

# **KELCO F29 PROGRAMMABLE FLOW SWITCH**

## **INSTALLATION INSTRUCTIONS**

**Version 130416**

# **VERY IMPORTANT**

**This Kelco controller has been fully tested and calibrated. It is presently unlocked and has a simple program loaded. It is set to operate in a basic way with most of its special functions and features switched off.**

On start up this controller will run the pump using its start-up timer. If it finds normal operating conditions in the pipe system it will continue to run the pump. If pressure or flow conditions change the pump will continue to run for a short period held on by the controller's built in run-on timer. If acceptable conditions fail to return the pump will be shut down after the run-on time period. Pressing the red reset button on the controller's lid or resetting the power will repeat this basic process.

To change the functions of this controller please first read the programming book supplied with this unit.

## **IMPORTANT**

**DO NOT EXPOSE THIS CONTROLLER TO VIBRATION. INSTALL ONLY IN PIPEWORK OR MANIFOLDS THAT DO NOT VIBRATE.** Vibration will damage the sensitive electronics within the controller and will void your product warranty.

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# Warning Symbols Explained



## WARNING

This symbol is intended to alert the user to the presence of important operating and maintenance instructions in the literature accompanying the F29 flow switch.



## WARNING

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

# **IMPORTANT SAFETY INSTRUCTIONS**

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



## **WARNING**

Please read these installation and operating instructions carefully and fully before installing or servicing this flow switch. The F29 is a mains voltage device. Death or serious injury may result if this product is not correctly installed and operated.

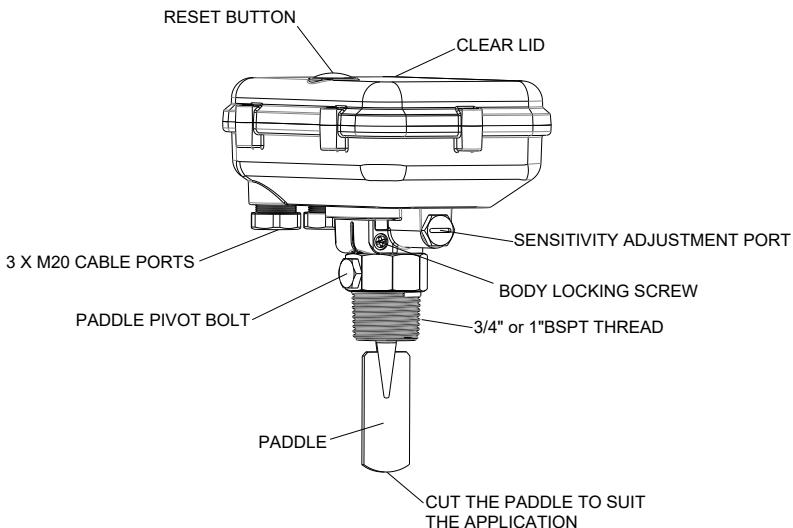
# Overview

The F29 programmable flow switch can be configured in a variety of ways to control a pump and to protect it. The flow switch can be set to start a pump in spite of an initial lack of flow and to then do no more than protect the pump against loss of flow. The F29 can also be programmed to simulate complex pump control panels and to react to external control via its remote input. This document sets out in detail the installation and functions of the F29 flow switch and some of the main ways in which it can be used in pumping and irrigation systems.



## WARNING

Without its lid in place the F29 flow switch is not water resistant and presents a potential shock hazard. Take great care not to splash water onto the F29 when the lid is not in place. Always replace the lid and fully tighten its 6 securing screws immediately after any changes to the flow switch's settings are made.



# INSTALLING THE F29 FLOW SWITCH

## Location

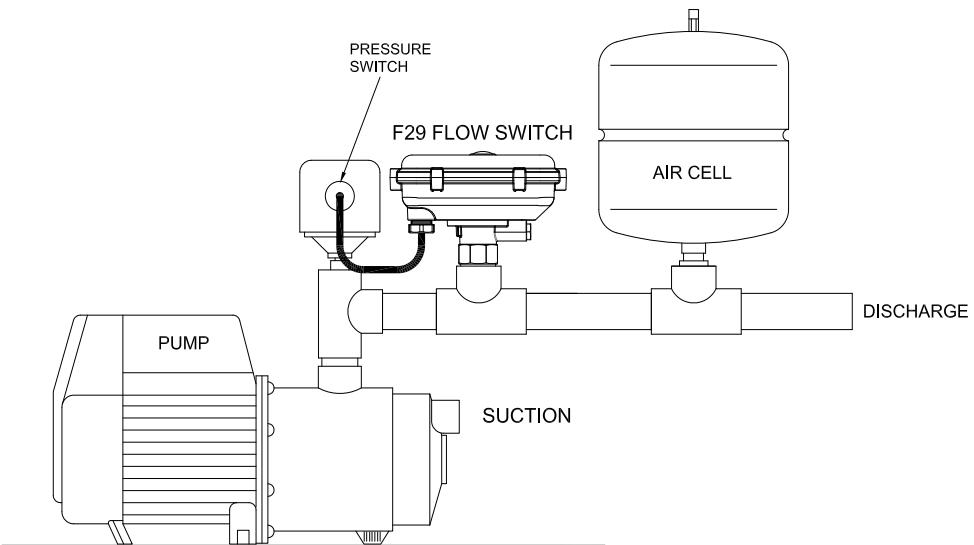
Where possible install this flow switch in a location that is sheltered from direct exposure to the weather. The F29 is weatherproof and is supplied with a protective clip on cover. However, to ensure a long reliable life we recommend it be protected from direct exposure to the sun and rain. Intense sun light will eventually cause discolouration and degradation of the flow switch's housing. It is therefore advisable to protect the flow switch from the weather if possible.

The F29 should be installed in a straight section of pipe preferably with 5 diameters of straight pipe either side of the paddle. The F29 can be installed in a suitable pipe socket, tapping saddle or pipe tee.

The F29 flow switch can be installed in either the suction or discharge pipework of the pump. It is more common to install it in the discharge pipe either before or after the system's air cell. If the system includes an air cell a decision has to be made as to which side of the air cell to locate the flow switch. The way the overall system functions will depend on this decision.

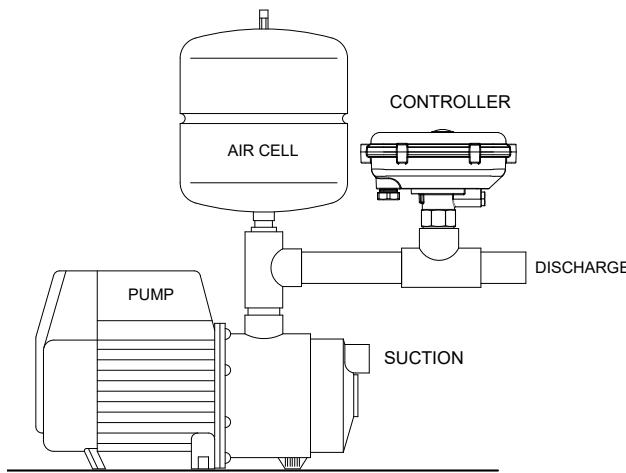
## Before The Air Cell

If the F29 is installed before the air cell in the system it will only start the pump on pressure drop via an external pressure switch since the initial draw off will be supplied from the air cell and will not push the paddle of the F29 into its on position. The only change in state the flow switch will see will be the closing of the external pressure switch's contacts on a falling pressure. Choose this arrangement if you want to keep pump starts to a minimum and you are prepared to accept the delay in starting associated with the slow pressure fall from the air cell.



