Base Load Power Hub (BLPH)

MANUAL VALVES – GATE, GLOBE, CHECK
FACTORY ACCEPTANCE TEST PROCEDURE

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.1.1 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.

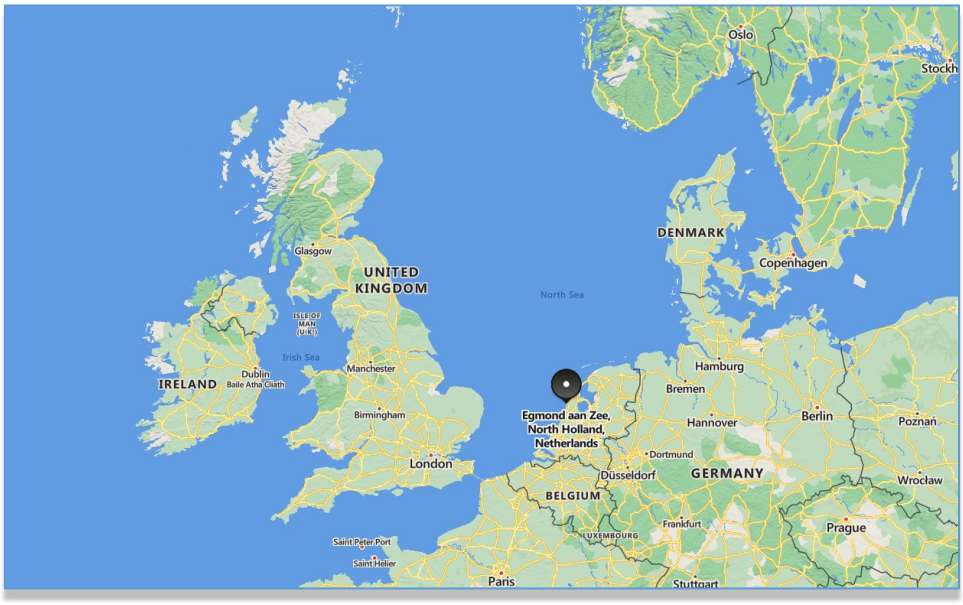


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

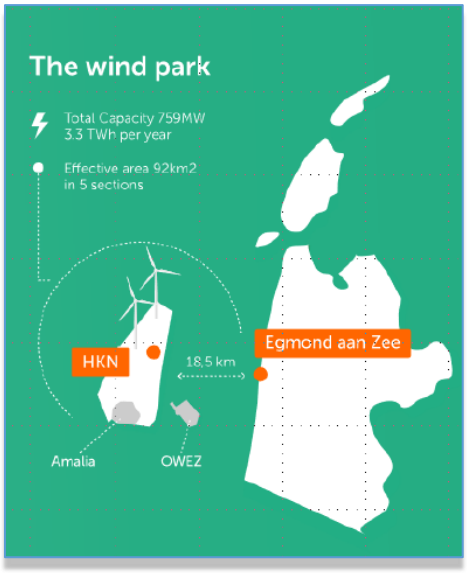


Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2 Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

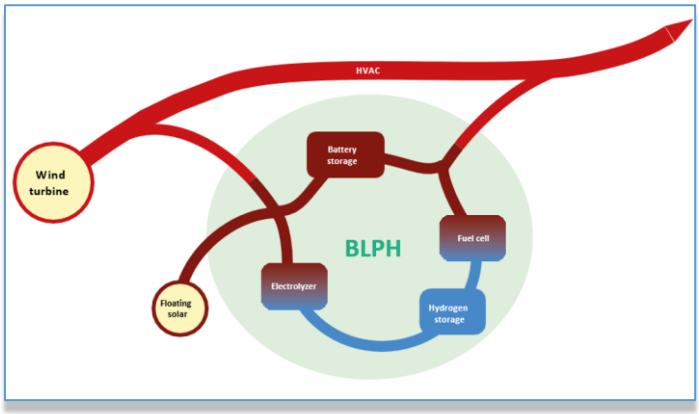


Figure 3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.

The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

2 DOCUMENT SCOPE

The document's scope is to define the index of final record book.

