

# ***OZtherm***<sup>TM</sup>

## *Digital Power Controller*

### **F-330**

### **3 PHASE S.C.R. CONTROLLER**

\*  
**FEATURING  
PHASE ANGLE SWITCHING  
FOR CONTROL OF  
AC OR DC  
OUTPUT**

\*  
**DESIGNED  
and  
MANUFACTURED  
by**

***Fastron***  
**Electronics**

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- Power Semiconductors
- Electrical Measurement
- Process Control

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**Fastron** first released their "X" Series of S.C.R. Power Controllers in 1980, progressively developing over 20 different models and selling over 1000 controllers worldwide.

These controllers were primarily designed as custom built, open frame, OEM assemblies sold directly to equipment manufacturers.

The **OZtherm™** range of controllers capitalize on our experience in this field to provide a reliable and robust design housed in a series of standard assemblies and enclosures.

|                          |                    |       |                                                                                                                      |
|--------------------------|--------------------|-------|----------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> | <b>F100 SERIES</b> | ..... | Contactors utilizing CRYDOM solid state relays mounted on a Heat Sink Assembly with fuses and transient suppressors. |
| <input type="checkbox"/> | <b>F200 SERIES</b> | ..... | Solid State Contactors utilizing S.C.R.'s and control card mounted in standard enclosures.                           |
| <input type="checkbox"/> | <b>F300 SERIES</b> | ..... | Phase Angle Controllers utilizing S.C.R.'s and control card mounted in standard enclosure's                          |
| <input type="checkbox"/> | <b>F400 SERIES</b> | ..... | Burst Controllers, similar to F300 in construction, featuring fast cycle, zero cross switching.                      |

### BENEFITS OF THE **OZtherm™** F330 PHASE ANGLE CONTROLLER

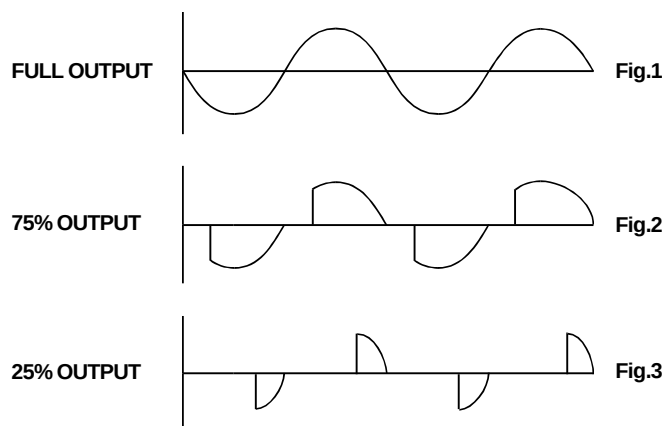
- ☐ Continuously variable control, 0 - 100%
- ☐ Digital Control eliminates the D.C offset into transformer loads which is commonly found on inferior controllers.  
This also provides more precise and stable control whilst minimizing nuisance tripping of circuit breakers and blowing of fuses due to transformer saturation.
- ☐ Wide range of standard options to suit many applications
- ☐ Proudly Australian Designed and Manufactured in our Melbourne factory enabling us to provide complete local support for customer applications, engineering and service.

### PHASE ANGLE SWITCHING

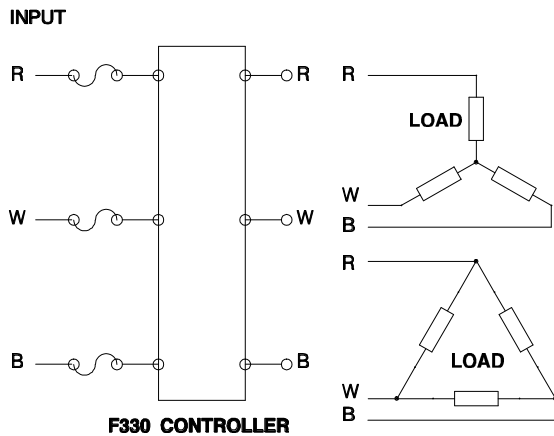
Phase Angle Control provides continuously variable power to the load.

The firing of the thyristors is determined by the controller circuitry which causes the thyristors to conduct for part of the A.C supply cycle. **Fig.2** shows the voltage waveform at 75% and **Fig.3** 25% for A.C loads.

