



BSI Standards Publication

Explosives for civil uses — Detonators and detonating cord

Part 1: Requirements

National foreword

This British Standard is the UK implementation of EN 13763-1:2025. It supersedes BS EN 13763-1:2004, which is withdrawn. Together with BS EN 13938-1:2025, BS EN 13631-1:2025 and BS EN 13630-1:2025, it supersedes BS EN 13857-3:2002, which will be withdrawn upon publication of the rest of these standards.

The UK participation in its preparation was entrusted to Technical Committee CII/61, Explosives for civil uses.

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European foreword

This document (EN 13763-1:2025) has been prepared by Technical Committee CEN/TC 321 “Explosives for civil uses”, the secretariat of which is held by UNE.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2026 and conflicting national standards shall be withdrawn at the latest by April 2026.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13763-1:2004. Together with EN 13630-1:2025, EN 13631-1:2025 and EN 13938-1:2025 this document will supersede EN 13857-3:2002.

EN 13763-1:2025 includes the following significant technical changes with respect to EN-13763-1:2004:

- a) the document title has been changed from “Detonators and relays — Part 1: Requirements” to “Detonators and detonating cord relays — Part 1: Requirements”;
- b) the Scope has been revised to clarify the covered explosives and to include semi-finished detonators, electronic detonators and electronic initiation systems;
- c) the normative references have been updated;
- d) the Clause 4 “Requirements” has been completely revised so that now for each explosive a separate subclause has been added divided into the following two sections each time:
 - 1) a section on the requirements on information to be provided for the explosive – these requirements have partly been moved here from EN 13857-3:2002 in revised form;
 - 2) a section on the requirements on properties for the explosive – these requirements have partially been taken over from the former Clause 4;
- e) a differentiation between the different types of detonators has been introduced to Clause 4 – non-electric, electric, electronic, plain and semi-finished detonators;
- f) the requirements on electronic detonators, semi-finished detonators and electronic initiation systems have been added;
- g) the requirements on properties of the explosives covered in this document have been converted into “pass”/ “fail”-criteria and the specification on these criteria are now given in the corresponding test method standards of the EN 13763 series;
- h) the former Annex A “Classification of electric detonators” has been removed;
- i) a new Annex A “Specifications on reference detonators” has been added;
- j) the former Annex B “Bruceton method” has been removed;
- k) the Annex C is now called “PROBIT model” instead of “PROBIT TEST (PBBS test)”;
- l) the former Annex D “Classification of defects” is now Annex B and has been updated to consider all explosives covered in this document;

- m) the former Annex E “Range of validity of test results” has been removed;
- n) the Annex ZA has been updated;
- o) the Bibliography has been updated.

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annex ZA, which is an integral part of this document.

A list of all parts in the EN 13763 series, published under the general title *Explosives for civil uses — Detonators and detonating cord relays*, can be found on the CEN website.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

1 Scope

This document specifies the requirements for electric detonators, non-electric detonators, electronic detonators, plain detonators, semi-finished detonators, electronic initiation systems, surface connectors, shock tubes and detonating cord relays.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 13763-2:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 2: Verification of thermal stability of detonators, surface connectors, detonating cord relays and shock tubes*

EN 13763-3:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 3: Verification of insensitiveness to impact of detonators, surface connectors, detonating cord relays and shock tubes*

EN 13763-4:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 4: Verification of resistance to abrasion of leading wires and shock tubes*

EN 13763-5:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 5: Verification of resistance to cutting damage of leading wires and shock tubes*

EN 13763-6:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 6: Verification of resistance to cracking of leading wires*

EN 13763-7:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 7: Verification of pull-out resistance of detonators*

EN 13763-8:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 8: Verification of resistance to vibration of plain and semi-finished detonators*

EN 13763-9:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 9: Verification of resistance to bending of detonators*

EN 13763-11:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 11: Verification of resistance to damage by dropping of detonators, detonating cord relays and surface connectors*

EN 13763-12:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 12: Verification of resistance to hydrostatic pressure of detonators, detonating cord relays and surface connectors*