2.1 REFERENCES

Doc. No.	Description
123A90-DDL-PP-SP-70000	Piping Material Classes
123A90-DDL-PP-DS-70003	Manual Valve Data Sheets
Appendix 1 extracted from doc. 123A90-DDL-PP-LIS-70002	Gate, Globe & Check Valves MTO
123A90-DDL-PP-SP-70030	TSS - Manual Valves & Strainers
1724000799-QC-DB-00008	Factory acceptance test procedure
1724000799-QC-ITP-00002_00	Inspection and test plan

Table 1 - Reference Documents

2.2 DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY):	Crosswind
CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project
ISO	International Organization for Standardization
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ITP	Inspection Test Plan
HKN	Hollandse Kust Noord
BLPH	Base Load Power Hub
VooW	Van Oord Offshore Wind
PV	Photovoltaic

BESS	Battery energy storage system
MTO	Material Take Off
PO	Purchase order
FAT	Factory acceptance test
FET	Fugitive Emission Test
FRI	Fabbricazione Rappresentanze Industriali
QC	Quality control
HSE	Health, Safety, and Environment
DN	Nominal Diameter
NPS	Nominal Pipe Size
N/A	Not Available
PQC	Product Quality Control

Table 2 - Definitions and Abbreviations

3 TABLE OF APPLICABLE TESTS FOR EACH ITEM

PO ITEM	CODICE SAP	NO. DATASHEET 123A90-DDL PP-DS-70003 Rev.02	VALVE TYPE	TAG NUMBER	FAT PROCEDURE	STANDARD TEST PROCEDURE	SPECIAL TEST PROCEDURE	FET PROCEDURE
10	VDA0NN16000100	HS01B02RF	GLOBE	BLPH-MV-418	X		X	X
20	VDA0NN16150H00	HS01P01KT	GLOBE	BLPH-MV-215 BLPH-MV-401	X	X		
30	VDE0NN02580100	NT01B02RF	GLOBE	BLPH-MV-171	X	X		
40	VDRNNN02460100	CH01C02RFH	CHECK PISTON	BLPH-NRV-020 BLPH-NRV-021	X		X	X
50	VDRNNN02511H00	CH01F02RF	CHECK PISTON	BLPH-NRV-004 BLPH-NRV-008	X	X		
60	VDRNNN02580100	CH01B02RF	CHECK PISTON	BLPH-NRV-019	X	X		
70	VDRNNN02591H00	CH01B02RF	CHECK PISTON	BLPH-NRV-028	X	X		
80	VDRNNN02620100	CH03C02RFH	CHECK PISTON	BLPH-NRV-023 BLPH-NRV-027 BLPH-NRV-029 BLPH-NRV-030 BLPH-NRV-031	X		X	X
90	VDRNNN02640100	CH01P01KT	CHECK PISTON	BLPH-NRV-007 BLPH-NRV-024 BLPH-NRV-025	X	X		

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4 FAT PROCEDURE

4.1 SCOPE

The purpose of this procedure is to define the methods, procedures, criteria and responsibilities according to which FAT (Factory acceptance test) is performed.

The procedure applies to actuated valves according to ITP requests.

4.2 REFERENCES

- ISO 9001:2015 Standard par. 8.6;
- Quality System Manual par. 8.6;
- API Q1 Specification 9th Edition § 5.9;
- API Q1 QMS Manual § 5.9;

4.3 DEFINITIONS

- FAT "Factory Acceptance Test" is a test carried out at FRI and at the qualified supplier's manufacturer facility of FRI before delivery, to prove that the product works properly before installing it in the final site.
- ITP Inspection and Test Plan or quality controls plan: it defines the requested tests and control for the job.

4.4 RESPONSABILITIES AND AUTHORITIES

FRI Technical Direction and FRI Quality Control Dept are in charge of the test.

4.5 TEST METHOD

The complete valve shall be function-tested.

As part of the function testing the complete assembly shall be stroked four times under simulated operating conditions. This shall be deemed to be the following:

The valve shall be operated from the closed to the open position four (4) times.

- Close valve fully.
- Pressurize end A of valve (see fig.4) to the maximum differential pressure specified in the purchase order data sheet.
- Open valve fully.
- Return pressure in the valve cavities to atmospheric pressure.

For the remaining two cycles the sequence shall be:

- Close valve fully.
- Pressurize end B (see fig.4) of valve to the maximum operating differential pressure specified.
- Open valve fully.
- Return pressure in the valve cavities to atmospheric pressure.

During each of the above operations the valve torque shall be measured (not applicable for check valves).

