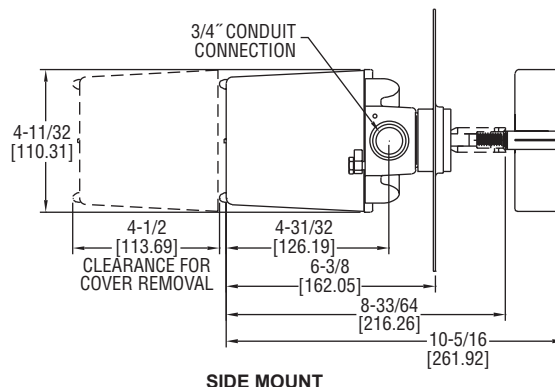




## Series PLS Paddle Level Switch

### Specifications – Installation and Operating Instructions



Incorporated in the design of the PLS is a magnetic drive that is time proven by decades of use in our Mark Series valve position indicator product line. A synchronous motor rotates the paddle utilizing a magnetic drive. As product builds up the paddle is impeded from moving and the resulting motor torque activates the output switches and stops the motor. A spring mechanism reactivates the motor and returns the switches to normal state when the product no longer impedes the paddle rotation. Weatherproof models include a bright red LED switch status indication light.

Standard construction is weatherproof with explosion-proof optional, and the unit can be side or top mounted. A high temperature option is available for use with media up to 500°F (260°C). The PLS is designed with the industry standard 1-1/4" male NPT connection and mounting flanges.

#### FEATURES

- **Magnetic drive** that isolates and completely seals the control head from the process and environment preventing material or dust from entering the control head.
- **Motor shuts-off** when paddle stalls increasing motor life, preventing motor burnout, and decreasing power usage.
- **Slip clutch** design enabled by the magnetic drive that prevents damage to motor and drive mechanism from sudden or excessive loading on the paddle.
- **Status indication light** on weatherproof models. Light is on the side of the enclosure making it easy to view.
- **Screw cover** on the enclosure for easy access with no worries about losing bolts or screws.
- **Modular design** to allow field installation of any paddle, flanges, shaft extensions, or shaft guards.
- **Flexible coupling** available for protection of the paddle and drive from side loads, surges or impacts. Recommended for top mount applications with shaft extension and applications with large or heavy materials.

#### SPECIFICATIONS

**Service:** Dry powder or bulk materials compatible with wetted materials.

**Sensitivity:** Minimum material density of 5 lb/ft<sup>3</sup> (80 kg/m<sup>3</sup>), maximum of 200 lb/ft<sup>3</sup> (3200 kg/m<sup>3</sup>).

#### Wetted Materials:

**Paddles:** 316 SS.

**Exposed Shaft:** 316 SS.

**Shaft Seal:** PTFE.

**Mounting Boss:** Aluminum.

**Flexible Coupling:** 316 SS.

**Mounting Flanges:** Carbon Steel or 316 SS.

**Shaft Extension and Shaft Guards:** Galvanized Steel or 316 SS.

#### Temperature Limits:

**Standard Construction:** Process: -40 to 300°F (-40 to 148.9°C),

Control Head: -40 to 185°F (-40 to 85°C).

**High Temperature:** Process: -40 to 500°F (-40 to 260°C),

Control Head: -40 to 185°F (-40 to 85°C).

**Time Delay Relay:** Control Head: -25 to 140°F (-31.7 to 60.0°C).

**CE Compliant Construction:** Process: -40 to 185°F (-40 to 85°C),

Control Head: -40 to 185°F (-40 to 85°C).

**Pressure Limit:** 30 psig (2.07 bar) maximum for .5 micron or larger material.

**Power Requirement:** Select by part number: 110-120 VAC (~); 60 Hz, 230 VAC (~); 50/60 Hz, 24 VAC (~); 60 Hz, 48 VAC (~); 100 Hz, 12 VDC (=), or 24 VDC (=).

**Power Consumption:** Weatherproof models: 5 watts, Explosion-proof models: 3 watts. Time Delay option is an additional 3 watt consumption.

