

# PS61 Series

## Instruction bulletin

### General Description:

The PS61 delivers excellent pressure capability in a compact 24 mm (15/16") size. The modular design allows the user to customize the pressure interface with a wide variety of US, British and ISO stud ends. In addition, numerous elastomers are available to ensure compatibility with the end user's fluid and expected operating temperature range. The PS61 is available with seven different electrical termination options including integral connectors, flying leads, cable and connector harnesses. All of this flexibility in a compact package, plus the availability of adjustable models, makes the PS61 the ideal product solution for demanding pressure switch applications.

### Principle of Operation:

The PS61 is designed to be used with liquids or gases depending on the pressure range chosen (reference Table 1). The media under pressure enters a small port in the mounting fitting. This pressure applies a force to a pressure sensing component that translates through the mechanism and moves the electrical contacts. For normally open versions (A circuit), the contacts close on increasing pressure which complete a low resistance path between either the terminal blades (-SP or -TS), two wires (-FLA, -FLF, -FLSA, -FLSF or -CAB) or two connector pins (-SS, -WM, -WF, -DE or -DT). When the pressure decreases, the contacts will reopen creating an open circuit between the electrical interfaces described above. The normally closed version (B circuit) exhibits a low resistance path between the electrical terminations at 0 psi and conversely creates an open circuit upon the exposure to increasing pressure. The point at which the pressure switch operates can be either factory set or adjustable. Only the -SP, TS, -FLA and -FLSA versions are adjustable. See the adjustment section for the procedure. The other versions are adjusted to the customer's desired setpoint at the factory and cannot be changed by the user.

### Specifications:

<b>Wetted Materials</b>	<b>Housing Material</b>	RoHS compliant zinc plated steel (316 L Stainless Steel available Range 10-60)
	<b>Housing O-ring Material</b>	Nitrile (std); Optional FKM or EPDM
	<b>Diaphragm (Range 10-60)</b>	Low-Temp Nitrile (std); Optional FKM or EPDM
	<b>Piston Rod Material (Range 70-100)</b>	Hardened alloy steel
	<b>Piston Rod Seal (Range 70-100)</b>	Low-Temp Nitrile (std); Optional FKM or EPDM
	<b>Piston Rod Backup (Range 70-100)</b>	Proprietary filled PTFE
	<b>Bearing (Range 70-100)</b>	Proprietary plastic resistant to almost all chemicals
<b>Pressures</b>	<b>Proof</b>	See Table 1
	<b>Burst</b>	See Table 1
<b>Temperatures</b>	<b>Fluid</b>	-22° to 250°F (-30° to 121°C) depending on pressure range, set point, fluid viscosity and elastomer chosen
	<b>Ambient</b>	-40° to 250°F (-40° to 121°C) depending on set point, fluid viscosity and elastomer chosen (-CAB limited to 75°C)
	<b>Storage</b>	-65° to 275°F (-54° to 135°C) (-CAB limited to 100°C)
<b>Electrical</b>	<b>Rating</b>	100 VA max (42VDC max for silver contacts). Gold contacts recommended for logic level loads (<12 VDC and < 20 mA). Avoid inductive loads to prevent contact erosion which will alter the set points.
	<b>Contact resistance</b>	4-15 milliohms typical
<b>Impact Rating (IK)</b>	<b>-SP, -TS, -SS, -DT, -FLA, -FLF, -FLSA, -FLSF and -CAB</b>	IK06
<b>Ingress Protection (IP)</b>	<b>-SP and -TS</b>	IP00
	<b>-SS, -DT, -FLA, -FLF, -FLSA, -FLSF and -CAB</b>	IP67 per IEC 60529
		IPX9K per DIN 40050-9
<b>Approvals</b>		CE per EN 61010-1:2010*, RoHS *exception for wire/cable flame retardant requirement section 9.3.2

