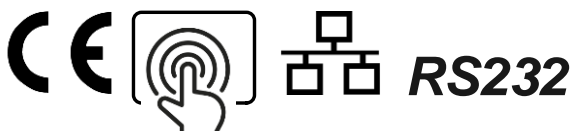


### PERFORMANCES

- High accuracy
- High stability
- Fast transients
- High inrush current facilities
- Wide bandwidth
- Very low distortion
- Quadrant change without transition
- Very low output impedance



### APPLICATIONS

- 3 insulated outputs
- AC, AC+DC, DC
- Avionic network 300-800-1200Hz
- Industrial networks 50-60 Hz
- Tests in accordance with ABD100.1.8 / MIL-STD-704
- Disturbed networks
- AC or DC motor simulation
- Non-linear loads
- Harmonics generation

### DESCRIPTION

- PA-10k is a « 4 quadrants » power amplifiers, AC+DC, single-phase or three-phase, operating in voltage regulation:
  - For each phase, an analog input receives its « pilot » signal which amplitude is 0~±10 V peak
  - After insulation, the equipment amplifies this signal depending on selected range with a very short transition time,
  - Option: isolated analog outputs, two per phase, return images of voltage and current at the output of the equipment, with an amplitude of 0~±10 V peak.
- Built in linear technology, these amplifiers have high dynamics, a very low distortion over a wide frequency band and bandwidth. This technology also allows them to provide power up to 4 times their rated power peaks.
- Linear technology allows a quick and easy integration for "Real time" or "Hardware In the Loop" applications in combination with simulators such as Opal-RT, dSpace or National Instruments.
- Entirely self-sufficient with local control on touch screen, they can be controlled remotely from a supervisor system via an Ethernet or RS232 link for an easy integration in a complex test system.
- The addition of a "resistive load" allows increasing from 30% to 100% its absorption capacity for use as alternative or continuous load.



## FEATURES

<b>OUTPUTS</b>	<b>Power</b>		
	Rated power per output (1)	10.000VA	
	AC ranges	35V / 270V	
	Output type	Direct (without transformer)	
	<b>Voltage and current</b>		
		Range 35V	Range 270V
	AC voltage (VRMS)	0-35	0-270
	Permanent AC current In (ARMS)	0-37	0-37
	Maximum peak current (3.In < 5 s)	100	100
	<b>Voltage accuracy</b>		
	Typical	0,1% of range + 0,1% of programmed value	
	Resolution	12 bits	
	<b>Current accuracy</b>		
	Typical	0,1% of range + 0,1% of programmed value	
	Resolution	12 bits	
	<b>Voltage distortion at full output power</b>		
	Typical	< 0,3%	
	Max	< 0,7%	
	<b>Voltage regulation for a mains variation of +6% / -10%</b>		
	Max	< 0,1% of rated voltage	
	<b>Voltage regulation for a current variation from 0 to 100%</b>		
	Max	< 0,1% of rated voltage	
	<b>Noise</b>		
	Max RMS	0,02% of rated voltage	
	Max peak to peak	0,3% of rated voltage	
	<b>Bandwidth</b>		
	Full scale	DC – 5 kHz	
	Small signals at -3 dB	25 kHz	
	<b>Variation with a square signal pilot</b>		
	Rise time 10% / 90%	< 20 μs	
	Fall time 10% / 90%	< 20 μs	
	Transfer time	< 20 μs	
	Transition from Q1 to Q4	< 10μs	
	<b>Variation according temperature</b>		
Typical	50 ppm/°C		
Max	100 ppm/°C		
<b>Stability after 15 minutes of operation</b>			
Max	< 0,05% of rated voltage		
<b>Insulation of the outputs versus case ground</b>			
Measurement at 500 VDC	> 100 MΩ		
<b>Accuracy of the measurements displayed on the touch screen</b>			
Voltage measurement	0,3% of range + 0,3% of measure		
Current measurement	0,3% of range + 0,3% of measure		

- 1) The output power of each phase is 10 kVA. To have 30 kVA, output "Phase 1", output "Phase 2" and "output Phase 3" are connected **IN PARALLEL**:
- "Phase 1" uses voltage regulation to fix output voltage,
  - "Phase 2" and "Phase 3" use current regulation,
  - "Pilot" signal have to be generated in accordance with voltage and current expected.

