4Q POWER AMPLIFIERS
AC - DC - THREE-PHASE - 3x750VA

APPLICATIONS

- AC network simulation
- Avionic or industrial networks
- AC motor simulation
- Harmonics simulation

PERFORMANCES

- Three insulated outputs:
  - From mains
  - From analog inputs
  - Common Neutral pin
- Generation and absorption AC
- Fast transients < 20 µs
- Quadrant changes without transition
- High inrush current facilities (4 x I_n)
- Wide bandwidth 25 kHz at -3dB
- Very low distortion < 0.3%
- Very low output impedance
- Low noise S/B > 70 dB
- High accuracy < 0.2%
- High stability < 0.1%
- Installed in a rack with safety management, On-Off buttons et Emergency Stop

DESCRIPTION

PA-3x750 is a real “4 quadrants” power amplifiers, three-phase, operating in voltage regulation:

- For each output, the analog input receives a “pilot” signal whose amplitude is 0~±10 V (7.07 VRMS) peak, coming from internal synthetizer or from an external synthetizer,
- Gain of amplifier is elected using a rotational switch on front panel,
- A 10-turn potentiometer allows to adjust and lock the gain of each phase,
- Two analog outputs per power output, and insulated from power output, return images of voltage and current with amplitude 0~±10 V peak.

The linear technology used for these amplifiers allows:

- To provide power peaks up to 4 times its nominal power during 20 ms,
- An easy integration for “Real-Time” or “Power Hardware In the Loop” applications with simulators,
- An instantaneous quadrant changes from operation as generator, power factor +1, to operation as a load, power factor -1.

Entirely self-sufficient with their internal regulation board, switches and potentiometers allow to select the gain (same gain for the three phases) and to adjust it manually (one potentiometer for each phase).

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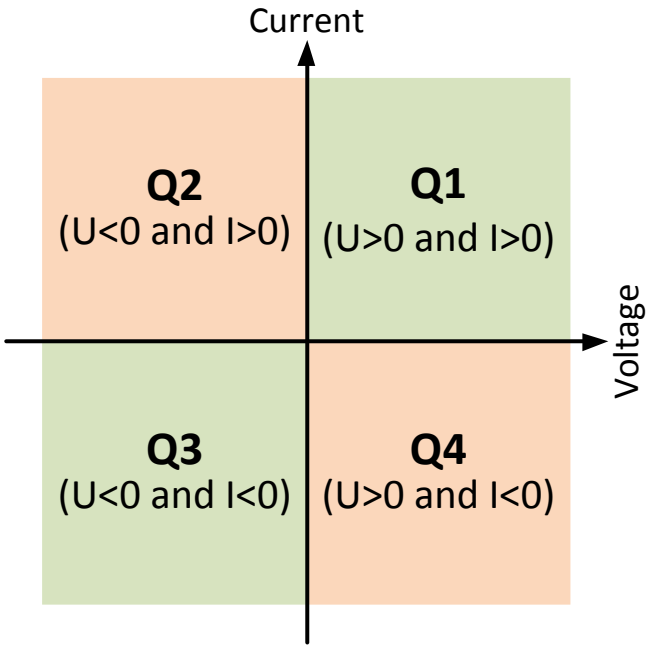
PERMANENT OPERATING AREAS

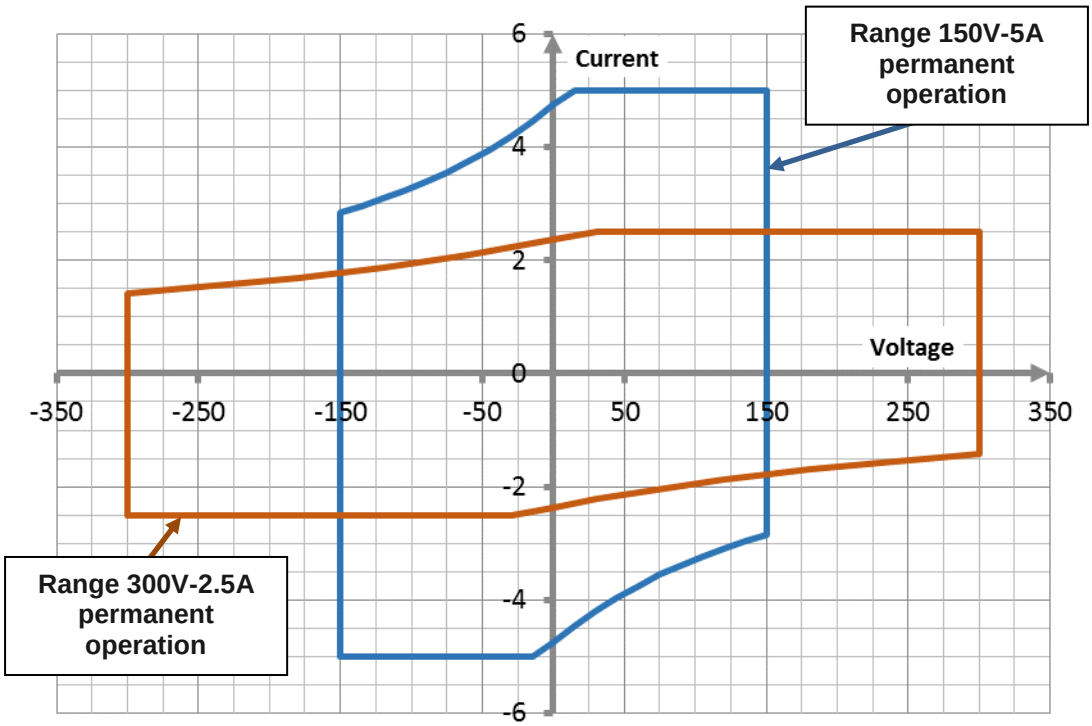
Following diagrams explain the relationship between the current and the voltage in the different quadrants, for each phase, in AC and then in DC. X-axis explain the voltage, Y-axis explain the current.

