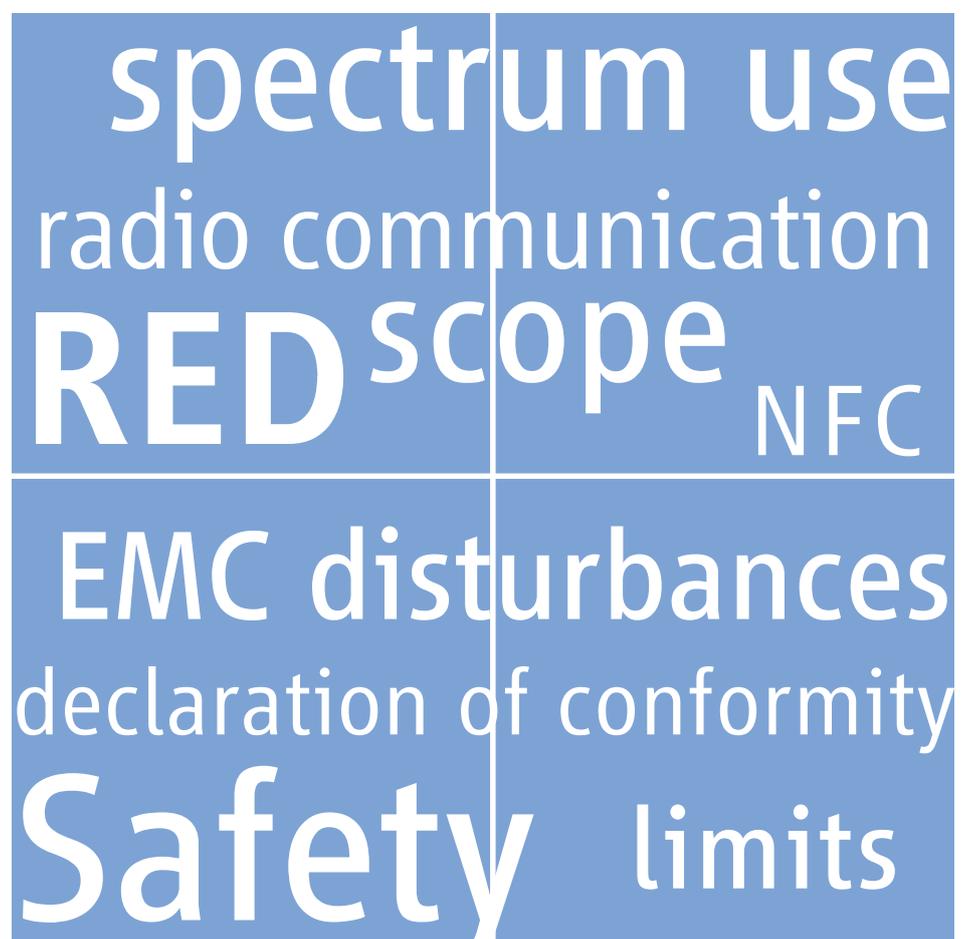


Position Paper

The Radio Equipment Directive **RED**

Information for Manufacturers of Lighting Equipment with Radio Communication



ZVEI:
Die Elektroindustrie

The Radio Equipment Directive RED

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1 Summary

- Lighting products with permanently affixed radio transmitters or receivers are in the scope of 2014/53/EU (RED – Radio Equipment Directive).
- Radio equipment requires a CE declaration of conformity based on the RED. Either the full CE declaration or a shortened version with a download link for the full version needs to be shipped together with the product.
- The following essential requirements are in place for radio equipment: Product safety; EMC; effective and efficient spectrum use; further requirements, if applicable. The low voltage directive (LVD) and the EMC directive are only not applicable regarding the basic requirements but are not applied in the EU conformity assessment.
- If OJEU cited harmonized standards have been applied for the essential requirement »effective and efficient spectrum use«, the RED allows a manufacturer selfdeclaration of conformity certification (conformity assessment module A – internal production control). Therefore, lighting products with radio communication can typically be placed on the market without the legal requirement to involve notified bodies.
- For the safety and EMC assessment of radio equipment it is recommended to make use of the relevant European Standards (EN) under consideration of the technical state of the art.
- For the assessment of effective and efficient spectrum use, it is strongly advised to apply the relevant harmonized and OJEU cited European Standards (EN), because the involvement of a notified body is otherwise mandatory.
- In case there are individual (part) assessments available for the lighting product (without radio) on the one hand and the radio transmitter/receiver on the other, these can be used for the assessment of the combined product. However, a delta analysis shall be performed to evaluate, if there are any additional aspects resulting from the combination that require further assessment. As guidance, you may refer to ETSI EG 203 367 »Guide to ...combined radio and non-radio equipment«.
- In particular, the corresponding technical documentation from radio transmitters/receivers acquired from third parties and built into a lighting product may be reused for the technical documentation of the lighting product. Manufacturer specifications with respect to integration and use of the radio transmitter/receiver shall be obeyed.
- With respect to the effective and efficient spectrum use requirements typically the conformity declaration of the radio manufacturer is sufficient for the lighting product – given the radio manufacturer’s specifications are met and the radio manufacturer made use of a harmonized standard for the effective and efficient spectrum use requirement. However, the lighting manufacturer has to examine and assess the effects of the new electromagnetic environment when integrating the radio transmitter/receiver into the lighting product.
