POWER CONTROLLER – PCW / PCWE

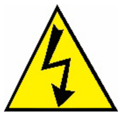
USER GUIDE — V1.0x I

NOVUS
We Measure, We Control, We Record

Johannesburg Branch
MIMIC COMPONENTS
Cape Town Branch
Mimic Cape

1 SAFETY ALERTS

The symbols below are used on the equipment and throughout this document to draw the user's attention to important operational and safety information.

		
CAUTION Read the manual fully before installing and operating the device.	**CAUTION OR HAZARD** Risk of electric shock.	**ATTENTION** Material sensitive to static charge. Check precautions before handling it.

All safety-related instructions that appear in the manual must be observed to ensure personal safety and to prevent damage to either the instrument or the system. If the instrument is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired

2 PRESENTATION

The **NOVUS** power controller is a type of electronic equipment with functions to control and limit the electric power delivered to a generic electric load. These functions are executed with modern techniques, in order to provide significant gains for the process, all with durability, precision, efficiency and economy.

It also executes the important function of protecting the connected load and the system as a whole, since it has ultra-fast fuses included in all its versions.

There are two types of controller models: **PCW** and **PCWE**. The **PCWE** model has a feature that limits the electric power delivered to the load (Load Limit), the only difference between the two models.

3 SPECIFICATIONS

3.1 GENERAL SPECIFICATIONS

Load Voltage (MAIN POWER): ....180~440 Vac; 50/60 Hz
Command Signal (INPUT) :..........0-20 mA, 4-20 mA
..........0-5 V, 1-5 V, 0-10 V e 2-10 V
..........10 k (Potentiometer)
Type of control:..........PWM and phase angle
Control feed (AUX. POWER):..........220 Vac (PCWE)
..........220/380 Vac (PCW)
Alarm: ....relay SPST; 3 A / 250 Vac
Dielectric rigidity between parts:.......... 2500 V
Operating temperature: .... -10 to 60 ºC
Plastic cabinet: ....ABS+PC / UL-94V0

3.2 MONOPHASE MODELS

MODEL	PCW-1P-100	PCWE-1P-200
Load Current	100 A	200 A
Protection	Fuse 100 A	Fuse 200 A
Surge Current (10 ms)	1600 A	5400 A
Dimensions	**Figure 1**	**Figure 4**
Fan	12 Vdc	
Electrical Connections	**Figure 6**	

Table 1

3.3 TWO PHASE MODELS WITH TWO CONTROLLERD PHASES

MODEL	PCW-2P-60	PCW-2P-100	PCW-2P-150
Load Current	60 A	100 A	150 A
Protection	Fuse 60 A	Fuse 100 A	Fuse 150 A
Surge Current (10 ms)	1200 A	1600 A	2250 A
Dimensions	**Figure 1**	**Figure 2**	**Figure 3**
Fan	12 Vdc		
Electrical Connections	**Figure 7**		

Table 2

Note 1: The **Phase Angle** control type is not available for two-phase models.

3.4 THREE PHASE MODELS WITH TWO CONTROLLED PHASES

MODEL	PCWE-2P-200
Load Current	200 A
Protections	Fuse 200 A
Surge Current (10 ms)	5400 A
Dimensions	**Figure 5**
Fan	220 Vac
Electrical Connections	**Figure 8**

Table 3

3.5 THREE PHASE MODELS WITH THREE CONTROLLED PHASES

MODEL	PCW-3P-60	PCWE-3P-100	PCWE-3P-160	PCWE-3P-200
Load Current	60 A	100 A	160 A	200 A
Protection	Fuse 60 A	Fuse 100 A	Fuse 160 A	Fuse 200 A
Surge Current (10 ms)	1200 A	1600 A	2250 A	5400 A
Dimensions	**Figure 2**	**Figure 5**		
Fan	12 Vdc	220 Vac		
Electrical Connections	**Figure 9**			

Table 4

4 INSTALLATION

The controller is made to be attached vertically, for instance, in the rear of a control panel. It needs an open area for an appropriate air circulation and the environment should meet the typical requirements for electronic equipment.

