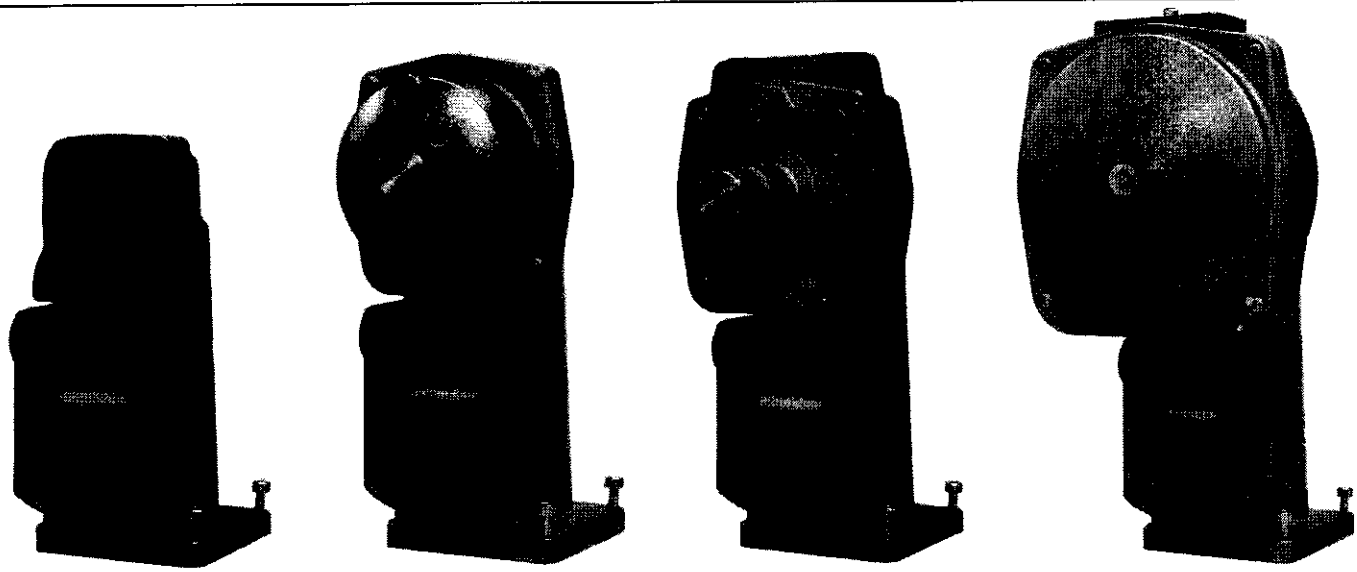
SIEMENS

SKPx5 Series

Technical Instructions
Document No. 7643
SKPx5.xxxUx
April 11, 2018

SKPx5.xxxUx Gas Valve Actuator with Safety Shutoff Function



SKP15.xxxUx SKP25.xxxUx SKP55.xxxUx SKP75.xxxUx

ISO 9001 and 14000 REGISTERED FIRM

Only when assembled to series VGxxx.xxxU gas valves

General description

SKPx5.xxxUx electro-hydraulic actuators are used in combination with VGxxx.xxxU gas valve bodies to provide slow opening, fast closing safety shut-off and, depending on model gas pressure regulation and air/gas ratio control for industrial and commercial burner applications. Since safety shut-off, constant pressure regulation or air/gas ratio control can be performed by a single valve, fewer gas train components and fittings are required to assemble a gas train. This significantly reduces both the size and weight of the gas train. The total pressure drop across the gas train arrangement is reduced, allowing for the use of smaller diameter gas trains in most applications.

The compact SKPx5.xxxUx actuator opens slowly when powered and closes immediately upon power interruption. The modular design allows the SKPx5.xxxUx to be used in combination with all VGxxx.xxxU gas valves bodies from ½" to 6" sizes. The actuator can easily be mounted on the square flange of any VGxxx.xxxU valve with four pre-mounted screws. No gaskets or seals are required when mounting the actuator. A visible position indicator on the front of the actuator displays the entire stroke of the valve. A light indicates when the actuator is powered.

Application

All SKPx5.xxxUx electro-hydraulic actuators combine with VGxxx.xxxU gas valves to provide safety shut-off control for industrial and commercial burner applications.

VGxxx.xxxU or VRD40.xxxU gas valve bodies to be ordered separately.

Type of valve	Medium	Data Sheet
VGG10.xxxU	Natural gas, air	N7636us
VGD20.xxxU VGD4x.xxxU	Natural gas, air	N7631us
VRD40.xxxU	Biogases Recycling gases Air	N7649us

SKP25.xxxUx

The 5KP25.xxxUx controls the burner manifold gas pressure according to a fixed setpoint. The SKP25.xxxUx can also be applied as a 1:1 air/gas proportionator or zero governor.

SKP55.xxxUx

The SKP55.xxxUx actuator controls the pressure difference across a restriction in the gas supply line as a function of the pressure difference across a restriction in the air supply duct, so that the air/gas ratio remains constant irrespective of air volume changes. There is no need for an upstream constant pressure regulator when using an SKP55.xxxUx actuator within the applicable pressure range of the VGxxx.xxxU valve body.

SKP75.xxxUx

The SKP75.xxxUx controls the burner manifold gas pressure as a function of the combustion air pressure. There is no need for an upstream constant pressure regulator when using an SKP75.xxxUx actuator within the acceptable pressure range of the VGxxx.xxxU valve body.

If the combustion air pressure exceeds the permissible value of 12" or 20" w.c. (see *Specifications*), the pressure must be reduced by means of a pressure reducing T-fitting AGA78.

Features

SKPx5.xxxUx

- UL listed, FM approved, CSA certified, IRI approval, and ISO 9001 certified. European, Australian and Japanese approved versions available.
- Proof of Closure with Over Travel (POC) option.
- Optional NEMA 4 protection.
- Visual position indication.
- "Power on" indication light.
- Quick connect wiring terminals.
- Optional adjustable auxiliary switch.
- Modular design with 360° actuator rotation for easy field wiring and installation.
- Low (10 VA typical), power consumption.

SKP25.xxxUx

- Safety shut-off function and pressure regulating function in one compact unit.
- Applicable as 1:1 air/gas proportionator or zero governor.
- Accurate pressure control characteristics, and zero offset (drop).
- Integral regulation leak limiter.
- Excellent tracking characteristic.
- Supports high burner turndown ratios such as 40 to 1 when correctly applied. Turndown is dependent on variables including gas inlet pressure and use of AGA25.2.

SKP55.xxxUx

- Safety shut-off function, pressure regulating function and air/gas ΔP control in one compact unit.
- Simplifies commissioning and reduces start-up time for:
  - o Recuperative burners with combustion air preheating.
  - o Burners with continuously variable air or gas nozzle openings in the burner head.
  - o Burners where either the air or gas pressure is not representative of the actual flow.
  - o Burners with negative combustion air pressure levels.
- Maintains air/gas ratio when the airflow is disrupted.
- Automatic compensation for combustion chamber back pressure fluctuations.

SKP75.xxxUx

- Safety shut-off function, pressure regulating function and air/gas ratio control in one device.
- Compensation for air temperature fluctuations.
- Automatic compensation for combustion chamber back pressure fluctuations.

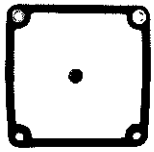
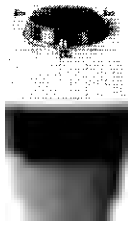
Product Numbers

Table 1. SKPx5.xxxUx model numbers

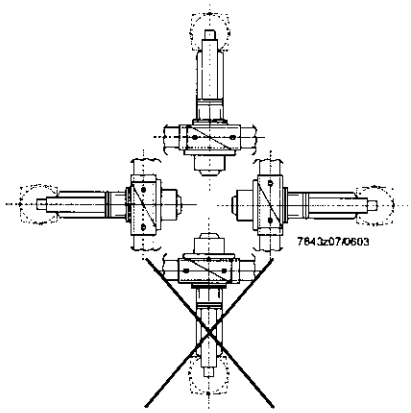
Product Number	Operating Voltage	Proof of Closure Switch [3]	Auxiliary Switch [3]	Type of Switch
SKP1S.011U1	120 Vac	•	---	SPDT
SKP15.012U1	120 Vac	•	•	SPDT SPDT
SKP15.012U2	230 Vac	•	•	SPDT SPDT
5KP15.013U1	120 Vac	---	---	---
SKP25.011U1	120 Vac	•	---	SPDT
SKP25.012U1	120 Vac	•	•	SPDT SPDT
SKP25.012U2	230 Vac	•	•	5PDT SPDT
SKP25.013U1	120 Vac	---	---	---
SKP25.411U1 [1]	120 Vac	•	---	SPDT
SKP25.611U1 [2]	120 Vac	•	---	5PDT
5KP55.011U1	120 Vac	•	---	SPDT
5KP55.012U1	120 Vac	•	•	5PDT 5PDT
5KP55.013U1	120 Vac	---	---	---
SKP75.011U1	120 Vac	•	---	SPDT
SKP75.012U1	120 Vac	•	•	SPDT 5PDT
SKP75.013U1	120 Vac	---	---	---

NOTE:
1. High outlet pressure model for 1.5 to 20 psi outlet pressure regulation.
2. High bias model for proportionator function with 0" to – 4" w.c. bias.
3. Proof of closure and auxiliary switches cannot be field installed.

Accessories

 AGA22	Yellow setpoint spring for 6" to 48" w.c. (1.5 to 10 psi for SKP25.411U1)
AGA23	Red setpoint spring for 40" to 100" w.c. (8.5 to 20 psi for SKP25.411U1)
AGA25.2 	Damping orifice for mounting into vent connection of SKP25.0xxUx or SKP25.4xxUx models
 AGA28	Black bias spring to install if SKP25.0xxUx for -0.4" to 0.4" w.c. is used as proportionator or zero governor
AGA29	Unpainted setpoint spring for 0" to 8.5" w.c. (included in SKP25.0xxUx as standard)
AGA66 	Sealing gasket to provide NEMA 3, NEMA 3R, and NEMA 4 protection. Gasket kit to mount SKPxx.xxxUx • Placed between actuator SKPxx.xxxUx and valve VGxxx.xxxU or valve VRD40.xxxU • Increases degree of protection from IP54 to IP65 • Refer to Mounting Instruction M7643.2 (74 319 0421 0)
AGA7S.U1/4NPT 	Damping throttle for SKP55.xxxUx / SKP75.xxxUx, US thread ¼" NPT • Optional, pipe connection for ∅6 mm • Refer to Mounting Instructions 4 319 2078 0
AGA78 	Air pressure reducing T-fitting
AGA30.7 	Adaptation to SKP2S.xxxUx For motorized pressure correction Siemens part number: SSS8S1-Z401-A100 See Mounting Instructions ASW00000658.
SAS... 	Motorized setpoint adjuster for SKP25.0xxUx • For 5.5 mm stroke • See Data Sheet N4581 and Mounting Instructions A5W00000658 (M7643)

Specifications

Agency approvals	As safety shut-off valve	UL/429, FM/7400, ANSI Z21.21/CSA6.5 C/I Agency marks apply only for SKPx5.xxxUx actuators with VGxxx.xxxU series gas valve bodies.
SKP25.xxxUx, SKP55.xxxUx and SKP75.xxxUx	As a pressure regulator	ANSI Z21.18/CSA 6.3
Power supply	Operating voltage	120 Vac + 10% to -15% 230 Vac + 10% to -15%
	Operating frequency	50 to 60 Hz + 6%
	Power consumption	13,5 VA
	Duty cycle	Continuous (100%)
Operating environment	Ambient operating temperature	14°F to 140°F (–10 °C to 60 °C)
	Permissible mounting positions	 Always with the diaphragms in a vertical position
	Maximum inlet gas pressure	Same as VGxxx.xxxU series
	Maximum temperature of air and flue gas at the control connections	140°F (60 °C)

Specifications Continued

Physical characteristics	Weight	
	SKP15.xxxUx	2.4 lb (1.1 kg)
	SKP25.xxxUx	3.5 lb (1.6 kg)
	SKP55.xxxUx	4.2 lb (1.9 kg)
	SKP75.xxxUx	5.1 lb (2.3 kg)
	Enclosure	NEMA 1, 2, 5, and 12 NEMA 3, 3R, and 4 with optional AGA66 sealing gasket (mounted with VGG10.xxxU / VGDxx.xxxU / VRD40.xxxU valves)
	Dimensions	See Figures 12...16
	Specification for valve bodies	See gas valve *Technical Instructions*, for *VGG10.xxxxU* N7636us, for *VGDxx.xxxU* N7631us, for *VRD40.xxxU* N7649us
Connections	Conduit connection	Two 1/2-inch NPSM threaded knock-outs
	Electrical connection	Spring-loaded terminals for 14 AWG wires
	Gas connection	1/4" NPT (see *Installation notes*)
	Air connection	1/4" Rp (see *Installation notes*)
	Gas pressure test connection	Hose barb with close-off screw
SKP75.xxxUx	Combustion chamber pressure test connection	Hose barb with close-off screw
Operating characteristics	Opening speed, typical (approx. 2 mm/s)	The opening time for full stroke varies with valve size
	Closing time	<0.8 seconds slower opening speed at lower temperature

Specifications Continued

Operation / installation	Outlet pressure spring range	0" to 8.5" w.c. (standard, unpainted spring, AGA29)
SKP25.xxxUx	for SKP25.0xxUx models	6" to 48" w.c. (yellow spring, AGA22) 40" to 100" w.c. (red spring, AGA23)
	for SKP25.411U1 models	1.5 to 10 psi (standard, yellow spring, AGA22) 8.5 to 20 psi (red spring, AGA23)
	With air pressure loading in SKP25.0xxUx models	± 0.4" w.c. bias (black spring AGA28)
	With zero governor in SKP25.611U1	0.4" to – 4" w.c. bias
	Maximum sensing line pressure / leakage test pressure	20 psi
	Maximum sensing line vacuum	3 psi
	Minimum sensing line diameter	1/4" inside diameter
	Minimum distance between sensing line and gas valve outlet	5 times the pipe diameter (could be less if proven with application)
	Minimum time required for high to low fire load changes	4 seconds (depending on valve stroke)
SKP55.xxxUx	Differential pressure ratio	1:1
	Permissible pressure differences during operation for accurate control	Gas: minimum 0.1" w.c. Gas: maximum 80" w.c. Air: minimum 0.1" w.c. Air: maximum 80" w.c.
	Low fire bias range	-0.4 to 0.4" w.c.
	Minimum distance of impulse pipe connections	3 pipe diameters before and 5 pipe diameters after any valve, damper, elbow, coupling, or flow disruption
SKP75.xxxUx	Setting range of gas to air pressure ratio	Pg / Pa from 0.4:1 to 9:1
	Permissible pressures:	
	Min. air pressure for accurate control	0.2" w.c. (Pa-Pc)
	Max. air pressure: with setting Pg/Pa <2	20" w.c. (Pa-Pc)
	Max. air pressure: with setting Pg/Pa >2	12" w.c. (Pa-Pc) (with higher air pressures use AGA78)
	Min. downstream gas pressure for accurate control	0.4" w.c. (Pa-Pc or Pg-Pa)
	Max. downstream gas pressure	40" w.c. at any Pg/Pa setting during operation
	Minimum distance between gas sensing line and gas valve outlet (5KP75.xxxUx)	5 times the pipe diameter

NOTE:
When the combustion chamber pressure Pc is connected, the above pressures should be considered pressure differentials Pg-Pc and Pa-Pc.

Specifications Continued

Auxiliary features	Proof of closure switch	Non-adjustable
	Setting range of auxiliary switch	40% to 100% of stroke
	Switch rating	4 A (2 A, cosφ = 0.3)

NOTE:
AUX-circuit not for SELV (safety extra low voltage)!

Operation
(see Figure 1)

Safety shut-off function

The electro-hydraulic actuator consists of a cylinder filled with oil, a piston containing an electric oscillating pump, and a relief system. When power is supplied to the actuator, the relief system closes, and the pump moves oil from the reservoir into the pressure chamber. This action causes the piston to move downward in the cylinder, opening the gas valve. When power to the actuator is interrupted, the relief system opens and the gas valve closes in less than 0.8 seconds.

A position indicator, visible through the transparent window of the terminal box cover, shows the entire possible stroke range of the actuator. A light, which is visible through the lower left transparent window of the terminal box cover, indicates when the actuator receives power. An optional, non-adjustable SPDT proof of closure over travel switch signals the closed position after the gas valve has closed. An optional SPDT auxiliary switch is adjustable between 40% and 100% of the stroke. The adjustment screw and scale are located on the right side in the terminal box, and are visible through the transparent window of the terminal box cover.

The sealing gasket, AGA66, can be installed between the actuator and the gas valve to provide NEMA 3, 3R, and 4 protection rating for VGG10.xxxU / VGDxx.xxxU / VRD40.xxxU valves.

