TECHNICAL REFERENCE

LANTIME M300 WWVB

NTP Time Server with WWVB Receiver

3rd September 2019

Meinberg Radio Clocks GmbH & Co. KG
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1 Imprint

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Date:   2019-09-03
2 Important Safety Information

2.1 Important Safety Instructions and Protective Measures

The following safety instructions must be respected in all operating and installation phases of the device. Non-observance of safety instructions, or rather special warnings and operating instructions in product manuals, violates safety standards, manufacturer instructions and proper usage of the device. Meinberg Funkuhren shall not be responsible for any damage arising due to non-observance of these regulations.

Depending on your device or the installed options some information is not valid for your device.


If a procedure is marked with the following signal words, you may only continue, if you have understood and fulfilled all requirements. In this documentation dangers and indications are classified and illustrated as follows:

⚠️ DANGER!
The signal word indicates an imminently hazardous situation with a high risk level. This notice draws attention to an operating procedure or similar proceedings, of which a non-observance may result in serious personal injury or death.

⚠️ WARNING!
The signal word indicates a hazard with a medium risk gradient. This notice draws attention to an operating procedure, a procedure or the like which, if not followed, can lead to serious injuries, possibly resulting in death.

⚠️ CAUTION!
The signal word indicates a hazard with a low risk gradient. This notice draws attention to an operating procedure, a procedure or the like which, if not followed, can lead to minor injuries.

⚠️ ATTENTION!
This notice draws attention to an operating procedure, a procedure or the like which, if not followed, can cause damage to the product or loss of important data.
2.2 Used Symbols

The following symbols and pictograms are used in this manual. To illustrate the source of danger, pictograms are used, which can occur in all hazard classes.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Beschreibung / Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>⬇️</td>
<td>IEC 60417-5031 Gleichstrom / Direct current</td>
</tr>
<tr>
<td>⬆️</td>
<td>IEC 60417-5032 Wechselstrom / Alternating current</td>
</tr>
<tr>
<td>⬇️</td>
<td>IEC 60417-5017 Erdungsanschluss / Earth (ground) terminal</td>
</tr>
<tr>
<td>⬇️</td>
<td>IEC 60417-5019 Schutzleiteranschluss / Protective earth (ground) terminal</td>
</tr>
<tr>
<td>⚠️</td>
<td>ISO 7000-0434A Vorsicht / Caution</td>
</tr>
<tr>
<td>⚠️</td>
<td>IEC 60417-6042 Vorsicht, Risiko eines elektrischen Schlages / Caution, risk of electric shock</td>
</tr>
<tr>
<td>⚠️</td>
<td>IEC 60417-5041 Vorsicht, heiße Oberfläche / Caution, hot surface</td>
</tr>
<tr>
<td>⚠️</td>
<td>IEC 60417-6056 Vorsicht, Gefährlich sich bewegende Teile / Caution, moving fan blades</td>
</tr>
<tr>
<td>⚠️</td>
<td>IEC 60417-6172 Trennen Sie alle Netzstecker / Disconnection, all power plugs</td>
</tr>
<tr>
<td>⚠️</td>
<td>IEC 60417-5134 Elektrostatisch gefährdete Bauteile / Electrostatic Sensitive Devices</td>
</tr>
<tr>
<td>⚠️</td>
<td>IEC 60417-6222 Information generell / Information general</td>
</tr>
<tr>
<td>⚠️</td>
<td>2012/19/EU Dieses Produkt fällt unter die B2B Kategorie. Zur Entsorgung muss es an den Hersteller übergeben werden. This product is handled as a B2B category product. In order to secure a WEEE compliant waste disposal it has to be returned to the manufacturer.</td>
</tr>
</tbody>
</table>
The manuals for a product are included in the scope of delivery of the device on a USB stick. The manuals can also be obtained via the Internet. Enter www.meinbergglobal.com into your browser, then enter the corresponding device name in the search field at the top.

This manual contains important safety instructions for the installation and operation of the device. Please read this manual completely before using the unit. This device may only be used for the purpose described in this manual. In particular, the given limits of the device must be observed. The safety of the installation in which the unit is integrated is the responsibility of the installer!

Non-observance of these instructions can lead to a reduction in the safety of this device!

Please keep this manual in a safe place.

