



Recognized technical code (Anerkanntes Technisches Regelwerk, ATR)

Construction, equipment, testing, approval, marking and use of seamless sample pressure receptacles made of metallic materials

as transportable pressure equipment

(ATR D 1/22; Revision of ATR D 1/14)

Based on section 8 no. 10 of the Ordinance on the Transport of Dangerous Goods by Road, Rail and Inland Waterways (GGVSEB) of 26 March 2021 (Federal Law Gazette I, p. 481), the Federal Institute for Materials Research and Testing (BAM) in agreement with the Federal Ministry for Digital and Transport (BMDV) promulgates, in accordance with section 6.2.5 of ADR and RID¹, the recognized technical code for the construction, equipment, testing, approval, marking and use of seamless sample pressure receptacles made of metallic materials (ATR D 1/22) as set out below.

The Federal Institute for Materials Research and Testing promulgates this ATR also based on section 12 paragraph 1 no. 9 of the Transport of Dangerous Goods by Sea Ordinance in the version promulgated on 21 October 2019 (Federal Law Gazette I, p. 1475) in conjunction with sub-section 6.2.3.1 of the IMDG Code².

The present code may be applied from the date of its publication in the Federal Ministry for Digital and Transport Gazette. The Federal Ministry for Digital and Transport will submit this code to the competent OTIF³ and ECE⁴ Secretariats in accordance with section 6.2.5 of ADR/RID.

The present ATR may be applied to the approval of seamless sample pressure receptacles for carriage by rail, road, inland waterways and sea.

¹RID Regulations governing the international carriage of dangerous goods by rail
ADR Agreement concerning the international carriage of dangerous goods by road

²IMDG Code International Maritime Dangerous Goods Code

³OTIF Intergovernmental Organisation for International Carriage by Rail (Bern)

⁴ECE United Nations Economic Commission for Europe (Geneva)



1 Introduction

- 1.1 The reason for the elaboration of the present recognized technical code is the need to use specifically designed pressure receptacles as sample pressure receptacles e.g. for the exploration of petroleum or natural gas. The samples have to be carried to specialized laboratories for analysis and these transport operations fall within the scope of dangerous goods legislation.

For the purpose of use described above, the specific pressure receptacles must be corrosion resistant to the fluids to be expected, able to withstand very high pressures and easily usable under practical conditions.

- 1.2 In order to meet these requirements, alternative metallic materials with high tensile strength should be used which do not meet the definition of "steel", e.g. titanium. Moreover, it should also be permissible to construct the sample pressure receptacles without bottle-like tapering (i.e. with flat ends).
- 1.3 For the construction, testing and approval, a recognized standard for pressure receptacles is to be used, if possible. With a view to the international use and the application also for materials with high tensile strength, standard EN ISO 9809-2:2020 was selected for this purpose: "Gas cylinders and tubes – Design, construction and testing of refillable seamless steel gas cylinders and tubes; Part 2: Quenched and tempered steel cylinders and tubes with tensile strength greater than or equal to 1100 MPa".

Permissible deviations from standard EN ISO 9809-2:2020 are determined below under no. 3. Wherever this is possible, reference is made to other internationally recognized standards.



2 Scope of application

- 2.1 The present ATR may be applied to the approval and use of seamless sample pressure receptacles of an alternative design for carriage by rail, road, inland waterways and sea.
- 2.2 Seamless sample pressure receptacles under this ATR shall be constructed, equipped, tested, marked, approved, placed on the market and used for transport in accordance with the Ordinance on portable pressure equipment (Ortsbewegliche Druckgeräte-Verordnung) of 29 November 2011 (Federal Law Gazette I, p. 2349), as amended by Article 491 of the Ordinance of 31 August 2015 (Federal Law Gazette I, p. 1474), in conjunction with section 6.2.5 of ADR/RID as well as section 6.2.3 of the IMDG Code.
- 2.3 For conformity assessment, the procedure under section 1.8.7 and paragraph 6.2.3.6.1 of ADR/RID in the applicable version shall be applied.



3 Specifications for the materials, design, manufacture and testing of seamless sample pressure receptacles

3.1 Definitions

- 3.1.1 Within the framework of the present recognized technical code, the definitions and characters (symbols) of sections 3 and 4 of standard EN ISO 9809-2:2020 shall apply.
- 3.1.2 By derogation from standard EN ISO 9809-2:2020, the tensile strength may be lower than 1,100 N/mm².
- 3.1.3 Therefore, in the application of the present recognized technical code, the term "high tensile strength" used in this ATR does not automatically mean that the tensile strength is greater than 1,100 N/mm².