**Enclosure:** Aluminum, powder coated.

**Enclosure Rating:** Weatherproof (W, WH construction): NEMA 4X, Explosion-proof (E, EH construction): NEMA 4X and rated for Class I, Div. 1 & 2, Groups C & D, Div. 1 & 2, Groups E, F, & G.

**Switch Type:** SPDT or DPDT snap switch.

**Electrical Rating:** 15A @ 120/230 VAC, 5A @ 24 VDC.

**Time Delay Relay Option:** 10A @ 120/240 VAC and 30 VDC.

**Electric Connections:** Screw terminals.

**Conduit Connection:** 3/4" female NPT.

**Process Connection:** 1-1/4" male NPT. Optional flange.

**Installation Category:** II (Transient over-voltage).

**Pollution Degree:** 2.

**Altitude Limit:** 6560 ft (2000 m) max.

**Environment:** Intended for indoor and outdoor use.

**Humidity:** 80% RH (non-condensing).

**Mounting Orientation:** Side or top mounting.

**Weight:** Control head only: 4 lb (1.81 kg).

**Indication Light:** Red LED that activates when switch is made or when switch is not made with RL option. (Not available on Explosion-proof models).

**Time Delay Relay Option:** Five field adjustable ranges from 0-1 to 0-31 minutes.

(RL option not available, DPDT option not available with 230 VAC time delay).

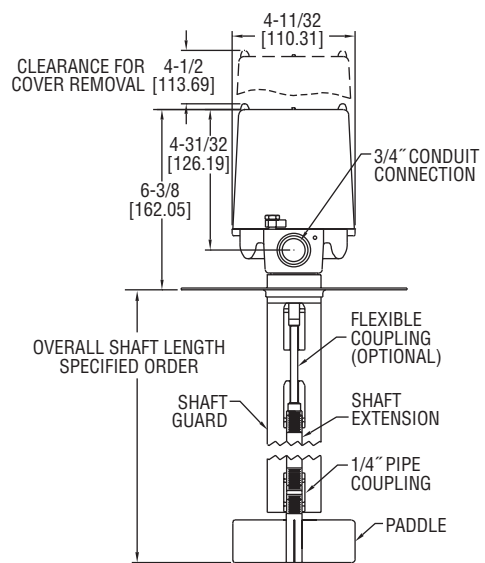
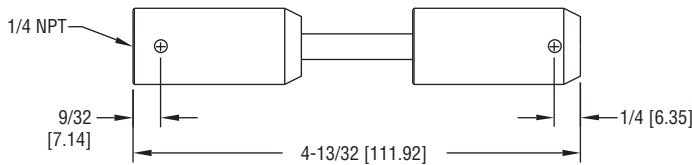
**Agency Approvals:** UL approved as an auxiliary device or as an auxiliary device for hazardous locations.

# MODEL CHART

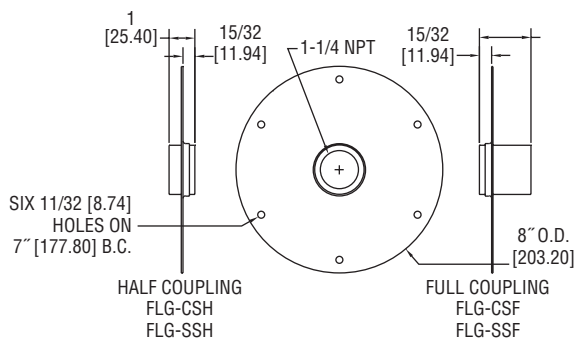
<b>Example</b>	<b>PLS</b>	<b>W</b>	<b>S</b>	<b>1</b>	<b>1</b>	<b>SSF</b>	<b>SS</b>	<b>SS</b>	<b>024</b>	<b>FC</b>	<b>PLS-W-S-1-1-SSF-SS-SS-024-FC</b>
<b>Series</b>	PLS										Paddle Level Switch
<b>Construction</b>		W E WH EH									Weatherproof Explosion-proof Weatherproof High Temperature Explosion-proof High Temperature
<b>Switch</b>			S D TD1 TD2								SPDT DPDT DPDT Time Delay – 120 VAC DPDT Time Delay – 230 VAC
<b>Power Supply</b>				1 2 3 4 5 6 7							110-120 VAC 230 VAC 24 VAC 48 VAC 12 VDC 24 VDC 230 VAC CE Compliant
<b>Paddle</b>				0 1 2 3 4							No paddle for Motor Control Only Style Low Density Paddle (PDL-1) Medium Density Paddle (PDL-2) Bayonet Paddle (PDL-3) High Density Paddle (PDL-4)
<b>Flange</b>					0 CSH CSF SSH SSF						No Mounting Flange Carbon Steel with Half Coupling (FLG-CSH) Carbon Steel with Full Coupling (FLG-CSF) 316 SS with Half Coupling (FLG-SSH) 316 SS with Full Coupling (FLG-SSF)
<b>Shaft Extension Material</b>						0 GS SS					None 1/4" NPS Galvanized Steel 1/4" NPS 316 SS
<b>Protective Shield</b>							0 GS SS				None 1-1/4" NPS Galvanized Steel 1-1/4" NPS 316 SS
<b>Shaft Extension and Shield Length</b>									XXX		Specify length in inches. Minimum 6, Maximum 48. May go longer on custom ordered product.
<b>Options</b>										RL FC	Reversed Light – light indication when paddle free rotating Flexible Coupling (CPL-FLX)

