

# **KELCO IPG20 INTELLIGENT PUMP GUARD**

## **INSTALLATION INSTRUCTIONS**

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## **WARNING**

**This symbol is intended to alert the user to the presence of important operating and maintenance instructions in the literature accompanying the pump controller**



## **WARNING**

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

# IMPORTANT SAFETY INSTRUCTIONS

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



## WARNING

Please read these installation and operating instructions fully and carefully before installing or servicing this controller. The IPG20 Pump Guard is a mains voltage device. Death or serious injury may result if this product is not correctly installed and operated.

# Overview

The IPG20 intelligent pump guard is a pressure and flow based device that “learns” the operating pressure each time the system is started. This allows for finely targeted parameters where any significant variation in the operating pressure or loss of flow will trigger an alarm and shut the system down. This product is ideally suited to pumps with a steep pressure curve.

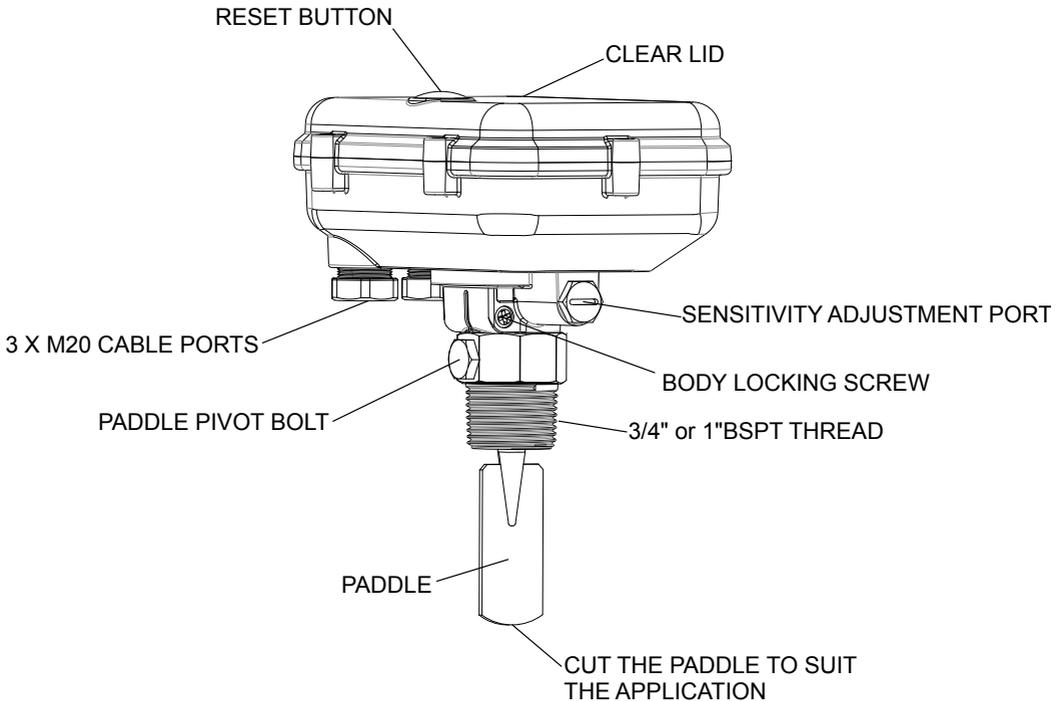
Because the operating pressure will change each time the irrigator system is moved to a different hydrant or hydrant group, or even a different height on the same hydrant, it is normally impossible to give a high degree of protection against over pressure due to a blockage or low pressure due to a leak. With the IPG20 each time the pumping system is started and after the operator has verified the system is running with no problems the learning phase of the controller can be instigated. The controller then starts to “learn” what the operating pressure will be on this particular set up. If a stable pressure is reached within the allotted time the switch will lock this pressure in as the set point and apply the predetermined under and over pressure settings. If there is no expected change of pressure; eg. Fixed sprinklers, stationary irrigator or irrigator on flat land, then the low pressure and high pressure margin can be set very close to the set point.

With a travelling irrigator the pressure margins would need to allow for the maximum change of contour on the irrigator’s run.

Alternatively Auto Terrain Compensation can be selected. The switch then adjusts itself automatically to compensate for a change in contour. This allows for a very small over and under margin, which gives a very high degree of protection against leaks or blockages.



**Without its lid in place the IPG20 is not water resistant and presents a potential shock hazard. Take great care not to splash water onto the IPG20 when the lid is not in place. Always replace the lid and fully tighten its 6 securing screws immediately after any changes to the controller's settings are made.**



# INSTALLING THE IPG20 PUMP GUARD

## Location

Install this controller in a location that is sheltered from direct exposure to the weather whenever possible. The IPG20 is weatherproof and can be used in fully exposed locations; however, to ensure a long reliable life from the controller we recommend it be protected from direct exposure to the sun and rain. Intense sunlight will eventually cause discoloration of the clear lid on the controller and will also degrade its LCD screen. It is therefore advisable to always protect the controller from the weather using the clip-on skull cap supplied with the controller.

The IPG20 should be installed in a straight section of pipe preferably with 5 diameters of straight pipe either side of the paddle. The controller can be installed in a suitable pipe socket, tapping saddle or pipe tee. The controller should be installed in the discharge pipework of the pumping system. The IPG20 should not be installed in the suction pipe of a pump as it requires positive pressure to operate properly. The IPG20 can be installed in either a horizontal or vertical pipe. If it is installed in a vertical pipe the flow must be in an upward direction. Do not install this controller on the underside of horizontal pipework.



## **WARNING**

**After programming the IPG20 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 controller for extended periods. Without its lid in place the IPG20 is not water resistant and presents a potential shock hazard. Take great care not to splash water onto the controller when the lid is not in place. Without its lid the controller is not weather or insect proof and presents a potential shock hazard that may result in death or serious injury.**

# Installation

The IPG20 pump guard 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, taking care that the sealing O-ring is on the stem and is in location and in good order. 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.