This manual is intended exclusively for electricians or persons trained by an electrician who are familiar with the applicable national standards and safety rules. Installation, commissioning and operation of this device may only be carried out by qualified personnel.
2.3 Security during Installation

WARNING!

Preparing for Commissioning
This built-in unit has been designed and examined according to the requirements of the standard IEC 60950-1 „Information Technology Equipment - Safety“.

When the built-in unit is used in a terminal (e.g., housing cabinet), additional requirements according to Standard IEC 60950-1 must be observed and complied with. In particular, the general requirements and the safety of electrical equipment (such as IEC, VDE, DIN, ANSI) as well as the applicable national standards are to be observed.

The device has been developed for use in the industrial sector as well as in residential areas and can only be used in such environments. For environments with higher levels of soiling, additional measures, e.g. Installation in an air-conditioned control cabinet required.

Transport, Unpacking, Installation
If the unit is brought into the operating room from a cold environment, condensation may occur, wait until the unit is temperature-controlled and absolutely dry before operating it.

When unpacking, setting up, and before operating the equipment, be sure to read the information on the hardware installation and the specifications of the equipment. These include, for example, dimensions, electrical characteristics, and necessary ambient and climatic conditions, etc.

The fire protection must be ensured in the installed state.

For mounting, the housing must not be damaged. No holes may be drilled in the housing.

For safety reasons, the device with the highest mass should be installed in the lowest position of the rack. Other devices must be placed from the bottom to the top.

The device must be protected against mechanical stress such as vibration or shock.
Connecting Data Cables
During a thunderstorm, data transmission lines must not be connected or disconnected (risk of lightning).

When wiring the devices, the cables must be connected or disconnected in the order of the arrangement described in the user documentation accompanying the device. Always attach all cables to the plug during connection and removal. Never pull the cable itself. Pulling the cable can cause the cables to disconnect from the plug.

Install the cables in way that they do not constitute a hazard (danger of tripping) and are not damaged, i.e. kinked.

Connecting Power Supply
This equipment is operated at a hazardous voltage. Non-observance of the safety instructions in this manual may result in serious personal injury or property damage.

Before connecting to the power supply, a grounding cable must be connected to the earth connection of the device.

Before operation, check that all cables and lines work properly and are undamaged. Pay particular attention to the facts that the cables do not have kinks or that they are not too short around corners, and no objects are placed on the cables. Also make sure that all connections are secure.

Faulty shielding or cabling will endanger your health (electrical shock) and may destroy other equipment.

Ensure that all necessary safety precautions have been taken. Make all connections to a unit before turning on the power. Observe the safety instructions on the device (see safety symbols).

The metal housing of the device is grounded. It must be ensured that enough air and creepage distances to neighboring voltage-carrying parts are provided during assembly in the control cabinet and no short circuits are caused.

In the case of malfunctions or servicing (e.g. in the event of a damaged housing or power cable or when fluids or foreign objects enter), the current flow can be interrupted. Questions about the house installation, need to be clarified with your house administration.

The power supply should be connected with a short, low-inductance line.
## Important Safety Information

**AC Power Supply**

- The device is a device of protection class 1 and may only be connected to a grounded outlet (TN system).
- For safe operation, the device must be protected by an installation fuse of max. 16 A and equipped with a residual current circuit breaker in accordance with the applicable national standards.
- The unit must always be disconnected from the mains and not from the appliance.
- Devices with mains plugs are equipped with a safety-tested mains cable of the country of use and may only be connected to a grounded shockproof socket, otherwise electric shock may occur.
- Make sure that the mains socket on the appliance or the mains socket of the house installation is freely accessible to the user so that the mains cable can be pulled out of the socket in case of emergency.

**DC Power Supply**

- Outside the assembly group the device must be disconnectable from the power supply in accordance with the provisions of IEC 60950-1 (e.g. by the primary line protection).
- Installation and disassembly of the power supply plug is only permitted if the assembly group is switched off (e.g. by the primary line protection).
- The supply lines must be adequately secured and dimensioned.

*Connection Cross Section:*

- 1 mm² – 2.5 mm²
- 17 AWG – 13 AWG

- The device must be supplied with a suitable disconnector (switch). The separation device must be easily accessible, placed near the device and marked as a separation device for the unit.
2.4 Protective Conductor- / Ground-Terminal

ATTENTION!

