

# INSTALLING AND USING THE KELCO F50 PUMP CONTROLLER

## WARNING

Please read this installation sheet fully and carefully. The F50 Pump Controller is a mains voltage device. Death or serious injury may result if this product is not correctly installed and used.

## INTRODUCTION

The F50 pump controller is a microprocessor based integrated pressure and flow device. It is designed for controlling the operation of a pump and for protecting it against running dry.

The F50 pump controller can be used in a variety of situations to control and safeguard a pump. Some models can directly control single-phase pump motors up to 3.75kW (5HP) without the need for an interposing contactor. In addition to protecting the pump from dry run damage the F50 can be set to automatically maintain line pressure in stock watering applications or for cyclically pumping low yield stock or domestic bores.



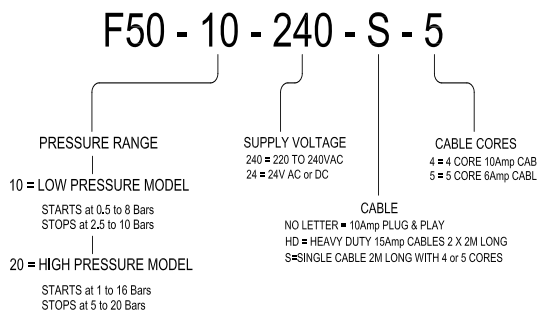
## WARNING

The F50 pump controller 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 F50 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 F50 may present a shock hazard and death or serious injury may result if water enters the F50's electrical housing. There are no user serviceable parts in this pump controller. Under no circumstances should the main housing be opened. Warranty on this product is automatically void if the sealed body screws are opened.

## 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.

## MODELS



## OPERATING ENVIRONMENT ALL MODELS

Supply F50-240	220 to 250VAC 50Hz
Supply F50-24	12 to 28 Volts AC or DC, 100mA
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 ALL MODELS

Start-up Timer	Adjustable from 1 sec. to 3 minutes in 15 steps
Run-on Timer	Adjustable from 1 sec. to 5 minutes in 15 steps
Automatic Restart Timer	Automatic 4 attempts to Start after 15 mins, 1 hr, 6 hrs and 12 hrs
Pump Start Pressure Range (10 Bar model)	0.5 to 8 Bars in steps of 0.5 Bars
Pump Start Pressure Range (20 Bar model)	1 to 16 Bars in steps of 1 Bar
Pump Stop Pressure Range (10 Bar model)	2.5 to 10 Bars in steps of 0.5 Bars
Pump Stop Pressure Range (20 Bar model)	5 to 20 Bars in steps of 1 Bar
Recommended Pipe Sizes	25mm (1") or larger. (There is no upper limit)
Maximum Switched Load F50-240	250VAC 50Hz 2.4kW (Motors up to 3HP)
Maximum Switched Load F50-240HD	250VAC 50Hz 3.75kW (Motors up to 5HP)
Maximum Switched Load F50-240-S-4	250VAC 50Hz 2.4kW (Motors up to 3HP)
Maximum Switched Load F50-240-S-5	250VAC 50Hz 6Amps Non Inductive
Maximum Switched Load F50-24-S-5	250VAC 50Hz 6Amps Non Inductive
Operating Pressure Range, Static or Dynamic, all models	0 to 20 Bars (0 to 300psi) See Note Below
Burst Pressure, all models	50 Bars (750 psi)

**NOTE: The F50 pump controller must NOT be used in hot water applications (>60°C). The F50 pump controller is rated to withstand water pressure to 20 Bars (300 psi) and must not be used in applications where the static or dynamic pressure exceeds this rating.**

