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TECHNICAL – DELIVERY CONDITIONS

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

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1. PURPOSE

The purpose of the working document is to define basic technological and delivery terms for suppliers of ball valves for eustream a.s.

2. AREA OF FORCE

These technological and delivery terms are in force for all suppliers of ball valves (hereinafter only GU) for eustream a.s. and relate to GU from DN300 up to DN1400 mm inclusive (12" up to 56") and to pressure PN63 up to PN100 inclusive.

Material for all parts of ball valves must satisfy ISO 14313/API-6D, STN EN 14141, STN EN 1594, STN EN 1503-1 and STN EN 1503-2. For production of individual parts of ball valves (except of welding ends) it is possible to use steel with guaranteed minimal yield point, lower than 360 MPa, if meet other requirements of STN EN 1594 as chemical composition, strength, impact strength, welding ability.

3. TERMS AND ABBREVIATIONS

Abbreviation	Description of the abbreviation
DN	Nominal diameter
EHO	Electrically and hydraulically actuator
EO	Electrical actuator
COT	Procurement department of tech. goods and services
GU	Ball valve
HPO	Hydraulic-pneumatic actuator
Mk	Detaching moment (torque moment) twist moment which ball valve need for move from end position
PN	Nominal pressure
R _e	Yield point

4. DESCRIPTION

4.1. DEFINITION OF BASIC OPERATIONAL CONDITIONS OF BALL VALVES

4.1.1. Operational temperatures

- considered temperature of transported gas: maximum + 59° C, at the specially requirements high
- temperature of environment: from -29° C up to +59° C

4.1.2. Transported medium

Transported medium is natural gas with content of mechanical admixtures max. 100g/m³, with max. dimension of particles up to 5 mm in a volume sample of natural gas.

Admixtures:

- content of carbon disulphide ≤ 5 mg/m³
- total content of sulphur ≤ 100 mg/m³

- total mercaptan $\leq 15 \text{ mg/m}^3$
- content of nitrogen dioxide $\leq 2 \%$

4.1.3. Pressures

Maximal operational pressure and nominal pressure will be determined in the order.

4.1.4. Environment of ball valves

Ball valve will work in the environment - Zone 1 according to STN EN 60079-10, (ball valve to explosion environment – explosive gases).

Ball valve must be fully reliable and safety also at vibrations of the pipeline system, of which it will be a part. Effective value of vibration speed measured in frequency range 6 - 50 Hz is maximum 4 mm/s.

4.2. TECHNOLOGICAL DESIGN

Producer of the ball valve must have quality management system according EN ISO 9001.

The GU producer must have at disposal an EU certification in accordance with ISO 3183 - Annex B, of the GU prior the competition of tenders.

Structure of the ball valve, including used materials, must meet the following requirements.

4.2.1. Structural requirements

- a) Ball valve must have full (non-reduced) flow, and there must be ability to open it at full differential pressure without any damage of any of its part.
- b) Warranty produced by the producer must be at least 3 years.
- c) Ball valve must have manual and automatic control (if it is required by a buyer), and in the case of buyer's requirement it must be prepared for installation of the driving gear (the type will be determined by the buyer).
- d) Ball valve must be equipped by systems „Double Block and Bleed“ and „Double Piston Effect“
- e) Ball valve must have anti-static design.
- f) Ball valve must be resistant to fire in accordance with STN EN ISO 10497 and certified in accordance with STN ISO 14313 Annex A5.
- g) The body must be welded in the whole extent.
- h) The ball in the valve must be firmly laid in bearings.
- i) Ball valve must have connecting weldable ends, or in the case of special requirement it must have connecting ends with flanges.

4.2.2. Sealing systems

4.2.2.1. Sealing system of seats

Ball valve must be equipped by 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).

4.2.2.2. Sealing system of the shaft

- a) Ball valve must be equipped, in the shaft area, by the sealing system „anti-blow-out“ at least with double sealing .
- b) System must enable a replacement of the sealing element in full operation of the pipeline, in which the ball valve is built-in.
- c) The sealing system of the shaft must enable the additional sealing by means of the emergency sealing system (injection of the lubricant).

4.2.3. Connecting ends

4.2.3.1. Welding connection

At welding ends of the ball valve the welding ability with pipeline material, which will be meets the conditions specified in the standard STN EN ISO 3183.

