

CRANE

CRYOFLO^{H₂}

Keeping Cryogenics Cool

LIQUID HYDROGEN
BELLOWS
SEAL GLOBE

VALVE

www.cranecryoflo.com

brands you trust.

REDUCED HEAT FLUX. INCREASED FLOW RATE.

CRANE CRYOFLO® Bellows Seal Globe Valves stop Hydrogen loss by minimizing heat transfer rates, reducing pipeline latency in liquid transfer applications and leveraging bellows zero-leak design.

CRANE ChemPharma & Energy



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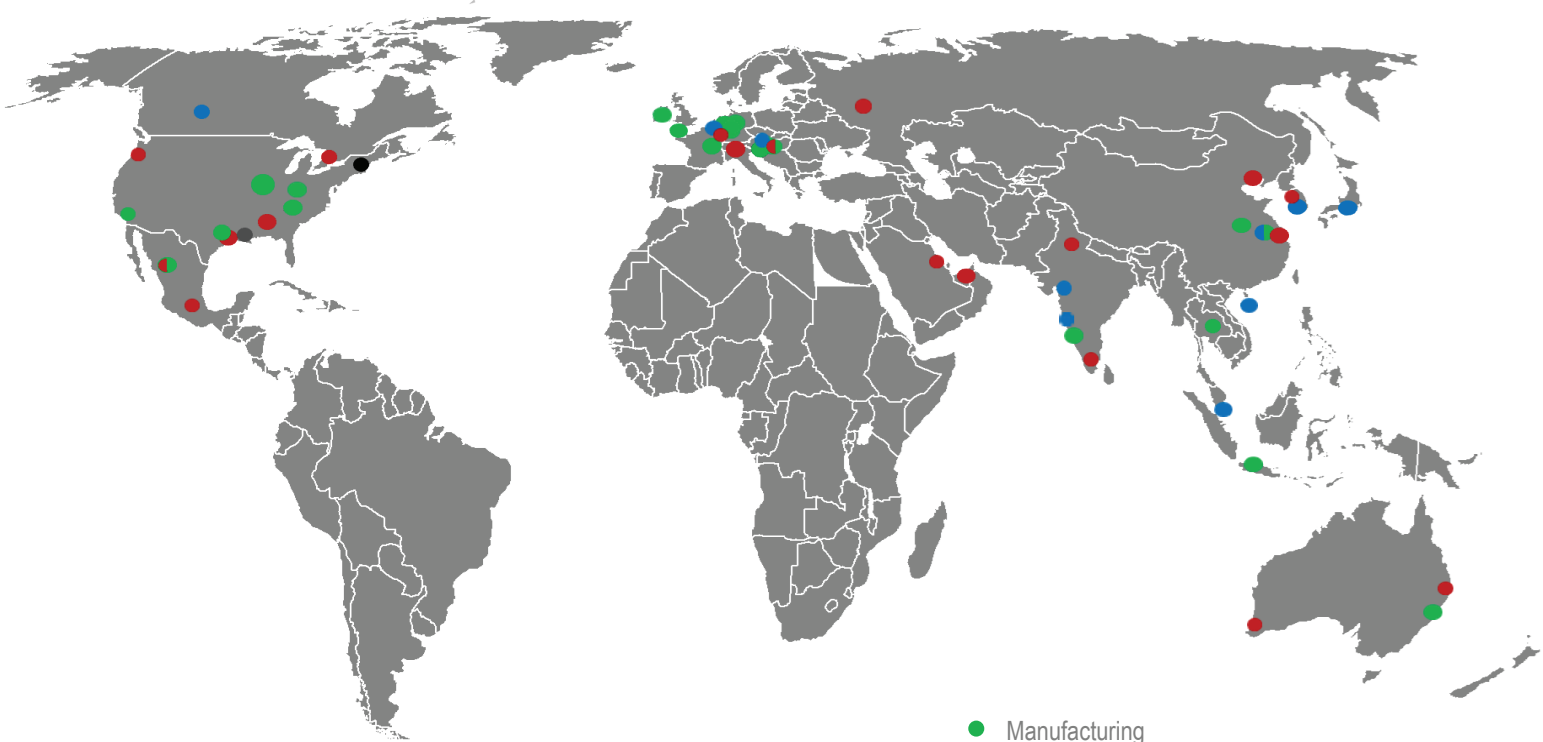


Crane ChemPharma & Energy **INTRODUCTION**

Crane Co. is a diversified manufacturer of highly engineered industrial products with a substantial presence in a number of focused niche markets. We are dedicated to integrity and honest dealings in all that we do.

