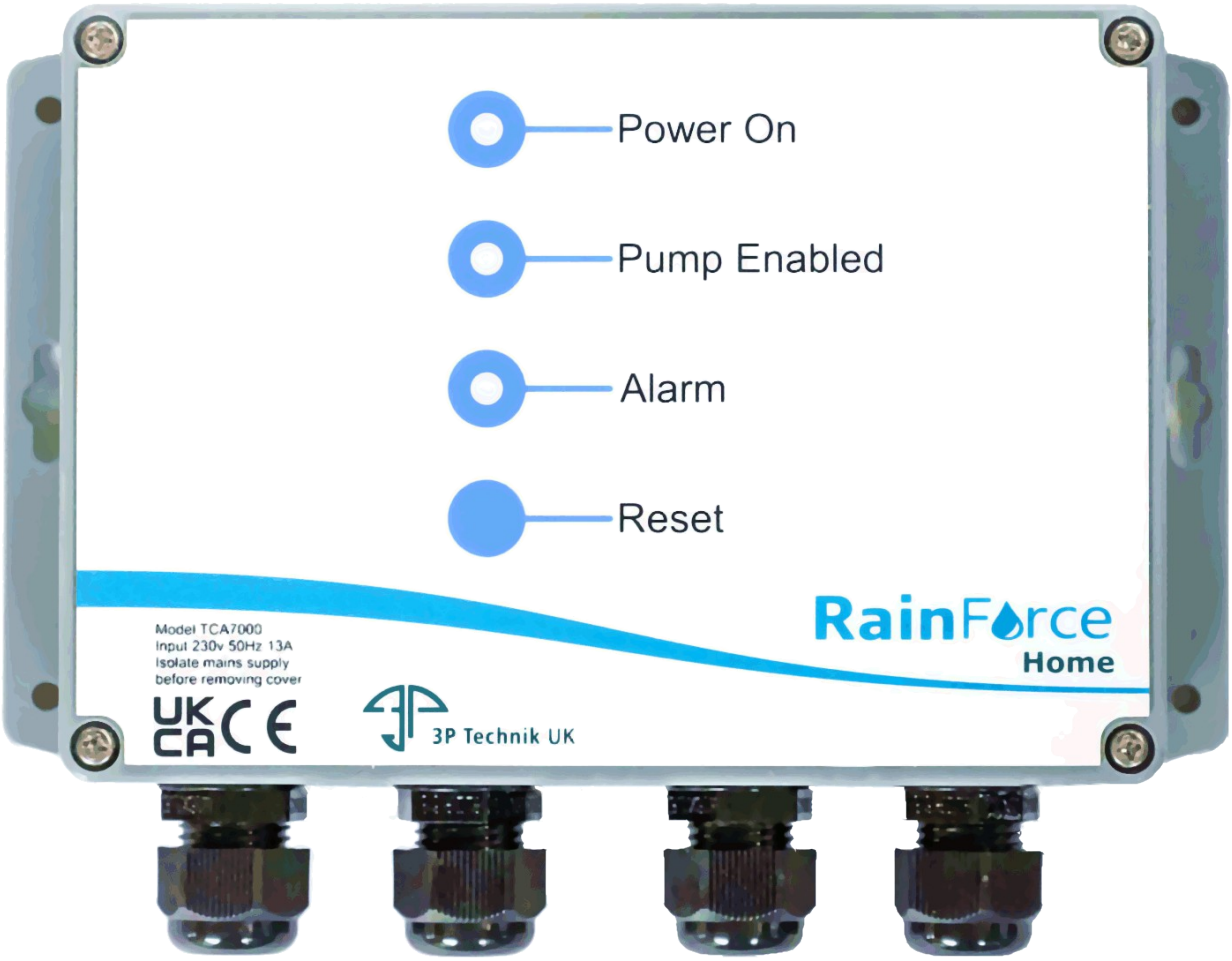
3P RainForce Home

TCA7000

Installation and Operation Manual



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Product Description

Automatic mains water top-up, for rainwater or mains water tanks, with leak detection feature and pump dry-run protection.

This unit is primarily designed to work with either automatic pumps, i.e. pumps which measure pressure and flow and start and stop themselves, or pumps controlled by a pressure controller or inverter. TCA7000 is not a pump pressure switch and won't control a basic manual pump. It will isolate a pump to prevent dry-running and the need to re-prime. If you are in any doubt, please consult a professional. Your supplier can advise you.

