



## Other features

- **Output power:** 2.5 kVA, 5kVA, 7.5kVA, 10kVA, 15kVA, 20kVA.
- **Three-phase power supply voltage:** 400VAC +10% -5% (FAA). The regulators are designed to work with the input voltage down up to -10% providing IEC performances.
- **Frequency:** 50 Hz  $\pm$  7.5%.
- **Maximum output current to the series circuit:** 6.6A, adjustable through step from 1.8A. The output current values are accurately regulated within the limits stated by the Specs, considering the following operating conditions which can be happened contemporary too:
  - \* any load from short circuit to full rated load
  - \* any input voltage within -5% (-10% for IEC) + 10 % of the rated input voltage, at the rated frequency;
  - \* any of the hereabove described environmental conditions
  - \* maximum 30% of the secondary windings of the isolating transformers open-circuited, considering a rated load not less than 50% of the rated one.
- **Efficiency :** not less than 0.90, with rated input voltage, at the maximum output setting (6.6A), with rated resistive load. Average efficiency exceeding IEC requirements.
- **Power factor :** not less than 0.97, with rated input voltage, at the maximum output setting (6.6A), with rated resistive load. Power factor exceeding IEC requirements.
- **Input current harmonic conten:** less than 30%.
- **Output current harmonic content:** less than al 3% at any load condition.
- **Remote control voltage:** 48 VDC, internal.
- **Protection degree:** IP 20.

## EQUIPMENT DESCRIPTION

The unit is assembled into a metal box consisting of a structural frame, a front panel, a rear panel, both of them screwed to the frame, and one front crate mounting all the CCR control/monitoring withdrawable PCBs. The front and rear panels can be removed, by unscrewing the relevant fixing screws, for complete inspection of the inside components.

The CCR is equipped with a main circuit breaker, rated according to the its power, to protect the power supply line and to surely cut out the power supply to the regulator.

The PCBs support keyboards, displays and signalling leds.

The finishing is made by phospatating and baked electrostatic epoxy powder coating, colour RAL 7032.

The assembly is equipped with four lifting eyebolts. The lower side of the unit is suitably shaped, to allow the handling by means of a fork truck too.

The cable entrance is provided through the bottom of the unit.

One grounding bolt, complete with washers and nuts, is outside provided in the right rear side of the unit (close to the bottom). Inside the unit (always in the rear side, close to the bottom) a grounding bar allows the grounding of all the unit metallic parts through screws, washers and nuts.

The identification label, including electrical and manufacturing data and standard conformity, are mounted on the front side of the regulator.

Warning labels are placed outside and inside the unit.

### **Dimensions, the same of the single-phase regulators:**

(CCRs up to 15 kVA): 475 mm wide, 750 mm deep, 1530 mm high. (CCRs 20 ÷ 30 kVA): 600 mm wide, 900 mm deep, 1630 mm high.

## THEORY OF OPERATION

(1) Input circuit: consists of an input filter for EMC compatibility and a four-pole main circuit breaker.

(2) Precharging circuit: it allows to charge the input power capacitors of the DC filter (see block n. 4) by a controlled current, limited by resistors. Once the capacitors are fully charged, the resistors are short-circuited by the contacts of the main contactor.

(3) AC/DC rectifier bridge: it rectifies the input voltage to provide a direct current voltage of approx 500 VDC by using uncontrolled diodes.

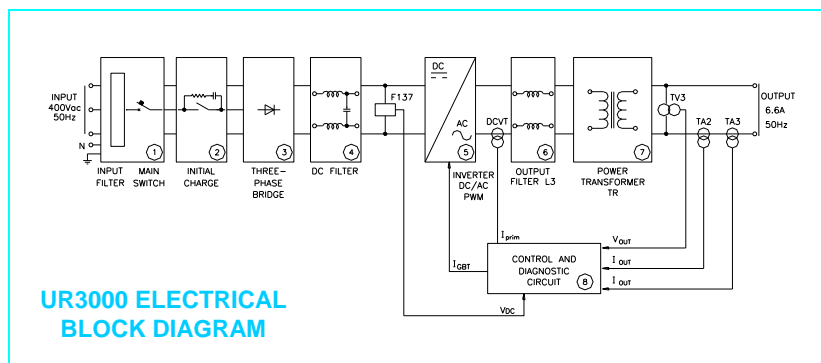
(4) DC filter: it includes an inductance and an electrolytic capacitor bank with discharge resistances, to filter the rectified voltage; at the output of this block we have a filtered DC voltage of approx 500 V.

(5) PWM (Pulse Wave Modulation) DC/AC inverter: it consists of an IGBT bridge with measuring sensors. The width of the pulse is modulated to follow the theoretical 50 Hz sinewave, as fixed by the control system (set point). The frequency of the carrier pulse is 12 kHz and the modulating sinewave has a frequency of 50 Hz..

(6) Output filter: it consists of an inductance, which filters the 12 kHz frequency of the carrier and practically allows the passage of the 50 Hz basic harmonic only.

(7) Power transformer: increases the output voltage and isolates the constant current regulator from the series circuit.

(8) Control and diagnostic circuit: this circuit, based on DSP technology, constantly monitors the input voltage and current, the output current of the power module, the load voltage and current, to grant the correct operation of the unit. The internal loop assures the maximum bandwidth to provide a very fast response to any instantaneous changes at the CCR output (from full load to short circuit conditions).



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