Technical Specification

POLYETHYLENE VALVES

ET 304

Revision No. 3 | 10 April 2023

Index

Register of revisions

Revision No.	Date	Description
0	21-09-2005	Initial wording.
1	21-05-2008	General review.
2	08-04-2020	General revision and replacement of the reference "EDP Gás Distribuição" by "Portgás".
3	2023-04-10	General revision carried out by IDOM Consulting, Engineering, Architecture, SAU

Information classification

Confidential	☐	Restricted	☐	Internal use	☐	Public	☒

Distribution of the document

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Nominal	< name, function, position >

Caption:

CA: Board of Directors
AT: Technical Area
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ACR-RD: Clients and Networks Area - Networks

Elaborated:	Check:	Approved:
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The approval of this document formalised in this page, prevails over the totality of its contents.

Preamble

As part of the "H2 REN Programme" aimed at adapting technical specifications to prepare assets to receive hydrogen up to 100%, Portgás identified this regulation to be subject to assessment and consequent revision.

The revision now presented results from work conducted by IDOM Consulting, Engineering, Architecture, SAU, which has made the necessary changes to the specification in order to ensure that "Polyethylene valves" supplied pursuant to this specification are ready to receive hydrogen.

This revision of ET 304 cancels and replaces the previous revision dated 8 April 2020, and it is advisable to read this technical specification in full for a correct application of its provisions.

This Technical Specification should be given the status of a Portgás standard that establishes the rules to be followed to achieve the discriminated objective.

1. Objective

The purpose of this Material Technical Specification is to establish the technical conditions, standards, quality requirements and to define the main construction and operating characteristics of the valves for polyethylene nets, as well as the technical requirements and conditions to be met with a view to model approval.

2. Scope

This technical specification applies to all valves for polyethylene networks from PE Ø20 to PE Ø200, intended for use in the gas distribution system allowing, under normal operating conditions, a pressure of 4 bar (maximum), classified in accordance with Despacho n° 806-B/2022 and for operating temperatures between -5°C and 50°C.

This specification is valid for pressures up to 4 bar. Polyethylene is technically unsuitable for the carriage of hydrogen at pressures above 4 bar. For transporting hydrogen at pressures above 4 bar it is recommended to use another material (i.e. polyamide 12).

3. References external

All undated documents should be considered in their latest version.

Despacho nº 806-B/2022, de 19 de janeiro

"Regulamento da Rede Nacional de Distribuição de Gás."

EN 10204

"Metal products. Types of inspection documents."

EN 682

"Elastomeric seals. Material requirements for seals used in pipes and fittings carrying gas and hydrocarbon fluids."

EN 682: 2002/A1

"Elastomeric seals. Material requirements for seals used in pipes and fittings carrying gas and hydrocarbon fluids."

NP EN 1555 - 1

"Plastic piping systems for gaseous fuel supply. Polyethylene (PE). Part 1: General aspects".

NP EN 1555 - 2

"Plastic piping systems for gaseous fuel supply. Polyethylene (PE). Part 2: Pipes. "

EN 1555 - 4

"Plastic piping systems for the supply of gaseous fuels. Polyethylene (PE). Part 4: Valves."

EN 1555 - 5

"Plastic piping systems for gaseous fuel supply. Polyethylene (PE). Part 5: Fitness for use of the system."

CEN/TS 1555-7

Plastic piping systems for the supply of gaseous fuels. Polyethylene (PE). Part 7: Assessment of conformity.

DVS 2202 - 1

"Imperfections in thermoplastic welding joints; features, descriptions, evaluation.".

ISO 11922-1

"Thermoplastic pipes for the conveyance of fluids. Dimensions and tolerances. Part 1: Metric series."

4. Definitions

The definitions used in this specification are those expressed in the documents referred to in chapter 3 of this technical specification.

5. Valves

5.1. Non-plastic materials

a) All valve components must comply with the respective European standards.

b) The materials and constituent parts used for manufacturing the valves (including rubber, grease and any metallic parts) shall be resistant to the environment (internal and external) and have a life span at least equal, under identical operating conditions, to that of the PE pipes to which they are to be welded.

c) When in contact with polyethylene pipes, the above components should not affect the pipes or cause any bursting stress.

5.1.1. Metal components

a) All parts liable to corrosion must be suitably protected.

b) When using components made of different metals that are in contact with moisture, conditions must be created to avoid the possibility of galvanic corrosion.

