



**NET4GAS, s.r.o**

# **HP PIPELINE DN 1400, NODE KATEŘINSKÝ POTOK – NODE PŘIMDA**

## **Line Valves - Specification**

**22.11.2018**

**DVZ**

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## 1 GENERAL

### 1.1 Scope of the Document

This Specification defines the minimum requirements for production, inspection, acceptance testing, identification and supply of Line Valves designed in the C4G Projects, sub-project HPPL.

### 1.2 Definitions

Term	Explanation
Employer	NET4GAS
Consultant	ILF Consulting Engineers
Supplier	Company having signed the ball valve supply contract with the Employer
Authority expert	Shall refer to independent Third Party
Shall	Indicates a mandatory requirement
Should	Indicates a strong recommendation to comply with the requirements of this document

### 1.3 General Requirements

The Supplier assumes the obligation of selecting the ball valves and their materials in accordance with international standards and industry good practice, the latest technological developments and available experience, allowing for economic aspects.

The Supplier shall have suitable qualification and adequate experience in the field of ball valve manufacture for gas transmission pipelines.

The Supplier shall bear sole responsibility for ensuring that the details of the valve, required for correct design and rating of the actuators, is submitted directly to the actuator Supplier. All coordination work required for this shall be performed by the Supplier at his own responsibility.

The Supplier shall bear sole responsibility for ensuring that design, materials, fabrication and inspection/testing comply with all requirements of this Specification, as well as all relevant legislation, codes, standards and regulations in Czech Republic.

Changes, such as design concessions or deviations from the requirements of this Specification, shall always be submitted to the Employer in writing for approval.

The Supplier shall declare, in his Bid, the country of product origin, and if product is not manufactured by Supplier, the manufacturer shall be stated.

#### **1.4 Quality Assurance**

All designs, documentation, purchased items, items manufactured and services etc. shall be based on the quality requirements of ISO 9001 - 9003. The level of quality assurance (QA) shall be indicated in the bid documents.

The Supplier of pressure containing equipment shall be qualified in accordance with Pressure Equipment Directive (2014/68/EU).

Exceptions may be permitted only by approval of the Employer.

#### **1.5 Scope of Work**

Scope of Work is defined as

- Design, manufacturing/assembling, work shop testing, painting of fully assembled/operable valves as per the requirements of this specification. For above ground valves the prime coat is required only, while for underground valves full insulation and coats are required. Final coat will be done using the same system as for the structure after installation.
- Provision of proper export packing, protection coating, caps/blanks, drying chemical bags, etc. for transport and site storage
- All expenses for 3<sup>rd</sup> Party Inspection (TPI)
- Transportation to site exclusive unloading
- Installation services, i.e. any site works to provide fully assembled valves
- First filling/provision of utilities, like hydraulic liquids, grease, etc. if any
- Manufacturing technical documentation
- Special Tools for installation, testing, maintenance and emergency sealing system
- Any site works to provide fully assembled valves, in case individual goods are delivered as loose items
- Spare Parts Proposal for commissioning and 2-year operation
- Personnel training, on a daily rate basis, inclusive all training materials and trainer expenses

## 1.6 Conflicting Requirements, Exceptions

The Supplier shall notify the Employer of any conflict between the Specification, the Codes and Standards and any other Specifications included as part of the procurement documentation.

Any exceptions to this Specification and referenced documentation shall be raised by the Supplier and approved by the Employer in writing.

## 1.7 Abbreviations

Term	Explanation
API	American Petroleum Institute
ATEX	ATEX directive ( explosive atmosphere)
BTS	Border Transfer Station
CE	Conformity marking
ČSN	Czech Standards Institute
DIN	German Institute for Standardization
DN	Diameter Nominal
DP	Design Pressure
EN	European Standards
ESD	Emergency shut down system
GH	Gas-hydraulic
HNBR	Hydrogenated Nitrile Butadiene Rubber
IEC	International Electrotechnical Commission
IP	Ingress Protection Classification
ISO	International Organization for Standardization
ITP	Inspection and Test Plan
LBC	Line Break Control

NAMUR	Standardization Association for Measurement and Control in Chemical Industries
NBR	Nitrile Butadiene Rubber
NDT	Non-destructive Testing
PED	Pressure Equipment Directive
PN	Pressure Nominal
SIL	Safety Integrity Level
SSV	Safety Shut-off valve
TPG	Technical Regulations - Gas
TP	Test Pressure
TPI	Third Party Inspection
QA	Quality Assurance

## 2 CODES, STANDARDS AND REFERENCED DOCUMENTS

### 2.1 Codes and Standards

In particular, but not limited to, the following laws, codes, standards and regulations shall be observed. (It shall at always be checked that the latest revision of each standard is used.) Supplier shall be responsible to design ball valves and related components in accordance with the requirements of applicable documents.

#### 2.1.1 Basic Code

The design, materials selection, fabrication, inspection and testing of lines valves shall be in accordance with the ČSN EN 1594 - Gas supply systems - Pipelines for maximum operating pressures over 16 bar – Functional requirements.



