Powertech
TEST REPORT

12388 88th Ave.,
Surrey, B.C.,
Canada V3W 7R7
(604) 590-7500
www.powertechlabs.com

Swagelok Company – Check Valve – ISO 19880-3 Section 6 – Excess Torque Resistance

Prepared for: Swagelok Company
PO Reference: 4506406901

Project Number: PL-05589
Test Report Number: TR-05589-06-R0

Client: Swagelok Company
29500 Solon Road
Solon, Ohio, 44139, USA

Manufacturer: Swagelok Company
29500 Solon Road
Solon, Ohio, 44139, USA

Part Type: Check Valve

Serial Numbers and Part Numbers:

Part #	Description
SS-CVT6FK6-H2 (PLI: 3788)	3/8" CV Excess Torque Compound A
SS-CVT6FK6-H2 (PLI: 3789)	3/8" CV Excess Torque Compound B
SS-CVT9FK9-H2 (PLI: 3790)	9/16" CV Excess Torque Compound A
SS-CVT9FK9-H2 (PLI: 3791)	9/16" CV Excess Torque Compound B
SS-CVT12FK12-H2 (PLI: 3792)	3/4" CV Excess Torque Compound A
SS-CVT12FK12-H2 (PLI: 3793)	3/4" CV Excess Torque Compound B

Receipt Date: 2024-10-24

Test Dates: 2025-01-31 to 2025-02-13

Test Medium: Hydrogen gas

TEST CONDUCTED

The following test was conducted in accordance with:

- ISO 19880-3 – 2018, Gaseous hydrogen — Fuelling stations — Part 3: Valves, Clause 6

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TEST PROCEDURE

Excess torque resistance test (per ISO 19880-3:2018, Clause 5.8 and 6.8)

Specifications for maximum allowable torque were provided by the manufacturer. A torque of 1.5 times the maximum allowable torque shall be applied to the inlet and outlet ports of the samples for a period of 15 minutes, as outlined in Table 1.

Table 1. Excess torque resistance test requirements

Sample #	Sample Type	Maximum Allowable Torque (ft·lbs)	Required Test Torque Value (ft·lbs)
3788	¾”	225	337.5
3789	¾”	225	337.5
3790	9/16”	170	255
3791	9/16”	170	255
3792	⅜”	45	67.5
3793	⅜”	45	67.5

The torque was then released, and the samples removed to check if there is any deformation or damage.

Without disassembly, the samples were subjected to external and internal leakage tests per 5.4.2 and 6.4.

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External and Internal Leakage (per ISO 19880-3:2018, Clause 5.4.2 and 6.4)

The samples were subjected to an external and internal leakage test using hydrogen gas as shown in Figure 1.

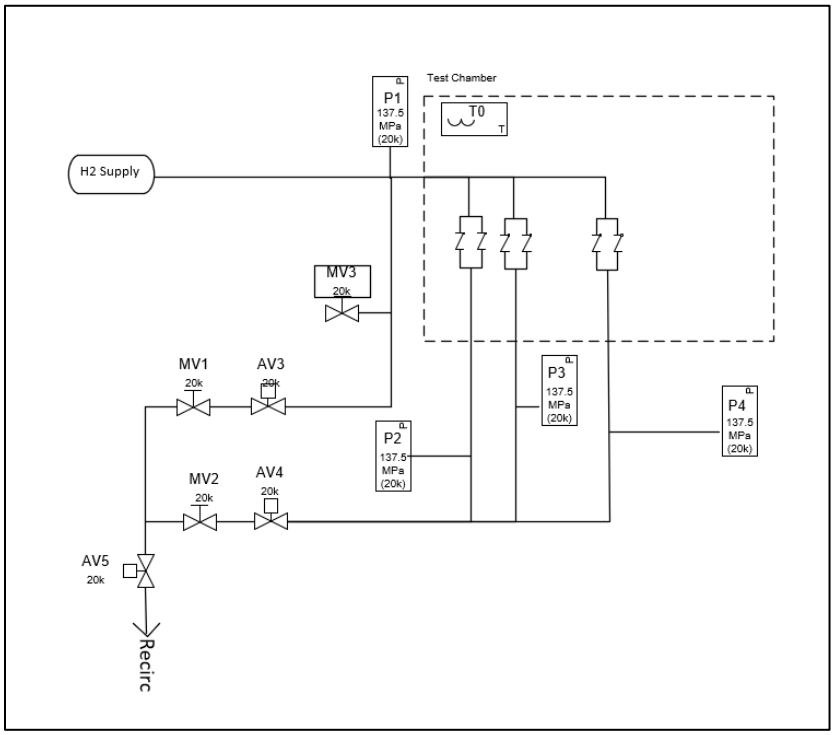

Figure 1. Leakage test schematic

The test temperatures and pressure conditions for the external leakage test were as follows:

1. 85°C (+3/-0°C) @ 105 MPa
2. -40°C (+0/-3°C) @ 105 MPa

The test temperatures and pressure conditions for the internal leakage test were as follows:

1. 85°C (+3/-0°C) @ 105 MPa
2. 85°C (+3/-0°C) @ 10.5 MPa
3. -40°C (+0/-3°C) @ 105 MPa
4. -40°C (+0/-3°C) @ 10.5 MPa

External leakage tests were performed using SNOOP® leak detection agent and a handheld detector, whereas internal leakage tests were performed via the bubble leak test method. The leak rate shall not exceed 10 Ncm^3/h.

