FIRE EXTINGUISHER CONFORMITY ASSESSMENT – A CASE STUDY

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Abstract: The development of large fires has an extremely detrimental effect on the working and living environment. The chances for their effective extinguishing are greatest in the initial stages of flare-up, but that time interval is very short. That is why it is extremely important that fire extinguishers be reliable and, above all, efficient. The usable quality of extinguishers is assessed through a series of laboratory and field experimental tests in the certification process, i.e. prior to placing on the market, an assessment of their conformity with the specified requirements of the relevant standards must be performed. As a result of the previous statements, it can be concluded that it is necessary to develop an appropriate certification scheme for manual and mobile fire extinguishers so that we would have the means with the appropriate level of quality in use. The paper presents a case study of fire extinguishers certification by the certification body - Technical Testing Center.

Keywords: quality, testing, conformity assessment, fire extinguishers, product certification.

INTRODUCTION

Fire extinguishers in the Republic of Serbia are certified pursuant to the Ordinance on mandatory attestation of portable and mobile fire extinguishers (Official Gazette of the SFRY No. 16/83). This document prescribes technical and other requirements for portable and mobile fire extinguishers. In addition to the requirements prescribed by particular technical regulations, fire extinguishers put in the market or in use must also fulfil the requirements determined by the Serbian standards:

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1) SRPS Z.C2.020 - Portable and mobile fire extinguishers - General requirements;
2) SRPS Z.C2.022 - Portable and mobile fire extinguishers - Testing specifications;
3) SRPS Z.C2.035 - Portable and mobile fire extinguishers - Dry powder portable fire extinguishers;
4) SRPS Z.C2.040 - Portable and mobile extinguishers - Portable carbon dioxide fire extinguishers;
5) SRPS Z.C2.135 - Portable and mobile fire extinguishers - Mobile dry powder extinguishers;
6) SRPS Z.C2.140 - Portable and mobile fire extinguishers - Mobile carbon dioxide fire extinguishers.

In March 2012, the Government of the Republic of Serbia adopted the document titled Strategy of protection from fire for the period from 2012 to 2017. Taking into account the basic strategic field defined as normative regulation of fire protection, its goal was set which should also be reached, and it was the adoption of new laws and bylaws. The criterion was the harmonization with international, primarily European regulations and standards. Accordingly, the previously listed SRPS Z.C2 standards were withdrawn and replaced with the corresponding SRPS EN3 standards. However, there have remained several thousand fire extinguishers still in use in the market of the Republic of Serbia, which have not been attested according to the European norms, but which have been certified and fulfil the criteria of the withdrawn standards. The majority of those fire extinguishers have been used for several years without any failure and in correct functional state. To discontinue the use of these extinguishers, or to replace them mostly with imported fire extinguishers (among the domestic manufacturers only Todorović Company from Kragujevac has EN attests and not for the entire range of products) would present a huge financial load on the economy of the Republic of Serbia, particularly highlighting the justification of such an investment (Mićović at al., 2017: 363-374). Fire extinguishers older than 20 years are gradually written off through periodic examinations by authorized service shops based on the manufacturer's recommendations that the useful life of fire extinguishers is 20 years, since after that time there appears material fatigue and it is not possible to purchase spare parts for their maintenance.

The fact that there is not a single laboratory in the Republic of Serbia accredited to test fire extinguishers pursuant to EN standards results from the fact that SRPS-EN standard is not binding and it is not applied (the jurisdiction of the Sector for Emergencies and the Ministry of Interior of the Republic of Serbia), so no one is interested and finds no economic interest to invest both in terms of money and human resources to equip testing laboratory. Also, since the standard has been harmonized with the European standard, the testing can be done in any European accredited laboratory (MPA Dresden, for instance). The neighbouring countries such as Slovenia, Croatia, or Bulgaria do not have accredited laboratories either but test their equipment in Germany, Greece or Belgium.

All the above said explains the reasons why fire extinguishers are still attested and examined pursuant to the standard which are no longer in use.

FIRE EXTINGUISHER QUALITY REQUIREMENTS

The request for imported fire extinguisher certification is submitted by either the agent, importer or distributor registered as legal entity in the territory of Serbia. The validity of extinguisher certificate is not time limited if the control of conformity determines that the product complies with the certified type. Conformity control for imported fire extinguishers is performed at the sample taken from each

batch of delivery. This means that the certificate holder is obliged to submit to conformity control each batch of imported fire extinguishers. Conformity control for domestic fire extinguishers is performed according to the supervision plan submitted to the certificate holder.

