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TECHNICAL AND DELIEVRY CONDITIONS

Ball valves for DN 300 – DN 1400 high-pressure gas pipelines

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1. PURPOSE

The purpose of this document is to define the basic technical and delivery conditions for suppliers of ball valves for eustream, a.s.

When procuring new ball valves (BV) DN 300 to DN 1400, we prefer suppliers whose ball valves of the specified types and dimensions are already in use in our pipeline systems.

In the case of using ball valves (BV) from manufacturers other than those whose ball valves of the specified dimensions we already use, it is necessary to ensure the following when commissioning these BV:

- training of eustream employees in the operation and maintenance of the BV, confirmed by eustream, a.s. in writing;

2. SCOPE OF APPLICABILITY

These technical and delivery conditions apply to all suppliers of ball valves (hereinafter BV) for eustream, a.s. and pertain to BV from DN 300 to DN 1400 (12" to 56") inclusive and pressure levels PN 63 to PN 100 (ANSI Class 400 to 600) for high-pressure gas pipelines.

3. TERMS AND ABBREVIATIONS

Abbreviation	Abbreviation description
DN	Nominal diameter
EHO	Electro-hydraulic control
EO	Electric control
EU	European Union
BV	Ball valve
Mk	Breakaway torque
PN	Nominal pressure
R _e	Yield strength

4. DESCRIPTION

4.1 DEFINITION OF THE BASIC OPERATING CONDITIONS OF BV

4.1.1 Operating temperatures

- transported gas temperature: maximum +59°C, may be higher for special requirements
- ambient temperature: from - 29 °C to + 59 °C

4.1.2 Transported medium

The transported medium is natural gas (including liquefied natural gas, biomethane, gas produced from biomass, as well as other types of gas, provided these gases meet the conditions for gas transport in accordance with the Technical Conditions and relevant interconnection agreements). The solid particle content is up to 100 g/m³, with particle sizes up to 5 mm in the volume sample of natural gas.

Additives:

- | | | |
|-----------------------------|-----------|-------------------|
| a) hydrogen sulfide content | ≤ 5 | mg/m ³ |
| b) total sulfur content | ≤ 50 | mg/m ³ |
| c) total methyl mercaptan | ≤ 10 | mg/m ³ |
| d) nitrogen content | ≤ 5 | mol % |
| e) hydrogen content | ≤ 10 | mol % |

4.1.3 Pressures

The Maximum Operating Pressure (MOP) and design pressure (PN) are specified in the order.

4.1.4 BV surroundings

4.1.4.1 The BV will operate in the environment - ATEX Zone 2 according to STN EN IEC 60079-10-1

4.1.4.2 The BV must be fully reliable and safe even during vibration of the pipeline system which it will be a part of. The effective vibration velocity measured in the frequency range of 6 - 50 Hz is a maximum of 4 mm/s.

4.1.5 Safety factors

- line section $s = 2.00$ ($f_0 = 1/s$)
- compressor stations: $s = 2.15$ ($f_0 = 1/s$)

4.2 TECHNICAL DESIGN

The BV manufacturer must have a quality management system in accordance with EN ISO 9001.

The BV manufacturer must hold a certification for BV in the EU before the call for tenders initiation date in accordance with the "Regulation of the Government of the Slovak Republic on equipment and protective systems intended for use in explosive atmospheres 149/2016 Coll." or the "Directive 2014/34/EU of the European Parliament and of the Council on the harmonization of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres", regarding the suitability of the equipment for use in the defined environment Zone II, and "Act 56/2018 Coll. on the conformity assessment of products, making designated products available on the market, and amending and supplementing certain laws".

The manufacturer shall provide certification that the offered and supplied valves meet the requirement for use in the transport of natural gas mixed with hydrogen up to 10 mol %, including seals, used and recommended lubricants, and sealing compounds.

The warranty provided by the manufacturer must be at least 3 years.

4.2.1 Design requirements

- a) The design of the BV must comply with EN 13942 (API Spec. 6D).
- b) Steels and materials that meet the specified requirements of product standards for the required pressure level may be used for the manufacture of parts of the BV (except for the weld ends).
- c) The BV must be designed with full (non-reduced) flow and must be able to open at full differential pressure without any damage to any of its parts.

- d) The BV must be equipped with 'Double Block and Bleed' and 'Double Piston Effect' systems (double-isolation-and-bleed valve) in accordance with API 6D/ISO 14313.
- e) The BV must be fire-resistant according to ISO 10497 (API Spec. 6FA).
- f) The body must be fully welded.
- g) The ball in the valve must be securely seated in bearings.
- h) The BV must have welding connection ends. In the case of a special requirement, it should have flanged connection ends.

