



The Synchronization Experts.



SETUP GUIDE

Meinberg Inline Amplifier

INA-20, INA-30

Meinberg Funkuhren GmbH & Co. KG

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1 Change Log

Version	Date	Revision Notes
1.0	2025-10-07	Initial version

2 About This Manual

2.1 Imprint and Legal Information

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2.2 Copyright and Liability Exclusion

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You may also write to techsupport@meinberg.de to request an updated version at any time or provide feedback on errors or suggested improvements, which we are grateful to receive.

Meinberg reserves the right to make changes of any type to this document at any time as is necessary for the purpose of improving its products and services and ensuring compliance with applicable standards, laws & regulations.

2.3 Applicability of Content in this Manual

This manual provides all of the guidance required for the initial installation and connection of your Meinberg Inline-Verstärker.

Meinberg products are subject to ongoing development even after their market release, with new features and enhancements added on a regular basis via firmware and software updates. Meinberg also revises its product manuals to account for these feature updates.

New versions of the manual are published on the Meinberg Customer Portal at <https://www.meinberg.support>.

2.4 Presentation Conventions in this Manual

2.4.1 Conventions for the Presentation of Critical Safety Warnings

Warnings are indicated with the following warning boxes, using the following signal words, colors, and symbols:



Caution!

This signal word indicates a hazard with a **low risk level**. Such a notice refers to a procedure or other action that may result in **minor injury** if not observed or if improperly performed.



Warning!

This signal word indicates a hazard with a **medium risk level**. Such a notice refers to a procedure or other action that may result in **serious injury** or even **death** if not observed or if improperly performed.



Danger!

This signal word indicates a hazard with a **high risk level**. Such a notice refers to a procedure or other action that will very likely result in **serious injury** or even **death** if not observed or if improperly performed.

2.4.2 Secondary Symbols Used in Safety Warnings

Some warning boxes may feature a secondary symbol that emphasizes the defining nature of a hazard or risk.



The presence of an “electrical hazard” symbol is indicative of a risk of electric shock or lightning strike.



The presence of a “fall hazard” symbol is indicative of a risk of falling when performing work at height.



This “laser hazard” symbol is indicative of a risk relating to laser radiation.

2.4.3 Conventions for the Presentation of Other Important Information

Beyond the above safety-related warning boxes, the following warning and information boxes are also used to indicate risks of product damage, data loss, and information security breaches, and also to provide general information for the sake of clarity, convenience, and optimum operation:



Important!

Warnings of risks of product damage, data loss, and also information security risks are indicated with this type of warning box.



Information:

Additional information that may be relevant for improving efficiency or avoiding confusion or misunderstandings is provided in this form.

2.4.4 Generally Applicable Symbols

The following symbols and pictograms are also used in a broader context in this manual and on the product.



The presence of the “ESD” symbol is indicative of a risk of product damage caused by electrostatic discharge.



Direct Current (DC) (*symbol definition IEC 60417-5031*)



Alternating Current (AC) (*symbol definition IEC 60417-5032*)



Grounding Terminal (*symbol definition IEC 60417-5017*)



Protective Earth Connection (*symbol definition IEC 60417-5019*)



Disconnect All Power Connectors (*symbol definition IEC 60417-6172*)

2.5 Your Feedback is Valuable: A Message from Meinberg's Technical Documentation Team

We in the Meinberg Technical Documentation Team prepare our manuals with a view to providing you with the most comprehensive yet relevant source of information needed to prepare, install, set up, use, and manage your Meinberg product. Our technical writers actively engage with Meinberg's development and support engineers in the preparation of this manual, and we regularly review our documentation to keep it up to date with the latest features and to accommodate feedback.

Of course, no feedback is more valuable than that which we receive from the end users of Meinberg products, as your experiences primarily inform the direction that we take in the preparation of our documentation. We truly hope that this manual meets your requirements and expectations, but if you feel that anything is unclear or missing, please feel free to drop us a line and let us know. We are grateful for your feedback and ideas, and we of course handle them with the respect and seriousness they deserve.

Meinberg Technical Support

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3 Important Safety Information



The safety information provided in this chapter as well as specific safety warnings provided at relevant points in this manual must be observed during every installation, set-up, and operation procedure of the device, as well as its removal from service.

Any safety information affixed to the product itself must also be observed.

Any failure to observe this safety information, these safety warnings, and other safety-critical operating instructions in the product documentation, or any other improper usage of the product may result in unpredictable behavior from the product, and may result in injury or death.