- Should technical characteristics be altered by the integration of a radio transmitter/receiver into the lighting product or the radio manufacturer’s specifications are not met, then the radio characteristics need to be reassessed for the resulting combined product. If this includes deviations from a harmonized and OJEU cited EN, this results in the mandatory involvement of a notified body.

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2 The RED Scope – which products have to comply?

The scope of the Radio Equipment Directive 2014/53/EU (RED) which is solely in place for radio equipment since 2017 comprises all products that are covered by the following definition (Art 2.1 of the RED):

»an electrical or electronic product, which intentionally emits and/or receives radio waves for the purpose of radio communication and/or radio determination, or an electrical or electronic product which must be completed with an accessory, such as antenna, so as to intentionally emit and/or receive radio waves for the purpose of radio communication and/or radio determination.«

In this context, radio communication and radio determination are legally seen in a very broad sense. Without exclusions for low frequencies, the complete electromagnetic spectrum below 3.000 GHz is regarded radio waves and there are no exceptions for low power, short range applications such as near field communication (NFC) or receive-only devices, such as GPS or GALILEO receivers.

To understand the profound implications of the RED for the lighting industry in general, two more facts need to be considered:

First, more and more lighting products (such as luminaires, controlgear, light sources, sensors etc.) are becoming connected and incorporate radio control and communication.

Second, whenever such a lighting product incorporates a radio transmitter and/or receiver, it becomes radio equipment itself in the sense of the directive, as soon as the radio transmitter/receiver is incorporated into the lighting product and permanently affixed to it¹. Therefore, a luminaire with a built-in high frequency motion sensor is in the scope of the RED. The luminaire and the sensor may only be declared individually to different legislation (RED for the sensor, LVD and EMCD for the luminaire), if the sensor is an independent device that can easily be disentangled from the luminaire.

Therefore, the RED becomes increasingly relevant for lighting manufacturers and why this document has been published in order to give advice to manufacturers of lighting products how to make sure that products comply with the RED requirements, both on a technical as well as on the administrative level.

3 The RED in relation to the LVD and the EMCD

Typically lighting products (without radio communication) are in the scope of the following two directives:

- The low voltage directive (LVD) 2014/35/EU governing safety of electrical equipment
- The EMC directive 2014/30/EU that covers electromagnetic compatibility of the latter

For radio equipment, safety and EMC requirements are covered by the RED; the aforementioned two directives are mutually exclusive to the applicability of the RED².

4 Specific requirements for RED products

Radio equipment needs to comply with the essential requirement to effectively use and support the efficient use of radio spectrum, see article 3(2) of the RED.

