

DIGITAL WE DAYS 2023



RADIO CONFORMITY & OTHER REGULATIONS

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

TODAY'S SPEAKERS



PRESENTATION

Bodo Mumm | Pascal Baranger
Technical Support Engineer | General Support
Wireless Connectivity & Sensors



MODERATION

Markus Eberle
Marketing Department

INFORMATION ABOUT THE WEBINAR

You are muted during the webinar.

However, you can ask us questions using the chat function.

Duration of the presentation 30 Min
Q&A: 10 – 15 Min

Any questions?
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We are looking forward to your feedback.

On our channel Würth Elektronik Group
And on [Digital WE Days 2023 YouTube Playlist](#)



WORDING

Declaration

European Declaration of Conformity (CE)

UK Declaration of Conformity (UKCA)

Qualification

Bluetooth Qualification

(Bluetooth Qualified Expert needed)

Environmental testing

Certification

FCC, IC, ARIB

Wi-Fi

Listing

Bluetooth

TABLE OF CONTENT

- Radio Conformity
 - EU & UK
 - US & Canada
 - Japan & China
 - Module Integration
 - Build your own firmware
- Radio Protocol Specific Requirements
 - Bluetooth
 - Wi-Fi
 - Cellular



WHY REGULATING THE RADIO?

Regulation is needed because

- radio spectrum is a limited resource
- its use is strongly growing

Or with the words of the Radio Equipment Directive Article 3 § 2:

Radio equipment shall be so constructed that it both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference.

NATIONAL IMPLEMENTATION

- Radio Directive (RED)
- Implementation in national laws in Germany
 - for example the Funkanlagen Gesetz (FuAG) which corresponds 1:1 to the directive
- Bundesnetzagentur, Frequency Plan
 - [WEBLINK](#)
- Bundesnetzagentur, general assignment
 - [WEBLINK](#)

ARTICLE 3 OF THE RED

1. Radio equipment shall be constructed so as to ensure:
 - (a) the protection of health and safety of persons and of domestic animals and the protection of property, including the objectives with respect to safety requirements set out in Directive **2014/35/EU**, but **with no voltage limit** applying;
 - (b) an adequate level of electromagnetic compatibility as set out in Directive **2014/30/EU**.
2. Radio equipment shall be so constructed that it both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference.

ARTICLE 3 OF THE RED

Cyber Security

3. Radio equipment within certain categories or classes shall be so constructed that it complies with the following essential requirements:

- (a) radio equipment interworks with accessories, in particular with common chargers;
- (b) radio equipment interworks via networks with other radio equipment; 22.5.2014 L 153/72 Official Journal of the European Union EN
- (c) radio equipment can be connected to interfaces of the appropriate type throughout the Union;
- (d) radio equipment does not harm the network or its functioning nor misuse network resources, thereby causing an unacceptable degradation of service;
- (e) radio equipment incorporates safeguards to ensure that the personal data and privacy of the user and of the subscriber are protected;
- (f) radio equipment supports certain features ensuring protection from fraud;
- (g) radio equipment supports certain features ensuring access to emergency services;
- (h) radio equipment supports certain features in order to facilitate its use by users with a disability;
- (i) radio equipment supports certain features in order to ensure that software can only be loaded into the radio equipment where the compliance of the combination of the radio equipment and software has been demonstrated.

DIRECTIVES AND STANDARDS



R&TTE TO RED = OLD HAT ?

- The RED was published in the OJEU on 22 May 2014, entered into force on 11 June 2014 and is applicable as of 13 June 2016. It included a one-year transitional period, which ended on 12 June 2017 (Article 48).
- Just in time the radio standards (Article 3 § 2) had been harmonized.
- For EMC, article 3 § 1(b) the publication of the standards (301 489-x) in the official journal is still pending.

