K SERIES · APPLICATION NOTE

TWO-FLOAT PUMP CONTROL WITH A LATCHING RELAY

A wide, adjustable pumping range from two K Series level regulators – without a PLC or pump controller

WHEN YOU NEED IT

A single K Series float switches over a level change of about 35 mm. That suits alarms and close level control, but used alone to run a pump it would start and stop the pump very often.

For a wider band between start and stop – a high differential – use two K Series floats: one sets the high level and one sets the low level. A relay latches the pump on at one level and holds it until the other level is reached. The band is set simply by where the two floats hang.

If the pump is run by a PLC or a pump controller, wire each float to its own input and do the latching in the controller instead. The circuit in this note is for installations with no controller.

HOW IT WORKS

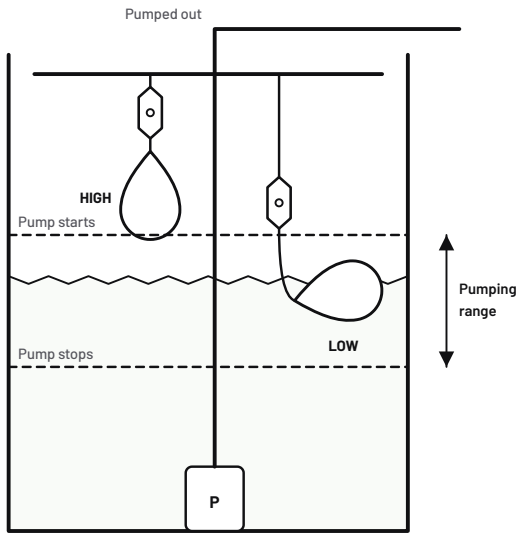


FIG. 1a Pumping out (emptying a sump or pit)

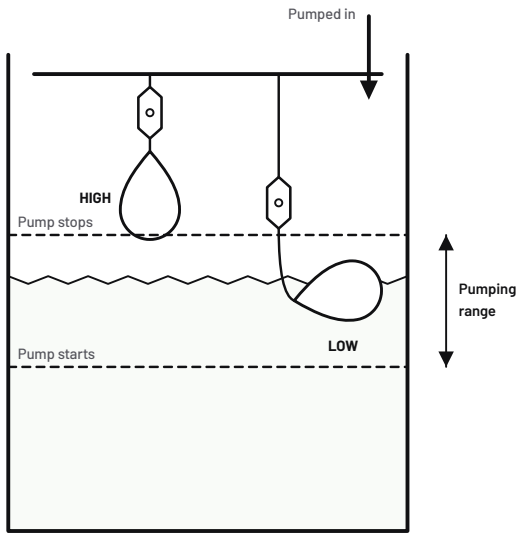


FIG. 1b Pumping in (filling a tank)

Pumping out. As the level rises past the low float, its contact closes, but nothing happens yet. When the level reaches the high float, its contact closes and relay K1 energises. Contact K1 13-14 then bridges the high float, so the relay stays on, and contact K1 23-24 runs the pump through contactor KM. The level falls, the high float opens, and the relay holds. Only when the level drops below the low float does the circuit open and the pump stop.

Pumping in. The same circuit, wired to the floats' normally closed (black) cores, works the other way round. The pump starts when the level falls to the low float, is held on as the tank fills, and stops when the liquid reaches the high float.

