The Deeter Group®

Dual Level Controller

Deeter House, Valley Road, Hughenden Valley, High Wycombe, Buckinghamshire, UK. HP14 4LW

Contents

1 Packing List

- Controller box with lid, 4 screws, 4 screw covers and lid sealing gasket fitted.
- 12Volt power supply unit with European, UK and US style mains plug adaptors.
- This manual!

If any parts are missing or damaged please contact the Deeter Group at:

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2 Description

The Deeter Dual Level Controller (DLC) allows low-voltage float-switches to safely control mains-voltage pumps and solenoids. Isolation is provided by relays and a 12VDC wall adapter power supply.

There are three versions of the DLC: the DLC-1 with a single relay, the DLC-2 with two relays, and the DLC-3, a sealed version of the DLC-2 with two relays. The sealed DLC-3 has an ingress protection rating of IP65.

The primary relay (only relay in the DLC-1) provides a latching action when used with two float-switches. This latching action can be arranged to either fill or empty a tank automatically, depending on the requirements of the application. For example, if arranged to fill a tank, a pump or valve will be energised when the liquid level reaches the bottom float-switch and will be turned off when the level reaches the top switch. The bottom switch initiates the filling cycle and the top switch terminates it. Alternatively, a tank can be set for automatic emptying, with the process initiated by the top float-switch and terminated by the lower float-switch.

The DCL-2 has an auxiliary relay controlled by a third float-switch, typically used to drive an emergency pump or sound an alarm. The auxiliary relay is directly controlled by the float-switch, with no latching action.

Both relays provide double-pole switching for full isolation of the load. Where this is not a requirement, the separate poles can be used to control more than one device.

- Relay contacts are rated at 8 amps and 240VAC. Please ensure your pump or valve cannot exceed these ratings.

- When switching inductive loads such as solenoids and pump motors, a transient voltage suppressor may be required to protect the relay contacts.

3 Installation Examples

The following wiring diagrams show the two most popular configurations for the DLC.

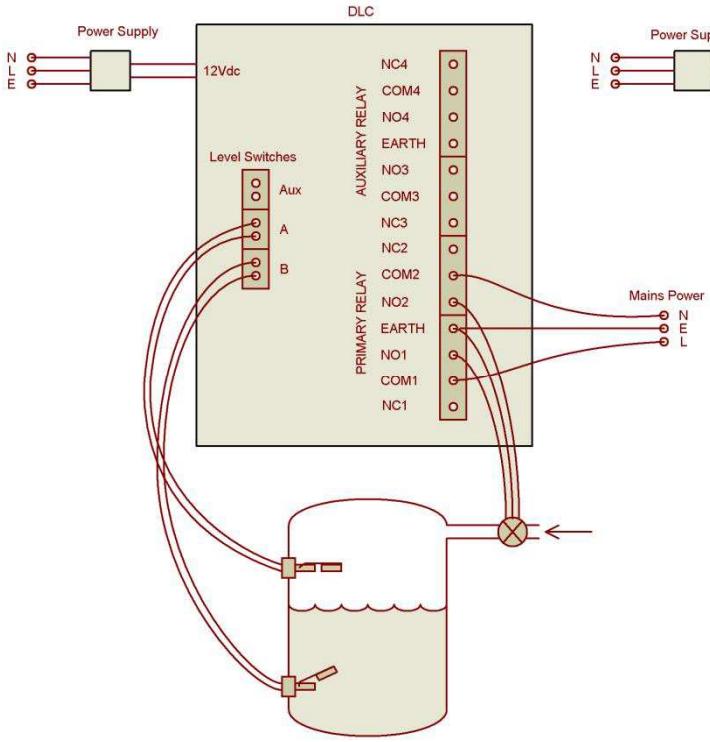


Figure 1

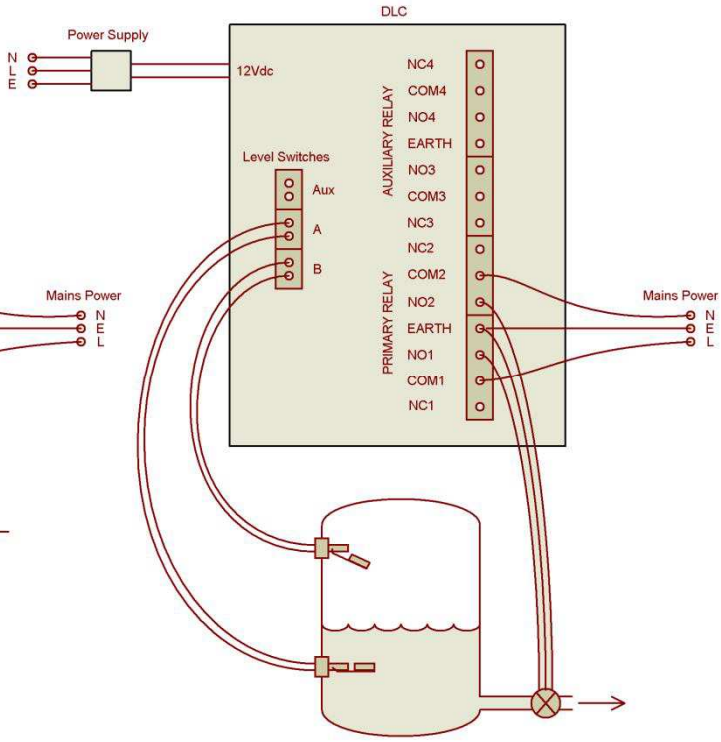


Figure 2

In Figure 1 a valve is opened to fill the tank. The top float-switch goes to the terminals labelled 'A' and the bottom switch to the terminals labelled 'B'. Note that the switches are open-circuit when the float rises (open when full).