Work Item	Current Status	Voting Start	Approval End	Adoption	Publication	OJ Publication
EN 301 489-1 REN/ERM-EMC-368	Publication 2019-11-20	2019-09-19	2019-11-18	2019-11-18	2019-11-20	
	Title					
EN 301 489-1 REN/ERM-EMC-333	Publication 2017-02-06	2016-11-23	2017-01-23	2017-01-23	2017-02-06	
	Title	essential requirements of article 6 of Directive 2014/30/EU				
EN 301 489-1 REN/ERM-EMC-268-1	Citation in the OJ 2012-10-23		2011-08-16	2011-09-15	2011-09-22	2012-10-23
	Title					

[harmonized standards Work Item Plan](#)

HARMONIZED STANDARD

Harmonised Standards

A harmonised standard is a European standard developed by a recognised European Standards Organisation: CEN, CENELEC, or ETSI. It is created following a request from the European Commission to one of these organisations. Manufacturers, other economic operators, or conformity assessment bodies can use harmonised standards to demonstrate that products, services, or processes comply with relevant EU legislation.

The references of harmonised standards must be published in the Official Journal of the European Union (OJEU). The purpose of this website is to **provide access to the latest lists of references of harmonised standards** and other European standards published in the OJEU.

[Link](#)

ADVANTAGES OF A CE CONFORM MODULE WITH TEST REPORT



1. Test result summary

If partial testing was performed, this shall be indicated in the relevant column (N.t.⁸) of the tables below.

1.1 Transmitter

Clause	Transmitter parameters	Test result			Page number	
8.1	Operating Frequency	Pass	Fail	N.t. ⁸	10	✓
8.2.1	Effective Radiated Power (conducted measurement)	Pass	Fail	N.t. ⁸	17 – 18	✓
8.2.2	Effective Radiated Power (radiated measurement)	Pass	Fail	N.t. ⁸	19	✗
8.3	Maximum Effective Radiated Power spectral density	Pass	Fail	N.t. ⁷	20	✓
8.4	Duty Cycle	Pass	Fail	N.t. ¹⁴	21	
8.5	Duty Cycle Template	Pass	Fail	N.t. ¹⁰	22	
8.6	Occupied Bandwidth	Pass	Fail	N.t. ⁸	23 – 27	✓
8.7	Tx Out Of Band Emissions	Pass	Fail	N.t. ⁸	28 – 29	✗
8.8	Unwanted Emission in the Spurious Domain	Pass	Fail	N.t. ⁸	30 – 43	✗
8.9	Transient Power	Pass	Fail	N.t. ⁸	44 – 48	✓
8.10	Adjacent Power	Pass	Fail	N.t. ²	49 – 50	✓
8.11	TX behaviour under Low Voltage Conditions	Pass	Fail	N.t. ⁹	51	
8.12	Adaptive Power Control	Pass	Fail	N.t. ¹⁰	52	

1.2 Receiver

Clause	Receiver parameters	Test result			Page number	
9.1	RX sensitivity level	Pass	Fail	N.t. ¹²	53	✗
9.5	Blocking	Pass	Fail	N.t. ⁸	54 – 56	✓

1.3 Spectrum access

Clause	Spectrum access techniques	Test result			Page number
10.1	Clear Channel Assessment threshold	Pass	Fail	N.t. ¹²	57
10.2	Polite spectrum access timing parameters	Pass	Fail	N.t. ¹²	58
10.3	Adaptive Frequency Agility	Pass	Fail	N.t. ¹²	59