Depending on your specific device configuration and installed options, some safety information may not be applicable to your device.

Meinberg accepts no responsibility for injury or death arising from a failure to observe the safety information, warnings, and safety-critical instructions provided in the product documentation.

It is the responsibility of the operator to ensure that the product is safely and properly used.

Should you require additional assistance or advice on safety-related matters for your product, Meinberg's Technical Support team will be happy to assist you at any time. Simply send a mail to [✉ techsupport@meinberg.de](mailto:techsupport@meinberg.de).

3.1 Appropriate Usage



The device must only be used appropriately in accordance with the specifications of the product documentation! Appropriate usage is defined exclusively by this manual as well as any other relevant documentation provided directly by Meinberg.

Appropriate usage includes in particular compliance with specified limits! The device's operating parameters must never exceed or fall below these limits!

3.2 Product Documentation

The information in this manual is intended for readers with an appropriate degree of safety awareness.

The following are deemed to possess such an appropriate degree of safety awareness:

- **skilled personnel** with a familiarity with relevant national safety standards and regulations,
- **instructed personnel** having received suitable instruction from skilled personnel on relevant national safety standards and regulations.



Read the product manual carefully and completely before you set the product up for use.

If any of the safety information in the product documentation is unclear for you, do **not** continue with the set-up or operation of the device!

Safety standards and regulations change on a regular basis and Meinberg updates the corresponding safety information and warnings to reflect these changes. It is therefore recommended to regularly visit the Meinberg website at <https://www.meinbergglobal.com> or the Meinberg Customer Portal at <https://meinberg.support> to download up-to-date manuals.

Please keep all product documentation, including this manual, in a safe place in a digital or printed format to ensure that it is always easily accessible.

Meinberg's Technical Support team is also always available at techsupport@meinberg.de if you require additional assistance or advice on safety aspects of your Meinberg product.

4 Introduction to the Meinberg Inline Amplifier

The Meinberg INA-20 and INA-30 inline amplifiers are high-performance accessories designed to ensure maximum signal quality as well as reliable and precise signal amplification for GNSS signals in all GNSS bands for your specific application. The two models available—the INA-20 for 20 dB amplification and the INA-30 for 30 dB amplification—provides the means to ensure that the signal receiver is supplied with its ideal signal level. The specific circumstances dictate whether these models should be used individually or together in the cable route to be covered.

With a typical noise figure (F) of 0.8 dB, the INA provides a superb signal-to-noise ratio, resulting in reliable signal transmission. The integrated surge protection provides dependable protection for downstream electronics and the antenna installation against surge voltages. The nickel-plated housing is robust and satisfies the requirements of the IP68 protection class.

These inline amplifiers are part of the Kybernion range of products, which also includes the Meinberg GPS antenna GPSANTv2 and the Meinberg multi-band GNSS antenna GNMANTv2. The Meinberg inline amplifier is therefore also fully compatible with Meinberg's proprietary mbgARC technology (patent pending), in which the receiver and antenna actively exchange operating data.



This manual contains all guidance required to installation and set up your Meinberg Inline-Verstärker as quickly and simply as possible. It covers two key steps:

- → [Chapter 7.1, “Planning the Installation”](#)
- → [Chapter 7.2, “Installing and Connecting the Inline Amplifier”](#)

Information on the compatibility of the INA is provided in → [Chapter 5.1, “Installing and Connecting the Inline Amplifier”](#).

If you require additional assistance with the set-up of your Meinberg Inline-Verstärker at any time, please do not hesitate to contact Meinberg's Technical Support Team, who will be pleased to assist you further.

Phone: +49 (0) 5281 – 9309- 888

Email: [✉ techsupport@meinberg.de](mailto:techsupport@meinberg.de)

5 General Information

5.1 Compatibility of the Inline Amplifier

The Meinberg Inline-Verstärker INA-20 and INA-30 are designed for use with the following Meinberg products:

Compatible Antennas

- GNMANTv2 Multi-GNSS Antenna
- GNMANTv1 Multi-GNSS Antenna*
- PCTEL GPSGL-TMG-SPI-40NCB Antenna*

Compatible Reference Clocks

The INA-20 and INA-30 are specified for use with the following reference clock types installed in IMS LAN-TIME systems or M-Series LANTIME systems

- GNM181
- GNS181
- GNS182
- GNS183
- GXL183

* *For existing antenna installations using the PCTEL L1 antenna or Meinberg (GNMANTv1) multi-band antenna..*

6 Preparation

6.1 Unpacking Your Meinberg Inline-Verstärker

Carefully unpack the Meinberg Inline-Verstärker and all accessories. Meinberg recommends retaining the original packaging materials, in case the product needs to be placed into storage, shipped, or transported again at a later date.

