

KELCO E30 DIGITAL PRESSURE SWITCH

PROGRAMMING INSTRUCTIONS

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Please Read Me First

The E30 digital pressure switch is supplied pre-loaded with a simple program. It is set to mode 1, loss of prime pressure switch, and it has its startup and run-on timers both set to 5 seconds. All other functions are turned off and its pressure set points are all set to zero.

Provided the E30 is unlocked you can restore it 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 reset button while still holding down the (P) button and then release the (P) button. This process is called purging the system and doing this removes any settings you have entered and restores the E30 to its original default state.

Introduction

The E30 digital pressure switch is a multifunction digitally programmable pressure switch that can be set up to function as a conventional differential pressure switch, a loss of prime pressure switch, an over and under pressure protection device (a pressure guard) or as a digital snap action pressure switch with normally open or normally closed contacts and an adjustable differential.

The way the E30 functions is selected using the pressure switch's simple menu structure. The switch functions are divided into three modes. Mode 1 sets the E30 up as a loss of prime pressure switch and by leaving its trip pressure set to zero, a conventional differential pressure switch. Mode 2 sets it up as a pressure guard and mode 3 emulates the function of a mechanical snap action single pressure point pressure switch.

The actual selection of a suitable mode of operation is beyond the scope of this book as it is related to the system requirements and the specific control the system requires. A specific mode must be selected prior to programming the E30 and that selection will depend on what level of control is required. In order to achieve the best performance from the E30, observe the following basic points.

- 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 produce unexpected interactions between the various functions.
- 2) When moving from mode to mode and from function to function always reset time and pressure values back to zero before moving on. Do not leave timers or pressures set up with some value entered and subsequently decide not to use that specific function. If you do this then enter zero values or purge the system before exiting the unrequired function. Provided the E30 is unlocked, a quick way to reset and clear out any unwanted settings is to press and hold down the (P) button while also pressing the (R) reset button. This is called purging the system and doing this clears all the user settings out of the E30 and restores it to its original default state.
- 3) Set realistic and sensible values into the various functions. For example, do not try to set a pump to stop at a lower pressure than you set it to start at. Always set the E30's starting and stopping pressures to as wide a difference as possible.

E30 Modes and Functions

MODE	1	2	3
Functions (# User Settable)			
# Selectable pressure units kPa or psi	Y	Y	Y
# Start-up timer, fully adjustable and self terminating	Y	Y	Y
# Run-on timer, fully adjustable and self terminating	Y	Y	Y
# Delayed re-starting timer, once stopped delays the restart	Y		
# Batch control, sets a specific run time for the pump	Y		
# Auto restart if run dry, both single and multiple attempts	Y		
# Trip pressure, fully adjustable and can be turned on or off	Y	Y	
# Snap pressure, allows the setting of a single switch point			Y
# Snap pressure switching differential (delta pressure)			Y
# Starting pressure, fully adjustable and can be turned off	Y	Y	
# Stopping pressure, fully adjustable and can be turned off	Y	Y	
# Anti-cycling controls the number of motor starts per hour	Y		Y
# Anti-cycling sensitivity control to avoid nuisance tripping	Y		
# Start the pump at a preset low pressure	Y	Y	Y
# Stop the pump at a preset high pressure	Y	Y	Y
# User can configure the E30's output to be relay 1 or relay 2			Y
# User can configure the E30's output relay to be NO or NC			Y
# Start & stop a pump using an external low voltage switch	Y	Y	Y
Displays the system's pressure in preferred units, kPa or psi	Y	Y	Y
Displays the high & low pressure set points in preferred units	Y	Y	
Displays the snap pressure point in preferred units			Y
Displays a warning if you enter incorrect pressure settings	Y	Y	
Displays the reasons for faults and alarms on its LCD screen	Y	Y	Y
Over pressure alarm automatically invoked at 22 Bars	Y	Y	Y
# Alarm relay can be set to close on 1 of 7 specific conditions	Y	Y	Y

