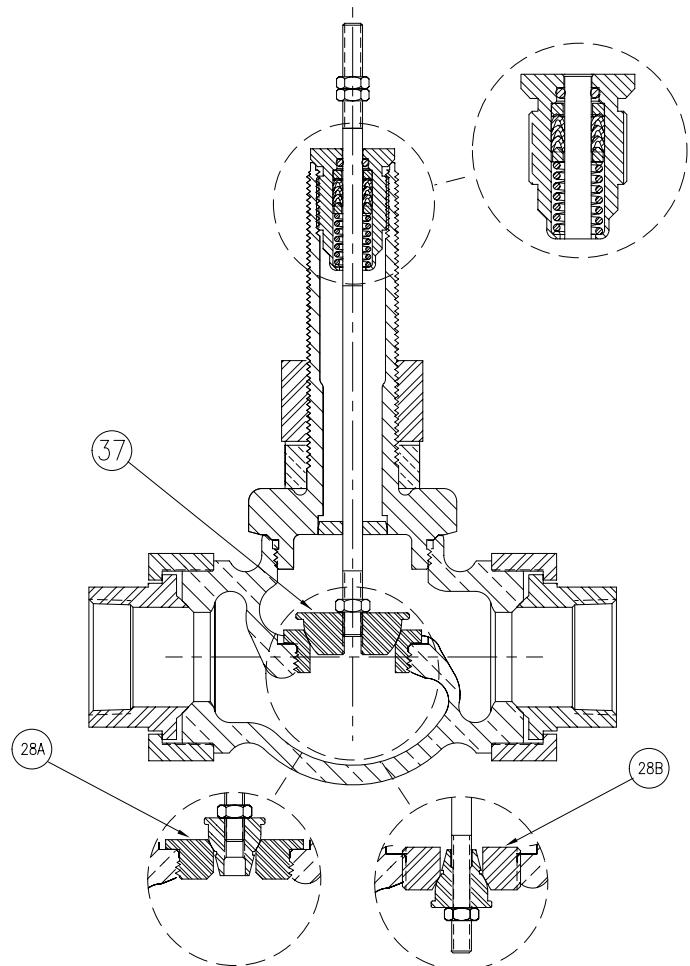


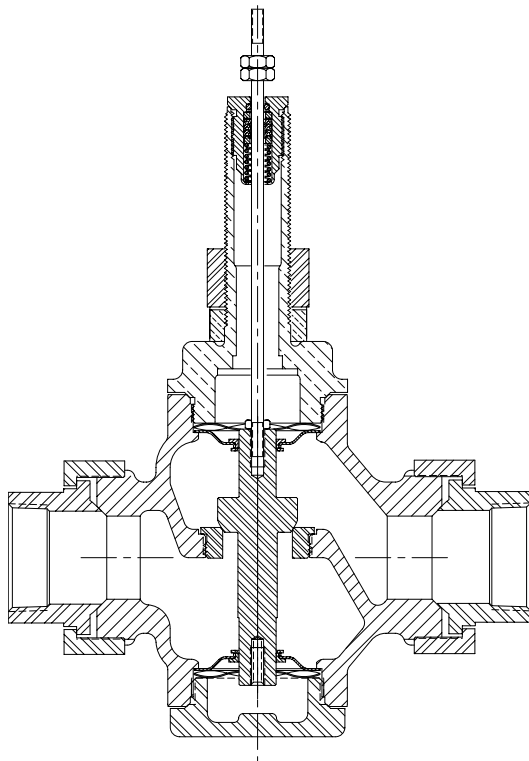
FIGURE 4 -  
VALVE BODY ASSEMBLY - K5 & K6 - 1/2" - 3/4"

