



GENERAL PRESENTATION

FEATURES

The "WATTCOR W211" thyristor power controllers are designed to control:

- standard resistive loads with a low temperature coefficient
- short, medium and long wave infrared heaters

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.
- **Triphase:** use of two W211 in the biphasic control

This model is designed on the basis of a common architecture, whose dimensions are defined by the eight 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. When the instrument does not include the partial breakage option of the RPC load, the working voltage can vary from a minimum of 24Vac to a maximum of 660Vac (Max. range 20....725Vac).

The zero crossing switching device ensures the integrity of the network and conformity with EC regulations.

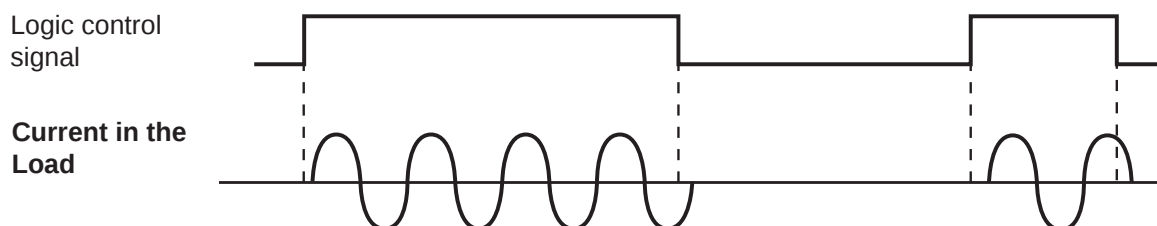
A logic input can be used to inhibit the power controller interrupting, where necessary, the power delivery, notwithstanding the presence of the command signal.

The LED indicators on the front indicate:

- the presence of the electronics auxiliary supply voltage;
- the conduction status of the instrument
- the alarm status due to:
 - : detection of partial or total breakage of the load
 - : detection of a short-circuit of the thyristor.

This simple and robust instrument carries out the function of a static relay. The functioning is by means of synchronous wave trains starting from a logic command signal which, in relation to its own level, enables or inhibits the thyristor.

Conduction begins at the first zero crossing of the load's supply voltage following a control signal (logic level 1). The switching off occurs at the first zero crossing of the current in the load after the fall of the control signal (logic level 0).



The triphase load control can be carried out by two (biphasic control) or three WATTCOR W211 connected in line, controlled by the same logic signal.

The presence of an auxiliary supply of the electronic unit is necessary if:

- an option (partial or total breakage of the load, thyristor short-circuit) is present
- or if the functioning or inhibition command needs to be carried out by a contact without potential.

The auxiliary supply can be completely independent from the voltage applied to the load.

The partial breakage alarm option of the (RPC) load is available on all nominal capacities/currents from 25 to 600A with voltage on the load to be specified in the order phase (load nominal voltage from 115 to 400V).

ORDER CODE

MODEL	
W211	

NOMINAL CURRENT	
25Aac	25
40Aac	40
75Aac	75
100Aac	100
150Aac	150
250Aac	250
400Aac	400
600Aac	600

NOMINAL VOLTAGE	
660Vac (if the RPC option is present, the functioning range is 350 ... 440Vac).	660
660Vac (for the RPC option with range of 260...350Vac)	661
660Vac (for the RPC option with range of 180...260Vac)	662
660Vac (for the RPC option with range of 90...180Vac)	663

MICROSWITCH for FUSE RUPTURE $\geq 250A$	
0	None ($\leq 250A$)
1	Microswitch ($\geq 250A$)

AUXILIARY SUPPLY (for options and sizes $\geq 150A$)	
0	None
1	115Vac 50...60Hz
2	230Vac 50...60Hz

OPTIONS	
0	None
3	RPC
5	DTC

Note:
With work voltage > 440Vac the RPC option is not available

Kindly contact GEFRAN for information on available codes.

ELECTRIC PANEL - COOLING

The power controllers must be assembled in a closed cabin, protected from dust, humidity and any corrosive factors. The room temperature of the cabin must not exceed 50°C. If necessary, provide forced ventilation with a filter so as not to exceed this value.

Each WATTCOR dissipates a power approximately defined by the equation:

$$W=1.21 I$$

W = dissipated power in Watt

I = current in Amperes controlled by the power controller

The instruments with capacity from 25 to 100A are cooled by natural convection. To ensure this occurs, the cooling fins must absolutely be in a vertical position.

The capacities $\geq 150A$ involve the presence of an integrated ventilator which in the installation must be below the dissipater. A thermal safety switch is available to activate an alarm or inhibit the conduction in case of overheating of the dissipater (broken fan....).

The thermal switch opens when the temperature is near 100°C; closing hysteresis is approximately 35°C.

The frequent intervention of this safety device indicates that ventilation is insufficient. Where this is so it is essential to verify the temperature and aeration of the cabin.

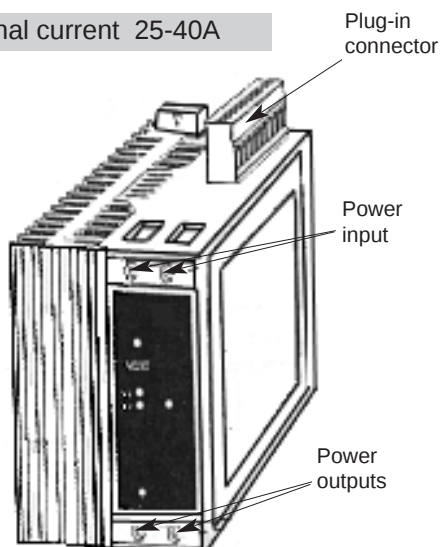


The dissipater can reach a high temperature. Even if electrically insulated, (with the exception of versions 400 and 600A) any contact must be avoided during functioning.

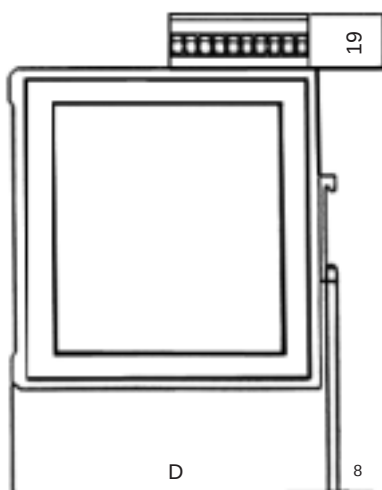
Even with the electric panel off the thermal inertia of the dissipater must be borne in mind.

