

# INSTALLING AND USING THE KELCO F28 QUAD TIMER FLOW SWITCH

## WARNING

Please read this installation sheet fully and carefully. The F28 Quad Timer Flow Switch is a mains voltage device. Death or serious injury may result if this product is not correctly installed and used.

## INTRODUCTION

The F28 quad timer flow switch is a paddle actuated flow switch that has 4 built-in electronic timers. The timers function independently of each other but also interact and in combination respond to water flowing past the paddle of the flow switch. When used in combination the 4 timers provide very powerful and versatile control of a pumping system.

The F28 quad timer flow switch can be used in a variety of situations to control and safeguard a pump. Its powerful hybrid drive can directly control single-phase pump motors up to 5HP without the need for an interposing contactor. In addition to protecting the pump from dry run damage, the F28 can be set to run and stop pumps at any one of 256 time intervals making it ideal for such applications as backwashing pools and spas, pressurising stock watering systems and for cyclically pumping stock and domestic bores.

## IMPORTANT

This installation and usage information sheet must be read with reference to the specific model controller being installed. The power switching capacity and the pressure rating of the controllers vary from model to model, and it is very important to understand the limitations of a specific controller before installing it.

### F28 - 240 - S - 5

SUPPLY VOLTAGE  
240 = 220 TO 240VAC  
24 = 24V AC or DC

CABLE CORES  
4 = 4 CORE 10Amp CABLE  
5 = 5 CORE 6Amp CABLE

CABLE  
NO LETTER = 10Amp PLUG & PLAY  
HD = HEAVY DUTY 15Amp CABLES 2 X 2M LONG  
S=SINGLE CABLE 2M LONG WITH 4 or 5 CORES



## WARNING

The F28 flow switch is water resistant to IP67. This rating only applies if the clear control lid is in place and its two fixing screws fully tightened. The F28 is not water resistant unless the clear lid is in place and fully secured. Always replace the clear lid and fully tighten its two screws after making changes to the settings. The F28 may present a shock hazard and death or serious injury may result if water enters the flow switch electrical housing. There are no user serviceable parts in this flow switch. Under no circumstances should the main housing be opened. Warranty on this product is automatically void if the sealed body screws are opened.

## OPERATING ENVIRONMENT

Supply F28-240	220 to 250VAC 50Hz
Supply F28-24	12 to 28V AC or DC at 80mA Max.
Ambient Temperature Range	1°C to 50°C
Liquid Temperature Range	1°C to 60°C See note below
Ingress Protection Rating	IP67

## OPERATING RANGE

Start-up Timer	Adjustable from 1sec. to 3 minutes in 15 steps
Run-on Timer	Adjustable from 1 sec. to 5 minutes in 15 step
Restart Timer	Adjustable from 1 min. to 48 hours in 15 steps
Stop Timer	Adjustable from 1 min. to 48 hours in 15 steps
Recommended Pipe Sizes	25mm (1") and larger
Maximum Switched Load F28-240	250V ~ 50Hz 2.4kW (3HP)
Maximum Switched Load F28-240-HD only	250V ~50Hz 3.75kW (5HP)
Maximum Switched Load F28-240-S	250V ~ 50Hz 2.4kW (3HP)
Maximum Switched Load F28-24	250V ~ 50Hz 2.4kW (3HP)
Operating Pressure Range	-1 Bar to 20 Bars (-14psi to 300psi) See Note Below
Minimum Burst Pressure	50 Bars (720 psi)

NOTE: In the interests of safety the F28 must NOT be used in hot water applications (>60°C).

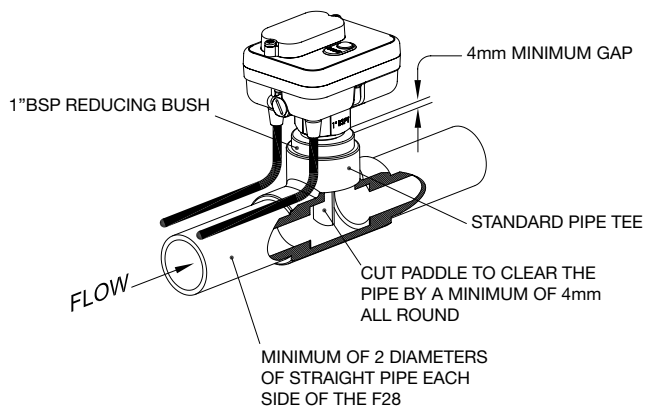
The F28 is designed to withstand water pressures to 20 Bars (300 psi) and must not be used in applications where either the static or dynamic pressure exceeds this rating.