## After The Air Cell

If you install the F29 in the pipework after the air cell the flow switch will start the pump each time flow from the air cell pushes its paddle forward or each time pressure falls to whatever pressure you have set the external pressure switch to start at. Choose this arrangement if you want the system to deliver a fairly steady pressure and to start your pump each time flow is sensed.



CONTROLLER INSTALLED AFTER THE AIR CELL



## **WARNING**

After programming the flow switch always replace its lid and fully tighten all 6 securing screws. Also ensure all cable glands are fully tightened. Never leave the lid off the flow switch for extended periods. Without its lid in place the F29 is not water resistant and presents a potential shock hazard. Take great care not to splash water onto the flow switch when the lid is not in place.

# Installation

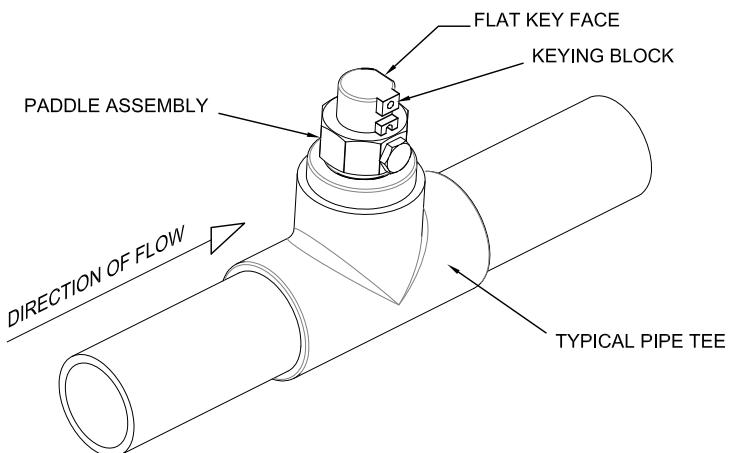
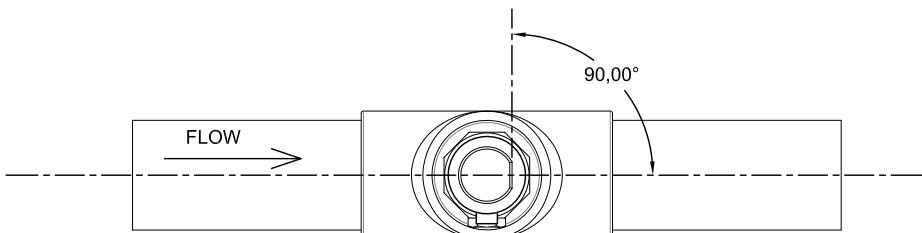
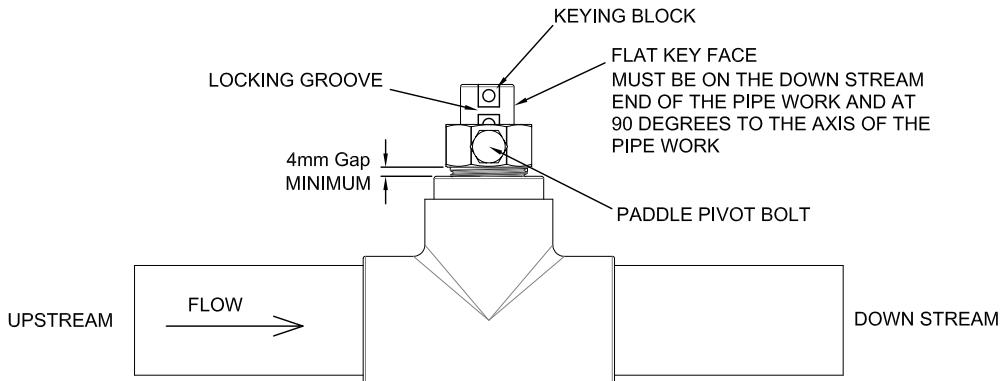
The F29 flow switch is supplied as two separate assemblies, the paddle assembly and the electrical housing. The paddle assembly should be installed in the pipework first and the electrical housing should then be fitted onto the spigot on top of the paddle assembly. There is a flat keying face on the cylindrical body of the paddle assembly that keys the electrical housing onto the paddle assembly and aligns it correctly. It is critical that the keying flat is on the downstream side and at 90 degrees to the axis of the pipework (see sketch). To secure the electrical housing onto the paddle assembly an Allen head cap screw is supplied.

The cap screw should be screwed fully through the hole provided on the underside of the electrical housing and should be securely tightened using a 3mm A/F Allen key (supplied). Under no circumstances should the electrical housing be twisted or used to screw the paddle assembly into the pipework, or to align the flow switch with the axis of the pipework. To do so may irreparably damage the flow switch and void its warranty.

To fit the paddle assembly into the pipework use a suitable spanner and use the spanner flats provided to screw the paddle assembly into your socket or pipe tee. The F29 flow switch can be installed in either vertical or horizontal pipework. When installed in vertical pipework flow must be in an upward direction past the paddle unless the paddle is trimmed to Less than 50mm long.

The F29 may have been supplied with either a  $\frac{3}{4}$ " or 1" BSP or NPT process connection. A matching female threaded socket or pipe tee must be provided to fit the flow switch into pipework. The F29 flow switch should not be installed on the underside of horizontal pipework.

# ALIGNING THE PADDLE ASSEMBLY



# Trimming The Paddle

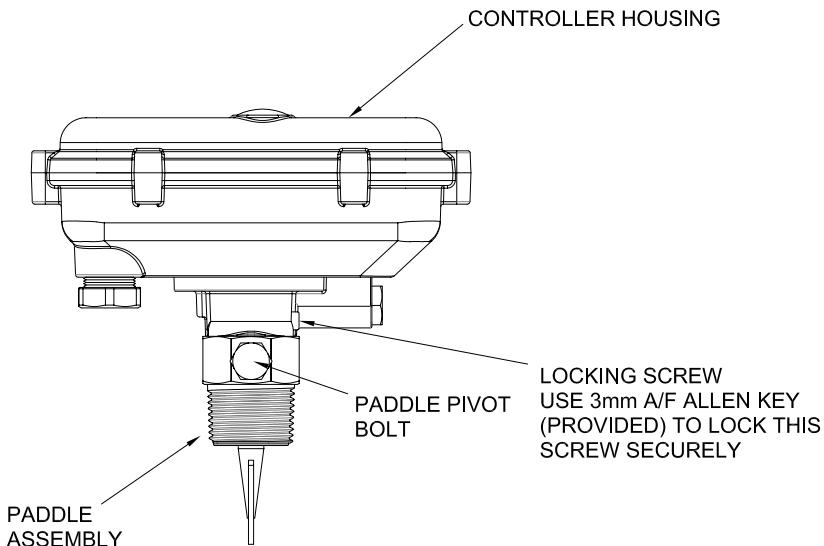
The paddle of the flow switch can be cut down to suit the specific pipe size and intended application. Cut the paddle using a hacksaw or tin snips so it clears the sides of the pipe socket and protrudes approximately half to two thirds of the way across the pipe when the flow switch is screwed into the pipework. If a low flow rate is expected through the system the paddle should be cut longer, perhaps until it only clears the bottom of the pipe by 4 or 5mm. If you are unsure as to what length the paddle should be, a paddle trimming calculator is available at [www.kelco.com.au](http://www.kelco.com.au). If you know what the expected flow rate is, the calculator allows you to enter your pipe diameter and paddle dimensions. It will then determine if the selected paddle dimensions are adequate for the application. Spare paddles to suit the F29 are available from the manufacturer or from your distributor.