The certification scheme takes into account the following characteristics of fire extinguishers quality: fire extinguishing efficiency; jet range and duration of operation; resistance to vibrations; quantity of foam; endurance under pressure; non-permeability; efficiency of safety device and usability for extinguishing fires at electric installations.

The requirements for accreditation of certification bodies are stipulated by ISO/IEC 17065 standards. In addition to meeting the requirements of the said standard, certification body must be equipped with the following: testing ground for typical test fires; fire house; hydraulic laboratory and laboratory with equipment for testing safety valves; climate chambers for climate and mechanical testing; vibration table; device to test usability of fire extinguisher on electric installations, etc.

CONSTRUCTION-SAFETY REQUIREMENTS

Fire extinguisher construction must be such as to exclude the possibility of injury of a person operating it or of the persons in its vicinity while it is used or filled.

- All extinguishers, except for the hand-operated pump extinguishers, must have safety device installed, which will prevent the pressure rising above the allowed value. The portable extinguishers whose cylinder volume is up to 15 dm^3, and test pressure up to 25 bars can be excluded from this.

- Safety device must be activated if the pressure within the extinguisher reaches the interval whose lower limit is 2/3 of the test pressure and upper limit is for 3 bars lower than test pressure. This does not apply for steel tank valves.

- Steel tank safety valve must be activated if the pressure inside the extinguisher increases to 170 ± 5 bars for the extinguishers whose test pressure is 190 bars, 195 ± 5 bars for the cylinders whose test pressure is 225 bars and 215 ± 5 bars for the cylinders whose test pressure is 250 bars.

- Safety device must appear completely reliable and it cannot be exposed to chemical action of fire extinguishing medium. The jet that this device discharges at activation must be aimed at the direction of extinguishing jet or the connection of flexible pipe, in other words contrary to the normal position of the person operating the extinguisher.

- The extinguisher cylinder cap must be designed in such a way as to provide for harmless balancing of pressure remaining after the extinguisher was used with atmospheric pressure by unscrewing for 1/3 of a screw thread or connecting elements.

- For steel cylinders whose volume is below 220 cm^3, which are not tested under pressure, the manufacturer must take on himself the warranty of safety regarding both material and manufacture. The following marks have to be impressed on these cylinders: company, or the name and trademark of the manufacturer, if there is one; gas symbol; year of manufacturing and serial number, mass of empty cylinder with the cap and mass of the filling, in grams (for instance: 150 + 40).

- For the extinguishers where there is possibility of fire extinguishing medium leakage, before use the nozzle must be secured with an adaptable shield (rubber or similar), which is made in such a way as to be easily ejected by pressure when the extinguisher is activated.

• Extinguisher cylinders, except for those of the carbon dioxide extinguishers and portable foam extinguishers, must have sufficient expansion area provided. In order to provide this space during filling, extinguisher cylinder must be filled up to the corresponding marking or according to the manufacturer's instructions.

• The parts which activate the extinguisher (button, lever, valve wheel and similar) must be sealed or protected by other appropriate means in order to prevent unauthorized use and in order to make permanent control easier. The means used for this purpose must be such as to provide for direct and fast activation of fire extinguisher with the force of maximum 50 N.

The construction of the extinguisher must provide for safe operation under normal climatic conditions and corresponding temperature range. Normal climatic conditions do not include storage in wet rooms, exposure to influence of acid fumes or other harmful matters *(SRPS Z.C2.020)*.

GENERAL REQUIREMENTS FOR CONSTRUCTION, SHAPE, MANUFACTURE AND OPERATING CHARACTERISTICS

• The extinguisher must be designed for simple operation – so that any person can use it safely upon reading a short instruction.

• Activation time (the time from action on the activation device to the beginning of jet discharge), at the temperature of 20°C, can be maximum 5 sec for portable extinguishers and 10 sec for wheeled extinguishers.

• The shortest time of continuous discharge of an extinguisher depends on the mass of the extinguishing filling and must correspond to the values given in Table 1 (SRPS Z.C2.020).