You will need to Commission a pressure controlled pump system, which needs to feed into a water tight delivery network. If you are in any doubt, please consult a professional. Experienced pump commissioning professionals are available to assist you. Failure to commission a pressure activated pump system may invalidate its warranty. A guide to commissioning is available as an Appendix to this document. A pressure vessel will prolong the life of pressure activated pumps.

Component Listing

1. Ball Valve, for isolating mains water supply.
2. 30cm Braided Steel Flexi Hose with Isolation Valve. To mains water feed.
3. Solenoid Valve.
4. 3P Tundish with Steel Wall Bracket. DN 40 Overflow. DN 50 Outlet.
5. TCA7000 Control Unit.
6. Level Probe, 20m standard.

Handling and Storage, Pre-installation

• Do not leave the Control Unit or solenoid valve outdoors in the rain. They are not IP68 waterproof. Do not store or use in a location subject to freezing temperatures. This may include some outbuildings and uninsulated loft spaces.

• This is not an armoured or heavy-duty appliance, it will not survive impact and drops, crushing, etc. Do not leave on the floor. If damaged do not use it.

• Do not store with or upon cement, sand, plaster, etc. These materials will corrode the circuit board (and cause cosmetic damage).

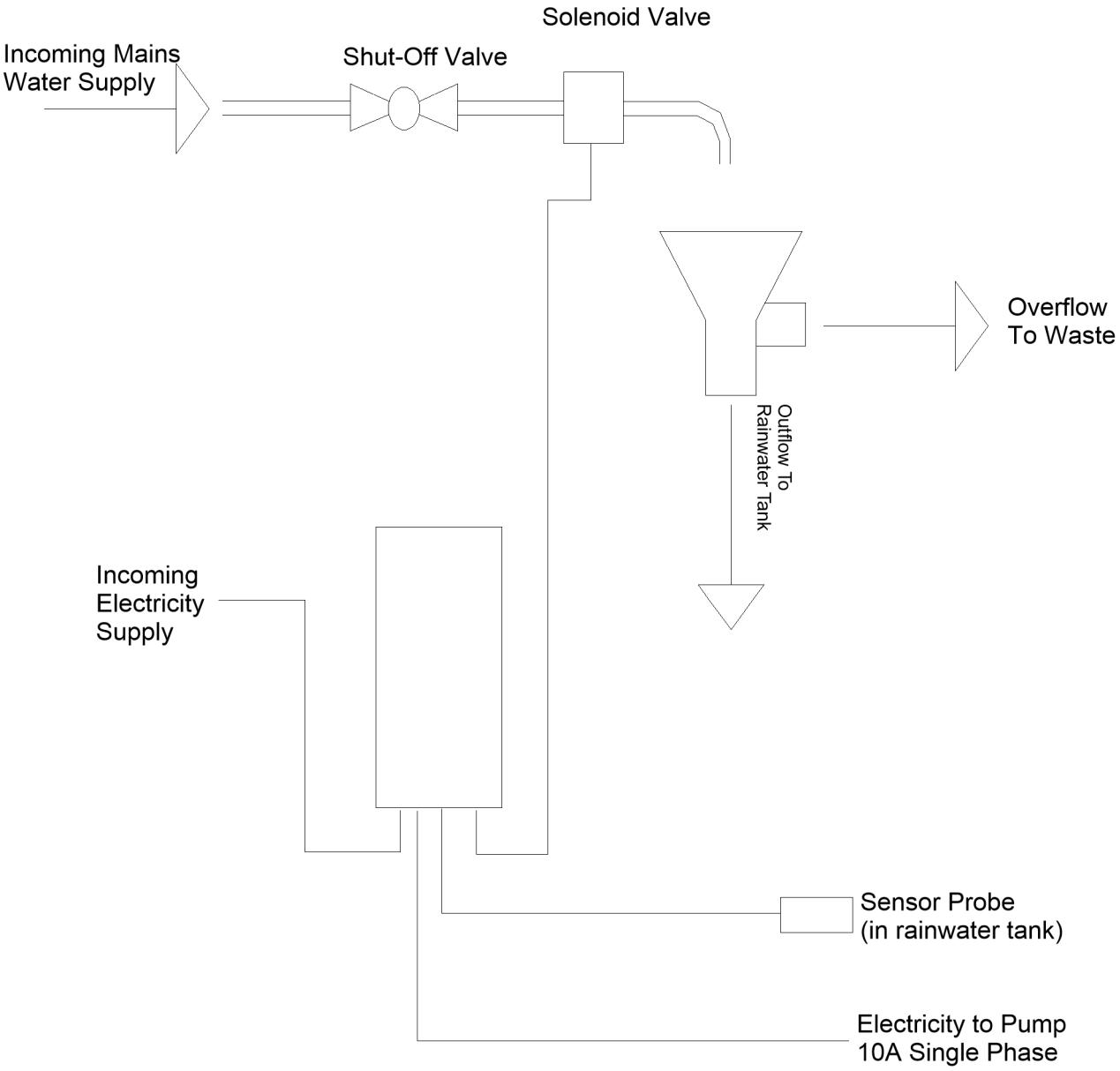
Installation

Site Selection for the 3P Control Unit
We recommend installation be carried out by a qualified electrician.
The Control Unit and Solenoid Valve must be mounted in a dry and sheltered location. Do not install the solenoid valve in a location subject to freezing temperatures.
It can be wall mounted.

NOTE: It is not a waterproof unit (splash resistant only). DO NOT install in a tank turret.

3P strongly recommends wiring the unit on a dedicated circuit, protected by a 10A Type C circuit protective device, in accordance with current best practice and regulatory requirements as defined by BS 7671, current IEE wiring regulations, and Part P of Building Regulations (where applicable). If in any doubt consult a qualified electrician.

If in any doubt you **MUST** consult a qualified electrician.


Solenoid Valve
Incoming Mains
Water Supply
Shut-Off Valve
Overflow
To Waste
Outflow To
Rainwater Tank
Incoming
Electricity
Supply
Sensor Probe
(in rainwater tank)
Electricity to Pump
10A Single Phase