Apply sealing compound or Teflon tape to the process connection thread on the flow switch and screw the flow switch into the pipework using the spanner flats on the paddle assembly. Do not screw the flow switch into the pipework by twisting the electrical housing.

The flow switch can be permanently damaged by twisting the electrical housing. When correctly installed, there should be a minimum 4mm gap between the top of the pipe socket and the top of the thread on the pump controller. The flow switch must be square to the axis of the pipework with the direction of flow arrow pointing in the direction of flow and the paddle must be free to swing back and forward to the full extent of its travel. The paddle must not make contact with the sides of the pipe tee or socket. It must be completely free and unobstructed in its movement.

# Locking The Assemblies Together

With the electrical housing located on the paddle assembly and in position, screw the 4mm Allen head cap screw fully through the housing. Tighten the screw using the Allen key (supplied). See sketch for details.



# **Detaching The Electrical Housing**

To allow easy access to the flow switch's paddle, the electrical housing of the F29 can be detached from the paddle assembly. Removing the electrical housing allows access to the paddle without the need to disconnect the electrical connections to the flow switch. To remove the electrical assembly, switch off the system's power and undo and completely remove the locking screw (see diagram).

Once the locking screw is removed, lift the electrical housing straight off (do not twist it when doing this). Once the electrical housing has been removed, the paddle assembly can be unscrewed from the pipework using the spanner flats on the body of the assembly. Simply reverse this procedure to refit the electrical housing to the controller.



## **WARNING**

**Always de-pressure the piping system before commencing work on the paddle assembly of the F29 flow switch. The electrical housing can be removed from the flow switch while the system is pressurised but in order to carry out any work on the paddle itself, the pipe system must be completely de-pressured and vented to atmosphere. If the F29 is located in a section of pipework that is flooded then that section of pipework must be fitted with isolation valves and the valves must be fully closed before removing the paddle assembly from the piping.**

# Sensitivity Adjustment

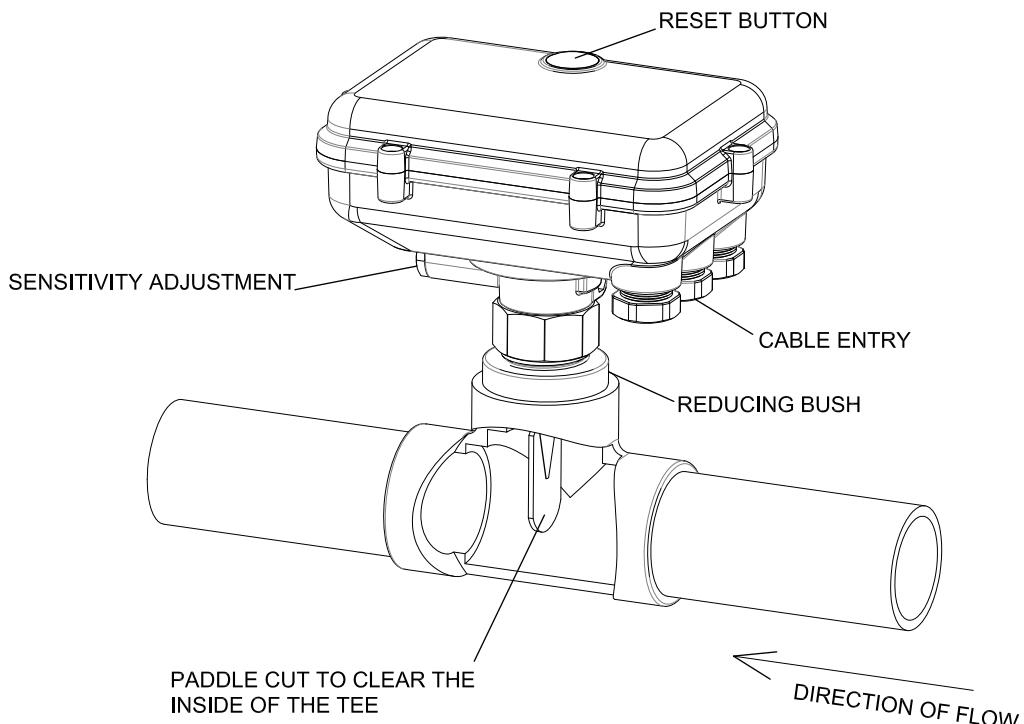
Under the end of the electrical housing on the F29 is a red hexagonal dust cap. If you remove this dust cap you gain access to an adjustment screw that allows the paddle preload to be reduced. As supplied the sensitivity adjustment screw is wound fully in. In this position the paddle is at its least sensitive. In this position it takes a substantial force from the moving water to move the paddle.

If you wind the sensitivity adjustment screw anti-clockwise (outward) the force against the paddle that resists flow will be reduced. The paddle will become increasingly more sensitive and will respond to progressively lower and lower flows the further out you wind the adjusting screw. The total adjustment range is 10 turns of the screw. If you wind the adjustment screw out beyond 10 turns there will not be enough residual force to return the paddle to the off position when flow stops and the flow switch will remain on.

The range of sensitivity adjustment will also be affected by the orientation of the flow switch. In horizontal pipework with the F29 mounted vertically the usable range of adjustment is approximately 8 turns. In vertical pipe with the F29 installed horizontally, the full 10 turn range can be utilised. With the F29 installed in the pipework and the pump running, regulate the outlet flow until a moderate discharge is obtained. If the flow light (18) is red the sensitivity adjusting screw should be wound outward one or two turns at a time using a broad bladed screwdriver, until the flow light turns green. The green flow light indicates the paddle of the F29 is detecting flow.

If the sensitivity screw is wound out 8 turns and the flow light remains red, it is an indication that the paddle is jammed and unable to move freely or that the paddle has been trimmed excessively. In this situation check that the paddle is free to move and is not binding on the pipe tee. If the problem remains unresolved the paddle should be replaced. The replacement paddle should initially be left substantially longer and the sensitivity screw wound back to its fully in position.

# Typical Pipe Tee Installation



TYPICAL PIPE TEE INSTALLATION

# Limitations



## WARNING

The F29 flow switch is water resistant to IP67. This rating only applies if the clear lid and its gasket are in place and the lid's 6 fixing screws are fully tightened. The F29 is not water resistant unless the clear lid is in place and fully secured and all cable glands are correctly assembled and tightened. Always replace the clear lid and fully tighten the six securing screws after making changes to the flow switch's settings. The F29 may present a shock hazard and death or serious injury may result if water enters its electrical housing. There are no user serviceable parts in this flow switch. Under no circumstances should the main electronics housing be opened. Warranty on this product is automatically void if the electronics compartment is opened.

- 1 ) The F29 is weatherproof. However, to ensure a long reliable life from the flow switch we recommend it be protected from direct exposure to the sun and rain whenever possible. Where this is not possible always ensure the protective clip on cover is in place over the clear lid to prevent intense sun light from degrading the clear cover and LCD screen.
- 2 ) Do not expose the standard thermoplastic F29 flow switch to freezing. If the F29 is to be used in areas where freezing conditions will be encountered, use the stainless steel versions of the F29 and always lag the pipework for several metres either side of the flow switch to prevent the adjacent pipework from freezing.
- 3) Do not use the standard thermoplastic F29 flow switch in hot water applications. The standard F29 is not designed to be used in water hotter than 60°C. The stainless steel model can be used in water up to 80°C.
- 4) Do not expose the all plastic F29 to static or dynamic pressures greater than 18 Bars, 261 psi. Do not expose the stainless steel F29 to static or dynamic pressures greater than 200 Bars, 2900 psi.
- 5) Do not install this flow switch in a section of pipe that is subject to vibration. Vibration will cause premature failure of the electronic components within the switch.

