VDE Prüf- und
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Notified Body RED
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# Information on devices with radio interface

## 1 When does a device fall under the Radio Directive?

If devices are equipped with a radio interface of any kind, they are covered by the Radio Equipment Directive (RED) 2014/53/EU, irrespective of their primary function. Any equipment is considered to be radio equipment if the radio interface is

- **built** into the "non-radio" equipment,
  and
- **permanently attached** to the "non-radio".

A coffee machine that has a radio module plugged internally onto the main board would fall under the RED, since the radio module is built-in and permanently attached.

A device that receives its radio interface via an externally pluggable radio module (e.g. via USB) would therefore not fall under the RED. The device and the radio module can then have separate declarations of conformity. However, the manufacturer who places the combination on the market is obliged to take this combination of radio module and device into account in his risk assessment and in the tests. This can generally be covered by certain partial EMC tests and spot tests for the radio matters.

Application of the Low Voltage Directive (2014/35/EU) and the EMC Directive (2014/30/EU) in addition to the Radio Equipment Directive is not envisaged. The radio directive covers EMC and safety completely.

Detailed training (1/2 to 1 day) on the topic of radio guidelines (RED) is possible by the VDE. Please inform your VDE contact if you are interested. We would be happy to make you an offer.

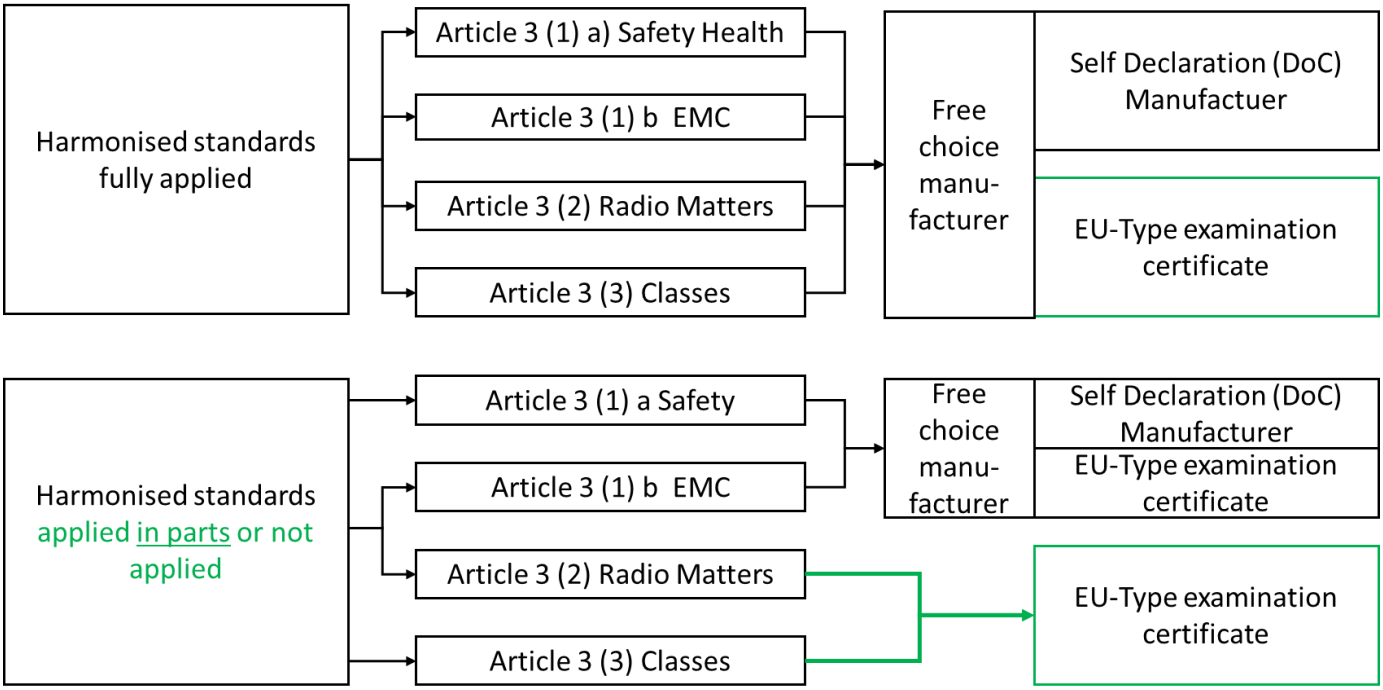
## 2 What are the basic requirements that the radio devices shall meet?

