

INT ET 012/2006

**CONTROL VALVES
TECHNICAL SPECIFICATION**

REV.	FECHA	DESCRIPCION	PREPARADO POR	APROBADO POR



División
Industrialización

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1. SCOPE

This Technical Specification establishes the general requirements for the supply of Control Valves.

2. APPLICABLE DOCUMENTATION

The last editions of the following codes and standards will be followed.

- ASTM - American Society for Testing and Materials
- MSS - Manufacturers Standardization Society of the Valve and Fittings Industry
- ANSI - American National Standard Institute
 - ANSI B1.1 Nuts and bolts for process equipment
 - ANSI B1.20.1 Connection threads (NPT).
 - ANSI B4.1 Limits and adjustments for revolution pieces
 - ANSI B16.5 Flanges connections
 - ANSI B16.10 Dimensions between valve ends
 - ANSI B16.34 Welded, screwed and flanges valves
 - ANSI B16.37 Control valves hydraulic test
 - ANSI B16.104 Maximum losses allowed in valves
- ISA - Instrument Society of America
 - ISA RP550 I-6 Installation manual
 - ISA S75.01 Flow equations.
 - ISA S75.02 Capacity test procedures.
 - ISA S75.05 Terminology.
 - ISA S75.11 Inherent flow characteristics and "rangeability".
 - ISA S75.14 Globe valves with welded ends. Dimensions between ends.
 - ISA S75.15 Globe valves with welded ends. Dimensions between ends (CL 150, 300, 600, 900, 1500, 2500).
 - ISA S75.16 Globe valves with flanged ends. Dimensions between ends (CL 900, 1500, 2500).
- NEMA - National Electrical Manufacturers Association
- AISI - American Iron and Steel Institute
- ASME - American Society of Mechanical Engineers
- API - American Petroleum Institute
 - API Std 607 FIRE SAFE design for ball valves.
 - API RP6F Fireproof valves testing.
- FM - Factory Mutual System
 - FM 6033 Acceptance procedures for fireproof valves.
- NACE International
 - MR0103 Materials Resistant to Sulfide Stress Cracking in Corrosive Petroleum Refining Environments

3. GENERAL VALVE CHARACTERISTICS

- A. Whenever possible valves will be the manufacturer standard design provided they meet this specification requirements.
- B. Welded bodies or connections won't be accepted.
- C. Threaded bonnets will not be accepted. Also the bonnets shall be manufactured of the same material as the body.