Table 1 – *The shortest time of uninterrupted discharge of fire extinguishers*

Mass of extinguishing medium in kilograms	up to 3	above 3 up to 6	above 6 up to 12	above 12 up to 100	above 100
The shortest time of continuous discharge in seconds	6	9	12	20	30

• Manufacture of cylinders and steel tanks whose volume exceeds 220 cm^3 must conform to the current technical regulations for compressed gas vessels. This does not include the cylinders of hand-operated pump fire extinguisher.

• All extinguishers that have some gas under constant pressure in their cylinders except for carbon-dioxide must have pressure indicator installed.

• All portable extinguishers with filling mass exceeding 1 kg, except for the extinguishers with hand-operated pump and carbon-dioxide extinguishers, must be equipped with corresponding support for stable suspension. All portable extinguishers must also be equipped with the support for installing on transport vehicle which must be made in such a way as to provide for easy setting and removing of the extinguisher.

• Fire extinguisher cylinders must be painted in red on the outside. All inside surfaces made from materials that are not resistant to the action of fire extinguishing medium must be protected appropriately *(SRPS Z.C2.020)*.

REQUIREMENTS FOR FIRE EXTINGUISHER MARKING

Fire extinguishers must contain the following marking:

• Impressed: factory number and year of manufacture;

• Written in the colour which is in clear contrast to the red colour of the cylinder: extinguisher mark; time of continuous discharge; fire class it is intended for; special warning if the extinguisher is not intended for fires of electrical installations; the highest value of electrical installation voltage for which the extinguisher can be used; temperature range within which the extinguisher can be used; name and address of the manufacturer, as well as trade mark (if any); the instructions for use, brief and clear with the required pictograms *(SRPS Z.C2.020)*.

ASSESSMENT OF FIRE EXTINGUISHERS CONFORMITY

The authors of this paper have developed a scheme of fire extinguisher certification for the market of the Republic of Serbia, which include essential examinations defined according to certain order in this case study. The procedures of application, reception and activities prior to product testing have been defined in the document titled "Rules of product certification in the Technical Testing Center" and are not given in this paper. Conducting extinguisher testing according to the scheme leads to rationalization of testing costs and provides for its uniformity. The scheme is devised in such a manner as to perform first those tests and controls whose positive results are precondition to continue with more expensive and more complex testing and control. For instance, previous control examination of the extinguisher's completeness and its construction being in conformity with construction documentation, then the marks on the body and labeling, as well as the corresponding indications of charge are absolute preconditions for sending samples for further testing for influence of vibrations. In case any discrepancies are noticed in the first step, the decision is made on either continuation or interruption of testing and the applicant is notified about it.

TESTING THE IMPACT OF VIBRATIONS

Testing the impact of vibrations is run on the fire extinguishers intended for use in transport vehicles. Filled fire extinguisher is exposed, together with its support, to the vibrations of 0.8 mm amplitude and 20 Hz frequency for a period of 15 minutes. If the extinguisher and its support withstand this test without any changes, the marking on the extinguisher can be added the following text: "Approved for transport with support", which approves also its use for instalment into transport vehicles.

This test is mandatory to perform before efficiency of extinguishing is tested *(SRPS Z.C2.022)*.

PERMEABILITY TEST

Testing permeability is mandatory only for the extinguishers whose cylinder is under constant pressure of compressed gas. When testing permeability the first step is to read and record the gas pressure within the extinguisher cylinder, and the extinguisher in the operating position is then subjected to vibrations of the same amplitude and frequency as when testing the influence of vibrations (0.8 mm amplitude and 20 Hz frequency), for a period of 1 minute. The extinguisher is then turned upside down and the procedure is repeated. This cycle of exposure to vibrations is repeated for 10 times. After that, when checking pressure any loss of pressure must not be detected in the extinguisher (*(SRPS Z.C2.022)*.

TESTING AT INCREASED AND DECREASED TEMPERATURES

Testing at increased and decreased temperatures is run on the extinguishers in order to check their characteristics and functionality at border temperature conditions of use according to reference standards valid for certain type of fire extinguishers. After exposure to extreme temperature conditions the functionality of extinguishers is checked *(SRPS Z.C2.022)*.