## K5 & K6 VALVE BODY ASSEMBLY PART NUMBERS

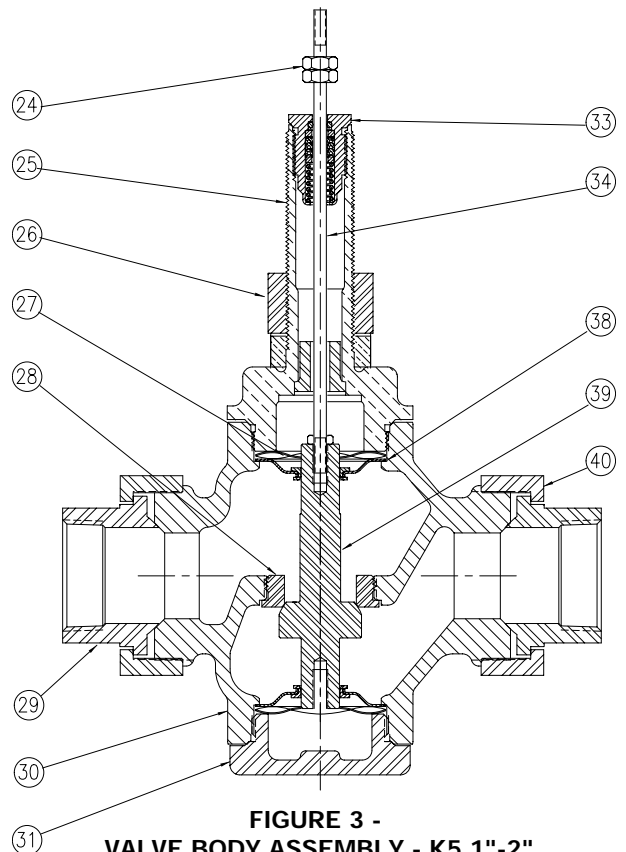
ITEM NO.	PART NAME	MATERIAL	VALVE SIZE					
			1/2	3/4	1	1-1/4	1-1/2	2
24	STEM NUT	BRASS	05-17342-00	05-17342-00	05-17342-00	05-17342-00	05-17342-00	05-17342-00
25	BONNET ASSY	BRASS	557B109-01	557B109-01	557B107-02	557B107-02	557B110-02	557B110-02
27	WAVE WASHER	ST STL	—	—	122A155-01	122A155-02	122A155-02	122A155-02
28A	SEAT RING, 1/2A K1	ST STL	SN217	—	—	—	—	—
	SEAT RING, 1/2B K1	ST STL	SUU217	—	—	—	—	—
	SEAT RING, 1/2C K1	ST STL	SN217	—	—	—	—	—
	SEAT RING, 1/2E K1	ST STL	SN217	—	—	—	—	—
	SEAT RING, T K1	ST STL	SX217	SM217	562A114-02	562A114-03	562A114-04	562A114-05
28B	SEAT RING, 1/2A K5	ST STL	562A110-01	—	—	—	—	—
	SEAT RING, 1/2B K5	ST STL	562A110-01	—	—	—	—	—
	SEAT RING, 1/2C K5	ST STL	562A110-01	—	—	—	—	—
	SEAT RING, 1/2E K5	ST STL	562A110-01	—	—	—	—	—
	SEAT RING, T K5	ST STL	562A112-01	562A113-01	562A114-02	562A114-03	562A114-04	562A114-05
29	TAILPIECE	GALV IRON	SX227	SMP462	SMP463	SBB227	SMP465	SMP593
30	BODY	BRONZE	292B110-01	292B110-01	SAM1167B	SAN1167B	SAN1167B	564B116-01
31	CAP	BRASS	—	—	557B101-01	SB312E	SB312E	SB312E
33	V RING PACKING SET	TFE/SS/VITON	204A104-01	204A104-01	204A104-01	204A104-01	204A104-01	204A104-01
34	STEM	ST STL	552A117-01	552A117-01	552A115-01	552A115-02	552A115-02	552A115-02
36**	SPACER	BRASS	04-17280-00	04-17280-00	04-17280-00	04-17280-00	04-17280-00	04-17280-00
37	NUT	ST STL	05-17342-00	05-17342-00	—	—	—	—
38	GUIDE	ST STL	—	—	556A111-01	556A111-02	556A111-02	556A111-02
39	PLUG, 1/2A	ST STL	554A154	—	—	—	—	—
	PLUG, 1/2B	ST STL	554A158	—	—	—	—	—
	PLUG, 1/2C	ST STL	554A153	—	—	—	—	—
	PLUG, 1/2D	ST STL	554A156	—	—	—	—	—
	PLUG, 1/2E	ST STL	554A159	—	—	—	—	—
	PLUG, T	ST STL	554A157	554A155	554A146-02	554A146-03	554A146-04	554A146-05
40	UNION NUT	GALV IRON	SMP487	SMP467	SMP468	SMP470	SMP470	SMP592

\* Not included in body assembly; order K-KIT separately.

\*\*Not included in body assembly; order separately.



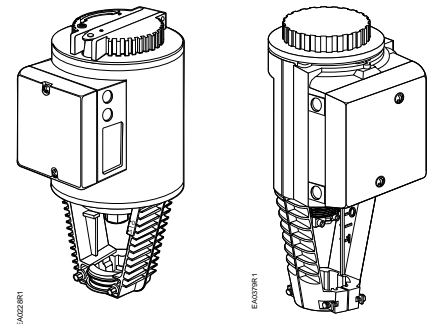
**FIGURE 2 -  
VALVE BODY ASSEMBLY - K6 1" - 2"**



**FIGURE 3 -  
VALVE BODY ASSEMBLY - K5 1"-2"**

## Flowrite™ EA 599 Series

### SKB/C/D 62UA Series Electronic Valve Actuator 24 Vac Proportional Control Advanced Features



SKB/C

SKD

#### Description

The Flowrite EA 599 Series SKB/C/D62UA Electronic Valve Actuator requires a 24 Vac supply and receives a 0 to 10 Vdc or a 4 to 20 mA control signal to proportionally control a valve. This actuator is designed to work with Flowrite VF 599 Series valves and Siemens Building Technologies, Inc. standard 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
- Automatic stroke calibration
- Direct or reverse acting
- Adjustable start and span
- Stroke limit control
- Selectable operation direction (direct-acting/reverse acting)
- Choice of linear or equal-percentage flow characteristic
- Maintenance-free

#### Application

These electronic actuators are designed to be used with Flowrite VF 599 Series valves with either 3/4-inch (20 mm) stroke (SKB/D) or a 1-1/2 inch (40 mm) stroke (SKC) in liquid service and steam service applications; or other manufacturer's valves with appropriate Universal Valve Linkage Kit.