Operation continued

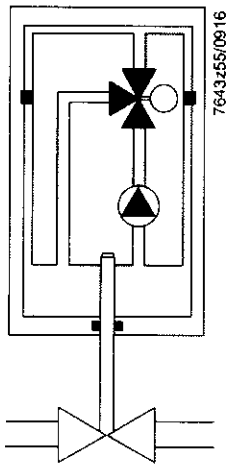


Figure 1. SKP15.xxxUx operation

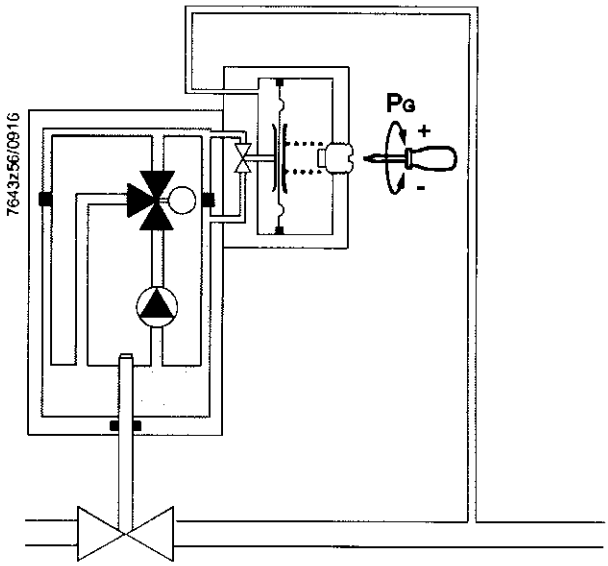


Figure 2. SKP25.xxxUx operation

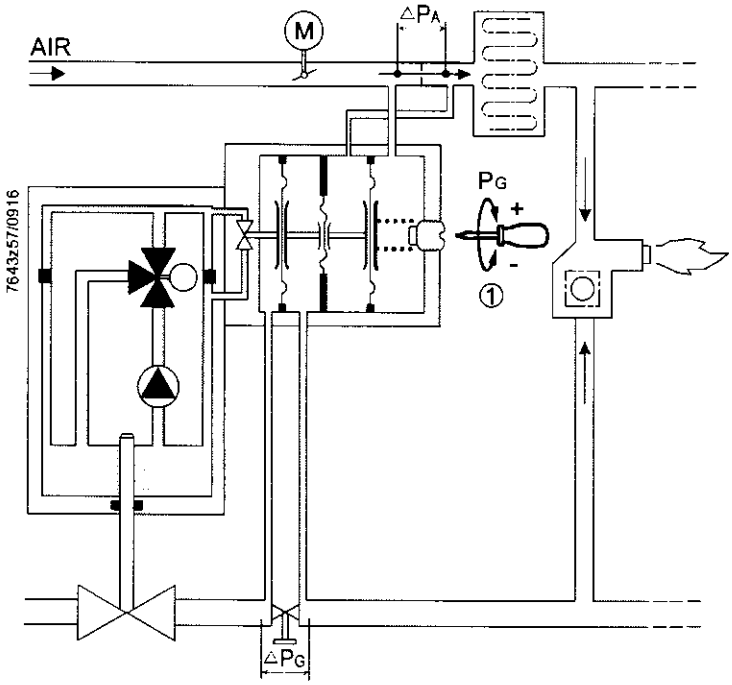


Figure 3. SKP55.xxxUx operation

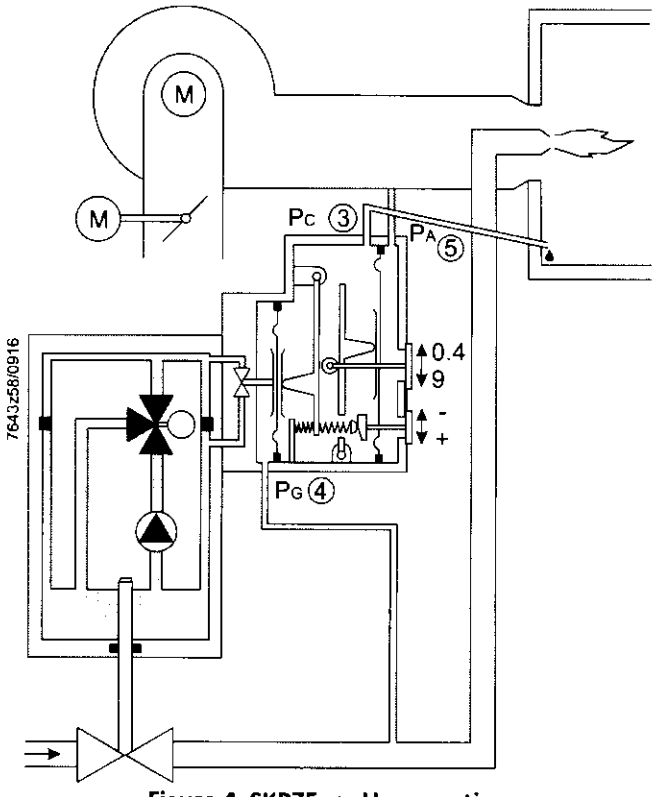


Figure 4. SKP75.xxxUx operation

Operation continued

(see Figure 2)

Regulating function

SKP25.xxxUx

The outlet gas pressure sensing line is connected to the pressure regulator housing. The outlet pressure acts on the regulator diaphragm. The diaphragm is opposed by an adjustable setpoint spring force, which represents the desired gas pressure value. The movement of the diaphragm modulates a hydraulic bypass valve connecting the pressure chamber to the hydraulic fluid reservoir. When the outlet gas pressure is lower than the desired value, the bypass valve is closed by the movement of the diaphragm, causing the actuator piston to open the gas valve.
The opposite occurs when the outlet gas pressure is higher than the desired value; the diaphragm moves to open the bypass causing the actuator piston to close the gas valve. The movement of the actuator piston stops once the outlet gas pressure is equal to the setpoint. In this position the bypass valve is partially open so that the oil flow supplied by the pump is identical to the return flow.
Unlike the conventional direct acting regulators, the SKP25.xxxUx servo operated regulating system displays virtually zero droop (offset) across the turndown range.

The SKP25.0xxUx models may be applied as a 1:1 air/gas proportionator or as a zero governor. For either application, the standard spring has to be replaced with AGA28 spring, which allows adjusting the bias between +0.4" to -0.4" w.c. For proportionator operation, the air pressure sensing line must be connected to the port marked "AIR". High bias model SKP25.611U1 is a 1:1 air/gas proportionator with a factory installed spring for 0.4" to -4.0" w.c. bias.

NOTE:

1. To avoid oscillation, do not oversize the VGxxx.xxxU valve body (see *Technical Instructions,* N7636us and N7631us).
2. SKP25.4xxUx models must not be used as proportionators.

Operation continued

(see Figure 3)

SKP55.xxxUx

During the burner pre-purge period, when the gas valve is closed, only the air pressure difference acts on the regulator causing the air diaphragm to move and close the regulating hydraulic bypass valve. When the actuator is powered, the gas valve begins to open. The downstream gas pressure difference immediately begins to increase until the gas pressure difference is in balance with the air pressure difference (in accordance with the pressure ratio adjusted on the regulator). The bypass valve is now partially open so that the oil flow supplied by the pump is identical to the return flow.

If, for example, heat demand increases, the air damper opens further increasing the differential air pressure. The SKP55.xxxUx air diaphragm moves and causes the bypass valve to close and the gas valve to open further. The opening of the gas valve increases the differential gas pressure moving the gas diaphragm to the right until balance is restored and the flow supplied by the pump is once again identical to the return flow through the regulator bypass.
Unlike conventional direct acting regulators, the SKP55.xxxUx servo operated regulating system displays virtually zero drop (offset) across the turndown range.

☞ **NOTE:**
The SKP55.xxxUx / VGxxx.xxxU is a 1:1 differential pressure air/gas ratio controller. This means that the control adjusts the same pressure difference on the gas side as it senses on the air side. Any other gas to air ratio adjustment will require a modification to one of the restrictions or the installation of an adjustable orifice (this is normally an adjustable metering orifice in the gas line). For this purpose the VGxxx.xxxU gas valve with manual operation kit AGA61 may be used. See gas valve *Technical Instructions* N7636us and N7631us.

☞ **NOTE:**
1. For optimal performance, both the air damper and SKP55.xxxUx /VGxxx.xxxU gas valve must be installed upstream of its pressure differential orifice. For other layouts please consult your authorized Siemens AG Building Technologies Division Products sales representative.
2. To avoid oscillation, do not oversize the VGxxx.xxxU valves (see *Technical Instructions* N7636us and N7631us).

Many burner designs, because of reduced mixing energy at the low fire level, require increased excess air at low fire in order to maintain optimum combustion parameters. To accommodate this requirement the SKP55.xxxUx incorporates a bias adjustment, which allows the characteristic of the regulator to be displaced either towards excess air or reduced air. Pressure fluctuations in the combustion chamber do not influence the performance of the SKP55.xxxUx air/gas ratio controller. There is no need for any compensation circuit.

Operation continued

(see Figure 4)

SKP75.xxxUx

During the burner pre-purge period, when the gas valve is closed, only the air pressure acts on the regulator. This causes the air diaphragm to move to the left and close the regulating hydraulic bypass valve. When the actuator is powered, the gas valve begins to open. The downstream gas pressure immediately begins to increase until the downstream gas pressure is in balance with the air pressure (in accordance with the pressure ratio adjusted on the regulator). The bypass valve is now partially open so that the oil flow supplied by the pump is identical to the return flow.

If, for example, heat demand increases, the air damper would open further increasing the air pressure. The air diaphragm would move to the left, causing the bypass valve to close and the gas valve to open further. The opening of the gas valve increases the downstream gas pressure moving the gas diaphragm to the right until balance is restored and the flow supplied by the pump is once again identical to the return flow through the regulator bypass. Unlike conventional direct acting regulators the SKP75.xxxUx servo operated regulating system displays virtually zero droop (offset) across the turndown range.

The gas to air pressure ratio is adjustable from 0.4:1 to 9:1. The setting is visible through a window in the regulator. Once set, the gas to air pressure ratio remains constant over the entire output range. The gas to air flow ratio will remain constant (if the cross sections of the air and gas orifices in the burner head are fixed). The SKP75.xxxUx is not recommended for use with burners incorporating a sliding / continuously adjustable head arrangement.

Many burner designs, because of reduced mixing energy at the low fire level, require increased excess air at low fire in order to maintain optimum combustion parameters. To accommodate this requirement the SKP75.xxxUx incorporates a bias adjustment, which allows the characteristic of the regulator to be displaced either towards excess air or reduced air. Pressure fluctuations in the combustion chamber do not influence the performance of the SKP75.xxxUx air/gas ratio controller. There is no need for any compensation circuit.

NOTE:
To avoid oscillation, do not oversize the VGxxx.xxxU valves (see *Technical Instructions*, N7636us and N7631us).

Installation

WARNING:

- Personal injury or loss of life may occur if procedures are not followed as specified.
- All installations must be performed by qualified personnel only.
- Do not pull the actuator shaft.
- The AGA66 gasket must be installed between the actuator and the gas valve body to provide NEMA 3, 3R, and 4 protection rating for VGG10.xxxU and VGDxx.xxxU valves if a liquid-tight conduit connection is used.

NOTE:
Wiring must meet all relevant electrical codes.

- The SKPx5.xxxUx actuator is directly coupled to the VGxxx.xxxU series valve body by four premounted 4 mm Allen (R) key screws.
- The square mounting flange can be rotated in steps of 90° to provide four different mounting positions. The SKPx5.xxxUx actuator can be mounted in any position with the diaphragms vertical, except upside down.
- The actuator can be mounted or replaced while the valve body is under pressure.
- The SKPx5.xxxUx actuator has two knock-outs for the installation of 1/2"-14 NPSM conduit connections.
- When conduit routing is connected, flexible conduit must be used.
- Liquid tight flexible conduit must be used in combination with AGA66 to provide NEMA 3, 3R, and 4 protection.
- The terminal marked GND, located above the wiring terminals, must be connected to the electrical ground.

The pressure pick-up connections must be flush with the inner wall of the pipe or housing in order to sense turbulence-free pressures. The pressure pick-up connections should be located at least 5 pipe diameters downstream of the valve, damper, elbow, coupling, orifice, or other flow disturbing fitting. Using the taps on the valve body for gas connection to the regulator may show turbulence.

SKP25.xxxUx, SKP55.xxxUx and SKP75.xxxUx

- If minimum gas pressure detection is required, the pressure switch must be mounted upstream of the regulating gas valve or if mounted downstream electrically by-passed to ensure sufficient gas pressure before starting the burner. If mounted downstream.
- The gas pressure sensing line must be at least 1/4-inch inside diameter.
- The pressure connection pipe should be as short as possible to allow the regulator to react to sudden changes.

SKP25.xxxUx

Depending on the application and applicable installation regulations, measures to detect and avoid a downstream overpressure situation might be required. To avoid excessive gas pressure downstream of the regulator SKP25.xxxUx, a maximum pressure switch shall be used to switch off the SKP25.xxxUx/VGxxx.xxxU. The downstream gas pressure and the gas flow will consequently be shut off. The gas release to the environment will be limited to the period for overpressure detection and shut off (<5 seconds).

Installation continued

SKP55.xxxUx

The pressure connection pipes should be as short as possible to allow the regulator to react to sudden changes. In cases where it is not possible to install an orifice in the air line, (e.g., lack of available air pressure) the SKP55.xxxUx actuator may be connected to the air pressure upstream of the burner and the combustion chamber pressure, using the pressure differential across the burner orifice. This arrangement is not applicable to installations utilizing combustion air preheating systems.

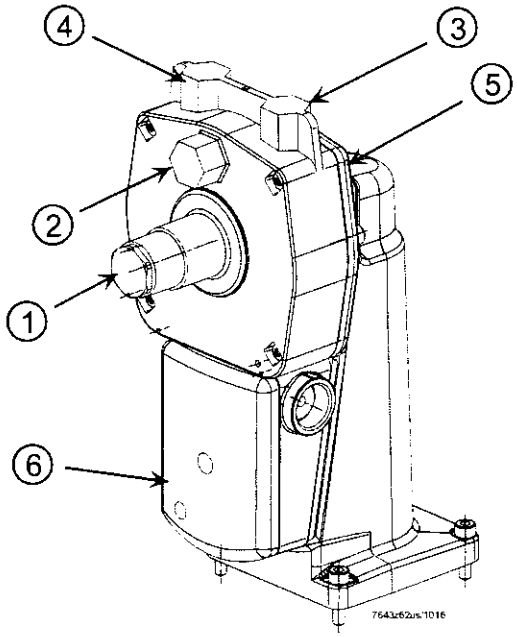


Figure 5. 5KP55.xxxUx Connections and adjustments

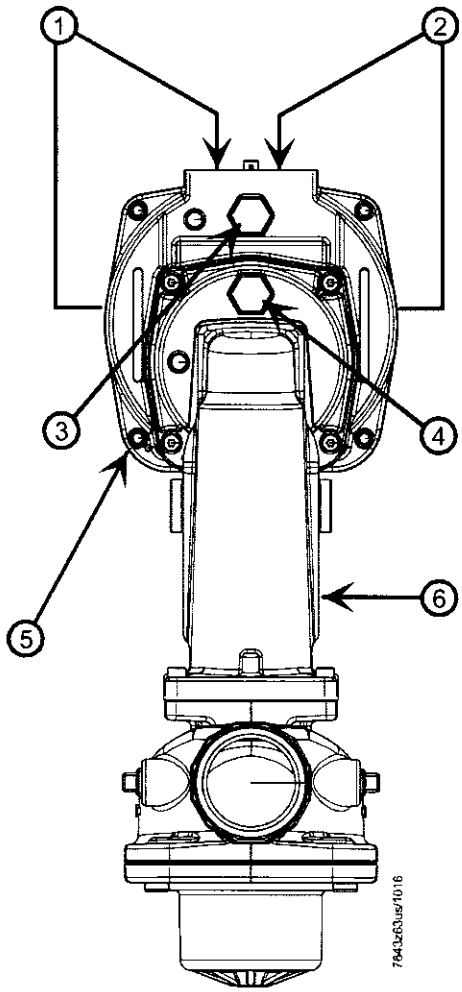
1 Adjustment of the bias (behind cap)
2 Connection for the air pressure (+) sensing line
3 Connection for the air pressure (-) sensing line
4 Connection for the gas pressure (-) sensing line
5 Connection for the gas pressure (+) sensing line
6 Stroke indication

Installation continued

SKP75.xxxUx

- Air proving safety device normally required to guarantee minimum airflow must also be provided when using the SKP75.xxxUx.
- The sensing line for the combustion chamber pressure (if needed) must be installed so that condensing flue gases cannot enter into the regulator but run back into the combustion chamber. If necessary, a water separator must be installed.
- Air pressure sensing lines must be at least ¼-inch inside diameter. For air/gas pressure ratios over three, the air and combustion pressure sensing lines must be at least 3/8-inch inside diameter.
- The SKP75.xxxUx does not work in installations with negative air pressure unless a higher negative chamber pressure is connected to the regulator.

NOTE:
Wiring must meet all relevant electrical standards.



1 Adjustment and indication of the air/gas ratio
2 Adjustment and indication to the bias
3 Connection for the combustion chamber pressure sensing line
4 Connection for the gas pressure sensing line
5 Connection for the air pressure sensing line (on the front)
6 Position indication (on the front)

Figure 6. SKP75.xxxUx Connections and adjustments

Start-up

Regulator

WARNING:
When firing at maximum burner capacity, ensure that the SKPx5.xxxUx / VGxxx.xxxU is not in the fully open position. If this is the case, either the gas valve is sized too small or the gas supply pressure is too low.

SKP25.xxxUx

The gas outlet pressure setpoint adjustment screw is located in the center of the regulator cover. The SKP25.0xxUx models are available with three interchangeable setpoint springs for an adjustable range of 0" to 100" w.c. The SKP25.411Ux models are available with two interchangeable setpoint springs for an adjustable range of 1.5 to 20 psi. The bias for the SKP25.611U1 model is adjustable from 0.4" to -4.0" w.c. (see *Specifications* and Table 2). Clockwise rotation of the setpoint adjustment screw increases the outlet gas pressure. The hexagonal cap must be tightened after the setpoint screw has been adjusted and may be sealed from tampering by means of a wire and lead seal.

Start-up continued

SKP55.xxxUx

1. The setting screw 1 on the SKP55.xxxUx is factory-adjusted so that the air/gas ratio curve intersects the zero point (no bias). If required, on-site adjustment may be achieved as follows:
   - Turn setting screw 1 counterclockwise until spring becomes completely loose.
   - Shut off gas supply upstream of the SKPS5.xxxUx actuator.
   - Make sure that there is no air pressure working on the SKP55.xxxUx actuator.
   - Apply power to the SKP55.xxxUx actuator.
   - Turn the setting screw clockwise until valve starts to open.
2. Set the adjustable orifice to the pre-calculated value so that equal pressure difference on both air and gas side results in approximate stoichiometric combustion.
3. Start the burner and run it at approximately 90% capacity by opening the air damper.
4. Measure the combustion values and correct the flow using the adjustable orifice until optimum values are obtained.
5. Return to low fire position by closing the air damper and check the combustion values. If necessary, correct the working characteristic until optimum values are obtained by rotating the setting screw 1. To obtain more gas: rotate clockwise. To obtain less gas: Rotate counter-clockwise.
6. Limit the low fire air damper position (e.g. by cam switch adjustment).
7. If a substantial bias of the working characteristic was needed the adjustment of the 90% position must be checked and corrected, if necessary, by adjusting the orifice. Repeat the procedure from Step 3.
8. Run the burner to the required high fire position and limit the air damper position.
9. Check flue gas values at several intermediate output levels. If corrections are necessary, note:
   - At high fire, correct with the adjustable orifice.
   - At low fire, correct with setting screw 1 on the 5KP55.xxxUx actuator.

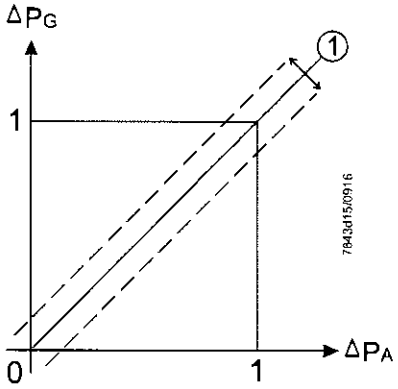


Figure 7. SKPS5.xxxUx Adjustments

Start-up continued

SKP75.xxxUx

The pressure ratio and bias adjustment screws are located on top of the regulator under a sealable cover plate. The actual settings can be seen through windows on each side of the regulator.