In order to ensure safe operation and to meet the requirements of IEC 62368-1, the device must be correctly connected to the protective earth conductor via the protective earth connection terminal.

If an external earth connection is provided on the housing, it must be connected to the equipotential bonding rail (grounding rail). The mounting parts (without cable) are not included in the scope of delivery.

Note:
Please use a grounding cable ≥ 1.5 mm²
Always pay attention to a correct crimp connection!
2.5 Safety during Operation

**WARNING!**

**Avoiding Short-Circuits**
Make sure not to get any objects or liquids inside the unit. Electric shock or short circuit could result.

**Ventilation Slots**
Make sure that the ventilation slots are not covered or dusty, as there is a danger of overheating during operation. Disturbances during operation can result.

**Normal Operation**
The normal operation and the observance of the EMC limits (electromagnetic compatibility) are only ensured if the housing cover is properly installed and when the doors are closed (cooling, fire protection, shielding against electrical, magnetic and electromagnetic fields).

**Switch off in fault / service case**
By switching off, the devices are not disconnected from the power supply. In the event of a fault or service case, the devices must be immediately disconnected from all power supplies.

**Follow the steps below:**
- Switch off the device
- Disconnect all power plugs
- Inform the service
- Devices that are connected via one or more uninterruptible power supplies (UPS) remain operational even when the UPS power cord is disconnected. Therefore, you must put the UPS out of operation according to the documentation of the corresponding user documentation.
2.6 Safety during Maintenance

**WARNING!**

When you are expanding the device, use only device parts that are approved for the system. Non-observance may result in injury to the EMC or safety standards and cause malfunction of the device.

If device parts, which are released for the system, are extended or removed there may be a risk of injury in the area of the hands, due to the pull-out forces (approx. 60 N).

The service informs you which device parts may be installed.

The device must not be opened, repairs to the device may only be carried out by the manufacturer or by authorized personnel. Improper repairs can result in considerable danger to the user (electric shock, fire hazard).

Unauthorized opening of the device or of individual parts of the device can also lead to considerable risks for the user and result in a loss of warranty as well as an exclusion of liability.

- Danger due to moving parts - keep away from moving parts.

- Device parts can become very hot during operation. Do not touch these surfaces! If necessary, switch off the unit before installing or removing any equipment, and allow it to cool down.

2.7 Handling Batteries

**CAUTION!**

The lithium battery on the receiver modules has a service life of at least 10 years. If an exchange is necessary, the following notes must be observed:

The device is equipped with a lithium battery. The battery must not be short-circuited or recharged. Replacement of the lithium battery may only be carried out by the manufacturer or authorized personnel.

Risk of explosion if the battery is not replaced correctly. Replace only with the same or equivalent type recommended by the manufacturer.

When disposing used batteries, observe the local regulations for the disposal of hazardous waste.
2.8 Cleaning and Care

ATTENTION!

Do not wet clean the appliance! Penetrating water can cause considerable dangers to the user (e.g., electric shock).

Liquid can destroy the electronics of the device! Liquid penetrates into the housing of the device and can cause a short circuit of the electronics.

Only clean with a soft, dry cloth. Never use solvents or cleaners.

2.9 Prevention of ESD Damage

ATTENTION!

The designation ESD (Electrostatic Sensitive Devices) refers to measures which are used to protect electrostatically endangered components from electrostatic discharge and thus to prevent destruction. Systems and assemblies with electrostatically endangered components usually have the following characteristics:

Indicator for assemblies with electrostatic endangered components

The following measures protect electrostatically endangered components from destruction:

Prepare removal and installation of assemblies
Unload yourself (for example, by touching a grounded object) before touching assemblies.

Ensure that you wear a grounding strap on the wrist when working with such assemblies, which you attach to an unpainted, non-conductive metal part of the system.

Use only tools and devices that are free from static electricity.

Transporting Assemblies
Assemblies may only be touched at the edge. Do not touch any pins or conductors on assemblies.

Installing and Removing Assemblies
Do not touch persons who are not grounded while removing or installing components. This could result in a loss of grounding protection from your electrostatic discharge.

Storing Assemblies
Always keep assemblies in ESD protective covers. These protective covers must be undamaged. ESD protective covers, which are extremely wrinkled or even have holes, no longer protect against electrostatic discharge.