With the electrical housing located on the spigot and in position, press down with the flat of your hand on the top face of the lid of the electrical enclosure. While pressing down, screw the 4mm Allen screw fully through the housing using the 3mm Allen Key (supplied). Tighten the screw and then release your hand from the top of the housing. Pressing down with your hand on the housing preloads the O-ring seal between the housing and the paddle assembly. It enables the M4 Allan screw to easily screw fully through the side of the housing.

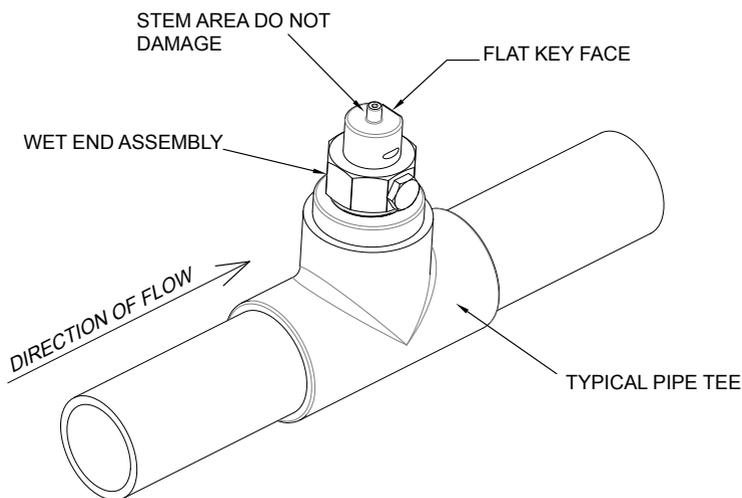
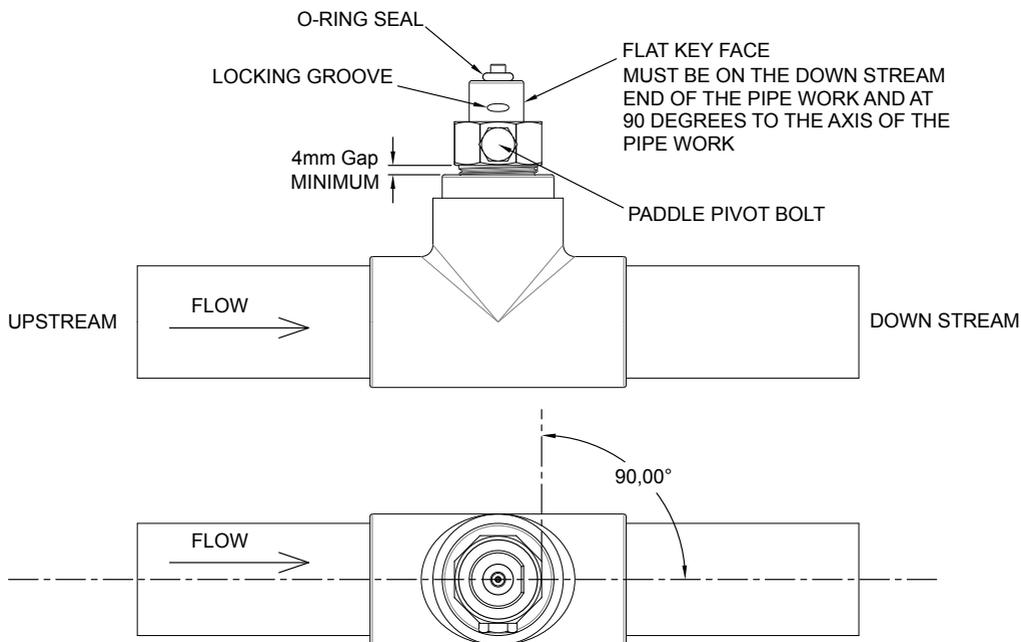
Under no circumstances should the electrical housing be twisted or used to screw the paddle assembly into the pipework, or to align the controller with the axis of the pipework. To do so will irreparably damage the controller and void its warranty. Never apply water pressure to the controller unless the M4 locking screw is in place and fully tightened (see sketch for details). To fit the paddle assembly into the pipework use a suitable spanner and use the spanner flats provided on the paddle assembly (directly above the process connection thread).

The IPG20 can be installed in either vertical or horizontal pipe. When installed in vertical pipework flow must be in an upward direction past the controller's paddle. The IPG20 is supplied with a 1" BSP process connection. A matching female threaded socket or pipe tee must be provided to fit the controller into pipework.

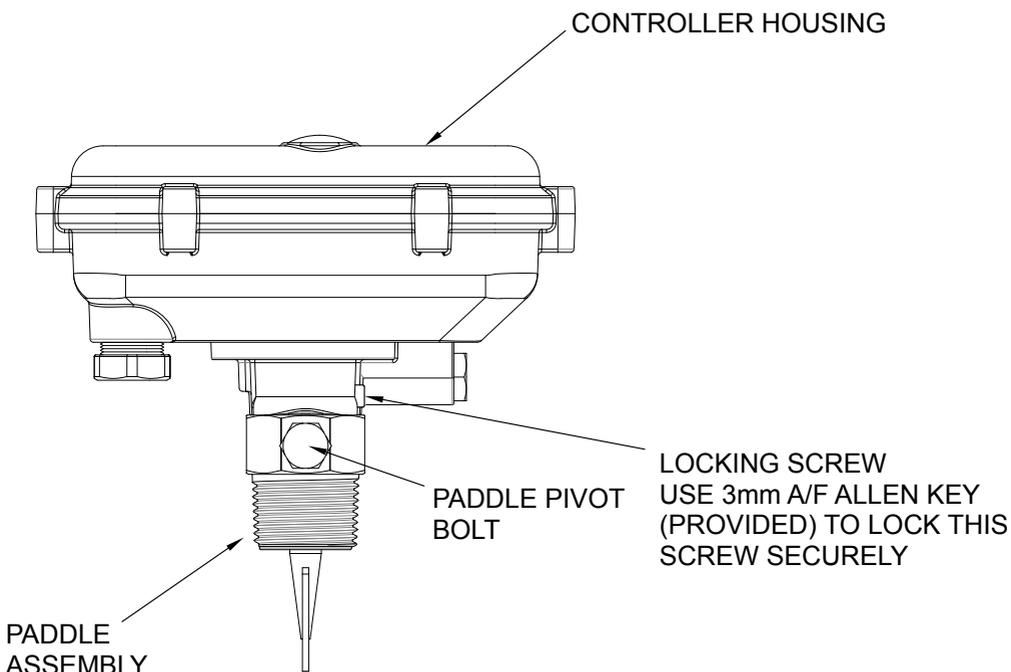
The IPG20 is supplied with one paddle to suit pipe sizes 25mm and greater, and two trailing wires to suit pipe sizes from 65mm - 100mmID, subject to velocity.

