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Guidance on Industry Standard for ISO 14313 (API 6D) Pipeline Valves (non- subsea)

GIS 43-351

BP GROUP
ENGINEERING TECHNICAL PRACTICES

Foreword

This is the first issue of Engineering Technical Practice (ETP) GIS 43-351. This Guidance on Industry Standard (GIS) is closely comparable with the following GIS applicable to valves located in piping systems designed in accordance with ASME B31.3:

GIS 62-013	Guidance on Industry Standard for Ball Valves Greater than Class 600 or Greater than DN 500 (NPS 20).
GIS 62-020	Guidance on Industry Standard for Slab and Expanding Gate Valves (all sizes), Wedge Gate Valves Greater than DN 600 (NPS 24).

Subsea pipeline valves are covered by GIS 43-352.

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Introduction

- a. Guidance for pipeline valves is based on ISO 14313, Pipeline Valves, 1999 (API Specification 6D, Twenty-second edition, January, 2002).
- b. Guidance statements of this GIS are modifications to ISO 14313.
- c. Modifications to ISO 14313 are identified as Add, Modify to Read, or Delete.
- d. Clause numbers in this GIS correspond to ISO 14313.
- e. Clauses of ISO 14313 that are not revised remain applicable.



1 Scope

Modify to Read

Ball, check, gate, and plug valves for land based pipelines and the non-subsea sections of offshore pipelines designed to a pipeline design code (such as ISO 13623, ASME B31.4, ASME B31.8, BSI PD 8010, etc.).

- a. Class rated valves greater than DN 40 (NPS 1 ½) up to Class 2500 rating.
- b. Valves greater than DN 40 (NPS 1 ½) and greater than Class 2500 rating.
- c. PN rated valves.

*For valves that are part of piping systems designed in accordance with ASME B31.3, see the GIS 62-*** range of documents. For subsea valves, see GIS 43-352.*

2 Normative references

Add

API 6A718	Specification of Nickel Base Alloy 718 (UNS N07718) for Oil and Gas Drilling and Production Equipment.
ASME B16.11	Forged Fittings, Socket-Welding and Threaded.
ASME B16.20	Metallic Gaskets for Pipe Flanges Ring-Joint, Spiral Wound, and Jacketed.
ASME B31.3	Process Piping.
ASTM A194/A194M	Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature.
ASTM A275	Standard Test Method for Magnetic Particle Examination of Steel Forgings.
ASTM E165	Recommended Practice for Liquid Penetrant Inspection Method.
ASTM E562	Practice for Determining Volume Fraction by Systematic Manual Point Count.
ASTM E709	Standard Guide for Magnetic Particle Examination.
ASTM G48	Standard Test Methods for Pitting and Crevice Corrosion Resistance of Stainless Steels and Related Alloys by Use of Ferric Chloride Solution.
BSI PD 5500	Unfired fusion welded pressure vessels.
BSI PD 8010	Code of practice for pipelines.
SWIP/PCN	Certification Scheme for Welding & Inspection Personnel/Personnel Certification in Non-Destructive Testing.
DS 43-350	Data Sheet for Pipeline Gate Valves (non-subsea).
DS 43-351	Data Sheet for Pipeline Ball Valves (non-subsea).
DS 43-352	Data Sheet for Pipeline Check Valves (non-subsea).
EN 1092-1	Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, PN designated- Part 1: Steel flanges.
EN 12516, Parts 1 to 3	Valve shell strength.
EN 12982	Industrial valves - End-to-end and centre-to-end dimensions for butt welding end valves.
EN 13445	Unfired pressure vessels.



