

# DENISON HYDRAULICS

## Multi-Function Proportional Valve Dual Driver ( Encapsulated )



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### Introduction:

Denison Hydraulics Have Long Recognised the Need for Driver Electronics Which Are Reasonably Priced, Easy to Apply, Mechanically Sound and Can Be Utilised in Many Differing Environments and With a Wide Range of Proportional Products.

The Ideal Is to Keep Product Variation to a Minimum Which Will Reduce Spares Stocking As Well As Allowing Commissioning Engineers, System Designers and Machine Operators to Become Familiar With a Limited Range of Connections and Adjustments Which Will Improve Overall Efficiency, Confidence in the Electronic and Hydraulic Components and Once Comfortable With the Operation and Parameters, Will Generate Proven Electro-Hydraulic 'Building-Blocks' Which Can Be Used Time and Time Again Without Extra Design or Production Time Being Wasted on Learning a New Product.

This Dual Driver uses the latest internal component and circuit design technology to give **full CE compliance** to present **EMC** directives to ensure maximum operational potential and efficiency, while offering Multiple supply voltages, command and valve current options ( all selected by internal PCB mounted links ) in **ONE** unique and easy to apply package.

The following 'Application Hints' for this versatile range of Dual Driver units are only issued as a guide and if required, further help and /or advice should be sought from your Local distributor or from Denison Hydraulics internal sales departments.

### Note:

**'Encapsulated'** means the main Printed circuit board is totally encased in a black flame proof resin which is impervious to external matter such as liquids e.t.c.

**027-22071-0** 'Encapsulated ( IP68 ) Printed Circuit Board ( PCB ).

- Mobile applications where 'Externally', 'Internally' or 'Cab' mounted .
- 'Outdoor' applications.
- Aggressive environmental applications
- Marine usage ( when mounted in suitable sealed housing )
- Applications where humidity is a factor.

### Product Compatibility:

Valve Type	Design Letter	Coil Voltage	Unit Supply Voltage	Link 'F'	Links 'A' & 'B'
4DP01	A	12V	12V ( ± 10% )	F2	A3 & B3
4DP01	A	24V	24V ( ± 20% )	F2	A4 & B4
4DP01	B	12V	12V ( ± 10% )	F3	A3 & B3
4DP01	B	24V	24V ( ± 20% )	F3	A4 & B4
4DP02	A	12V	12V ( ± 10% )	F1	A3 & B3
4DP02	A	24V	24V ( ± 20% )	F1	A4 & B4
4DP02 single sol	B	12V	12V ( ± 10% )	F2	A3 & B3
4DP02 double sol	B	12V	12V ( ± 10% )	F1	A3 & B3
4DP03	A	12V	12V ( ± 10% )	F2	A3 & B3
4DP03	A	24V	24V ( ± 20% )	F1	A4 & B4
3DP03	A	12V	12V ( ± 10% )	F2	A3 & B3
3DP03	A	24V	24V ( ± 20% )	F2	A4 & B4
3DP06	A	12V	12V ( ± 10% )	F2	A3 & B3
3DP06	A	24V	24V ( ± 20% )	F2	A4 & B4
4DP06	A	12V	12V ( ± 10% )	F2	A3 & B3
4DP06	A	24V	24V ( ± 20% )	F1	A4 & B3
4RP01	A	12V	12V ( ± 10% )	F2	A3 & B3
4RP01	A	24V	24V ( ± 20% )	F2	A4 & B4
4RP01	D	12V	12V ( ± 10% )	F3	A3 & B3
4RP01	D	24V	24V ( ± 20% )	F2	A4 & B4
9A	A	12V	12V ( ± 10% )	F2	A1 & B1
9A	A	24V	24V ( ± 20% )	F2	A2 & B2
F5C	A	12V	12V ( ± 10% )	F1	A1 or B1
VP01	A	24V	24V ( ± 20% )	F2	A4 or B4
VP01	B	12V	12V ( ± 10% )	F3	A3 or B3
VP01	B	24V	24V ( ± 20% )	F3	A4 or B4

## Product Advantages:

- **Fully EMC compliant product status to EN50081-1 and EN50082-2 ( heavy industrial spec. )**
- ◆ 2 x dual proportional protected MosFet driver outputs ( PWM ) at upto 3 amps ( @12V ) each.
- ◆ **Unit comprises of field and time tested and proved electronic circuit design.**
- ◆ **No extra DIN housing or 'Card Holder' to buy.**
- ◆ High level of product integrity maintained under extreme operational environments.
- ◆ Remote 'Enable' OR 'Emergency Stop' input for maximum system safety.
- ◆ Fully 'Isolated' product design for improved safety and ease of application difficult areas.
- ◆ Internally generated +/- voltages for immediate connection to external/ remote 10K joystick or pot.
- ◆ **Unrivalled Industry leading 'Linear' Input / Output electrical characteristic for this type of unit.**
- ◆ Unique, Small compact size, light weight unit with 'Blend-Anywhere' colour.
- ◆ Front panel full unit status '**Diagnostic**' LED display
- ◆ **Able to drive many different proportional products with ONE unit giving reduced inventory.**
- ◆ Very Low cost compared to DIN cards and other available modules with comparative functions.
- ◆ Easy to use front panel adjustments for all major parameters.
- ◆ 'Digital' & visual signal output of 'mA Loop Failure' for indication and remote system shutdown.
- ◆ Separate Linear characteristic Ramp 'UP' and Ramp 'Down' adjustments.
- ◆ Separate 'I Min' and 'I Max' adjustments for each solenoid.
- ◆ '**Ruggedised**' internal & external **design** allowing use on 'Internal' OR 'External' applications.
- ◆ Heavy duty 'Two-Part' polarised screw terminal connectors for easy application and use.
- ◆ User configurable ( by Links ) for 12V or 24V supply input.
- ◆ User choice of command input signal ( by Links ) from 0 to +/-5V, 0 to +/-10V or 0 to +/-20mA.
- ◆ User definable ( by Links ) 'Dither' frequency ( 100Hz, 140Hz & 250 Hz )
- ◆ 'Bulkhead', wall or panel mounting, rust proof, high impact absorbing ABS molded enclosure.
- ◆ Easy and **secure mounting** via 3 x 5mm fixings.
- ◆ Flame proof resin encapsulation.
- ◆ Protected inputs and user outputs for maximum reliability and product life.
- ◆ Range of 'Add-On' option sub-boards to enhance base characteristics.