## INSTALLATION

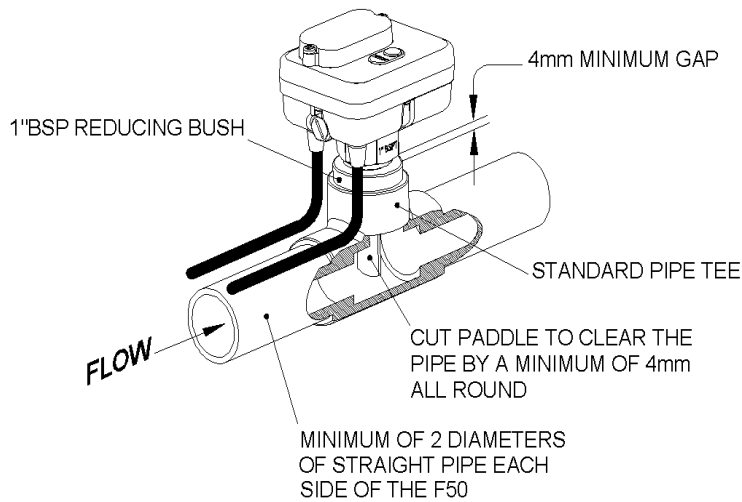
The F50 is suitable for use in all cold-water based applications such as potable water, seawater, bore water, chlorinated pool water, brackish water or filtered effluent. A suitable location should be selected for the controller in the delivery pipework of the pump. The controller should be installed in a location that is away from both vibration and heat, 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 controller. The controller should be located on the topside of a horizontal section of the pipework with a minimum of 2 diameters of straight pipe either side of the controller. Under no circumstances mount the F50 under a pipe or close to valves, tees, bends or any other obstructions likely to cause major turbulence in the flow. The F50 can be mounted in vertical pipework if required, and flow can pass either in an upward or downward direction.

### BEFORE OR AFTER THE AIR CELL?

Where a pump system includes an air cell, it is possible to install the F50 pump controller upstream or down stream of the cell. The system will behave quite differently depending on the location chosen. If the F50 is installed after the air cell it will start the pump as soon as flow starts. This is because flow from the air cell will be sensed by the F50, which will in turn start the pump. If the F50 is installed before the air cell, initial flow from the cell will not be detected by the F50 and therefore not cause the pump to start. In such an installation the system will not start until the system's pressure falls to whatever the starting pressure dial is set to.

In most installations the paddle of the F50 will need to be trimmed to suit the specific pipe tee in which it is to be installed. The paddle of the controller 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 controller. Be aware that high velocity flow can generate high forces and may damage the paddle. As a general guide the paddle of the F50 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. 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 F50 into the socket using the spanner flats provided. When properly installed the controller should be square to the axis of the pipe, with the flow arrow on the side of the F50's 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 F50's spanner flats. Under no circumstances should the F50 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 controller's housing cracking under pressure.

# HOW TO INSTALL AN F50 PUMP CONTROLLER



## ELECTRICAL

The F50 pump controller 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 F50 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 F50 is stable and that the current carrying capacity of the cable is adequate for the job.

Never use long or coiled extension leads (longer than 5 metres) to connect a pump to the F50. The Standard F50-240 pump controller is supplied fitted with a 10 Amp plug and socket. Pumps up to 2.4kW single phase (P1) can be plugged directly into the socket connection to the controller.

**NOTE: For mains voltage applications we recommend that the supply to the F50 be isolated by a 10Amp RCD that has a maxi-**

## WARNING

When installing the F50 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 F50 is to be used to control pump motors up to 2.4kW (3HP) the supply to the F50 must be protected by a 10Amp fuse or by a 10Amp circuit breaker.

