



**Avalanche Beacons operating at 457 kHz;
Transmitter-receiver systems;
Part 2: Harmonised Standard for features
for emergency services**

Reference

REN/ERM-TG28-512-2

Keywords

harmonised standard, radio, safety, SAR, testing

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Foreword

This draft Harmonised European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for the combined Public Enquiry and Vote phase of the ETSI standards EN Approval Procedure.

This draft Harmonised European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM) and is now submitted for the combined Public Enquiry and Vote phase of the ETSI standards EN Approval Procedure.

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.2] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.1].

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in table A.1 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive and associated EFTA regulations.

The present document implements requirements laid down in Commission Decision 2001/148/EC [i.3].

The present document is part 2 of a multi-part deliverable. Full details of the entire series can be found in part 1 [1].

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	18 months after doa

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

1 Scope

The present document specifies technical characteristics and methods of measurements for avalanche beacons operating at 457 kHz transmitter-receiver systems.

NOTE: The relationship between the present document and essential requirements of article 3.3g of Directive 2014/53/EU [i.1] is given in annex A.

2 References

2.1 Normative references

References are specific, identified by date of publication and/or edition number or version number. Only the cited version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <https://docbox.etsi.org/Reference/>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

- [1] ETSI EN 300 718-1 (V2.1.0) (09-2017): "Avalanche Beacons operating at 457 kHz; Transmitter-receiver systems; Part 1: Harmonised standard for access to radio spectrum".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC.
- [i.2] Commission Implementing Decision C(2015) 5376 final of 4.8.2015 on a standardisation request to the European Committee for Electrotechnical Standardisation and to the European Telecommunications Standards Institute as regards radio equipment in support of Directive 2014/53/EU of the European Parliament and of the Council.
- [i.3] Commission Decision 2001/148/EC of 21 February 2001 on the application of Article 3(3)(e) of Directive 1999/5/EC to avalanche beacons.
- [i.4] EN 60068-2-5-2011: "Environmental testing. Tests. Test Sa. Simulated solar radiation at ground level and guidance for solar radiation testing".
- [i.5] ETSI TR 100 028 (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".

3 Definitions, symbols and abbreviations

For the purposes of the present document, the terms and definitions, symbols and abbreviations given in ETSI EN 300 718-1 [1], clause 3, apply.

4 Technical requirements specifications

4.1 Environmental profile

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be declared by the manufacturer. The equipment shall comply with all the technical requirements of the present document which are identified as applicable in annex A at all times when operating within the boundary limits of the declared operational environmental profile.

4.2 Environmental conformance requirements

4.2.1 General requirements

Environmental tests shall be carried out before tests of the same equipment in respect to the other requirements of the present document are performed. The following tests shall be carried out in the order they appear in clause 4.2.

Where electrical tests are required the equipment shall be powered by its internal battery.

4.2.2 Drop test on hard surface

4.2.2.1 Description

The immunity against the effects of dropping is the ability of the equipment to maintain the specified mechanical and electrical performance after being subjected to a series of drops on a hard wooden test surface.

4.2.2.2 Method of measurement

The test shall consist of a series of 6 drops, one on each surface.

During the test the equipment shall be fitted with a suitable set of batteries and it shall be switched on in transmit mode. The test shall be carried out under normal temperature and humidity conditions.

The hard wooden test surface shall consist of a piece of solid hard wood with a minimum thickness of 15 cm and a mass of 30 kg or more.

The height of the lowest part of the equipment under test relative to the test surface at the moment of release shall be 1 m.

Equipment shall be subjected to the present document configured for use as in operational circumstances.

4.2.2.3 Requirements

After the test, the equipment shall be fully operational in both the transmit and the receive modes. The requirement shall be checked by interacting with another sample of the same equipment to form a transmitter - receiver pair.

4.2.3 Temperature tests

4.2.3.1 General

The maximum rate of raising or reducing the temperature of the chamber in which the equipment is being tested shall be 1 °C/minute.

4.2.3.2 Dry heat cycle

The equipment shall be placed in a chamber of normal temperature. The temperature shall then be raised to and maintained at the upper extreme storage temperature (± 3 °C) for a period of at least 10 hours. After this period any climatic control device provided in the equipment may be switched on and the chamber cooled to the upper extreme operating temperature (± 3 °C). The cooling of the chamber shall be completed within 30 minutes. The equipment shall then be switched on and shall be kept working continuously in transmitting mode for a period of two hours.

The temperature of the chamber shall be maintained at the upper extreme operating temperature (± 3 °C) during the two hour period.