## Installation and Mounting :

- For all straight thread units, an O-ring or washer seal of the appropriate material, durometer and size is required to seal the pressure switch to the customer's port. The chart below details the O-ring Gems supplies as standard with a unit. The O-ring material will be of the same elastomer family as the seal material chosen during product specification. It is the customer's responsibility to ascertain the suitability of the O-ring compound, durometer and temperature range with their application.
- Tighten the sensor to the applicable rotation outlined in note 3 (tapered threads) or torque given in the table below (straight threads) using a 15/16 or 24 mm crows foot or open end wrench. Do not apply torque of any kind to any of the plastic components. Over-torquing of the pressure switch could permanently damage or weaken the sensor.
- 1/8 or 1/4 NPT sensors: After applying heavy duty Teflon tape or high pressure thread paste to the male threads, tighten the pressure switch 1.5 to 2.5 turns past finger tight engagement. Over-torquing of the pressure switch could permanently damage or weaken the sensor.

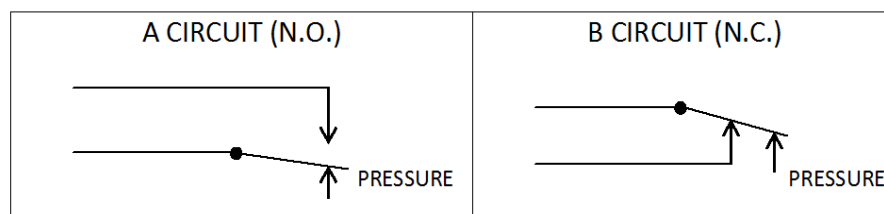
Thread Sizes	O-ring or Washer	Torque
1/8 NPT	N/A	See Note 3
1/4 NPT	N/A	See Note 3
7/16-20 SAE J1926-2	3-904, 90 duro	20-22 N-m (14.8-16.2 lbf-ft)
9/16-18 SAE J1926-2	3-906, 90 duro	45-49.5 N-m (33.2/36.5 lbf-ft)
1/8-28 G style per ISO228-1	N/A (Dowty® recommended)	TBD N-m (TBD lbf-ft) (Range 10-60 only)
1/4-19 G style per ISO228-1	N/A (Dowty® recommended)	40-44 N-m (29.5-32.5 lbf-ft)
M10x1.0 per ISO 6149-2	8.1MMx1.6MM, 90 duro	20-22 N-m (14.8-16.2 lbf-ft) 16.4-18 N-m (12.1-13.3 lbf-ft) (Range 70-80 only)
M12x1.5 per ISO 6149-2	9.3MMx2.2MM, 90 duro	35-38.5 N-m (25.8-28.4 lbf-ft)
M14x1.5 per ISO 6149-2	11.3MMx2.2MM, 90 duro	45-49.5 N-m (33.2-36.5 lbf-ft)

- Electrical termination. The PS61 is available with a wide variety of electrical terminations. Connecting these options properly will ensure the IP ratings are met and the electrical performance is maintained. See the chart below for recommended practices. Remember to follow safe wiring practices and abide by all electrical codes. An over current device of appropriate size and style is required to ensure adherence to CE.

