

Sales & Support:

Via Leonardo da Vinci, 21/23
20090 Segrate (MI) - ITALY
Tel.: +39 02 2699871
Fax: +39 02 26998700

Manufacturing Plant:

Via Benessea, 29/B
17035 Cisano sul Neva (SV)
Tel.: +39 0182 58641
Fax: +39 0182 586400

User's Manual

PMM L1-150

ARTIFICIAL MAINS NETWORK

SERIAL NUMBER OF THE INSTRUMENT

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

Serial Number is in the form : 0000X00000.

The first four digits and the letter are the Serial Number prefix, the last five digits are the Serial 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:

If the instrument is used in any other way than as described in this Users Manual, it may become unsafe

Before using this product, the related documentation must be read with great care and fully understood to familiarize with all the safety prescriptions.



To ensure the correct use and the maximum safety level, the User shall know all the instructions and recommendations contained in this document.


This products are a **Safety Class I** and **Installation Category II** instrument according to IEC classification and has been designed to meet the requirements of EN61010-1 (Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use).

This product has a **Pollution Degree II** normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.



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

KEY TO THE ELECTRIC 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.



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

KEY TO THE SYMBOLS USED IN THIS DOCUMENT



DANGER

The DANGER sign draws attention to a potential risk to a person's safety. All the precautions must be fully understood and applied before proceeding.



WARNING

The WARNING sign draws attention to a potential risk of damage to the apparatus or loss of data. All the precautions must be fully understood and applied before proceeding.



CAUTION

The CAUTION sign draws attention against unsafe practices for the apparatus functionality.



NOTE:

The NOTE draw attention to important information.

Contents

Safety considerations and instructions.....	Page
EC Conformity Certificate.....	IV
1 General Information	Page
1.1 Documentation.....	1-1
1.2 Introduction to PMM L1-150.....	1-1
1.3 Shipping components.....	1-2
1.4 Environment.....	1-2
1.5 Return for service.....	1-2
1.6 Equipment cleaning.....	1-2
2 Main Specification	Page
2.1 Main specifications.....	2-1
3 Front and Rear Panel connections	Page
3.1 Front and Rear panels.....	3-1
3.2 Safety covers installation.....	3-2
4 Installation	Page
4.1 Introduction.....	4-1
4.2 Initial inspection.....	4-1
4.3 Packing unpacking.....	4-1
4.4 Preparation for use.....	4-1
4.5 Installation check list.....	4-2
5 Operating PMM L1-150 Network	Page
5.1 Test Set-Up Considerations.....	5-1
5.2 Network verification and maintenance.....	5-2
6 PMM L1-150 Network schematics	Page
6.1 PMM L1-150 Network schematics.....	6-1
7 PMM L1-150 Network components	Page
7.1 PMM L1-150 Network components.....	7-1

Figures

Figure		Page
1-1	CISPR 16 Equivalent circuit.....	1-2
3-1	Front panel.....	3-1
3-2	Rear panel.....	3-1
3-3	Front safety cover.....	3-2
3-4	Rear safety cover.....	3-2
5-1	Test configuration.....	5-1
5-2	Typical test set-up.....	5-2
6-1	PMM L1-150 Network schematics.....	6-1
7-1	PMM L1-150 Network components.....	7-1

Tables

Table		Page
2-1	Main Specification.....	2-1



SAFETY RECOMMENDATIONS AND INSTRUCTIONS

This product has been designed, produced and tested in Italy, and it left the factory in conditions fully complying with the current safety standards. To maintain it in safe conditions and ensure correct use, these general instructions must be fully understood and applied before the product is used.