Operating Range

Ambient temperature range	1°C to 50°C
Liquid temperature range	1°C to 60°C
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.
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.
Anti-cycling	Adjustable from 1 motor start per hour to 1800 starts per hour.
Anti-cycling sensitivity adjustment	Adjustable from 2 to 50 sequential starts
Run dry auto restart settable to single or repeated attempts	Adjustable from 1 minute to 99 Hours 59 minutes in 1 minute increments.
Maximum operating pressure static or dynamic	20 Bars 290 psi
Minimum operating pressure static or dynamic	1 Bar absolute or 14.7 psi absolute 0 kPa gauge or 0 psi gauge.
Minimum burst pressure, all models	> 30 Bars 435 psi
Trip pressure range	Adjustable from 0 to 2000 kPa or 0 to 290 psi in increments of 1 kPa or 1 psi
Snap pressure range, mode 3 only	Adjustable from 1 to 2000 kPa or 1 to 290 psi in increments of 1 kPa or 1 psi
Snap pressure differential, mode 3 only	Adjustable from 7 to 140 kPa or 1 to 20 psi in increments of 7 kPa or 1 psi
Starting pressure range	Adjustable from 0 to 2000 kPa or 0 to 290 psi in increments of 1 kPa or 1 psi
Stopping pressure range	Adjustable from 0 to 2000 kPa or 0 to 290 psi in increments of 1 kPa or 1 psi
Minimum pressure differential on to off or off to on, modes 1 and 2 only	1 kPa or 1 psi. Practical limit is nominally 7 kPa or 1 psi
Automatic over pressure shut down	Fixed setting 2200 kPa 22 Bars 430 psi

Important: The E30 must not be used in negative pressure or partial vacuum applications. It must only ever be used in positive pressure systems.

Programming the E30

The E30 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 E30's menu, provided the pressure switch is unlocked. 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 E30's memory and steps you to the next option. When you reach the end of the options list the menu asks you to press the (R) reset button to confirm your settings and to resume normal running. You can automatically save any changes you have made and exit out of the menu at any time by simply pressing the reset button. The settings you make are non-volatile and are recorded into the E30's memory. Your settings will not be lost if the pressure switch is switched off for extended periods. When power resumes the E30 is switched back on and the E30 will automatically boot up and resume running using the settings you recorded in its memory.

The Three Operating Modes

The E30 can be set to operate in one of three fundamental modes. An initial choice must be made as to how you want to control the pump. Once you have made your choice the E30's menu will ask you a series of questions that relate to the specific mode you have chosen.

Mode 1 Pressure Switch

In mode 1 the E30 operates as a differential loss of prime pressure switch. Mode 1 provides you with a start-up timer to allow time for the pump to start and for the system pressure to climb above whatever trip pressure you may enter. A run-on timer is also available so the E30 can ignore short term dips in pressure without tripping out on low pressure. In addition, delayed restarting is available as is anti-cycling, batch running and automatic run dry restarting.

In mode 1 the E30 can be used to control a pump and to give it dry run protection in the event of loss of pressure. Conventional pressure switches will continue to run a pump if pressure is lost. This invariably damages the pump. In addition to

the high pressure cut-out and low pressure cut-in settings found in conventional pressure switches the E30 included a third set point called the “trip pressure”. The trip pressure can be set to some value that is less than the pressure switch’s normal switch on pressure. In the event of the system’s pressure falling below the trip pressure the run-on timer is invoked. The run-on timer can be set to ignore the state of the pressure for a period of 1 second to 900 seconds (15 minutes). If the system pressure recovers and rises above the trip pressure before the end of the run-on time the E30 immediately reverts to normal operation. If at the end of the run-on the pressure has not recovered and remains lower than the set trip pressure then the E30 will shut down the pump.

The advantage of this system over a conventional mechanical loss of prime pressure switch is that the E30 can tolerate dips in pressure for short periods without tripping out and stopping the pump. Often momentary dips in pressure occur when valves open in irrigation systems. The E30 is able to ignore these pressure fluctuations while still providing loss of pressure protection when a genuine problem occurs.

If you leave the trip pressure set to zero the E30 reverts to operating like a conventional pressure switch with no loss of pressure protection.

