Going to Extremes

CRYSEAL TRIPLE OFFSET CRYOGENIC VALVE

TOMOETRITEC

THE ULTIMATE PROCESS VALVE

At the leading edge

The need for positive, verifiable, maintainable shut-off in critical applications has led to the wide-spread use of triple offset butterfly valves in cryogenic applications. Traditionally these valves have been ball or plug valves, both of which penalise the user in terms of weight, operating torque, initial material cost and of course maintainability that translates into cost of ownership. The Tomoe Tritec 'Cryseal' range incorporates a triple offset high performance butterfly valve designed specifically to meet the requirements of international Cryogenic Valve standards, including BS6364(1984) and Shell SPE 77/306.

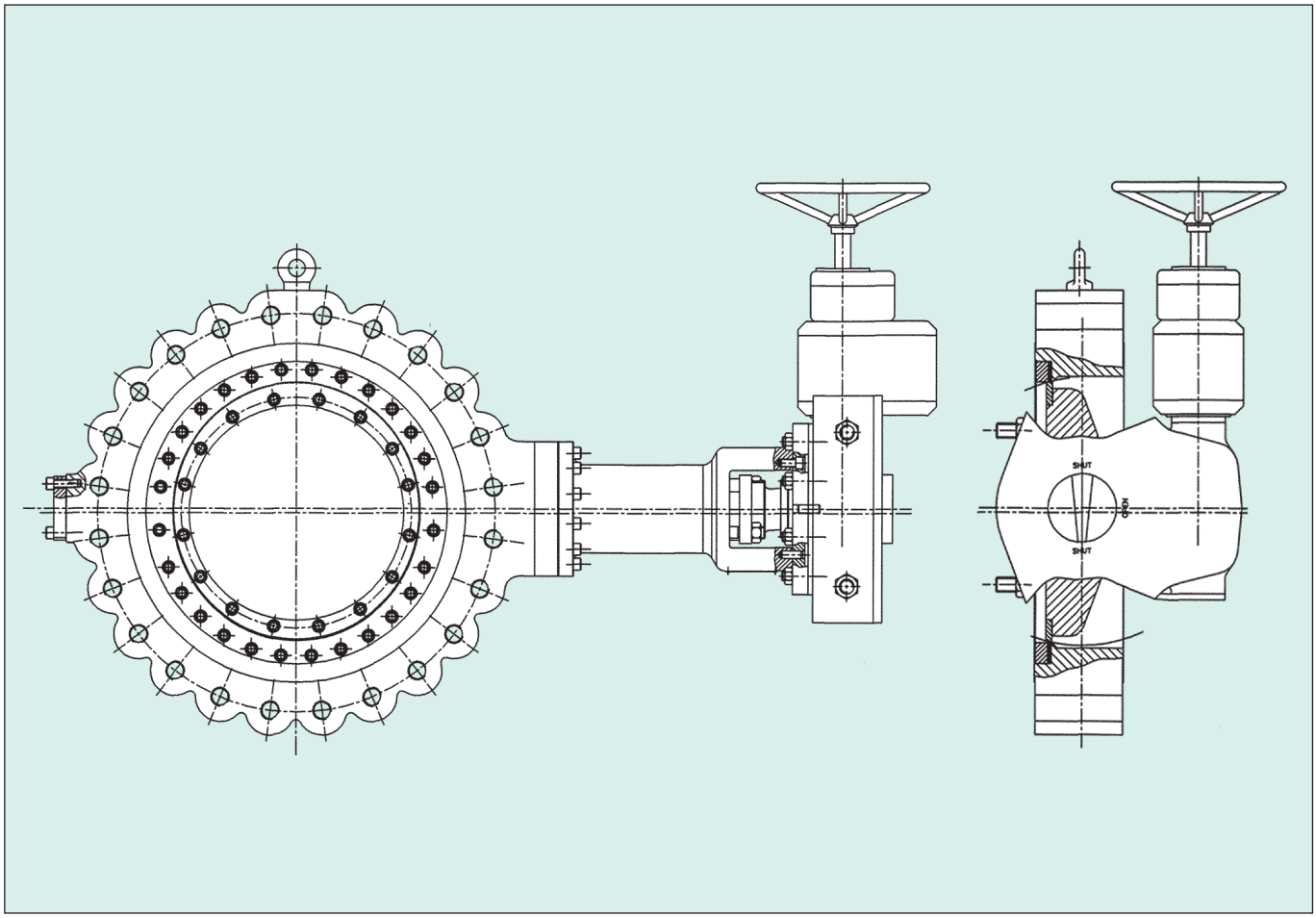
The Cryseal range has been extensively used on applications including low temperature gas and liquid service (Liquid Nitrogen, Oxygen & Hydrogen), LNG Tankers on process duties, Onshore LNG Production Plants and Onshore Gas Distribution Terminals.