#### Product Numbers

Table 1. Product Numbers

Actuator Stroke	Order Number
3/4-inch (20 mm)	SKB62UA
	SKD62UA

1-1/2 inch (40 mm)	SKC62UA
--------------------	---------

### Warning/Caution Notations

<b>WARNING:</b>		Personal injury/loss of life may occur if a procedure is not performed as specified.
<b>CAUTION:</b>		Equipment damage, or loss of data may occur if the user does not follow a procedure as specified.

### Specifications

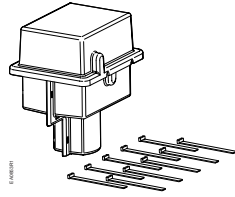
<b>Power Supply</b>	Operating voltage (SELV, PELV)	24 Vac $\pm$ 20%		
	Frequency	50 or 60 Hz		
	Power consumption	SKB62UA	17 VA/ 12W	
		SKC62UA	28 VA/ 20W	
		SKD62UA	17 VA/ 12W	
<b>Operating</b>	Type of control (proportional)	0 to 10 Vdc; 4 to 20 mA; or 0 to 1000 ohm		
	Running time		<u>Opening:</u>	<u>Closing:</u>
		SKB62UA	120 sec	15 sec
		SKC62UA	120 sec	20 sec
		SKD62UA	30 sec	15 sec
	Spring-return time	Closing:		
		SKB62UA	15 sec	
		SKC62UA	20 sec	
		SKD62UA	15 sec	
	Nominal stroke	SKB62UA	3/4-inch (20 mm)	
SKC62UA		1-1/2-inch (40 mm)		
SKD62UA		3/4-inch (20 mm)		
Position force	SKB/C 62UA	2800N		
	SKD62UA	1000N		
<b>Signal Inputs</b>	Terminal Y			
	Voltage	0 to 10 Vdc		
	Input impedance	100K ohm		
	Current	4 to 20 mA		
	Input impedance	240 ohm		
	Signal resolution	<1%		
	Hysteresis	<1%		

	Terminal Z Resistance	0 to 1000 ohm
	Override control functions Z not connected Z connected directly to G Z connected directly to G0 Z connected to M via 0 to 1000 ohm	No function (priority at Terminal Y) Maximum stroke 100% Minimum stroke 0% Linear or equal percentage
<b>Signal Inputs, continued</b>	Terminal U Voltage Load impedance Current Load impedance	0 to 9.8 Vdc $\pm$ 2% >500 ohm 4 to 19.6 mA $\pm$ 2% <500 ohms
<b>Ambient Conditions</b>	Maximum admissible temperature of medium in the connected valve: Ambient temperature Media temperature	$\leq$ 284°F (140°C) 5°F to 130°F (-15°C to 55°C) 14°F to 300°F (-10°C to 150°C)
	Operation Environmental conditions Temperature Humidity	To IEC 721-3-3 Class 3K5 5°F to 122°F (-15°C to 50°C) 5% to 95% rh
	Transport Environmental conditions Temperature Humidity	To IEC 721-2-1 Class 3K5 22°F to 149°F (-5°C to 65°C) <95% rh
	Storage Environmental conditions Temperature Humidity	To IEC 721-3-1 Class 1K3 5°F to 122°F (-15°C to 50°C) 5% to 95% rh
<b>Agency Certification</b>		UL listed to UL873 C-UL certified to Canadian standard C22.2 No. 24-93
	Meet CE requirements: EMC Directive	89/336/EEC
	C-tick	N474
	Protection standard Protection Class	IP54 to EN 60 529 III to EN 60 730
<b>Miscellaneous</b>	Materials Actuator housing and bracket Housing box and manual adjustor Conduit opening Dimensions Weight SKB62UA SKC62UA SKD62UA	Die-cast aluminum Plastic 1/2-inch NPSM See Figures 25 and 26 18.9 lbs (8,60 kg) 22.5 lbs (10,00 kg) 8.5 lbs (3,85 kg)
<b>Housing</b>	NEMA Rating	NEMA 1 (Interior only) See <i>Accessories</i>



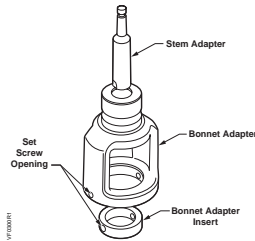


**Accessories,  
 continued**



**Figure 5. SKD Weather Shield.**

**599-10071** The SKD actuator is UL listed to meet NEMA TYPE 3R requirements (a degree of protection against rain, sleet, and damage from external ice formation) when installed with this weather shield and outdoor-rated conduit fittings in the vertical position. See *Service Kits* for replacement UV resistant cable ties.