EN 13763-13:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 13: Verification of the resistance to electrostatic discharge (ESD) of electric and electronic detonators*

EN 13763-15:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 15: Verification of equivalent initiating capability of electric, non-electric and electronic detonators*

EN 13763-16:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 16: Verification of delay time accuracy of electric and non-electric detonators, surface connectors and detonating cord relays*

EN 13763-17:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 17: Verification of the no-fire current of electric detonators*

EN 13763-18:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 18: Verification of the series firing current for electric detonators*

EN 13763-19:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 19: Verification of all-fire impulse and no-fire impulse of electric detonators*

EN 13763-20:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 20: Verification of total electrical resistance of electric detonators*

EN 13763-21:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 21: Verification of flash-over voltage of electric detonators*

EN 13763-22:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 22: Verification of capacitance, insulation resistance and insulation breakdown of leading wires*

EN 13763-23:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 23: Verification of the shock wave velocity of shock tubes*

EN 13763-24:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 24: Verification of electrical non-conductivity of shock tubes*

EN 13763-25:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 25: Verification of transfer capability of detonating cord relays, surface connectors and coupling accessories*

EN 13763-27:2025, *Explosives for civil uses — Detonators and detonating cord relays — Part 27: Test methods for electronic initiation systems*

EN 13857-1:2025, *Explosives for civil uses — Part 1: Vocabulary*

EN IEC 60812:2018, *Failure modes and effects analysis (FMEA and FMECA) (IEC 60812:2018)*

EN 61882:2016, *Hazard and operability studies (HAZOP studies) — Application guide (IEC 61882:2016)*

EN ISO 13849-2:2012, *Safety of machinery — Safety related parts of control systems — Part 2 Validation (ISO 13849-2:2012)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13857-1:2025 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp/>

4 Requirements

4.1 General

For the verification of the properties of the explosives covered in this document, Annex B provides information on the minimum test sample size under consideration of the classification of defects. Annex B does not apply to electronic initiation systems and their components different from electronic detonators.

4.2 Electric detonators

4.2.1 Information to be provided for electric detonators

4.2.1.1 Temperature of use

The temperature range in which the detonator may be used shall be given as minimum and as maximum temperature expressed in °C.

If the detonator may be temporarily subjected to a temperature outside of the above temperature range, the minimum or the maximum temperature shall be given and the exposure time during which the detonator may be subjected to this temperature shall be given.

For detonators with a maximum temperature of use > 100 °C, the maximum exposure time shall be specified.

EXAMPLE

- “suitable for use up to a maximum temperature of ...°C for ...min or h or d”;
- “suitable for use down to a minimum temperature of ...°C for ...min (or h or d)”.

4.2.1.2 Storage conditions

4.2.1.2.1 Temperature

The temperature range for storage of the detonator shall be given as minimum and as maximum temperature expressed in °C.

4.2.1.2.2 Relative humidity

The range of relative humidity for storage of the detonator shall be given as minimum and as maximum value expressed in %.

4.2.1.3 Use in wet conditions

It shall be specified whether or not the detonator may be used in wet conditions.

In case that the detonator is resistant to hydrostatic pressure, the value of resistance against hydrostatic pressure shall be specified and expressed in MPa.

4.2.1.4 Means of initiation

The means of initiation for the detonator shall be specified.

The series firing current, I_s , shall be specified.

The all-fire current, I_{AF} , shall be specified.

The no-fire current, I_{NF} , shall be specified.

The all-fire impulse, W_{AF} , shall be specified.

The no-fire-impulse W_{NF} shall be specified.

Depending on the specified no-fire current, the class of the electric detonator shall be specified in accordance with Table 1.

