



Main applications

- Industrial furnaces for heat treatments, metallurgy
- Wood-working machines (edge-banding, gluing)
- Welding machines
- Kilns

FEATURES

The "WATTCOR W312" thyristor power controllers are designed to control:

- standard resistive loads with a low temperature coefficient,
- short, wave infrared heaters.
- Inductive loads, transformer primaries

They can be used in the following cases:

• **Single-phase:** connection of the load and instrument between 2 phases or between one phase and Neutral.

• **Three-phase:** use of three W312 open delta or star connected with neutral.

The W312 series is designed on the basis of a common architecture, whose dimensions are defined by the five different current load specifications for a room temperature of 50°C.

The power circuit has been designed to operate under a wide range of voltage. The working voltage can vary from a minimum of 24Vac to a maximum of 660Vac (Max. range 20...725Vac). The operating principle is phase angle firing.

With this type of switch-on, the load power control is performed by slicing the individual half-waves.

The conduction angle varies in proportion to the analog control signal so that power can be adjusted from 0 to 100%. The voltage control signal (0...5V or 0...10V) or current control signal (0/4...20mA) is normally supplied by a temperature controller or directly from a potentiometer (manual control).

The phase angle switching device guarantees precise power control and adequate switching speed, which also permits use of the soft-start function.

The soft-start function introduces a power ramp when the auxiliary power supply is switched on. The conduction angle varies from zero up to the value corresponding to the control input in a set time. This function is indispensable with resistive loads at low resistance when cold (tungsten, molybdenum disilicide, kanthal super).

A logic input can be used to inhibit the power controller interrupting, where necessary, the power delivery, notwithstanding the presence of the command signal.

The LED indicators on the front indicate:

- the presence of the electronics auxiliary supply voltage;
- the conduction status of the instrument.

WATTCOR W312 products are designed to guarantee rated current and tension values at a room temperature of 50°C.

Working range is -5°C to 60°C. Signal connectors are "plug-in" type for easy wiring. The product can be installed either on the DIN bar or on the front panel.

Main features

- Analog/potentiometer/logic signal input control
- Phase angle switching
- High-capacity antiparallel double thyristor (SCR)
- Conduction inhibitor input
- LED indicators
- MOV protections (varistor)
- DIN bar and front panel installation
- Softstart

TECHNICAL DATA

Main features

Rated working voltage 660Vac

(max. range 20...725Vac)

Rated frequency: 50 (60Hz on request)

Current sizes (50°C)

	Repetitive overcurrent (t=1s)	Non-Repetitive overcurrent (t=20ms)
25Arms	≤ 74A	≤ 600A
40Arms	≤ 100A	≤ 1500A
75Arms	≤ 180A	≤ 1700A
100Arms	≤ 300A	≤ 4800A
150Arms	≤ 300A	≤ 4800A
	I ² t for fusing (t=1-10ms)	dv/dt critical with deactivated output
25Arms	≤ 1800A ² s	1000V/μs
40Arms	≤ 11200A ² s	1000V/μs
75Arms	≤ 14450A ² s	1000V/μs
100Arms	≤ 151000A ² s	1000V/μs
150Arms	≤ 151000A ² s	1000V/μs

Isolation

Rated input/output isolation voltage 3750Vac

Dissipated power:

1.2 W per load Amp

Control input

- Analog input configurable in voltage or current

- Voltage range:

0-5V (potentiometer 10KΩ); 0-10V

- Current range: 0-20mA; 4-20mA
- Typical impedance:
35 K Ω @ 0-5V, 70 K Ω @ 0-10V,
250 Ω @ 0-20 / 4-20mA

Inhibition input

- Max. dynamic.: 0...30Vdc
- Impedance: 100K Ω
- Active inhibition: $\geq$ 5Vdc

Auxiliary power supply

- 230 or 400Vac 50...60Hz - 5VA
- Fan power supply (for 150A)
230Vac 50/60Hz - 14VA

Analog control or digital control mode

Analog control mode

The analog control type (0-10Vdc default) can be set by acting on the dip switches SW1...4.

The power output is obtained by activating the logic input and deactivating the inhibition input.

The stop and restart of the power output can be carried out by activating and deactivating the logic input.

Digital control mode

The function is enabled with dip switches SW1-4. In this mode the power output is activated/deactivated according to the status of the digital input.

