KELCO T20 TIMER

INSTALLATION & PROGRAMMING INSTRUCTIONS

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WARNING

This symbol is intended to alert the user to the presence of important operating and maintenance instructions in the literature accompanying the T20 timer

WARNING

This symbol is intended to alert the user to the presence of un-insulated “dangerous voltage” within the timer’s enclosure that may be of sufficient magnitude to constitute a risk of severe electric shock.

IMPORTANT SAFETY INSTRUCTIONS

- **Read these instructions.**
- **Keep these instructions.**
- **Heed all warnings.**
- **Follow all instructions.**
- **Do not allow water to enter this timer.**
- **Install this timer per the manufacturer's instructions.**
- **Do not install this timer near any heat source such as radiators, gas heaters, stoves or any other appliance that produces heat.**
- **Do not modify this timer in any way.**
- **Do not drill holes in this timer's casing.**
- **Refer all installation and servicing to qualified service personnel.**
- **Servicing is required when the timer has been damaged in any way, such as submerged in water, exposed to fire, dropped or objects dropped on it. Exposed to moisture or water when the timer's lid is removed.**

WARNING

Please read these installation and operating instructions carefully and fully before installing or servicing this timer. The T20 is a mains voltage device. Death or serious injury may result if this product is not correctly installed and operated.

Overview

When connected to an external flow switch the T20 timer provides a pumping system with a set of useful time and flow based functions. The T20 can be configured in a variety of ways to control the pump and to protect it. It can be set to start a pump in spite of an initial lack of flow and to then do no more than protect it against loss of flow. The T20 can also be programmed to simulate a complex pump control panel. This document sets out in detail the installation and functions of the T20 timer and some of the main ways in which it can be used in pumping and irrigation systems.

WARNING

Without its lid in place the T20 timer is not water resistant and presents a potential shock hazard. Take great care not to splash water onto the T20 when the lid is not in place. Always replace the lid and fully tighten its 6 securing screws immediately after any changes to the timer's settings are made.

INSTALLING THE T20 TIMER

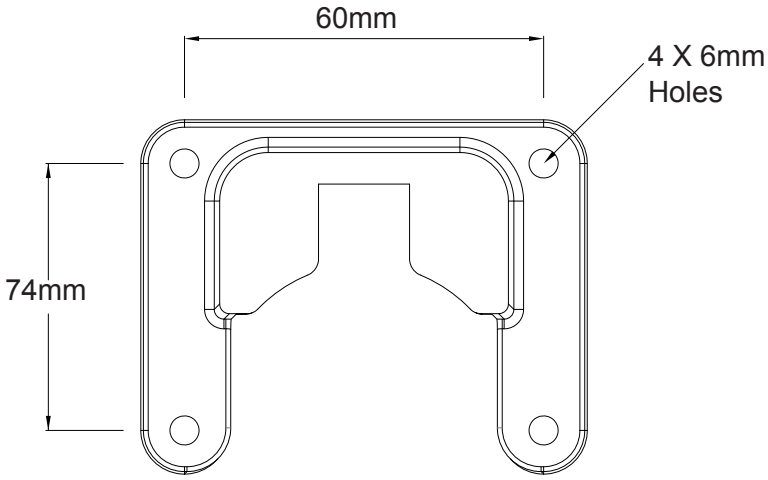
Location

Where possible install this timer in a location that is sheltered from direct exposure to the weather. The T20 is weatherproof and is supplied with a protective clip on cover. However, to ensure a long reliable life we recommend it be protected from direct exposure to the sun and rain. Intense sun light will eventually cause discolouration and degradation of the timer's housing. It is therefore advisable to protect the timer from the weather if possible.

The T20 timer should be installed on a wall or on a bracket attached to a pump or its pipework. Where large pump motors are to be directly controlled, mount the T20 as close as practical to the supply and pump to keep heavy cable runs to a minimum.

Installing the T20

The T20 timer is supplied as two separate assemblies, the wall mounting bracket and the electrical housing. The mounting bracket should be installed first by securing it to a wall or to a plate attached to the pipework or pump. The drilling pattern is shown below.



Attach the electrical housing to the wall bracket by engaging the two toes on the bracket into the two notches in the retainer plate on the underside of the electrical housing. Secure the electrical housing to the wall bracket using the large hex headed red bolt supplied in the kit. Tighten the red bolt using a broad bladed screwdriver or small socket wrench. Do not overtighten it.

Electrical

WARNING

All electrical work associated with the T20 must be carried out by qualified electrical personnel and all electrical work must conform to AS/NZ standards and to local wiring rules. For mains voltage applications we recommend the supply to the T20 be isolated by an RCD that has a maximum trip current of 30mA.

Introduction

The T20 timer is designed to directly control single-phase pump motors to 3.75kW. No interposing contactor is required for such applications. If a supply neutral or transformer is available, the timer can also be used to control 3 phase pump motors via an appropriate interposing contactor that has a suitable coil voltage.

The T20 timer requires a 220V to 240V AC 50Hz supply when operated from the mains. It can also be operated from an 18 to 24V AC or DC supply by utilising the low voltage active terminal LV and common neutral terminal N, see the included wiring diagrams. When operated from a low voltage DC supply the terminals LV and neutral N are not polarity sensitive. The T20 timer requires a stable supply voltage in order to operate correctly. Pay particular attention to cable sizes, and ensure cables are adequate for the specific pump motor load. This is particularly important where long cable runs are to be used in the installation. If the voltage drop associated with the starting of the pump motor is excessive the T20 will automatically reset and this may cause the pump to jog. Jogging can snap the main spindle of a pump very easily, so please take all precautions to ensure the voltage supply to the T20 is stable and that the current carrying capacity of the cable used is adequate for the job.

Brownout Or Blackout

If a blackout or brownout occurs the T20 timer will not retain memory of where in its run or stop cycles it may have been. When power resumes, the T20 will reboot and resume running. A manual reboot can be done at any time by pressing the timer's reset button.

