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# User's Manual

## PMM PA6001

### WIDEBAND RF POWER AMPLIFIER

**100 kHz - 250 MHz / 40 Watts**

#### **SERIAL NUMBER OF THE INSTRUMENT**

You can find the Series Number on the rear panel of the instrument.

Series Number is in the form: 0000X00000.

The first four digits and the letter are the Series Number prefix, the last five digits are the Series Number suffix. The prefix is the same for identical instruments, it changes only when a configuration change is made to the instrument.

The suffix is different for each instrument.

**NOTE:**

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Do not use the equipment in a function not specified by the manufacturer.







This instruction manual must be read before attempting to install or operate the amplifier.

Before using the equipment the user must insure that all instructions at switch on as indicated in chapter 2 have been properly made and checked.


The information contained in this document is subject to change without notice.


**EXPLANATION OF ELECTRICAL AND SAFETY SYMBOLS :**

 You now own a high-quality instrument that will give you many years of reliable service. Nevertheless, even this product will eventually become obsolete. When that time comes, please remember that electronic equipment must be disposed of in accordance with local regulations. This product conforms to the WEEE Directive of the European Union (2002/96/EC) and belongs to Category 9 (Monitoring and Control Instruments). You can return the instrument to us free of charge for proper environment friendly disposal. You can obtain further information from your local Narda Sales Partner or by visiting our website at [www.narda-sts.it](http://www.narda-sts.it).


	Warning, danger of electric shock		Earth
	Read carefully the Operating Manual and its instructions, pay attention to the safety symbols.		Unit Earth Connection
	Earth Protection		Equipotential

**EXPLANATION OF SYMBOLS USED IN THIS DOCUMENT :**

 The **DANGER** sign draws attention to a serious risk to a person's safety, which, if not avoided, will result in death or serious injury. All the precautions must be fully understood and applied before proceeding.

 The **WARNING** sign indicates a hazardous situation, which, if not avoided, could result in death or serious injury. All the precautions must be fully understood and applied before proceeding.

 The **CAUTION** sign indicates a hazardous situation, which, if not avoided, could result in minor or moderate injury.

 The **NOTICE** sign draws attention to a potential risk of damage to the apparatus or loss of data.

 The **NOTE** sign draws attention to important information.

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**⚠ WARNING**

***SAFETY RECOMMENDATIONS AND INSTRUCTIONS***

To maintain it in safe conditions and ensure correct use, these general instructions must be fully understood and applied before the product is used.

- CAT 1 Terminals are present on the equipment; do not use for categories of measurement II, III and IV.
- High leakage current equipment, connect the protective earth terminal before connection to mains.
- Hazardous live voltage are present at the outputs of the amplifier, connect load(s) to the amplifier outputs before using.
- Install the equipment in a shielding zone to meet the emission specifications of the directive 2004/108/CE. Inside the shielding area, other test equipments could be disturbed.
- For safety reasons, do not leave the equipment under mains voltage when the RF output is not connected.
- Before using the amplifier, the input level of the signal generator must be checked (0 dBm typical, + 10 dBm max.).
- Special care must be taken with regards to the level of radiation of all equipments connected to the amplifier.
- For the operator safety, do not connect or disconnect the load when the amplifier delivers the RF signal.
- When the amplifier is in the “RF ON” mode and during any change of input signal conditions, special care must be taken against transient and spurious signals generation.
- Connect terminal loads (50  $\Omega$ ) with adequate power capability (see output power curves in calibration document) when the amplifier is operating.

# Dichiarazione di Conformità *EU Declaration of Conformity*

In accordo alla Decisione 768/2008/EC, conforme alle direttive EMC 2014/30/UE, Bassa Tensione 2014/35/UE e RoHS 2011/65/UE, ed anche alle norme ISO/IEC 17050-1 e 17050-2.  
*In accordance with the Decision 768/2008/EC, compliant to the Directives EMC 2014/30/EU, Low Voltage 2014/35/EU and RoHS 2011/65/EU, also compliant to the ISO/IEC standard 17050-1 and 17050-2*

Il costruttore  
*The manufacturer* **narda Safety Test Solutions S.r.l. Socio Unico**

Indirizzo  
*Address* **Via Benessea, 29 / B**

**I-17035 Cisano sul Neva (SV) - Italy**

**sulla base delle seguenti norme europee armonizzate, applicate con esito positivo:**  
*based on the following harmonized European Standards, successfully applied:*