If an increasing torque trend is seen from these tests the Customer Representative shall have the right to continue the testing until the trend stabilizers.

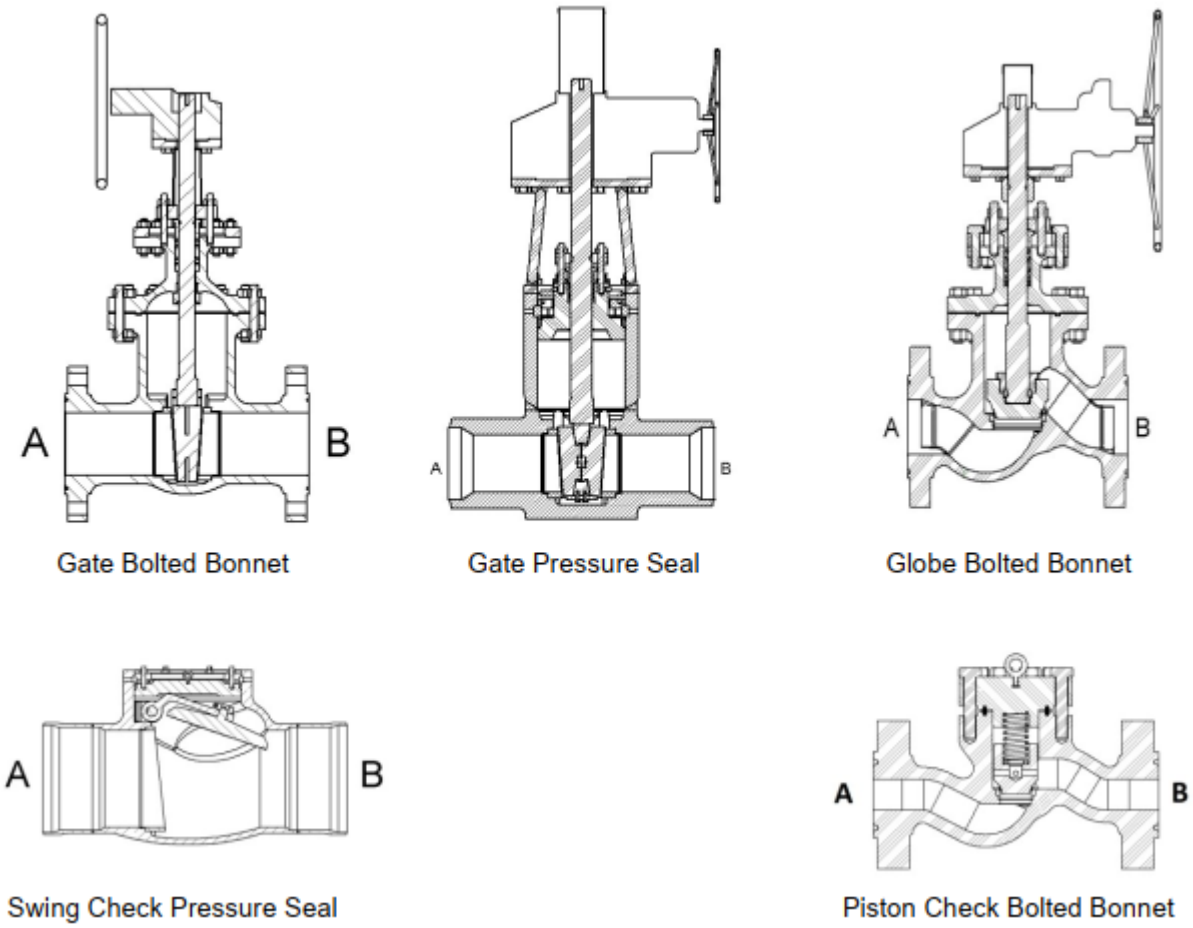


Figure 4 (rev.01)- Side A and B of the valves

4.6 FLOW CHART

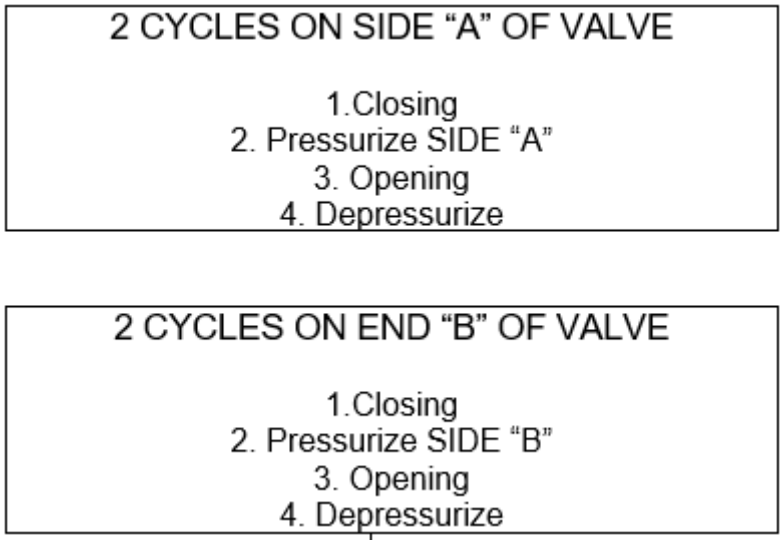


Figure 5-Flow chart FAT

5 STANDARD TEST PROCEDURE

5.1 SCOPE

This procedure describes the methods and the acceptance criteria for the pressure tests carried out on valves manufactured in accordance with API 598 Specification.

5.2 APPLICATION RACE

This procedure states the minimum requirement for carrying out the hydrostatic/pneumatic test, applies when requested tests in accordance with API 598.

NOTE: All tests have to be carried out before the valve is painted and any sealer is applied on obturator and gasket.

This do not apply to internal lined valves. The pressure test of internally lined valves can be performed after the coating is applied.

Residuals of lubricants oil used in assembling, are allowed only if the viscosity is lower than SEA 10W.

5.3 REFERENCES

- UNI EN ISO 9001:2015 § 8.6.
- Quality System Manual § 8.6.
- ASME B 16.34 – Valves Flanged, Threaded and Welding End.
- API 598 – Valve Inspection and Testing.
- ISO 5208 – Pressure Testing of Metallic Valves.

5.4 RESPONSABILITIES AND AUTHORITY

This activity is conduced under Technical Dept. Control.

The test in accordance with this procedure is performed by skilled Production Dept. staff.

QC is informed by Production Department about any kind of problems during test activities.

5.5 GENERAL INFORMATIONS ON THE TESTING

5.5.1 General informations

- All valves have to be tested before shipping.
- Pressure test are carried out before coating of the valves, if requested.
- Supply pressure shall be stabilized for 1 minute prior to the start of the pressure testing and shall be held for the minimum test durations.
- When defined in ITP and percentage explained on it, valves testing can be supervised (witnessed) by the customer or his representative.
- Results of test are recorded.

5.6 PERSONNEL

- People performing test are trained, skilled and experienced for such activities.