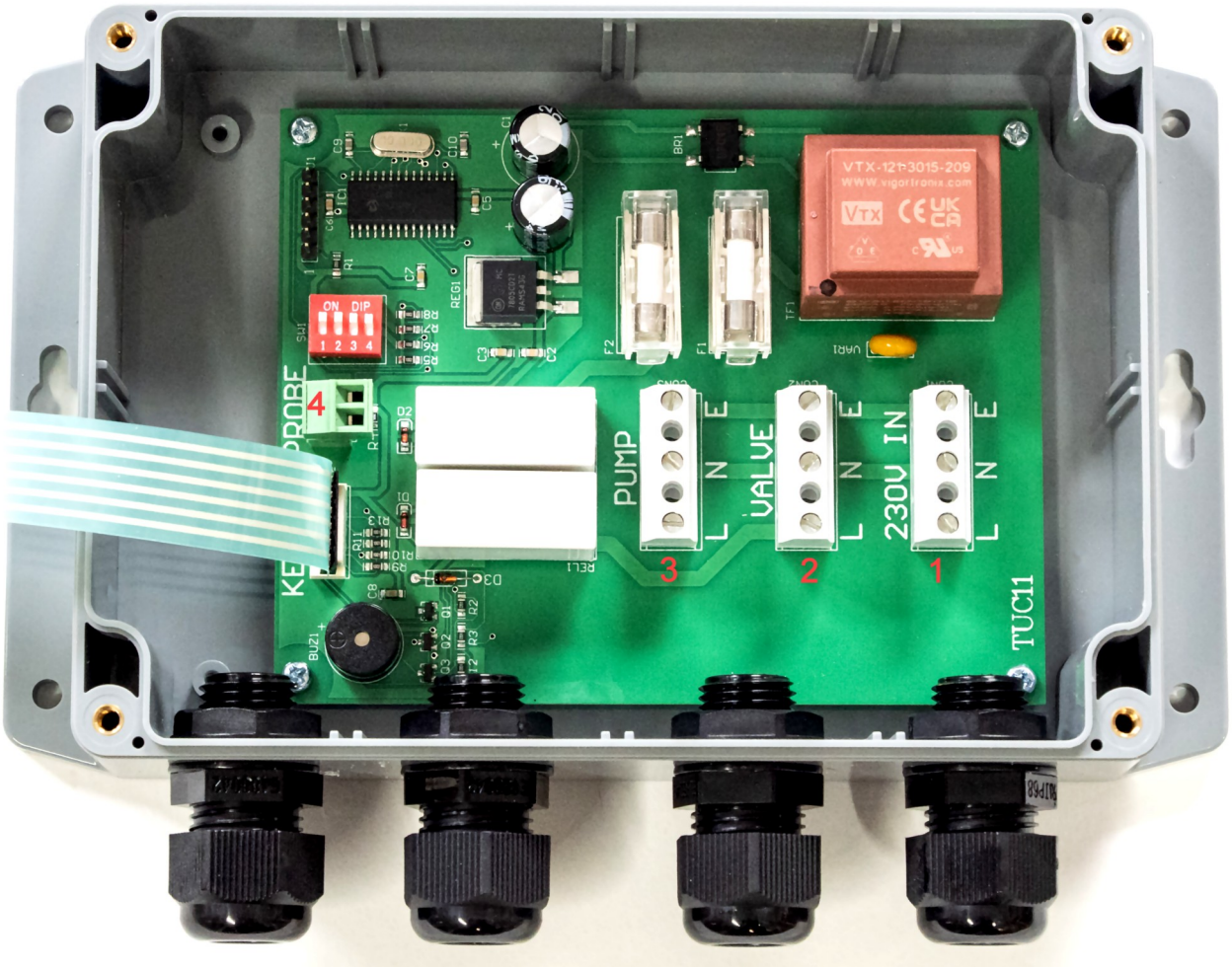
Wiring Connections

Connect the mains power to the terminal marked 230V IN (1)

Connect the solenoid valve to the terminal marked VALVE (2)

Connect the pump to the terminal marked PUMP (3) (optional – see notes below)

Connect the level probe to the green plug-in terminal marked PROBE (4)



Connecting a pump

The connection of a pump to TCA7000 prevents dry running by halting the pump during the top-up cycle to ensure it won't fully empty the tank and draw in air. But in some circumstances you may wish to omit this connection and connect the pump directly to mains power. For example, a washing machine supplied by the pump may fail to complete its cycle and cause annoyance if the water supply were suddenly shut off. Note that we only recommend omitting this connection if the pump has alternative dry-run protection (float switch or automatic pump).

The 3P Tundish and bracket assembly

The 3P Tundish acts as a Type AA air gap to comply with BS EN 13076: Devices to prevent pollution by backflow of potable water. The 3P Tundish itself and its' ½" feed nozzle are both freely rotatable in the wall mounting bracket.

Install the 3P Tundish so that the potable water feed can gravity flow freely into the tank. Check the rate of delivery of potable water does not exceed the capacity of the connected hose/pipework to reach the tank at your site, without backing up. This is part of the Commissioning of your rainwater harvesting system installation process.

The 3P Tundish outlet to the tank (Nominal OD 47mm, ID 39mm) can be connected using 2" hose or with a 50mm MDPE Compression fitting, usually reducing to 32mm minimum, or using Waste Pipe at 50mm.

