



Operating Conditions for DIR-Plants

- *Medium* *hot ore*
hot ore dust
hydrogen
- *Temperature* *up to + 1,600 ° F*
- *Pressure* *ANSI Class 150 to 600*
- *Nominal sizes* *4" to 16 "*





Perrin Ball Valves for Cryogenic Application

- 1 Series 80-N - (2-Way Ball Valve)**
- 2 Series 17-N - (2-Way Ball Valve)**
- 3 Series 14-N - (2 Way Ball Valve)**
- 4 Typical Materials of Construction**
- 5 Typical Low Temperature Test**
- 6 Test Equipment – Schematic**
- 7 Reference List**



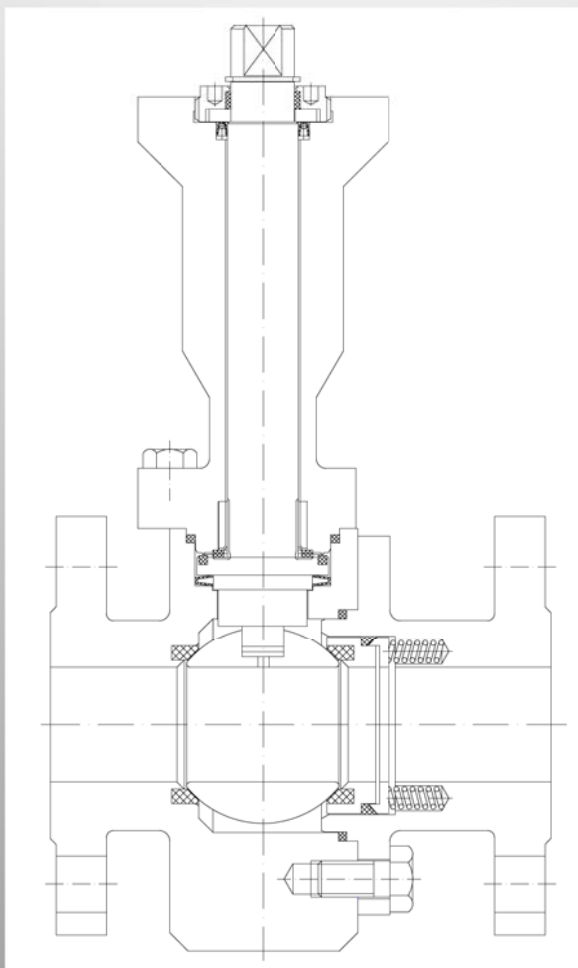
Series 80-N (2-Way Ball Valve)

Service: Cryogenic

Medium: LNG, LPG

Pressure: PN 16 to PN 40
Class 150 to 300

Temp.: -196 to 100°C
-320 to 212°F



Design:

- soft-seated
- spring-supported seat
- split body design
- floating ball
- cavity relief system
- live-loaded stem packing
- anti-Static device
- fire safe
- DIN/ISO 5211



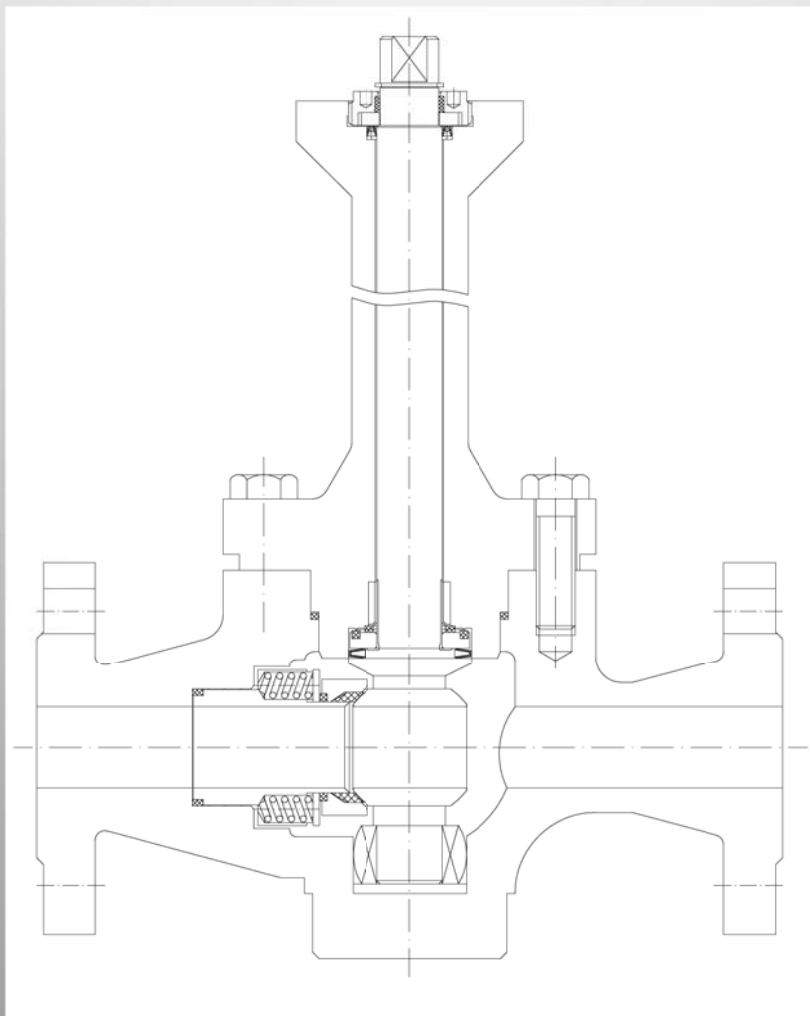
Series 17-N (2-Way ball Valve)