## 2.1.2 Standards to be used

API 6D	Specification for Pipeline and Piping Valves
API 607	Fire test for Quarter-turn Valves and Valves Equipped with Nonmetallic Seats
ČSN EN 19	Industrial valves – Marking of metallic valves
ČSN EN 1369	Founding. Magnetic particle inspection
ČSN EN 1371	Founding. Liquid penetrant inspection
ČSN EN 1594	Gas supply systems - Pipelines for maximum operating pressures over 16 bar – Functional requirements
ČSN EN 10204	Metallic products – Types of inspection documents
ČSN EN 10290	Steel tubes and fittings for onshore and offshore pipelines. External liquid applied polyurethane and polyurethane-modified coatings
ČSN EN 12266	Industrial valves – Testing of valves
ČSN EN 13942	Pipeline transportation system – Pipelines valves
ČSN EN 14141	Valves for natural gas transportation in pipelines – Performance requirements and tests
ČSN EN 60079-1	Explosive atmospheres – Equipment protection by flameproof enclosures “d”
ČSN EN 60079-7	Explosive atmospheres – Equipment protection by increased safety “e”
ČSN EN 60079-10	Classification of areas- Explosive gas atmospheres
ČSN EN 60079-11	Explosive atmospheres – Equipment protection by intrinsic safety “i”
ČSN EN 60529	Degrees of protection provided by enclosures (IP Code)
ČSN EN ISO 3452-1	Non-destructive testing – Penetrant testing – Part 1: General Principles
ČSN EN ISO 5211	Industrial valves – Part-turn actuator attachments
ČSN EN ISO 8501-1	Rust grades and preparation of uncoated steel substrates and steel substrates after overall removal of previous coatings
ČSN EN ISO 12944	Corrosion protection of steel structure by protective paint systems
ČSN EN ISO 17636	Non-destructive testing of welds – Radiographic testing
ČSN EN ISO 17637	Non-destructive testing of welds – Visual testing of fusion-welded joints
ČSN EN ISO 17638	Non-destructive examination of welds – Magnetic particle testing
ČSN EN ISO 17640	Non-destructive testing of welds – Ultrasonic testing

IEC 61508	Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems
IEC 61511	Functional safety - Safety instrumented systems for the process industry sector
ISO 5208	Industrial valves – Pressure testing of metallic valves
ISO 9001	Quality Management Systems – Requirements
ISO 9002	Quality System – Model for quality assurance in production, installation and servicing
ISO 9003	Quality System – Model for Quality Assurance in Final Inspection and Test
ISO 10497	Testing of valves – Fire type-testing requirements
ISO 14313	Pipeline transportation systems – Pipeline valves
MSS-SP-55	Quality Standard for Steel Castings for Valves, Flanges, Fittings, and Other Piping Components – Visual Method for Evaluation of Surface Irregularities
PED 2014/68/EU	Pressure equipment directive

## 2.2 ATEX, CE Marking and Explosion Protection

Explosion protection shall comply with the ATEX Directives. It shall be the Supplier's responsibility to submit the corresponding type certificates and approval certificates at the latest on delivery of the equipment. Individual certificates shall be permitted in special cases.

All certificates in accordance with ATEX shall be submitted. CE marking shall be attached.

All devices and components shall be designed for use in Explosion Hazard Zone (Ex Zone) 1 in accordance to ČSN EN 60079-10 - Electrical apparatus for explosive gas atmospheres-Part 10 Classifications of hazardous areas.

## 2.3 Reference Documents

The following referenced documents shall apply and shall be read in conjunction with this document in the latest revision.

- Line Valves Datasheet
- Composition of Process Gas
- Typical Loop Diagram

### **3 PROCESS DATA**

#### **3.1 General**

The ball valves together with actuators and accessories, including all exterior piping for drainage, relief and sealant injection facilities, shall be suitable for operation throughout the entire year. The ambient conditions outdoor shall be taken into consideration regardless of the actual installation location. The conditions at the installation location (aboveground or underground refer to future specification in datasheets) shall be allowed for in respect of design and coating selection. The ball valves must have a high airtightness against external environment even in critical operating conditions and shall be able to transfer additional piping stresses, without affecting the ball tightness and external airtightness.

#### **3.2 Gas Quality**

The pipeline system will transport non-aggressive natural gas as per document Composition of Process Gas.

#### **3.3 Design Data**

Ball valves shall be supplied in accordance with ČSN EN 13942 (API 6D / ISO 14313) compliant with ISO 5211.

The particular design parameters for each type/range of line valves are specially stated in the related datasheet.

### **4 TECHNICAL REQUIREMENTS**

#### **4.1 Valve Materials**

The following requirements shall apply, unless otherwise stated in the datasheets.

The Supplier shall confirm that all materials are suitable for contact with specified natural gas.

The maximum carbon content and carbon equivalent of all pressure containing parts, including welding ends, on which welding operations will be carried out, shall be in accordance with API 6D. Other restrictions on material chemistry shall apply as per API 6D.

The materials used for manufacture shall be suitable for the entire planned service life of the valves.

- Pressure containing casing parts - in accordance with ČSN EN 13942 / API 6D
- Ball - nickel-plated hardened or other suitable surface treatment, the thickness of the layer shall be min. 30 µm max 80 µm

## 4.2 Design of the Valves

### 4.2.1 General Requirements

The line valves shall be designed in accordance with this specification and shall meet the requirements of listed standards and ČSN EN 13942 (API 6D / ISO 14313).

The line valves shall be of an antistatic design. All valves shall be fire-safe (whether aboveground or underground installed) and shall have successfully passed the fire-safe test requirements. The ball valves shall be designed as a fire-resistant in accordance with API 607.