- The activity is under the Technical Direction Dept control.

5.7 TEST EQUIPMENT

Pressure gauges are managed according to procedures / instructions issued by FRI or issued by supplier and approved by FRI.

Pressure measuring devices shall be pressure gauges or pressure transducers, which have an accuracy at least of ±2% of the full-scale reading.

The value of the pressure measured shall be within 25% and 75% of the full pressure range of the measuring device (not applicable for digital pressure transducers).

The leakage through the seats of a trunnion mounted ball valve, during hydraulic test, shall be detected visually through the body cavity vent (after the stabilization time). The plug shall be removed (or open if possible) and the level shall not increase during the test. Variation in measurements of Bench's pressure gauges, related to leakage in internal bench connections have not to be considered as evidence of pressure drop.

If there are any leakage, they shall be measured by means of a measuring cylinder.

Hydraulic leakage for floating ball valves shall be detected through the opposite side, using for the monitoring the connections and the instruments included in the testing equipments and at the time disposable.

The seat leakage during the pneumatic testing shall be detected by means of a bubbler (pipe in a water tank) connected to the body cavity vent (trunnion ball valves) or the opposite side (floating ball valves).

Body leakage during hydrostatic test shall be visually detected only. No instruments shall be used (including bubble soap leak detector).

Body leakage during gas test must be detected by means of bubble soap method.

5.8 HSE RECOMMENDATIONS

Tests have to be performed in accordance to the national safety laws and the operating instructions for lifting and transportation of the valves with regards to the internal rules.

Lifting and moving the valves have to be performed by using the suitable lifting equipment, as clearly identified by colours and tags.

Testing and the moving the valve have to be performed with safe operations. The valves have to be well locked into the bench in order to avoid pressure drops toward the external.