Refer to the paddle trim calculator on the Kelco website [www.kelco.co.nz](http://www.kelco.co.nz).

# Aligning the Paddle Assembly



# Locking the Electrical Housing onto the Paddle Assembly



# Trimming the Paddle

The polypropylene paddle of the IPG20 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 an appropriate distance, subject to the expected flow, into the pipe when the controller is installed in the pipework. If it is necessary to shorten the trailing wire it must be tig welded to avoid fraying. If you are unsure as to what length the paddle should be, a paddle trimming calculator is available at [www.kelco.co.nz](http://www.kelco.co.nz). 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 and trailing wires to suit the IPG20 pump controller are available from Kelco or from your distributor.

Apply sealing compound or Teflon tape to the process connection thread on the controller and screw the controller into the pipework using the spanner flats on the process connection. Do not screw the controller into the pipework by twisting the electrical housing. The controller 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 IPG20. The controller must be square to the axis of the pipework with the direction of flow arrow pointing in the direction of flow.

# Detaching the Electrical Housing

To allow easy access to the controller's paddle, the electrical housing of the IPG20 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 controller. To remove the electrical assembly, switch off the system's power and undo and completely remove the M4 Allen head 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 paddle housing. Simply reverse this procedure to refit the electrical housing to the controller, taking care to ensure the pressure seal O-ring on the top of the wet end is in place and is clean and in good condition.



## WARNING

**Always de-pressurise the piping system before removing the electrical housing or carrying out any work on the paddle assembly of the IPG20. The securing screw that locks the electrical housing onto the paddle assembly of the IPG20 must never be loosened or removed while the pipe system is under pressure. In order to carry out any work on the paddle itself, the pipe system must be completely depressurized and vented to atmosphere. If the IPG20 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 pipework.**

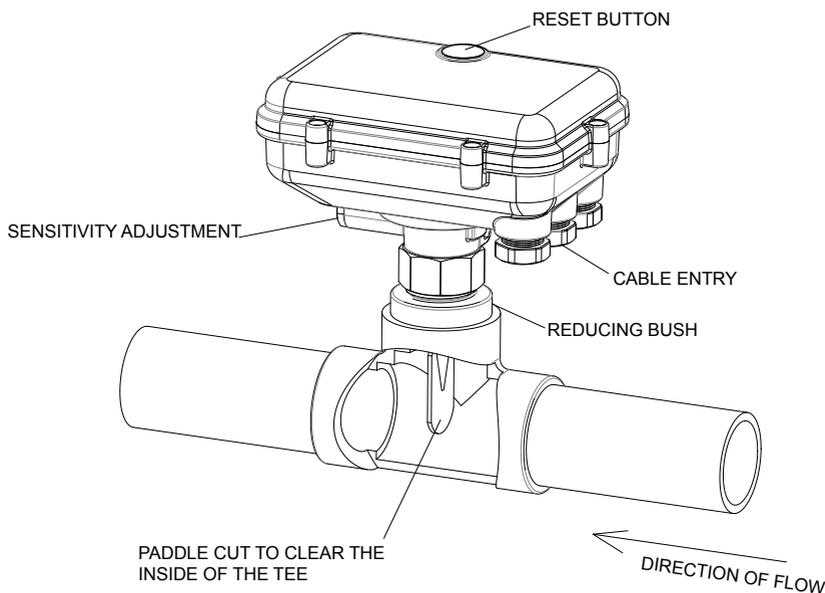
# Sensitivity Adjustment

Under the end of the electrical housing on the IPG20 is a 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.

The range of sensitivity adjustment will also be affected by the orientation of the controller. In horizontal pipework with the IPG20 mounted vertically the useable range of adjustment is approximately 8 turns. In vertical pipe with the IPG20 installed horizontally the full 10 turn range can be utilised.



TYPICAL PIPE TEE INSTALLATION

# Limitations



## WARNING

The IPG20 pump guard is water resistant to IP67. This rating only applies if the clear lid and its gasket are in place and the lids 6 fixing screws are fully tightened. The IPG20 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 6 securing screws after making changes to the controller's settings. The IPG20 may present a shock hazard and death or serious injury may result if water enters the controller's electrical housing. There are no user serviceable parts in this pump controller. Under no circumstances should the main electronics housing be opened. Warranty on this product is automatically void if the electronics compartment is opened.

- 1 ) Do not install this controller in a fully exposed outdoor location without its black skull cap in place. The IPG20 is weatherproof; however, to ensure a long reliable life from the controller we recommend it be protected from direct exposure to the sun and rain. Each IPG20 is supplied with a clip on cover for this purpose.
- 2 ) Do not expose this controller to freezing. If the pipework in which the IPG20 is installed freezes, the pressure sensor in the controller may fail. If the IPG20 is to be used in areas where low temperatures will be encountered, always lag the pipework for several metres either side of the controller and also lag the base of the controller to prevent the unit and any adjacent pipework from freezing.
- 3) Do not use this controller in hot water applications. The IPG20 is not designed to be used in water hotter than 60°C.
- 4) Do not expose this controller to static or dynamic pressures greater than 20 Bars, 290 psi.
- 5) Do not install this pump controller in a section of pipe that is subject to vibration. Vibration will cause premature failure of the electronic components within the controller.