Table 1 — Overview on electric detonator classes

		Class of the electric detonator			
		Class I	Class II	Class III	Class IV
No-fire current	[A]	$0,18 < I_{nf} < 0,45$	$0,45 \leq I_{nf} < 1,20$	$1,20 \leq I_{nf} < 4,00$	$4,00 \leq I_{nf}$
Minimum no-fire impulse, W_{nf}	[mJ]/ Ω	0,5	8	80	500

4.2.1.5 Leading wires

It shall be specified whether the leading wires are category 1 or category 2 leading wires in relation to testing according to EN 13763-4:2025.

It shall be specified whether the leading wires are single or dual.

The length of the leading wires shall be expressed in m. In case of more than one leading wire length for the detonator, all different lengths shall be specified.

The temperature of use shall be as specified in 4.2.1.1 and the temperature range for the storage shall be as specified in 4.2.1.2.1.

4.2.1.6 Delay characteristics

It shall be specified whether the detonator contains a delay element.

It shall be specified whether the detonator forms part of a delay series.

If the detonators form part of a delay series, the delay numbers (k) and the corresponding nominal delay times ($t_{nom,k}$) shall be specified.

If the detonators form part of a delay series, it shall be specified whether different delay compositions are used for different detonators of different delay times.

It shall be specified whether the fuse head of all detonators of the delay series consisting of delay and instantaneous detonators have the same design.

4.2.1.7 Initiating capability

The corresponding reference detonator in accordance with Table A.1 shall be specified.

4.2.1.8 Total electric resistance

The total electric resistance of the detonator shall be given for the detonators with the longest and shortest leading wire as specified in 4.2.1.5.

4.2.2 Requirements on properties of electric detonators

4.2.2.1 Thermal stability

When tested in accordance with EN 13763-2:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-2:2025, Clause 8.

4.2.2.2 Insensitiveness to impact

When tested in accordance with EN 13763-3:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-3:2025, Clause 8.

4.2.2.3 Resistance to abrasion of leading wires

When tested in accordance with EN 13763-4:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-4:2025, 8.1.

4.2.2.4 Resistance to cutting damage of leading wires

When tested in accordance with EN 13763-5:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-5:2025, 8.1.

4.2.2.5 Resistance to cracking of insulation in low temperatures of leading wires

When tested in accordance with EN 13763-6:2025 Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-6:2025, Clause 8.

4.2.2.6 Pull-out resistance

When tested in accordance with EN 13763-7:2025 Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-7:2025, Clause 8.

4.2.2.7 Resistance to bending

When tested in accordance with EN 13763-9:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-9:2025, Clause 8.

4.2.2.8 Resistance to damage by dropping

When tested in accordance with EN 13763-11:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-11:2025 8.1.

4.2.2.9 Resistance to hydrostatic pressure

For detonators for which resistance to water is specified in accordance with 4.2.1.3, when tested in accordance with EN 13763-12:2025, Clauses 6 to 8, the test result shall be “pass” in accordance with EN 13763-12:2025, 9.1.

4.2.2.10 Resistance to electrostatic discharge (ESD)

When tested in accordance with EN 13763-13:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-13:2025, Clause 8.

4.2.2.11 Equivalent initiating capability

When tested in accordance with EN 13763-15:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-15:2025, Clause 8.

4.2.2.12 Delay accuracy

For detonators that form part of a delay series as specified in accordance with 4.2.1.6, when tested in accordance with EN 13763-16:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-16:2025, 8.1.

4.2.2.13 No-fire current

When tested in accordance with EN 13763-17:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-17:2025, Clause 8.

NOTE For the determination of the no-fire current level in accordance with EN 13763-17:2025, 7.3, the PROBIT model in accordance with Annex C is applied.

4.2.2.14 Series firing current

When tested in accordance with EN 13763-18:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-18:2025, Clause 8.

4.2.2.15 All-fire and no-fire impulse

When tested in accordance with EN 13763-19:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-19:2025, Clause 8.

NOTE For the determination of the all-fire and no-fire impulse values in accordance with EN 13763-19:2025, 7.3, the PROBIT model in accordance with Annex C is applied.

4.2.2.16 Total electrical resistance

When tested in accordance with EN 13763-20:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-20:2025, Clause 8.