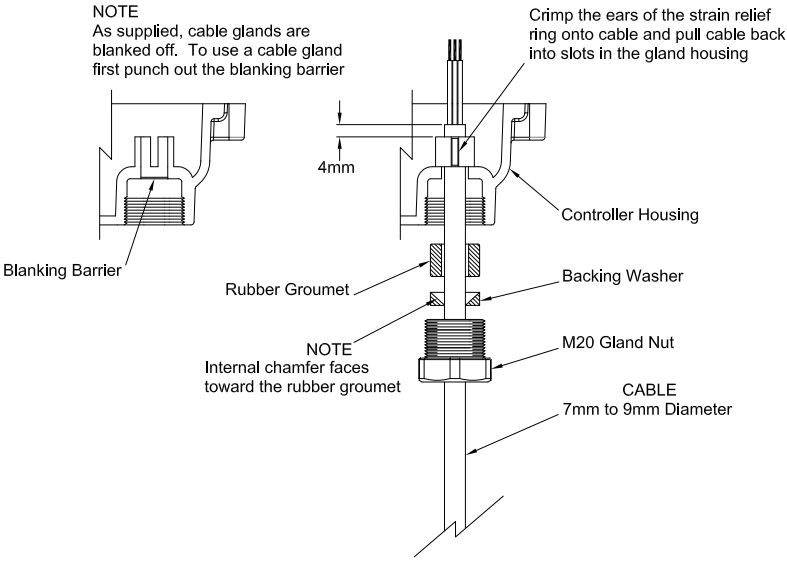
WARNING

The T20 timer derives low voltage for its operation from a non-isolated reactance power supply (not through an isolated transformer). All external devices connected to the T20 must be earthed and must be regarded as operating at full mains potential. For all mains voltage applications we recommend the supply to the T20 be isolated by an RCD that has a maximum trip current of 30mA.

Cables

The T20 timer has 3 X M20 cable glands. As supplied the cable glands are blanked off. To use the glands first punch out the blanking barriers using a suitable punch. The cable glands can accept cable from 7 to 9mm diameter. See attached sketch for assembling the cable gland components. The timer is supplied with a set of steel crimp rings. The crimp rings are to provide strain relief for the timers cables. To use the crimps, place one on the cable approximately 4mm below the end to the cable's outer sheathing. Crimp the two ears of the ring flat using bull nosed pliers. Pull the cable back through the cable gland until the crimp ring's ears are fully engaged in the two slots in the gland housing.

Cable Gland Assembly



CABLE GLAND ASSEMBLY

Relays

The T20 timer houses 2 relays. The contacts of both relays are voltage free and are normally open. The relays are marked Relay 1 and Relay 2 on the terminal block. Relay 1 is the primary relay and is used to control the pump motor. It has an electrical rating of 30 Amps (resistive) at 240VAC. Relay 2 is a 16 Amp (resistive) 240VAC rated relay and is used for actuating an external alarm. The relays built into the T20 timer are not suitable for the direct control of DC motors.

The HD (Heavy Duty) Terminal

WARNING

The HD terminal must be left unused or only ever be linked to the relay terminal Relay 1 Normally Open. It must never be used for any other purpose and it must never be connected to any external device. Under no circumstances connect the HD terminal to the terminals of Relay 2. The HD terminal must be regarded as live at all times and at full mains potential

The T20 timer contains a solid-state switch (HD Heavy Duty drive) that can be used to protect the contacts of Relay 1 by eliminating the destructive arcing caused by the starting and stopping of pump motors. The solid-state switch is accessible from the HD (Heavy Duty) terminal on the terminal block. We recommend the HD drive be used whenever the timer is used to directly control a pump motor. The HD drive should not be used when the T20 is connected to external timers, contactors, relays or to any other external device where voltage free contacts are required. It is strictly intended for the direct control of highly inductive AC motor loads. The HD terminal and the timer's built in relays must never be connected to a DC motor under any circumstances.

When the HD terminal is linked to the terminal Relay 1 Normally Open, the HD drive in effect parallels a 40Amp solid state switch across the relay's normally open contacts. This increases the momentary current carrying capacity of the relay's contacts to well over 70 Amps. The solid state HD drive is only activated for a short period when the pump starts and stops. It effectively handles the high inrush current associated with the pump starting, and it provides a current path for the destructive back EMF associated with the pump motor stopping.

To use the HD drive place a heavy link wire, 1.0mm or 1.5mm Sq between the HD terminal and the Normally Open terminal of Relay 1.

VOLTAGE LIMITS ON TERMINALS A & N	
Maximum Supply Voltage	250VAC 50Hz
Minimum Supply Voltage	160VAC 50Hz

VOLTAGE LIMITS ON TERMINALS LV & N	
Maximum Supply Voltage	25VAC 50Hz or 25VDC
Minimum Supply Voltage	18VAC 50Hz or 18VDC

RELAY 1 CONTACT RATING	
16A at 250VAC	Resistive Load
16A at 30VDC	Resistive Load

RELAY 2 CONTACT RATING	
16A at 250VAC	Resistive Load
16A at 30VDC	Resistive Load

WARNING

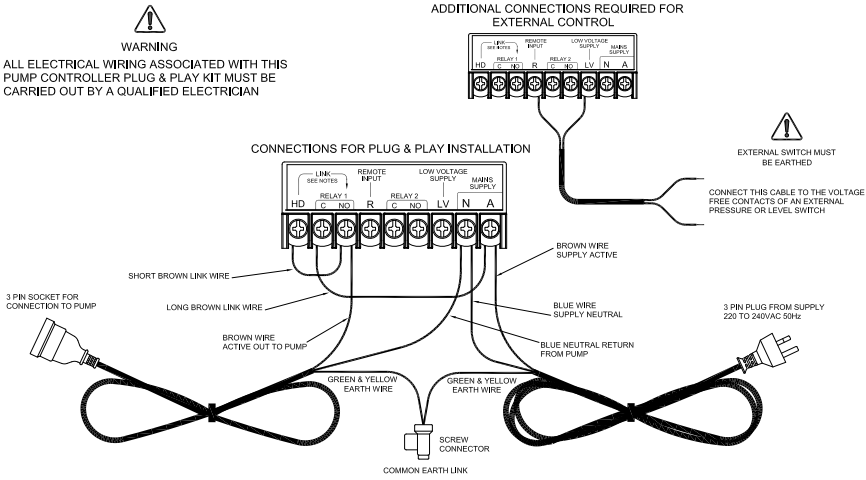
Do not connect any supply greater than 25VAC or DC to the LV terminal on the T20 timer. The LV terminal is only for use with a low voltage supply of less than 25V AC or DC. If a voltage greater than 25V AC or DC is connected to the LV terminal of the T20 timer the timer will be damaged and any warranty on the product will be void.

