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TECHNICAL SPECIFICATION
FASTENING DEVICES
FOR CNG CYLINDERS



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1. PURPOSE:

To determine the requirements of fastening devices (hereinafter devices) for the installation of CNG cylinders in motor vehicles.

2. SCOPE:

The requirements of this specification apply to all devices in motor vehicles using CNG in their propulsion system.

3. GENERAL ASPECTS:

- 3.1 Types foreseen by this specification are preferably constructed on steel shape bars or straps, coated against corrosion.
- 3.2 If types are not designed as stated in this specification, they may also be approved as long as they are similar in nature to the types described herein and the resulting safety and efficiency aspects are equivalent.
- 3.3 Besides the standards and test methods quoted in this specification, other references may be used as long as they are of the same nature, and resulting safety and efficiency aspects are similar.
- 3.4 This specification supplements the ones included in section 1.1.3.- *CNG cylinder installation in vehicles* of PROVISIONAL STANDARD GE N° 1-116 "*Minimum technical and safety standard specifications for mounting CNG equipment in motor vehicles and methods of test*" - *Gas del Estado 1984* -
- 3.5 Composite cylinder devices must be authorized by the manufacturer or importer.

4. DESCRIPTION:

The device shall be designed so as to support cylinders adequately and shall be equipped with at least two cradles or hold downs capable of resisting static loads and dynamic stresses, and two support straps fit for resisting dynamic loads.

5. CHARACTERISTICS:

- 5.1 The device components assembly shall be treated as a unit designed for the permanent installation of cylinders, and shall avoid their displacement and any contact with the vehicle.
- 5.2 Fastening straps, fitting bolts, reinforced plates outside the vehicle and elastomers used as protective joint, perform different functions, thus requiring special attention. This shall be foreseen in the design.
- 5.3 The device shall be type specific for each vehicle according to the instructions of the vehicle manufacturer for avoiding weakening of its structure.
- 5.4 For the purposes of the previous point, the make and model of the vehicle for which this device is suitable shall be indicated in every device type.
- 5.5 The device shall be designed such as to support one or more cylinders, and foreseen variants shall be specified, including appropriate diameters and lengths. When the device is used for more than one cylinder, the addition of all the tares in the containers shall be considered during sizing.
- 5.6 The device shall be affixed to the vehicle with bolts. Once the device is assembled and the cylinders are mounted, it shall withstand:
- A load twenty times heavier than the full container, in the vehicle's axial direction.
 - A load eight times heavier than the full container in any other direction.
- 5.7. Besides following the instructions indicated in 5.3 for device assembly, reinforced plates shall be located between the external part of the vehicle and the cradle so as to reinforce it.

6. MATERIALS:

- 6.1. The material of each part in contact with the container shall be electrochemically compatible with the cylinder.

Cradles, fastening straps and other metal components except bolts, shall be made of commercial quality structural steel with a minimum tensile strength of 34 kg/mm^2 .

- 6.3 **For cylinders of up to 110 kg tare**, fastening straps shall be at least 30 mm wide and 3 mm thick. Other types allowed shall have a section equivalent to 90 mm^2 .

- 6.4 For cylinders of up to 110 kg tare**, fastening straps shall be at least 45 mm wide and 5 mm thick. Other types allowed shall have a section equivalent to 225 mm².
- 6.5** When more than two fastening straps are used, the total area of the selected section shall be at least equal to the one specified in points 6.3. or 6.4., as the case may be.
- 6.6** Reinforced plates shall be of the same thickness and width of cradles, and shall be used for reinforcing the vehicle areas where the latter are located. Their shape shall be square when they have only one hole and rectangular, in case of having more than one, considering their length as of the external tangents, at least once the hole diameter.
- 6.7** Non-corrosion resistant metal materials shall undergo a surface treatment such as painting, zincplating, chromeplating, etc., which shall endure the test described in section 7.1. Black should be used in case of painted finishes.
- 6.8** Screws shall be of forged or redrawn steel, 50 kg/mm² minimum tensile strength. Nuts shall be of forged steel or redrawn, 34 kg/mm² minimum tensile strength.
- 6.9** Non-corrosion resistant screws, nuts and washers shall undergo a surface treatment such as zincplating, chromeplating or a similar one, which shall endure the test described in section 7.1.
- 6.10 For cylinders of up to 110 kg tare**, materials different from the ones indicated in 6.8 shall be considered only if their characteristics are similar to four steel screws W 7/16" x 14 threads per inch, with their corresponding safety washers and nuts. Screws with different threads are acceptable if their minimum diameter is 10 mm.
- 6.11 For cylinders of more than 110 kg tare**, materials different from the ones indicated in 6.8 shall be considered only if their characteristics are similar to four steel screws W 1/2" x 12 threads per inch, with their corresponding safety washers and nuts. Screws with different threads are acceptable if their minimum diameter is 12 mm.
- 6.12** Cylinders are externally protected by elastomer strip permanently adhered to the cradles and hold down straps. Elastomer and metal may be joined by vulcanizing, sticking or any other method preventing elastomer displacement. No part of the cylinder shall be in contact with the device metal parts.
- 6.13** Elastomer strips shall be sized such as to project at least 5 mm on each side of the metal supports. Minimum thickness shall be 3 mm.