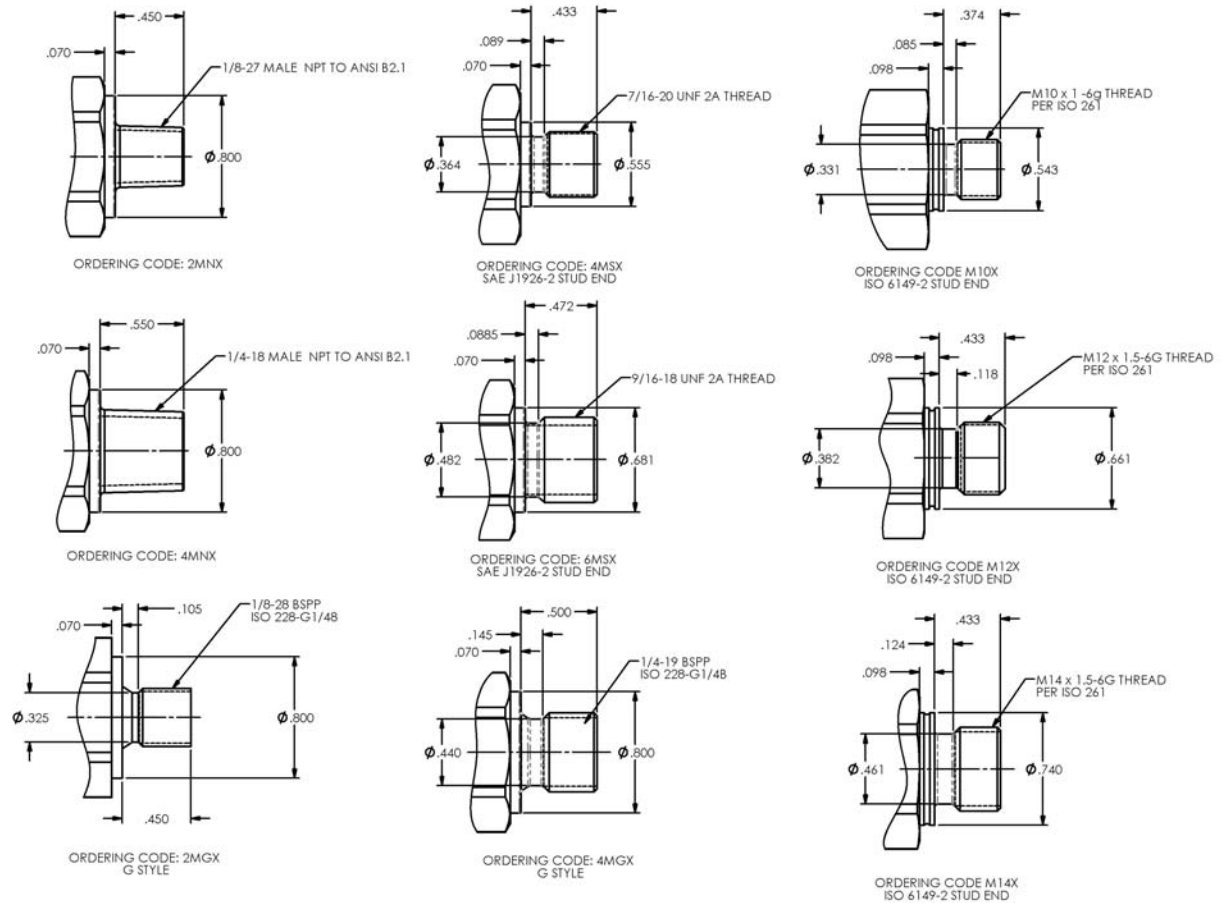
Electrical Termination:	Description	Recommended mating termination
-SP	1/4"x.032" Male Spades	Insulated 1/4" female quick connects crimped to wire of appropriate temperature and ampacity
-TS	6-32 Terminal Screws	18-24 AWG wire of appropriate temperature and ampacity
-SS	Integral AMP Superseal 1.5	Amp 282080-1 connector with wire/cable appropriate sockets
-DT	Integral Deutsch DT04-2P	DT06-2S mating connector with wire/cable appropriate sockets
-DE	Deutsch DT04-2P harness	DT06-2S mating connector with wire/cable appropriate sockets
-WM	Weather pack 12010973 hsg with two 12089040 pins wire harness	Weather pack 12015792 hsg with wire/cable appropriate sockets
-WF	Weather pack 12015792 hsg with two 12089188 sockets wire harness	Weather pack 12010973 hsg with wire/cable appropriate pins
-CAB	18 AWG, 75°C PVC jacketed cable	Application dependent
-FL (all styles)	SAE J1128 105°C wire	Application dependent

- The PS61 will function in any orientation. However, it is recommended to mount the switch to maximize gravitational drainage around the electrical interfaces. The use of protective shields to guard against particle impact and pressure washing is also recommended. Proper ingress protection is only maintained when harnesses and connectors of suitable IP ratings are utilized and properly installed. Ingress protection ratings may become IP00 without proper electrical terminations. The PS61 is not suitable for wet locations and not rated for altitudes greater than 2000 meters.