DIMENSIONS

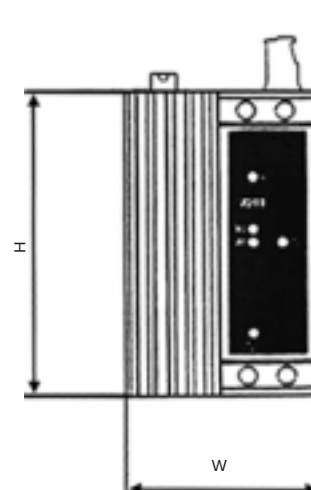
Nominal current 25-40A



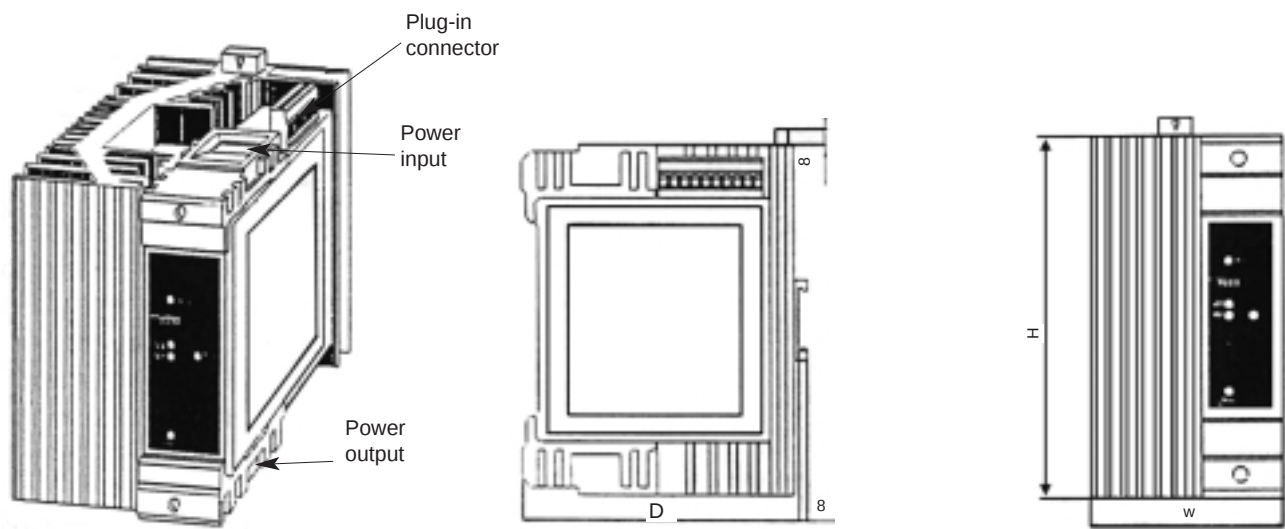
Side view



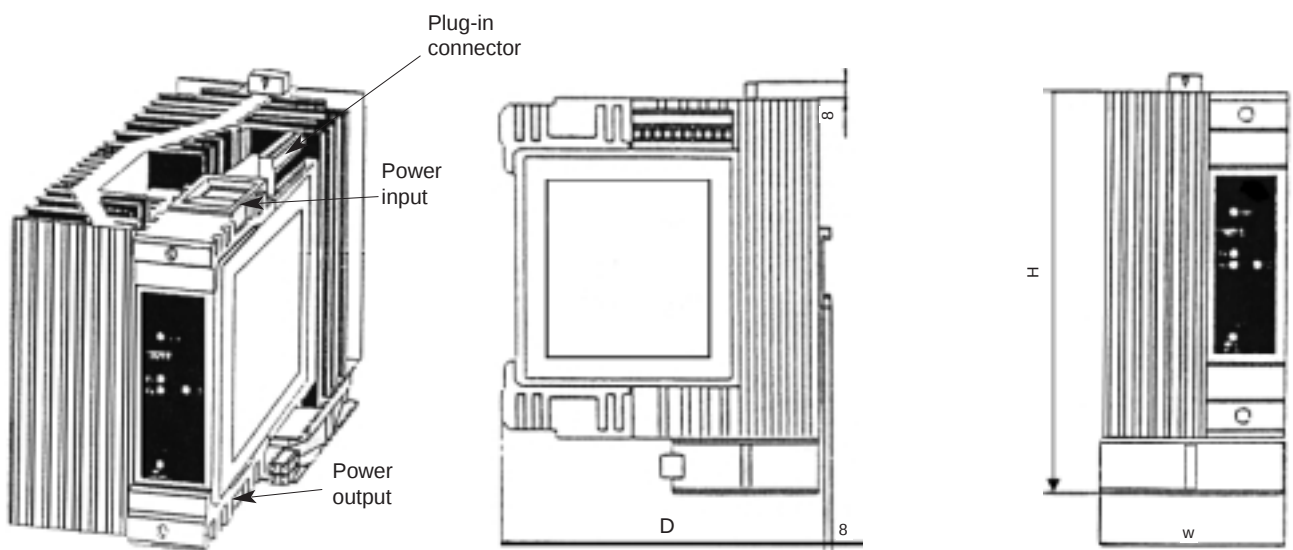
Front view



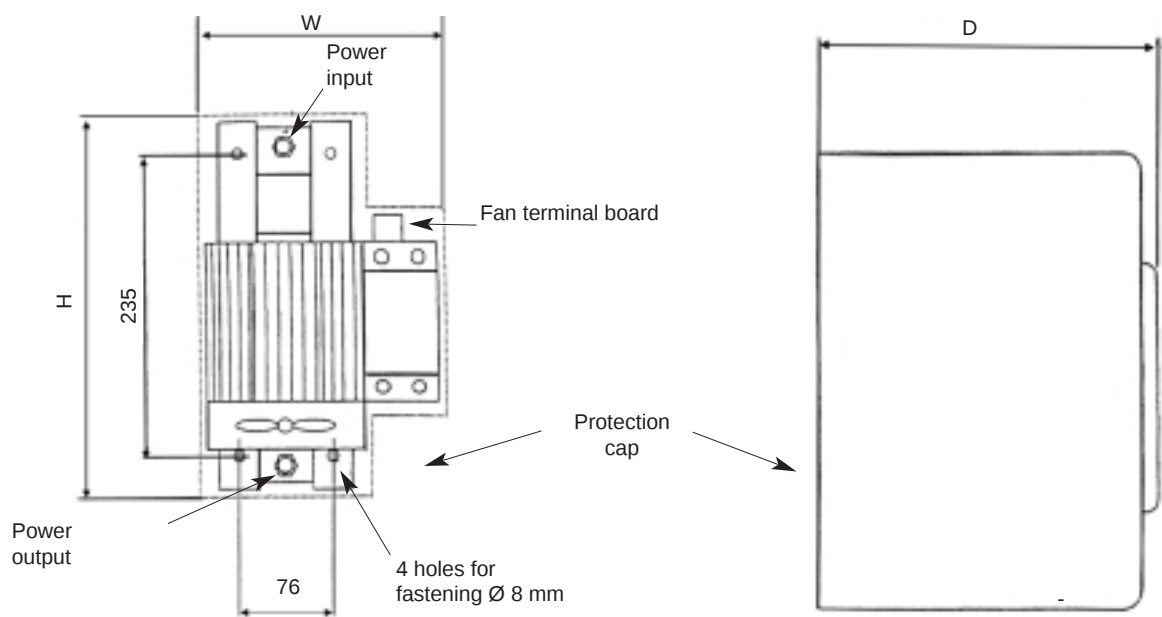
Nominal current 75-100

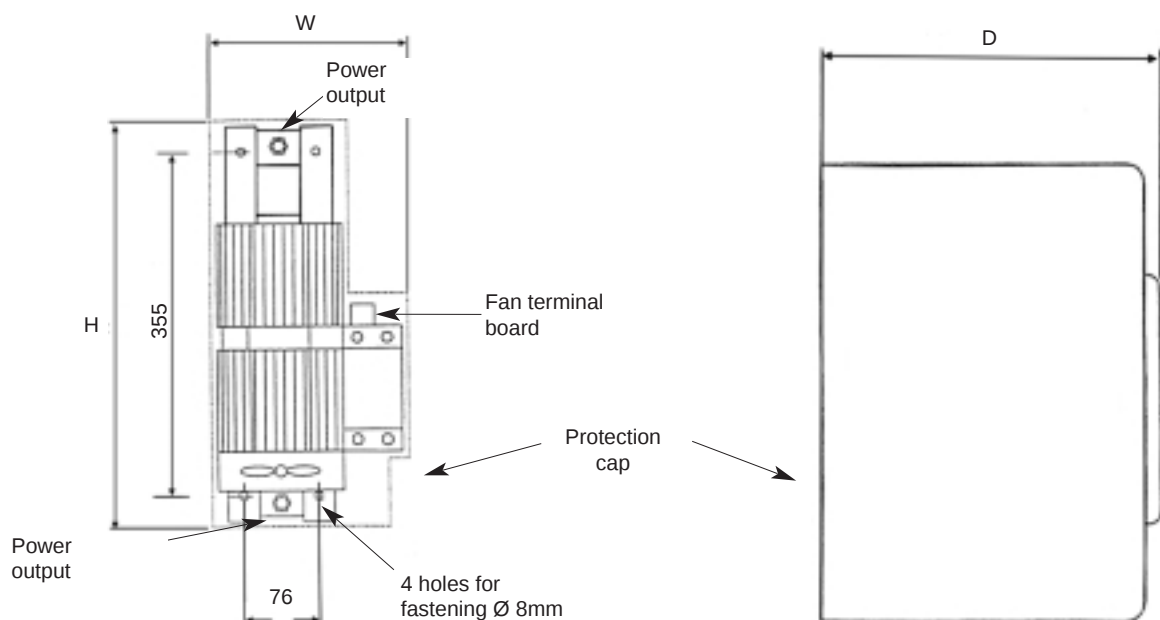


Nominal current 150A



Nominal current 250A





Dimensions in mm and average weight of the models (ref. Nominal Current)

CAPACITY AMPERES	WIDTH W	HEIGHT H	DEPHT D	WEIGHT Kg.
25	66	130	105	0,8
40	83	130	120	1,2
75	83	175	125	1,7
100	83	175	160	2,3
150	83	215	160	2,7
250	170	330	230	6
400	170	450	230	10,3
600	170	450	230	11