# Operating Range

Ambient Temperature Range	1°C to 50°C
Liquid Temperature Range	1°C to 60°C See note below
Ingress Protection Rating	IP67
Maximum Operating Pressure Static or Dynamic	20 Bars 290 psi See note below
Minimum Burst Pressure	> 30 Bars 435 psi
Minimum Pressure Differential	1kPa. Practical limit is nominally 3kPa
Recommended Pipe Size	25mm 1" or larger (There is no upper limit)

**Note :** The IPG20 must NOT be used in hot water applications >60°C. The controller is rated to withstand water pressure to 20Bars (290psi) and must not be used in applications where the static or dynamic pressure exceeds this rating.

# Electrical



## WARNING

**All electrical work associated with the IPG20 must be carried out by qualified electrical personnel and all electrical work must conform to AS/NZ standards and to local wiring rules. For mains voltage applications we recommend the supply to the IPG20 be isolated by an RCD that has a maximum trip current of 30mA.**

## Introduction

The IPG20 is designed to directly control single-phase pump motors to 2.4kW. No interposing contactor is required for such applications. If a supply neutral is available the controller can also be used to control 3-phase pump motors via an appropriate interposing contactor.

The IPG20 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 controller requires a stable supply voltage in order to operate correctly. Pay particular attention to cable sizes, and ensure cables are adequate for the specific pump motor load.

This is particularly important where long cable runs are to be used in the installation. If the voltage drop associated with the starting of the pump motor is excessive the IPG20 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 IPG20 is stable and that the current carrying capacity of the cable is adequate for the job.

# Brownout Or Blackout

If a brownout or blackout occurs the IPG20 pump controller will not retain any memory of where in its run or stop cycle it may have been, it will simply shut down the pump. When power resumes, the IPG20 will reboot, restart the pump and run any timer settings from the beginning. A manual reboot can be done at any time by simply pressing the controller's reset button.



## WARNING

**The IPG20 derives low voltage for its operation from a non-isolated reactance power supply (not through an isolated transformer). All external devices connected to the IPG20 controller must be earthed and must be regarded as operating at full mains potential.**

## Cables

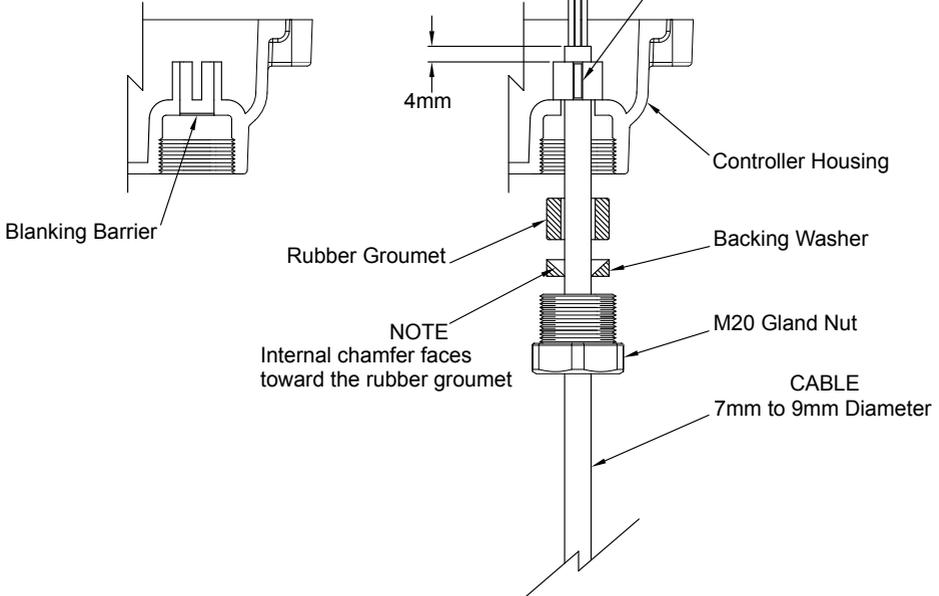
The IPG20 has 3 X M20 cable glands. As supplied, the cable glands are blanked off. To use the glands first punch out the blanking barriers using a suitable punch. The cable glands can accept cable from 7 to 9mm diameter. See attached sketch for assembling the cable gland components. The controller is supplied with a set of steel crimp rings. The crimp rings are to provide strain relief for the controller's cables. To use the crimps, place one on the cable approximately 3 to 4mm below the end to 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 located into the slots in the cable 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



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

Maximum Supply Voltage	250VAC 50Hz
Minimum Supply Voltage	220VAC 50Hz

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

Maximum Supply Voltage	25VAC 50Hz or 25VDC
Minimum Supply Voltage	18VAC 50Hz or 18VDC

### **RELAY 1 CONTACT RATING**

16A at 250VAC	Resistive Load
16A at 30VDC	Resistive Load
500mA at 5VDC	Minimum Load

### **RELAY 2 CONTACT RATING**

16A at 250VAC	Resistive Load
16A at 30VDC	Resistive Load



## **WARNING**

Do not connect any supply greater than 25VAC or DC to the LV terminal on the IPG20. The LV terminal is only for use with a Low Voltage supply of less than 25V AC or DC. If a Voltage greater than 25V AC or DC is connected to the LV terminal of the controller, the controller will be damaged and any warranty on the controller will be void.

# Remote Input

A remote momentary on switch with voltage free contacts can be used to start the learning process. The supply to the remote switch must be taken from the (LV) terminal (Low Voltage active terminal) of the IPG20 when the controller is powered from the mains or from a 24VAC source. The IPG20 must always be powered from the same source as the supply to the remote switch. In all cases the remote switch return wire must be connected to the Remote input (R) terminal on the IPG20. The supply to the external switch will range from 12 - 24VDC or from 20V - 35VAC depending 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 IPG20 is powered from the mains.

The remote switch can be installed some distance from the IPG20. 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 IPG20's remote input. For cable runs longer than 150 meters 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.

Remote Input	Resistance in Ohms per 1000 Meters
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 controller across the 2 remote connection wires with the external remote switch closed.