The line valves with combined sealing shall be designed as full-bore line valves, allowing the smooth passage of cleaning and measuring elements. The valves shall be designed as welded end connection. For **aboveground** installation shall be fully welded body but exceptionally is possible use bolted split body, and for **underground** installation shall be permitted only fully welded body. The successful implementation of all mandatory tests and non-mandatory wear tests in accordance with ČSN EN 14141.

The joint efficiency weld factor shall be  $v = 1.0$ .

The material of valve weld ends is expected to be adequate for connection to the following pipe materials:

For DN 1400 = L485ME

For DN 900 = L415ME/NE

The structure of ball valves will be of “Double Block and Bleed” type, the line valves has guaranteed tightness at the outlet and, at the same time, even in the line valve interspace, both at closed and open position of the ball. There must be bonding between the ball valve outer sheath, the ball and the stem. The line valve structure must be of an antistatic type.

All valves shall be operated with the actuator acc. to Datasheet specification.

## 4.2.2 Seat Sealing System

### 4.2.2.1 Type

Seat for combined metal-soft sealing (stem-bedded ball) shall be Double Piston Effect Seat Rings, which are seats with doubled tightness downstream the flow. In the case of damage to the seat at the inlet, the second seat takes over of the tightening function.

### 4.2.2.2 Material

Seat body : steel, e.g. A 350 LF2

Seat packing ring :

combined sealing: e.g.: HNBR (Therban)

“O”-rings: e.g.: NBR

## 4.2.3 Stem System

### 4.2.3.1 Type

The stem type shall always be secured against blow out when dismantling the actuator (Anti-Blow-Out). The structural design of the stem node secures that the potential pressure in the ball valve center during dismantling of the actuator neither blows out the stem, nor other elements of the node.

The stem must be tightened by two or three sealing components and supplemented with the emergency shut-off system. Statically stressed sealing components must be doubled.

### 4.2.3.2 Material

Stem: steel e.g. AISI 4140

“O”-rings: e.g.: NBR or HNBR (Therban)

“Fire-safe” sealing: e.g.: graphite, SIGRAFLEX

## 4.2.4 Supporting legs

The ball valves shall be equipped with supporting legs or ribs, if required. Necessity of legs / ribs will be specified in ball valve Data Sheet. The drain, if any, shall be extended out of the legs or aboveground, depending on valve installation. Any support welding to valve body shall be avoided. The drawings of supported legs or ribs shall be attached in bid documentation.

All line valves shall be provided with lifting lugs.

#### 4.2.5 Accessories Line Valve

Line valves shall be provided with the following accessories:

- Valve Vent
- Valve Drain
- Pressure Balancing By-pass
- Power Supply to Actuator (when gas is required as operating)
- Grease Fittings / Sealant lines injection media

Drain Pipes, vent pipes and actuator power supply lines shall be terminated by line valves. The sealant injection lines shall be terminated by two independent grease fittings.

For underground installation the tubing/piping shall be extended that all valve accessories can be operated from ground level by one man.

All accessories shall copy the surface of the Line valve body leaving a gap for insulation and Holiday test only.

#### 4.2.6 Lifespan

During their whole lifespan the ball valves are operated which means the closing/opening cycles of the line valves occur. The lifespan of line valves is a period for which the valve is able to perform the functions required at a set system of maintenance and repairs. Min. 25 year lifespan is expected.

The external tightness of the ball valves shall be guaranteed by the Supplier over the whole lifespan period irrespective of the number of the cycles.

### 4.3 Actuators

#### 4.3.1 General Requirements

Matching the actuators to the valves shall be included in the work and services of the Supplier. The valve and actuator shall be electrically separated with an isolating coupling in order to avoid an influence on the cathodic protection system of the pipeline.

The valves shall be actuated with following actuators:

- Electro-hydraulic actuators
- Gas-hydraulic actuators
- E-Motor actuators
- Pneumatic actuators

The type of valve actuator is indicated in the corresponding data sheet.

The connection shall be performed according to ČSN EN ISO 5211.

The actuators of underground valves shall be operable approx. 1.5 m above ground. The venting and draining lines shall be terminated 0.5 m above ground. The pipe cover is defined in the data sheet.

Faults attributable to failure of the actuator shall remain restricted to the actuator.

All parts of the actuator shall be able to be exchanged with no interruption in operation of the valve.

The actuator shall be self-locking.

The actuators shall be provided with a position indicator. This indicator shall indicate the positions "open" – "closed".

The actuators and all accessory components, bearings, gearboxes and lubricants shall be suitable for the specified ambient and operating temperature range.

The connection between actuator and valve shall be designed watertight.

The actuators shall be connected to the valves at the Supplier plant and subjected to a function test in accordance with ČSN EN 14141 while using ČSN EN 12266.

The actuators and valves shall be inspected and adjusted by the Supplier after installation on site prior to commissioning.

Accessories of actuators shall be supplied and mounted by Supplier or his Sub-supplier. Instruments shall be suitable for minimum temperature as stated in the relevant Datasheet and related data sheet and be certified to at least IP 65 classification unless otherwise specified.

All actuators shall be designed for at 1.2 times the breakaway torque of the valve in worst case operating condition.

#### 4.3.2 Electro-hydraulic Actuators

##### 4.3.2.1 General

The electro-hydraulic actuator shall consist of the following main components:

- Reservoir for hydraulic fluid (biodegradable oil).
- Electro-hydraulic pump, 400 V 3 phase, 50 Hz, max. 1.5 kW.
- Hydraulic pressure accumulator for minimum 3 motions at minimum supply pressure and maximum allowable differential pressure at the valve.
- Stainless steel tubing including all filters, non-return valves and other facilities required for operation.