- Over current protection is not provided in the LISN. The LISN must be connected to a power mains which has the properly rated mains protection installed.
- When the device must be connected permanently, first provide effective grounding;
- If the device must be connected to other equipment or accessories, make sure they are all safely grounded;
- In case of devices permanently connected to the power supply, and lacking any fuses or other devices of mains protection, the power line must be equipped with adequate protection commensurate to the consumption of all the devices connected to it;
- In case of connection of the device to the power mains, make sure before connection that the voltage selected on the voltage switch and the fuses are adequate for the voltage of the actual mains;
- Devices in Safety Class I, equipped with connection to the power mains by means of cord and plug, can only be plugged into a socket equipped with a ground wire;
- Any interruption or loosening of the ground wire or of a connecting power cable, inside or outside the device, will cause a potential risk for the safety of the personnel;
- Ground connections must not be interrupted intentionally;
- To prevent the possible danger of electrocution, do not remove any covers, panels or guards installed on the device, and refer only to NARDA Service Centers if maintenance should be necessary;
- To maintain adequate protection from fire hazards, replace fuses only with others of the same type and rating;
- Follow the safety regulations and any additional instructions in this manual to prevent accidents and damages.
- The probe cannot be handled in proximity of high voltage mains line.
- If the probe is to be connected to high voltage mains line a safety interlock equipment must be installed to ensure the mains line be switched off before any probe handling or connection
- The user must provide a safety protection cover with a low voltage interlock switch able to cut off mains voltage before probe handling or connection.

EC Conformity Certificate

(in accordance with the directives: EMC 89/336/EEC and low voltage 73/23/EEC)

This is to certify that the product: PMM L1-150 Artificial Mains Network

Produced by: NARDA S.r.l.
Safety Test Solution
Via Benessea 29/B
17035 Cisano sul Neva (SV) - ITALY

complies with the following European Standards

Safety: EN 61010-1 (1994) - CEI EN 61010-1 / A2 (1996)

EMC: According to art. 2, par. 1 of 89/336/EEC Directive the product herewith is built by passive electronic components and is not liable to cause electromagnetic disturbance or the performance of which is not liable to be affected by such disturbance

This product complies with the requirements of Low Voltage Directive 73/23/EEC, amended by 93/68/EEC.

NARDA S.r.l.

1 - General Information

1.1 Documentation

Enclosed with this manual are a service questionnaire to send back to NARDA in case of equipment service is needed, and an accessories check list to verify all accessories enclosed in the packaging.

1.2 Introduction to PMM L1-150 Artificial Mains Network

The single-phase V-network PMM's Artificial Mains Network L1-150, with an equivalent circuit of $50 \text{ ohm} \parallel (1 \text{ ohm} + 5 \mu\text{H})$, meets the requirements of CISPR publication 16 (low-impedance power supplies) and VDE 0876 part 1 (on-board power supplies) regulations.

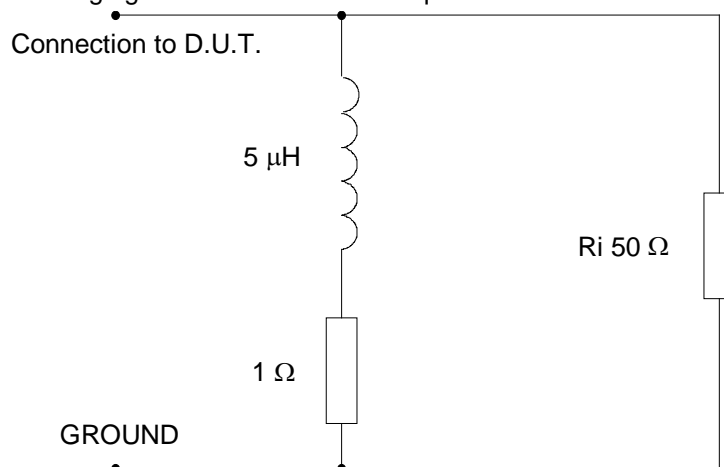
L1-150 is suited to perform measurements on conducted interference in the frequency range from 100 kHz to 200 MHz on both AC or DC power supplied equipment.

Designed according to criteria of cheaply and compactness it can be used together with PMM 8010 System for Conducted Interference or any other RF receiver.

The main functions performed by the Artificial Mains Network are:

- terminate the DUT with a standardized impedance against reference ground;
- supply power to the DUT;
- insulate the test circuits against external interference coming, for example, from AC-voltage network;
- route the EMI (Electro Magnetic Interference) of the DUT to the receiver, in case of conducted emission measurement, and the EMI from the signal generator to the DUT, in case of susceptibility test (current injection).