In Figure 2 a valve is used to empty the tank. The top float-switch goes to the terminals labelled 'B' and the bottom switch to the terminals labelled 'A' and they open circuit when the float falls (open when empty).

4 Step-By-Step Configuration Guide

The following guide is intended to help determine the float orientation, decide which float goes to which input on the DLC, and whether to use the normally-open or the normally-closed contacts of the relay.

Table 1

	Relay Contacts				
	'NO'	'NC'			
	Pump or Valve Function		**Float-Switch Orientation**	**Float-Switch Location**	
Row 1	Fill	Empty	Open when full	Top	Bottom
Row 2	Empty	Fill	Open when empty	Bottom	Top
				Switch Inputs	
				'A'	'B'

- Step 1 – Choose a Fail-Safe Relay Contact

For fail-safe operation, use the **NO** (normally-open) contacts to drive equipment that must be **off** if power to the DLC is interrupted. Use the **NC** (normally-closed) contacts to drive equipment that must remain **on** during a power failure (assuming there is back-up power for the equipment, but not the DLC).

Select a column based on the fail-safe choice, either 'NO' or 'NC'.

- Step 2 – Select Table Row

From the *Pump or Valve Function* columns, select the row that represents your installation. For example, if in step 1 'NO' contacts were chosen and the system is required to fill the tank, select Row 1.

- Step 3 – Float-Switch Orientation

The row number selected in Step 2 determines the orientation of the float-switches, as shown by the table. Figure 1 shows an example of the switches mounted in the *open-when-full* orientation and Figure 2 shows the alternative *open-when-empty* orientation.

- Step 4 – Float-Switch Location

The row number selected in Step 2 determines the location of the float-switches within the tank by looking down the *Float-Switch Location* columns. For *Row 1* the top switch goes to the terminals labelled 'A' and the bottom switch goes to 'B'. For *Row 2* the top switch goes to the terminals labelled 'B' and the bottom switch goes to 'A'.

5 Wiring Instructions

The following assumes the relays are used to switch mains-voltage equipment, but the DLC is equally suited to switching low-voltage AC or DC equipment.

Consult a qualified electrician if you are unsure how to install this device.

- **WARNING**: isolate mains power before attempting to wire to this device!

- Feed float-switch wires through cable glands on the low-voltage side of the enclosure and connect them to the screw terminal pairs marked 'A' and 'B'. (See section 4 for guidance on which float goes to which input pair). Although the terminal pairs are labelled '+' and '-', for normal operation there is no polarity and the float-switch wires can be connected either way round.

- The sealed version (DLC-3) has 4 cable glands on the low-voltage side to accommodate three separate float-switch cables plus the 12V power supply. Make sure there is a proper seal around all inputs and plug any unused glands.

- If wiring the sealed version, the 12V power wires connect to the terminal pair labelled 'DC SUPPLY'. The positive wire (identified by a red band) must go to the '+' terminal, and the negative wire must go to the '–' terminal.

- Feed the mains supply cable and pump/valve cable through cable glands on the high-voltage side of the enclosure and strip back approximately 60mm of the outer sheaf.

- Connect the input LIVE wire to the terminal marked 'COM1' and the input NEUTRAL to 'COM2'. Connect the switched LIVE wire to either the 'NC1' or 'NO1' terminal depending on the fail-safe choice (see section 4), and the switched Neutral to either 'NC2' or 'NO2', the same choice that was used for LIVE.

- The EARTH terminal can provide a common connection for the two cable EARTH wires. The wires should be twisted together and secured tightly to provide a continuation of the safety earth. The screw terminals will accept a pair of 14awg (2.5mm^2) wires, but if the wire are larger than this or cannot be securely joined, use a separate insulated connector strip ('choc' block) within the enclosure.

- Make sure all cable glands are tightened to provide strain relief for wires inside the enclosure.

WARNING: mains isolation will be compromised if wires can be pulled from their terminals. For electrical safety, wires must be securely held by the screw terminals **and** cable glands and must not be restrained by the screw terminals alone.

