

Conductivity-Based Liquid Level Control

Control Function

Warrick Controls are used for a wide variety of control, automation and safety interface functions.

Some of the most common are:

Electrical Control: Energize or de-energize solenoids, pumps, lights, horns, heaters as well as input to PLC's and other devices.

Pump Control: Automatic start and stop of pumps for refill and pump down.

Alarm Activation: High level, and low level, for operator safety and equipment protection.

Low Water Cut Off: Primary low water shut down control for boilers.

Applications

- Storage tanks
- Boilers
- Cooling Towers
- Humidifiers
- Steam Generators
- Steam Cookers
- Autoclaves
- Dishwashers
- Machine Tool Cooling
- Quenching Systems
- Sewage Disposal
- Deep wells
- Groundwater remediation
- Oil Water separators
- Water Treatment
- Chemical Storage
- Intrinsically safe Interface

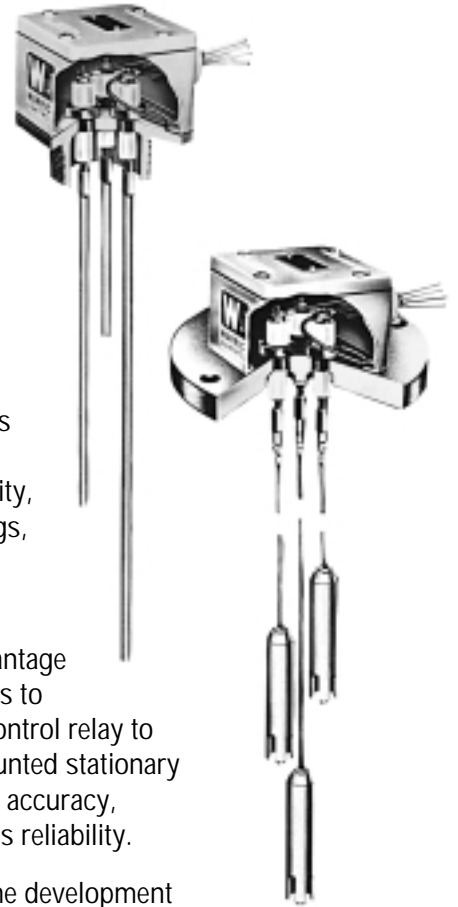
Conductivity Based Level Control

For over 50 years Warrick Controls have offered dependable no-moving-parts control and monitoring of conductive liquids.

Now as part of the Gems Sensors family, Warrick conductivity controls continue to offer reliability, process automation, labor savings, flexibility and operator safety at economical cost.

The concept is simple: Take advantage of a liquid's conductive properties to complete a circuit and cause a control relay to actuate. Use of permanently-mounted stationary electrodes gives the user precise accuracy, repeatability and no-moving-parts reliability.

This simple concept has led to the development of a complete line of conductivity-based controls and electrode fittings shown here. For OEM's we also have the capability to custom configure controls and electrode fittings to meet your specific application requirements.



System Components

The illustration, below, graphically defines the typical Warrick® liquid level control system, which includes three basic elements:

1. The control is an electrical device with contacts that open and close in response to liquid levels sensed by the probes. Because it is wired directly to the power source and to the sensing source, it can send signals that activate or de-activate solenoids, pumps, or alarms.

Warrick® controls are available in many different designs and sensitivity ratings for a wide range of application requirements.

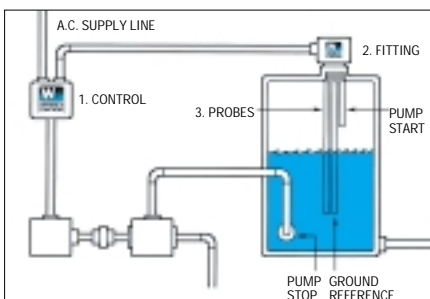
2. The fitting is a housing that holds the probes (or floats), insulates them from the vessel, and provides a means of connection to the control.

Warrick® fittings are available for single-probe or multi-probe applications, for mounting to vessels in a variety of ways, and in open or pressure tight styles.