5.1.2. Elastomers

a) Elastomeric seals must comply with EN 682.

b) Other materials to be used as seals shall be permitted if designed for the supply of combustible gas.

5.1.3. Other materials

a) Grease must not appear in the fusion zones and must not affect the characteristics of the valve materials.

b) Other materials may be used, provided that the valves comply with the provisions of this specification.

5.2. Polyethylene resin

5.2.1. Additives

The PE resin is obtained by adding to the base polymer only the additives required to produce the valves, without affecting their fusibility and storage. The additives must be uniformly dispersed in the valve.

5.2.2. Colour

The resin should be black, uniform in all its extension.

5.2.3. Features

a) During the raw material approval process, the valve supplier shall prepare a report evidencing that the tests set out in this document have been carried out by an independent entity;

b) In the continuity process the valve supplier shall carry out the tests listed in Table 1 and present the result of these tests on the manufacturing certificate;

c) Both the process of approval of the raw material and the process of continuity, the tests shall be carried out in accordance with the sampling plan set out in standard CEN/TS 1555-7.

5.2.3.1 Raw material in granule form

The raw material in the form of granules shall be subject to the tests specified in Table 1 of this document.

Tests	References	Approval	Continuity	Acceptance Criteria
• Density	NP EN 1555-1 Section 4.2.3.1	☑✓	☑✓	≥ 930 kg/m³ (Base Compound)
• Thermal Stability (ILO)		☑✓	☑✓	> 20 min
• Fluidity Index (*)		☑✓	☑✓	0.2 to 1.4 g/10min
• Volatile Content		☑✓	☑✓	≤ 350 mg/kg
• Water content (* *)		✓☑	☑✓	≤ 300 mg/kg
• Carbon Black content		☑✓	☑✓	(2.0 to 2.5)% by mass
• Carbon Black Dispersion		☑✓	✓☑	≤ grade 3

Table 1: Tests to be performed on raw material in granule form

(*) A maximum variation of± 20% from the value expressed by the manufacturer in the Quality Certificate is permissible;

(**) This test will only be required if the result obtained for the volatile products content does not correspond to that required.

5.2.3.2. Pipe-shaped raw material

The raw material in tube form shall be subjected to the tests specified in Table 2.

Tests	References	Approval	Continuity	Acceptance Criteria
• Resistance to Gas Constituents	NP EN 1555-1 Section 4.2.3.2	☑		No faults during the test
• Resistance to Rapid Crack Propagation ($P_{c\,S4}$) (e ≥15mm)		☑		≥(MOP/2.4)-(13/18) bar
• Resistance to Slow Crack Growth (dn: 110 or 125mm - SDR11)		☑		No faults during the test
• Classification and Designation (LIC)	NP EN 1555-1 Section 4.3	☑		PE 80 - MRS 8.0 PE 100 - MRS 10.0
• Welding Compatibility	EN 1555-5 Section 4.5	☑		Declaration of the accessory manufacturer

Table 2: Tests to be performed to the raw material in tube form

5.2.4. Recycled material

Under no circumstances is the use of:

- Recycled material;
- Mixture of resins;
- Introduction of complementary additives or others that are not necessary for the manufacture of the valves.

5.3. General features

5.3.1. Appearance

a) Valves shall have smooth internal and external surfaces that are clean and free of any defects.

b) The ends of the valves shall be flat and perpendicular to their axis, with no irregularities of any kind being acceptable.

5.3.2. Model

The valve should be designed so that its body cannot be dismantled on site.

5.3.3. Obturator organ

a) The plug unit shall be of the spherical plug type and shall be connected to the valve operating head in such a manner that it is impossible to separate them without the use of special tools.

b) The obturating organ shall have the minimum admissible passage:

- 70% of the inside diameter, for valves DN ≤ 110;
- 50% of the inside diameter, for valves DN > 110.

c) The valve should close by rotating the operating head ¼ turn clockwise.

d) The closing and fully opening positions must be limited by fixed stops (limit stop), which cannot be adjusted.

