

HIGH PRESSURE (HP) TRANSMISSION SYSTEMS

GATE VALVES DN > 50 (SHUT-OFF)

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REFERENCES DOCUMENTS

Technical Spec DSF-SPC-MEC-009 [Plant Coating of Buried Valves for Pipeline]

Technical Spec DSF-SPC-QAC-005
[Shop Inspection of Equipment and Materials]

EN 1759-1 [Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, class-designated. Steel flanges, NPS 1/2 to 24]

EN ISO 148-1
[Charpy Impact test on metallic materials-part 1: test method]

EN 10204
[Inspection Documents for metallic products]

EN 13445-4
[Unfired pressure vessels - Part-4: Fabrication]

EN 13942 (ISO 14313 modified)
[Petroleum and natural gas industries - Pipeline transportation systems - Pipeline valves]

EN 14141
[Valves natural gas transportation in pipelines - Performance and tests]

EN ISO 4527
[Metallic coatings - Autocatalytic (electroless) nickel-phosphorus alloy coatings - Specifications and test methods]

EN ISO 10497
[Testing of valves - Fire type testing requirements]

ASME B16.5
[Pipe Flanges and Flanged Fittings]

All standards or codes mentioned in this specification are valid in their latest version or by the relative superseded edition.

1. SCOPE

1.1 ITEM

Gate valves (shut-off) DN > 50.

1.2 SERVICE

Sweet, natural gas with sporadic passage of water and glycol.

1.3 APPLICATION

Shut-off valves of class PN 20 and PN 50 may occasionally also be used for throttling.

1.4 ADDITIONAL INFORMATION

Additional information may be given in the Data Sheet and Material Requisition and these documents should be read in conjunction with this Job Specification.

Any conflict between requirements of this specification, drawings, Data Sheet and Material Requisition supplementary Design Data or Standards shall be referred to Owner for clarification before proceeding with fabrication of concerned part.

Gate Valves (shut-off) Manufacturer shall be responsible to design valves and their components in accordance with the requirements of applicable documents. In no event, however, are thicknesses, dimensions etc. to be less than those shown on valve drawings, unless specific written approval to the contrary is received from Owner.

2. GENERAL REQUIREMENTS

2.1 APPLICABLE STANDARDS

EN 14141 and **EN 13942** (ISO 14313 modified) additionally satisfying the requirements herein.

2.2 UNITS

Metric for all units.

2.3 PRESSURE RATING

Refer to Valve Data Sheet. Maximum allowable pressure differential across valve shall be equal to the pressure rating.

2.4 PATTERN

Refer to Data Sheet.

2.5 CONSTRUCTION

2.5.1 GATE

Conduit type

2.5.2 SEATS

Double seated floating seats.

2.5.3 SEAT SEALING

Metal to metal with resilient inserts.

2.5.4 PRESSURE RELIEF CONNECTION

Plugged with DN s 15 threaded solid hexagonal head safety plug which allows cavity pressure to escape prior to disengagement of the thread.

2.5.5 DRAIN CONNECTION

Refer to Data Sheet for type, either plugged or valved.

Valves for use below ground specified with drain valve shall have a connection line DN < 150 extended to near valve operator, with two block valves, Class PN 250, mounted on the valve body and at the free end, respectively.

The block valve mounted at the free end shall terminate with a threaded hexagonal head plug.

Screwed joints are only acceptable if fully engaged and seal welded.

2.5.6 BODY/BONNET JOINT

Bolted or fully welded design.

2.5.7 STEM

Inside screw or outside screw with rising stem in a dustproof enclosure. Handwheel shall be non-rising.

2.5.8 STEM/GATE CONNECTION

Shall prevent lateral strain on the stem (T-head).

2.5.9 STEM SEALS

Dual O-rings or special design of equivalent or better quality.

2.5.10 STEM EXTENSION HOUSING

Housing shall be rigidly mounted to valve body by flanges (or similar joint). Housing design and its connections to valve and gear operator shall prevent any ingress of water, humid air or other substances which may affect valve operation, particularly during cold periods. Where air tightness cannot be ensured, filling of the

housing with a suitable lubricant can be considered acceptable.

2.5.11 WELDING ENDS

Shall match the diameters of the abutting ends within a tolerance of ± 1.6 mm. Refer to Data Sheet for abutting pipe dimensions. Beveling shall be as specified in **EN 14141**.

2.5.12 FLANGES

Raised face or Ring joint as per **EN 1759-1**. For flanges with DN>600 not covered by this standard, dimensions given in **ASME B16.5** applies.