4.1 DIMENSIONS

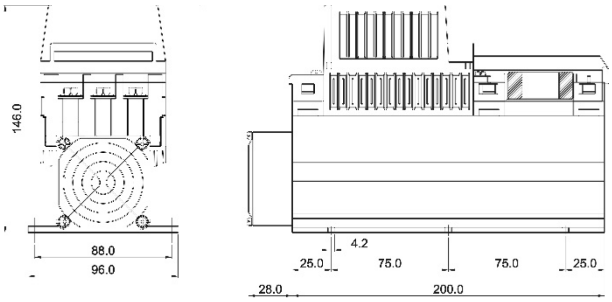


Figure 1

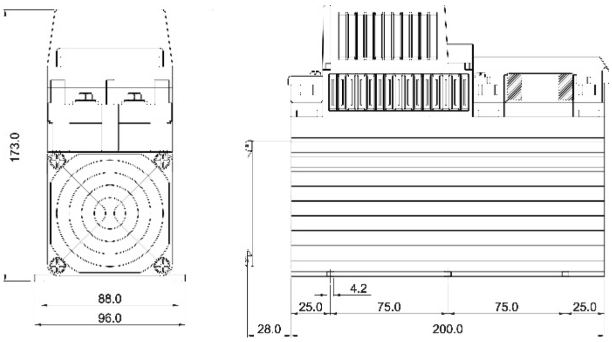


Figure 2

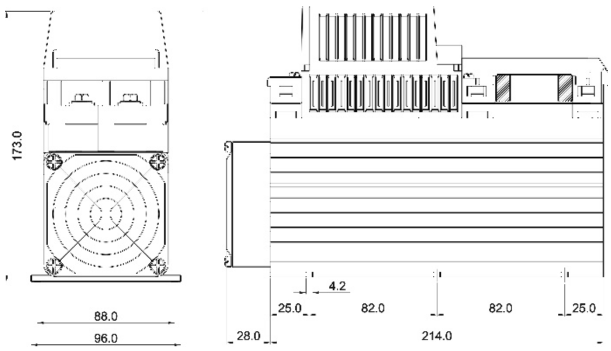


Figure 3

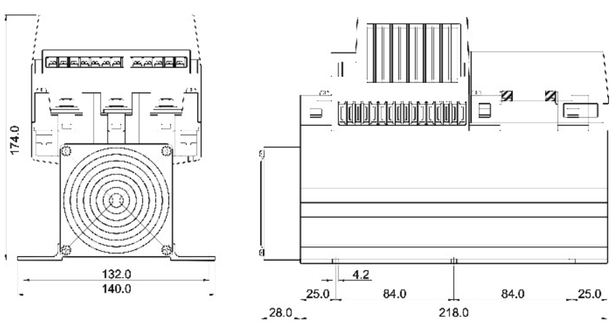


Figure 4

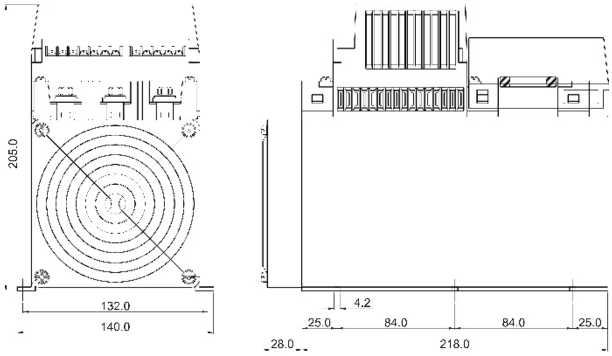


Figure 5

4.2 ELECTRICAL CONNECTIONS

The electrical connections of each model are shown in the figures below:

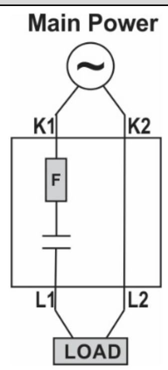
<table>
<tr><th>MODEL</th><th>ELECTRICAL CONNECTIONS</th></tr>
<tr><td>PCW-1P-100</td><td rowspan="2">

Figure 6</td></tr>
<tr><td>PCWE-1P-200</td></tr>
</table>

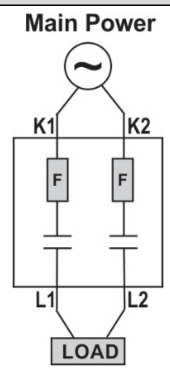
<table>
<tr><th>MODELO</th><th>ELECTRICAL CONNECTIONS</th></tr>
<tr><td>PCW-2P-60</td><td rowspan="3">

Figure 7</td></tr>
<tr><td>PCW-2P-100</td></tr>
<tr><td>PCWE-2P-150</td></tr>
</table>

