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Electromagnetic locators for buried pipes and cables - Performance and safety

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English version

Electromagnetic locators for buried pipes and cables - Performance and safety

Localisateurs électromagnétiques pour câbles et canalisations enterrés - Performances et sécurité

Elektromagnetische Ortungsgeräte für unter Erde verlegte Rohre und Kabel - Leistungsmerkmale und Sicherheit

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CENELEC
European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

This European Standard was prepared by CENELEC BTWG 72-2, Metallic pipe and cable locators.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50249 on 2002-07-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2003-07-01

- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2005-07-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, Annexes A, C and D are normative and Annex B is informative.

Of all pipe and cable locators, those employing electromagnetic principles are the most commonly used for locating buried metallic plant.

Pipe and cable locators are used for the following purposes:

– to determine the position of a buried target line at a particular location;
– to trace the route of a buried target line;
– to determine the position of lines buried adjacent to target lines.

Such locators make a major contribution towards minimizing the risk of damaging buried plant, and injury to operatives, during subsequent excavation.

This European Standard specifies the minimum performance requirements to which all pipe and cable locators should conform, in order to ensure that locators have an acceptable performance consistent with the user's needs.

Contents

1 Scope

This European Standard specifies the performance and safety requirements for outdoor portable electromagnetic locators for the location of buried conductive pipes, cables and wires (including allied components) by means of detecting the electromagnetic field caused by a flow of a.c. current.

An electromagnetic locator is not designed for use for specific cable identification purposes.

This European Standard excludes the following locators and locating systems:

a) radar systems;

b) fix point marker systems;

c) vibrating probes;

d) apparatus which detect such items as internal wiring, structural supports, and conduit in buildings;

e) apparatus and built-in facility designed for the detection of metallic objects;

f) sondes and accessories for use for pipe location and guidance of drilling systems;

g) non-portable locators;

h) cable identifiers;

i) cable/insulation fault locators.

This standard is only applicable to locators, any accessible part of which is at less than hazardous live, as defined in EN 61010-1.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 50065-1	Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148,5 kHz – Part 1: General requirements, frequency bands and electromagnetic disturbances
EN 60068-2-5	Environmental testing – Part 2 : Tests – Test Sa: Simulated solar radiation at ground level (IEC 60068-2-5)
EN 60068-2-6	Environmental testing – Part 2 : Tests – Test Fc: Vibration (sinusoidal) (IEC 60068-2-6)
EN 60068-2-29	Basic environmental testing procedures – Part 2: Tests – Test Eb and guidance: Bump (IEC 60068-2-29)
EN 60068-2-32	Basic environmental testing procedures – Part 2: Tests – Test Ed: Free fall (IEC 60068-2-32)
EN 60068-2-64	Environmental testing – Part 2: Test methods – Test Fh: Vibration, broad-band random (digital control) and guidance (IEC 60068-2-64)

EN 60086-2	Primary batteries – Part 2: Physical and electrical specifications (IEC 60086-2)
EN 60315 Series	Methods of measurement on radio receivers for various classes of emission (IEC 60315 series)
EN 60318 Series	Electroacoustics – Simulators of human head and ear (IEC 60318 series)
EN 60529	Degrees of protection provided by enclosures (IP code) (IEC 60529)
EN 61000-6-2	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments (IEC 61000-6-2)
EN 61000-6-3	Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments (IEC 61000-6-3)
EN 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements (IEC 61010-1)
EN 61010-2-031	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 2-031: Particular requirements for hand-held probe assemblies for electrical measurement and test (IEC 61010-2-031)
EN 61010-2-032	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 2-032: Particular requirements for hand-held current clamps for electrical measurement and test (IEC 61010-2-032)

3 Definitions

For the purposes of this standard the following definitions apply.

