

# INSTALLING AND USING THE KELCO E20 LOSS OF PRIME PRESSURE SWITCH

## WARNING

Please read this installation sheet fully and carefully. The E20 Pressure Switch is a mains voltage device. Death or serious injury may result if this product is not correctly installed and used.

## INTRODUCTION

The E20 loss of prime pressure switch is a microprocessor controlled solid-state pressure switch. It is designed for controlling the operation of a pump and for protecting it against running dry. The E20 features an adjustable trip point that can be set to stop a pump if pressure falls to below the system's normal operating range. The trip point feature has an automatic 30-second time delay buffer built in to allow normal pressure fluctuations to be ignored. System pressure can drop to below the trip point setting for up to 30 seconds without triggering the trip and alarm feature. The E20 also has a fine tune zeroing adjustment that allows the pressure switch to be calibrated accurately to any required pressure within its range. The fine tune adjustment dial can also be used to offset the entire operating range of the switch and to select pressure set points that may lie in between the main dial graduations of the switch.



## WARNING

The E20 pressure 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 E20 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 E20 may present a shock hazard and death or serious injury may result if water enters the E20's electrical housing. There are no user serviceable parts in this pressure switch. 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.

**E20 - 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

PRESSURE RANGE  
20 = 0 to 20Bars

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

## OPERATING ENVIRONMENT

Ambient Temperature Range	1°C to 50°C
Liquid Temperature Range	1°C to 60°C, See note below
Ingress Protection Rating	IP67
Supply E20-240 (240VAC Model)	220 to 240VAC 50Hz
Supply E20-24 Low Voltage AC/DC Model	12 to 28Volts AC or DC at 80mA Max
Maximum Operating Pressure	20 Bars (300 psi)

## OPERATING RANGE

Start-up Timer	Automatic and limited to 30 seconds Max.
Cut out Pressure	Adjustable from 2 to 20 Bars in 16 steps
Cut in Pressure	Adjustable from 1 to 19 Bars in 16 steps
Trip Pressure	Adjustable from 0 to 18 Bars in 16 steps
Fine Tune Adjustment	Adjustable Range +/-1 Bar in 16 steps
Minimum Differential Pressure On to Off	1 Bars (100kPa)~(14.7 psi)
Maximum Differential Pressure On to Off	19 Bars (1900kPa)~(274psi)
Maximum Switched Load E20-240 (Plug & Play Model)	240VAC 50Hz 2.4kW (Motors up to 3HP)
Maximum Switched Load E20-240-HD Model Only	240VAC 50Hz 3.75kW (Motors up to 5HP)
Maximum Switched Load E20-240-S-4	240VAC 50Hz 2.4kW (Motors up to 3HP)
Maximum Switched Load E20-240-S-5	240VAC 50Hz 6 Amps. For control circuit applications only
Maximum Switched Load E20-24-S-5	240VAC 50Hz 6 Amps. For control circuit applications only
Operating Pressure Range	0 to 20 Bars (0 to 300psi) See note below
Burst Pressure	45 Bars (650psi)

**SAFETY WARNING NOTE:** The E20 pressure switch must not be used in hot water applications >60°C.

The E20 pressure switch is designed to operate at pressures up to 20 Bars (300 psi), and must not be used in applications where either the static or dynamic pressure exceeds this rating.

## INSTALLATION

The E20 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 pressure switch in the delivery pipework of the pump. The pressure switch 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. Drill and tap a 1/4" BSP thread in the pipework at the required location and fit the E20 pressure switch using a 1/4" brass or stainless nipple (not supplied). The E20 can be mounted in any orientation required in either vertical or horizontal pipework.

Apply a suitable thread sealant tape or thread paste and screw the E20 pressure switch and its interposing nipple into the pipework, using the spanner flats provided. When properly installed the controller should be square to the axis of the pipe with the top controls in an accessible position.

# ELECTRICAL

## IMPORTANT

The standard E20-240 pressure switch is not suitable for control circuit applications. It includes a solid-state drive system that is specifically designed for the direct control of pump motors. Where control circuits are to include an E20, including contactor, relay and timer logic circuits, use only the E20-S-5. Switches designated S-5 are specifically for low wattage control circuit applications and do not include the solid-state drive system found in the standard switches.

The E20 pressure 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 E20 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 E20 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 E20. The plug and play E20 pressure 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 pressure switch.

**For mains voltage applications we recommend that the supply to the E20 be isolated by a 10Amp RCD that has a maximum trip current of 30mA.**

## WARNING

When installing the E20, 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 E20 is to be used to control pump motors up to 2.4kW 3HP the supply to the E20 must be protected by a 10 Amp fuse or by a 10 Amp circuit breaker.