The inhibition input must be deactivated and the terminals of the analog input must not be connected.

Soft Start

When the soft start function is enable, at power up, the output set value is reached gradually in 40seconds.

Variation gradient

When the variation gradient is enable, any variation of the output set value is reached gradually (2.2 seconds for a variation from 0 to 100%).

Installation notes

Use the high-speed fuses indicated in the catalog according to the connection example supplied.

- Applications with solid state power units must include an automatic safety switch to isolate the power line from the load. the panel in order to have adequate heat exchange between the heat sink and the surrounding air under conditions of natural convection.

Assemble the device vertically (inclined a maximum of 10° to the vertical axis)

- Vertical distance between a device and the panel wall: >100mm
- Horizontal distance between a device and the panel wall: at least 20mm
- Vertical distance between one device and another: at least 300mm.
- Horizontal distance between one device and another: at least 20mm.

Make sure that the wire raceways do not reduce such distances. If they do, assemble the groups cantilevered to the board so that air can flow vertically over

the heat sink without obstruction.

The need to use a filter to reduce emissions conducted on the line when the SCRs are switched on at a specific phase angle depends on the applications for which the W312 is used. The levels depend on machine layout and on load type.

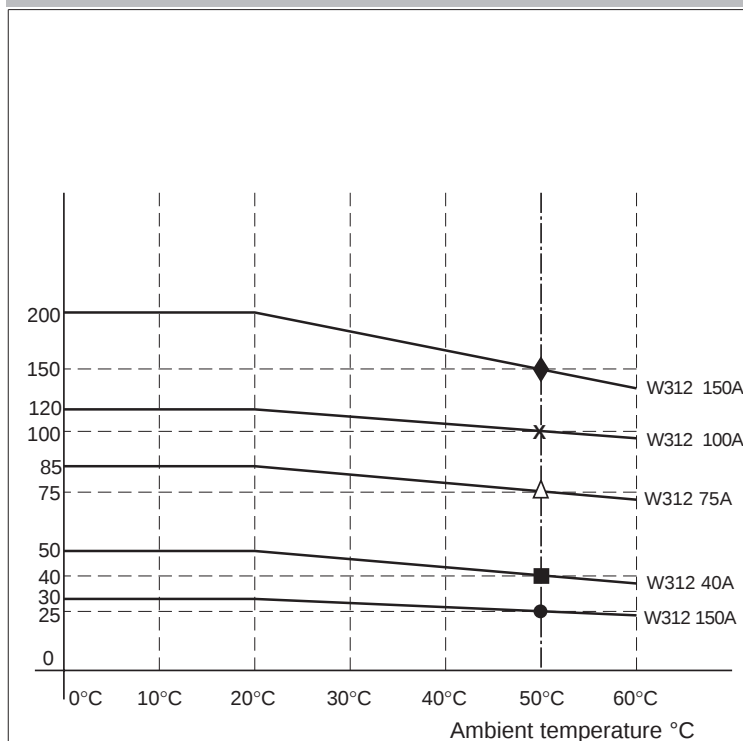
We strongly advise you to check the machine emission level in order to decide how to eliminate noise.

The power filter must be connected as close as possible to the solid state power unit.

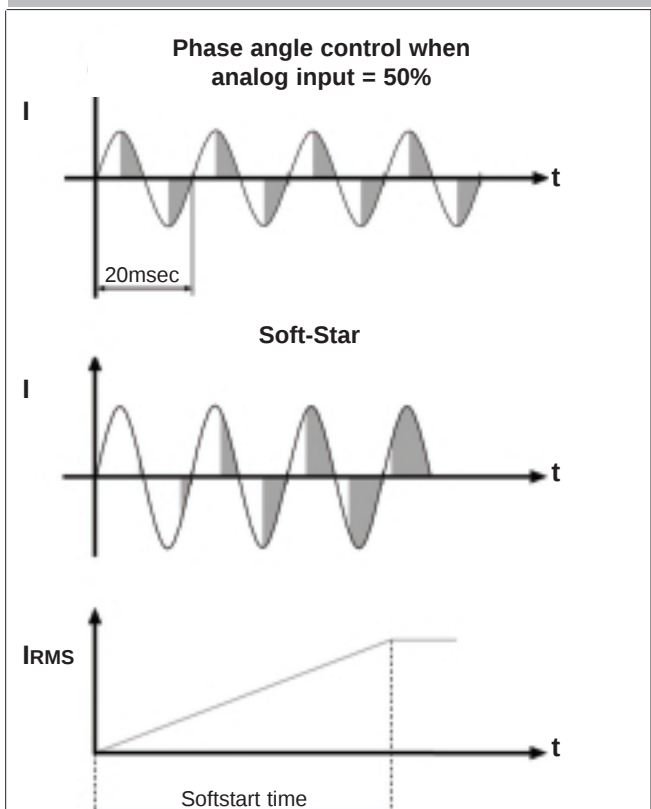
We recommend a filter with the following characteristics:

- Voltage: Load voltage
- Current: Maximum current on load
- Work frequency: 50/60Hz
- Common attenuation mode:
>35dB@100KHz
>60 dB from 150KHz to 1.5MHz
- Differential attenuation mode:
>50dB@100KHz
>60 dB from 150KHz to 1.5MHz.

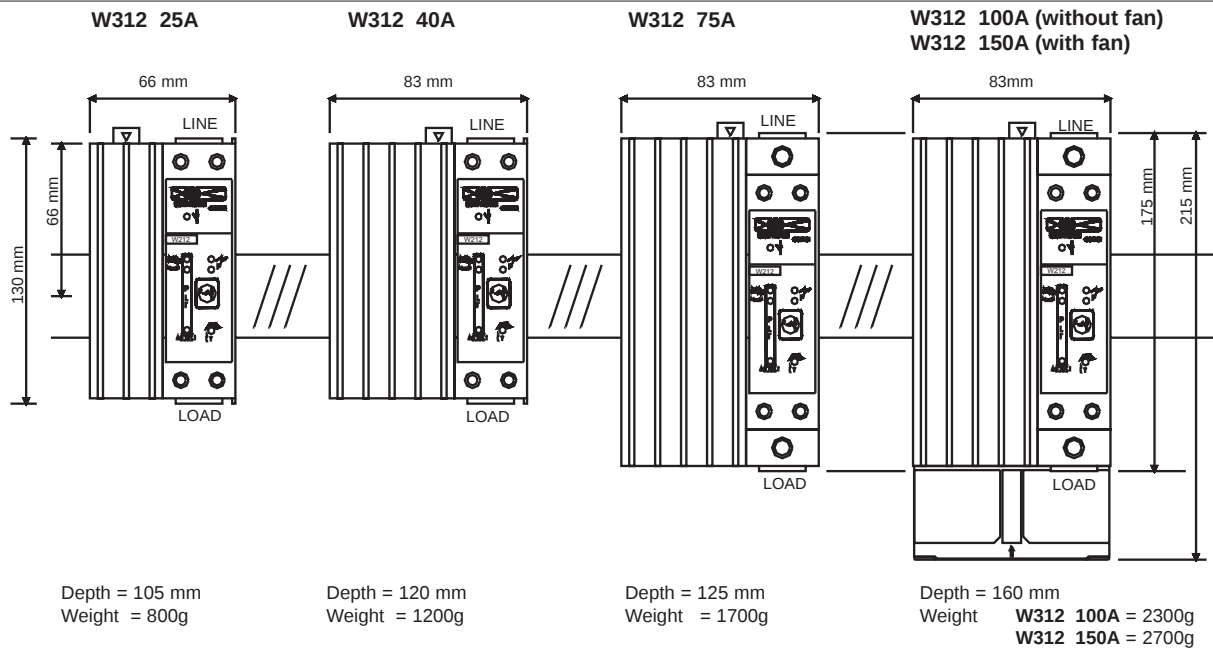
DISSIPATION CURVES



TYPE OF OPERATION



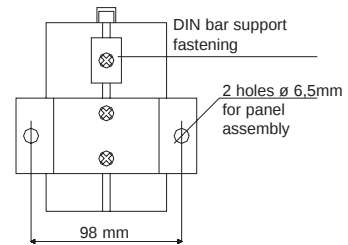
OVERALL AND INSTALLATION DIMENSIONS



FASTENING

- DIN bar support fastening
- Panel assembly kit for sizes 75-150A (accessory 1886001)

PANEL ASSEMBLY KIT



ACCESSORIES

Size	Fuses	Fuseholders
25A	FUS-050	PF 22x58
40A	FUS-063	PF 22x58
75A	FUS-100	PF 22x58
100A	FUS-250	PF 27x60
150A	FUS-250	PF 27x60