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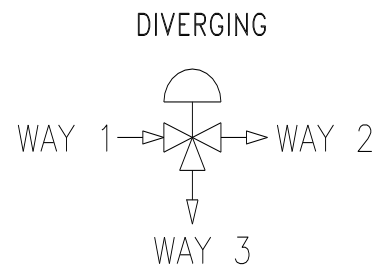
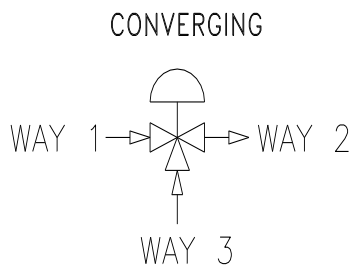
- D. Valve dimensions will meet the referred standards. The following diameters will not be accepted:
1 ¼", 2 ½", 3 ½", 4 ½", 5" and 7".
- E. Valves will have an arrow indicating the flow direction stamped or casted with the main body.
- F. Valve body minimum ratings shall be : 300 # RF for carbon steel body (250# FF for cast iron body) and pipe diameter from ½" to 4", for diameter higher to 4" rating must be according to rating of piping class associated.
- G. The specified materials will meet the detailed ASTM or AISI descriptions, or the standard characteristics and composition of the materials described by their commercial names, ej:
- Stellite: Co-Cr alloy or Alloy 6 from Cabot Co.
 - 17 - 4PH: stainless steel from Armco Co.
 - TFE: Polytetrafluorinethylene from Dupont Co., etc.
- H. Vendor standard quality materials will be used for other valve parts, actuators and accessories when not defined in this specification or the data sheets, according with the other specified materials and the process conditions.
- I. Stud bolts, nuts and bolts linking parts under pressure (ex. body, bonnet) will be made of the indicated quality materials or better, depending on the valve body material:
For carbon steel bodies:
- ASTM A 193 Gr. B7 for bolts and stud bolts.
 - ASTM A 194 Gr. 2H for nuts.
- For alloy steels and stainless steels:
- ASTM A 320 Gr. B8 class 2 for bolts and stud bolts
 - ASTM A 194 8 for nuts
- J. Bolts and stud bolts will meet the following codes:
- ANSI B16.5 and ANSI B1.1 CL2A
and nuts:
 - ANSI B18.2.2 and B1.1 CL2B
- J. Different materials can be offered for the valves provided they meet or exceed the specified requirements. A technical justification for these changes will be presented during the offering stage. This changes may be approved or not.
- K. "HRC" in the data sheets means "Hardness Rockwell C" and indicates the minimum value for the material.
- L. "ENC" in the data sheets refers to "Electroless Nickel Coating".
- M. The Vendor will verify the preliminary sizing of the control valves included in these specs and submit the calculations sheets with the proposal. The vendor will verify the calculations and indicate the selected CV for the valve offered (100% travel).
- N. The vendor will indicate the travel corresponding to min. and max. flow for the offered valve. Valves will not operate below 10% travel. For gas or two-phase services (flashing or cavitation) the vendor will assure that the sonic speed is not reached (Mach = 1) in the plug/seal area and outlet connection.
- O. The Vendor will be responsible for the noise calculations. This level will be below 85 dBA, measured at a distance of 3 feet from the output flange of the valve in any direction. If this level is exceeded, the vendor will propose the use of special design trims (low noise) or the addition of accessories (diffusers, silencers) to reduce the noise level below the mentioned value. Acoustic isolators on the valve or pipe are not allowed.
- P. Noise calculations will be submitted with the proposal for each valve with the sizing.



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- Q. Control valve Seat Leakage classifications indicated in the data sheets will be as per ANSI B16.104 standard.
- R. The packing design will avoid the possibility of being ejected by the internal pressure. For non Teflon packing (TFE), if recommended, the valve will include a lubrication system with an isolating valve. packing design must be : Teflon for temperatures 200° C and below, and for higher temperatures : Laminate Grafite (Grafoil).
- S. An easily removable seat with a threaded design will be preferred.
- T. When "*flashing*" service is indicated in the datasheets, it means there is "saturated liquid" at the input of the valve, at its bubbling point, and the liquid/vapor flows indicated correspond to the output flows after the flashing.
- U. Valves, actuators and accessories, shall be protected and suitable for operation in a salt laden marine atmosphere. All accessories shall have NEMA 4X / IP65 Enclosures.
- V. Convention used for Three Way Body Valves as following:



- W. Selection of control valves must consider : for globe valves that the normally flow shall be equal or lower than 70% of the valve capacity.
- X. When not indicated, all flanges ends shall be according to ANSI / ASME B16.5, finish serrated concentric 125 μm (3.2 μm) to 250 μm (6.4 μm) Ra – Max, Acc. To MSS SP-6 , and when indicated as finish serrated , Acc. To MSS SP-6
- For valves in hydrogen service flanges shall be serrated concentric 125 μm (3.2 μm) Ra – Max, Acc. To MSS SP-6 .
- Y. Control valves in hydrogen service shall have stamped the statement “ hydrogen serve”.
- Z. Control valves in hydrogen service shall have low emission packing, as indicated in data sheets.