## **Remote Switch**

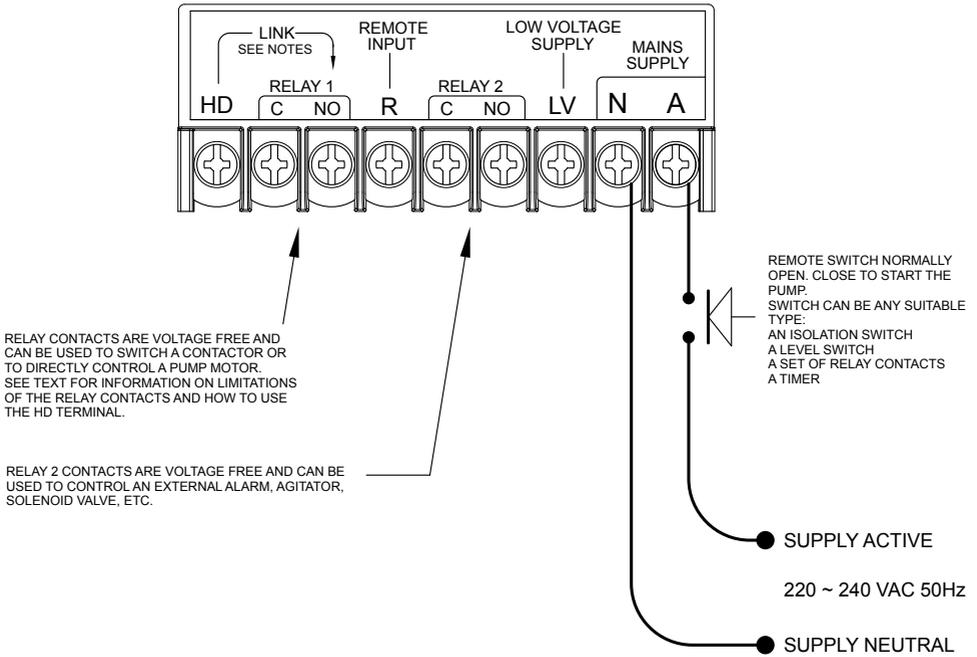
The remote switch should be suitable for low voltage low current operation. In particular its contacts should only require a low wetting current. The current in the remote loop only runs to a few milliamperes and requires a switch that will conduct when closed under low current conditions. Mechanical 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 oxidation of their contacts and therefore their contact resistance does not increase over time.



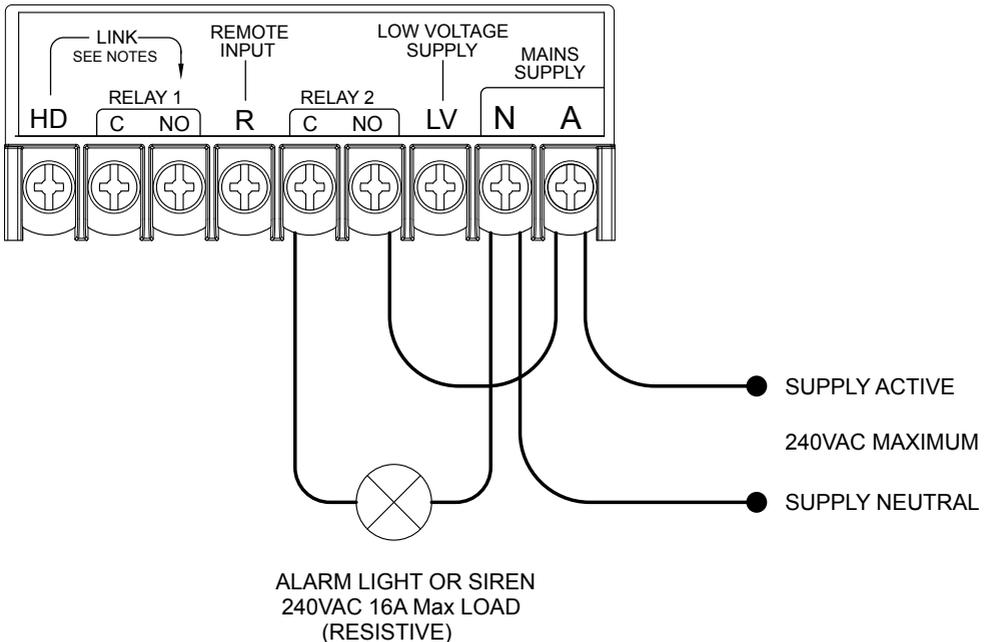
## **WARNING**

**Never connect an external power source to the (R) remote input terminal of the IPG20. The remote input terminal must only ever be connected to a supply that is sourced from the LV terminal on the IPG20 itself when the controller is powered from the mains.**