Mode 2 Pressure Guard

If you choose to use the E30 in mode 2 the pressure switch will function as a pressure guard. The pressure guard allows you to set a starting and stopping pressure and a trip pressure. In addition, a start-up timer and a run-on timer are included. The pressure guard functions as a protection device for systems that are normally controlled by other means. For example, a variable speed drive that is fully controlled by a 4 to 20mA pressure transmitter may benefit from the inclusion of an E30 operating as a pressure guard. In the event of a problem developing with the VS drive or with its pressure transmitter, the E30 is able to override the system and shut the pump down if the pressure rises above or falls below settable limits. The E30’s run-on timer facilitates momentary dips in pressure without invoking the pressure guard’s loss of pressure protection and the E30’s start-up timer allows time for the system to pressurise before the pressure protection functions commence.

Mode 3 Snap Action Pressure Switch

In mode 3 the E30 functions as a single point pressure snap action switch. Either of the pressure switch's two output relays can be configured as the snap action output and the output relay can be configured to have normally open or normally closed contacts. The state of the output will change as the system pressure passes through your set snap pressure. The hysteresis of the E30 operating in mode 3 can also be adjusted from within the user program. The E30 is a solid state device so unlike a mechanical pressure switch the hysteresis is determined solely by the pressure units you choose to use.

Mode 1 In Detail

When set to mode 1 the E30 functions as a loss of prime pressure switch. The user menu allows you to select your preferred pressure units in either kPa or psi. Once you make your selection the units you have chosen will be displayed on the LCD screen in all relevant phases of operation.

Mode 1 Remote Input

In mode 1 you can select to use a remote input switch to trigger the starting and stopping of the pump. If you select to use the remote input the E30 will only allow the pump to run while ever the remote switch is closed. The remote switch would normally be a two position level switch in a remote tank or the contacts of a relay in an external controller.

Mode 1 Start-up Timer

The E30 includes a start-up timer. The purpose of the start-up timer is to ignore any initial lack of pressure and allow time for the system pressure to rise above your set trip pressure before imposing any pressure limits on the pump's operation. The start-up timer can be adjusted from 1 second to 240 seconds (4 minutes) in increments of 1 second. The time you set on the start-up timer will depend on the system. In a bore pump application with a self-draining riser it may take a considerable time for the line pressure to rise to any appreciable degree, while a pressure system that is fully primed may only require one or two seconds to establish pressure.

The start-up timer automatically terminates its run as soon as a pressure higher than the set starting pressure is detected. You may have set the start-up timer to

30 seconds. If pressure above your set starting pressure is detected by the E30 in 5 seconds then the start-up timer will terminate its run in 5 seconds and revert to normal running.

The start-up timer is initially set to 5 seconds by default. If you purge the E30 program the start-up timer will be reset back to its default 5 seconds.

Mode 1 Run-on Timer

The E30 includes a run-on timer that can be set from 1 second to 900 seconds (15 minutes) in increments of 1 second. The purpose of the run-on timer is to allow the E30 time to tolerate momentary dips in pressure that would otherwise cause the shutdown of the pump. You can choose not to use the run-on timer by setting its time to zero. If you do this then the instant the E30 detects a pressure less than its trip pressure the pump will be shut down. In applications where motorised valves are opening or long runs of pipe take time to pressurise the run-on timers ability to tolerate system pressures that are less than the normal running pressure is an invaluable feature.

The run-on timer is initially set to 5 seconds by default. If you purge the E30 program the run-on timer will be reset back to its default 5 seconds.

Delayed Restart

The E30 includes a function called delayed restart. If you choose to use this function and press (P) you will be asked for a delay time in hours and then in minutes. The range of adjustment is 1 minute to 99 hours 59 minutes in increments of 1 minute.

The purpose of the delayed restart is to prevent the pump from restarting once it has stopped on high pressure. As an example, if the pump system was being used to fill a tank that had a float valve fitted to it and the valve closed then the system pressure would rise and the E30 would shut the pump down once the pressure reached your high pressure cut-out point. Ordinarily, if the float leaked or opened, the pressure would fall and the E30 would start the pump as soon as the pressure reached your set cut-in pressure. The delayed restart function can be used in such a situation to delay the restarting of the pump. The delay may be to prevent the pump from hunting on and off in the leaking valve scenario or it may be to allow time for the water level in the tank to drop some distance before allowing the pump to restart.