According to commission decision 2000/299/EC, a classification of radio equipment (class I/II and corresponding subclasses) based on application and technical parameters has been introduced. Only Class I equipment may be placed on the market making use of self-declaration of RED conformity. We

¹ EU Commission's »LVD EMCD RED Supplementary Guidance« (2018-05)

² Art. 4.1 of the RED excludes the application of the LVD for products in scope of the RED; the EMCD contains a statement that it is not applicable for products covered by the R&TED. According to Art. 50 of the RED, this exclusion is transferred to the RED.

recommend to design lighting products in a way that they fulfil the requirements of class I equipment. This typically means a certain sub-class dependent emission power level must not be exceeded and the products shall operate within a harmonized frequency band. Most of the common radio technologies like Bluetooth, WiFi (2,4 GHz), ZigBee or ZWave operate compliant with class I requirements.

If in exceptional cases the manufacturer decides to use a frequency band which implies use restrictions (for instance, because the frequency band used is subject to use restrictions in certain areas within the EU) then according to article 10(10) of the RED there is a corresponding marking requirement for the device. More information about the package design in such cases can be found in the implementation regulation³. For identification of use restrictions, the consultation of the EFIS (European Frequency Information System) is recommended⁴. Further details of the manufacturer obligations may be found in article 10 of the RED and in chapter 2.6 of the RED guide.⁵

5 Essential requirements – safety and EMC

The essential requirements with respect to safety (Art. 3.1a of the RED) and electromagnetic compatibility (Art. 3.1b of the RED) are identical to those of the LVD or EMC, respectively but without any voltage limit.

Therefore, standards that are appropriate to cover safety or electromagnetic compatibility requirements under the LVD or EMC, respectively, can be applied to products in the scope of the RED as well. As far as appropriate, RED listed standards can be used as well. A manufacturer self-declaration of conformity (conformity assessment module A – internal production control) is always allowed (with respect to safety and EMC essential requirements) independent if harmonised and RED OJEU cited standards have been applied.

There may, however, be additional aspects introduced by the radio transmitter/receiver that are not covered by these standards which need to be addressed additionally (more information below in the paragraph with assessment examples).

6 Essential requirements – spectrum use

Spectrum use characteristics are mainly defined by the radio transmitter/receiver itself. Therefore, in many cases the corresponding assessment of the component supplier may be re-used and is sufficient also for the technical documentation of the lighting product. Of course, use and assembly instructions for the radio transmitter/receiver shall be followed in that case. A statement about this accordance should be made in the manufacturers own technical documentation.

Generally, when transmitters/receivers are acquired from third party suppliers for built-in use it is recommended to refer to the expertise of those, when in doubt.

For class I equipment, a manufacturer self-declaration of conformity (conformity assessment module A – internal production control) is allowed for the essential requirement of efficient frequency use, if the standard has been applied for the lighting product and is harmonized and cited in the OJEU with respect to the RED (see next clause).

³ http://eur-lex.europa.eu/legal-content/EN/TXT?uri=uriserv:OJ.L_.2017.190.01.0007.01.ENG

⁴ www.efis.dk

⁵ <https://ec.europa.eu/docsroom/documents/23321/attachments/1/translations/en/renditions/native>

7 Missing harmonized standards under the RED

For various reasons, the number of RED harmonized standards is still very limited (2019-11). More precisely, not a single RED harmonized safety standard is available and only a very limited number of RED harmonized EMC standards.

However, as the safety requirements in the RED are made by reference to those of the LVD, they are identical to those of the LVD. As a result, a factual presumption of conformity is given for standards harmonized with respect to the LVD. This applies in the same way to standards harmonized under the EMC Directive, as far as the radio function is adequately covered (see paragraph on assessment examples).

The key criteria for the application of any product safety standard and any EMC standard when assessing a product are the following:

- Does the scope of the standard adequately cover the product concerned?
- Do the requirements of the standard adequately match with the essential requirements of the RED (safety, EMC)?
- Does the standard represent the technological state of the art?

It is essential that the answer is yes to all three of these questions. Only on a secondary level, it should be considered, if the standard is harmonized.

Nevertheless, the harmonization of safety and (further) EMC standards under the RED is highly appreciated, because harmonization generally reduces assessment and communication efforts for all stakeholders – including manufacturers, market authorities and notified bodies alike.