- Instrumentation: contact pressure gauge with "min." and "max." switching contacts for pump control, pressure switch for min-min alarm, float switch in reservoir and visual oil level indicator (sight glass).
- Solenoid valves, explosion-proof
- Protective housing for valves and tubing.
- Control box containing all control elements (lockable), located on actuator or on separate holder and connected with actuator by piping or tube. The Control Box shall be made from stainless steel material. The door shall be one piece and openable to the right side. The opening retainer shall be gas type spring.
- Control unit for manual actuation – Local 3-way switch :Auto/Manual/Maintenance
- Hand pump

#### 4.3.2.2 Design

The electro-hydraulic actuator shall be PED 2014/68/EU compliant.

The electro-hydraulic actuator shall comply with the following requirement:

Actuator type: Refer to Datasheets

Operating times: Refer to Datasheets

Protective housing:

All safety facilities required in accordance with most recent regulations shall be accommodated in the local control cubicle unless otherwise required in detail.

These shall include:

- Fuses
- Motor protection switch
- Switching facilities for Start/Stop
- Signals in relation to fuse failure
- Tripping of motor protection with latching facility to prevent automatic reclosing (e.g. during the timeout of the runtime of the pump)
- Interlock circuit and float switch (protection against dry running)

The supplier of the actuator shall state all information required for planning and coordination of the safety facilities.

Limit switches (NAMUR or electro-mechanical):

Two sets of limit switches (1 NC contact and 1 NO contact) of EEx(de) design shall be provided per end position. One pair of limit switches shall serve the purpose of internal control of the hydraulic unit and the other pair shall serve the purpose of remote signalling to the control.



#### Solenoid valves:

Only directly controlled solenoid valves may be used for high-pressure actuators (up to 400 bar). The solenoid valve shall be equipped with a mechanical emergency manual override to guarantee that the hydraulic actuator can still be actuated in the event of electrical power failure. Only stainless steel fabrication shall be acceptable.

#### Process piping:

All tubing shall be made of stainless steel with wall thickness not less than 1.5 mm outer diameter of 10 mm possible 12 mm if otherwise specified in Datasheet. Compression fittings, (Swagelok, Parker or equivalent of one brand only, no mixing of systems permitted), shall be used.

Control Units: The electrical control unit shall be accommodated in an electrically heated, insulated box (min. IP 65). Control buttons, switches and indicator lamps for the valves shall be fitted in the control unit junction box. A lockable switch for Remote/Local, 2 buttons for Open/Close/Off and a 2-colour indicator lamp (red-green) for signaling the end position shall be provided for each actuator. The junction box area shall be designed to reliably discharge rainwater impinging on it. The door of junction box shall be provided with a seal. The metallic junction box shall be equipped with an earthing connection point.

Power supply:	400 V AC for 3 - phase motor (50 Hz);
Signalization voltage	24 VDC
Control voltage	24 VDC

Signaling, limit switches and control contacts shall be for 24 VDC.

The power, heating and control wiring shall be made by cables led through tree Ex cable grommets (2xM25x1.5 and M20x1.5, one M25 hole shall be reduced by an adaptor to M20 including 1xM25 and 2xM20 grommets).

### 4.3.3 Gas-hydraulic Actuators

#### Principle

The gas-hydraulic actuator shall be high-pressure, compact with a link, gas acts straight on the piston. The hydraulic part is determined for motion dampening and emergency control.

Type	GH
Preset of position	Within 90°
Supply medium (Operating media)	Natural gas
Minimum Supply Pressure	3.8 MPa
Mechanical position indicator	Open – Close

### Control box

- contains all control elements (lockable)
- located on actuator or on separate holder and connected with actuator by piping or tube
- box is made from stainless material
- with gas pressure reservoir for 1 motions (in the case the valve is provided with a safety function)
- with limit switches of hazardous-duty design
- complete tubing of stainless material
- threaded coupling Swagelok or similar
- type label in Czech
- hydraulic oil (biodegradable)
- gas pressure regulator to reduce max torque
- by-pass and air-bleed valves
- oil and gas filters

The control unit will be equipped with following emergency and safety elements:

- high-pressure magnetic valves (solenoid) with the possibility of manual control
- manual high-pressure pump for emergency pre-setting of actuator with remote control interlocking
- signalization voltage 24 VDC
- control voltage 24 VDC
- signaling, limit switches and control contacts shall be for 24 VDC
- The limit switches of Actuator shall have always two contacts for each position. One contact is for signalisation to SCS, the second one for the internal blocking of the actuator for the case of contradictional commands
- Line Break shall be equipped with two contacts, one for signalisation to DCS, the second one for open-command blocking
- Expected maximum current through contacts is 500 mA
- cover IP 65 according to ČSN EN 60529
- CE EX design into zone 1 ATEX II 2G at least IIB T3 certified
- Ex d cable glands

The power, heating and control wiring shall be made by cables led through three Ex cable grommets (2xM25x1.5 and M20x1.5, one M25 hole shall be reduced by an adaptor to M20 including 1xM25 and 2xM20 grommets).

GH actuators can be delivered as NO or NC, i.e. safe Close or Open position when the actuator takes always the defined position in case of pressure or supply voltage losses.