Note the 3P Tundish has an optional overflow. This is recommended and particularly useful if the top-up feed pipework to the underground tank gets blocked, as it will then likely prevent flooding of the room where the Controller is located.

The Level Probe, a Conductivity Sensor

The supplied conductivity Level Probe is used as a minimum water level detector in the rainwater tank. The standard length of cable supplied is 20m. Longer probes can be purchased up to 100m. It carries a very low voltage/current.

Position the Level Probe in the tank so that it is suspended approximately 0.3 to 0.4 metres above the bottom, depending on the shape of the tank and position of pump inlet. It should be positioned to ensure there is no risk of cavitation or air entrainment to the pump inlet. If in doubt you MUST consult an approved and qualified plumber. The height of the Level Probe determines the minimum water level of the tank at which the pump will run.

The Level Probe works by conductivity. When the Level Probe's contacts are immersed in water a circuit is completed and the control unit detects this. When the prongs of the probe come out of the water, the top-up cycle is activated.

OPERATIONAL ADVICE NOTES

Ensure that the tank is entirely free of debris before installing a pump and this controller. Sand, grit, cement and even plastic swarf from manufacturing and other debris can quickly clog any filters and may damage the pump's internal parts and the pump's impellers, prematurely shortening the operational life of the system, and invalidate pump and other component warranties. The potable feed pipework to the solenoid must also be clear and free of debris.