4.2.2.17 Flash-over voltage

When tested in accordance with EN 13763-21:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-21:2025, Clause 8.

4.2.2.18 Capacitance, insulation resistance and insulation breakdown of leading wires

When tested in accordance with EN 13763-22:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-22:2025, Clause 8.

4.3 Non-electric detonators

4.3.1 Information to be provided for non-electric detonators

4.3.1.1 Temperature of use

The temperature range in which the detonator may be used shall be given as minimum and as maximum temperature expressed in °C.

If the detonator may be temporarily subjected to a temperature outside of the above temperature range, the minimum or the maximum temperature shall be given and the maximum duration during which the detonator may be subjected to this temperature shall be given.

EXAMPLE

- “suitable for use up to a maximum temperature of ...°C for ...min or h or d”;
- “suitable for use down to a minimum temperature of ...°C for ...min (or h or d)”.

4.3.1.2 Storage conditions

4.3.1.2.1 Temperature

The temperature range for storage of the detonator shall be given as minimum and as maximum temperature expressed in °C.

4.3.1.2.2 Relative humidity

The range of relative humidity for storage of the detonator shall be given as minimum and as maximum value expressed in %.

4.3.1.3 Use in wet conditions

It shall be specified whether or not the detonator may be used in wet conditions.

In case that the detonator is resistant to hydrostatic pressure, the value of resistance against hydrostatic pressure shall be specified and expressed in MPa.

4.3.1.4 Means of initiation

The means of initiation for the used shock tube of the non-electric detonator is specified in 4.9.1.4.

4.3.1.5 Shock tube

The shock tube of the non-electric detonator shall be specified in accordance with 4.9.1.

4.3.1.6 Delay characteristics

It shall be specified whether the detonator contains a delay element.

It shall be specified whether the detonator forms part of a delay series.

If the detonators form part of a delay series, the delay numbers (k) and the corresponding nominal delay times ($t_{nom,k}$) shall be specified.

If the detonators form part of a delay series, it shall be specified whether different delay compositions are used for different detonators of different delay times.

4.3.1.7 Initiating capability

The corresponding reference detonator in accordance with Table A.1 shall be specified.

4.3.2 Requirements on properties of non-electric detonators

4.3.2.1 Thermal stability

When tested in accordance with EN 13763-2:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-2:2025, Clause 8.

4.3.2.2 Insensitiveness to impact

When tested in accordance with EN 13763-3:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-3:2025, Clause 8.

4.3.2.3 Resistance to abrasion of shock tube

In case that the detonator is equipped with shock tube, when tested in accordance with EN 13763-4:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-4:2025, 8.2.

4.3.2.4 Resistance to cutting damage of shock tube

In case that the detonator is equipped with shock tube, when tested in accordance with EN 13763-5:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-5:2025, 8.2.

4.3.2.5 Pull-out resistance

In case that the detonator is equipped with shock tube, when tested in accordance with EN 13763-7:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-7:2025, Clause 8.

4.3.2.6 Resistance to bending

When tested in accordance with EN 13763-9:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-9:2025, Clause 8.

4.3.2.7 Resistance to damage by dropping

When tested in accordance with EN 13763-11:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-11:2025, 8.1.

4.3.2.8 Resistance to hydrostatic pressure

When tested in accordance with EN 13763-12:2025, Clauses 6 to 8, the test result shall be “pass” in accordance with EN 13763-12:2025, 9.1.

4.3.2.9 Equivalent initiating capability

When tested in accordance with EN 13763-15:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-15:2025, Clause 8.

4.3.2.10 Delay accuracy

For detonators that form part of a delay series as specified in accordance with 4.3.1.6, when tested in accordance with EN 13763-16:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-16:2025, 8.1.

4.3.2.11 Shock wave velocity of shock tube

When tested in accordance with EN 13763-23:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-23:2025, Clause 8.

4.3.2.12 Electrical non-conductivity of shock tube

In case that the detonator is equipped with shock tube, when tested in accordance with EN 13763-24:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-24:2025, Clause 8.

