

**TECHNICAL SPECIFICATION OF
MANUAL CRYOGENIC GLOBE VALVES**

Valve Type:

Manually Operated Extended Stem Cryogenic Bellow sealed Globe valves: **MO-ESBSGV**

Tag number	:	As given in Table-1A
Quantity	:	As given in Table-1A
Pattern	:	Globe
Actuation	:	By Hand wheel operation (manual)
Configuration of ports/ways	:	As given in Table-1A
Application	:	Shut-off/ isolation
Fluid medium	:	As given in Table-1A
Working temperature range	:	As given in Table-1A
Nominal size (mm)	:	As given in Table-1A
Maximum Allowable Working Pressure (MAWP)	:	As given in Table-1A
Valve coefficient	:	To be specified by the bidder in the quotation
<u>Permissible leakage rate across body</u>	:	1E-7 Pa-m ³ /s (1E-6 mbar l/s.) of GHe
<u>Permissible Helium leakage rate across seat</u>	:	1E-6 Pa-m ³ /s (1E-5 mbar l/s.)
Guaranteed operation	Cycle of	: 5,000 cycles

End connection:

- **BW**: Butt welding ends as per ASME B 16.25 / 16.9. Pipe stubs as per ASME B 36.10 / 36.19 of 100 mm length each shall be butt-welded to the body on either side, the ends of which shall be prepared for butt welding. The butt welding ends shall be suitable to mate with the interfacing pipe size & schedule as per Table 1A.

Style of construction:

Body	:	With full port (standard bore) and in-line end connections
Bonnet	:	Bolted or screwed to body with metal seals/ spring energized seals (such as Helicoflex, Enerseal, etc)/ any other suitable seals. The body bonnet joint shall be located on top of the stem extension such that the seal experiences near-ambient temperature. The stem extension shall be as per design code. The stem shall be of non rotating type.
Stem	:	Non-rotating, rising stem. The stem operation for high pressure valves may be assisted by requisite bearing for easy operation of valve stem with/without load.
Length of stem extension	:	As per BS 6364 or equivalent
<u>Stem (dynamic) seal</u>	:	By bellows with redundant gland packing. Between the bellows seal and the redundant gland packing, a <i>tell-tale</i> indicator pressure gauge shall be provided.
Plug	:	Renewable (replaceable) from stem
Seat	:	Renewable from body with seat insert. (Alternatively Seat may be

	integral with body provided that it is harder than the plug insert)
Shut off Mode	: Bi-directional shut off
Flow direction	: Flow-to-open (Flow-under-plug) and all the valves shall have bi-directional shut-off.
<u>Material of construction:</u>	
Body and bonnet	: ASTM A 182 F 304/ 316/ 304L/ 316L/ 321 (or) ASTM A351 CF 3/3M /CF 8/8M
Stem, plug, seat	: ASTM A 479 304/316/ 304L/ 316L/ 321
Bellows	: Stainless steel 316L/ 316Ti/ 321/ Hastelloy C 276/ Inconel 600/ 625/Incoloy
Gland packing	: PTFE/ Glass-filled PTFE/ PEEK/PCTFE (Kel-F)
Plug & Seat insert	: PCTFE (Kel-F)/ Polycarbonate
Pipe stub	: Seamless pipe - ASTM A 312 TP 304L/316L
Bolts	: ASTM A 193 Gr B 8
Nuts	: ASTM A 194 Gr 8
The valves shall be either inherently anti-static or provided with anti-static features.	
Design code	: BS5352 / BS 6364/ API 6-D/ ASME B16.34 or equivalent
Test code	: BS6755 / BS5155/ API 598/API 607 ASME B 16.34 or equivalent
Note:	
1. The valves shall be either inherently anti-static or provided with anti-static features.	
2. Alternative materials, if chosen as per manufacturer's standards, for any of the above parts the same shall be subject to approval by the purchaser.	