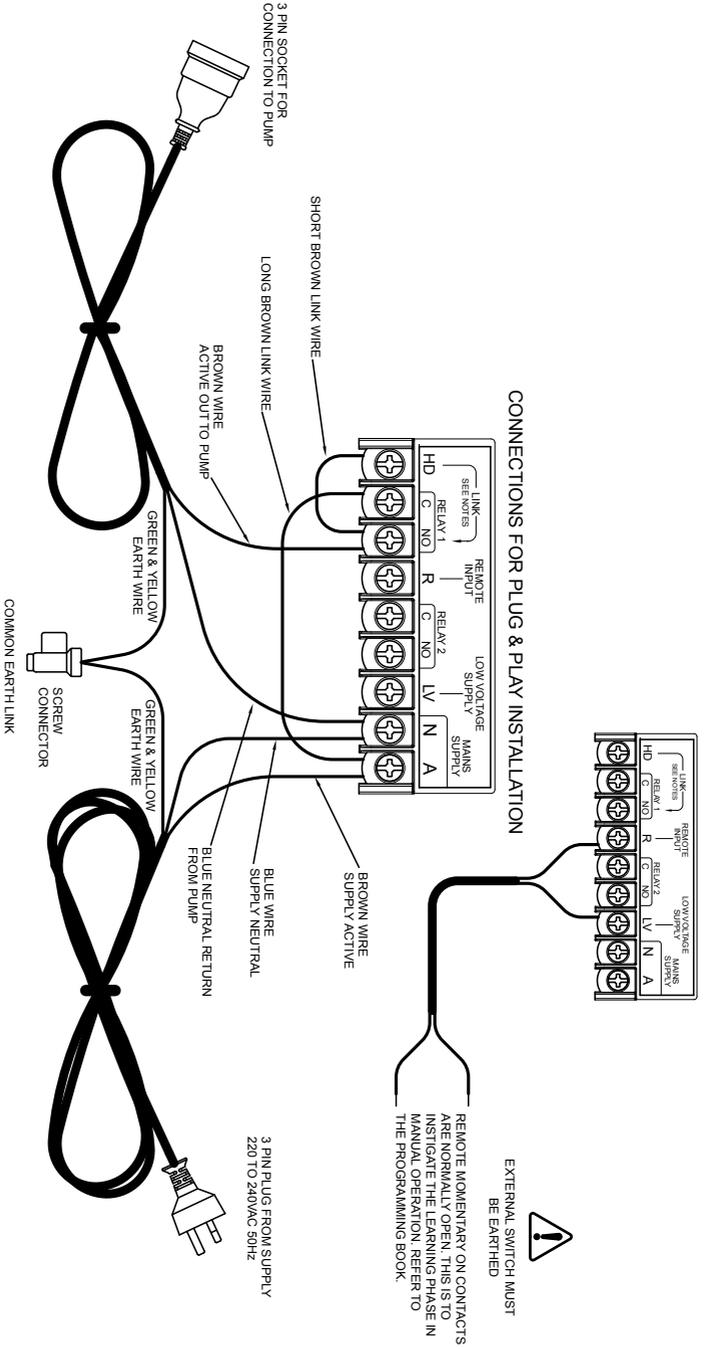
## STANDARD WAY TO CONNECT THE SUPPLY



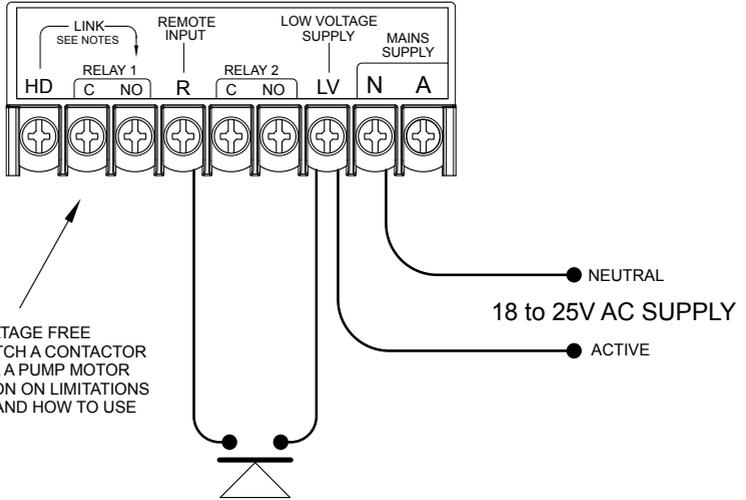
## MAINS VOLTAGE EXTERNAL ALARM CONNECTIONS



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



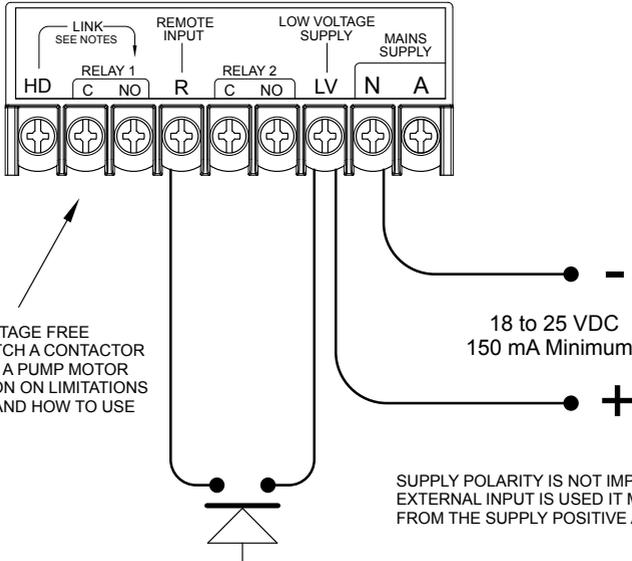
## LOW VOLTAGE AC CONNECTIONS WITH REMOTE INPUT



RELAY CONTACTS ARE VOLTAGE FREE AND CAN BE USED TO SWITCH A CONTACTOR OR TO DIRECTLY CONTROL A PUMP MOTOR SEE TEXT FOR INFORMATION ON LIMITATIONS OF THE RELAY CONTACTS AND HOW TO USE THE HD TERMINAL

REMOTE MOMENTARY ON CONTACTS ARE NORMALLY OPEN. THIS IS TO INSTIGATE THE LEARNING PHASE IN MANYUAL OPERATION. REFER TO THE PROGRAMMING BOOK