POWER CIRCUIT

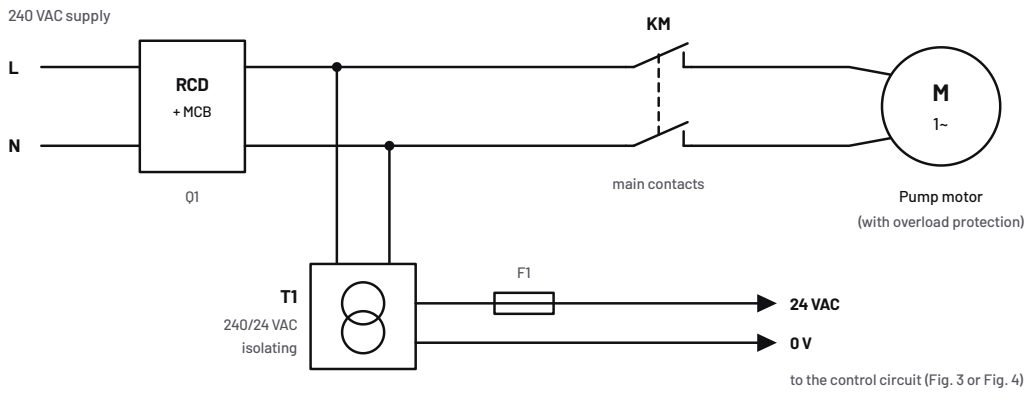


FIG. 2 Pump supply and 24 VAC control supply (single phase shown)

CONTROL CIRCUIT – PUMPING OUT

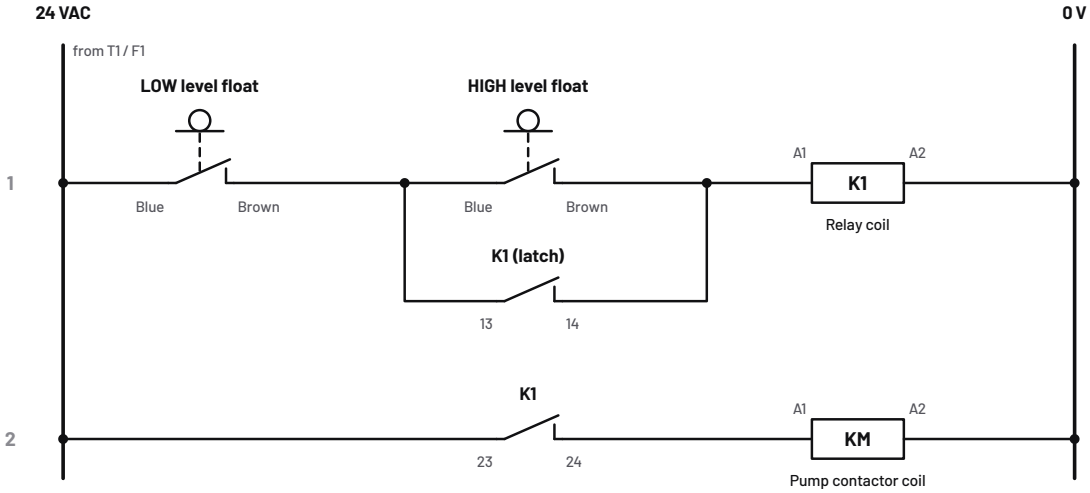


FIG. 3 Latching circuit for emptying. Both floats use their blue (common) and brown (normally open) cores.

LIQUID LEVEL	LOW FLOAT blue-brown	HIGH FLOAT blue-brown	RELAY K1	PUMP
Below the low float	Open	Open	Off	**Off**
Rises past the low float	Closed	Open	Off	**Off**
Reaches the high float	Closed	Closed	On – latches	**Starts**
Falls between the floats	Closed	Open	On – held by K1 13-14	**Runs**
Falls below the low float	Open	Open	Off	**Stops**