## FIXED INSTALLATION

## WARNING

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

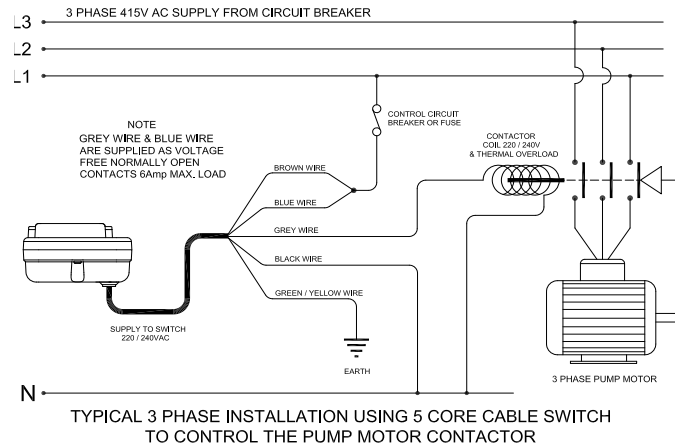
The standard F50-240 can directly control single-phase 240V~ 50Hz pump motors up to 2.4kW. When used in a fixed installation a disconnecting device such as a switch or a circuit breaker must isolate the F50. The disconnecting device must be easily and readily accessible after installation. Where a circuit breaker is used it must be rated at 10 Amp. Where an isolation switch is used the circuit must be protected by a 10Amp fuse. In the interests of safety a 10Amp RCD with a maximum 30mA trip should also be installed in the supply.

## F50-240HD MODEL ONLY

## WARNING

The F50-240HD is supplied with heavy duty flying leads for fixed installation use only. It must be installed by a licensed electrician and isolated by a 15Amp fuse or a 15Amp circuit breaker. We recommend that the supply to the F50-240HD be isolated by a 15Amp RCD that has a maximum trip current of 30mA.

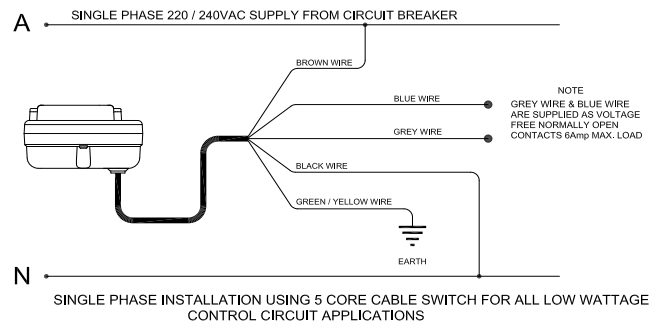
# BASIC WIRING DIAGRAMS



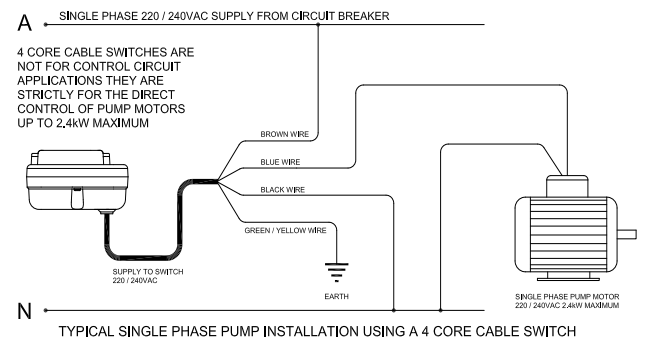
TYPICAL 3 PHASE INSTALLATION USING 5 CORE CABLE SWITCH TO CONTROL THE PUMP MOTOR CONTACTOR

## IMPORTANT

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



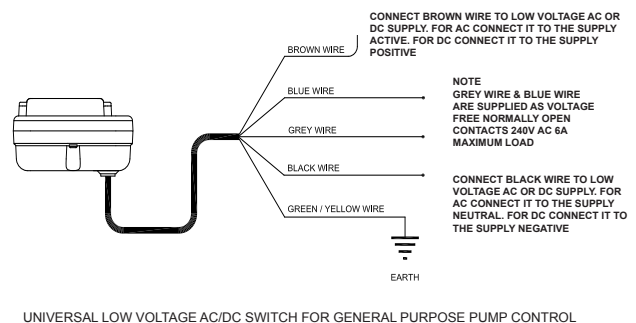
SINGLE PHASE INSTALLATION USING 5 CORE CABLE SWITCH FOR ALL LOW WATTAGE CONTROL CIRCUIT APPLICATIONS