EMC - Emissioni:  
*EMC - Emission:* **EN 61326-1 (2013)**

EMC - Immunità:  
*EMC - Immunity:* **EN 61326-1 (2013)**

Sicurezza:  
*Safety:* **EN 61010-1 (2010)**

**dichiara, sotto la propria responsabilità, che il prodotto:**  
*declares, under its sole responsibility, that the product:*

Descrizione  
*Description* **AMPLIFICATORE DI POTENZA**  
**POWER AMPLIFIER**

Modello  
*Model* **PA 6001**

**è conforme ai requisiti essenziali delle seguenti Direttive:**  
*conforms with the essential requirements of the following Directives:*

Bassa Tensione  
*Low Voltage* **2014/35/EU**

Compatibilità Elettromagnetica  
*EMC* **2014/30/EU**

RoHS  
*RoHS* **2011/65/EU**

**Cisano sul Neva, 3 May 2017**

**Egon Stocca,  
General Manager**



# 1 - General Information

## 1.1 General Information

The PA6001 amplifier is an up-to-date and high-performance equipment leading to all kinds of applications:

- EMC tests of radiated susceptibility (antennas, striplines, TEM and GTEM cells, etc),
- EMC tests of conducted susceptibility, according to each type of couplings
- Direct coupling,
- Capacitor coupling ,
- Inductor coupling,
- Transformer coupling,
- All types of modulation: AM, FM, pulse modulation,
- IEMN pulse tests (Damp Sine, Single-pole bi-exponential, etc).

The PA6001 amplifier is manufactured to operate in a CW mode (CW) with a single instantaneous range from 100 kHz to 250 MHz.

The typical output power is about 40 watts minimum on a 50 ohms load.

The equipment operates under any VSWR conditions. It can deliver a high RF current under short circuit conditions and a high voltage under open circuit conditions. This key feature makes the amplifier PA6001 a high performance tool with a high degree of safety.

The bandwidth is instantaneous. This allows to use a sweep frequency generator or to amplify large frequency spectrum signals. Consequently, no adjustment of the amplifier is necessary.



Fig. 1-1 PA6001

## 1.2 Main specifications

<b>TABLE 1-1 Technical specifications</b>	
<b>Frequency bandwidth</b>	100 kHz – 250 MHz
<b>Typical output power</b>	40 W
<b>Power at 3 dB compression</b>	40 W min. up to 100 MHz / 35 W min. from 100 MHz to 250 MHz
<b>Power at 1 dB compression</b>	35 W min. up to 100 MHz / 30 W min. from 100 MHz to 250 MHz
<b>Harmonics distortion</b>	H2, H3 < -20 dBc for the output power at 1 dB compression limit
<b>Class type</b>	Class A
<b>Gain</b>	43 dB
<b>Linear power gain flatness</b>	± 3 dB max
<b>Mismatch tolerance</b>	Infinite without damage
<b>Input impedance</b>	50 Ω / VSWR: 2:1max
<b>Output impedance</b>	50 Ω / VSWR: 2:1max
<b>Input power</b>	+ 10 dBm max.
<b>RF input connector</b>	Type N fem. (front or rear panel) – other connector type on request
<b>RF output connector</b>	Type N fem. (front or rear panel) – other connector type on request
<b>Ambient operating temperature</b>	0 °C / + 35 °C
<b>Room temperature storage</b>	-20 °C / + 70 °C
<b>Cooling</b>	Forced air: 20 l/sec max. (self contained fans)
<b>Power voltage</b>	90 – 250 Vac, 47 – 63 Hz, single phase
<b>Rated current</b>	2 A @ 230 Vac
<b>Dimensions</b>	438 x 410 x 125 mm (3U) / 17.2 x 16.1 x 4.9 in (3U)
<b>Weight</b>	12 kg / 26.4 lb



## 2 - Installation

### 2.1 Mains supply cable

The mains cable is connected to a single phase network (16A min + neutral + ground). The typical current measured when the amplifier is in **RF ON** mode (amplification is active) is :

$$110 \text{ Vac} := 3.7 \text{ Amps AC} \quad // \quad 230 \text{ Vac} := 1.8 \text{ Amps AC}$$

**NOTICE**

Use a plug with minimum rating of 16 A min.