ASSEMBLY - FASTENING

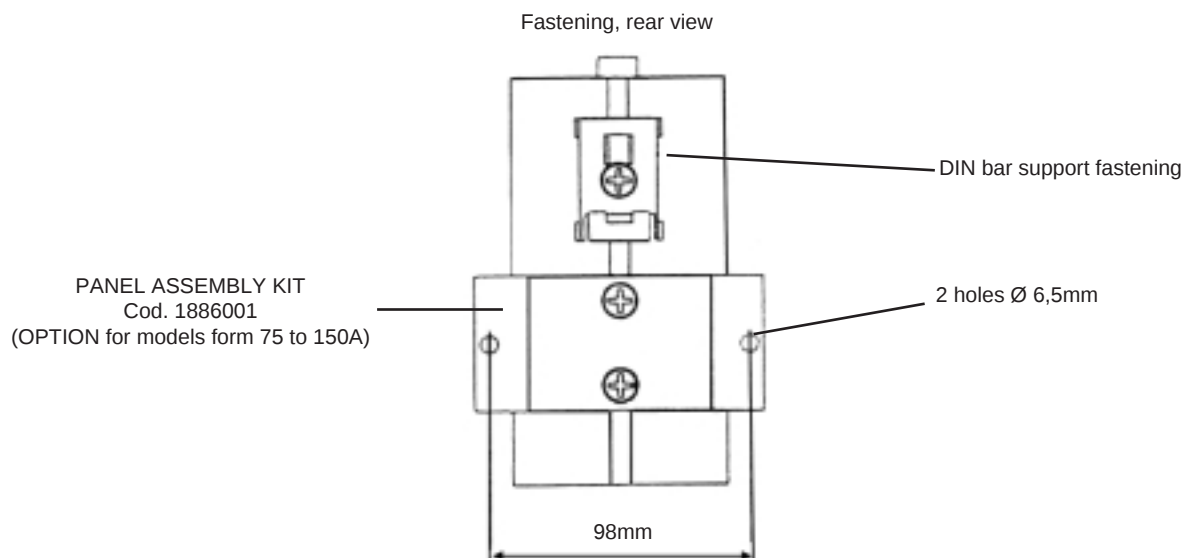
To ensure correct cooling, the minimum horizontal distance to be respected between the power controllers must be of 20mm. Where there is overlapping, assemble the power units in a quincuncial layout and leave sufficient vertical space (approximately 100 mm) to facilitate the connections.



Do not lift or manipulate the power controllers $\geq 250A$ using the protection cap/casing.

• THE DEVICES CAN BE FASTENED:

- normally on a symmetrical DIN bar for instruments $\leq 150A$. For sizes from 75 to 150A it is advisable to assemble a second bar to be used as a support, to prevent the anchorage bar from bending under the unit's weight.
- On the panel, using a fixing plate supplied as an option and available only for models 75A, 100A and 150A. (see figure on page 5).
- On the panel, using 4 fastening screws $\varnothing 6$ mm for models $\geq 250A$ (for the distance between centres refer to figures on pages 3 and 4).



CONNECTIONS

• GENERAL PRECAUTIONS

The power controllers are not sectioning or insulating devices.

In order to guarantee functional safety, it is advisable to:

- install a general power supply switch off system which ensures the insulation between the device and the network.
- Connect the dissipater of the power controllers from 25 to 250 A to earth before carrying out all other connections and before disconnecting it or carrying out any intervention on the unit.



The dissipaters of the power controllers from 400 and 600A are in tension and must not be earthed.

Assemble a protection device suitable for the installation features (automatic switch, fuses, ...)

The ultra rapid fuses usually assembled on models $\geq 250A$ or proposed as an option for models $\leq 150A$ only provide protection for the thyristors of the unit and do not ensure complete protection of the instrument.



The dissipater can reach a high temperature. Any type of contact must be avoided, even accidental, between the dissipater and the electric connection cables.

The installation and wiring must be carried out in full compliance with the standards in force. Special care must be taken to keep the power cables separate from the control cables along their entire length. The control signals connection must be done with shielded cables where the shield is earthed to a single point, preferably on the side of the origin of the signal.



The protection cap for the power controllers $\geq 250A$ absolutely must be assembled before any voltage is applied to them.

• CONNECTION TERMINAL BOARD

The CAGE power terminals of power controllers $\leq 150A$ permit the use of cables without lead-in cables or toothed connectors.

For 25 and 40A power controllers it is possible to connect in input the two phases or one phase and one neutral. In this case the inner crossing connection between input 1 and output 3 is used.

For devices $\geq 250A$, the connection can be made using cables with lead-in cables or with bars.



It is essential to respect the correct locking torque and choose the cable section which is most suitable for the capacity used, in order to avoid dangerous overheating of the unit.

Nominal Capacity in A	Terminals locking capacity in mm ²	Locking torque in Nm
25 - 40	from 1,5 to 16	from 1,2 to 1,4
75 - 100 - 150	from 20 to 70	from 6 to 7
250 - 400 - 600	Cables with ring-type terminals or bars	from 12 to 13

The command and inhibition signal, slave output, thermal safety switch, electronics supply are grouped on a black or grey plug-in connector which allows the use of cables with a cross section $\leq 1.5 \text{ mm}^2$.
 The signals required for the options of DE electronic lock-out, partial breakage of the RPC load, thyristor anomaly and total breakage of the DTC load, and the corresponding alarm output are grouped on the green plug-in connector which accepts cables with a cross section of 1.5 mm^2 .
 The fan of models $\geq 150\text{A}$ is linked to the network 115 o 230V ~ by means of a specific connector.

WATTCOR W211 CONNECTION

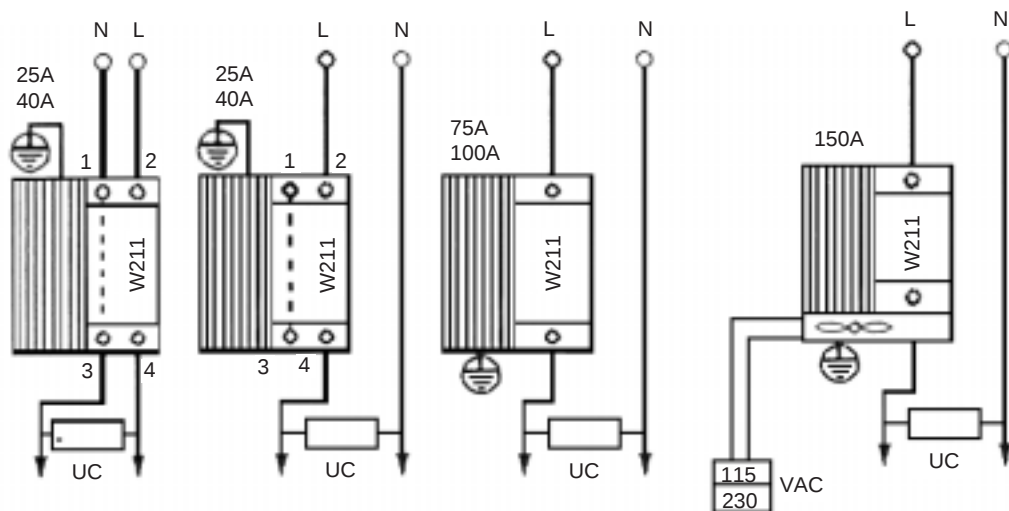


The fan of models $\geq 150\text{A}$ has a terminal board that is independent of the command signals.
 The dissipaters of models from 400 to 600A are under voltage and must never be connected to earth.
 After connection, to guarantee the IP20 protection, assemble the protection cap on models $\geq 250\text{A}$.

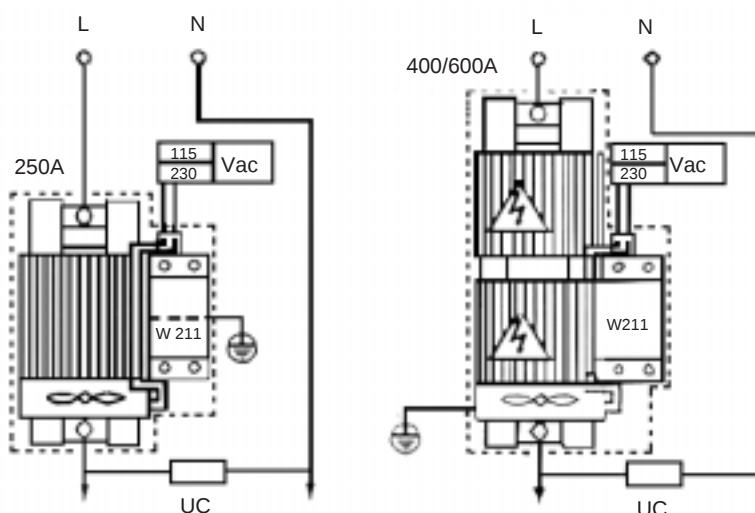
SINGLE-PHASE LOADS CONTROL

• POWER CABLES CONNECTION

Direct internal connection: Input 1 - Output 3

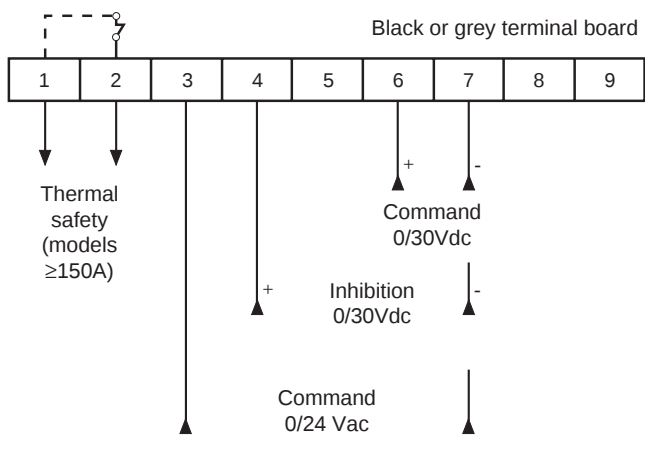


The (UC) load voltage must be connected to terminals 10 and 12 of the green connector when the RPC option is used.