At the end of the delay period the E30 will only allow the pump to start if the pressure has fallen to below the set start pressure. If, after the delay the pressure remains above your set starting pressure the E30 will prevent the pump from starting until the pressure drops to the preset starting pressure.

Auto Restart

If the system pressure falls to below your set trip pressure, the E30 runs its run-on timer and if no pressure is detected by the end of the run-on period the E30 will shut the pump down. This is based on the assumption the pump has run dry. In such a situation the auto restart function can be used to have the pump wait for some set period of time and then attempt to restart the pump. The range of adjustment is 1 minute to 99 hours 59 minutes in increments of 1 minute.

If you choose to use the auto restart and press (P) you will be asked if you require single or repeated restarting. If you choose single restart the E30 will attempt to restart the pump after your set delay period. If it fails to start the pump because no pressure rise is detected within the E30's set start-up time or if it successfully starts the pump and subsequently runs dry again the E30 will then go into permanent alarm. It will shut the pump down, close its relay contacts and display a message on its LCD screen to indicate the pump has run dry.

If you choose to set the auto restart to repeated restart then each time the E30 detects a loss of pressure situation it will shut the pump down, wait for your set restart delay period and then attempt to restart the pump. Each time loss of pressure is detected the E30 will repeat this process. The auto restart function can be used to cyclically pump down low yield bores and to have the pump shut down and wait for a set period for the standing water level to recover before automatically restarting the pump and repeating the process.

Batch Control

If you choose to use auto restart as described above, the E30's batch controller will not appear in the menu. To use the batch controller you must first have set auto restart to off. The batch controller and auto restart functions conflict so the E30's menu prevents you from selecting both functions.

If you choose to use the batch controller and press (P) you will be asked for a batch running time in hours and then in minutes. The range of adjustment is 1 minute to 99 hours 59 minutes in increments of 1 minute.

The batch controller allows you to have the pump run for a set period of time and then automatically shut down. An example of its use would be to pump X hours of water to a tank and then have the pump shut down. Pressing the reset button on the E30 will then repeat this process.

If pressure rises to above the E30's set high pressure cut-out point while the batch is running the E30 will shut the pump down on high pressure and wait for the pressure to fall to whatever you have set the starting pressure to. When the pump restarts the batch controller will restart its run from 1 minute less than where it left off. If you choose to use delayed restarting in conjunction with the batch controller then the batch run will resume from 1 minute less than where it stopped at as soon as the delayed restart period ends.

If pressure is lost when batch running and delayed restart is not used the E30 will time out on its run-on timer and then shut the pump down and go into dry run alarm. Batch running will only then recommence once you press reset or reset the power to the E30. No knowledge will be retained as to where in its batch run it was when flow was lost. The batch run in this situation will recommence from the beginning of the set time.

Mode 1 Trip Pressure

The trip pressure can be set to any value from zero to 2000 kPa or from zero to 290 psi depending on the pressure units you have chosen to use. The trip pressure must be set to some value that is less than the start pressure. If the system pressure falls to below your set trip pressure during normal operation, it is the set trip point that invokes the run-on timer and ultimately shuts the pump down if pressure fails to rise above the trip pressure by the end of the run-on period.

The trip pressure can be set to 1 kPa or 1 psi less than your start pressure or it can be set substantially less than the start pressure.

If you choose not to use the trip pressure and leave it set to zero then the E30 reverts to operating like a basic pressure switch. Its contacts will remain closed at all pressures that are less than your set high pressure cut-out. If no pressure is present in the system the contacts of the E30 will be closed. No loss of pressure protection will be provided by the E30 if it is set up this way.

The trip pressure can be set as low as 1 kPa or 1 psi and it will provide loss of pressure protection to a pumping system but it is important to remember that if it is set to zero no low pressure protection will be provided by the E30.