TYPICAL SINGLE PHASE PUMP INSTALLATION USING A 4 CORE CABLE SWITCH

## 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



UNIVERSAL LOW VOLTAGE AC/DC SWITCH FOR GENERAL PURPOSE PUMP CONTROL



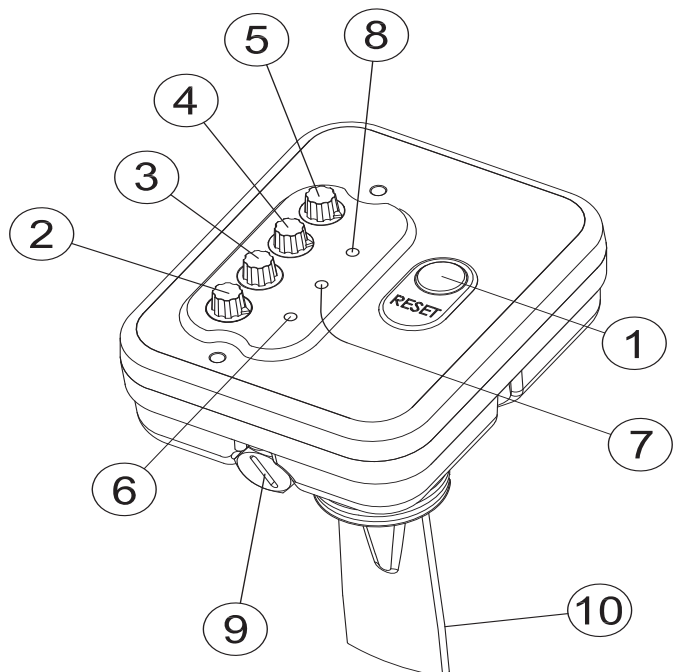
## WARNING

Without the cover in place the F50 is not water resistant and presents a potential shock hazard. Take great care not to splash water onto the F50 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 change to the settings on the 4 control dials you must always press the reset button for the changes to take effect.

## BROWNOUT OR BLACKOUT

If a blackout or brownout occurs while the F50 is operating the controller 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 F50 will reboot, restart the pump and run any timer settings from the beginning. A manual reboot can be done by simply pressing the reset button on the top deck of the controller.



## ADJUSTING SETTINGS

There are 4 rotary switches located under the clear cover on the top deck of the F50. These 4 dials are for adjusting the timers and pressure switch settings that control the F50's actions. 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 settings.