Operating Range	
Ambient Temperature Range	1°C to 50°C
Liquid Temperature Range Standard Thermoplastic Model	1°C to 60°C See note below.
Liquid Temperature Range Stainless Steel Model	-20°C to 80°C
Ingress Protection Rating	IP67
Pre-start Delay Timer	Adjustable from 1 second to 1 hour in 1 second increments.
Start-up Timer	Adjustable from 1 second to 4 minutes in 1 second increments.
Run-on Timer	Adjustable from 1 second to 900 seconds (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.
Cyclic Running & Stopping	Running and stopping times both adjustable from 1 minute to 99 hours 59 minutes in 1 minute increments.
Anti-Cycling	Adjustable from 1 motor start per hour to 1800 motor starts per hour.
Burst Pipe Detector	Adjustable from 1 minute to 99 hours 59 minutes in 1 minute increments.
Maximum Operating Pressure Static or Dynamic Thermoplastic Model	18 Bars 261 psi See note below.
Maximum Operating Pressure Static or Dynamic Stainless Steel Model	200 Bars 2900 psi
Maximum Operating Pressure Static or Dynamic Stainless Steel Model	200 Bars 2900 psi See note below.
Maximum Operating Pressure Static or Dynamic Stainless Steel Model	200 Bars 2900 psi
Minimum Burst Pressure Thermoplastic Model	> 45 Bars 652 psi
Recommended pipe size	25mm 1" or larger (There is no upper limit).

**NOTE:** The standard thermoplastic F29 must NOT be used in hot water applications (>60°C). The thermoplastic F29 is rated to withstand water pressure to 18 Bars 261 psi maximum and must not be used in applications where the static or dynamic pressure exceeds this rating.

# Electrical



## WARNING

All electrical work associated with the F29 must be carried out by qualified electrical personnel and all electrical work must conform to AU/NZ standards and to local wiring rules. For mains voltage applications we recommend the supply to the F29 be isolated by an RCD that has a maximum trip current of 30mA.

## Introduction

When controlled via its HD terminal and the contacts of relay 1, The F29 flow switch can directly control single-phase pump motors to 2.4kW. No interposing contactor is required for such applications. If a supply neutral or transformer is available, the flow switch can also be used to control 3 phase pump motors via an appropriate interposing contactor that has a suitable coil voltage.

The F29 requires a 220V to 240V AC 50Hz supply when operated from the mains. It can also be operated from an 18 to 24V AC or DC supply by utilising the low voltage active terminal LV and common neutral terminal N, see the included wiring diagrams. When operated from a low voltage DC supply the terminals LV and neutral N are not polarity sensitive. The flow switch requires a stable supply voltage in order to operate correctly. Pay particular attention to cable sizes, and ensure cables are adequate for the specific pump motor load. This is particularly important where long cable runs are to be used in the installation. If the voltage drop associated with the starting of the pump motor is excessive the F29 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 F29 is stable and that the current carrying capacity of the cable used is adequate for the job.

# Brownout Or Blackout

If a blackout or brownout occurs the F29 flow switch will not retain memory of where in its run or stop cycles it may have been. When power resumes, the F29 will reboot and resume running. A manual reboot can be done at any time by pressing the flow switch's reset button.



## WARNING

The F29 flow switch derives low voltage for its operation from a non-isolated reactance power supply (not through an isolated transformer). All external devices connected to the F29 must be earthed and must be regarded as operating at full mains potential. For all mains voltage applications we recommend the supply to the F29 be isolated by an RCD that has a maximum trip current of 30mA.

## Cables

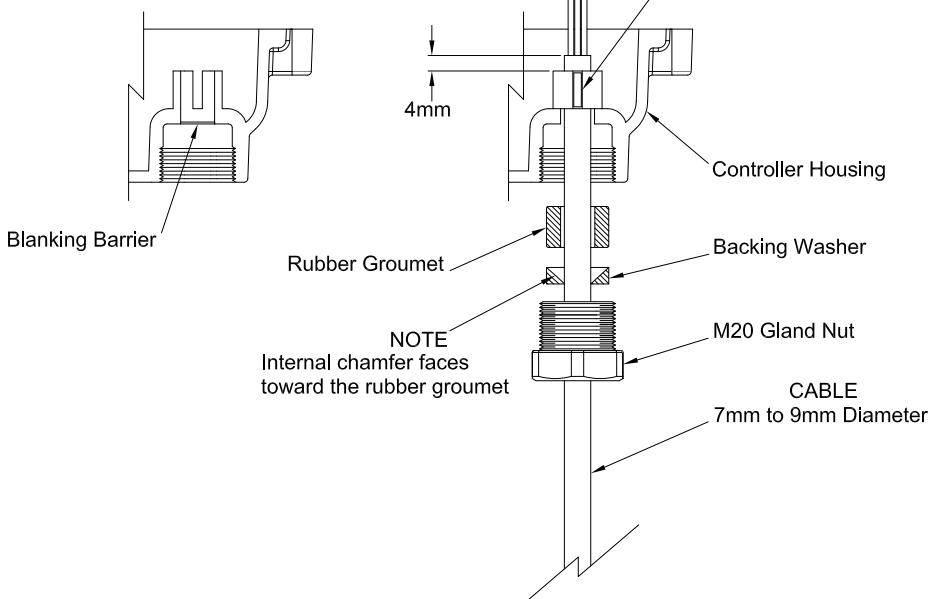
The F29 flow switch has 3 X M20 cable glands. As supplied, the cable glands are blanked off. To use the glands first punch out the blanking barriers using a suitable punch. The cable glands can accept cable from 7mm to 9mm diameter. See attached sketch for assembling the cable gland components. The flow switch is supplied with a set of steel crimp rings. The crimp rings are to provide strain relief for the flow switch's cables. To use the crimps, place one on the cable approximately 4mm below the end of the cable's outer sheathing. Crimp the two ears of the ring flat using bull nosed pliers. Pull the cable back through the cable gland until the crimp ring's ears are fully engaged in the two slots in the gland housing.

# Cable Gland Assembly

## NOTE

As supplied, cable glands are blanked off. To use a cable gland first punch out the blanking barrier

Crimp the ears of the strain relief ring onto cable and pull cable back into slots in the gland housing



## External Control Relays

The F29 flow switch houses 2 relays. The contacts of both relays are voltage free and are normally open. The relays are marked Relay 1 and Relay 2 on the terminal block. Relay 1 is the primary relay and is used to control the pump motor. It has an electrical rating of 16 Amps at 240VAC. Relay 2 is a 16 Amp 240VAC rated relay and is used for actuating an external alarm. The relays built into the F29 flow switch are not suitable for the direct control of DC motors.

# The HD (Heavy Duty) Terminal



## WARNING

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

The F29 flow switch contains a solid-state switch (HD Heavy Duty drive) that can be used to protect the contacts of Relay 1 by eliminating the destructive arcing caused by the starting and stopping of pump motors. The solid-state switch is accessible from the HD (Heavy Duty) terminal on the terminal block. We recommend the HD drive be used whenever the flow switch is used to directly control a pump motor. The HD drive should not be used when the F29 flow switch is connected to external timers or low wattage relays or to any other external device where voltage free contacts are required. It is strictly intended for the direct control of highly inductive AC motor loads. The HD terminal and the controller's built in relays must never be connected to a DC motor under any circumstances.