Circuit Diagrams

The following pages give some examples of ways the T20 timer can be wired.

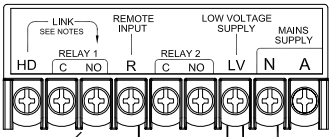
Please note all electrical work associated with the T20 timer must be carried out by suitably qualified electricians and must conform to AU/NZ wiring rules.

FOR PUMP MOTORS TO 2.4 kW
CONNECTIONS FOR PLUG & PLAY INSTALLATION



CONNECTIONS FOR PLUG & PLAY INSTALLATION
220~240VAC 10Amp Maximum

LOW VOLTAGE AC CONNECTIONS



RELAY CONTACTS ARE VOLTAGE FREE AND CAN BE USED TO SWITCH A CONTACTOR OR TO DIRECTLY CONTROL A PUMP MOTOR. SEE TEXT FOR INFORMATION ON THE LIMITATIONS OF THE RELAY CONTACTS AND HOW TO USE THE HD TERMINAL.

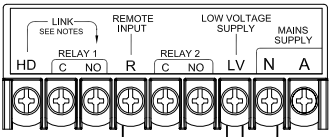
18 to 25VAC SUPPLY

NEUTRAL

ACTIVE

REMOTE FLOW SWITCH. CONTACTS ARE NORMALLY OPEN.

LOW VOLTAGE DC CONNECTIONS



RELAY CONTACTS ARE VOLTAGE FREE AND CAN BE USED TO SWITCH A CONTACTOR OR TO DIRECTLY CONTROL A PUMP MOTOR. SEE TEXT FOR INFORMATION ON THE LIMITATIONS OF THE RELAY CONTACTS AND HOW TO USE THE HD TERMINAL.

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18 TO 25 VDC 150mA MINIMUM

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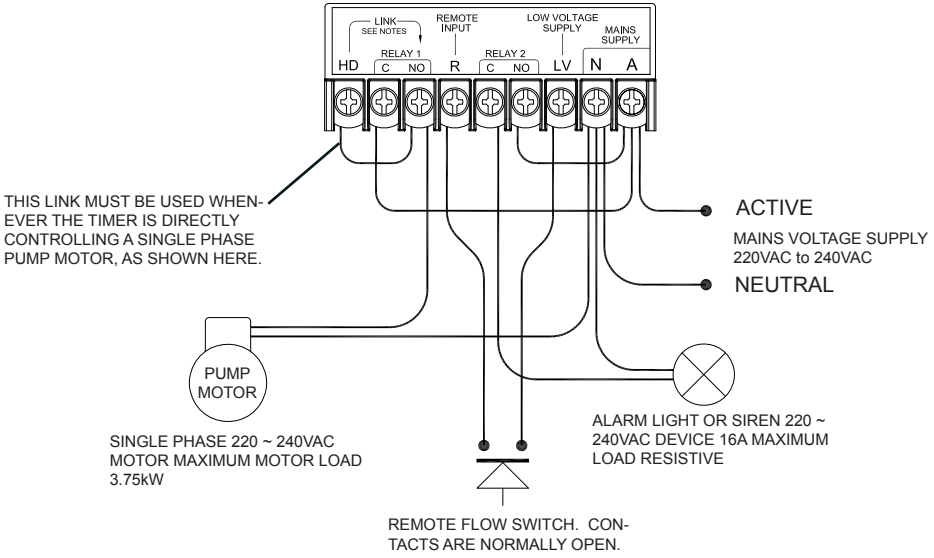
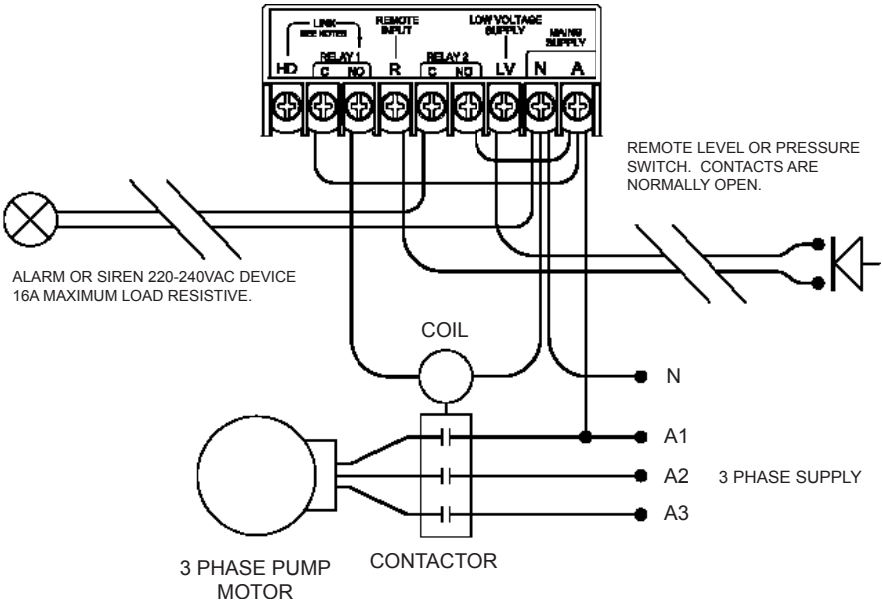
SUPPLY POLARITY IS NOT IMPORTANT BUT IF THE EXTERNAL INPUT IS USED IT MUST BE SOURCED FROM THE SUPPLY POSITIVE AS SHOWN HERE.

REMOTE FLOW SWITCH. CONTACTS ARE NORMALLY OPEN.