4.2.3.2. Flange connection

Material of flanges must satisfy STN ISO 14313 (ANSI B16.5 and MSS SP-44). The sealing must be made of metal, wound in spiral, type „Spiroflex“.

4.2.4. Material properties of connecting ends

- a) At steel the welding ability must be guaranteed, at temperature of environment reaching above 0° C, without thermal processing .
- b) Yield point of welded on ends $R_e \geq 360$ MPa.
- c) A5 minimum 18%.
- d) Ratio of the yield rate and ultimate strength must not exceed value 0,9.
- e) Notch toughness KCV from 3 tests at -20°C:
 - average value min. 40 J;
 - value of any test must not be lower than 30 J;
 - the test will be done for the basic material in accordance with STN EN ISO 148-1 and for the weld joint in accordance with STN EN ISO 9016.

4.2.4.1. Chemical composition

- a) The used material must satisfy 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) Carbon equivalent CEV will be calculated from the following formula from values of piece analysis:

$$CEV = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15} \leq 0,45 \%$$

4.2.5. Auxiliary equipment

4.2.5.1. Additional piping

- a) Ball valve must be equipped by individual piping ($\phi = 1''$ for ball valve up to DN 400 inclusive, $\phi = 2''$ from DN 500 up to DN 1400 inclusive) for mud discharge and venting of ball interspace and pressurizing ball interspace from both sides of the ball valve. Each of these piping must be ended by two valves, from which at least one is the ball valve equipped by a control device (lever).
- b) Ball valve must be equipped by piping for a seat system with additional sealing.
- c) Ball valve must be equipped by piping with ball valves, which will enable pressurisation of ball inter space from both sides of the ball valve.
- d) Piping for mud discharge, venting, additional sealing of seats, and pressurisation of ball inter a space must be made of stainless steel and for underground design it must be brought a 100 mm height approximetaly of under the flange of the ball valve driving gear.
- e) All piping of the ball valve (mud discharge, venting, additional sealing of seats, and pressurisation of ball) must be led so, that in the most possible way it will copy the shape of the ball valve, and must be firmly fixed to the ball valve.

4.2.5.2. Stand

Ball valve must be equipped by a stand or by technological area, which will provide its stability and safe position. Distance between the lowest part of mud discharge and the (horizontal plane) lowest part of stand (technological area) must be 30 mm at minimum.

4.2.6. Safety factors of welding ends

- line part : $s = 2,00$ (against nominal pressure and material yield point)
- compressor station: $s = 2,15$ (against nominal pressure and material yield point)

4.3. MATERIAL TESTS

All tests must have testing certificate STN EN 10204 item 3.1.

4.4. NON-DESTRUCTIVE TESTS

All activities of the non-destructive test must be done by qualified and competent personnel with certificate in accordance with STN EN ISO 9712, stage 2.

4.4.1. Welds

- a) All welds will be submitted to the radiation test in accordance with STN EN ISO 17636-1 and will be evaluated in accordance with level 1 STN EN ISO 10675.
- b) In points where it is not possible, the welds are submitted to the ultrasonic test in accordance with STN EN ISO 17640 and evaluated in accordance with level 2 STN EN ISO 11666.
- c) In points where it is not possible to do any of above stated tests, the magnetic-powder method is allowed in accordance with STN EN ISO 17638 and evaluated in accordance with level 1 STN EN ISO 23278.
- d) In points of welds made on stainless steel materials and connection of stainless steel material with black material it is necessary to use the capillary method in accordance with STN EN ISO 3452-1 and evaluation in accordance with level 1 STN EN ISO 23277.

- e) All welds are submitted to 100 % visual inspection in accordance with STN EN ISO 17637.

4.4.2. Welding ends

are submitted to the ultrasonic test in accordance with class 3 STN EN 10228-3, in width 25 mm from welding edge.

4.5. DIMENSIONS AND TOLERANCES

Ball valves will be delivered with dimensions determined in the order.

4.5.1. Dimensions and tolerances

The buyer shall give dimensions and material of the pipeline, in which he will set the ball valve as well as other technical requirements. The producer will submit to the buyer calculation of strength and drawing of the ball valve for approval. The drawing of the ball valve must clearly present the main dimensions, safety factor, tolerances, details of geometry, material used for welding ends, a type of actuator (with required technical accessories), actuator position on ball valve, a type of protective paint and its colour as well as technical parameters required by buyer.

