B2 Test Facility
at
NASA Stennis Space Center

Liquid Oxygen Valve Package: Globe Valves

Specification Number

11BHF-GM01

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APPROVED:

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GENERAL REQUIREMENTS

1.1 SUMMARY

The work to be performed under this project consists of the design, fabrication, inspection, testing and delivery to Stennis Space Center, Stennis, Mississippi the valves indicated in the data sheets in the Appendix.

1.2 REFERENCES

AMERICAN SOCIETY OF NON DESTRUCTIVE TESTING (ASNT)

ASNT-TC-1A – Manual of Recommended Practice

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE AS5202	Bosses, Fluid Connector – Internal Straight Thread

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) BOILER AND PRESSURE VESSEL CODE

ASME B16.5	Pipe Flanges and Flanged Fittings
ASME B16.9	Factory Made Wrought Steel Butt Welding Fittings
ASME B16.34	Valves – Flanged, Threaded and Welding Ends
ASME B31.3	Process Piping

NASA & SSC STANDARDS AND SPECIFICATIONS (SSC)

NASA-RPT-STD-8070-0001	SURFACE CLEANLINESS STANDARD FOR FLUID SYSTEMS FOR ROCKET ENGINE TEST FACILITIES OF THE NASA ROCKET PROPULSION TEST PROGRAM
NASA-STD-5008B	Protective coating of carbon steel, stainless steel, and aluminum on launch structures, facilities and ground support equipment.

SSC-DWG No. 54000-GM30

SPECIFICATION FOR MATERIALS USED IN LOX OR GOX SERVICE EXEMPT FROM BATCH TEST REQUIREMENTS

1.3 SUBMITTALS

The following shall be submitted in sufficient detail to show full compliance with the specification:

Data

The Contractor shall furnish design calculations covering performance features of the valve and actuator package. Design calculations for the valve shall be submitted with the shop drawings. These are due no later than three weeks after award of the contract. Design calculations shall include:

Actuator Sizing (specifically a force balance showing the valve can perform under full differential pressure)

Drawings

Shop Fabrication Drawings shall be submitted of each valve and of each shop assembly component as needed for the assembly of the valve, due at the conclusion of the contract. Shop drawings shall show the location and details of:

all dimensions and details of construction
lifting points
center of gravity (of complete valve assembly)
support design requirements (as needed)
bill of Materials

Schedules

A copy of Fabrication time and test and inspection schedules shall be submitted no later than three weeks after award of contract.

Statements

The Contractor shall submit the following items within three weeks after award of contract:

Detailed drawing of valve including vacuum jacket
Cleaning Procedures
Hydrostatic Leak Check Procedures
Functional Test Procedures
Painting Specifications and Procedures (if applicable)
Complete listing of all materials for soft goods per SSC-DWG No 54000-GM30.

Reports

Prior to shipment, the Contractor shall submit a copy of the following items:

Mill Test Reports for all metallic components
Hydrostatic Test Report including test set-up configuration and log of time versus pressure
Functional Test Report
Cleaning and Sampling Report
Documentation showing valves are ASME B31.3 compliant

1.4 REQUIREMENTS

Each valve shall be designed, fabricated, tested, cleaned and delivered in accordance with the detailed requirements of this specification and the attached data sheets. The requirements specified herein are minimum requirements. The Contractor shall take whatever additional measures are necessary in his design, fabrication, inspection and testing to produce a valve, which will satisfactorily pass the tests specified herein without damage. Where specific requirements are set forth, and where such specific requirements depart from requirements or alternatives contained in any documents referenced herein, the specific requirements contained herein shall govern and take precedence. The general requirements for each type of valve are provided within the body of this specification with specific requirements for each valve type provided in data sheets located in the appendices.