Crane CP&E designs and manufactures a variety of high performance products including: highly-engineered check valves, sleeved plug valves, lined valves, process ball valves, high performance butterfly valves, bellows sealed globe valves, aseptic and industrial diaphragm valves, multi/quarter-turn valves, actuation, sight glasses, lined pipe, fitting and hoses, and air-operated diaphragm and peristaltic pumps. Its trusted brands are in use worldwide in many industries, including Oil & Gas, Oil Refining, Petrochemical, Power Generation, Chemical Processing, Biotechnology, and Pharmaceutical.

Crane CP&E WORLDWIDE



- Manufacturing
- Service
- Other (Office/Warehouse/Foundry)

CPE MANUFACTURING SITES (Examples):



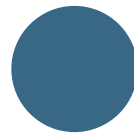
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 MALAI, INDIA



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BRISBANE • KEWDALE • MEL-
 BOURNE • ST. MARYS



MIDDLE EAST

AL KHOBAR, SAUDI ARABIA • DUBAI,
 UAE



Local **SERVICE**

CRANE is committed to delivering efficient service and local technical expertise.

Crane is built on quality principles and practices to achieve the best safety, quality, performance, delivery, service and total cost.

Our vision as a global provider is to be the Supplier of Choice for on/off process valve solutions in chemical, power and refining, known for best-in-class customer responsiveness.



