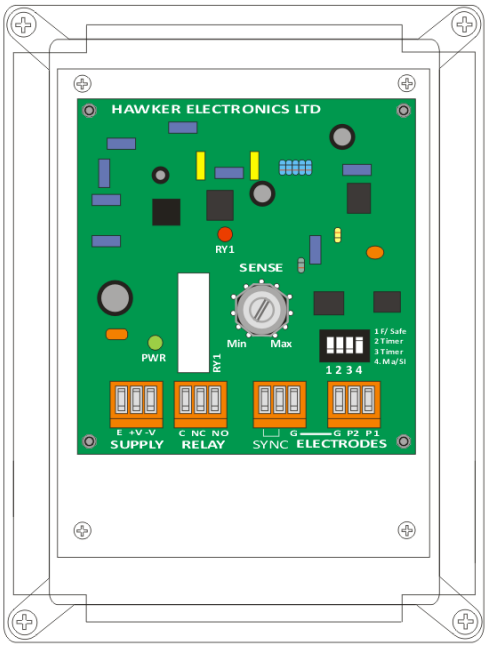
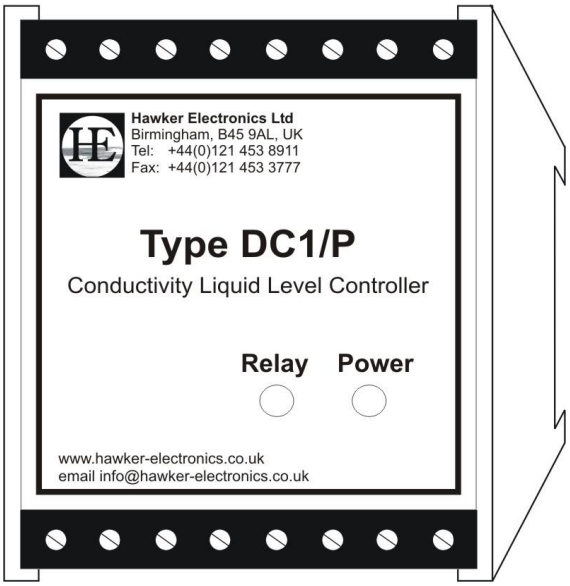
Type DC1 & DC1/P

DC Powered Conductivity Level Controller with ON/OFF Timer

OPERATING AND INSTALLATION INSTRUCTIONS





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The user should read this manual prior to installation or commissioning.

1. PRODUCT OVERVIEW

The DC1 controller is for use with Hawker sensing electrodes for detecting conducting liquids. The DC1 can be used with two electrodes to provide high or low level alarm or with three electrodes to provide control between two levels such as for pump control. The internal control relay provides volt free changeover contacts and can be set to either energise or de-energise on the presence of liquid thereby providing a 'fail to safe' feature to suit either 'filling' or 'emptying' of a vessel. Three selectable time delays are available and can be used to prevent erratic operation due to wave motion, turbulence or for general time delay applications.

2. OPERATING PRINCIPLE

The controller employs sophisticated circuitry that converts DC to low voltage AC signals for the electrode circuits. The level controller senses a change in the electrode signals when the measuring electrodes are touched by an electrically conductive liquid. Using low voltage AC prevents corrosion of the electrodes (electrolysis) and the low voltage ensures electrical safety. The electrode circuits are isolated from the users power supply.

3. MOUNTING, ELECTRICAL INSTALLATION AND CONNECTION

The product contains no user serviceable parts. The product should only be installed and used by suitably qualified persons, or those who have relevant experience. The product should be installed in line with national and or local regulations.

Two versions are available: The DC1/P which is DIN rail mounting and DC1 which is supplied in a wall mounting enclosure. When using the DC1 the user must fit suitable cable glands for the application. Care should be taken when drilling the cable gland holes so as not to damage the electronic circuit or enclosure.