The following figure shows the CISPR equivalent circuit.



R_i = input impedance of the RFI receiver

CISPR equivalent circuit

Fig. 1-1 CISPR equivalent circuit

1.3 Shipping components

PMM L1-150 Network is composed by the following parts:

- PMM L1-150 Network
- Operating Manual.
- RF Cable
- N-Bnc adapter
- Calibration Chart
- Return for repair form

1.4 Environment

The operating environment is specified to be within the following limitations :

- Temperature 0° to +45° C
- Humidity < 90% relative

The instrument should be stored in a clean, dry environment

The storage and shipping environment is specified to be within the following limitations :

- Temperature -25° to + 70° C
- Humidity < 95% relative

1.5 Return for service

If the instrument should be returned to NARDA for service, please complete the service questionnaire enclosed with the Operating Manual and attach it to the instrument.

To minimize the repair time, be as specific as possible when describing the failure. If the failure only occurs under certain conditions, explain how to duplicate the failure.

If possible, reuse of the original packaging to ship the equipment is preferable.

In case other package should be used ensure to wrap the instrument in heavy paper or plastic.

Use a strong shipping container and use enough shock absorbing material around all sides of the equipment to provide a firm cushion and prevent movement in the container.

Seal the shipping container securely with shipment tape.

Mark the shipping container FRAGILE to encourage careful handling.

1.6 Equipment cleaning

Use a clean, dry non abrasive cloth for external cleaning of the equipment.



CAUTION

To clean the equipment do not use any solvent, thinner, turpentine, acid, acetone or similar matter to avoid damage to external plastic and surfaces.

2 - Main specifications

2.1 Main specifications

Table 2-1 lists the PMM L1-150 Network performance specifications.
 The following conditions apply to all specifications :

- The ambient temperature must be 0° to 45°.

TABLE 1-1 Main specifications	
Frequency range:	100 kHz to 200 MHz
Continuous rated output current:	100 A
Maximum output current (up to $T_a=45^\circ\text{C}$):	150 A
Max permissible operating voltages:	DC: 600 Volt AC: 250 Volt
AC supply frequency range:	0 to 440 Hz
Equivalent circuit:	50 Ohm / 5 μ H
RF output:	N female
Power supply:	screw terminal M1
Test item:	screw terminal M1
Ground:	screw terminal M1 (2x)
Rated temperature:	0 to + 45 C
Storage temperature	- 25 to + 70 C
Overall dimension (W x H x D):	mm 260 x 160 x 400
Weight:	5 kg

This page has been left blank intentionally

3 - Front and Rear Panel connections

3.1 Front and Rear Panels

In Figure 3-1 and Figure 3-2 you can see front and rear connecting points and terminals of PMM L1-150 Network.



Fig. 3-1 Front Panel



Fig. 3-2 Rear Panel

Legend:

- 1- Device Under Test Power Line connecting point
- 2- Device Under Test Ground contact
- 3- RF output to EMI Signal Analyzer (50 ohm, N female connector)
- 4- AC or DC supply connecting point
- 5- AC or DC ground Protective Earth connecting point



WARNING

To avoid hazardous electrical shock do not operate PMM L1-150 Network without install safety covers on active connecting terminals.

3.2 Safety covers installation

After connection of supply line and Equipment Under Test line, install safety covers on the connecting terminals.

Each cover has a hollow to hold the active cable in place during operation.

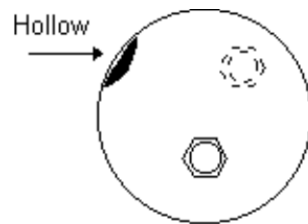
Front safety cover has the hollow on the upper left side.

Rear safety cover has the hollow on the upper right side.

The active cable shall come out from the cover hollow on the side indicated by an arrow on the front and rear panel.