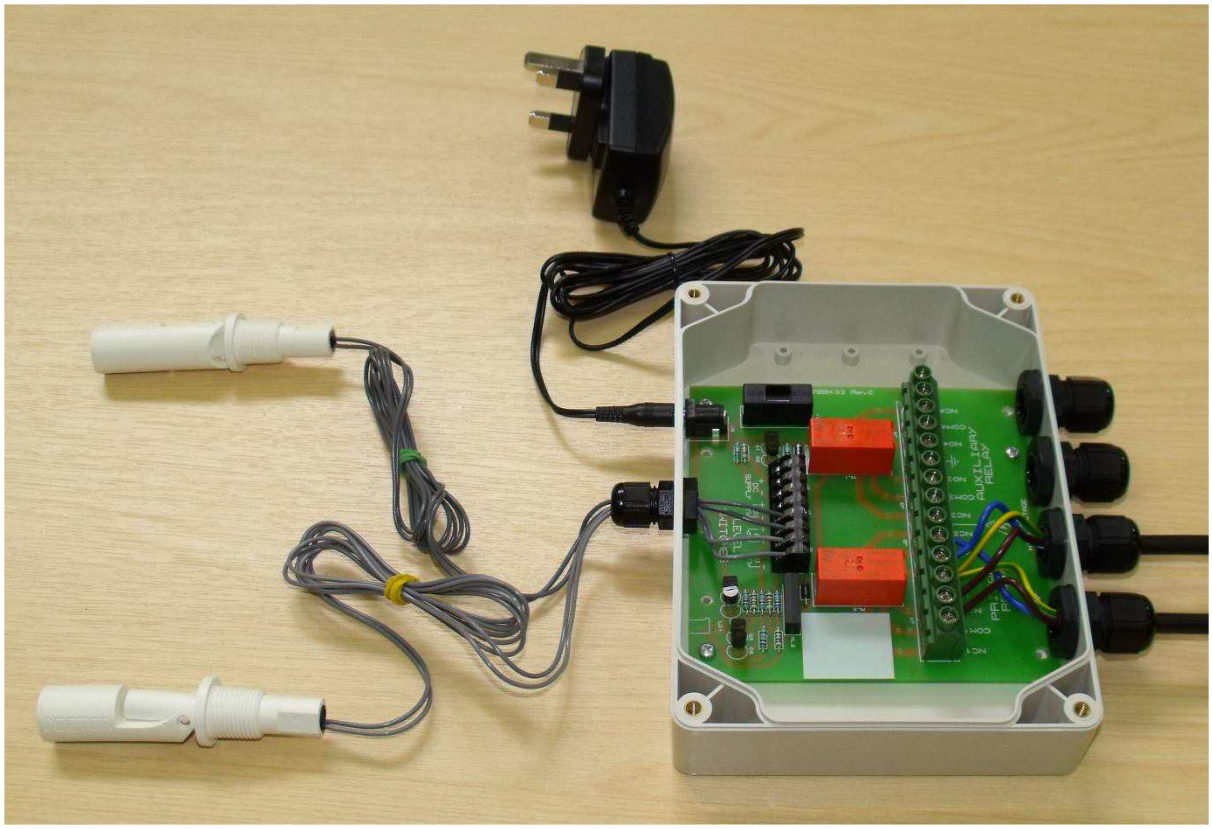


Figure 3

- Fit the Dual Level Controller lid.

- If wiring a DLC-1 or DLC-2, the 12VDC power supply plugs directly to the socket on the low-voltage side of the DLC.

5.1 Auxiliary Relay

The DLC-2 and DLC-3 have an additional float-switch input to activate an auxiliary relay. This relay is directly controlled by the float-switch without latching action. Wiring instructions are the same as for the primary relay, using the AUX terminals for the low-voltage float-switch input and terminal blocks J3 and J4 on the high-voltage side.

Note: The Primary and Auxiliary EARTH terminals are not connected inside the DLC but will be common if the input power is from the same supply.

The primary relay can be made to operate in the same manner as the auxiliary relay (i.e. no latching action), by connecting a float-switch to just the 'B' terminals and leaving the 'A' terminals disconnected – see section 6.5, Figure 9 for an example.