TESTING OF ENDURANCE UNDER PRESSURE

The cylinder and its fittings are tested for action of cold water pressure on the cylinder (CWP) for a period of 3 minutes. Test pressure must be at least 1.3 P_{max} at the temperature of 20°C. P_{max} represents the highest operating pressure at the temperature of 20°C. The value of this pressure must be stated in the documentation submitted when the extinguisher is handed over for testing. During this test any leakage of water must not occur, and any cracks or deformations must not appear.

Flexible pipes of carbon-dioxide extinguishers (CO_2) are tested at CWP of 60-bar water pressure, and the pipes of other extinguishers with water pressure corresponding to the pressure for testing the cylinders of the type of extinguishers they belong to.

Water temperature for these tests should range from 5°C to 20°C. Steel tanks with volume that exceeds 220 cm^3 and the valves installed on them are tested fully in accordance with the current regulations on technical standards for pressure vessels *(SRPS Z.C2.022)*.

In order for the examiner to be safe, it is necessary to perform the testing in specially provided areas where tested cylinders are separated by safety barrier, which serves as a protection in case of uncontrolled explosion or burst of cylinder.

SAFETY DEVICE TESTING

This test is intended to check if safety device would be activated reliably at the prescribed pressure value. Safety device test is done on the extinguishers whose cylinder is under constant pressure of compressed gas. This may exclude portable extinguishers whose cylinders are up to 15 dm^3 and test pressure up to 25 bars.

Safety valve must not be exposed to chemical action of fire extinguishing medium, and the jet the extinguisher discharges when activated must be aimed at the direction of extinguishing jet or the connection of the flexible pipe, in other words contrary to the position of the person handling the extinguisher and standing in an operating position.

Fire extinguisher is deemed to meet all requirements if its safety device is activated when the pressure in the extinguisher reaches an interval whose lower limit is 2/3 of the test pressure, and the upper limit for 3 bars lower than test pressure. Test pressure value is usually impressed on the extinguisher tank, and it can be stated in technical documentation as well. Safety device of steel tank valve must be activated if the pressure in the extinguisher rises to 170 ± 5 bars for the tanks whose test pressure is 190 bars, 195±5 bars for the tanks whose test pressure is 225 bars, and 215 ±5 bars for the tanks whose test pressure is higher or equal to 250 bars. Test pressure for steel tanks must be impressed on the tank *(SRPS Z.C2.022)*.

EXPLOITATION TESTING

Measuring jet range, time of continuous discharge and quantity of foam

Fire extinguisher that is being tested should be pre-filled, in other words prepared for operation and stored at the temperature of 20 ± 5°C at least 24 h before testing. During jet range testing there must not be any wind. The time of continuous discharge is the time of operation of fire extinguisher from the beginning to the end of continuing discharge of extinguishing medium.

When measuring jet range and the time of continuous discharge three experiments are carried out (Figure 1). The nozzle must be positioned horizontally at the height of 1.1 m above the upper edge of the vessel in which the discharged extinguishing medium is collected. These vessels have square bottom with the edge length of 0.5 m and the height of 0.25 m. The vessels are positioned next to each other in the direction of extinguisher operation *(SRPS Z.C2.022)*.

Figure 1 – *Measuring jet range and time of continuous discharge*

After discharge the volume is measured of discharged extinguishing medium in each vessel respectively. Horizontal distance between the center of the vessel base in which the biggest quantity of extinguishing medium is collected and the nozzle opening represents the jet range.

If the extinguishing medium is prone to evaporate, the jet range is measured in such a way that the extinguishing medium is discharged along the black board divided into 0.5 m x 0.5 m squares at which the trace of the highest density jet is clearly seen. The range is determined in such a way that the difference in height between the nozzle opening and the final point of jet is 1.1 m. In the course of this testing, time is also measured of continuous discharge of the cylinder containing the fire extinguishing medium. The shortest time of continuous discharge of the extinguisher depends on the mass of fire ex-

tinguishing medium in the extinguisher and must conform to the values given in Table 1. As a final result of testing the average values are taken of jet range and discharge time from all three experiments.

The quantity of foam is measured in such a way that the foam jet from fire extinguisher during its operation is collected into a corresponding vessel which is marked (graduated) that it is possible to read easily the volume of the discharged foam. Measuring is done once, and the value obtained must not be lower than the value determined by the special standard for the respective type of extinguisher.