3.2 General requirements

- 3.2.1 Seamless sample pressure receptacles of an alternative design and made of alternative materials shall comply with the general requirements in sections 6.2.1, 6.2.3 and 6.2.5 of ADR/RID and/or 6.2.1 and 6.2.3 of the IMDG Code as well as with the specifications of standard EN ISO 9809-2:2020 "Gas cylinders and tubes – Design, construction and testing of refillable seamless steel gas cylinders and tubes; Part 2: Quenched and tempered steel cylinders and tubes with tensile strength greater than or equal to 1100 MPa" regarding construction, equipment, testing, marking, approval and use, unless deviations are explicitly permitted in the present ATR.

Note: Here, EN ISO 9809-2:2020 is made reference to with a scope of application extended in accordance with no. 3.4 below.

- 3.2.2 The capacity of seamless sample pressure receptacles shall not exceed 150 litres.

Note: Here, EN ISO 9809-2:2020 is made reference to with a limited scope of application of only up to 150 litres for the sample pressure receptacles.



- 3.2.3 Seamless sample pressure receptacles of an alternative design shall be permitted to have special construction features required for their intended use, such as flat ends, and shall be permitted to be made of materials that do not meet the definition of "steel" (e.g. titanium).

3.3 Material requirements

- 3.3.1 Materials that do not conform to the categories a) to c) defined in sub-section 6.1.1 of standard EN ISO 9809-2:2020 may be used if the material is resistant to ageing and corrosion resistant for the intended application. This shall be proven within the framework of a corrosion technical expert opinion by a testing agency of type Xa by applying recognized methods. If sufficient literature values are available, technical tests may be omitted.

Note: For comparable possibilities, see sub-section 6.1.4 of standard EN ISO 9809-1:2020.

- 3.3.2 Any necessary thermal treatment shall be considered when drawing up the corrosion technical expert opinion. Furthermore, the possible effects of a wall thickness greater than that specified in the scope of standard EN ISO 9809-2:2020 shall be evaluated within the framework of the expert opinion.

3.4 Design of the seamless sample pressure receptacles

- 3.4.1 The specifications in section 7 of standard EN ISO 9809-2:2020 shall apply, unless otherwise stipulated in the following.
- 3.4.2 The notes in section 7.3 shall not be applied to allow for a greater wall thickness of the receptacles as described above under no. 3.2.
- 3.4.3 The properties of ends which deviate from the regular shape of cylinders shall be proved by way of calculation in accordance with the recognized standards and codes for the design of pressure receptacles. Where possible and applicable, standard EN 13445, as amended, shall be applied within this framework. If standard EN 13445 is partly not applicable or cannot be fully met, or if its application would yield results which are not adequate with a view to safety, specification sheet AD 2000-B8 as published by the



Arbeitsgemeinschaft Druckbehälter (pressure vessels working group) may be applied instead of the standard.

Note: The specification sheet AD 2000-B8 is available from Beuth Verlag, Berlin.

3.5 Manufacture

The specifications in part 8 of standard EN ISO 9809-2:2020 shall apply, unless otherwise stipulated in the following. In addition to the methods described in section 8.1 of standard EN ISO 9809-2:2020, the vessel may be manufactured by deformation machining of rods or tubes.

3.6 Type approval procedure

- 3.6.1 The provisions of ADR/RID as well as the specifications in section 7 of standard EN ISO 9809-2:2020 shall apply, unless otherwise stipulated in the following.
- 3.6.2 By derogation from the acceptance criteria in sub-section 10.4.3 of standard EN ISO 9809-2:2020, it shall be permissible at a test pressure of at least 1,000 bar that, at a pressure of not less than $2.0 p_h$ (twice the test pressure), the receptacle does not fail by bursting but by leakage at the gaskets. However, within the framework of the flawed cylinder burst test in accordance with sub-section 9.2.4 of EN ISO 9809-2:2020 required in accordance with no. 3.6.4 below, the sample pressure receptacle shall fail in line with requirements.

Note: EN ISO 9809-2:2020 requires $p_b \geq 1.6 p_h$.

If the sample fails during the flawed cylinder burst test in accordance with sub-section 9.2.4 of EN ISO 9809-2:2020 in a way that does not meet the criterion for crack propagation in the flawed cylinder burst test, the following criterion may be applied instead by derogation from EN ISO 9809-2:2020:

If, at a flaw depth of at least 50% of the nominal wall thickness, the burst pressure of at least $1.6 p_h$ or $2.0 p_h$ at a flaw depth of 30% of the nominal wall thickness is attained, the fracture is ductile and no fragmentation occurs, the flawed cylinder burst test shall still be considered to have been passed.