Maintenance Advice

It is good practice to gently clean the probe at intervals of three years or whenever checking the tank.

We recommend that the product and it's installation should be fully tested after installation and be inspected and tested periodically thereafter.

Operation

Control Unit Operation

When the Control Unit is powered up:

High Water Level: If the Level Probe is immersed in rainwater, (i.e. below the rainwater level in the tank) then the green Power On LED and the Pump Enabled LED remain on, there is power to the pump socket (so a connected pump will then run) and the solenoid valve is closed (i.e. not topping up).

Low Water Level: If the rainwater level falls below the Level Probe a top-up cycle will begin. The green LED flashes and the Solenoid Valve opens to allow mains water to flow via the Tundish and so into the rainwater tank. During the top-up cycle the pump will be turned off (power to the pump is isolated during topping up) and the Pump Enabled light goes out.

NOTE – Connecting the pump to TCA7000 is optional, it prevents the pump from dry-running and potentially needing to be re-primed. It also interrupts the supply of rainwater during top-up which may not be desirable for some appliances such as some washing machines.

Top-up Overfill Delay: Once the water level reaches the Level Probe again the pump is re-enabled, and so allowed to run. The solenoid valve will remain open for a further ONE minute (default setting) before closing. The top-up cycle is now complete and the Power On LED changes from flashing to solid.

Anti-Blocking Cycle: After 3 days of solenoid inactivity (no mains water top-up needed) the Control Unit will momentarily open and close the Solenoid Valve to prevent seizure due do limescale or other contaminants. This process takes place automatically.

Top-up Failure Alarm: During a top-up cycle, if the water level in the tank has not reached the level probe after 30 minutes of topping up, the unit will shut off the pump and close the solenoid. The red alarm LED lights to indicate that there is one or more of the following:

1. a leak or blockage in the delivery pipework feeding to the tank
2. a failure of the tank itself, or
3. a problem with the solenoid valve.

A buzzer will sound until the unit is reset.

Reset: To reset the control unit, press and hold the reset button. If the buzzer is sounding it will stop, if the buzzer is not sounding it will beep once. The top-up time delay and alarm timer are reset.

LED Indicators

LED	Colour	On	Off	Flashing
Power On	Green	System is active	System is inactive (isolated from power)	Mains water top-up in progress
Pump Enabled	Green	Automatic pump is able to operate	Automatic pump is isolated, top-up in progress	
Alarm	Red	Mains water top-up exceeded time-out duration. System halted.	Normal operation	

Adjustable Top-up & Alarm Settings

The top-up overfill duration and the top-up time-out alarm duration can be adjusted, TCA7000 has a wide range of settings to allow for most situations. In addition you can put the system into test mode to check all the operating parts of the controller.

The power supply MUST be disconnected before opening the Control Unit, there are hazardous voltages inside.

Mode	Switch				Top-up Overfill Duration (Minutes)	Top-up Timeout Alarm (Minutes)
	1	2	3	4		
1	0	0	0	0	1	30
2	0	0	0	1	15	45
3	0	0	1	0	30	120
4	0	0	1	1	60	180
5	0	1	0	0	120	240
6	0	1	0	1	0	1
7	0	1	1	0	0	30
8	0	1	1	1	0	240
9	1	0	0	0	1	Disabled
10	1	0	0	1	15	
11	1	0	1	0	30	
12	1	0	1	1	60	
13	1	1	0	0	120	
14	1	1	0	1	240	
15	1	1	1	0	0	
16	1	1	1	1	0	Test Mode

After changing the operating mode, reset the controller by pressing and holding the reset button, a confirmation beep will be heard after approximately 1 second, the system has now reset and is operating in the chosen operating mode.

TCA7000 is supplied set to mode 1

In modes 6, 7, 8, 15 top-up will cease the moment the water level reaches the conductivity probe. This will suit very small tanks such as header/break tanks, or for testing the top-up function during installation.

Modes 9-15 have no top-up timeout alarm, this can suit systems with very large tank capacity or very limited mains water flow rates. In the event of a top-up failure the solenoid valve will be powered until the fault is discovered by other means, no alarm will occur.