Continuous operation is allowed “insides areas” curves. Limitations are due to the heating of the power transistors. Operation “outside areas” will result in:

- An immediate switch-off by over-current protection if current is above the limits,
- A break after a delay by thermal protection in case of overheating of the power parts.



When amplifier is working as an absorber in AC, permanent current is around 50% of rated current of selected range.



FEATURES OF THE AMPLIFIERS

OUTPUTS: POWER			
Power			
Outputs	3 phases (independent)		
Rated power	750 VA per phase		
Peak power	2 times rated current during 50 ms		
Regulation	Voltage regulation		
Number of ranges (1)	2		
Output ranges	150 V		300 V
Selectable gain	10.5	21	42
Voltage Ph-N (VRMS)	75 V / 5A	150 V / 5 A	300 V / 2.5 A
Current per phase (ARMS)	5 A	5 A	2.5 A
Gain adjustment by trimmers on front panel for each phase			
Typical	10.5 ± 1	21 ± 1	42 ± 2
Voltage linearity			
Typical	0,1%		
Voltage distortion at full power			
Typical	< 0.2%		
Max	< 0.5%		
Voltage regulation for a mains variation of +6% -10%			
Max	< 0.1% of rated voltage		
Voltage regulation for a variation of 0 to 100% of the output current			
Max	< 0.1% of rated voltage		
Noise			
Max RMS	0.02% of rated voltage		
Max peak to peak	0.3% of rated voltage		
Variation regarding temperature			
Typical	50 ppm/°C		
Max	100 ppm/°C		
Stability after 15 minutes of operation			
Max	< 0.05% of rated voltage		
Insulation of output versus case ground			
Measured at 500 VDC	> 100 MΩ		

Notes:

(1) Same ranges for the three phases

OUTPUTS: TIME AND FREQUENCY	
Bandwidth	
Full scale	DC and 40 to 3500 Hz
Small signals at -3 dB	25 kHz
Variation time of full scale using a square pilot signal	
Rise time 10% / 90%	< 10 µs
Fall time 10% / 90%	< 10 µs
Transfer time	< 15 µs
Transition from Q1 to Q4	< 10µs

OUTPUTS: IMAGES AND MEASURES	
Images outputs (2)	
Voltage image	1 VRMS / 44.44 ARMS (6.75 VRMS for 300 VRMS on output)
Current image	1 VRMS / 1 ARMS (5 VRMS for 5 ARMS on output)

Notes:

(2) Analog outputs “Image” are insulated from power outputs.

INPUTS: AMPLITUDE AND FREQUENCY	
Input signal amplitude (external generator)	
Insulation (3)	> 10 MΩ
Voltage (full output scale)	7,07 VRMS / ± 10V peak
Max voltage	± 15 V peak
Input impedance	10 kΩ
Input signal frequency	
Fundamental	DC to 3500 Hz
Harmonics (small signals)	Max 50 kHz