# FIXED INSTALLATION

## WARNING

Mains voltage fixed installations must only ever be carried out by a licensed electrician and must conform to local wiring rules.

The E20-240 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 E20. 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

## MODEL E20-240-HD ONLY

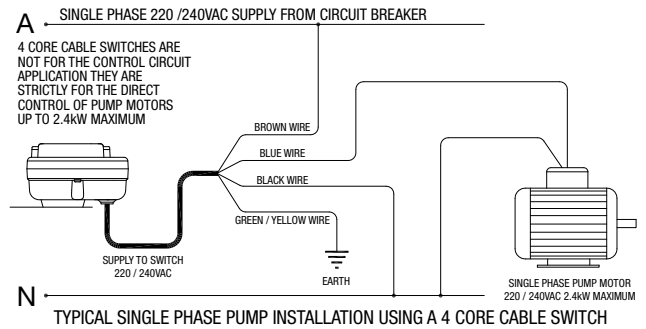
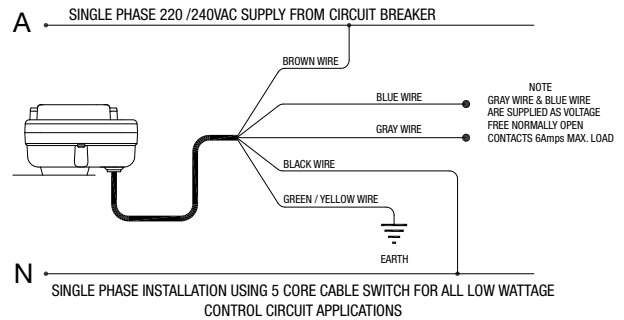
## WARNING

The E20-240-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 15Amp fuse or a 15Amp circuit breaker.

# BROWNOUT OR BLACKOUT

If a blackout or brownout occurs while the E20 is operating, the pressure switch will not retain any memory of its previous state. It will simply shut down the pump. When power resumes, the E20 will reboot, restart the pump and run the start-up time from the beginning. A manual reboot can be done at any time by simply pressing the reset button on the top deck of the pressure switch.

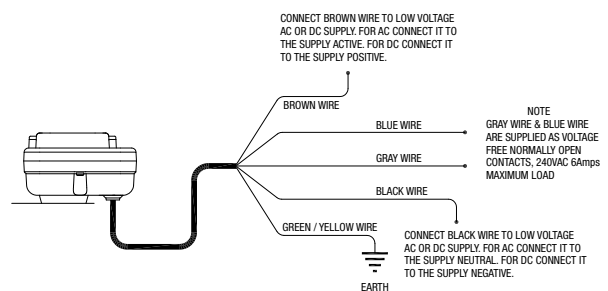
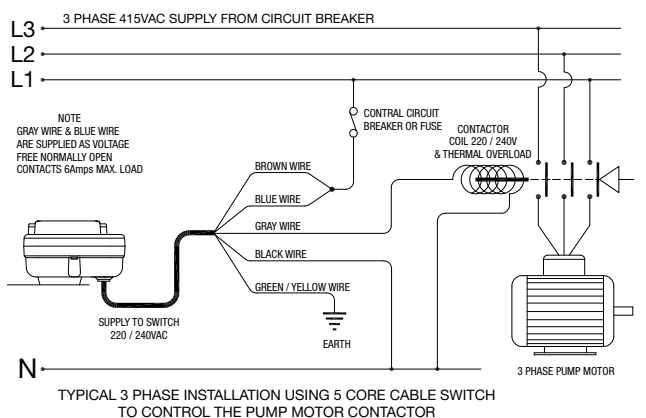
# BASIC WIRING DIAGRAMS



## 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



## ADJUSTING SETTINGS

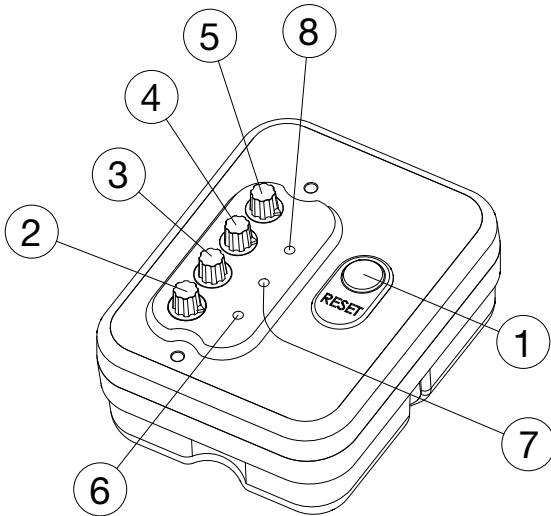
There are 4 rotary switches located under the clear cover on the top deck of the E20. These 4 dials are for adjusting the pressure settings that control the E20's actions. To access the 4 dials undo the 2 screws that hold the clear cover in place. Note that the clear cover must always be replaced and tightened after making changes to the settings.