Benefits

- Full pressure rating up to Class 2500
- Operating Temperature range to –196OC
- Firesafe to BS6755 part2, API 6FA, API 607 4th edition
- Field replaceable Body Seat and Disc Seal
- 1 piece shaft, no linkage or potential point of failure
- Anti blow-out mechanism at both top and bottom of shaft
- Extension bonnet dowelled both to valve and operator to eliminate potential loss of torque

Options

- Helium Gland Emission testing available to EPA21, ISA-SP-93, ANSI/FCI 91-1
- Available de-greased and specially cleaned to customer standards for clean gas service.
- Standard extension bonnet length to BS6364 with other extension bonnet lengths to customer order.
- Any face to face, no pipe modifications required.
- Buttweld with or without top entry port.



Cryogenic Valve Bill of Materials

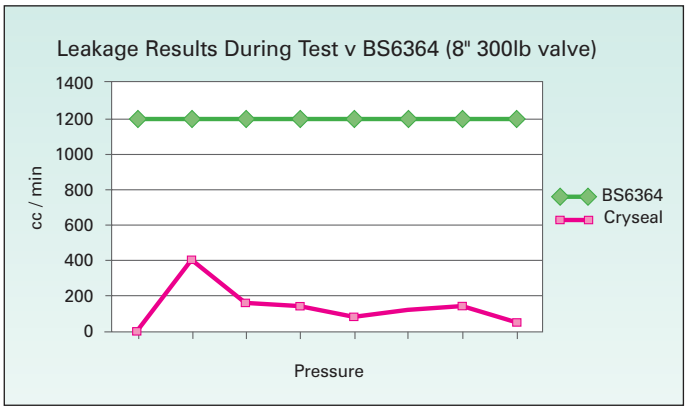
Component	For applications to –46ºC	For applications to –196ºC
Body	A352LCC	A351 CF8M
Disc	A352LCC	A351 CF8M
Body Seat	316SS/Graphite Laminate	Inconel 625/Graphite Laminate
Body Seat Retainer	316 Stainless Steel	316 Stainless Steel
Disc Seal	316 Stainless Steel	316 Stainless Steel
Shaft	17-4PH	Inconel 718
Shaft Pins	17-4PH	Inconel 718
Bearings	CR/316SS	CR/316SS
Thrust Ring	CR/316SS	CR/316SS
Thrust Pad	17-4PH	Inconel 718
End Cover	316 Stainless Steel	316 Stainless Steel
Gland Plate	316 Stainless Steel	316 Stainless Steel
Gaskets	Graphite (Supagraf)	Graphite (Supagraf)
Mounting Plate	Steel	Steel
Fixings	17-4PH	Inconel 718
Gland packing	Graphite (Supagraf)	Graphite (Supagraf)

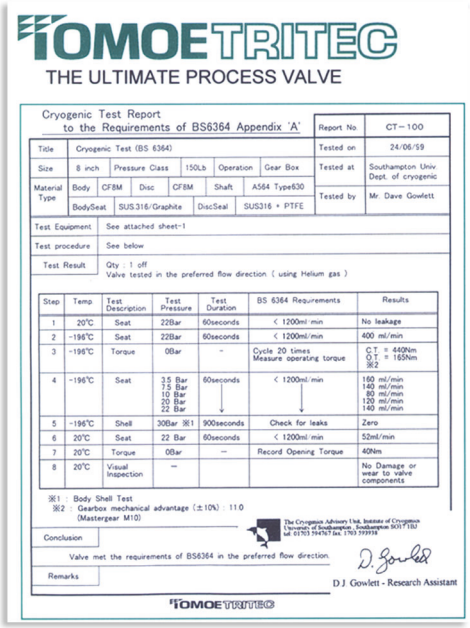
Cryogenic Testing

The Cryseal range of valves can be cryogenically tested in accordance with BS6364 and Shell SPE 77/306. These standards specify the requirements for the design, manufacture and testing of valves for cryogenic service.