The buyer will give length of extension for actuator (length is distance between pipe axis and flange of actuator).

Dimensions and tolerances must meet terms stated in STN EN ISO 3183 with the following deviations and completions.

Shaping of welding ends of the ball valves

- edges bevelling at welding ends: 1,5 mm + 0,5 mm;
- taper for the weld: $30^\circ + 5^\circ$;
- slope edge from inside of welding end: max. 15° ;
- deviation of separation cut from normal line to pipe axis must not exceed 0,005 D max. however 1,6 mm;
- geometry of welding ends must enable problem free performance of test by radiation of assembly welds at welding of the ball valve on the gas pipeline.

4.6. REQUIREMENTS OF FACTORY INSULATION OF BALL VALVES

4.6.1. Above ground design

Ball valves will have protected surface against corrosion by protective paint with guaranteed service life at least 15 years.

Selection of the of the kind of the paint must be agreed by the buyer on the basis of the offer from the producer. Colour shade of the of the covering paint of the ball valve will be specified by the buyer.

Welding ends in width 150 mm must be protected only by temporal protective paint, which must not influence the weldability of the ball valve with pipeline in the terrain.

4.6.2. Underground design:

Ball valves will be protected on surface against corrosion by anti-corrosive polyurethane coat in accordance with standard STN EN 10290 (resp. DIN 30677) with minimal thickness of the

protective layer 2,5 mm. Its porosity-free status will be verified by electric spark test with voltage 25 kV.

Welding on ends must be protected in width 150 mm by temporal protective paint, which must not influence the weldability of the ball valve with pipeline in the terrain.

4.7. MARKING OF BALL VALVES

At the welding ends of the ball valves must be impacted indications about the base material of connecting ends, melt the parameters of connecting ends (at flange connection must be impacted min. a type of flange and the standard.

Ball valve must be equipped by identification label in Slovak language, which must contain the following data:

- a) protective mark of the producer;
- b) production number of the ball valve;
- c) number of the order;
- d) mark of the material at welding ends;
- e) maximal operational pressure;
- f) nominal diameter;
- g) type of the ball valve;
- h) production year;
- i) mass;
- j) name and thickness o protective coat or paint.

In the case that the ball valve will be delivered with the drive, also this must be equipped by the label, which must contain at least the following data:

- a) protective mark of the producer;
- b) type of the actuator;
- c) controlling voltage of coil;
- d) production number of the actuator;
- e) torque of the actuator;
- f) mass;

4.8. PACKAGING

Ball valve must be packed in non-returnable factory packing, in order to prevent its damaging during transportation or decreased functional abilities. The price of the packaging is included in the price of the ball valve.

Welding ends must be packed and blinded, in order to prevent water and impurities penetration into the ball valve. Edges of welding ends must be protected by tape against eventual devaluation.

4.9. ACCEPTANCE OF BALL VALVES IN THE PRODUCTION PLANT BY A CUSTOMER OR BY HIS AUTHORISED PERSON

The buyer reserves the right to participate in the output inspection of the ball valve.

In the framework of the acceptance procedure the ball valve is submitted to the inspection of dimensions according to the drawing agreed by the buyer, inspection of the documentation completeness, and the following final testing.

4.9.1. Rules of participation of customer's authorised person

The following rules are applied for participation of the authorised persons of the buyer:

- date of final tests will be announced by the producer to the buyer at least 14 days in advance;
- if in spite of an early call no authorised person of the buyer takes part at final tests, the producer is authorised to dispatch the ball valve without acceptance of the buyer;
- presence of the representative of the buyer at tests does not have influence on responsibility and guarantees of the producer;
- the producer will prepare the ball valve for testing in the state, in which this will be dispatched including the driving gear, with exception of anticorrosive paints and packaging;
- during tests it is not possible to utilise means of emergency additional sealing of seats or the shaft;
- small mechanical damages found out during the acceptance can be repaired only in the extent of the standard STN EN 14141 item 5.4;
- in the case that the ball valve not satisfies tests, the producer has duty to announce it to the buyer with technical clarification of the defect. After this clarification and elimination of defects he can prepare the ball valve for repeated acceptance;
- one ball valve can be submitted to the closing testing maximum 2 times. If the ball valve does not satisfy the closing tests at the first test and also at the repeated test, the buyer will not accept this ball valve and the producer must replace it by other ball valve.

