

Basic Activities for Awarding of CE Mark for Products Defined by Standards from the EN 286 Series

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1. Introduction

The establishment of the European New Approach Directives, which determine the essential security requirements, eliminates technical barriers to trade by building confidence into the quality and reliability of products, quality and competence of manufacturers and the quality and competence of the inspection, testing, certification and accreditation bodies.

In that regard, implementation of the New Approach Directives on the national level before the defined deadline and application of harmonized standards which provide detailed technical specifications create preconditions for harmonization for certain areas that are covered by corresponding directives. The harmonization of products with the essential and security requirements of relevant directives is confirmed by the CE mark (Conformité Européenne), which allows the product to be used and placed on the market of EU countries without any limitations.

Subject review

The series of harmonized standards EN 286 – Parts 1, 2, 3 and 4 which support Directive 87/404/EEC – Simple pressure vessels, is related to tanks of air braking systems for motor and rail vehicles of different shapes, materials, dimensions and operational parameters, which determine their diverse application. However, as vessels under pressure they also present a potential hazard, either when active or when idle. In order to allow the placement of these products and their use on the European market without any limitations, certain activities have to be undertaken on CE marking of these products, meaning the criteria for awarding of the CE mark must be fulfilled. The course of the awarding of the CE mark is determined by the function of value, meaning the products of pressure and volume of vessel, pursuant to which the manufacturer selects an adequate modular approach.

Osnovne aktivnosti za dodjelu CE znaka za proizvode definirane standardima serije EN 286

Pregledni rad

Serijsa harmoniziranih standarda EN 286 – Dijelovi 1, 2, 3 i 4, koji podržavaju Direktivu 87/404/EEC – Simple pressure vessels (Jednostavne posude pod pritiskom), odnosi se na rezervoare zračnih kočnih sistema motornih i šinskih vozila različitih oblika, materijala, dimenzija i radnih parametara, što determinira njihovu raznovrsnu primjenu. Međutim, kao posude pod pritiskom predstavljaju i potencijalnu opasnost, kako u aktivnom stanju, tako i u stanju mirovanja. Da bi se ovim proizvodima omogućilo plasiranje i upotreba na evropskom tržištu bez ikakvih ograničenja, moraju se sprovesti određene aktivnosti za EC označavanje ovih proizvoda, odnosno zadovoljiti kriteriji za dodjelu CE znaka. Tok dodjele CE znaka određuje funkcija vrijednosti, odnosno proizvod pritiska i zapremine posude, prema kojoj proizvođač bira odgovarajući modularni pristup.

It should be emphasized that the CE mark indicates that a product is designed and manufactured in accordance with the essential health and security requirements and other applicable provisions of directives and that it was a subject of corresponding conformity assessment procedures in accordance with all applicable directives.

The CE mark must be put by the manufacturer/ authorized representative/importer on the product/label plate/packing/accompanying documents (format and location are described in Directive 93/68/EEC) and must be visible, legible and non-erasable and cannot be combined with quality marks. It is put after compiling of EC Declaration on conformity before the product is put on the market and put in use. The procedure of conformity assessment of a product and awarding of the CE mark is most often (for approximately 90% of products) conducted by the manufacturer itself, and for other products the Directive defines the engagement of appointed certification bodies which are registered in the European Commission, so-called Notifying body (N.B.)

The basic activities that manufacturers or their authorized representatives must implement for placing of the CE mark on a product are:

- Defining of product;
- Identification of all applicable New Approach Directives on a product;
- Identification of harmonized standards for defined product which support the applicable directive;
- Collecting of necessary documentation and implementation of all necessary activities required for EC Declaration/statement on harmonization of product and placing of the CE mark.

2. Defining of product

Removal of technical barriers in trade, which may be a result of different requirements for a product and different procedures of conformity assessment in different countries can be eliminated through harmonization of requirements for a product as well as by mutual recognition of results of conformity assessment. In that regard, the tanks for air braking systems are simple vessels under pressure, with different technical characteristics (shape, material, volume, working temperature, pressure and accumulated energy of vessel) which, having in mind their various application and function, present a potential hazard both in the state of exploitation and in the idle state. Because of the mentioned characteristics, these products are subject to differentiated criteria in the quality assurance processes, but with the common mandatory requirements defined within identified applicable directives.