**Figure 6. Valve Retrofit Kit.**

**Universal Retrofit Kit**

Kit contains the parts needed to adapt a valve to the following Siemens 599 Series Flowrite actuators: SKB, SKC, SKD, SQX. Selected valves from the following manufacturers can also be accommodated: Honeywell, Johnson Controls and Siebe. See your local Siemens representative for details.

**Service Kits**

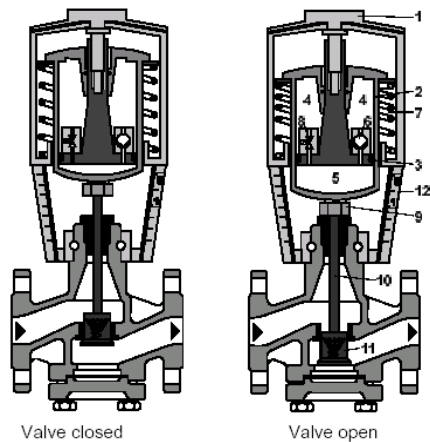
Circuit board replacement	4 668 5751 8
Manual override kit	4268 5510 8
Plastic wiring compartment cover	4 104 5582 8
Stem retainer kit	
Contains one stem nut (Figure 7, Item 6) and one stem retainer clip.	
2-1/2 and 3-inch valves	599-10048
4, 5, and 6-inch valves	599-10049
Retainer clamp kit	599-10200
Ultraviolet (UV) resistant cable ties (pkg. of 8)	538-994



**WARNING:**

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

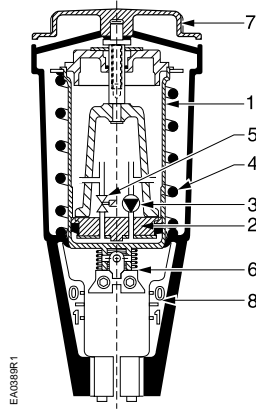
**Valve Details**



1. Manual Adjuster
2. Pressure Cylinder
3. Piston
4. Reservoir
5. Pressure Chamber
6. Pump
7. Return Spring
8. Bypass Valve
9. Coupling
10. Valve Stem
11. Inner Valve
12. Position Indicator (0 to 1)

**Figure 7. SKB/C Valve Parts.**

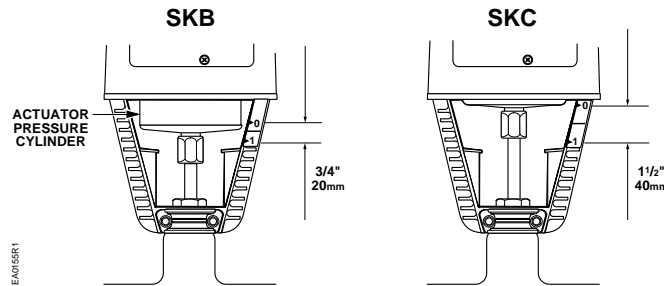
**Valve Details,  
 continued**



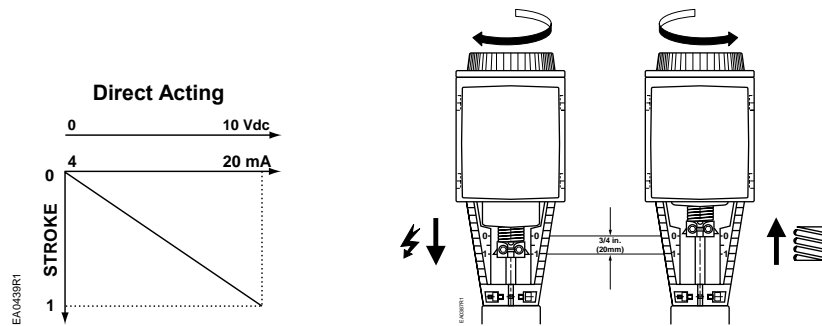
1. Pressure cylinder
2. Piston
3. Oscillating pump
4. Return spring
5. Bypass valve
6. Valve stem retainer
7. Manual override knob
8. Position indicator

**Figure 8. SKD Valve Parts.**

**Standard Operation**



**Figure 9. SKB\C Valve Stem Travel Indication.**

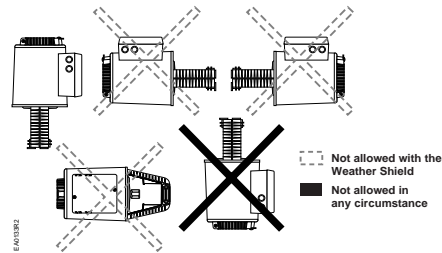


**Figure 10. SKD Valve Stem Travel Indication.**

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 actuator spring returns the valve to its normal position.