CONTROL CIRCUIT - PUMPING IN

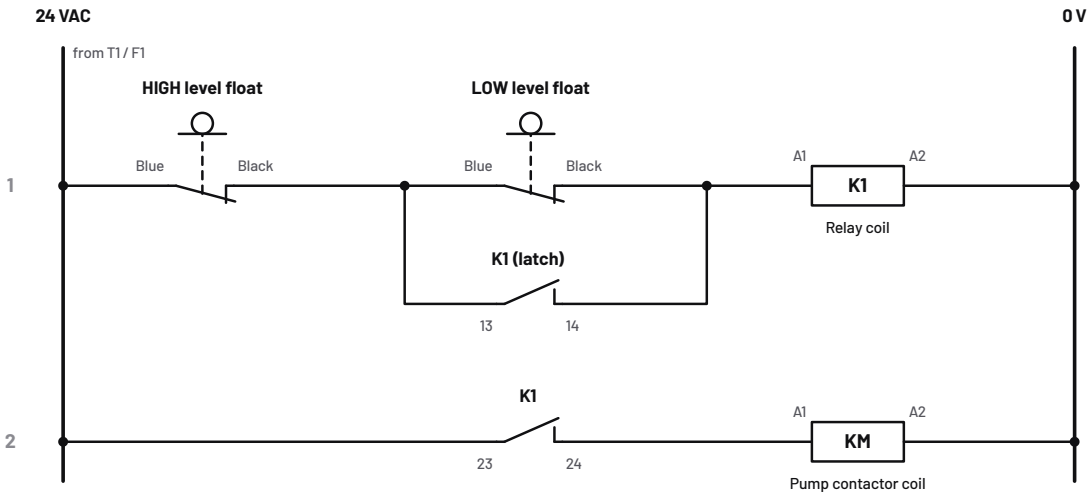


FIG. 4 Latching circuit for filling. Both floats use their blue (common) and black (normally closed) cores.

LIQUID LEVEL	LOW FLOAT blue-black	HIGH FLOAT blue-black	RELAY K1	PUMP
Above the high float	Open	Open	Off	**Off**
Falls past the high float	Open	Closed	Off	**Off**
Falls to the low float	Closed	Closed	On – latches	**Starts**
Rises between the floats	Open	Closed	On – held by K1 13-14	**Runs**
Reaches the high float	Open	Open	Off	**Stops**

FLOAT SWITCH CORES

Blue	Common
Brown	Closed to blue when the liquid lifts and tilts the float (normally open)
Black	Closed to blue when the float hangs vertically (normally closed)

NOTE Only two of the three cores are used. The unused core becomes live when the float switches – insulate and terminate it, never leave it bare.

COMPONENTS

Float switches	2 × K Series level regulator, each with a cable weight
Q1 – RCD and circuit breaker	Earth leakage protection on the supply, as required for any mains voltage float switch installation
T1 – control transformer	240/24 VAC safety isolating transformer, rated for the relay and contactor coils
F1 – fuse	Secondary fuse sized for the control circuit
K1 – relay	24 VAC coil, two normally open contacts (a two-pole changeover relay is also suitable)
KM – contactor	24 VAC coil, main contacts rated for the pump motor (AC-3), with motor overload protection

NOTE For a small pump within the rating of its contacts, relay contact K1 23-24 can switch the pump directly. A low voltage control circuit with a contactor is preferred.

SETTING UP

1. Hang the low float so that it switches above the pump's minimum submergence (pumping out) or at the lowest level you want to keep (pumping in). It must switch at least 50 mm above the floor.
2. Hang the high float at the level where the pump should start (pumping out) or stop (pumping in). Keep at least 150 mm between each float and its cable weight or tethering point.
3. Keep the two floats apart so they cannot touch or tangle, and clear of the inflow, pump and other equipment.
4. Terminate the cables in a junction box well above the high level.

TESTING

Isolate the pump motor, switch the control circuit on and work the floats by hand:

1. **Pumping out:** tilt the low float up – nothing should happen. Tilt the high float up as well – K1 and KM pull in. Let the high float hang – they stay in (latched). Let the low float hang – they drop out.
2. **Pumping in:** with both floats hanging, K1 and KM pull in. Tilt the low float up – they stay in (latched). Tilt the high float up as well – they drop out.
3. Reconnect the pump and run a full cycle on liquid before leaving the site.

⚠ WARNING

K Series float switches are rated for mains voltage, but in the interest of safety we recommend a low voltage control circuit at 24 to 48 VAC from an isolating transformer, as shown. Where mains voltage is unavoidable, the installation must have earth leakage protection. All wiring must be carried out by a licensed electrician to local regulations.

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