TESTING EXTINGUISHING EFFICIENCY

Efficiency of fire extinguishers is determined by extinguishing fire of standard test fires. Typical test fires are formed for certain fire classes that the subject extinguisher is intended for. Typical test fires represent fires class A (combustible materials), B (flammable liquids), C (flammable gas) and D (metal scrapings). Typical test fires and how they are formed are defined in SRPS Z.C2.022 standard.

In the Standard on fire classification SRPS EN 2:2011, which replaced the standard SRPS ISO 3941:1994, fires class E (electric installations) were replaced with fires class F (fires of vegetable and animal oils and greases).

Before the beginning of testing it is necessary to provide conformity to the reference testing conditions. Environmental temperature at which testing is performed must be within 5°C and 25°C, and the wind speed when extinguishing a typical test fire for fires class B and C must be max. 3 m/s. When extinguishing typical test fire for fires class A and D, there must be no wind at all. In case the wind appears, the testing is carried out indoors. The extinguishers that are tested must be made ready for operation at least 24 h before testing begins and stored at the temperature of 20 ± 5°C.

Experimental extinguishing is performed four times of formed and ignited typical test fires out of which at least three must be successful. Experimental extinguishing is considered successful if the flame after the extinguishing has been completed does not reappear within 5 min of a typical test fire for fire class A. For typical test fire for fires class B, C and D, extinguishing is considered successful if the flame does not reappear at all. The additional condition is that upon extinguishing, and after the subsequent igniting of a typical test fire, the presence of non-combusted remains must be determined.

This kind of testing differs substantially from testing according to EN standards, according to which testing is completed when two experimental fires are extinguished, but within one size of test fire. There are no limits in terms of number of extinguishing attempts. If just one of three attempts was successful, it is possible to proceed with the first smaller test fire. If it is also extinguished, it is acknowledged that the extinguisher can put out this smaller size of test fire. Testing according to EN standards define efficiency of fire extinguishing, which is expressed by ratings. Fire extinguisher rating shows its quality, and the higher the rating the higher the quality of an extinguisher.

Figure 2 – *Extinguishing fire at type B test fire*

Before the beginning of testing the extinguisher is positioned at a certain distance from a typical test fire in the waiting position (Table 2). After that the handler of experimental extinguishing approaches the test fire and from a certain place/distance from the edge of the test fire he starts extinguishing fire.

Table 2 – *Distance of waiting position and the position of the beginning of extinguishing from the edge of test fire for fires class A and B*

Extinguisher type	Distance of waiting position in meters	Distance of extinguishing position in meters
S1, S2, S3, S6, S9, S12, Pz9, Pz15, Ph10, V15, Vr15, VP15 $CO_2$2, $CO_2$3, $CO_2$5	10	5
S25, S50, S100, S150, Pz50, Pz100, Pz150, Ph50, Ph100, Ph150, HL25, HL50	20	10

It should be mentioned that the Ordinance on handling the substances harmful for the ozone layer, as well as the conditions on issuing licenses for import and export of those substances (Official Gazette of the RS, No. 114/13, 23/18, 44/18, 95/18), it has been defined that "the owners of fire protection systems and fire extinguishers containing halon and which are not intended for critical use (for instance, the protection of specially endangered military objects), are obliged to discontinue their use until December 31, 2020". It is clear from this regulation that it refers to stable fire extinguishing systems which use halon, but it is not quite clear whether it refers to fire extinguishers which contain halon.

For extinguishing test fires classes C and D the distances are not defined at which fire extinguisher is waiting and the distances from which extinguishing is performed. Figures 3 and 4 show how the typical test fires classes A and B look like.

Figure 3 – *Typical test fire class A*

Figure 4 – *Typical test fire class B*

The selection of typical test fires depends on the size of the fire extinguisher and the type of extinguishing agent.

Class A test fire is made of wooden lattices in 6 sizes. This test fire is ignited using petrol lit in a vessel under stacked wood which is burning for 2 minutes. Then the vessel containing petrol is taken out and another 4 minutes are waited for the wood to blaze up. After that a member of the test team starts extinguishing. Class A test fire can be set both indoors and in the open space.

Class B test fire is made in 11 sizes. The foundation of the test fire is water in which precisely defined quantity of petrol and petroleum is added. The time of blazing up of typical test fire for testing gas-filled fire extinguishers is 30 s. For all other fire extinguishers the time of blazing up of typical test fire is 60 s. In order to ignite test fire, 2% petrol is added from the prescribed quantity of petroleum required to form a test fire. Petrol is set on fire, then it is waited for 90 s for petroleum to blaze up and then extinguishing begins. The test fire is formed in the open space.