4. DESIGN CONDITIONS

Control Valves must be selected according to ISA standards & recommended practices, anyhow ANCAP requires the performance of the following individual specifications:

- A. For high pressure drop application where critical flow condition can be reached the preferred design is to use two identical valves connected in series and operated with the same control signal.
To use in this situation only one valve, this valve shall be certified by the manufacturer to be use for high pressure drop applications. The pressure drop through the valve shall not be concentrated in a reduced trim area instead it shall be distributed along the valve.
Anticavitation trims shall not be allowed.



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- B. For erosive subcritical flow service with down stream pressure / up stream pressure relationship less than 0.75 and pressure drop greater than 5 Kgf/cm², the design shall follow this preference order:
- single seated contour plug, angle body, flow tending to close.
 - tight shut-off cage valve, flow over the seat.
 - single seated contour plug, globe body.
- C. Trim material selection shall be in accordance to:
- For services with pressure drop greater than 8 Kgf/cm² and/or solid particles suspended the plug and seat material shall be solid Alloy #6 (Stellite) and the cage material shall be 17-4PH Stainless Steel.
 - For pressures less than 8 Kgf/cm² and greater than 4 Kgf/cm² the plug and seat material shall be 316 Stainless Steel with Alloy #6 faced and the cage material shall be 17-4PH Stainless Steel.
 - For pressures less than 4 Kgf/cm² the plug and seat material shall be 316 Stainless Steel.
- D. Standard body material selection shall be in accordance to:
- Cast Carbon Steel ASTM A216-WCB for common service.
 - Type 316 Stainless Steel ASTM A351CF8M for water, steam, corrosive fluids (PH less than 7) and others specific applications.
 - 4-6% Chrome-Moly Steel ASTM A217-C5 for any specific applications.
- For particular service conditions other materials may be required.



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5. ACTUATORS CHARACTERISTICS

- A. Each valve will be supplied with its corresponding actuator as required in the data sheets.
- B. In general, actuators will be of the diaphragm type, simple effect with spring. Pneumatic diaphragm type actuators is the preferred design , other solution (per example piston type) shall require ANCAP approval.
- C. In all cases, the actuators sizing will be performed using the shutoff pressure of the datasheets as the max. static differential pressure the actuator will support. However, the vendor will consider for sizing, dynamic forces to be supported by the actuator with the valve partially or completely open. Actuator shall be sized to exceed 10 % the force needed to insure maximum allowable pressure drop when the valve is closed.
- D. Actuators will be sized considering the pneumatic pressure supply indicated in the datasheets, considered as a minimum. Pressures of up to 50% higher can be present. If necessary, pressure regulators will be supplied.
- E. Bleeding type regulators will not be accepted and the accessories like positioners and manual/solenoid valves will be sized to discharge in a line with a 0.5 Kg/cm² back pressure. All these connections will be NPT .
- F. The vendor will include a filter located before the regulator.
- G. When a hand wheel is specified with the pneumatic actuator, it will be mounted on the side of the valve-actuator assembly. Actuators with handwheel for manual valve control shall allow both actions, to close and to open the valve.
- H. In those cases requiring fireproof actuators, each one will be supplied with a certificate issued by FM (Factory Mutual-USA) or an equivalent international association, certifying the agreement and test of the fireproof condition.
- I. During the offering stage the vendor will indicate explicitly that the referred certificates will be submitted. In case of a different association than FM-USA, the vendor will present, under his total responsibility, a note indicating the equivalence between both associations. These associations will be independent, without any link with commercial firms.
- J. Maximum air supply pressure to final control elements shall not exceed 70 PSIG.
Admissible pneumatic control signal ranges: standard 3-15 PSI; exceptionally according to special service requirements 6-30 PSI and / or split range (example valve "A" 3-9 PSI, valve "B" 9-15 PSI).
- K. The valve positioner shall be of smart type that can digitally communicate with DCS through Field bus foundation or Hart standard (fulfilling the EDDL specification – IEC 61804).
The positioner shall provide advanced diagnostics, for example:
 - Valve Signature
 - Dynamic Error Band
 - Drive Signal
 - Output Signal
 - Step ResponseThe positioner shall provide local indication of the air supply pressure, the output, the control signal and the actual position. Conversion between direct and reverse action shall be possible.
- L. Actuator springs exposed to the atmosphere will be protected against corrosion (electrochemical protection) and painted following the vendor standards.
- M. The flow direction (to close/open) will coincide with the valve safe position. If not, the spring will be designed with a 2 safety factor.