Mode 1 Start Pressure

The start pressure can be set to any value from 1 kPa to 2000 kPa or from 1 psi to 290 psi in increments of 1 kPa or 1 psi. Normally the start pressure would be set to the pressure at which you want the pump to start. In normal operation each time pressure drops to whatever value you have set, the pump will start. Once running the pressure can fall to below the value you have set and the pump will continue to run. In fact if you have not set the trip pressure to some value greater than zero, the pump will continue to run in spite of a complete lack of pressure.

The start pressure can be set as low as 1 kPa or 1 psi and the E30 will function in the manner described above. If you choose to set the start pressure to zero you will invoke a warning message from the E30 to check your pressure settings. The E30 will not tolerate having its start pressure set to zero. The start pressure must always be set to a higher pressure than the trip pressure. If you have set the trip pressure to zero and you also set the start pressure to zero then both pressures would be the same and the E30 will not tolerate this and will display a message telling you to check your pressure settings.

Mode 1 Stop Pressure

The stop pressure is the pressure at which the E30 will shut down the pump in normal operation. It must be set to some value that is higher than start and trip pressures. The range of adjustment is zero to 2000 kPa or zero to 290 psi in increments of 1 kPa or 1 psi. If you attempt to set the stop pressure to a value that is less than the start or trip pressures you will invoke a warning message from the E30 to check your pressure settings.

The stop pressure can be set to a minimum of 1 kPa or 1 psi higher than the start pressure and the E30 will function. Normally you would set the difference between the starting and stopping pressures to some value that is much greater but for some special applications the close operating differential capability of the E30 is an invaluable feature and can be used in some circumstances as an alternative to the single point snap action pressure switch described in mode 3.

Mode 1 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 E30 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 by a settable number of consecutive starts in any one hour period the pump will be automatically shut down and the E30 will display a message indicating the starts per hour rate was exceeded.

The anti-cycling function can be adjusted in terms of its sensitivity to repeated rapid restarts. The E30's menu asks you for a sensitivity number. The range is 2 to 50 restarts in sequence at a time interval that is less than the number of starts per hour you have entered. The default value is 10. You can make the E30 more sensitive to rapid cycling by decreasing this number or less sensitive by increasing this value.

As an example, consider a pump set to a sensitivity value of 10 and also set to 360 starts per hour, one start every 10 seconds maximum. If the pump starts 9 times in a row at less than 10 seconds between starts and then does not start again for 12 seconds the anti-cycling alarm will not be invoked. If however, the pump were to start 10 times in a row at less than 10 seconds between starts, on the eleventh start the anti-cycling system would be invoked and the pump would be shut down. In the same situation, if the sensitivity setting was 2 rather than 10 then the anti-cycling alarm would be invoked after only 2 consecutive starts at less than 10 seconds between each start, making it 5 times less tolerant of rapid cycling that it previously was.

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 E30'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.

Mode 2 In Detail

When set to mode 2 the E30 functions as a pressure guard. The pressure guard is a protection device for protecting a pump system from pressure extremes, both high and low. Its normal application is not to control the pump but to provide pressure protection should the system's normal control fail. Consider a multistage centrifugal pump or a helical rotor pump discharging into low grade Poly pipe. If the pump's normal pressure control fails and the pressure rises uncontrollably, the E30 in pressure guard mode can be set to trip out and stop the pump thus preventing the pipe system from bursting. If you choose to use the E30 in pressure guard mode and press (P) you will be asked a series of questions that will lead you through the configuration process.

Select Pressure Units

The first question the E30 asks is what pressure units you want to work in, kPa or psi. The units you choose will be used in all appropriate displays throughout the E30 once you make your choice.

Mode 2 Remote Input

If you select to use the remote input function the E30 in pressure guard mode will only operate while the remote input switch is closed. The remote switch can be a two position level switch in a remote tank or the contacts of a relay in an external controller.

Mode 2 Start-up Timer

The E30 includes a start-up timer. The purpose of the start-up timer is to ignore any initial lack of pressure and allow time for the system pressure to rise above your set trip pressure before imposing any pressure limits on the pump's operation. The start-up timer can be adjusted from 1 second to 240 seconds (4 minutes) in increments of 1 second. The time you set on the start-up timer will depend on the system. In a bore pump application with a self-draining riser it may take a considerable time for the line pressure to rise to any appreciable degree, while a pressure system that is fully primed may only require one or two seconds to establish pressure.

