



Power Controller – PCW / PCWE

INSTRUCTION MANUAL – V1.0x D

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.

SPECIFICATIONS

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 °C
 Plastic CabinetABS+PC / UL-94V0

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	

Three Phase Models – Two controlled phases

MODEL	PCW-2P-60	PCW-2P-100	PCW-2P-150	PCWE-2P-200
Load Current	60 A	100 A	150 A	200 A
Protections	Fuse 60 A	Fuse 100 A	Fuse 150 A	Fuse 200 A
Surge Current (10 ms)	1200 A	1600 A	2250 A	5400 A
Dimensions	Figure 1	Figure 2	Figure 3	Figure 5
Fan	12 Vdc			220 Vac

Three Phase Models – Three controlled phases

MODEL	PCW-3P-60	PCWE-3P-100	PCWE-3P-160	PCWE-3P-200
Load Current	60 A	100 A	150 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		

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.

DIMENSIONS

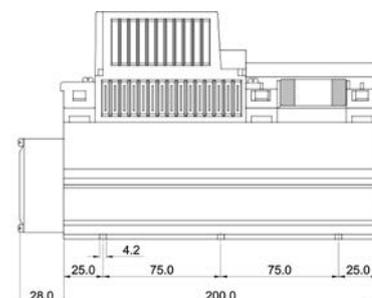
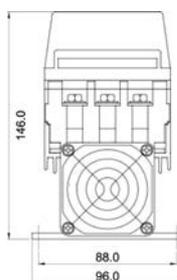


Figure 1

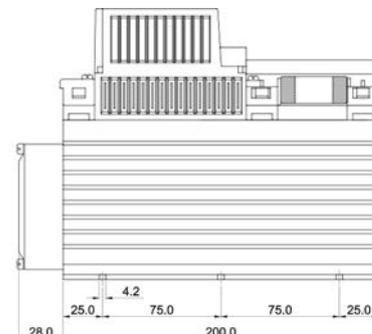
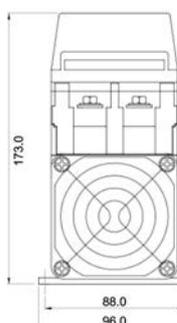


Figure 2

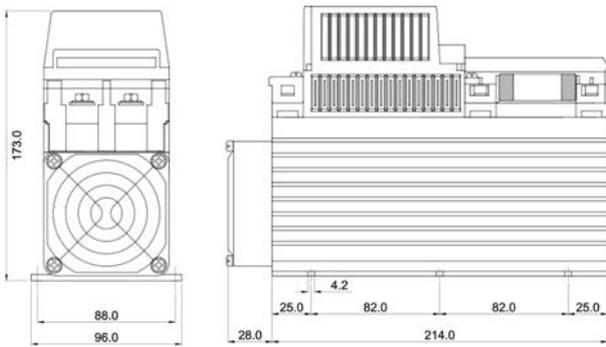


Figure 3

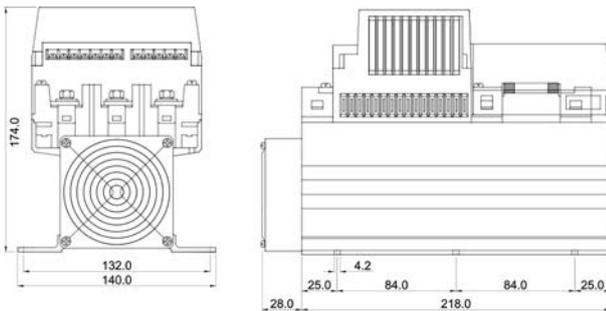


Figure 4

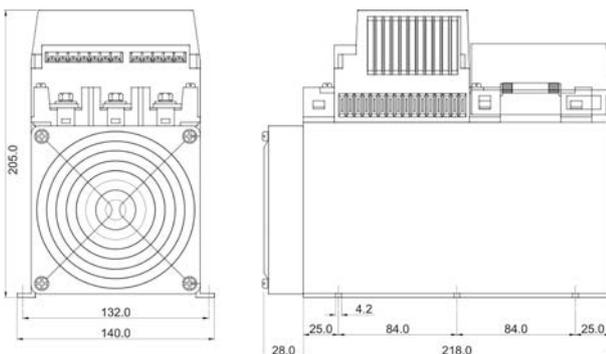


Figure 5

ELECTRICAL CONNECTIONS

The available features of the connector bar for the power controller is shown in Figure 6 and 7:

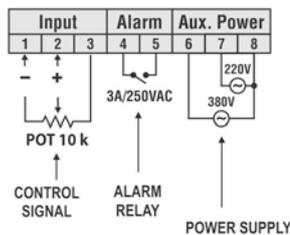


Figure 6 – Connector bar for the power controller, model PCW

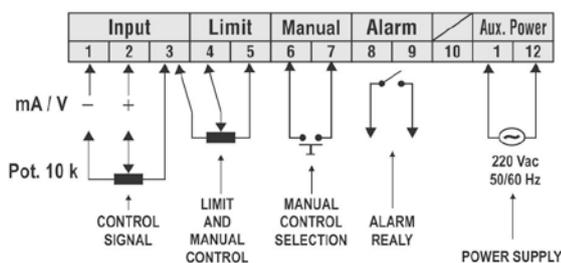


Figure 7 – Connector bar for the power controller, model PCWE

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 can not assure total protection.

RESOURCES

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.

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.

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.

TYPE OF CONTROL

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

PWM – Con0

In this 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.