WIRING/TERMINALS

Power terminals

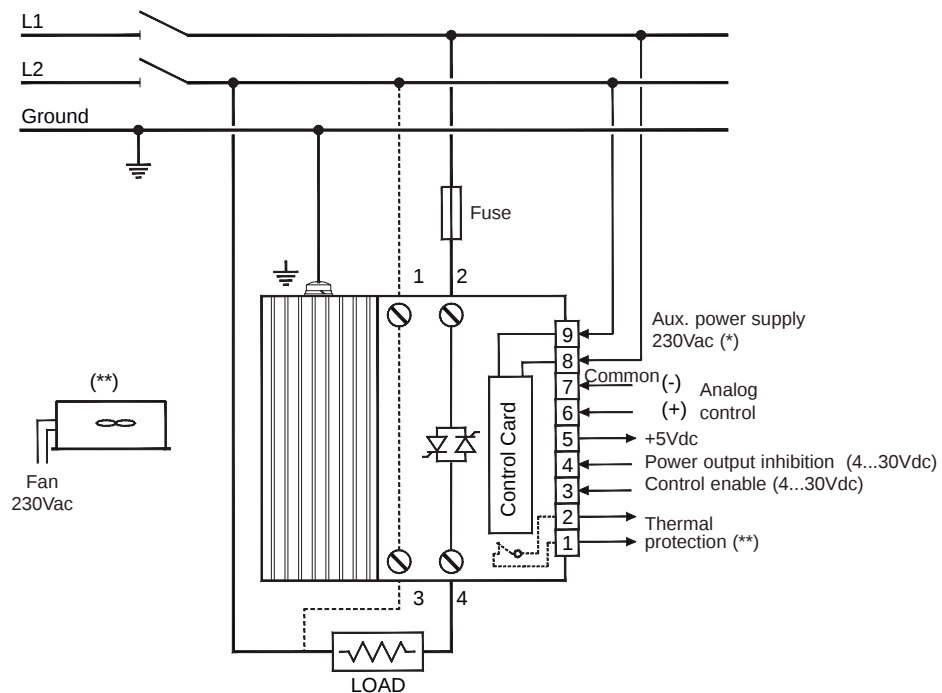
The power terminals on the solid state power units let you use wires without terminals or connectors to be crimped. For 25 and 40A solid state power units, you can connect the two phases or one phase and one neutral in input. In this case, use the internal through connection between input 1 and output 3.

Current sizes	Terminal tightening capacity [mm²]	Driving torque [Nm]
25-40A	From 1,5 to 16	From 1,2 to 1,4
75-100-150	From 20 to 70	From 6 to 7