The start-up timer automatically terminates its run as soon as a pressure higher than the set starting pressure is detected. You may have set the start-up timer to 30 seconds. If pressure above your set starting pressure is detected by the E30 in 5 seconds then the start-up timer will terminate its run in 5 seconds and revert to normal running.

The start-up timer is initially set to 5 seconds by default. If you purge the E30 program the start-up timer will be reset back to its default 5 seconds.

Mode 2 Run-on Timer

The E30 includes a run-on timer that can be set from 1 second to 900 seconds (15 minutes) in increments of 1 second. The purpose of the run-on timer is to allow the E30 time to tolerate momentary dips in pressure that would otherwise cause the shut down of the pump. You can choose not to use the run-on timer by setting its time to zero. If you do this then the instant the E30 detects a pressure less than its trip pressure the pump will be shut down. In applications where motorised valves are opening or long runs of pipe take time to pressurise, the run-on timers ability to tolerate system pressures that are less than the normal running pressure is an invaluable feature.

The run-on timer is initially set to 5 seconds by default. If you purge the E30 program the run-on timer will be reset back to its default 5 seconds.

Mode 2 Low Pressure Trip

The low pressure trip point can be set to any value from zero to 2000 kPa or from zero to 290 psi, depending on the pressure units you have chosen to use. The low pressure trip point must be set to some value that is less than the high pressure trip point. If you attempt to set the low pressure trip point to a pressure that is greater than the high pressure trip point you will invoke a pressure warning from the E30 alerting you to the problem. If the pressure falls to below the low pressure trip point during normal operation, it is the set trip pressure that invokes the run-on timer and ultimately shuts the system down if pressure fails to rise above its set point by the end of the run-on period. The trip pressure will normally be set to some value that is well below the high pressure trip point setting.

Mode 2 High Pressure Trip

The high pressure trip point can be set to any required value above the low pressure trip point. The range of adjustment is zero to 2000 kPa or zero to 290 psi in increments of 1 kPa or 1 psi depending on the pressure units you have chosen to use.

The high pressure trip point will ordinarily be set to some value that is well above the low pressure trip point. If you attempt to set the high pressure trip point to a pressure that is lower than the low pressure trip point you will invoke a pressure warning from the E30 to check your pressure settings.

If the system pressure rises to above the high pressure trip point the E30 will immediately shut down the system and close its alarm relay contacts and display a message to the effect that the pressure is too high.

If you choose not to use the high pressure trip point and leave it set to zero the E30 reverts to providing low pressure protection only for the system. When set up this way the E30 will start the system using its start-up timer and will expect to see the system pressure rise to above whatever low pressure trip point you have set, before the start-up timer times out. Once above the low pressure trip point the E30 will run the system without any regard to a high pressure limit. If the pressure falls to below your low pressure trip point the E30 will run its run-on timer and if pressure fails to rise above the low pressure trip point by the end of the run-on, the E30 will shut the system down and display a message that the system pressure is too low.

When operated in the mode described above the E30 does not provide any high pressure trip point. However, the E30 has an operating pressure range that is limited to 2000 kPa or 290 psi. If the system pressure exceeds this limit for any reason and reaches 2200 kPa or 430 psi the E30 will automatically shut down the system and display a message that its 22 Bar excess pressure limit has been exceeded. The 22 Bar, 2200 kPa, 430 psi limit is not adjustable and is intended to protect the E30's built in pressure sensor against excess pressure.

Mode 3 In Detail

Mode 3 functions as a single point pressure switch. You can choose either relay 1 or relay 2 as your main output and you can configure the chosen relay to have either normally open or normally closed contacts. A single switch point is set in the range 7 to 2000 kPa or 1 to 290 psi and the user menu also allows the setting of a small pressure differential to prevent the switch hunting on and off in situations where the pressure hovers around the switch point.