An air gap of 5mm minimum should be left around the enclosures outer perimeter for proper air circulation to prevent overheating. It is recommended that the input supply is sourced via a suitably fused isolator located near the product. If the user is switching hazardous voltages through the product's output relay contacts e.g. mains 240VAC this should also be isolated and fused locally. Maintenance is not required for this product other than periodic testing if demanded by the application. Cleaning can be performed using a mild detergent and care should be taken not to clean the product with aggressive substances that may damage the enclosure, terminals or labels. Cleaning should be performed with the power disconnected; the unit should be completely dry before power is reapplied.

The product should not be mounted close to heat sources; electrically noisy apparatus e.g. welding machines and inverter drives; locations subject to strong vibrations or shocks; dusty or corrosive gas environments; outdoors in direct sunlight or high humidity areas.

3.1 Connections

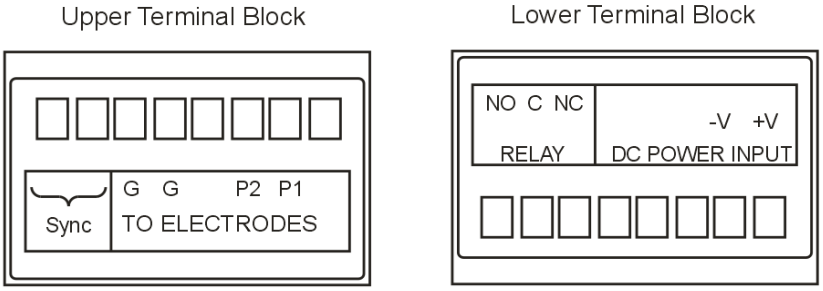
Each terminal block is labelled and care should be taken to ensure the correct terminals are connected to the appropriate installation wiring. All wiring and connections should be double checked before applying power to the product.

Relay contacts may be switching hazardous voltages, depending on the user application, take care.

When commissioning it is advisable to check the units basic operation is correct before connecting the relay contact wiring.

DC1/P

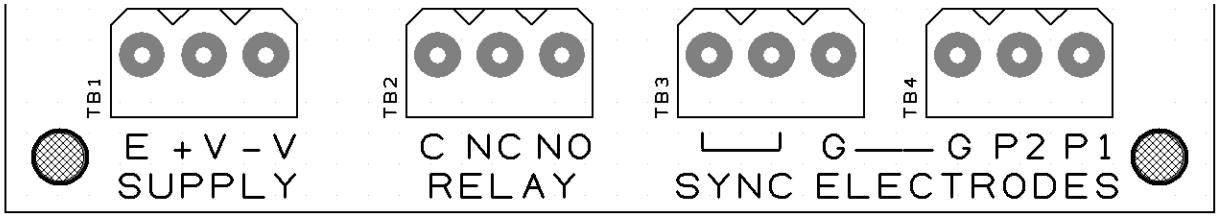
The DC1/P has an upper and lower terminal block, the power input terminals at the bottom, electrode terminals at the top.



DC1

During commissioning the enclosure lid may need to be removed on the DC1 to adjust the sensitivity control and DIP switches. It is recommended that if the volt free contacts are switching hazardous voltages the supply to these are turned off and disconnected whilst adjusting the product controls.

The DC1 has terminals via plug and socket fittings in a row at the bottom of the PCB.



Terminal Connections

The terminals connected are as follows:

+V –V	DC Power supply input to the product
C NC NO	User volt-free relay contacts
P1	To the shortest electrode in the vessel
P2	To intermediate electrode in the vessel (if used)
G	To longest electrode in the vessel or wall of metal vessel. See section 5.4.
SYNC	Used only when more than one controller is installed in a sump or tank. See section 5.3.

The DC1 has an additional earth terminal marked ‘E’; this is connected to the lower PCB mounting holes but is isolated from the rest of the circuitry. If the user has an incoming earth cable they can connect it to this terminal.