At the end of the test, and with the equipment still in the chamber, the chamber shall be brought to room temperature in not less than one hour. The equipment shall then be exposed to normal room temperature and humidity for not less than three hours before the next test is carried out.

4.2.3.3 Low temperature cycle

The equipment shall be placed in a chamber at normal room temperature. Then the temperature shall be reduced to, and maintained at, the lower extreme storage temperature (± 3 °C) for a period of at least 10 hours.

The chamber shall be warmed to the lower extreme operating temperature (± 3 °C). The warming of the chamber shall be completed within 30 (± 5) minutes. The equipment shall then be switched on and shall be kept working continuously in transmitting mode for a period of two hours.

The temperature of the chamber shall be then maintained at the lower extreme operating temperature (± 3 °C) during the two hour period.

At the end of the test, and with the equipment still in the chamber, the chamber shall be brought to room temperature in not less than one hour. The equipment shall then be exposed to normal room temperature for not less than three hours, or until moisture has dispersed, whichever is longer, before the next test is carried out.

4.2.3.4 Requirements

After the dry heat and the low temperature cycles, the equipment shall be fully operational in both the transmit and the receive modes. The requirement shall be checked by interacting with another sample of the same equipment to form a transmitter - receiver pair.

4.2.4 Immersion test

4.2.4.1 Method of measurement

The equipment shall be immersed into water for one hour in a horizontal position at a depth of 15 cm. The equipment and the water shall both be at room temperature. The device shall be transmitting while immersed.

4.2.4.2 Requirements

The equipment shall be able to transmit during and after immersion. The requirement shall be checked by interacting with another sample of the same equipment to form a transmitter - receiver pair.

4.2.5 Solar radiation

4.2.5.1 Method of measurement

The equipment shall be placed on a suitable support and exposed continuously to a simulated solar radiation source as specified in annex B for 80 hours.

NOTE: More detailed information on method of measurement can be found in EN 60068-2-5-2011 [i.4].

4.2.5.2 Requirements

There shall be no harmful deterioration of the equipment visible to the naked eye. After the test, the equipment shall be fully operational in both the transmit and the receive modes. The requirement shall be checked by interacting with another sample of the same equipment to form a transmitter - receiver pair.

4.2.6 Tensile test

4.2.6.1 Method of measurement

All joints between essential parts of the equipment shall be submitted to a tensile stress of at least 10 N by suitable means.

4.2.6.2 Requirements

No damage shall be visible to the naked eye. After the test, the equipment shall be fully operational in both the transmit and the receive modes. The requirement shall be checked by interacting with another sample of the same equipment to form a transmitter - receiver pair.

4.3 Mechanical and electrical design conformance requirements

4.3.1 Operational Requirements

The equipment shall be designed, constructed and manufactured in accordance with good engineering practice, and with the aim of minimizing harmful interference to other equipment and services.

Transmitter and receiver shall be combined in one unit and be capable of being attached to the user's body.

The equipment shall be portable and capable of being used only for rescue operations, caused by avalanche, between persons that are in snowy, arctic areas or in similar areas.

The equipment shall in one unit comprise at least:

- an transmitter/receiver including antenna and battery;
- a control unit including an on/off switch with a visual indication that the equipment is switched on;
- a means for conveying information about the received signals to the user; and
- a battery check feature.

Where a unit of equipment provides a facility which is additional to requirements of the present document, the operation or malfunction of such an additional facility shall not prevent the avalanche beacons conforming fully to the requirements of the present document during normal combined operation.

4.3.2 Maintaining the transmit mode

A safety feature against involuntary or accidental leaving of the transmit mode shall be provided in the equipment.

4.3.3 Operating time

With a set of batteries as recommended by the manufacturer, the equipment shall be capable of at least 200 hours of transmitting at a temperature of +10 °C and subsequent receiving for 1 hour at a temperature of -10 °C, in compliance with the requirements as stated in ETSI EN 300 718-1 [1], clauses 4.2.3 and 4.3.1.

4.3.4 Battery check

The equipment shall include a battery check feature. A positive check shall indicate the capability of at least 20 hours of transmitting at a temperature of +10 °C and subsequent receiving for 1 hour at a temperature of -10 °C, in compliance with the requirements as stated in ETSI EN 300 718-1 [1], clauses 4.2.3 and 4.3.1.

The equipment shall use a widely obtained battery type.

4.3.5 Carrying system

The equipment shall include a carrying system that gives the possibility for easy operation and safe placing. The carrying system can be a part of the equipment or an accessory device. The carrying system shall have a joint tensile strength of at least 50 N.