When the HD terminal is linked to the terminal Relay 1 Normally Open, the HD drive in effect parallels a 40 Amp solid state switch across the relay's normally open contacts. This increases the momentary current carrying capacity of the relay's contacts to well over 50 Amps. The solid state HD drive is only activated for a short period when the pump starts and stops. It effectively handles the high inrush current associated with the pump starting, and it provides a current path for the destructive back EMF associated with the pump motor stopping.

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

## **VOLTAGE LIMITS ON TERMINALS A & N**

Maximum Supply Voltage	250VAC 50Hz
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Minimum Supply Voltage	220VAC 50Hz
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## **VOLTAGE LIMITS ON TERMINALS LV & N**

Maximum Supply Voltage	25VAC 50Hz or 25VDC
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Minimum Supply Voltage	18VAC 50Hz or 18VDC
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## **RELAY 1 CONTACT RATING**

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

16A at 250VAC	Resistive Load
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16A at 30VDC	Resistive Load
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## **WARNING**

**Do not connect any supply greater than 25VAC or DC to the LV terminal on the F29 flow switch. The LV terminal is only for use with a low voltage supply of less than 25V AC or DC. If a voltage greater than 25VAC or DC is connected to the LV terminal of the F29 the flow switch will be damaged and any warranty on the product will be void.**

The following pages give some examples of ways the F29 flow switch can be wired up.

# CIRCUIT DRAWINGS



## WARNING

Please note all electrical work associated with the F29 flow switch must be carried out by suitably qualified electrical persons and must conform to AU/NZ wiring rules.

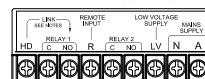
## CONNECTIONS FOR PLUG & PLAY INSTALLATION FOR PUMP MOTORS TO 2.4 kW



### WARNING

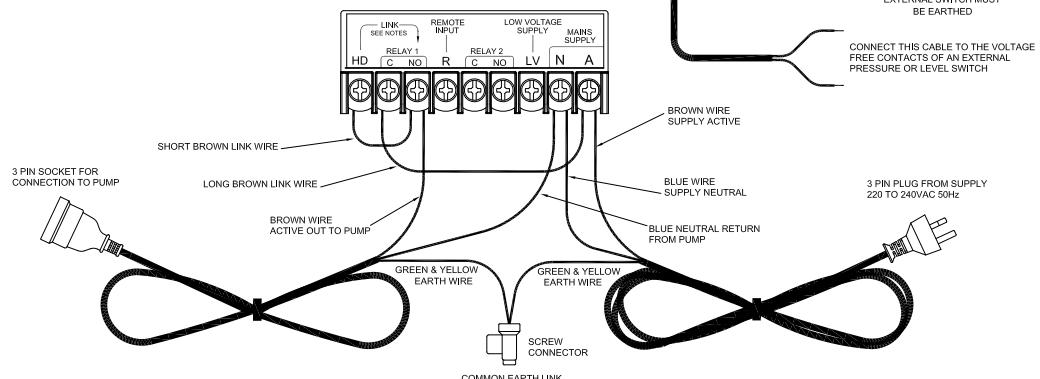
ALL ELECTRICAL WIRING ASSOCIATED WITH THIS PUMP CONTROLLER PLUG & PLAY KIT MUST BE CARRIED OUT BY A QUALIFIED ELECTRICIAN

### ADDITIONAL CONNECTIONS REQUIRED FOR EXTERNAL CONTROL



EXTERNAL SWITCH MUST BE EARTHED

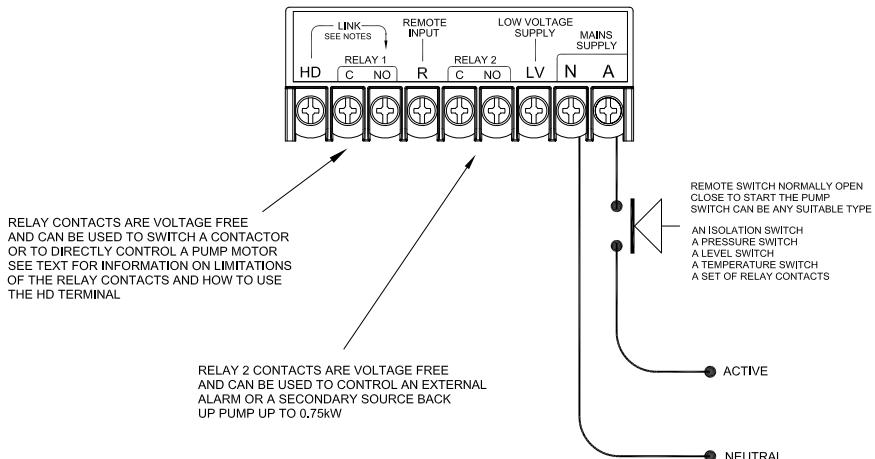
### CONNECTIONS FOR PLUG & PLAY INSTALLATION



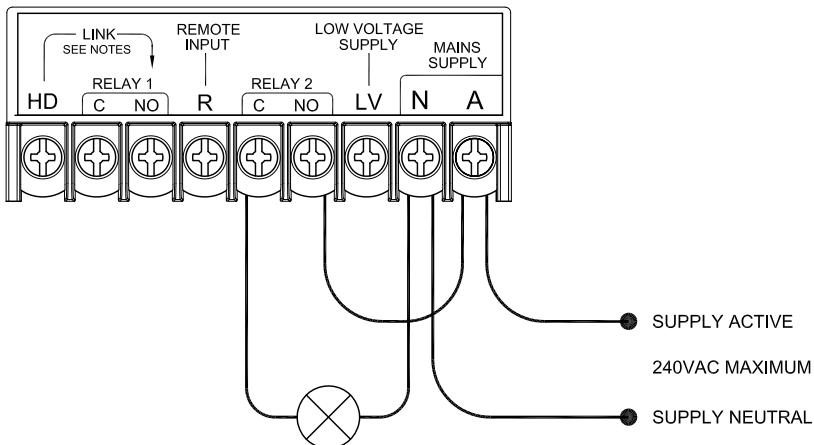
### CONNECTIONS FOR PLUG & PLAY INSTALLATION 220~240VAC 10Amp Maximum

# MOST BASIC WAY TO CONNECT THE SUPPLY

IF CONNECTED UP THIS WAY THE CONTROLLER WILL NOT DISPLAY ANY INFORMATION ABOUT THE STATE OF THE PUMP IF THE REMOTE SWITCH IS OPEN. IT IS FAR BETTER IN MOST APPLICATIONS TO HAVE A PERMANENT SUPPLY ONTO THE ACTIVE AND NEUTRAL TERMINALS AND TO CONNECT A REMOTE SWITCH TO THE LV & R TERMINALS.

