



Rooted in Creative Innovation

Cryogenic Globe Control Valve

Series 10C



Foreword

Series 10C cryogenic valves use the Body

Numerous valves have been effectively utilized in challenging conditions across various global air separation units and LNG services for many years. These valves have extended plug travels with additional intermediate control points for improved control, and their trim parts are manufactured with meticulous tolerances and clearances based on operating temperatures. They also undergo thorough process control with meticulous inspection and traceability, as well as robust design review, verification, and validation in accordance with the latest specifications and ISO-9001 standards.

They are designed to meet the highest quality standards and undergo stringent quality control measures to ensure their reliability and performance. These valves have been extensively tested and refined to deliver exceptional performance and reliability in critical applications.

They are the result of advanced engineering and manufacturing processes that adhere to industry standards and best practices. They are built to last and deliver reliable performance in the most challenging conditions.

Their robust design, adherence to industry standards and thorough quality control measures make them a dependable choice for critical applications, and you can trust their durability, precision, and control in demanding environments such as Air separation, LNG production and Liquefaction, LNG storage and LNG receiving facilities

Valve Model Numbering

Series	Rating	Trim Type	Temperature
10C	1 - 150	10 – Contour unbalanced	4 - Cryogenic
	2 - 300	20 – Micro Spline	
	3 - 600	30 – Cage, Unbalanced*	
		40 – Cage, Balanced*	

*Ported Cage, MHC, Anti-cavitation and Low Noise Trims

Engineering Data

Table 1.1 Engineering Data

Body Style	Globe Straight
Design Standard	ASME B16.34
Sizes, Pressure rating	1" to 8", ASME Class 150-600
Trim Type	Micro Spline Contoured Multi Hole Cage (MHC) Anti – Cavitation Low Noise Trim
Trim Characteristics	Equal Percentage Linear
Flow Co-efficient	Refer Table 6.1 to 6.5, Consult factory for customized Cv / Trim Characteristics.
Guiding	Top Guided Cage Guided
Seat Leakage	As per ANSI / FCI 70.2 / IEC 60534-4 Standard: Class IV Optional: Class V & VI
Flow Direction	Unbalanced Trims: Flow Under Contoured, Microspline, MHC Balanced Trims: Ported cage: Flow Over MHC: Flow Over is standard; Flow Under when used for low noise service Anti-cavitation trim: Flow Over Low noise trim: Flow Under
Bonnet Design	Cryogenic (-196°C to -46°C) Option - 1: 12" Extension Option - 2: 24" Extension
NACE Conformance	NACE conformance shall be offered for Body, Bonnet & Bolting material when requested
Trim Balancing	Unbalanced 1" to 4" Balanced 1" to 8"
End Connection Styles	Standard Flanged RF as per ASME B16.5 Optional Flanged RTJ as per ASME B16.5, Socket Welding as per ASME B16.11 (0.5" to 2"), Butt welding ends as per ASME B 16.25
Face To Face	Globe Straight: ISA 75.08.01 (Up to 8") Globe Angle: ISA 75.08.08 (Up to 8")
Cleanliness Requirements	General cleanliness for ASU. Cleanliness for O ₂ service
Cryogenic Testing	Cryogenic testing shall be performed at -196°C on request
Drip Plate / Cold Box Mounting Plate	Drip plate / cold box mounting plate on bonnet shall be provided on request

Trim Designs

Micro Spline

Micro splined trims are suitable for very low Cv applications that require precise control. The plug and seat are manufactured as a matched pair. Flow under is preferred.

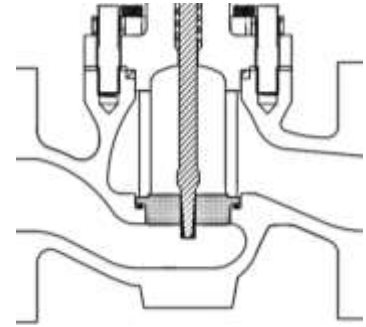


Fig 1: Micro spline

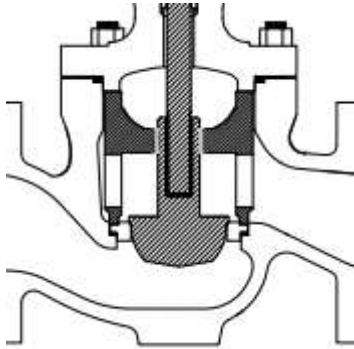


Fig 2 : Contoured

Contoured

Contoured plug with post guiding enables perfect alignment of the trim components. The trim offers wide range of Cv and characteristics. This design is suitable for viscous, dirty fluid and non-lubricating process.