Quick access to high-demand stock



Engineering support



System design and drawings



MRO services



Training and testing

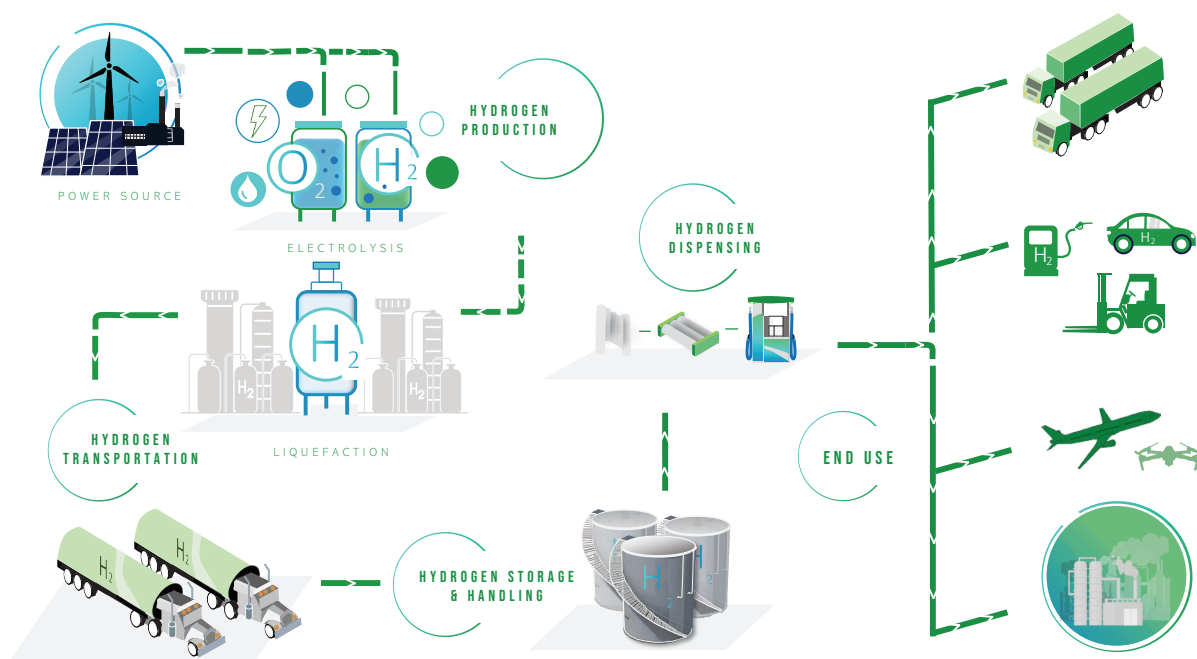


ABOUT CRANE CRYOFLO®

For hydrogen energy to be an effective and efficient alternative to fossil fuels, liquefaction plants, storage facilities, transportation methods and pipelines must be outfitted with state-of-the-art PVF (Pipe Valves and Fittings) components. Crane® CRYOFLO® will be focused on solving Customer's toughest challenges within the Hydrogen Industry backed by decades of field experience in severe service applications.

Crane® CRYOFLO® Solutions for Hydrogen:

- Production
- Liquefaction
- Transportation
- Transfer
- Storage



ABOUT OUR VALVE

Crane CRYOFLO® Bellows Seal Globe Valves minimizes Hydrogen loss by improving heat transfer rates, reducing pipeline latency in liquid transfer applications and leveraging a robust zero-leak design.

Improved Flow Rate & REDUCED HEAT FLUX

Thermal performance and the Flow Coefficient are two of the most critical aspects to consider when designing high-efficiency cryogenic valves. Utilizing CFD simulations & analysis integral to the design and development of new products, Crane CRYOFLO® is pushing boundaries in Hydrogen.



Reduced Heat Leak

Enhanced engineered design offers best-in-class heat transfer, greatly reducing Hydrogen loss.



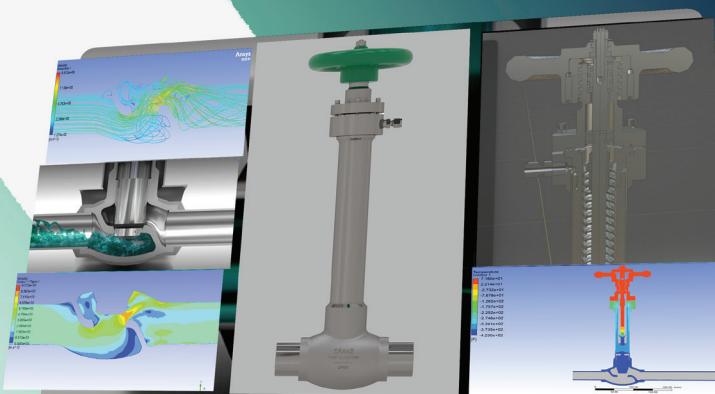
Improved CV

Innovative valve internals deliver improved CV in your application, improving liquid transfer times.



In-Line Repair

Unique cartridge replacement system allows for in-line repair, reducing down-time and increasing productivity





KEY FEATURES

Size Range

- 1/2" - 4"

Pressure Ratings

- 300 psi MAWP

Materials of Construction

- CF8M/316SS body, bonnet and stem
- CF8/304SS disc

Design Standards and Compliance

- ASME B16.34
- Tested to API-598
- Designed and Tested to MSS-SP-134
- ISO 15848

Temperature Range

Designed for -253°C – 100°C (-423.4°F – 212°F)

End Connections

- Pipe stub ends
- Butt-weld

Assembly Configurations

- Vacuum Jacketed and Non-Jacketed
- Extended bonnet/stem per MSS-SP-134
- Custom extended bonnets/stems available
- Cold Box Cuff option

Sealing and Packaging

- Bellows design to eliminate stem/packing fugitive emissions
- Bellows tested to 10,000 cycles
- Self-Centering C-PTFE Seat
- ANSI Class VI Leak Rate

KEY FEATURES

Standard Features

- Proprietary PTFE insert design to limit bonnet dead volume
- Metal-to-metal secondary seat seal
- Spiral wound bonnet flange gasket for improved sealing