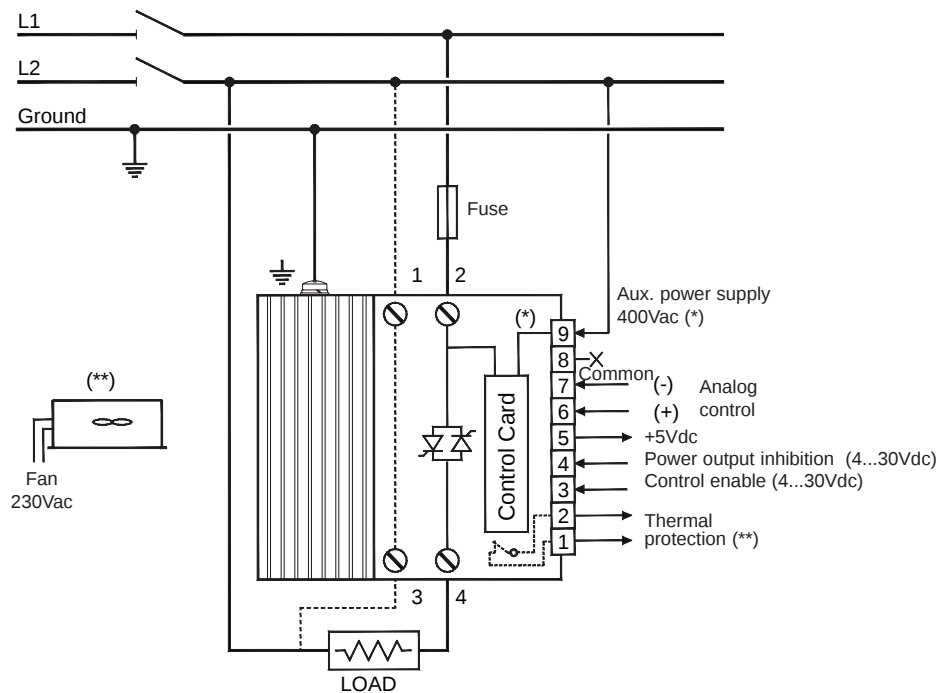
W312 WIRING DIAGRAMS

SINGLE-PHASE LOAD CONTROL

Models with 230 VAC auxiliary power supply: code W312 ... 020



Models with auxiliary power supply >230 VAC (for ex.: code W312...030, auxiliary power supply 400 Vac).



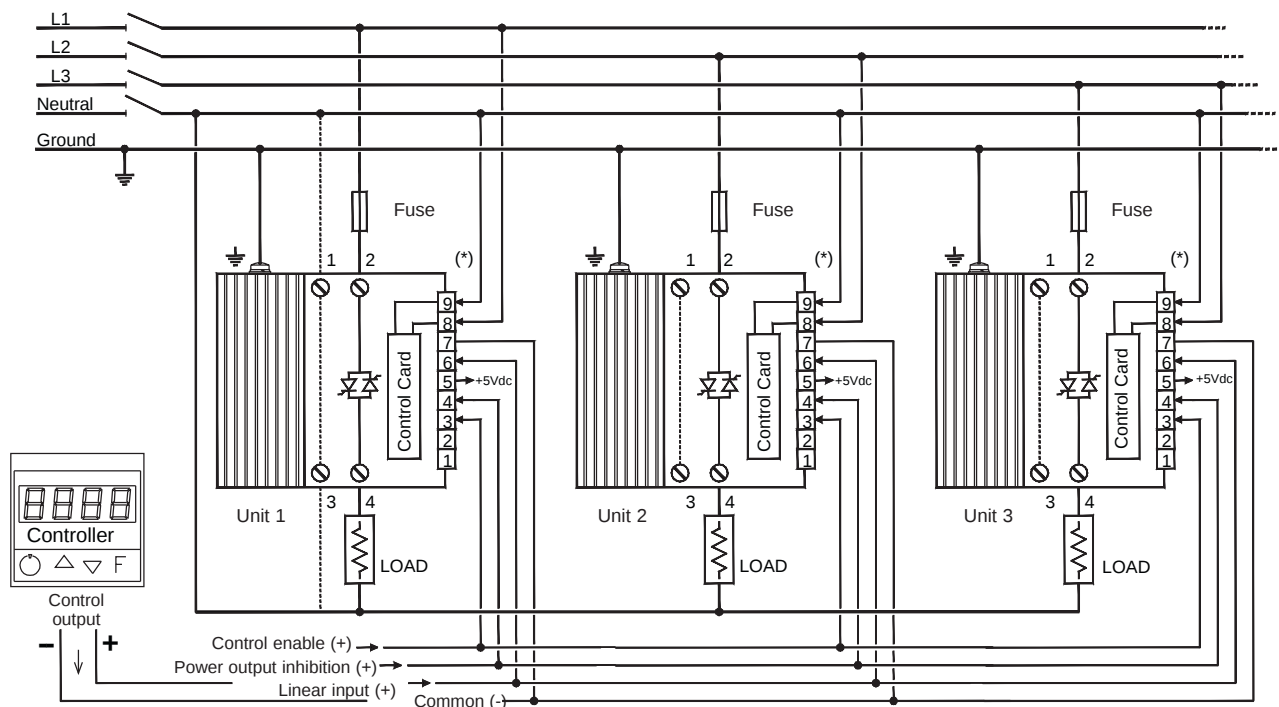
- On 25A and 40A models, direct connection with terminals 1-3 is available for connecting one of the phases to the load, as an alternative to outside connection.
- (*) Auxiliary power supply for control board (indicated in code and on label): must be in phase (synchronized) with the voltage applied to the load.
If not directly available, use an external auxiliary transformer.
- IMPORTANT**
On models with auxiliary power supply >230 VAC, one phase of the power supply for the control board is already connected internally. Therefore, terminal 8 is not used and must not be connected.
- (**) 150A mod. only

CONTROL OF THREE-PHASE LOADS WITH THREE WATTCORS OPERATING IN SINGLE PHASE

Example 1 - Star connection with neutral.

