Liquid Level Control Systems

Liquid Level Control Applications for SSAC Products

Fast Facts

Application notes

Pumps and Pumping Systems Applications for SSAC Products:

ABB group offers a wide assortment of products to control and monitor the level of conductive liquids in commercial appliances and pumping systems. ABB's SSAC, family of products, provide solutions that prevent thermal runaway in boilers, detect leaks in submersible pump seals and control the level of liquids in holding tanks. Alternating relays save energy while equalizing the running time two parallel pumps. The SSAC brand includes over 30 years experience designing and manufacturing controls and electronic relays for the equipment manufacturers that supply products and systems for this industry.

Advantages of Partnering with ABB SSAC:

- Over 30 years of experience designing & manufacturing controls
- OEM liquid level monitors and controls designed for commercial appliances and pumping industries
- Coated circuit boards designed for OEM boiler, humidifier, and cooking appliance applications
- Proven solid state designs are rated for extended reliable operation
- 10 Year product warranty
- Rush delivery capability
- RoHS manufacturing means 100% lead free compatibility
- ISO 9000 Quality Management System
- LEAN manufacturing approach allows attractive cost structure
- Full staff of application engineers that understand the needs of liquid level control equipment manufacturers

ABB Group offers the power of a world wide organization with strong local support to ensure your customers get fast, reliable support and customer service.

LLC

Fast Facts

Application notes

LLC

Application Benefits:

Liquid Level Controls in Commercial Appliances and Equipment:

Leak Seal Detection:


LLC5


LLC2

OEM products: potable or waste water sump pumps

- Detects a leak in the water seal of a submersible pump
- Prevents premature pump failure
- Allows scheduled maintenance not emergency replacement
- Easy to install, lowers cost by using casing as common probe

(see application note on next page)

Low Level Limit Protection – UL353 Approval

OEM products: Boilers, steam generators, steam humidifiers, steam cleaning equipment


LLC6

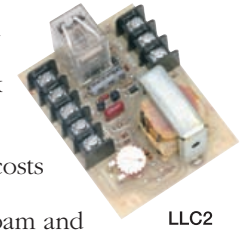

LLC8

- UL353 approved for low limit switch protection
- Protects against thermal runaway caused by low water level
- Essential safety control in boilers and commercial hot water & steam appliances
- Single probe design locks OFF heating element if water is low
- Isolated 12 AC voltage on the probes reduces maintenance costs and service calls
- Industry standard base wiring allows fast, positive part replacement

Dual Level Control:

OEM products: Custom control panels for chemical processing, food preparation, dispensing equipment, car wash, holding tanks, and municipal delivery installations


LLC5

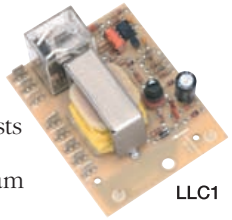

LLC2

- Dual probe level control for conductive liquids to 100K ohms
- Automatically maintains liquid between a selected upper and lower level
- Easy to establish min and max levels by probe positioning
- Isolated 12 AC voltage on the probes reduces maintenance costs and service calls
- Adjustable set point ignores foam and debris for positive level control
- Order fill or drain operation
- Industry standard base wiring allows fast positive part replacement

(see application note on next page)

Single Level Control:


LLC4


LLC1

OEM products: Commercial: coffee brewers, steam tables, dish washers, dry cleaning equipment

- Single probe level control for conductive liquids to 250K ohms
- Uses a single probe and time delay to maintain liquid level
- This approach lowers installed cost and probe maintenance
- Isolated 12 AC voltage on the probe reduces maintenance costs and service calls
- Adjustable set point ignores foam and debris for positive level control
- Order fill or drain operation
- Industry standard base wiring allows fast positive part replacement

Dual Level Control with Alarm Contacts:

OEM products: Custom control panels for chemical processing, food preparation, dispensing equipment, car wash, holding tanks, and municipal delivery installations


CM-ENN

- Dual probe level control for conductive liquids to 100K ohms
- Automatically maintain liquid between a selected upper and lower level
- Has separate output contacts for low level and overflow alarm indication
- Can be configured to add a backup pump when the level is out of range
- Adjustable set point ignores foam and debris for positive level control
- Switch selectable fill or drain operation
- DIN 3 mounting with IP20 screw terminal connections

{**Note:** CM-ENN is not RoHS compliant and is covered by a 1 year factory warranty}

Alternating Relays:


KRPS

- Equalize the running time of two pumps
- Switches at the end of a cycle
- Duplexing allows both pumps to run simultaneously
- Duplexing improves efficiency and reliability by sharing run time between two pumps. Pumps can be sized for half the required maximum load (2x10 Hp pumps instead of 1x20 Hp pump) and the alternating relay insures shared run time. Lower horsepower pumps are more efficiently matched to average loads, and backup is always available. During peak demand, an optional lag input energizes both pumps.