## Wiring Diagram: (0 PSIG)



## Thread Details :



## Unit Types :

<p><b>SPADE</b></p> <p>ELECTRICAL OPTION (SP)</p> <p>15/16" HEX. (24mm)</p> <p>(2) SPADES 1/4" X 1/32"</p> <p>SILICON RUBBER ADJUSTMENT SCREW CAP (REMOVE TO ADJUST)</p> <p>MEDIUM CONNECTION (SEE THREAD DETAILS)</p>	<p><b>TERMINAL SCREWS</b></p> <p>ELECTRICAL OPTION (TS)</p> <p>15/16" HEX. (24mm)</p> <p>(2) TERMINAL SCREWS #6-32 THREADS</p> <p>SILICON RUBBER ADJUSTMENT SCREW CAP (REMOVE TO ADJUST)</p> <p>MEDIUM CONNECTION (SEE THREAD DETAILS)</p>	<p><b>AMP SUPERSEAL 1.5</b></p> <p>ELECTRICAL OPTION (SS)</p> <p>15/16" HEX. (24mm)</p> <p>2 PIN, INTEGRAL MALE CONNECTOR</p> <p>MEDIUM CONNECTION (SEE THREAD DETAILS)</p>	<p><b>DEUTSCH DT04-2P</b></p> <p>ELECTRICAL OPTION (DT)</p> <p>15/16" HEX. (24mm)</p> <p>2 PIN, INTEGRAL MALE CONNECTOR</p> <p>MEDIUM CONNECTION (SEE THREAD DETAILS)</p>
<p><b>FLYING LEADS</b></p> <p>ELECTRICAL OPTION (FLAXXX)*FLFXXX)</p> <p>15/16" HEX. (24mm)</p> <p>FLYING LEADS, BLACK SAE J1128</p> <p>SILICON RUBBER ADJUSTMENT SCREW CAP (-FLA MODEL ONLY, REMOVE TO ADJUST)</p> <p>MEDIUM CONNECTION (SEE THREAD DETAILS)</p>	<p><b>FLYING LEADS W/SHRINK</b></p> <p>ELECTRICAL OPTION (FLSAXXX)*FLSFXX)</p> <p>15/16" HEX. (24mm)</p> <p>FLYING LEADS, BLACK SAE J1128</p> <p>PVC SHRINK TUBING</p> <p>SILICON RUBBER ADJUSTMENT SCREW CAP (-FLSA MODEL ONLY, REMOVE TO ADJUST)</p> <p>MEDIUM CONNECTION (SEE THREAD DETAILS)</p>	<p><b>CABLE</b></p> <p>ELECTRICAL OPTION (CABXX)</p> <p>15/16" HEX. (24mm)</p> <p>CABLE, PVC, #18 AWG BLACK/RED CONDUCTORS</p> <p>GLUE LINED POLYOLEFIN SHRINK TUBING SEAL</p> <p>MEDIUM CONNECTION (SEE THREAD DETAILS)</p>	<p><b>TERMINATION OPTIONS</b></p> <p><b>WEATHERPACK FEMALE</b> OPTION (FWF)</p> <p><b>WEATHERPACK MALE</b> OPTION (FWM)</p> <p><b>DEUTSCH CONNECTOR</b> OPTION (FDE)</p>

## Adjustment :

**Warning:** Only the -SP, -TS, -FLA and -FLSA models are adjustable.

**Warning:** All adjustments shall be performed while applying a controlled and monitored hydraulic pressure using fittings and hardware of appropriate pressure capability. The electrical contacts shall also be monitored by a digital multimeter or by using LED indicator lights of suitable electrical rating to avoid damaging the contacts.

