Warrick® Conductivity-Based Liquid Level Control

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.

Application Versatility

Pumps. For feeding of elevated tanks; drainage of wastewater from industrial sumps; batch processing; irrigation and flood control; sewage disposal; seal leakage detection.

Boilers. Supervise feedwater flow; critical low water cutoff protection; alarm functions.

Steam. Steam cookers; steam generators; evaporators; sterilizers. Automatic shut off of heat source in the event of a low water level; proper water level maintenance through the energizing of a solenoid valve.

Drink Dispensers. Control the carbonator tanks' water level.

High and/or Low Level Alarms. In boilers, process and storage tanks and similar equipment.

Solenoid Control. As simple on/off devices, for process control.

Fuel. Fuel storage tank level detection and leakage indication.

Sewage. Sewage and waste water level detection.

Specialty Control Panels.

System Components

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

1. **Controls.** 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. **Fittings.** 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.

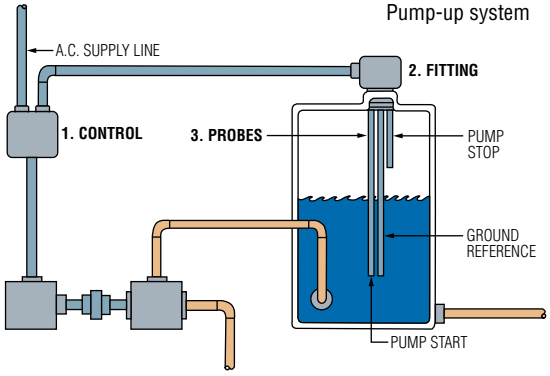
3. **Probes.** The probe is a sensor that extends downward from the fitting, with the tip positioned precisely at the level where the control should be activated.

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

Example of Warrick System Application

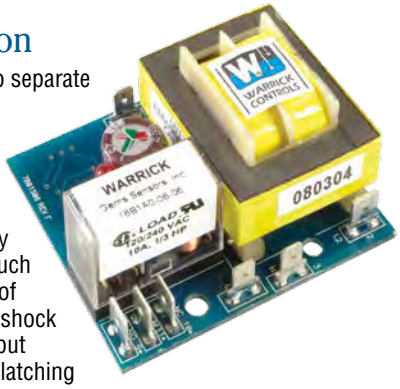
The liquid level control system shown here is designed for "pump up" application. The pump will start refilling the vessel when the liquid reaches the lower probe tip, then stop refilling the vessel when the liquid reaches the higher probe tip.

Pump-up system



Order from: C A Briggs Company; 622 Mary Street; Suite 101 - Warminster, PA 18974
Phone: 267-673-8117 - Fax: 267-673-8118; E-Mail: Sales@cabriggs.com - www.cabriggs.com

Principle of Operation



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 16, 16D, 16M, 16DM, 16VM	Series 17	Series 27, 37	Series 47	Series 67	Series 26, 26M	Series 19MR	Series DF
50	—	—	—	—	—	—	—	—
450	—	—	—	—	—	—	—	—
1,500	—	—	—	—	—	—	—	—
3,000	—	—	4000	—	—	—	—	—
3,300	—	5000	—	—	—	—	—	—
4,700	10000	3500	—	—	4000	900	—	900
7,000	—	—	—	—	—	—	—	—
10,000	5700	1750	900	—	2400	600	—	600
11,000	—	—	—	—	—	—	5500	—
19,000	—	—	—	—	—	—	3000	—
20,000	—	—	—	—	—	—	—	—
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.