### FEATURES

<b>MAINS</b>	Mains network	
	Number of phases	3 Phases + Earth without Neutral
	Voltage	400 VRMS -10% +6%
	Frequency	45 - 65 Hz
	Mains current at full output power	
	Max	45 ARMS per phase
	Protection	Magneto thermal breaker
	Inrush current	Limited to 2 x Max current
	Dielectric strength of the mains input versus the output connected to the case ground	
Measurement at 2500VRMS / 50Hz	Current < 10 mA	

<b>INPUTS</b>	Input signal amplitude	
	Insulation	> 10 MΩ (2)
	Voltage for full output scale	7,07 VRMS / ± 10V peak
	Max. voltage	± 15 V peak
	Input impedance	10 kΩ
	Input signal frequency	
	Fundamental	DC – 5kHz
	Harmonics (small signals)	Max 50 kHz

<b>MECHANICAL AND ENVIRONMENTAL</b>	Metallic parts treatment		
	Frame	Aluminum painted RAL7021	
	Sides and rear panels	Aluminum painted RAL7035	
	Dimensions and weight		
	Width	800 mm	
	Depth (connectors excluded)	800 mm	
		With Option "PA-3X10K-L100"	Without Option "PA-3X10K-L100"
	Height	2230 mm (43U)	2010 mm (38U)
	Weight	675 kg	550 kg
	Temperature and humidity		
	Storage temperature	-10°C à +85°C	
	Operating temperature	+0°C à +50°C	
	Relative humidity	10% - 90% non-condensing	
	Sound level (fans at full speed)		
	Measured at 1 m of front panel	< 70 dBA	
	Marking		
	Marking	CE	
	Index of protection	IP20	
	Protections		
	Against overload	Limitation of voltage (3)	
	Against output short-circuit	Switch off the power stage (4)	
Against overheating	Switch off the power stage (5)		

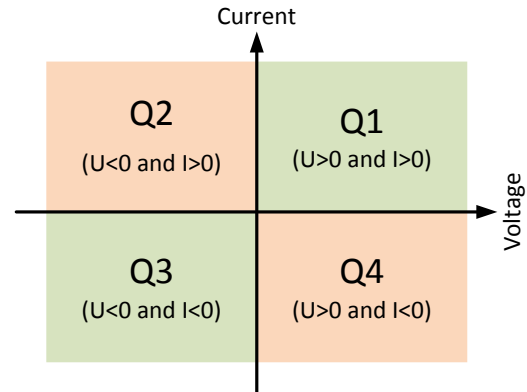
- 2) The analog inputs are isolated from power outputs.
- 3) In case of temporary overload the voltage decreases to limit the current.
- 4) The output is switched off and will have to be reactivated by the touch screen or an external command.
- 5) A temperature sensor is placed on every power part. It switches off the output of the amplifier in case of overheating.

## 4 QUADRANT OPERATION

Amplifiers operate in voltage regulation with current limitation: in case of temporary overload the voltage decreases to limit the current.

In "Q1" and "Q3" areas, the amplifier behaves in "GENERATOR or SOURCE": the instantaneous power is positive.

In "Q2" and "Q4" areas, the amplifier behaves in "ABSORBER or SINK": the instantaneous power is negative.



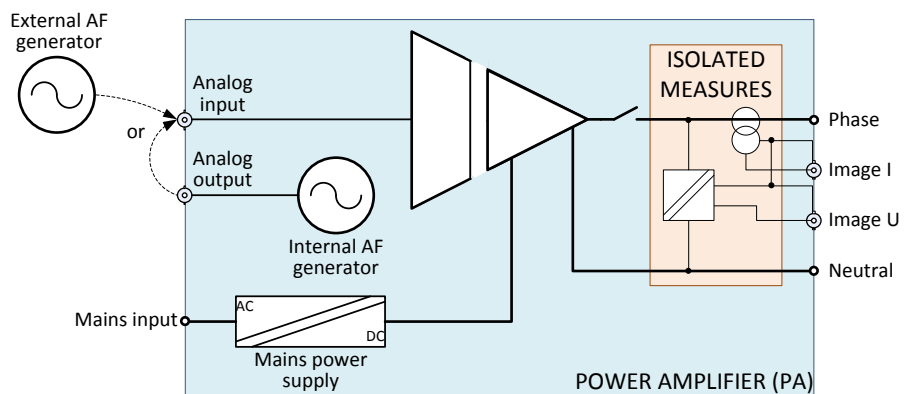
## INTERNAL CONSTITUTION

PA-3x10k amplifier is composed of three identical amplifiers of 10 kVA each.