GH actuators will be equipped with emergency failure protection responding to the speed of pressure loss in the gas line, with automatic closing of the fitting (HPO, LNB, LBS). The failure protection will work on the pneumatic and mechanical principle, it will be equipped with the signalization contact and device allowing its set-up and control. The electronic solution is not standardly permitted, but it can make a supplement. The actuator will be equipped for emergency operation with hydraulic pump with lever.

#### 4.3.4 Electric Actuators

The size of actuators in case of the electric one, and the suitable combination with the worm-gear unit will be designed by the Supplier of the fitting in view of the standard times of opening and closing of the fitting.

Electric actuators will always be three-phase for the electric system 3 x 400 V 50Hz TN-S. The actuator will be equipped for emergency operation with hand wheel and can be operated by one man.

The equipment with double position limit switches and torque limit switches is standardly required. The actuator will be equipped according to the standard specification with a temperature meter in the motor winding and 230 V AC heating and a manual wheel for emergency control. The power, heating and control wiring shall be made by cables conducted through three Ex cable grommets (2xM25x1.5 and M20x1.5, one M25 hole shall be reduced by an adaptor to M20 including 1xM25 and 2xM20 grommets).

- signalization voltage 24 VDC
- control voltage 24 VDC
- signaling, limit switches and control contacts shall be for 24 VDC

The electric actuators shall be provided with interfaces for parallel control and communication via Profibus.

#### Protection Requirements

Actuator motor, control unit and housing	EEx d acc. ČSN EN 60079-1/IEC 60079-1
Terminal box, limit switch housing	EEx e acc. ČSN EN 60079-2/IEC 60079-7
Explosion subgroup	IIB
Temperature Classes	T3

#### 4.3.5 Pneumatic Actuators

Types of actuator could be piston type or scotch-yoke type. Actuator shall be provided with return spring which shall be corrosion resistant.

Principle:

Instrument or plant air actuated on the piston with propellant air reservoir or springs as determined by valve purpose, hydraulic parts is intended for damping and emergency control.

- Driving medium Instrument air
- Minimum control pressure 6.0 barg
- Mechanical position indicator open-close
- Limit switches in an explosion-proof version

Control box:

Contains by type all necessary controls but not limited to the followings

- Lockable
- Located on the actuator or on a separate holder connected with the actuator by piping
- The box is made of stainless material
- Swagelock threaded coupling or similar
- Type label in Czech language
- Instrument air pressure regulator
- Current/pressure convertor to control the actuator
- By-pass and air bleed valves
- Instrument air filter

The control unit shall be equipped with manual high-pressure pump for emergency resetting of actuator with remote control locking.

The Control Box shall be made from stainless steel material. The door shall be one piece and openable to the right side. The opening retainer shall be gas type spring.

Power supply and signaling:

- Signaling voltage 24 VDC
- Control voltage 24 VDC
- Signaling, limit switches and control contacts shall be for 24 VDC
- The limit switches of Actuator shall have always two contacts for each position. One contact is for signalisation to SCS, the second one for the internal blocking of the actuator for the case of contradictory commands
- Expected maximum current through contacts is 500 mA
- Permissible current loading 0.5A and in line with Station Control (and ESD) System
- Cover of IP 65 according to EN 60629

#### 4.3.6 Marking

All actuators shall be fitted with a permanently attached stainless steel labels (not wired-on) showing as a minimum the following information:

- manufacturer's name
- model & serial numbers
- instrument tag number
- manufacturer's standard data
- position on actuation medium failure

In addition, the nameplate shall give the actuator design torque.

#### 4.3.7 Tests

##### 4.3.7.1 Workshop Tests

All valve actuators shall be tested completely and detailed in Supplier's workshop. All tests required by the codes and standards as well as all Supplier tests have to be performed. After the installation of actuators on valves respective tests and adjustment shall be carried out.

The test program for the work shop test has to be submitted at least 14 days prior to start of the tests.

Complete tests on valve actuators will normally not be required if respective type tests certificates are available.

Detailed test protocols of all tests performed have to be submitted prior to installation.

##### 4.3.7.2 Site Tests

The site tests shall include the following steps:

- Pre-installation testing
- Pre-commissioning (including "Loop Testing")
- Commissioning and test on completion
- Test runs
- Performance tests

The aim of the tests is to ensure and prove the proper function of the complete scope.

## 5 CORROSION PROTECTION

Before applying the surface corrosion protection, all surfaces must be perfectly degreased and abrasive blasted to cleanliness degree Sa 2 ½ pursuant to ČSN EN ISO

8501-1. Surface roughness Ra 50-70 µm. Internal surfaces of all line valve (bearing body, ball and lids cavities) must be preserved or coated with red epoxy coating. Surface quality must comply with the requirements of API RP 5L2.

Outside surfaces of line valve in underground design will be provided with PROTEGOL UR 32-55 insulating material with minimum layer thickness of 1.5 mm at least 30 cm above the expected terrain level. Unless agreed otherwise, the coating shall have to be applied and tested pursuant to the provisions of ČSN EN 10290. Welding edges shall not be coated within a distance of  $160 \pm 20$  mm unless otherwise agreed.

The top edge of the insulation above the terrain level must be bevelled with maximum angle of 30° with respect to the extension and tube axis. Protegol may not create bridge between surfaces.