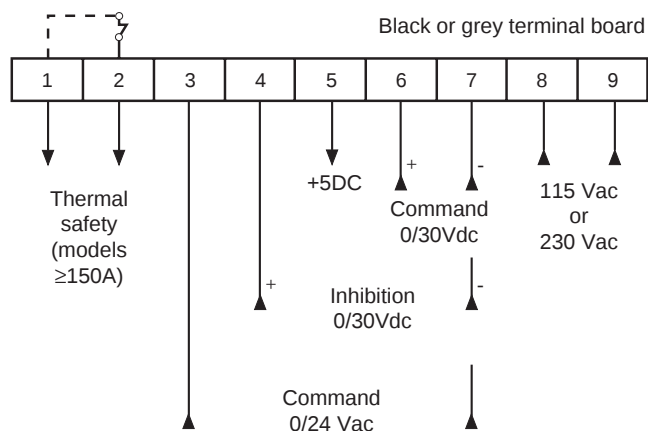


• CONNECTION OF THE CONTROL SIGNALS AND OPTIONS

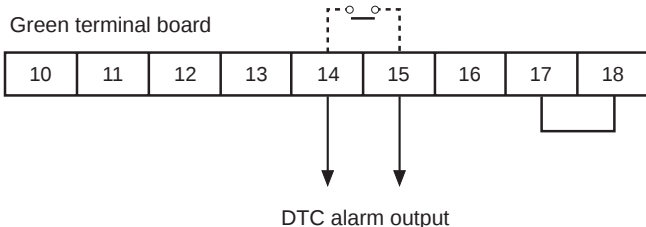
- Power controllers basic version (without options)



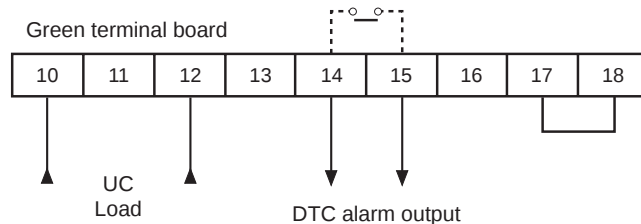
- Power controllers with DE+RPC or DTC option



DTC Option

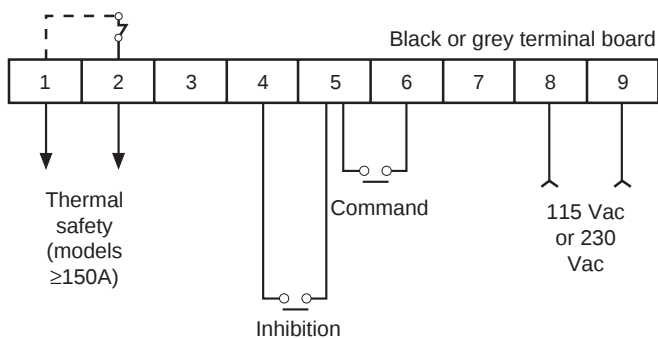


RPC Option

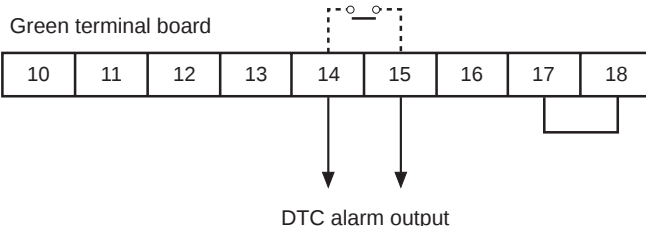


The auxiliary voltage 115 or 230Vac is essential for supplying the circuits of the DTC and RPC options. Its phase is independent of that of the voltage applied to the load.

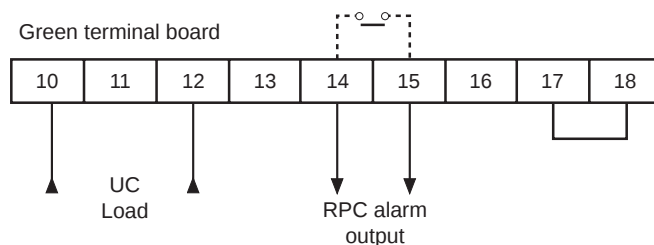
- Power controller with contact command free of potential.



DTC Option



RPC Option

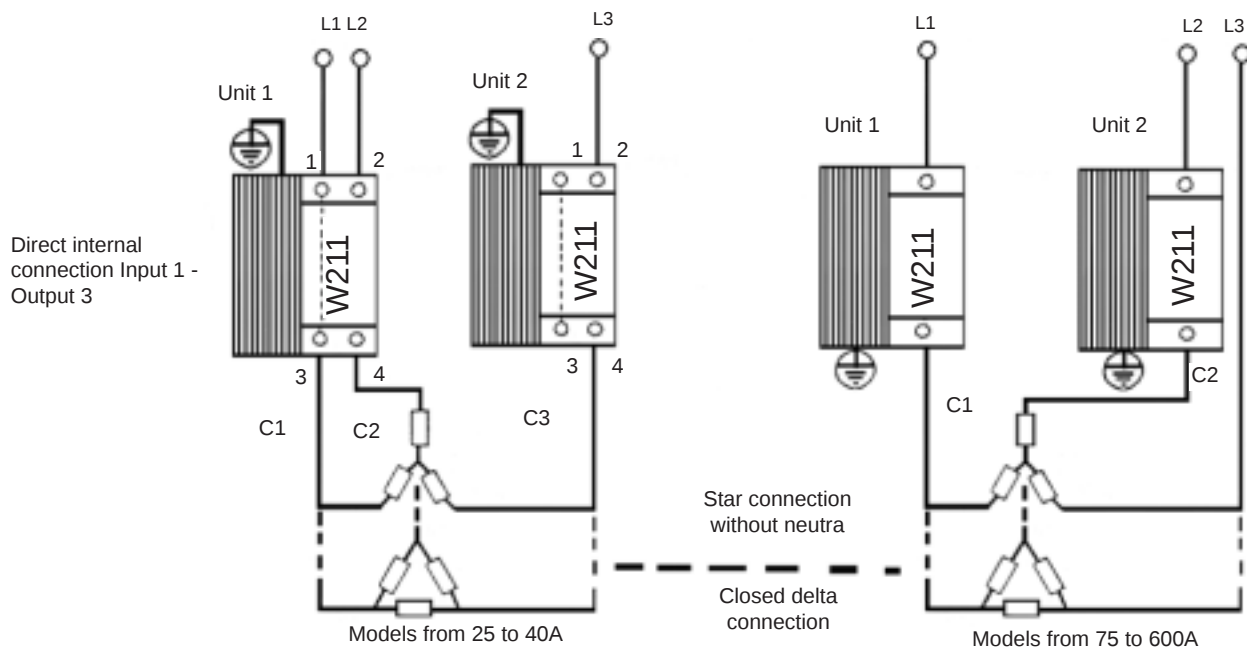


The auxiliary supply (terminals 8 and 9) is essential for using a contact in the function control or inhibition of the unit. The use of a logic signal to control the functioning or inhibition is always possible if the corresponding contact is not used.

