

Multi-function Liquid Level Control



Part No. :LLC2P24A, LLC2P120A



The Ingram **Multi-function Liquid Level Control Relay (LLC)** saves you time and money. No more time spent trying to figure out the part number and features of the model that you need. All you have to select is the voltage when ordering an Ingram LLC. Drain or fill, sensitivity and time delay are all user selectable on the unit. It only takes one Ingram LLC to do the job of several of the competitor's LLCs.

The LLC was designed for use in two different applications:

- (1) Two probe (start-stop), liquid level controller.
- (2) Seal monitor relay for use with submersible pumps.

Features

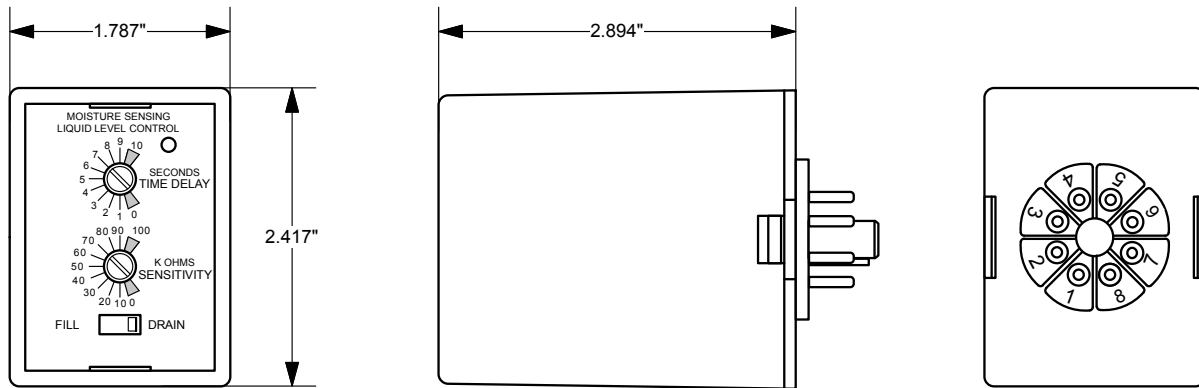
- Drain/Fill selector switch
- Adjustable time delay
- Adjustable sensitivity up to 100K Ω
- Stock item - same day shipping available
- LED Indicator reduces adjustment time
- SPDT isolated contacts
- Isolated AC voltage on the probe
- 5 year warranty
- UL Recognized: File E308954

Technical Specifications

| | |
|--------------------------|------------------------------|
| LLC2P24A | 69mA @ 24 VAC |
| LLC2P120A | 26mA @ 120 VAC |
| Probe Voltage | 12VAC |
| Max Current at Probe | 0.5mA |
| Probe Isolation | >1500 VAC |
| Adjustable Sensitivity | 500 Ω - 100K Ω |
| Adjustable Response Time | 0.5 - 10 seconds |
| Reset Time | 10 msec |
| Reset Type | Automatic |
| Output | SPDT Isolated Relay Contacts |
| Relay Contact Ratings | 4A resistive @ 240VAC |
| | 1/10hp @ 240VAC |
| Operating Temperatures | -20°C to +40°C |
| Life Expectancy | Mechanical 100,000 |
| | Electrical 50,000 |
| Humidity Tolerance | 0 to 99% no condensing |
| Enclosure | ABS Plastic |
| Mounting | Octal Base Plug In |
| Weight | 8.46oz |

Applications

- Pump seal monitor
- High or low level alarm (field selectable)
- 2 point level control (start-stop)
- Single point liquid level controls
- Moisture sensing relay
- Solenoid control
- Boiler low water cutoff protection
- Boiler feed water level control
- Tap water
- Sea water
- Pump control
- Sump pump
- Hydropneumatic tank liquid level control
- Food and cooking equipment
- Dairy equipment
- Steam cookers
- Drink dispensers



APPLICATION EXAMPLES

Liquid Level Control

Scenario A: To start and stop a pump that pumps liquid out of a tank to prevent overflow. (See diagram 1). The DRAIN-FILL switch needs to be in the DRAIN position for this application. As liquid rises in the tank it will touch the COMMON probe; no action will occur. As the liquid level continues to rise it will come into contact with the LOW probe and no action will occur. The liquid will continue to rise until it comes into contact with the HIGH probe. When the liquid touches the HIGH probe the LED will come on, the timer will start and the relay contacts will transfer after the time delay elapses. The relay contacts can be used to start a pump to expel liquid from the tank. The pump will remain on until the liquid level falls below the LOW probe at which time the relay will de-energize and stop the pump.