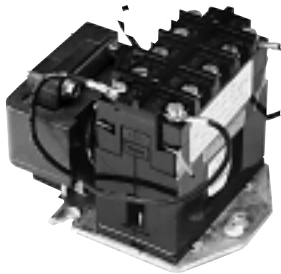
3. The probe is a sensor that extends downward from the fitting, with the tip positioned precisely at the level where the control should be activated.

Warrick® probes are available in a variety of materials to suit different liquids and a variety of lengths to fit different depth requirements.

The liquid level control system shown here is designed for "pump up" application. The pump will start refilling the vessel when the liquid reaches the lower probe tip, then stop refilling the vessel when the liquid reaches the higher probe tip.



Principle of Operation



Electromechanical Controls employ a simple series circuit which includes the transformer, relay coil, electrode probes and the liquid media being monitored. When liquid contacts both the reference and set point electrode probes, current flows through the liquid media which in turn energizes the relay coil and mechanically changes the output contacts state.

When liquid is below the electrode probes, the probe circuit is open, the relay coil is not energized, and the output contacts return to their 'normal' state.

Sensitivity (the maximum liquid resistance allowable) is adjusted by changing the secondary voltage passed through the electrodes and liquid media (500 VAC max).

Solid State Controls employ two separate circuits, one for sensing and comparing current flow and one for energizing the output relay. This 'switch within a switch' allows solid state controls to operate at much lower secondary voltages (12VAC typical), and much higher sensitivities. Advantages of this technology include reduced shock hazard, one moving part the output relay, wide sensitivity range and latching capability for auto refill or empty applications.



Intrinsically Safe Controls are solid state controls which limit current and voltage to a level incapable of igniting flammable gasses, vapors or dust. They can be used as conductivity liquid level controls or with dry contact devices such as Gems Flow and Level Switches or other non voltage storing or producing devices.

Sensitivity Data

Sensitivity vs. Maximum Probe Wire Distances – in feet*

| Ohms | Controls | | | | | | | | |
|-----------|--------------------------------------|---------------------------------|-----------|---------------|-----------|-----------|---------------|-------------|-----------|
| | Series 1 | Series 16, 16D, 16M, 16DM, 16VM | Series 17 | Series 27, 37 | Series 47 | Series 67 | Series 26,26M | Series 19MR | Series DF |
| 50 | 75000 | — | — | — | — | — | — | — | — |
| 450 | 7500 | — | — | — | — | — | — | — | — |
| 1,500 | 1750 | — | — | — | — | — | — | — | — |
| 3,000 | — | — | — | 4000 | — | — | — | — | — |
| 3,300 | — | — | 5000 | — | — | — | — | — | — |
| 4,700 | — | 10000 | 3500 | — | — | 4000 | 900 | — | 900 |
| 7,000 | 500 | — | — | — | — | — | — | — | — |
| 10,000 | — | 5700 | 1750 | 900 | — | 2400 | 600 | — | 600 |
| 11,000 | — | — | — | — | — | — | — | 5500 | — |
| 19,000 | — | — | — | — | — | — | — | 3000 | — |
| 20,000 | 150 | — | — | — | — | — | — | — | — |
| 22,000 | — | — | 1000 | — | — | — | — | — | — |
| 26,000 | — | 2200 | — | — | 1500 | 1200 | 250 | — | 250 |
| 47,000 | — | — | 500 | — | — | — | — | — | — |
| 50,000 | — | 1075 | — | — | 900 | 600 | — | — | — |
| 100,000 | — | 570 | 250 | 75 | — | — | — | — | — |
| 470,000 | — | 270 | — | — | — | — | — | — | — |
| 1,000,000 | — | 38 | — | — | 400 | 300 | — | — | — |
| 3,000,000 | Contact factory for more information | | | | | | | | |
| 5,500,000 | | | | | | | | | |

* Based on type MTW or THHN #14 or #16 AWG wire. Other wire size and sensing medium may reduce overall maximum distance.

Notes:

1. DC on probe circuit-maximum distance between control and probe is limited to the total resistance of the wire and liquid.
2. Total resistance must not exceed the sensitivity of the control.
3. On controls directly connected to floats rather than probes, maximum distance is limited only to the total resistance of the wire.
4. AC on probe circuit has greater restrictions on maximum distance.