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ISO 15848-1 QUALIFICATION CERTIFICATE

TÜV SÜD Industrie Service

Certificate No.:278937 Rev.1

Ref. Test report No.:278936 Rev.1

We hereby certify that the valve below has passed the fugitive emission test successfully according to Class BH of ISO15848-1:2015+Amd.1:2017 for a total of **205** cycles.

Name of manufactuer	Antiwear (Suzhou) Industrial Intelligent Technology Co., Ltd.
Postal Address of manufactuer	No. 988, Yuexiu Road, Fenhu Economic Development Zone, PC: 215200, Suzhou City, Jiangsu Province, P.R. China
Item	SSBBJ-10S15BW-LT-F-D Ball Valve
Valve size	10"
Pressure rating	Class1500
Stem size	Φ100 mm
Body/bonnet material	ASTM A351 CF3M
Seal material	Graphite + EPDM O-Ring
Valve assembly drawing no.	SSBBJ-10S15BW-LT-F-D Rev.A1

The tested valve covers performance class (para.6.6):

ISO FE BH – CO1 – SSA1 – t(-196℃,200℃)– CL1500 – ISO 15848-1

Extension of qualification (in particular) to untested valves in accordance with paragraph 8 of ISO15848-1.

Other stem sizes qualified: 50 mm up to 200 mm

Other pressure ranges qualified: Class 1500 and lower

This certificate must be read in conjunction with test report No.:278936 Rev.1

Chen Guilin

TÜV SÜD Industrie Service GmbH

Shanghai, July 9, 2022
(Place, date)

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Industrie Service

Test Report

(Valve fugitive emission test according to ISO15848-1: 2015+Amd.1:2017)

Certificate No. :278937 Rev.1
Test Report No.:278936 Rev.1

Applicant / Manufacturer: Antiwear (Suzhou) Industrial Intelligent Technology Co., Ltd.
No.988, Yuexiu Road, Fenhu Economic Development Zone,
PC: 215200, Suzhou City, Jiangsu Province, P. R. China

Inspection body: TÜV SÜD Industrie Service GmbH
Floor 3-13, No.151, Heng Tong Road, Shanghai, P. R. China

Lab of test: Antiwear (Suzhou) Industrial Intelligent Technology Co., Ltd.
Test Laboratory

Test Date: July 12-23, 2021

Description of valves: SSBBJ-10S15BW-LT-F-D Ball Valve
Size:10"
Pressure Rating: Class1500
Drawing No.: SSBBJ-10S15BW-LT-F-D Rev.A1

Test Witnessed By: CHEN Guilin / TÜV SÜD Inspector

TÜV SÜD Industrie Service GmbH
Shanghai Office
Floor 3-13, No.151, Heng Tong Road,
Shanghai 200070 P. R. China

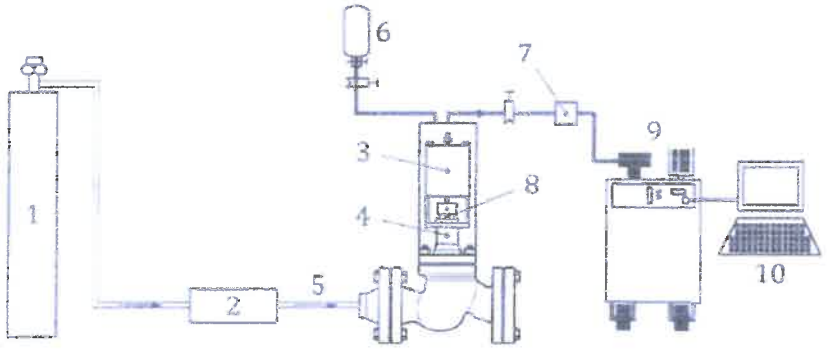
Industrie Service

Inspection and Tests

1. Conformity of Equipment

The test equipment was verified by TÜV SÜD inspector according to requirements of ISO15848-1:2015+Amd.1:2017 and found satisfactory. The detailed arrangement of the fugitive emission test equipment is shown below:

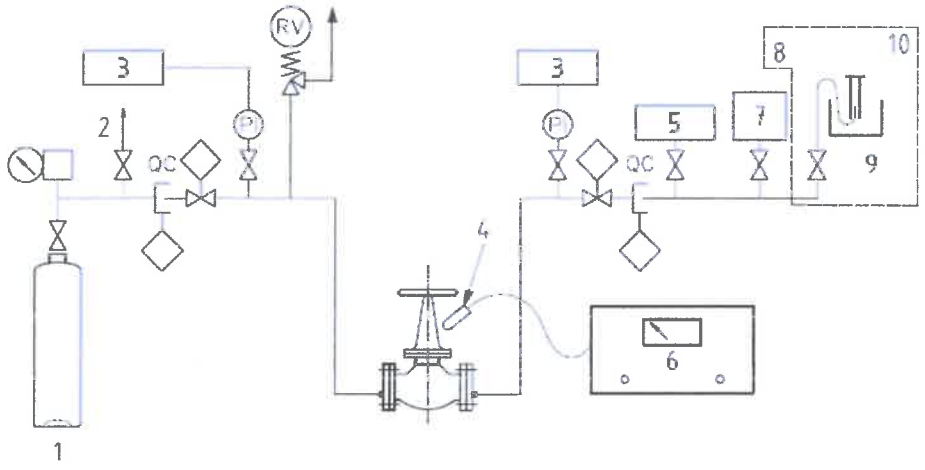
Figure 1 Typical stem seal leakage measurement system with Vacuum Method



Key

1	helium at 97 % purity	6	standard calibrated leak
2	pressure control	7	vacuum breaker (optional)
3	actuator	8	tested stem sealing
4	vacuum	9	helium mass spectrometer
5	helium	10	data acquisition

Figure 2 Typical body seal leakage measurement system with Sniffing Method



Key

QC quick coupling

1	helium gas supply	6	mass spectrometer
2	vent	7	flow rotameter
3	pressure recorder	8	hose
4	probe	9	measuring cylinder
5	gas flow meter	10	safe location (outside)

2. Document review

The specific product data file provided by the valve manufacturer includes:

a) cross sectional valve assembly drawing;

b) bill of valve material

c) stem or shaft seal description, dimension and specifications;

d) body seal description, dimension and specifications;

e) material specifications of stem or shaft seal components;

f) hydrostatic test certificate.

The above documents are reviewed with no objection.

3.Technical Data of Test Valve:

General description of test valve

Name of manufactuer	Antiwear (Suzhou) Industrial Intelligent Technology Co., Ltd.
Postal Address of manufactuer	No. 988, Yuexiu Road, Fenhu Economic Development Zone, PC: 215200, Suzhou City, Jiangsu Province, P.R. China
Item	SSBBJ-10S15BW-LT-F-D Ball Valve
Valve size	10"
Pressure rating	Class1500
Stem size	Φ100 mm
Body/bonnet material	ASTM A351 CF3M
Seal material	Flexible Graphite + EPDM O-Ring
Valve assembly drawing no.	SSBBJ-10S15BW-LT-F-D Rev.A1

4.Visual and dimensional check of the test valve:

The test valve was chosen at random by the manufacturer in its workshop and submitted to the laboratory. The visual and dimensional check was performed according to drawing No.: SSBBJ-10S15BW-LT-F-D Rev.A1 and results found satisfactory. The mark was verified on valve as following:

	10"	1500	CF3M
Manufacturer` Brand	Size	Class	Material

The stem size was measured as Ø100mm.

5.Preparation of the test valve:

Before the fugitive emission test, the test valve was hydrostatic tested under 372bar, the test showed no visible leakage or deformation. Then the valve was cleaned and dried.

6.Calibration of test instrument

The test instrument was turned on, warmed up at the minimum time according to the requirements of the equipment manufacturer and calibrated with the standard calibrated leak 100% helium according to the procedure specified in Annex A, Para.A.1.4.2 of ISO15848-1:2015+Amd.1:2017.

7.Fugitive emission test and measurement

The test valve was mounted on a test rig with the stem positioned vertical. And the fugitive emission test is carried out as per requirement of ISO15848-1:2015+Amd.1:2017 Para.5.

