

INSTALLATION AND OPERATING OF KELCO LC20 MODULAR LEVEL SENSORS

INTRODUCTION

The LC20 modular level sensing system consists of a number of electromechanical sensor heads positioned vertically along a riser pipe that is made from a length of standard 20mm PVC or 1 inch stainless steel or copper tube. Liquid level rising and falling in a vessel and in the riser pipe carries a small float through the sensor heads and provides a series of switching points that can be used for a multitude of level control and sensing applications.

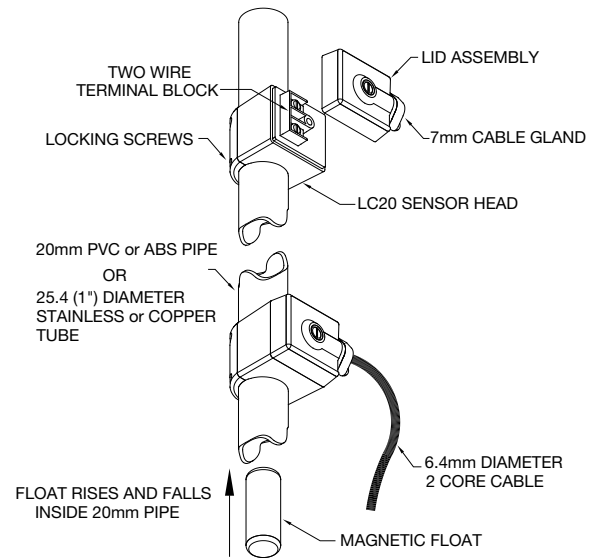
SENSOR HEADS

Sensor heads are available in two configurations, normally on or normally off. Both versions are sealed and weatherproof and can be used in fully exposed outdoors applications. The sensors clamp around the outside of a riser pipe and can be easily positioned or moved up or down. A spacer shim is supplied with each head to allow it to be adapted to 25.4mm (1") diameter metal or glass tubing. Each sensor provides a single switching point, and any number of sensors can be stacked along a riser pipe, but typical systems generally consist of 2 to 6 heads. It is possible to build continuous level gauging systems by stacking sensors close together along the riser pipe. The minimum distance between sensors is 40mm. Once actuated, a level change of approximately 5mm, either up or down will cause the sensor to de-actuate. Sensor heads are ideal for relay control, for making and breaking latched relay logic circuits and for PLC control. It is perfectly practical to mix normally open and normally closed heads in the one system.

ELECTRICAL OPTIONS

The LC20 sensor heads are available in two electrical configurations. For PLC, relay logic and telemetry circuits the model LC20-B provides a single set of voltage free contacts in the form of a dry contact reed switch. For heavy current AC applications, a high power model designated LC20-R containing a Triac relay is also available. Both models are magnetically self-powered and are one wire in, one wire out switches. Both the reed switch and Triac based models are available as normally open or normally closed switches.

LC20 SYSTEM DETAILS



FLOAT

A float containing a magnet is supplied with each LC20 sensor head. The float is made from Polypropylene and will operate in liquids with a specific gravity of >0.80. The float can tolerate pressures to 10Bars (150PSI), and temperatures to 90°C continuously or 100°C for short periods. It is sized to fit down the inside of 20mm Class 18 PVC pipe, or 1" 16 SWG metal tubing. The top end of the float has an eyelet so a cord can be attached. To commission and test LC20 systems attach a string to the float eyelet and lower the float into the riser pipe slowly past each sensor head. The sensor heads should switch on or off, depending on the model, as the float is lowered through each one.