5.9 TESTS

5.9.1 Required tests

NPS ≤ 4 Class ≤ 1500

Test description	Globe	Check
Shell	*Required*	*Required*
Backseat	*Required*	N/A
Low Pressure Closure	*Optional*	*Optional*
High Pressure Closure	*Required*	*Required*

5.10 TEST REQUIREMENTS

5.10.1 Test fluids

- Hydrostatic test shall be performed with fresh and clear water containing a corrosion inhibitor and, if necessary, an antifreeze.
- Water Chloride content shall not exceed 15 μ g/g (15ppm)
- pH value between 6.0 and 8.0
- Low pressure gas test should be performed with air or inert gas.

5.10.2 Test temperature

The test is conducted at ambient temperature (between 5 to 35°C).

5.10.3 Test duration

Test: duration of the test shall be as per Table D

5.10.4 Test pressure

- Shell Test: the pressure shall be the ones indicated in Table "A"(see section 5.15)[1.5 times the rating]
- Stem backseat test: test pressure shall be the ones indicated in Table "B" (see section 5.16) [1.1 times the rating]
- Low pressure closure test pressure shall be the between 4 and 7 bars
- High pressure closure test (fluid: water) pressure shall be the ones indicated in Table "B" (see section 5.16) [1.1 times the rating].

5.10.5 Allowable leakages

- Hydrostatic Shell test: no visible leakage is permitted during the test.
- Stem backseat test: no visible leakage is permitted during the hydrostatic shell test.

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- Closure Tests: the allowable leakage is defined as per Table "E" (see section 5.19).

5.11 TEST SEQUENCE

5.11.1 Hydrostatic shell test

- Put the valve on the hydraulic test bench or close the valve ends with test blind flanges, and put the ball in the half-open position.
- Fill the valve with water through the valve ends, if the valve is fitted with a body cavity vent, vent off as much air as possible through it.
- Close the body cavity vent and pressurize to the pressure indicated in Table "A" (see section 5.15).
- After a stabilization period, pressure shall be maintained for the time specified in Table "D" (see section 5.18).
- Thoroughly examine the entire surface of the valve, making sure that there are no visible drops or Humidity traces for all the test duration.
- Relieve the pressure.

5.11.2 Hydrostatic seat test

- Fill the valve and the body cavity with water, venting off all the air from the body cavity vent.
- Put the wedge in the closed position.
- Pressurize one side of the valve to the pressure indicate in Table "B" (see section 5.16) and, after a stabilization period, maintain the pressure for the time indicated in Table "D" (see section 5.18)
- Monitor the seat leakage via the body cavity vent or via the other seat.
- Relieve the pressure and repeat the test on the opposite side.

5.11.3 Backseat test

- Packing gland shall be loose. Self energizing stem packing or seal shall be removed.
- Put the valve on the hydraulic test bench or close the valve ends with test blind flanges, and put the wedge / disc in the half-open position.
- Fill the valve with water through the valve ends, till test fluid around stem is observed
- Close the backseat and pressurize to the pressure indicated in Table "B" (see section 5.16).
- After a stabilization period, pressure shall be maintained for the time specified in Table "D" (see section 5.18).
- Thoroughly examine the entire surface of the stem area, making sure that there are no visible drops or Humidity traces for all the test duration.

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5.11.4 Low pressure closure test

- Type I: The seat test shall be repeated using air or nitrogen as test medium, at a test pressure between 0.5 [barg] and 1.0 [barg].
- Type II: The seat test shall be repeated using air or nitrogen as test medium, at a test pressure between 4.8 [barg] and 6.2 [barg].

5.12 POST TEST OPERATIONS

- Put the valve in half-open position.
- Thoroughly dry the valve from test fluid and dry carefully and completely the valves.
- Open the valve and suitably protect the valve ends.

5.13 NON-CONFORMITIES

Every information relating to non-conformities found is registered on the non-conformity reports, like every methods used in the decision making for corrective actions to be implemented.

5.14 TEST RECORDS

Pressure test certificate is the document certifying the results of pressure and functional tests; it is collected in the Final Data Book (called also "Book") at the end of all activities.