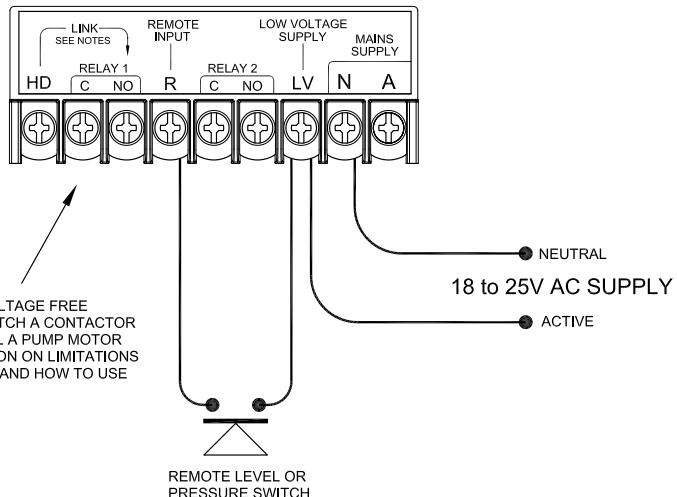


## MAINS VOLTAGE EXTERNAL ALARM CONNECTIONS

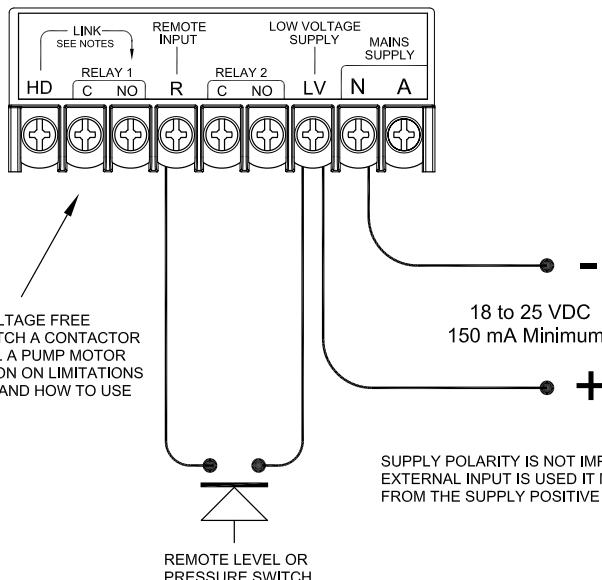


ALARM LIGHT OR SIREN  
240VAC 16A Max LOAD  
(RESISTIVE)