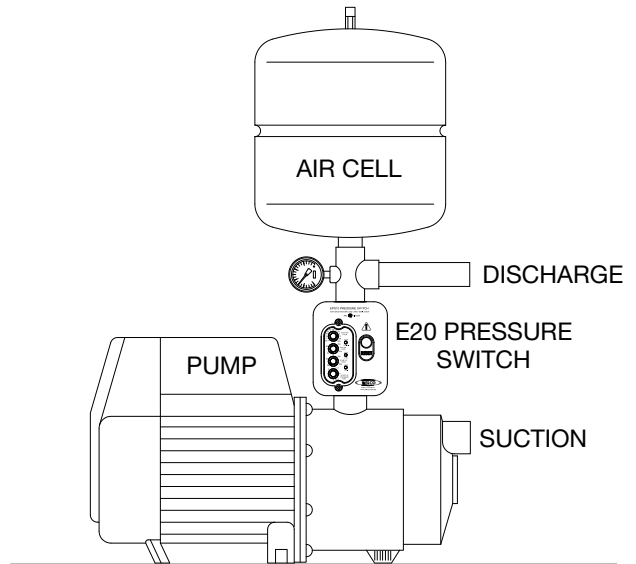
### WARNING

Without the cover in place the E20 is not water resistant and presents a potential shock hazard. Take great care not to splash water onto the E20 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.



## TYPICAL PRESSURE SYSTEM



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 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. The start timer is reset to zero when the reset button is pressed.
2	FINE TUNE SETTING	This dial allows the entire pressure range of the switch to be shifted up or down in a series of fine steps. In effect, it allows the pressure switch to be zeroed in against any pressure within the overall range of 20 Bars. Using the fine tune dial it is possible to set the switch cut in, cut out or trip at virtually any point above or below the settings on the main turn on, turn off and trip dials.
3	TRIP POINT	This dial allow you to set the pressure at which the E20 will turn off the pump should the pressure ever fall to this level. The dial can be set from zero to 18 bars, in steps of 1.2 Bars. When the system is first turned on the start-up timer will run the pump for up to 30 seconds, ignoring the fact that the pressure may be low. The pressure must rise to higher than the trip point setting before the start timer times out. If it fails to do so, the E20 will shut the pump down and flash its red warning light (8). Pressing the master reset button (1) will cause the E20 to start the pump and attempt to raise the pressure to within the pumps normal operating range.
4	TURN ON	This dial sets the low-pressure limit of the normal operation of the pump. The pump will switch on when the pressure drops to this level. It is adjustable from 1 to 19 Bars in 16 steps of 1.2 Bars each.
5	TURN OFF	This dial sets the high limit of the normal operating range of the pump. The pump will switch off when the pressure reaches this setting. It is adjustable from 2 to 20 Bars in 16 steps of 1.2 Bars each.
6	START TIMER LED	This light flashes rapidly blue whenever the start timer is running. This light will go out as soon as the system pressure rises to above the trip point pressure setting (3). If the pressure fails to reach the required level this light will stay on until the end of its fixed 30 second set time and then the pump will stop and alarm light (8) will flash rapidly red to indicate a problem. This light also switches on steady blue for up to 30 seconds each time the pressure drops to below the trip point pressure setting (3). During the 30 second time out the pump continues to run and attempts to bring the pressure back above the trip point. If the pressure fails to rise to above the pressure set on the trip dial (3) by the end of the 30 second timeout the pump will shut down and the alarm light (8) will flash rapidly red to indicate loss of pressure.
7	NORMAL RUN LED	This light will show a steady green whenever the pump is operating within its normal pressure range. It means all is OK.
8	ALARM & STOP LED	This light shows steady red whenever the pump has stopped on high pressure. It means there is no demand for water and the pump has stopped on its normal high pressure cut out. This light also flashes rapidly red if there is a problem. If the pump has lost pressure or has been run dry, this light will flash rapidly red. It means the E20's loss of prime feature has been activated and has stopped the pump.