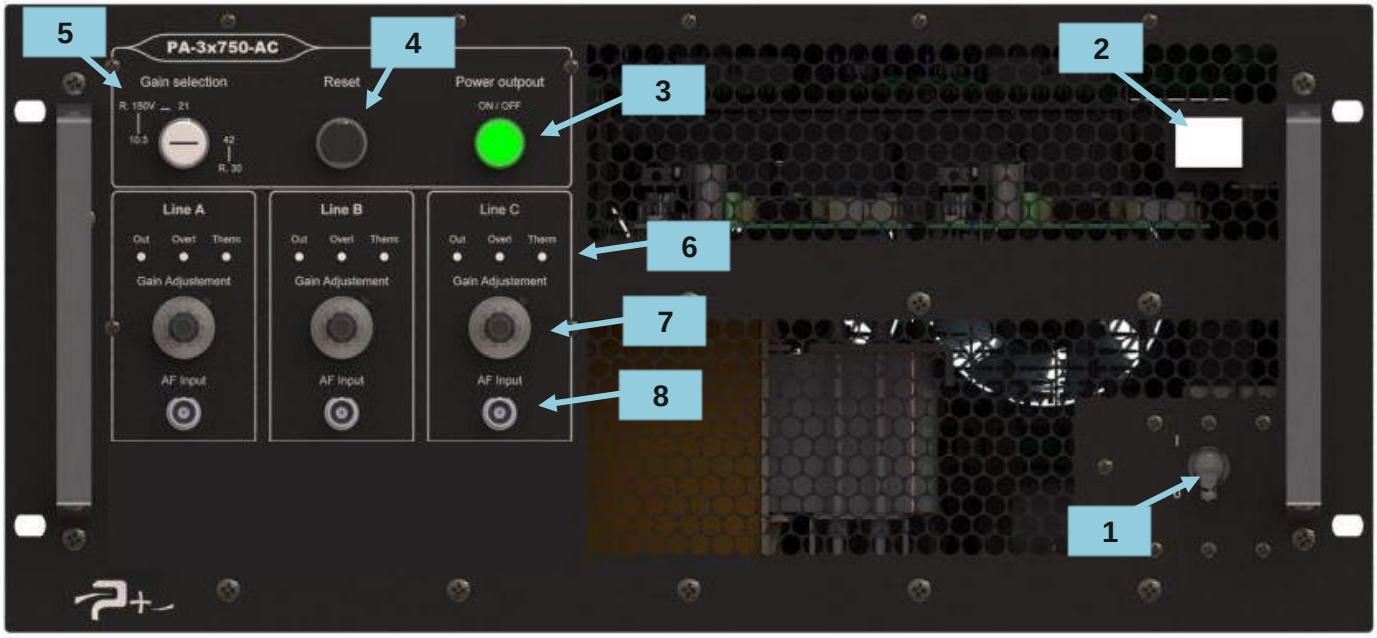
Notes:

(3) “Pilot” analog inputs are insulated from power outputs.

MAINS POWER SUPPLY	
Mains network	
Number of phases	One-Phase + Neutral + Earth
Voltage	230 VRMS ±10%
Frequency	47 - 63 Hz
Input current	
Max at full output power	20 ARMS
Protection	Magneto-thermal breaker
Inrush current	Limited to 2 x max current
Dielectric strength mains input versus outputs connected to case ground	
Measured at 2500 VRMS / 50Hz	Current < 10 mA

MECANICAL AND ENVIRONMENTAL	
Material and surface treatment	
Front panel	Aluminum painted RAL7021
Rear panel	Aluminum anodized black
Dimensions and weight	
Width	600 mm (19 inches)
Depth	800 mm
Height	222 mm (5U)
Total weight	60 kg
Temperature and humidity	
Stockage temperature	-10°C à +85°C
Operation temperature	+0°C à +40°C
Humidity	10% - 90% non-condensing
Noise (fans at full speed)	
Measured at 1 m	< 70 dBA
Marking	
Marking	CE
Protection	IP20

FRONT PANEL



Common tools:

1	This breaker switches power ON or OFF for this amplifier.
2	This white light is ON when mains is ON.
3	This green light is ON when output power is ON.
4	In case of overcurrent or thermal fault, output is switched OFF. This button allows to reset fault and restart outputs.
5	This rotative knob allows range and gain selection: 150V-10.5, 150V-21 or 300V-42.