## ALWAYS

## Important Notes:

- ✓ **Take a few minutes to FULLY read THESE information / data sheets BEFORE starting.**
- ✓ Make sure the unit supply voltage is the same as the coils on the valve being driven !
- ✓ Ensure that you are aware of the available adjustments on the electronics and hydraulics.
- ✓ Make sure you have the correct tools to do the intended job ( i.e. D.V.M. ) e.t.c.
- ✓ '**Isolate**' this unit from all other equipment BEFORE any form of welding takes place.
- ✓ Check **ALL** connections to and from this unit to ensure **NO** short circuits.
- ✓ '**Start**' operating a new system at **LOW** pressure and with **SMALL** command signals.
- ✓ Check the units supply voltage is **CORRECT**, '**ELECTRICALLY CLEAN**' and **STABLE**.
- ✓ Operate the units within specified operating temperature for best & reliable performance.
- ✓ Ensure that any unused wires / terminals are terminated safely and **not shorted together**.
- ✓ Contact DENISON Hydraulics for more information if you are unsure of connecting this unit.
- ✓ Fit the supplied rubber gasket correctly between valve coil and plug top driver unit.
- ✓ Keep High Voltage AC cables separate from Low Voltage DC signal and supply cables.
- ✓ **Follow the set-up procedures in this manual for best operational results.**

## NEVER

- ✗ **Arc Weld or Charge Batteries with this driver unit connected as damage can occur.**
- ✗ Attempt to use this unit if you are unsure of connections or expected operation.
- ✗ Attempt to use this unit in Areas where AC or DC coils **HAVE NOT** been fully suppressed.
- ✗ Use a power supply that is not rated for the correct required O/P current under full load.
- ✗ Allow wires TO or FROM the unit to short circuit ( to each other or chassis/cabinet e.t.c. ).
- ✗ Attempt to use this unit in areas of intense RF without adequate screening measures.
- ✗ Disconnect or connect wires to or from this unit unless it is isolated from the power supply.
- ✗ Use this unit in temperatures that exceed those specified as operation may be effected.

## Manual Notes:

Denison Hydraulics have engineered this range of proportional valve drivers to meet today's exacting industry needs. The units can, because of their unique design and array of built in options, be applied in market areas ranging from marine to mobile with the confidence that our valve, vane and piston product lines already enjoy.

This 'Dual Driver' module is a culmination of many years field experience and are based on application ideas that have come from all the various walks of industry that are already using Electro-hydraulic equipment. These self contained units consist of all the necessary building blocks which will allow Electro-hydraulic system designers to fully explore the advantages of proportional product whether mounted on a pump or as a means of controlling pressure or flow. And to see quickly and effectively how we can say that DENISON hydraulics do have :- **' Active Solutions to Dynamic Problems '**.

Denison Hydraulics prides itself on the fact that the product we supply to you is of outstanding quality that can be applied easily and quickly with success but it is important for us to also understand changing customer needs, market trends and application requirements. With this in mind, we will be only too glad to discuss new applications and listen to new requirements that we can include in our future product designs, and use these ideas to improve still further the products usability and application flexibility.

The information contained in this literature brochure is intended as a **Guide Only**. Installation and application of either electronic or hydraulic product supplied by DENISON hydraulics, should only be undertaken by competent personnel with a good understanding of Electro-hydraulic systems as well as being able to comply with all of the required industry standards and working practices.

This 'Dual Driver' have been designed to not only comply with required 'CE' legislation but in many areas, exceed the test specifications demanded by the 'EMC directives currently available as of February 1997. The units will however only meet the specifications laid down in en-50081-1 & en-50082-2 ( heavy industrial specification ) if they are connected in accordance with the relative 'application data sheets' supplied in this booklet.

With the supply of this literature and it's contents, every effort has been made by DENISON hydraulics U.K. To show due diligence and to offer as much advice as possible on application of the product such that it will comply with the relative EC directives , however, it is the purchasers responsibility to ensure that a copy of this literature is available to the nominated competent personnel who are assembling the equipment on their behalf so that the 'application data sheets' and their contained information can be followed and adhered to.

While these units are 'CE' marked to show compliance with E.M.C. Directives, further advice on matters pertaining to 'CE' marking of systems and equipment can be obtained from the D.T.I. Who have a specific 'Hotline' set up to deal with these matters.

*Denison Hydraulics reserve the right to alter, modify, up-issue and improve this products design, specification and performance to meet new legislation, EC directive requirements and changing application areas without giving prior notice.*

## Application Areas:

- Single or Dual coil proportional pressure , flow or screw-in cartridge control valves.
- Mobile applications where 'Chassis' or externally mounted.
- Hostile environments.
- High Vibration and /or 'G' force applications.
- High Humidity applications.
- Marine usage.
- System load / Unload valves.
- Pump stroker ( single or dual sided operation )
- System building applications.
- Cost conscious applications.

## Controller Operation:

The Dual Driver unit 027-22071-0 is designed to operate continuously in any environment from a single polarity +12VDC ( +/-10%) OR +24VDC ( +/-20%) supply voltage. Choice of the supply input voltage is made when selecting the output current for the valve(s) being driven at links 'A' and 'B'.