To comply with the Radio Directive, radio equipment must comply with the essential requirements of the RED.

| **Essential Requirement** | **Short designation** | **Explanation of the requirement** |
|---|---|---|
| Article 3 (1) (a) | Safety and Health | Safety and health as in the requirements of the Low Voltage Directive 2014/35/EU, but without voltage limit (e.g. battery devices < 50 V must therefore be tested!) and requirements for protection against electromagnetic fields of the transmitters installed in the radio devices. |
| Article 3 (1) (b) | Electromagnetic compatibility | Electromagnetic compatibility as listed in Directive 2014/30/EU (EMC Directive). The EMC must be considered both for the normal function of the devices and for radio transmission. |
| Article 3 (2) | Effective and efficient use of the spectrum (Radio matters) | Transmitters must be effective (transmit as little as possible, bandwidth as low as necessary) and receivers must be efficient (sensitive, interference-proof) to make the best use of the general spectrum resource. |
| Article 3 (3) | Additional requirements for certain classes and categories of radios | A wide variety of requirements (e.g.: protection of networks, interoperability, protection against fraud, data protection, access for emergency services and support for people with disabilities).<br>As the EU Commission has not yet issued any specific requirements (so-called delegated acts) in this area, there are usually no tests to be carried out here. |

To demonstrate compliance with the essential requirements of the Directive, either harmonized standards published under the RED in the Official Journal of the EU (OJEU) or other available standards may be applied. These standards must cover the relevant essential requirements. Whether a standard covers the basic requirement can usually be found in Annex ZZ for EN standards or in Annex A or in the title of the standard for ETSI standards.

The manufacturer is always free to contact a notified body RED, which can issue an EU-Type examination certificate. In the case of the essential requirements safety and EMC, this is always voluntary. However, if there are no harmonised standards for Article 3 (2) (Radio matters) or Article 3 (3) (Classes) or if they have not been applied in full, the notified body shall be involved! The following picture explains this this again.




If an already tested or pre-certified radio module is integrated into a device, then there is no test report for the harmonised standards for Article 3 (2) and Article 3 (3) for the final device available. There is only a test report available for the radio module. Therefore, the harmonised standard for Article 3 (2) was applied only in parts to the combined equipment. In this case a notified body must be involved and an EU-type examination for the device must be performed by the notified body RED.

## 3 Usual procedure for manufacturers together with VDE

The RED allows different ways to achieve compliance with the requirements. A typical path that many customers of the VDE Testing and Certification Institute have chosen and that has proven itself as effective is to be shown here.

In the following, "device" means the device without radio module, i.e. the "non-radio" device. We assume here that the manufacturer installs an already tested radio module in his device. Together the “Non-radio” device and the radio-module are the so called “combined equipment”.

However, the procedure could also be applied if a self-developed radio "module" (e.g. based on an integrated circuit directly on the board of the device. In this case, the EMC and radio standards (Article 3 (2) and Article 3 (1)b)) must be completely tested.

| **Procedures for complying with the Radio Equipment Directive** | | |
|---|---|---|
| **Essential requirement** | **Short designation** | **Verification/Testing** |
| Article 3 (1) (a) | Safety and health | - VDE safety mark for compliance with standards (can also be used for the EU declaration of conformity according to LVD (2014/35/EU)) taking into account the non-existent voltage limits of the RED.<br>- EMF (fields) test report of the radio module manufacturer. Sometimes a recalculation or even measurement of the generated fields in the combined equipment might be s necessary. |
| Article 3 (1) (b) | Electromagnetic compatibility | - EMC test report according to the applicable standards of the non-radio device<br>- Delta test according to ETSI standards (typically EN 301 489-X) with the radio module installed in the combined equipment (evaluates the EMC of the radio module inside the device) and is carried out according to EG 203 367.<br>- EU type examination certificate for the combined equipment (optional, but is also selected by many customers) |
| Article 3 (2) | Effective and efficient use of the spectrum (Radio matters) | - Radio matters test report (e.g. according to ETSI EN 300 328) of the manufacturer of the radio module (should be from an accredited laboratory).<br>- Spectrum spot tests (e.g. according to ETSI EN 300 328) on the combined equipment with built-in radio module according to EG 203 367.<br>- EU type examination certificate of the notified body for the device (mandatory) |
| Article 3 (3) | Specific requirements for certain classes and categories of radios | - Currently there are usually no requirements in this area on the part of the directive, therefore no tests or assessments are usually carried out.<br>- EU type examination certificate of the notified body for the device (mandatory). |

It makes sense to define the necessary tests in a test plan before starting all tests. If, for example, the radio test is only carried out after the safety tests, then there is usually additional work and double testing.