GIS 62-021	Guidance on Industry Standard for EEMUA 182 Integral Block and Bleed Manifolds.
ISA 93.00.01	Standard Method for the Evaluation of External Leakage of Manual and Automated On-Off Valves.
ISO 5752	Metal valves for use in flanged pipe systems – Face to face and centre to face dimensions.
ISO 9001	Quality systems model for quality assurance in design, development, production, installation and servicing.
ISO 10423	Petroleum and natural gas industries -- Drilling and production equipment -- Wellhead and christmas tree equipment.
ISO 15156	Materials for use in H ₂ S containing environments.
ISO 15848-1	Industrial valves - Fugitive emissions - Measurement, test and qualification procedures - Part 1: Classification system and qualification procedures for type testing of valves.
ISO 15607	Specification and qualification of welding procedures for metallic materials. General rules.
ISO 15609	Specification and qualification of welding procedures for metallic materials. Welding procedure specification. Arc welding.
ISO 15614	Specification and qualification of welding procedures for metallic materials.
ISO 17292	Metal ball valves for petroleum, petrochemical and allied industries.
MSS SP-55	Quality Standard for Steel Castings for Valves, Flanges and Fittings and Other Piping Components - Visual Method for Evaluation of Surface Irregularities.
NAS 1638	National Aeronautical Society standard for hydraulic cleanliness.
NORSOK M-630	Material data sheets for piping.
NORSOK M-650	Qualification of manufacturers of special materials
VDI 2440	Emission control - Mineral oil refineries.

3 Terms and definitions

Add

Double isolation valve

A single valve having two seating surfaces, each of which provides a seal against pressure from a single source. This feature may be provided in one direction or in both directions.

In the latter case, the seats of trunnion mounted ball valves do not automatically relieve body cavity overpressure.

5 Valve types and configurations

5.1 Valve types

5.1.1 Gate valves

Add

Hand operated valve gates shall move “down” to close. Actuated valve gates shall move “up” to close, unless otherwise specified.



Gate valves shall be of the full opening, through conduit type, suitable for the passage of pigs, unless otherwise specified.

Valves shall be of the rising stem, outside screw type, unless otherwise specified.

Slab type gate valves shall be “upstream plus downstream sealing” type, unless otherwise agreed.

Expanding type gate valves shall be of the “double expanding” type where the gate makes a seal with the seats in both open and closed positions, unless otherwise specified. The arrangements incorporated to prevent jamming during opening shall be advised.

5.1.3 Ball valves

Add

Valves may be end entry, top entry, or welded body, as specified.

Valves shall be trunnion mounted type.

Valves shall be full opening, through conduit type, suitable for the passage of pigs, unless otherwise specified.

5.1.4 Check valves

Add

Axial flow, nozzle check valves may also be used.

Single plate wafer style valves shall not be used.

5.2.1 Full-opening valves

Modify to Read

Full opening valves shall have an unobstructed opening not smaller than the bore of the end connections

5.2.2 Reduced-opening valves

Modify to Read

Reduced opening valves with a circular bore through the obturator shall be supplied with a minimum bore as follows unless otherwise agreed.

For valves less than or equal to DN 300 (NPS 12): One line size below nominal size of valve with bore according to Table 1.

For valves DN 300 to DN 600 (NPS 12 to NPS 24): Two line sizes below nominal size of valve with bore according to Table 1.

For valves > DN 600 (NPS 24): by agreement

Example: A DN 400 (NPS 16) reduced opening ball valve shall have a minimum bore of 287 mm (11,3 in).

6 Design

Add

Valves shall be bi-directional sealing.

Design pressure, design differential pressure, and max./min. design temperatures shall be as specified.



Pressure boundary design, including bolted joints, shall meet ASME VIII Div 1 or 2 or BSI PD 5500 or EN 13445 with allowance for pipe loads (during operation and installation), operating forces, etc.; and, if necessary, an increased design pressure to permit safe application of the hydrostatic shell test pressure. In addition, valve bodies having nominal sizes less than or equal to DN 300 (NPS 12) and a pressure rating less than or equal to Class 2500 or PN 420 shall meet the minimum wall thickness requirements of ASME B16.34 or EN 12516 Part 1 as appropriate for the specified rating, nominal size and material. Alternatively, valves may be designed in accordance with EN 12516 Part 2 using allowable stresses determined as required by ASME VIII Div.1. An appropriate assumption shall be made about pipe loads based on the strength of the connected pipe.

The basis for design shall be clearly stated in the proposal and any deviations from these requirements clearly identified.

Clause 6.1 specifies pressure classes by reference to ASME B16.34. Pressure boundary design, wall thicknesses, etc. are not specifically addressed in the reference standard so additional text in 6.0 has been included.