Ported Cage

Ported Cages offer massive guiding and high flow capacity even with shorter travels. These Trims are suitable for low-pressure drop general service applications. Ported cages are often investment cast and are manufactured from standard stock parts.

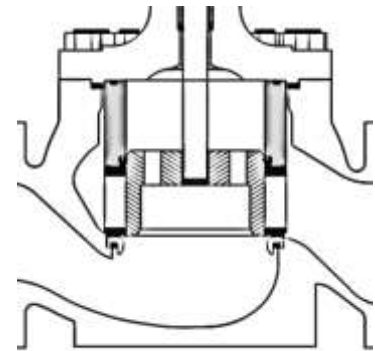


Fig 3 : Ported Cage

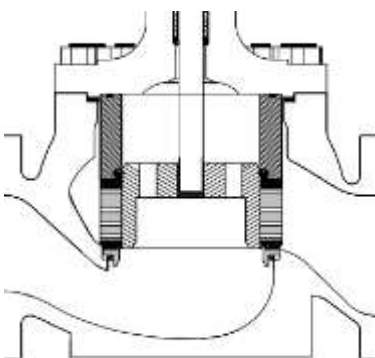


Fig 4 : Multi Hole Cage

Multi Hole Cage

Single and multiple heavy section 'drilled hole' cage design offers low-pressure recovery that reduce the potential for excessive noise, cavitation, vibration and erosion. The MHC trim range has been designed to operate on all fluid combinations, both clean and dirty service.

The MHC range of trims are preferred choice for medium to relatively high-pressure drop applications. In addition, MHC trims are easily available in various special material combinations.

Bonnet Designs



Fig 5 :
12" Cryogenic Bonnet

12" Extension Cryogenic Bonnet

12" Extension Cryogenic bonnets are designed to typically operate in service conditions with temperature ranging from -196°C to 232°C in yard valve application the length of the extension is sufficient to maintain the stem packing far enough away from the cold area of the valve to prevent freeze-up of the packing



Fig 6 :
24" Cryogenic Bonnet

24" Extension Cryogenic Bonnet

24" Extension Cryogenic bonnets are designed to typically operate in service conditions with temperature ranging from -196°C to 232°C in cold box application The length of the extension is sufficient to maintain the stem packing far enough away from the cold area of the valve to prevent freeze-up of the packing

Packing Box

Single PTFE

Single PTFE arrangement uses a positioning springs, his packing arrangement offers very good seal performance with lowest packing friction. The operating temperature ranges from -196°C to 232°C. This packing set consists of box ring, positioning spring, anti-extrusion rings & set of V-rings.

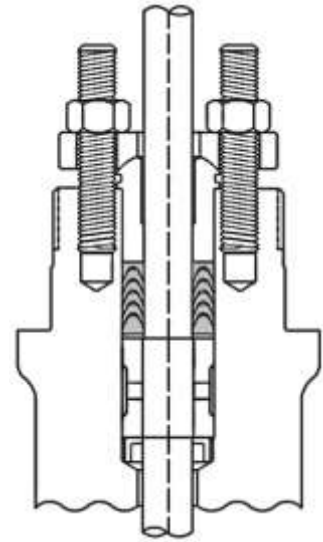


Fig 7 : Single PTFE

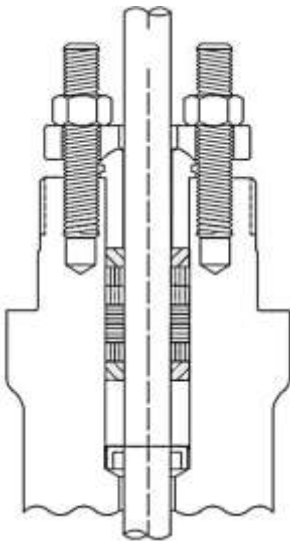


Fig 8 : Graphite

Graphite

Graphite packing system operate at higher stress levels and have higher friction values for a given level of sealing. It suitable for a wide range of temperatures.