For the essential requirement of efficient use of frequency (article 3.2), the situation is very different. Here the use of a harmonized standard (or more correctly, the harmonized and OJEU cited edition of a standard) is strongly advised, because otherwise the product assessment mandatorily involves a notified body. Fortunately, for almost all typical applications (e.g. WiFi, RFID, Bluetooth, ZWave, ZigBee) harmonized frequency use standards are available.

8 EU declaration of conformity

With their CE declaration a manufacturer claims that his product complies with the essential requirements of all relevant EU legislation requiring a CE declaration. Without a valid CE declaration such a product may not be placed on the market. The RED requires that the CE declaration actually accompanies the product – either in full or in a simplified version.⁶ The simplified version is as follows (according to annex VII of the RED):

Hereby, [Name of manufacturer] declares that the radio equipment type [designation of type of radio equipment] is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address:

It is recommended not to change and alter this text.

⁶ See RED Art 10 (9), Art 18.

9 Practical examples with testing for relevant standards conformity:

9.1 Example 1 – LED Controlgear with NFC

General (possible exemption)

According to what has been described before, controlgear that allows for its configuration by NFC is out of scope of the RED only, when the NFC function has been permanently disabled for field use when placing the controlgear on the market. In many cases, however, it will be desired to allow for the parameterization of the controlgear via its NFC function in the context of manufacturing a luminaire or even in service of the luminaire, i.e. after the installation of the luminaire in the field. In this case the (built-in) controlgear must comply with the RED; corresponding customer information concerning the NFC function and the intended use is required.

General safety

General product safety of the NFC-capable LED controlgear is assessed by applying EN 61347-2-13 »Particular requirements for DC or AC supplied electronic controlgears for LED modules« to the controlgear with the built-in NFC transceiver. By this, all safety aspects except EMF are covered.

EMF

EMF aspects are covered by applying EN 62493 »Assessment of lighting equipment related to human exposure to electromagnetic fields« which in principle requires testing up to 10 MHz. LED controlgear has been generally found to have negligible emission, however, and is thus deemed to comply with EN 62493 without testing for the following reason: When using the NFC function, radio waves are emitted from the NFC reader, while any (passive) NFC transceiver does not emit any (net) power. Therefore, in such a corresponding setup the reader will need to be assessed with respect to EMF, the controlgear, however, will not contribute to EMF and can be expected to comply without testing.

EMC

For the lighting function the EMC standards EN 55015, EN 61547, EN 61000-3-2 and EN 61000-3-3 are applicable. For the radio functionality the ETSI EN 301 489-3 in conjunction with ETSI EN 301 489-1 is applicable.

Typically, the immunity tests for the lighting function and the radio function can be combined. For details of performance criteria, you may refer to ETSI EG 203 367. Therefore, the test is done according to the requirements of the lighting function EMC standards, but considering the correct function of the radio function which is required in the ETSI EMC standards. That means that for all immunity tests in EN 61547 it is additionally required that after the EMC tests, NFC must continue to function as intended and the adjustable parameters of the controlgear must not have changed.

Risk assessment

In any case, manufacturers are legally required to carry out a risk assessment. It is advised that this risk assessment should include an additional analysis of the safety implications of potential misconfiguration of the controlgear via the NFC function. However, it can be expected that the short-range nature of NFC together with short activation cycles (few seconds) at large intervals (carried out maybe a few times per year) typically will result in the conclusion that the safety risks and the EMC implications will be very low.

In this context the following points should be primarily covered in the risk analysis:

- What is the frequency of use of the NFC function and how does this translate into a risk?
- What is the duration of use and the corresponding risk?
- What is the impact of a malfunction?
- What is the risk of malfunction due to external factors (e.g. radiated fields)?