4.3.2.13 Transfer capability

For detonators equipped with a shock tube with a coupling accessory, when tested in accordance with EN 13763-25:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-25:2025, Clause 8.

4.4 Electronic detonators

4.4.1 Information to be provided for electronic detonators

4.4.1.1 Temperature of use

The temperature range in which the detonator may be used shall be given as minimum and as maximum temperature expressed in °C.

If the detonator may be temporarily subjected to a temperature outside of the above temperature range, the minimum or the maximum temperature shall be given and the maximum duration during which the detonator may be subjected to this temperature shall be given.

EXAMPLE

- “suitable for use up to a maximum temperature of ...°C for ...min or h or d”;
- “suitable for use down to a minimum temperature of ...°C for ...min (or h or d)”.

4.4.1.2 Storage conditions

4.4.1.2.1 Temperature

The temperature range for storage of the detonator shall be given as minimum and as maximum temperature expressed in °C.

4.4.1.2.2 Relative humidity

The range of relative humidity for storage of the detonator shall be given as minimum and as maximum value expressed in %.

4.4.1.3 Use in wet conditions

It shall be specified whether or not the detonator may be used in wet conditions.

In case that the detonator is resistant to hydrostatic pressure, the value of resistance against hydrostatic pressure shall be specified and expressed in MPa.

4.4.1.4 Means of initiation

The means of initiation for the detonator shall be specified.

If the electronic detonator is equipped with a shock tube, the means of initiation for the used shock tube is specified in accordance with 4.9.1.4.

4.4.1.5 Leading wires

It shall be specified whether the leading wires are category 1 or category 2 leading wires in relation to testing according to EN 13763-4:2025.

The length of the leading wires shall be specified expressed in m. In case of more than one leading wire length, all different lengths shall be specified.

It shall be specified whether the leading wires are equipped with a connector.

The temperature of use shall be as specified in 4.4.1.1 and the temperature range for the storage shall be as specified in 4.4.1.2.1.

4.4.1.6 Bus wires

For bus wires the following characteristics shall be specified:

- a) the material of the conductors;
- b) the diameter of the conductors;
- c) the design of the conductors, e.g. single core or multi core;
- d) the resistance of the conductor, expressed in Ω/m ;
- e) the insulation material;
- f) the number of conductors; and
- g) the construction of the bus wire, e.g. twisted pair, ribbon conductor.

4.4.1.7 Shock tube

In case that the detonator is equipped with a shock tube, the shock tube shall be specified in accordance with 4.9.1.

4.4.1.8 Delay characteristics

4.4.1.8.1 General

It shall be specified whether the detonator contains a delay element.

It shall be specified whether the detonator is programmable or pre-programmed.

4.4.1.8.2 Programmable electronic detonators

The delay range of the electronic initiation system with programmable electronic detonators shall be specified together with

- a) the programmable step size of the delays;
- b) the recommended step size of the delay, if applicable;
- c) the delay accuracy, according to temperature range and firing mode (calibration options or other options of the firing unit), if applicable.

If any of these parameters changes over the entire delay range, sub-delay ranges shall be specified.

The delay accuracy shall be expressed as standard deviation or coefficient of variation, i.e. the standard deviation divided by the delay time.

It is recommended to specify the characteristics for the programmable electronic detonators in a table. An example for such a table is given as Table 2.

Table 2 — Example for a table, which includes the information on delay time for programmable electronic detonators

Delay range	Programmable step size	Recommended step size	Delay accuracy	Temperature range	Firing mode
[ms]	[ms]	[ms]	μs/ %	[°C]	

4.4.1.8.3 Pre-programmed electronic detonators

In case of pre-programmed electronic detonators, it shall be specified whether the detonators are part of a delay series.

If the detonators are part of a delay series, the delay range of the electronic initiation system with pre-programmed electronic detonators shall be specified together with the delay numbers (k) and the corresponding nominal delay times ($t_{nom,k}$).

If the detonators are not part of a delay series, all delay times shall be specified.