3.1
line
any metallic (conductive) pipe, wire or cable

3.2
locator
any device or system for determining the position of buried lines

3.3
target line
particular line that the user is trying to locate

3.4
signal
alternating magnetic field resulting from the flow of alternating electric current

3.5
passive signal
signal originating from a source other than a transmitter which emanates from lines, e.g. 50 Hz power energy, re-radiated VLF energy and emission from lines carrying data

3.6
receiver
part of a locator which detects a signal and responds to changes in the signal

3.7
active locator
locator comprising a transmitter and a receiver

3.8
transmitter
part of an active locator which causes a current to flow in a line or lines

3.9
passive locator
receiver that locates lines by detecting passive signals

3.10
active mode
mode in which the receiver responds to a signal generated by a transmitter

3.11
passive mode
mode in which the receiver responds to passive signals

3.12
induction mode
active mode in which a transmitter causes a signal by the use of an induction coil, which does not require direct access to the line

3.13
clamp mode
active mode in which a transmitter causes a signal by the use of a toroidal magnetic core placed around the line

3.14
direct connection mode
active mode in which a transmitter causes a signal by direct electrical connection of the transmitter to the line

3.15
power mode
mode in which the passive signal is caused by the electric power distribution system

3.16
radio mode
mode in which the passive signal is caused other than by the electric power distribution system

3.17
response
change in receiver output as it reacts to a signal

3.18
detectable current range
range of current over which the receiver conforms to its specification

4 Principles of operation

Principles of operation and operating modes are outlined in Annex B.

5 General requirements

5.1 Enclosure

All enclosures shall be IP54, tested as specified in A.3.14.

5.2 Robustness

Receivers and transmitters shall suffer no detrimental effects as specified in A.3.12, when subjected to the following robustness requirements:

a) vibration as specified in A.3.12.1;

b) free fall as specified in A.3.12.2;

c) bump as specified in A.3.12.3;

d) impact as specified in A.3.12.4.

5.3 UV protection

Locators shall be ultraviolet (UV) protected.

When tested in accordance with A.3.12.5, no cracking or distortion shall occur.

5.4 Controls

The controls shall be robust and shall be the minimum necessary, when subjected to the following requirements:

5.4.1 Operation

The receiver shall be capable of being operated by the hand used to carry the instrument for a given mode of operation. The controls shall be robust and shall be the minimum necessary.

Conformity shall be checked by inspection.

5.4.2 Control size

Receivers and transmitters shall have controls of a size permitting easy and positive operation while the operator is wearing a pair of heavy-duty gloves.

Conformity shall be checked by satisfactory operation of the receiver and transmitter, including adjustment of all controls, while wearing a pair of heavy-duty gloves.

5.5 Temperature range

The receiver and transmitter shall operate satisfactorily within at least the temperature range of –10 °C to +50 °C.

Conformity shall be checked by the tests of A.3.8.

5.6 Relative humidity

The receiver and transmitter shall operate satisfactorily at 80 % RH.

Conformity shall be checked by the test of A.3.15.

5.7 Battery housing access

Receiver and transmitter battery housings containing cells which require regular access shall allow access without the use of tools. The battery housing shall be constructed so that if cell decomposition occurs, the components of the locator are not affected. Indication of cell polarity and type(s) shall be provided in or adjacent to the battery housing.

Conformity shall be checked by inspection.

5.8 Power supply polarity protection

The power supply of receivers and transmitters shall be reverse polarity protected.

Conformity shall be checked by either

a) it being physically not possible to install/connect the batteries and, where appropriate, the battery assembly, such that the locator conforms to the tests specified at A.3.9,

or

b) be protected from incorrect installation/connection of batteries and, where applicable the battery assembly, such that the locator conforms to the tests specified at A.3.9.

5.9 Power supply cell type

Receivers and transmitters shall use integral cell types conforming to EN 60086-2, or their secondary cell equivalent.

Conformity shall be checked by inspection.

5.10 Battery operating life

A new set of primary cells or a set of fully charged secondary cells shall as specified by the manufacturer permit continuous operation of locator units in the highest consumption mode associated with the standard internal battery for a minimum period of 8 h at a temperature of 20 °C ± 5 °C without replacement or low battery warning operation.