Material Specifications and Temperature for Body and Bonnet

Table 4.1 Material and Temperature for body & bonnet

Body, Bonnet Materials	NACE MR0175 / 0103	Stud, Nut Material	Balance seal (Note 1)
CF3M & CF8M	NA	B8M / 8M st.hardened	PTFE Seal
	Yes	B8M / 8MA Annealed	PTFE Seal

Notes:

1. Temperature limits -196°C to 232°C
2. Cryo Bonnets shall be fabricated from cast, forge and pipe of stainless steel grade materials based on manufacturing feasibility and availability of materials

Material and Temperature Limits for Trim Parts

Table 5.1 Material and Temperature Limits for Trim

Trim Type	Trim No	Stem	Plug	Seat	Cage	Seat Clamp	Temp	
							Min.	Max.
Contoured	1	316	316	316	-	316 CoCr-A Guide	-196°C	232°C
	2	316	316 CoCr-A SA	316 CoCr-A	-	316 CoCr-A Guide	-196°C	232°C
	3	316	316 CoCr-A FC	316 CoCr-A	-	316 CoCr-A Guide	-196°C	232°C
Cage guided	4	316	316	316	316	-	-196°C	232°C
	5	316	316 CoCr-A SA	316 CoCr-A	316	-	-196°C	232°C
	6	316	316 CoCr-A FC	316 CoCr-A	316	-	-196°C	232°C

Note: For other materials consult factory

Table 5.2 Other Parts

Item	Standard
Gasket	316L spiral wound gaskets w/ graphite filler
Packing Spacer	316
Packing Rings	PTFE, Carbon filled PTFE, High density PTFE
Gaskets	Graphite
Gland Follower	SS316 hard faced CoCr- A
Gland Flange	CF8M

Notes:

1. All soft parts are available with BAM certification on request.
2. Temperature limits -196°C to 232°C

Flow Coefficients

Table 6.1 Micro Spline Trim

Valve Size	Seat Bore	Travel	Flow Direction	Cv, Eq %
½" to 2"	1/4	3/4	Under	1.08
½" to 2"	1/4	3/4	Under	0.351
½" to 2"	3/16	3/4	Under	0.177
½" to 2"	3/16	3/4	Under	0.073

Table 6.2 Contoured Trim

Valve Size	Seat Bore	Travel	Flow Direction	Cv, Eq %	Cv, Lin
1	1	3/4	Under	13.1	13.2
1	3/4	3/4	Under	8.79	-
1	1/2	3/4	Under	4.96	-
1	3/8	3/4	Under	3.05	-
1 1/2	1 1/2	3/4	Under	27.8	30.8
1 1/2	1	3/4	Under	16.9	16.4
1 1/2	3/4	3/4	Under	9.98	-
1 1/2	1/2	3/4	Under	5.21	-
1 1/2	3/8	3/4	Under	3.15	-
2	2	1 1/8	Under	53.6	51.8
2	1	3/4	Under	16.2	14.8
2	3/4	3/4	Under	9.98	-
2	1/2	3/4	Under	5.21	-
2	3/8	3/4	Under	3.15	-
3	3	1 1/2	Under	109	110
3	2	1 1/8	Under	71.8	81.2
4	4	2	Under	192	210
4	2	1 1/8	Under	71.9	85.2

Table 6.3 Ported / Multi Hole Cage

Valve Size	Seat Bore	Travel	Flow Direction	Ported Cage		MHC	
				Cv, Eq %	Cv, Lin	Cv, Eq %	Cv, Lin
1	1 5/16	3/4	Under	18.8	20.2	15.0	16.2
1 1/2	1 7/8	3/4	Under	36.2	39.5	29.0	31.6
1 1/2	1 5/16	3/4	Under	22.7	28.7	18.2	23.0
2	2 5/16	1 1/8	Under	61.1	71.5	48.9	57.2
2	1 5/16	3/4	Under	23.8	32.2	19.0	25.8
3	3 7/16	1 1/2	Over	137	149	110	119
3	2 5/16	1 1/8	Over	70.4	103	56.3	82.4
4	4 3/8	2	Over	225	233	180	186
4	2 7/8	1 1/2	Over	110	109	88.0	87.2
6	7	2	Over	395	428	316	342
6	4 3/8	2	Over	270	319	216	255
8	8	3	Over	816	848	653	678
8	8	2	Over	564	685	451	548

Table 6.4 Anti Cavitation Trim

Valve Size	Flow Direction	1-stage			2-stage		
		Seat Bore	Travel	Cv, Lin	Seat Bore	Travel	Cv, Lin
1	Over	1 5/16	1	15.3	1	1	5.8
1 1/2	Over	1 7/8	7/8	22.2	1 5/16	1 1/2	9.5
2	Over	2 5/16	1 1/8	35.7	1 7/8	2	20.9
3	Over	3 7/16	1 5/8	86.8	2 7/8	3	48.7
4	Over	4 3/8	2 1/8	147	2 7/8	4	69.2
4	Over	-	-	-	2 7/8	3	53.4
6	Over	7	2 1/4	255	5 3/8	4	145
8	Over	8	3 3/8	434	7	6	260