Scenario B: To start and stop a pump that pumps liquid into a tank to keep the tank from becoming empty. (See diagram 1) The DRAIN-FILL switch needs to be in the FILL position for this application. If the tank is full of liquid touching all three probes, no action will occur. As the liquid level falls it will stop touching the HIGH probe first; no action will occur. As the liquid continues to fall it will stop touching the LOW probe. At this point, the LED will come on, the timer will start and the relay contacts will transfer after the time delay elapses. The relay contacts can be used to start a pump that will supply liquid to the tank. As the level rises and touches the LOW probe, no action will occur. When it reaches the HIGH probe, the relay will de-energize, stopping the pump.

Two probe liquid level controller.

The LLC relay can be used as a two point (on off) liquid level controller of conductive liquids.

Adjusting LLC for liquid level control.

There are three adjustments that need to be set for liquid level indication and control:

DRAIN-FILL selector switch located on the top of the LLC.

DRAIN position: The probe connected to pin #8 will activate and start timing when the liquid level reaches the probe. At the end of the time delay, the relay will energize and the contacts will transfer.

FILL position: If the liquid level falls below the bottom of the probe connected to pin 6 of the LLC, it will initiate timing and the contacts will transfer after the time delay elapses.

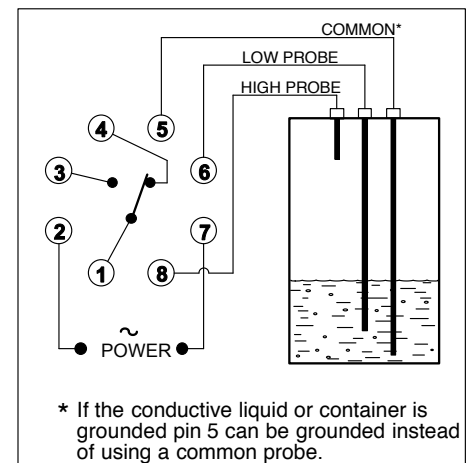
Screwdriver adjustable time delay located on top of the LLC.

The purpose of the time delay is to prevent false or momentary activation of the LLC due to wave action or agitation. It can be adjusted from 0.5 to 10 seconds.

Sensitivity adjustment located on top of the LLC.

The sensitivity should be set as low as practical so long as the LLC responds reliably when the liquid touches or stops touching the probe. Our table of liquid sensitivity will give you a good idea of the maximum sensitivity required for various liquids.

DIAGRAM 1



Seal Monitor Relay

Most submersible pumps have seal chambers filled with oil that has a high electrical resistance. When the seal for the shaft of the submersible begins to fail, water enters the seal chamber and mixes with the oil causing the resistance to drop. The MSR senses this drop in resistance and energizes the electromechanical relay. The relay is normally used to turn on a red warning indicator light that indicates a seal leak in the pump it is monitoring.

This early warning indicates that the pump seal needs to be repaired before the pump motor becomes damaged by liquid intrusion.

Failure probes are installed in the seal chamber using two different methods. The most common method is to install one probe in the chamber. The resistance between the probe and ground or pump housing is monitored by the seal monitor relay (see diagram 2). The other method uses two probes installed in the seal chamber. The resistance between the two probes in the seal chamber is monitored by the seal monitor relay (see diagram 3).

DIAGRAM 2

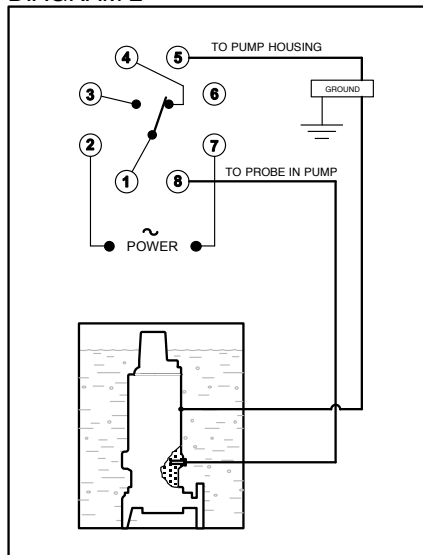
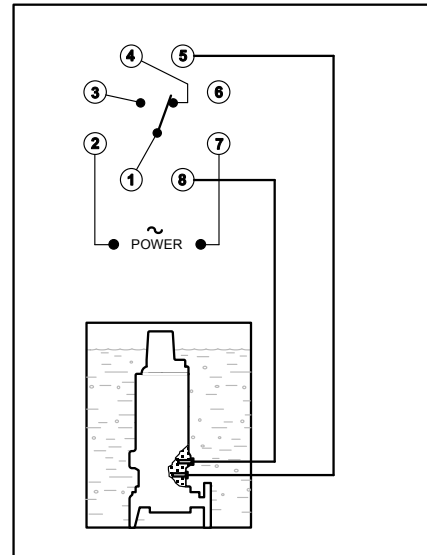


DIAGRAM 3



Adjusting Seal Monitor Relay

Most manufacturers of submersible pumps requiring seal monitoring have a recommended sensitivity setting for their pumps. The moisture sensing relay should be set at the pump manufacturer's recommended sensitivity setting. Ingram's LLC sensitivity can be adjusted from 500Ω to 100K ohms. It also has an adjustable time delay from 0.5 to 10 seconds to prevent nuisance tripping.