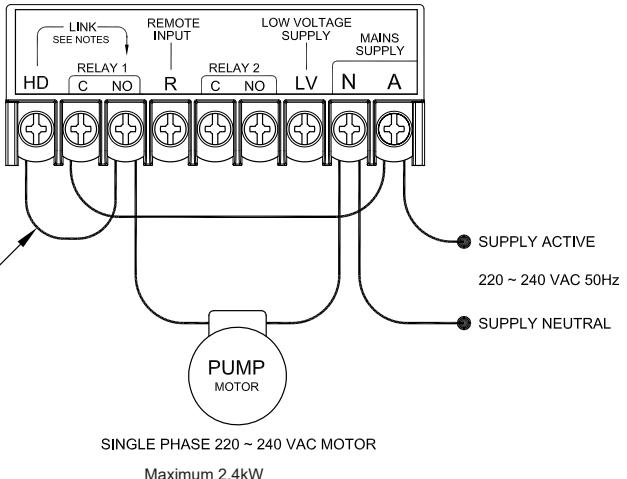
## LOW VOLTAGE AC CONNECTIONS WITH A REMOTE INPUT SWITCH



## LOW VOLTAGE DC CONNECTIONS WITH A REMOTE INPUT SWITCH

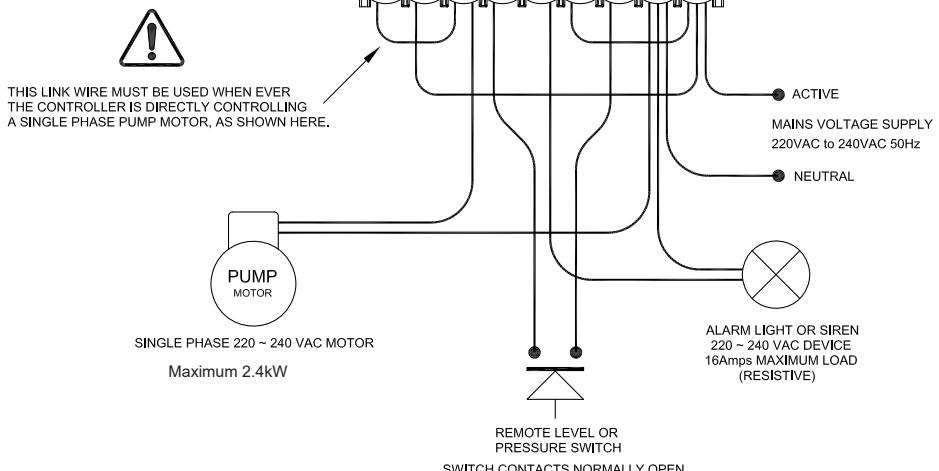


# BASIC SINGLE PHASE WIRING DIAGRAM

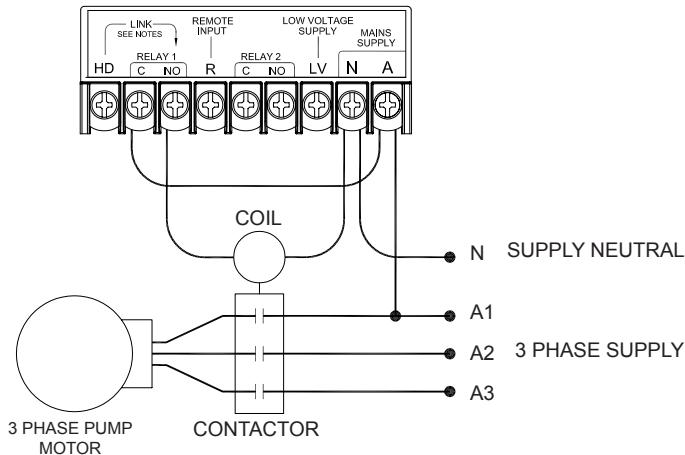


## CONTROL OF A SINGLE PHASE PUMP MOTOR WITH REMOTE INPUT AND AN EXTERNAL ALARM

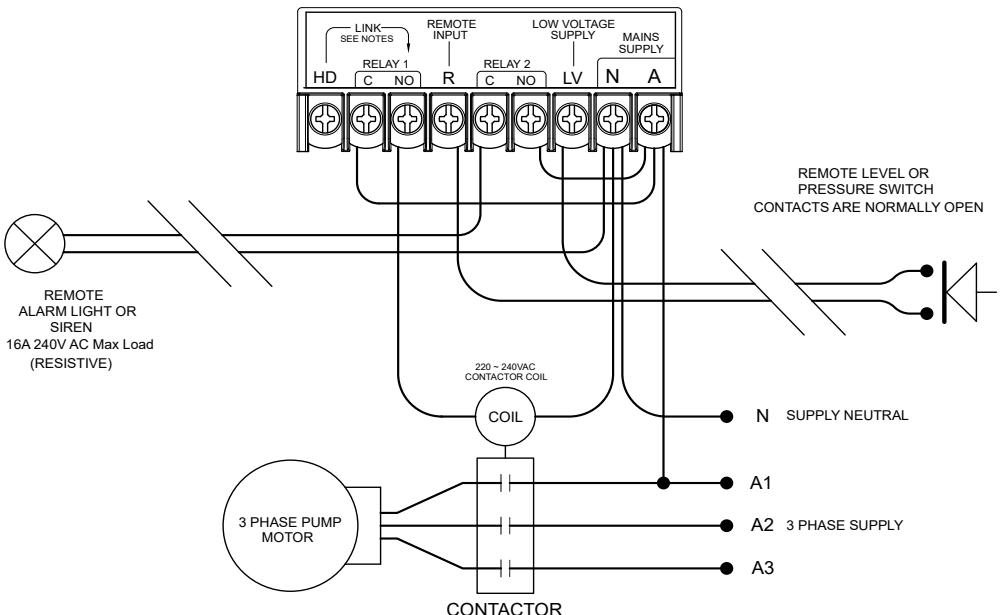
CONTROL OF A SINGLE PHASE PUMP MOTOR  
WITH REMOTE INPUT AND AN EXTERNAL ALARM



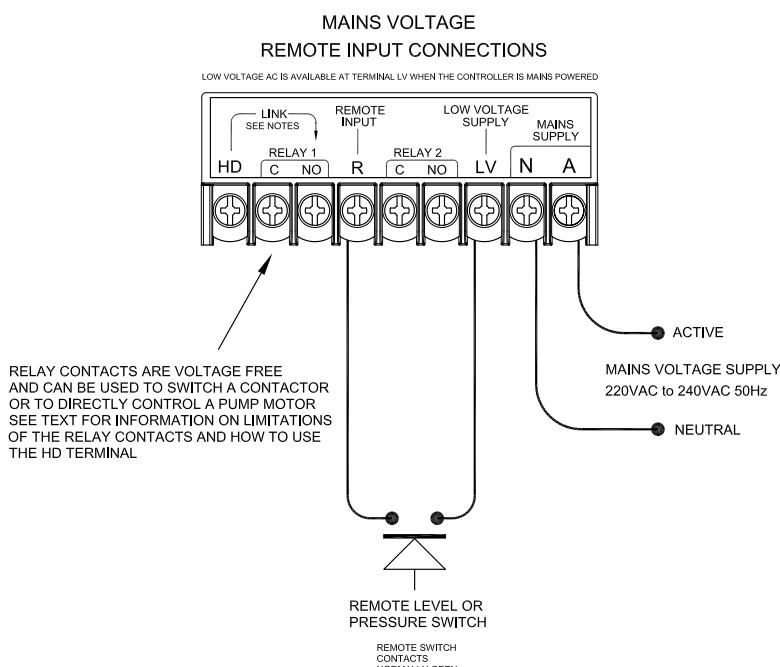
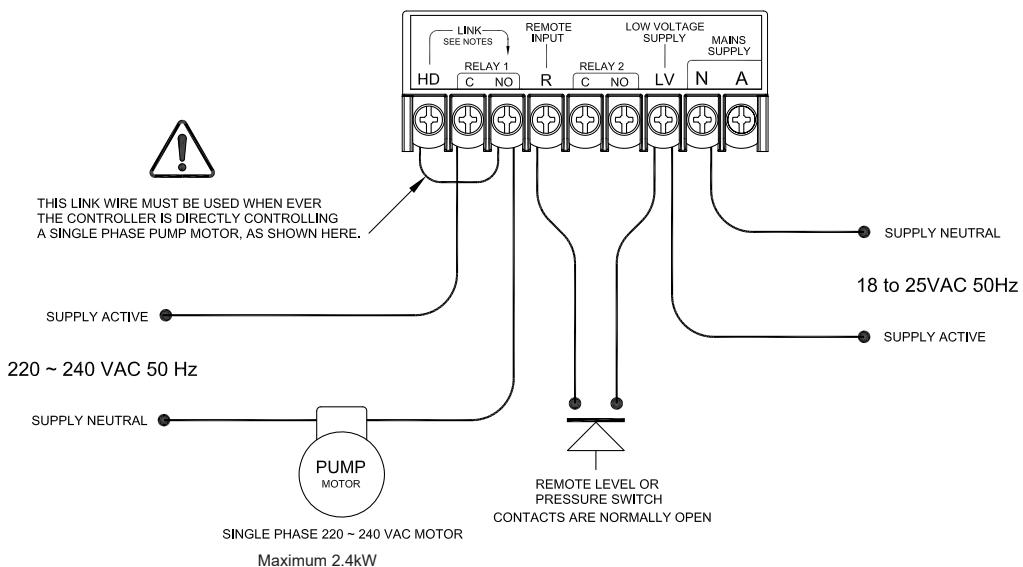
## TYPICAL 3 PHASE PUMP CONNECTIONS



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



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



# 12VDC F29 Flow Switch

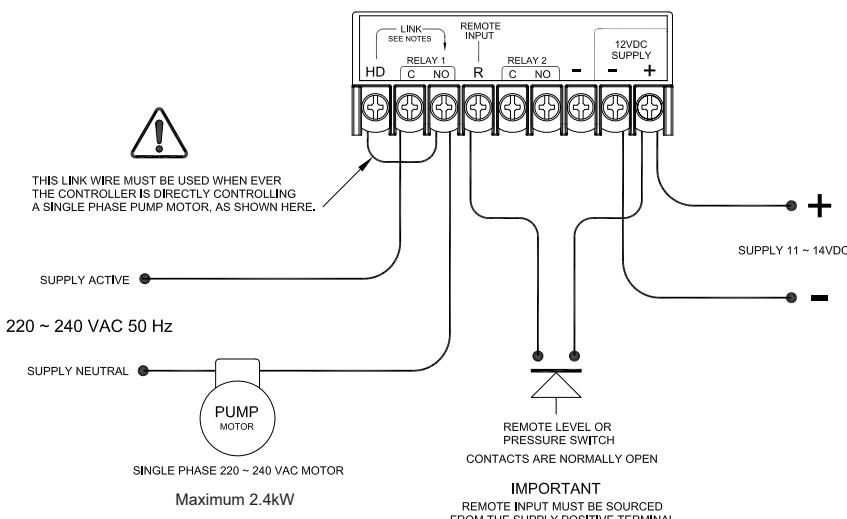
A special 12VDC version of the F29 flow switch is available for battery operation and for use in solar pumping systems. Functionally, the 12VDC model is exactly the same as the mains voltage model except for the terminal block markings. On the 12VDC model the active and neutral terminals are replaced by a positive + and a negative - terminal. Supply voltage across the positive and negative terminals must never exceed 14VDC or the flow switch will be damaged. The supply terminals are reverse polarity protected. However, the flow switch will simply not operate unless the supply polarity is correct.

If a remote switch is connected to the 12VDC F29 flow switch the supply to the remote switch must be taken from the positive terminal on the flow switch. The remote switch and its connecting circuit will operate at 12VDC.