**Danger:** The adjustment screw is electrically conductive to the contacts. Therefore, to prevent an electric shock always use insulated tools and only monitor the circuit with a digital multimeter or low voltage (<12 VDC) LED lights while adjusting the setpoints. Never contact any wire, cable, connector pin or terminal blade with a conductive portion of the adjusting tool while adjusting the switch.

**Tools Required:** A 5/32" (4 mm) security style hex key is required to adjust the setpoint. The security hole must be 0.102" (2.6 mm) diameter minimum with a 0.13" (3.3 mm) minimum depth . The use of a standard 5/32" (4 mm) hex key will cause damage to the actuator tip and prevent the user from achieving the high end of the setpoint range due to the hex key "camming" out.

1. **Accessing the Adjuster:** Remove the black silicone rubber cap. See the enclosed configuration drawing for the location based on the specific model. It is either between the two terminal blades on units with Spade or Terminal Screw terminations or located between the wire exits on units with flying leads.
2. **Adjusting the setpoint:** Insert the hex key and rotate slightly in either direction until the hex flats engage. Increase the pressure applied to the switch while monitoring both the pressure and the continuity of the switch. Note the pressure at which the continuity changes (circuit open to closed for A circuits; circuit closed to open for B circuits). Lower the pressure back to ambient. If the setpoint desired is higher than the noted pressure, turn the hex key clockwise to increase the setpoint. Raise the pressure again until the continuity changes. Note the new setpoint. Decrease the pressure to ambient. If the setpoint is now lower than desired, rotate the hex key counterclockwise to lower the setpoint. Keep raising and lowering the pressure and rotating the hex key until the desired setpoint is obtained. This typically takes a few attempts to achieve the target setpoint. Best results are obtained if small (less than 1 turn) rotational movements of the adjustment screw are made at one time. The adjustment range is engraved on the hex flats of the switch for reference. Any rising or falling setpoints can be obtained within the range listed with proper adjustment.

**Field Locking of the Adjustment Screw (if req'd):** The adjustment screw is self-locking from the factory. However, in high vibratory and applications where the field adjustment will be repetitive, it may be desirable to increase the factory's self-locking breakaway torque. Gems recommends that 1 drop of Loctite (r) 290 dispensed from an 0.020" diameter syringe tip be applied to the adjustment screw and it's electrical housing interface.

**Warning:** Loctite 290 is a penetrating Loctite. Therefore, it is critical to prevent Loctite from being applied to the center of the adjustment screw where the actuator slides or any surface of the adjustment screw hex socket. Application in these areas could render the switch inoperable. The application of more than 1 drop may allow Loctite to penetrate into the interior of the switch which could also cause switch malfunction.

3. **Verification of setpoint:** Verify the new setpoint by slowly increasing and decreasing the pressure (or vacuum) while monitoring the electrical contacts. Repeat the adjustment procedure if necessary to obtain the desired setpoint.
4. **Replace the Adjustment Screw Cap :** After adjusting the setpoint and locking the screw (if req'd), insert the black silicone rubber cap firmly into the adjustment screw access hole.

**Warning:** Failure to replace the adjustment screw cap may allow ingress of foreign matter which could cause switch malfunction. In addition, the IP ratings will not apply to a switch without a properly applied adjustment screw cap.