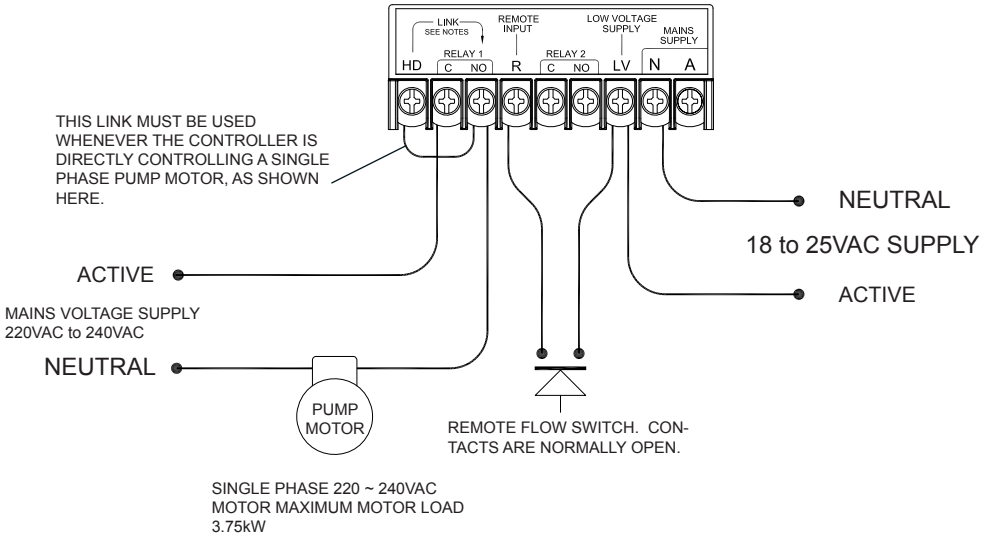
CONTROL OF A SINGLE PHASE PUMP MOTOR WITH REMOTE FLOW SWITCH INPUT AND AN EXTERNAL ALARM



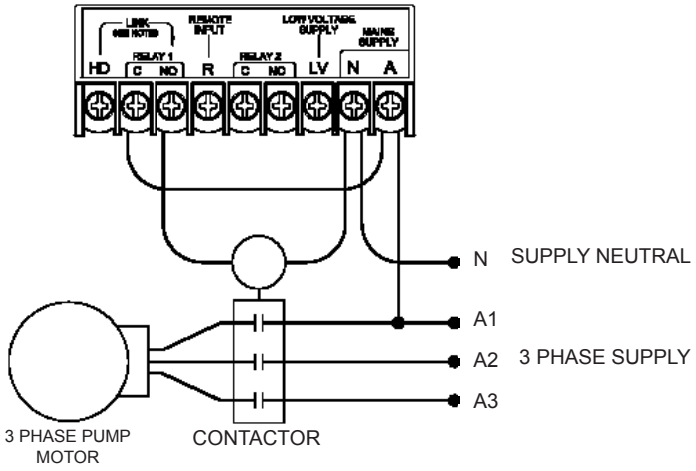
CONTROLLING A 3 PHASE PUMP WITH REMOTE FLOW SWITCH INPUT AND AN EXTERNAL ALARM



CONTROLLING A 240VAC SINGLE PHASE PUMP MOTOR WITH THE T20 TIMER POWERED FROM A LOW VOLTAGE AC SUPPLY



BASIC 3 PHASE PUMP CONNECTIONS



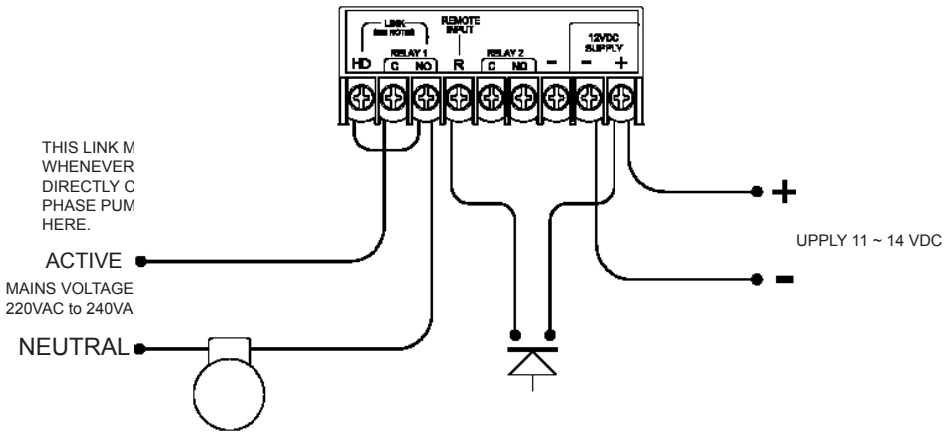
12VDC T20 TIMER

A special 12VDC version of the T20 timer is available for battery operation and for use in solar pumping systems. Functionally the 12VDC model is exactly the same as the mains voltage model except for the terminal block markings. On the 12VDC model the active and neutral terminals are replaced by a positive + and a negative – terminal. Supply voltage across the positive and negative terminals must never exceed 14VDC or the timer will be damaged. The supply terminals are reverse polarity protected. However, the timer will simply not operate unless the supply polarity is correct.

When connecting a remote flow switch to the 12VDC T20 timer the supply to the flow switch must be taken from the positive terminal on the T20 timer. The flow switch and its connecting circuit will operate at 12VDC.