The delay accuracy, according to temperature range and firing mode (e.g. calibration options or other options of the firing unit), if applicable, shall be specified.

If the delay accuracy changes over the entire delay range, sub-delay ranges shall be specified.

The delay accuracy shall be expressed as standard deviation or coefficient of variation, i.e. the standard deviation divided by the delay time.

It is recommended to specify the characteristics for the pre-programmable electronic detonators being part of a delay series in a table. An example for such a table is given as Table 3.

Table 3 — Example for a table, which includes the information on delay time for pre-programmed electronic detonators

Delay range	Delay Interval	Delay accuracy	Temperature range	Firing mode
[ms]	[ms]	µs/ %	[°C]	

4.4.1.9 Initiating capability

The corresponding reference detonator in accordance with Table A.1 shall be specified.

4.4.1.10 Wiring scheme

For electronic detonators, not equipped with connectors, instructions shall be provided which describe the wiring for connecting multiple detonators to the firing unit.

4.4.1.11 Design drawings and circuit diagrams

Drawings of the mechanical design as well as circuit diagrams of the electronic circuits of the electronic detonator shall be provided.

4.4.1.12 Firing capacitor

The firing capacitor shall be specified, if applicable.

4.4.1.13 Fuse head parameters

The following parameters of the fuse head shall be specified:

- a) no-fire impulse;
- b) no-fire energy;
- c) no-fire current;
- d) resistance with the tolerance.

4.4.1.14 Minimum distance for no sympathetic detonation

The minimum distance at which no sympathetic detonation occurs shall be specified in cm in relation to testing dynamic pressure (EN 13763-27:2025, 5.2).

4.4.1.15 Minimum distance for no misfire

The minimum distance at which no misfire occurs shall be specified in cm in relation to testing dynamic pressure (EN 13763-27:2025, 5.2).

4.4.1.16 Reference detonator for dynamic pressure

The reference detonator in relation to testing dynamic pressure (see EN 13763-27:2025, 5.2) shall be specified in accordance with Table A.1.

4.4.1.17 No-fire voltage

The maximum voltage supplied to the detonator that will not initiate the detonator when commanded to fire shall be specified as the no-fire voltage.

4.4.2 Requirements on properties of electronic detonators

4.4.2.1 Thermal stability

When tested in accordance with EN 13763-2:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-2:2025, Clause 8.

4.4.2.2 Insensitiveness to impact

When tested in accordance with EN 13763-3:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-3:2025, Clause 8.

4.4.2.3 Resistance to abrasion of leading wires or shock tube

For detonators equipped with leading wires, when tested in accordance with EN 13763-4:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-4:2025, 8.1.

For detonators equipped with shock tube, when tested in accordance with EN 13763-4:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-4:2025, 8.2.

4.4.2.4 Resistance to cutting damage of leading wires or shock tube

For detonators equipped with leading wires, when tested in accordance with EN 13763-5:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-5:2025, 8.1.

For detonators equipped with shock tube, when tested in accordance with EN 13763-5:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-5:2025, 8.2.

4.4.2.5 Resistance to cracking of insulation in low temperatures of leading wires

For detonators equipped with leading wires, when tested in accordance with EN 13763-6:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-6:2025, Clause 8.

4.4.2.6 Pull-out resistance

For detonators equipped with leading wires or shock tube, when tested in accordance with EN 13763-7:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-7:2025, Clause 8.

4.4.2.7 Resistance to bending

When tested in accordance with EN 13763-9:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-9:2025, Clause 8.

4.4.2.8 Resistance to damage by dropping

When tested in accordance with EN 13763-11:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-11:2025, 8.1.

4.4.2.9 Resistance to hydrostatic pressure

When tested in accordance with EN 13763-12:2025, Clauses 6 to 8, the test result shall be “pass” in accordance with EN 13763-12:2025, Clause 9.1.

4.4.2.10 Resistance to electrostatic discharge (ESD)

When tested in accordance with EN 13763-13:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-13:2025, Clause 8.