5.3.4. Operating head

a) The operating head should have the configuration shown below (Fig. 1):

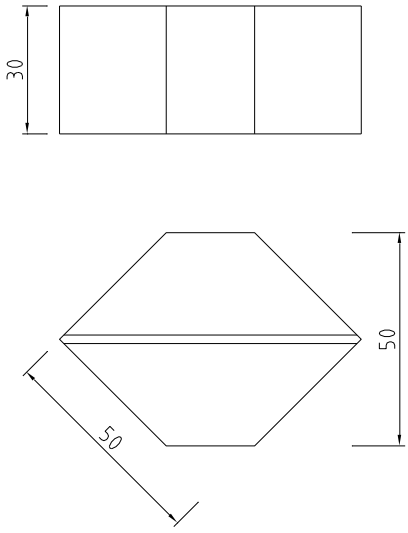

Fig. 1

b) The valves shall be delivered with an accessory (protective collar) mounted with a DN110 protective tube (telescopic sleeve) that prevents sand or other foreign matter from entering the operating head of the valve according to figure 2 below. The telescopic sleeve shall be suitably equipped with a 1/8 turn locking cap according to figure 3 below.

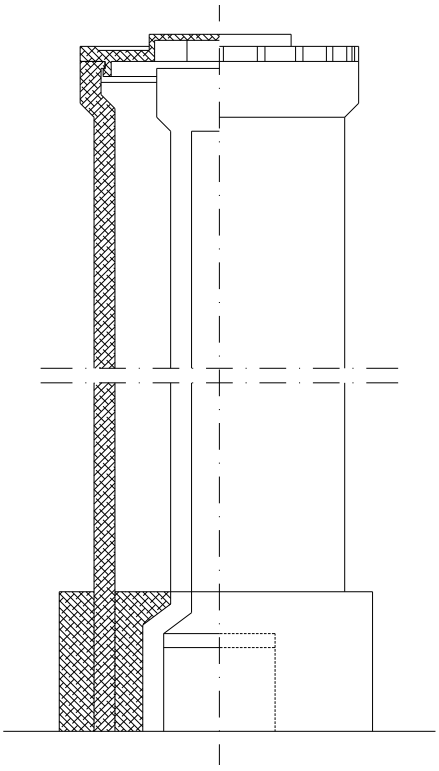

Fig. 2

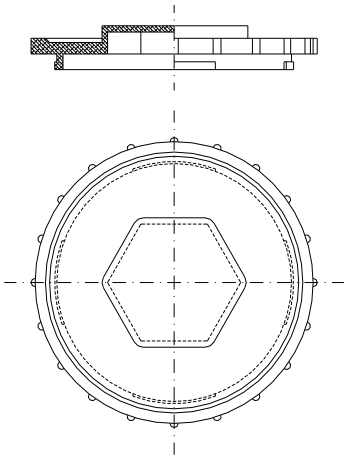

Fig. 3

c) The plug unit shall be of the spherical plug type and shall be connected to the valve operating head in such a manner that it is impossible to separate them without the use of special tools.

5.3.5. Switch

The operating key shall be T-shaped, with a long stem (min. 1 metre), and when fitted to the operating head of the valve its position shall indicate the state of opening or closing of the valve, thus:

- Key perpendicular to the gas flow direction indicates that the valve is closed;
- Key coinciding with the gas flow direction indicates that the valve is open.

5.3.6. Seals

Seals shall be in accordance with standard EN 1555-4, section 6.4.4.

5.3.7. Geometric characteristics

a) Valves should comply with standard EN 1555-4 section 6.1.

b) Valve measurements shall be in accordance with EN 1555-4 section 6.2.

c) The wall thickness of the valve body shall be in accordance with EN 1555-4 section 6.3.

d) Valve dimensions shall be in accordance with EN 1555-4 section 6.4.

e) The dimensions of the switchgear head shall be in accordance with EN 1555-4 section 6.4.

5.4. Compatibility

a) Valves should be compatible with:

- All pipes and fittings made from different PE resins (approved);
- The following gases: natural gas, propane and propane air, biomethane, synthetic methane, and hydrogen, either in mixtures with other gases or, for example, 100% hydrogen

b) In order to verify compatibility between welded resins (butt and butt weld and electro weld) a visual and dimensional control of the weld obtained should also be carried out:

5.4.1. Butt welding

a) The weld seam between the welded parts should be uniform around its entire perimeter and have a closed development. Gaps greater than 5% of thickness and variations in the width of the weld bead of more than 1mm are not permissible.

b) The admissible welding bead width shall follow the criteria presented by the "DVS 2202 - 1" standard.