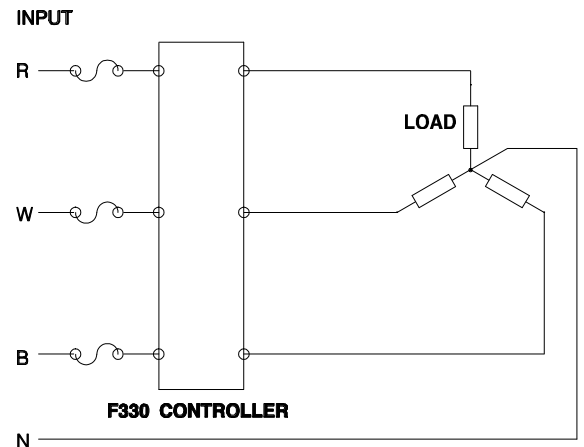
The more power that is required, the more the conduction angle is increased until 100% power when the full cycle is conducting. **Fig.1**



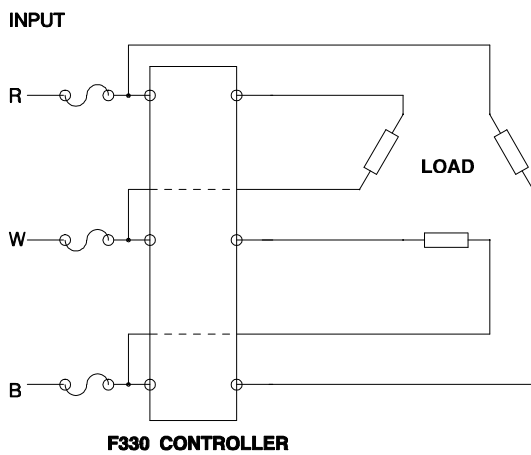
## CIRCUIT CONFIGURATIONS



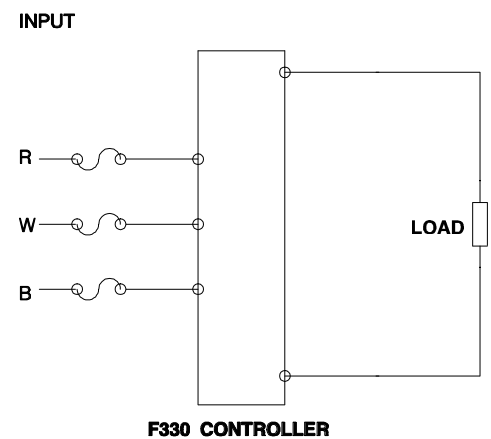
3 WIRE STAR OR DELTA



4 WIRE STAR



6 WIRE OPEN DELTA



3 PHASE D.C BRIDGE

## APPLICATION LOAD / OPTION SELECTION

( Table 1 )

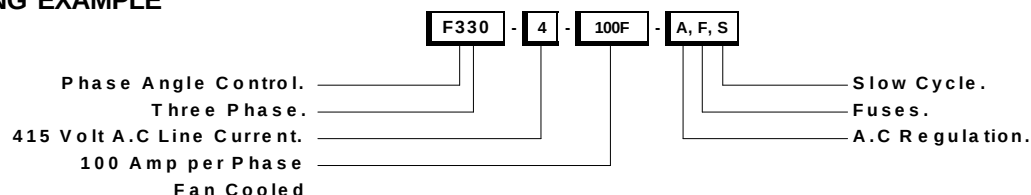
| Series Name | Primary Control of Transformer | Number | Applicable Load                                                                                                          | Option Selection          |
|-------------|--------------------------------|--------|--------------------------------------------------------------------------------------------------------------------------|---------------------------|
| F330        | YES                            | 1      | Load where resistance does not change.<br>( Nichrome, Iron-chrome, Kanthal, etc. )                                       | Standard type<br>C option |
|             |                                | 2      | Load where resistance changes with temperature.<br>( Tungsten, Molybdenum, Kanthal super<br>and D.C plating rectifiers ) | CC option                 |
|             |                                | 3      | Load where resistance changes over the elements lifetime.<br>( Silicon Carbide, etc )                                    | PW option                 |
|             |                                | 4      | Load which has peak in rush current.<br>( Tungsten Halogen Lamp, Far infrared lamp etc. )                                | C option                  |
|             |                                | 5      | Battery Chargers and regulated D.C supplies.                                                                             | C option                  |

Option A. will add improved control to ( 1 ) and ( 4 ) ( Refer Table 2 and 3 for Option Details )