3. Identification of applicable directives

The manufacturing of tanks for air braking systems for motor and rail vehicles must be harmonized with Directive 87/404/EEC which includes security requirements from the aspect of risks arising from damages to assembly line-produced simple vessels under pressure.

The Directive includes different provisions for different categories of vessels depending on the energy-generating product they contain and the product of maximum working pressure and capacity of vessel.

The essential security requirements are related to the selection of materials in accordance with the intended purpose of the vessel, design, methods of calculation, production processes and control in accordance with the project and production specifications before and after the product is placed on the market.

Pursuant to Directive 87/404/EEC, simple vessels under pressure is any welded cylindrical vessel with the circular cross-section, closed with flat or convex bottom,

intended for air or nitrogen and not foreseen for exposure to fire and which must meet the following requirements:

- Working pressure: $0.5 \text{ bar} < P < 30 \text{ bar}$,
- Product of pressure and capacity of vessel, $P \cdot V$: maximum 10 000 bar liter,
- Materials for manufacturing of parts under pressure: non-alloy quality steel or non-alloy aluminum or aluminum alloys resistance to wear-out,
- Thickness of the vessel wall:
For steel vessels: $e \geq 2 \text{ mm}$
For vessels made of aluminum alloys: $e \geq 3 \text{ mm}$
- Working temperature:
- for steel vessels: $50 \text{ }^\circ\text{C} < T < 300 \text{ }^\circ\text{C}$,
- for vessels made of aluminum and aluminum alloys: $50 \text{ }^\circ\text{C} < T < 100 \text{ }^\circ\text{C}$.

The scope of the Directive excludes vessels designed for nuclear use, vessels for powering of ship or airplane systems and fire extinguishers.

4. Identification of harmonized standards

The »New Approach« to technical harmonization through defining of essential requirements refers to harmonized standards (HS) which conform to the corresponding directive.

Harmonized standards that support the Directive 87/404/EEC, and which are related to assembly line-manufactured simple vessels under pressure are standards of the series EN 286, that is:

EN 286-1:1998, Simple unfired pressure vessels designed to contain air or nitrogen - Part 1: Pressure vessels for general purposes
+ 1998/A1:2002, 1998/AC:2002 +EN 286-1/A2:2005

EN 286-2:1992, Simple unfired pressure vessels designed to contain air or nitrogen - Part 2: Pressure vessels for air braking and auxiliary systems for motor vehicles and their trailers

EN 286-3:1994, Simple unfired pressure vessels designed to contain air or nitrogen - Part 3: Steel pressure vessels designed for air braking equipment and auxiliary pneumatic equipment for railway rolling stock

286-4: 1994, Simple unfired pressure vessels designed to contain air or nitrogen - Part 4: Aluminum alloy pressure vessels designed for air braking equipment and auxiliary pneumatic equipment for railway rolling stock

In the International Classification of Standards– ICS, these standards are located in the following scope, group and sub-group:

23 FLUID SYSTEMS AND COMPONENTS FOR GENERAL USE

23.020 Fluid storage devices

23.020.30 Gas pressure vessels, gas cylinders

It is important to emphasize that the harmonized standards are the only mandatory technical standards that all EU member countries should take over as national standards.¹

4.1. Essential security requirements defined by standard EN 286 – 2

Harmonized standard EN 286-2 is applied for the design and manufacturing of simple, unfired, assembly line-manufactured vessels under pressure, which contain only compressed air and are intended for air braking and auxiliary systems for motor vehicles and their trailers.

The essential security requirements defined by the standard EN 286 - 2, which determine the course of procedure for awarding of the CE mark are:

1. *Materials for parts that are exposed to pressure*

For steel vessels:

Sheet metal, strip and bar in accordance with EN 10027: SPH 235, SPH 265 and SPHL 275;

Pipes in accordance with ISO 2604: Part 2 (type TS5 and TS9) and ISO 2604: Part 3 (types TW5 and TW9);

Forged steel in accordance with ISO 2604: Part 1 (typeF9)

For aluminum vessels, thickness of wall $e \geq 3$ mm:

Al, AlMg, AlMn, AlMgMn

2. *Exploitation conditions*

Internal pressure: above 0.5 bar

Working pressure: below 30 bar

Volume of vessel: below 150 liters

Product of pressure and volume:

$50 \text{ bar liter} \leq P \cdot V \leq 1 \text{ 500 bar liter}$

Working temperature: $- 50 \text{ }^\circ\text{C} \leq T \leq 100 \text{ }^\circ\text{C}$

4.2. Essential security requirements defined by the EN 286 – 3 standard

The harmonized standard EN 286-3 is applied for the design and manufacturing of simple, unfired, assembly line-manufactured steel vessels under pressure, which are intended for air braking equipment and auxiliary pneumatic equipment for rail vehicles.