## INSTALLATION

The F28 is suitable for use in all cold-water based applications such as potable water, seawater, bore water, chlorinated pool water, brackish water or effluent. A suitable location should be selected for the flow switch in either the suction or delivery pipework of the pump. The switch should be installed in a location that is away from both vibration and heat and is preferably out of direct exposure to the weather and above any flood level. A 1" BSP socket, or threaded pipe tee must be provided in the pipework to fit the switch. The switch should be located on the topside of a horizontal section of the pipe with a minimum of 5 diameters of straight pipe either side of the switch. Under no circumstances mount the F28 under the pipe or close to valves, tees, bends or any other obstructions likely to cause major turbulence in the flow. The F28 can be mounted in vertical pipework if required and flow can pass either upward or downward past the switch.

In most installations the paddle of the F28 will need to be trimmed to suit the specific pipe in which it is to be installed. The paddle of the flow switch needs a force equivalent to 20 grams dead weight acting on it from the flow in order to operate correctly. The force is generated by water in motion pushing against the exposed area of the paddle. The more area of paddle exposed to the flow, the more force available to actuate the switch. Be aware that high velocity flow can generate high forces and damage the paddle. As a general guide the paddle of the flow switch should extend to slightly past the centre line of the pipe. The paddle would not normally be left longer than this unless the expected flow rate was very low. If you know the likely flow rate and the pipe size of your pump system there is an online calculator available at [www.kelco.com.au](http://www.kelco.com.au) that will help you to work out an exact size to cut the paddle. Use tin snips, side cutters or a hacksaw to cut the paddle so it extends to a little past the centre line of the pipe when screwed into its socket. If needed, cut away the sides of the paddle so it clears the pipe socket and pipe walls by at least 4mm at its closest point. Apply a suitable thread sealant tape or paste and screw the flow switch into the socket using the spanner flats provided. When properly installed the flow switch should be square to the axis of the pipe, with the flow arrow on the side of the switch body correctly oriented and parallel to the line of flow. In addition, there should be a gap of at least 4mm between the top of the 1" BSP pipe socket and the under edge of the F28's spanner flats. Under no circumstances should the F28 be wound into the pipe socket until its thread bottoms out in the socket as to do so places the thread in tension and may result in the flow switch housing cracking under pressure.

## SECTION OF A PIPE TEE SHOWING HOW TO INSTALL AN F28



## ELECTRICAL

The F28 flow switch 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 F28 will automatically reset and this may cause the pump to jog. Jogging can snap the main spindle of a pump very quickly so please take all precautions to ensure the voltage supply to the F28 is stable and that the current carrying capacity of the cable is adequate for the job.

Never use long or coiled extension leads to connect a pump to the F28. The F28-240 quad timer flow switch is supplied fitted with a 10 Amp plug and socket. Pumps up to 2.4kW can be plugged directly into the socket connection to the flow switch.

### Note

For mains voltage applications we recommend that the supply to the F28 be isolated by a 10Amp RCD that has a maximum trip current of 30mA.

## WARNING

When installing the F28, the socket outlet connection (GPO) for the input power must be accessible and must be positioned in a dry and protected location out of the weather and above any flood or water level. Where the F28 is to be used to control pump motors up to 2.4kW 3HP the supply to the F28 must be protected by a 10 Amp fuse or by a 10 Amp circuit breaker.

## FIXED INSTALLATION

## WARNING

Fixed Installations must only be carried out by a licensed electrician and must conform to local wiring rules.

The standard F28-240 flow switch can directly control single-phase 240V~50Hz pump motors up to 2.4kW. In all fixed installations a disconnecting device, such as a switch or a circuit breaker must isolate the F28. The disconnecting device must be easily and readily accessible after installation. Where a circuit breaker is used it must be rated at 10 Amp. Where an isolation switch is used the circuit must be protected by a 10 Amp fuse. In the interests of safety a 10 Amp RCD with a maximum 30mA trip should also be installed in the supply.