6.14 The elastomer shall be of similar characteristics to those of products used in the motor vehicle industry, foreseen in standard SAE J 14, according to the minimum requirements of Type S class SB, Grade SB 705. It shall be non hygroscopic, hydrocarbon resistant and its hardness shall be equal to or exceed that of a Shore 70.

7 TESTS:

7.1. Metal test. Corrosion:

7.1.1 Salt spray (fog) testing shall be applied according to standard ASTM B 117.

7.1.2 Once coated, ferrous material shall be placed in a salt spray chamber with 5% sodium chloride concentration, at 35 °C during 48 hours.

7.1.3 It shall be successful if no red corrosion stains are observed in the metal base.

7.2 Elastomers test. Resistance to hydrocarbons.

7.2.1. The synthetic material used, shall be hydrocarbon resistant according to standard ASTM D 471.

7.2.2. ASTM N° 1 oil shall be used at 100 °C during 70 hours.

7.2.3. Deviation from the limit of the admitted volume is 0 to + 40 %.

7.3 Elastomers test. Hardness

7.3.1 Hardness shall be tested according to standard ASTM D 2240.

7.3.2 The acceptable value shall be equal to or above Shore 70.

7.4 Elastomer test. Resistance to water.

7.4.1 In order to determine water absorption capacity, the test shall be performed according to standard ASTM D 471.

7.4.2 The test shall be performed at 100 °C during 70 hours.

7.4.3 A volume deviation not above $\pm 5\%$ shall be allowed

7.5 Steel tests. Tensile strength.

7.5.1 The test shall be performed according to standard ASTM E 8.

8. PRODUCTION CONTROL:

8.1 The manufacturer shall establish an adequate assurance quality system to ensure that the requirements of this specification are complied with. This system shall be assessed and supervised by the Certification Organization (hereinafter CO) who shall certify that the characteristics of the products launched into the market are similar to those of the approved type.

8.2 Certificates of the materials used shall be available

9. APPROVAL

9.1. Each type shall be approved by a CO, accredited by ENARGAS.

9.2. Any modification resulting from the use of other types of cylinders or change of design or material shall require new approval.

9.3. For each type, together with the approval request, the manufacturer shall submit:

Specifications report of the manufacturing process.

- a) Quality certificate of all the materials used for manufacturing the set.
- b) Resistance calculation.
- c) Approved welding procedures (the electrodes shall be cellulose or basic).
- d) Welders' qualifications.
- e) General plan and breakdown of the set.
- f) Mounting instructions (brochure).
- g) Internal quality control processes
- h) Tests according to section 7.

9.4 Each type shall be approved according to the indications of section 7. TESTS and materials certificates shall be accepted if **C.O** deems it convenient.

10. MARKING:

10.1 Marking shall include at least the following information:

1. Manufacturer's name, make or logo.
2. Approval number.
3. Single logo indicated in the Resolution of ENARGAS N° 138/95 authorized by a recognized CO
4. Country of origin.
5. Models of vehicles in which they may be mounted.
6. Diameter and weight of cylinders to be used.

10.2. Marking stated in points 1 to 3 shall be stamped, engraved or embossed. Points 4 to 6 may be marked differently as long as they provide correct identification.

10.3. The manufacturer shall provide explanatory brochures for their installation, including possible configurations for mounting, location in the vehicle depending on the make, model and type of cylinders considered. He shall determine the correct torque to which screws shall be subjected during assembly.

FORM FOR PROPOSALS ON ET-ENRG-GD N°1 TECHNICAL SPECIFICATION – FASTENING DEVICES FOR CNG CYLINDERS - REVISION 1

Company: _____ **Technical representative:** _____

Address: _____ **zip code:** _____ **TE:** _____

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- 1) Complete in bold letters (hand written or printed), with indelible ink.
- 2) In the space identified as "Quote", copy the text you propose to modify or else summarize it as long as there are no doubts or ambiguities about the text it refers to.
- 3) In the space identified as "Proposal", indicate the exact wording to be inserted.
- 4) In the space identified as "Substantiation for Proposal", state the problem that will be resolved or improved by your recommendation. Give the specific reason for your proposal including the technical bibliography on which it is grounded providing copies, if possible, or else describing the experience it is based on.
- 5) This Proposal must be submitted to the Distribution Management of the ENTE NACIONAL REGULADOR DEL GAS (ENARGAS) Suipacha 636 4° Piso TE 325-2500.