Conformity shall be checked by the test of A.3.7.

5.11 Low battery warning

5.11.1 General

Receiver and transmitter units shall incorporate a means to warn the user to change the battery when in use.

Conformity shall be checked by inspection.

The unit shall continue to operate for at least 15 min at 20 °C ± 5 °C after activation of the warning.

Conformity shall be checked by measurement.

The unit shall operate within the performance specified in 5.11.2 for receivers and 5.11.3 for transmitters when applying the minimum voltage declared by the manufacturer + 0,5 % - 0 %.

5.11.2 Receiver test requirements

Depending on the mode of operation of the locator, conformity shall be tested in accordance with A.3.4.2.

5.11.3 Transmitter test requirements

Conformity shall be checked by carrying out the transmitter output level check specified in A.3.5.3 for an output load of 100 Ω.

5.12 Transmitter case buoyancy

The transmitter case shall not float when immersed in 25 mm depth of water.

Conformity shall be checked by carrying out the test specified in A.3.11.

5.13 External electrical connector protection

Transmitters and receivers shall have all external electrical connections protected against the ingress of mud and debris (which prevent a connection being made) when not in use.

Compliance shall be checked by inspection.

5.14 Hazardous electrical contact

All parts of receivers and transmitters which can be contacted by the jointed test finger of EN 60529 shall operate at less than hazardous live voltage as specified in EN 61010-1.

Conformity shall be checked by inspection.

5.15 Surface temperature

The surface temperatures of any parts of the locator shall not exceed those specified in EN 61010-1 under normal or abnormal operation.

Conformity shall be checked by measurement.

5.16 Electromagnetic compatibility

The receiver and transmitter shall conform to generic requirements for electromagnetic compatibility (EMC).

Conformity shall be checked in accordance with EN 61000-6-2 and EN 61000-6-3.

5.17 Safety

The receiver and transmitter shall conform to the safety requirements for electrical equipment for measurement, control and laboratory use.

Conformity shall be checked in accordance with the general requirements specified in EN 61010-1 and, where appropriate, with the particular requirements specified in EN 61010-2-031 and EN 61010-2-032.

6 Transmitter construction

6.1 Transmitter case

The transmitter case shall be stable when it is standing on a surface which is inclined at 30° to the horizontal.

Conformity shall be checked by testing (see A.3.10).

6.2 Weight

Transmitters, excluding accessories, should weigh no more than 4,0 kg, including batteries.

7 Electrical characteristics of the transmitter

7.1 General

Unless otherwise specified, all electrical tests shall be carried out with a new set of primary cells or a set of fully charged secondary cells.

7.2 On/off indication

Transmitters shall have a clear indication of whether the unit is switched on or off. The indication shall be either audio or visual or both.

Conformity shall be checked by inspection.

7.3 Frequency band

Transmitters shall operate only within approved frequency bands for each country of use, and shall conform to EN 50065-1.

Conformity shall be checked by inspection of the manufacturer's stated operating frequency and evidence of the approved frequency band(s).

Data on transmitter signal characteristics shall be provided by the manufacturer in the technical data sheet, as specified in Annex C.

Conformity shall be checked by inspection.

The manufacturer shall include in the technical data sheet and operating instructions that it is the operator's responsibility to apply for a licence, if necessary, from the appropriate national regulatory authority for the intended country(ies) of operation.

Conformity shall be checked by inspection of manufacturer's data sheet.

7.4 Output level

The - 3 dB points of the transmitter output level, including any modulations which, for example, may be caused by low battery condition, shall be quoted by the manufacturer. They shall be quoted in the technical data sheet for all modes of operation and for all output levels.

Conformity with regard to the - 3 dB points shall be checked by measurement of the frequency of the output of the transmitter in each mode of operation. A 300 Ω ± 1 % resistive load shall be connected when checking compliance in the direct connection mode.