7.1 Preliminary tests at room temperature (test 1)

The valve was pressurized with test fluid Helium to 248.2bar according to manufacturer's requirements in the partly opened position, the temperature at locations "X"/"Y"/"Z" are measure and recorded as room temperature

The stem seal leakage measurement was performed by the Vacuum method as described in ISO15848-1 Annex A.

The body seal leakage measurement was performed by the sniffing method as described in ISO15848-1 Annex B.

The test results are as follows:

Test results of preliminary tests

Item	ISO15848-1 Required Value	Actual Value
Stem leakage (mbar.l/s)	$\leq 1.78\times10^{-4}$	4.2×10^{-7}
Body seal leakage(ppmv)	≤50	1.5
The test results meet the requirements of ISO15848-1:2015+Amd.1:2017.		

7.2 Mechanical cycle test at the room temperature (test 2)

A total of 50 mechanical cycles was performed on the test valve while it was kept pressurized with 248.2bar according to manufacturer's requirements at room temperature. The leakage from the stem seal was measured with following results:

Test results of final tests

Item	ISO15848-1 Required Value	Actual Value
Stem leakage (mbar.l/s)	$\leq 1.78\times10^{-4}$	9.5×10^{-7}
The test results meet the requirements of ISO15848-1:2015+Amd.1:2017.		

7.3 Static test at the selected test temperature (test 3)

The test valve was cooled till to -196℃. The test valve was kept pressurized with 248.2bar according to manufacturer's requirements at the temperature -186℃~-206℃. The leakage from the stem seal were measured with following results:

Test results of final tests

Item	ISO15848-1 Required Value	Actual Value
Stem leakage (mbar.l/s)	$\leq 1.78\times10^{-4}$	1.5×10^{-6}
The test results meet the requirements of ISO15848-1:2015+Amd.1:2017.		

7.4 Mechanical cycle test at the selected temperature (test 4)

A total of 50 mechanical cycles was performed on the test valve while it was kept pressurized with 248.2bar according to manufacturer's requirements at the temperature -186℃~-206℃. The leakage from the stem seal was measured with following results:

Test results of final tests

Item	ISO15848-1 Required Value	Actual Value
Stem leakage (mbar.l/s)	$\leq 1.78\times10^{-4}$	4.5×10^{-6}
The test results meet the requirements of ISO15848-1:2015+Amd.1:2017.		

7.5 Repeat of static test at the room temperature (test 5)

The test valve returned to the room temperature naturally, without artificial cooling/heating. After the temperature was stabilized at room temperature. Then the stem seal leakage under 248.2bar accord ing to manufacturer's requirements was measured using the same method as mentioned above, with following test result:

Test results of final tests

Item	ISO15848-1 Required Value	Actual Value
Stem leakage (mbar.l/s)	$\leq 1.78\times10^{-4}$	1.8×10^{-6}
The test results meet the requirements of ISO15848-1:2015+Amd.1:2017.		

7.6 Repeat of mechanical cycle test at the room temperature (test 2)

A total of 50 mechanical cycles was performed on the test valve while it was kept pressurized with 248.2bar according to manufacturer's requirements at room temperature. The leakage from the stem seal was measured with following results:

Test results of final tests

Item	ISO15848-1 Required Value	Actual Value
Stem leakage (mbar.l/s)	$\leq 1.78\times10^{-4}$	3.2×10^{-6}
The test results meet the requirements of ISO15848-1:2015+Amd.1:2017.		

7.7 Repeat of static test at the selected test temperature (test 3)

The test valve was cooled till to -196℃. The test valve was kept pressurized with 248.2bar according to manufacturer's requirements at the temperature between -186℃~-206℃. The leakage from the stem seal were measured with following results:

Test results of final tests

Item	ISO15848-1 Required Value	Actual Value
Stem leakage (mbar.l/s)	$\leq 1.78\times10^{-4}$	5.3×10^{-6}
The test results meet the requirements of ISO15848-1:2015+Amd.1:2017.		

7.8 Repeat of Mechanical cycle test at the selected temperature (test 4)

A total of 50 mechanical cycles was performed on the test valve while it was kept pressurized with 248.2bar according to manufacturer's requirements at the temperature -186℃~-206℃. The leakage from the stem seal was measured with following results:

Test results of final tests

Item	ISO15848-1 Required Value	Actual Value
Stem leakage (mbar.l/s)	$\leq 1.78\times10^{-4}$	$7.3\text{x }10^{-6}$
The test results meet the requirements of ISO15848-1:2015+Amd.1:2017.		