For each phase: A, B or C

6	Three LED: ➢ Out: green means output is ON, off means output is OFF ➢ OverI (Overcurrent): off means no overcurrent, red means overcurrent detected ➢ Therm (Thermal fault): green means OK, red means thermal fault occured
7	10-turn gain adjustment potentiometer with a mechanical lock
8	AF input using an insulated BNC socket

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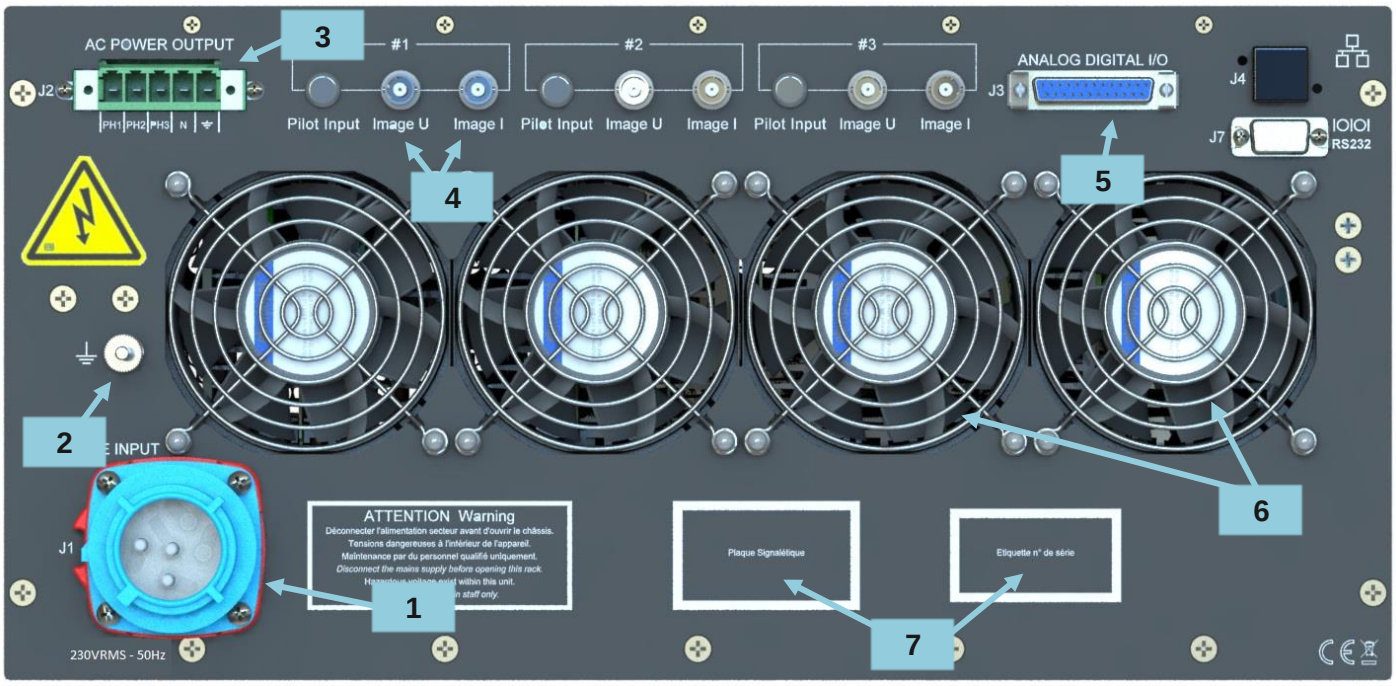
REAR PANEL



1	Mains socket MARECHAL Phase + Neutral + Earth.
2	Case ground connection.
3	Power output: Phase1 + Phase2 + Phase3 + Neutral + Earth (Neutral of each output are connected together inside the rack.
4	Images of Voltage and Current outputs (±10V peak) for closed loop systems.
5	Ausiliary connector: a link between pins 1 and 2 must be established to allow power output (inhibition input).
6	Four fans with variable speed in accordance with heath to evacuate.
7	Identification labels: reference, serial number, dimensions, weight…

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PROTECTIONS

Against overload: current limitation

Amplifiers in linear technology can generate up to four times their rated power during short time. They are using voltage regulation with current limitation: if current is higher than programmed value, a timer starts. At the end of a programmable time between 0.1 and 5 seconds, output voltage decreases to limit current to the programmed value.

Against short-circuit on output: automatic output switch-off

Output is switched off on all phases et must be reactivated using touchscreen or an external command.

Against overtemperature: automatic output switch-off

A temperature sensor is installed on each power part. It switches off outputs of the three phases in case of overheating. After cooling, output must be reactivated using touchscreen or an external command.

ORDER INFORMATION

PA-3x750-AC-300V-5A-2G

Amplifier 3x750 VA, max voltage (L-N) 300VRMS, max. current 5A,
3 ranges 75V-5A, 150V-5A and 300V-2.5A

AVAILABLE OPTION (to order separately)

AC0289: integration in a cabinet of two amplifiers with a set of thermal and differential breakers, an automatic "switch off" function, and an emergency management.

DELIVERIES

Amplifier is delivered with its user manual, its performances list (acceptance test report), its UE declaration and its mains plug.

Specification may change without notice

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