**Mounting and Installation**

The vertical position is the recommended position for mounting and the only position for NEMA Type 3R rating with the Weather Shield. Acceptable mounting positions are shown in Figure 11.



**Figure 11. Acceptable Mounting Positions.**

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 25 and Figure 26.

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



**CAUTION:**

When removing the knockout do not damage the circuit board. Use the top knockout position, if possible.

**Start-up**

Check the wiring for proper connections.

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

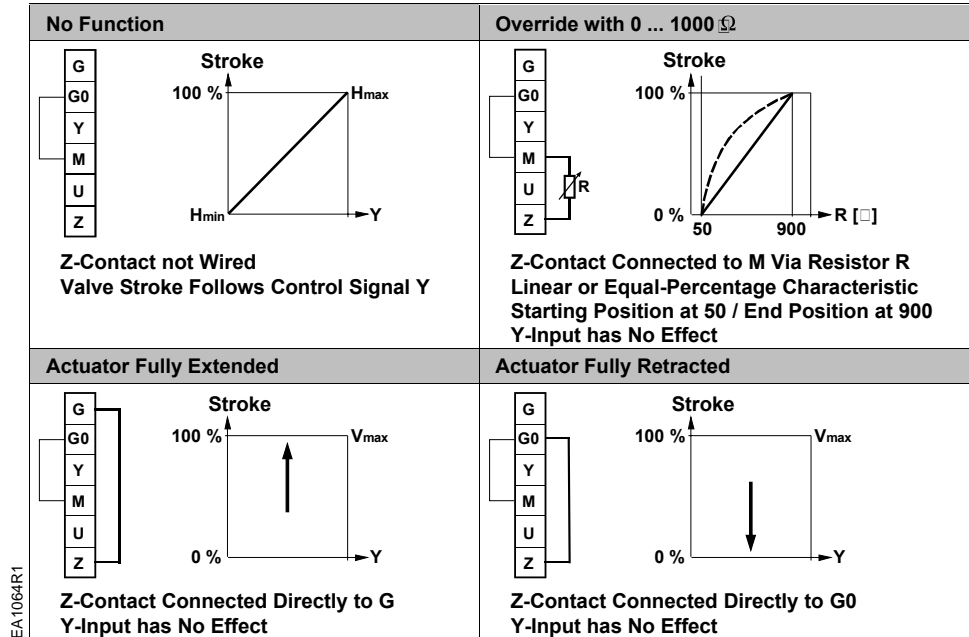
**Spring Return Function**

All SKB/C/D62UA actuators are factory-fitted with a spring-return function. If the control signal or power supply fails, the actuator will return to the 0% stroke position (stem fully retracted).

**Start-up continued**

**Override Control**

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



**NOTE:** The Z-modes have a "direct acting" factory setting.

**Stroke Calibration**

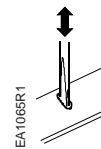
To determine the stroke positions 0% and 100% in the valve, calibration is required when the valve/actuator are commissioned for the first time. The actuator must be mechanically connected to a valve and must have a supply voltage of 24 Vac. The calibration procedure can be repeated as often as necessary



**CAUTION:**

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

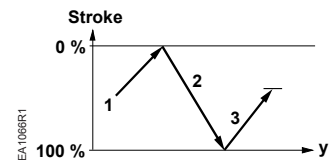
There is a slot on the printed circuit boards for the actuators. To initiate the calibration procedure, the contacts inside this slot must be short-circuited (possibly with a screwdriver). See Figure 12.



**Figure 12.**

Automatic calibration proceeds as follows (See Figure 13):

- Actuator runs to the 0% stroke position (1), the green LED flashes.
- Actuator then runs to the 100% stroke position (2), the 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 steady (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.



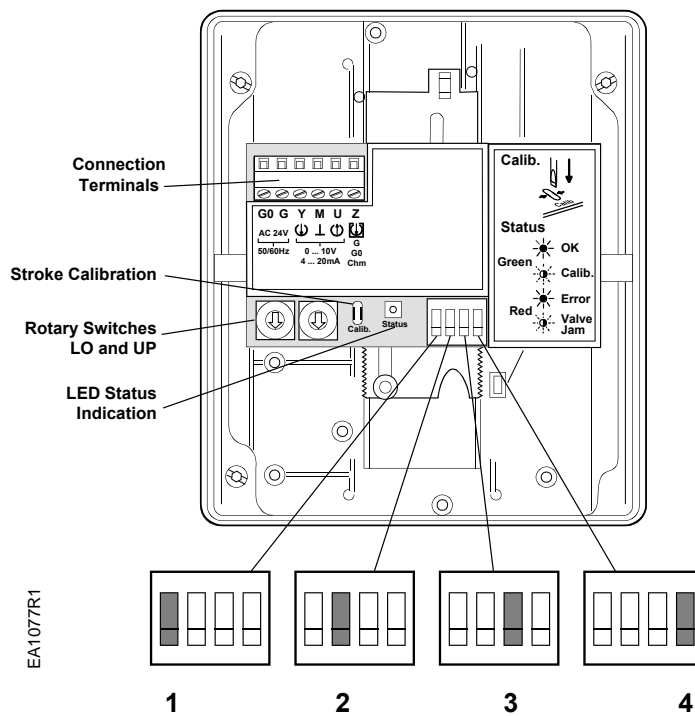
**Figure 13.**  
**Automatic Calibration.**