No.	DESCRIPTION	FUNCTION
1.	MASTER RESET BUTTON	With power on, press this button to start the pump. Always press it after changes to the settings on any of the 4 timer dials. Any changes you have made will not take effect until you press the reset button. This button should only be pressed when the pump is stationary, not while it is running. All timers are reset to zero when the reset button is pressed.
2.	STARTUP TIMER (AND AUTO RESTART SWITCH)	<p>With this dial in the zero (6 o'clock position) the dry run auto restart feature on the F50 is active. In all other dial positions auto restart is off and the dial simply provides an adjustable override on start time delay. The time delay range is adjustable from 1 second to 3 minutes.</p> <p>If this dial is left on zero, then the dry run restart feature will be active and if the F50 senses the pump has run dry it will automatically attempt to restart the pump after 15 minutes. If it fails, it will try again 3 more times after a progressively increasing time delay. If after 4 attempts the system is still running dry the F50 will go into full alarm mode and flash its red warning lights (7 &amp; 8) rapidly and alternately. The system will not then restart until the reset (1) is pressed. The four restart delay times are 15 minutes, 1 hour, 6 hours &amp; 12 hours.</p> <p>In normal use, this dial is set to marginally longer than the time required for the system to establish flow. Regardless of what delay it is set to, the auto-terminating timer automatically ends its run as soon as the F50 senses flow.</p>
3.	RUN-ON TIMER (AND AUTO RESETTING RUN-ON TIMER)	<p>With this dial set to zero (6 o'clock position) the automatic resetting run-on is active. In all other positions the dial simply provides an ever increasing run-on time. The auto resetting run-on feature is a self-resetting 2 second timer that is capable of running a pump on the snore (when virtually dry). Systems with entrained gas or highly interrupted flows will run smoothly with the run-on dial in this position.</p> <p>For normal operation and on the vast majority of pumps, set this dial to sufficient time to recharge the system pressure to the desired level, or sufficient time for the high pressure cut out (5) to operate. The run-on time is adjustable from 1 second to 5 minutes by turning the dial clockwise.</p>
4.	STARTING PRESSURE	This dial sets the system's normal start-up pressure. If the F50 is installed before an air cell or if there is a slow leak then the pressure set on this dial is the pressure that the pump will start at.
5.	STOPPING PRESSURE	This dial sets the maximum system pressure. It is the pressure at which the pump will switch off. When no upper operating pressure limitation is required simply wind this dial up to a pressure that is above the shutoff pressure of the pump.
6.	START & RUN ON TIMER LIGHT	<p>This light flashes rapidly blue whenever the start-up timer is running. It means the pump is running under the control of the start up timer and the light is letting you know that when the F50 senses flow or when the start timer times out the pump will either continue to run, if there is a demand for flow, or automatically shut down and wait for a pressure drop or flow demand to re-trigger it. The start-up timer in the F50 automatically terminates its run as soon as flow is detected. In a properly primed pump, this blue light may only be on for a fraction of a second, since the start up timer terminates its run as soon as flow is detected.</p> <p>This light also shows steady blue whenever the run-on timer is running. If flow is interrupted for any reason, this light will show steady blue while the run-on timer times out.</p>
7.	FLOW STATUS & ALARM LIGHT	This light will show a steady green whenever the paddle of the F50 is held on by flow. It will also flash red whenever the F50 is in full dry run lock out mode. It will be on and showing a steady green at all times there is a modest flow through the system.
8.	STOP PUMP LIGHT	This light shows steady red whenever the pump has stopped in normal operation. If the system has been run dry it also pulses slowly red in a coded sequence that indicates the number of times the F50 has attempted to restart the system. One pulse indicates the first dry run, two pulses the second through to four pulses during the fourth wait period. After four attempts, if the system is still running dry the F50 will go into full lock out alarm mode. In this state the lights (7) and (8) flash continuously and alternately red to indicate an alarm.
9.	FLOW SENSITIVITY ADJUSTMENT	Under this dust cap is a screw that sets the sensitivity of the F50 to flow. As supplied, this screw is wound fully in which is its least sensitive position. By winding this screw anti-clockwise (out) the F50 can be set to detect progressively lower flows. In other words become more sensitive and responsive to low flows. The screw should not be wound out beyond where the dust cap can be refitted. The F50 will not operate if this screw is fully removed. Use a wide bladed screwdriver to adjust this screw.

## START TIMER

Setting the start timer (1) will override the off state of the F50 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 flash rapidly while the timer is running, and if correctly set, and if there is a flow demand, 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 the 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 F50 and for the flow status light (7) to come on steady green. The start timer automatically terminates its run as soon as flow is detected. You may have the dial set to perhaps 10 seconds but if the pump is primed the timer may only run for 1 or 2 seconds.

If the start timer dial is set to zero (6 o'clock position) the start time is a fixed 20 seconds and the auto restart feature will be active. If the pump runs dry the auto restart will automatically attempt to restart it 15 minutes after it runs dry. Note that the fixed 20 second time out is also self-terminating as soon as flow is detected.