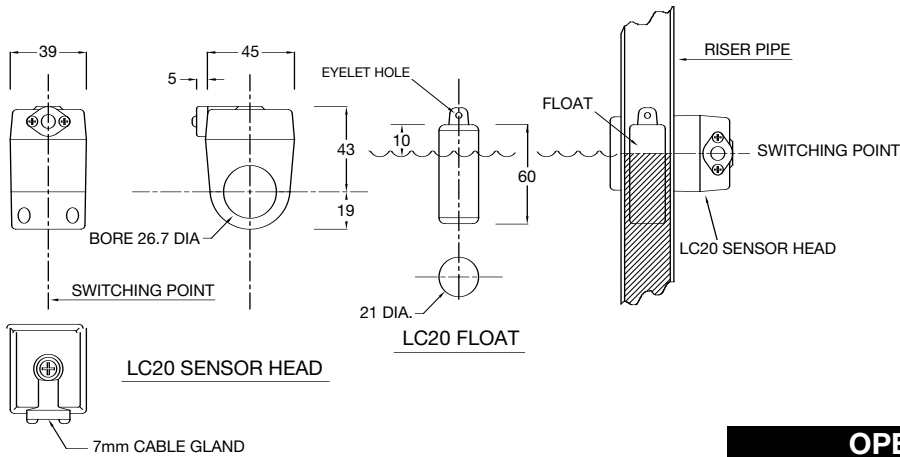
ELECTRICAL DATA

Sensor Model	Module Type	Contact Configuration	Switched Power Maximum	Switched Voltage Maximum	Switched Current Resistive AC (rms) Maximum	Inductive Loads (Power Factor 0.4)	Typical Application
LC20-B	Dry Reed Switch	S.P.S.T NO or NC	40Watts	240VAC 200VDC	1 Amp	Not Suitable	PLC Telemetry and Relay Logic circuits
LC20-R	Solid State Relay (Triac)	S.P.S.T NO or NC	750Watts	5 to 240V AC only	4 Amps	4 Amps at 240V	AC control circuits and direct pump control

Note: LC20-B sensor heads use a dry contact reed switch as the output switch. Reed switches are exceptionally reliable devices but can be easily damaged if overloaded. Never exceed the recommended rating for the reed switch. Where long cable runs (>50 metres) are unavoidable use screened cable. For DC applications and for minor inductive loads such as relay control, parallel a blocking diode across the reed switch to prevent the reed contacts from welding. Do not use reed switches to control filament lamps, due to the high current inrush, which can be as much as 10 times the steady state current. If in doubt, always use an interposing relay to protect the reed switch. When used in hot liquid applications the switched power rating of the LC20-B sensor heads does not require de-rating.

LC20-R sensor heads use a Triac as the output switch. These sensors will only operate in AC applications. They will not work on DC. The Triac is ideal for control of inductive loads such as small pump motors. When mounted on plastic riser pipes the maximum switched power must not exceed 375 Watts. The switched power of the LC20-R module given in the table above refers to a sensor operating on a metal riser pipe at ambient temperature. In hot liquid applications the switched power must be proportionally reduced to avoid overheating the Triac. At the top operating temperature of 90°C the switched power must not exceed 375Watts. When used for control applications the Triac requires a minimum load of 10mA to operate properly. Some small loads such as electronic timers may not work with the Triac based sensor heads as they draw such a small current they will run on the leakage current through the Triac.

DIMENSIONS



RISER PIPE

Riser pipes should be made from class 18 PVC or ABS pressure pipe. Do not use lower class pipe as it's larger bore size and lack of rigidity may affect the operation of the LC20 system. The riser pipe can be any required length, and can be supported by suitable brackets without affecting the action of the sensors. The riser pipe must be vented to atmosphere, or for pressure applications, back into the vessel. A standard pipe cap with a small vent hole drilled in it should be fitted to open top riser pipes to prevent insects and other foreign matter from entering the pipe.

STAINLESS STEEL TUBE SYSTEMS

The LC20 level sensing system operates magnetically and will only work in tube and pipe systems that are magnetically transparent. A riser tube can be constructed from essentially any material that is of the correct diameter and bore and is non magnetic. For example 1" diameter 1.6mm wall brass or copper tube will work perfectly, as will 1" diameter thin walled glass tube. Some grades of stainless and some special corrosion resistant alloys will attract a magnet and are therefore unsuitable. Normally, 304 and 316 stainless steel is non magnetic and will work perfectly with the LC20 system. If in any doubt as to the suitability of a specific tube, use a magnet to test the tube before installing it in a system. A strong permanent magnet must not adhere to the tube under test.