**Start-up continued**

**Table 2. LED Status.**

LED	Display	Function	Action
Green	ON	Normal Operation	Automatic operation
	Flashing	Stroke calibration In Progress	Wait for calibration to be completed (LED stops flashing)
Red	ON	Faulty stroke calibration Internal Error	- Check mounting - Restart stroke calibration (by short-circuiting calibration slot) - Replace electronics
	Flashing	Valve plug jammed	Check the valve
	OFF	<ul style="list-style-type: none"> <li>No power supply</li> <li>Faulty electronics</li> </ul>	- Check mains - Replace electronics

**Advanced Features**



**Figure 14. DIP Switches.**

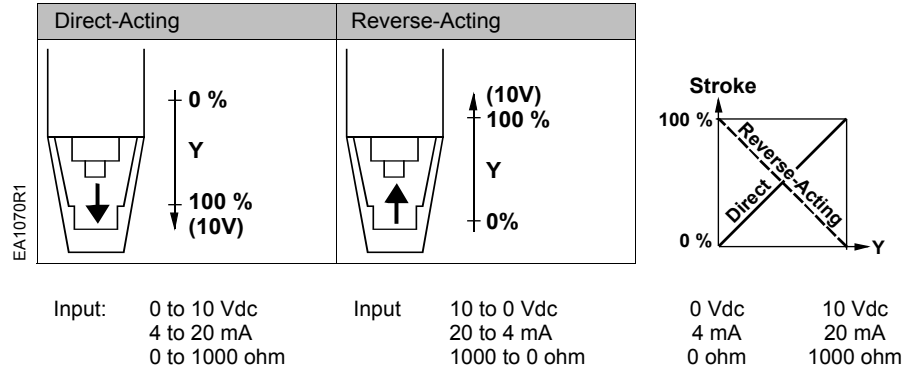
DIP Switches (From Left to Right)	1 Select Direction of Operation	2 Sequence Control or Stroke Limit Control	3 Selection of Control Signal	4 Selection of Flow Characteristic
ON	Reverse-acting	Sequence control	4 to 20 mA	Modified*
OFF (Factory Settings)	Direct-acting	Stroke limit control	0 to 10 Vdc	Default

\*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.

**Start-Up,  
 continued**

**Selecting the  
 Direction of  
 Operation**

- With normally-closed valves, "direct-acting" means that with a 0 Vdc signal input, the valve is closed.
- With Normally-open valves, "direct-acting" means that with a 0 Vdc signal input, the valve is open.



**Figure 15. Direction of Operation.**

**Sequence Control  
 or Stroke Limit  
 Control**

Check the wiring for proper connections.

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

**Table 3.**

Setting the Stroke Limit Control			
The rotary switches LO and UP can be used to apply an upper and lower limit to the stroke in increments of 3% up to a maximum of 45%.			
Position of LO	Lower Stroke Limit	Position of UP	Upper Stroke Limit
0	0%	0	100%
1	3%	1	97%
2	6%	2	94%
3	9%	3	91%
4	12%	4	88%
5	15%	5	85%
6	18%	6	82%
7	21%	7	79%
8	24%	8	76%
9	27%	9	73%
A	30%	A	70%
B	33%	B	67%
C	36%	C	64%
D	39%	D	61%
E	42%	E	58%
F	45%	F	55%

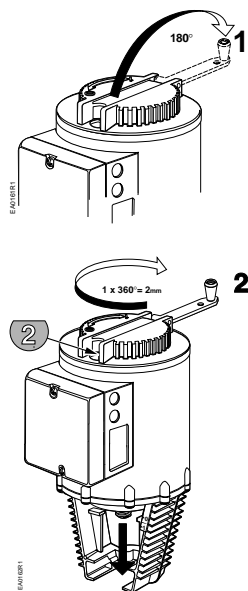
**Table 4.**

Setting the Sequence Control			
The rotary switches LO and UP can be used to determine the starting point (Start) or the operating range of a sequence (Span).			
Position of LO	Starting Point for Sequence Control	Position of UP	Operating Range of Sequence Control
0	0V	0	10V
1	1V	1	10V*
2	2V	2	10V*
3	3V	3	3V*
4	4V	4	4V
5	5V	5	5V
6	6V	6	6V
7	7V	7	7V
8	8V	8	8V
9	9V	9	9V
A	10V	A	10V
B	11V	B	11V
C	12V	C	12V
D	13V	D	13V
E	14V	E	14V
F	15V	F	15V

\*The smallest adjustment is 3 Vdc; Control with 0 to 3 Vdc is possible only via Y.