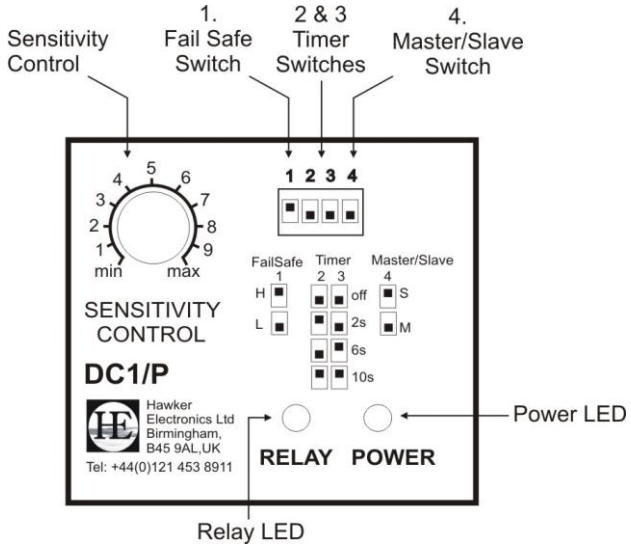
3.2 Cable installation general

The DC power supply and electrode cables may be run as single cores or multi-core cable. The use of screened cables is not necessary unless run in an electrically noisy environment, in this installation the screen may be earthed usually at the controller end to provide a shield.
It is important to avoid running the low voltage electrode signal cables or the low voltage DC supply cable alongside high voltage cables (i.e. 110V/250V/415VAC) where possible.

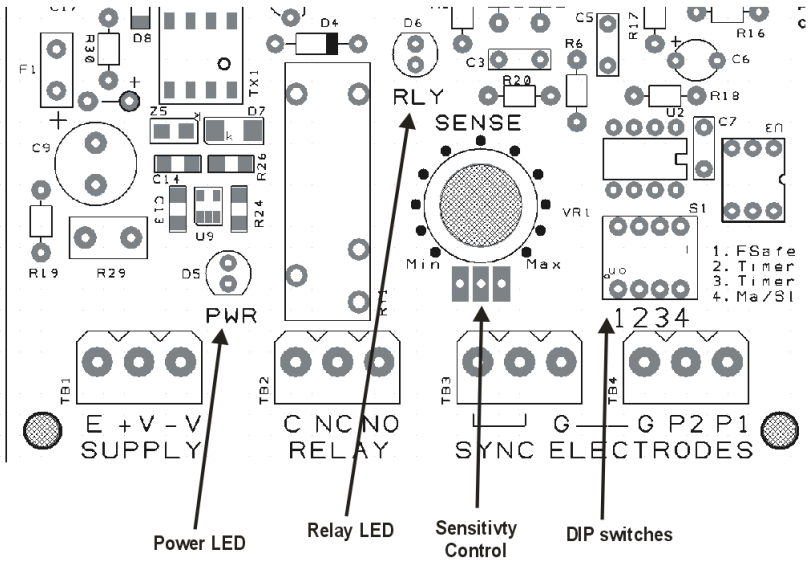
The maximum electrode cable length is limited by the electrode cable capacitance, but distances of several hundred metres are achievable using suitable cables. Screened cables generally have a higher capacitance per metre than single core per metre, and the higher the number of cores in a multi-core the higher the capacitance. Both of which should be considered when selecting the installation cable, especially for lengths over 100m.

4. CONTROLS AND INDICATORS

The DC1/P has a facia plate which shows the user settings and LEDs, this can be found under its snap ON/OFF cover.



The DC1 sensitivity control and switches are found on the PCB.



Green Led On when DC power is applied.

Red Led On when control relay is energised.

Sensitivity Control See section 5.1.

DIL Switch

Switch 1 Upper position sets Fail Safe to High. Relay de-energises when liquid is sensed.

Lower position sets Fail Safe Low, Relay de-energises when liquid is absent.

Switches 2 & 3 Set the control relay time delay. See section 5.2.

Switch 4 Sets the Master/Slave operation. See section 5.3.

5.0 ADJUSTING THE CONTROLS

5.1 Sensitivity Control

For clean liquid applications setting of the sensitivity control is not critical and it can be set to maximum. If foam is present on the surface a lower setting will enable this to be ignored.