Check the contents of the delivery against the enclosed packing list to ensure that nothing is missing. If any of the listed items are missing, please contact Meinberg's Sales Department at [✉ sales@meinberg.de](mailto:sales@meinberg.de) or your Authorized Meinberg Distributor.

Check that the product has not been damaged in transit. If the product is damaged or fails to operate upon installation, please contact Meinberg's Sales Department at [✉ sales@meinberg.de](mailto:sales@meinberg.de) or your Authorized Meinberg Distributor immediately. Please note that in many cases, forwarders will only accept claims or complaints filed by the recipient for damage caused in transit.

7 Installing the Inline Amplifier

7.1 Planning the Installation

Management of the antenna signal plays a key role in the signal route from the antenna to the reference clock of your Meinberg system.

When planning the receiver system, it is important to consider that the satellite signals transmitted along the coaxial cable between the GNSS antenna and the reference clock are attenuated (weakened). This is why GNSS antennas typically integrate an amplifier (usually 37 dB) that increases the signal level. This allows a cable route of up to 70 meters (230 feet) to be established using the Speedfoam HFJ240 coaxial cable recommended by Meinberg without the use of the INA inline amplifier.

When the INA is Required

Satellite receivers require a certain frontend gain of between 12 and 20 dB, such that the gain of the antenna is not adequate for compensating for the attenuation induced by the coaxial cable by the time the signal reaches the satellite receiver.

As soon as the coaxial cable exhibits attenuation of greater than 25 dB at a frequency of 1.575 GHz, an inline amplifier (the INA) is required to boost the signal level again. However, it is also important to ensure that the receiver of the reference clock is not overdriven (fed with an overpowered signal), as overdrive caused by excessive signal gain will result in the receiver no longer being able to process the incoming satellite signals.

The objective is therefore to operate all components in an ideal HF dynamic range that allows the low-powered satellite signals to be received in such a way that does not result in receiver overdrive. Meinberg offers the two inline amplifiers INA-20 (for 20 dB gain) and INA-30 (for 30 dB gain) for this purpose.

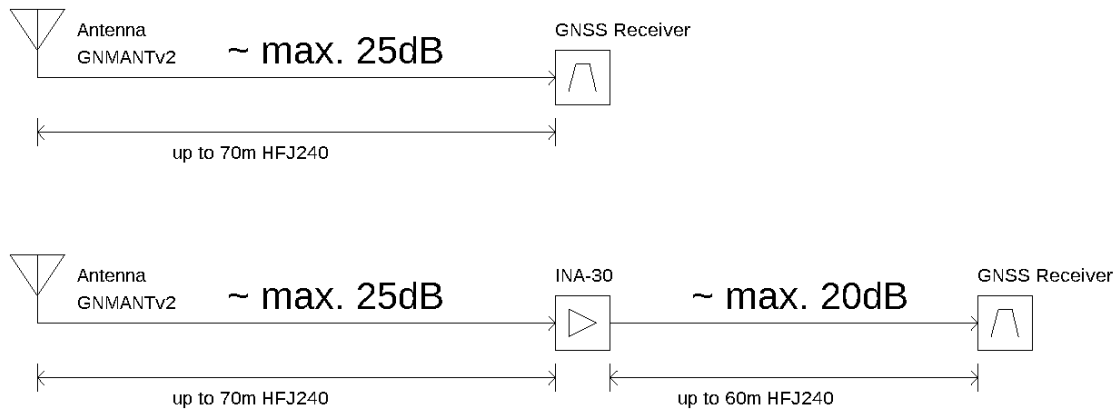


Figure 7.1: Use of inline amplifiers

The Meinberg INA inline amplifier is integrated directly into the coaxial cable route between the GNSS antenna and the GNSS receiver. Please note the cable lengths specified in the diagram [Fig. 7.1](#) and employ the inline amplifiers accordingly.



Information:

When connecting multiple inline amplifiers in series (cascading), the required gain must be calculated precisely. For assistance in this matter, please contact techsupport@meinberg.de.