4.2.2 Sealing systems

4.2.2.1 Seat sealing system

The BV must be equipped with the following sealing systems:

- a) primary sealing - "metal to metal";
- b) secondary sealing - soft sealing element;
- c) tertiary sealing - emergency sealing system (injection of lubricant or sealing compound).

4.2.2.2 Shaft sealing system

- a) The BV must be equipped with an "anti-blow-out" shaft sealing system with at least double sealing.
- b) The system must allow for the replacement of the sealing element while the pipeline in which the BV is installed is in full operation.
- c) The shaft sealing system must allow for resealing using an emergency sealing system.

4.2.3 Connecting ends

4.2.3.1 Welding connection

The welding ends of the BV must be guaranteed to be weldable with pipeline material that meets the requirements of STN EN ISO 3183 (API Spec 5L) and STN EN 1594 standards.

4.2.3.2 Flange connection

The type of flanges and the type of sealing surface will be specified in the order, and the counter flange, if required, must be guaranteed to be weldable with pipeline material that meets the requirements of STN EN ISO 3183 (API Spec 5L) standard. The gasket must be a metallic spiral-wound type in accordance with the ASME B16.20 (API 601) gasket standard.

4.2.3.3 Material properties of welding ends

- a) The steel must be guaranteed to be weldable without heat treatment at an ambient temperature above 0 °C.
- b) The yield strength of the steel for the welding ends must be $R_e \geq 360$ MPa.
- c) The extension of the ends must be $A_5 \geq 18\%$.
- d) The yield strength to tensile strength ratio must not exceed 0.9.
- e) KCV notch toughness from 3 tests at -20°C:
 - average value min. 40 J;
 - the value of any test must not be less than 30 J;
 - the test will be performed on the base material according to STN EN ISO 148-1 and on the weld joint according to STN EN ISO 9016.

4.2.3.4 Chemical composition of welding ends

- a) The materials used must meet the following criteria:

$$C_{\max.} \leq 0.18 \% , \quad S \leq 0.02 \% \quad P \leq 0.02 \% \quad S + P \leq 0.03 \%$$

- b) CE_{IIW} carbon equivalent:

$$CE_{IIW} = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15} \leq 0.43 \%$$

4.2.4 Auxiliary equipment

4.2.4.1 Additional piping

- The BV must be equipped with separate piping ($\phi = 1''$ for BV up to DN 650 inclusive, $\phi = 2''$ from DN 700 to DN 1400 inclusive) for draining and venting the ball cavity and for pressurizing the ball cavity from both sides of the BV.
- The drainage and venting must be terminated with two ball valves equipped with a control device (lever).
- Pressurization of the ball cavity must be equipped with a BV on both sides.
- The BV must be equipped with a technical solution for the seat resealing system.
- The piping for drainage, venting, seat resealing, and pressurizing the ball cavity must be made of stainless steel, and for underground installation, it must be extended to approximately 100 mm below the actuator flange of the BV. The piping located underground must not contain detachable joints.
- All BV piping (drainage, venting, resealing, ball pressurization) must be routed to closely follow the shape of the BV and must be securely attached to the BV.

4.2.4.2 Stand

The BV must be equipped with a stand or a mounting surface that ensures its stable and safe position. The distance from the lowest drainage point to the base plane of the stand (mounting surface) must be at least 30 mm.

4.3 CERTIFICATES AND TESTS

- 4.3.1.1 tests of the BV will be conducted in accordance with STN EN 14141 standard;

- 4.3.1.2 The BV will be supplied with an inspection certificate 3.2 according to STN EN 10204,

4.4 NON-DESTRUCTIVE TESTS

All non-destructive testing activities must be carried out by qualified and competent personnel certified according to STN EN ISO 9712, Level 2.

4.4.1 Welds

- All welds are subjected to radiographic testing according to STN EN ISO 17636-1 and evaluated to Level 1 according to STN EN ISO 10675.
- In locations where this is not possible, the welds are subjected to ultrasonic testing according to STN EN ISO 17640 and evaluated to Level 2 according to STN EN ISO 11666.

- c) In locations where neither of the above tests can be performed, the magnetic particle method according to STN EN ISO 17638 is permitted and evaluated to Level 1 according to STN EN ISO 23278.
- d) In the area of stainless steel welds and the junctions between stainless and carbon steel materials, the penetrant method according to STN EN ISO 3452-1 should be used, with evaluation to Level 1 according to STN EN ISO 23277.
- e) All welds are subjected to 100 % visual inspection according to STN EN ISO 17637.

4.4.2 Welding ends

They are subjected to ultrasonic testing according to Class 3 STN EN 10228-3, within a width of 25 mm from the weld edge

4.5 DIMENSIONS AND TOLERANCES

The BV are supplied with dimensions specified in the order.