TRIPHASE LOAD CONTROL WITH TWO WATTCOR IN LINE

• POWER CABLES CONNECTION

The loads are closed delta or star connected without neutral



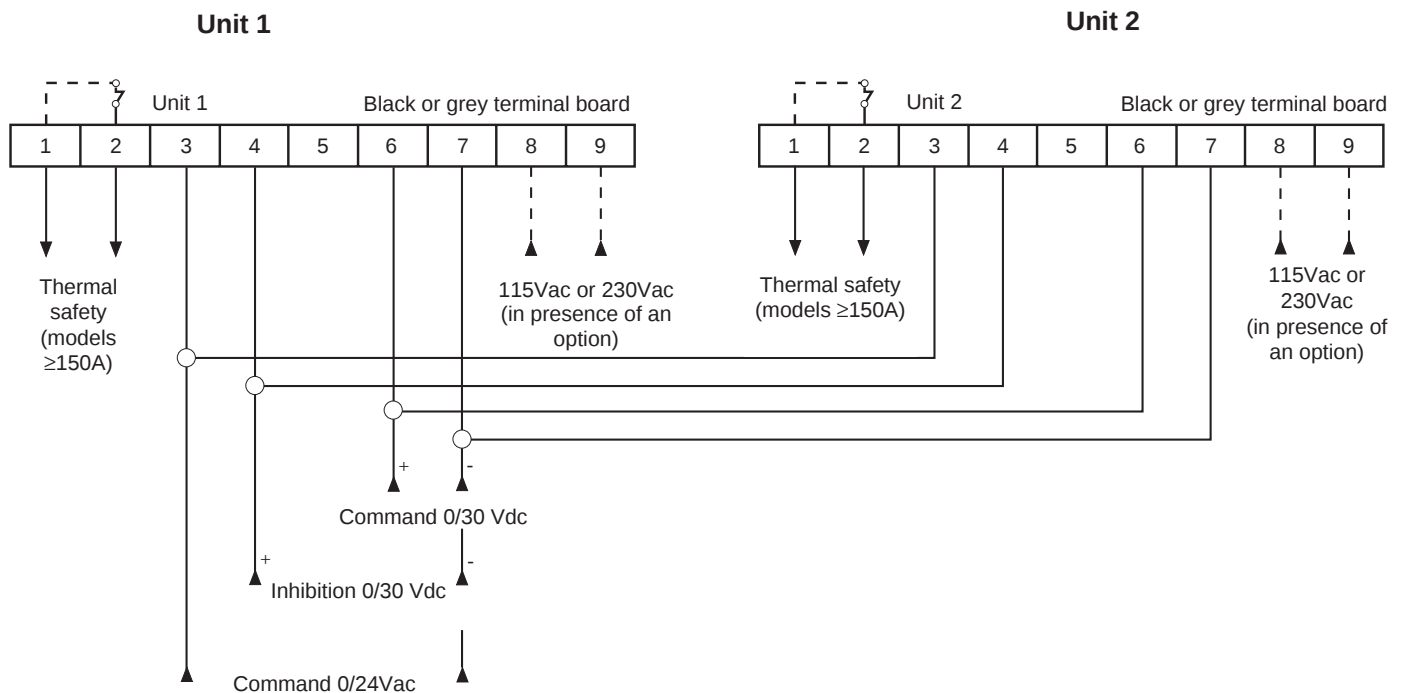
The dissipaters of units from 400 to 600A are not insulated and must not be connected to earth or ground.

If the RPC option is used, connect the voltages of loads UC1 and UC2 to the respective terminals (10-12) on units UC1 between C1-C2, UC2 between C2-L3 or C2-C3.

• CONTROL SIGNALS CONNECTION

The control and inhibition inputs of the two power controllers must be connected in parallel.

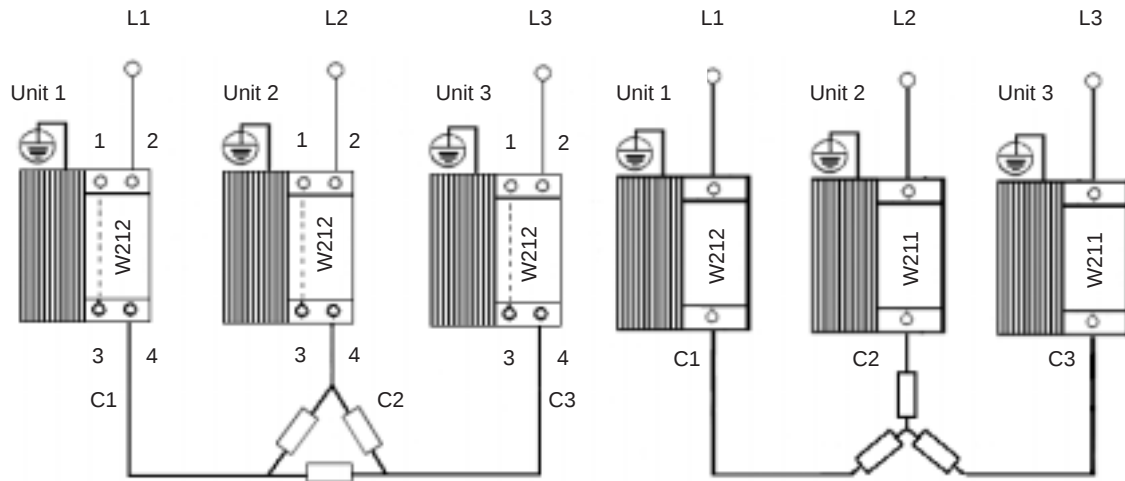
- Command from logic signal 0/30Vdc or 0/24Vac



TRIPHASE LOADS CONTROL WITH THREE WATTCOR IN LINE

• POWER CABLES CONNECTION

The loads are closed delta or star connected without neutral.



Example: closed delta connection
for models 25-40A

Example: star connection without neutral for
models from 75 to 600A

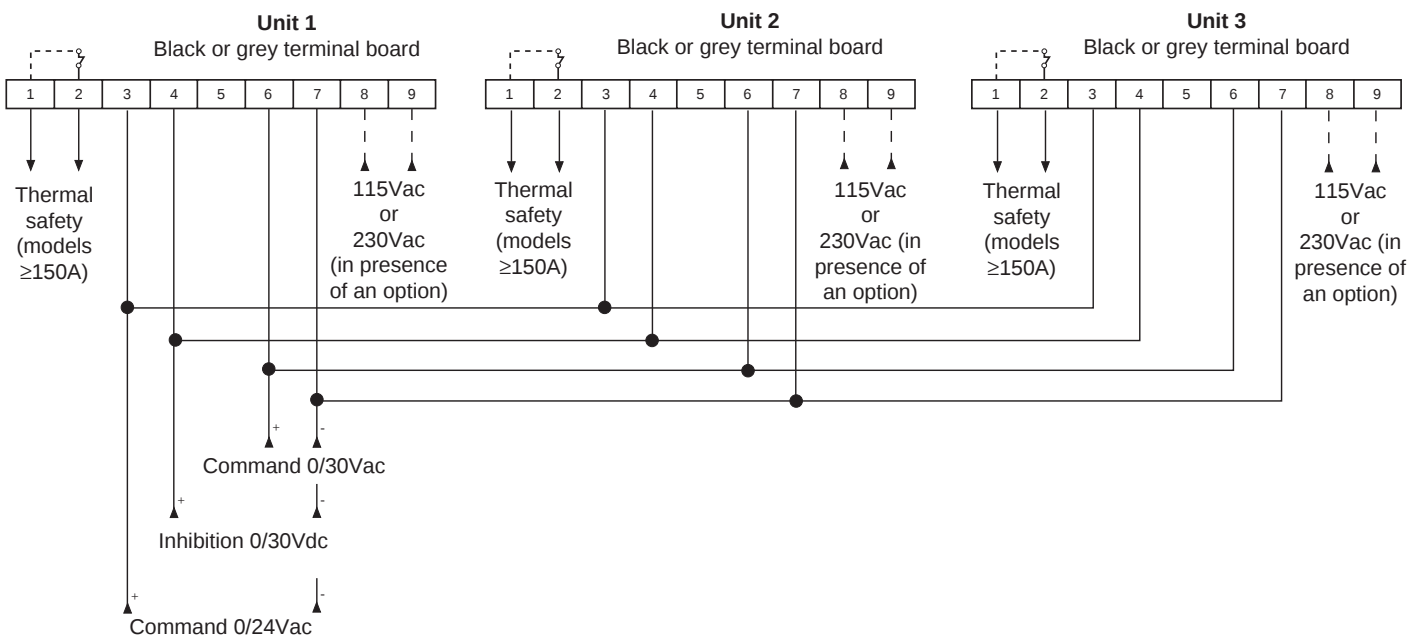
If the RPC option is used, connect the voltage of the loads UC1, UC2 and UC3 to the respective terminals (10-12) on units: UC1 between C1-C2, UC2 between C2-C3, UC3 between C3-C1



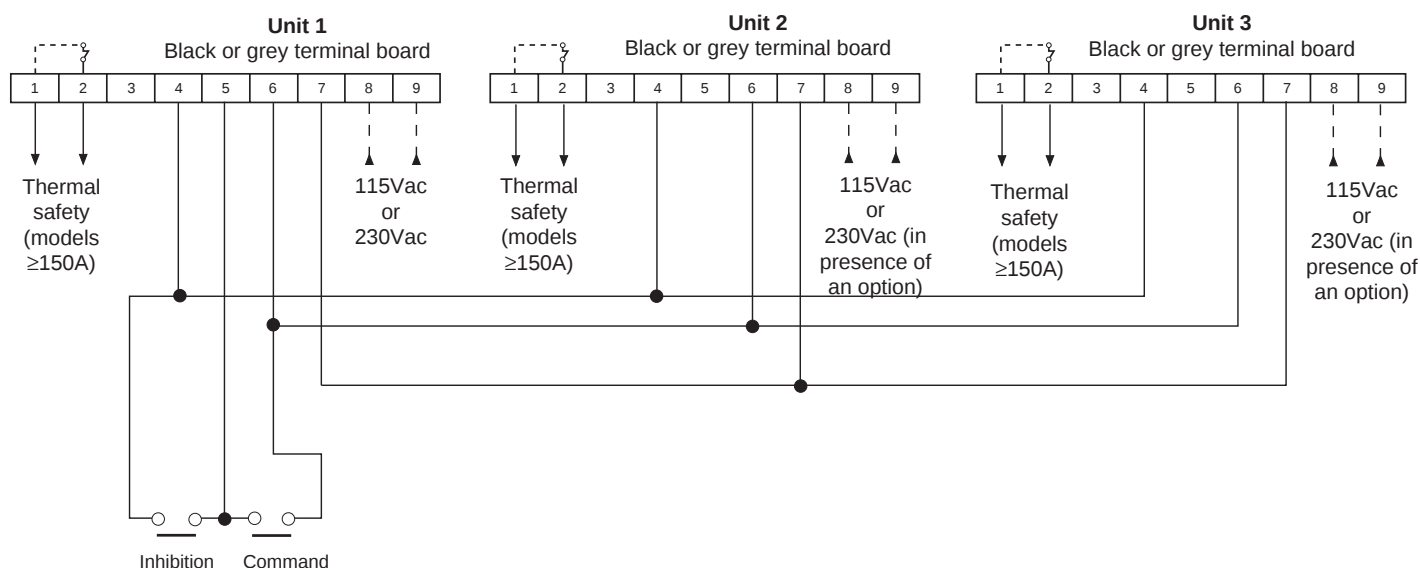
The dissipaters of units 400 and 600A are not insulated and must both be connected to earth or ground.