## F28-240-HD MODEL ONLY

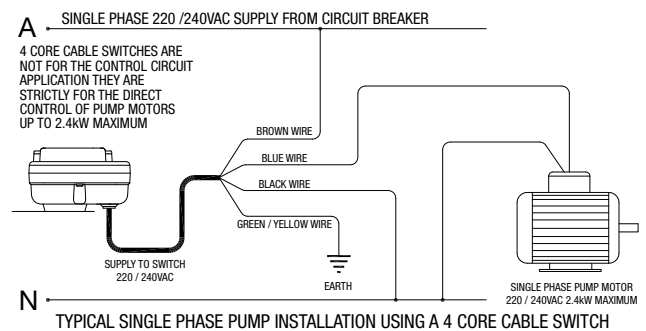
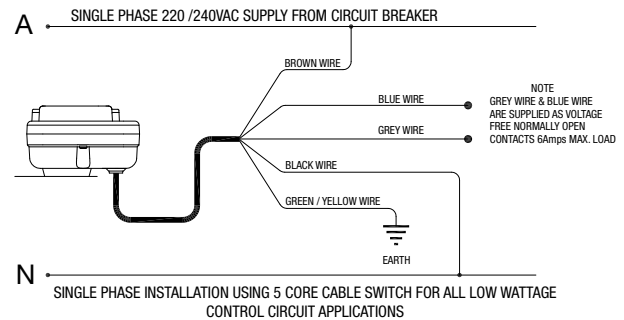
## WARNING

The F28-240-HD is supplied with heavy duty flying leads for fixed installation use only. It must be installed by a licensed electrician and isolated by a 15 Amp fuse or a 15 Amp Circuit breaker. We recommend that the supply to the F28-240-HD be isolated by a 15 Amp RCD that has a maximum trip current of 30mA.

## BROWNOUT OR BLACKOUT

If a blackout or brownout occurs while the F28 is operating, the flow switch will not retain any memory of where in its run or stop cycle it may have been, it will simply shut down the pump. When power resumes, the F28 will reboot, restart the pump and run any timer settings from the beginning. A manual reboot can be done at any time by simply pressing the reset button on the top deck of the flow switch.

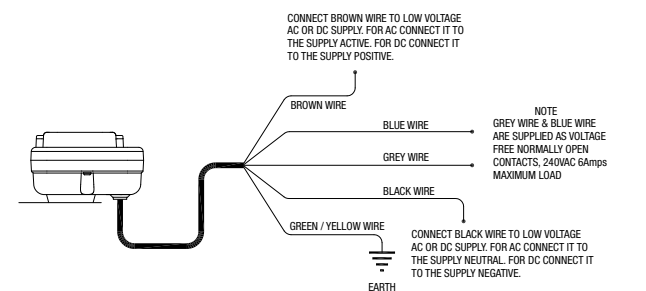
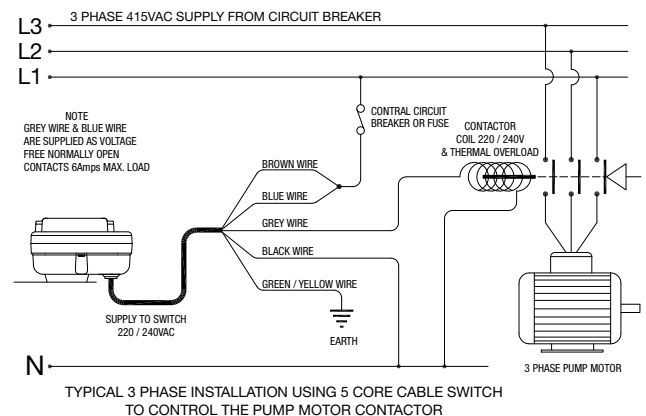
## BASIC WIRING DIAGRAMS



### IMPORTANT

4 CORE CABLE SWITCHES ARE NOT SUITABLE FOR CONTROL CIRCUIT APPLICATIONS THEY ARE STRICTLY FOR THE DIRECT CONTROL OF PUMP MOTORS AS SHOWN ABOVE THEY HOUSE A POWERFUL SOLID STATE DRIVE SYSTEM THAT WILL NOT WORK IN LOW WATTAGE CONTROL CIRCUITS

5 CORE CABLE SWITCHES ARE NOT SUITABLE FOR THE DIRECT CONTROL OF PUMP MOTORS THEY ARE FOR THE CONTROL OF CONTACTORS, RELAYS, TIMERS, PLC'S, VS DRIVES AND OTHER LIGHT DUTY CONTROL CIRCUIT APPLICATIONS