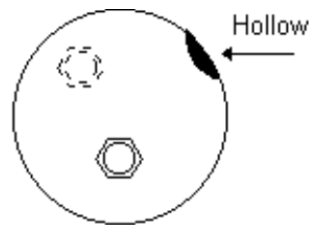
Pay attention installing covers to avoid hazardous electrical shock on active line.

Refer to the following figures for covers installation :



Front safety cover

Fig. 3-3 Front safety cover



Rear safety cover

Fig. 3-4 Rear safety cover

4 - Installation

4.1 Introduction

This section provides the information needed to install the PMM L1-150 Network.

4.2 Initial inspection

Included is information pertinent to initial inspection, power requirements, interconnections, environment, instrument mounting, cleaning, storage and shipment.



WARNING

To avoid hazardous electrical shock, do not turn on the instrument when there are signs of shipping damage to any portion of it.

4.3 Packing Unpacking

Inspect the shipping container for damage.

If the shipping container or cushion material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically.

Verify the accessories availability in the shipping container referring to the accessories check list enclosed with the Operating Manual.

Notify any damage to the carrier as well as the NARDA Representative.

4.4 Preparation for use

From the line conductor to the case of the unit there is a leakage current of approx. 80 mA when operating at 220 V 50 Hz.

The line conductor is connected to ground via a 2 μ F capacitor due to the measurement system to be applied.



NOTE

The leakage currents between the phase and the earth line generally exceed permitted limits for typical house environments; for this reason the supply distribution in your environment shall not use differential breakers. In case, use an insulating transformer to supply the PMM L1-150 Network.



WARNING

To avoid hazardous electrical shock, it is absolutely mandatory that ground terminals 2 and 5 of the Network be connected to protection earth line before operation with voltages above 40 V.

This is a Safety Class I equipment, it is provided with a protective earth terminal.

Before connecting this instrument, ensure that an uninterruptible safety earth ground is provided from the main power source to the product protective earth connection. If this instrument is to be connected to other equipment or accessories, prior to energizing either unit verify that a common ground exists between them.

Any interruption or loosening of the protective earth ground conductor, either inside or outside the unit or in an extension cable will cause a potential shock hazard that could result in personal injury. Verify the safety earth ground functionality before operation.



WARNING



WARNING

PMM L1-150 Network, the insulating transformer and Equipment Under Test must be overload protected by an appropriate current rating breaker or fuse on the supply line.



WARNING

PMM L1-150 Network, the insulating transformer and Equipment Under Test must be provided by an appropriate current rated contact breaker as closest as possible on the supply line and with a safety indication of equipment operated by.

The PMM L1-150 Network has only one current path from terminal 4 on the rear panel to terminal 1 on the front panel (see Fig. 3-1 and Fig. 3-2 on section 3), the ground terminals 2 and 5 are connected together and to the equipment case, they may be used as a return line only when the Equipment Under Test and its generator use reference ground as a return line. Using AC supply lines isolated from reference ground a separate Network should be used for each line.



WARNING

Install and screw safety covers on front and rear line connections before operation.



CAUTION

To avoid any damage caused by transient current pulses, disconnect the test Signal Analyzer input before switching AC supply on or off

4.5 Installation Check list Before operation ensure the following steps are taken :

- Check the line voltage to ensure the compatibility with the equipment requirements.
- Ensure that the to be provided fuse or breaker current rating is appropriate for the equipment setup.
- Protection earth line is connected to PMM L1-150 input terminal 5.
- Ensure that cables and terminals used to connect PMM L1-150 Network to supply line and to Equipment Under Test are suitable for the setup current rating and proper safety insulation.
- Ensure that cables and terminals used to connect PMM L1-150 Network to supply line and to Equipment Under Test are properly screwed on Network connections.
- Install safety covers on front and rear connections.
- Verify that 50 ohm coaxial line to the EMI Signal Analyzer input be disconnected before switch on or off the supply line.
- Prior to energizing either unit verify that a common ground connection exists between all equipment in the test setup and safety protection earth.