4.3.6 Operating instructions

Operating instructions shall be delivered with every equipment. They shall cover the following subjects:

- a) a statement on avalanche danger;
- b) instruction for checking the battery, transmitter and receiver performance and range;
- c) instructions for turning on the transmitter and strapping the beacon to the body;
- d) instructions for changing to the receive mode and the search strategy (coarse search and fine search);
- e) instructions for changing back to the transmit mode, in particular in the case of secondary avalanche;
- f) a statement on the temperature sensitivity of essential parts;
- g) a statement on the battery lifetime;
- h) device-specific measures on a tour.

4.3.7 Short form operating instructions

A short form of the operating instructions shall be printed onto the case. The printing shall be clearly visible and abrasion proof. Also, the proper positioning of the batteries shall be indicated.

4.3.8 Operating and storage temperatures

The operating and storage temperature ranges declared by the manufacturer of the equipment shall at least include the ranges as specified below.

The equipment shall be able to operate correctly in the temperature range from -20 °C to +45 °C and shall be stored without damage in the temperature range from -25 °C to +70 °C.

4.4 Radio performance requirements

4.4.1 Transmitter requirements

4.4.1.1 Minimum output field strength (H-field)

Minimum output field strength requirement and its limits shall be as defined in ETSI EN 300 718-1 [1], clause 4.2.3.

4.4.2 Receiver requirements

4.4.2.1 Changes in the received signal

4.4.2.1.1 Definition

Changes in the received signal are changes related to variation of the distance between the transmitter and the receiver.

4.4.2.1.2 Requirement

Changing the distance between transmitter and receiver by 25 % shall produce a distinct change in indication over the entire operating range down to a distance of 1 metre.

5 Test conditions, power sources and ambient temperatures

5.1 Normal and extreme test conditions

Type testing shall be made under normal test conditions, and also, where stated, under extreme test conditions.

The test conditions and procedures shall be as specified in clauses 5.2 to 5.4.

5.2 External test power source

During type tests, the power source of the equipment shall be replaced by an external test power source capable of producing normal and extreme test voltages as specified in clauses 5.3.2 and 5.4.2. The internal impedance of the external test power source shall be low enough for its effect on the test results to be negligible. For the purpose of the tests, the voltage of the external test power source shall be measured at the input terminals of the equipment.

The non-grounded terminal of the batteries shall be disconnected, but batteries shall be left in place. The external test power source shall be suitably de-coupled and applied as close to the equipment battery terminals as practicable. The power leads shall be as short as practicable and properly dressed. For radiated measurements fully charged internal batteries should be used. The batteries used should be as supplied or recommended by the manufacturer.

During tests the external test power source voltages shall be within a tolerance ± 1 % relative to the voltage at the beginning of each test.

5.3 Normal test conditions

5.3.1 Normal temperature and humidity

The normal temperature and humidity conditions for tests shall be any convenient combination of temperature and humidity within the following ranges:

- temperature: +15 °C to +35 °C;

- relative humidity: 20 % to 75 %.

When it is impracticable to carry out tests under these conditions, a note to this effect, stating the ambient temperature and relative humidity during the tests, shall be added to the test report.

5.3.2 Normal test voltage

The normal test voltage shall be declared by the manufacturer. The values shall be stated in the test report.

5.4 Extreme test conditions

5.4.1 Extreme temperatures

The extreme operating and storage temperatures used for the tests shall be those declared by the manufacturer for the equipment.

5.4.2 Extreme test voltages

5.4.2.1 General requirement

The extreme test voltages shall be declared by the manufacturer.

5.4.2.2 Procedure for tests at extreme temperatures

Before measurements are made the equipment shall have reached thermal balance in the test chamber.

The equipment shall be switched off during the temperature stabilizing period.

In the case of equipment containing temperature stabilization circuits designed to operate continuously, the temperature stabilization circuits shall be switched on for 15 minutes after thermal balance has been obtained, and the equipment shall then meet the specified requirements.

If the thermal balance is not checked by measurements, a temperature stabilizing period of at least one hour, or such period as may be decided by the accredited test laboratory, shall be allowed. The sequence of measurements shall be chosen, and the humidity content in the test chamber shall be controlled so that excessive condensation does not occur.

5.5 Measurement uncertainty

The interpretation of the results recorded in a test report for the measurements described in the present document shall be as follows:

- the measured value related to the corresponding limit will be used to decide whether an equipment meets the requirements of the present document;
- the value of the measurement uncertainty for the measurement of each parameter shall be included in the test report;
- the recorded value of the measurement uncertainty shall be, for each measurement, equal to or less than the figures in table 1.