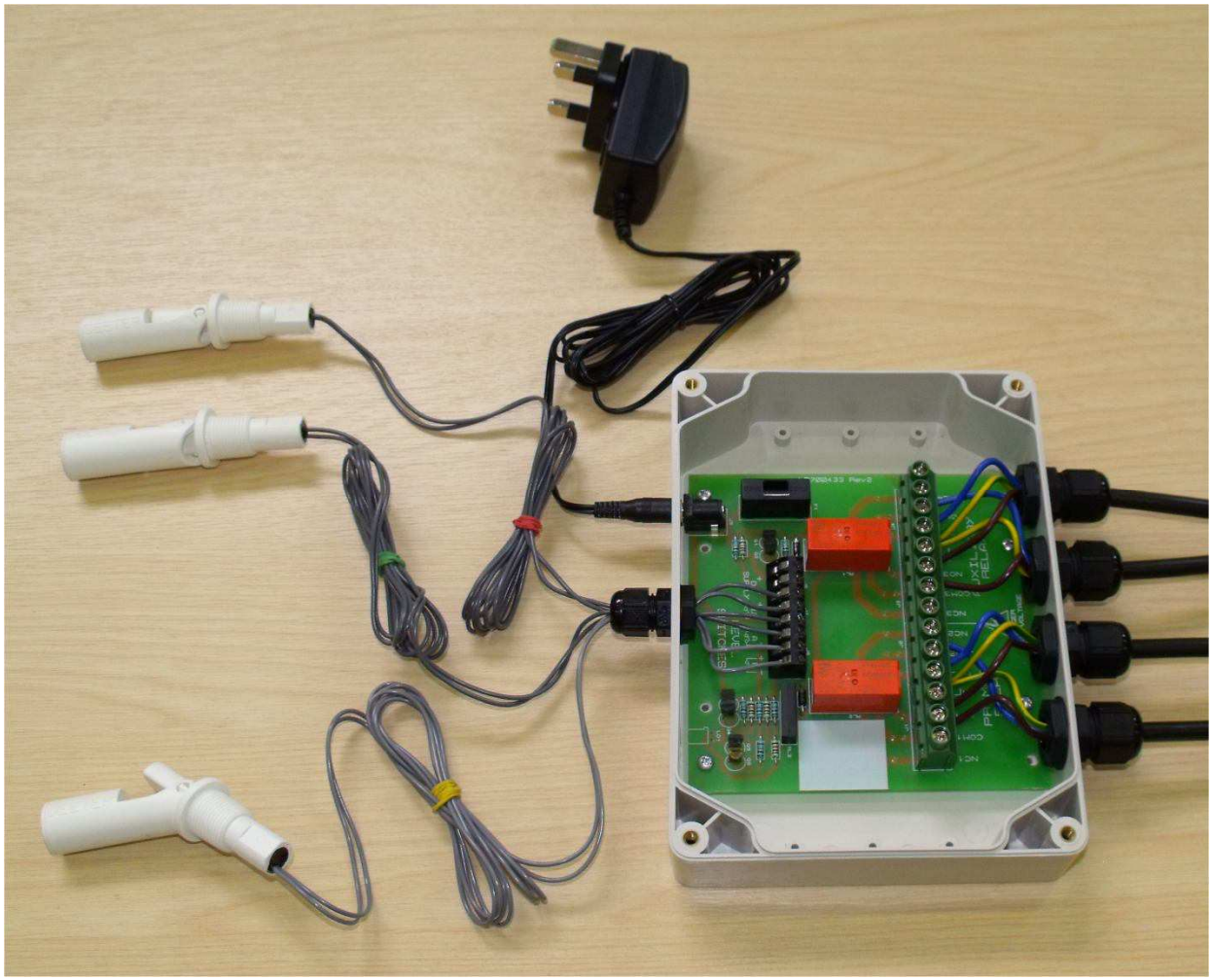


Figure 4

6 Application Examples

6.1 Filling a Tank – NO Contacts

This example shows a DLC-1 used to fill a tank and is equivalent to the arrangement in Figure 1.

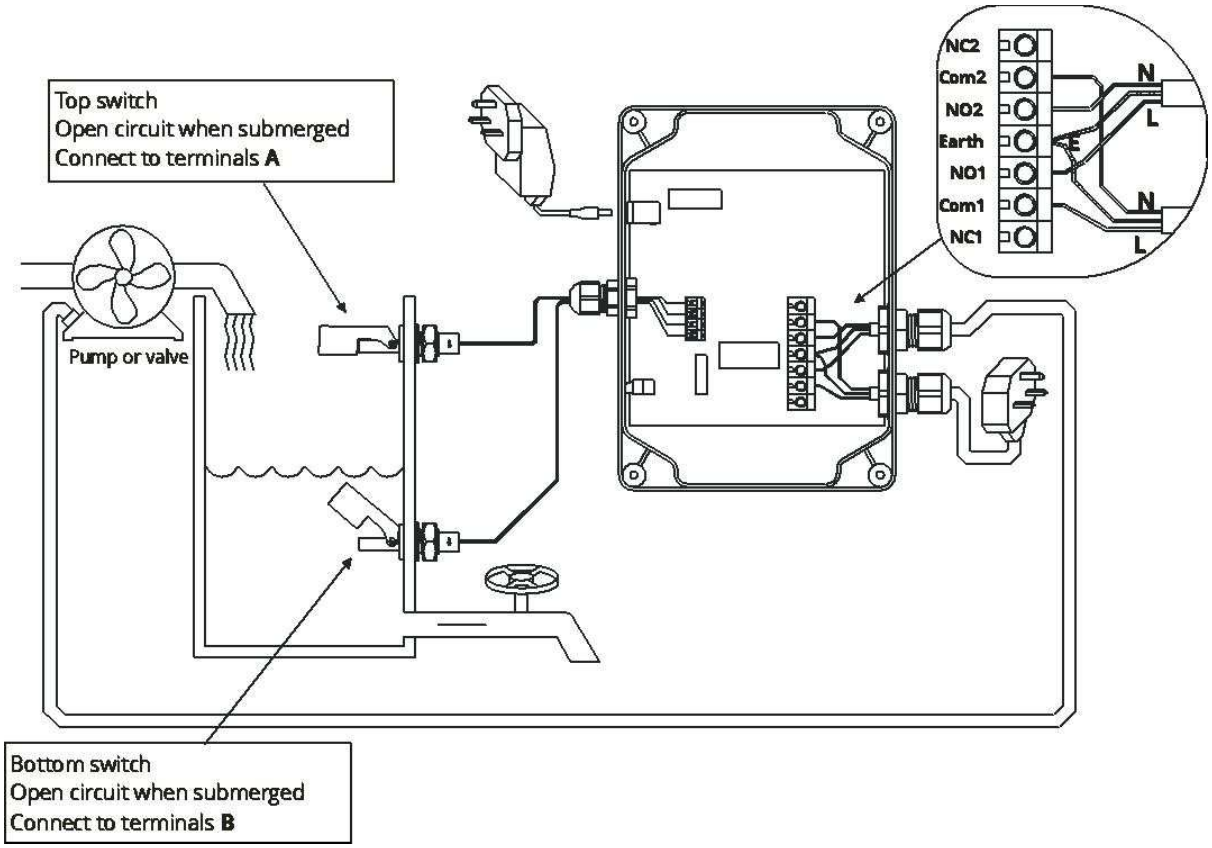


Figure 5

6.2 Emptying a Tank – NC Contacts

This example shows a DLC-1 used to empty a tank. Note that although this is the same function as in Figure 2, the float-switch orientation and connections are not the same because the NC contacts of the relay are used.