• CONTROL SIGNALS CONNECTIONS

The command and inhibition inputs of the three power controllers must be connected in parallel.



- Command from contacts free of (without) potential

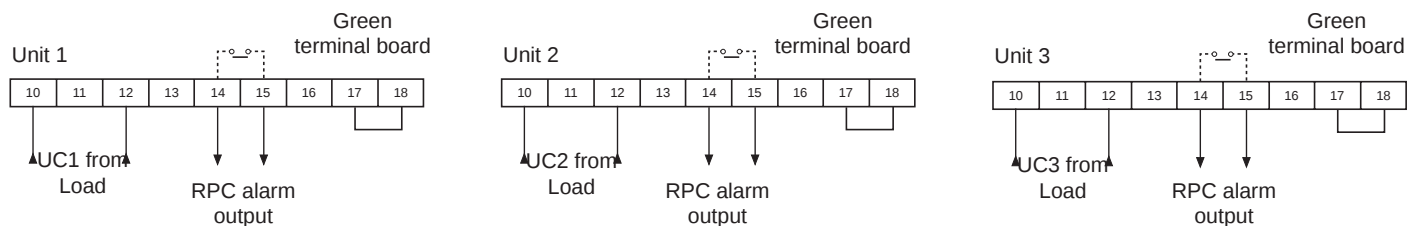


The auxiliary supply (terminals 8 and 9) is essential on unit 1 which generates the +5V which are necessary for the polarisation of the command contacts.

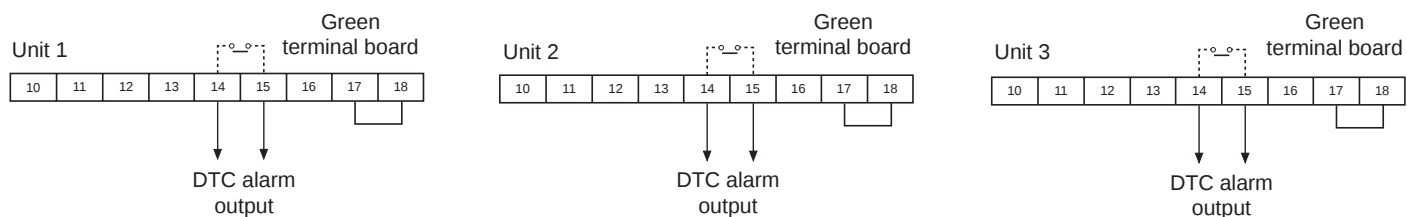
- **RPC, DTC OPTIONS CONNECTIONS**

When an option is present, the supply must be connected on each unit (terminals 8 and 9).

- Partial breakage of the RPC load option



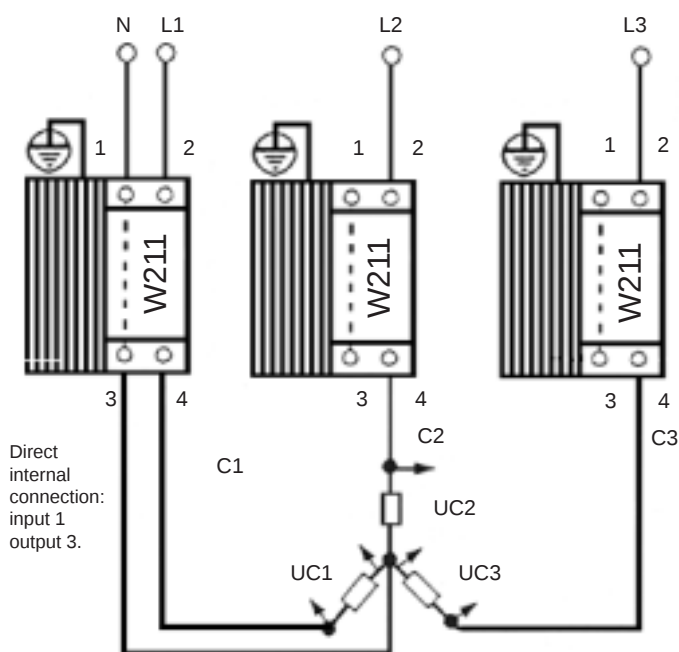
- Thyristor anomaly option - DTC load



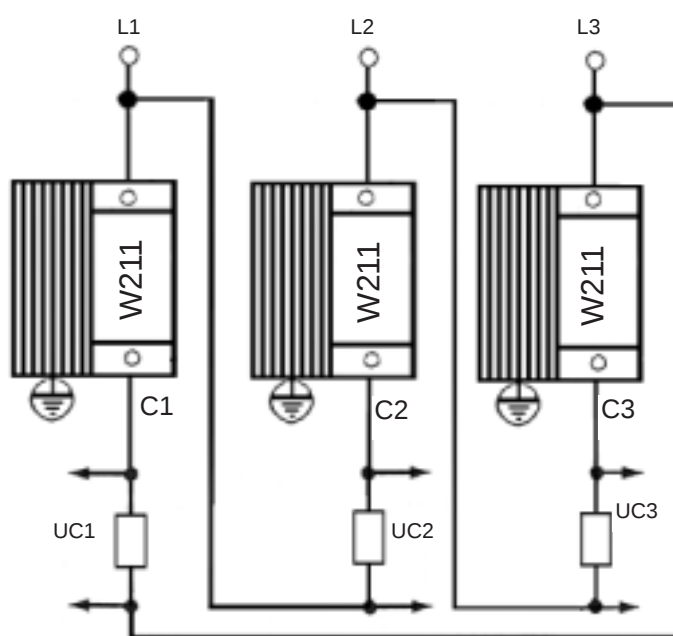
TRIPHASE LOADS CONTROL WITH THREE SINGLE-PHASE FUNCTION WATTCOR.

• POWER CABLES CONNECTION

The loads are open delta or star connected with neutral. Every unit functions in an independent way in single-phase.



Example: star connection with neutral for capacities 25-40A



Example: open delta connection for capacities from 75 to 600A



The dissipaters of units 400 and 600A are not insulated and must not be connected to earth or ground.

The command and inhibition inputs must be connected in parallel in compliance with what is set out in the paragraph for "DE, RPC and DTC options connection".

When the RPC option is used, the voltages of the loads UC1, UC2 and UC3 must be connected to terminals 10 and 12 on the green terminal board of the relative units 1, 2 and 3.

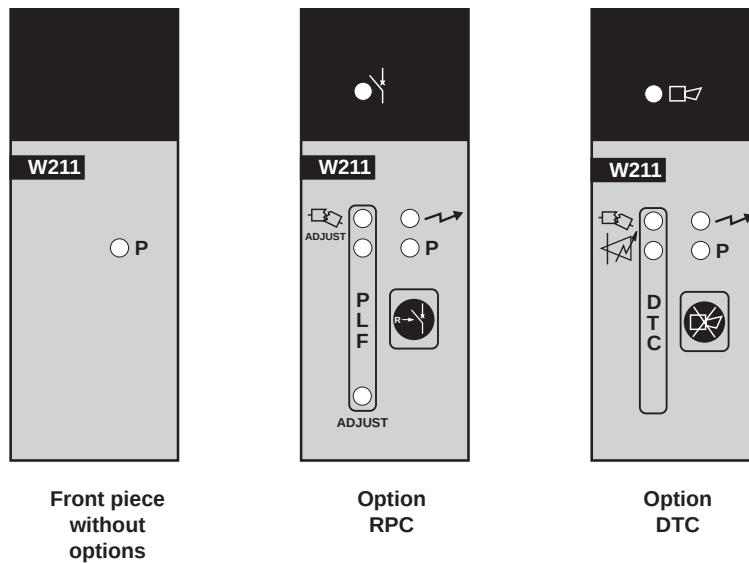
COMMAND SIGNALS

The WATTCOR W211 have two inputs:

- a thyristor conduction/inhibition command input:
 - logic signal (0/30Vdc, 0/24Vac) or contact free of potential.
- An inhibition logic input 0/30Vdc or contact without potential which impose the lock condition of the power controller when the latter is active, even in the presence of the command signal.