NOTE:
The burner capacity is controlled by the position of the air damper. The combustion quality (air/gas ratio) is controlled by the settings on the regular (the + and - indications relate to the change in gas flow). Adjustment in clockwise direction decreases the gas flow.

1. Set the air/gas ratio to the desired value using adjusting screw 1 (coarse setting).
2. Start the burner and run it at approximately 90% of full capacity.
3. Measure CO2 or O2 content in the flue gases and correct the ratio by adjusting screw 1 until optimum values are obtained (fine setting).
4. Return to low fire position and measure the CO2 or O2 content in the flue gases. If necessary, correct the setting by adjusting screw 2 (figure 6) until optimum values are obtained.
5. Limit the damper position for low fire operation. If considerable bias adjustment was necessary to achieve optimum combustion, repeat the procedure from step 3.
6. Run the burner to the required high fire position and limit the air damper position.
7. Check flue gas values at several intermediate output levels. If corrections are necessary, note the following:
   - Adjust the pressure ratio screw 1 at high operation only.
   - Adjust the bias screw 2 at low fire operation only.

If the air pressure exceeds the maximum value of 12" or 20" w.c. (see *Specifications*), the pressure must be reduced with a pressure reducing T-fitting (AGA78).

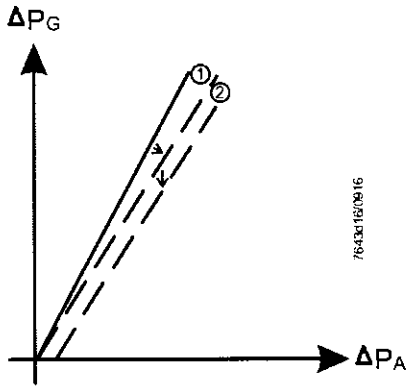


Figure 8. SKP7S.xxxUx Adjustments

Pressure Reducing T-Fitting AGA78

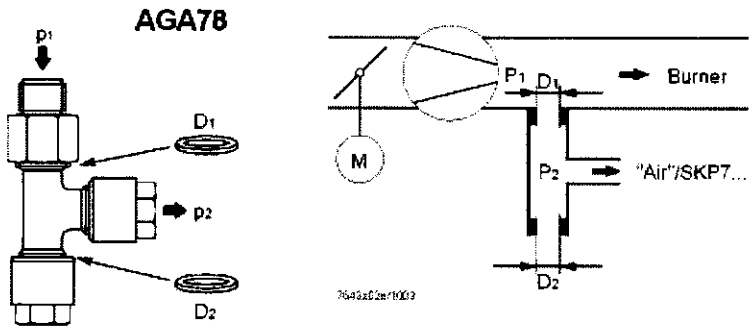


Figure 9. AGA78 Operation.

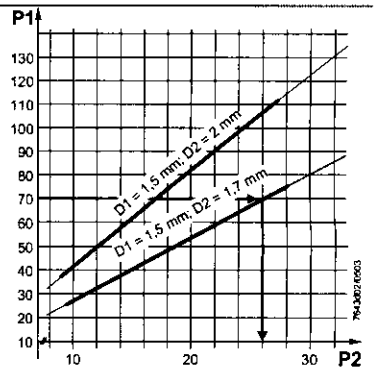


Figure 10. AGA78 Adjustments.

Function

The air is blown out continuously into the atmosphere through the restrictor D2. The air undergoes a drop in pressure across the restrictor D1. The correlationsships are shown in the diagram (Figure 10).

Example:
Given p1 = 70 mbar, D1 = 1.5 mm, D2 = 1.7 mm
Find: Pressure signal P2 for SKP75.xxxUx
P2 = 26 mbar

Reducing T-fitting AGA78 is supplied ready for mounting, complete with D1 = 1.5 mm and D2 = 1.7 mm. An additional restrictor D2 with a diameter of 2 mm is included with the actuator.

Wiring and switch adjustment

(See *Terminal designations*)

- The actuator is equipped with spring-loaded terminals for 14 AWG wires.
- The actuator has two line and two neutral terminals. Both can be connected to other devices.
- Insert one wire into the opening of the terminal while pressing the lever downward with a screwdriver. Make sure that all strands insert into the opening.
- Adjust the auxiliary switch (if provided) according to the wiring diagram on the label below the terminals (see Figure 11). The adjustment screw and scale are located on the right side of the terminal box, and are visible through the transparent portion of the terminal cover.

NOTE:

1. The auxiliary switch is adjustable between 40% and 100% of the stroke. The factory setting is at 40%.
2. The auxiliary switch must not be used for proof of closure detection or other safety interlock functions.
3. The Proof of Closure Switch is non-adjustable.

Service

There are no serviceable parts on the SKPx5.xxxUx series actuators. If inoperative, replace the entire actuator. Tag wires before servicing.