Option D. will add improved control to ( 5 )

| F330 - - -                        |     |       |  | DESCRIPTION                                     | Fuse Rating                                                                                                                                                                                                                                                                                                    | Case Size | Weight KG | Cable Termination mm <sup>2</sup> | Dissipation Watts | I <sup>2</sup> t Thyristor Rating |
|-----------------------------------|-----|-------|--|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|-----------------------------------|-------------------|-----------------------------------|
| Line Voltage                      | 1   |       |  | 110 volt A.C line input                         |                                                                                                                                                                                                                                                                                                                |           |           |                                   |                   |                                   |
|                                   | 2   |       |  | 240 volt A.C line input                         |                                                                                                                                                                                                                                                                                                                |           |           |                                   |                   |                                   |
|                                   | 4   |       |  | 415 volt A.C line input                         |                                                                                                                                                                                                                                                                                                                |           |           |                                   |                   |                                   |
| Rated Current at 50 deg. Celcius. |     | 20    |  | 20 amperes A.C line current                     | 25                                                                                                                                                                                                                                                                                                             | fig.5     | 10        | 2.5 - 6.                          | 119               | 610                               |
|                                   |     | 30    |  | 30 amperes A.C line current                     | 35                                                                                                                                                                                                                                                                                                             | fig.5     | 10        | 2.5 - 6.                          | 134               | 2,300                             |
|                                   |     | 40    |  | 40 amperes A.C line current                     | 45                                                                                                                                                                                                                                                                                                             | fig.5     | 10        | 10 - 16.                          | 165               | 5,000                             |
|                                   |     | 50    |  | 50 amperes A.C line current                     | 55                                                                                                                                                                                                                                                                                                             | fig.5     | 10        | 10 - 16.                          | 188               | 9,100                             |
|                                   |     | 70    |  | 70 amperes A.C line current                     | 75                                                                                                                                                                                                                                                                                                             | fig.5     | 10        | 10 - 25.                          | 232               | 16,200                            |
|                                   |     | 80    |  | 80 amperes A.C line current                     | 90                                                                                                                                                                                                                                                                                                             | fig.5     | 10        | 10 - 25.                          | 241               | 97,000                            |
|                                   |     | 100F  |  | 100 amperes A.C line current - fan              | 100                                                                                                                                                                                                                                                                                                            | fig.6     | 12        | M6 bolt                           | 333               | 16,200                            |
|                                   |     | 120   |  | 120 amperes A.C line current                    | 125                                                                                                                                                                                                                                                                                                            | fig.7     | 26        | M10 bolt                          | 393               | 24,000                            |
|                                   |     | 130   |  | 130 amperes A.C line current                    | 150                                                                                                                                                                                                                                                                                                            | fig.7     | 26        | M10 bolt                          | 386               | 97,000                            |
|                                   |     | 150F  |  | 150 amperes A.C line current - fan              | 150                                                                                                                                                                                                                                                                                                            | fig.7     | 28        | M10 bolt                          | 505               | 24,000                            |
|                                   |     | 150   |  | 150 amperes A.C line current                    | 175                                                                                                                                                                                                                                                                                                            | fig.7     | 26        | M10 bolt                          | 502               | 168,000                           |
|                                   |     | 175   |  | 175 amperes A.C line current                    | 200                                                                                                                                                                                                                                                                                                            | fig.7     | 26        | M10 bolt                          | 482               | 245,000                           |
|                                   |     | 200F  |  | 200 amperes A.C line current - fan              | 250                                                                                                                                                                                                                                                                                                            | fig.7     | 28        | M10 bolt                          | 657               | 84,000                            |
|                                   |     | 240F  |  | 240 amperes A.C line current - fan              | 250                                                                                                                                                                                                                                                                                                            | fig.7     | 28        | M12 bolt                          | 755               | 97,000                            |
|                                   |     | 280F  |  | 280 amperes A.C line current - fan              | 300                                                                                                                                                                                                                                                                                                            | fig.7     | 28        | M12 bolt                          | 995               | 168,000                           |
|                                   |     | 340F  |  | 340 amperes A.C line current - fan              | 375                                                                                                                                                                                                                                                                                                            | fig.7     | 28        | M12 bolt                          | 1016              | 245,000                           |
|                                   |     | 400F  |  | 400 amperes A.C line current - fan              | 400                                                                                                                                                                                                                                                                                                            | fig.8     | 60        | M10 bolt                          | 1600              | 106,000                           |
|                                   |     | 500F  |  | 500 amperes A.C line current - fan              | 500                                                                                                                                                                                                                                                                                                            | fig.8     | 60        | M10 bolt                          | 1780              | 238,000                           |