Actuator Mounting

- Easy conversion between handwheel and actuator
- Fits most common actuator solutions

Options

- Oxygen cleaning (Process clean standard for LH2 service) for Oxygen system compatibility
- Cold Box Cuff
- Extended Bonnet & Stem lengths

Added applications

- Liquid Hydrogen
- LIN, LAR, LOX, LNG, L-CO2

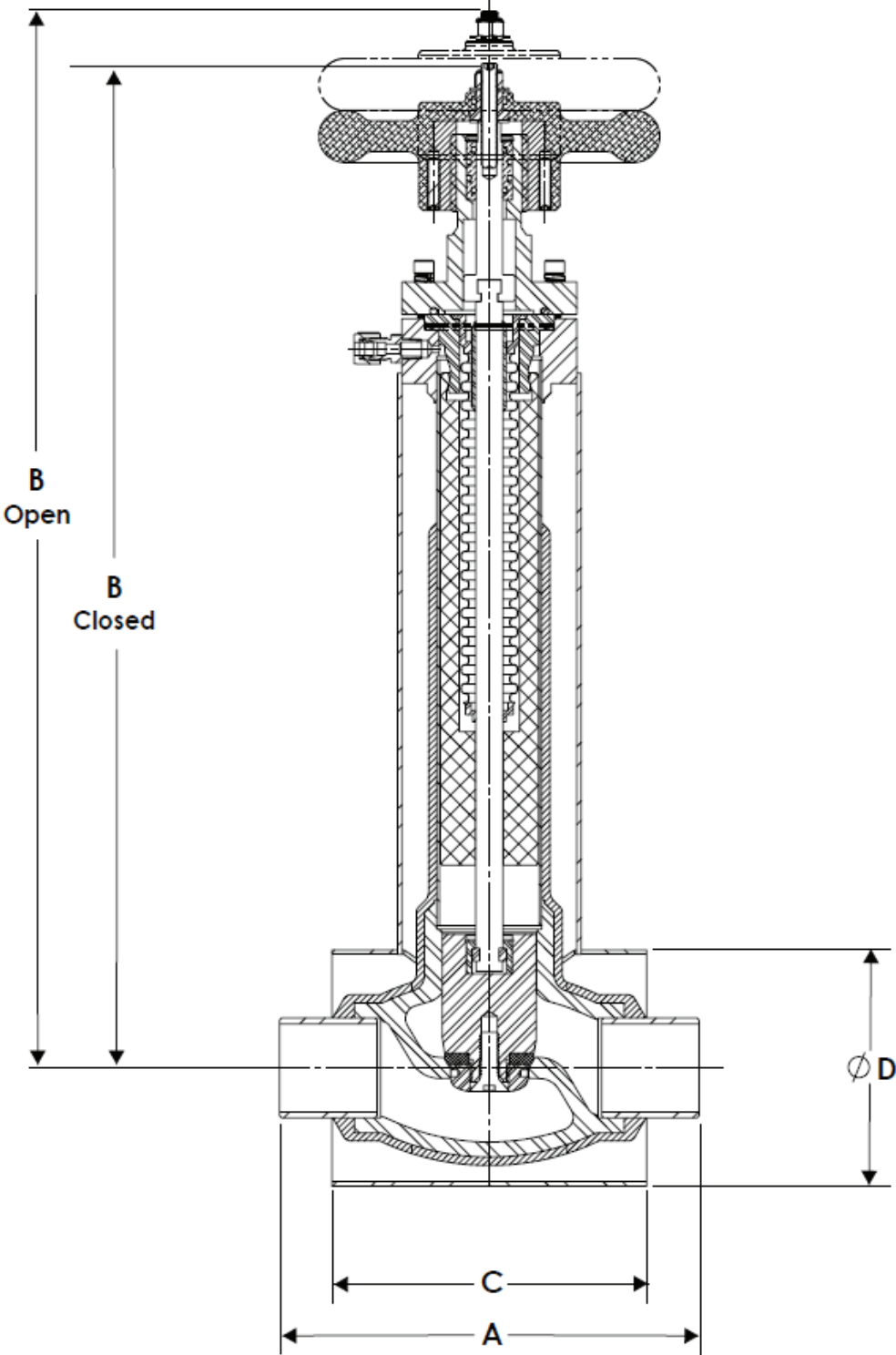


Available Configurations

- Vacuum Jacketed and Non-Jacketed
- Extended bonnet/stem per MSS-SP-134
- Custom extended bonnets/stems available
- Cold Box Cuff option