Terminal designations

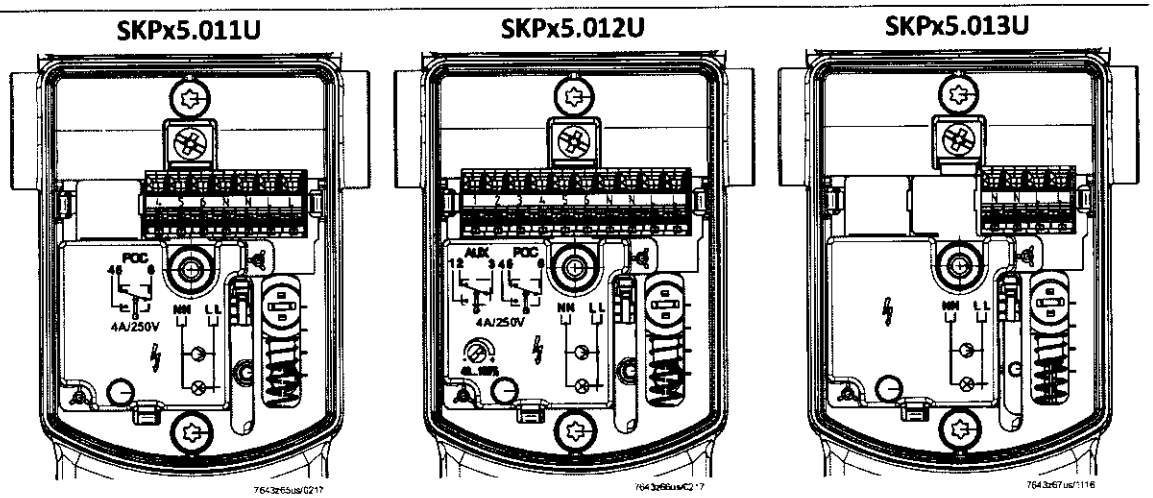


Figure 11. Terminal designations

Dimensions

Dimensions in inches; millimeters [mm] in brackets

SKP15.xxxUx

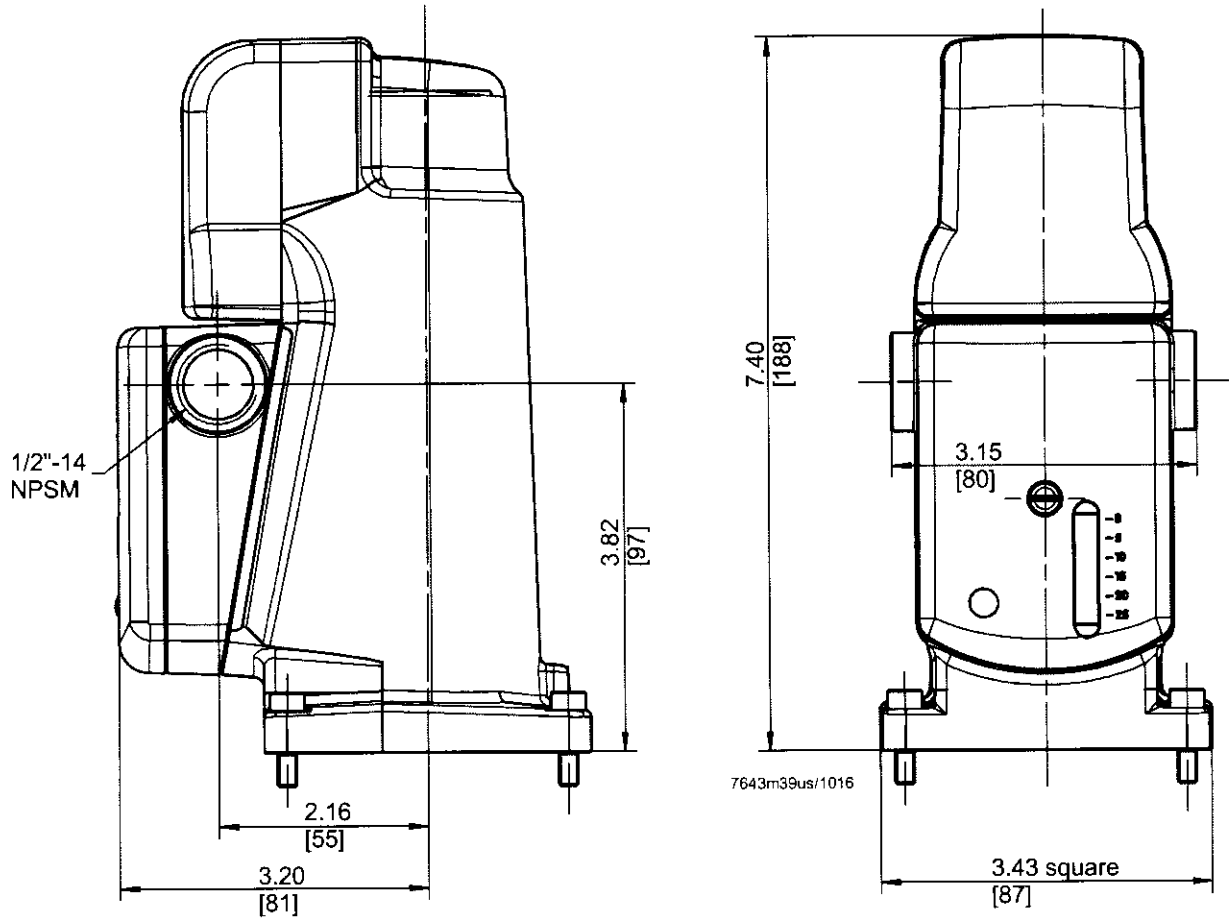


Figure 12. SKP15.xxxUx dimensions

Dimensions continued

Dimensions in inches; millimeters [mm] in brackets

SKP25.0xxUx

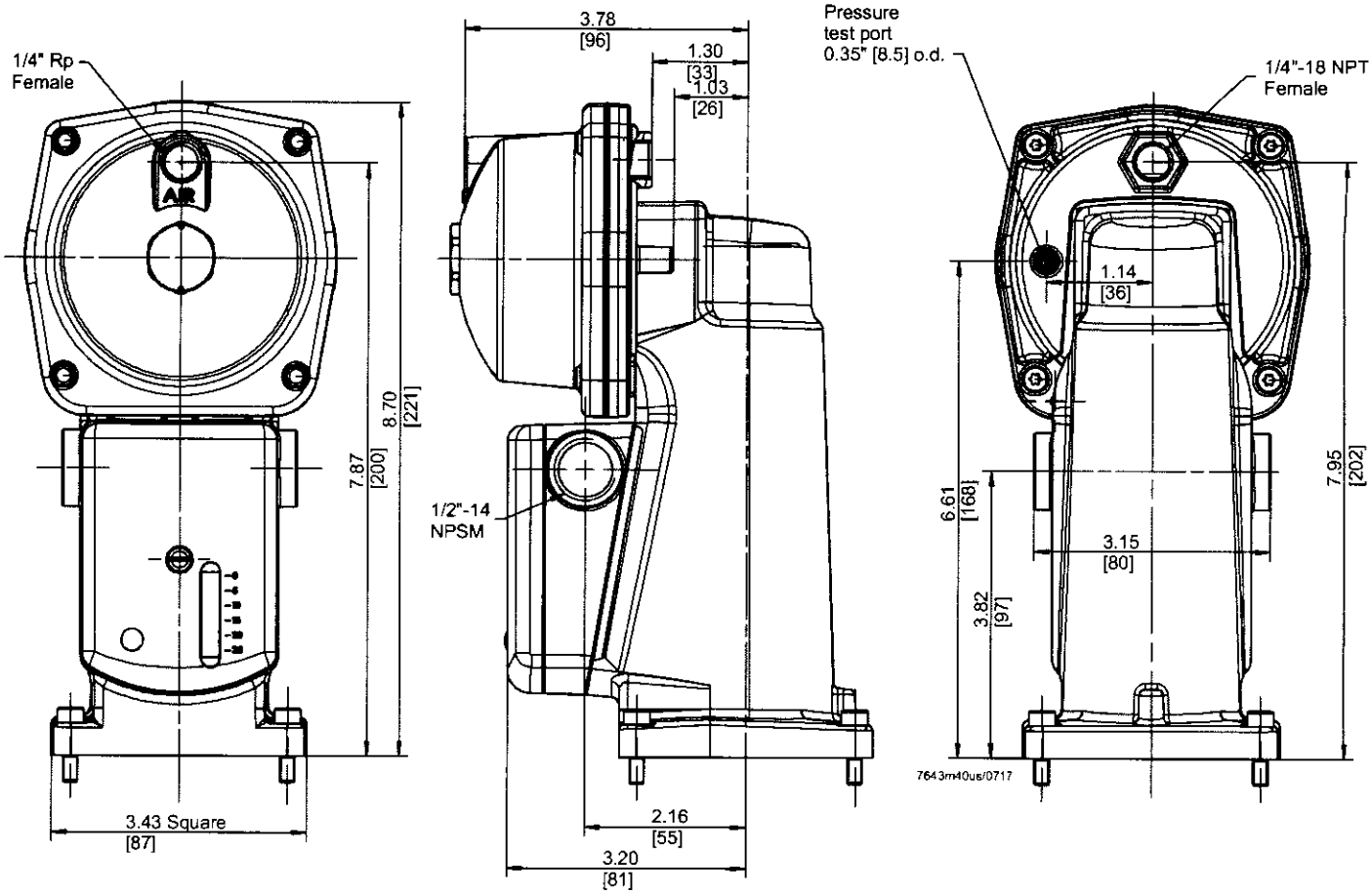


Figure 13. SKP25.0xxUx dimensions

Dimensions continued

Dimensions in inches; millimeters [mm] in brackets

SKP25.4xxUx

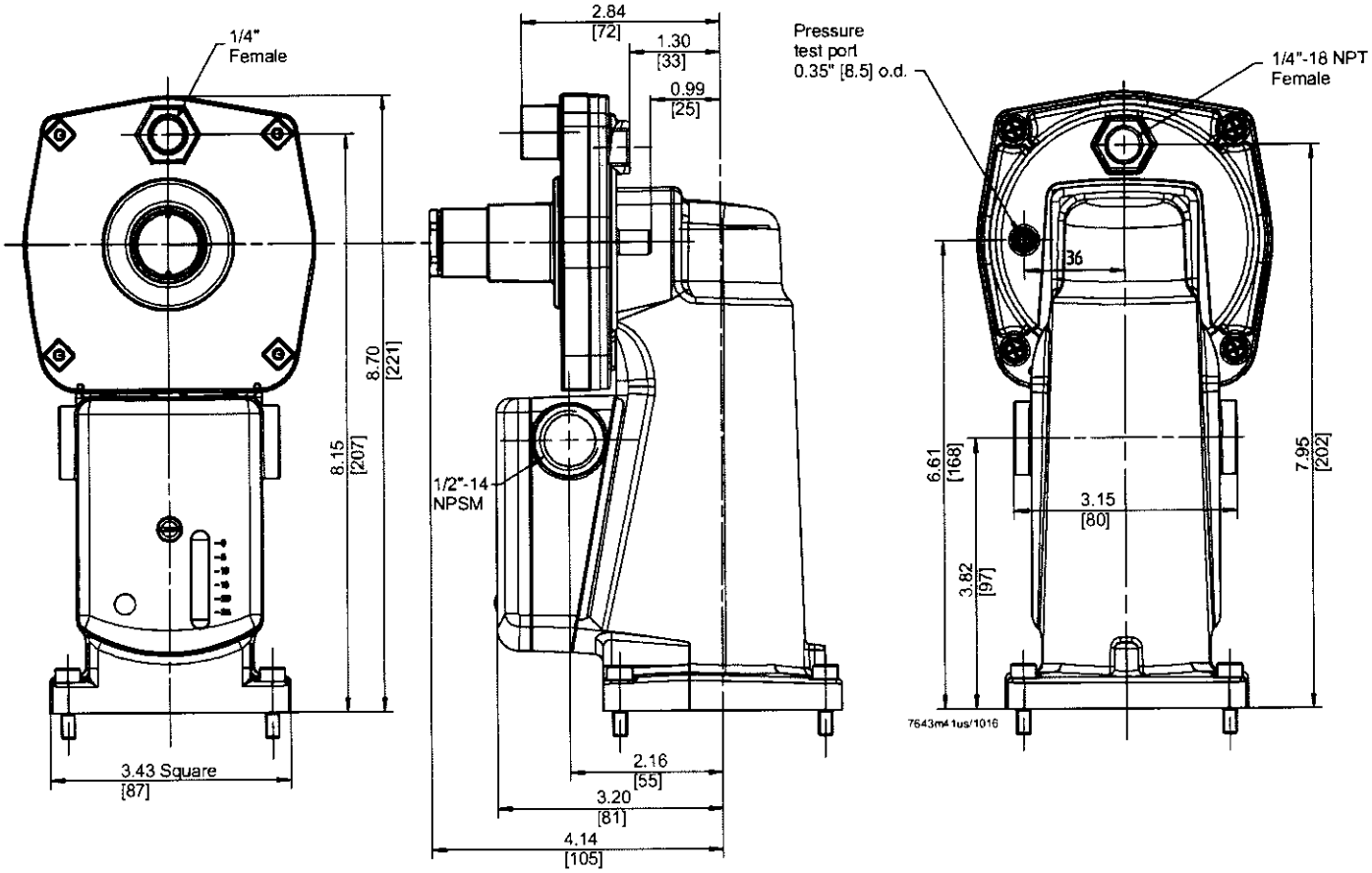


Figure 14. SKP25.4xxUx dimensions

Dimensions continued

Dimensions in inches; millimeters [mm] in brackets

SKP55.xxxUx

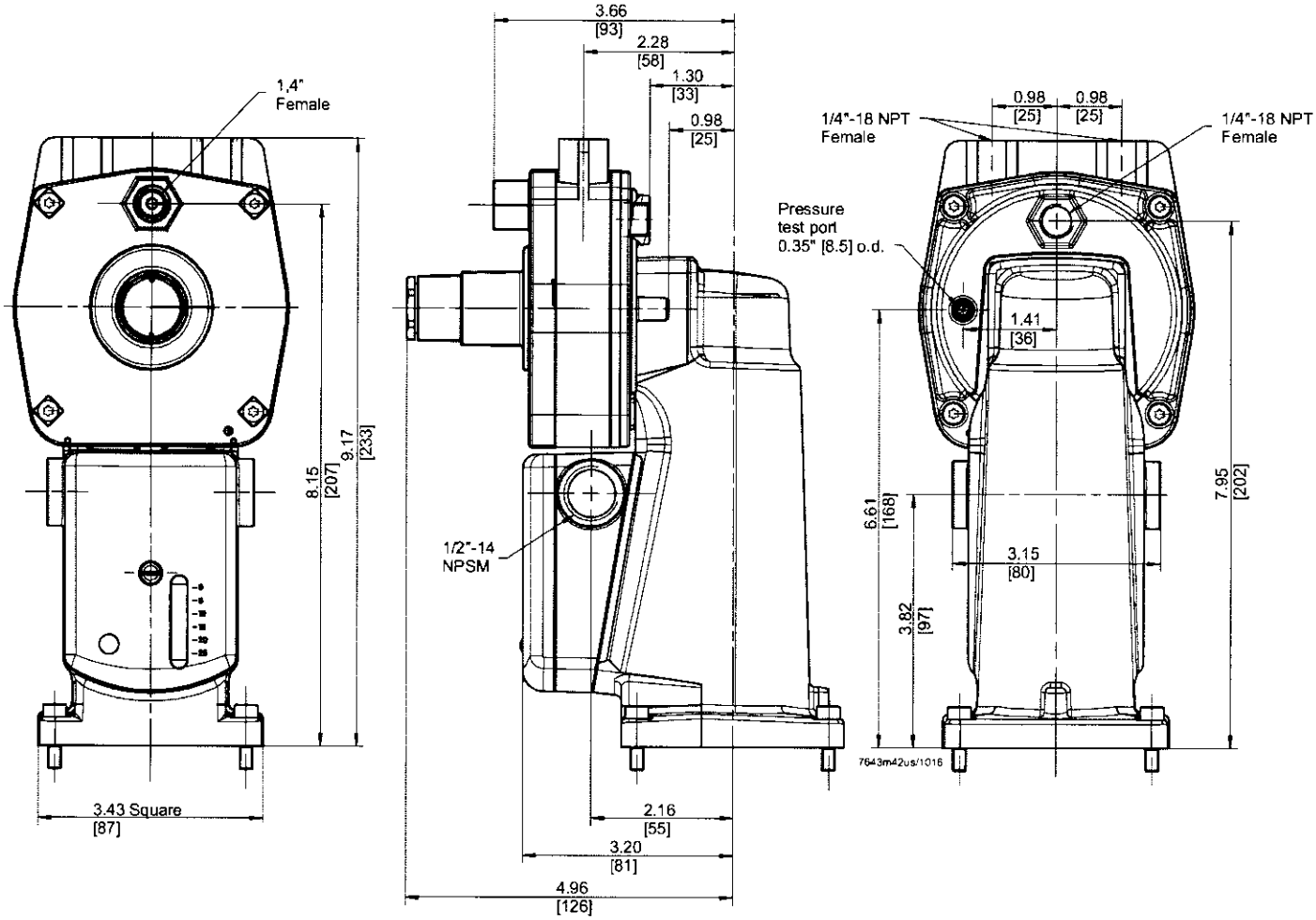


Figure 15. SKP55.xxxUx dimensions

Dimensions continued

Dimensions in inches; millimeters [mm] in brackets

SKP75.xxxUx

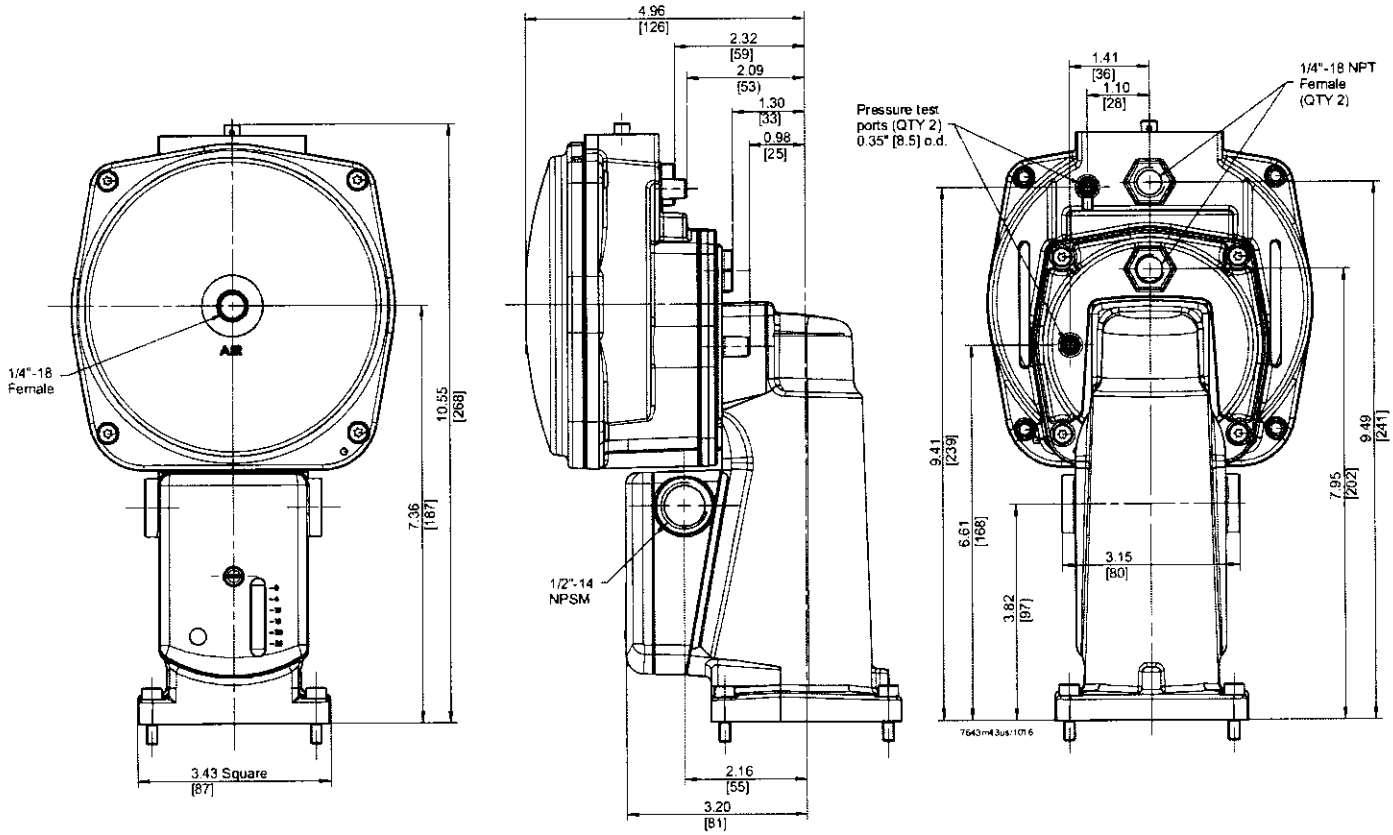


Figure 16. SKP75.xxxUx dimensions

SCC Inc.

Specifications

Document No. CVLV-2010

November 5, 2015

VKG...U Series
½" to 4" Butterfly Valves

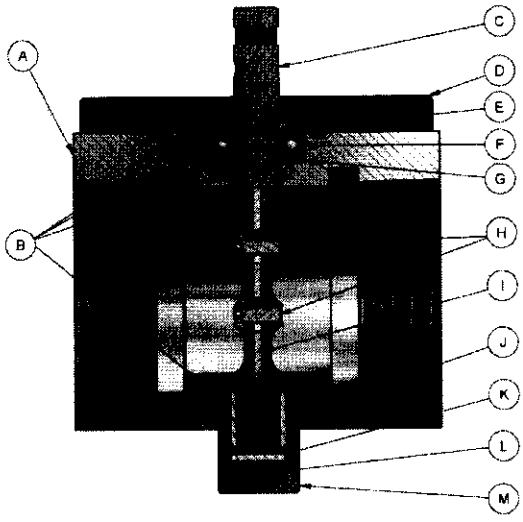
Product Description

VKG...U series NPT threaded butterfly valves control the flow of natural gas, propane, butane, or air. Full, medium, and reduced port sizes are offered to optimize control and ease of installation. Valves are positioned using a manual kit, crank arm kit, or rotary actuator.

Technical Specifications

Body Sizes	1/2", 3/4", 1", 1-1/4", 1-1/2", 2", 2-1/2", 3", 4"	
Body Material	Aluminum 6061-T6 billet	
Connection	Threaded NPT	
Port	**1/2" and 3/4"**	Full port
	1" and 1-1/4"	Full or medium port
	1-1/2" through 4"	Full , medium, or reduced port
Operating Pressure Rating	**1/2" through 3"**	25 PSI operating pressure
	4" medium or reduced port	25 PSI operating pressure
	4" full port	15 PSI operating pressure
Surge Pressure Rating	**1/2" through 4"**	75 PSI surge pressure
Turndown	100+:1	
Temperature Range	-40° to 160° F	

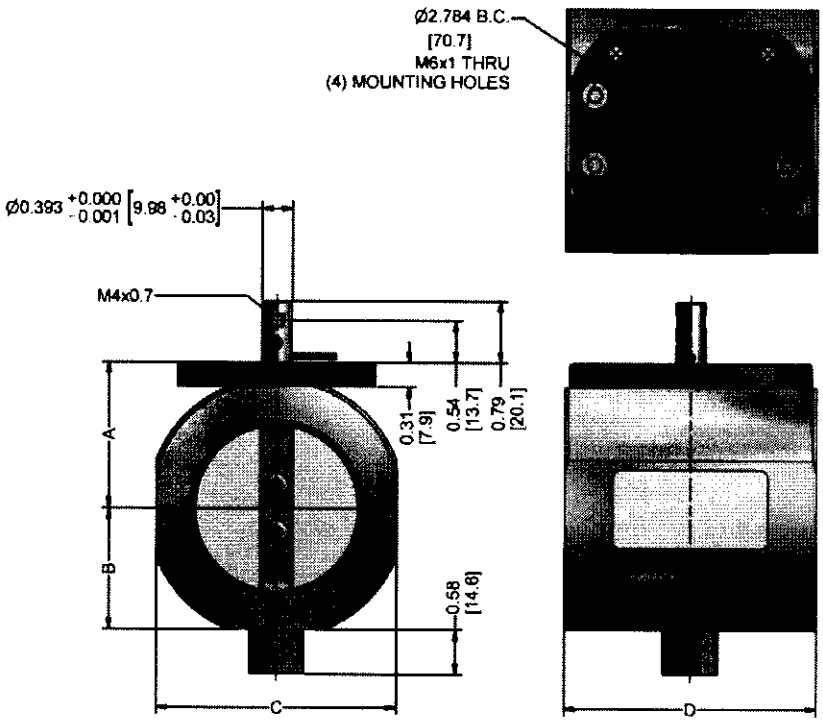
Materials



Item	Description	Material
A	Valve body	Aluminum-6061
B	Seal	Buna-N
C	Shaft	Stainless Steel (300-series)
D	Dial	Aluminum-6061
E	Shim	Teflon
F	Bearing (ball)	Steel
G	Shim	Stainless Steel
H	Fastener	Steel (Zinc-plated)
I	Disk	Stainless Steel (300-series)
J	Bearing (sleeve)	Acetal
K	Bearing (thrust)	Acetal
L	Spring	Stainless Steel (17-4 PH)
M	Plug	Aluminum-6061

Dimensions

Dimensions in inches; millimeters in brackets



Part Number	Weight - lb [kg]
VKG10.015U	1.50 [0.68]
VKG10.020U	1.41 [0.64]
VKG10.025U	1.29 [0.59]
VKG10.032U	1.51 [0.68]
VKG10.040U	1.59 [0.72]
VKG10.050U	1.84 [0.83]
VKG10.065U	3.09 [1.40]
VKG10.080U	3.35 [1.52]
VKG10.100U	4.83 [2.19]
VKG20.025U	1.33 [0.60]
VKG20.032U	1.58 [0.72]
VKG20.040U	1.63 [0.74]
VKG20.050U	1.97 [0.89]
VKG20.065U	3.34 [1.51]
VKG20.080U	3.68 [1.67]
VKG20.100U	5.63 [2.55]
VKG30.040U	1.70 [0.77]
VKG30.050U	2.01 [0.91]
VKG30.065U	3.53 [1.60]
VKG30.080U	3.92 [1.78]
VKG30.100U	6.02 [2.73]

Part Number	A	B	C	D
VKGxx.015U	1.35 [34]	1.04 [26]	2.08 [53]	3.25 [83]
VKGxx.020U	1.35 [34]	1.04 [26]	2.08 [53]	3.25 [83]
VKGxx.025U	1.35 [34]	1.04 [26]	2.08 [53]	3.25 [83]
VKGxx.032U	1.53 [39]	1.22 [31]	2.44 [62]	3.25 [83]
VKGxx.040U	1.63 [41]	1.31 [33]	2.63 [67]	3.25 [83]
VKGxx.050U	1.87 [47]	1.55 [39]	3.11 [79]	3.25 [83]
VKGxx.065U	2.18 [55]	1.87 [47]	3.74 [95]	4.38 [111]
VKGxx.080U	2.44 [62]	2.13 [54]	4.26 [108]	4.38 [111]
VKGxx.100U	2.96 [75]	2.64 [67]	5.28 [134]	5.00 [127]

SCC Inc.

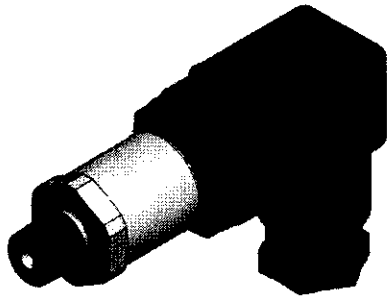
Technical Instructions

Document No. SEN-2000

April 15, 2015

7MF Series

Sitrans Pressure Transducers



Description	7MF... series pressure transducers accurately measure the pressure of liquid, gas, or vapor.
Features	• Measuring accuracy of 0.25% of full scale • Temperature-compensated measuring cell • Suitable for aggressive and non-aggressive media • Stainless steel NEMA 4 housing • 1/2" NPT electrical connection • Compact design
Application	7MF... series transducers measure the pressure of liquid, gas, or vapor. A selection of transducers is available for measuring pressures up to 750 PSI. 7MF... series pressure transducers produce either a 4-20 mA or 0-10 Vdc output signal that is linearly proportional to the input pressure.

Product Part Numbers

Table 1: Available 7MF... Pressure Transducers

Pressure Range	Output Signal	
	4-20 mA	0-10 Vdc
0-15 PSI	7MF1565-4BB00-5EA1	7MF1565-4BB10-5EA1
0-30 PSI	7MF1565-4BE00-5EA1	7MF1565-4BE10-5EA1
0-60 PSI	7MF1565-4BF00-5EA1	7MF1565-4BF10-5EA1
0-100 PSI	7MF1565-4BG00-5EA1	N/A
0-150 PSI	7MF1565-4CA00-5EA1	7MF1565-4CA10-5EA1
0-200 PSI	7MF1565-4CB00-5EA1	7MF1565-4CB10-5EA1
0-300 PSI	7MF1565-4CD00-5EA1	7MF1565-4CD10-5EA1
0-500 PSI	7MF1565-4CE00-5EA1	7MF1565-4CE10-5EA1
0-750 PSI	7MF1565-4CF00-5EA1	7MF1565-4CF10-5EA1

Specifications

Physical characteristics

Materials	
-Housing	Stainless Steel
-Measuring cell	Ceramic
-Electronics module	Ceramic
-Gasket	Viton
-Process connection	Stainless steel
Media	Aggressive and non-aggressive liquid, gas, or vapor
Electrical connection	1/2" NPT
Process connection	1/4" NPT
NEMA rating	NEMA 4
Accuracy	0.25% of full scale
Process temperature	5 to 257 °F [-15 to 125 °C]
Ambient temperature	-13 to 185 °F [-25 to 85 °C]
Weight	0.55 lb [0.25 kg]

Installation

- The output signal is linearly proportional to the input pressure.

- A steam syphon loop (pig tail) should be installed between the steam source and the pressure transducer as shown in Figure 1. As condensate forms in the syphon loop, it creates a water barrier to protect the transducer from heat and chemicals. On new installations, it is recommended to add water to the syphon loop to protect the transducer when condensate has not yet formed.

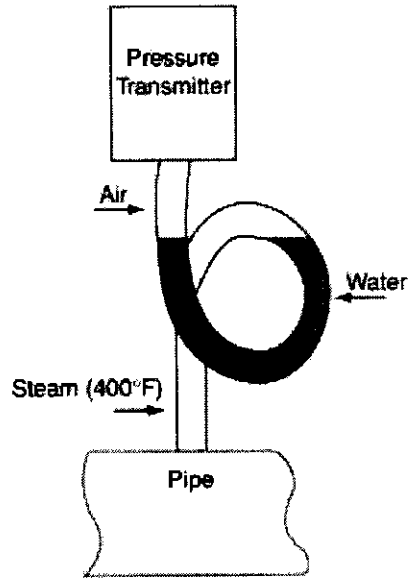
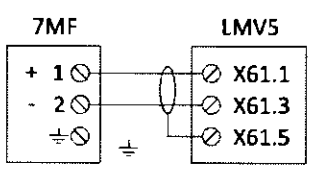
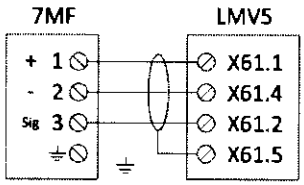
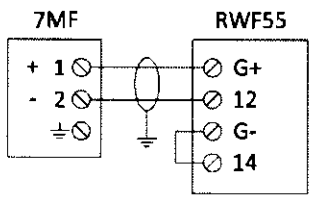
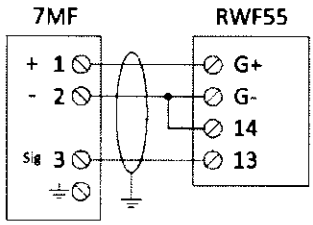
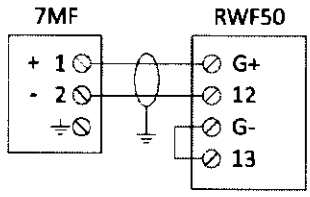
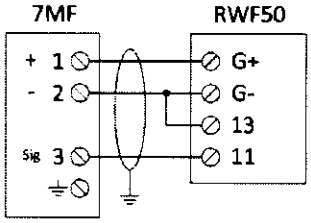
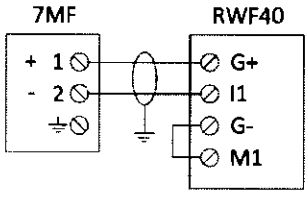
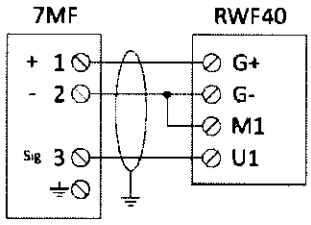
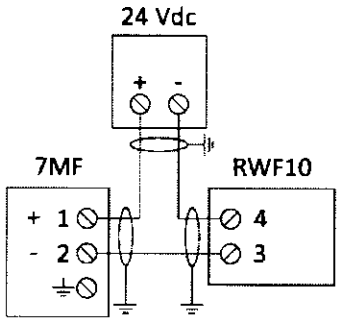
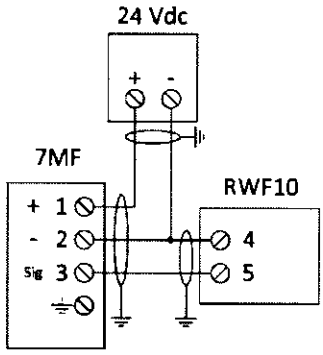


Figure 1: Example of a Syphon Loop

- A cord grip comes installed on the back of the transducer for the electrical connection. To use 1/2" conduit instead, remove the cord grip, washer, and packing.