The driver use the latest 'MosFet' type output stage with 'Current Feedback' to ensure accurate efficient operation and on the proportional valve, give an unrivaled linear output characteristic relative to a linear command voltage. Due to the current feedback sensing circuit, each valve coil MUST be individually connected using separate cables and NONE of these wires should be connected to Earth, 0V or shared with any other valve driver or coil.

The output driver is 'Normally Off' but on application of a command signal, uses Pulse Width Modulation ( PWM ) which, when set at the required frequency using the 'F' links, ( See 'Link Options Data Sheet' later in this brochure for further information ) to suit the type and size of valve being driven, also provides the necessary 'Dither' signal to ensure that the valves operation is not impaired by ' Stiction ' and that the mechanical ' Hysteresis ' is kept to a minimum ( see Valve data sheet for 'Dither' frequency recommendation ).

The Proportional output drive from this unit is capable of driving a 'Double Solenoid' valve in a 'Push-Push' configuration where only ONE of the two solenoids per valve can ever be energised at any one time with the circuit configured internally such that a positive (+) voltage command will energise the 'A' output drive while a negative (-) voltage command will operate the 'B' output driver OR a 'Single Solenoid' valve normally connected to output 'A' and reacting to a positive (+) command signal.

The valves start point ( Minimum ) is set by 'I Min' while the end point ( maximum ) is set by 'I Max' for each individual coil by the potentiometers on the front panel. The minimum output value ( I Min ) will only be seen on the respective output drive AFTER an internally set **Comparator Detection Circuit** ( described below ) has been exceeded by the incoming command signal.

The 'I Min' A & B and 'I Max' A & B adjustments are **CLOCKWISE to INCREASE** the relative channels output current and **ANTI-CLOCKWISE to DECREASE** the output current with all four potentiometers being approx. 20 turn variety ( ±5 turns ) with mechanical end stop slipping clutches to protect them from over adjustment.

The Standard unit is supplied with the command type select 'S' link in a **NULL STORAGE POSITION** ( see page 22, bottom right of page ) which defaults the Dual Driver to **+/-5V command**. This can be easily changed by altering the links position to either S1, or S3, which configures the unit to accept 0 to +/-20mA OR 0 to ±10V command signals respectively. The unit has an internally set **Comparator Detection Circuit** which will ignore any command signal input upto ±170mV ( Approx. for ±10V command ) and ±85mV ( Approx. for ±5V command ). This is done to ensure that when zero drive is required, it can be achieved without the fear of 'Electrical Noise' on the command signal wires causing an erroneous valve operation. This 'Zero-Band' also allows for mechanical tolerances and increasing 'sloppiness' in Joysticks or potentiometers at the zero position with age and usage.

The units **Ramp Generator** is of the linear variety, is imposed onto the command signal and is fully adjustable from the front panel potentiometers in the range of 20mS to 10 Secs ( Approx.) The 'UP' slope adjustment effects any signal going from a numerically smaller value to a Larger one ( i.e. +1V to +4V OR -1V to -4V ) In any quadrant, while the 'DOWN' adjustment effects any signal going from Larger numeric value to a smaller one ( i.e. -4V to -1V OR +4V to +1V ) again In any quadrant.

The ramp generator adjustments are **CLOCKWISE to INCREASE** rate of change of signal ( longer ramp time ) and **ANTI-CLOCKWISE to DECREASE** the rate of change of signal ( shorter ramp time ) with both potentiometers being approx. 20 turn variety with mechanical end stop slipping clutches to protect them from over adjustment.

The Dual Driver controller 027-22071-0 has also been designed to accept a range of optional 'Add-On' sub boards which locate onto two sets of vertical connector pins and are held mechanically in place by a single M3 plastic screw ( supplied with Sub-board ).

With the addition and fitting of any sub-board, the user should observe the details associated with the new option and connect the Input / Output signals appropriately.

## Add-On Boards:

There are several Add-On boards available to the user to alter the base drivers characteristics:-

**027-22072-0:- 4-20mA command input board with safety alarm and override.**

**027-22073-0:- Voltage command signal summer and offset board.**

**027-22074-0:- Inductive joystick ( 2 axis ) signal interface conditioning board.**

**027-22075-0:- Electronic Horse power limiter board ( current transformer input ).**

All of the above 'Sub-boards' are designed to fit onto the rear of a dual driver controller 027-22071-0 ONLY.

It should be noted that only ONE sub-board function per dual driver is possible.

**027-22072-0 '4-20mA command' input board.**

This sub-board also has a built in 'Loop Fault' detector circuit which activates if the current loop input falls below approx.. 3.7mA ( Industry Standard for current loop failure ). If this occurs, the command signal is immediately sent to zero ( the output led's 'A' & 'B' will immediately go 'Off' ) and is held there until the current loop goes above the 3.7mA threshold when the driver will again \*\*\* start to follow the command. At the same time as the 'Fault' is detected, an open collector transistor circuit is triggered and made available on terminals 'T1' & 'T2' which goes from a 'HI' level ( approx.. 8V with 3K3 pull-up ) to a 'LO' level ( approx. 0V ) on error. A front panel RED led on the Dual Driver base unit also lights as a visual indicator of the problem to the operator.

*\*\*\* It should be observed that if the 027-22072-0 sub-board is configured for Bi-Directional output and the current command comes back 'ON' at 4mA after a fault, the valve driver will be commanded to drive fully in the 'B' coil direction which may be a danger. It is therefore strongly recommended that the 'Loop Fault' detect circuit output is made part of the control system such that if a fault occurs, the command is automatically sent to 12mA ( zero ) and that the 'Emergency Stop' on the base Dual Driver unit is activated until the equipment is ensured to be safe for operation.*

**027-22073-0 'Voltage Summing' options board.**

This Sub-board has been designed to allow simple voltage signal summation / subtraction and to allow the user to set hydraulic 'Offsets' electrically for applications such as winches where a minimum tension may be required at a zero command signal.