5.15 TABLE "A" – SHELL TEST PRESSURE

Body Material	150#	300#
ASTM A105 / A350 LF2	30	77
ASTM A182 F316	29	75
ASTM A182 F316L	24	63
ASTM A182 F53/F55	30	78
UNS N10276 (HASTELLOY C276)	30	78

5.16 TABLE "B" – SEAT TEST PRESSURE

Body Material	150#	300#
ASTM A105 / A350 LF2	22	57
ASTM A182 F316	*21*	55
ASTM A182 F316L	18	46
ASTM A182 F53/F55	*22*	58

UNS N10276 (HASTELLOY C276)	*22*	58

5.17 TABLE "C" –ASME B 16.34 RATING PRESSURE

Body Material	150#	300#
ASTM A105 / A350 LF2	*19.6*	51.1
ASTM A182 F316	19.0	49.6
ASTM A182 F316L	15.9	41.4
ASTM A182 F53/F55	20	51.7
UNS N10276 (HASTELLOY C276)	20	51.7

5.18 TABLE "D" – DURATION OF TEST

Valve size		Test duration (seconds)			
DN (mm)	NPS (inch.)	Shell	Backseat	Closure Check Valves	Closure Other Valves
15 – 50	1/2" – 2"	15	15	60	15

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5.19 TABLE "E" – ALLOWABLE LEAKAGES

Valve Size		All Resilient seated Valves	Metal Seated Valves Except Check		Metal Seated Check Valves		
DN (mm)	NPS (in.)		Liquid Test [a] (drops/min)	Gas Test [a] (bubbles/min)	Liquid Test (drops/min)	Liquid Test (cc/min)	Gas Test (m^3/h)
≤ 50	≤ 2	0	0 [b]	0 [b]	96	6	0.08
65	2 1/2	0	5	10	120	7,5	0.11
80	3	0	6	12	144	9	0.13
100	4	0	8	16	192	12	0.17
125	5	0	10	20	240	15	0.21
150	6	0	12	24	288	18	0.25
200	8	0	16	32	384	24	0.34
250	10	0	20	40	480	30	0.43
300	12	0	24	48	576	36	0.50
350	14	0	28	56	672	42	0.59
400	16	0	32	64	768	48	0.67
450	18	0	36	72	864	54	0.76
500	20	0	40	80	960	60	0.84
600	24	0	48	96	1152	72	1.01
650	26	0	52	104	1248	78	1.09
700	28	0	56	112	1344	84	1.18
750	30	0	60	120	1440	90	1.26
800	32	0	64	128	1536	96	1.34
900	36	0	72	144	1728	108	1.51
1000	40	0	80	160	1920	120	1.68
1050	42	0	84	168	2016	126	1.76
1200	48	0	96	192	2304	144	2.02

[a] For the liquid test, **1mL is considered equivalent to 16 drops**. For the gas test 1 mL is considered equivalent to 100 bubbles.

[b] There shall be no leakage for the minimum specified test duration (see Table "D"). for liquid test, 0 drops means no visible leakage per minimum specified test duration. For standard gas test, 0 bubbles means less than 1 bubble per minimum specified test duration. For high-pressure pneumatic closure test refer to § 5.4 of API 598 Standard.

[c] Leakage rates for sizes above DN 1200 (NPS 48) shall be calculated by the following formulas:
Liquid Test for Metal Seated Valves except Check: **2 X NPS (drops/min)**
Gas Test for Metal Seated Valves except Check: **4 X NPS (bubbles/min)**
Liquid Test for Metal Seated Check Valves: **3 X NPS (cc/min)**
Gas Test for Metal Seated Check Valves: **0.042 X NPS (m^3/h)**
Gas Test for Metal Seated Check Valves: **1.5 X NPS (ft^3/h)**

For references see API 598 Specification Table 5.

6 SPECIAL TEST PROCEDURE

6.1 SCOPE

This procedure describes the methods and the acceptance criteria for the pressure tests carried

out on valves manufactured in accordance with API 598 Specification. This procedure is applicable only for items reported on §3-TABLE OF APPLICABLE TESTS FOR EACH ITEM.

6.2 APPLICATION RACE

This procedure states the minimum requirement for carrying out the hydrostatic/pneumatic test, applies when requested tests in accordance with API 598.

NOTE: All tests have to be carried out before the valve is painted and any sealer is applied on obturator and gasket.

This do not apply to internal lined valves. The pressure test of internally lined valves can be performed after the coating is applied.