1.5 QUALITY ASSURANCE

The Contract Administrator and Government reserve the right to inspect all work at all times during and upon completion of fabrication and to witness any or all tests. The Contractor shall cooperate fully to enable the SSC COTR or Government designated representative to be present at the performance of any or all tests and any other activity as specifically requested. The Contractor shall furnish all equipment and materials for all tests except where specially stated otherwise. The Contractor shall notify the COTR fourteen calendar (14) calendar days prior to performance of any and all tests.

As a minimum, the following hold points shall apply:

Item No.	Surveillance	Type
1	Government review and approval of actuator sizing calculations	Verification
2	Cleaning & Packaging of valve for shipment	Witness
3	Hydrostatic Test	Witness
4	Functional Test (as identified in data sheets)	Witness

1.6 WELDING PROCEDURE AND WELDING OPERATOR QUALIFICATIONS

Welding procedure and welders qualifications shall be performed in accordance with Section IX of the ASME Boiler and Pressure Vessel Code.

1.7 GUARANTEE

All equipment to be furnished under this specification shall be guaranteed against defective materials, design, and workmanship for a period of one year from receipt of the valve. Upon receipt of notice of failure of any part of the guaranteed equipment during the guarantee period, new replacement parts shall be furnished and installed promptly by the Contractor at no additional cost. The Contractor shall acknowledge his responsibility under these guarantee provisions by letter, stating the inclusive dates of the guarantee period for which the equipment and materials referred herein are guaranteed.

1.8 TESTING

All valves shall be hydrostatically tested to 1.5 times the MAWP and held for 10 minutes. The hydrostatic test pressure and test date shall be permanently marked on the valve body.

All valves shall be functionally tested per the attached data sheet.

1.9 CLEANING

Valves shall be cleaned to the level indicated on the data sheet per NASA RPT STD 8070-0001. A report showing the particulate and/or NVR sampling results must be kept and submitted at the end of the contract. After cleaning and verification of clean level, valves shall be packaged in accordance with NASA RPT STD 8070-0001.

-- End of Section --

APPENDIX A

GLOBE VALVES FOR LIQUID OXYGEN SERVICE

2.5" Globe Valve Data Sheet

- Nominal Size: 3" valve with 2.5" connections
- Valve Type: Rising Stem Globe Valve
- Maximum Allowable Working Pressure/Design Pressure: 720 psig
- Maximum Operating Pressure: 720 psig
- Temperature Rating: -320 °F to +120 °F
- Materials of Construction:
  - Body: A286 SS, 316L SS, 304L SS
  - Shaft/Disc: A286 SS, 316L SS, 304L SS
  - Seals: Spring energized Virgin PTFE and Virgin PTFE chevron type packing per SSC-DWG No. 54000-GM30
  - Seat: PCTFE per SSC-DWG No. 54000-GM30.
  - Guides: Copper Alloys, Bronze Alloys, Nickel-Copper Alloys
- End Connections: 2.5" 300# RF WN ANSI Concentrically Serrated Flange w/Reducer
- Face-to-Face Dimension: 24.175"
- Service Fluid Compatibility: Liquid Oxygen, Gaseous Nitrogen, Liquid Nitrogen
- Service Fluid: Liquid Oxygen
- Cleanliness Level: Level 400A per NASA RPT STD 8070-0001
- Minimum Required Cv: 150
- Actuator Type: Double Acting, spring to fail, pneumatic piston actuator
- Stroke Time: 3 seconds to close
- Stroke Time: 3 seconds to open
- Fail Position: Fail Closed
- External Operating environment of valve will be +20°F to +120°F and 100% relative humidity
- Valve will be subject to deluge water spray
- All valves shall have material certifications traceable by manufacturer's serial number.
- Valve must have lifting lugs.
- No metric threads are allowed
- All welds must meet ASME Boiler and Pressure Vessel Code, Div. 1 sections II, V, VIII, IX. Welds must be backed with Argon only, no Nitrogen.
- The Government reserves the right to inspect any or all component piece parts for cleanliness and workmanship prior to assembly with advanced two week notice.
- Valve must be hydrostatically proof tested to 1.5 times design pressure rating and held for a minimum of 10 minutes.
- Valve shall be permanently marked in the following way:
  - Manufacturer
  - Model #
  - Serial #
  - Nominal Size
  - MAWP
  - Temperature Rating
  - Max Cv
  - Proof Test Type / Pressure / Date
  - Weight
  - Flow Direction Arrow
- Manufacturer must supply any special tools needed for disassembly or reassembly of valve
- Manufacturer shall supply two (2) sets of spare softgoods with delivery of valve. A softgood set shall be defined as any and all non-metallic parts, plastic parts, parts recommended to be changed every time the valve is reassembled, and parts that experience severe wear.
- Valve shall be functionally internally leak tested in primary direction of flow with gaseous nitrogen at Maximum Operating Pressure for no less than 3 minutes. Acceptable leakage is no more than 1 standard cubic centimeter per minute per inch of nominal valve size. No external leakage is acceptable.