Test Mode

In this mode both outputs are powered allowing a technician to test for mains voltage at the connectors CON2 and CON3, verifying the operation of the output relays and 10A fuse. Additionally the Power On and Pump Enabled indicators are lit to verify their operation. Upon measuring conductivity or simply closing the contacts at CON6 (also marked PROBE), the Alarm indicator lights up and buzzer sounds. In this way all parts of TCA7000 are tested (outputs, lights, input, and buzzer).

Troubleshooting Guide

Problem	Lights			Possible Faults	Solution
	Power On	Pump Enabled	Alarm		
Top-up not working	On	On	Off	Water detected when probe is not immersed	Check probe for any cable joints that may have become wet, or damaged sections.
				Probe immersed	Check/adjust probe height in tank
	Flashing	Off	Off	Solenoid valve siezed	Verify power to solenoid, replace parts as necessary.
				Solenoid valve coil failed	
				Mains water supply failure	Restore mains water supply
				Mains water overflowing – duct to tank blocked	Clear blockage
				Power output to solenoid failed	Return TCA7000 for repair
	On	Off	Flashing	Top-up alarm duration exceeded	Reset TCA7000 – press and

					hold reset button
					Increase top-up alarm timeout
	Off	Off	Off	Mains power fault	Restore mains power
				Fuse F1 blown	Check/replace fuse
				TCA7000 faulty	Return TCA7000 for repair
Pump not working	On	On	Off	Fuse F2 blown	Check/replace fuse
				Power output to pump failed	Return TCA7000 for repair
				Pump failed	Refer to pump supplier/manufacturer
	On	Off	Flashing	Top-up alarm duration exceeded.	Reset TCA7000 – press and hold reset button
					Increase top-up alarm timeout
Mains top-up does not stop	On	On	Off	Permanent power to solenoid, relay siezed on.	Verify voltage to solenoid, return TCA7000 for repair.
				Low mains water pressure	Check/adjust any pressure reducing valves in water supply, or change solenoid for direct acting type.
Supply RCD trips	-	-	-	Mains current leaks from	Disconnect

(earth leakage)				phase to ground or to protective earth conductor	pump and re-test.
					Check TCA7000 for water ingress or visible damage
					Return TCA7000 for repair
Supply MCB trips (overcurrent)	-	-	-	Excessive mains current	Disconnect pump and re-test.
					Return TCA7000 for repair

Warranty

All products are covered by a 12 month limited RTB (Return To Base) warranty against materials and manufacturing defects from the date of purchase. The warranty does not cover malfunctioning due to a failure to properly install and / or commission the product in accordance with the installation instructions. The warranty does not cover modification, physical damage or misuse, or operation outside of the products electrical or environmental limits. The warranty is limited to the repair, replacement or cost of replacement of the product at the discretion of 3P Technik UK Limted and does not cover inconvenience or consequential losses. We do not guarantee continuity of operation of any product under any circumstances. For full details see 3P Technik UK Limited terms and conditions.

Technical Specification

Control Unit

Dimensions (W x H x D):	55mm x 171mm x 121 mm
Weight:	0.5 kg
Supply voltage:	AC 230/240 V 50 Hz
Nominal Power Consumption:	5w (excluding pump)
Internal fuses:	F1 100 mA F2 10A
Pump power outlet rating:	AC 230/240 V, max. 10 A (fused)
Operating Temperature Range Ambient:	0 °C to +40 °C
Electrical Insulation:	Class 2
Ingress Protection:	IP 65 (BS EN 60529)
Electrical noise immunity:	According to BS EN 50082-1
Electrical noise suppression:	According to BS EN 50081-1

Level Probe

Supply voltage:	DC 1.65 V
Probe current:	1.2 mA
Cable length:	20m (max. 100m)
Cable material:	PVC
Weight:	0.2 kg
Material:	Stainless Steel
Principle of operation:	Conductivity
Medium:	Clean water

½” Solenoid Valve

Dimensions (W x H x D):	171mm x 121mm x 55mm
Weight:	0.5 kg
Supply voltage:	AC 230-240 V 50 Hz
Power consumption:	max. 5.5 VA
Connection cable:	2m
Mounting position:	Any
Medium:	Clean water
Maximum pressure:	10 bar
Water Connections:	Inlet: 1/2” BSP
Flow coefficient KV (lpm):	59
Function:	Normally closed
Protection:	IP 65 (EN 60529)