## STARTING THE SYSTEM

In a typical pressure system the E20 should be set to turn the pump on at some nominal starting pressure. This will depend entirely on your requirements and on the specific pump and system. The switch should also be set to turn the pump off at some required pressure that is higher than the turn on pressure. To do this, set the required pressures on the turn on dial (4) and the turn off dial (5). If dry run protection is required, set the trip point dial to some pressure value that is less than the setting on the turn on dial, for example to 1 or 2 Bars. Ensure water is available at the pump and that the pump is primed. Turn on the power. The pump should start and run for some period up to 30 seconds. The blue timer light (6) will flash rapidly during this start time. Once the pressure rises to above the trip point setting the blue light will go out but the pump will continue to run. If the pressure fails to reach the pressure you have set on the trip dial (3), the pump will then stop after its 30 second time out. The red alarm light (8) will flash rapidly to indicate a problem. Press the master reset button (1) and the process will repeat. Once within your set operating range the pump will continue to run if there is any demand for flow, that is, if a tap is turned on. If there is no demand then the pressure will continue to rise and eventually reach the turn off pressure (5). If all valves are closed and the pressure fails to reach a level that causes the pump to switch off, then adjust the turn off pressure dial (5) down one or two clicks and press the master reset button (1). The pump should switch off and the red stoplight (8) should come on steady red. To adjust the whole operation of the pump slightly upward in pressure turn the fine tune dial (3) clockwise. Each click of the switch increases the three set pressures, start, stop and trip slightly. If you turn the fine tune dial anticlockwise the effect is reversed and the pressure range is shifted progressively lower. The fine tune dial can thus be used to fine tune the overall performance of the pressure system and to zero it onto any specific required set point that may fall in between the graduations on the set point dials.

## TESTING FOR LOSS OF PRIME

If the water supply to the pump is turned off, or the pump suction is vented to atmosphere, the pump's discharge pressure will fall, and the pump will start when the pressure reaches the level set on the start dial (4). If the pressure drops to the level set on the trip point dial (3), the blue start timer led (6) will come on steady blue and the pump will continue to run for a fixed time of 30 seconds and try to bring the pressure back above the level set on the trip point dial (3). If the pressure fails to rise to above the trip point by the end of the 30 second timeout, the pump will stop and the red alarm light (8) will flash rapidly. To recover from such a dry run test, fix the water supply problem, prime the pump and press the master reset button. The pump should start and the pressure should climb to within its normal operating range as set on the start and stop pressure dials.

## GETTING THE SETTINGS WRONG

If the pressure setting dials are not correctly set the E20 pressure switch will not allow the pump to start. The lights (6), (7) and (8) will flash rapidly and alternately red green and blue, to indicate to you that there is a problem. Check the dial settings and make sure the turn off pressure (5) is set higher than the turn on pressure (4) and that the trip point setting (3) is set to less than the turn on pressure. Once you have corrected the switch settings, press the master reset for the changes to take effect. The pump should then start normally.

## LOW PRESSURE DIFFERENTIAL SYSTEMS

It is often highly desirable to maintain a fairly constant pressure in pipe systems, for example in a stock watering system where long runs of pipe are involved and draw off at the stock trough's is highly variable. Controlling a pressure pump in such systems can be very difficult. A pump under the control of an E20 pressure switch can be set to differentiate between very small pressure changes. The turn on pressure on the E20 can be set to as little as 1Bar (100kPa) less than the turn off pressure. This is often a sufficiently small difference in pressure to detect and respond to the pressure drop that occurs when a remote stock trough float valve opens. When the flow demand ceases, the E20 can detect and shut the pump down on the small pressure rise that occurs when the stock trough float valve closes. The E20 will then monitor the pressure and restart the system whenever the pressure drops again. 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 mechanical pressure switch. An E20 can automatically start the pump and run it for however long it takes for the line to re-pressurise. This may take hours or minutes and may vary considerably from time to time. If for any reason flow is lost while the pump is running, this will be detected by the E20 and the pump will be automatically shut down by the E20's loss of prime feature.

## AIR CELLS AND PUMP STARTS

An air cell is normally required in a pressure pump system to store pressure energy and provide hysteresis to prevent the pump from rapidly hunting or cycling on and off. 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 a more constant pressure but at the expense of more frequent starting. Most pumps have a limit to the number of times per hour that they should be started. This is particularly important with bore pumps as excessive cycling easily damages submersible motors. Care should be taken to ensure the draw off capacity of the air cell used is sufficient to keep pump starts within the pump manufacturer's recommended limit.

## LIMITATIONS

Depending on the specific model the E20 loss of prime pressure switch requires a stable 220 to 240V AC 50Hz supply in order to operate properly. Where large pumps are connected to an E20 care should be taken to ensure cable sizes are adequate. Never use the E20 with long or coiled extension leads or on generator sets. The electronics built into the E20 are protected against surges and brownouts and these protection systems can be triggered by voltage drop, severe voltage spikes, or by an erratic electrical supply.

The E20 pressure switch 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 E20 pressure switch must never be used in hot water applications (greater than 60°C) and must also be protected from freezing in cold water applications.

The E20 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 E20 Loss of Prime Pressure 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.**

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**PLEASE NOTE:** The Kelco E20 Pressure Switch is the subject of Australian and international patent and trademark applications.

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