On-board links are provided to allow signal polarity to be set to give the required output command sense relative to the voltages being conditioned.

**027-22074-0 ' Inductive Joystick' options board.**

This option allows the user to interface with inductive joysticks from several manufacturers. There are provisions for output gain settings to cater for differing mechanical movements

The one sub-board is also able to condition two channels from an 'X', 'Y' joystick and control 2 x dual driver controllers to give a full system if required.

**027-22075-0 ' Electronic Horse Power limiter' options board.**

Effective and cost effective HP limiting can be achieved with better accuracy and repeatability with this option compared to standard mechanical versions.

The option also allows much lower HP to be set and controlled as well as offering remote setting and operation using a normal 900 series pump stroker.

For added **safety**, the dual driver controllers have a separate 'High Current' input supply for the output stage.

This connection **MUST** be made for the unit to work and should normally be connected to the supply voltage via a **NORMALLY CLOSED 'Emergency Stop' switch**. If this switch is opened, the output immediately goes to zero, the 'A' or 'B' output On led's on the front panel go 'OFF' and the front panel led marked as 'Emergency Stop' illuminates \*\*\* ( this will only happen IF the other 'Low Current' supply input is connected and powered ).

*\*\*\* If the valve has no command signal ( valve at zero position ) at the time of 'Emergency Stop' line being activated, the front panel RED light may take a few seconds to illuminate fully. This is normal operation and is due to an internal electrical noise filter circuit on the emergency stop input having to discharge before allowing the light to come on. If a command is applied during this period, the light immediately illuminates and the valve is turned OFF.*

## Initial Dry set-up procedure:

- 1) Isolate electric motor drives to the hydraulic pumps.
- 2) Ensure that all connections conform with one of the suggested schematic diagrams shown in this manual.
- 3) Check that all connections are secure and **NOT** shorting together OR to the case OR any other equipment.
- 4) Ensure that **ALL** the links needed are fitted and configured to suit the required application, product and available signals.
- 5) Install a 'Current meter' in line with the 'A' output, set to a relative current range.
- 6) Make sure that ( If Fitted ) the 'Emergency Stop' switch is closed and connected to correct supply voltage.
- 6) Apply power ( +12V +/-10% OR +24V +/-20% ) to the unit and ensure that the 'Power On' light is on and bright.
- 8) Move the joystick or command potentiometer until Approx.. **+10%** of chosen configured command is achieved.
- 9) Set 'I Min' A to give Approx.10% of the valve products maximum drive current ( see valve literature ) on the relative meter.
- 10) Ensure that front panel indicator 'Output A' lights ( Dimly )
- 11) Move the joystick or command potentiometer until **+100%** of chosen configured command is achieved.
- 12) Set 'I Max' A give 100% of the valve products maximum drive current ( see valve literature ) on the relative meter.
- 13) Ensure that front panel indicator 'Output A' lights ( Brightly ).
- 14) Repeat steps 8) thro 13) until required Min & Max currents are reached for +10% and +100% command signal input.
- 15) Open 'Emergency Stop' switch and check that:-
  - a) Active Outputs immediately go to zero mA.
  - b) 'Emergency Stop' front panel Indicator lights.
- 16) Set command signal to zero position.
- 17) Reset 'Emergency Stop' switch to closed position and ensure that 'Emergency Stop' Indicator light goes OUT.
- 18) Repeat steps 8) thro 17) using **-10%** and **-100%** command signal values and moving the current meter to the 'B' output.