Designed for LH2 and other key industrial gases such as LIN, LOX, LAR, and LNG. Rated to -253°C (-423.4°F)

TECHNICAL DATA



Size	Pipe Ends					Flow Coefficient Cv
	A	(Open) B	(Closed) B	C	D	
1/2"	4.75	16.2	15.4	3.75	2.875	7.1
3/4"	5.375	16.3	15.5	4.375	3.5	14.0
1"	6.0	16.3	15.5	5.0	3.5	17.0
1 1/2"	8.0	20.0	19.1	6.0	4.5	35.0
2"	8.5	22.1	20.5	6.5	5.563	57.0

STANDARD T-BSGV

BILL OF MATERIAL

DESCRIPTION	MATERIAL
BODY	ASTM A351 CF8M
BODY STUB PIPE	ASTM A312 TP304
TOP PIPE FLANGE	ASTM A479 316SS
BODY NECK PIPE	ASTM A312 TP304
DISC	ASTM A479 304SS
SEAT	C-PTFE
PTFE SLEEVE	PCTFE
METAL BELLOW	1.4404
SLEEVE HOLDER	ASTM A479 316SS
SPIRAL WOUND GASKET	316SS+PTFE+GRAPHITE
BONNET	ASTM A276 304SS
SOCKET HEAD CAP SCREW	ASTM A320 B8 CL.2
O-RING	VITON
HANDWHEEL	LM-25
HANDWHEEL NUT	SS 18-8

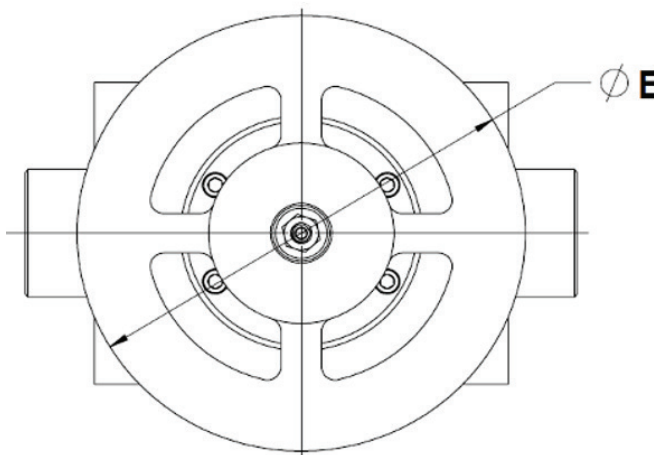


ANCILLARY COMPONENTS

The CRYOFLO® Bellows Seal Globe Valve standard top works offering is a lightweight aluminum handwheel, designed to ensure long-life and reliability in the field. It's adaptability provides quick and easy conversion to a wide range of pneumatic and electric actuators.