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- N. Actuator material and coating must be suitable to continuous operation in atmospheres with normal corrosion grade for petroleum refineries (fundamentally H₂S). In particular this applies to actuator stem tied to diaphragm.
- O. It shall not be allowed to use equal percentage positioner cam in order to convert a linear characterist valve to a an equal percentage one.

6. ACCESSORIES

- A. The stem position will be indicated on a scale with a pointer, directly attached to it.
- B. All accessories required and/or supplied with the valve (yokes, etc.) will be mounted on it. For elements of the pneumatic circuit it will also be furnished all the tubing and fittings required to conform a fully operational unit.
- C. For normal services, 1/4" (minimum diameter) copper tube with flare less bronze or iron NPT fittings will be used. For fireproof actuators, stainless steel tube and NPT fittings will be used. All accessories will be of the double ferrule type.
- D. When solenoid valves are specified the following type shall be supplied: 3 way - 24 VCC - IS: with weather proof and watertight case NEMA 4x / IP65, to be used with intrinsically safe barriers certified by FM-USA, 24 Vcc, three (3) electrical connections NPT, with internal terminals continuous service. ASCO or similar.
- E. When a fireproof actuator is specified, the accessories (solenoid valves, etc.) will meet this requirement. Fire protections or similar can be used to assure the operation during the emergency condition(fire).
- F. Limit switches, when specified, will be NEMA 4X, for intrinsically safe circuits FM-USA. They will have one (1) SPDT switch, 24 Vcc - 2A. Each valve will use two limit switches (valve open "ZSO" / close "ZSC").
- G. Pneumatic valves 2 POS - 3 ways - manual operation, when specified, will have a non-return lever with an "open-close" indicator, located on the body or yoke of the main valve, accessibly by the operator, with a stainless steel body and NPT electrical connections.
- H. Solenoid valves for control valves, except when specified in contrary, will be mounted between the positioner and the diaphragm in such a way that when de-energized the diaphragm chamber will be vented and the valve go the fail position.

7. SPARE PARTS

- A. This supply will include a list of spare parts (with braked prices) for start-up and/or plant operation as indicated in Material Requisition.
- B. Spare parts that will definitely be included in the supply (with unit prices in the proposal) are:
- one (1) set of gaskets per installed valve.
 - one (1) set of packing per installed valve.
 - one (1) trim that include: plug, seat/s, cage (if type cage), stem, guides, internal joints per every five valves for each type and size.
 - One (1) diaphragm per every ten valves for each type and size.
 - One (1) complete positioner per every ten of each model.



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8. INSPECTIONS AND TESTS

- A. Hydraulic tests for the body and seat of the valves may be required. In that case, the vendor will submit a recommended test procedure for client approval.
- B. Manufacturing or material origin (bodies/internals) certificates may be required.
- C. Non-destructive material tests as per ASME code will only be performed if it is explicitly required.
- D. For different materials the following techniques will be used: x-rays, ultrasound, penetrating inks or magnetic particles.
- E. The INSPECTION may require each valve, totally assembled, to be operated three times at the factory, under pressure conditions, to demonstrate the whole assembly is operative. All the required equipment for the test will be provided by the vendor.
- F. For each fire proof actuator an individual certificate will be required stating that condition, as established in the corresponding paragraph.

9. PROPOSAL

The proposal will be accompanied with the corresponding sizing and noise calculations for each valve plus the remainder of the required documentation.