## 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 a large air cell. It will keep your pump running for up to 5 minutes after the flow has reduced to a point below where the paddle of the F50 can detect. Alternatively, it could also be set to only a few seconds to simply allow the pump to ignore minor fluctuations in flow. The run-on timer only starts 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 run-on timer is self-terminating, and regardless of its setting will terminate its run as soon as flow is detected.

If the run-on timer dial is set to zero (6 o'clock position) it actuates the auto run-on feature and has a 20 second fixed run-on that automatically resets its time setting each time flow is sensed. In a situation where entrained air is present in the pipework the paddle of the F50 will bounce rapidly back and forward, the auto resetting run-on will keep the pump running regardless of this. It will only allow the pump to stop if flow actually ceases for the full 20 seconds.

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 5 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 auto run-on (6 o'clock position) 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 F50 is able to detect.

## STARTING PRESSURE

Set the start pressure to slightly higher than the system's static pressure (the pressure when the system is fully primed and the pump is switched off). Once the system starts the start timer should keep the pump running long enough for pressure to rise to above whatever the start pressure is set to. If it fails to do so, the pump will shut down and go into dry run mode. If this occurs, set the start timer to a slightly longer delay and press the reset button. The pump will restart and again attempt to bring the system pressure up above whatever pressure you have set the start pressure to.

## STOPPING PRESSURE

The stop pressure dial sets the high pressure limit at which the pump will shut down. It can be set to limit system pressure to a safe level. The pump will switch off at the stopping pressure regardless of flow demand. If the pump has shut down on high pressure and a tap is turned on, the pressure will fall all the way down to the starting pressure before the pump will restart. This feature ensures the pump can't hunt on and off at the upper pressure limit. Note that the run-on timer will not allow the pump to run up in pressure to higher than the upper pressure set point. The run-on timer will automatically terminate its run as soon as the high-pressure setting is reached. When not required to limit system pressure the stopping pressure dial can be set to some value higher than the maximum pressure that the pump is capable of. In such applications the run-on timer can be used to set the system's maximum pressure by running the pump on for a set time after flow stops to achieve whatever pressure is required within the capacity of the pump.

## PRESSURE SYSTEMS

The F50 pump controller can be used as an alternative to a conventional pressure switch to start and stop a pump on pressure. Unlike a pressure switch, the F50 has the added benefit of preventing the 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. The F50 is an ideal alternative because it monitors flow as well as pressure and will stop the pump from running dry by detecting the loss of flow. The pump will switch on on a falling pressure and switch off when flow ceases or when the upper pressure set point is reached.

## AIR CELLS AND PUMP STARTS

An air cell can be used in a pump system to store pressure energy and provide the motive power to trigger the system and restart the pump. The F50 relies on either pressure drop or flow to start a pump. If an F50 is installed in a pump system before the air cell, any demand at the tap will be met by the draw off from the air cell until the pressure falls to the level set on the F50's start pressure dial. The pump will then start and if there is an on going demand continue to pump. In such a system the draw off capacity of the air cell and the flow demand will determine how frequently the pump starts. A large capacity air cell will reduce the frequency of starting and thus the cycling of the pump. A small draw off air cell will give more frequent starting.

If the F50 is installed after the air cell, any more than a slight flow from the air cell will start the pump on flow. If the flow demand is extremely low, eventually the pump will simply start on pressure drop once the pressure reaches the start pressure dial's set point. Where a system is required to supply a constant pressure the F50 should be mounted after the air cell. When pump cycling is to be kept to a minimum, the F50 should be mounted before the air cell and a large draw off capacity air cell should be used in the system.