The list of final tests of the ball valve is presented in Annex 1

4.9.2. Test (measurement) of the detaching moment - measurement of detaching moment by torque wrench

The test must be done in accordance with the following procedure:

- the ball is in position „closed“;
- pressurisation by one side pressure PN;
- at used HPO to increase pressure in the inlet and to follow, at which pressure the actuator will turn the ball, this pressure should be write down;
- at used EHO to follow the pressure in the driving gear, which will turn the ball valve, the pressure should be written down;
- at EO to test individually the ball valve with calibrated meters, and measured detaching moment M_k compare with table M_k ;
- at manual drive to test individually the ball valve with calibrated meters, and measured detaching moment M_k compare with table M_k ;
- to repeat the test on the other side of the ball valve.

4.9.3. Test of time for resetting of the valve

Measurement of the resetting time from one end position to the other.

The resetting time is defined by the customer at specification of the ball valve and the type of the actuator.

4.9.4. Tests of driving function (if the delivery is with the actuator)

According to the type of the driving gear verification of their functions should be done, however at least:

- HPO: manual turning of the ball valve, reversion motion, LBC (it is built-in), continuity of the motion at valve resetting;
- EHO: manual turning of the ball valve, reversion motion, continuity of the motion at valve resetting;
- EO: manual turning of the ball valve, reversion motion, continuity of the motion at valve resetting.

4.9.5. Inspections of ball valves' dimensions

The following dimensions will be checked:

- length;
- height;
- internal diameter;
- connecting dimensions of the ball valve;
- geometry of welding ends;
- deviation of ends from rectangularity.

4.9.6. Visual inspection

Inspection:

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

4.9.7. Inspection of documentation

Part of the delivery of the ball valve must by documentation, which contain at least:

- the assembly drawing of the ball valve (with the driving gear, with main dimensions and their tolerances) approved by the buyer;
- list of used material for main parts, including their attests and thermal processing;
- detail geometry of welding ends;
- material documents of all pressure parts of the ball valve with corresponding chemical and mechanical values in accordance with the standard STN EN 10204 item 3.1;
- certificate of quality and completeness of the product;
- attests on performance of non-destructive tests and their results;
- protocol on successful performance of final testing procedure signed by representatives of the buyer;

- protocol on measurement of thickness and electric spark test of the protective coat;
- certificate on suitability to use the device in defined environment Zone 2, if is not specified differently;
- certificate „fire safe“;
- verification on certification of the ball valve in the European Union;
- general instructions for maintenance and operation of the ball valve and the actuator in Slovak language – must also contain safe locking of ball valve in the closed position

The term of safe locking means a sequence of activities and acts which are necessary to be performed with the ball valve and actuator to prevent ball valve from its spontaneous opening, and/or ball valve opening due to illegitimate handling (a procedure of reducing the pressure in the inner space of ball valve to atmospheric pressure, stopping the actuator function, reducing the pressure in a control to atmospheric pressure, disconnection from electricity, impossibility of manual handling using, for example, a manual pump, etc.).

- protocols from RTG tests.

5. RELATING EXTERNAL REGULATIONS

STN EN 1594	Gas infrastructure. Pipelines for maximum operating pressure over 16 bar. Functional requir.
STN EN 1503-1	Valves. Materials for bodies, bonnets and covers. Part 1: Steels specified in European Standards.
STN EN 1503-2	Valves. Materials for bodies, bonnets and covers. Part 2: Steels other than those specified in European Standards.
STN EN 60079-10	Electrical apparatus for explosive gas atmospheres Part 10: Classification of hazardous areas.
STN ISO 14313	Petroleum and natural gas industries. Pipeline transportation systems. Pipeline valves.
STN EN ISO 10497	Testing of valves. Fire type-testing requirements.
STN EN ISO 3183	Petroleum and natural gas industries - Steel pipe for pipeline transportation systems (ISO 3183:2012)
STN EN 10204	Metallic products. Types of inspection documents.
STN EN ISO 9712	Non-destructive testing. Qualification and certification of NDT personnel

6. DISTRIBUTION LIST

Special: TA,
 TT
 TU,
 TKO.

7. LIST OF ANNEXES

Annex 1: List of final tests of the ball valve