ARP

(see application note on the last page)

Alarm Flashers:


FS 126

OEM Equipment: Custom Control Panels

- Flash an alarm lamp
- Sound an alarm horn

ABB Low Voltage Products & Systems
Sales Information (USA) 1-888-385-1221 option #2
Technical Support (USA) 1-888-385-1221 option #4
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Mid-West & Pacific Region: 1-866-222-8368

SSAC

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Seal Leak Detection

Conductive liquid level controls are often used as seal leak detectors. An electrode is placed in contact with the non-conductive oil (Figure A) within a pump/motor casing. If a leak in a watertight seal occurs, the conductive contaminates introduced into the oil lowers its resistance. The LLC senses this change in resistance. The example illustrates a typical sewage sump pump application. The probe is inserted through a seal in the casing. A separate wire runs from the pump case to the LLC common to complete the sensing path. Sewage has a resistance of 5K ohms. An LLC setting, of approximately 21K ohms, (Figure B) will allow detection of sewage in the oil. The output of the LLC would then be connected to signal a leak, allowing routine maintenance to be scheduled to replace the damaged seal.

Seal Leak Application

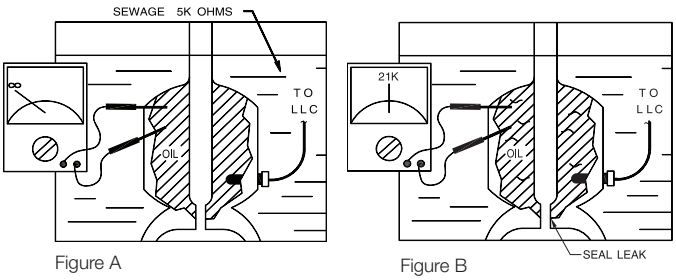


Figure A

Figure B

Dual Probe Level Control

The dual probe input LLC's are designed to maintain the high or low level of a liquid within the containment tank. Figure C is an example of a water well reservoir application. Using an LLC5 series 8 pin plug-in (with the 'B' fill logic), you can maintain a precise level within the holding vessel.

As long as the water (with a typical resistance of 5K ohms) remains in constant contact with the upper and lower probes, the LLC's output remains de-energized. During usage, the demand pump lowers the water level. When the water level drops below the lower probe, the LLC's output energizes causing the fill pump to refill the tank. Filling continues until the water touches the upper probe, then it stops. The LLC5 restarts the fill cycle when both probes are no longer touching the water. With the probe depths set accurately, the high level of the tank is maintained and the low level will not drop below the intake of the submersible pump, thus avoiding a loss of prime condition.

Dual Probe Application

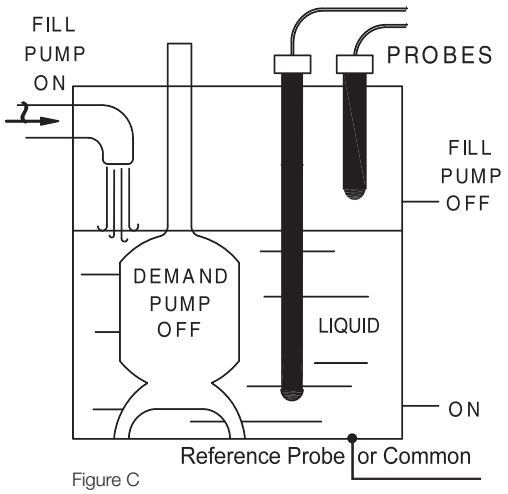
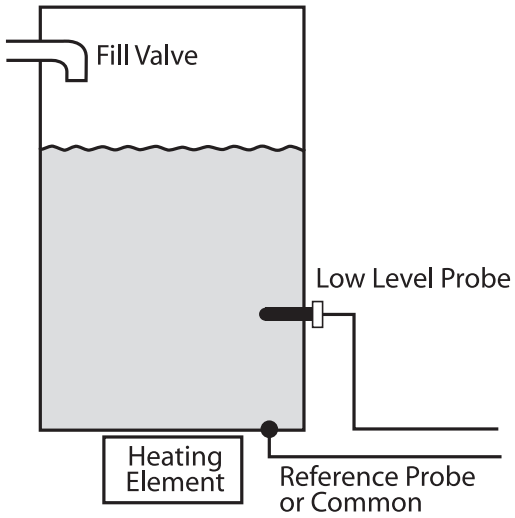


Figure C

Low Level Limit Protection - UL353 Approval

Pressurized holding tanks used in boilers, steam humidifiers, and hot water or steam heated commercial cooking equipment must have protection against excessive internal pressure cased by low water level. Without the heat stabilizing effect of the water in the tank, a condition called thermal runaway can occur. If unchecked the equipment can pose a safety risk. The LLC6 & LLC8 low level cutoff controls are designed to monitor the liquid level in the tank and disconnect the heating element or burner if the level falls below a safe level. These products include UL353 approval for limit switches in this application. Various reset options are available to provide adequate protection without unnecessary operator intervention. Automatic reset allows the equipment to run whenever the liquid level is acceptable. Manual reset requires operator restart after a low level event. The power outage version of manual reset, allows the equipment to restart if the level is acceptable before and after the power outage. Operator restart is required after all low level events.