DUTY CYCLE

The Sub GHz Bands in EU are limited in Duty Cycle

Table B.1: EU wide harmonised national radio interfaces from 25 MHz to 1 000 MHz

	Operational Frequency Band	Maximum effective radiated power, e.r.p.	Channel access and occupation rules (e.g. Duty cycle or LBT + AFA)	Maximum occupied bandwidth	Other usage restrictions	Band number from EC Decision 2017/1483/EU [2]
D	169,400 MHz to 169,475 MHz	500 mW e.r.p.	≤ 1,0 % duty cycle For metering devices duty cycle limit is 10 %	50 kHz		37c
E	169,4000 MHz to 169,4875 MHz	10 mW	≤ 0,1 % duty	The whole band		38
F	169,4875 MHz to 169,5875 MHz	10 mW	≤ 0,001 % duty cycle Between 00.00 and 06.00 local time a duty cycle limit of 0,1 % may be used	The whole band	Equipment that concentrates or multiplexes individual equipment is excluded.	39b
G	169,5875 MHz to 169,8125 MHz	10 mW	≤ 0,1 % duty cycle	The whole band		40
H	433,050 MHz to 434,790 MHz	10 mW	10 %	The whole band		44b, 45b
I	433,050 MHz to 434,790 MHz	1 mW e.r.p. -13 dBm/10 kHz power spectral density for bandwidth modulation larger than 250 kHz	No requirement	The whole band	Audio and video applications are excluded.	44a, 45a
J	434,040 MHz to 434,790 MHz	10 mW	No requirement	25 kHz	Audio and video applications are excluded.	45c
K	863 MHz to 865 MHz	25 mW e.r.p.	≤ 0,1 % duty cycle or polite spectrum access	The whole band except for audio & video applications limited to 300 kHz		46a
L	865 MHz to 868 MHz	25 mW e.r.p.	≤ 1 % duty cycle or polite spectrum access	The whole band		47
M	868,000 MHz to 868,600 MHz	25 mW e.r.p.	≤ 1 % duty cycle or polite spectrum access	The whole band		48
N	868,700 MHz to 869,200 MHz	25 mW e.r.p.	≤ 0,1 % duty cycle or polite spectrum access	The whole sub-band		50
P	869,400 MHz to 869,650 MHz	500 mW e.r.p.	≤ 10 % duty cycle or polite spectrum access	The whole band		54
P	869,700 MHz to 870,000 MHz	5 mW e.r.p.	No requirement	The whole band	Audio and video applications are excluded.	56a
Q	869,700 MHz to 870,000 MHz	25 mW e.r.p.	≤ 1 % duty cycle or polite spectrum access	The whole band	Analogous audio applications are excluded. Analogous video applications are excluded.	56b

COMBINED EQUIPMENT

Equipment **consisting of two or more products** where at least **one** of **which is radio communication** or radio determination equipment (i.e. radio equipment as defined in the RED [i.1])

- [ETSI EG 203 367](#): Guide to the application of harmonized standards covering articles 3.1b and 3.2 of the Directive 2014/53/EU (RED) to multi-radio and combined radio and non-radio equipment
- The **manufacturer of the combined equipment is responsible** to ensure the conformity of the equipment against the RED [i.1].
- If the manufacturer of the combined equipment installs the radio product in a host non-radio product in **equivalent assessment conditions** (i.e. host equivalent to the one used for the assessment of the radio product) and according to the installation instructions for the radio product, then **no additional assessment** of the combined equipment against article 3.2 of the RED [i.1] **is required**.

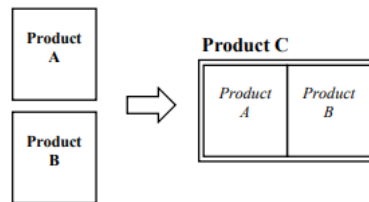


Figure 1: Concept of combined equipment (Product C)

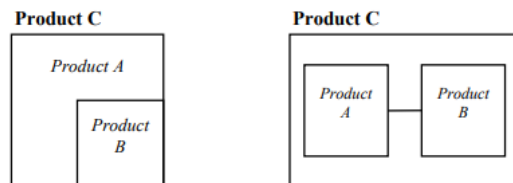
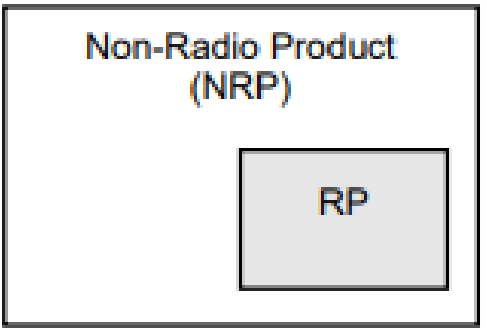


Figure 2: Example configurations of combined equipment (Product C)

Table 1: Overview of possible RED conformity assessments		of the RED [i.1]
	RED CAP (for the RP) EMC DIRECTIVE CAP (for the NRP) Δ (for the combination) (see note)	ETSI EG 203 367

WHAT HAS THE MANUFACTURER OF THE END DEVICE TO DO FOR CE

- The CE is a self declaration. The manufacturers of the end products has the sole responsibility, that the end product conforms to all applicable requirements.
- It is an option to do no testing on end device, referencing the Würths eiSos test report and referencing ETSI EG 203 367 equivalent assessment conditions.
- But after our experience the integration has impact on the radio characteristic.
- For this reason my personal recommendation is to do the so called delta or spot check, to verify that radiated emissions are not enlarged due to the design in, especially if high quantities are planed.