ESD protective covers must not be low-resistance and metallically conductive if a lithium battery is installed on the assembly.
2.10 Return of Electrical and Electronic Equipment

ATTENTION!

WEEE Directive on Waste Electrical and Electronic Equipment 2012/19 / EU
(WEEE Waste Electrical and Electronic Equipment)

Separate Collection
Product Category: According to the device types listed in the WEEE Directive, Appendix 1, this product is classified as an IT and communication device.

This product meets the labeling requirements of the WEEE Directive. The product symbol on the left indicates that this electronic product must not be disposed of in domestic waste.

Return and Collection Systems
For returning your old equipment, please use the country-specific return and collection systems available to you or contact Meinberg.

The withdrawal may be refused in the case of waste equipment which presents a risk to human health or safety due to contamination during use.

Return of used Batteries
Batteries marked with one of the following symbols may not be disposed of together with the household waste according to the EU Directive.
3 Global Information LANTIME M300/WWVB

The LANTIME (Local Area Network Time Server) provides a high precision time base to a TCP/IP network (Stratum-1-Server). The NTP (Network Time Protocol) is used to synchronize all NTP clients with the reference. The several LANTIME variants differ from each other by the time reference and output configuration. A GPS or GNSS (GPS, GLONASS, Galileo, BeiDou) receiver, GNS-UC (only GPS and Galileo), a long wave receiver (like DCF77, MSF or WWVB) or an IRIG time code receiver can be integrated as an internal reference as well as a combination of these references (hybrid system). External references are also possible.

The LANTIME system is a set of equipment composed of an integrated WWVB receiver, a single-board computer and a power supply, all installed in a metal 19 inch modular chassis and ready to operate. A simplified LINUX operating system is installed on the single-board computers flash disk. Eight push buttons and a display can be used to configure and monitor the time server.

After the network connection has been established the time server can also be configured and monitored remotely from a workstation via TELNET or FTP. An integrated web server enables access to the LANTIME by using an ordinary web browser.
4 Technical Specifications LANTIME Chassis

Protection
Rating: 1P20

Power
Consumption:

- Base configuration: 30 W
- (max. 50 W - depending on the integrated module options)

Ambient Temperature: 0 ... 50 °C

Storage Temperature: -20 ... 70 °C

Humidity: max. 85% (non-condensing) @ 30 °C

External Ground Connection on the Housing

This connector must be wired to an equipotential bonding bar (earthing bar). Connection is possible on both sides of the housing. The mounting parts (without cable) are included in the scope of delivery.
5 LANTIME M300 - Front connectors

1. The main menu is displayed after switching on the device and having completed the initialization phase. In the main menu the most important status information are displayed. In the top line of the display the operating mode of the reference clock / reference time is shown. Instead of "WWVB: NORMAL OPERATION" the messages "WWVB: NO SIGNAL" can appear. In case the antenna connection is interrupted, the following message is shown: "WWVB: ANTENNA FAULTY" or "WWVB: NO SIGNAL".

2. By using the 4 arrows and the "ESC", "F1" and "F2" buttons of the keypad you can navigate through each menu in the display. You can always return to the main menu by pressing the "ESC" button several times.
3. "Ref. Time"
green: the reference clock (e.g. build-in WWVB)
provides a valid time.
red: the reference clock does not provide a valid time

"Time Service"
green: NTP is synchronized to the reference clock, e.g. WWVB
red: NTP is not synchronized or switched to the 'local clock' 

"Network"
green: all monitored network interfaces are connected ('Link up')
red: at least one of the monitored network interfaces is faulty

"Alarm"
off: no error
red: general error

4. To connect a serial terminal use the 9 pin SUBD RS232 connector in the front panel. Via the serial terminal connection it is possible to configure the parameters with a terminal program. To establish a connection between the LANTIME and a PC, use a NULL-MODEM cable. Configure your terminal program with 38400 Baud, 8 Databits, no parity and one Stopbit (8N1). The terminal emulation has to be set to VT100. After connecting to the time server the login message will be displayed. Enter user name and password:

Default User: root; Password: timeserver

5. All devices of the LANTIME M-Series dispose a USB interface, which can be used to plug in a USB Stick. The USB Stick can be deployed for the following tasks:

- to lock the keys on the LC-Display, to prevent unauthorized access
- to save the LANTIME configuration
- to transfer the configuration between several LANTIMES
- to save log files
6 M300 - Rear connectors

6.1 AC Power Connector

Connector Type: IEC320 AC inlet

<table>
<thead>
<tr>
<th>Input Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Voltage Range: $U_N$</td>
<td>100–240 V$\sim$</td>
</tr>
<tr>
<td>Maximum Voltage Range: $U_{\text{max}}$</td>
<td>90–265 V$\sim$</td>
</tr>
<tr>
<td>Nominal Current: $I_N$</td>
<td>0.30 A</td>
</tr>
<tr>
<td>Nominal Frequency Range: $f_N$</td>
<td>50–60 Hz</td>
</tr>
<tr>
<td>Maximum Frequency Range: $f_{\text{max}}$</td>
<td>47–63 Hz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Power: $P_{\text{max}}$</td>
<td>30 W</td>
</tr>
<tr>
<td>Heat Emission: $E_{\text{therm}}$</td>
<td>$108.00 \text{ kJ/h (102.37 BTU/h)}$</td>
</tr>
</tbody>
</table>

**WARNING!**
This equipment is operated at a hazardous voltage.

**Danger to life due to electrical shock!**
- Only qualified personnel (electricians) may connect the device.
- Never work with open terminals and plugs while the power is on.
- All connectors must be protected against touching live parts with a suitable plug housing!
- **Note:** Always ensure safe wiring!
- **Important:** The device must be connected to a proper grounding (PE).
6.2 RS232 COMx Timestring

Data transfer: serial

Baudrate/framing: 19200 / 8N1 (default)

Timestring: Meinberg Standard (default)

Assignment:
Pin 2: TxD (transmit)
Pin 3: RxD (receive)
Pin 5: GND (ground)

Connection type: D-SUB female 9pin.

Cable:
data cable (shielded)
PC connector 1:1
6.3 Error Relay

On the back panel of the device you can find a DFK connector labeled “Error”. This relay output is connected to the TTL TIME_SYNC output of the reference clock (GPS, PZF, TCR, ...). If the internal reference clock has been synchronized by its source (GPS, DCF77 or IRIG) the relay will switch to mode "NO". In case of bad antenna signal or the device has been switched off the relay falls back to mode "NC".

Technical Specification

Switching Voltage max.: 125 V DC
140 V AC

Switching Current max.: 1A

Switching Load max.: DC 30 W
AC 60 VA

Switching Current UL/CSA: 0.46 A 140 V AC
0.46 A 65 V DC
1A 30 V DC

Response Time: ca.2ms

WARNING!
This equipment is operated at a hazardous voltage.

Danger to life due to electrical shock!
- Never work with open terminals and plugs while the power is on!
- When working on the connectors of the error relay cable, always remove both sides of the cable from the respective devices!
- Dangerous voltages can occur at the terminal of the fault signal relay! Work on the terminal of the fault signal relay must never be carried out with the signal voltage present!
### 6.4 WWVB Antenna

- **Cable:** shielded coaxial line
- **Cable Length:** max. 300m to RG58
- **Connector:** BNC female
- **Frequency:** 60kHz

![WWVB Antenna](image1)

### 6.5 10MHz Frequency Output

- **Output signal:** 10MHz frequency
- **Signal level:** TTL, 2.5 V into 50 Ohm
- **Connector:** BNC, female
- **Cable:** shielded coax line

![10MHz Out](image2)

### 6.6 Pulse Per Second Output

- **Output signal:** PPS (pulse per second)
- **Signal level:** TTL 2.5 V into 50 Ohm
- **Pulse length:** 200 ms
- **Connection type:** BNC, female
- **Cable:** shielded coax line

![PPS Out](image3)
### 6.7 10/100Base-T Network Port (IEEE 803.2)

<table>
<thead>
<tr>
<th>Output signal</th>
<th>100Base-T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data transmission speed</td>
<td>10/100 MBit/s</td>
</tr>
<tr>
<td>Connection type</td>
<td>8P8C (RJ45)</td>
</tr>
<tr>
<td>Cable</td>
<td>Copper twisted pair, e.g. CAT 5.0</td>
</tr>
<tr>
<td>Duplex Modes</td>
<td>Half/Ful/Autonegotiation</td>
</tr>
</tbody>
</table>
7 WWVB Antenna

The antenna of WWVB receivers (AW02-60) includes a ferrite rod which must be aligned to the transmitter. The antenna should be installed with a distance of at least 30cm to all metal objects because they would detune the antenna resonance. A distance of several meters to computer monitors must be kept. If they are running in a high screen resolution mode, their line frequency is close to the carrier frequency of the WWVB transmitter, which would cause a worse or no reception.