CONTROLLING A 220 ~ 240 VAC SINGLE PHASE PUMP MOTOR WITH THE T20 TIMER POWERED FROM A 12V DC SUPPLY

WIRING DIAGRAM
12VDC CONTROLLER ONLY

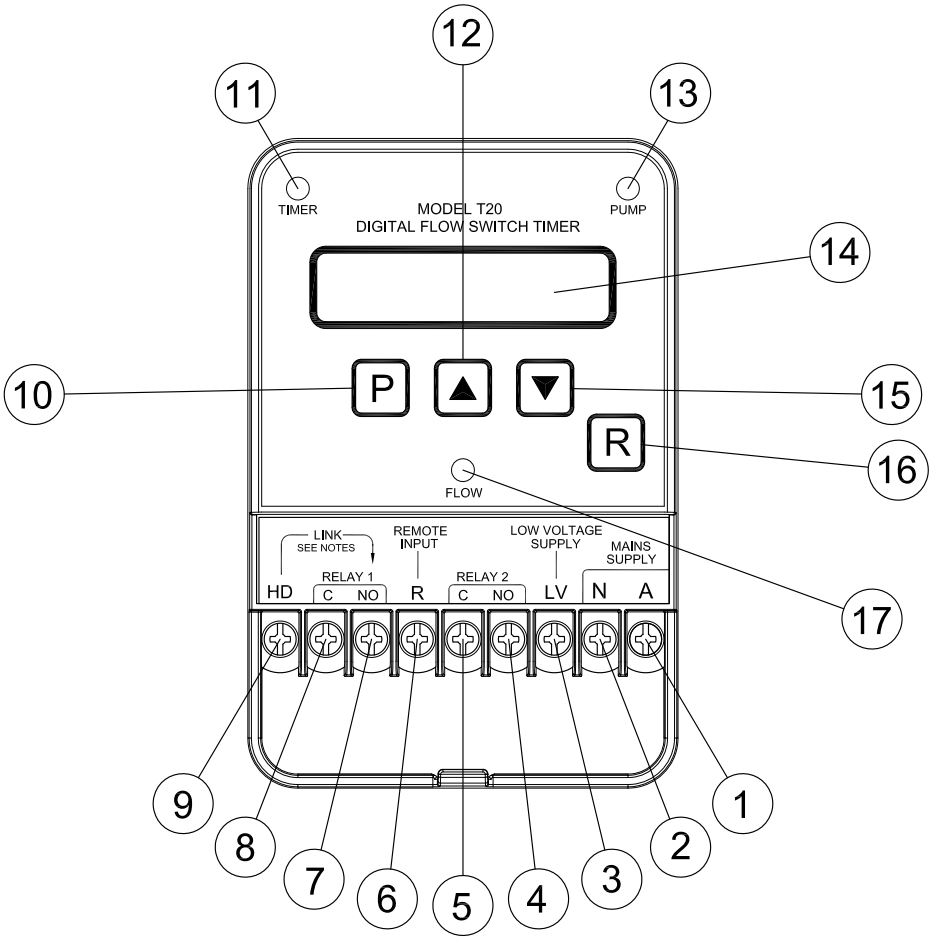


SINGLE PHASE 220 ~ 240VAC
MOTOR MAXIMUM MOTOR LOAD
3.75kW

IMPORTANT

THE SUPPLY TO THE REMOTE FLOW SWITCH MUST BE SOURCED FROM THE SUPPLY POSITIVE AS SHOWN HERE.

T20 Controls and Terminals



No.	Description	Function
1	Mains Voltage Active Terminal	For all mains voltage applications this is the supply connection.
2	Supply Neutral Terminal	For all applications this is the supply neutral connection.
3	Low Voltage Active Terminal	This is the supply active terminal for all low voltage applications.
4	Alarm Relay Terminal Normally Open	This terminal is for connecting an external alarm. It is voltage free.
5	Alarm Relay Contact Common	This terminal is for connecting an external alarm. It is voltage free.
6	Remote Input Terminal	This is the remote switch input terminal for connection to an external flow switch.
7	Pump Relay Terminal Normally Open	This terminal is for connection to a pump motor or contactor.
8	Pump Relay Terminal Common	This terminal is for connection to a pump motor or contactor.
9	Heavy Duty Drive Terminal	Link this terminal to the relay 1 Normally Open terminal when directly controlling pump motors.
10	Program Button	Press this button to program the T20 timer.
11	Timer Light (Red or Green)	This light is green whenever a run timer is running. It turns red whenever a stop timer is running.
12	Up Button	Use this button when programming the flow switch to enter data.
13	Pump Start Light (Red or Green)	This light is red whenever the pump is stopped and it is green whenever the pump is running.
14	LCD Screen	The LCD screen displays information whenever the timer is switched on.
15	Down Button	Use this button when programming the T20 to enter data. It also turns on the LCD backlight.
16	Reset Button	This button reboots the T20 timer each time it is pressed.
17	Flow Status Light (Red or Green)	This light is green whenever flow is detected and red when no flow is detected. It indicates the T20's microprocessor has read the true state of the external flow switch.

Remote Flow Switch Input

An external flow switch with voltage free contacts or a set of external relay contacts can be used to start and stop a pump under the control of the T20. The supply to the external switch must be taken from the (LV) terminal (Low Voltage active terminal) of the T20 timer when the timer is powered from the mains or from a 24VAC source. The T20 must always be powered from the same source as the supply to the external flow switch. The supply to the remote flow switch on the T20-12 (low voltage DC model) must be taken from the supply positive terminal. In all cases the external flow switch return wire must be connected to the Remote input (R) terminal on the T20. The Supply to the external flow switch will range from 12 to 24 VDC or from 20V to 35V AC depending on the model of the timer and on the supply voltage.

WARNING : The low voltage source available at the LV terminal is non-isolated and in terms of insulation must be regarded as operating at full mains potential whenever the T20 timer is powered from the mains.

The remote flow switch can be installed some distance from the T20 timer. The maximum distance is limited by cable resistance and capacitance. The total cable resistance must not exceed 5K Ohms with the remote flow switch's contacts closed. The total capacitance of the cable must not exceed 25nF with the remote flow switch's contacts open. Wires to the remote flow switch should be run separately from power carrying cables. Do not run the remote flow switch wires in a conduit that also contains power cables. Capacitive coupling between the adjacent cables may cause false triggering of the T20's remote input. For cable runs longer than 150 metres suggest using 2 separate wires to reduce capacitive coupling between the adjacent wires. When set up this way cable resistance becomes the limiting factor for distance. The table that follows sets out the resistance of typical copper wire of various diameters.

Nominal Cross Section of copper wire in square millimetres	Resistance in Ohms per 1000 Metres
0.2	95.30
0.5	36.20
0.75	24.13
1.0	18.10
1.5	12.10

Note: Resistance may vary depending on the wire standard and the actual construction of the wire. The cable resistance refers to the total resistance out to the remote flow switch and back again, as measured at the T20 timer across the 2 remote flow switch connection wires with the flow switch contacts closed.

Example
A flow switch is located 1000 metres from the T20 timer. Two separate wires each 0.2mm^2 are run to the remote flow switch (total wire length is 2000 metres). The resistance as measured across the 2 wires back at the T20 (with the flow switch‘s contacts closed is 190 Ohms. This is well under the 5,000 Ohm limit. The remote input to the T20 will operate properly provide the wires are separated by sufficient distance that the capacitance between them is less than 25nF. Capacitance should be measured between the wires when the remote flow switch’s contacts are open, and it must be less than 25nF.