SIGNALLING OF “STATUSES”

The front piece makes it possible to identify the WATTCOR model used and the presence or not of the options: DE electronics disjunction/interruption, partial breakage of the RPC load alarm, DTC thyristor or load anomaly.



The green P LED indicates the command status:

- if on: thyristor conduction
- if off: thyristor inhibition.

The green LED on signals the presence of the command electronics supply voltage.

- **Supplementary visualisation linked to the RPC and DTC options.**

The red LED on indicates the detection of a total or partial breakage of the load (DTC and RPC option).

The green **“Adjust”** LED is used for the adjustment by means of the ADJUST trimmer of the intervention threshold of the partial breakage of the load installed (RPC option).

The red LED ~~on~~ signals the short-circuit of the thyristor (DTC option).

The red LED on indicates the functioning of the alarm and its memorisation (DTC option).

The **R** or  button cancels either the memorised alarm triggered for the intervention of the total or partial breakage detection or the alarm of the thyristors short-circuit.

TECHNICAL SPECIFICATIONS

POWER LINE VOLTAGES

MODEL	NOMINAL VOLTAGE		RANGE OF USE (Veff)		
			Minimum	Standard	Maximum
W211	660Vac	With RPC option	90	-	440
		Without RPC option	20	660	725
	NETWORK FREQUENCY - Hz		47	50	63

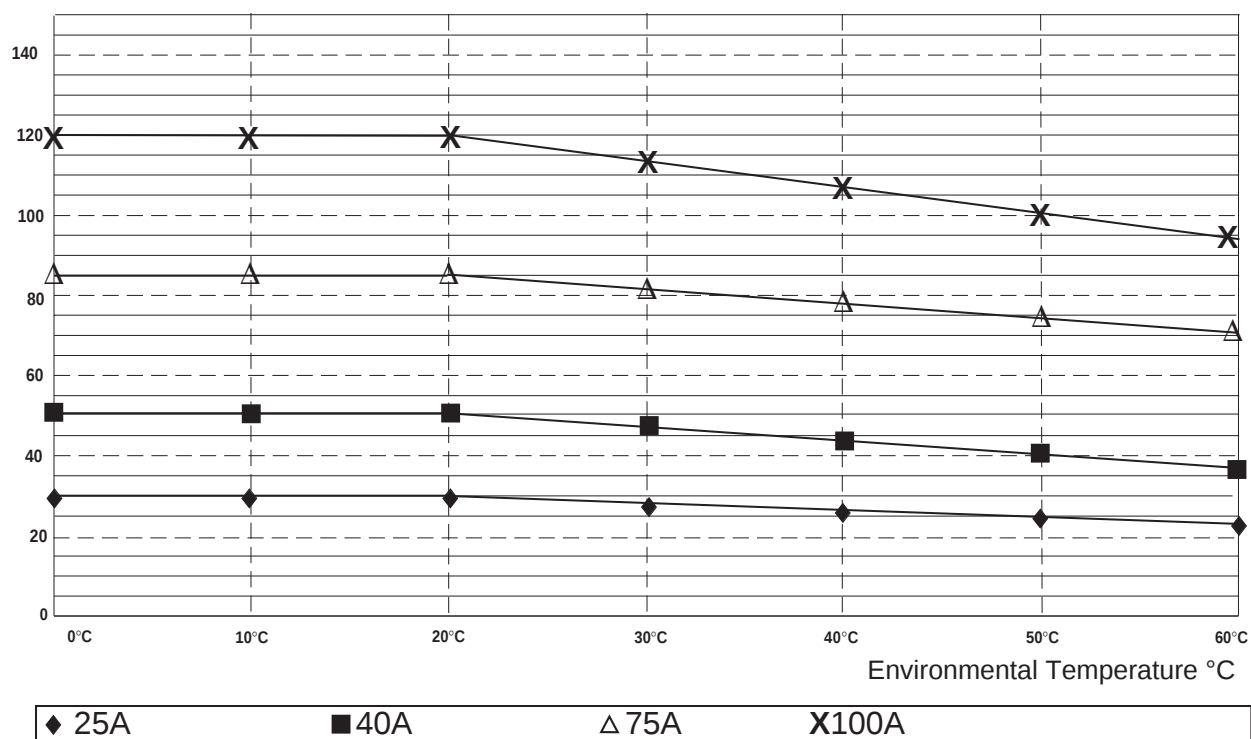
CONTROLLED NOMINAL INTENSITY

The capacities are specified at a environment temperature of 50°C. Typical dissipation: 1.2 Watt per ampère

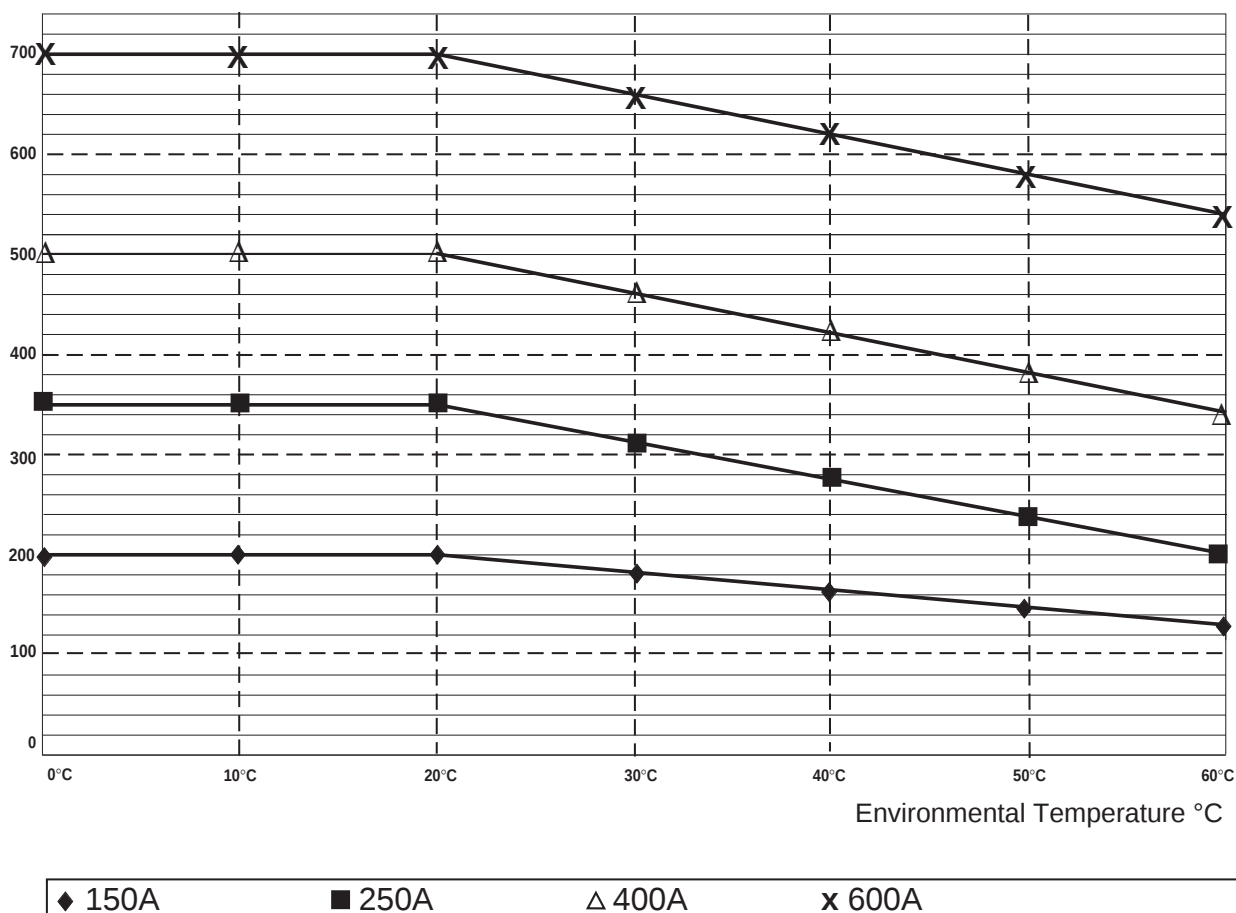
Model	I minimum Ampère	I maximum with Environment Temp. 20°C Ampère	I maximum with Environment Temp. 50°C Ampère	I ² t at 10ms A²S	Dissipation at I nominal Watt
25A	1	30	25	1800	30
40A	2	50	40	11200	50
75A	2	85	75	14450	90
100A	3	120	100	151000	120
150A	3	200	150	151000	180
250A	5	350	250	200000	300
400A	5	500	400	1125000	480
600A	5	700	600	1125000	720

VARIATION OF THE CONTROLLED EFFECTIVE CURRENT IN RELATION TO THE ENVIRONMENTAL TEMPERATURE

Ampère



Ampère



CONTROL SIGNALS

Model	Signal		Value in V			Absorbed current (mA)		Input impedance (K Ω)
	type	level	Minimum	Nominal	Maximum	Value	Condition	
W211	Logic command 0/30Vdc	0 (not active)	0		1			1 a 5Vd.c. ↕ 2,5 a 30Vd.c.
		1 (active)	4	5	30	5 6,6 12	a 5Vd.c. a 10Vd.c. a 30Vd.c.	
	Logic command 0/24Vac	0 (not active)	0		5			1,5
		1 (active)	15	24	32	9 15 20	a 15Va.c. a 24Va.c. a 32Va.c.	
	Inhibition logic command 0/30Vdc	0 (not active)	0		1			15
		1 (active)	3	5	30	0,3	a 5Vd.c.	