FIRMWARE INFLUENCE

Using the example of our radio modules from Würth Elektronik

FW individualization or Customization

If radio settings remain unaffected:

- CE conformity is given.
- Würth Elektronik set up internally documentation for our radio modules, declaring, that radio is identical to conformity assessment.
- We recommend delta measurement after module integration.

Build your own FW

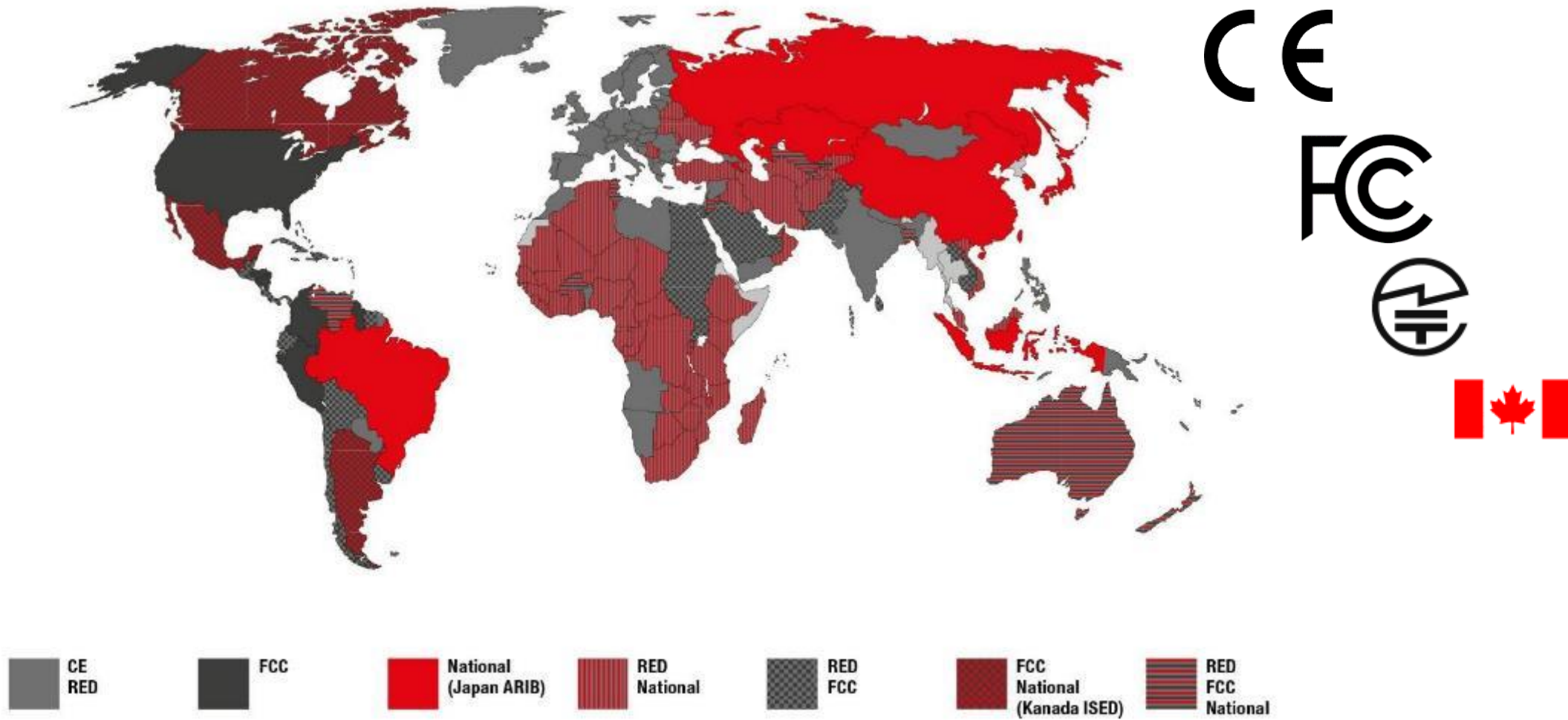
- The manufacturer of a radio module (Würth Elektronik) has no control of conformity, the customer is fully responsible.
- Würth Elektronik can put CE sign on label, on customers instruction, with customers IDs, to avoid being called to account for conformity.
- Würth Elektronik is not appearing as responsible manufacturer.
- In case of known protocols like Bluetooth Low Energy using Nordic stacks, where tests are performed with the same DTM direct test mode firmware, customer can do internal documentation and set up declaration of conformity.