7.2 Installing and Connecting the Inline Amplifier

Components and Accessories of the Inline Amplifier

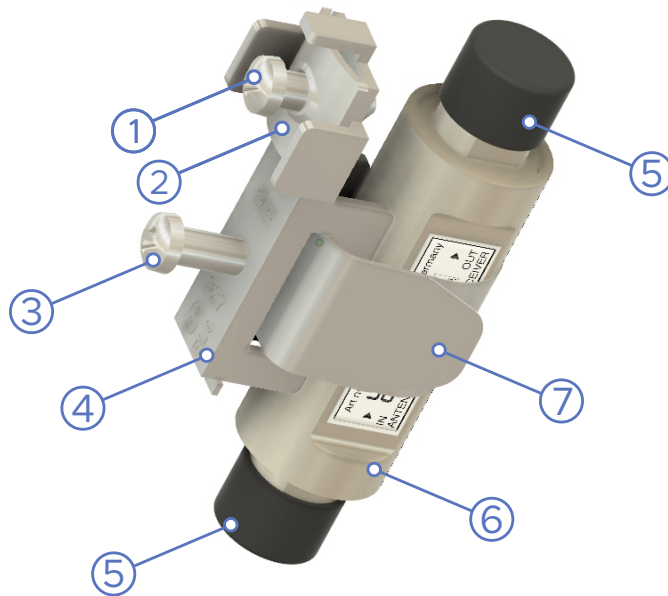


Figure 7.2: INA Components

1. Pan-head screw (for fixture of grounding cable)
2. Grounding clamp
3. Pan-head screw (for fixture of clamp strap)
4. Clamp unit
5. Female Type-N connector
6. Meinberg Inline Amplifier (INA)
7. Clamp strap

Installing the Inline Amplifier

1. Release the screw (3) if necessary.
2. Feed the clamp strap (7) through the slot in the clamp unit (4) and pull it far enough through the slot that there is enough space to insert the INA.
3. Feed the INA (6) through the arched clamp strap (7) and place it in the middle of the clamp unit.
4. Pull the clamp strap so that it securely holds the INA (see [Fig. 7.2](#)).
5. Secure the INA by tightening the screw (3).

Connecting the INA



Caution!

The INA has a dedicated signal input for connecting the coaxial cable from the antenna as well as a signal output for connecting the coaxial cable to the reference clock. Please note the label on the housing to identify the correct orientation of the device. (See [Fig. ??](#))

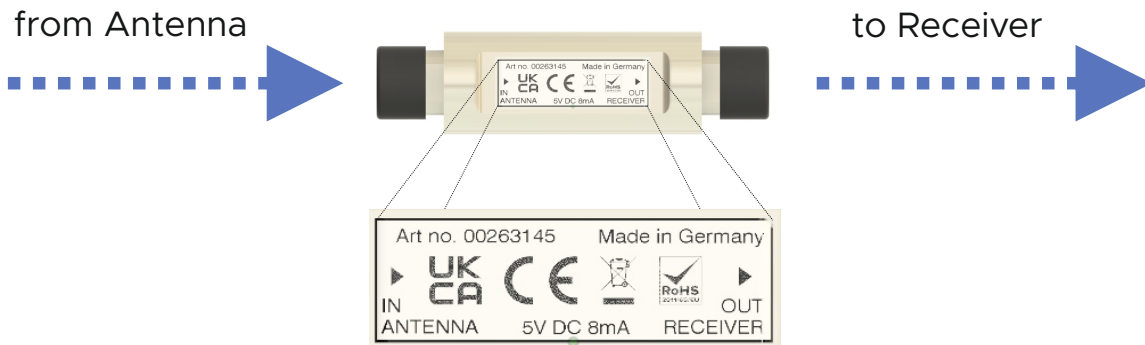


Figure 7.3: Installation orientation of INA

The INA is mounted downstream of a 70 m segment of a coaxial cable route (Speedfoam HFJ240) using the attached grounding strap clamp and connected directly into the cable route. Begin by grounding the INA to divert any potential excess voltages. Proceed as follows when connecting the device:

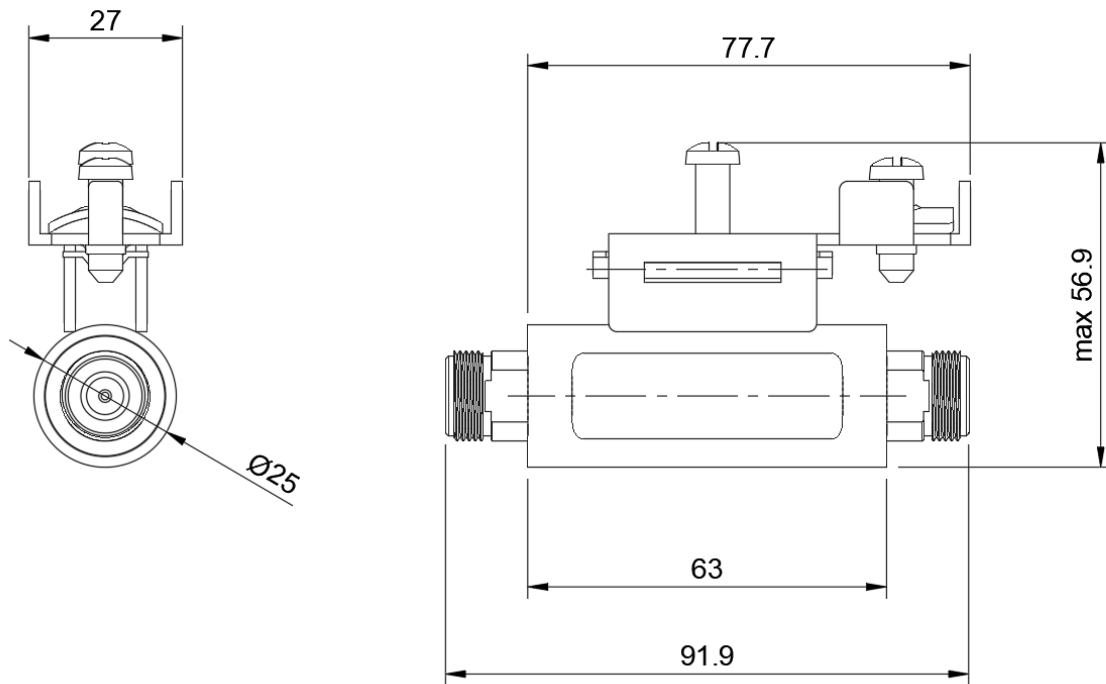
6. Feed a maximum of two grounding cables with a diameter of between 2.5 mm² and 25 mm² through the grounding terminal (2) of the INA.
7. Secure the grounding cable by tightening the screw (1).
8. Remove the two protective caps on the Type-N connectors of the INA.
9. Screw the coaxial cable from the antenna (Type-N male connector) onto the Type-N female connector of the INA labeled "IN ANTENNA" and tighten it (**max. torque 1 Nm**).
10. Screw the coaxial cable from the receiver (Type-N male connector) onto the Type-N female connector of the INA labeled "OUT RECEIVER" and tighten it (**max. torque 1 Nm**).

8 Technical Appendix

8.1 Technical Specifications

8.1.1 Technical Specifications: Meinberg Inline Amplifier INA-20, INA-30

Physical Dimensions



Physical Specifications

Housing:	Vernickeltes Messinggehäuse für Außen- und Inneninstallation
Weight:	273 g (9.63 oz), including grounding strap clamp

Antenna Connection

Connector Type:	Type-N, Female
Input Impedance: (Nominal)	50 Ω
Grounding:	Grounding terminal for cable of diameter 2.5 mm ² to 25 mm ²

Electrical Specifications

Power Supply: (via Antenna Cable)	3.6 V – 5.5 V $\overline{\text{DC}}$
Current Draw: (typical)	8 mA @ 5 V
Bypass Current: (Maximum)	100 mA

Reception and Signal Properties

Frequency Range:	1164 MHz – 1615 MHz
Signal Amplification:	INA-20 (20 dB), INA-30 (30 dB)
Return Loss: (Input – Output)	> 10 dB
Output Compression Point:	11 dBm
Noise Figure: (Typical)	0,8 dB
Noise Figure: (Maximum)	1.1 dB
Propagation Delay:	1176.45 MHz: 2.44 ns 1227.60 MHz: 2.67 ns 1575.42 MHz: 1.94 ns
Group Delay in GNSS Bands:	< 0.1 ns

Environmental Conditions

Temperature Range (Operation):	−70 °C to +85 °C (−94 °F to +185 °F)
Temperature Range (Storage):	−70 °C to +95 °C (−94 °F to +203 °F)
Relative Humidity:	Max. 95 % at 40 °C (104 °F), non-condensing
IP Rating:	IP68

8.2 Further Reading

This Setup Guide contains the information required to set up a Meinberg Inline-Verstärker quickly and easily for use. We recommend also carefully studying the following documents alongside this Setup Guide for the use of your Meinberg Inline-Verstärker:

Meinberg GNMANTv2 Multi-GNSS Antenna Setup Guide

<http://mbg.link/gnssant>

The Setup Guide of the Meinberg GNMANTv2 Multi-Band Antenna provides additional information, including on best practices related to the positioning and installation of an antenna and surge protection, as well as specifications and laying of the recommended coaxial cable. The manual is also available for download via the Meinberg Customer Portal at <https://www.meinberg.support>.