UNIVERSAL LOW VOLTAGE AC / DC SWITCH FOR GENERAL PURPOSE CONTROL CIRCUIT APPLICATIONS

## ADJUSTING TIMER SETTINGS

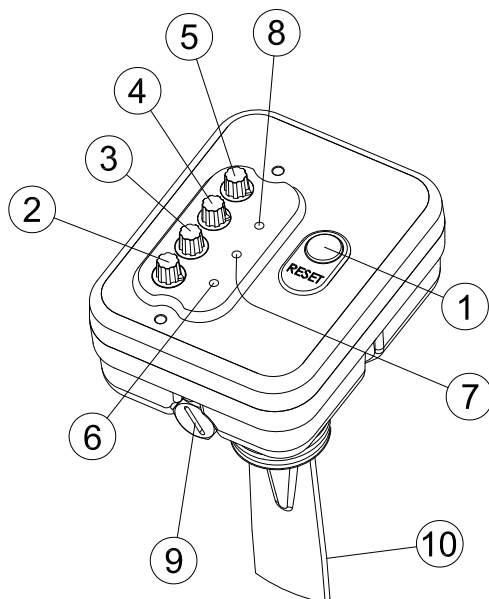
There are 4 rotary switches located under the clear cover on the top deck of the F28. These 4 dials are for adjusting the 4 timers that control the flow switch's timer delay settings. To access the 4 dials undo the 2 screws that hold the clear cover in place. Note that the clear cover must always be replaced and tightened after making changes to the timer settings.



### WARNING

**Without the cover in place the F28 is not water resistant and presents a potential shock hazard. Take great care not to splash water onto the F28 when the control cover is removed and always replace the cover immediately and fully tighten its securing screws after any changes to the settings are made.**

*After you make any changes to the settings on the 4 timer dials you must always press the reset button for the changes to take effect.*



## BASIC OPERATION - NO TIMERS USED

With all four timer dials set to zero the F28 flow switch will behave like a basic on/off switch, it will simply turn on and off in direct response to paddle movement. Any pump connected to it will also start and stop in direct response to the actual flow past the paddle of the switch. Power can be switched on to such a system and the pump will not automatically start unless there is initially enough flow past the paddle of the F28 to actually turn it on. This inability to automatically start is the very reason why a timer is normally required to override the off state of the flow switch and start the pump. The only condition under which such a system would automatically start would be if there was flow from some external source, such as from an air cell or a gravity feed from an elevated water source.

## START TIMER

Setting the start timer (2) will override the off state of the F28, so that when power is applied, your pump will start and will run for whatever time you have set on the start timer dial. The blue light (6) will be on while the timer is running and if correctly set flow will push the paddle (10) to its on position before the start timer times out. Flow is indicated by the flow status light (7) turning steady green in response to flow. When correctly set the start timer should run for slightly longer than the time it takes for the water flow to actuate the paddle of the F28 and for the flow status light (7) to come on.

## RUN-ON TIMER

The run-on timer can be set to suit the specific application. For example it can be set to several minutes to pressurise long pipes or an air cell. It will keep your pump running for several minutes after the flow has reduced to a point below which the paddle of the F28 can detect. Alternatively, it could also be set to only a few seconds to simply allow the pump to ignore minor fluctuations in flow. It can also be left set to zero if not required. The run-on timer only starts to run when flow has essentially stopped. For example, air passing through the flow switch would normally stop the pump due to the paddle detecting the momentary loss of flow. The run-on timer will keep the pump running seamlessly and ignore this loss of flow for whatever time period it is set to.

The start timer and the run-on timer function independently of each other and are totally flexible. For example, you can set the start timer to 3 seconds to get a pump started and the run-on timer to 4 minutes to run a pump on and pressurise a pipe system or an air cell. Alternatively you could set the start timer to 3 minutes to allow a bore pump with a self draining riser time to fill its pipework and you could also set the run-on timer to 1 second to ignore bubbles of entrained gas in the pipe system. Note that the run-on period will only commence when the flow has reduced to a lower rate than the F28 is able to detect.