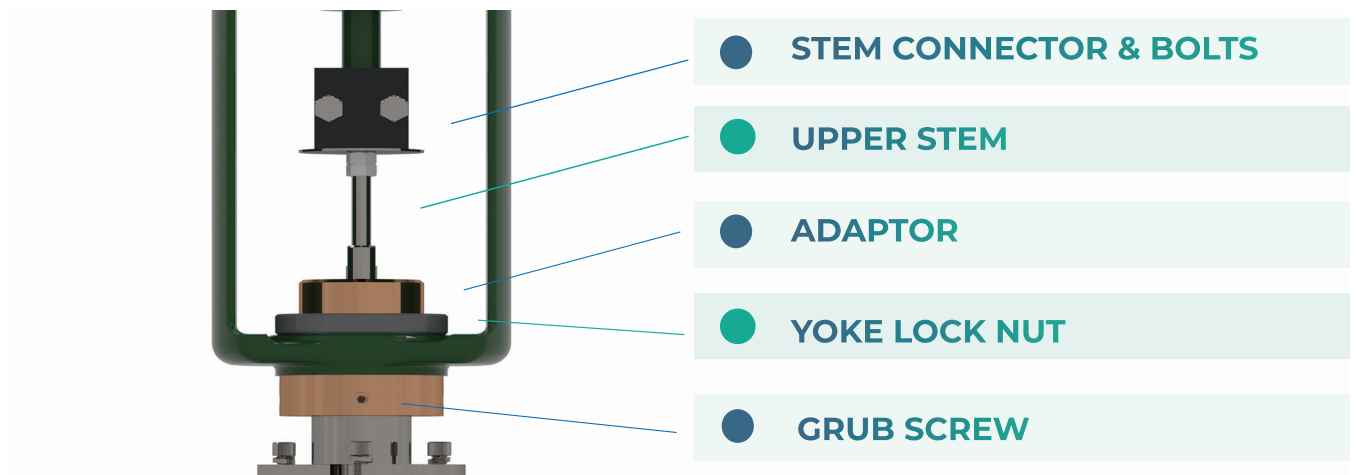
HANDWHEEL (Lightweight)

The CRYOFLO® BSGV handwheel is both lightweight and durable. It is made of Aluminum to minimize the weight of the valve, which is especially important for trailer applications, while maintaining a robust design to ensure long-life and reliability in the field. Additionally, the CRYOFLO® BSGV utilizes a bronze connection between the valve and handwheel, reducing the torque required and ensuring smooth operation even after years of use.



SIZE	ØE (inches)	JACKETED GROSS WEIGHT (lbs)	NON JACKETED GROSS WEIGHT (lbs)	BARE STEM JACKETED WEIGHT	BARE STEM NON JACKETED WEIGHT
1/2"	6.5	14.0	11.5	15.0	12
3/4"	6.5	15.1	12.4	15.6	12.8
1"	6.5	16.0	12.8	17.0	13.7
1.5"	6.5	25.3	19.8	25.7	19.8
2"	8.0	36.0	28.7	36.5	29.5
3"	9.0	95.0	70		
4"	10.75	152.7	132		

Our CRYOFLO® BSGV Handwheel is >50% lighter than the industry leading offer



**Pneumatic and Electric Actuation available upon request*

TESTING

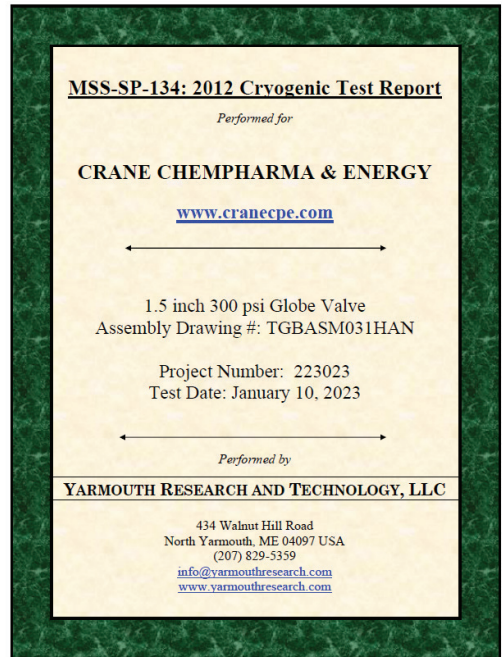
Research and development, together with practical experience in reconditioning all types of valves, have contributed to the design and manufacture of CRYOFLO® Bellows Seal Globe Valves. High quality materials and workmanship, combined with the modern manufacturing methods used in producing these valves are your assurance of a dependable, uniform product.