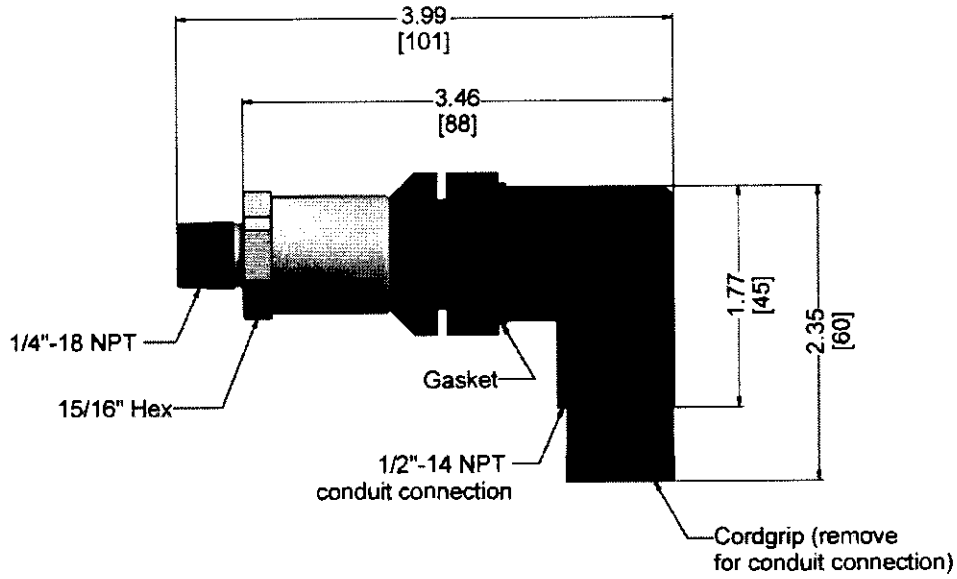
Wiring

Table 2: 7MF... Pressure Transducer Wiring

Controller Type	4-20 mA	0-10 Vdc
LMV5...		
RWF55...		
RWF50...		
RWF40...		
RWF10...		

Dimensions

Dimensions in inches; millimeters in brackets

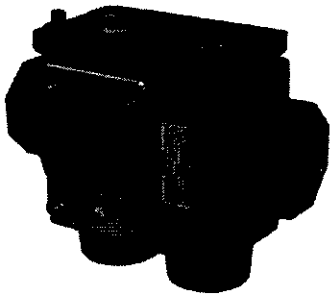


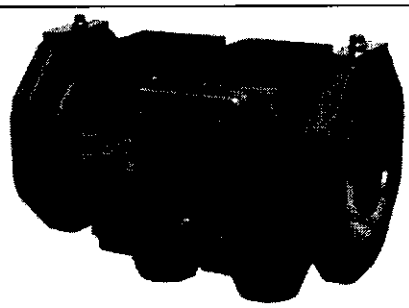
SIEMENS

Technical Instructions
Document No. 7649
VRD40.xxxUx
September 08, 2016

VRD Series

VRD40.xxxUx Double Valves
for use with SKP... electro-hydraulic actuators





ISO 9001 and 14001 REGISTERED FIRM

Only with series SKPxx.xxxUx actuators

Description

The normally closed VRDxx.xxxUx series of modular double-body gas valves combine with SKP... series electro-hydraulic actuators to provide safety shut-off, gas pressure regulation and/or air-gas ratio control for commercial or industrial gas burners.

Table 1. VRDxx.xxxU model numbers

Model Numbers	Body style	Connection
VRD40.040U	Double	NPT thread
VRD40.050U	Double	NPT thread
VRD40.065UF	Double	ANSI flange
VRD40.080UF	Double	ANSI flange
VRD40.100UF	Double	ANSI flange
VRD40.150UF	Double	ANSI flange

Features

All Models

- UL listed, FM approved, CSA certified, ISO 9001 and 14000 certified. CE approved versions available
- Suitable for biogases, process gases, natural gas and air
- Stainless steel mesh inlet filter protects the valve seats as well as downstream components
- ¼" NPT inlet and outlet pressure taps (see *Table 2* for details)
- Dual stem guides ensure precise disc alignment and tight shut-off
- Strong sealing force, withstands up to 4 psi differential back pressure
- Valves connected with SKP... actuators open slowly and close rapidly
- Compact VRD40.xxxUx double-valve bodies consist of 2 safety shut-off valves in series
- Each individual safety shut-off valve has double seats to achieve high flow
- Patented seat construction with individual closing spring for each seat to assure reliable shut-off and high close-off pressure rating
- Full port vent line connection plates are available

NOTE:
VRD40.xxxUx valves and AGA40.xxxxU vent connection plates must be ordered as separate items (see *Table 2*).

Application

VRD40.xxxUx valves can be combined with any SKP... series actuator. The actuator can be mounted while the valve is installed and under pressure.

SKP... regulating actuators are applicable for both low and high supply gas pressure applications, eliminating excessive regulator inventories. Maximum pressure ratings vary with valve size (see *Table 2*).

All VRD40.xxxUx valves perform these functions in combination with each of the following actuators:

SKP15...	Safety shut-off
SKP25...	Safety shut-off and constant pressure regulation or zero governor
SKP55...	Safety shut-off, pressure regulation and differential pressure air-gas ratio control
SKP75...	Safety shut-off, pressure regulation and adjustable air/gas ratio control

Since more than one function can be performed by a single valve, fewer components and fittings are required, significantly reducing both the size and weight of the gas train. In addition, smaller diameter gas valves can be used. For details on valve sizing see the flow charts (*figures* 2).

CAUTION:
Do not oversize valves equipped with a regulating SKP2... / SKP5... / SKP7... actuator. Oversizing may limit turndown and could cause oscillations.

Ordering information

Gas valves and actuators are ordered separately. For additional SKP... actuator information, see the following technical instructions:

SKP15...	155-751P25
SKP25...	155-752P25
5KP55...	155-753P25
5KP75...	155-754P25

NOTE:
The SKP... actuators have an operating temperature range of 14 °F to 140 °F (-10 °C to 60 °C)!

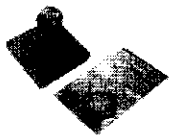
Table 2. Product numbers

Product number	Size	Maximum operating pressure psi	Close-off pressure psi	Capacity CFH Natural gas at ΔP=1" W.C.	Number of test points, 1/4" NPT		Valve body material
					Inlet	Outlet	
VRD40.040U	1-1/2" NPT	20	75	1800	1	1	Aluminum
VRD40.050U	2" NPT	20	75	2300	1	1	Aluminum
VRD40.065UF	2-1/2" Flanged	10	75	3.880	1	1	Aluminum
VRD40.080UF	3" Flanged	10	75	5.370	1	1	Aluminum
VRD40.100UF	4" Flanged	10	30	9.680	1	1	Aluminum
VRD40.150UF	6" Flanged	10	30	17.490	1	1	Aluminum

Table 3. Accessories

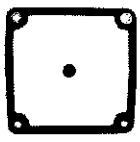
Part Number	Description	Notes
AGA40.4050U	1" NPT vent connection plate	Each vent connection includes a ¼" NPT test port, see Mounting instruction M7631.3 (74 319 0278 0)
AGA40.6580U	1 ¼" NPT vent connection plate	
AGA40.0100U	2" NPT vent connection plate	
AGA40.0150U	2 ½" NPT vent connection plate	

AGA61



Manual adjusting throttle attachment AGA61 permits VRD40.xxxUx series valves to be used as adjustable limiting orifice valves. Once adjusted, the AGA61 has a provision to be sealed from tampering.

AGA66



Sealing gasket to provide NEMA 3, NEMA 3R, and NEMA 4 protection.
Gasket kit to SKP...
- Place between actuator SKP... and valve VRD40.xxxUx
- Increases degree of protection from IP54 to IP65
- Refer to Mounting Instruction M7643.2 (74 319 0421 0)

Specifications **Approvals**	Agency approvals/standards	UL/429, FM/7400, CSA/ANSI Z21.21/CSA 6.5 C / I Commercial/industrial IRI approvable Agency marks apply only for VRD40.xxxU series gas valve bodies assembled with SKPxx.xxxUx actuators.
Operating environment	Maximum operating pressure	See *Table 2*
	Maximum back pressure (differential)	4 psi (300 mbar)
	Close-off pressure	See *Table 2*
	Permissible gases	See *Type of gases* and *Use*
	Permissible gas temperature	14 °F to 140 °F (-10 °C to 60 °C)
	Permissible operating temperature	14 °F to 140 °F (-10 °C to 60 °C)

Use

Functionally, the valves correspond to Siemens gas valves in accordance with UL 429.

They are designed for use with slightly aggressive and dry gases
- Maximum 140 °F (60 °C)
- Gases like biogases, digester gases, process gases, natural gas or air

The valve is used as:
- Shutoff valve (in connection with SKP15...)
- Control valve with shutoff function (in connection with SKP25..., 5KP5... or SKP7...)
  For SKP... with pressure regulation function (SKP2..., SKP5... and SKP7...) is recommended to review with Siemens with regard to suitability with the relevant type biogases.

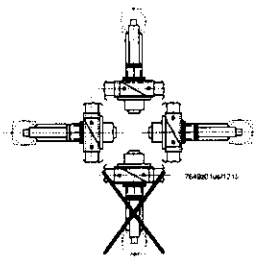
The chemical composition and aggressiveness of each type of biogas or recycling gas is different, not constant and depends on several factors.

Aggressiveness of the gas against valve materials augments especially
- as the hydrogen sulfide content H_2S increases
- as the moisture content and the temperature of the gas increases. Condensation in the valve is not permitted.

The user must decide after consultation with Siemens whether the valve materials are suited for the relevant type of gas.
The composition and concentration of the gas components may vary.
It is therefore impossible to provide a guarantee regarding life expectancy.
The suitability in principle is based on tests carried out on the gases to be used.

With VRD40.xxxUx valves in biogas applications. It is recommended to
- install a valve proving device / sequence
- leak test the valves at 6- to 12-month intervals
- install SKPx5... with POC

Specifications

Perm. mounting position		
	See *Mounting notes*	
Operating pressure	See *Type summory*	
Types of gases	Suitable for biogases, process gas, natural gas or air - up to maximum 1 vol.% H2S, dry - up to maximum 1 vol.% NH3, dry For more information see *Use*.	
Strainer	Built-in, mesh size 0.9 mm	
Physical characteristics	Body materials Weight All valve parts	See *Table 2* See *Table 6* Nonferrous
Connections	Pipe connections Pressure and vent taps	NPT threads or ANSI class 150 flanges (see *Table 2*) See *Dimensions*

Operation

All VRD40.xxxUx gas valves are normally closed, two-way valves. The valves have a standard, integral, stainless steel mesh filter (0.9 mm) in the inlet to protect the downstream components against contamination.

VRD40.xxxUx double valves consist of two valves in series. Each valve has a double seat to achieve high flow (see *Figure 1*).

All valves have ¼-inch NPT ports for pressure test connection. A full size vent connection plate is available as an accessory.
See *Table 2 and 3* for details on ports and vent connection plates.

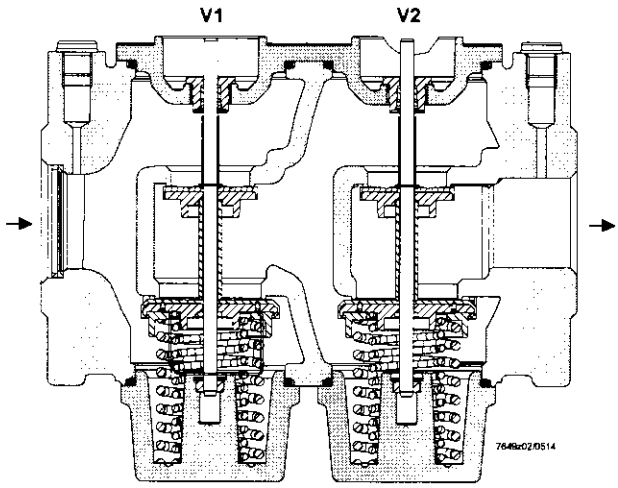


Figure 1. Sectional view of VRD40.06SUF

Closing springs:
Each double seat uses one pair of springs. The spring forces act separately as closing forces on the individual valve seats.

Gas flow charts

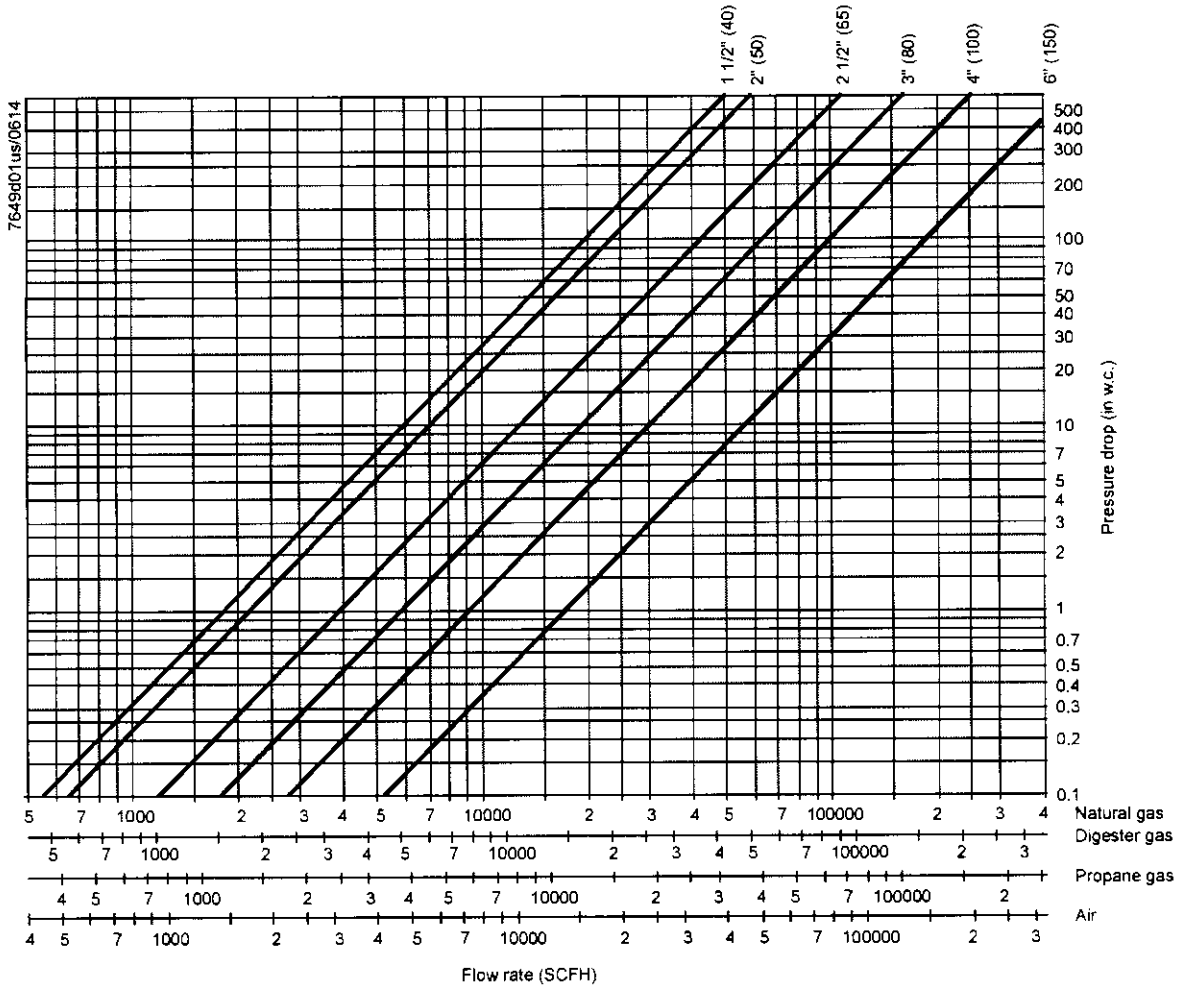


Figure 2. Sizing double valves

Assumptions:
1) Pressure downstream of valve is atmospheric
2) Maximum gas temperature of 140 °F
3) Valve in fully open position

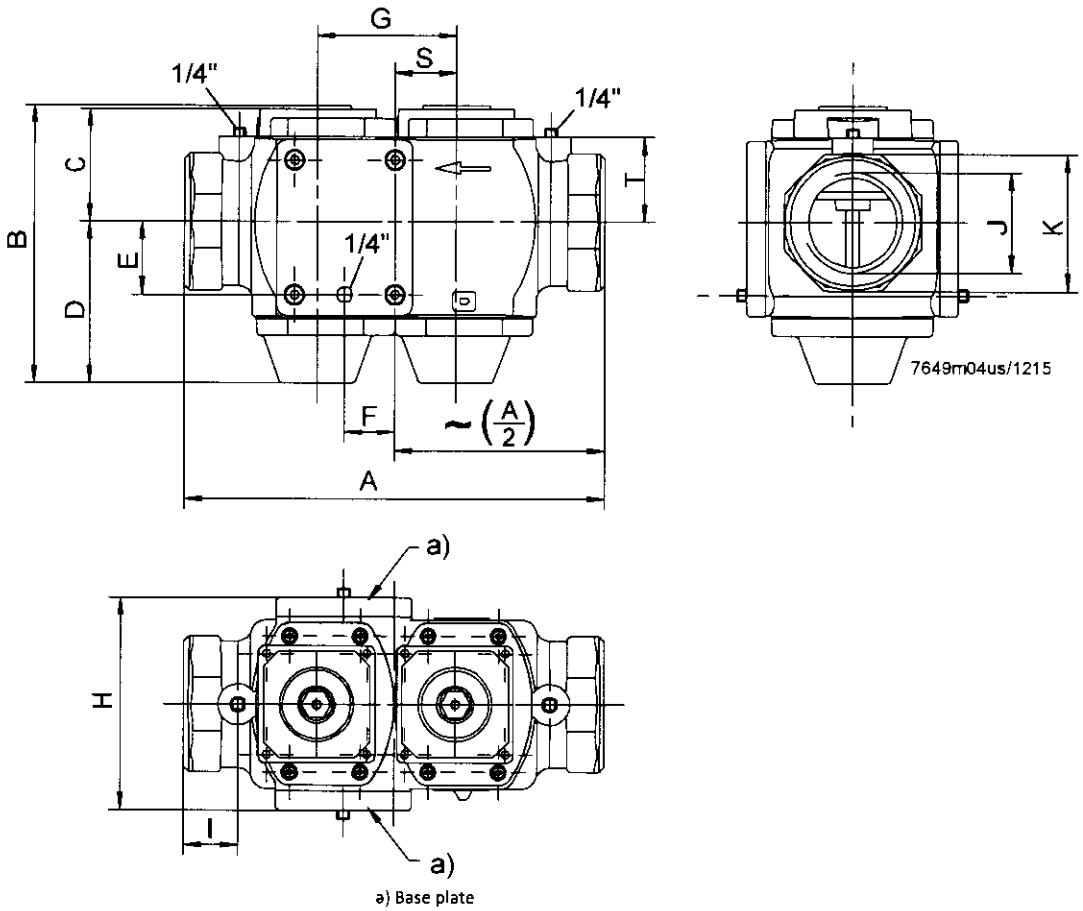
NOTE:
Pressure drop is total drop across both valves when using SKPx5... actuator, with or without an AGA66.