**NOTICE**

Installation requirements on which the equipment is connected: low voltage installation to IEC 60364 (NFC15-100).

**WARNING**

High current leakage equipment.

Connect the auxiliary earth conductor to the protective ground before switching on the equipment.

### 2.2 Auxiliary earth conductor connection

See below how to connect the auxiliary earth conductors

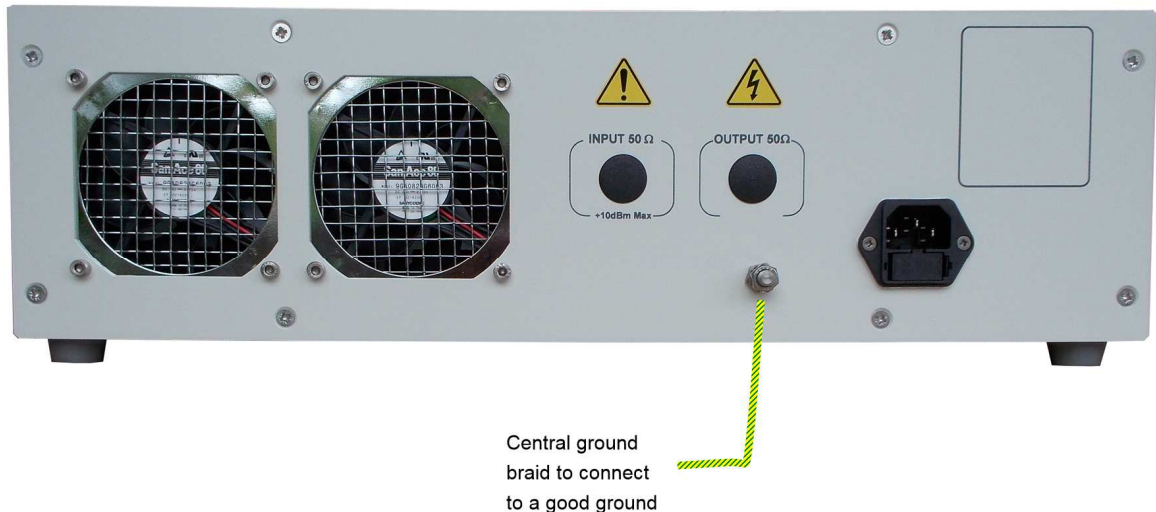


Fig. 2-1 PA6001 Auxiliary earth conductor connection

### 2.3 Air intake and escape (in house installation)

The air intake is allowed via the front panel and the sides of the equipment. The air exhaust is provided on the rear panel (horizontal air flow). It is imperative to avoid any air flow obstruction and to allow air exhaust toward the front panel and the sides of the equipment.

**NOTICE**

The rear panel of the amplifier must be located at 1 meter minimum from any wall, except in case of air forced extract

### 2.4 Weight of the equipment

**NOTICE**

Heavy equipment

This equipment weighs 10 kg, the tables or cabinet where it will be installed must be capable of supporting this weight.

**2.5 Moving of the equipment** In the event of displacement, first of all switch off the amplifier, disconnect the equipment of the electrical supply network, then all the external cables (including the connections of ground) must be removed

**2.6 RF interconnections** The cables used must be of a sufficient quality to allow operation up to 1000 MHz and to withstand the power delivered by the amplifier. The connectors recommended are N male for output power connections and N male for input power. The characteristic impedance of the cable must be 50  $\Omega$  in order to allow maximum power operation. As this equipment will be used in an EMC test environment, we recommend using cable as short as possible and with a length less than 3 meters

**2.7 Switch on (for 1<sup>st</sup> check step)** For this simple check step, connect a 50  $\Omega$  load to the RF input and output connectors.

Execute the following operations to switch on the amplifier :

- Install the mains supply cable,
- Push the button "**POWER**",
- Verify the fans switch on on the rear panel.



**For safety reason, do not switch on the equipment if its input and output are not connected to an adequate 50  $\Omega$  load.**

**2.8 Switch off (for 1<sup>st</sup> check step)**

Press the "**POWER**" button to completely stop the amplifier.

Please refer to Chapter 3 for the user operation instructions.