Aboveground surfaces of underground line valve above the buried level and outside surfaces of aboveground ball valve will be painted in accordance with ČSN EN ISO 12944, parts 1-8, with a paint system consisting of:

Prime coat

- epoxy coating with high dry matter content, containing Zn pigment ( $\geq 80$  %)
- layer thickness 40 - 60 µm

Intermediate layer

- two component epoxy with high dry matter content
- layer thickness 100 - 120 µm

Top coating

- two component polyurethane, white aluminium RAL 9006 (below the actuator flange)
- two component polyurethane, yellow RAL 1023 (above the actuator flange); exceptionally the Electric Actuators can be painted with white aluminium RAL 9006
- layer thickness 80 µm

Total nominal dry film thickness shall be 240 µm.

Coating of above-ground parts of underground ball valve must overlap the PROTEGOL spray at least 30 cm.

Outside surfaces of weld-on ends in the length of 100 mm of along the entire cylindrical end length will be protected by an easy to remove protective coating not influencing their weldability.

For aboveground installation welding edges shall not be painted within a distance of  $100 \pm 10$  mm unless otherwise agreed.

All information labels shall be fitted to the body after complete surface protection without any damage of painting.

## **6 INSPECTION, TESTING AND CERTIFICATION**

### **6.1 Preliminary Inspection**

Acceptance test Type 3.2 in accordance with ČSN EN 10204 for all dimension of valves and corresponding actuators shall be provided.

### **6.2 Test and Inspections**

#### **6.2.1 Standard test**

Offered line valve must be subject to standard tests in mandatory scope pursuant to ČSN EN 14141, pursuant to API 6D/ČSN EN 13942. Successful passing of the test will be documented in compliance statement.

In addition of these mandatory standard tests, each line valve intended for Employer must comply the criteria of standard option tests:

- Functional tests of resistance to wear caused by polluted medium pursuant to ČSN EN 14141, Annex E
- Fire resistance test API 607 Test during production and acceptance

Correct fulfilment of the requirements specified in Table I is continuously checked by the manufacturer and will be reviewed by inspector during acceptance.

Functional test of valve with actuator will be performed with relevant actuator supplied with the valve during pressure test or during acceptance.

Conformity to PED shall be verified with conformity assessment procedure Module H or Module G.

#### **6.2.2 NDT**

Each line valve will be subjected to NDT test during production and after its completion within the scope specified in standard and attached Table II, the scope and places will be marked in NDT scheme. Records on such tests will form part of the documentation.

#### **6.2.3 Pressure test**

Line valves must be subjected to pressure test pursuant to ČSN EN 14141 in accordance with API 6D/ ČSN EN 13942 and comply with the requirements specified in the following Table III. Tests under items 6, 7, 8 shall be carried with high pressure air.

#### 6.2.4 Acceptance

Acceptance will be usually carried out at the manufacturer. The manufacturer shall invite the Employer or its nominated Inspection Representative to participate in pressure test and final acceptance 14 days in advance and will check compliance of the product with the requirements of the specification, marking, completeness and correct function. Documentation and consistency of the documentation with product will be also checked.

## 7 MARKING

Will comply with ČSN EN 13942. The following information will be punched and located on ball valve surface:

#### *The ball valve cover - Punched*

- number of ultrasonic test of the welded end of the lid
- magnetic testing of the weld edge
- material quality
- heat number
- job sequence number and inspection mark
- mark of X-ray inspection of cover-socked weld

#### *The ball valve body – Punched*

- material quality
- heat number
- punched number of body cover weld ultrasonic inspection

In case of the aboveground installation the label with DN, the pressure class rating and label with other identification data will be imprinted directly on line valve body.

As a minimum, it will comprise:

- manufacturer`s sign
- nominal inside diameter
- max. operating pressure
- valve length
- strength test pressure (TP)
- material and heat number
- serial No.
- date of production
- actuator number
- identification number



In case of the underground installation the label with DN, pressure class rating and label with other identification data will be doubled and fitted also to the extension (above terrain). Individual ball valves equipment tubes will be marked with label and route number under actuator flange.

## **8 SHIPPING AND LOADING**

After testing, painting and preservation the valves shall be adequately protected for shipping such that handling damage during shipping is prevented. The Supplier shall notify Employer of the shipping date at least forty-eight (48) hours prior to shipment. All documentation in accordance to appendix 1 shall be sent to Employer for approval before shipping of valves.

The individual delivery components shall not contain harmful substances or underestimate the health of the environment, and the delivery of the parts shall not exhibit increased radioactivity.

## **9 SPARE PARTS / SPECIAL TOOLS**

A list of special tools and recommended spare parts for 2 years operation shall be provided with the offer and updated with the final documentation.

Customer service and spare parts delivery shall be guaranteed by Supplier for whole lifespan of ball valves and actuators.

Employer required complete list of spare parts with order numbers and prices at the time of delivery of the product.

Supplier shall provide two sets of High-Pressure Lever-Operated Sealant Gun together with sealant paste, and adequate Coupler Assemblies.

## **10 WARRANTY**

The warranty in accordance with the Contract of Supplies shall cover all parts of the valves, actuators and spare parts.