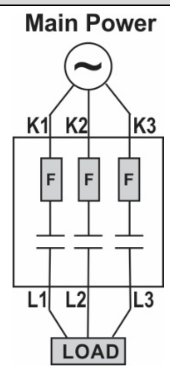
<table>
<tr><th>MODELO</th><th>ELECTRICAL CONNECTIONS</th></tr>
<tr><td>PCWE-2P-200</td><td>

Figure 8</td></tr>
</table>

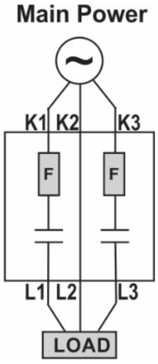
<table>
<tr><th>MODEL</th><th>ELECTRICAL CONNECTIONS</th></tr>
<tr><td>PCW-3P-60</td><td rowspan="4">

Figure 9</td></tr>
<tr><td>PCWE-3P-100</td></tr>
<tr><td>PCWE-3P-160</td></tr>
<tr><td>PCWE-3P-200</td></tr>
</table>

The available features of the connector bar for the power controller are shown in the figures below:

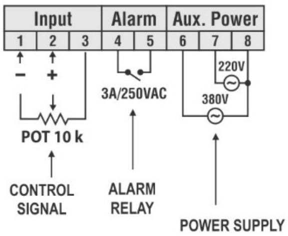
<table>
<tr><th>Connector bar for the power controller, model PCW</th><th>Connector bar for the power controller, model PCWE</th></tr>
<tr><td>

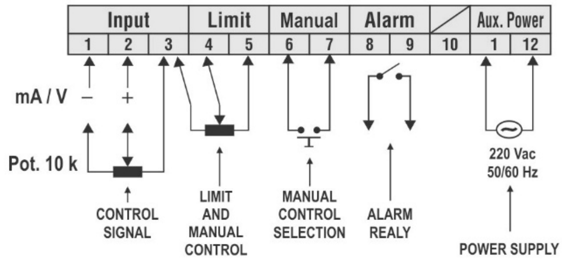
Figure 10</td><td>

Figure 11</td></tr>
</table>

4.2.1 RECOMMENDATIONS FOR THE INSTALLATION

- To minimize the pick-up of electrical noise, the low voltage DC connections and the sensor input wiring should be routed away from high-current power conductors. If this is impractical, use shielded cables. In general, keep cable lengths to a minimum.
- All electronic instruments must be powered by a clean mains supply, proper for instrumentation.
- It is strongly recommended to apply RC'S FILTERS (noise suppressor) to contactor coils, solenoids, etc.
- In any application it is essential to consider what can happen when any part of the system fails. The controller features by themselves cannot assure total protection.

5 RESOURCES

5.1 CONTROL SIGNAL (INPUT)

The control signal is selected by the user during the configuration of the power controller. There are (7) different types of control signals accepted:

- 4~20 mA
- 0~20 mA
- 1~5 V
- 2~10 V
- 0~5 V
- 0~10 V
- 10 k Power meter

The control signal should be applied in terminals 1, 2 and 3 of the controller's connector bar.

5.2 MANUAL CONTROL

Feature that allows the user to manually establish the percentage value of the power delivered to the load. The options for a manual control are:

- Via keypad adjustment. Available when following a recommendation such as "**Manual** percentage value of the power delivered to the load." See **Mode of Operation** later in this manual.
- Via power meter in **Input**.
- Via power meter in **Limit**. **MANUAL** digital entry, available in terminals 6 and 7, selects the adoption of the manual control mode when activated (closed switch). In the open switch position, the **Limit** connected power meter begins to execute the **Load Limit** function.

5.3 LOAD LIMIT (LIMIT)

Feature that determines the maximum power limit to be delivered to the load, regardless of the value demonstrated by the control signal. A potentiometer, of 10 k Ohms, installed in the **Limit** establishes this maximum value. For this function to work, the MANUAL digital entry should remain in the closed position (AUTO).

This limit **is not in regards to the load current**. It limits the portion of the network cycle, or the network cycle number, applied to the load. For the processes where the load does not have linear behavior, the load current should be known and considered.

5.4 TYPE OF CONTROL

There are two types of possible controls in this power controller: **PWM** control and **Phase Angle** control.

5.4.1 PWM – ConD

In **PWM** mode, the electric power controller is from the control of the electrical network cycles delivered to the load. The activation always occurs at zero voltage and the shutdown and zero current.