|                                   |     | 650F  |  | 650 amperes A.C line current - fan              | 350x2                                                                                                                                                                                                                                                                                                          | fig.8     | 60        | M10 bolt                          | 2384              | 781,000                           |
|                                   |     | 750F  |  | 750 amperes A.C line current - fan              | 400x2                                                                                                                                                                                                                                                                                                          | fig.8     | 60        | M10 bolt                          | 2479              | 2x10 <sup>6</sup>                 |
|                                   |     | 900F  |  | 900 amperes A.C line current - fan              | 500x2                                                                                                                                                                                                                                                                                                          | fig.9     | 98        | M10 bolt                          | 3523              | 781,000                           |
|                                   |     | 1100F |  | 1100 amperes A.C line current - fan             | 600x2                                                                                                                                                                                                                                                                                                          | fig.9     | 98        | M10 bolt                          | 3810              | 2x10 <sup>6</sup>                 |
| Options.                          | A   |       |  | A.C. Voltage regulation.                        | A.C. current measurement.<br>A.C. current measurement.<br>D.C. current measurement.<br>D.C. current measurement.<br><br>Three phase and neutral.<br><br>Requires C, CC, CCE or CE option.<br>Requires PW option.<br>Requires A, D or DE option.<br><br>Requires A and C option.<br><br>Standard on fan models. |           |           |                                   |                   |                                   |
|                                   | C   |       |  | Current limit and trip.                         |                                                                                                                                                                                                                                                                                                                |           |           |                                   |                   |                                   |
|                                   | CC  |       |  | Voltage limit and current trip. Current source  |                                                                                                                                                                                                                                                                                                                |           |           |                                   |                   |                                   |
|                                   | CCE |       |  | Voltage limit and current trip. Current source. |                                                                                                                                                                                                                                                                                                                |           |           |                                   |                   |                                   |
|                                   | CE  |       |  | Current limit and trip.                         |                                                                                                                                                                                                                                                                                                                |           |           |                                   |                   |                                   |
|                                   | D   |       |  | D.C. Voltage regulation.                        |                                                                                                                                                                                                                                                                                                                |           |           |                                   |                   |                                   |
|                                   | DE  |       |  | D.C. Voltage regulation.                        |                                                                                                                                                                                                                                                                                                                |           |           |                                   |                   |                                   |
|                                   | DS  |       |  | Demand sharing.                                 |                                                                                                                                                                                                                                                                                                                |           |           |                                   |                   |                                   |
|                                   | F   |       |  | High speed fuses.                               |                                                                                                                                                                                                                                                                                                                |           |           |                                   |                   |                                   |
|                                   | FW  |       |  | 4 wire load.                                    |                                                                                                                                                                                                                                                                                                                |           |           |                                   |                   |                                   |
|                                   | MD  |       |  | Meter output of input control signal.           |                                                                                                                                                                                                                                                                                                                |           |           |                                   |                   |                                   |
|                                   | MI  |       |  | Meter output of average current.                |                                                                                                                                                                                                                                                                                                                |           |           |                                   |                   |                                   |
|                                   | MP  |       |  | Meter output of average power.                  |                                                                                                                                                                                                                                                                                                                |           |           |                                   |                   |                                   |
|                                   | MV  |       |  | Meter output of average voltage.                |                                                                                                                                                                                                                                                                                                                |           |           |                                   |                   |                                   |
|                                   | PH  |       |  | Phase loss output.                              |                                                                                                                                                                                                                                                                                                                |           |           |                                   |                   |                                   |
|                                   | PW  |       |  | Power limit.                                    |                                                                                                                                                                                                                                                                                                                |           |           |                                   |                   |                                   |
|                                   | S   |       |  | Slow cycle.                                     |                                                                                                                                                                                                                                                                                                                |           |           |                                   |                   |                                   |
|                                   | T   |       |  | Thermal cutout.                                 |                                                                                                                                                                                                                                                                                                                |           |           |                                   |                   |                                   |