**Danger:** Failure to replace the adjustment screw cap will expose the user to the electrically live adjustment screw.

**TABLE 1**

**PRESSURE RANGE CODES AND PERFORMANCE**

Pressure Range Code	Style	Recommended Media	Pressure Range	Repeatability <sup>1</sup>	Average Deadband <sup>2</sup>	Proof Pressure	Burst Pressure
10	Diaphragm	Liquids & Gases	10-60 psig (0.7-4.1 bar)	±1.5 psi (0.10 bar) +3% of setting	12% of setting	6,000 psi (414 bar)	9,000 psi (620 bar)
20			40-150 psig (2.8-10.3 bar)	±2.5 psi (0.17 bar) +3% of setting	13% of setting		
30			75-275 psig (5.2-19 bar)	±3.75 psi (0.26 bar) +3% of setting	13% of setting		
40			150-500 psig (10.3-34.5 bar)	±5 psi (0.34 bar) +3% of setting	14% of setting		
50			275-800 psig (19-55.1 bar)	±8 psi (0.55 bar) +3% of setting	15% of setting		
60			400-1350 psig (27.6-93 bar)	±13 psi (0.90 bar) +3% of setting	17% of setting		
70	Piston	Liquids	510-1235 psig (35-85 bar)	±30 psi (2.1 bar) +4% of setting	14% of setting	7,000 psi (483 bar)	22,000 psi (1517 bar)
80			800-1960 psig (55-135 bar)	±48 psi (3.3 bar) +4% of setting	17% of setting		
90			1835-3115 psig (125-215 bar)	±110 psi (7.6 bar) +6% of setting	21% of setting		
100			2970-4350 psig (205-300 bar)	±190 psi (13.1 bar) +6% of setting	24% of setting		

**Performance: Notes**

<sup>1</sup>Repeatability and setpoint of units will vary depending on temperature, fluid viscosity, cycle rate and ramp rate. Repeatability values are based on room temperature. Long term inactuation will lead to a higher initial setpoint reading due to the non-linear behavior of the elastomer diaphragms or seals. Fluids with low and stable viscosities over the expected temperature range will exhibit better performance.


<sup>2</sup>Deadband values are an approximation at room temperature with nitrogen or compressed air (Ranges 10-40) or a 100 Cp fluid (Ranges 40-100). At lower temperatures and/or higher fluid viscosities the deadband will be much larger than the value shown. At high fluid temperature and a rapid cycle rate, the deadband may be lower than the approximations given. Please consult the factory if specific statistical analysis is required.

**Pressure Equipment Directive**

The pressure switch is designed and manufactured in accordance with Sound Engineering Practice as defined by the Pressure Equipment Directive 97/23/EC. This pressure switch must not be used as a "safety accessory" as defined by the Pressure Equipment, Article 1, Paragraph 2.1.3

The CE mark on the unit does not relate to the Pressure Equipment Directive.

***Important Points:***

- Gems products must be maintained and installed in strict accordance with the National Electrical Code and the applicable Gems product instruction Bulletin that covers installation, operation, and proper maintenance. Failure to observe this information may result in serious injury or damages. The instruction Bulletin must be consulted when/if the  symbol is present on the product.
- For hazardous area applications involving such things as, but not limited to, ignitable mixtures, combustible dust, and flammable materials, use an appropriate explosion proof enclosure or intrinsically safe interface device. The PS61 is not intended for use with poisonous or injurious gases and substances.
- Please adhere to the pressure and temperature limitations shown throughout this catalog. These limitations must not be exceeded. These pressures and temperatures take into consideration possible system surge pressures/temperatures and their frequencies.
- Selection of materials for compatibility with the media is critical to the life and operation of Gems products. Take care in the proper selection of materials of construction; Testing is required.
- Our sensors have been designed to resist shock and vibration. However, shock and vibration should be minimized.
- Electrical entries and mounting points in an enclosed tank may require liquid/vapor sealing.
- Our sensors must not be field-repaired.
- Physical damage sustained by product may render it unserviceable.

***Return Policy***

Returns are accepted on stock items up to 30 days from date of order. You must contact our Returns Department for a Return Authorization (RA) number. Return the goods—freight prepaid—in the original container and include original packing slip. COD returns are not accepted. Gems reserves the right to apply restocking charges.