Line voltage 400 VAC. 3 units W312 25A (or 40A).

Analogue control (linear signal). Auxiliary power supply 230 Vac (W312 - □ □ □ - 660 - □ - 020)



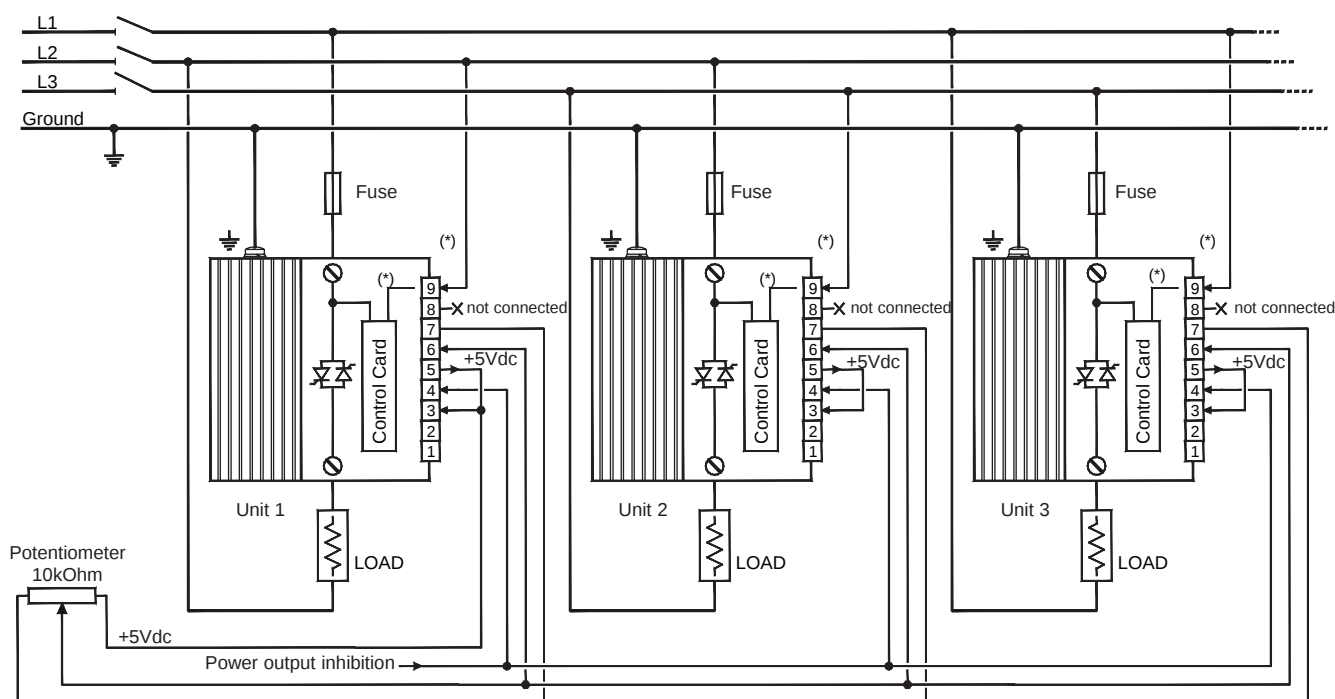
---- On 25A and 40A models, direct connection with terminals 1-3 is available for connecting one of the phases to the load, as an alternative to outside connection.

(*) Auxiliary power supply 230 VAC + 10%-20%-50Hz for control board (indicated in code and on label): must be in phase (synchronized) with the voltage applied to the load. If not directly available, use an external auxiliary transformer.

Example 2 - Open delta connection.

Line voltage 400 VAC. 3 units W312 75A (or 100A).

Potentiometer control. Auxiliary power supply 400 Vac (W312 - □ □ □ - 660 - □ - 030)



(*) Auxiliary power supply 400 VAC + 10%-20%-50Hz for control board (indicated in code and on label): must be in phase (synchronized) with the voltage applied to the load.

IMPORTANT

On models with auxiliary power supply >230 VAC, one phase of the power supply for the control board is already connected internally. Therefore, terminal 8 is not used and must not be connected.