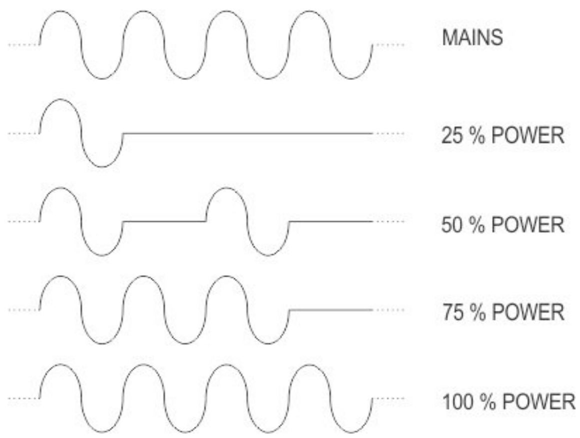


Figure 12

5.4.2 PHASE ANGLE – Con 1

In **Phase Angle** mode, the load activation occurs with each semi-cycles of the electric network. The quantity of energy delivered to the load depends on how much of each cycle of the electric network is passed on to the load.

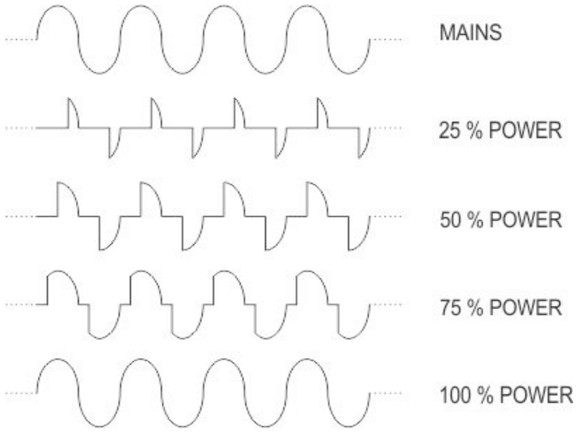


Figure 13

The shutdown always occurs at zero current, which does not cause significant disturbances to the electrical network.

In this mode, it is possible to have more refined control over the process. Low values for signal entry promotes low voltage values to the load. This characteristic is important in a process where there is a need to limit the electrical current during the first moments of the activated process.

This is the type of control recommended for installation in the primary side of transformers. In these applications, to avoid problems when deactivating the load, electrical power values of under 25 % should be avoided.

The type of control is defined during the configuration of the controller using the parameter **Con0** / **Con 1**.

* The **Phase Angle** control type is not available for biphasic models.

5.5 ALARM

As a protection feature, the controller also has an alarm that is activated with:

- Lack of phase
- Fuse rupture

The alarm activates a relay that can be configured to operate in NO or NC mode. The **ALn.0** configuration parameter defines the relay's operation mode.

5.6 SOFT START FUNCTION - Str.0

Allows for a slow and gradual power increase delivered to the load. The increase speed of the delivered power is determined by a time interval that can be adjusted by the user in seconds. During this time interval, the power delivered to the load varies from a minimum value to a value defined by the **control signal**. The time interval is defined in the **t.000** configuration parameter.

The value of the power delivered to the load continues to be defined by the control signal. The Soft Start function simply limits the speed on the increase of this power value during the time interval defined by the user.

Associated with the **Phase Angle** control type, the Soft Start function is normally used in processes that require a slow start, where the instant application of 100% of the available power to the load could damage system parts.

This function is disabled (**t.000**) when the time interval is set at 0.

5.7 KICK START FUNCTION – Str. 1

The Kick Start function, as opposed to the soft-start function, begins releasing maximum power to the process and then reduces until reaching the value set by the entry signal.

This function is disabled (**t.000**) when the time interval is set at 0 (zero).

5.8 OFFSET

Percentage value added to the recommended value. Allows the user to make a small adjustment to the process. Adjustable between -99 and 99 % in the **F.000** parameter.

6 OPERATION

The front panel of the controller, with their elements, can be seen in the figures below:

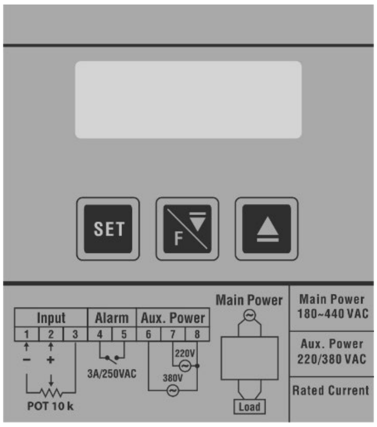


Figure 14

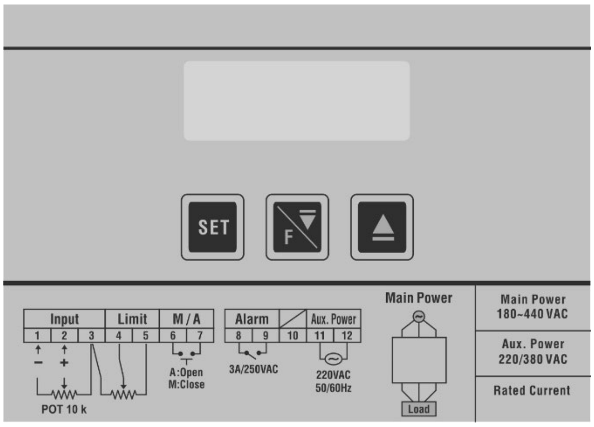


Figure 15

6.1 OPERATION MODE

In **Operation** mode, the controller applies an electrical power value to the load that is proportional to the value of the control signal. In this mode, the controller constantly shows on its display the **Output Indication** that can show three different value options:

- Percentage value of the power delivered to the load
- Load current value
- **Manual** percentage value of the power delivered to the load

The selection of the desired recommendation type happens during the configuration of the controller in **Configuration Mode**.

6.2 CONFIGURATION MODE

In **Configuration** mode, the user configures the power controller to operate according to their needs. The configuration defines each of the various **configuration parameters** presented by the controller. The user needs to understand the importance of each parameter, and for each one, they must determine a valid condition or a valid value.

The configuration parameters are gathered in two groups:

6.2.1 GROUP 1

Accessed when the SET and F keys are pressed simultaneously for 3 seconds. The first parameter (**LcY.0**) of this group is shown. The remaining parameters are presented with each new compression of the SET key.

The following table shows all the parameters of group 1 in the order they are presented in the controller display.

To alter the conditions of the parameters use the F and ▲.

PARAMETER	**A.000** or **i.000** or **n.000**
LcY.0	Configuration protection: **LcY.0** Blocks alteration on all parameters. **LcY.1** Allows for alteration in parameters of group 1. **LcY.2** Allows alteration on all parameters.
A. / i. / n.	Selection of output indication type: **A.** Recommends **Percentage value of the power** delivered to the load. **i.** Recommends **load current value**. **n.** Recommends **manual percentage value of the power** delivered to the load.
Int.0	Selection of the control signal: **Int0** 4~20 mA. **Int1** 0~20 mA. **Int2** 1~5 V. **Int3** 2~10 V. **Int4** 0~5 V. **Int5** 0~10 V. **Int6** 10 k Power meter.
Con.0	Type of control: **Con.0** Square Wave control.

PARAMETER	A.000 or i.000 or n.000
	Con.1 Phase Angle control.
Str.0 (*)	Soft Start / Kick Start function: Str.0 Adopts the Soft Start function. Str.1 Adopts the Kick Start function.

Table 5

(*) To access the Str0 / Str 1, on Con.0 / Con. 1 press SET again for 3 seconds.

6.2.2 GROUP 2

Accessed when the SET key is pressed for 3 seconds. The first parameter (L.000) of this group is shown. The remaining parameters are presented with each new compression of the SET key. The following table shows all the parameters of group 2 in the order they are presented in the controller display.

To alter the conditions of the parameters use the F and ▲ keys.

PARAMETER	A.000 or i.000 or n.000
L.000	Recommendation for the minimum amount for the signal control. Defines the range for the **power percentage value** type of recommendation.
H.000	Recommendation for the maximum amount for signal control. Defines the range for the **power percentage value** type of recommendation.
i.99.9	Maximum value for load current. Defined the range for the **load current value** type of recommendation.
t.000	Time interval for the Soft Start and Kick Start functions. In seconds.
d.000	Non valid parameter for the PCW and PCWE models. Maintain at 000.
ALn.0	Operation mode for alarm relay: ALn.0 Relay with Normally Open (NO) contact. ALn.1 Relay with Normally Closed (NC) contact.
F.000 (*)	**Offset** percentage value.

Table 6

(*) To access the offset parameter (F.000), on ALn.0 / ALn. 1 press SET again for 3 seconds.

6.3 FAILURE SIGNAL

nPEr	Signals the lack of phase or open fuse.
FnEr	Fan malfunction.
OhEr	Controller overheating.

Table 7

7 WARRANTY

Warranty conditions are available on our website www.novusautomation.com/warranty.

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