For dirty liquid applications the sensitivity can be decreased. This will reduce false operation due to suspended matter clinging to the electrode such as a rag in sewage installations.

The sensitivity control is adjusted using the following procedure;

1. With the timer turned OFF (DIL switches 2 & 3 in the lower position) turn the sensitivity control fully anticlockwise. Raise the liquid level to immerse the P1 electrode tip by at least 5mm. Slowly turn the sensitivity clockwise until the relay changes state i.e. liquid is detected, continue turning clockwise one more division.

2. Lower and raise the liquid level to ensure optimum setting.

Note: The sensitivity control setting is inversely proportional to the length of bare electrode required for liquid detection, i.e. as the sensitivity control is increased less of the electrode has to be covered by the liquid before the controller switches. It is recommended that at least 50mm of electrode is bared. This will provide a better electrically conductive path should part of the electrode be contaminated with an insulating material e.g. fat or grease.

Where there are long cable lengths to the electrodes, the sensitivity can be set lower in order to counteract cable capacitance if this is found to be a problem. See section 3.2 Cable Installation.

5.2 Setting the Timer

The timer delays both the energising and de-energising of the control relay. This can be used to avoid false operation due to splashing, wave motion or turbulence. The timer can also be used to allow a pump to run on so as to clear solids where 'benching' in sump does not allow the stop electrode to be low enough.

Four settings are available using the DIL switch:

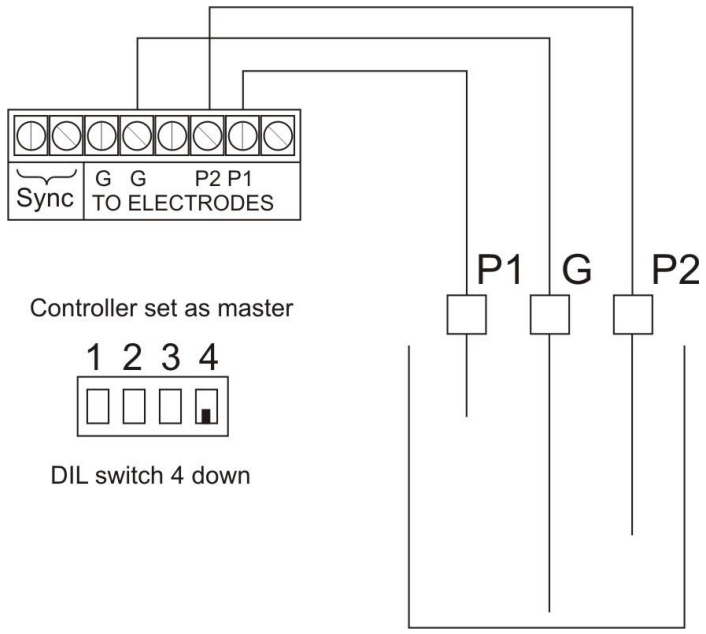
Time	Switch 2	Switch 3
OFF	DOWN	DOWN
2 Seconds	UP	DOWN
6 Seconds	DOWN	UP
10 Seconds	UP	UP

5.3 Setting the Master/Slave switch

The following application drawings show the DC1/P terminal blocks but also apply to the appropriate connection on the DC1.

Application 1: Single controller for Alarm or Control application

When using a single controller with up to three electrodes in a vessel, switch 4 must be set ‘down’ to the Master position and no connections are required to the ‘sync’ terminals.



Application 2: Multiple controllers for Alarm and/or Control in the same vessel using a common ‘G’ electrode