MSS-SP-134 prototype approval tests have been performed on all sizes of the Crane CRYOFLO® Bellows Seal Globe Valve. These tests include operating cycles, measurements at ambient, high and low temperatures, and fugitive emission testing in static and dynamic states. Each valve was dismantled, the components inspected and studied by an independent QA/QC inspector, to validate the robustness and integrity of the parts after testing. The end user can rest assured that each valve will perform optimally throughout its lifetime.

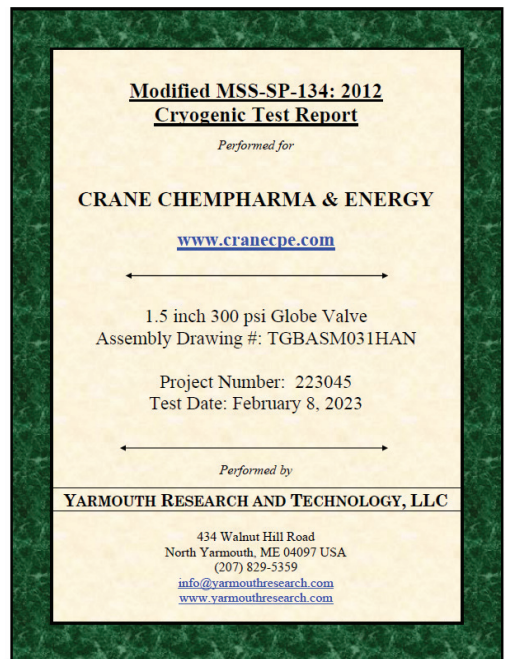
5,000 Cycles in Liquid Hydrogen

- Valve tested to 4,000 cycles in Liquid Nitrogen, passing MSS-SP-134
- No valve sweating in liquid hydrogen
- No seat leakage or emissions to atmosphere detected

Bellows tested to 10,000 cycles in liquid nitrogen



Modified MSS-SP-134 (4000 Cycles)



PRODUCT APPLICATIONS

Bellows seal globe valves are an essential component of liquid hydrogen storage tanks and trailers, particularly in applications where safety is of utmost importance. The use of bellows technology prevents the escape of hazardous gases and liquids, making them ideal for use in environments where leaks can have catastrophic consequences.

Bellows seal globe valves are used extensively on liquid hydrogen storage tanks and trailers to load, unload and balance lines. The CRYOFLO® BSGV are design to optimize the flow rate and minimize the pressure loss in liquid transfer applications while maintaining tight shut-off capability and eliminating leaks to the environment.

Applications Include:

- Liquefaction – Cold Box
- Liquid hydrogen storage tanks and transportation
- Storage facilities and pipelines



Photos provided as courtesy by CHART

Bellows seal globe valves are frequently utilized on liquefaction applications. During the liquefaction process, hydrogen gas is cooled to extremely low temperatures, requiring valves that can operate reliably below -253°C (-423.4°F). The CRYOFLO® BSGV has been optimized and tested extensively in liquid hydrogen to maximize flow rates while minimizing heat transfer in these critical applications.

HOW TO ORDER

VALVE SIZE	VALVE TYPE	MAWP	MOC	DISC TYPE	GASKET MATERIAL	END CONNECTION	ACTUATION TYPE	JACKETING	SPECIAL FEATURES
□□□□ -	□□	-	□	□	□	□	- □□	- □	- □□

* ORDER EXAMPLE AVAILABLE BELOW

VALVE SIZE		VALVE TYPE		MAWP		MOC		DISC TYPE	
CF0H	1/2"	T	Bellows Seal T-Globe	3	300 PSIG	A	CF8M body, 304ss disc, 304/304L pipe	Q	PCTFE, Quick opening
CF0Q	3/4"	Y	Bellows Seal Y-Globe			B	CF8M body, 304ss disc, 316/316L pipe	L	PCTFE, Linear
CF01	1"	L	Lift Check Valve			C	CF8M body, 316/316L disc & pipe	E	PCTFE, Equal Percent
CF1Q	1.25"					D	CF3M body, 316Lss disc & pipe		
CF1H	1.5"								
CF02	2"								