Each amplifier is electrically insulated from the two others.

Each amplifier includes:

- one AF generator,
- one analog input,
- one power output,
- two outputs « image »



The outputs "Voltage image" and "Current image" are isolated from power outputs. They are used for amplifier used in PHIL system.

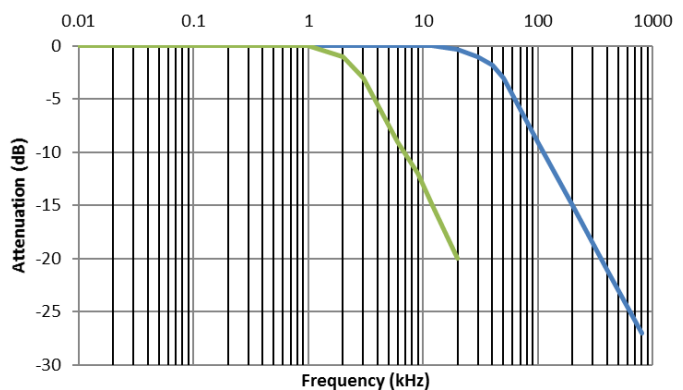
## BANDWIDTH "small signals"

### Blue trace:

In voltage regulation bandwidth at -3dB is 25 kHz.

### Green trace:

When equipment is used as a one-phase amplifier, bandwidth at -3dB is 2.5 kHz.



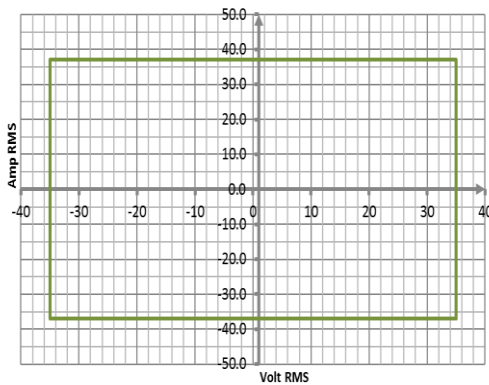
## PERMANENT OPERATION IN AC

These diagrams explain relation between current and voltage for a power factor of 1 (SOURCE) and -1 (SINK).

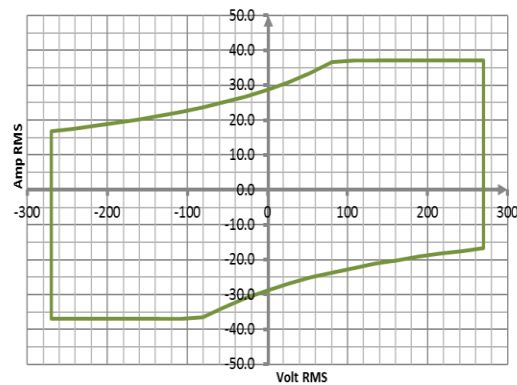
Continuous operation is allowed “inside” diagrams. In generation or absorption limitations are due to the heating of the power transistors.

Operation “outside” diagrams 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.

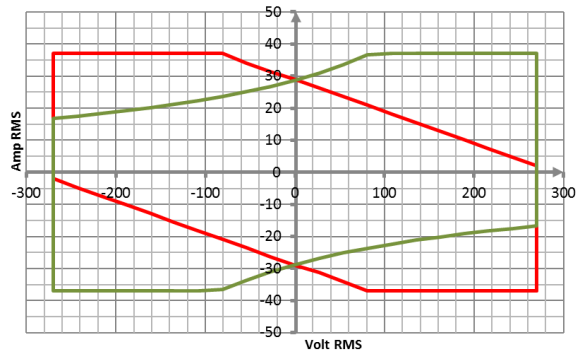


**RANGE 35V-37A**  
(full “4Q”)



**RANGE 270V-37A**  
(absorption is limited to 30%)

When option “PA-3X10K-L100 resistive load” is installed, absorption is increased to 100% between 80 and 270 VRMS in quadrants “Q2” and “Q4” as shown by red trace.



## SALES REFERENCES

**PA-3x10k-AC/DC-270V-37A-2G-HP**

## AVAILABLE OPTIONS (to order separately)

**PA-3X10K-L100:** resistive load to increase absorption capability up to 100% in 270V range

**PA-RC-MAINS:** mains network: 210V 50Hz-60Hz between phases instead of 400V 50Hz-60Hz

**PA-3X10K-SR:** customized ranges – Please consult us

Specification subject to change without notice.