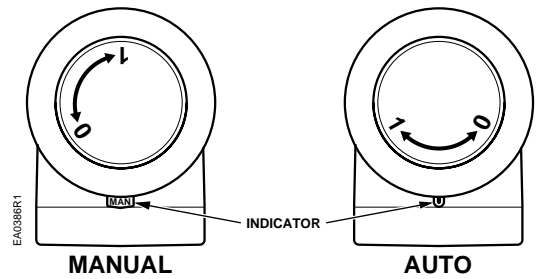
<b>Start-up, continued</b>	When actuator pressure cylinder: Moves outward (0 to 1): Valve opens.
<b>Normally Closed Valve</b>	Moves inward (1 to 0): Valve closes.
<b>Normally Open Valve</b>	When actuator pressure cylinder: Moves outward (0 to 1): Valve closes. Moves inward (1 to 0): Valve opens.
<b>Three Way Valve</b>	When actuator pressure cylinder: Moves outward (0 to 1): Valve opens between port NC and C. Moves 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**



**Figure 16. SKB/C Manual Operation.**

**NOTE:** 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.



**Figure 17. SKD Manual Operation.**

Turn the manual setting knob clockwise for manual operation. As you begin to turn, a red indicator becomes visible. Each complete revolution (360°) is equal to 3/32-inch (2.5 mm) stroke.

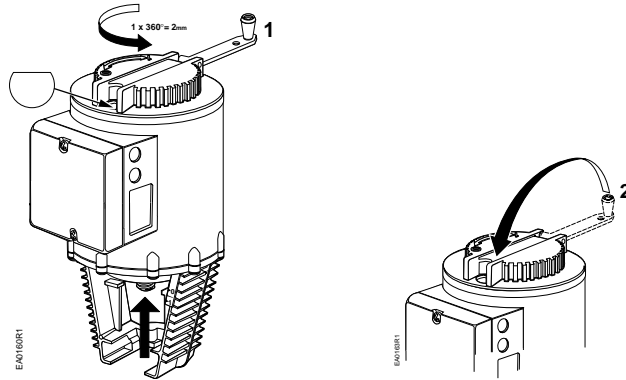


**Start-up continued**

**Automatic Operation**

**SKB/C**

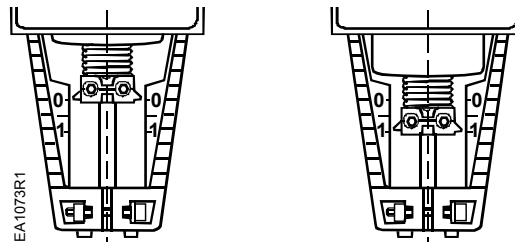
When returning to automatic control, you must turn the crank arm of the manual setting knob counterclockwise until the red numbers disappear. It is essential that the window is clear and the crank arm is snapped into position. See Figure 18.



**Figure 18. SKB/C Automatic Operation.**

**SKD**

For automatic operation, the manual override knob must be in the fully closed position. Turn the manual override knob counterclockwise until the red indicator disappears.



**Figure 19.**

Fully Retracted Coupling  
 ► Stroke = 0%

Fully Extended Coupling  
 ► Stroke = 100%



**CAUTION:**  
 The manual adjuster must be rotated counterclockwise to the end stop until the red indicator marked MAN is no longer visible.

### Wiring

Do not use auto-transformers. Use earth ground isolating step-down Class II power supplies.

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

Determine the rating for Class 2 step-down transformer is 100 VA and consider the following requirements:

SKB62A = 17 VA      SKC62UA = 28 VA      SKD62UA = 17 VA;

A maximum of four actuators can be powered by one transformer (80% of transformer VA). Operating more than four SK series 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

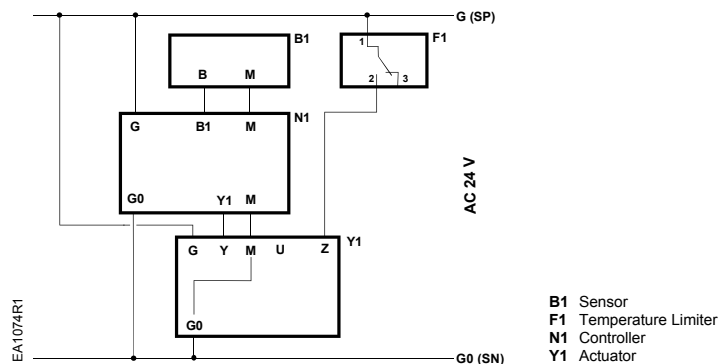


Figure 20. Terminal Connections.

24 Vac	
G	System potential (SP)
G0	System neutral (SN)
Y	Control input signal 0 to 10 (30) Vdc or 4 to 20 mA
M	Measuring neutral
U	Position indication 0 to 10 Vdc or 4 to 20 mA (see Table 1)
Z	Override input.