CAUTION:
Do not oversize valves equipped with regulating actuators SKP2..., SKP5... or SKP7... Oversizing may limit turndown and could cause oscillations.

Dimensions

Dimensions in Inches (mm)
(Shipment conditions: Mounted base plates on both sides)

VRD40.040U / VRD40.050U



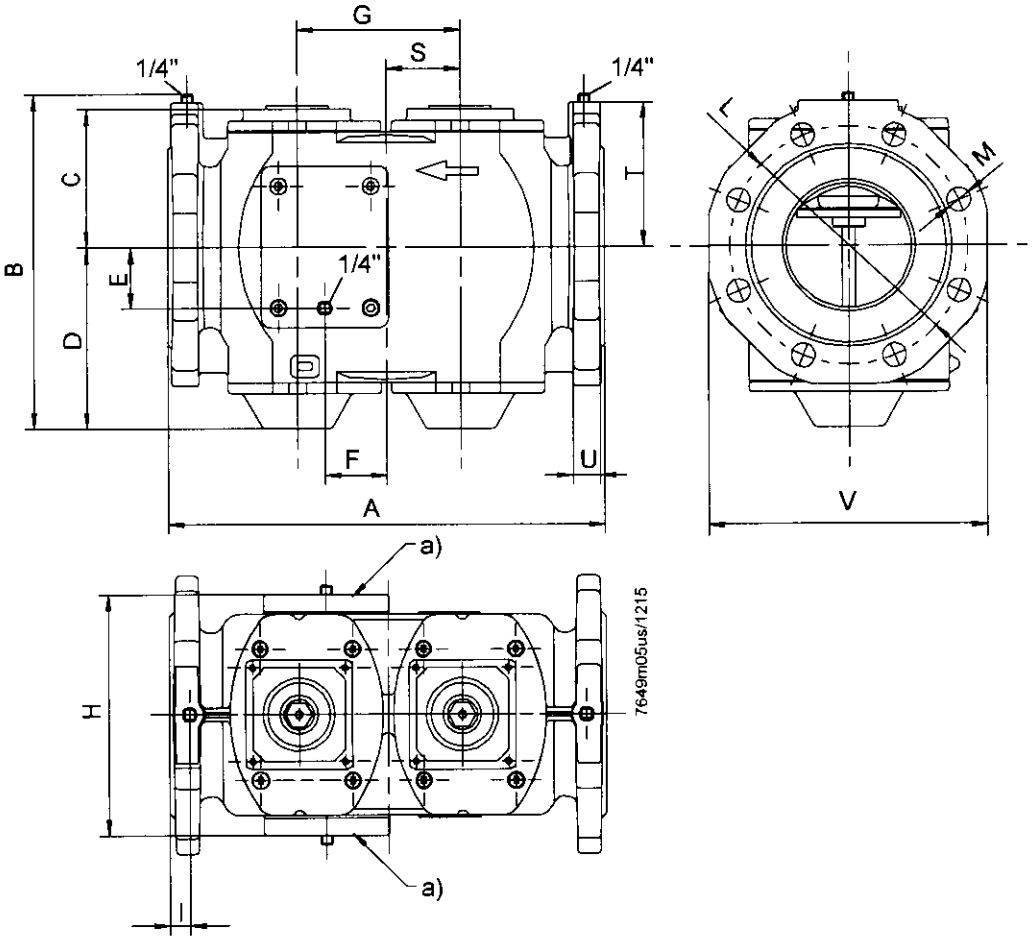
a) Base plate

Dimensions, continued

Dimensions in Inches (mm)

(Shipment conditions: Mounted base plates on both sides)

VRD40.065UF / VRD40.080UF / VRD40.100UF / VRD40.150UF



a) Base plate

Table 5. VRD40.xxxUx dimensions in inches (mm)

Type	A inch (mm)	B inch (mm)	C inch (mm)	D inch (mm)	E inch (mm)	F inch (mm)	G inch (mm)	H inch (mm)	I inch (mm)	J inch NPT	K (SW*) inch (mm)	L (d =) inch (mm)	M (d =) inch (mm)	S inch (mm)	T inch (mm)	U inch (mm)	V inch (mm)
VRD40.040U	10.24 (260)	7.76 (197)	3.11 (79)	4.53 (115)	1.97 (50)	0.55 (14)	3.46 (88)	5.35 (136)	1.18 (30)	1½"	2.76 (70)	---	---	0.83 (21)	2.8 (71)	---	---
VRD40.050U	10.24 (260)	7.76 (197)	3.11 (79)	4.53 (115)	1.97 (50)	0.55 (14)	3.46 (88)	5.35 (136)	1.18 (30)	2"	3.15 (80)	---	---	0.83 (21)	2.8 (71)	---	---
VRD40.065UF	11.42 (290)	8.54 (217)	3.25 (82.5)	4.63 (117.5)	2.09 (53.1)	1.46 (37)	4.02 (102)	6.14 (156)	0.63 (16)	---	---	5.5 (139.7)	0.75 (19)	1.77 (45)	3.64 (92.5)	0.80 (20.4)	7.01 (178)
VRD40.080UF	12.20 (310)	9.39 (238.5)	3.64 (92.5)	5.18 (131.5)	2.09 (47)	0.79 (20)	4.21 (107)	6.30 (160)	0.63 (16)	---	---	6.0 (152.4)	0.75 (19)	1.2 (30.5)	3.94 (100)	0.88 (22.4)	7.56 (192)
VRD40.100UF	13.78 (350)	10.52 (267.3)	4.33 (110)	5.70 (144.8)	1.93 (49)	1.95 (49.5)	5.16 (131)	7.56 (192)	0.63 (16)	---	---	7.5 (190.5)	0.75 (19)	2.83 (72)	4.55 (115.5)	0.87 (22)	8.74 (222)
VRD40.150UF	18.90 (480)	13.29 (337.5)	5.71 (145)	7.40 (188)	2.09 (53)	2.30 (58.5)	6.61 (168)	10.31 (262)	0.63 (16)	---	---	9.5 (241)	0.91 (23)	3.54 (90)	5.61 (142.5)	0.90 (22.9)	10.63 (270)

* SW = width across flats

Dimensions, continued

Dimensions in Inches (mm)

VRD40.xxxUx valve with vent connection plate

Option: a) Base plate
b) Vent connection plate AGA40.xxxxU (optional) to be ordered separately
a) and b) are interchangeable

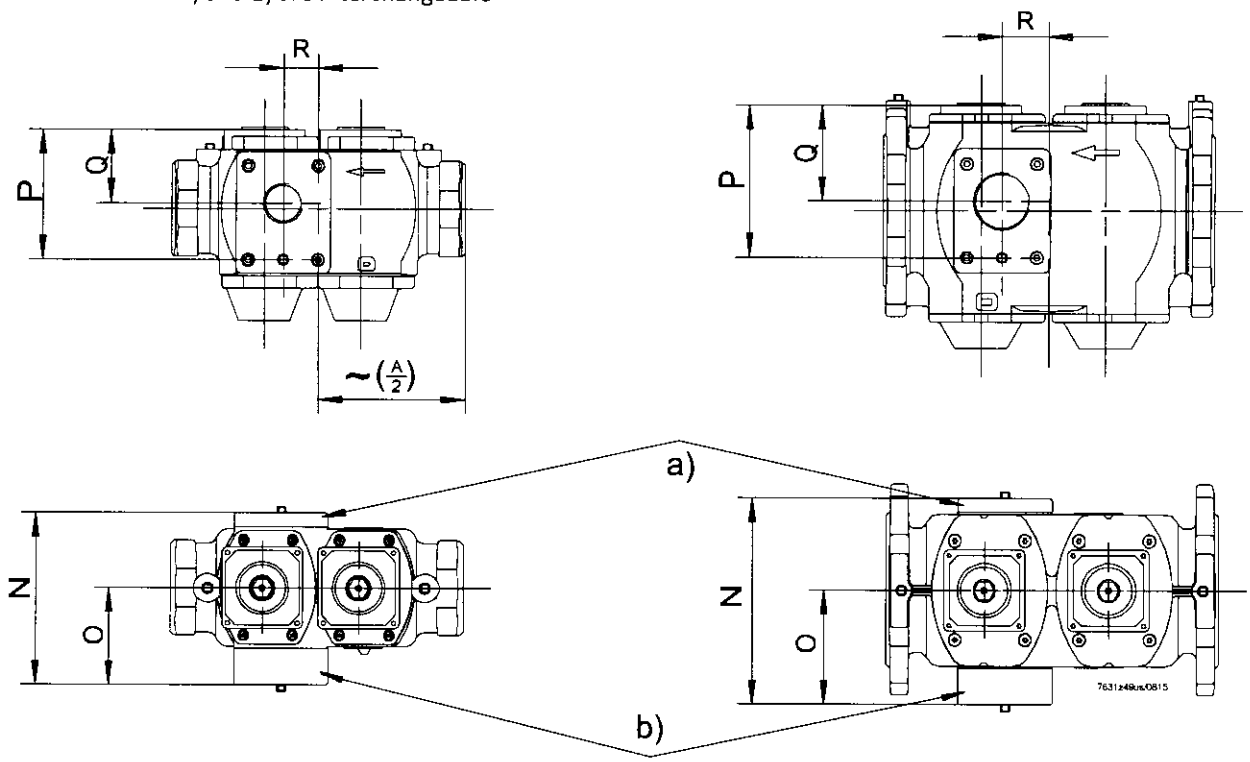


Table 6. VRD40.xxxUx dimensions in inches (mm) with mounted vent connecting plate.

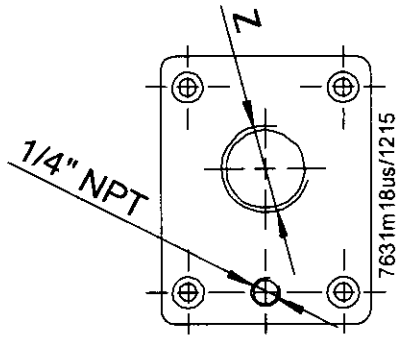
Valve model	N inch (mm)	O inch (mm)	P inch (mm)	Q inch (mm)	R inch (mm)	Weight pounds (kg)
VRD40.040U	6.38 (162)	3.66 (93)	5.08 (129)	2.76 (70)	0.55 (14)	13.7 (6.2)
VRD40.050U	6.38 (162)	3.66 (93)	5.08 (129)	2.76 (70)	0.55 (14)	13.7 (6.2)
VRD40.065UF	7.13 (181)	4.06 (103)	5.34 (135.6)	3.02 (76.59)	1.46 (37)	18.5 (8.4)
VRD40.080UF	7.28 (185)	4.13 (105)	5.49 (139.5)	3.17 (80.5)	0.79 (20)	21 (9.6)
VRD40.100UF	8.54 (210)	4.76 (121)	6.26 (159)	3.94 (100)	1.95 (49.5)	29 (13)
VRD40.150UF	11.30 (287)	6.14 (156)	7.80 (198)	5.47 (139)	2.28 (58)	53 (24)

Dimensions, continued

Dimensions in Inches (mm)

Table 7. AGA40.xxxxU Models

Vent connection plate (optional)							
	VRD40.040U	VRD40.050U	VRD40.065UF	VRD40.080UF	VRD40.100UF	VRD40.150UF	Vent connection thread "Z"
AGA40.4050U	●	●					1" NPT
AGA40.6580U			●	●			1¼" NPT
AGA40.0100U					●		2" NPT
AGA40.0150U						●	2½" NPT



Siemens AG Building Technologies Division
Berliner Ring 23
76437 Rastatt
GERMANY

Your feedback is important to us. If you have comments about this document, please send them to techsupport@SCCcombustion.com

Document No. CC1N7649us
Country of Origin: DE

SCC Inc.

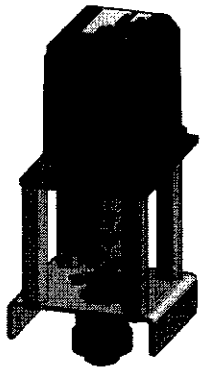
Technical Instructions

Document No. VA-4000

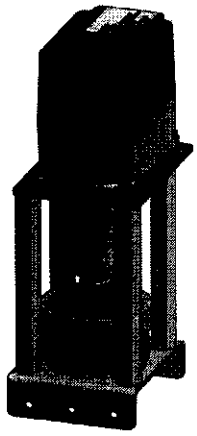
January 19, 2017

VA Series

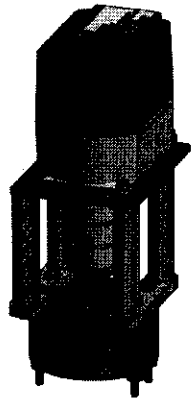
VA... Valve Actuator Assemblies with Hauck Oil Valves



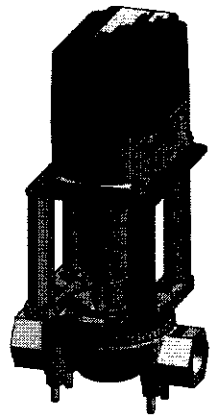
S Series



AS Series



B & F Series



G & K Series

Description

VA... valve actuator assemblies include a Siemens SQM... actuator reliably mounted to a Hauck oil valve.

Features

- Engineered for precise shaft alignment with less actuator wear
- Valve assemblies with S, AS, B, F, G, and K series Hauck valves available
- Valve assembly includes Siemens SQM33, SQM45, or SQM48 actuator
- Rigid and robust design

Application

VA... valve actuator assemblies mount an SQM33, SQM45, or SQM48 actuator to a Hauck oil valve. A variety of Hauck oil valves are available to accommodate a wide range of flow rates and applications. The Hauck oil valve and SQM... actuator are rigidly mounted with Siemens engineered brackets and couplings to ensure precise shaft alignment.

Product Part Numbers

Table 1 lists available VA... assembly part numbers including an SQM33 actuator. Technical instructions (N7813) for SQM33 actuators are available at www.scccombustion.com.

Table 1: Available VA... Assemblies Using an SQM33 Actuator

Part Number	Description
VA33-S33	SQM33.550A9 to S-3-3 Hauck oil valve
VA33-S35	SQM33.550A9 to S-3-5 Hauck oil valve
VA33-S37	SQM33.550A9 to S-3-7 Hauck oil valve
VA33-S39	SQM33.550A9 to S-3-9 Hauck oil valve
VA33-S311	SQM33.550A9 to S-3-11 Hauck oil valve
VA33-S313	SQM33.550A9 to S-3-13 Hauck oil valve
VA33-S31610	SQM33.550A9 to S-3-1610 Hauck oil valve
VA33-AS33	SQM33.550A9 to AS-3-3 Hauck oil valve
VA33-AS35	SQM33.550A9 to AS-3-5 Hauck oil valve
VA33-AS37	SQM33.550A9 to AS-3-7 Hauck oil valve
VA33-AS39	SQM33.550A9 to AS-3-9 Hauck oil valve
VA33-AS311	SQM33.550A9 to AS-3-11 Hauck oil valve

Table 2 lists available VA... assembly part numbers including an SQM45 actuator. Technical instructions (N7814) for SQM45 actuators are available at www.scccombustion.com.

Table 2: Available VA... Assemblies Using an SQM45 Actuator

Part Number	Description
VA45.2-S33	SQM45.295B9 to S-3-3 Hauck oil valve
VA45.2-S35	SQM45.295B9 to S-3-5 Hauck oil valve
VA45.2-S37	SQM45.295B9 to S-3-7 Hauck oil valve
VA45.2-S39	SQM45.295B9 to S-3-9 Hauck oil valve
VA45.2-S311	SQM45.295B9 to S-3-11 Hauck oil valve
VA45.2-S313	SQM45.295B9 to S-3-13 Hauck oil valve
VA45.2-S31610	SQM45.295B9 to S-3-1610 Hauck oil valve
VA45.2-AS33	SQM45.295B9 to AS-3-3 Hauck oil valve
VA45.2-AS35	SQM45.295B9 to AS-3-5 Hauck oil valve
VA45.2-AS37	SQM45.295B9 to AS-3-7 Hauck oil valve
VA45.2-AS39	SQM45.295B9 to AS-3-9 Hauck oil valve
VA45.2-AS311	SQM45.295B9 to AS-3-11 Hauck oil valve

Product Part Numbers (continued)

Table 3 lists available VA... assembly part numbers including an SQM48 actuator. Technical instructions (N7814) for SQM48 actuators are available at www.scccombustion.com.