6.1 Pressure and temperature rating

Add

Weld end, compact connector, or compact flange valves greater than Class 900 rating and greater than DN 250 (NPS 10) size may be designed to an intermediate ASME Class by agreement with the purchaser if there is advantage in so doing. Such proposals shall be clearly identified in the bid as an alternative to the standard valve. Such valves shall have their pressure limitations clearly marked on the nameplate and valve body.

Standard flanged valves may not be designed to an intermediate rating because of the danger of their being transferred to a different application requiring a valve having the full flange rating.

Weld end valves may be designated as Special Class Valves. In this case the pressure/temperature ratings of ASME B16.34 for Special Class for the applicable material specification and the applicable Class Rating apply and the valves shall meet all the requirements of that standard. The required non-destructive examination shall be conducted in accordance with section 9 of this GIS.

For steel PN rated valves the pressure/temperature ratings applicable to the valve pressure containing shell (body, bonnet, etc.) shall be in accordance with those specified for PN rated flanges in the tables of EN 1092-1.

The PN valves listed in 6.1 do not relate to pressure and temperature rating tables and should be ignored.

For high pressure valves that are outside the scope of the reference standard, relevant clauses of the reference standard shall apply and valves shall be rated and designed in accordance with one of the following alternatives:

- a. ASME B16.34 standard ratings up to and including Class 4500.
- b. For weld end, compact flange valves and compact connector valves, an ASME B16.34 intermediate rating up to Class 4500.
- c. ISO 10423 (API SPEC 6A) 10 000 or 15 000 rating (PSL3 minimum) except that for austenitic, superaustenitic, duplex, and superduplex stainless steels the allowable stress limit S_m shall be the lower of $2/3 S_y$ at design temperature or $1/3 S_u$ at design temperature. Allowable stress limits shall also meet any requirements specified by the pipeline design standard.



The allowable stress limits of ISO 10423 (API 6A) are unconservative in the case of materials that do not exhibit a yield point and can result in "cold creep" if working or test stresses are high.

Valves so designed shall be tested in accordance with clauses 9 and 10 and meet all other relevant requirements, unless otherwise agreed. The API 6A monogram shall not be applied unless all requirements of that standard are also met. Weld end, compact connector, or compact flange valves may be designed to an API intermediate rating by agreement with the purchaser if there is advantage in so doing. Such proposals shall be clearly identified in the bid as an alternative to the standard valve. Such valves shall have their pressure limitations clearly marked on the nameplate and valve body and the API 6A monogram shall not be applied.

ISO 10423 (API 6A) makes no provision for intermediate ratings which can often provide a useful weight/cost saving.

Operating temperature limitations imposed by the sealing/seating materials, etc. shall be clearly identified in the proposal and marked on the valve nameplate.

6.3 Face-to-face and end-to-end dimensions

Add

Short pattern valves are not acceptable, unless specifically agreed.

Valves of nominal sizes larger than covered in ISO 14313 shall be to the valve manufacturer's standard face-to-face dimensions and be subject to approval by the purchaser.

For PN rated valves, face-to-face dimensions for flanged end valves shall be in accordance with ISO 5752 and end-to-end dimensions for butt-welding end valves shall be in accordance with EN 12982.

6.5 Valve operation

Add

Valves shall be operated by handwheel or lever or by pneumatic, hydraulic, or electric motor power actuators, as specified.

The valve manufacturer shall be responsible for the specification and performance of the combined valve and actuator/gear operator, unless otherwise specified.

Valve actuators and gear operators shall be mounted on the valves by the valve manufacturer at the factory, unless otherwise specified.

Valves shall be capable of being opened and closed against the design differential pressure.

Ball valve gearboxes and actuators shall be provided with adjustable mechanical stops for the open and closed positions. Gate valve gearboxes actuators shall be provided with an adjustable mechanical stop in the open position.

Gearboxes and actuators shall be fitted with a clearly visible, mechanical position indicator. If specified, they shall also be fitted with position switches indicating full open and closed positions, or a device providing a continuous read-out of position.

Hand operated valves shall be supplied with a gear operator as indicated in Table 6.5. Other sizes of valve may be provided with a gearbox as necessary (e.g., if fast closure may result in water hammer). In the case of reduced bore ball valves, the nominal sizes may be increased by 50 mm (2 in).

If a gear operator is provided, the number of handwheel turns required for a full stroke of the valve shall be advised.