- Along with valve, delivery shall include detailed drawings of valve, test procedures, and material certifications for both metal parts and soft goods.
- Valve shall be provided with pneumatic actuator with the following specifications:

- Valve actuator tubing and tube fittings shall be made of a 300 series stainless steel, except that type 303 stainless steel is not permitted. All carbon steel external surfaces shall be coated with a fully bonded, abrasion resistant, and water-tight paint or coating system in accordance with requirements specified in NASA-STD-5008B. Insulating spacers, barriers, grommets shall be utilized to prevent contact between dissimilar metals in locations where moisture entry and accumulation is possible. Composite or non-metallic cylinders are not allowed.

  The actuating medium will be air or nitrogen gas at a nominal supply pressure of 100 psig. Upon complete loss of actuating pressure, the spring shall be capable of stroking the valve to its fail position with a differential pressure across the seat equal to the valve's maximum operating pressure, where this differential pressure opposes the actuator motion. Valve opening/closing time shall be varied within the time ranges provided via a variable orifice metering valve on the actuator exhaust port.

  Pneumatic supply and vent connections on the cylinder shall be 1/2" to ¾" FNPT or shall be 1/2" to ¾" SAE AS5202 straight threaded connectors. Actuator shall be double acting with spring assist to failure position and sized and configured such that it can cycle the valve from full open to full close and vice versa within the maximum allowed stroke range specified above and with a differential pressure across the seat equal to the valve's maximum operating pressure, where this differential pressure opposes the actuator motion.

  Solenoid valves shall be constructed of stainless steel. Solenoid valves shall operate on 24-28 VDC, less than 2 Amps. Solenoids shall be rated for minimum 350 PSIG service in dry, oil free nitrogen or compressed air. Solenoid valves shall be constructed to pull in with a minimum voltage of 18 VDC.

  Actuator shall be functionally tested to maximum allowable working pressure (MAWP). Test pressure and date shall be stamped on the actuator housing.

  Two limit switches are required, one is to indicate the fully open valve position and the other is to indicate the fully closed valve position. Limit switches shall be magnetic proximity type and approved for Class 1, Div. 2, Group B per the National Electric Code.

  With the exception of the control solenoid valves, all electrical components and all wiring, including control and instrumentation wiring, mounted to the valve assembly, shall conform to the requirements of the National Electric Code, Article 500, "Hazardous Locations", for Class I, Div. 2, Group B locations.