Table 3: Available VA... Assemblies Using an SQM48 Actuator

Part Number	Description
VA48.4-S33	SQM48.497B9 to S-3-3 Hauck oil valve
VA48.4-S35	SQM48.497B9 to S-3-5 Hauck oil valve
VA48.4-S37	SQM48.497B9 to S-3-7 Hauck oil valve
VA48.4-S39	SQM48.497B9 to S-3-9 Hauck oil valve
VA48.4-S311	SQM48.497B9 to S-3-11 Hauck oil valve
VA48.4-S313	SQM48.497B9 to S-3-13 Hauck oil valve
VA48.4-S31610	SQM48.497B9 to S-3-1610 Hauck oil valve
VA48.4-AS33	SQM48.497B9 to AS-3-3 Hauck oil valve
VA48.4-AS35	SQM48.497B9 to AS-3-5 Hauck oil valve
VA48.4-AS37	SQM48.497B9 to AS-3-7 Hauck oil valve
VA48.4-AS39	SQM48.497B9 to AS-3-9 Hauck oil valve
VA48.4-AS311	SQM48.497B9 to AS-3-11 Hauck oil valve
VA48.4-B.5-12	SQM48.497B9 to B-1/2-12 Hauck oil valve
VA48.4-B.5-16	SQM48.497B9 to B-1/2-16 Hauck oil valve
VA48.4-B.5-18	SQM48.497B9 to B-1/2-18 Hauck oil valve
VA48.4-B.5-20	SQM48.497B9 to B-1/2-20 Hauck oil valve
VA48.4-B.5-24	SQM48.497B9 to B-1/2-24 Hauck oil valve
VA48.4-F.5-16	SQM48.497B9 to F-1/2-16 Hauck oil valve
VA48.4-F.5-18	SQM48.497B9 to F-1/2-18 Hauck oil valve
VA48.4-F.5-20	SQM48.497B9 to F-1/2-20 Hauck oil valve
VA48.4-F.5-24	SQM48.497B9 to F-1/2-24 Hauck oil valve
VA48.4-G-1.0-29	SQM48.497B9 to G-1-29 Hauck oil valve
VA48.4-K-1.0-29	SQM48.497B9 to K-1-29 Hauck oil valve
VA48.4-K-1.0-38	SQM48.497B9 to K-1-38 Hauck oil valve

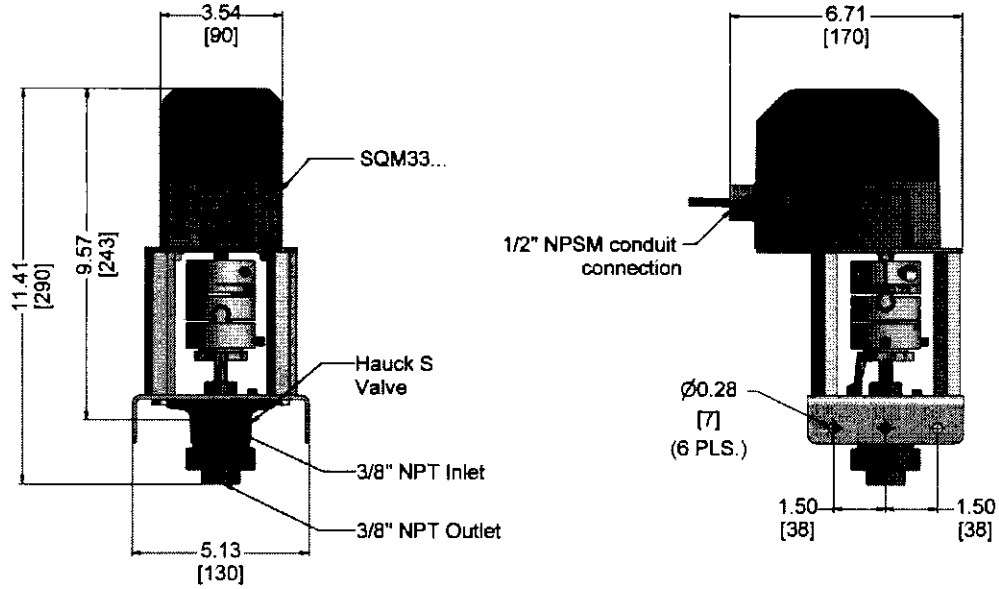
Installation

- Assembly may be mounted in any position except upside down.
- Valve position indicator shows valve position after installation.
- Assembly ships with the set screws on the coupling loose. Once light off position has been established, tighten the set screws to 160 in-lb.

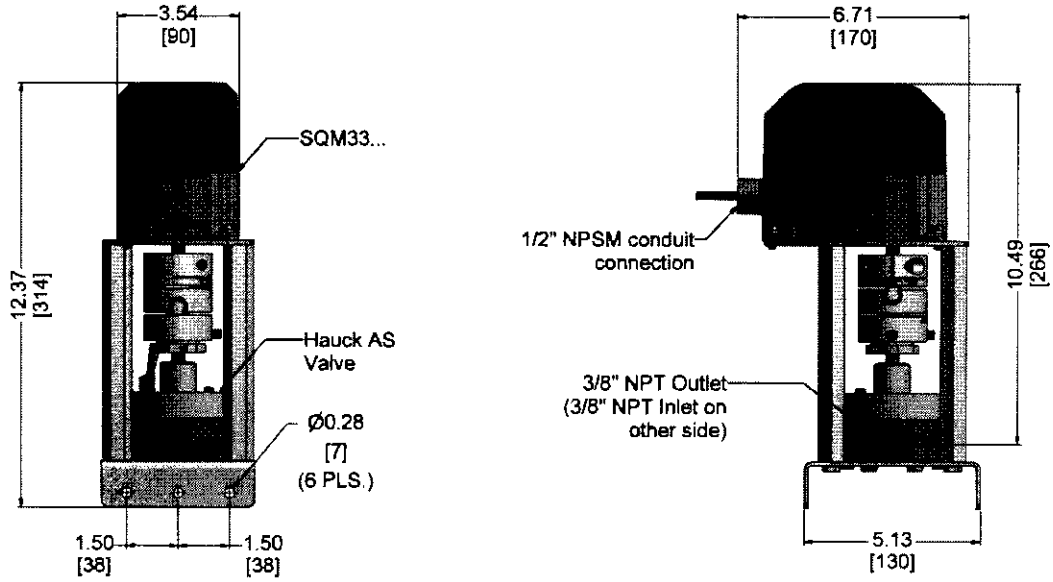
Dimensions

Dimensions in inches; millimeters in brackets

VA33... Assemblies Including a Hauck S Series Valve



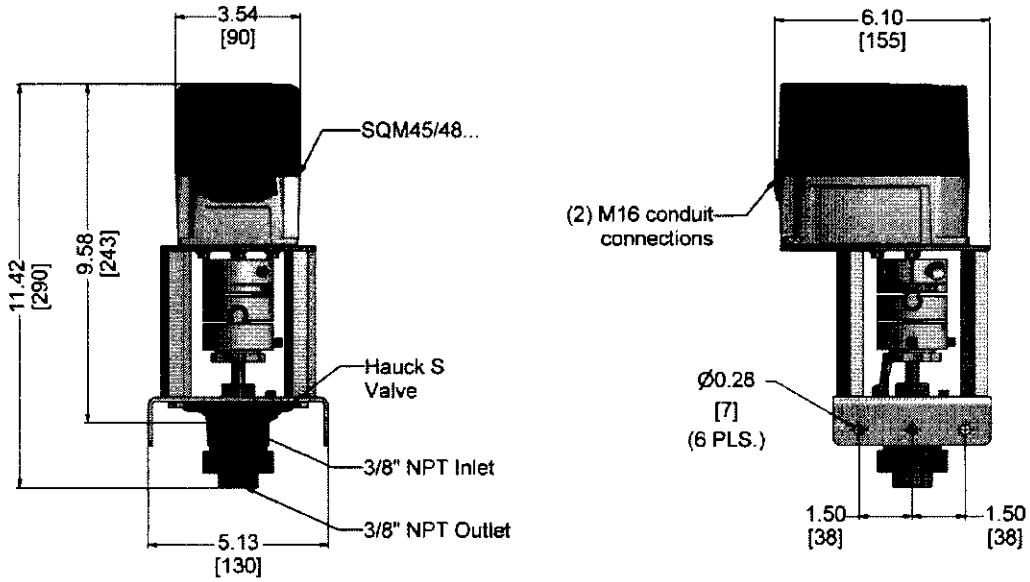
VA33... Assemblies Including a Hauck AS Series Valve



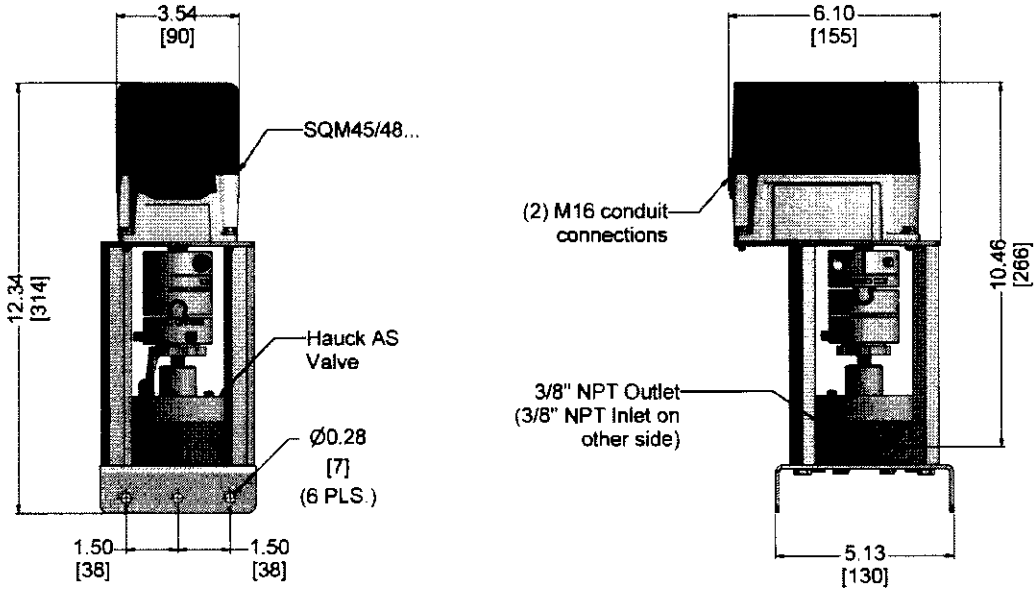
Dimensions (continued)

Dimensions in inches; millimeters in brackets

VA45... and VA48... Assemblies Including a Hauck S Series Valve



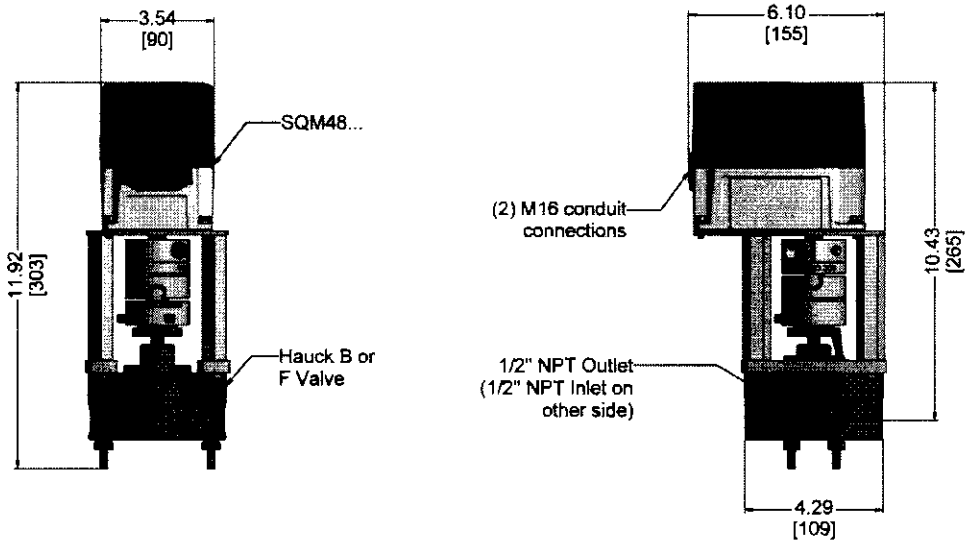
VA45... and VA48... Assemblies Including a Hauck AS Series Valve



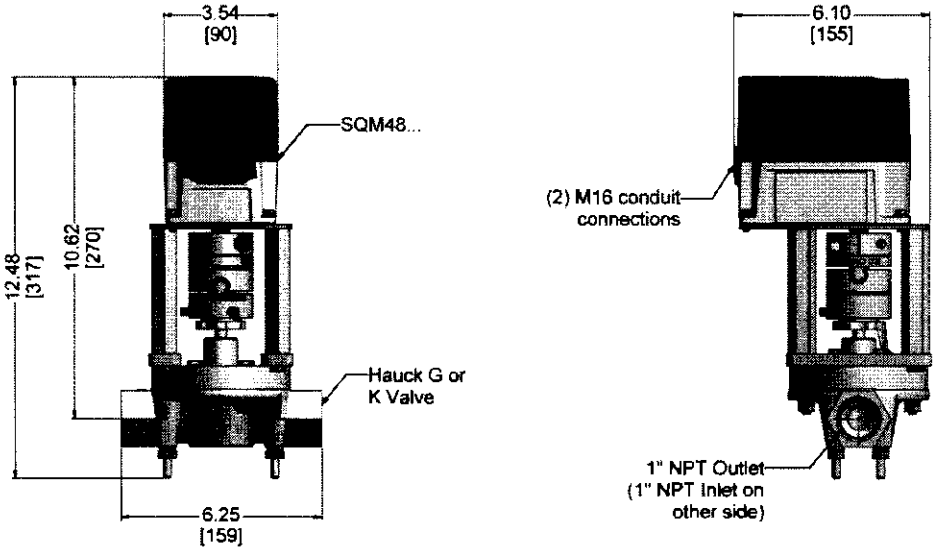
Dimensions (continued)

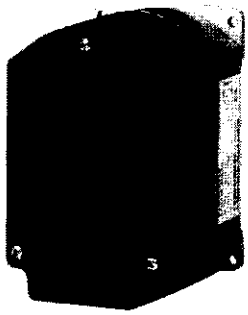
Dimensions in inches; millimeters in brackets

VA48... Assemblies Including a Hauck B or F Series Valve



VA48... Assemblies Including a Hauck G or K Series Valve





Actuators for air and gas dampers

SQM45...
SQM48...

Electromotoric actuators

- **Torques:** – **SQM45...** **up to 3 Nm**
  – **SQM48...** **up to 20 Nm**
  – **SQM48.6...** **up to 35 Nm**
- **Running times:** [1] – **SQM45...** **10 ... 120 s**
  – **SQM48...** **30 ... 120 s**
  – **SQM48.6...** **60 ... 120 s**
  [1] **Depending on the type of basic unit (LMV5...)**
- **Versions:** – **Choice of drive shafts (refer to «Type summary»)**

The actuators SQM45... / SQM48... and this Data sheet are intended for use by OEMs which integrate the actuators in their products!

Use

The SQM45 / SQM48 actuators are suited for driving oil pressure controllers, butterfly valves, dampers or for use on other applications that require rotary motion.
Areas of application are oil and gas burners of medium to larger capacity, as well as thermal process plants.

The actuators are used primarily for the load-dependent control of the gas flow, oil volume and combustion air volume in connection with the electronic ratio control LMV5.

Supplementary documentation

Product type	Type of documentation	Documentation number
LMV5...	Basic documentation	P7550
AZL5...	User documentation	A7550

Warning notes

To avoid injury to persons, damage to property or the environment, the following warning notes must be observed!

Do not open, interfere with or modify the actuators!

- Read the documentation on the actuators carefully and fully. If not observed, dangerous situations can occur
- The user must ensure that the actuators meet the requirements of the relevant application standards
- Safety-related applications are only available with Siemens burner controls
- All product-related activities (mounting, settings and maintenance) must be performed by qualified and authorized personnel

Attention!

- Risk of electric shock – to disconnect the equipment from the power, it may be necessary to open more than one switch. Before performing maintenance work, the equipment must be disconnected from power
- The electrical connection between the conduit fittings is not made automatically. It must be established on installation site
- The connecting plate is made of plastic and does not provide earthing of the conduit fittings. Earthing must be ensured by adequate washers and wire links.

- To ensure protection against electric shock, the connection terminals must have adequate protection. Make certain that non-insulated connections or wires cannot be touched
- Each time work has been carried out (mounting, installation, service work, etc.), check to ensure that wiring is in an orderly state
- Fall or shock can adversely affect the safety functions. Such units must not be put into operation, even if they do not exhibit any damage
- Static charges must be avoided since they can damage the electronic components on contact.
  Recommended: Use ESD equipment

Notes on use in North America

Only flexible conduits with relevant accessories may be used.

Mounting notes

- Ensure that the relevant national safety regulations and notes on standards are complied with
- In the geographical areas where DIN regulations are in use, the requirements of VDE must be complied with, especially DIN/VDE 0100, 0550 and DIN/VDE 0722
- Make certain that the actuator is not exposed to direct solar radiation
- Required tightening torques for the fixing screws of the
  - housing cover: 3.5 Nm
  - connecting cover: 2 Nm
- The connection between actuator drive shaft and controlling element must be **flexible but torsionally rigid couplings** with **free from backlash**

Positive connection

Note!

Possible connection with drive shaft or hub:

- Groove with Woodruff key
- Drive shaft with flat edge and matching counter piece

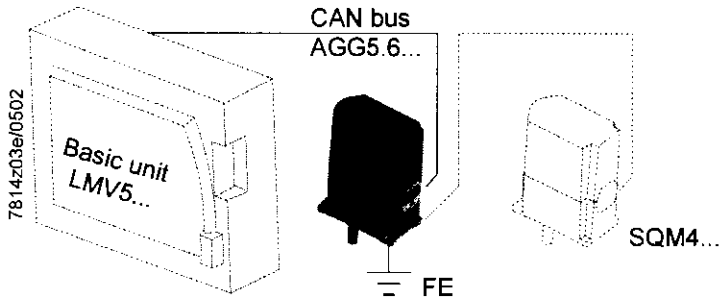
To avoid inadmissible loads and moments by mechanical overload, appropriate actions must be taken at the mechanical coupling

Example: Metal bellows clutches as compensating clutches with no mechanical play

Cable and cable shielding

Only the specified cable may be used (refer to Basic Documentation P7550). The cable's shielding must be connected to the printed circuit board using the tab provided.

Warning!
Ensure that the actuator's housing is connected to functional earth (FE) of the system.
If necessary, remove isolating layers of paint from the fixing points on the burner's casing or run separate earth wires. For detailed information, refer to «Installation Instructions for the LMV5... system» (J7550.1).



