



EUROPEAN COMMISSION

Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs

Consumer, Environmental and Health Technologies
Chemicals

Brussels, 03.03.2017

FM

Results of the consultation of the Group of Experts on Explosives on harmonised standards for explosives

To the members and the observers of the Group of Experts on Explosives,

On 18.10.2016 the Commission launched a written consultation via a questionnaire within the Group of Experts on Explosives on the need to update the existing harmonised standards and/or develop new harmonised standards for civil explosives.

Replies from 18 Member States, EEA/EFTA countries, Notified Bodies and stakeholders were received.

To the **first question** ("*Is there in your view a need to update some of the existing harmonised standards for civil explosives?*"), 9 respondents replied with a "no", while 9 other respondents replied with "yes", and provided the following suggestions/motivations:

Ireland: Generally most of the standards are quite old and might benefit from being refreshed.

Sweden: EN 13763, Explosives for civil uses - Detonators and relays. Reasoning: recent development in electronic detonators is not covered by the standard. Comments: EN 13763-26 (devices and accessories for reliable and safe function of detonators and relays) is not a harmonised standard but should also be revised to cover the new electronic detonators.

BAM (notified body): According to decisions taken at the last CEN/TC 321 meeting on 2015-07-14 the following standards shall be revised: EN 13631-14, EN 13763-1, EN 13763-5, EN 13763-13, EN 13763-17, EN 13763-19, EN 13938-4. New Work Item Proposal (NWIP) ballots are still outstanding.

Norway: Most of the standards are old. It would be beneficial to have a systematic review based on experiences (suppliers, notified bodies and market) vs technology and distribution of today. Elements as well as limits should be discussed and evaluated together with lesson learned over the years, in particular with respect to user environment (as combinations with mobile manufacturing). A more comprehensive justification can be developed

together with industry and users but will require more resources. A well organised pre-study may be an alternative.

KCEM: The standards for Detonators and Relays, EN 13763 part 1-25, need a general update based on the experience of testing done by the Notified Bodies. In 2014 the TC secretariat proposed an update of some standards for Detonators (parts 5, 13, 17 and 19). A meeting was held in Madrid June 2015. Some amendments were decided but nothing has happened. Electronic detonators are the latest development regarding detonators. The standard for electronic detonators, CEN/TS 13763-27, is not a full standard just a Technical Specification (TS). It's time to develop it to a harmonised standard.

The standards for High Explosives, EN 13631, are based mainly on experience from the use of dynamites and ANFO. The emulsions/site mixed High Explosives are the most commonly used High Explosives in Sweden and the other Nordic countries. A general update of the standards for High Explosives is consequently necessary.

Czech Rep.: EN 13631-1 Explosives for civil uses - High explosives - Part 1: Requirements.

EN 13631-5 Explosives for civil uses - High explosives - Part 5: Determination of resistance to water: Articles 4.4 and 4.5 of the standard contains boundary hydrostatic pressure 0,3 MPa for decision, whether to apply EN 13631-5 or 13631-6. This boundary hydrostatic pressure seems to be too high as long as the procedure according to EN 13631-5 includes testing in water in depth of 200 mm (no matter the test includes incisions), which correspond to circa only 0,002 MPa. Significantly higher hydrostatic pressure in hole might negatively affect the explosive and the test according to EN 13631-5 may not reveal those negative effects. Our recommendation is therefore to asses, whether testing conditions according to EN 13631-5 are suitable enough to conclude in EN 13631-1 that the explosive is capable of withstanding the hydrostatic pressure 0,3 MPa if passing the test positively.

EN 13631-1 Explosives for civil uses - High explosives - Part 1: Requirements

EN 13631-6 Explosives for civil uses - High explosives - Part 6: Determination of resistance to hydrostatic pressure: Article 4.5 of the standard deals with testing under high hydrostatic pressures with assessment/evaluation of detonation according to EN 13631-6. However, as far as we know (unfortunately from only a few tests carried out by the Czech notified body) the transmission of detonation may be at (or after being exposed to) those high hydrostatic pressures significantly lower than under normal condition. But the transmission of the detonation is only tested according to EN 13631-11 at normal condition and is presumed to be valid even for maximum hydrostatic pressure tested. Our recommendation is therefore to asses, whether testing condition according to EN 13631-6 should contain test of transmission of detonation at those higher hydrostatic pressures.

EN 13631-14 Explosives for civil uses - High explosives - Part 14: Determination of velocity of detonation: The standard does not contain testing with alternative measurement of velocity, for instance with using continual measurement with resistance sensor, that may be used e.g. at real conditions during blasting operation. Our recommendation is therefore to amend EN 13631-14 so that it would contain this type of measurement.

GIG (notified body):

1. Detonating cords and safety fuses (according European standard of EN 13630 series)

1.	Explosives for civil uses - Detonating cords and safety fuses - Part 2: Determination of thermal stability of detonating cords and safety fuses.	EN 13630-2:2002
<p>The standard (point 6) does not specify how to register the occurrence of chemical decomposition during the test 48 hours.</p> <p>We suggest adding a verification of performance of the detonating cord after conditioning in 75°C for 48 h (i.e. reliability of initiation).</p>		
2.	Explosives for civil uses - Detonating cords and safety fuses - Part 9: Determination of transmission of detonation from detonating cord to detonating cord.	EN 13630-9:2004
<p>In point 6 of the standard there is a lack of a detailed description of connecting the active detonating cord with passive detonating cord/-s.</p> <p>We suggest making the connection between active fuse and passive fuse/-s by "overlap" (used in practice mining).</p>		
3.	Explosives for civil uses - Detonating cords and safety fuses - Part 10: Determination of initiating capability of detonating cords.	EN 13630-10:2005
<p>The scope of the standard is limited to detonating cords, whose weight is up to 40 g explosive per meter. It is suggested to extend the scope of the standard for cords that contain more explosive per meter, i.e.: 80 or 100 g/m.</p>		