Tests:

- a. Material test certificates: The material test certificates, detailing the physical and chemical properties, of the principal pressure-bearing parts shall be provided.
- b. Dimensional Inspection: All valves have to be subjected to dimensional inspection as per the approved drawings.
- c. Welding joint test (wherever applicable): All butt welding joints in the valve (including the joints between the body and the pipe stubs) shall be subjected to dye-penetrant test and radiographic test with X-rays or gamma rays to 2% sensitivity as per Section IX, ASME. All the butt & socket welding joints shall be subject to dye-penetrant test.
- d. Bellows cyclic life test: 3 Sample bellows drawn from each batch of the same size and type shall be subjected to (destructive) cyclic life (proto-type) test as per BS 5352/relevant standards. **If the manufacturer of the bellows has already performed such test, copy of the certificate may be produced.**
- e. Pre-assembly hydraulic shell pressure test: The valve shell, prior to assembly with the bellows, in partially open position, shall be subjected to pressure test with Water (with suitable corrosion inhibitor) at 1.5 times the maximum rated working pressure of the particular pressure rating class of the valve.
- f. Pneumatic shell pressure test: The valve, upon final assembly including the bellows, in partially open position shall be subjected to pressure test with dry air or GN2 at 1.1 times the maximum rated working pressure of the particular pressure rating class.
- g. Pneumatic seat pressure test: The valve, in closed position, shall be subjected to pressure test at 1.1 times the maximum rated working pressure of the particular pressure rating class of the valve.
- h. MSLD shell leakage test: The valve in open position, the global leakage rate across body shall be measured with gaseous Helium Mass Spectrometer Leakage Detector (MSLD) to establish the permissible leakage rate values specified above by *hood technique* as per Article 10, Section V, ASME. The leakage test shall be performed by shrouding the entire outside surface of the valve with a plastic bag to hold gaseous Helium at a positive pressure and by evacuating and connecting the inlet/ outlet port to MSLD.

Leakage test by detector probe or tracer probe technique is not acceptable.

- i. MSLD seat leakage test: The global leakage rate across seat shall be measured with gaseous Helium MSLD to establish the permissible leakage rate values specified above by *hood technique* as per Article 10, Section V, ASME. The leakage test shall be performed by pressurizing the inlet not less than 25% of Maximum rated working pressure of particular pressure rating class of the valve with gaseous Helium and by evacuating and connecting the outlet to MSLD. Leakage test by detector probe or tracer probe technique is not acceptable.
- j. Functional Test: Each valve has to be subjected to functional test for free operation of valves to the full stroke length.
- k. Ultrasonic test: 100% ultrasonic test shall be conducted for the pipe stubs.
- l. Soundness test for castings (wherever applicable): All the castings/Forgings/pipe/Machined pressure bearing components shall be subjected to soundness test with radiographic or ultrasonic technique for flaw detection.

Cleanliness

All the interior flow surfaces of the valve shall be degreased and cleaned to Oxygen service standards as per CGA G-4.1 or MIL-C-52211 or ASTM G 93. The valves shall be dispatched with end connection sealed by suitable plastic plugs to avoid contamination during transportation.

Marking

All the valves are assigned tag numbers for the sake of identification. The tag number for each valve, as indicated above, besides size, pressure rating class, material of construction, etc, shall be legibly and indelibly engraved on the body of the valves.

Quality Assurance Plan (QAP) as per Table 1B

Table 1A: List of Manual Cryogenic Globe valves

Sl. No.	Tag No	Valve type	Configuration of Ports / ways	Fluid medium	Working Temperature (K)	Pressure rating Class	MAWP, MPa	Nominal Size (mm)	End connection	Pipe Schedule	Qty (Nos.)
1	UVM 1001, 1003, 1004, 1005, 1012 & 1013	MO-ESBSGV	2/2	LOX / LN2	75-323	150#	1.4	DN 15	BW with pipe stub	10S	6
2	UTV 1001 (Three way manual change over valve)	MO-ESBSGV	3/2	GO2 / GN2	75-323	150#	1.4	DN 25	BW with pipe stub	10S	1
Total											7

Note:

1. Manually Operated Extended Stem Cryogenic Bellow sealed Globe valve : **MO-ESBSGV**
2. LOX- Liquid Oxygen
3. LN2- Liquid Nitrogen
4. GO2- Gaseous Oxygen
5. GN2- Gaseous Nitrogen

Table 1B: QUALITY ASSURANCE PLAN FOR MANUAL CRYOGENIC GLOBE VALVES

S No	Test	Object tested	Characteristic sought for	Sample size	Test procedure	Acceptance criterion	Form of record	Test performed by	Test witnessed & certified by	Record reviewed by
1.	Material test	Specimen from raw materials	Chemical composition and physical properties	1 per heat/lot	Relevant standard	Relevant material specification	Material certificate	Vendor or Third party laboratory	-	Vendor, Inspector
2.	Bellows cyclic life test	Bellows	Cyclic life under fatigue	3 per batch of same size and type	BS 5352	BS 5352	Test certificate	Sub-vendor	-	Vendor, Inspector
3.	Welding joint test (wherever applicable)	Socket welding joints	Absence of surface defects	100 %	Dye penetrant test	Relevant standard	Test certificate	Vendor	-	Inspector
		Butt welding joints	Absence of defects	100 %	Radiographic test	ASME, Section IX	Test certificate	Vendor	-	Inspector
4.	Soundness test for castings (wherever applicable)	Castings	Absence of defects	100 %	Radiographic or ultrasonic test	Relevant standard	Test certificate	Vendor	-	Inspector
5.	Ultrasonic test for pipe stub (Wherever applicable)	Pipe of size \geq DN 25	Internal flaw detection	100%	ASTM E 213	ASTM E 213	Test certificate	Sub-Vendor/vendor	-	Vendor/Inspector

S No	Test	Object tested	Characteristic sought for	Sample size	Test procedure	Acceptance criterion	Form of record	Test performed by	Test witnessed & certified by	Record reviewed by
6.	Eddy current test for pipe stub (Wherever applicable)	Pipe of size \leq DN 20	Internal flaw detection	100%	ASTM E 426	ASTM E 426	Test certificate	Sub-Vendor/vendor	-	Vendor/Inspector
7.	Dimensional check	Valve	Dimensions	100 %	Metrology	Relevant standard/ Purchaser-approved drawing	Test report	Vendor	-	Inspector
8.	Pre-assembly hydraulic shell pressure test	Valve before assembly with bellows	Structural integrity under stress	100 %	1.5 times maximum rated working pressure	BS 6755 Part 1/BS 5155/ API 598/ API 607/ ASME B 16.34	Test certificate	Vendor	Inspector	Inspector
9.	Final shell pressure test	Valve after assembly with bellows	Structural integrity of body under stress	100 %	1.1 times maximum rated working pressure	BS 6755 Part 1/BS 5155/ API 598/ API 607/ASME B 16.34	Test certificate	Vendor	Inspector	Inspector
10.	Pneumatic seat pressure test	Valve in closed position	Structural integrity of seat under stress	100 %	1.1 times maximum rated working pressure	BS 6755 Part 1/BS 5155/ API 598/ API 607/ASME B 16.34	Test certificate	Vendor	Inspector	Inspector

S No	Test	Object tested	Characteristic sought for	Sample size	Test procedure	Acceptance criterion	Form of record	Test performed by	Test witnessed & certified by	Record reviewed by
11.	MSLD shell leakage test	Valve in open position	Leakage rate across body	100 %	ASME, Section V, Article 10	Purchase order specification	Test certificate	Vendor	Inspector	Inspector
12.	MSLD seat leakage test	Valve in closed position	Leakage rate across seat	100 %	ASME, Section V, Article 10	Purchase order specification	Test certificate	Vendor	Inspector	Inspector
13.	Cleanliness	Valve	Cleanliness for Oxygen service	100 %	CGA G - 4.1/ASTM G 93	CGA G - 4.1/ASTM G 93	Certificate	Vendor	-	Inspector

Note: 1. Inspector: Third party inspection agency.