In most cases the risk is expected to be very low, as the worst-case scenario would be a non-functional luminaire which does not constitute a safety risk typically. It is the responsibility of the controlgear manufacturer, however, to ensure safe operation of the controlgear, so a different outcome of the risk analysis may be possible depending on the product and its application. If in doubt, additional measures may still be required. With respect to the efficient use of frequency requirements

ETSI EN 300 330 »short range devices 9 kHz to 25 MHz« is applicable: For passive NFC transceiver this basically means that spurious emissions shall be assessed (together with the specified reader) according to clause 4.4.2. If a corresponding technical documentation of the NFC transceiver supplier is available, this can be re-used for the controlgear assessment – given that the use restrictions and installation specifications of the supplier are met, see ETSI EG 203 367, clause 5.1.1.3. Nevertheless, it remains in the responsibility of the controlgear manufacturer to ensure that the corresponding requirements are still met after integration of the NFC transceiver into the controlgear. Therefore, if in doubt, retesting is advised.

Possible manufacturer self-declaration of conformity

A manufacturer self-declaration of conformity (conformity assessment module A – internal production control) for the controlgear is possible, if the following two requirements are met (the example given applies to the NFC technology at 13,6 MHz currently used typically in lighting controlgear classifying for class I, subclass 28):

- NFC power in the assigned frequency range (13,553 - 13,567 MHz) must be below 42 dB μ A/m (in a distance of 10 m)⁷
- A harmonized and OJEU cited edition of the standard ETSI EN 300 330 is applied to demonstrate compliance with article 3.2 (effective use of radio spectrum) of the RED⁸

If these requirements are not met, a notified body is legally required to be involved in the assessment.

9.2 Example 2: Luminaire incorporating an NFC capable controlgear

General

In case controlgear with radio communication is incorporated into a luminaire in a fixed and permanent way, the luminaire becomes radio equipment itself. Thus, for a luminaire where the NFC function can be used by the customer, the RED applies.

Possible re-use of the test results from the radio component (NFC)

The assessment of the radio component – the NFC controlgear in this case – can be reused for the luminaire assessment. However, a delta analysis is needed, i.e. it must be determined, to what extent safety, EMC and frequency use characteristics of the luminaire are different with respect to the radio component and if the corresponding essential requirements are still met.

As radio characteristics are defined by the component and by the very nature of NFC technology, NFC is inherently compliant to the safety, EMC and frequency use requirements of the RED. Thus, it can be assumed that no additional radio related safety, EMC and frequency use characteristics need to be considered for the luminaire with respect to the controlgear. Therefore, if integration and use instructions of the controlgear manufacturer are followed, it can be assumed that no additional radio aspects need to be considered for the luminaire. The luminaire can, thus, be assessed as any other »ordinary« luminaire (without NFC).

Since the manufacturer of the luminaire declares in his DoC application and compliance with the EN, it remains in the responsibility of the luminaire manufacturer to ensure that the legal requirements are still met after integration of the NFC controlgear into the luminaire. Therefore, if in doubt, retesting of the luminaire and/or involvement of a notified body is advised.

Technical documentation of the NFC luminaire is, however, not complete without the addition of the (radio related) controlgear assessment plus the delta assessment after integration – even if this will typically be a statement that use and integration instruction of the controlgear manufacturer are followed, the radio characteristics remain unaltered after integration and for this reason no additional tests need to be performed to demonstrate compliance to legal requirements.

It should be noted that for the NFC luminaire – being in the scope of the RED nonetheless – the additional RED marking requirements (radio power and frequency band) need to be obeyed as well as that the CE declaration of the luminaire – simplified or full – needs to be shipped with the luminaire.

⁷ Only in this case it qualifies as class 1 radio equipment which allows for module A (class 1, subclass 28)

⁸ As of 2020-05, this is V2.1.1 of ETSI EN 300 330

9.3 Example 3 – LED Luminaire with Wireless Communication in the 2,4 GHz band

General safety

When a wireless communication technology is integrated into a luminaire in a fixed way the RED applies. General product safety requirements – including mechanical, electrical and thermal safety aspects – can nevertheless be assessed by applying the relevant part of the luminaire safety standard series EN 60598, such as EN 60598-2-1 for »fixed general-purpose luminaires«. However, the impact of the radio transmitter/receiver which is not explicitly considered in the EN 60598 series requirements needs to be reflected in the assessment. For certain tests, this may require the transmission function to be turned on at maximum transmission power, for instance when checking the maximum temperature for accessible parts that also must not be exceeded with the additional heat emitted from the radio transmitter/receiver. Additionally, it is important that the radio module operates within its specified temperature range in order to avoid harmful interference. With respect to radiation safety, of course, photobiological safety does not require any additional aspects to be covered; EMF safety needs additional considerations, however. Conveniently, the EMF standards for lighting product (EN 62493) already incorporate an informative annex for the assessment of »intentional radiators« which should be applied accordingly.