During testing, the valve is immersed in liquid nitrogen and cooled to a temperature of –196°C. Dry oil-free air or inert gas (usually helium) is passed through the valve and the seat is pressure tested in increments up to the maximum permissible working pressure. The valve gland and body/bonnet joint are also tested for leakage.

In tests, the Cryseal valve design has been shown to produce leakage rates significantly below those allowable to achieve the standard (see Graph).





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Cryogenic Test Report
to the Requirements of BS6364 Appendix 'A'

Report No.	CT–100								
Tested on	24/06/99								
Tested at	Southampton Univ. Dept. of cryogenic								
Tested by	Mr. Dave Gowlett								
Title	Cryogenic Test (BS 6364)								
Size	8 inch	Pressure Class	150Lb	Operation	Gear Box				
Material Type	Body	CF8M	Disc	CF8M	Shaft	A564 Type630			
	BodySeat	SUS.316/Graphite	DiscSeal	SUS316 + PTFE					
Test Equipment	See attached sheet-1								
Test procedure	See below								
Test Result	Qty : 1 off Valve tested in the preferred flow direction (using Helium gas)								

Step	Temp.	Test Description	Test Pressure	Test Duration	BS 6364 Requirements	Results
1	20°C	Seat	22Bar	60seconds	< 1200ml/min	No leakage
2	-196°C	Seat	22Bar	60seconds	< 1200ml/min	400 ml/min
3	-196°C	Torque	0Bar	–	Cycle 20 times Measure operating torque	C.T = 440Nm O.T = 165Nm ※2
4	-196°C	Seat	3.5 Bar 7.5 Bar 10 Bar 20 Bar 22 Bar	60seconds	< 1200ml/min	160 ml/min 140 ml/min 80 ml/min 120 ml/min 140 ml/min
5	-196°C	Shell	30Bar ※1	900seconds	Check for leaks	Zero
6	20°C	Seat	22 Bar	60seconds	< 1200ml/min	52ml/min
7	20°C	Torque	0Bar	–	Record Opening Torque	40Nm
8	20°C	Visual Inspection	–			No Damage or wear to valve components

※1 : Body Shell Test
※2 : Gearbox mechanical advantage (±10%) : 11.0 (Mastergear M10)

Conclusion: Valve met the requirements of BS6364 in the preferred flow direction.

Remarks:

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D.Gowlett

D.J. Gowlett - Research Assistant

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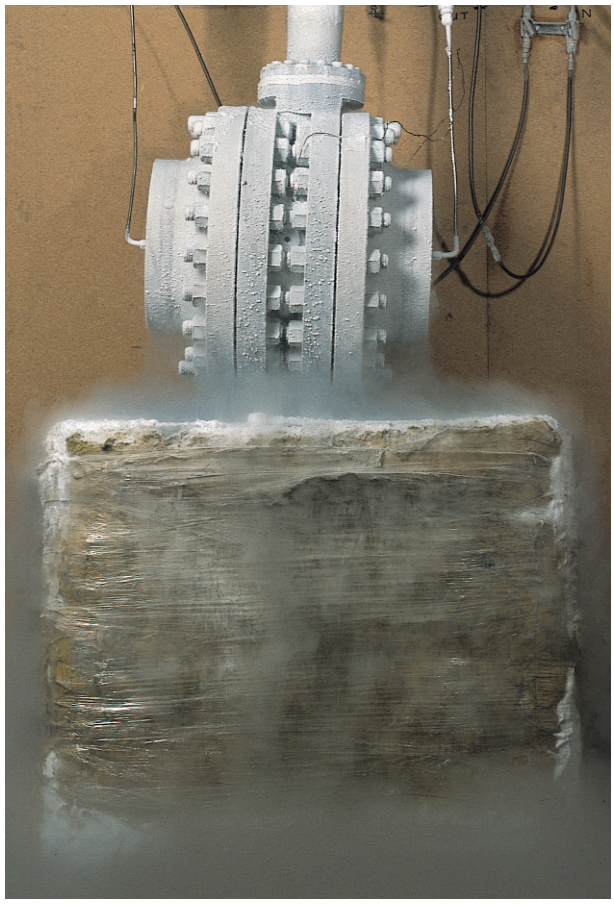

Cryseal valve undergoing low temperature liquid nitrogen test (photos courtesy Valve Testing Centre, Leeds University)