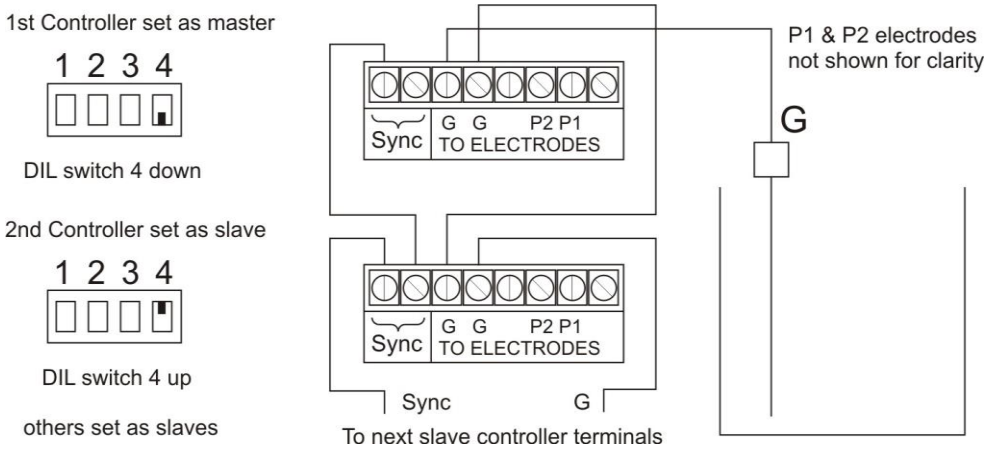
When using multiple controllers with electrodes in close proximity in the same vessel with a common ‘G’ electrode ensure the following is carried out to obtain best performance.

1. Configure one controller as a Master and the others as Slaves using the facia DIL switch. Link ‘sync’ terminals between controllers. Two internally linked ‘sync’ terminals are provided to facilitate wiring.

2. It is recommended that a maximum of six controllers share a common ‘G’ electrode, 1 master + 5 slaves. These can be for Alarm, Control or either.

3. When using a common ‘G’ electrode in a cluster of electrodes always position the common ‘G’ electrode central to the other electrodes. The objective is to ensure the active bare electrode tip has a clear conductive path to the ‘G’ electrode.

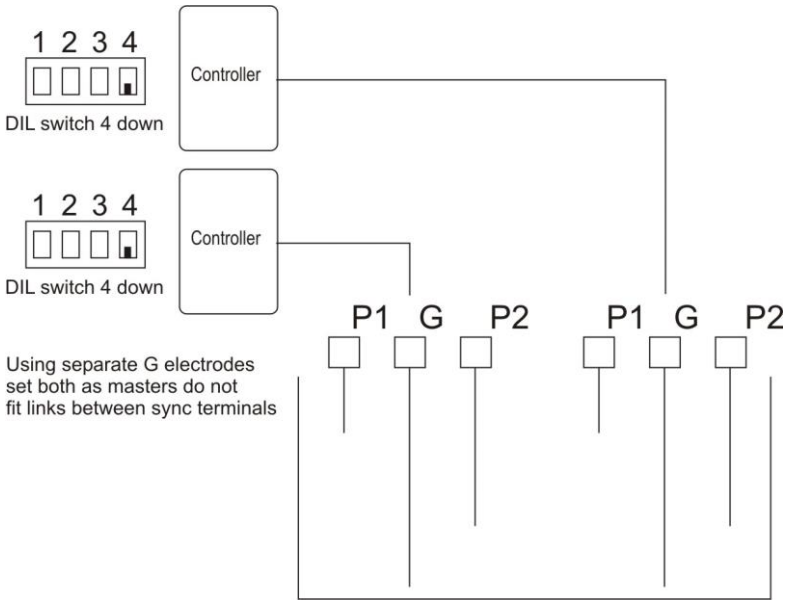
4. Try to keep each controller P1 and P2 electrodes close together; do not mount them in the conductive path of other controllers' electrodes.



Application 3: Multiple controllers with separate 'G' electrodes in the same vessel.

Configure the controllers as master devices switching DIL switch 4 to the lower position. No connections to the 'sync' terminals.

Ensure a minimum spacing between each different controller's electrodes of 300mm for optimum performance.



5.4 General Electrode Considerations

1. Try to keep each individual controller's electrodes together as a set i.e. do not locate an electrode of one controller in-between the electrodes of another.