Working range of actuator

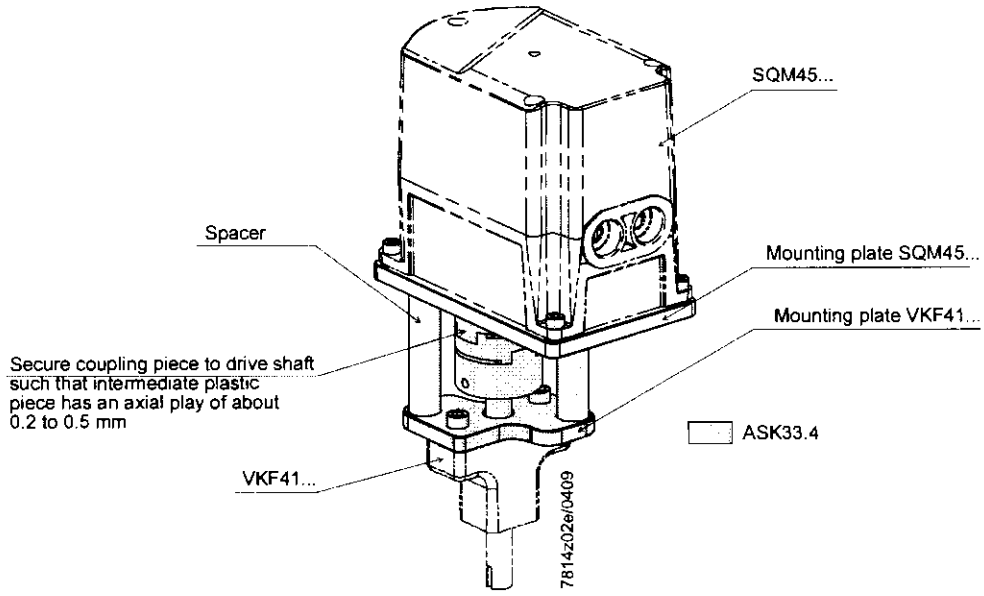
The working range is given on the type field and must be observed when mounting the actuator. To ensure the actuator is accurately located on the burner, a positioning pin of 6 mm diameter must be fitted on the mounting surface.

Mounting notes (cont'd)

IP54

To ensure **degree of protection IP54,** suitable M16 glands must be fitted in the actuator's M16 openings. The M16 glands used must feature cable strain relief. To ensure degree of protection IP54 during the actuator's entire service life, the bearing of the drive shaft must be located such that it will not be directly exposed to water or dust.

Mounting example



Warning!
SQM45.xxxB9 / SQM48.xxxB9 must be installed at a sufficient distance from magnetic fields (e.g. permanent magnets, transformers, electric motors, etc.). With magnetic fields of ≤1000 mT, a minimum distance of 10 cm must be complied with. For stronger magnetic fields (>1...10 T), a minimum distance of 40 cm must be complied with.

Installation notes

- Ensure that the electrical wiring is in compliance with national and local regulations.
- Make certain that strain relief of the connected cables is in compliance with the relevant standards (e.g. as per DIN EN 60730 and DIN EN 60335)
- Ensure that spliced wires cannot come into contact with neighboring terminals. Use suitable ferrules
- In case of increased vibration requirements, the internal connector system must be additionally secured
- The connection between the actuator drive shaft and the relevant controlling element must be form-fitted
- The holding torque is reduced when the actuator's power supply is switched off

Housing cover

Warning!
The housing cover may only be removed for short periods of time for wiring or when making the addressing. It must be made certain that dust or dirt will not get inside the actuator while such work is carried out.

ESD

Warning!
The actuator contains a printed circuit board with ESD-sensitive components. The top side of the board carries a cover which affords protection against direct contact. This protective cover must not be removed! The underside side of the board must not be touched.

Addressing

Addressing (assignment of functions) defines whether the SQM4... shall operate as a

- fuel actuator
- air damper actuator, or
- auxiliary actuator,

and is made with the display and operating unit AZL5... and the addressing button on the actuator, which is located under the housing cover (refer to Basic Documentation P7550).
The correct assignment of actuator functions can be checked with the help of flashing LEDs.

Cable length
Topology

For the maximum permissible cable length, refer to the Basic Documentation.
Cabling must be strictly serial (**no branching permitted!**).

Electrical connection

The supplied RAST3.5 connector must be used with screw terminals for electrical connections. A tightening torque of 0.25 Nm must be observed for fitting the screw.

Standards and certificates

CE

Note!
Only in conjunction with the basic unit LMV5 (see Basic Documentation P7550).

EAC

EAC Conformity mark (Eurasian Conformity mark)

ISO 9001:2008
ISO 14001:2004
OHSAS 18001:2007

c UL us

China RoHS
Hazardous substances table:
http://www.siemens.com/download?A6V10883536

Lifetime

The actuator has a designed lifetime* of 250,000 start cycles (OFF ⇨ ON ⇨ OFF) under load with the rated torque in the entire rotation angle range, which under normal operating conditions in heating mode corresponds to approx. 10 years of service (starting from the production date given on the nameplate). This is based on the endurance tests specified in the standard EN 298.
A summary of the conditions has been published by the European Control Manufacturers Association (Afecor) (www.afecor.org).

The designed lifetime is based on use of the actuator according to the manufacturer's data sheet. After reaching the designed lifetime in terms of the number of burner startup cycles, or after the corresponding usage time, the actuator must be replaced by authorized personnel.

* The designed lifetime is not the warranty time specified in the Terms of Delivery.

Service notes

Replacement

When replacing an actuator, the following points must be checked and, if necessary, corrected:

- Addressing (assignment of functions)
- Bus termination
- Adjustment of the curvepoints of electronic fuel / air ratio control (e.g. with the LMV5...)

Disposal notes

The actuator contains electrical and electronic components and must not be disposed of together with domestic waste.
Local and currently valid legislation must be observed.

Mechanical design

Housing	Die-cast aluminum lower housing. Housing cover made of impact-proof and heat-resistant plastic. Color of cover: Black
Drive motor	Stepper motor
Type of position feedback	**Type** — **Component part** SQM45.xxxA9 / SQM48.xxxA9 — Double conductive plastic potentiometer SQM45.xxxB9 / SQM48.xxxB9 — Hall sensor
Adjustment of switching points / position indication	In connection with the basic unit (e.g. LMV5...): Via the display and operating unit AZL5... (refer to Basic Documentation P7550).
Electrical connections	RAST3.5 terminals (supplied together with the AGG5.720 / AGG5.721).
Gear train	SQM45...: Spur gears made of plastic with small backlash and permanent lubrication. SQM48...: Spur gears made of steel with small backlash and permanent lubrication.
Drive shaft	Made of black-finished steel, ready fitted to the front of the gear train (SQM48... uses a drive shaft made of hardened steel).
Mounting and fixing	The front of the gear train is used as the mounting surface. The actuator has 4 fixing holes and 1 elongated hole for the positioning pin. Alternatively, the actuator can be secured from the side of the controlling element with 3 self-tapping screws.
Mounting kit ASK33.4	For mounting of SQM45.295A9 actuator on VKF41.xxC butterfly valve, an ASK33.4 mounting kit is always required. The mounting kit consists of coupling with a preassembled mounting kit.

Type summary

Actuators SQM4... When ordering, please give type references of actuator and accessories according to «Type summary».

Order number	Type	Drive shaft 1)	Running time (min.) for 90°	Nominal output torque 3) 4) (max.)	Holding torque 2) 3) 4) (max.)	Radial bearing force (max.)
		no.	s	Nm	Nm	N
BPZ:SQM45.291A9	SQM45.291A9	1	10	3	1,5	190
S55451-D201-A100	SQM45.291B9	1	10	3	1,5	190
BPZ:SQM45.295A9	SQM45.295A9	5	10	3	1,5	190
S55451-D202-A100	SQM45.295B9	5	10	3	1,5	190
BPZ:SQM48.497A9	SQM48.497A9	7	30	20	20	420
S55451-D301-A100	SQM48.497B9	7	30	20	20	420
BPZ:SQM48.697A9	SQM48.697A9	7	60	35	35	800
S55451-D302-A100	SQM48.697B9	7	60	35	35	800

Legend

1) Refer to «Dimensions»
2) With operating voltage applied
3) Under nominal conditions 20 °C. Under extreme conditions (below –15 °C ambient temperature), the available torque is about 15 % lower
4) Under nominal conditions 20 °C. Under extreme conditions (above +50 °C ambient temperature), the torque is about 15 % lower

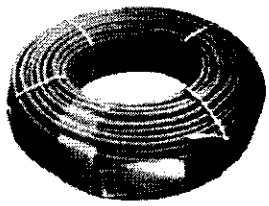
Accessories

Accessories must be ordered as separate items.

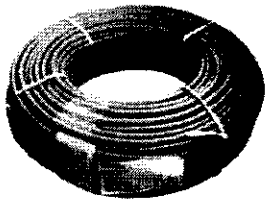
Proportional controlling element with mounting plate **VKP...**
Proportional controlling element for mounting between threaded flanges in gas trains.
See Data sheet N7632.

Mounting plate **ASK33.1**
For mounting the SQM45.295x9 on the proportional controlling element VKP.
Refer to Mounting Instructions 74 319 0843 0 (M7646)

Mounting kit **ASK33.4**
For mounting of SQM45.295x9 on VKF41.xxC butterfly valve.
Refer to Mounting Instructions 74 319 0916 0 (M7813/7814)



CAN bus connecting cable **AGG5.641**
- Between LMV5... and system components
- Shielded 5-core cable
- Cable length 100 m
- 2 x 1,25 mm² + 1 x 0,5 mm² + 2 x 0,25 mm²



CAN bus connecting cable **AGG5.631**
- Between LMV5... and system components
- Shielded 5-core cable
- Cable length 100 m
- 3 x 0,5 mm² + 2 x 0,25 mm²

Separable cable entry (single packing) **AGG5.810**

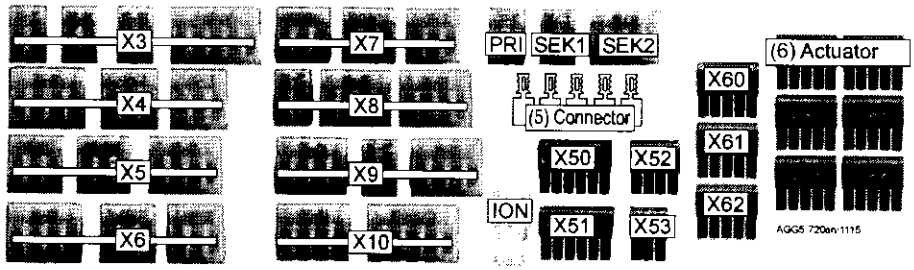
Separable cable entry (packed in sets of 50) **AGG5.812**

Note!
Specified connecting cables are mandatory!

Accessories must be ordered as separate items.

Connector set **AGG5.720**

Standard connector set LMV5 for gas applications / oil applications with up to 3 actuators



Connector set **AGG5.721**

Extension connector set LMV5 (complementing AGG5.720, all connector versions are covered)

Transformer
AGG5.2...

Flame detector
QRB...

- Variable speed drive
- Fuel meter

Actuator
SQM45...
SQM48...

Example

Single connectors **AGG9.853**

- Connector type RAST3.5
- 5-pole
- Packing unit 200 in total

Technical data

Actuator	Operating voltage	AC 2 x 12 V via bus cable from the basic unit or via a separate transformer
	Drive motor	Stepper motor
	Power consumption	
	- SQM45...	9...15 VA
	- SQM48...	26...34 VA
	Angular adjustment	Max. 90°
	Mounting position	Optional
	Degree of protection	To EN 60529, IP54, provided adequate cable entries are used
	Safety class	III according to DIN EN 60730 part 1 and part 2-14
	External overload fuse	Max. 4 AT (slow) to DIN EN 60127-2/5
	Cable entry	SQM45... / SQM48...: Insertable threaded cable glands for 2 x M16
	Direction of rotation (when facing the shaft)	
	- Standard	Counterclockwise
	- Reverse	Clockwise
	Torques and holding torques	Refer to «Type summary»
	Running times	Refer to «Type summary» (can be selected on the basic unit)
	Drive shaft	Supplied as standard, not replaceable
	Weight	
	- SQM45...	Approx. 1 kg
	- SQM48...	Approx. 1.6 kg
	Temperature of the mounting surface	Max. 60 °C

	Life cycle	250,000 start cycles (CLOSE ⇨OPEN ⇨CLOSE) under load with the rated torque in the entire rotation angle range. 2,000,000 control cycles under load with 75% of rated torque in rotation angle range of 10°.
	On time	50 %, max. 3 min. continuously
	Electrical connections	RAST3.5 terminals (for details, refer to the basic unit)
	Ferrules	Matching the dia. of the stranded wire
	Direction of rotation	Can be selected on the basic unit
	Reproducibility (typically in the show-room condition)	± 0.2° (when used with the basic unit LMV5...)
Environment conditions	**Storage**	DIN EN 60721-3-1
	Climatic conditions	Class 1K3
	Mechanical conditions	Class 1M2
	Temperature range	-20...+60 °C
	Humidity	<95 % r.h.
	Transport	DIN EN 60721-3-2
	Climatic conditions	Class 2K2
	Mechanical conditions	Class 2M2
	Temperature range	-20...+70 °C
	Humidity	<95 % r.h.
	Operation	DIN EN 60721-3-3
	Climatic conditions	Class 3K3
	Mechanical conditions	Class 3M3
	Temperature range	-20...+60 °C
	Humidity	<95 % r.h.
	Installation altitude	Max. 2,000 m above sea level

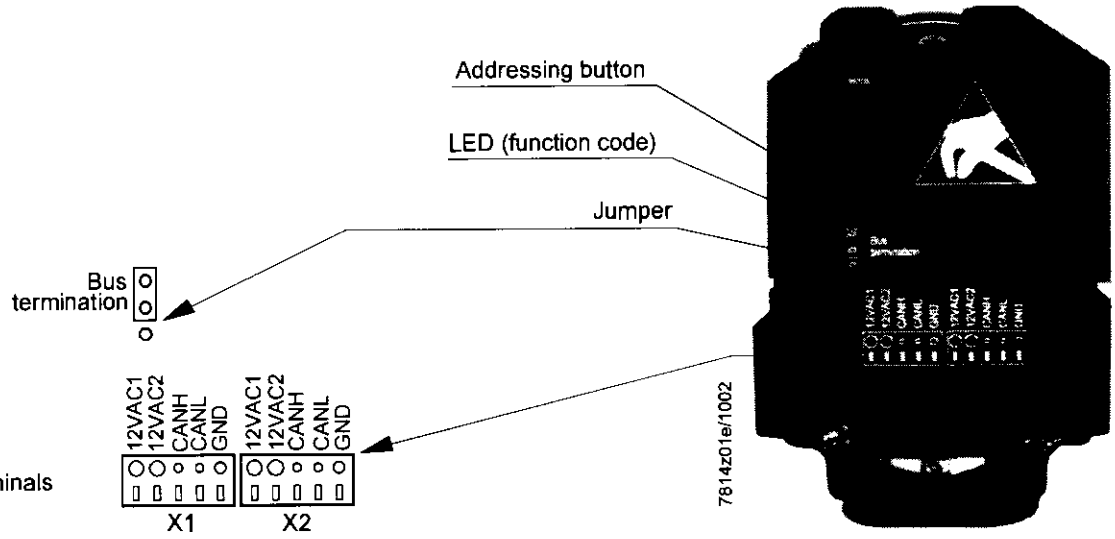
Warning!
Condensation, formation of ice and ingress of water are not permitted!
If this is not observed, there is a risk of loss of safety functions.

Function

The actuators SQM45... / SQM48... are of robust design and have a gear train with only small backlash.
Control and position feedback take place via a bus system (CAN).
The bus cable is also used for powering the actuators.
The actuators are driven by stepper motors and can be positioned with a resolution of 0.1°.
The characteristics and settings (running time, direction of rotation, limit positions) of the SQM4... are determined by the controlling basic unit (e.g. LMV5...; for details, refer to the Basic Documentation P7550 of the LMV5...).
The running times of the associated controlling elements are varied by the basic unit depending on the burner's control phase (e.g. startup phase: short running time; operation: long running time).

Terminating resistor

At the end of the serial bus cabling, a terminating resistor must be fitted.
For that purpose, a jumper must be set to BUS TERMINATION on the last actuator of the bus cable, which will activate the resistor.
On all the other actuators, that jumper must be set to the other position (deactivated).



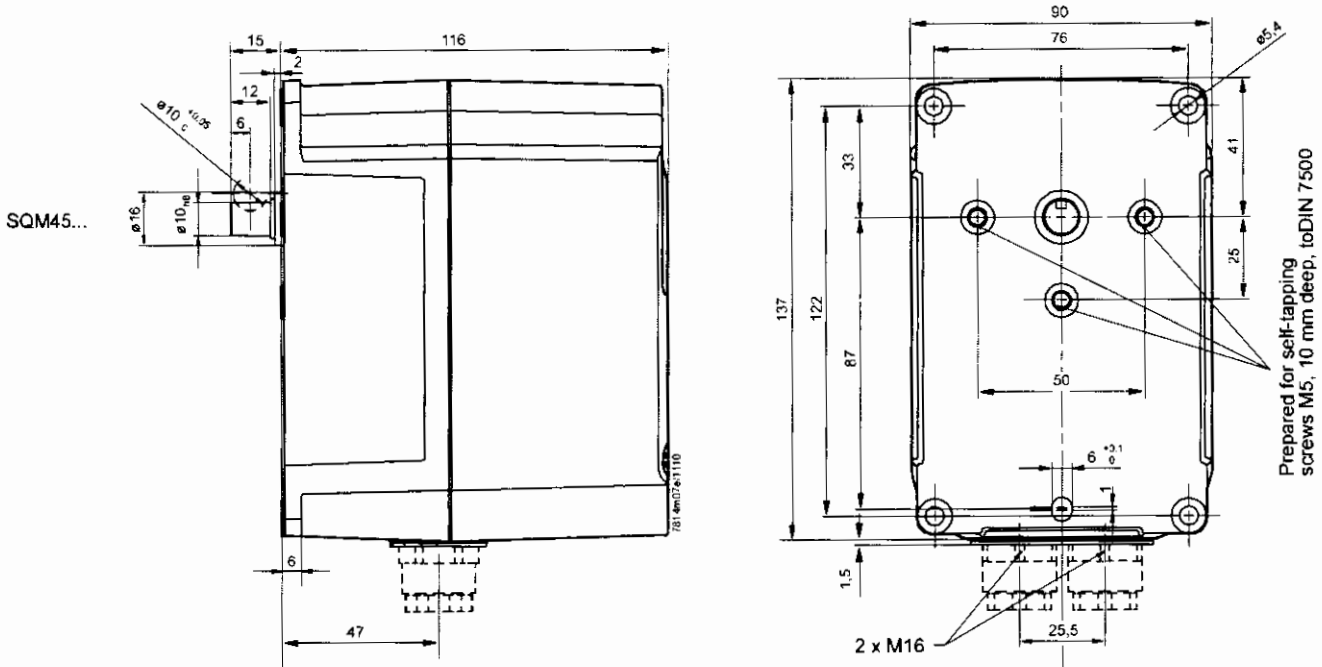
Assignment of terminals

The 2 terminal blocks (X1 and X2) are identical.

Dimensions

Dimensions in mm

SQM45... / SQM48...



Choice of drive shaft lateral view

Drive shaft no. to "Type summary"

Choice of drive shaft vertical section