## LOW VOLTAGE DC CONNECTIONS WITH REMOTE INPUT

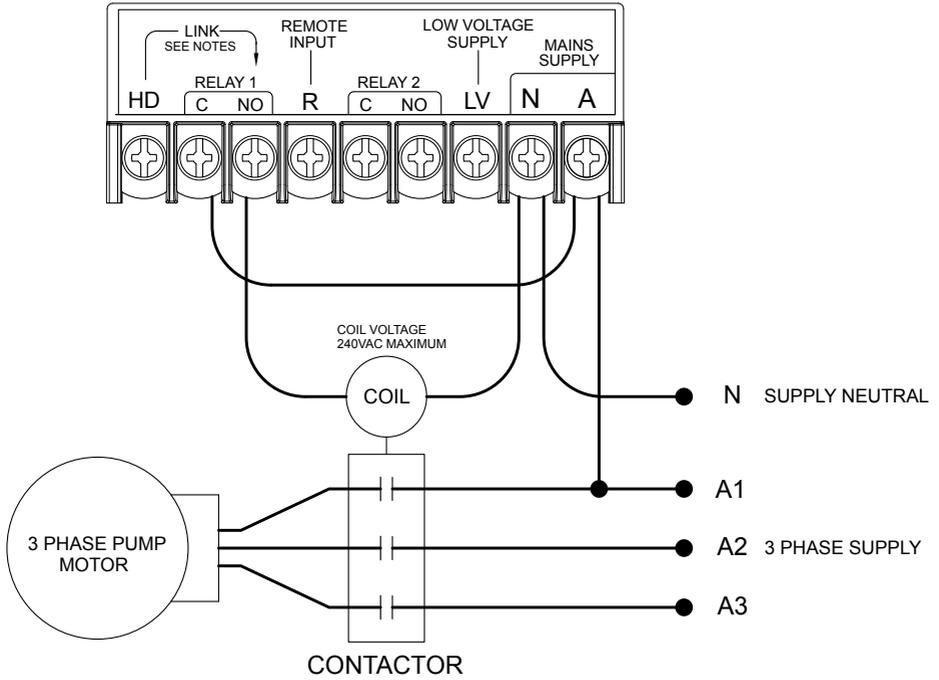


RELAY CONTACTS ARE VOLTAGE FREE AND CAN BE USED TO SWITCH A CONTACTOR OR TO DIRECTLY CONTROL A PUMP MOTOR SEE TEXT FOR INFORMATION ON LIMITATIONS OF THE RELAY CONTACTS AND HOW TO USE THE HD TERMINAL

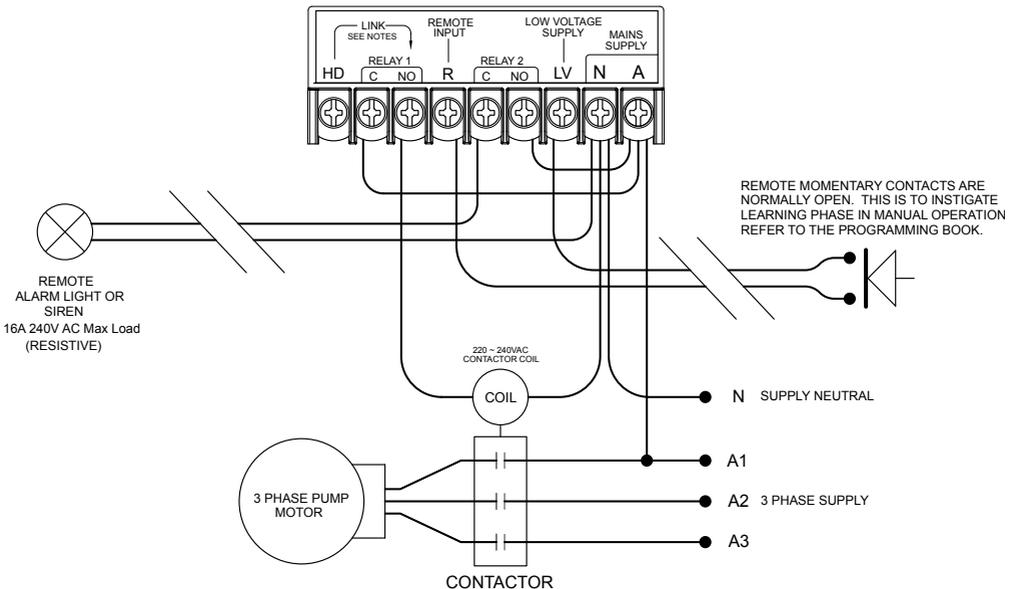
SUPPLY POLARITY IS NOT IMPORTANT BUT IF THE EXTERNAL INPUT IS USED IT MUST BE SOURCED FROM THE SUPPLY POSITIVE AS SHOWN HERE

REMOTE MOMENTARY ON CONTACTS ARE NORMALLY OPEN. THIS IS TO INSTIGATE THE LEARNING PHASE IN MANUAL OPERATION. REFER TO THE PROGRAMMING BOOK.