## 3 – Operating Instruction

### 3.1 Front panel in standard configuration

The mains cable is connected to a single phase network (16A min + neutral + ground). The typical current measured when the amplifier is in **RF ON** mode (amplification is active) is :

110V AC : = 3.7 Amps AC // 230V AC : = 1.8 Amps AC

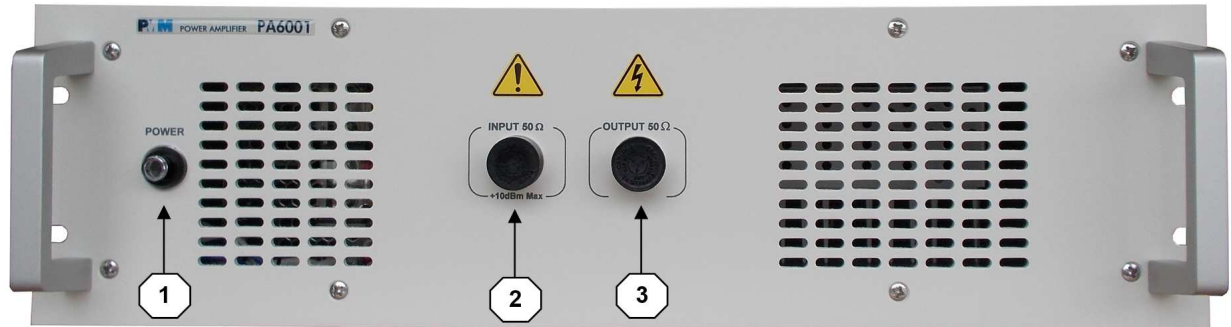


Fig. 4-1 PA6001 front panel

#### Legend:

**1 - Button "POWER":** A push button with green window allows the switch on and switch off of the amplifier.

**2 - Connector "INPUT 50Ω":** N type female, to be connected to the generator.

**3 - Connector "OUTPUT 50Ω":** N type female, to be connected to the load.

### 3.2 Operation Instructions

#### 3.2.1 Switch on



Before using the equipment the user must insure that all instructions at switch on as indicated in chapter 2 have been properly made and checked.



Hazardous live voltage are present, connect load before using.

Connect the generator to the connector "INPUT 50 Ω" and the load to the connector "OUTPUT 50 Ω"



Before using the amplifier, the input level of the signal generator must be checked (0 dBm typical, + 10 dBm max.)



Special care must be taken with regards to the level of radiation of all equipments connected to the amplifier

Push the **"POWER"** mains switch after following the instructions presented in § 2.7. Switch on

**WARNING**

**For the operator safety, do not connect or disconnect the load when the amplifier delivers the RF signal.**

**NOTICE**

**When the amplifier is on the "RF ON" mode and during any change of input signal conditions, special care must be taken against transient and spurious signals generation.**

### 3.3 Operation

#### 3.3.1 Power measurement

If the amplifier does not have the optional integrated measurements capability, the direct and reflected powers levels can be however measured by using a directional coupler placed on the output of the amplifier without affecting the signal applied to the load.  
An attenuator or a matched 50  $\Omega$  load can be used as load to allow the measurement of the power received.

If no power can be measured then refers to chapter 4.

#### 3.3.2 Excess direct power

The direct power can generate large harmonics distortions when it is higher than the nominal power.

#### 3.3.3 Mismatch

The load is mismatched when its value varies from its nominal setting of 50  $\Omega$  (ex : 40 or 60  $\Omega$ ).

The amplifier allows permanent operation on all impedance conditions. However, with a mismatched load, an important power can be reflected toward the amplifier so the power delivered to the load decreases.

In case of short circuit, the delivered current is approximately twice the nominal current on a 50  $\Omega$  load.

In case of open circuit, the delivered voltage is approximately twice the nominal voltage on a 50  $\Omega$  load.

#### 3.3.4 Temperature

In case of thermal effect excess, power stages are stopped.

The defect may have four reasons:

- Bad installation with an internal overheating consequence (see chapter 2),
- Excessive Ambient air temperature ( see chapter 4),
- Failure of a RF power stage,
- Air cooling system failure.

The class A operation of the amplifier implies a higher thermal dissipation when no RF signal is delivered to the output load.

In case of no disappearance of the defect, call the Narda customer care service.

#### 3.3.5 Switch off

Press the **"POWER"** button to completely stop the amplifier.