## Final 'Live' calibration procedure

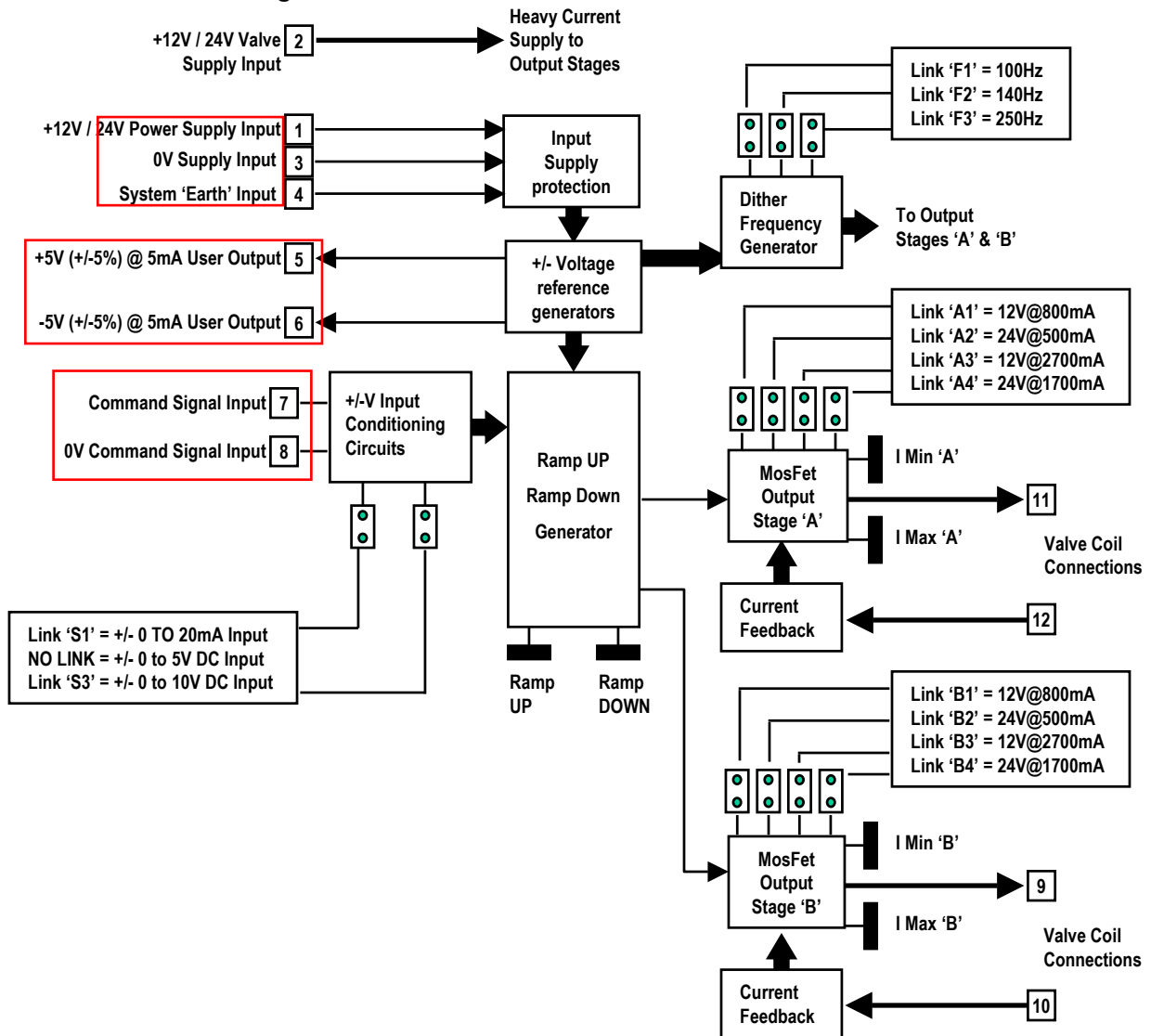
- 1) **Ensure that ALL moving parts are guarded and personnel are aware of a 'LIVE' system run.**
- 2) Ensure joystick or command potentiometer is at zero position with zero % command output.
- 3) Start hydraulic power pack and wait until constant speed / set pressure has been achieved.
- 4) Move the joystick or command potentiometer **SLOWLY** until Approx. **+10%** of chosen configured command is achieved.
- 5) Monitor hydraulic product being controlled and set 'I Min' A to give desired minimum flow or pressure.
- 6) Move the joystick or command potentiometer **SLOWLY** until **+100%** of chosen configured command is achieved.
- 7) Monitor hydraulic product being controlled and set 'I Max' A to give desired maximum flow or pressure.
- 8) Repeat steps 4) thro 7) until required minimum and maximum system flows are achieved for +10% and +100% command.
- 9) Set command signal to zero position.
- 10) Repeat steps 4) thro 7) using **-10%** and **-100%** command signal.
- 11) Set command signal to zero position.

## Electrical specifications:

- |                                  |  |
|----------------------------------|--|
| 1) Board Style:                  | Denison Hydraulics Unique Size and Mounting.                               |
| 2) Connector Type:               | Heavy Duty Two Part Polarised 'Screw' Type Terminal Connectors.            |
| 3) Input Supply Voltage(s):      | +10 - +32 VDC ( Max ) ( set supply volts the same as coil voltage )        |
| 4) Input Supply Current ( Max ): | Maximum Valve Current Setting + 200mA Quiescent (Max)                      |
| 5) User Output Voltages:         | +/- 5V D.C. ( +/- 5% ) Rated @ 5mA Per rail.                               |
| 6) Command Input Type(s):        | D.C. Voltage and Current.  |
| 7) Command Input Value(s):       | +/-5V, +/-10V & 0 to +/-20mA   |
| 8) Available adjustments:        | I Min 'A', I Max 'A', I Min 'B', I Max 'B', Ramp UP, Ramp DOWN.            |
| 9) Ramp Type:                    | Linear and Continuously Variable by 20 Turn ( +/- 5 Turns ) Potentiometers |
| 10) Min Ramp Time UP:            | 20mS ( +/-20% )  |
| 11) Maximum Ramp Time UP:        | 10S ( +/-20% )   |
| 12) Min Ramp Time DOWN:          | 20mS ( +/-20% )  |
| 13) Minimum Ramp Time DOWN:      | 10S ( +/-20% )   |
| 14) Dither Frequencies :         | Link Selectable 100Hz, 140Hz, 240Hz ( All +/- 20% )                        |
| 15) Environmental:               | 'ENCAPSULATED' Printed Circuit Board.                                      |
| 16) IP Rating for PCB Only:      | IP65 ( Without Being Mounted In External Enclosure )                       |
| 17) IP rating for Housing:       | IP56 ( Due to user accessibility of connector screw terminals. )           |
| 18) Humidity:                    | 90% Non Condensing.  |
| 19) Storage temp.:               | 80 Deg C ( Max )   |
| 20) Working temp.:               | 60 Deg C ( Max )   |

## Multi-Function Proportional Valve Dual Driver ( Encapsulated )

### Controller Block Diagram:



### Notes:-

- 1) Positive polarity (+) command **ALWAYS** controls output 'A'.
- 2) Negative polarity (-) command **ALWAYS** controls output 'B'.
- 3) Reduced supply voltage will result in a reduced output availability to the coil being controlled due to circuit losses. To achieve maximum coil current ( if required for maximum pressure or flow ) , ensure that the supply voltage is at the upper supply limit as shown below:-

For 12V coils, use 12V +20% ( Approx. 13.8 – 14VDC )

For 24V coils, use 24V +20% ( Approx. 28 – 32VDC )



# Multi-Function Proportional Valve Dual Driver ( Encapsulated )

Link locator:

## Valve Coil 'B'

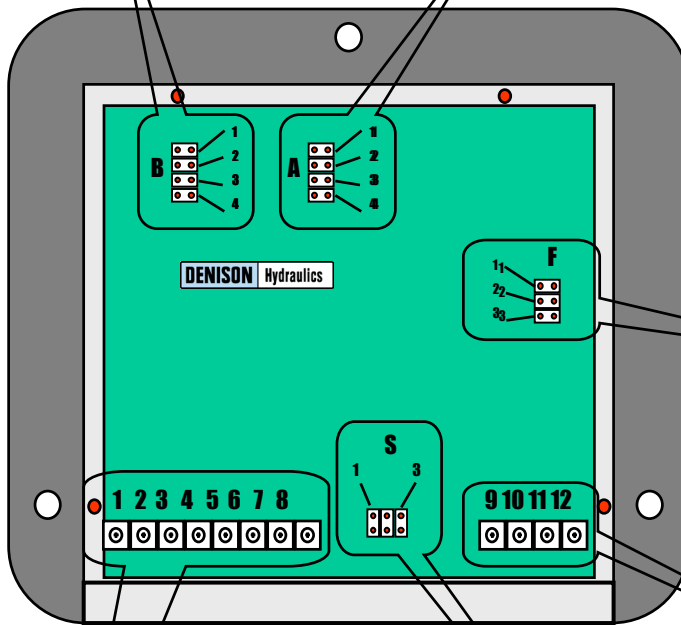
Link Number	Function
'B 1' ----	12V Coil @ 800mA
'B 2' ----	24V Coil @ 500mA
'B 3' ----	12V Coil @ 2700mA
'B 4' ----	24V Coil @ 1700mA

## Valve Coil 'A'

Link Number	Function
'A 1' ----	12V Coil @ 800mA
'A 2' ----	24V Coil @ 500mA
'A 3' ----	12V Coil @ 2700mA
'A 4' ----	24V Coil @ 1700mA

Base unit will accept the following command signals:-

Voltage:-	0 - 5V
Voltage:-	0 - +/- 5V,
Voltage:-	0 - 10V
Voltage:-	0 - +/- 10V
Current:-	0 - 20mA
Current:-	0 - +/- 20mA



Unit Rear View With Lid Removed

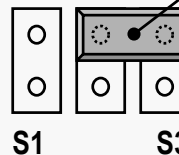
Link Number	Function
'F 1' ----	100 Hz Dither Frequency Option select
'F 2' ----	140 Hz Dither Frequency Option Select
'F 3' -	240 Hz Dither Frequency Option select

Terminal Number	Function
9 ----	Output 'B' +
10 ----	Output 'B' -
11 ----	Output 'A' +
12 ----	Output 'A' -

Terminal Number	Function
1 ----	+V DC Power Supply Input
2 ----	+V DC Valve Supply Input
3 ----	0V DC Power Input
4 ----	System Earth Connection
5 ----	+5V (+/-5%) @ 5mA User Output
6 ----	-5V (+/-5%) @ 5mA User Output
7 ----	Command Signal Input
8 ----	Command Signal 0V (0V Sig)

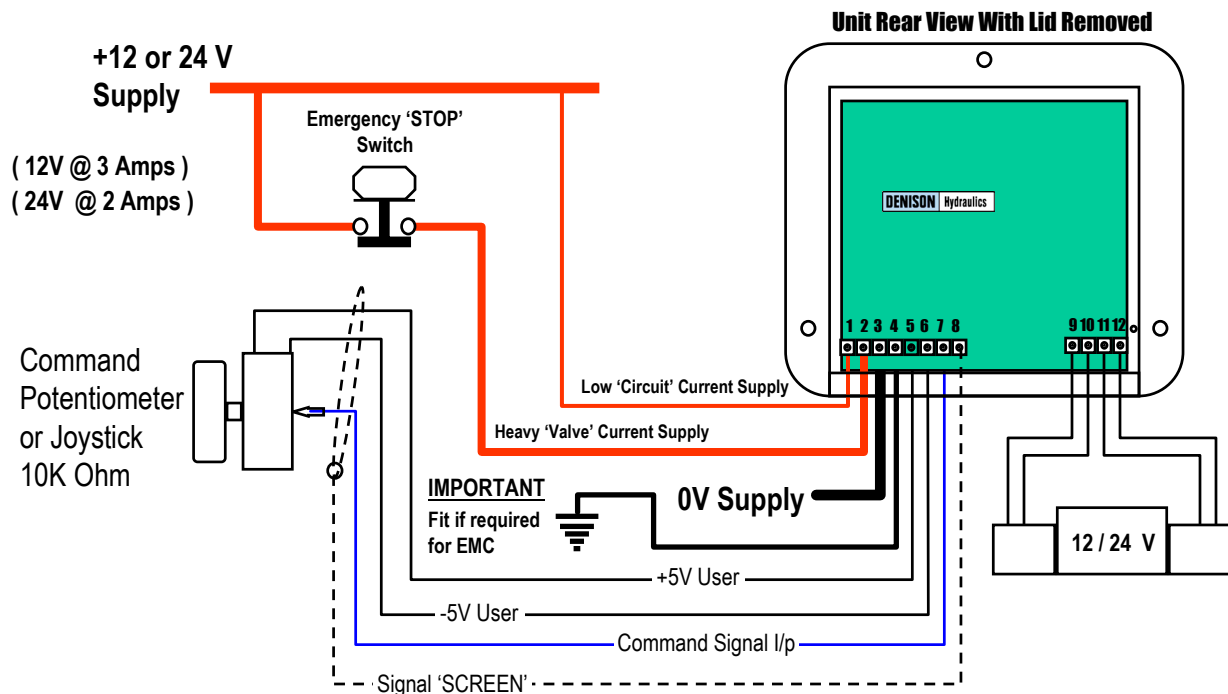
Link Number	Function
'S 1' ----	+/- 0 to 20mA Command Input Option Select
NO LINK----	+/- 5V DC Command Input Option select
'S 3' -	+/- 10V Command Input Option select

Selector link storage position = +/- 5V I/P command.