Refer to Data Sheet for type.

Bore to be derived from abutting, pipe dimensions see Data Sheet.

2.5.13 VALVE OPERATION

Refer to Data Sheet for method.

2.5.14 LIFTING EYES

Required for valves size DN <150.

2.5.15 SUPPORT RIBS OR LEGS

Refer to Data Sheet for requirement.

Where a support is required the size of the area actually transferring the load to a base below shall be at least 20 mm² per kilogram of valve weight.

2.5.16 PASSAGE OF SCRAPERS OR OTHER INSTRUMENTS

Required for full bore valves. Bore diameter shall be > 96% of abutting pipe.

2.6 MATERIALS

2.6.1 GENERAL

Only fully killed fine grain carbon steel (with exceptions to trim) and conforming to European Standards EN 14141 shall be used.

When normalized and tempered materials are specified, the tempering shall be performed prior to any welding unless specifically otherwise authorized in writing by Owner. The tempering temperature shall be 10°C higher than that required for post weld Heat Treatment, unless otherwise specified.

Attention is drawn to section 3 detailing documentation requirements.

For pressure containing parts all materials shall have impact tests for each type of material

used as per EN 14141 and EN ISO 148. The test temperature shall be -20°C, unless a lower temperature is specified in the Data Sheet, with an acceptance criterion of: Mean value from the 3 tests 31 Joules or better, with the lowest single value 24 Joules.

2.6.2 BUTTWELDING ENDS

Only fine grained steel suitable for field welding and with SMYS not to exceed 290 N/mm² is allowed for sizes up to DN < 300. For size DN > 350 SMYS not to exceed 360 N/mm².

Chemical analysis is specified below (as per EN 14141):

Carbon content C shall be < 0.21% on heat analysis.

Carbon equivalent (CEV) <0.45% for grades with SMYS ≤360 N/mm²

Sulfur content will be < 0.030% on heat analysis.

2.6.3 BODY AND BONNET

Carbon steels, i.e.

Castings to grade GP240GH/1.0619 or G20Mn5/1.6220 or equivalent.

Forgings to grade P280GH/1.0426 or P285NH/1.0477 or equivalent.

Plates to grade P275NH/1.0487 or P355NH/1.0565 or equivalent.

2.6.4 TRIM

Stainless steels, e.g. grade X2CrNiMo 17-12-2/1.4404 or X5CrNiMo 17-12-2/1.4401 or equivalent

Carbon steel may be used for gate and seat rings, if coated with 30 microns electroless nickel plate or equivalent providing adhesion (bend) test and porosity (ferroxyl) test as EN ISO 4527 or equivalent are carried out to sample plates coated with these components and are without failure.

Mating seating surfaces shall have a hardness differential of at least 50 HB.

2.6.5 SEAT INSERTS

Suitable elastomer.

2.6.6 STEM SEALS

Suitable elastomer.

2.7 FABRICATION

2.7.1 FORMING OF PLATE

As per EN 13445-4.

Subsequent heat treatment, if required shall be normalizing.

2.7.2 WELDING

As per EN 13942 (ISO 14313 modified).

Hardness of the weld seam and heat affected zone may nowhere exceed 260 HV 10.

2.7.3 REPAIR BY WELDING

Only permitted in welds and castings.

2.7.4 POSTWELD HEAT TREATMENT

As per EN 13445-4, with exceptions for closure welds.

Valve bodies of welded construction shall be stress relieved if welded wall thickness is <30 mm.

Any heat treatment operation performed by valve Manufacturer and intended to enhance mechanical properties, shall obtain Owner's approval.

2.8 NON DESTRUCTIVE EXAMINATION

2.8.1 CASTING

All items shall be examined according to EN 14141.

All castings shall be 100% visual inspected.

All valves shall be subject to 100% surface examination on all accessible internal and external areas by magnetic particle examination or penetrant testing.

All valves with DN>200 shall be examined radiographically.

2.8.2 PLATES AND WELDED PIPE

All items shall be examined radiographically or ultrasonically according to EN 14141.

2.8.3 WELDS

All joints shall be examined according to EN 14141.

All welds shall be 100% visual inspected.

- For DN<200 penetrant testing or magnetic particle testing.
- For DN>200 ultrasonic or radiographic testing.

Where radiography or ultrasonic examination is unfit for detection then magnetic particle examination may be used. Radiographic films during shop inspection performed by Owner's TPI shall be available at request.