When operated in mode 3 the E30 can be used as an alternative to the pressure guard described in mode 2. The mode 2 pressure guard trips out and shuts the system down if the system pressure rises or falls outside settable limits. Once tripped it will not allow the system to restart unless it is rebooted or its remote input, if used, is triggered. The E30 operated in mode 3 can be used as an alternate protection device. The principle difference between the two modes being that unlike the pressure guard operation of mode 2, in mode 3 the E30 will

automatically reset the system and resume normal running as soon as pressure passes the set or snap pressure point. This makes the E30 running in mode 3 an ideal device for shutting down a pump if the pressure rises excessively but resetting and letting the system resume normal operation as soon as the pressure falls back to an acceptable level.

Mode 3 Remote Input

To set the E30 to operate in mode 3 first select your preferred pressure units from the menu and choose to either use or not to use the remote input function. If you choose to use the remote input function the snap action pressure switch will only operate while the contacts of the external switch are closed. The remote switch can be any set of voltage free contacts such as the contacts of an external relay.

Mode 3 Relay Usage

In mode 3 you can choose to use either relay 1 or relay 2 as your preferred output device. In the E30 relay 1 is the primary relay and it is intended to drive heavy loads. Relay 1 can be used on its own as a set of voltage free contacts or it can be used in conjunction with the HD solid state drive to directly control pump motors up to 3.75kW single phase or via an interposing contactor that can be used to switch pump motors of any size. Relay 1 has special features built in that allow time for pump motors to wind up and wind down when starting and stopping.

The timers built into relay 1 limit the speed the relay can open and close to about 1.5 seconds per cycle. This is perfectly acceptable if the E30 is being used to directly drive a pump motor. If relay 1 is chosen as the output device and the intended application is frequency counting or some other fast response requirement then the speed limitations of relay 1 will impede the high speed performance. For such applications relay 2 should be used as its speed limit is only limited by the speed at which its contacts can open and close.

To summarise, select relay 1 as the output device when controlling pump motors directly with or without the HD drive implemented and choose relay 2 as the output device for all other applications.

If you choose to use relay 1 then relay 2 will mirror relay 1's action. It will be on when relay 1 is off and it will be off when relay 1 is on. It can be used to control an external alarm or simply in conjunction with relay 1 to provide a set of break before make S.P.D.T. contacts. If you make relay 2 your chosen output device then relay 1 will not be used. It will not respond to the state of relay 2, it will simply remain open in all situations.

Mode 3 Relay Contact Configuration

After choosing which relay you want to use as the primary output device the E30's menu asks you how you want the chosen relay's contacts to behave. If you choose normally open the contacts of the relay will remain open until the system pressure reaches the set snap pressure, at which point the contacts will change state and close.

If you choose to have the relay contacts normally closed then on boot up the relay will close its contacts and they will remain closed until the system pressure reaches the snap pressure, at which point they will open.

Mode 3 Set Pressure

After choosing the output relay's contact configuration the E30 menu asks you to enter a set pressure. The set or snap pressure is the pressure at which the switch will change state from on to off or from off to on, depending on how you have configured the relay's contacts. Enter your required set pressure in the range 7 to 2000 kPa or 1 to 290 psi. Press the (P) button to record your setting and move to the next screen.

Mode 3 Delta Pressure

Once the set pressure is confirmed the E30 asks you to enter a delta pressure. This is the differential pressure or difference between the on and off pressure you require. The range of adjustment is 7 to 140 kPa or 1 to 20 psi in increments of 7 kPa or 1 psi. The higher the value you enter the more stable and tolerant the switch will become to minor pressure fluctuations. As an example of the way the set and delta pressures work consider a set pressure of 500 kPa and a delta pressure of 14 kPa.

Assume also the E30 is configured so its output relay contacts are normally closed. On boot up the E30 will close its relay contacts and it will open them if the system pressure rises to 514 kPa. The pressure may then rise further, however, the E30 will not respond unless the 2200 kPa excess pressure alarm is activated. If the system pressure falls the E30 will ignore the pressure drop until it reaches 500 kPa, at which point the chosen output relay will revert to normally closed.

To summarise, the delta or differential pressure will sit on the high side of the set pressure. This shifts the high pressure switching point to a point equal to the sum of the set pressure and the delta pressure, $500 + 14 = 514$ kPa. On a falling pressure the change of state of the chosen relay's contacts will occur at the set 500 kPa pressure.