The essential security requirements defined by standards EN 286 – 3, as well as the exploitation

conditions that determine the course of the procedure for awarding of the CE mark are:

1. *Materials for parts that are exposed to pressure*

Non-alloy steel, mark: SPH 235 or SPH 265, in accordance with EN 10027

2. *Exploitation conditions*

Interior pressure: above 0.5 bar

Working pressure: maximum 10 bar

Product of pressure and volume:

$50 \text{ bar liter} \leq P \cdot V \leq 10 \text{ 000 bar liter}$

Working temperature:

$- 40 \text{ }^\circ\text{C} < T < +100 \text{ }^\circ\text{C}$

4.3. Essential security requirements defined by the EN 286 – 4 standard

The EN 286-4 standard is applied for simple unfired vessels under pressure made of aluminum alloy, intended for air braking equipment and auxiliary pneumatic equipment for rail vehicles.

The essential security requirements defined by standards EN 286 – 4, as well as the exploitation conditions that determine the course of the procedure for awarding of the CE mark are:

1. *Materials for parts that are exposed to pressure*

Aluminum alloys, marks: AlMg2Mn0,8; AlMg3; AlMg3Mn; AlMg4; AlMg4,5Mn0,7 in accordance with ISO 209-1 and 2

2. *Exploitation conditions*

Interior pressure: above 0.5 bar

Working pressure: maximum 10 bar

Product of pressure and volume:

$50 \text{ bar liter} \leq P \cdot V \leq 10 \text{ 000 bar liter}$

Working temperature:

$- 50 \text{ }^\circ\text{C} < T < +100 \text{ }^\circ\text{C}$

for Al alloys mark: AlMg2Mn0,8; AlMg3; AlMg3Mn.

$- 50 \text{ }^\circ\text{C} < T < + 65 \text{ }^\circ\text{C}$

for Al alloys mark: AlMg4 and AlMg4,5Mn0,7

5. Marking of defined products

All tanks of air braking systems that are constructed in accordance with standards EN 286 2, 3 and 4 must carry the EC mark and labels.

¹ The Bosnia and Herzegovina Technical Committee – BAS TC 41 transposed standards from series 286 as national ones, that is: BAS EN 286-1:2006; BAS EN 286-1/A2:2007; BAS EN 286-2:2006; BAS EN 286-3:2009; BAS EN 286-4:2009.

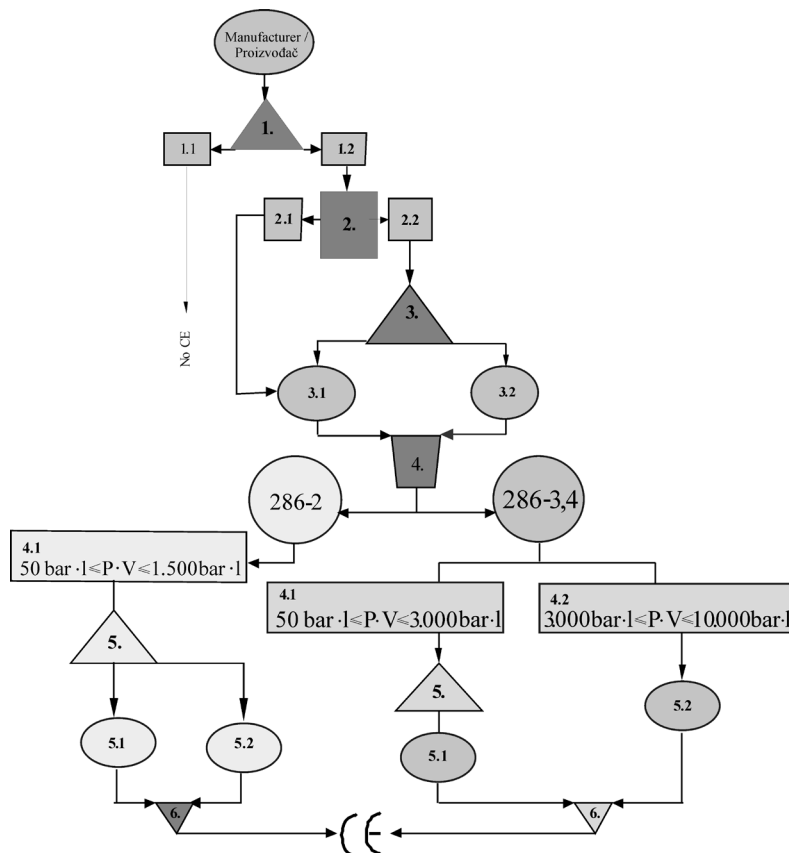


Figure 1. The procedure for awarding of the CE mark in accordance with standards EN 286-2, 3, 4