2.8.4 WELDING ENDS

All welding ends made from plate, tubulars or forgings shall be radiographically or ultrasonically examined according to **EN 14141**. Any discontinuity with a width exceeding 6 mm shall be cause for rejection.

2.8.5 SEALING AND SEAT RING SURFACES

All sealing and seat ring surfaces shall be examined according to **EN 14141**. However laminar defects are not acceptable.

Surfaces to be electroless nickel plated shall be examined prior to plating.

2.8.6 ELECTROLESS NICKEL PLATED COMPONENTS

Thickness tests shall be carried out in accordance with **EN ISO 4527**.

2.9 FIRE TEST

If so specified on the data sheet valve design shall have been qualified under to **EN ISO 10497**.

"Fire Safe" certification shall include "fire-safe" tests representing all sizes and pressure ratings of each valve model. "Fire-safe" tests shall be witnessed by the Inspector. Previous acceptance of certification by the Owner's Engineer is acceptable in lieu of requalification of identical valves.

2.10 FACTORY TESTING

2.10.1 STRENGTH AND TIGHTNESS TEST

Air seat tests plus hydrostatic shell tests as per **EN 14141** are required.

2.10.2 OPERATIONAL TORQUE TEST

Required, after mounting of operating equipment and inclusive of operator functions.

2.11 SURFACE TREATMENT

As per Data Sheet. Valves to be installed below ground shall be coated externally by supplier. External coating for buried valves shall be in accordance with **tech Spec DSF-SPC-MEC-009**. Valves to be installed above ground shall be primed and painted.

2.12 MARKING

Valves to be installed below ground shall be marked on a welding end with valve serial number, Client contract number and material grade of welding end, and all marking shall be as per **EN 13942** (ISO 14313 modified) on the nameplate which shall be fixed at a point close to the actuator/operator.

Valves to be installed above ground shall be marked on their bodies with serial number and Client contract number. Welding ends shall be marked with material grade, and all marking shall be as per **EN 13942** (ISO 14313 modified) on the nameplate.

The nameplate shall additionally bear the Inspection Body stamp as per **EN 10204** and Job Specification **DSF-SPC-QAC-005**.

2.13 TAGGING

All valves shall be tagged with the valve number (commodity code) as stated on the data sheet and be prefixed by the valve nominal size. This shall be clearly stamped on a non-corrodible metal tag which is to be securely attached to the valve with a noncorrodible metal wire.

2.14 DELIVERY

When wrench is specified on the Data Sheet one piece shall be supplied with each valve.

Handle extension is required if valve is to be installed below ground.

Handwheels and wrenches may be shipped in accordance with the Manufacturer's standard

procedure, otherwise the valve shall be delivered in fully assembled condition with all openings, pipe ends, nipples, etc. capped for protection. Open/ Close direction on handwheels must be clearly marked.

3. ADDITIONAL REQUIREMENTS FOR HYDROGEN USE

3.1. General Remarks

Valves shall be PED certified and comply also with EN 13942 and EN 14141.

Valves shall be designed and tested to minimize the leakage thru the stem packing.

Pressure relief system shall be carefully designed to avoid any leakage to the ambient.

To minimize the risk of leakage, threaded connections for drain and vent on valve body should be avoided.

It will be necessary to specify some additional requirements on chemistry and on hardness of CS steel components, similar to those specified for the piping forged components in ASME B.31.12. The same requirements shall apply to the pup pieces used.

3.2. Materials

The gate shall be manufactured from austenitic stainless-steel material X5CrNiM017-12-2 (SS 1.4401) or X2CrNiMnMoNNb21.16.5.3 (SS 1.3964).

SEAT/RINGS: For Seals Viton material shall be AED (Anti-Explosive Decompression) type and suitable for 100% of H₂ (confirmed by Manufacturer). In alternative, PTFE Lip Seal material shall be used.

Spring material on X-750 can be considered provided the maximum hardness limited at 50 HRC.

Not all high strength materials such as martensitic stainless steels or high strength chrome nickel alloys normally adopted for the stem shaft are compatible with Hydrogen. Manufacturer shall confirm the suitability of the material used.

3.3. Testing

Stem seals shall be fugitive emission tested in accordance with ISO 15848-2. Test shall be carried out at both ambient and maximum design pressure with helium as fluid. The fugitive emission tightness class shall be BH ($\leq 1.78 \cdot 10^{-7}$ mbar·l·s⁻¹ per mm stem diameter).