### ORDERING EXAMPLE



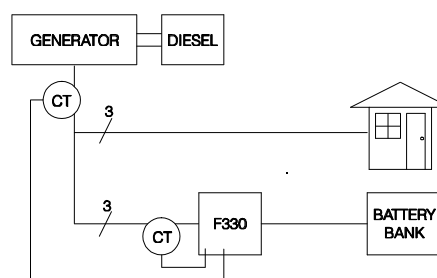
## DESCRIPTION OF OPTIONS

( Table 3 )

| OPTION     | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                     | APPLICATION                                                                                                                                                           |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A</b>   | Regulates output voltage when input voltage fluctuates. The red / white output voltage is monitored.                                                                                                                                                                                                                                                                                            | Used where significant supply fluctuations can cause;- nuisance current limit / trip operation; excessive power to the load and erratic control.                      |
| <b>C</b>   | Maintains current output to a predetermined level for A.C systems. Current limit can be set by internal or external potentiometer. LED indicates current limit operation. Current trip is adjustable " on board " and volt free output contact is provided for external indication. The trip function inhibits operation until manually reset.<br>( A.C. Current transformers supplied loose. ) | Typically used with constant resistance and transformer loads.<br>Reduces output to match and protect lower rated loads.<br>( Control input controls output voltage ) |
| <b>CC</b>  | Current source operation.<br>Voltage limit and current trip independently adjustable by internal potentiometer. Maintains constant current under variable resistance loads for A.C systems.<br>( A.C. Current transformers supplied loose. )                                                                                                                                                    | Particularly suitable for plating rectifiers via primary A.C transformers.<br>( Control input controls output current )                                               |
| <b>CCE</b> | Similar to CC. option but for use with D.C systems.<br>( D.C. Hall Effect Sensor not included. )                                                                                                                                                                                                                                                                                                |                                                                                                                                                                       |
| <b>CE</b>  | Similar to C. option but used with D.C systems.<br>( D.C. Hall Effect Sensor not included )                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                       |
| <b>D</b>   | Regulates D.C output voltage when the input voltage fluctuates<br>Effective for loads from 20% - 100% of rated output voltage.                                                                                                                                                                                                                                                                  | Used for D.C supplies such as battery charger applications with constant output.                                                                                      |
| <b>DE</b>  | Similar to D. option but effective for loads from 0% - 100% of rated output voltage, using a Hall Effect Voltage Sensor.<br>( Not included )                                                                                                                                                                                                                                                    |                                                                                                                                                                       |
| <b>DS</b>  | An adjustable auxiliary current limit which operates when an external load monitored by a current transformer exceeds a preset level.<br>( Current Transformer not included )                                                                                                                                                                                                                   | Especially useful for generator load sharing in remote area power supplies.<br>See fig.4                                                                              |

**Fig. 4**

If the house draws too much load from the supply the OZTHERM Power Controller reduces the battery charging current so as not to overload the generator.



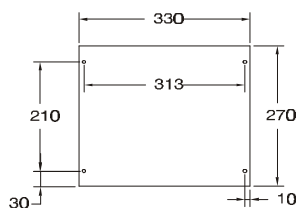
| OPTION    | DESCRIPTION                                                                                                                                                                                                                                                                                  | APPLICATION                                                                                                                   |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| <b>F</b>  | Supplied loose with isolated stand-offs for external mounting.                                                                                                                                                                                                                               |                                                                                                                               |
| <b>FW</b> | This option must be specified when the load is a three phase plus neutral configuration.                                                                                                                                                                                                     |                                                                                                                               |
| <b>MD</b> | 0 -1 milliamp retransmission of input control signal.                                                                                                                                                                                                                                        | Suitable for 1 milliamp moving coil meter.                                                                                    |
| <b>MI</b> | Single 0 -1 milliamp D.C output signal proportional to the average of the summation of the output current of each of the three phases.                                                                                                                                                       | Suitable for 1 milliamp moving coil meter.                                                                                    |
| <b>MP</b> | Similar to MI. option but indicating average red / white output power (VA ).                                                                                                                                                                                                                 | Suitable for 1 milliamp moving coil meter.                                                                                    |
| <b>MV</b> | Similar to MI. option but indicating average red / white output voltage.                                                                                                                                                                                                                     | Suitable for 1 milliamp moving coil meter.                                                                                    |
| <b>PH</b> | For indication of loss of a phase including momentary loss. A latched volt free contact is provided which will stay latched until manually reset.                                                                                                                                            |                                                                                                                               |
| <b>PW</b> | Red / White phase is monitored to maintain a preset average VA limit, common to all three phases. A balanced load and a unity power factor is assumed.<br>( This function can be used on current source or D.C. systems. Consult factory. )                                                  | Designed for critical loads such as silicon carbide elements which require a watts density limit for maximizing element life. |
| <b>S</b>  | A slow cycle form of control providing " bursts " of full power to the load on a time proportioning basis as set by the control signal. Phase angle ramp up and down is standard.                                                                                                            | Suitable for applications where supply harmonics generated by phase angle switching needs to be minimized.                    |
| <b>T</b>  | Thermal switches are mounted on the heatsink to ensure the controller is shut off, and automatically resets when an over temperature condition is reached within the unit. This option is standard on fan cooled units. It automatically resets when temperature falls below the trip level. |                                                                                                                               |