Remote Flow Switch
The remote flow switch should be suitable for low voltage low current operation. In particular its contacts should only require a low wetting current. The current in the remote loop only runs to a few milliamperes and requires a flow switch that will conduct when closed under low current conditions. Reed switches are the preferred method of controlling the remote input to the T20 timer. Suitable Kelco flow switch models are listed in the following table.

Suitable Flow Switches

The flow switches listed below all use reed switches as their output device and are suitable for use with the T20 timer.

Paddle flow switches with BSP or NPT threads and poly or stainless bodies.	Inline flow switches with poly, brass or stainless bodies and BSP or NPT threads.	Trailing wire flow Switches with poly or stainless bodies and BSP or NPT threads.
F20-S-R	P20-B, P20-C	TW20-S-R
F20-SS-R	P25-B, P25-C	TW20-SS-R
F21-S-R	UB20-B, UB20-C	TW21-S-R
F21-SS-R	UB25-B, UB25-C	TW21-SS-R
F25-B	C20-B	
F25-C	C25-B	

Full technical details of the flow switches listed above can be downloaded from **www.kelco.com.au**

Purging the T20 Timer

The T20 timer is supplied unlocked and pre-loaded with a simple program. It is set up with a 5 second start override time and a 5 second run-on time. All other functions are turned off. With the default program loaded, the T20 will start a pump in spite of an initial lack of flow, run the pump for 5 seconds and expect to establish flow past the paddle of its remote flow switch within this start up time. Given flow is established it will then run the pump continuously while flow is present and it will shut the pump down if flow is interrupted for more than 5 seconds or if flow stops completely.

You can restore the T20 to this default state at any time by pressing and holding down the (P) button and pressing the (R) reset button at the same time. Release the (R) button and then release the (P) button. The timer light will then flash rapidly red to indicate the process is complete. Doing this removes any settings you may have entered and restores the T20 to its original default state. You can then enter new settings or just press reset (R) again and run the pump.

Introduction to Programming

The T20 flow switch timer includes a set of functions that can be set up to control a pump. The functions range from a simple override on start timer that allows a pump to start in spite of an initial lack of flow, through to a range of sophisticated timing and flow based sequences. The functions are independently accessible and adjustable through the T20's simple programming interface. The pages that follow set out what each function does and how to set it up.

The actual selection of a suitable set of functions must be decided prior to programming and will depend on what level of control the pumping system requires. In order to achieve the best performance from this flow switch observe the following basic rules.

1) Use the least number of functions possible. Do not program in functions you do not specifically require, as to do so will make the system's operation unnecessarily complicated and may introduce unpredictable interactions that could cause the T20 to behave in a manner you had not anticipated.

2) The best way to switch off a function that you have previously selected and subsequently decided not to use is to purge the entire program and restore it to its default state rather than simply switch the particular function off. Purging the program ensures the functions are properly disabled and their stored values are all set to zero or off. To purge the program press the (P) button and the (R) reset button. Release the reset button while still holding the (P) button down, then release the (P) button. The LCD screen will display the message “Settings Cleared, Press (P) to Continue” Press (P) and then step through the program making your new selections as you go.

3) Set realistic and sensible values into the various functions. For example, do not set a pump to cycle on and off rapidly. Always set the T20’s running and stopping times to realistic values.

Programming The T20 Timer

The T20 timer is fully programmable; it accepts input via 4 push buttons. The buttons are marked (P) for programming, Up and Down for data entry and a reset button (R). Pressing the (P) button during normal operation stops the pump and allows entry to the timer’s menu. Subsequent pressing of the (P) button steps you through the menu from one option to the next. Each option can be adjusted using the up and down buttons. Pressing the (P) button stores the settings you make into the timer’s memory and steps you to the next option. When you reach the end of the option list the timer asks you to accept the settings you have made and to press the (P) button to resume normal running. You can automatically save any changes you have made and exit out of the menu at any stage during programming by simply pressing the (R) reset button. The settings you make are non-volatile and are recorded in the timer’s memory. Your setting will not be lost if the timer is switched off for extended periods. When the unit is switched back on the timer will boot up and operate using the setting you previously recorded in its memory.

Basic Operation

Purging the T20 timer (pressing the (P) button and then pressing the (R) reset button) automatically loads in a 5 second start-up time and a 5 second run-on time. This is the factory default setting for the T20. All other functions will be turned off or set to zero. If you subsequently press the (P) button while the pump is running, the pump will stop and the LCD screen will display the Kelco splash screen and the timer's model number. Pressing the (P) button again steps you to the first selection in the menu, the start-up timer.

Start-up and Run-on Timers

The start-up timer is set to 5 seconds as the factory default. You can increase or decrease this by pressing the up or down buttons and then pressing the (P) button to step to the next function, the run-on timer. The run-on timer is also set to 5 seconds by default and again you can increase or decrease this by pressing the up or down buttons. The start-up timer has a range of 0 to 240 seconds and the run-on timer can be set from 0 to 900 seconds. Both the start-up and run-on timers are self terminating. This means they cancel out their runs and revert to normal pump running as soon as flow is detected rather than running for the full time that you have entered. In addition, the run-on timer automatically resets its clock each time flow is detected. This feature means the flow switch connected to the T20 will ignore entrained gas in the pipe system. The flow has to remain continuously off for whatever time you set on the run-on timer for the pump to stop. The pump may be running dry for the period you set on the run-on timer so take care not to set a run-on time that is longer than absolutely necessary.

Once you have set the run-on timer and pressed (P) to confirm its setting you are presented with a screen that asks if you want to use the advanced functions of the T20 timer. If your application only requires dry run protection for a pump and a start override to get the pump going in spite of an initial lack of flow then you will not require the advanced functions. In this situation just accept the default "NO" and press (P). You will then be asked to confirm your choice and press the (R) reset button to run the pump. If you select "NO" to the confirmation question the T20 will step back to the top of the menu and allow you to change whatever settings you want.