## FLEX COUPLING, MODEL CPL-FLX

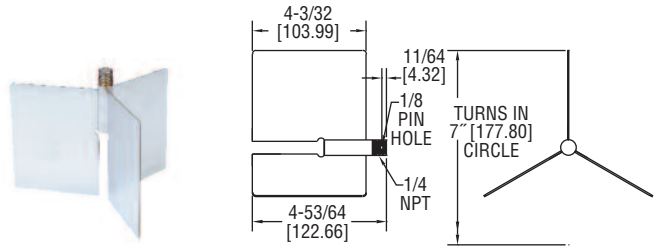
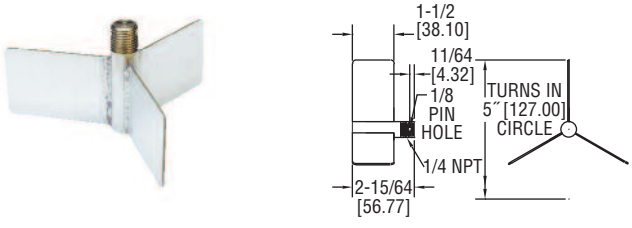
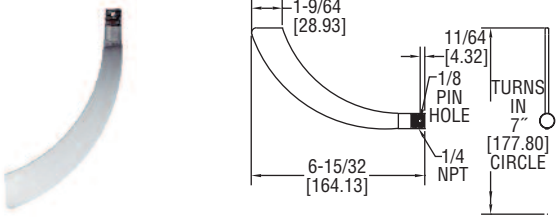
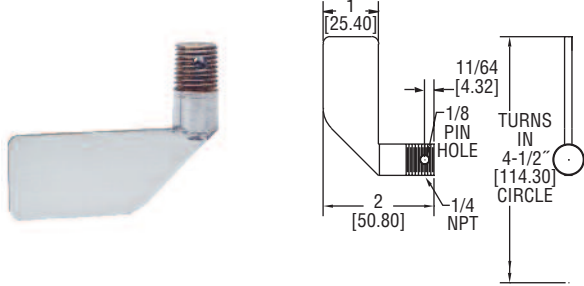
## TOP MOUNT



## MOUNTING FLANGE



## PADDLES

 <p><b>PDL-1.</b> 316 SS three vane paddle for light weight materials with a minimum bulk density of 5 lb/ft<sup>3</sup> (80 kg/m<sup>3</sup>).</p>	 <p><b>PDL-2.</b> 316 SS three vane paddle for medium weight materials with minimum bulk density of 30 lb/ft<sup>3</sup> (481 kg/m<sup>3</sup>).</p>
 <p><b>PDL-3.</b> 316 SS single vane paddle for medium weight materials with a minimum bulk density of 30 lb/ft<sup>3</sup> (481 kg/m<sup>3</sup>). Fits through a 1-1/4" coupling eliminating the need for a mounting flange.</p>	 <p><b>PDL-4.</b> 316 SS single vane paddle for heavy weight materials with a minimum bulk density of 70 lb/ft<sup>3</sup> (1122 kg/m<sup>3</sup>). Fits through 1-1/4" coupling eliminating the need for a mounting flange.</p>

## INSTALLATION

### Mounting Location

Select a location where the paddle is out of the direct flow of media/material, and where media does not accumulate permanently. It may be necessary to protect the paddle with a protective shield or baffle protection.