Table 6.5 Low Noise Trim

Valve Size	Seat Bore	Travel	Flow Direction	Cv, Lin								
				1.1	1.3	2.1	2.3	3.1	3.3	4.1	4.3	
1	1 5/16	3/4	Under	15.7	-	-	-	-	-	-	-	-
1 1/2	1 7/8	3/4	Under	25.5	-	-	-	-	-	-	-	-
1 1/2	1 5/16	3/4	Under	-	21.1	15.7	11.8	-	-	-	-	-
1 1/2	3/4	1 1/8	Under	-	-	-	-	7.27	8.22	7.36	8.24	-
2	2 5/16	1 3/8	Under	49.5	-	-	-	-	-	-	-	-
2	1 5/16	1 1/4	Under	-	29.3	24.4	19.5	14.2	14.0	13.8	13.6	-
3	3 7/16	1 1/2	Under	99.1	-	-	-	-	-	-	-	-
3	2 5/16	1 1/2	Under	-	88.9	67.1	74.4	45.1	44.7	45.1	44.7	-
4	4 3/8	2	Under	156	-	-	-	-	-	-	-	-
4	3 7/16	2	Under	-	138	110	99.4	75.9	73.3	75.8	73.3	-
6	7	2	Under	285	-	-	-	-	-	-	-	-
6	5 3/8	3	Under	295	294	232	226	127	139	127	102	-
8	8	3	Under	426	-	-	-	-	-	-	-	-
8	8	4	Under	635	635	405	405	278	258	-	-	-

Note:

The 1st Digit here indicate the distance between holes. And 2nd Digit here indicate the hole size (or) diameter.

Dimensions & Weights

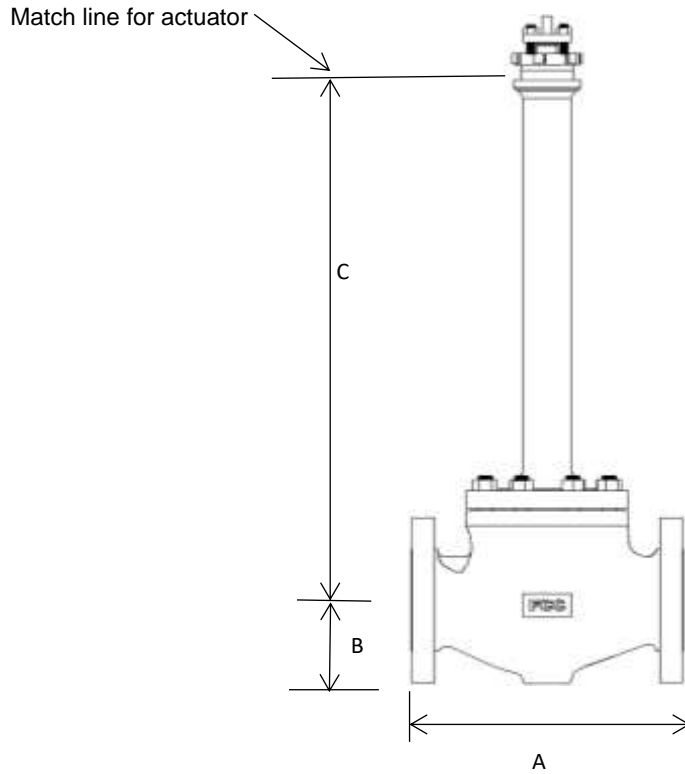


Table 7.1 Dimensions & Weights

Valve Size (inch)	Stem Dia	A (mm)			B (mm)		C ⁽¹⁾ (mm)	Weight (kg)	
		150#	300#	600#	150-300#	600#		150-300#	600#
1	3/8	184	197	210	60		739	20	22
1	1/2	184	197	210	60		762		
1 1/2	3/8	222	235	251	71		735	27	29
1 1/2	1/2	222	235	251	71		754		
2	1/2	254	267	286	78		778	43	45
2	3/4	254	267	286	78		772		
3	1/2	298	317	337	97		805	72	75
3	3/4	298	317	337	97		802		
4	1/2	353	368	394	129		836	88	90
4	3/4	353	368	394	129		829		
6	3/4	451	473	508	162		865	186	192
6	1	451	473	508	162		878		
6 ⁽²⁾	3/4	451	473	508	162		920		
6 ⁽²⁾	1	451	473	508	162		985		
8	3/4	543	568	610	191		989	496	500
8	1	543	568	610	191		1040		

For non-standard sizes consult factory

Note 1: Applicable only for 12" Ext bonnet

Note 2: Only for Low noise trim

Note 3: Dimension C of 24" Ext bonnet = 12" + Dimension C of 12" Ext bonnet

Note 4: The Dim 'A' is for RF & FF, for RTJ the 'X' factor from ASME B16.10 shall be added



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