Slika 1. Tok dodjele CE znaka prema standardima EN 286 -2, 3, 4

The mark must be put in a visible, easily legible form on the tank or fastened label plate with the following information:

Name or trade mark of the manufacturer and place of manufacture

1. Year of manufacture
2. Number of vessel model and identification of series
3. Volume (in liters)
4. Maximum working pressure (in bar)

Mark of conformity with European standards:

EN 286 – 2 or

EN 286 – 3 or

EN 286 – 4, last two digits of the year in which the mark was placed,

CE mark and recognition number of an authorized inspection body.

5. Minimum working temperature T_{min} (in $^{\circ}C$)
6. Maximum working temperature T_{max} (in $^{\circ}C$).
7. Name or trademark of user. Number of order by the user.

8. Mark of the date (last two digits of the year) and a stamp from inspector that matches the details of supervision and testing.

The procedure for awarding of the CE mark in accordance with standards EN 286- 2, 3 and 4 is indicated in Figure 1, with the following meaning of the applied marks:

1. Function of value:

- 1.1. $PS \cdot V \leq 50 \text{ bar l} \rightarrow$ no CE mark
- 1.2. $PS \cdot V \geq 50 \text{ bar l} \rightarrow$ 2.

2. Harmonization with standards

- 2.1. No or partial \rightarrow 3.1.
- 2.2. Yes \rightarrow 3.

3. Selection of manufacturer

- 3.1. EC type testing, module B² \rightarrow 4.
- 3.2. Certification on adequacy of documentation, module Aa³ \rightarrow 4

4. Function of value

- pursuant to standard EN 286-2

- 4.1. $50 \text{ bar l} \leq P \cdot V \leq 1\,500 \text{ bar l} \rightarrow$ 5.

- pursuant to standard EN 286-3,4

- 4.1. $50 \text{ bar l} \leq P \cdot V \leq 3\,000 \text{ bar l} \rightarrow$ 5.

- 4.2. $3\,000 \text{ bar l} \leq PS \cdot V \leq 10\,000 \text{ bar l} \rightarrow$ 5.2

5. Selection of manufacturer

- 5.1. EC Declaration by the manufacturer, module Aa and EC supervision by a neutral body (N.B.), if $P \cdot V \geq 200 \text{ bar l}$, module C⁴ \rightarrow 6.

² **Module B** includes type testing and covers the phase of design, after which there must be a module that provides for assessment in the phase of production (modules C and F). With this module, the manufacturer hands over to the Notified Body the type and the adequate technical documentation that determined conformity with the essential requirements, performs testing if necessary and issues a certificate on type tests.

³ **Module Aa** covers the internal design and control of production. The manufacturer gives a statement on harmonization and puts the CE mark. This model does not require the involvement of a Notified Body.

⁴ **Module C** covers the phase of production and it follows module B. It includes the manufacturer's internal control of production. In the phase of production, the manufacturer declares conformity with the approved type and puts the CE mark. For a design once approved by the third party in accordance with module B, module C allows the manufacturer to self-certify the production.

5.2. EC verification, module F⁵ → 6.

6. Putting of CE mark

6. Conclusion

The tanks of air braking systems of motor and rail vehicles must carry the EC mark and labels, and the procedures of awarding of the CE mark are harmonized with the requirements defined within Directive 87/404EEC and harmonized standards EN 286-1,2,3 and 4. The course of awarding of the CE mark is determined by the function of value, meaning a product of pressure and volume of the vessel, pursuant to which the manufacturer selects the appropriate module and in such way secures a safe product and its uninterrupted placement on the market.

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⁵ **Module F** follows module B and presents verification of products in a way that the manufacturer declares conformity with the approved type or with the essential requirements and puts the CE mark, and the Notified Body (N.B.) verifies this conformity and issues a certificate on conformity.