TESTING SAFETY TO USE FIRE EXTINGUISHERS ON ELECTRICAL INSTALLATIONS

This testing is done in order to check safety of handlers when extinguishing fires on electrical installations with a certain type of fire extinguishers, so that the extinguisher could be labelled as "extinguishing fires at electrical installations up to 1,000 volts from the distance of at least 1 m".

During the testing the fire extinguisher must be placed on a support made from insulation material so that the nozzle opening is 1m far from live metal plate and directed at its center. Metal plate 1m x 1m in size is hanging vertically by the elements made of insulation material and connected to high voltage transformer, which enables to obtain alternating voltage up to 50 kV between the plate and the ground. Apparent resistance of the circuit must be such that the current in secondary winding is at least 0.1 mA when this winding is put into short circuit, and primary winding is under voltage which amounts to 10% of normal supply voltage (Figure 5).

Figure 5 – *Testing on electrical installations*

Fire extinguishers are deemed to meet the requirements if during the action of the extinguisher on the live plate the strength of current between the extinguisher and the ground, i.e. of the nozzle lever and the ground, does not exceed 0.5 mA.

Every fire extinguisher that has not met the quality requirements must be labelled "Not suitable for electrical installations".

TESTING POSSIBILITY TO EXTINGUISH FIRE OF GAS INSTALLATIONS

Testing the possibility to extinguish fire of gas installations (class C) is performed at gas installation formed pursuant to the requirements of SRPS Z.C2.022. Testing is carried out in such a way that upon gas is set to fire 20 s is waited and then the nozzle of the extinguisher is aimed at the flame and the fire is extinguished (Figure 6).

Figure 6 – *Testing extinguishing at gas installations*

Fire extinguisher is deemed to fulfil the requirements if the flame does not reignite at the outlet nozzle of gas installation immediately upon extinguishing.

TESTING POSSIBILITY TO EXTINGUISH FIRE OF METAL SCRAPINGS

Testing the possibility of fire extinguishers to extinguish fire of metal scrapings (class D) is carried out at typical test fire made in one size which consists of a steel vessel 0.4 m high and 0.4 m long in which 2 kg of scrapings of light metal alloys containing 83-88% of magnesium are evenly distributed. These scrapings are set to fire in one angle of the vessel, then it is waited for the flame to catch approximately 1/3 of scrapings and then the extinguishing begins. This test fire is always set indoors.

The analyzed testing methods are verified and validated at the Certification body and testing laboratories of the Technical Test Center. Certification body and testing laboratories have been accredited by the Accreditation Agency of the Republic of Serbia. Certification and accreditation have been carried out pursuant to the requirements of ISO/IEC 17065 and ISO/IEC 17025 standards respectively. In the assessment process the attestation procedure has been carried out of all testing methods included in this certification scheme.

It should mention that in addition to testing of fire extinguishers defined in the paper, it is also important for their reliability and functionality during the entire life of their exploitation to perform periodical as well as control testing by the accredited control bodies verified with the Accreditation Body of Serbia in accordance with ISO/IEC 17020 standard.

CONCLUSION

Reliability of fire extinguishers and efficient fire extinguishing is of great significance for the protection of people, as well as of working and living environment. The authors of this paper have developed the fire extinguisher certification scheme for the market of the Republic of Serbia. The developed certification scheme includes the certification of the extinguisher type, the control of conformity of extinguishers sampled from the manufacturing and the control of conformity of extinguishers sampled from each batch of import. The certification scheme has been verified through the process of accreditation at the Certification body in the Technical Test Centre. Certification body has been harmonized with the requirements of ISO/IEC 17065 standard and has relevant equipment, as well as the required level of competence to apply the defined certification scheme.

This certification scheme includes substantive tests of fire extinguishers, which have been analysed in this case study. The defined tests confirm that the fire extinguisher characteristics are according to the Ordinance on mandatory attestation of portable and mobile fire extinguishers. In this way it is ensured that the fire extinguishers prevailing in the territory of the Republic of Serbia are reliable and efficient in fire extinguishing, until the beginning of application of SRPS EN 3 and EN ISO 1866 standards in the market of the Republic of Serbia.

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