BREXIT

- After shifting the dead line till when CE marking would be accepted several times, UK government announced to extend recognition of the CE marking for placing most goods on the market in Great Britain indefinitely. Radio products are within the scope of this announcement.
- Directives are adopted in the first step:
 - 2014/53/EU Radio Equipment Directive -> 2017 No. 1206 TELECOMMUNICATIONS The Radio Equipment Regulations 2017 (S.I./2017/1206)
 - 2014/35/EU Low Voltage Directive -> 2016 No. 1101 The Electrical Equipment (Safety) Regulations 2016 (S.I./2016/1101)
 - 2014/30/EU Electromagnetic Compatibility -> 2016 No. 1091 The Electromagnetic Compatibility Regulations 2016 (S.I./2016/1091)
- EU standards become designated standards.

UK
CA

WORLD WIDE CERTIFICATION



FCC

FCC Title 47 Chapter I A Part 15 C Intentional Radiators

- §15.203 Antenna requirement.
- §15.212 Modular transmitters.
- §15.209 Radiated emission limits; general requirements.
- §15.247 Operation within the bands
902-928 MHz,
2400-2483.5 MHz
5725-5850 MHz.
- §15.249 Operation within the bands
902-928 MHz,
2400-2483.5 MHz,
5725-5875 MHz, and
24.0-24.25 GHz.

[Link](#)

BUILD YOUR OWN FIRMWARE

Using the example of our radio modules from Würth Elektronik, WE has no control of conformity

- Manufacturer of the end device takes FCC certified module and flashes his own firmware.
- Manufacturer of the end device is informed by user manual about §15.21, that changes could void the FCC authorization to operate the module.
- Manufacturer of the end device is fully responsible.
- In case of known protocols like Bluetooth Low Energy using Nordic stacks, where tests are performed with the same DTM direct test mode firmware, the manufacturer of the end device can do permissive change class I with internal documentation.
- Change in ID §2.933
- Customer get's own FCC ID referencing his own trade mark etc. authorized by the manufacturer of the end device .
- Würth Elektronik is flashing customers firmware on modules labeled with customer IDs.
- Customer is fully responsible.
- Würth Elektornik is not appearing as manufacturer.
- If the manufacturer of the end device want to avoid change in ID using Würth Elektronik FCC ID with their own firmware leads to an unclean situation of responsibility.

TELEC

TELEC = certificate, ARIB = standard, MIC = authority

- Testing through a Japan certified test lab.
- Antenna characteristic required.
- A TELEC certified radio module can be designed in and sold/used in Japan, without re-test/re-certification under the condition that the antenna did not change..
- In case an other antenna is used, the new antenna has to be added to the certification.
- Frequencies: 2.4 GHz (ARIB STD-T66),
- 920 MHz (STD-T106, STD-T107, STD-T108)
 - Limited to 20mW
 - Channel assignment restricted
 - Transmission time restrictions

CHINA

SRRC = Radio Conformity Certification, CCC = Safety Certification (not applicable for radio modules)

- China is continuously changing its requirements (ask three laboratories getting three opinions).
- Modular approval has restrictions on application
- Certificate is limited to 5 years
- Cost through German test lab around 10.500 €
- Frequencies:
 - 2.4 GHz, Bluetooth, cordless phone, remote control
 - 433 MHz remote control
 - 868 MHz 5 mW remote control

BLUETOOTH QUALIFICATION OVERVIEW

Qualification process with

Required Testing

1. Project Basics
2. Layer Selection
3. ICS Selection
4. Testing
5. Test Documentation
6. Product Declaration
7. Declaration ID
8. Review & Submit

Membership

- Adopter: \$0
- Associate < \$100M USD revenue: \$9,000
- Associate > \$100M USD revenue: \$42,000

ca. 8.500 €
Test+BQC



9.600 US\$



Q. Component

Q. Component

Q. Component

No Required Testing

1. Project Basics

2. Product Declaration
3. Declaration ID
4. Review & Submit

[Bluetooth Qualification](#)

[Qualification Consultants](#)

[WE Bluetooth Listing Guide](#)

End Product



Q. Controller Subsystem

Q. Host Subsystem

Q. Profile Subsystem

Q. < 3Y Component

Q. < 3Y Component

Q. < 3Y Component

FAQ: IS IT POSSIBLE TO AVOID A LISTING BY USING A BLUETOOTH DONGLE?