7.9 Intermediate static test at the room temperature (test 5)

The test valve returned to the room temperature naturally, without artificial cooling/heating. After the temperature was stabilized at room temperature, the leakage from the stem seal was measured with following results while it was kept pressurized with 248.2bar:

Test results of final tests

Item	ISO15848-1 Required Value	Actual Value
Stem leakage (mbar.l/s)	$\leq 1.78\times10^{-4}$	$7.3\text{x }10^{-6}$
The test results meet the requirements of ISO15848-1:2015+Amd.1:2017.		

7.10Final test at the room temperature (test 6)

The test valve returned to the room temperature naturally, without artificial cooling/heating. After the temperature was stabilized at room temperature, A total of 5 mechanical cycles was performed on the test valve while it was kept pressurized with 248.2bar according to manufacturer's requirements at room temperature. the leakage from the stem seal and from the valve body seal under 248.2bar according to manufacturer's requirements were both measured using the same method as mentioned in paragraph 7.1, with following results:

Test results of final tests at room temperature (test 6)

Item	ISO15848-1 Required Value	Actual Value
Stem leakage (mbar.l/s)	$\leq 1.78\times10^{-4}$	$7.2\text{x }10^{-6}$
Body seal leakage(ppmv)	≤50	2
The test results meet the requirements of ISO15848-1:2015+Amd.1:2017.		

7.11 Preliminary tests at room temperature (test 1)

The valve was pressurized with test fluid Helium to 248.2bar according to manufacturer's requirements in the partly opened position, the temperature at locations "X"/"Y"/"Z" are measure and recorded as room temperature.

The stem seal leakage measurement was performed by the Vacuum method as described in ISO15848-1 Annex A.

The body seal leakage measurement was performed by the sniffing method as described in ISO15848-1 Annex B.

The test results are as follows:

Test results of preliminary tests

Item	ISO15848-1 Required Value	Actual Value
Stem leakage (mbar.l/s)	$\leq 1.78\times10^{-4}$	7.2×10^{-6}
Body seal leakage(ppmv)	≤50	2.5
The test results meet the requirements of ISO15848-1:2015+Amd.1:2017.		

7.12 Mechanical cycle test at the room temperature (test 2)

A total of 50 mechanical cycles was performed on the test valve while it was kept pressurized with 248.2bar according to manufacturer's requirements at room temperature. The leakage from the stem seal was measured with following results:

Test results of final tests

Item	ISO15848-1 Required Value	Actual Value
Stem leakage (mbar.l/s)	$\leq 1.78\times10^{-4}$	7.3×10^{-6}
The test results meet the requirements of ISO15848-1:2015+Amd.1:2017.		

7.13 Static test at the selected test temperature (test 3)

The test valve was heated till to 200℃. The test valve was kept pressurized with 178.3bar according to manufacturer's requirements at the temperature 190℃~-210℃. The leakage from the stem seal were measured with following results:

Test results of final tests

Item	ISO15848-1 Required Value	Actual Value
Stem leakage (mbar.l/s)	$\leq 1.78\times10^{-4}$	8.2×10^{-6}
The test results meet the requirements of ISO15848-1:2015+Amd.1:2017.		

7.14 Mechanical cycle test at the selected temperature (test 4)

A total of 50 mechanical cycles was performed on the test valve while it was kept pressurized with 178.3bar according to manufacturer's requirements at the temperature -190℃~-210℃. The leakage from the stem seal was measured with following results:

Test results of final tests

Item	ISO15848-1 Required Value	Actual Value
Stem leakage (mbar.l/s)	$\leq 1.78\times10^{-4}$	7.9×10^{-6}
The test results meet the requirements of ISO15848-1:2015+Amd.1:2017.		