EMC immunity

For EMC immunity, EN 61547 can be applied. Here it is important to demonstrate compliance to the immunity requirements with the radio transmitter/receiver being actively communicating (and therefore susceptible to external electromagnetic disturbances). The wireless communication constitutes a »regulating« control and shall thus still operate as intended during the tests (criterion A) or be restored under the conditions given (criterion B and C). Details about the performance criteria can be found in the relevant part of the ETSI EN 301 489 series. Additionally, radiated immunity from 80 MHz to 2 700 MHz (with the exception of the exclusion band) should be tested according to ETSI EN 301 489-3, as this frequency range is not covered by EN 61547 but may affect the radio transmitter/receiver. If this has been done on component level already and the corresponding documentation is available, this may be re-used for the luminaire assessment – given that assembly and use instructions have been obeyed. In case of wideband data communication like WLAN or Bluetooth the applicable radio EMC standard is EN 301 489-17 with a radiated immunity frequency range from 80 MHz to 6000 MHz.

EMC emissions

EN 55015 covers radiated emissions up to 1 GHz, while ETSI EN 300 328 covers unwanted out of band domain and spurious emission domain from 30 MHz to 12,74 GHz. Therefore, it is suggested to apply EN 55015 and ETSI EN 300 328 to the luminaire with both the lighting function and the communication function on. Note that EN 300 328 needs to be applied anyway (see below). If this has been done on component level – for instance controlgear – already and the corresponding documentation is available, this may be re-used for the luminaire assessment – given that assembly and use instructions have been obeyed and equivalent assessment conditions (see EG 203 367) can be asserted. The application of EN 55015 also covers voltage disturbances at the mains supply, load and control terminals due to radiated disturbances caused by the lighting equipment. Wired EMC disturbances are checked by applying EN 61000-3-2 »EMC - Part 3-2 Limits for harmonic current emissions« and EN 61000-3-3 »EMC - Part 3-3: Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems«. Generally, when testing the disturbances, the radio transmitter/receiver should be actually transmitting/receiving to make sure that its contribution is adequately covered and do not add to the luminaire's emission in a way that in combination limits are exceeded.

Mandating notified body or self-certification

For the 2,4 GHz band requirements for efficient spectrum use as laid down in ETSI EN 300 328 are more demanding than for NFC applications. The most straightforward way is to mandate a notified body to provide an EU-type examination evaluation regarding the ETSI EN 300 328 requirements. This might include a partial testing according EN 300 328 on luminaire level (with the radio transmitter/receiver built into the luminaire).