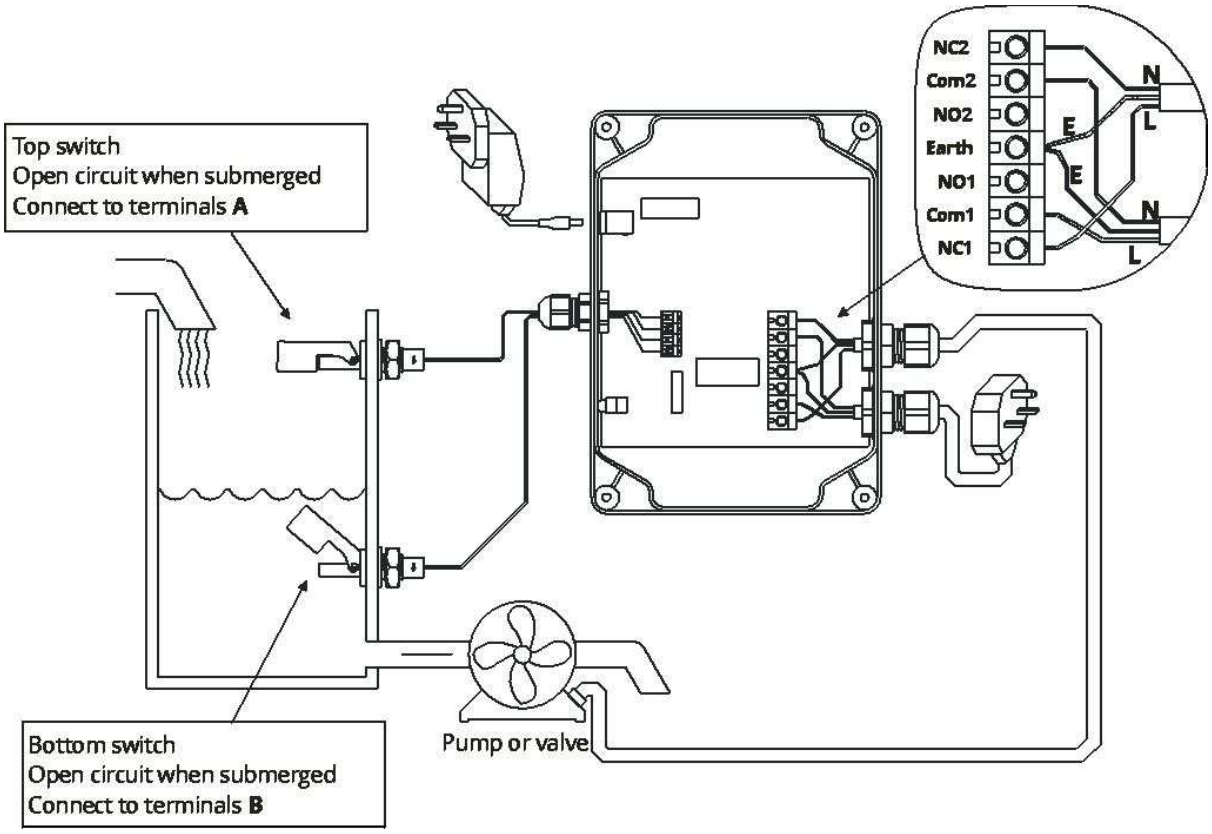


Figure 6

6.3 Filling from a Header Tank

This example shows a DLC-1 used to fill a main tank from a header tank, with the header tank prevented from running dry.

The main tank wiring is similar to Figure 5, but the '-' terminals of the 'A' and 'B' inputs are connected via a third float-switch in the header tank.

Note the orientation of the float-switch in the header tank is opposite to those in the main tank.