T20 Table of Limitations

Ambient Temperature Range	1ºC to 50ºC
Ingress Protection Rating	IP67
Start-up Timer	Adjustable from 1 second to 4 minutes in 1 second increments.
Run-on Timer	Adjustable from 1 second to 15 minutes in 1 second increments.
Pre-Start Delay Timer	Adjustable from 1 second to 4 minutes in 1 second increments.
Batch Controller	Adjustable from 1 minute to 99 hours 59 minutes in 1 minute increments.
Delayed Restarting	Adjustable from 1 minute to 99 hours 59 minutes in 1 minute increments.
Cyclic Running & Stopping	Running and stopping times both adjustable from 1 minute to 99 hours 59 minutes in 1 minute increments.
Anti-Cycling	Adjustable from 1 motor start per hour to 1800 motor starts per hour.
Burst Pipe Detector	Adjustable from 1 minute to 99 hours 59 minutes in 1 minute increments.

Advanced Functions

The T20 timer includes a set of advanced functions that extend the capability of the timer well beyond basic loss of flow protection. The advanced functions are directly accessible by moving beyond the more basic start-up and run-on timers previously described. There follows here a detailed description of each of the advanced functions. Advanced functions can be used singularly or in combination with other advanced functions as well as with the start-up and run-on timers. Some advanced functions conflict with others and the T20 timer will automatically step over conflicting functions based on your progressive selections.

Pre-Start Delay Timer

On moving into the advanced functions section of the T20's menu you are first presented with the option to include a pre-start delay time. The pre-start delay timer delays the starting of the pump for a selectable period. It can be set from zero to 240 seconds (4 minutes) in 1 second increments. If you choose to use this timer the actual starting of your pump will be delayed by whatever delay you set this timer to. Each time the T20 is switched on it boots up but prevents the actual starting of the pump for the set period. As soon as the set time has elapsed the pump will start and run normally. The pre-start timer can be used to allow peripheral equipment time to boot up. For example, some VS drives require a few seconds to stabilise and the T20's pre-start timer can hold off the starting of the pump until the system has stabilised. The pre-start timer can also be used to stage or stagger the starting of multiple pumps. If you want to use the delayed starting function press the up or down buttons to display "YES" and then press the (P) button. You will then be able to enter your required delay period using the up and down buttons. The range of adjustment is zero to 240 seconds in 1 second increments. When you have entered your required time press (P) to move on to the next function.

Batch Control

The batch control function built into the T20 timer lets you program into the timer a set running time for the pump. The range of adjustment is 1 minute to 99 hours 59 minutes in increments of 1 minute. The running of the set time can be initiated by powering up the T20 or by pressing the (R) reset button.

If flow is lost during a batch run, due to the pump running dry or a valve closing, the T20 will shut down the pump. If flow subsequently resumes the batch controller will re-initiate its run from the beginning. It will not resume running from the point in its previous run that it shut down at. This function can be used in tank filling applications to send a set volume of water to a tank but to terminate the batch run when the flow stops due to the float valve in the tank closing.

Batching With Additional Functions

If you choose to use the T20 batch controller, you can also use additional functions at the same time. Once you make the choice to use the batch controller the T20 automatically makes available to you functions that will work while the batch controller is in operation. Functions that will not work with the batch controller are automatically stepped over by the menu program. Functions that will not work include cyclic running and burst pipe detection.

If you choose to use a function such as delayed restarting please be aware that when the delayed restart is invoked the batch controller resets its run time to your original entered value. At the end of the delay time the pump will start and run your set batch from the beginning. This process will repeat each time the pump shuts down for any reason, the batch counter will reset and run your batch from the start.

If you choose to use the batch controller the T20's cyclic running function will be disabled. If you choose not to use batch running then cyclic running will appear in the menu. Cyclic running can be used for batch processes. To do this set the cyclic running time to some value and set the cyclic stopping time to zero. In effect, zero stopping time means infinite stopping time as there is no defined set stop time. Set up this way the T20 will run for whatever time you have entered into the cyclic running run time and will then stop. This batching process can be repeated by pressing the reset button.

Delayed Restarting

If you set this option to on, each time the pump stops, due to flow stopping the T20 will prevent the pump from restarting for the set period of time. The delay time can be set from zero to 99 hours 59 minutes in increments of 1 minute. Delayed restarting is a form of anti-cycling and cyclic running, wherein the pump is limited in its ability to cycle on and off by preventing it from restarting for a set time period. Its uses include preventing rapid cycling if the system's air cell becomes water logged or if a fault develops in the system.

If you choose to use the delayed restarting function and press (P) you will be asked to enter the delay hours and minutes. You will then be asked if you want automatic starting at the end of the delay period. If you choose yes to this question the T20 will automatically start your pump at the end of the delay period. If you choose no the T20 will only start the pump after the delay if flow pushes the paddle of the remote flow switch into the on position.

You may choose to set the delayed restart to perhaps 12 hours. At the end of the 12 hour period the pump will automatically start and if the tank level is low, the pump will run continuously until the tank fills and the float valve in the tank closes. If however, there has been no draw-off from the tank during the 12 hour period, the automatic restart at the end of the delay will start the pump and run it for whatever period you have set on the start timer (perhaps a few seconds). The flow switch connected to the T20 will sense no flow because the float valve will still be closed. The T20 will then shut down the pump and again wait for 12 hours before attempting to start the pump. Using this technique prevents the pump from hunting on and off when the tank is full because of slight leakage from the float valve or pipework. It allows you to set the pump to only operate after a chosen delay, and if there has been no usage of water, to test the system for demand by momentarily starting, and only run the pump if there is a genuine call for water.

Cyclic Running

The T20 timer can be programmed to run and stop a pump for set periods of time. Both the running and stopping times can be set to any value you choose from 1 minute to 99 hours 59 minutes in increments of 1 minute. The cyclic running option is highly flexible. The run and stop timers are independent of each other. If a set running and stopping time are programmed in, the T20 will run the pump for whatever time it is set to and then stop for the time set on its stop timer.

If a run time is set to some value and the stop time is left set at zero, the T20 will behave as a one-shot batch controller. On pressing the reset button or switching the pump on, the pump will run for the set period and then shut down. It will not then restart until you again press the reset button or reset the power to the unit. In cyclic running mode the T20 monitors the elapsed time and displays the remaining time on its LCD screen in hours and minutes.