Protection provided by the equipment may be impaired if the equipment is used with accessories not provided or recommended by Proximity, or is used in a manner not specified by Proximity.

### Mounting Accessories

#### Shaft Extensions and Flexible Shaft/Coupling

A standard paddle extension is supplied with all controls that is used to connect the stub shaft of the control head to a paddle or to an extension shaft constructed of 1/4" pipe. Shaft extensions may be purchased from Proximity Controls in carbon steel and stainless steel. Shaft extensions may also be constructed from 1/4" pipe, which is threaded with 1/4" male NPT connections on both ends. Drill .152" diameter holes through the pipe at a distance of .170" from each end. These holes should accept a 1/8" diameter roll pin. Shaft extensions should not exceed 48" in length. Multiple couplings may be connected using coupling model number CPL-1.

**Note:** All joints should be secured with the 1/8" diameter roll pins supplied. Care should be taken to press pins flush without damaging the bearings of the control.

A flexible shaft/coupling, model number CPL-FLX, may be substituted for the standard extension. The flexible coupling helps protect the control by absorbing side loading, heavy loading, or loading caused by material surges. It is also recommended for top mount applications when shaft extensions are used.

#### Shaft Shields

Shaft shields are recommended for use with shaft lengths over 12" to protect the shaft from side loading. Shaft shields are available from Proximity Controls in carbon steel and stainless steel. Shields may also be constructed from 1-1/4" pipe, which is threaded with a 1-1/4" male NPT connection on one end. Shield pipe should be cut to cover the shaft length while allowing sufficient clearance between the paddle and bottom of shield. The shaft shield should be securely threaded into a full coupling welded to the bin or a full coupling mounting flange attached to the bin. Shaft should not contact the inside diameter of the shaft shield.

### Mounting Procedure

#### Mounting without a Flange

Paddles PDL-1 and PDL-3 will fit through a 1-1/4" coupling making a mounting flange unnecessary. A mounting flange may also be avoided for applications where there is access to the inside of the bin to attach the paddle from the inside once the switch control head is installed.

Locate the desired mounting point and cut a hole in the bin of the proper diameter to insert a 1-1/4" pipe coupling. For mounting without a shaft shield weld a 1-1/4" half pipe coupling to the bin wall so that the coupling is flush with the interior wall. For mounting with a shaft shield weld a 1-1/4" full coupling so that the coupling is halfway into the bin. If using a PDL-1 or PDL-3 attach the paddle to the switch control head, if not already connected, by screwing into the 1/4" NPT connection on the shaft and inserting the roll pin. Attach the switch control head to the pipe coupling by inserting the paddle through the coupling and screwing in. If attaching the paddle from the inside then first attach the switch to the coupling and then attach the paddle from the inside of the bin as described above.

#### Mounting with a Flange

Paddles PDL-2 and PDL-4 will require flange mounting if the interior of the bin is not accessible. Half coupling flanges (Models FLG-CSH and FLG-SH) should be used on installations not requiring a shaft guard. Full coupling mounting flanges (Models FLG-CSF and FLG-SSF) should be used with installations requiring a shaft guard.

If the mounting flange is used on a flat surface, layout a 7" bolt circle. The flange is designed with clearance holes for 1/4" bolts or screws. Drill and tap 6 holes equally spaced, on the bolt circle, of the appropriate thread type. At the center cut a hole of sufficient clearance diameter to allow insertion of the paddle selected. It may be necessary to tack weld bolts or screws to the flange or inner surface of the bin. On bins with curved surfaces it may be necessary to create a template, which will follow the contour of the bin wall, in order to locate the hole positions. Use the gasket supplied if required between the bin wall and flange.