Service: Cryogenic

Medium: LNG, LPG, others

Pressure: PN 16 to PN 100
Class 150 to 600

Temp.: -196 to 100°C
-380 to 212°F



Design:

- soft-seated***
- spring-supported seat***
- top-entry design***
- trunnion mounted ball with integral stem***
- cavity relief system***
- live-loaded stem packing***
- anti-Static device***
- fire safe design***
- DIN/ISO 5211***



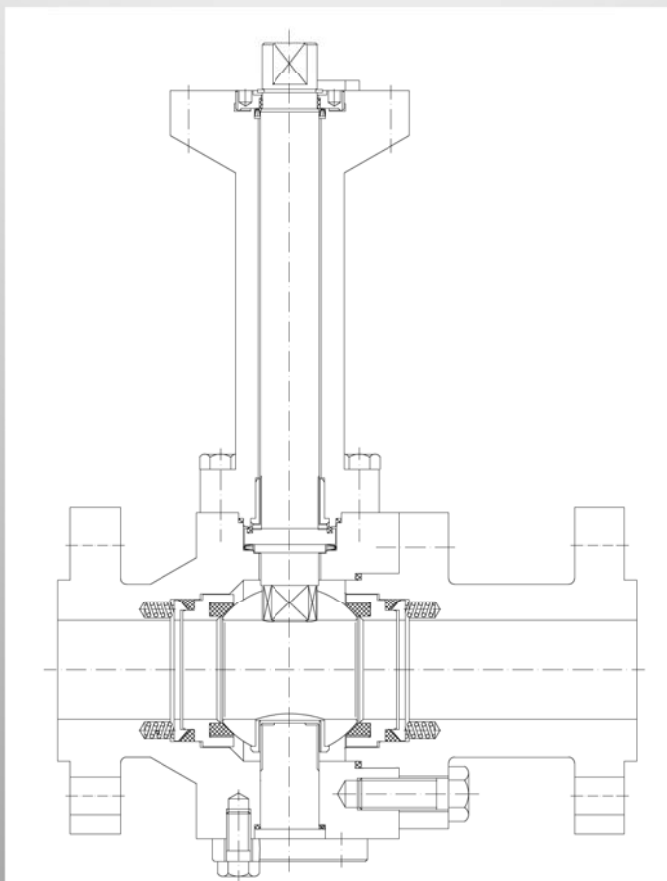
Series 14-N (2-Way Ball Valves)

Service: Cryogenic

Medium: LNG, LPG, others

Pressure: PN 16 to PN 100
Class 150 to 900

Temp.: -196 to 100°C
-380 to 212°F



Design:

- split body design
- trunnion mounted ball
with integral stem
- spring supported seat
- cavity relief system
- live-loaded stem packing
- anti-Blowout Stem
- anti-Static device
- fire safe design



„Typical“ Ball Valve Material of Construction

Main Components:

Body: (incl. end Connections)	Stainless Steel, ASTM A351 CF3M / A182 F304 or DIN 1.4308 / DIN 1.4571
Ball:	Stainless Steel, ASTM A351 CF3M / A182F304 or DIN 1.4308 / DIN 1.4571
Stem:	Stainless Steel, DIN 1.4571
Trim:	Stainless Steel, DIN 1.4571
Seats:	PCTFE
Seals / Gaskets:	Graphite, (alt: PTFE / Glass)
Gland packing:	Natrium
Screws:	Stainless Steel, DIN A 2.70

Note:

Materials listed are „Typical“ for all Ball Valve „Series“ referenced



Summary for Cryogenic Ball Valve

- **Professional Design**
 - **Extended Stem extension ensures that the Gland Packing is far away from low temperature**
 - **Special low temperature seat material KEL-F (PCTFE)**
 - **Bi-directional service**
- **Different Design Possibilities**
 - **2-way - side entry (floating / trunnion mounted ball)**
 - **2-way - top entry**
 - **3-way**
- **Long Lifetime**
- **Low Leakage Rate**
10 ccm³ / min / inch (15 ccm³ / min / inch required in standard)



Low Temperature Valve „Typical“ Test Procedure

1.0 Scope:

This procedure provides instructions to perform “tightness” and “functional” Tests on Ball Valves at a temperature of -196°C

2.0 Reference Documents:

General specification S6364

3.0 Principles:

The testing to be performed in the presence of the clients representative

4.0 Scope of Tests:

10% of each ball valve “Type” will be tested.

- “Types” are determined by seat size & rating.*
- If a “Type” comprises valves which are to be Pneumatically operated, one actuator will be assembled on the valve during the test.*



Low Temperature Valve „Typical“ Test Procedure

5.0 Test Equipment:

View the Equipment Schematic on“page 10“

Tank manufactured in Stainless Steel.

- All seals of virgin Teflon.
- Test medium – inside the ball valve – helium.
- Test medium – outside the ball valve – liquid nitrogen
- Temperature monitoring – Thermocouples located inside & outside the ball valve.
- Flow meter – for measurement of Leakage Rate – „U-tube“ fitted with a scale.
- „Calibrated“ pressure gauges throughout – for pressure measurement.

6.0 Procedure:

- The ball valve components will be de-greased, dried & assembled.
- The initial test will be made at Ambient temperature, using helium to ensure the ball valve is in a suitable condition for the test to proceed.
- With the ball valve in the closed position the helium is introduced into the upstream side of the ball valve and the pressure raised to the seat test pressure of 7 bar.
- This pressure is maintained for period of not less than 2 mins.
- The test is to be performed in both directions.
- Maximum leakage: 15 Ncc/inch/min.



Low Temperature Valve „Typical“ Test Procedure

6.0 Procedure (Continued):

Stem gland & cover seal are checked for tightness. No leakage permitted

- The set-up for the Low Temperature Test is shown schematically on page 10
- The ball valve is positioned in the tank as shown and all connections made.
- Care should be taken to ensure that the ball valve stem “Gland” is positioned clear of the cold boil-off gas in the top of the tank.
- The ball valve is cooled down by immersion in liquid nitrogen.
- The Level of the nitrogen is to cover the top of the ball valve body cover.
- Throughout the cooling operation, a purge of helium is maintained to prevent the ingress of moisture to the ball valve.
- Throughout the cooling operation, the temperature of the ball valve body & the nitrogen is regularly monitored.
- The inlet & outlet valves of the helium supply are closed after purging.
- The positions of the thermocouples are shown on the schematic.

At the temperature of -196°C the ball valve is left to soak for a reasonable time, continually monitoring the thermocouples, to ensure the temperature stabilises at $+ 5^{\circ}\text{C}$