# 11 TABLE I - CHECK OF BALL VALVE DESIGN

No	Requirement	Test	According to	Evaluation	Standard
1.	Initial material inspection	Check of attestations, dimensions and quality check	-	Without defects	N4G specification
2.	Compliance with data in the specification	Check of all basic data, check of equipment and design, check of documentation, visual inspection	-	Without defects	N4G specification
3.	Distance between flanges and/or weld-on ends	Dimensional check - measurement	ČSN EN 13942:2009	Without deviations	ČSN EN 14141:2013, 5.1.2 A.4.3
4.	Design and dimensions of weld-on edges	Check of design and dimensions by measurement, check of type and design, check of sealing surface (execution and roughness)	ASME B 16.20	Without deviations	ČSN EN 14141:2013, 5.1.3 A.4.3
5.	Resealing	Check of execution, connection point, check valves	Specification and ČSN EN 14141:2013	Without deviations	ČSN EN 14141:2013, 5.1.5
6.	Design of blow-down, air bleeding, by-pass, tubing; tightness of these lines	Check of design, materials, dimensions. Tightness will be tested within the framework of tightness tests, check of DP valves	Specification and ČSN EN 14141:2013	Without deviations	ČSN EN 14141:2013, 5.1.6
7.	Easy operation of the valve with hand wheel	Hand wheel, dimensions, corresponding control force, length, automatic disconnection of actuator in case of manual operation	Specification and ČSN EN 14141:2013	360N force, maximum hand wheel length 2 L of valve, maximum wheel diameter 1 m	ČSN EN 14141:2013 5.2.1 to 5.2.3
8.	Torque	Torque measurement (to be carried out during hydraulic tests) - see Table III.	ČSN EN 13942:2009 B.6	Within limits	ČSN EN 13942:2009 B.6
9.	Materials in general	Check of used materials, radiation check (radiation)	Specification	Compliance and less than limit	Specification

No	Requirement	Test	According to	Evaluation	Standard
10.	Metallic materials for pressure parts	Certificates pursuant to ČSN EN 10204:2005 3.1 or 3.2 according to specification Composition, yield point, and impact strength, C <sub>ev</sub> , C <sub>max</sub> , P+S	Specifications and relevant material standards	Within tolerances, without deviations	ČSN EN 14141:2013 5.3.2, 5.3.3, 5.3.4
11.	Repairs during production	Unacceptable without negotiation with the customer, defined scope of conditions	Negotiation	Without repairs or subject to compliance with the conditions	Specification and ČSN EN 14141:2013 5.4
12.	Marking	Check of marking from the perspective of correctness, completeness, compliance with documentation, and legibility	Specifications, ČSN EN 19	Completeness and correctness	Specification
13.	Corrosion protection, execution	Visual inspection and thickness measurement of the paint system for all BV, absence of pores for underground BV with protegol	Specifications	Total thickness over 240 micrometers, Protegol thickness over 1500 µm, no pores at 12kV holiday test	Specifications and relevant standards
14.	Corrosion protection, resistance	Visually for all BV, for underground BV as required: Adhesion test according to ČSN EN 10290	Specifications	Without defects	Grid method
15.	Functional test with actuator	Simple, quiet startup and operation of valve without impacts, check of circuits, electrical components, and protections connection, oil leaks. May be partially replaced by acceptance of actuators at the contractor and by operating test with a substitute actuator at the contractor Testing of accumulated energy for the required tests	Specifications and further in the tables	Correct and steady function without surges, compliance with specification The actuator must carry out the required number of cycles when no drive energy is available	-

**12 TABLE II - NDT**

No.	Requirement	Test	Requirement	Evaluation	Standard
1.	Welds, visual inspection	100% of welds - visual inspection	ČSN EN 14141:2013 5.5.2	Without defects	ČSN EN ISO 17637
2.	Welds, penetrant test	Only where UT or X-ray examination is not possible to be carried out	ČSN EN 14141:2013 5.5.2	acceptability level 2X according to ČSN EN ISO 23277	ČSN EN ISO 3452-1
3.	Welds, magnetic particle Inspection	Only where UT or X-ray examination is not possible to be carried out	ČSN EN 14141:2013 5.5.2	acceptability level 2X according to ČSN EN ISO 23278	ČSN EN ISO 17638
4.	Welds, ultrasonic testing		ČSN EN 14141:2013 5.5.2	acceptability level 2 according to ČSN EN ISO 11666	ČSN EN ISO 17640
5.	Welds, X-ray testing		ČSN EN 14141:2013 5.5.2	acceptability level 1 according to ČSN EN ISO 10675-1	ČSN EN ISO 17636-1, X-ray technique B
6.	Castings, visual inspection	100% of castings	ČSN EN 14141:2013 5.5.3	MSS-SP-55	MSS-SP-55
7.	Castings, magnetic particle inspection or capillary test	All castings will be 100% inspected (both inside and outside surfaces) with magnetic particle inspection or capillary test	ČSN EN 14141:2013 5.5.3	quality level 2 quality level 1	ČSN EN 1369 ČSN EN 1371-1
8.	Castings, X-ray inspection	All critical points will be X-ray inspected Positions and number of X-ray tests will be agreed between the manufacturer and customer	ČSN EN 14141:2013 5.5.4		ČSN EN 12 681 or B.3 ČSN EN 13942:2009
9.	Weld edges - rolled and forged;	100% UT	ČSN EN 14141:2013 5.5.5	Quality class 3	ČSN EN 10 228-3 ČSN EN 10 228-4
10.	Cast weld edges	100% X-ray	ČSN EN 14141:2013 5.5.5	ČSN EN 12 681 or B.3 ČSN EN 13942:2009	