- Using an existing Bluetooth Design, with existing Listing, QDID etc., and selling it as distributor/reseller is possible **without** additional Listing, **as long as it is not rebranded.**

- Using an existing Bluetooth Design, with existing Listing, QDID etc., but selling it under a different company name generates the need of a **new Listing.**

Integrating the dongle in an end device the principle remains the same:

- If the original brand is obviously recognizable, **no listing** would be needed,
- but integrating in inside the end device in a way that the original brand and listing is no longer recognizable, it is no longer possible to refer to the distributor/reseller status and a **new Listing** would be needed.



[Listings Search](#) search for Wurth, as „ü“ is not possible

FAQ: WHAT CAN BE COLLECTED IN ONE BLUETOOTH FAMILY LISTING?

- Same, unmodified Qualified Design(s) (QDID) (same BT HW & SW)
- Same manufacturer / company (listing holder)
- Bluetooth specification version has not been withdrawn



[adding a product](#)

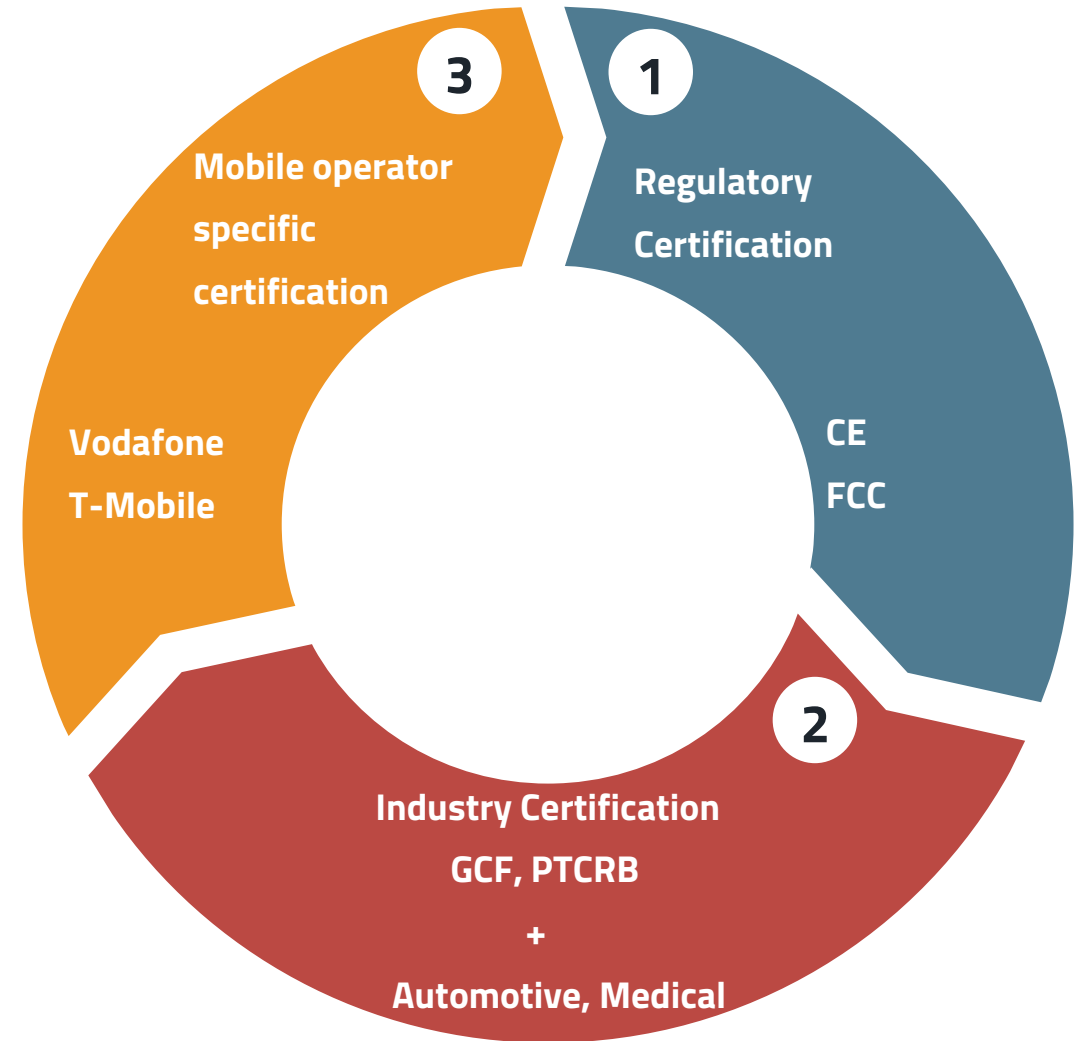
WI-FI® CERTIFICATION

- Wi-Fi® Certification is needed to use the trade mark and the name.
- The company must be a member of the Wi-Fi Alliance (5,150 US\$/year)
 - <https://www.wi-fi.org/membership/member-companies>
- Certification fee of 4,000 US\$
- When the system is based on a certified product the certification can be transferred using the WFA Certificate ID provided that the certificate uses the most current specification (new derivative product certification).
- End products based on the certified Würth Elektronik WiFi module "Calypso" can not be certified, as it is not based on the current specification and Texas Instruments is not working on an update.
 - <https://www.wi-fi.org/product-finder> -> search for Calypso



CELLULAR CERTIFICATION

- **Regulatory Certification:** Country specific to comply with country's regulations. Testing covers safety aspects, RF emissions do not interfere with other wireless equipment's (e.g. RF transmitter and receiver tests, EMC, electrical safety and environmental).
- **Industry Certification:** The Global Certification Forum (GCF) is a certification organization in which manufacturers, operators and test laboratories deal with the compliance of devices in mobile networks with 3GPP standards and specifications.
- **Mobile operator specific certification:** Testing specific to their network configuration and network parameter settings. This testing is focusing on field performance of the devices, such as radio sensitivity, data throughput.