No.	DESCRIPTION	FUNCTION
1	MASTER RESET BUTTON	With power on, press this button to start the pump at any time. Always press it after making any changes to the settings on the 4 timer dials. Any changes you have made will not take effect until you press the reset button. This button can be pressed at any time even if the pump is running under the control of the run timer. All timers are reset to zero when the reset button is pressed.
2	START TIMER	When the F28 is first turned on or when the reset button is pressed, the start timer sets how long the pump runs for and ignores the fact that there may be no flow present at that time. It can be set from zero to 3 minutes in 16 steps.
3	RUN-ON TIMER	If the flow is interrupted for any reason while the pump is running, this timer sets how long the loss of flow is ignored before the pump automatically shuts down. It can be set from zero to 5 minutes in 16 steps.
4	RUN TIMER	This timer sets how long the pump runs for. It can be set from 1 minute to 12 hours in 15 steps. If it is set to zero it is simply off and the pump will run without any time limit and while ever there is flow past its paddle.
5	STOP TIMER	If the flow is stopped because taps are turned off or because the pump has run out of water, the stop timer sets how long the pump remains off before the F28 attempts to restart it. This timer is adjustable from one minute to 48 hours in 15 steps. If the stop timer is set to zero the pump will not try to restart automatically under any conditions.
6	START & RUN TIMER LED	This light shows steady blue whenever the start-up timer is running and also flashes rapidly blue whenever the run timer is running. If you see this light flashing rapidly blue during normal operation of the pump, it means the pump is running under the control of the run timer and the light is letting you know that when the run timer times out the pump will automatically shut down.
7	FLOW STATUS & POWER LED	This light will show a steady green whenever the paddle of the F28 is held forward by flow. It will be on at all times there is flow past the F28's paddle. This light also pulses slowly red at 1 pulse every 2 seconds whenever the F28 is powered up and in standby mode. It indicates that everything is OK and the F28 is simply waiting for flow to push its paddle and start the pump.
8	RUN-ON & STOP TIMER LED	This light shows steady red whenever the run-on timer is running. If you have set the run-on timer to say 3 seconds to ignore air bubbles in the pipework then the pump will keep running and this light will come on steady red for 3 seconds every time air passes through the system. This light also flashes rapidly red whenever the pump is stopped and under the control of the stop timer. In this situation it simply indicates that the pump has stopped and will restart automatically after whatever delay is set on the stop timer dial.
9	FLOW SENSITIVITY ADJUSTMENT	Under this dust cap is a screw that sets the sensitivity of the F28 to flow. As supplied this screw is wound fully in which is its least sensitive position. By winding this screw anti-clockwise (out) the F28 can be set to detect progressively lower flows. The screw should not be wound out beyond where the dust cap can be refitted.
10	PADDLE	The paddle (a replaceable item) must be trimmed to suit the intended application. Normally the paddle is cut so when installed it intrudes to a little past the centre line of the pipe. The more area of paddle exposed to the flow the more responsive the F28 will be. The paddle is normally trimmed with a pair of tin snips or a hacksaw. It can be narrowed down and its end rounded to suit the specific pipe in which it is to be installed. The paddle should always be trimmed so there is a minimum of 4mm clearance to the closest adjacent pipe walls. If you know the likely flow rate and the pipe size of your pump system there is an online calculator available at <a href="http://www.kelco.com.au">www.kelco.com.au</a> that will help you to work out an exact size to cut the paddle.

## RUN TIMER

The run timer sets how long the pump will run once started. It can be set from 1 minute to 12 hours in 15 steps. If it is set to zero it is simply off and doesn't effect the operation of the F28. When running under the control of the run timer the start light (6) will flash rapidly blue. A typical application for the run timer would be to run a low yield bore pump long enough to pump the standing water level low and then to automatically shut the pump down.

## STOP TIMER

The stop timer sets how long the pump remains off once it has been shut down. It can be set from 1 minute to 48 hours in 15 steps. Shut down may have been because the pump ran dry or due to the pump being shut down by the run timer ending its run. Shut down may also have been because there was no demand for water in the system at the time. In the low yield bore example described above, the stop timer can be set for sufficient time for the standing water level in the bore to recover. At the end of the stop time the pump will automatically restart under the control of the F28. By using the run and stop timers this way a bore can be cycled and pumped to close to its maximum yield. The run light (8) will flash rapidly red whenever the stop timer is running. This is to indicate to you that while the pump is off it will restart automatically at the end of whatever time is set on the stop time dial.

## NOTES ON THE RUN & STOP TIMERS

The stop timer only starts when flow actually stops and then only after the run-on timer times out. This means that for accurate run or stop times the time set on the run-on timer has to be added to whatever time you have set on the run or stop timer. For example, in a system that is to be triggered by loss of flow you may have the stop timer set to 1 hour and the run-on timer set to 5 minutes. In this situation, 5 minutes after the flow is actually lost or is shut off, the stop time will commence. The pump will restart 65 minutes after the actual flow was lost. While independent of each other, the run and stop timers can be operated together. Together they can run a pump for some period of time then turn the pump off and have it stay off for a selectable period of time. You can also operate the run and stop timers independently of each other, and the effect is as follows: -

### RUN TIME WITHOUT STOP TIME

With the stop timer set to zero the run timer regards the stop time as infinite. In other words the run timer becomes a one shot timer and once timed out stops the pump indefinitely. This arrangement can be handy, for example it can be used to pump water to a remote tank for a set time and then shut down. Each time you want a batch of water sent to the tank simply press the reset button to start the batching process.