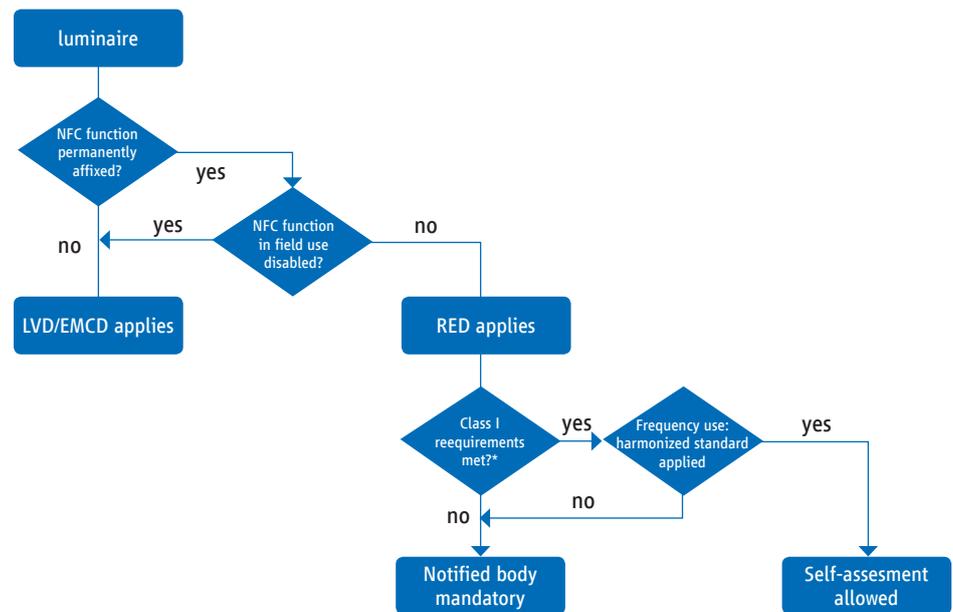
However, as ETSI EN 300 328 is a harmonized standard, the luminaire manufacturer may also self-declare compliance of the luminaire to the RED without involving a notified body (»internal production control«).

If a corresponding technical documentation of the radio transmitter supplier is available, the assessment may be simplified – given that the use restrictions and installation specifications of the supplier are met. In this case, the technical documentation shall comprise the following:

- the supplier’s technical documentation (including the ETSI EN 300 328 test report)
- a statement that use restrictions and installation specifications of the supplier are met
- a delta analysis that provides information, how far the test results from the supplier’s test report are valid for the luminaire. For guidance, refer to ETSI EN 203 367.
- as far as the latter is not the case: additional justification or test results for the luminaire to demonstrate compliance of the luminaire with respect to ETSI EN 300 328
- an assessment of the luminaire manufacturer that equivalent assessment conditions are asserted (see EG 203 367)

10 Flow chart – Lighting products incorporating NFC function – applicability of legislation and notified body involvement

The flowchart gives an overview how to assess the applicability of different legislation and the requirement to involve a notified body. For details, please refer to the relevant clauses of this document.



Source: ZVEI

*13,553 - 13,567 MHz; <42dB μ A/m (in a distance of 10 m)

Links:

- Radio Equipment Directive (2014/53/EU)
<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0053&from=EN>
- RED guide
<https://ec.europa.eu/docsroom/documents/29782>
- LVD EMCD RED Supplementary Guidance
<https://ec.europa.eu/docsroom/documents/29121>
- Harmonized RED standards
https://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/red_en
- Notified Bodies relating to the RED
http://ec.europa.eu/growth/tools-databases/nando/index.cfm?fuseaction=directive.notifiedbody&dir_id=154428
- Commission Decision on Class I/II radio equipment (2000/299/EC)
<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32000D0299&qid=1571109500619&from=EN>
- Class I radio equipment (and subclasses) classification
<https://ec.europa.eu/docsroom/documents/26843>
- EFIS - European Frequency Information System
<https://www.efis.dk/>

Standards referred in the examples given:

- EN IEC 55015:2019 »Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment«
- EN 60598-2-1 »Luminaires –Part 2-1:Particular requirements – Fixed general purpose luminaires«
- EN 61000-3-2 »Electromagnetic compatibility (EMC). Limits. Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)«
- EN 61000-3-3 »EMC - Part 3-3: Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems«
- EN 61347-2-13 »Particular requirements for DC or AC supplied electronic controlgears for LED modules«
- EN 61547 »Equipment for general lighting purposes. EMC immunity requirements«
- EN 62493:2015 »Assessment of lighting equipment related to human exposure to electromagnetic fields« Conducted EMC disturbances are checked by applying
- ETSI EG 203 267 »Guide to the application of harmonised standards covering articles 3.1b and 3.2 of the Directive 2014/53/EU«
- ETSI EN 300 330 »Short Range Devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU«
- ETSI EN 300 328 »Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum«
- ETSI EN 301 489-3 »EMC of radio communications equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 40 GHz«
- ETSI EN 301 489-17 »ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems«; Harmonised Standard for ElectroMagnetic Compatibility



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