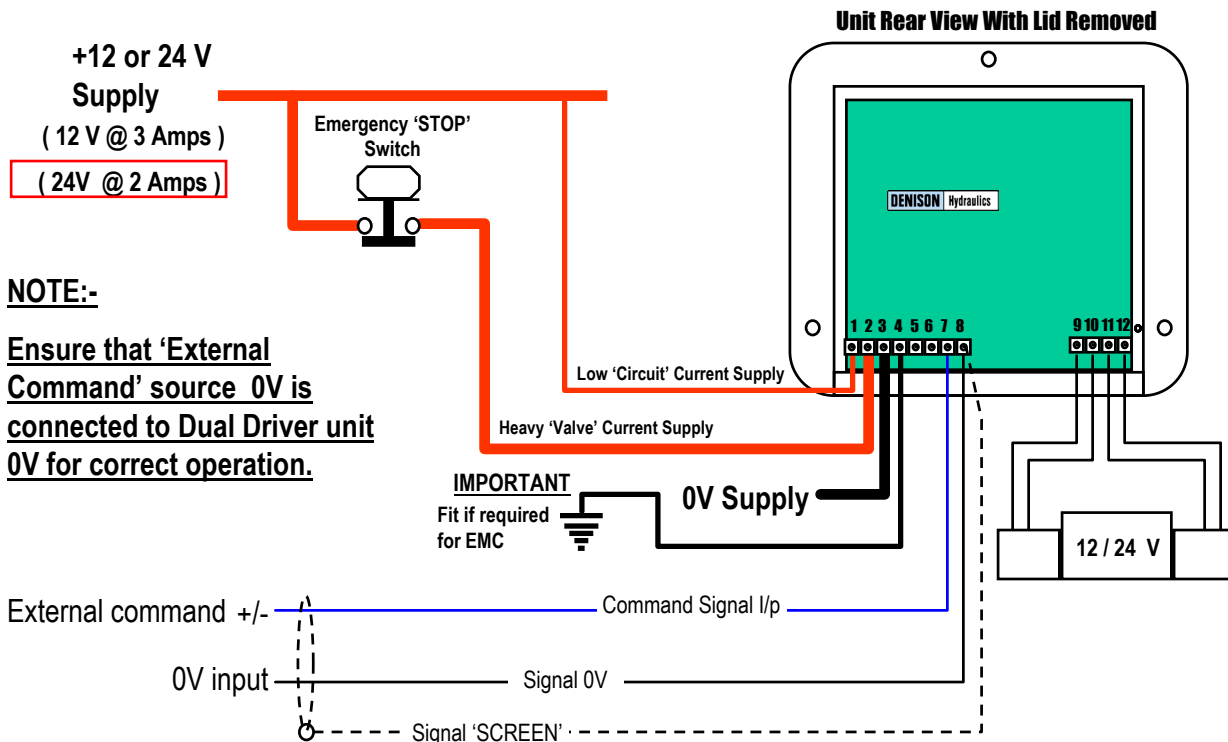


# Multi-Function Proportional Valve Dual Driver ( Encapsulated )

## Potentiometer / Joystick Connection example:



## External command Connection example:



### NOTE:-

Ensure that 'External Command' source 0V is connected to Dual Driver unit 0V for correct operation.

## Single Coil Connection Information:

### This information applies to all single coil applications:-

- Ensure that the supply voltage is the same as the coil voltage.
- Select the correct output current links on the Dual Driver unit for the valve coil.
- Connect valve coil to terminals 11 & 12 ( 'A' coil Output ) only.
- Connect the command potentiometer ( 10K ) between terminals 5 ( +5V ) and 8 ( 0V )
- Connect the command potentiometer wiper to terminal 7 ( Input )

This configuration ( using positive +5V reference voltage ) will only operate the 'A' output from the Dual driver unit, This means that only the I Min and I Max 'A' will be needed to adjust the output current. This set-up will also maximise the potentiometer electrical travel giving better resolution which means better control.

If an external command signal is used, select the correct 'S' link to suit and ensure that the 0V from the external signal source is connected to terminal 8 ( 0V ) and that only a positive polarity signal is fed to the Dual Driver unit.

If for any reason the 'B' output is required to be used, simply remove the potentiometer wire from terminal 5 ( +5V ) and re-connect to terminal 6 ( -5V ). This will also mean that I Min and I max 'B' now adjust the output current to the valve.

## Dual Coil Connection Information:

### This information applies to all Dual coil applications:-

- Ensure that the supply voltage is the same as the coils voltage.
- Select the correct output current links on the Dual Driver unit for the valve coil.
- Connect valve 'A' coil to terminals 11 & 12 ( 'A' coil Output ) only.
- Connect the valve 'B' coil to terminals 9 & 10 ( 'B' coil
- Connect the command potentiometer ( 10K )between terminals 5 ( +5V ) and 6 ( -5V )
- Connect the command potentiometer wiper to terminal 7 ( Input )

This configuration using the positive +5V and negative -5V reference voltages will operate the 'A' output from the +V command and the 'B' output from the -V command. This means that the I Min and I Max 'A' will be needed to adjust the 'A' output current and the I Min and I Max 'B' will be needed to adjust the 'B' output current . This set-up will maximise the potentiometer electrical travel giving better resolution which means better control.