## **4 – Maintenance**

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### **4.1 1<sup>st</sup> Level Maintenance**

When no output power can be measured on the output of the amplifier :

- Check the level of RF input signal of the generator.

If this point indicates there is no defect, call Narda customer care service.

### **4.2 Preventive maintenance**

A simple check of the output power over the frequency bandwidth allows to detect any eventual active components defects.

The tables in the calibration document show performance after factory acceptance

To reproduce these tests, it is necessary to use a signal generator, a wattmeter and a power load.

Install between the output of the amplifier and the wattmeter probe:

- A power attenuator,  
or
- A directional coupler connected to a power load.

Taking care to correct the ringing of the attenuator or of the coupler with regard to the frequency.

Any variation, higher than 1 dB from the nominal values must be reported to the Narda customer care service.

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**Caro cliente**

grazie per aver acquistato un prodotto NARDA! Sei in possesso di uno strumento che per molti anni ti garantirà un'alta qualità di servizio. NARDA riconosce l'importanza del Cliente come ragione di esistenza; ciascun commento e suggerimento, sottoposto all'attenzione della nostra organizzazione, è tenuto in grande considerazione. La nostra qualità è alla ricerca del miglioramento continuo. Se uno dei Suoi strumenti NARDA necessita di riparazione o calibrazione, può aiutarci a servirla più efficacemente compilando questa scheda e accludendola all'apparecchio.

Tuttavia, anche questo prodotto diventerà obsoleto. In questo caso, ti ricordiamo che lo smaltimento dell'apparecchiatura deve essere fatto in conformità con i regolamenti locali. Questo prodotto è conforme alle direttive WEEE dell'Unione Europea (2002/96/EC) ed appartiene alla categoria 9 (strumenti di controllo). Lo smaltimento, in un ambiente adeguato, può avvenire anche attraverso la restituzione del prodotto alla NARDA senza sostenere alcuna spesa. Può ottenere ulteriori informazioni contattando i venditori NARDA o visitando il nostro sito Web [www.narda-sts.it](http://www.narda-sts.it).

**Dear Customer**

thank you for purchasing a NARDA product! You now own a high-quality instrument that will give you many years of reliable service. NARDA recognizes the importance of the Customer as reason of existence; in this view, any comment and suggestion you would like to submit to the attention of our service organization is kept in great consideration. Moreover, we are continuously improving our quality, but we know this is a never ending process. We would be glad if our present efforts are pleasing you. Should one of your pieces of NARDA equipment need servicing you can help us serve you more effectively filling out this card and enclosing it with the product.

Nevertheless, even this product will become obsolete. When that time comes, please remember that electronic equipment must be disposed of in accordance with local regulations. This product conforms to the WEEE Directive of the European Union (2002/96/EC) and belongs to Category 9 (Monitoring and Control Instruments). You can return the instrument to us free of charge for proper environment friendly disposal. You can obtain further information from your local NARDA Sales Partner or by visiting our website at [www.narda-sts.it](http://www.narda-sts.it).

**Servizio richiesto:**  *Service needed:*

Solo taratura     Riparazione     Riparazione & Taratura     Taratura SIT     Altro:  
 Calibration only     Repair     Repair & Calibration     Certified Calibration     Other:

**Ditta:**

*Company:*

**Indirizzo:**

*Address:*

**Persona da contattare:**

*Technical contact person:*

**Telefono:**

*Phone n.*

**Modello:**

*Equipment model:*

**Numero di serie:**

*Serial n.*

**Accessori ritornati con l'apparecchiatura:**  **Nessuno**     **Cavo(i)**     **Cavo di alimentazione**    **Altro:**  
 *Accessories returned with unit:*     None     Cable(s)     Power cable    Other:

**Sintomi o problemi osservati:**  *Observed symptoms / problems:*

**Guasto:**  **Fisso**     **Intermittente**    **Sensibile a:**  **Freddo**     **Caldo**     **Vibrazioni**     **Altro**  
 *Failure:*  Continuous     Intermittent    *Sensitive to:*  Cold     Heat     Vibration     Other

**Descrizione del guasto/condizioni di funzionamento:**

*Failure symptoms/special control settings description:*

**Se l'unità è parte di un sistema descriverne la configurazione:**

*If unit is part of system please list other interconnected equipment and system set up:*