4.5.1 Dimensions and tolerances

The customer will specify the dimensions and material of the pipeline into which the BV will be installed, along with other technical requirements. The manufacturer will submit the BV drawing to the customer for approval. The BV drawing must clearly show the main dimensions, safety factor, tolerances, geometry details, materials used for the welding ends, type of actuator (with the required technical equipment), actuator placement on the BV, type of coating and its color shade, and the technical parameters required by the customer.

The customer will specify the length of the extension piece (extension is defined as the distance from the pipe axis to the actuator flange).

Dimensions and tolerances must meet the conditions specified in STN EN ISO 3183 with the following deviations and additions:

The design of the welding ends of the BV

- blunting of the welding ends 1.5 mm + 0.5 mm;
- bevel for welding 30° + 5°;
- leading edge from the inside of the welding end max. 15°;
- the deviations of the separation cut from the perpendicular to the pipe axis must not exceed 0.005 D, with a maximum of 1.6 mm;
- the geometry of the welding ends must allow for the seamless execution of radiographic testing of the installation welds when welding the BV into the gas pipeline.

4.6 REQUIREMENTS FOR BV FACTORY INSULATION

4.6.1 Above-ground installation

The BV will be surface-protected against corrosion with a protective coating guaranteed to have a minimum lifespan of 15 years.

The choice of coating type must be approved by the customer based on the manufacturer's offer. The RAL color shade of the top coating of the BV will be specified by the customer.

The welding ends must be protected with a temporary protective coating over a width of 150 mm, which must not affect the weldability of the BV with the pipeline in the field.

4.6.2 Underground installation

The BV will be surface-protected against corrosion with a protective polyurethane coating according to the STN EN 10290 standard (or DIN 30677) with a minimum protective layer thickness of 2.5 mm, the porosity of which will be tested by an electrical spark test at 25 kV.

The welding ends must be protected with a temporary protective coating over a width of 150 mm, which must not affect the weldability of the BV with the pipeline in the field.

4.7 BV LABELING

Information about the material, casting, connection dimensions (for flanged versions, at least the flange type and standard) must be stamped on the BV (on the welding ends) as a minimum.

The BV must be equipped with an identification label in the Slovak language, which must include the following information:

- a) manufacturer's trademark;
- b) serial number of the BV;
- c) designation of the material of the welding ends;
- d) maximum operating pressure;
- e) nominal diameter;
- f) BV type;
- g) year of manufacture;
- h) weight.
- i) CE marking supplemented with the identification number of the notified body in accordance with the European Parliament Directive 2014/34/EU

If the BV is supplied together with the actuator, the actuator must be equipped with a label that must include at least the following information:

- a) manufacturer's trademark;
- b) actuator type;
- c) coil control voltage;
- d) actuator serial number and year of manufacture
- e) maximum torque of the actuator;
- f) weight;
- g) the labeling of explosion-protected actuators on the identification plate must include the equipment group and category, explosion category and group, and temperature class, as well as the CE-Ex symbol, demonstrating compliance of the equipment with the European Directive 94/9/EC ATEX, Equipment group II, intended for gas Zone 2, protection level IIC according to European Parliament Directive 2014/34/EU and STN EN 60079.

4.8 PACKAGING

The BV must be packed in a non-returnable factory package to prevent damage or loss of functionality during transport. The cost of packaging is included in the price of the BV.

The welding ends must be wrapped and sealed to prevent water and dirt from entering the BV. The edges of the welding ends must be protected with tape to prevent potential damage.

4.9 ACCEPTANCE OF THE BV AT THE MANUFACTURING PLANT BY THE CUSTOMER OR THE CUSTOMER'S AUTHORIZED REPRESENTATIVE

The customer reserves the right to participate in the final inspection of the BV.

As part of the acceptance procedure, the BV undergoes dimension inspection according to the drawing approved by the customer, verification of documentation completeness, and subsequent final testing.

4.9.1 Rules for the participation of the customer's authorized representatives

The following rules apply to the participation of the customer's authorized representatives:

- the manufacturer shall notify the customer of the final test date at least 14 days in advance;

- If, despite timely notification, no authorized representative of the customer attends the final tests, the manufacturer is entitled to dispatch the BV without acceptance by the customer;
- the presence of the customer's representative during the tests does not affect the manufacturer's responsibility and warranties;
- the manufacturer will prepare the BV for testing in the condition in which it will be dispatched, including the actuator, with the exception of anti-corrosion coatings and packaging;
- during the tests, no emergency resealing methods for the seats or shaft are allowed to be used;
- minor mechanical damage detected during the inspection is allowed to be repaired only within the scope of the STN EN 14141 standard;
- if the BV fails the tests, the manufacturer is obliged to inform the customer with technical explanation of the defects. After the explanation and the rectification of defects, the manufacturer may prepare the BV for re-inspection;
- one BV may undergo final testing a maximum of 2 times. If the BV fails the final test the first time and also the repeated test, the customer will not accept it, and the manufacturer must replace it with another BV.