2. Always place the G in the centre of the active electrodes to shorten the conductive paths.

3. The 'G' electrode must always extend below the lowest electrode.

4. A metal vessel can be used for the 'G' electrode.

The crossed-out bin symbol, placed on the product, reminds you of the need to dispose of the product correctly at the end of its life

Technical Data

Specification given at 25^{0}C over full input span

Supply

Voltage current:	10-27V DC 10V DC 110mA 1.1W 12V DC 90mA 1.08W 24V DC 49mA 1.2W Reverse polarity protected. Maximum current under fault condition is limited to approx 150mA.

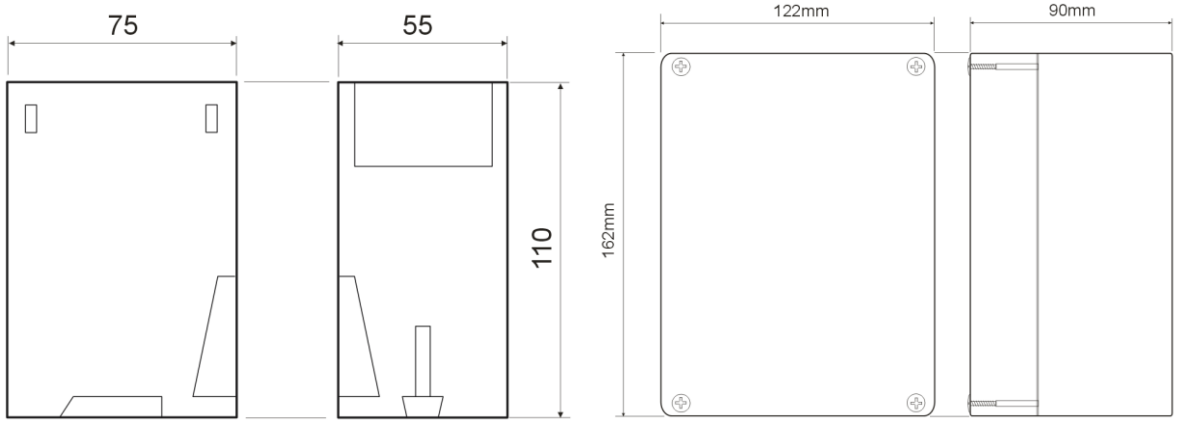
Electrodes

Configuration:	P1, P2 and G.
Voltage:	10VAC RMS max.
Peak to peak:	18V A.C.
Current:	5mA RMS max.
Frequency:	40Hz ±10%.
Cable capacitance:	Max cable capacitance is 180nF at maximum sensitivity, see cable manufacturers data sheet. Typically 300m max using instrument type cable <150pF/m core/core.
Cable type:	Typically, 0.75 – 2.5mm, single or multi-core, see general cable recommendations in user operating manual.
Liquid sensing range:	Approximately 200 to18,000 ohms, user adjustable via facia sensitivity potentiometer
Switching hysteresis:	Better than 5%.
Fail-safe:	Fail safe high or fail safe low user adjustable via facia DIL switch.
Timer:	Auto resetting anti-splash on/off delay timer. User adjustable via facia DIL switch 0, 2s, 6s, 10s ±0.25s.
Response timer:	<0.4s.

Output

Indication LED Green:	Power on.
Indication LED Red:	Relay energised LED on, relay de-energised LED off.
Relay:	SPCO, contact rating 5A 250V A.C./30V D.C., res. load Max switching power 1250VA/150W. Mechanical endurance 1x10^7 ops Electrical endurance min 1x10^5 ops (full load) Dielectric between open contacts 1000V A.C. 1 min
Operating temperature:	-10^{0}C to +50^{0}C.

Enclosure	DC1/P	DC1
Material:	Polycarbonate	Polycarbonate base and transparent polycarbonate cover
Dimensions:	55W x 110D x 75H mm	162H x 122W x 90D mm
Terminals:	Captive self-locking screws, accepts up to 4mm^2 conductor.	Internal Plug/Socket
IP:	IP20	IP66
Weight:	200g	550g



Due to continuing development Hawker Electronics Ltd reserve the right to alter the specifications without notice.