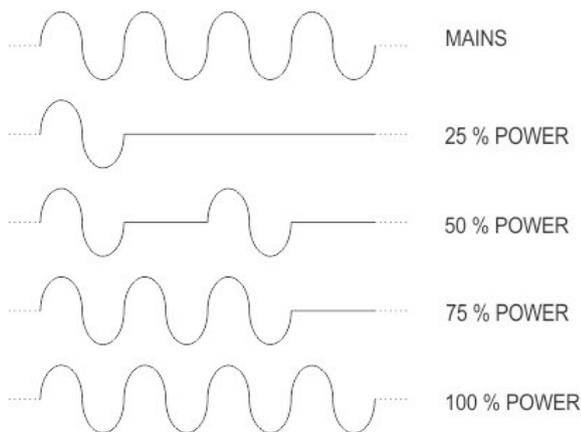


Figure 8 – Different quantities of electric power delivered to the load with the PWM type of control

Phase Angle – Con 1

With the **phase angle** control, 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.

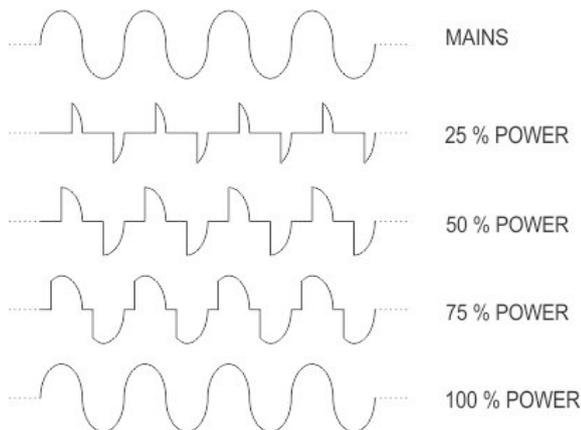


Figure 9 – Different quantities of electric power delivered to the load with the Phase Angle type of control

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**.

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 NA or NF mode. The **ALrD** configuration parameter defines the relay's operation mode.

SOFT START FUNCTION - StrD

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.DDD** 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.DDD**) when the time interval is set at 0 (zero).

KICK-START FUNCTION – Str. I

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.DDD**) when the time interval is set at 0 (zero).

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.DDD** parameter.

OPERATION

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

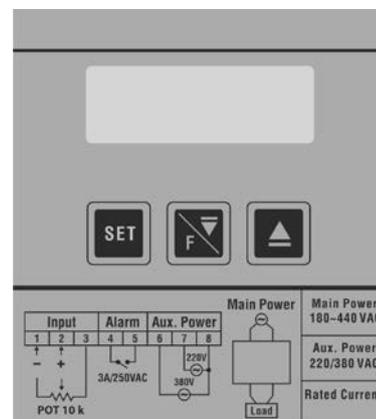


Figure 10 - Identification of the frontal panel parts

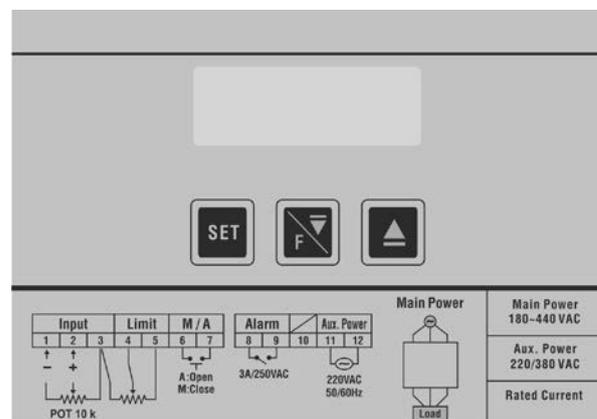


Figure 11 - Identification of the frontal panel parts

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**.

CONFIGURATION MODE

In this 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:

Group 1

Accessed when the  and  keys are pressed simultaneously for 3 seconds. The first parameter (**LcY0**) of this group is shown. The remaining parameters are presented with each new compression of the  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  and .

PARAMETER	R000 or 000 or n000
LcY0	Configuration Protection: LcY0 Blocks alteration on all parameters LcY1 Allows for alteration in parameters of group 1. LcY2 Allows alteration on all parameters
R / c / n	Selection of Output Indication type: R Recommends Percentage value of the power delivered to the load c Recommends load current value . n Recommends manual percentage value of the power delivered to the load
InE0	Selection of the Control Signal: InE0 4-20 mA InE1 0-20 mA InE2 1-5 V InE3 2-10 V InE4 0-5 V InE5 0-10 V InE6 10 k Power meter
Con0	Type of control: Con0 Square Wave control type Con1 Phase Angle Control
Str0 (*)	Soft-Start / Kick-Start Function: Str0 Adopts the Soft-start function Str1 Adopts the Kick-start function

(*) To access the **Str0 / Str1**, on **Con0 / Con1** press  again for 3 seconds.

Group 2

Accessed when the  key is pressed for 3 seconds. The first parameter (**L000**) of this group is shown. The remaining parameters are presented with each new compression of the  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  and  keys.

PARAMETER	R000 or 000 or n000
L000	Recommendation for the minimum amount for the signal control. Defines the range for the power percentage value type of recommendation.
H000	Recommendation for the maximum amount for the signal control. Defines the range for the power percentage value type of recommendation.
.99.9	Maximum value for load current. Defined the range for the load current value type of recommendation.
t000	Time interval for the Soft-Start and Kick-Start functions. In seconds.
d000	Non valid parameter for the PCW and PCWE models. Maintain at 000 .
ALn0	Operation mode for alarm relay: ALn0 Relay with Normally Open (NO) contact ALn1 Relay with Normally Closed (NC) contact
F.000 (*)	Offset percentage value.

(*) To access the offset parameter (**F.000**), on **ALn0 / ALn1** press  again for 3 seconds.

FAILURE SIGNAL

nPEr	Signals lack of phase or open fuse.
FnEr	Fan Malfunction.
OhEr	Controller Overheating