If the pump manufacturer does not have a recommended sensitivity setting, use one of the following methods:

Note: Drain-Fill selector switch must be in the Drain position for this application.

1. A sensitivity setting of 30K ohms with a two second delay is considered adequate for most submersible pumps in most applications.
2. To obtain the earliest possible warning of contaminants entering the seal chamber, set the sensitivity as follows:
 - A. Set the sensitivity potentiometer to the maximum 100K ohms. If the LED comes on and the LLC relay energizes, slowly turn the sensitivity potentiometer down until the LLC LED goes out.
 - B. Note the sensitivity value indicated by the pot when the LED turns off. Set the sensitivity for approximately 20% less than this value. For example, if the LED goes out at the 50KΩ position while you are turning the pot down, set the sensitivity to 40K ohms (20% less than 50K ohms).

If the LED does not come on when LLC is adjusted to maximum sensitivity of 100K ohms, leave the setting at the 100K ohm. Be aware that this high sensitivity setting may result in false seal failure alarms.

Addendum - Sensitivity Chart

Sensitivity Selection Based on Material

| Liquid Or Material | Sensitivity-Conductivity | |
|------------------------|--------------------------|---------------|
| | Ohms/cm | Micro-Mhos/cm |
| Acids | Consult Factory | |
| Aluminum Hydroxide | 2.2K | 450 |
| Aluminum Sulfate | 2.2K | 250 |
| Ammonia | 5K | 200 |
| Ammonium Chloride | 1K | 1K |
| Ammonium Hydroxide | 10K | 100 |
| Ammonium Nitrate | 18K | 50 |
| Ammonium Sulfate | 10K | 100 |
| Baby Foods | 1K | 1K |
| Barium Chloride | 1K | 1K |
| Barium Nitrate | 1K | 1K |
| Beer | 2.2K | 450 |
| Black Liquor | 1K | 1K |
| Borax-Aqueous | 10K | 100 |
| Bouillon | 200K | 5 |
| Brine | 1K | 1K |
| Buttermilk | 1K | 1K |
| Cadmium Chloride | 1K | 1K |
| Cadmium Nitrate | 1K | 1K |
| Cake Batter | 5K | 200 |
| Calcium Chloride | 1K | 1K |
| Calcium Hydroxide | 10K | 100 |
| Catsup | 2.2K | 450 |
| Caustic Soda | 1K | 1K |
| Cement Slurry | 5K | 200 |
| Coffee | 2.2K | 450 |
| Corn Syrup | 45K | 21 |
| Corn-Cream Style | 2.2K | 450 |
| Ferric Chloride | 10K | 100 |
| Ferrous Sulfate | 10K | 100 |
| Ink (Water Base) | 2.2K | 450 |
| Jams/Jellies | 45K | 21 |
| Juices-Fruit/Vegetable | 1K | 1K |
| Lithium Chloride | 1K | 1K |
| Magnesium Chloride | 1K | 1K |
| Magnesium Hydroxide | 2.2K | 450 |
| Mayonnaise | 5K | 200 |
| Mercuric Chloride | 90K | 11 |
| Milk | 1K | 1K |
| Molasses | 10K | 100 |
| Mustard | 1K | 1K |
| Oil-Soluble | 10K | 100 |
| Paper Stock | 5K | 200 |
| Photographic Solutions | 1K | 1K |
| Plating Solutions | 2.2K | 450 |
| Potassium Chloride | 1K | 1K |
| Salts-Chemical | 2.2K | 450 |
| Sewage | 5K | 200 |
| Silver Nitrate | 1K | 1K |
| Soap Foam | 18K | 50 |
| Sodium Carbonate | 2.2K | 450 |
| Sodium Hydroxide | 1K | 1K |
| Soups | 1K | 1K |
| Starch Solutions | 5K | 200 |
| Vinegar-Aqueous | 2.2K | 450 |
| Water-Carbonated | 3K | 330 |
| Water-Condensate | 18K | 50 |
| Water-Chlorinated | 5K | 200 |
| Water-Distilled | 450K | 2 |
| Water-Deionized | 2.0M | .5 |
| Water-Hard/Natural | 5K | 200 |
| Water-Salt | 2.2K | 450 |
| Wine | 2.2K | 450 |
| Zinc Chloride | 1K | 1K |
| Zinc Sulfate | 2.2K | 450 |