8.3 List of Abbreviations

INA	Inline Amplifier
B2B	Business-to-Business
CLK	Clock
DC	Direct Current
GND	Ground
GLONASS	Globalnaya Navigazionnaya Sputnikovaya Sistema (<u>or</u> Global Navigation Satellite System)
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
WEEE	Waste from Electrical and Electronic Equipment (EU Directive)

9 Regulatory Information

9.1 CE Marking

This product bears the CE mark as is required to introduce the product into the EU Single Market.



The use of this mark is a declaration that the product is compliant with all requirements of the EU directives effective and applicable as at the time of manufacture of the product.

These directives are listed in the EU Declaration of Conformity, appended to this manual as → [Chapter 10](#).

9.2 UKCA Marking

This product bears the British UKCA mark as is required to introduce the product into the United Kingdom (excluding Northern Ireland, where the CE marking remains valid).



The use of this mark is a declaration that the product is in conformity with all requirements of the UK statutory instruments applicable and effective as at the time of manufacture of the product.

These statutory instruments are listed in the UK Declaration of Conformity, appended to this manual as → [Chapter 11](#).

9.3 Disposal

Disposal of Packaging Materials



The packaging materials that we use are fully recyclable:

Material	Use for	Disposal
Polystyrene	Packaging frame/filling material	Recycling Depot
PE-LD (Low-density polyethylene)	Accessories packaging, bubble wrap	Recycling Depot
Cardboard	Shipping packaging, accessories packaging	Paper Recycling

For information on the proper disposal of packaging materials in your specific country, please inquire with your local waste disposal company or authority.

Disposal of the Device



This product falls under the labeling obligations of the Waste Electrical and Electronic Equipment Directive 2012/19/EU ("*WEEE Directive*") and thus bears this WEEE symbol. The presence of this symbol indicates that this electronic product may only be disposed of in accordance with the following provisions.



Important!

Do not dispose of the product via the household waste. Inquire with your local waste disposal company or authority on how to best dispose of the product if necessary.

This product is considered to be a "**B2B**" product for the purposes of the WEEE Directive and is also classified as "**IT and Telecommunications Equipment**" in accordance with Annex I of the Directive.

It can be returned to Meinberg for disposal. Any transportation expenses for returning this product (at end-of-life) must be covered by the end user, while Meinberg will bear the costs for the waste disposal itself. If you wish for Meinberg to handle disposal for you, please get in touch with us. Otherwise, please use the return and collection systems provided within your country to ensure that your device is disposed of in a compliant fashion to protect the environment and conserve valuable resources.

9.4 RoHS Conformity

Conformity with EU Directive 2011/65/EU (RoHS)

We hereby declare that this product is compliant with the European Union Directive 2011/65/EU and its delegated directive 2015/863/EU "Restrictions of Hazardous Substances in Electrical and Electronic Equipment" and that no impermissible substances are present in our products pursuant to these Directives.

We warrant that our electrical and electronic products sold in the EU do not contain lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBBs), polybrominated diphenyl ethers (PBDEs), bis(2-ethylhexyl)phthalat (DEHP), benzyl butyl phthalate (BBP), dibutyl phthalate (DBP), or diisobutyl phthalate (DIBP) above the legal limits.



11 Declaration of Conformity for Operation in the United Kingdom

UK Declaration of Conformity

Doc ID: Inline Amplifier INA-20, INA-30-2025-10-07

Manufacturer

Meinberg Funkuhren GmbH & Co. KG
Lange Wand 9
31812 Bad Pyrmont
Germany

declares that the product

Product Designation

Inline Amplifier INA-20, INA-30

to which this declaration relates, is in conformity with the following standards and provisions of the following regulations under British law:

Electromagnetic Compatibility
Regulations 2016 (as amended)
SI 2016/1091

EN IEC 61000-6-2:2019
EN IEC 61000-6-3:2021
EN 55035:2017/A11:2020
EN 55032:2015 + AC:2016 + A11:2020 + A1:2020

The Restriction of the Use of Certain
Hazardous Substances in Electrical and
Electronic Equipment Regulations 2012
(as amended)
SI 2012/3032

EN IEC 63000:2018

Bad Pyrmont, Germany, dated 2025-10-07

Aron Meinberg
Quality Management


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