Cryseal Reference List

Location	Application	Scope of Supply	Case History
Korea	Propane	3 x 14″ wafer Stainless Steel Class 300	LPG receiving terminal, process duty.
Japan	Process Air	1 x 16″ wafer Stainless Steel Class 300	Defence Agency test rig.
Japan	Process Air	1 x 20″ wafer Stainless Steel Class 150	Defence Agency test rig.
Scotland	Hydrocarbon Gas	2 x 12″ Double Flanged Stainless Steel Class 150	Sour gas storage facility. North Sea receiving plant.
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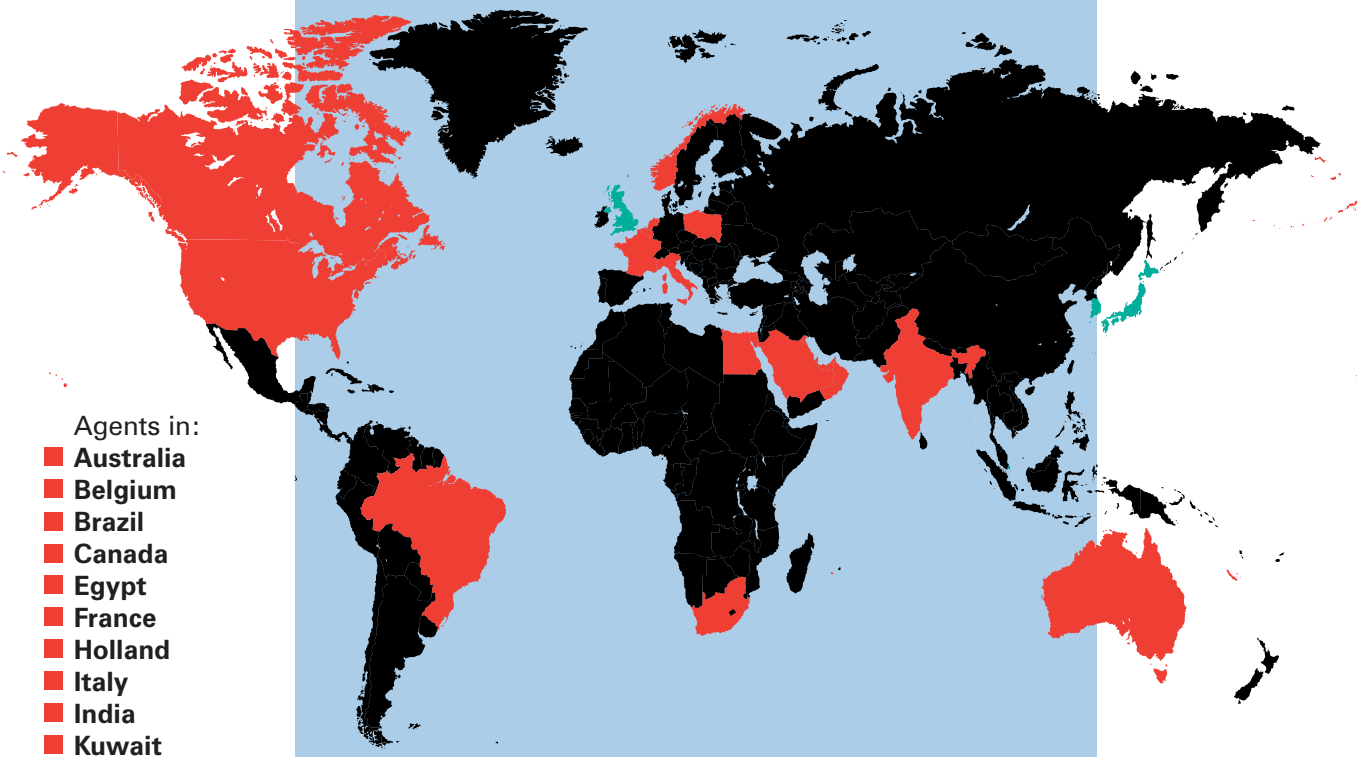
UK	Liquid LFT	1 x 20″ wafer Stainless Steel Class 300	Chemical plant isolation.
UK	Liquid LFT	1 x 3″ wafer Stainless Steel Class 300	Chemical plant isolation.
UK	Liquid LFT	1 x 4″ wafer Stainless Steel Class 300	Chemical plant isolation.
UK	Solid LFT	1 x 12″ wafer Hastelloy / Incon Class 150	Chemical plant hopper isolation.
UK	Process Fluid	6 x 3″ wafer Stainless Steel Class 300	Chemical plant low temperature gas isolation.



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E/CR/TOV/AB/11.01