Table 1

Parameter	Uncertainty
RF frequency	$\pm 1 \times 10^{-6}$
Radiated emission of transmitter, valid up to 1 GHz (substitution method)	± 2 dB
Radiated emission of transmitter, valid up to 1 GHz (direct measurement, using calibrated antennas)	± 6 dB
Temperature	$\pm 1^{\circ}\text{C}$
Humidity	± 5 %
Transmitted H field at a distance of 10 m	$\pm 0,1 \mu\text{A/m}$
Carrier keying times	± 3 ms
NOTE: For the test methods according to the present document the uncertainty figures are valid to a confidence level of 95 % calculated according to the methods described in the ETSI TR 100 028 [i.5].	

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated and shall correspond to an expansion factor (coverage factor) $k = 1,96$ or $k = 2$ (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)). Principles for the calculation of measurement uncertainty are contained in ETSI TR 100 028-2 [i.5], annex D.

Table 1 is based on such expansion factors.

Annex A (informative): Relationship between the present document and the essential requirements of Directive 2014/53/EU

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.2] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.1].

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in table A.1 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive and associated EFTA regulations.

Table A.1: Relationship between the present document and the essential requirements of Directive 2014/53/EU

Harmonised Standard ETSI EN 300 718-2					
Requirement				Requirement Conditionality	
No	Description	Essential requirements of Directive	Clause(s) of the present document	U/C	Condition
1	Drop test on hard surface	3.3g	4.2.2	U	
2	Temperature tests	3.3g	4.2.3	U	
3	Immersion test	3.3g	4.2.4	U	
4	Operational Requirements	3.3g	4.3.1	U	
5	Maintaining the transmit mode	3.3g	4.3.3	U	
6	Battery check	3.3g	4.3.5	U	
7	Minimum output field strength	3.3g	4.4.1.1	U	
8	Changes in the received signal	3.3g	4.4.2.1	U	

Key to columns:

Requirement:

No A unique identifier for one row of the table which may be used to identify a requirement.

Description A textual reference to the requirement.

Essential requirements of Directive

Identification of article(s) defining the requirement in the Directive.

Clause(s) of the present document

Identification of clause(s) defining the requirement in the present document unless another document is referenced explicitly.

Requirement Conditionality:

U/C Indicates whether the requirement is unconditionally applicable (U) or is conditional upon the manufacturer's claimed functionality of the equipment (C).

Condition Explains the conditions when the requirement is or is not applicable for a requirement which is classified "conditional".

Presumption of conformity stays valid only as long as a reference to the present document is maintained in the list published in the Official Journal of the European Union. Users of the present document should consult frequently the latest list published in the Official Journal of the European Union.

Other Union legislation may be applicable to the product(s) falling within the scope of the present document.

Annex B (normative): Simulated solar radiation source

The intensity at the test point shall be $1\,120\text{ W/m}^2 \pm 10\%$ with a spectral distribution given in table B.1.

The value $1\,120\text{ W/m}^2$ shall include any radiation reflected from the test enclosure.

Table B.1: Spectral energy distribution and permitted tolerances

Spectral region	Ultra-violet B (see note)	Ultra-violet A	Visible			Infra-red
Wavelength (nm)	0,28 to 0,32	0,32 to 0,40	0,40 to 0,52	0,52 to 0,64	0,64 to 0,78	0,78 to 3,00
Radiance (W/m^2)	5	63	200	186	174	492
Tolerance	$\pm 35\%$	$\pm 25\%$	$\pm 10\%$	$\pm 10\%$	$\pm 10\%$	$\pm 20\%$
NOTE: Radiation shorter than 0,30 nm reaching the earth's surface is insignificant.						

Annex C (informative): Change History

Version	Information about changes
1.3.1	Implemented Changes: Formal alignment with Directive 2014/53/EU. Measurement of Receiver Sensitivity moved to ETSI EN 300 718-2 Version 1.3.1 prepared by the Rapporteur
2.1.1	Implemented Changes: Due to merging ETSI EN 300 718-1 and ETSI EN 300718-2 into one document (ETSI EN 300 718-1) this document becomes ETSI EN 300 718-2

History

Document history		
V1.1.1	May 2001	Publication as parts 2 and 3 of ETSI EN 300 718
V1.2.1	February 2004	Publication as part 3 of ETSI EN 300 718
V2.1.0	September 2017	EN Approval Procedure AP 20171217: 2017-09-18 to 2017-12-18