### STOP TIME WITHOUT RUN TIME

With the run timer set to zero the stop timer will actuate each time flow stops. The flow stopping may be because the pump has been run dry or simply because all valves or taps have been shut. After the stop time the pump will automatically restart and run. The pump will then continue to run while ever flow is maintained. If there is no demand for water when the stop timer restarts the pump, the system will simply run for whatever time is set on the run-on times and then shut down the pump. The F28 will then re-run the stop timer and repeat the process. This configuration can be used to automatically recover from a dry run situation or to maintain pressure in pipework, for example, in a pipe feeding remote stock troughs. As an example, in such a system air cell pressure or simply line pressure is lost as stock drink. Often this slight drop in pressure is too low to be detected by a normal pressure switch actuated pump. An F28 can automatically start the pump and run it for however long it takes for the line to pressurise and for the flow to stop. This may take hours or minutes and may vary considerably from time to time. Once stopped, the F28's stop timer will hold the pump off for what ever time you have set it to and then restart the pump and re-pressurise the system. If for any reason flow is lost while the pump is running this will be detected by the F28 and the pump will be shut down. The pump will then attempt to restart and repeat the whole process after waiting for whatever time the stop timer has been set to.

## PRESSURE SYSTEMS

The F28 quad timer flow switch can be used to protect a conventional pressure start pressure stop pump from running dry if flow is lost. In a conventional pressure system a pressure switch turns the pump on when the pressure drops, and switches it off when the pressure rises. All such systems have one basic flaw, if they run out of water for any reason; the lack of pressure will hold the pressure switch on and keep the pump running. The result is usually severe damage to the pump. To protect a pressure pump in such a situation plug the pump into the F28 and connect the F28 to the power with the pressure switch in series. That is, the pressure switch is wired to simply interrupt the active supply to the F28. Note that with this arrangement the pressure switch will control the F28 and in turn the F28 will control the pump. The F28 will have no effect on the normal operation of the pressure system. The pump will switch on on a falling pressure and switch off on a rising pressure as normal. If however the pump runs dry the loss of flow will be detected by the F28 which will respond by running its run on timer for whatever time you have set it to and at the end of the timeout if flow has not been re-established the pump will be shut down, thus protecting it from damage.

## WARNING

**To set up an F28 to operate in the manner described requires electrical work that must be carried out by a licensed electrician and must conform to local wiring rules, Refer to the notes above concerning fixed installations.**

## SENSITIVITY ADJUSTMENT

A sensitivity adjusting screw (9) is provided for fine-tuning the F28. Under the end of the switch housing is a hex-headed plug that covers the adjusting screw. Remove the plug and using a broad-bladed screwdriver wind the adjusting screw anticlockwise to increase the sensitivity (reduce the flow rate needed to actuate the paddle). As supplied, the screw is wound fully in and the F28 is set to its least sensitive. The maximum sensitivity is reached with the screw wound out to a point where the hex dust cover can still be refitted. Normally the sensitivity screw should be left fully screwed in. If the paddle has been trimmed too short the resultant loss of sensitivity can be offset by winding the sensitivity screw out a few turns.

## LIMITATIONS

The F28 flow switch requires a stable 220 to 240V AC 50Hz supply in order to operate properly. Where large pumps are connected to an F28 care should be taken to ensure cable sizes are adequate. Never use the F28 with long or coiled extension leads or on generator sets. The electronics built into the F28 are protected against surges and brownout and these protection systems can be triggered by voltage drop, severe voltage spikes or by an erratic electrical supply.

The F28 should only be used in ambient temperature water applications. It is neither designed for nor is it intended to be used with liquids other than water. The F28 flow switch must never be used in hot water applications (greater than 60°C) and must also be protected from freezing.

The F28 is designed to withstand water pressures up to 20 Bars (300 PSI) and must not be used in applications where either the static or dynamic pressure exceeds this rating.

## WARNING

**If the F28 Flow Switch is used in a manner not specified by the manufacturer the protection provided by the device may be impaired or negated. In addition all warranties stated or implied will be rendered invalid.**

MADE IN AUSTRALIA BY

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**PLEASE NOTE:** The Kelco F28 Quad Timer Flow Switch is the subject of Australian and International patent and trademark applications.

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