**PLEASE NOTE;-** If your application requires the Power Controller to function differently to our standard specifications or you are uncertain about the choice of options please contact the factory.

|                      |                                                                                                                              |
|----------------------|------------------------------------------------------------------------------------------------------------------------------|
| Control Mode         | Phase angle. ( soft start provided as standard )                                                                             |
| Control Range        | 0 - 100%                                                                                                                     |
| Maximum Current      | 20 - 1100 amperes per phase ( higher currents available on request )                                                         |
| Power Supply         | 110/240/415 volts A.C . 50 HZ. +/- 10%<br>(60 HZ. and other voltages available on request )                                  |
| Transient Protection | Internal R.C snubber 68 ohms / .1 micro-farad                                                                                |
| Control Input        | 4 - 20 milliamps ( receiving impedance 100 ohms )<br>0 - 10 volts ( receiving impedance 10K ohms )<br>10K ohms potentiometer |
| Adjustments          | Ramp ( soft start time ) 1-20 seconds<br>Zero ( - 20% to +20% ) ; span ( 0 - full scale )                                    |
| Ambient Temperature  | 0 - 50 degrees Celsius ( Maximum temperature of cooling air )                                                                |
| Ambient Humidity     | 0 - 85% relative humidity                                                                                                    |
| Power Factor         | Unity                                                                                                                        |

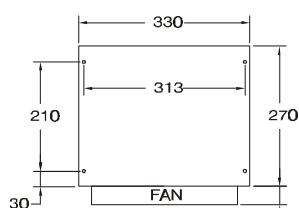
## DIMENSIONS / MOUNTING DETAILS

Shown mounted vertically in cabinet



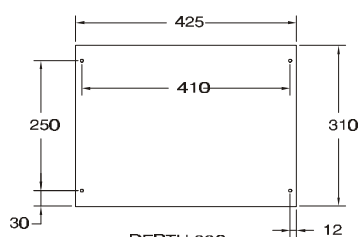
DEPTH 226mm  
M6 MOUNT

**Fig.5**



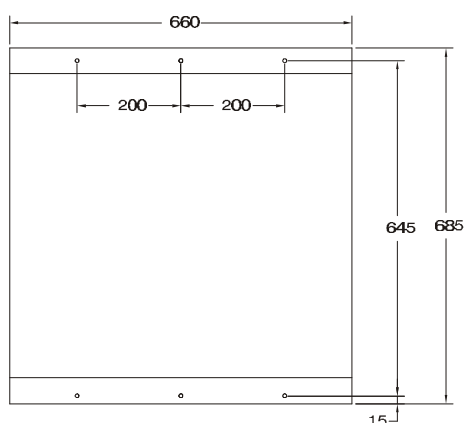
DEPTH 226mm  
M6 MOUNT

**Fig.6**



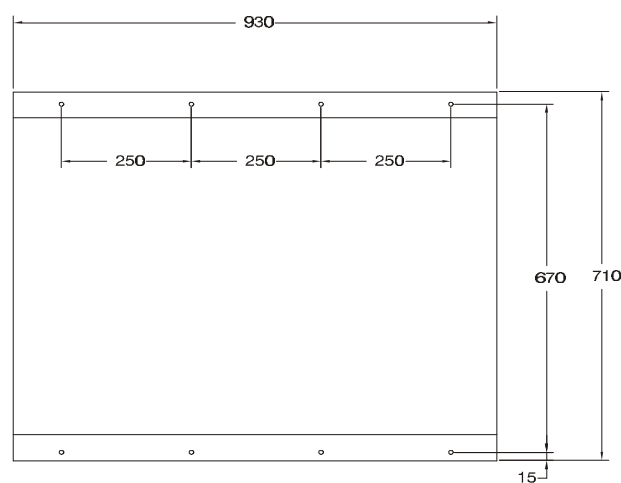
DEPTH 336mm  
M6 MOUNT

**Fig.7**



DEPTH 400mm  
M8 MOUNT

**Fig.8**



DEPTH 465mm  
M8 MOUNT

**Fig.9**

***Fastron***  
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