## General

If a control is mounted on the side wall of a bin, the conduit entry should be directed downwards. Also there should be ample clearance for cover removal. Paddles are secured to the extensions with a 1/4" NPT and 1/8" diameter roll pin. Care should be taken to press pins flush without damaging the bearings of the control.

## Electrical

Make electrical connections per the wiring diagram for output switch options selected. Wire in accordance with local codes. For hazardous locations, a sealing fitting must be located within 18" of the control.

## Wiring

An external switch or circuit breaker should be added to during the installation as a disconnecting device. The switch or circuit breaker must meet the requirements of IEC 60947-1 and IEC 60947-3, shall disconnect all current carrying conductors, and shall not interrupt the protective earth ground. The disconnecting switch or circuit breaker must be marked or labeled with the symbols "I" for on and "O" for off, per IEC 60417-5007 & IEC 60417-5008 and shall be marked as "Disconnecting Device". Do not position the PLS in a space where it is difficult to operate the disconnecting device that provides power. 300V @ 105°C 18 AWG/0.75 mm<sup>2</sup> wiring with PVC or equivalent insulation with 94-V0 or FV-0 flammability rating is recommended for the switch outputs and power.



As a permanently installed piece of equipment, a power disconnect switch, circuit breaker, or other approved disconnect device must be installed in close proximity to the installed board and within easy reach of the operator. This disconnect device must include a label indicating its function as a mains disconnect. A 15amp circuit breaker or fuse device is recommended.

## Time Delay

With the DIP position 1 set to "off" the delay is upon energizing of the relay, and with it set to "on" the delay is upon de-energizing of the relay. Select delay range wanted from the chart and set the dip switches to the appropriate positions. Then adjust the one-turn (360°) potentiometer for the exact time interval required within the selected delay range. Example: If a 5 minute delay is required, set DIP switches to 0-7 minute position. Then use potentiometer to adjust to 5 minute period.

Time Delay Range in Minutes	Dip Switch Positions						
	2	3	4	5	6	7	
0-1	ON	ON	OFF	OFF	OFF	OFF	
0-3	ON	ON	ON	OFF	OFF	OFF	
0-7	ON	ON	ON	ON	OFF	OFF	
0-15	ON	ON	ON	ON	ON	OFF	
0-31	ON	ON	ON	ON	ON	ON	

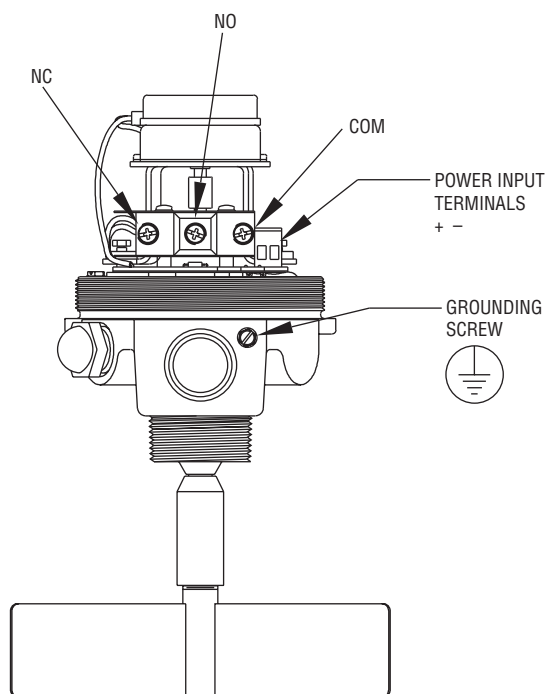
## MAINTENANCE

Upon final installation of the Series PLS Paddle Level Switch, no routine maintenance is required. A periodic check of system calibration is recommended. The Series PLS is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

## Explanation of Symbols:

Symbol	Publication	Description
	IEC 50417 - 5031	Direct current
	IEC 50417 - 5032	Alternating current
	IEC 50417 - 5019	Protective conductor terminal
	IEC 50417 - 5007	On (supply)
	IEC 50417 - 5008	Off (supply)

## STANDARD CONTROL WIRING DIAGRAM



## TIME DELAY OPTION WIRING DIAGRAM