Ideally, the manufacturer should send the VDE a brief overview of the project, which contains the essential points on the subject of radio. In Appendix 4 you will find a form that you can use as a kind of checklist. The VDE team will be happy to support you in this process. The VDE requires the required information for a meaningful and cost-optimized calculation of the testing effort. Particularly in the case of device series, there can be great savings potential in the testing and preparation of the EU-type examination process.

### 3.1 EU-type examination by the notified body RED

The notified body RED (VDE with EU number 0366), abbreviated NB = Notified body, must not be confused with the EMC and radio test laboratory. According to RED, the notified body is strictly separated from the testing laboratory and does NOT perform any laboratory tests. The notified body conducts the EU type examination exclusively on the basis of the documents submitted by the manufacturer (including the VDE test reports if applicable).

The procedure of the EU-type examination is strictly specified by the directive (RED) and the Federal Network Agency in Germany and cannot be changed by the VDE. The following is a brief outline of the process.

| Step | Who | Activities | Explanations |
|---|---|---|---|
| 1 | Client | Apply to the notified body (application form will be sent when the order is placed).<br>- Attach technical documentation (TCF) and existing test reports | The directive speaks of an "application". In any case, the manufacturer must keep the contents of the technical documentation available for the authorities. |
| 2 | NB | Checking of the documents for completeness | If necessary, the NB will request further documents. |
| 3 | NB | Assessment of the adequacy of the technical design of the radio equipment, examination of the technical documentation and additional evidence (e.g. test reports) without (laboratory) examination of a sample (type). | Does the radio system meet the essential requirements together with the submitted test certificates?<br>This question will be answered by the notified body in the evaluation process. |
| 4 | NB | Creation and dispatch of the following documents:<br>- Evaluation report<br>- EU-type examination certificate | If the result of the evaluation is "passed", the NB will issue an EU-type examination certificate.<br>If the result is "FAIL", the manufacturer will repair or the process is completed with "FAIL". In this case, the authorities must be informed by the NB unless the customer confirms not to place the device on the market in this way. |
| With these steps the regular initial process is completed.<br>**The EU type examination certificate is valid for 2 years.**<br>After that, the customer must order a renewal. Usually there is no need for physical tests, unless new standards or other specifications exist that require a test. | | | |

The holder of the EU type examination certificate is obliged to inform the notified body of any product changes.

A more detailed description of the activities and principles of the notified body RED (QM document number: CB 7 NB-EMC RED 0201 A01 RED) can be requested from your VDE contact.

### 3.2 Processing of orders

In this section, the usual process of an order to VDE for an EU-type examination is to be briefly indicated.

| | |
|---|---|
| Step 1 | Customer sends the information for effort estimation to VDE (see checklist in chapter 4) |
| Step 2 | VDE checks the documents, possibly requests further information and documents and prepares a cost estimate or directly an offer.<br>Contents: VDE safety test, EMC test, delta test EMC, spot test spectrum, EU type test by notified body |
| step 3 | The customer places an order and sends the test samples and technical documents requested in the order by the notified body (TCF = Technical Construction File). |
| Step 4 | Physical tests: Safety, EMC, Spectrum |
| Step 5 | EU-type examination on the basis of the documents submitted (TCF and test reports) |
| Step 6 | Delivery of the following documents to the customer by VDE:<br>Test reports (if ordered)<br>VDE marks approval (if ordered)<br>VDE EMC mark approval (if ordered)<br>EU-type examination certificate (EU-TEC) |
| Step 7 | Completion of the order |

It is particularly important to have all the information about radio interfaces, device series and the procedure desired by the customer before preparing the offer and before starting the laboratory tests, as this is the only way to ensure efficient testing without delays.