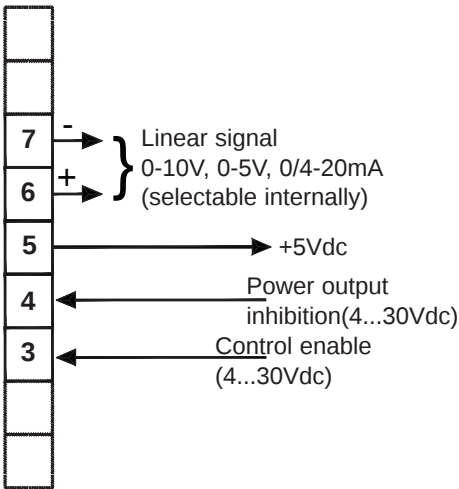
CONTROL SIGNALS

W312 units have the following control inputs available:

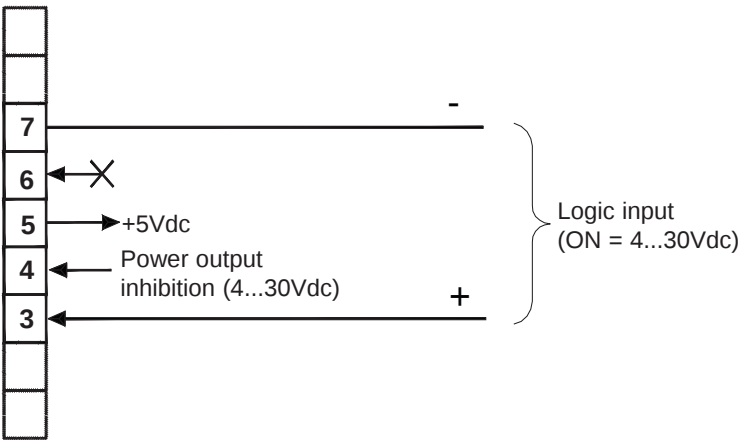
- analog input in current or voltage that allows to set the desired power output (0..10V standard, 0...5V / 0...20mA / 4...20mA selectable by dip-switch).
The analog input (0...5V) can also be used for control via potentiometer ($R=10k\Omega$).
- logic input that enables the control.
If not used, must be connected to terminal 5 (+5Vdc) .
- inhibition logic input that locks the power output when the unit is active, whatever the control signal level may be.

Enable/inhibit controls are active with voltage in the 4...30 VDC range, and can also be operated by means of potential-free contacts connected between terminals 3-5 and 4-5, respectively.

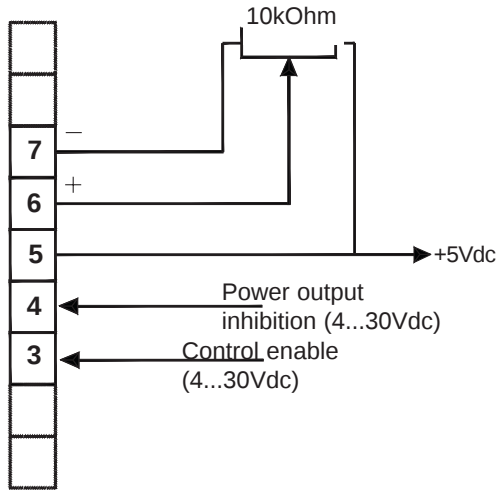
Analog control



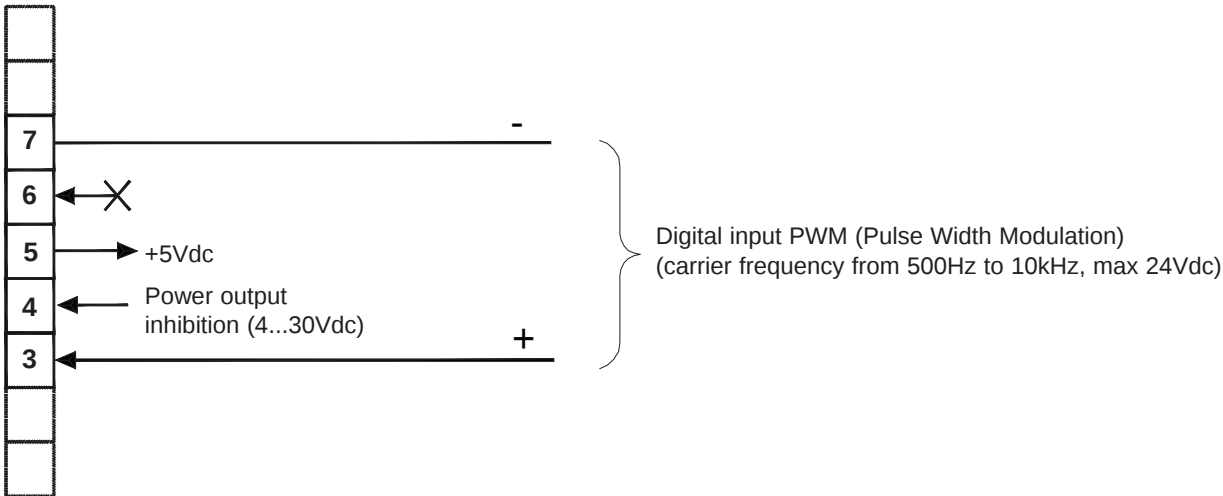
Logic control (ON/OFF)