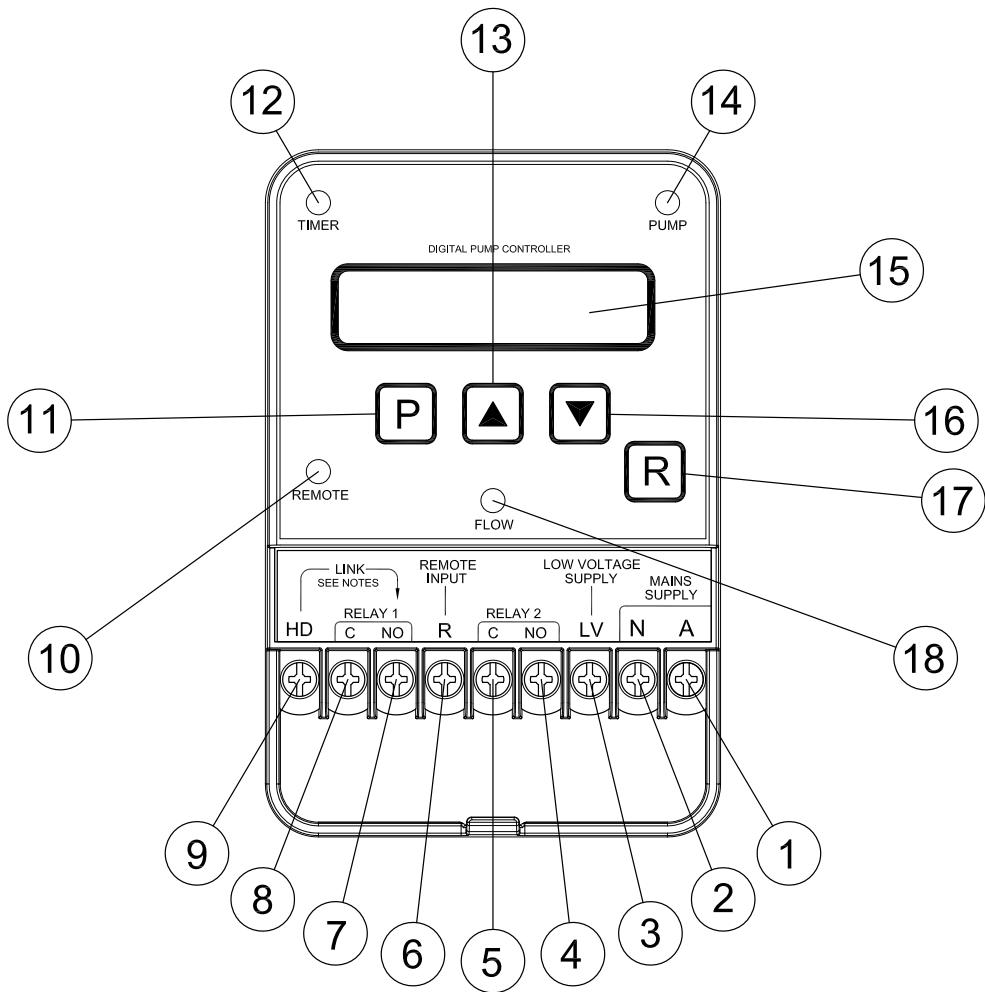
## CONTROLLING A 220 ~ 240 VAC SINGLE PHASE PUMP MOTOR WITH THE PUMP CONTROLLER POWERED FROM A 12V DC SUPPLY

### WIRING DIAGRAM 12V DC CONTROLLER ONLY

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



# F29 Controls and Terminals



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

# Remote Input

An external switch with voltage free contacts such as a tank level switch or a set of external relay contacts can be used to either start or to start and stop a pump under the control of the F29. The supply to the external switch must be taken from the (LV) terminal (Low Voltage active terminal) of the F29 when the flow switch is powered from the mains or from a 24VAC source. The F29 must always be powered from the same source as the supply to the external switch. The supply to the remote switch on the F29-12 (low voltage DC model) must be taken from the supply positive terminal. In all cases the external switch return wire must be connected to the Remote input (R) terminal on the F29. The Supply to the external switch will range from 12 to 24 VDC or from 20V to 35V AC depending on the model of the flow switch and on the supply voltage.

**WARNING:** The low voltage source available at the LV terminal is non-isolated and in terms of insulation must be regarded as operating at full mains potential whenever the F29 is powered from the mains.

The remote switch can be installed some distance from the F29. The maximum distance is limited by cable resistance and capacitance. The total cable resistance must not exceed 5K Ohms with the remote switch closed. The total capacitance of the cable must not exceed 25nF with the remote switch open. Wires to the remote switch should be run separately from power carrying cables. Do not run the remote switch wires in a conduit that also contains power cables. Capacitive coupling between the adjacent cables may cause false triggering of the F29's remote input. For cable runs longer than 150 metres we suggest using 2 separate wires to reduce capacitive coupling between the adjacent wires. When set up this way cable resistance becomes the limiting factor for distance. The table below sets out the resistance of typical copper wire of various diameters.

Nominal Cross Section of Copper Wire in Square Millimetres	Resistance in Ohms per 1000 Metres
0.2	95.30
0.5	36.20
0.75	24.13
1.0	18.10
1.5	12.10

**Note:** Resistance may vary depending on the wire standard and the actual construction of the wire.

Note that the cable resistance refers to the total resistance out to the remote switch and back again, as measured at the flow switch across the 2 remote connection wires with the external remote switch closed.

### **Example**

A water tank is located 2000 metres from the F29. Two separate wires each 0.2mm<sup>2</sup> are run to the remote tank (total wire length is 4000 metres). The resistance as measured across the 2 wires back at the F29 (with the tank level switch closed) is 382 Ohms. This is well under the 5,000 Ohm limit. The remote input to the F29 will operate properly provided the wires are separated by sufficient distance that the capacitance between them is less than 25nF. Capacitance should be measured between the wires when the remote switch is open, and it must be less than 25nF.

### **Remote Switch**

The remote switch should be suitable for low voltage, low current operation. In particular its contacts should only require a low wetting current. The current in the remote loop only runs to a few milliamperes and requires a switch that will conduct when closed under low current conditions. Mechanical microswitches with gold plated contacts or reed switches are the preferred method of controlling the remote input function. Conventional mechanical switches with exposed silver based contacts may initially function, however, over time their contacts will oxidise and the switch may not be able to conduct the small switching current. The contacts of reed switches are normally sealed in a glass tube filled with an inert gas that prevents oxidisation of their contacts and therefore their contact resistance does not increase over time.



### **WARNING**

**Never connect an external power source to the (R) remote input terminal of the F29. The remote input terminal must only ever be connected to a supply that is sourced from the LV terminal on the F29 itself when the flow switch is powered from the mains or from the supply positive terminal when the flow switch is powered from a 12VDC supply.**

# **Maintenance**

The F29 flow switch is a low maintenance device. If it is correctly installed in a location that is out of direct exposure to the elements it should give a long and reliable life and require little or no maintenance at all.

Factors that may reduce its life are lightning strikes or power surges, failure to fully tighten lid and cable glands, exposure to pressures or temperatures in excess of its ratings and operation outside its electrical limitations in terms of supply voltage and motor loads.

## **Spare Parts**

For the F29 flow switch spare paddles are available from your supplier.

## **Warranty**

The F29 flow switch is warranted against faulty workmanship and materials for a period of 12 months from the date of purchase. Our complete warranty statement can be downloaded from :

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

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



## **WARNING**

**If the F29 flow switch is used in a manner not specified by the manufacturer the pump protection provided by the flow switch may be impaired or negated. In addition, all warranties stated or implied will be rendered invalid.**

Designed and Manufactured in Australia by

**KELCO Engineering Pty Ltd**

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# **VERY IMPORTANT**

**This Kelco controller has been fully tested and calibrated. It is presently unlocked and has a simple program loaded. It is set to operate in a basic way with most of its special functions and features switched off.**

On start up this controller will run the pump using its start-up timer. If it finds normal operating conditions in the pipe system it will continue to run the pump. If pressure or flow conditions change the pump will continue to run for a short period held on by the controller's built in run-on timer. If acceptable conditions fail to return the pump will be shut down after the run-on time period. Pressing the red reset button on the controller's lid or resetting the power will repeat this basic process.

To change the functions of this controller please first read the programming book supplied with this unit.

## **IMPORTANT**

**DO NOT EXPOSE THIS CONTROLLER TO VIBRATION. INSTALL ONLY IN PIPEWORK OR MANIFOLDS THAT DO NOT VIBRATE.** Vibration will damage the sensitive electronics within the controller and will void your product warranty.