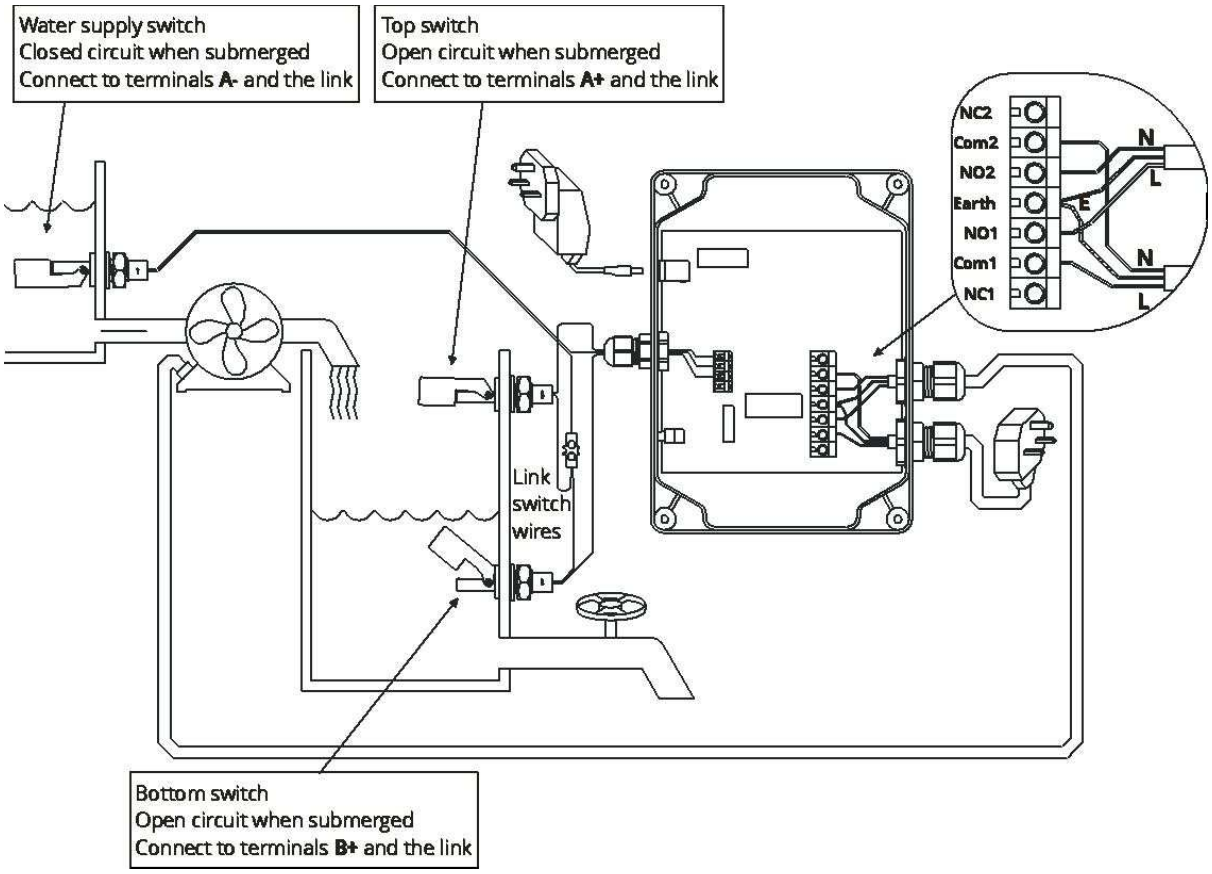


Figure 7

6.4 DLC-2 with Alarm

This example shows a DLC-2 used to empty a tank with the addition of an overflow alarm on the Auxiliary relay. The Alarm will sound whenever the top float-switch is closed (no latching action).

The tank emptying function is the same as Figure 6 but uses the NO relay contacts, so the float-switches are inverted (open when empty) and the 'A' and 'B' inputs are swapped.