6.3 REFERENCES

- UNI EN ISO 9001:2015 § 8.6.
- Quality System Manual § 8.6.
- ASME B 16.34 – Valves Flanged, Threaded and Welding End.
- API 598 – Valve Inspection and Testing.
- ISO 5208 – Pressure Testing of Metallic Valves.

6.4 RESPONSABILITIES AND AUTHORITY

This activity is conducted under Technical Dept. Control.

The test in accordance with this procedure is performed by skilled Production Dept. staff.

QC is informed by Production Department about any kind of problems during test activities.

6.5 GENERAL INFORMATIONS ON THE TESTING

6.5.1 General informations

- All valves have to be tested before shipping.
- Pressure tests are carried out before coating of the valves, if requested.
- Supply pressure shall be stabilized for 1 minute prior to the start of the pressure testing and shall be held for the minimum test durations.
- When defined in ITP and percentage explained on it, valves testing can be supervised (witnessed) by the customer or his representative.
- Results of test are recorded.

6.6 PERSONNEL

- People performing test are trained, skilled and experienced for such activities.
- The activity is under the Technical Direction Dept control.

6.7 TEST EQUIPMENT

Pressure gauges are managed according to procedure s/ instructions issued by FRI or issued by supplier and approved by FRI.

Pressure measuring devices shall be pressure gauges or pressure transducers, which have an accuracy at least of ±2% of the full-scale reading.

The value of the pressure measured shall be within 25% and 75% of the full pressure range of the measuring device (not applicable for digital pressure transducers).

The seat leakage during the pneumatic testing shall be detected by means of a bubbler (pipe in a water tank) connected to the body cavity vent (trunnion ball valves) or the opposite side (floating ball valves).

Body leakage during gas test must be detected by means of bubble soap method.

6.8 HSE RECOMMENDATIONS

Tests have to be performed in accordance to the national safety laws and the operating instructions for lifting and transportation of the valves with regards to the internal rules.

Lifting and moving the valves have to be performed by using the suitable lifting equipment, as clearly identified by colors and tags.

Testing and the moving the valve have to be performed with safe operations. The valves have to be well locked into the bench in order to avoid pressure drops toward the external.

6.9 TESTS

6.9.1 Required tests

NPS ≤ 4 Class ≤ 1500

Test description	Globe	Check
Shell (100% Helium)	*Required*	*Required*
Backseat (100% Helium)	*Required*	N/A
Low Pressure Closure	*Optional*	*Optional*
High Pressure Closure (100% Helium)	*Required*	*Required*

6.10 TEST REQUIREMENTS

6.10.1 Test fluids

- Shell, backseat and high-pressure closure test are performed with 100% helium gas.

6.10.2 Test temperature

The test is conducted at ambient temperature (between 5 to 35°C).

6.10.3 Test duration

Test: duration of the test shall be as per Table I.

6.10.4 Test pressure

- Shell Test: the pressure shall be the ones indicated in Table F [1.5 times the rating]
- Stem backseat test: test pressure shall be the ones indicated in Table G [1.1 times the rating]
- Low pressure closure test pressure shall be the between 4 and 7 barg
- High pressure closure test pressure shall be the ones indicated in Table G [1.1 times the rating].

6.10.5 Allowable leakages

- Shell test: no visible leakage is permitted during the test.
- Stem backseat test: no visible leakage is permitted during the test.
- Closure Tests: the allowable leakage is defined as per Table L.

6.11 TEST SEQUENCE

6.11.1 Helium shell test

- Brush surface with a mixture of soap and water or put valve in a tank and fill with water. These methods can be used to verify the external leakage of the valve.
- Put the valve on the test bench or close the valve ends with test blind flanges and put the disc in the half-open position.
- Fill the valve with helium through the valve ends, if the valve is fitted with a body cavity vent, vent off as much air as possible through it.
- Close the body cavity vent and pressurize to the pressure indicated in Table F.
- After a stabilization period, pressure shall be maintained for the time specified in Table F.
- Thoroughly examine the entire surface of the valve, making sure that there are no visible bubbles for all the test duration.
- Relieve the pressure.

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6.11.2 High pressure gas test

- The seat test shall be repeated with a high-pressure test using an inert gas (Helium) as test medium.
- Test pressure shall be the same as for the equivalent hydrostatic test, time as per Table L.
- Allowable leakage will be as per Table L- Allowable leakages (ISO 5208 rate G).