Sensitivity & Material Selection

Liquid or Material	Sensitivity-Conductivity		Probe Material	
	Ohms/cm	Micro-Mhos/cm	Good[1]	Better[2]
Acids[3]	Consult Factory		Consult Factory	
Aluminum Hydroxide	2.2K	450	316 Stainless Steel	Titanium
Aluminum Sulfate	2.2K	250	316 Stainless Steel	Hastelloy C
Ammonia	5K	200	316 Stainless Steel	N.A.
Ammonium Chloride	1K	1K	316 Stainless Steel	Titanium
Ammonium Hydroxide	10K	100	316 Stainless Steel	Titanium
Ammonium Nitrate	18K	50	316 Stainless Steel	316 Stainless Steel
Ammonium Sulfate	10K	100	316 Stainless Steel	Titanium
Baby Foods	1K	1K	316 Stainless Steel	316 Stainless Steel
Barium Chloride	1K	1K	Carpenter 20	N.A.
Barium Nitrate	1K	1K	316 Stainless Steel	N.A.
Beer	2.2K	450	316 Stainless Steel	316 Stainless Steel
Black Liquor	1K	1K	Consult Factory	
Borax – Aqueous	10K	100	Brass	316 Stainless Steel
Bourbon	200K	5	N.A.	316 Stainless Steel
Brine	1K	1K	N.A.	Hastelloy C
Buttermilk	1K	1K	N.A.	316 Stainless Steel
Cadmium Chloride	1K	1K	316 Stainless Steel	N.A.
Cadmium Nitrate	1K	1K	316 Stainless Steel	N.A.
Cake Batter	5K	200	316 Stainless Steel	316 Stainless Steel
Calcium Chloride	1K	1K	Carpenter 20	Hastelloy C
Calcium Hydroxide	10K	100	316 Stainless Steel	Titanium
Catsup	2.2K	450	316 Stainless Steel	316 Stainless Steel
Caustic Soda	1K	1K	316 Stainless Steel	Hastelloy B
Cement Slurry	5K	200	316 Stainless Steel	316 Stainless Steel
Coffee	2.2K	450	316 Stainless Steel	316 Stainless Steel
Corn Syrup	45K	21	316 Stainless Steel	316 Stainless Steel
Corn – Cream Style	2.2K	450	316 Stainless Steel	316 Stainless Steel
Ferric Chloride	10K	100	N.A.	Titanium
Ferrous Sulfate	10K	100	Carpenter 20	Titanium
Ink (Water Base)	2.2K	450	N.A.	316 Stainless Steel
Jams/Jellies	45K	21	316 Stainless Steel	316 Stainless Steel
Juices – Fruit/Vegetable	1K	1K	316 Stainless Steel	316 Stainless Steel
Lithium Chloride	1K	1K	N.A.	Carpenter 20
Magnesium Chloride	1K	1K	316 Stainless Steel	Carpenter 20
Magnesium Hydroxide	2.2K	450	316 Stainless Steel	N.A.
Mayonnaise	5K	200	316 Stainless Steel	316 Stainless Steel
Mercuric Chloride	90K	11	N.A.	Titanium
Milk	1K	1K	316 Stainless Steel	316 Stainless Steel
Molasses	10K	100	316 Stainless Steel	316 Stainless Steel
Mustard	1K	1K	316 Stainless Steel	316 Stainless Steel
Oil – Soluble	10K	100	N.A.	316 Stainless Steel
Paper Stock	5K	200	Titanium	N.A.
Photographic Solutions	1K	1K	316 Stainless Steel	Hastelloy C
Plating Solutions	2.2K	450	N.A.	316 Stainless Steel
Potassium Chloride	1K	1K	316 Stainless Steel	Titanium
Salts – Chemical	2.2K	450	Monel	N.A.
Sewage	5K	200	316 Stainless Steel	316 Stainless Steel
Silver Nitrate	1K	1K	316 Stainless Steel	Carpenter 20
Soap Foam	18K	50	316 Stainless Steel	316 Stainless Steel
Sodium Carbonate	2.2K	450	316 Stainless Steel	Monel
Sodium Hydroxide	1K	1K	316 Stainless Steel	Hastelloy B
Soups	1K	1K	316 Stainless Steel	316 Stainless Steel
Starch Solutions	5K	200	316 Stainless Steel	316 Stainless Steel
Vinegar – Aqueous	2.2K	450	316 Stainless Steel	Carpenter 20
Water – Carbonated	3K	330	316 Stainless Steel	316 Stainless Steel
Water – Condensate	18K	50	Brass	316 Stainless Steel
Water – Chlorinated	5K	200	316 Stainless Steel	Monel
Water – Distilled	450K	2	Brass	316 Stainless Steel
Water – Deionized	2.0M	0.5	Brass	316 Stainless Steel
Water – Hard/Natural	5K	200	Brass	316 Stainless Steel
Water – Salt	2.2K	450	Monel	N.A.
Water – R.O.	18M	0.056	N.A.	N.A.
Wine	2.2K	450	316 Stainless Steel	316 Stainless Steel
Zinc Chloride	1K	1K	Carpenter 20	Titanium
Zinc Sulfate	2.2K	450	316 Stainless Steel	Titanium

Notes:
1. Less than .020˝ erosion per year.
2. Less than .002˝ erosion per year.
3. Liquid concentration and temperature will affect conductivity and material erosion rate. Contact factory for detailed information.

N.A. – No material available with this erosion rate.