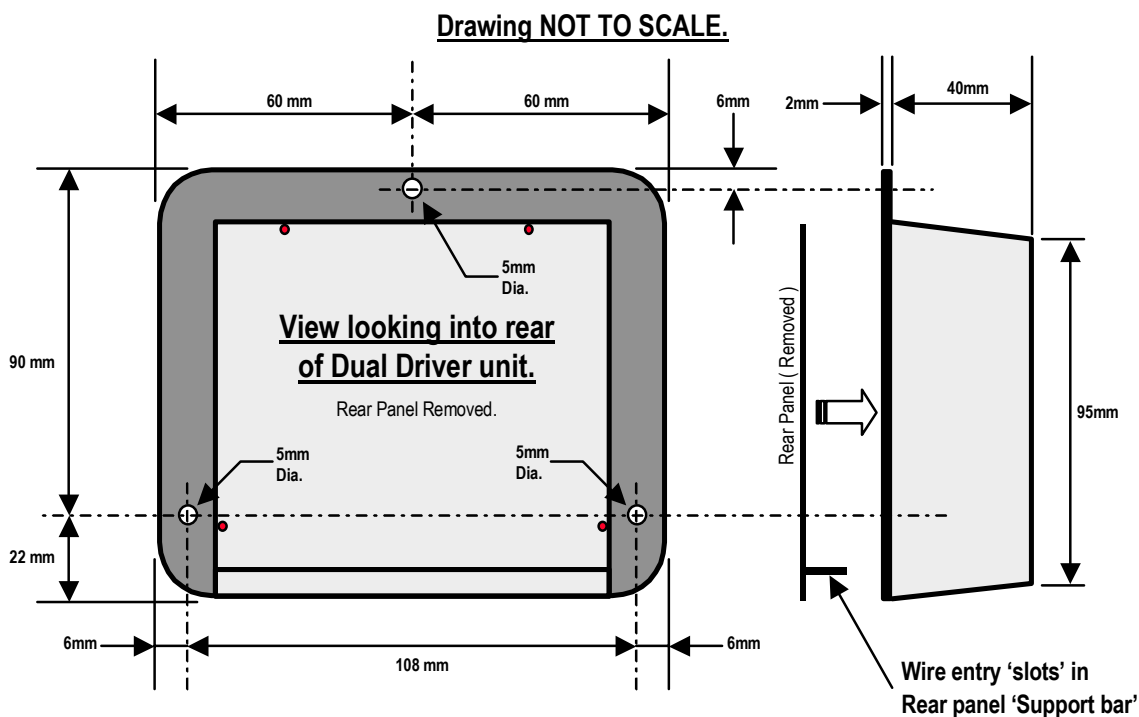
Zero output to the valve coils will be when the command signal is at zero ( 0V ) or approx. mid travel of the potentiometer being used.

If an external command signal is used, select the 'S' link to suit and ensure that the 0V from the external signal source is connected to terminal 8 ( 0V ) and that a positive and negative polarity signal is able to be fed to the Dual Driver unit for control of both coils.

## Trouble shooting Guide

- **Proportional product starts with a large flow or pressure for a small command input.**
  - 1) Reduce the respective 'I Min' setting on the front panel.
- **There is Not enough flow or pressure at maximum command input.**
  - 1) Increase the respective 'I Max' setting until the required levels are achieved.
  - 2) Check that the correct Link selection for the command input have been made.
- **Cannot achieve full flow or pressure at full command and full 'I Max' adjustment.**
  - 1) Check that the correct links for coil 'A' & 'B' current are selected.
  - 2) Check supply voltage is fully 12 or 24V and is stable under load conditions.
  - 3) Ensure that the coils fitted to the valve are correct for the supply voltage( i.e. 12 or 24V ).
- **The 'Emergency stop' Red led is always lit and no output is available.**
  - 1) Ensure that there is voltage supply to terminal No. 2 ( Valve supply input ).
- **The unit does not respond to an external command voltage.**
  - 1) Ensure that the external command source's 0V is connected to the driver units 0V terminal.
  - 2) Check continuity of command cables between source and driver unit.
- **The output from the driver goes between zero and full on only with no proportionality.**
  - 1) Ensure that there is a coil connected to the output.
  - 2) Check that the coil wires (2) are not shorted and correctly connected to the driver unit.
  - 3) Check that the some of the wires to the two coils have NOT become transposed.
- **There is no adjustment with the 'I Max' potentiometer possible.**
  - 1) Reduce the respective 'I Min' potentiometer setting as it is to high to get control with 'I Max'.
- **The unit has both outputs 'A' & 'B' on together.**
  - 1) Check that the command signal is not oscillating at a high frequency.
  - 2) The unit is damaged and needs to be replaced.
- **The unit is completely dead with no led's on at all.**
  - 1) Check that the supply voltage is present & correct
  - 2) Check the supply input fuse for continuity and correct fitting.
  - 3) The unit is damaged and needs to be replaced.
- **The unit is very slow to respond to command input signals.**
  - 1) Re-adjust the driver units 'Ramp Generator' settings to get required response.
- **The Units output 'flips' over from 'B' output to 'A' output.**
  - 1) This characteristic is not a fault , it occurs ONLY on the negative command side and is because the input command is well in excess ( approx. 50% higher ) of the option chosen. It is caused by the internal semiconductor amplifiers being over-driven and folding back upon themselves.

To avoid this mode of operation, Command signals should be accurately kept to the signal range selected and not allowed to exceed these levels by greater than 2% maximum.



## Housing Specification for Dual driver Units:-

**027-22071-0**

Housing Type:-	'Flanged' Bulkhead / Panel Mounting.
Housing Material:-	High Impact Resistant Molded ABS.
Housing Colour:-	Black.
Surface Finish:-	Matt.
Housing Thickness:-	2mm ( Mounting Flange and Face ), 1.7mm All Internal Dividers.
Base Dimensions:-	112mm X 120mm.
Rear Panel:-	Separate 'Self Locking' Rear Cover With.
Wire entry:-	Via 7 X 'Slots' in rear panel support bar.
Encapsulation:-	Flame Resistant, Black , Two Part Epoxy Resin.

**NOTE:-** Rear panel is 'self-locking' and comes in unit packaging and must be fitted by user once adjustments have been completed.