Valves purchased to API 6D requirements shall be capable of passing the pressure tests described in API 6D Annex H, para. H4, using helium as the test medium. Other valves shall be capable of passing the pressure tests described in API 598, using helium as the test medium.

4. TECHNICAL DOCUMENTATION. INSPECTION AND CERTIFICATION

4.1 QUANTITY

Four copies of each, inclusive of original, for all Documents and Certificates.

Four copies of each, inclusive of one reproducible, for all Drawings.

Also electronic files of all Documents and Certificates must be submitted by Contractor to the Owner.

4.2 INSPECTION AND CERTIFICATION

Inspection will be performed by an Independent Accredited Inspection Body or/and the Manufacturer's Authorized representative independent of the manufacturing department. Inspection requirements are defined in the following documents:

- a. Material requisition
- b. Job Specification DSF-SPC-QAC-005"Shop inspection of equipment and material for NGT project".
- c. Relevant project specifications
- d. Inspection clauses of Applicable Standards.

Inspection procedures to be followed are detailed in Owner document "Inspection and Test Instructions".

4.3 DOCUMENT REQUIREMENTS

4.3.1 WITH TENDER

Proof of design either as certificates of approval or prototype test report issued by an Accredited certifying authority.

Statement of Manufacturer's type number for each item if standard product offered.

Catalogues, general arrangement drawings and Parts List covering all items, inclusive of operating equipment.

Statement regarding materials used for all principle components with reference to material

standards herein.

Statement regarding materials for surface treatment.

Certificate confirming valve design has been qualified for Fire Test Approval (para. 2.9).

Dimensioned General Arrangement drawing including support ribs operating gear etc, together with a component material parts list, detailing material standard and grade, item number and description as well as certification level.

Welding Procedures specifications, forming procedures, testing procedures.

Recommended procedure for installation (welding) in pipeline to avoid excessive heat on valve.

Manufacturer's Detailed Test and Inspection plan. The plan should additionally show the control points at which the independent inspector's witnessing /approval is required, as per **section 3.2** herein.

4.3.2 ON DELIVERY

Inspection Data Book with IRN when required.

Comprehensive operation, maintenance and reconditioning manuals. List of recommended tools, spare parts, lubricants etc., necessary for two years operation.

All documents of final documentation package shall checked and originally signed by Owner's TPI when required.

4.4 VALVE CERTIFICATION PACKAGE.

Valve drawings shall include the following information printed clearly in, or adjacent to the title block:

- a. Contract No.
- b. Requisition No. and Item No.
- c. Purchase Order No.
- d. Valve number (commodity code)
- e. The principal dimensions of the valve, any gear operator, the size, type, and style.
- f. Materials of construction
- g. Pressure temperature limitations

Also, the weight of the valve, per size, should be included.

Drawings shall be checked and certified by the Manufacturer as being an actual record of the valve being supplied against the Purchase Order.

Drawings shall be sent to Owner accompanied by a transmittal note or letter marked for the attention of Procurement Department.

Owner's approval of Manufacturer drawings shall not be considered as relieving the Manufacturer of any responsibility for detailed design, dimensions and construction of equipment or deviation from specification.

Manufacturer shall not commence final manufacture of valves until receipt of Owner approval of his drawings.

5. SHIPMENT PROTECTIVE COATING AND END PROTECTION

Gate valves (shut-off) shall be shipped in the open position.

Unmachined exterior surfaces of valves shall be painted as per Manufacturer's standard.

Machined or threaded surfaces subject to atmospheric corrosion during shipment or subsequent storage shall be coated with easily removable rust preventive.

Valves with screwed or socket weld parts shall have the ends protected with metal, wood or plastic plugs.

Valves with flanged ends shall have the gasket surface protected by means of a suitable disc wired on.

Valves with butt-weld ends shall have the bevels covered with a suitable close fitting protector.

When lifting the valves, the slingers must be wrapped around the body only and not around the spindle lever.

Packing is to be in wood cases.

The valves to be transported must be firmly fixed to the case load - bearing bottom.

For valves with a weight greater than 0.6 tons fastening is performed with wooden saddles and joists nailed to the side walls. The saddles two for each valve must ensure a uniform distribution of the valve weight over the case bottom. For valves with a weight lighter than 0.6 tons only the joists nailed to the side walls are required. For the valve actuator units and the valve components (e.g. extension) the fastening will depend upon their shape, weight and dimensions.

The packing shall be mechanically protected i.e. from impact caused by falls during handling, vibration caused by transport etc.

Manufacturer Quality Plan shall include details about lifting, support during transportation, preservation, etc.