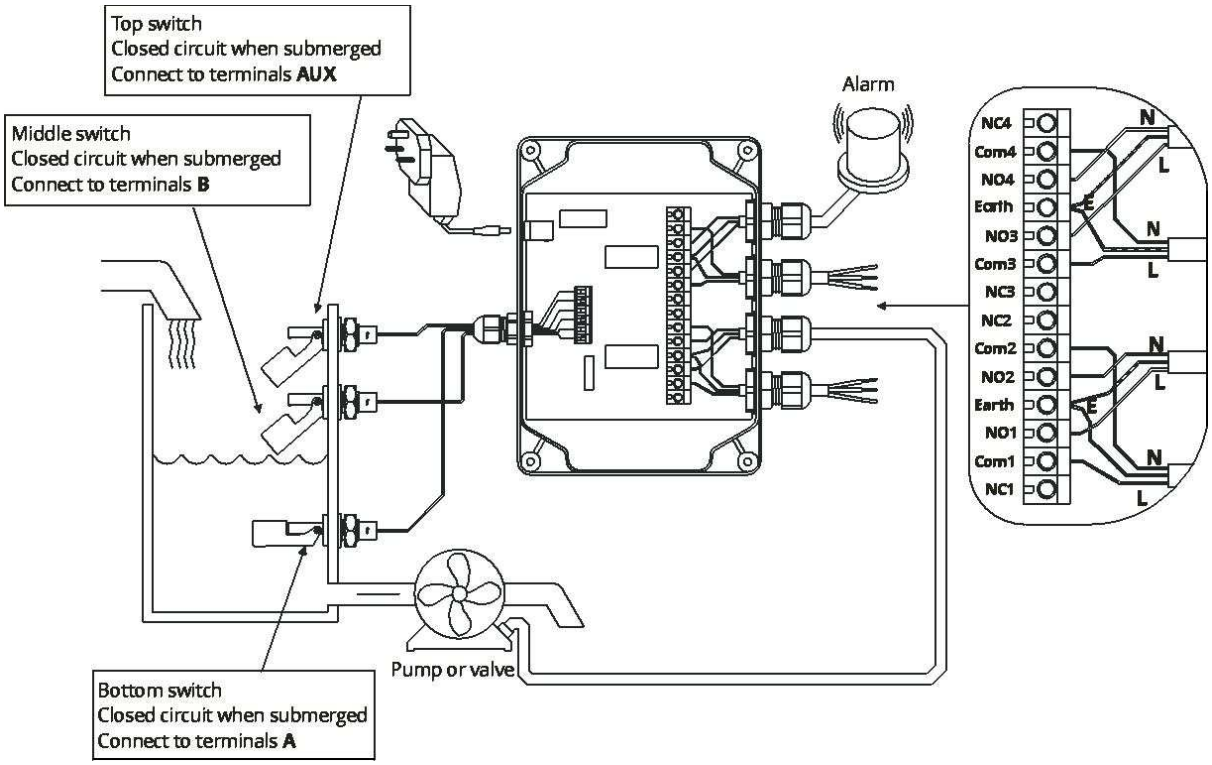


Figure 8

6.5 DLC-1 with Single Float-Switch

This example shows a DLC-1 used to empty a tank. There is no latching action so the pump will be activated whenever the float-switch is closed and turned off again when the float-switch opens.

There is some hysteresis between the on and off positions of most float-switches, which will enable this arrangement to work satisfactorily in many installations. However, this arrangement is not suitable for tanks with turbulent flow around the float-switch because the pump will switch on and off in rapidly succession.