6.11.3 Backseat test

- Brush surface with a mixture of soap and water or put valve in a tank and fill with water. These methods can be used to verify the external leakage of the valve.
- Packing gland shall be loose. Self energizing stem packing or seal shall be removed.
- Put the valve on the test bench or close the valve ends with test blind flanges, and put the wedge / disc in the half-open position.
- Fill the valve through the valve ends.
- Close the backseat and pressurize to the pressure indicated in Table G.
- After a stabilization period, pressure shall be maintained for the time specified in Table I.
- Thoroughly examine the entire surface of the valve, making sure that there are no visible bubbles for all the test duration.

6.11.4 Low pressure closure test

- Type I: The seat test shall be repeated using air or nitrogen as test medium, at a test pressure between 0.5 [barg] and 1.0 [barg].
- Type II: The seat test shall be repeated using air or nitrogen as test medium, at a test pressure between 4.8 [barg] and 6.2 [barg].

6.12 POST TEST OPERATIONS

- Put the valve in half-open position.
- Open the valve and suitably protect the valve ends.

6.13 NON-CONFORMITIES

Every information relating to non-conformities found is registered on the non-conformity reports, like every methods used in the decision making for corrective actions to be implemented.

6.14 TEST RECORDS

Pressure test certificate is the document certifying the results of pressure and functional tests; it is collected by the PM in the Final Data Book (called also "Book") at the end of all activities.

6.15 TABLE "F" – SHELL TEST PRESSURE

Body Material	150#	300#
ASTM A105 / A350 LF2	30	77
ASTM A182 F316	29	75
ASTM A182 F316L	24	63

6.16 TABLE "G" – SEAT TEST PRESSURE

Body Material	150#	300#
ASTM A105 / A350 LF2	22	57
ASTM A182 F316	*21*	55
ASTM A182 F316L	18	46

6.17 TABLE "H" –ASME B 16.34 RATING PRESSURE

Body Material	150#	300#
ASTM A105 / A350 LF2	*19.6*	51.1
ASTM A182 F316	19.0	49.6
ASTM A182 F316L	15.9	41.4

6.18 TABLE "I" – DURATION OF TEST

Valve size		Test duration (seconds)			
DN (mm)	NPS (inch.)	Shell	Backseat	Closure Check Valves	Closure Other Valves
15 – 50	1/2" – 2"	15	15	60	15

6.19 TABLE "L" – ALLOWABLE LEAKAGES

	Rate G
Gas test	6000 mm^3/s x DN

7 FUGITIVE EMISSION TEST

7.1 PURPOSE AND FIELD OF APPLICATION

Describe how to perform the Fugitive Emissions Test according to ISO 15848-2.

7.2 REFERENCES

- PQC40 procedure type test
- ISO 15848-2 Industrial valves - Measurement, test and qualification procedures for fugitive emission - Part 2: Production acceptance test of valves

7.3 GENERAL CONSIDERATIONS

The percentage of the valves to be tested is agreed with the customer, with a minimum of one valve per lot. The valves to be tested are chosen randomly for each lot, pressure class and nominal size.

This procedure is applicable to valves whose design has been previously approved by the PQC40 procedure type test.

7.4 TEST CONDITIONS

- The test gas is 97% helium minimum;
- Losses are measured using a sniffer (without the need for empty measurements) and are expressed in parts per million (ppm);
- The test pressure must be 6 barg, unless otherwise agreed with the customer
- The test temperature must be equal to the ambient temperature

7.5 ITER OF TEST

7.5.1 Losses at the baderna

- Open the valve halfway and bring it to the pressure indicated in section 7.4
- Open and close the valve completely for 5 (five) times
- Open the valve halfway and measure packing losses
- If the leaks exceed the acceptability criteria expressed in section 7.6.1, the entire lot belonging to the valve is discarded

7.5.2 Losses from the body gaskets

- Open the valve halfway and bring it to the pressure indicated in section 7.4.
- Once the pressure has stabilized, measure the losses with the sniffer.
- If the leaks exceed the acceptability criteria expressed in section 7.6.2, the entire lot belonging to the valve is discarded.

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7.6 ACCEPTABILITY CRITERIA

7.6.1 Losses to the baderna (Only for globe valve)

CLASS B: the allowed losses must be less than or equal to 100ppm

7.6.2 Loss from the body gaskets

The allowed losses must be less than or equal to 50ppm.