2. High explosives (according European standard of EN 13631 series)

1.	Explosives for civil uses - High explosives - Part 1: Requirements.	EN 13631-1:2005
<p>The standard (point 5.1) does not specify the requirements (maximum content) for toxic gases. Currently there is only delegation to the test method.</p>		

2.	Explosives for civil uses – High explosives – Part 7: Determination of safety and reliability at extreme temperatures.	EN 13631-7:2005
<p>In point 4.2c the test method is imprecisely defined - it is necessary to clarify is the test set/system should be removed from the insulated container.</p> <p>In point 4.3.1 and 4.3.2 it should be clarified if the audited entity has to be fired in a steel pipe or out.</p>		
3.	Explosives for civil uses – High explosives – Part 16: Detection and measurement of toxic gases.	EN 13631-16:2004
<p>The high inner diameter of the tube can affect the "channel effect" when charges with small diameters are fired.</p> <p>It is suggested to replace the steel pipe with a steel mortar with blasting hole that has an inner diameter 50 mm and a length of 1600 mm (dimensions mortar according to Polish Standard PN-92/C-86015-2).</p>		

3. Detonators and relays (according European standard of EN 13763 series)

1.	Explosives for civil uses - Detonators and relays - Part 2: Determination of thermal stability.	EN 13763-2:2002
<p>The standard (point 6) does not specify how to register the occurrence of noise or light in shock-tube.</p> <p>We suggest adding a verification of performance of the detonators after conditioning in 75°C for 48 h (i.e. determination of delay accuracy).</p>		
2.	Explosives for civil uses - Detonators and relays - Part 7: Determination of the mechanical strength of leading wires, shock tubes, connections, crimps and closures	EN 13763-7:2003
<p>Point 6.1 is imprecise – there is no information what should be in the highest operating temperature declared by the manufacturer: the detonator, detonator after storage or whole test stand?</p>		

France: EN 13631-1 to 16: it is needed to consider further and in a more detailed way the case of on-site manufactured explosives (MEMU). Test methods and requirements should be adapted accordingly.

EN 13763-1 to 27: technical evolutions should be taken into account (case of electronic detonators for example).

EN 13857-3: adjust the terminology and mandatory information, as provided for in the new directive 2014/28.

EN 13938-1 to 7: revision needed in order to tackle more widely all pyrotechnic compositions.

All standards: more generally, it would be appropriate to update all the references to the old directive 93/15 and the numbering of essential security requirement.

United Kingdom: We feel that there may need to be consideration within the standards to include wireless controlled detonators and electronic detonators. We also think that a review of the aim of some of the tests may be helpful, for example the thermal stability test for detonators, HE and propellants (EN 13763-2:2002, EN 13631-2:2002) is a 48 hour 75 degree test and so relevant for transport and storage, and not related to the recommended shelf life of any article.

In relation to practical aspects of the standards we would comment that the standards for abrasion of leading wire and shock tubes (EN 13763-4:2003) are based on the use of abrasion strips which are only available from SP in Sweden. We would suggest that the standard may wish to reflect the use of a more commercially available product.

UK industry feel that it would be beneficial if standard EN 13631-15 relating to the calculation of thermodynamic properties could be widened in scope to allow companies proprietary software to be used to generate the data if information on the equations of state and product sets are provided.

To the **second question** (*"Is there in your view a need to develop one or more new harmonised standards for civil explosives? If you answered yes, please provide a brief description of which kind of articles, falling under the scope of Directive 2014/28/EU but not yet covered by the existing harmonised standards, would need a harmonised standard in order to facilitate compliance with the essential safety requirements of the Directive"*), 13 respondents replied with a "no". 5 respondents replied with "yes", and submitted the following proposals:

Ireland: On Site mixed explosives, electronic detonators and Mobile Explosives Manufacturing Units (MEMUs).

BAM (notified body): Two kinds of articles require new or updating of standards:

1) "Electronic detonators": Detonators, where within the detonator shell an electronic circuit is included, have become more and more available. Such electronic circuits allow for higher accuracy in delay timing and also allow more sophisticated communication protocols between programming unit and the detonator. The ESR of the Directive require "to ensure maximum safety and reliability", both aspects which are not fully addressed by the current standards. Communication protocols are currently not

formal part of safety considerations and electronic circuits may show sensitivities not addressed so far.

2) "Remote firing systems": Although some remote firing systems operate at a level without contact to explosives themselves, more advanced technologies combine radio receivers with a detonator or booster charge to a single unit. Faults in remote firing systems in connection with explosives can cause significant injuries. Therefore the ESR of the Directive should be applied, no matter whether components of firing systems for explosives incorporate explosives or not. Industry is developing technical solutions since many years and is exercising "due care", a harmonised safety standard is, however, not available.

Norway: Electronic detonators are the obvious missing standard at the moment. In addition (to be discussed):

- Compliance controls for products delivered by mobile manufacturing.
- Minimum requirements for safety & security standards on equipment used in mobile manufacturing and supply (addendum to Machine Directive?).

GIG (notified body): There are new developed explosives – like boosters constructed on the basis of detonating cord, i.e. NITROBOOSTER 10M (produced by NITROERG – Company from Poland) – which are not covered with existing standards.

France: Depending on how the above-mentioned revisions are handled, it might be worth investigating the need for a new standard covering new technologies (e.g.: electronic initiators) or new compositions.

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