The list of final tests for the BV is provided in Annex 1 to this internal regulation.

4.9.2 Test (measurement) of breakaway torque - measuring the breakaway torque with a torque wrench

The test must be conducted according to the following procedure:

- the ball is in the "closed" position;
- pressurize with one-side PN pressure;
- when using the EHO, monitor the pressure in the actuator that rotates the BV. Record the pressure;
- with an EO, test the BV with calibrated instruments independently and compare the measured breakaway torque (Mk) with the Mk from the table;
- with a manual actuator, test the BV with calibrated instruments independently and compare the measured breakaway torque (Mk) with the Mk from the table;
- repeat the test on the other side of the BV.

4.9.3 Function tests of actuators (if the delivery includes an actuator)

Verification of their functions according to the types of actuators, however, the following as a minimum:

- EHO: manual rotation of the BV, reverse movement, smoothness of movement during valve adjustment;
- EO: manual rotation of the BV, reverse movement, smoothness of movement during valve adjustment.

4.9.4 Actuator transition time test

- Measurement of the transition time from one end position to the other;

4.9.5 BV dimension check

The following dimensions are checked:

- length;

- height;
- internal diameter;
- BV connection dimensions;
- geometry of the welding ends;
- deviation of the ends from perpendicularity.

4.9.6 Visual check

Inspection:

- surface of the ball and moving parts;
- inspection of the body surface, welds, and welding ends;
- Inspection of the marking of valve parts (material) and the data on the label.

4.9.7 Documentation check

The BV delivery must include documentation that contains at least the following:

- drawing of the BV with actuator, showing the main dimensions and their tolerances;
- detail of the geometry of the welding ends; the welding ends must be documented with a certificate;
- material certificates for all pressure parts of the BV with measured values of chemical composition and mechanical properties;
- inspection certificate 3.2 according to STN EN 10204;
- certificates of non-destructive testing and their results;
- protocol of successful completion of the final testing procedure, signed by the customer's representatives;
- protocol for thickness measurement and electrical spark testing of the protective coating;
- certificate of suitability for use of the equipment in the defined Zone 2 environment in accordance with the "Regulation of the Government of the Slovak Republic on equipment and protective systems intended for use in explosive atmospheres 149/2016 Coll." or the "Directive 2014/34/EU of the European Parliament and of the Council on the harmonization of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres", regarding the suitability of the equipment for use in the defined Zone II environment, and "Act 56/2018 Coll. on the conformity assessment of products, making designated products available on the market, and amending and supplementing certain laws".
- "fire safe" certificate;
- PED certificate "Pressure Equipment Directive" 2014/68/EU in accordance with Directive 2014/68/EU of the European Parliament and of the Council on the harmonization of the laws of the Member States concerning the making available of pressure equipment on the market;
- general maintenance and operation manual for the BV and actuator (in the Slovak language) – must also include safe securing of the BV in the closed position (safe securing refers to a sequence of actions and procedures that must be performed on the BV and its control to prevent unintended opening of the BV, or opening due to unauthorized manipulation, the procedure for depressurizing the internal space of the BV, disabling the control, depressurizing the control, disconnecting from the electrical power, and making it inoperable, including manual operation, for example, using a hand pump, etc.).

5. RELATED EXTERNAL REGULATIONS

STN EN 1594	Gas infrastructure. Pipelines for maximum operating pressure over 16 bar. Operational requirements.
STN EN IEC 60079-10-1:	Explosive atmospheres. Part 10-1: Classification of areas. Explosive gas atmospheres.
STN EN 13942	Petroleum and natural gas industries. Pipeline transportation systems. Pipeline valves.
STN EN 14141	Valves for natural gas transportation in pipelines. Performance requirements and tests
STN EN ISO 10497	Testing of valves. Fire type-testing requirements.
STN EN ISO 3183	Petroleum and natural gas industries. Transport pipeline systems. Pipe fittings.
STN EN 10204	Metallic products. Types of inspection documents.
STNEN ISO 9712	Non-destructive testing. Qualification and certification of NDT personnel (ISO 9712: 2019)

Directive 2014/34/EU of the European Parliament and of the Council on the harmonization of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres (recast)

6. DISTRIBUTION LIST

Special: TA,
TT,
TU,
TKO.

7. ANNEXES

Annex 1: List of final tests