7.15 Repeat of static test at the room temperature (test 5)

The test valve returned to the room temperature naturally, without artificial cooling/heating. After the temperature was stabilized at room temperature. Then the stem seal leakage under 248.2bar according to manufacturer's requirements was measured using the same method as mentioned above, with following test result:

Test results of final tests

Item	ISO15848-1 Required Value	Actual Value
Stem leakage (mbar.l/s)	≤1.78×10^{-4}	8.8 x 10^{-6}
The test results meet the requirements of ISO15848-1:2015+Amd.1:2017.		

7.16 Repeat of mechanical cycle test at the room temperature (test 2)

A total of 50 mechanical cycles was performed on the test valve while it was kept pressurized with 248.2bar according to manufacturer's requirements at room temperature. The leakage from the stem seal was measured with following results:

Test results of final tests

Item	ISO15848-1 Required Value	Actual Value
Stem leakage (mbar.l/s)	≤1.78×10^{-4}	1.2 x 10^{-5}
The test results meet the requirements of ISO15848-1:2015+Amd.1:2017. The stem has been adjusted once time.		

7.17 Repeat of static test at the selected test temperature (test 3)

The test valve was heated till to 200℃. The test valve was kept pressurized with 178.3bar according to manufacturer's requirements at the temperature between 190℃~-210℃. The leakage from the stem seal were measured with following results:

Test results of final tests

Item	ISO15848-1 Required Value	Actual Value
Stem leakage (mbar.l/s)	≤1.78×10^{-4}	6.3 x 10^{-6}
The test results meet the requirements of ISO15848-1:2015+Amd.1:2017.		

7.18 Repeat of Mechanical cycle test at the selected temperature (test 4)

A total of 50 mechanical cycles was performed on the test valve while it was kept pressurized with 178.3bar according to manufacturer's requirements at the temperature 190℃~-210℃. The leakage from the stem seal was measured with following results:

Test results of final tests

Item	ISO15848-1 Required Value	Actual Value
Stem leakage (mbar.l/s)	≤1.78×10^{-4}	7.3x 10^{-6}
The test results meet the requirements of ISO15848-1:2015+Amd.1:2017.		

7.19 Intermediate static test at the room temperature (test 5)

The test valve returned to the room temperature naturally, without artificial cooling/heating. After the temperature was stabilized at room temperature, the leakage from the stem seal was measured with following results while it was kept pressurized with 248.2bar:

Test results of final tests

Item	ISO15848-1 Required Value	Actual Value
Stem leakage (mbar.l/s)	≤1.78×10^{-4}	7.8x 10^{-6}
The test results meet the requirements of ISO15848-1:2015+Amd.1:2017.		

7.20 Final test at the room temperature (test 6)

The test valve returned to the room temperature naturally, without artificial cooling/heating. After the temperature was stabilized at room temperature, A total of 5 mechanical cycles was performed on the test valve while it was kept pressurized with 248.2bar according to manufacturer's requirements at room temperature. the leakage from the stem seal and from the valve body seal under 248.2bar according to manufacturer's requirements were both measured using the same method as mentioned in paragraph 7.1, with following results:

Test results of final tests at room temperature (test 6)

Item	ISO15848-1 Required Value	Actual Value
Stem leakage (mbar.l/s)	$\leq 1.78\times10^{-4}$	$7.2\text{x } 10^{-6}$
Body seal leakage(ppmv)	≤50	4
The test results meet the requirements of ISO15848-1:2015+Amd.1:2017.		

8. Post test examination

After all the above tests completed, the test valve was disassembled and all sealing components visually examined. It is found that no notable wear and any other significant observations.

9.Performance classes

As a result of the above tests, the test valve covered performance classes as follows:

ISO FE BH – CO1 – SSA1 – t(-196℃,200℃)– CL1500 – ISO 15848-1

10. Extension of qualification to untested valves shall be according to ISO15848-1:2015+Amd.1:2017 paragraph 8.

We, hereby declare that I have checked test valve and witnessed the fugitive emission test on the tested valve according to ISO15848-1:2015+Amd.1:2017. The test results are as mentioned in this report.
TÜV SÜD Industrie Service GmbH

Chen Guilin

Date: July 9, 2022

Annexes:

1) Copy of Drawing No.: SSBBJ-10S15BW-LT-F-D Rev.A1;
2) Test Report of Fugitive Emission Test No. ATW-QCDRZ-01.