4.4.2.11 Equivalent initiating capability

When tested in accordance with EN 13763-15:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-15:2025, Clause 8.

4.4.2.12 Capacitance, insulation resistance and insulation breakdown of leading wires

For detonators equipped with leading wires, when tested in accordance with EN 13763-22:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-22:2025, Clause 8.

4.4.2.13 Shock wave velocity of shock tubes

In case that the detonator is equipped with shock tube, when tested in accordance with EN 13763-23:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-23:2025, Clause 8.

4.4.2.14 Electrical non-conductivity of shock tube

In case that the detonator is equipped with shock tube, when tested in accordance with EN 13763-24:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-24:2025, Clause 8.

4.4.2.15 Transfer capability

For detonators equipped with a shock tube with a coupling accessory, when tested in accordance with EN 13763-25:2025, Clauses 5 to 7, the test result shall be “pass” in accordance with EN 13763-25:2025, Clause 8.

4.4.2.16 Resistance to overvoltage

When tested in accordance with EN 13763-27:2025, 5.1.2 to 5.1.4, the test result shall be “pass” in accordance with EN 13763-27:2025, 5.1.5.

4.4.2.17 Resistance to dynamic pressure

When tested in accordance with EN 13763-27:2025, 5.1.2 to 5.2.4, the test result shall be “pass” in accordance with EN 13763-27:2025, 5.2.5.

4.4.2.18 Resistance to slow temperature change

When tested in accordance with EN 13763-27:2025, 5.1.2 to 5.3.4, the test result shall be “pass” in accordance with EN 13763-27:2025, 5.3.5.

4.4.2.19 Resistance to rapid temperature change

When tested in accordance with EN 13763-27:2025, 5.1.2 to 5.4.4, the test result shall be “pass” in accordance with EN 13763-27:2025, 5.4.5.

4.4.2.20 Safety against unintended initiation due to electric energy storage in the detonator

When tested in accordance with EN 13763-27:2025, 5.1.2 to 5.5.4, the test result shall be “pass” in accordance with EN 13763-27:2025, 5.5.5.

4.4.2.21 Defined ways of firing electronic detonators

When tested in accordance with EN 13763-27:2025, 5.1.2 to 5.6.4, the test result shall be “pass” in accordance with EN 13763-27:2025, 5.6.5.

4.4.2.22 Discharge of firing capacitors of electronic detonators

When tested in accordance with EN 13763-27:2025, 5.1.2 to 5.7.4, the test result shall be “pass” in accordance with EN 13763-27:2025, 5.7.5.

4.4.2.23 Fuse head current of electronic detonators

When tested in accordance with EN 13763-27:2025, 5.1.2 to 5.8.4, the test result shall be “pass” in accordance with EN 13763-27:2025, 5.8.5.

4.4.2.24 Autonomous operation of electronic detonators

When tested in accordance with EN 13763-27:2025, 5.1.2 to 5.9.4, the test result shall be “pass” in accordance with EN 13763-27:2025, 5.9.5.

4.5 Semi-finished detonators

4.5.1 Information to be provided for semi-finished detonators

4.5.1.1 Temperature of use

The temperature range in which the detonator may be used shall be given as minimum and as maximum temperature expressed in °C.

If the detonator may be temporarily subjected to a temperature outside of the above temperature range, the minimum or the maximum temperature shall be given and the maximum duration during which the detonator may be subjected to this temperature shall be given.

EXAMPLE

- “suitable for use up to a maximum temperature of ...°C for ...min or h or d”;
- “suitable for use down to a minimum temperature of ...°C for ...min (or h or d)”.

4.5.1.2 Storage conditions

4.5.1.2.1 Temperature

The temperature range for storage of the detonator shall be given as minimum and as maximum temperature expressed in °C.

4.5.1.2.2 Relative humidity

The range of relative humidity for storage of the detonator shall be given as minimum and as maximum value expressed in %.

4.5.1.3 Means of initiation

The means of initiation for the detonator shall be specified.