**13 TABLE III - PRESSURE TEST**

No.	Requirement	Test	Requirement	Evaluation	Standard
1.	Outside tightness of the body, strength (Shell test)	Tightness and strength test of the shell, drainage, air bleeding, and shaft tightness with installed extension and tubing	Water test, (exceptionally air – immersion, or nitrogen) ball in intermediate position. Test pressure TP =1.5 DP Duration for DN 300 – 450 15 minutes DN 500 and more 30 minutes	Without apparent leakage or deformation In case of gas without bubbles upon immersion or no bubble when sprayed with foaming agent	ČSN EN 13942:2009 11.3
2.	Outside tightness of the body (Shell test)	Tightness test of the shell, drainage, air bleeding, and shaft tightness	Air/nitrogen test, ball in intermediate position. Test pressure 6 bar. Duration at least 3 minutes	Without apparent leakage, without bubbles upon immersion or no bubble when sprayed with foaming agent	ČSN EN 12266-1:2003
3.	Tightness of seats, air, L, low pressure	Left seat tightness	Test with air, pressure 6 bar, left part pressurized, ball and right part without pressure, check by ball deaeration. Duration 5 minutes	Inspection with bubbles; For all dimensions and seals ISO 5208:2008 rate A	ČSN EN 13942:2009 B.4 ISO 5208:2008
4.	Tightness of seats, air, R, low pressure	Right seat tightness	Air test, pressure of 6 bar . Right part pressurized, ball and left part without pressure, inspection by ball deaeration. Duration 5 minutes	Inspection with bubbles; For all dimensions and seals ISO 5208:2008 rate A	ČSN EN 13942:2009 B.4 ISO 5208:2008

No.	Requirement	Test	Requirement	Evaluation	Standard
5.	Tightness of seats, air, L+R, low pressure	Tightness of both seats – DBB test	Test with air, pressure 6 bar. Right and left part pressurized, ball without pressure, inspection by ball deaeration. Duration 5 minutes	Inspection with bubbles; For all dimensions and seals ISO 5208:2008 rate A	ČSN EN 13942:2009 B.4 ISO 5208:2008
6.	Tightness of seats, air, L, full pressure	Left seat tightness	Test with air, pressure rating. Left part pressurized, ball and right part without pressure, check by ball deaeration. Duration 5 minutes	Inspection with bubbles; For all dimensions and seals, ISO 5208:2008 rate A	N4G specification
7.	Tightness of seats, air, R, full pressure	Right seat tightness	Test with air, pressure rating. Right part pressurized, ball and left part without pressure, inspection by ball deaeration. Duration 5 minutes	Inspection with bubbles; For all dimensions and seals, ISO 5208:2008 rate A	N4G specification
8.	Tightness of seats, air, L+R, full pressure	Tightness of both seats – DBB test	Test with air, pressure rating. Right and left part pressurized, ball without pressure, inspection by ball deaeration. Duration 5 minutes	Inspection with bubbles; For all dimensions and seals, ISO 5208:2008 rate A	N4G specification
9.	Tightness, double piston effect	Tightness test of opposite seats for BV possible only if double piston effect exists	Test with air, pressure rating. Both left and right parts are depressurized, ball pressurized, inspection at both ends. Duration 5 minutes	Inspection with bubbles; For all dimensions and seals, ISO 5208:2008 rate A	ČSN EN 13942:2009 B.11 ISO 5208:2008

## APPENDIX 1 – Plan and Documentation Submission

C O D E	PLANS AND DOCUMENTATION	DATE/ NUMBER of SETS/ DELAY PENALTY											
		With offer		For approval			Before shipping			Final Documentation and all certificates			
	Name	A-Number. Of sets	E	H	AO in CW	P	H	BS in CW	P	A-Number. Of sets	O	H	P
A	Reference lists, technical brochures. Supplier's confirmation on applicability**) of ball valves Supplier certificates, permissions		YES										
B	Supplier's time schedule, List of technical documentation.		YES	YES	2	YES							
C	General assembly drawings		YES	YES	4	YES				2	YES	YES	YES
D	Material test certificates, proof of quality performance - ČSN EN 10204 3.2 (3.1 – for material from EU), inspection records. Final inspection certificate ČSN EN 10204 3.2 shall be submitted						YES	1	YES	2	YES	YES	YES
E	Expediting reports						YES	*	YES				

C O D E	PLANS AND DOCUMENTATION	DATE/ NUMBER of SETS/ DELAY PENALTY											
		With offer		For approval			Before shipping			Final Documentation and all certificates			
	Name	A-Number. Of sets	E	H	AO in CW	P	H	BS in CW	P	A-Number. Of sets	O	H	P
F	Inspection and test plan		YES	YES	4	YES							
G	List of deviations to tender		YES										
H	Painting/coating - specification		YES	YES	8	YES				2	YES	YES	YES
I	Sub-supplier list		YES	YES	2	YES							
<p>Legend:</p> <ul style="list-style-type: none"> <li>• A -Hard Copy (Number of sets)</li> <li>• E -Soft copy per E-Mail</li> <li>• H -Soft Copy via MOSS or per E-Mail (Final decision by Employer will be provided)</li> <li>• O -Original</li> <li>• AO -Number of CW (calendar weeks) after contract signature. (Doc. shall be submitted to Employer / Consultant)</li> <li>• BS -CW before shipping date set during the Technical Delivery Conditions meeting</li> <li>• P -Delay of required documents- penalty will be applied</li> </ul> <p>Remarks:</p> <p>*) Periodicity of sending od Expediting Reports shall be determined in the Contract.</p> <p>**) Applicable are only ball valves designated for natural gas service with certificates for tests pursuant to ČSN EN 14141.</p>													