CAUTION

To allow correct equipment ventilation ensure that the vent grid on the upper equipment cover be free by any obstructing object.

5 - Operating PMM L1-150 Network

5.1 Test Set-Up Considerations

Measurement repeatability is the main concern of standards and regulations, that exactly define the test set-up for interference measurements.

The Artificial Mains Network L1-150 complies with CISPR publ.16 (part 2), VDE 0876 and the American FCC part 15 rules and regulations.

The test SET-UPS required for various standards are largely identical; a detailed description is given in VDE 0877 part 1. (par. 9.2 "Measurements using LISNs").

The DUT has to be positioned on a non-metallic or conductive table (height >80cm.), 40 cm. in front of a metallic grounded wall with dimensions of at least 2 m. x 2 m.

The table may also be used inside a screened room.

The distance of the DUT from any metallic part may affect the measured RFI voltage values; VDE 0877 exactly define the dimensions for the test configurations, by means of the following drawing:.

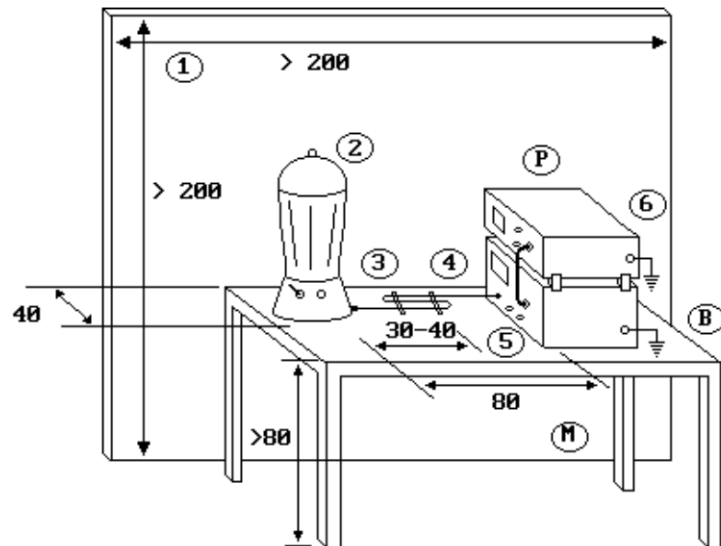


Fig. 5-1 Test configuration

The figure describes the test configuration and the interconnection of a mains operated DUT, according to the above mentioned VDE specification, where:

1. Metallic grounded wall;
 2. Device Under Test (DUT);
 3. Folded mains cable fixed with strips of adhesive tape;
 4. Non-metallic table;
 5. RFI measuring receiver;
 6. Line Impedance Stabilization Network (LISN) with:
 - B - connection to reference ground.
 - P - jack for DUT.
 - M - coaxial connection to measuring receiver.
- All dimensions are given in centimeters.

Figure shows a typical Test Set-up. The EMI Signal Analyzer connected to output 3 indicates the RFI voltage directly in dB μ V.