The antenna has to be mounted as exactly as possible. Turning it out of the main receive direction will result in less accurate time frames. The antenna must be placed in longitudinal direction to the WWVB-transmitter (Fort Collins - Colorado).
7.1 Mounting and Installation of a Longwave Antenna

The careful selection of the antenna location should be at the beginning of each antenna installation. It determines the reception quality and therefore the availability of the long-wave signal reception signal decisively. In principle, a long-wave signal reception within buildings is possible, however, the reception may deteriorate due to metallic objects (e.g. reinforced concrete walls, metal facades, heat protection glazing etc.) that shield or attenuate the reception.

For this reason we always recommend to mount the antenna outside of buildings. This has the advantage that the signal interference distance to electronic devices in buildings is usually enhanced and the reliability of the synchronisation is thus significantly increased.

Proper installation of an antenna for MSF, or WWVB is illustrated in the figure below:

![Figure: Longwave antenna mounted on a wall. The optional surge protector keeps high voltage strikes through the antenna cable away from the receiver.](image)

The antenna has to be aligned horizontally in longitudinal direction to the MSF or WWVB transmitter. If the antenna is not aligned properly then signal reception is degraded, which can result in a limited time accuracy. The antenna should be installed with a minimum distance of 30 cm away from all metal objects and possibly any microcomputers and electrical devices (engines, electricity, etc.). A distance of several meters from TV and computer monitors should be considered as well.

The best method to align a longwave antenna is to turn the antenna slowly until the monitored signal level is minimized, and then turn the antenna by 90° to achieve maximum reception. However, a high signal level alone is not a guarantee for good reception since it can even be caused by electrical noise in the associated frequency range. For standard longwave receivers it is important that the modulation mark is blinking exactly once per second, without intermediate flickering.
8 WEEE Compliance

Compliance with EU Directive 2011/65/EC (RoHS)

We hereby declare that this product is conform to the European Directive 2011/65/EC, "Restrictions of Hazardous Substances in Electrical and Electronic Equipment". We ensure that electrical and electronic products sold in the EU do not contain lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBBs), and polybrominated diphenyl ethers (PBDEs) above the legal threshold.

WEEE status of the product

This product is handled as a B2B (Business to Business) category product. In order to secure a WEEE compliant waste disposal it has to be returned to the manufacturer. Any transportation expenses for returning this product (at its end of life) have to be incurred by the end user, whereas Meinberg will bear the costs for the waste disposal itself.
9 Declaration of Conformity

Konformitätserklärung
Doc ID: LANTIME M300/WWVB-2019-09-03

Hersteller
Manufacturer
Meinberg Funkuhren GmbH & Co. KG
Lange Wand 9, D-31812 Bad Pyrmont

erklärt in alleiniger Verantwortung, dass das Produkt,
declares under its sole responsibility, that the product

Produktbezeichnung
Product Designation
LANTIME M300/WWVB

auf das sich diese Erklärung bezieht, mit den folgenden Normen und Richtlinien übereinstimmt:
to which this declaration relates is in conformity with the following standards and provisions of the directives:

RED – Richtlinie
RED – Directive
ETSI EN 303 413 V1.1.1 (2017-06)

EMV – Richtlinie
EMC – Directive
ETSI EN 301 489-1 V1.9.2 (2011-09)
DIN EN 61000-6-1:2005
DIN EN 61000-6-3:2007 + A1:2011
DIN EN 55032:2012
DIN EN 55024:2010

2014/30/EU

Niederspannungsrichtlinie
Low-voltage Directive

2014/35/EU

RoHS – Richtlinie
RoHS – Directive
DIN EN 50581:2012

2011/65/EU

Bad Pyrmont, den 2019-09-03

Stephan Meinberg
Production Manager