## 4 Checklist devices with radio

This checklist contains the most important information that VDE requires from its customers in order to be able to carry out a meaningful effort estimation for a type examination within the framework of the RED.

| **Project overview radio** | | | |
|---|---|---|---|
| **Parameter** | **Required information** | | **Instructions for filling in** |
| Manufacturer | | | Short information who is the manufacturer (certificate holder). |
| Single device | ☐ | Type specification | It is only a single device. Specify type designation. |
| Series of devices | ☐ | Important:<br>Which types are included?<br>- Differences of types (colour, housing, power etc.)?<br>- Where is the radio module installed (position, photo)?<br>- Is the other electronics different (if so, what exactly)? | This is a series of devices. Here you have to specify exactly which types should be included.<br>Above all the differences of the types to represent is important around the test expenditure to estimate to be able. |
| Short Device Description | Example: switching actuator with ZigBee interface, dimming actuator for LEDs up to 200 W with Zwave interface | | What does the device do? Short description. Attach data sheet if possible. |
| Radio module (type designation / manufacturer/ version) | Specify type designation and manufacturer and version of hardware and software/firmware. | | If possible, enclose data sheet of the radio module or (for self-created radio interface) data sheet of the IC. |
| Radio technology used | ☐ | WLAN b/g/n 2.4 GHz | In some cases, radio modules or circuits make it possible to use several radio technologies and processes. Which can be activated via software.<br><br>Therefore, it is essential to specify here which radio technologies are actually used in the device (even if the module may be capable of more). |
| | ☐ | WLAN a/h/n 5 GHz | |
| | ☐ | WLAN ac 5 GHz | |
| | ☐ | Bluetooth classic, Version: ? | |
| | ☐ | Bluetooth LE (Low Energy), Version: ? | |
| | ☐ | ZigBee 868 MHz | |
| | ☐ | ZigBee 2.4 GHz | |
| | ☐ | Zwave 868 MHz | |
| | ☐ | Proprietary, self-developed radio system | Here the exact data of the radio interface (frequency range, transmission power, modulation etc.) are absolutely necessary. |
| | ☐ | Miscellaneous: | |
| Maximum transmitted power | ?? dBm?? milliwatt | | Specified in mW or dBm. Important for the test effort. |
| Antenna | ☒ | Antenna(s) permanently integrated on the radio module | Chip antenna, PCB antenna, wire antenna |
| | ☐ | External antenna(s) (e.g. via SMA connector) | External antenna (SMA or other plug/jack) |

| **Project overview radio** | | | | |
|---|---|---|---|---|
| **Parameter** | **Required information** | | | **Instructions for filling in** |
| | | Antenna type designation:<br>Antenna gain: ?? dBi | | Specify the type and antenna gain of the prescribed antenna. |
| Multi-antenna technology (MIMO) used: | ☒ | No, not used | | MIMO is mainly used for powerful WLAN. |
| | ☐ | Yes, is used | | |
| Test certificates for radio module | ☒ | Are available and up to current standards | | Attention, pay attention to the latest standards! |
| | ☐ | Are available but not in accordance with current standards | | Partial checks may be required. Please indicate standard status. |
| | ☐ | No EMC and radio test reports available. | | If no test reports are available. |
| | | ☐ | Separate EMC and radio testing of the radio module required | May be useful if the radio module is also to be used in other devices. |
| | | ☐ | Testing of EMC and radio for the module should be carried out in the device | These results can also be used for other device types, but you are somewhat more limited to the device type. |
| Test certificates for device (with radio module)<br>- EMC<br>- Radio matters | Specify test reports: EMC, radio, etc. | | | Which test certificates (accredited/ TDAP) are available?<br>Please indicate here. |
| EU type examination by the notified body requested by the manufacturer | ☐ | Article 3 (1) (a) Health and safety | | We assume that this is covered by a VDE review of the reports provided by radio-module manufacturer. (See below). |
| | ☒ | Article 3 (1) b) EMC | | EU type examination |
| | ☒ | Article 3 (2) Efficient and effective use of the spectrum | | EU type examination |
| | ☒ | Article 3 (3) Further requirements | | EU type examination |
| Further information from the manufacturer:<br>-- | | | | |
| Device = device without radio (terminal, primary device)<br>Radio module = Module for radio functionality<br><br>Important:<br>With this table we assume that you want to submit the evidences for the essential requirement 3 (1) a) “Safety and Health” by a VDE test report and for Health (fields of the transmitter module) by a test report of the radio module manufacturer! | | | | |