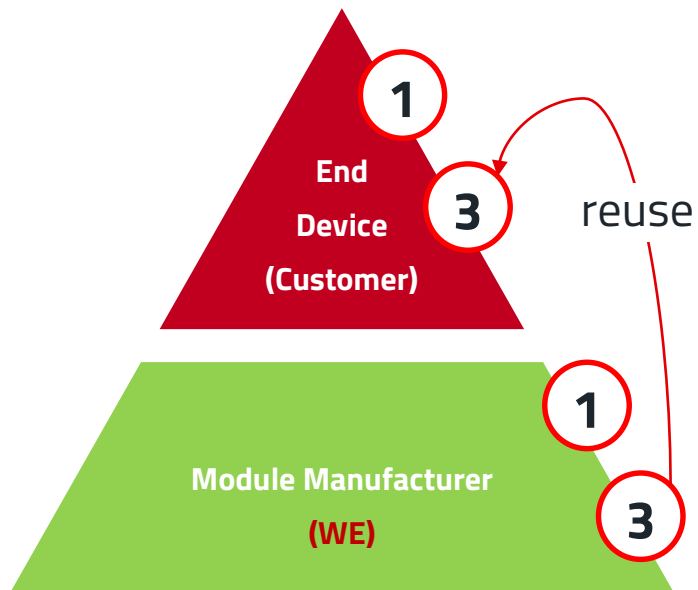


CELLULAR CERTIFICATION

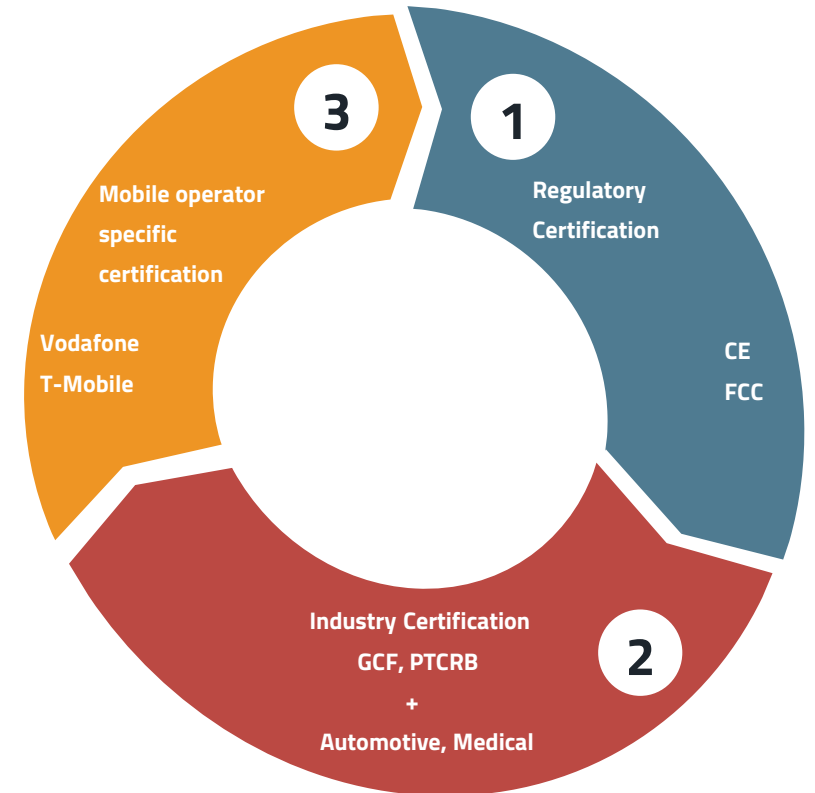
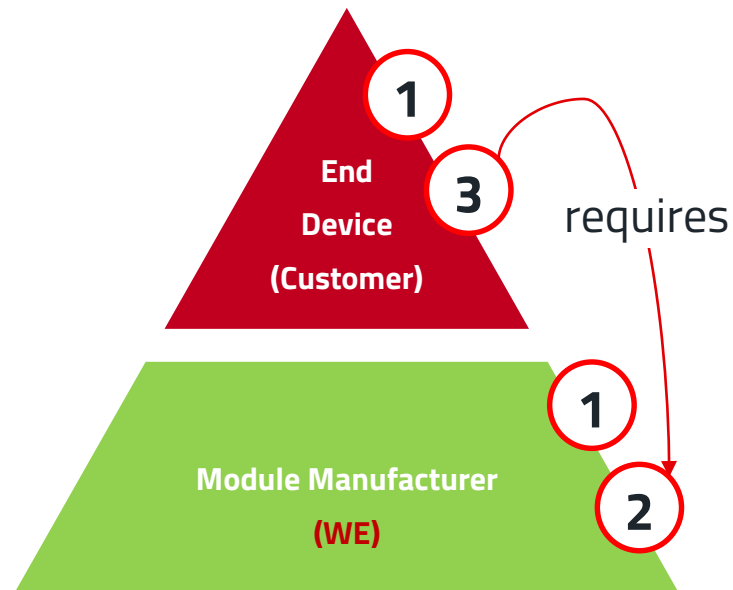
Example: Würth Elektronik Atrastea-I

- WE – Deutsche Telekom Certification:
 - Fast
 - Cost efficient

- Standard certification procedure
 - Flexible



<http://iotcreators.com/wuerth/>



ABBREVIATIONS

FCC: Federal Communications Commission

ETSI: European Telecommunication Standardization Institute

TCB: Telecommunication Certification Bodies.

BQC: Bluetooth Qualified Consultant (formerly BQE: Bluetooth Qualified Expert)

QDID: Qualified Design Identification Number (Bluetooth)

DOC: Declaration of Conformity (sometimes SDOC: Self declaration of Conformity)

ISED: Innovation, Science and Economic Development Canada

IC: Industry Canada

ARIB: Association of Radio Industries and Businesses (Japan, Standards)

MIC: Minister of Internal Affairs and Communications (Japan, authority)

SRRC: State Radio Regulatory Commission (China)

CCC: China Compulsory Certification

ITU: International Telecommunication Union

EMC: Electromagnetic Compatibility

RSE: Radiated Spurious Emissions

Questions

& Answers



We are here for you now!
Ask us directly via our chat or via E-Mail.

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wcs@we-online.com