5.4.2. Electro welding

a) After fusion the inner and outer surfaces of the welded parts, examined visually without magnification, shall be free from excess or overflowing matter, excluding that deliberately used as a fusion indicator.

b) No overflowing matter should cause the wire (electrical wire used in the fusion of the material) to move in such a way as to cause a short circuit.

c) After welding, there should be no excessive wrinkling of the internal surface of the welded parts.

d) The gap between welded parts shall be evenly distributed and in no case shall exceed the values expressed in Table 3.

DN	20	32	40	63	110	125	160	200
Clearance (mm)	2.0	3.5	3.5	4.0	4.5	5.0	5.5	6.0

Table 3: Maximum clearance between welded parts.

e) The thickness and diameter of the pipes shall be in accordance with specification ET 301, 'Polyethylene gas tubes'. The length of the pipes shall be such as to permit the installation of electrofusion joints according to specification ET 302, "Polyethylene gas fittings".

5.5. Mechanical characteristics

The mechanical characteristics shall be in accordance with that specified in standard EN 1555-4 section 7 and Table 4 of this document.

Tests	References	Approval	Continuity	Acceptance Criteria
• Resistance to Internal Hydraulic Pressure at 20°C (≥ 100h)	EN 1555-4 Section 7	✓		No failure during the test
• Resistance to Internal Hydraulic Pressure at 80°C (≥ 165h)			✓	No failure during the test
• Resistance to Internal Hydraulic Pressure at 80°C (≥ 1000h)		✓		No failure during the test
• Sealing of Seat and Packing (25 mbar, 6 bar) (2.5 Kpa; 0.6 MPa)		✓	✓	No leakage during the test
• Pressure Drop		✓		Air flow rate ratio (value to be specified by the manufacturer)
• Operating torque: DN≤ 63 63< DN≤ 125 125< DN≤ 225		✓	✓	Maximum Values: 35 N.m 70 N.m 150 N.m
• Travel Limiter Resistance		✓		2 x maximum operating torque value measured, with a minimum of 150Nm, for 15s. Internally and externally watertight

Table 4: Mechanical tests to be performed on valves

Tests	References	Approval	Continuity	Acceptance Criteria
• Bending Sealing	EN 1555-4 Section 7	✓		No leakage during test and maximum operating torque
• Resistance to thermal cycles DN> 63 mm		✓		No leakage during test and maximum operating torque
•Tensile Strength		✓		No leakage during test and maximum operating torque
• Bending Sealing under Thermal Cycles DN≤ 63 mm		✓		No leakage during the test
• Valve Operating Mechanism Resistance		✓		1.5 x operating torque value
• Sealing during and after Bending Applied to the Working Head		✓		No leakage during the test
• Impact Resistance		✓		No leakage during test and maximum operating torque
• Watertightness, Manoeuvrability and Impact Resistance after a Long Period under Pressure		✓		No leakage during test and maximum operating torque

Table 4: Mechanical tests to be performed on valves (continued)

5.6. Physical characteristics

Physical characteristics shall be as specified in EN 1555-4 section 8 and Table 5 of this document.

Tests	References	Approval	Continuity	Acceptance Criteria
• Thermal Stability (ILO)	EN 1555-4 Section 8	✓	✓	> 20 min
• Fluidity Index (*)		✓	✓	0.2 to 1.4 g/10min

Table 5: Physical tests to be performed on valves

5.7. Marking

a) Valve marking should be done outside the area to be welded and should never weaken the valve.

b) Each valve, or parts thereof, shall bear an easily legible and indelible marking under normal service conditions, containing the following information:

- Manufacturer's identification,
- Designation of the type of resin (**),
- Designation of the nominal and maximum working pressure (*),
- Nominal valve diameter,
- Standard to which it refers (EN 1555) (*),
- Thickness Series (***),
- The production dates of the parts and the body in PE (****),
- Intended fluid (*).

(*) This information may be stated on the valve itself or on a label associated with the valve;
(**) Class of resin referring to the pipe to be used (PE 100 and/or PE 80);
(***) Series of Thicknesses referring to the piping to be used (SDR11 and/or SDR17.6);
(****) This data can be directly related to the Batch Number and can be indicated by the Year /Week of manufacture or any other specific numbering.

c) An example of one possible way to organise valve marking is given in Table 6.
If, on the initiative of the manufacturer, other markings are made, they must not give rise to any confusion with the markings required and set out above.

d) During the valve approval process, the valve supplier shall prepare a report evidencing that the inspections and tests described in this document have been carried out by an independent entity.