AUXILIARY POWER SUPPLIES

For the command electronics of the WATTCOR W211

- 115 or 230V, 50/60HZ, 5VA
- Independent phase from that of the voltage applied to the load.

For fan with capacities $\geq 150A$:

- 115 or 230V, 50/60Hz, 35 VA

OPERATIVE CONDITIONS

- Function temperature : -5...+60°C
- Storage temperature : -20...+70°C
- Relative humidity : from 10...90% without condensation
- Non dusty, non explosive, non corrosive atmosphere.

SAFETY

- Insulation voltage of 3750Vac between the command electronics and the controlled power.
- Internal protection from excess voltage and dV/dt by means of varistors and RC systems.
- Insulated dissipater with the exception of models with capacity 400 and 600A.
- Thermal switch for capacities $\geq 150A$: opening of the contact at 100°C, closing hysteresis 35°C.
- IP20 degree of protection (with cap installed for devices with capacity $\geq 250A$).
- Self-extinguishing casing UL 94 VO.



The instrument is in conformity with European Union Directive 89/336/EEC and 73/23/EEC with reference to the general regulations: **EN 50082-2** (immunity in industrial environment) **EN 50081-1** (emissions in residential environment) **CEI EN 60947-4-2** and subsequent modifications.

OPTIONS AND ACCESSORIES

ULTRA RAPID FUSES and FUSES CAPACITY

The power controllers 250-400 and 600A are usually supplied with an ultra rapid fuse to protect the thyristors.

As standard, a microswitch is available controlling the status of the fuse.

The groups from 25 to 150 A do not have an integrated fuse. The latter and its disconnecting switch fuse holder are proposed as accessories to be specified when the order is made (see table).



The ultra rapid fuses are exclusively intended for the protection of the thyristors of the WATTCOR. In no case should these replace the device line protections. In order for the manufacturer's guarantee to be valid, it is obligatory to use the fuses indicated below for each type of WATTCOR. Where the load generates significant transitory excess currents (short wave infrared elements), it is necessary to consult us.

FUSEHOLDER FASTENING

- On symmetrical DIN bar for PF 22x58 (WATTCOR 25-40 and 75A).
- On panel by means of two screws diam. 6 mm with horizontal space between centres of 19mm for PF 27x60 (WATTCOR 100 and 150A).

FUSES AND FUSEHOLDERS CODES

Model	I _t Max. recommended for the fuse	Ultra Rapid Fuse Manufacturer/ Model mm		Fuse order number Code	Fuse holder order number Code Dimensions
W211/25A-660V	1800	22x58	50A FWP50A22F Bussmann	FUS-050	PF-22x58 H139 x L36 x P86
W211/40A-660V	11200	22x58	63A FWP63A22F Bussmann	FUS-063	PF-22x58 H139 x L36 x P86
W211/75A-660V	14450	22x58	100A FWP100A22F Bussmann	FUS-100	PF-22x58 H139 x L36 x P86
W211/100A-660V	151000	27x60	250A TO76308 Ferraz	FUS-250	PF-27x60 H139 x L39 x P107
W211/150A-660V	151000	27x60	250A TO76308 Ferraz	FUS-250	PF-27x60 H139 x L39 x P107
W211/250A-660V	200000	//	450A S300005 Ferraz	FUS-450N	Assembly inside W211
W211/400A-660V	1125000	//	630A W300008 Ferraz	FUS-630N	Assembly inside W211
W211/600A-660V	1125000	//	900A Q300072 Ferraz	FUS-900N	Assembly inside W211
Fuse microcontact for versions: W211/400A W211/600A			X31 0014 MS3V1.5 Ferraz	SW-FUS	

THE RPC LOAD PARTIAL BREAKAGE ALARM OPTION

This device makes it possible to control the increase of impedance of the load due, for example, to breakage of a heating element among many assembled in parallel.

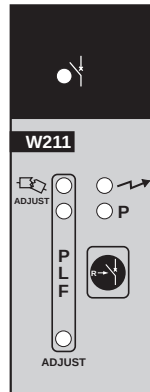
This option is available on all capacities from 25 to 600 A.

FEATURES

Breakage measurement sensitivity of identical elements linked in parallel:

- Single-phase and triphase open delta or star connection with neutral (functioning of the three power controllers in monophasic): **1 broken element out of 6.**
- Delta triphase connection with biphasic or triphase control in line: **1 broken element out of 3.**
- Star triphase connection without neutral with control on each phase: **1 broken element out of 3** (if the central points are connected) **1 broken element out of 5** (if the central points are not connected).

In the biphasic control: **no measurement/alarm on direct phase.**



W211
DE - RPC
Option

- Functioning range
- from 30 to 100% of the instrument's nominal current
- from 100 to 400V $\pm 10\%$. (The voltage must be specified when the order is made).
- Minimum functioning time required for the alarm: 400 ms.
- Response time: 1s for 100% of control.
- Alarm output: relay with contact in closure, common with option DE: 5A -250 Vac.

Adjustment on site

The measurer must be adjusted on the spot to adapt the threshold to the real installation features (current and voltage on load). To guarantee functioning, the current must be greater than or equal to $\geq 30\%$ of the nominal capacity of the instrument.

Adjustment sequence:

- short circuit terminals 17 and 18 of the green terminal board.
- Position the ADJUST trimmer in an anticlockwise direction up to mechanical end stroke.
- Supply the power controller and loads
- Enable the command logic signal
- The green ADJUST LED is on.
- Slowly rotate the ADJUST trimmer in a clockwise direction until the green ADJUST LED goes off.
- Repeat the operation a number of times around the point when the green ADJUST LED goes off to adjust as well as possible the measurement/alarm threshold.



Where there is a sudden alarm during the sequence, press the reset key "R". After adjustment, during normal employment of the instrument, the green ADJUST LED can light up without any influence on functioning. It is possible to put it out of service eliminating the short circuit between terminals 17 and 18 of the green connector.

Functioning sequence

When the impedance of the load increases by more than 17% in relation to that existing at the moment of adjustment:

- the red LED  lights up.
 - the alarm RELAY is active: closure of contact of the relay available for signalling.
- These conditions are memorised thereby making it possible to signal even random defects.

After remedying the cause of alarm, it is possible to reset it:

- using the "R" button
- interrupting the electronics auxiliary power supply.

(DTC) LOAD OR THYRISTORS ANOMALIES OPTION

This device makes it possible to detect:

- the short-circuit of the thyristors: current crossing in the load in the absence of the command signal.
 - total breakage of the power circuit; absence of current in the load notwithstanding the presence of the command signal (total breakage of the load, fuse or thyristor broken, absence of voltage on the load power supply line).
- The DTC option on WATTCOR W211 is operative on all capacities of current from 25 to 600A.

FEATURES

Operative range:

- From 20 to 100% of the nominal current capacity of the unit whatever the voltage applied to the load.
- The power circuit breakage alarm is produced for intensities equal to 20% of the nominal current.

Response time:

- 200ms to measure the thyristors short-circuit.
- 1s to measure the absence of current in the load

Alarm outputs:

- Relay with contact normally open from 5A -250V AC

Operative sequence

- Conduction of the thyristors in absence of the command signal: the red LED  lights up.
- Breakage of power circuit: absence of current in the load and presence of the command signal: the red LED  lights up.

In the two cases:

- the alarm relay is excited: closure of the contact available for signalling
- the red LED  lights up.

These two last actions are memorised.

After remedying the cause of the alarm (LED red  or  off), the alarm can be reset:

- using the key 
- removing auxiliary power supply of the electronics

During the load interruption measurement function it is possible to inhibit the alarm Relay output removing the connection between terminals 17 and 18 of the green terminal board. Where there is a defect, only the red LED  will light up, the alarm relay will remain inactive and the red LED  off.

W211
Opzione
DTC