Low Temperature Valve „Typical“ Test Procedure

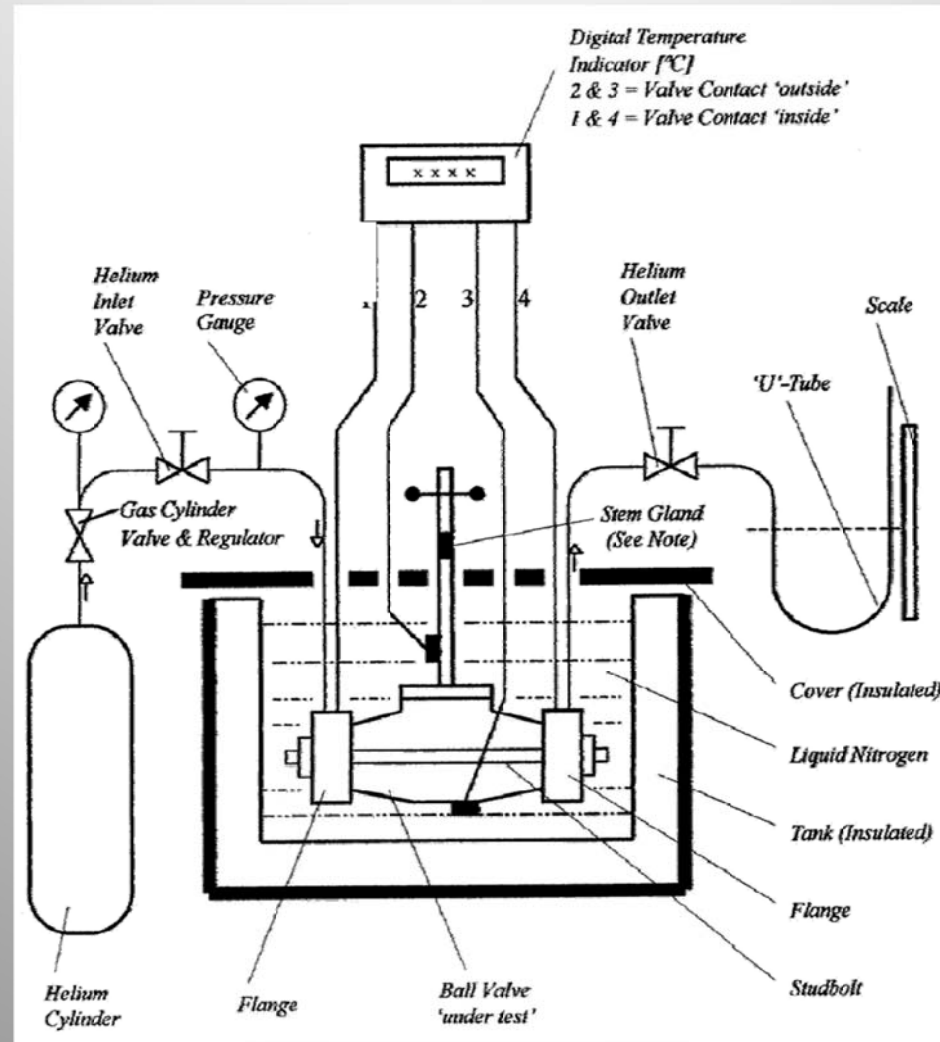
6.0 Procedure (Continued):

- The initial test at ambient temperature, as detailed in Section 6.0 Para. 1, is repeated at the temperature of -196°C .
- The ball valve is tested in both directions.
- The ball valve is opened & Closed two times with the opening & closing torque values measured & recorded. Note: This test is without pressure.
- The is followed by a ball valve function test, with actuator if fitted, with a differential pressure for opening, and a nominal pressure for closing.
- With the ball valve is in the open position, the helium outlet valve is closed and the ball valve body pressurised to 7 bar.
- This pressure is maintained for a period of 5 mins., the ball valve stem gland & body cover seal are checked for tightness. Tightness measured y means of a bubble test.

On completion of the test, the ball valve assembly is to be fully inspected.



Low Temperature Test ~ Typical Equipment Schematic ~



Note: Stem "Gland" To be outside tank



Maintenance and Service Issue

- *service on site*
 - *maintenance & operating Instruction*
 - *training*
 - *use original spares only*
 - *ball and seats can be refurbished by Perrin*
- *service by Perrin GmbH*
 - *on site*
 - *Perrin workshop in Germany*
- *service through a local workshop*



“Cryogenic” Ball Valve Reference List

Customer	Engineering Company	Plant Location	QTY	Temp. (°C)	Size	Pressure	Valve Series
Chantier de l'Atlantic	Chantier	Tanker	1280	-165°C	1" - 6"	150	13,17 & 21
La Ciotat	La Ciotat	Tanker & Terminal (Kuwait)	2890	-50°C -165°C	1" - 16" 12" - 16"	150 & 300	11,13 & 16
Air Liquide	Ari Liquide	Tanker	120	-196°C	1" - 4"	150	13
Distrigas	Tractebel	Zeebrugge	1400	-196°C	1/2" - 8"	150 & 300	17
A.D.N.O.C	Kellog	Das Island (U.A.E)	22	-196°C	3/4" - 8"	150	13 & 17
		Long Ann (China)	18	-196°C	3" - 6"	900	17
Whessoe	Whessoe	Terminal (Greece)	44	-196°C	1" - 6"	150 to 800	12
S.O.L	T.E.C.	Terminal	48	-196°C	2" - 6"	PN 40	13 & 17
Shanghai Municipal Gas Company	Sofregas	Terminal (Ping-Hu)	227	-196°C	1/2" - 6"	150 to 600	17
Tractebel		China	30	-196°C	1/2" - 10"	150 &	80
SVT-Schwelm		El-Paso	10	-196°C	16" /12"	150	14
SVT-Schwelm		Turkey	8	-196°C	16" /12"	150	14
SVT-Schwelm	Tractebel	Portugal	8	-196°C	16" /12"	150	14
SVT-Schwelm			8	-196°C	16"	150	14
SVT-Schwelm			6	-196°C	16"	150	80
SVT-Schwelm			40	-196°C	1/2"	150	80

PERRIN links Nidderau with the world



*Questions
are
welcome*

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