Cyclic running allows low yield bores to be pumped to their maximum capacity. A bore pump running under cyclic control can be set to pump the bore down to a low level, stop and wait for the standing water level to recover and then repeat the process endlessly. For transfer pumping applications cyclic running can be used to automatically top up remote tanks without the need for float valves or level control at the tank. It can also be used for one-shot tank filling. Press the reset button and pump a set number of hours of water to a tank, and then stop until the reset is again pressed.

Anti-Cycling

Electric motors are often limited in the number of times they can be safely started in an hour. This is particularly important in the operation of submersible bore pumps. When a motor starts there is an initial inrush of current that produces heat in the coils and iron rotor of the motor. If the frequency of starts is excessive the accumulation of heat within the motor can cause severe damage and eventual failure of the motor. Submersible bore pump motors are particularly prone to damage from excessive cycling (starting and stopping).

The anti-cycling option built into the T20 allows the user to set the maximum number of times the pump can be safely started in any one hour period. If you select yes to this option the screen that follows will ask you to enter the maximum number of times the pump can be started in any one hour. The number of starts can be set from 1 start per hour to 1800 starts per hour. Please contact your pump supplier to obtain the correct figure for your specific pump. In operation the anti-cycling system monitors both time and the number of starts and compares the two. If the starts per hour rate is exceeded 10 consecutive times in any one hour period the pump will be automatically shut down and the T20 will display a message indicating the starts per hour rate was exceeded.

As a simple example of the way the anti-cycling system works, if the starts per hour rate is set to 360 (one start every 10 seconds maximum) and the pump started 9 times in a row at less than 10 seconds between each start and then did not start again for 12 seconds the anti-cycling shutdown will not be invoked. If however, the pump were to start 10 times in a row with less than 10 seconds between the starts the anti-cycling system would be invoked and the pump would be shut down.

In a conventional pressure system the anti-cycling function can be used to protect the pump from damage in the event of the system's air cell losing its air charge. If air is lost from a system's air cell due to a ruptured diaphragm or leaking air valve, the pump will hunt on and off rapidly. Such rapid cycling will cause the pump to overheat very quickly. The T20's anti-cycling feature can be used to shut down the pump and prevent damage in such a situation. To use the anti-cycling function for this type of pump protection simply set the starts per hour to some value that is marginally higher than the system's normal start rate. This will avoid nuisance tripping but will shut the pump down if excessive sequential cycling is encountered.

Burst Pipe Detector

The T20 timer includes a system for detecting burst pipes. It is most commonly used in systems that are set up as a pressure system and are controlled by an external pressure switch.

If a pressure system bursts its discharge pipe the system pressure will fall and the pump will start at its low pressure setting. The pump will then run continuously until the water source is depleted. If the discharge pipe splits and the pump has sufficient capacity the result may be continuous cycling of the pump as it attempts to satisfy the leak. The T20 addresses these two scenarios with two separate functions, anti-cycling and burst pipe detection. When both functions are activated the complete spectrum of possibilities is covered. Anti-cycling will detect cyclic starting and stopping and can be set to shut the pump down after a predetermined number of cycles. This function detects split and leaking pipes.

The burst pipe detector addresses the issue of a completely burst pipe where the pump would ordinarily discharge at its full capacity until the source of water was depleted. It does this by using a timer that times out for a settable period each time the pump runs. The timer resets back to its original setting each time the pump stops. The range of adjustment is zero to 99 hours 59 minutes in increments of 1 minute.

In a typical application the burst pipe detector would be set to some time that was marginally longer than the longest time the pump would ordinarily run. For example, in a domestic pressure system day to day usage may require the pump to run for no longer than 15 minutes (for showers etc.) Perhaps once every few days the system is used for garden watering and required to run for 30 minutes. In this scenario the burst pipe detector would be set to 35 or 40 minutes.

Each time the pump switches on the burst pipe detector begins to count down. In normal circumstances the pump will shut off in less than 30 minutes. This resets the burst pipe detector's timer back to 40 minutes. If however, the pump continues to run due perhaps to a burst pipe, it will eventually reach the set point of 40 minutes. The pump will then be instantly shut down preserving whatever source water remains. The T20 will then display "burst pipe detected" on its LCD screen.

LCD Screen Back Light

The LCD screen on the T20 timer has a built-in backlight. The backlight switches on automatically whenever you are programming the timer and when the T20 is displaying certain fault conditions. In normal operation the backlight remains off.

The LCD screen backlight can be switched on manually at any time by pressing and holding down the down arrow button. The screen will remain illuminated while you are depressing the down button. The screen will switch off as soon as you release the button. The LCD backlight can't be permanently switched on, it only operates while the down button is held in.

Program Lock

The T20 timer has a hidden security lock. When activated, the lock disables the programming button P and prevents access to the T20's menu.

To lock or unlock the T20, press the up and down buttons together while the pump is in normal operation (not while it is being programmed). Pressing the up and down buttons together while in normal running mode shuts down the pump and opens the timer's lock screen. Once the lock screen is displayed the timer can be locked or unlocked by pressing the up or down buttons. Pressing P then exits the lock screen and the timer resumes normal operation. When locked, pressing the P button has no effect on the timer and does not take you into the menu in the usual way. Access to the menu can then only be obtained by first unlocking the program.

Maintenance

The T20 timer is a low maintenance device. If it is correctly installed in a location that is out of direct exposure to the elements it should give a long and reliable life and require little or no maintenance at all.

Factors that may reduce its life are lightning strikes or power surges, failure to fully tighten lid or cable glands, exposure to temperatures in excess of its ratings and operation outside its electrical limitations in terms of supply voltage and motor loads. Spare parts are available for the T20 timer from your supplier.

WARNING

If the T20 timer is used in a manner not specified by the manufacturer the pump protection provided by the timer may be impaired or negated. In addition, all warranties stated or implied will be rendered invalid.

Warranty

The T20 timer is warranted against faulty workmanship and materials for a period of 12 months from the date of purchase. Our complete warranty statement can be downloaded from :

http://www.kelco.com.au/menu/information/warranty-statement

If a warranty issue arrises with this product contact your supplier or Kelco Engineering Pty Ltd. You will be issued with a returns goods authorisation number. The RGA number and proof of purchase must accompany any goods returned to us under warranty.

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