3" Globe Valve Data Sheet

- Nominal Size: 3"
- Valve Type: Rising Stem Globe Valve
- Maximum Allowable Working Pressure/Design Pressure: 720 psig
- Maximum Operating Pressure: 720 psig
- Temperature Rating: -320 °F to +120 °F
- Materials of Construction:
  - Body: A286 SS, 316L SS, 304L SS
  - Shaft/Disc: A286 SS, 316L SS, 304L SS
  - Seals: Spring energized Virgin PTFE and Virgin PTFE chevron type packing per SSC-DWG No. 54000-GM30
  - Seat: PCTFE per SSC-DWG No. 54000-GM30.
  - Guides: Copper Alloys, Bronze Alloys, Nickel-Copper Alloys
- End Connections: 3" 300# RF WN ANSI Concentrically Serrated Flange
- Face-to-Face Dimension: 17.375"
- Service Fluid Compatibility: Liquid Oxygen, Gaseous Nitrogen, Liquid Nitrogen
- Service Fluid: Liquid Oxygen
- Cleanliness Level: Level 400A per NASA RPT STD 8070-0001
- Minimum Required Cv: 150
- Actuator Type: Double Acting, spring to fail, pneumatic piston actuator
- Stroke Time: 3 seconds to close
- Stroke Time: 3 seconds to open
- Fail Position: Fail Closed
- External Operating environment of valve will be +20°F to +120°F and 100% relative humidity
- Valve will be subject to deluge water spray
- All valves shall have material certifications traceable by manufacturer's serial number.
- Valve must have lifting lugs.
- No metric threads are allowed
- All welds must meet ASME Boiler and Pressure Vessel Code, Div. 1 sections II, V, VIII, IX. Welds must be backed with Argon only, no Nitrogen.
- The Government reserves the right to inspect any or all component piece parts for cleanliness and workmanship prior to assembly with advanced two week notice.
- Valve must be hydrostatically proof tested to 1.5 times design pressure rating and held for a minimum of 10 minutes.
- Valve shall be permanently marked in the following way:
  - Manufacturer
  - Model #
  - Serial #
  - Nominal Size
  - MAWP
  - Temperature Rating
  - Max Cv
  - Proof Test Type / Pressure / Date
  - Weight
  - Flow Direction Arrow
- Manufacturer must supply any special tools needed for disassembly or reassembly of valve
- Manufacturer shall supply two (2) sets of spare softgoods with delivery of valve. A softgood set shall be defined as any and all non-metallic parts, plastic parts, parts recommended to be changed every time the valve is reassembled, and parts that experience severe wear.
- Valve shall be functionally internally leak tested in primary direction of flow with gaseous nitrogen at Maximum Operating Pressure for no less than 3 minutes. Acceptable leakage is no more than 1 standard cubic centimeter per minute per inch of nominal valve size. No external leakage is acceptable.

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  The actuating medium will be air or nitrogen gas at a nominal supply pressure of 100 psig. Upon complete loss of actuating pressure, the spring shall be capable of stroking the valve to its fail position with a differential pressure across the seat equal to the valve's maximum operating pressure, where this differential pressure opposes the actuator motion. Valve opening/closing time shall be varied within the time ranges provided via a variable orifice metering valve on the actuator exhaust port.

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  Actuator shall be functionally tested to maximum allowable working pressure (MAWP). Test pressure and date shall be stamped on the actuator housing.

  Two limit switches are required, one is to indicate the fully open valve position and the other is to indicate the fully closed valve position. Limit switches shall be magnetic proximity type and approved for Class 1, Groups A, B, C and D per the National Electric Code.

  With the exception of the control solenoid valves, all electrical components and all wiring, including control and instrumentation wiring, mounted to the valve assembly, shall conform to the requirements of the National Electric Code, Article 500, "Hazardous Locations", for Class I, Div. 2, Group B locations.

APPENDIX B1

NASA RPT-STD-8070-0001

SURFACE CLEANLINESS STANDARD FOR FLUID SYSTEMS FOR ROCKET ENGINE TEST FACILITIES OF THE NASA ROCKET PROPULSION TEST PROGRAM

APPENDIX B2

NASA-STD-5008B

PROTECTIVE COATING OF CARBON STEEL, STAINLESS STEEL, AND ALUMINUM ON LAUNCH STRUCTURES, FACILITIES AND GROUND SUPPORT EQUIPEMENT

APPENDIX B3

SSC-DWG No. 54000-GM30

SPECIFICATION FOR MATERIALS USED IN LOX OR GOX SERVICE EXEMPT FROM BATCH TEST REQUIREMENTS