Once you have set the delta pressure and pressed (P) the E30 asks you to confirm

your settings and to press the reset button (R) to run the program. If you select no to the confirmation question the E30 takes you back to the beginning of the menu to allow you to make any changes you require.

Note that you can enter the menu at any time the program is unlocked simply by pressing the (P) button and you can step through the menu and make any change you require and then exit back out of the menu and back into normal running just by pressing the (R) reset button. You do not have to step right through the menu to make changes to your settings. Your settings and any changes you make are automatically updated as soon as you press the (R) reset button.

LCD Screen Back Light

The LCD screen on the E30 digital pressure switch has a built in backlight. The backlight switches on automatically whenever you are programming the controller and when the controller 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 ever 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 E30 includes a hidden lock. When activated the lock disables the programming button P, thus rendering the controller's menu inaccessible.

To lock or unlock the E30 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 the pump down and opens the controller's lock screen.

Once the lock screen is displayed the E30 can be locked or unlocked by pressing the up or down buttons. Pressing P then exits the lock screen and the pressure switch resumes normal operation. When locked, pressing the (P) button has no effect on the E30 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 (P) key.

Alarm Relay (Relay 2) in Detail

After selecting an operating mode and pressing “P” the menu asks you if you want to use the alarm relay. The E30 contains a dedicated relay (Relay 2) with 16 Amp 240VAC rated normally open voltage free contacts that can be used to control an external alarm, an auto dialer or even a second pump. Assuming you have selected either mode 1 or mode 2 you will be asked if you want to use the alarm relay. Selecting YES and pressing the “P” button takes you to the first of 7 screens that allow you to select how you would like the alarm relay to behave.

Pressing the up or down buttons steps you through the available configurations. Once you have made your choice simply press the “P” button to lock your selection in and to move to the next menu question. Note that you are not asked if you want to use the alarm relay if you have selected mode 3, snap switch. This is because the snap switch mode uses its own unique setting for the alarm relay.

The seven possible alarm relay configurations are : -

Closed if any Fault Develops

In Mode 1 with this option selected the E30 will close its alarm relays contacts if the pump runs dry or if any of the advanced functions are active and detect a problem. For example if the anti cycling set point is exceeded. In Mode 2, Pressure Guard, the alarm relay will close on a high or low pressure fault.

Closed if Pump is Off

If this configuration is selected the alarm relay's contacts will be closed whenever the pump is off and they will be open whenever the pump is running.

Closed if Pump is On

If this configurations is selected the alarm relay will mimic the main pump relay and be closed whenever the pump is running and open wherever the pump is off.

Closed only on a High Pressure Fault

This configuration relates to Mode 2, Pressure Guard. It will provide a set of closed contacts if the pressure guard detects too high pressure. At all other times the relay 2 contacts will be open.

Closed only on a Low Pressure Fault

This function again relates to Mode 2, Pressure Guard. It will provide a set of closed contacts if the pressure guard detects too low pressure. At all other times the relay 2 contacts will be open.

Closed only when Batch is Complete

This alarm configuration relates to the Mode 1 (pressure switch) batch controller. If you have selected the batch controller and set it to operate the pump for some period of time, on completion of the batch, the alarm relay will close its contacts. At all other times the alarm relays contacts will remain open.

Starts per Hour Setting Exceeded

If you intend selecting anti-cycling from the main menu then this alarm configuration can provide a set of dedicated contacts that will close in the event of the pump motor starting more times in an hour than you have set with the anti-cycling function. Like the previous selection, the alarm relay contacts will remain open at all times except under the specific condition where the anti cycling alarm has been invoked.

Electing not to use the Alarm Relay

If you do not want to use the alarm relay then just select NO to the “Use Alarm Relay” question. Doing this and pressing “P” renders the alarm relay inoperative and steps you to the next main menu question.



WARNING

If the E30 pressure switch is used in a manner not specified by the manufacturer the pump protection provided by the pressure switch may be impaired or negated. In addition, all warranties stated or implied will be rendered invalid.

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