Boiler Application



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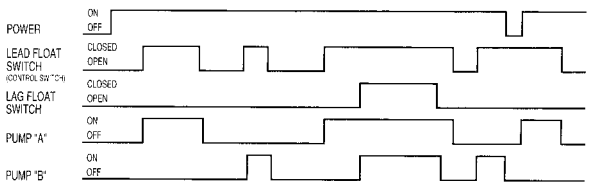
Alternating & Duplexing Relays

Many dual pump, duplex pumping applications, require two or more float switches to properly operate the system. The ARP Series of alternating relays are designed to equalize run time for two loads by automatically changing the "lead pump" and "lag pump" sequence at the end of each cycle. The ARP assures approximately equal wear on both loads, plus the duplexing models allow both pumps to operate simultaneously. This application can be used for water and wastewater pumping; and for circulating and distribution pumping of various liquids.

ARP

Alternating

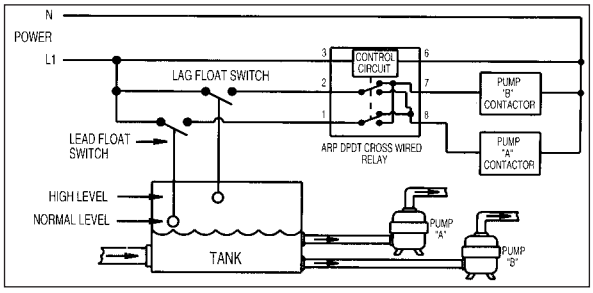
Power must be applied at all times. When the level in the tank rises to the normal level, the Lead Float Switch closes. Pump "A" is turned on via Pump "A" contactor, and will remain in this condition until the Lead Float Switch opens. When the Lead Float Switch opens, the ARP relay contacts transfer. When the level in the tank rises, the Lead Float Switch closes, energizing Pump "B" via Pump "B" contactor. Pump "B" will remain energized until the Lead Float Switch opens. The ARP relay contacts transfer back to their original position. The ARP's internal relay contacts transfer each time the Lead Float Switch opens. By alternating the lead pump for each successive operation, the total number of operating hours is similar.



Time Diagram - Duplexing

Duplexing

When an Alternating Relay is internally cross wired, the normal alternating operation is extended to include duplexing. If the Lead Float Switch cycles as explained above, normal alternating operation will occur. If the Lead Float Switch and the Lag Float Switch close simultaneously, due to a heavy flow in the tank, both pumps A & B are energized. The ability to alternate the pumps during normal work loads and then operate both when the load is high is called Duplexing. Duplexing relays can save energy by operating only one smaller pump for normal loading. The duplexing system has the capacity to handle twice the load, and provide a backup pump if needed.

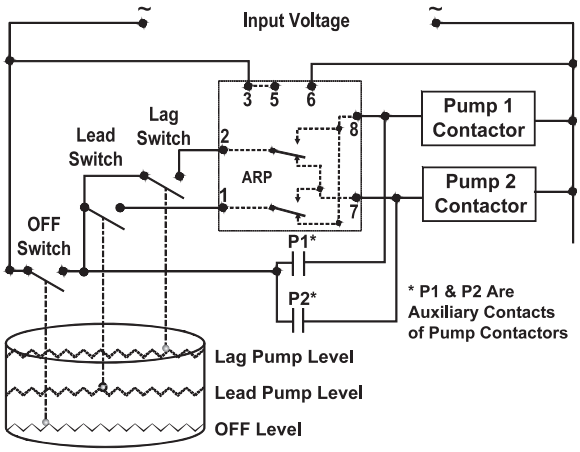


Duplex Pump Control

LLC

Duplex Panel with Latching Pump Down Operation

The diagram depicts a typical drain pumping application. The OFF, Lead and Lag, float switches are connected as shown. As the liquid level rises, first the OFF and then the lead float switches close; pump "1" energizes. The liquid is pumped down by pump "1" until the OFF switch opens because of the latching action of the P1 auxiliary contacts on the pumps contactor. As the OFF switch opens, pump "1" turns OFF and the ARP toggles making pump "2" the lead pump. This operation continues with the pumps alternating lead/lag order on each successive cycle. When the flow is too heavy for one pump, the lag float switch eventually closes. Both pumps energize and operate until the OFF float switch opens. A benefit of this connection method is the elimination of rapid cycling of the pump motors caused by float switch bounce.



Duplex Pump Control with Latching Contacts

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