## SENSITIVITY ADJUSTMENT

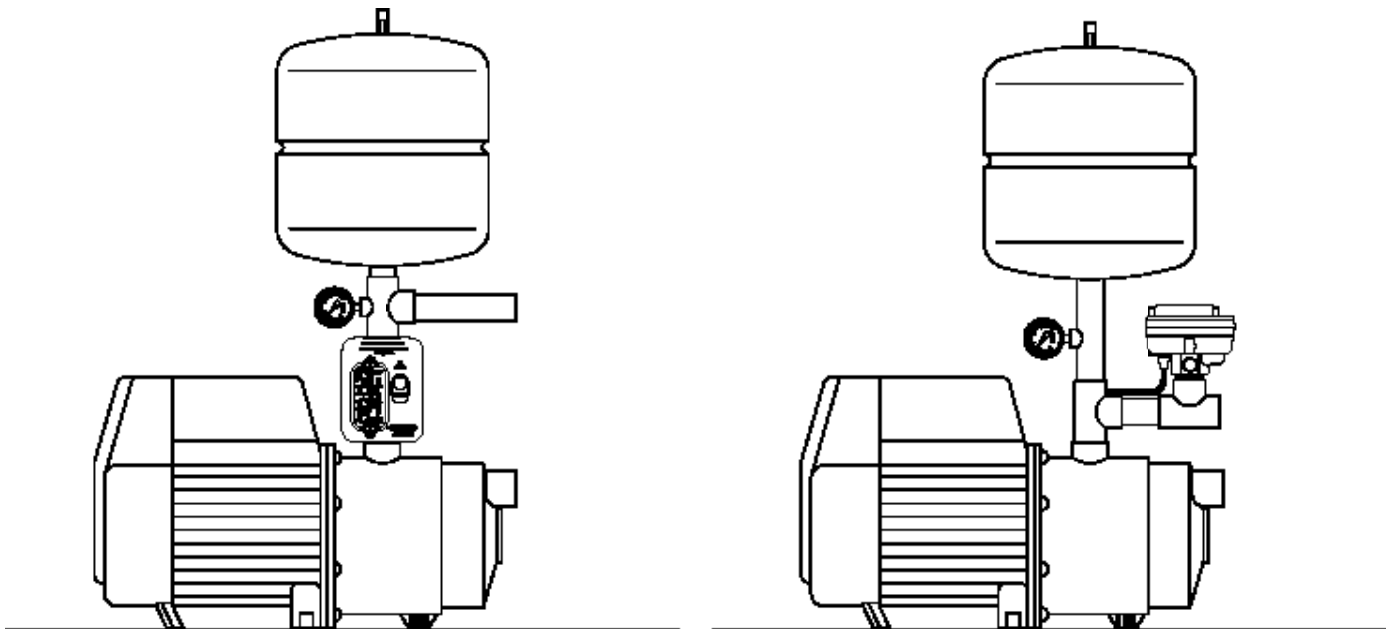
A sensitivity adjusting screw (9) is provided for fine-tuning the F50. Under the end of the switch housing is a hex-headed plug that covers the adjusting screw. Remove the plug and using a broad-bladed screwdriver wind the adjusting screw anticlockwise to increase the sensitivity (reduce the flow rate needed to actuate the paddle.) As supplied, the screw is wound fully in and the F50 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 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 mains voltage F50 pump controller requires a stable 220 to 240 VAC 50Hz supply in order to operate properly. Where large pumps are connected to an F50 care should be taken to ensure cable sizes are adequate. Never use the F50 with long or coiled extension leads or on generator sets. The electronics built into the F50 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 F50 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 F50 pump controller must never be used in hot water applications (greater than 60°C) and must also be protected from freezing.

The standard F50-10 is designed to withstand water pressures up to 20 Bars, (300psi) and must not be used in applications where either the static or dynamic pressure exceeds this rating.



F50 INSTALLED BEFORE THE AIR CELL  
(SEE TEXT)

F50 INSTALLED AFTER THE AIR CELL  
(SEE TEXT)

## WARNING

If the F50 Pump Controller 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 F50 Pump Controller is the subject of Australian and International patent and trademark applications.

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