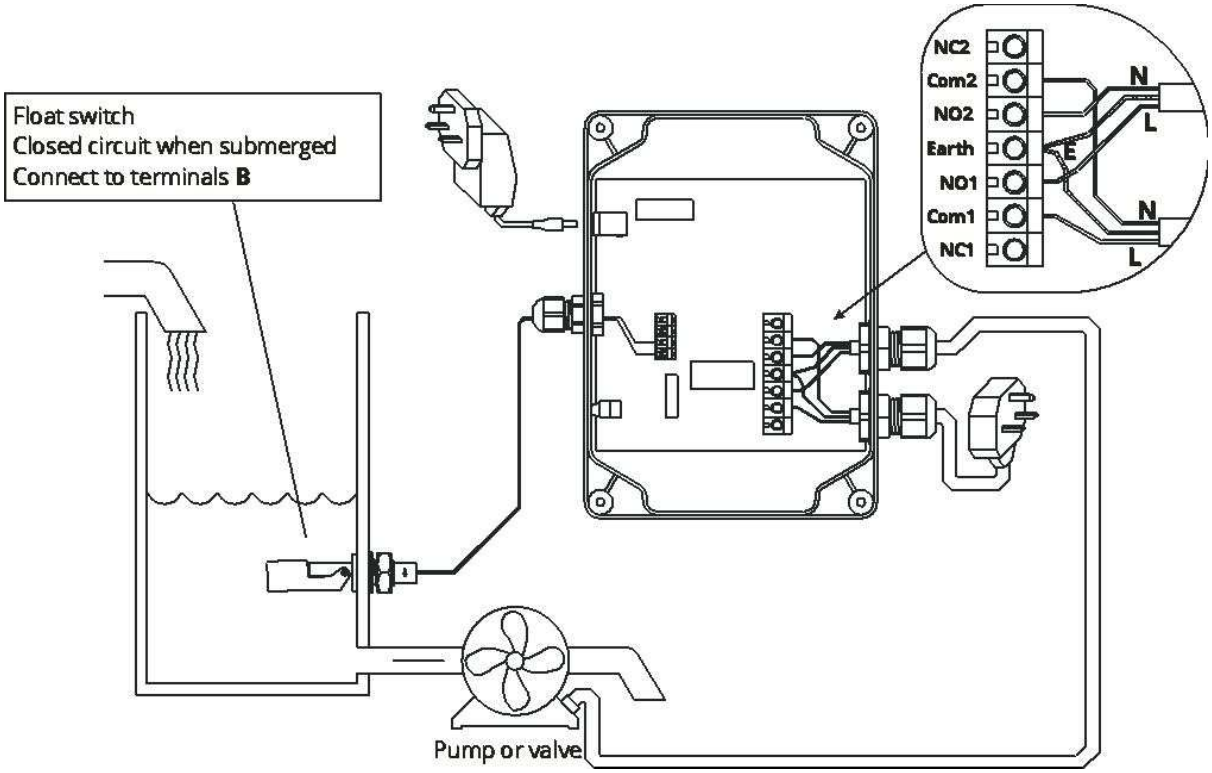


Figure 9

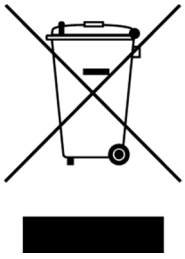
7 Specifications

Dimensions	63mm x 180mm x 175mm (including cable glands)
IP Rating	DLC-1 and DLC-2 – IP41 DLC-3 – IP65
Temperature Range	-20°C to +80°C
Power Requirement	10-14VDC @ 100mA
Mains Power Adapter – Supplied	100-240VAC input, 12VDC output @ 500mA
Power Input Terminal	DLC-1 and DLC-2 – 2.1mm socket, centre positive DLC-3 – screw terminals
Power Input Fuse	500mA anti-surge, 5x20mm cartridge
Float-switch Inputs – 'Open' State	>10k ohms (DC supply voltage across switch)
Float-switch Inputs – 'Closed' State	<100 ohms (1.2mA (typ.) through switch)
Relay Contacts – Maximum Current	8A continuous, 15A peak
Relay Contacts – Maximum Voltage	250VAC
Wire Sizes – Relay Screw Terminals	20 AWG – 12 AWG (2x14 AWG for 'earth' feed-through) 0.5mm^2 – 3.3mm^2
Wire Sizes – Float-switch Terminals	24 AWG – 14 AWG 0.2mm^2 – 2.0mm^2
Cable Sizes – High Voltage Side	4.5mm – 10mm diameter
Cable Sizes – Low Voltage Side	3.5mm – 7mm diameter

At the end of the equipment life, this product should be recycled according to the European Directive on Waste Electronic Equipment. Outside the EU, dispose of this product according to local recycling or waste disposal regulations.

This equipment is expected to have a long service life and regulations may change during that time.

This product must not be disposed in household waste.



8 Wall Mounting

The enclosure has a pair of mounting holes at each of the four corners, outside the seal and hidden by the cover. They will accept no. 4 wood screws or can easily be widened for larger screws. Figure 10 shows the drilling pattern.

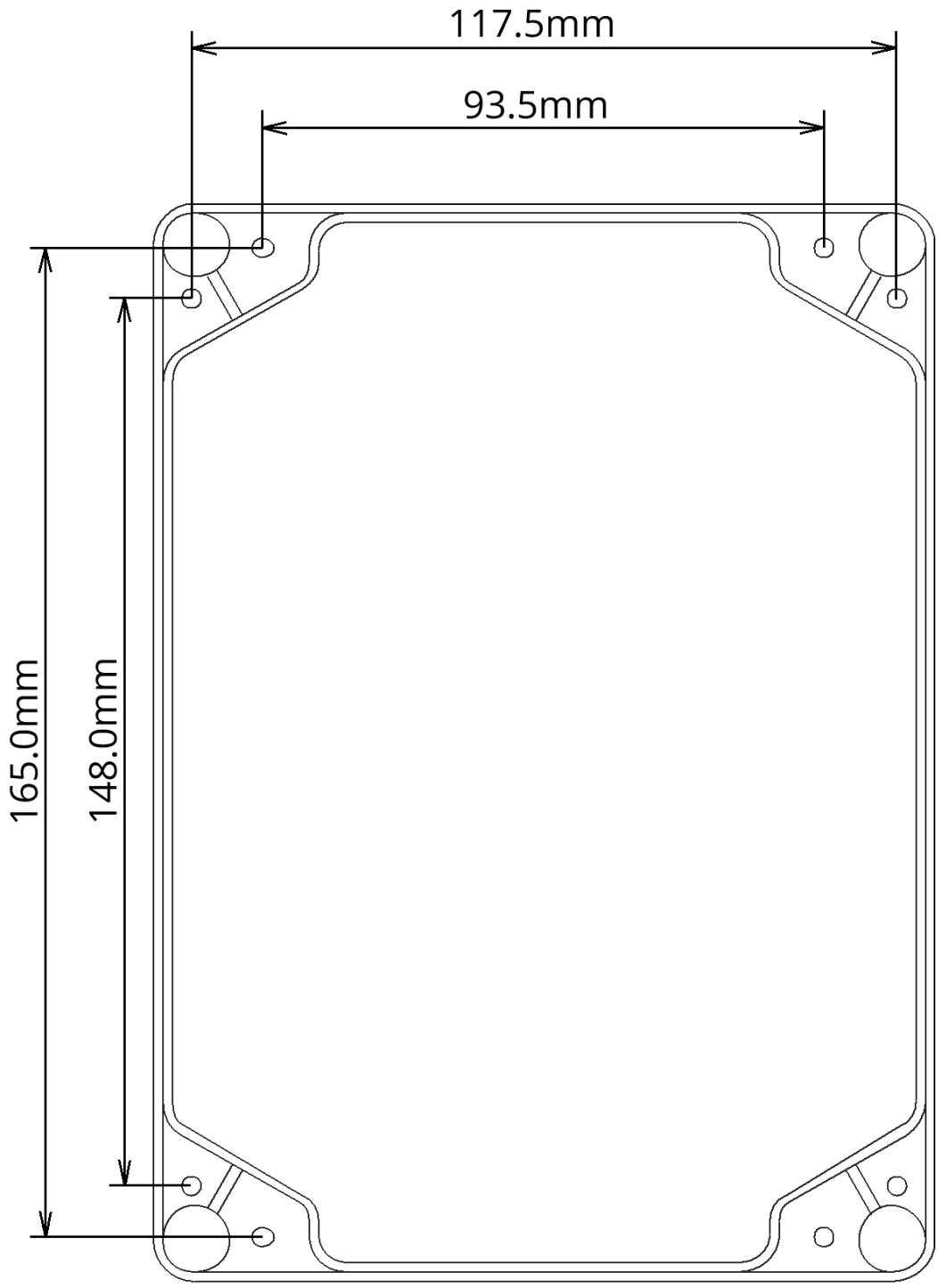


Figure 10