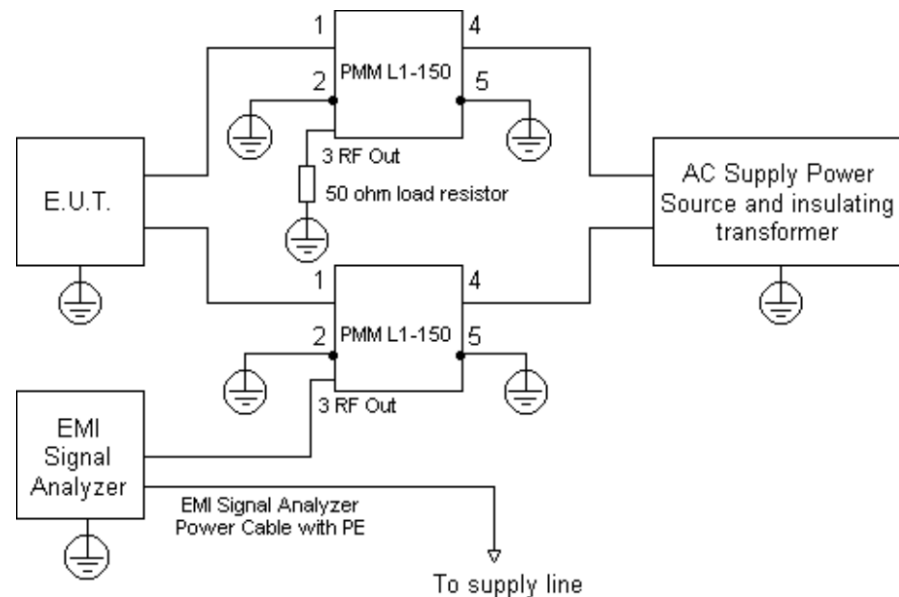


Fig. 5-1 Typical test set-up

5.2 Network verification and maintenance



WARNING

To verify proper operation of the PMM L1-150 Network use the following test procedure :

Do not connect any AC or DC supply to PMM L1-150 Network during this verification test.

Test equipment needed :

1. RF Generator and level measuring calibrated instrument or
2. Spectrum Analyzer with Tracking Generator.

In both cases, instrument shall be working at 1 MHz.

Verification test procedure :

1. Connect the RF signal (or tracking signal) to the mains output of L1-150 making sure that the ground is connected to the shield of the RF cable (grounded).
2. Connect PMM L1-150 Network RF output 3 to the level-meter input (or Spectrum Analyzer input).
3. Attenuation between generated signal level and measured level on output shall be less than 0.5dB at 1 MHz. If higher than 0.5 dB, please refer to qualified NARDA Service Center for maintenance of the unit.

This page has been left blank intentionally

7 - PMM L1-150 Network components

7.1 PMM L1-150 Network components

ARTIFICIAL MAINS NETWORK L1/150			Revised: August 22, 1996		
L1/150 Main			Revision: 896		
Bill Of Materials			August 22, 1996	13:02:54	Page 1
Item	Quantity	Reference	Part	DESCRIPTION	PMM Part-Code
1	1	C2	.22uF/250Vac	Cond.Poliestere 250Vac	CM-057.0017
2	2	C3a1,C3	1uF/250Vac	Cond.Poliestere 250Vac	CM-057.0019
3	1	C1	220n	Cond.Multistrato 25U / 50V / p.5,08	CM-057.0034
4	2	CN2,CN4	BNC.M.58.90^	Conn.Coax MAS 50ohm a 90^ Volante x RG-58	CM-057.0064
5	1	CN1	N.F.P.C2	Conn.Coax FEM 50ohm da pann. x cavo 2mm	CN-057.0277
6	1	CN3	N/M.->BNC/F.	Conn.Trans. N/MAS-->BNC/FEM	CN-057.0076
7	2	J1,J2	200uH	Imped. P.sso 6,3	IM-051.0086
8	1	PN1	P.Ant.L1/150	Pannello Anteriore Serigrafato x L1/150	PN-056.0001
9	1	PN2	P.Post.L1/150	Pannello Posteriore Verniciato x L1/150	PN-056.....
10	4	R2,R3,R4,R5	220	Res. Strato-Metall. 1/4W 1%	RS-057.0171
11	1	R6	1r0/2W	Res. Impasto 2W 20%	RS-030.0004
12	1	R1	100k/2W	Res. Impasto 2W 20%	RS-030.0001
13	1	SC1	Cont.8030	Contentitore EUROS. 3U 42TE 292/S.V	SC-058.0002
14	1	VR1	Bob.L1/150	Bobina Filo 6mm x L1/150	VR-008.0013
15	1	VR2	Kit.L1/150	Kit Nylon e Part. Metallici L1/150	VR-008.0014
16	1	2mt1	RG-58	Cavo COAX 50ohm RG-58/U	VR-057.0224
17	1	220mm1	RG-316	Cavo COAX TEFLON 50ohm / 2,6mm	VR-011.0009

Fig. 7-1 PMM L1-150 Network components

This page has been left blank intentionally

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.

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 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.

☒ **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:

[illegible]