Identification of the Manufacturer	Standard (*)	Resin Name	DN	Thickness Series (**)	Production Lot No. (***)	Fluid (*)
# # # # # #	EN 1555	PE # # #	# # #	SDR # #	# # # #	Gas

Table 6: Example of valve marking

6. Storage and dispatch

a) The use of equipment that may damage the product in any way is prohibited in the storage and expedition. The following are also forbidden
- Place valves in contact with solvents,
- Submit the valves to a temperature higher than 40 °C.

b) The supplier should provide suitable individual packaging, namely cardboard box or plastic bag, provided it is approved by Portgás. This packaging is intended to protect the valve until the date of its installation.

c) All packaging must indicate the expiry date (month and year) for the valve contained.

d) The valves should be accompanied, if necessary, by a technical sheet indicating their fusion parameters.

e) The ends of the valves should be protected by plugs.

f) When shipping the valves, they should be loaded in such a way as not to damage the material.

g) The maximum admissible period from the date of manufacture to the date of installation in the gas mains for polyethylene valves is two (2) years.

7. Approval report

7.1. General

a) The approval process for raw materials and valves requires the preparation of a Technical Approval Report, which is the responsibility of the valve supplier, containing the following information:
- Identification of the technical approval report,
- Tests performed on the raw material,
- Inspections and tests carried out on valves.

b) The referred technical approval report will be subject to Portgás' analysis and approval, and must be identified with:
- Manufacturer identification / raw material identification / date,
- Identification of the diameter range (according to CEN/TS 1555-7).

c) This report must be attached, by the contractor, to the final site report.

7.2. Tests performed on the material and valves

The technical approval report shall contain the results of the tests performed on the raw materials and valves manufactured in accordance with the specified in this document and with the applicable standards.

8. Certificate of manufacture

8.1. General

The supplier must issue a type "3.1" manufacturing certificate (according to EN 10204) containing the following information for each valve shipment:

- Identification of the manufacturing certificate;
- Guarantee that the raw material used has not changed;
- Tests performed on the raw material;
- Inspections and tests carried out on valves.

8.2. Identification of the certificate of manufacture

The certificate of manufacture shall be identified as follows:

- Manufacture batch no. / Year of manufacture / Manufacturer's abbreviation.

8.3. Guarantee that the raw materials used have not been altered

The certificate of manufacture shall contain a statement whereby the valve manufacturer shall confirm that the raw material used has the same characteristics as that contained in the Technical Approval Report for the valve.

8.4. Tests performed on the raw material

a) The manufacturing certificate must contain the results of tests carried out on the raw material approved by Portgás in accordance with this specification.

b) In case some of the tests are not carried out by the valve manufacturer, the latter must indicate which tests were carried out, submitting a report with the results and the identification of the entity that performed them.

c) The certificate of manufacture for the raw material must be attached when sending the certificate of manufacture.

8.5. Tests performed on valves

a) The manufacturing certificate shall contain the results of the tests carried out on valves manufactured from the raw material approved by Portgás in accordance with this specification.

b) The inspected valves should be identified with a sequential numbering.

c) The certificate shall identify the inspection equipment used for dimensional inspection.

9. Acceptance

a) During the manufacturing operations, the manufacturer shall provide all requested information in detail on the valve manufacturing activity.

b) The purchasing entity shall only conclude reception after analysing the manufacturing certificate referred to in 8.1 above and the completion of the quality control actions it deems necessary to carry out during the reception process, namely, visual and dimensional control in accordance with that specified in this document.

c) Portgás will inform, in the manner deemed most convenient, of the acceptance or non-acceptance of the order considering its Quality status.

d) If the valves are rejected, the manufacturer shall immediately replace the rejected valves, or recover them if accepted, at no cost to Portgás, and shall submit the new valves to a new inspection and test.

e) Inspections or tests carried out by the purchasing entity do not exclude or diminish in any way the Manufacturer's responsibility.

f) The certificate of manufacture, referred to above, must be attached to the report of work to be carried out by the contractor.