OPERATING ENVIRONMENT

The LC20 level sensing system is suitable for use with virtually any liquid that can be contained within the riser pipe. This includes acids, alkalis, seawater, brine solutions, chlorinated solutions and oils etc. Do not use the LC20 level sensing system with isomorphous solutions or with liquids containing material that coats out, cakes up, or contains solids larger than 0.5mm diameter. Any material in the process liquid that impedes the free movement of the system's float may cause the LC20 to malfunction. In systems where solids may be present such as in waste and effluent applications, it is generally possible to install a strainer at the base of the riser pipe to prevent ingress of solids. When used with PVC or ABS riser pipe, liquid temperature should never exceed 60°C. In stainless and copper tube systems, the LC20 sensor heads can be operated at temperatures of up to 90°C continuously. For short periods, such as for system sterilization the sensors and float will tolerate temperatures to 100°C.

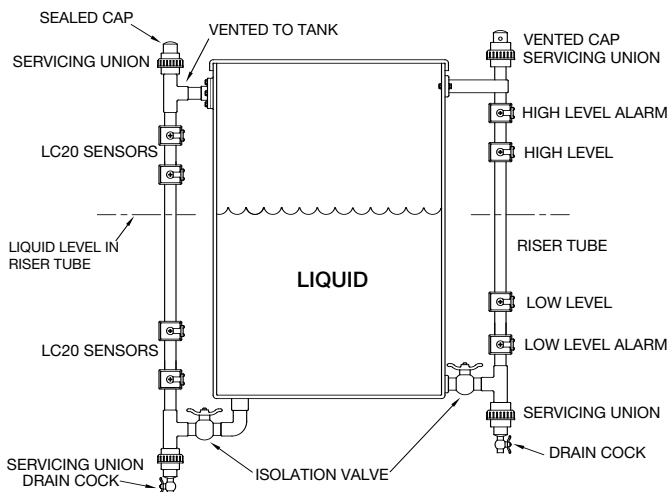
INSTALLATION

The accompanying drawing shows a typical system layout with sensor heads positioned along riser tubes attached to a vessel. Isolation and drain valves are included to allow the riser tube to be drained without draining the vessel. Servicing unions are also included so the system's float can be easily installed or removed from the tube for cleaning or inspection. Note that the top end of the riser tube must be vented to atmosphere or back into the vessel to ensure the liquid level in the tube can equalize with the level in the vessel. Do not simply blank off the top end of the riser tube or the system will fail to operate correctly.

DIFFICULT APPLICATIONS

Level control of liquids in tanks can be difficult in certain circumstances. For example, tanks in ships that are in motion or in mixing systems, or systems where the tank's volume changes rapidly can cause level switches to falsely trip. In many such situations the LC20 system offers a solution. The riser pipe in the LC20 system must be vented to atmosphere or back into the tank for the system to operate, and for the level in the riser to establish equilibrium with the liquid level in the tank. The venting of the riser can however be throttled and controlled by a small valve or a simple orifice plate in the top of the riser pipe, thereby causing a dampening action on the motion of the system's float. The net effect is to slow down the LC20 response time and allow rapid variations in the tank liquid level to be averaged out. A similar and more direct acting effect can be achieved by throttling the riser pipe's inlet isolation valve.

TYPICAL APPLICATIONS



HAZARDOUS APPLICATIONS

The LC20 level sensing system can be used in hazardous areas. The sensor heads are classed as simple devices as they do not contain components capable of storing or producing an electric charge. The LC20 system can be used in hazardous applications provided an intrinsically safe barrier, a zener barrier, isolates the sensors.

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