GASKET MATERIAL		END CONNECTION		ACTUATION TYPE		JACKETING	
1	Graphite	A	Pipe Sch.10	HW	Handwheel	N	Non-Jacketed
		B	Pipe Sch. 5	BS	Bare Stem	V	Vacuum Jacketed, Insulated for H2
		W	Butt-Weld End	A1 to Z9	Pneumatic Actuators	J	Vacuum jacket parts provided
		S	Socket, pipe	01 to 99	Electric Actuators		
		R	Socket, tube	00	None (Lift Check)		
		C	Custom				

SPECIAL ADD-ONS

ST - Manufacturer standard bonnet length, Non-cold box, Process Clean

S2 - Manufacturer standard bonnet length, Non-cold box, O2 Clean

CB = Cold Box Cuff

TW = Complete Top Works Cartridge Replacement

SG = Soft Goods Kit (Packing, Gaskets, Seals)

AM = Actuator Mounting Kit

CL = Custom bonnet length, length included in extended description

XX = Special or multiple custom requirements, included in extended description

MC = Cold box, non-O2 Clean

M2 = Cold box, O2 Clean

ORDER EXAMPLE:

FIGURE NUMBER: CF1H-T3-AQ1A-HW-V-ST
 1.5"-Globe Valve, Bellows Seal, 300 MAWP, CF8M body, 304ss disc, 316ss pipe, quick opening, graphite gasket, CPTFE seat, quick opening, graphite gasket, Schedule 10 Pipe Stubs, Handwheel, Vacuum Jacketed Standard bonnet length, Process Clean

OPTIONS

ACTUATION

FLOW CONTROL PLUG

VACUUM JACKETED WITH MLI

Light weight handwheel standard

Fisher pneumatic spring and diaphragm type 667, other manufacturers and types available

Fail-Safe electric linear actuators available

Positioners, Limit Switches, Solenoids and other accessories available

Quick Opening = Q (standard), Linear = L, Equal Percentage = E

Multi-layer insulation with welded 304ss jacket

UNIT CONVERSION DATA FOR HYDROGEN

	WEIGHT		GAS		LIQUID	
	pounds (lbs)	kilograms (kg)	cubic feet (scf)	cu meters (Nm ³)	gallons (gal)	liters (l)
1 pound	1.0	.4536	192	5.047	1.6928	6.408
1 kilogram	2.205	1.0	423.3	11.126	3.377	14.128
1 scf gas	.00521	.00236	1.0	.02628	.00882	0.03339
1 Nm ³ gas	.19815	.08988	38.04	1.0	.3355	1.2699
1 gallon liquid	.5906	.2697	113.4	2.981	1.0	3.785
1 liter liquid	.15604	.07078	29.99	.7881	.2642	1.0

	HYDROGEN	NATURAL GAS	GASOLINE	NO. 2 DIESEL
Physical State	Compressed gas or liquid	Compressed gas	Liquid	Liquid
Flammability Range in Air	4.1%-74%	5.3%-15%	1.4%-7.6%	1.0%-6.0%
Lower heating value (btu/lb)	52,217	20,263	18,676	18,394
Boiling Point (°F)	-423	-259	80-437	356-644
Specific Gravity (60°F)	0.07	0.424	0.72- 0.78	0.85
Energy Content per Gallon	gas: 6,500 Btu at 3,000 psi	gas: 33,000 - 38,000 Btu at 3,000 psi	109,000 - 125,000 Btu	128,000-130,000 Btu
Autoignition Temperature (°F)	1,085	900-1170	495	600
Latent Heat of Vaporization	192.1	219	150	100
Freezing Point (°F)	-435	-296	-40	-30 to -40

NOTES

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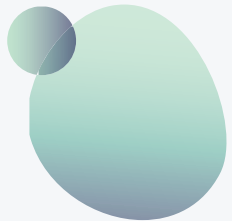


CRANE

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Keeping Cryogenics Cool

INNOVATION DRIVEN BY YOUR NEEDS



Our businesses are known for proprietary and differentiated technology, quality and reliability, deep vertical expertise, and responsiveness to unique customer needs.

brands you trust.



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