Potentiometer control



Digital control (PWM)



OPERATING MODES

W312 units offer the following control modes selectable by dip-switches:

- **analog control** (dip switch GC4=OFF): the solid state power unit transfers to the load a % of power proportional to the analog input signal (terminals 6-7).

The set power is supplied / interrupted by activating / deactivating the logic signal at terminal 3.

The type of analog signal (standard 0...10V) can be selected by the internal dip switches SW1-SW2-SW3-SW4 (see chart)

By enabling the "Soft-start at power-on" function (dip switch GC2=ON), when the auxiliary power supply is switched on (with logic signal present at terminal 3) the set power is reached gradually after a fixed time of about 40 sec.

By enabling the "Control variation gradient" function (dip switch GC4=ON) setpoint variations can be made more gradually; for example, a set point variation from 0 to 100% is performed on the load with a ramp of about 2.2 sec.

- **logic control** (dip switch GC4=ON, SW1=ON, SW2=OFF, SW3=ON, SW4=OFF): the solid state power unit transfers 100% of power to the load.

The power is supplied / interrupted by activating / deactivating the logic signal at terminal 3.

For this function, terminal 6 (analog input) must not be connected.

By enabling the "Soft-start at power-on" function (dip switch GC2=ON), when the auxiliary power supply is switched on (with logic signal present at terminal 3) the power is reached gradually after a fixed time of about 40 sec.

By enabling the "Control variation gradient" function (dip switch GC4=ON) the switching phase can be made more gradually; for example, passage from 0 to 100% of power takes place with a ramp of about 2.2 sec.

If GC3 and GC4 are both enabled, the 2.2 sec. (approx.) ramp is also executed when the logic control is deactivated.

- **PWM control** (dip switch GC4=ON, GC3 = ON, SW1 = ON, SW2 = OFF, SW3 = ON, SW4 = OFF). In logic control mode, you can send a PWM type digital signal (Pulse Width Modulation) to terminal 3.

The power controller transfers to the load a % of power proportional to the ratio between the "ON time" and the "OFF time" within the cycle; this function lets you set a power set point by means of digital signal (for ex., from PLC or controller with PWM output) with carrier frequency from 500 Hz to 10kHz, logic level Lo<0.6V, Hi>2.5V (max 24 VDC).

Example: with digital signal at 1 kHz and tON=50%, you have 50% of power output.

ORDER CODE

MODEL	
	W312

NOMINAL CURRENT	
25Aac	25
40Aac	40
75Aac	75
100Aac	100
150Aac **	150

NOMINAL VOLTAGE	
660Vac	660

AUXILIARY SUPPLY	
2	230Va.c. 50Hz
3	400Va.c. 50Hz

INPUT TYPE	
2	0-10 Vdc standard *

** With cooling fan (nominal voltage 230Vac)

- * analog input type selectable by dip switches:
- 0-5Vdc and potentiometer
 - 0-10Vdc (standard)
 - 0-20mAdc
 - 4-20mAdc

Kindly contact GEFRA for information on available codes.

GEFRAN spa reserves the right to make aesthetic or functional changes at any time and without notice.



This device conforms to European Union Directive 2004/108/CE and 2006/95/CE as amended with reference to generic standards: **EN 61000-6-2** (immunity in industrial environment) **EN 61000-6-4** (emission in industrial environment) - **EN 61010-1** (safety regulations).

GEFRAN

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DTS_W312_0709_ENG