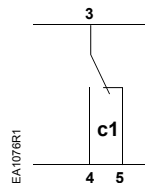
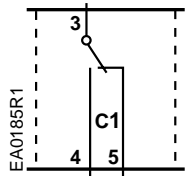


Figure 21. Auxiliary Switches.

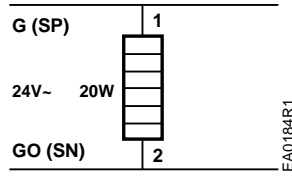
Table 1. Actuator Output Signal U.

Actuator input signal	Receiving Impedance	
	low (<500 ohm)	high (>10K ohm)
0 to 10 Vdc	0 to 20 mA	0 to 10 Vdc
4 to 20 mA	4 to 20 mA	2 to 10 Vdc

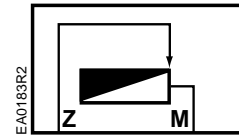
**Wiring Diagrams,  
 continued**



**Figure 22.  
 Auxiliary Switch  
 ASC1.6.**

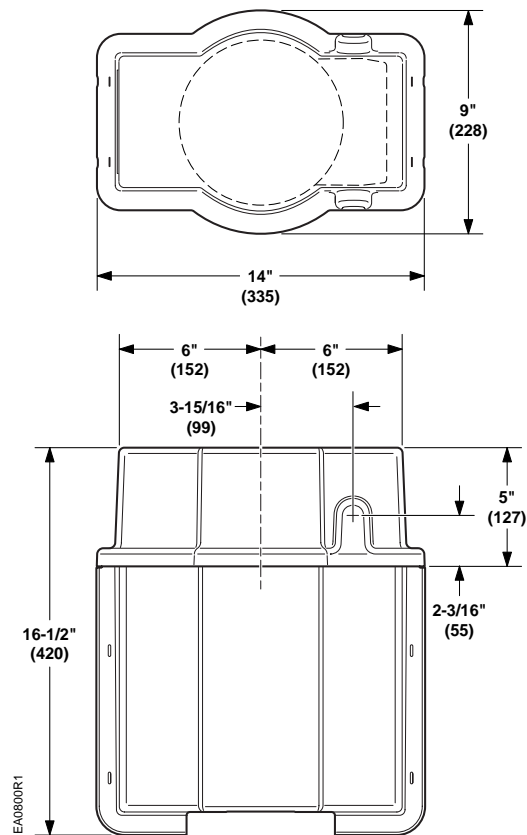


**Figure 23.  
 Packing Heating Element  
 599-00418.**



**Figure 24. Remote  
 Setting Unit  
 FZA21.11.**

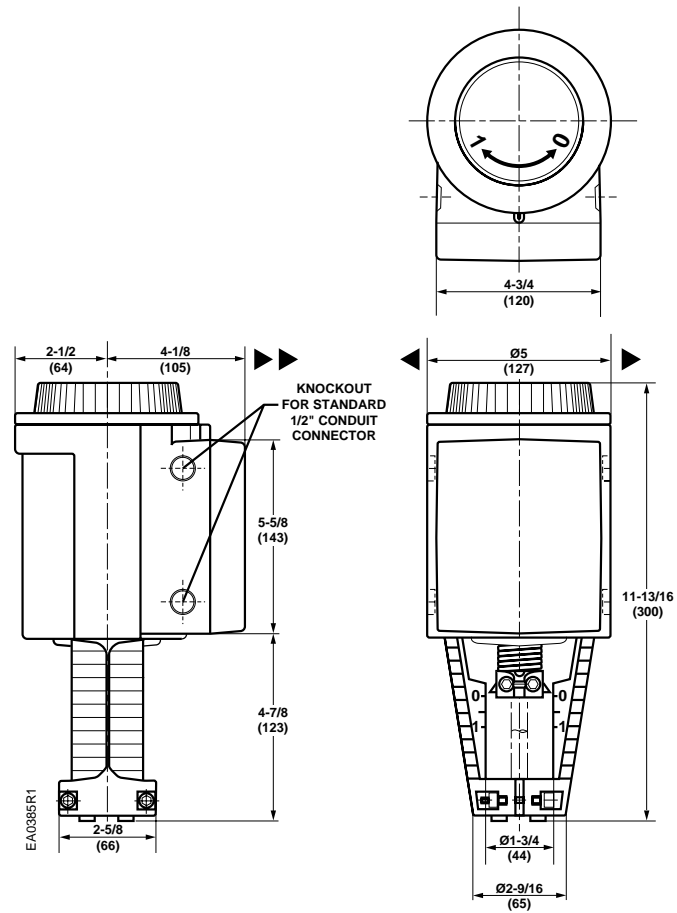
**Dimensions**



**Figure 25. Dimensions of 599-10065 SKB/C Weather Shield in Inches (Millimeters).**



**Dimensions,  
continued**



**Figure 28. Dimensions of SKD Actuator in Inches (Millimeters).**

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