Interpolation shall be permitted at a flaw depth of between 30 and 55% of the nominal wall thickness to allow for the consideration of tolerances when inducing the flaw.

This shall be verified on two receptacles instead of one.

- 3.6.3 The verification of the correlation between hardness and tensile strength required in accordance with sub-section 9.2.2 of standard EN ISO 9809-2:2020 shall only be necessary if there is such a correlation for the material used and if a recommendation in this respect is given in the expert opinion required under no. 3.3 of the present ATR.

Note: This test is not prescribed in standard EN ISO 9809-1:2020.

- 3.6.4 The flawed cylinder burst test required in accordance with sub-section 9.2.4 of standard EN ISO 9809-2:2020 shall also be carried out in the case of a tensile strength below 1,100 N/mm².

Note: The test is not prescribed in standard EN ISO 9809-1:2020; however, it shall be carried out for sample pressure receptacles and, for materials of lower tensile strength, provides a broader evidence base than required in standard EN ISO 9809-1:2020

On request of the manufacturer, a receptacle from the cycle test may be used for this verification. In this case, the test may be repeated with a new receptacle if the criteria set out under no. 3.6.2 are not met.

- 3.6.5 The flawed cylinder cycle test required in accordance with sub-section 9.2.5 of standard EN ISO 9809-2:2020 shall only be required if the tensile strength exceeds 1,100 N/mm² or if the expert opinion prescribed in no. 3.3 of the present ATR contains such a requirement.

Note: This test is not prescribed in standard EN ISO 9809-1:2020.



4 Initial inspection and test

- 4.1 By derogation from section 3.1 of EN ISO 9809-2:2020, irrespective of successive manufacturing, the size of the batch for batch testing shall be based on the heat of the raw material if the manufacturing is done exclusively by means of machining. The maximum number of cylinders in a batch shall be 202. The maximum manufacturing period for a batch shall be 26 calendar weeks.
- 4.2 By derogation from sub-section 10.1.2 of standard EN ISO 9809-2:2020, within the framework of batch testing, the tensile test and the impact test may be omitted if the manufacturing is done exclusively by means of machining and if the relevant material properties are confirmed by the material manufacturer by way of a test certificate 3.1 in accordance with standard EN 10204. The test in accordance with section 10.3 (bend test or flattening test or ring flattening test) shall, however, be carried out.
- 4.3 By derogation from sub-section 10.1.2 of standard EN ISO 9809-2:2020, in addition to the hydraulic bursting test in accordance with section 10.4 of standard EN ISO 9809-2:2020, a flawed cylinder burst test in accordance with sub-section 9.2.4 of standard EN ISO 9809-2:2020 shall be carried out if, within the framework of the hydraulic bursting test, no failure by bursting could be achieved.
- 4.4 By derogation from paragraph 6.2.1.5.1 (g) of ADR/RID (2021), the expansion may be determined by means of a batch test if it has been proved within the framework of the type test or on the basis of the first 50 cylinders manufactured that the increase in volume at test pressure is below 1% and is mainly due to the fitting of O-rings and end plugs. In this case, it shall suffice to carry out the hydraulic pressure test on all cylinders in accordance with the variant described in sub-section 11.2.1 of EN ISO 9809-2:2020. In addition, the volumetric expansion test in accordance with sub-section 11.2.2 of EN ISO 9809-2:2020 shall be repeated for a new batch of the cylinder material or/and for a new batch of the gasket material.



5 Marking

The seamless sample pressure receptacles of an alternative design shall be marked in accordance with the provisions in chapter 6.2 of ADR/RID. Instead of the standard, the following shall be indicated: "ATR D 1/22".

6 Periodic tests and inspections and exceptional checks

6.1 Seamless sample pressure receptacles of an alternative design in accordance with the present ATR shall be subjected to the regular periodic tests and inspections and exceptional checks in accordance with ADR/RID. The test period stipulated for steel pressure receptacles in packing provision P200 in chapter 4.1 shall apply.

6.2 An extension of the intervals between inspections in accordance with packing provision P200 (10) v, or (12) shall not be permitted.

7 Continued applicability of ATR D 1/14

7.1 ATR D 1/14 shall be repealed as from 1 July 2022. After 30 June 2022, new design types shall no longer be certified or approved in accordance with ATR D 1/14.

7.2 Design types certified or approved in accordance with ATR D 1/14 shall be permitted to be used for manufacturing until the end of the validity of an approval issued before the entry into force of ATR D 1/22.

7.3 Receptacles certified or approved under ATR D1/14 may be continued to be used.



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The present ATR includes 10 pages.