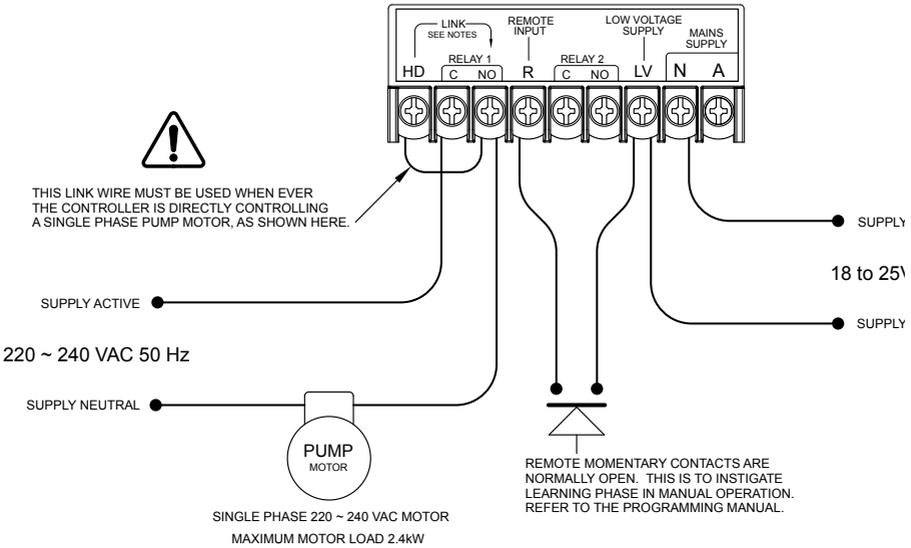
# TYPICAL 3 PHASE PUMP CONNECTIONS



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

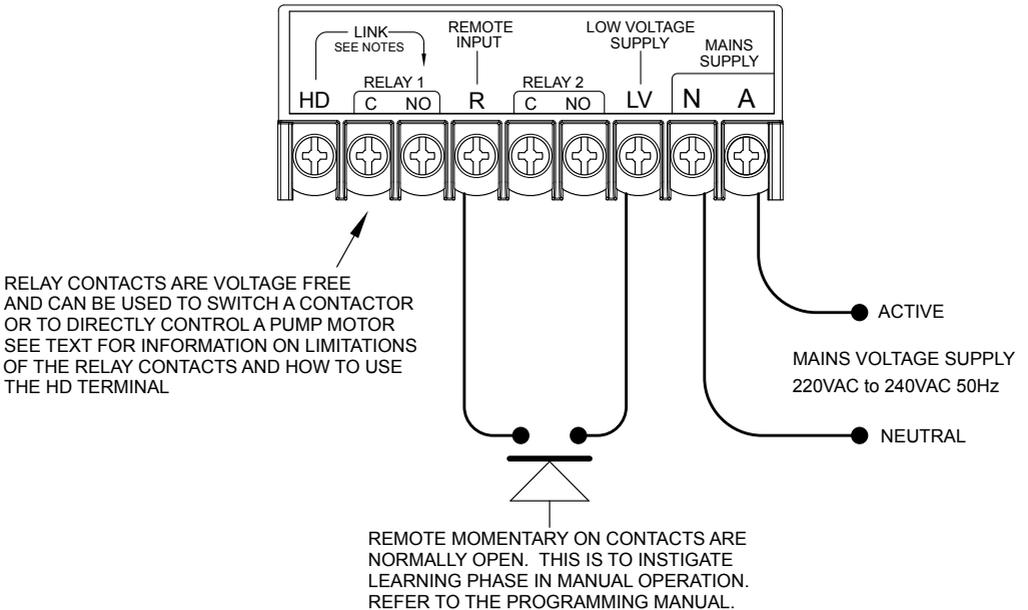


CONTROLLING A 220 ~240VAC SINGLE PHASE PUMP MOTOR WITH THE PUMP CONTROLLER POWERED FROM A LOW VOLTAGE AC SUPPLY

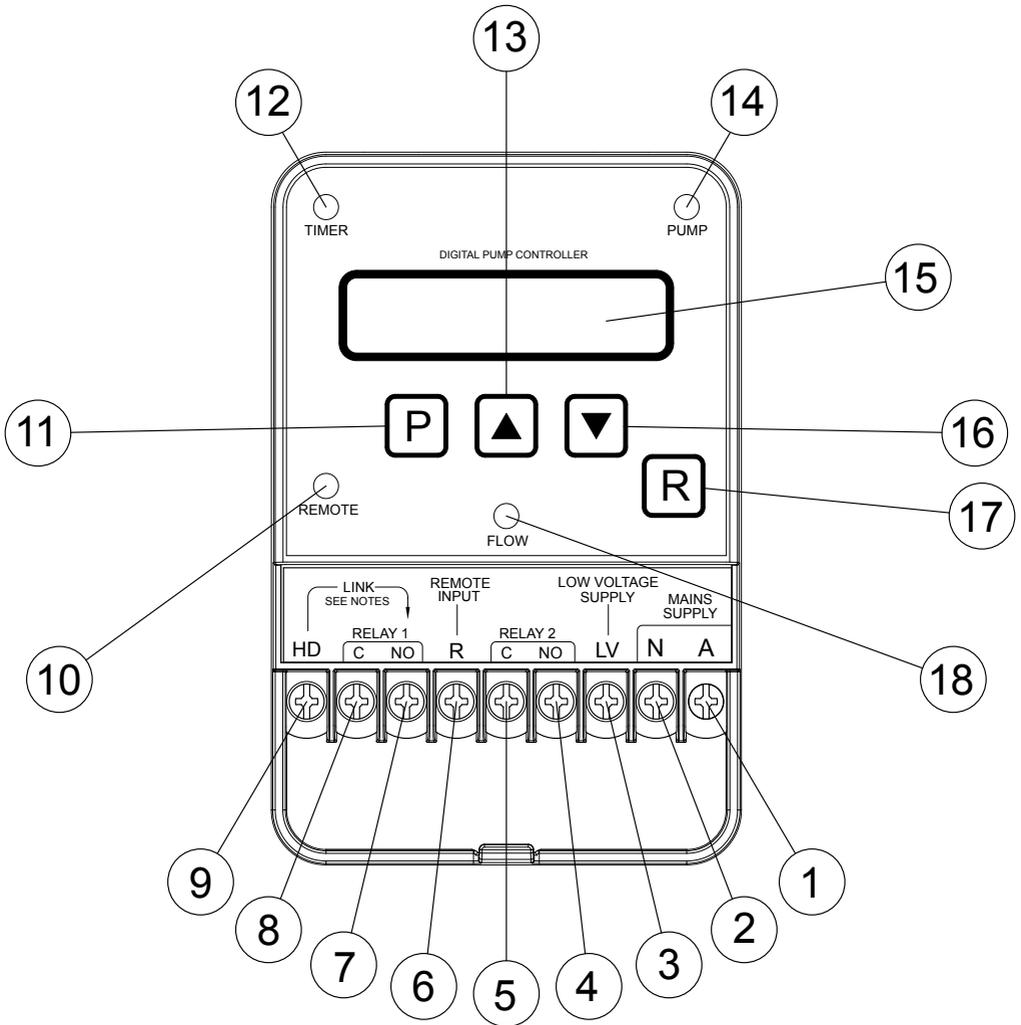


MAINS VOLTAGE  
REMOTE INPUT CONNECTIONS

LOW VOLTAGE AC IS AVAILABLE AT TERMINAL LV WHEN THE CONTROLLER IS MAINS POWERED



# IPG20 Controls & Their Functions



# Controls and their Functions

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.
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 or to turn 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.

# Maintenance

The IPG20 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 no maintenance at all.

Factors that may reduce its life are lightning strikes or power surges, failure to fully tighten its 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

Spare paddles and trailing wire arms are available for the IPG20 pump guard from your supplier.

# Warranty

The IPG20 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 IPG20 Pump Controller is used in a manner not specified by the manufacturer the pump protection provided by the controller may be impaired or negated. In addition, all warranties stated or implied may be rendered invalid.**

Designed and Manufactured in Australia by

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