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TEST EQUIPMENT AND INSTRUMENTATION

Details of the instrumentation used for the excess torque resistance test are outlined below in Table 2.

Table 2. Excess torque resistance test instrumentation summary

Parameter	PLI Asset No.	Instrument Type	Make and Model	Range
-	PLI1870	Torque Wrench	BMS, Super S3340	25 to 250 ft·lbs
-	PLI2008	Torque Wrench	Proto, J6347	60 to 600 ft·lbs
-	35570	Stopwatch	Traceable, 5CVT8	0 to 82,800 s
-	PLI2032	Digital Thermometer	Fluke, 52 II	-200°C to 200°C
T0	35186	Thermocouple	Conax Technologies, T-316SS12-U-MPJ-6	-200°C to 200°C

Details of the instrumentation used for the leakage test are outlined below in Table 3.

Table 3. Leakage test instrumentation summary

Parameter	PLI Asset No.	Instrument Type	Make and Model	Range
P1	33015	Pressure Transducer	Stellar Technology, GT3200-20000G-118	0 to 137.9 MPa
P2	01554	Pressure Transducer	Stellar Technology, GT1800-20000G-317	0 to 137.9 MPa
P3	32196	Pressure Transducer	Stellar Technology, GT1800-20000G-317	0 to 137.9 MPa
P4	35733	Pressure Transmitter	Canada Sensors Technology, 02-HYD	0 to 137.9 MPa
T0	33309	Thermocouple	Omega, TMQSS-125U-6	-200°C to 200°C

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TEST RESULTS

Excess torque resistance test (per ISO 19880-3:2018, Clause 5.8 and 6.8)
Temperature: 20±5°C
Test Date: 2025-01-31 to 2025-02-03
Test Location: Powertech Labs, Surrey, BC
Serial Number: 3788 to 3793

A torque of 150% of the rated installation value was applied to the inlet and outlet fittings of each sample. No issues were reported during testing. After 15 minutes, the torque was released, and each sample was evaluated. The results can be seen in Table 4.

Table 4. Excess torque resistance test results

Sample ID	Fitting location	150% of the rated torque (ft·lb)	Actual torque applied (ft·lb)	Temperature (°C)	Deformation or breakage
3788	Inlet	67.5	68.5	16.8	None
	Outlet	67.5	68.2	21.2	None
3789	Inlet	67.5	68.4	19.1	None
	Outlet	67.5	68.6	20.6	None
3790	Inlet	255	261.1	22.7	None
	Outlet	255	256.0	22.3	None
3791	Inlet	255	257.1	18.0	None
	Outlet	255	256.5	17.1	None
3792	Inlet	337.5	339.2	20.9	None
	Outlet	337.5	337.5	17.9	None
3793	Inlet	337.5	337.7	16.7	None
	Outlet	337.5	339.5	17.3	None

No deformation or breakage was observed after the test.

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External and Internal Leakage (per ISO 19880-3:2018, Clause 5.4.2 and 6.4)
Test Date: 2025-02-11 to 2025-02-13
Test Location: Powertech Labs, Surrey, BC
Serial Number: 3788 to 3793

The samples were subjected to an external and internal leakage test at -40°C and 85°C. The samples showed no signs of leakage using SNOOP® leak detection agent, a handheld detector, and the bubble leak test method. The results are seen in Table 5.

Table 5. Leakage test results for sample # 3788 to 3793

Sample #	Previous test	External Leakage		Internal Leakage			
		85°C	-40°C	85°C		-40°C	
		105 MPa	105 MPa	10.5 MPa	105 MPa	10.5 MPa	105 MPa
3788 & 3789	Excess torque resistance	No leak	No leak	No leak	No leak	No leak	No leak
3790 & 3791	Excess torque resistance	No leak	No leak	No leak	No leak	No leak	No leak
3792 & 3793	Excess torque resistance	No leak	No leak	No leak	No leak	No leak	No leak

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SUMMARY

All tested samples met the criteria of ISO 19880-3:2018, section 6.8 Excess torque resistance test, and thus are considered to have passed the test.

Tested By:	Approved By:
Alan Yen, EIT Project Engineer Hydrogen Industry Technology & Testing	Marcus Treacy, P.Eng Senior Engineer Hydrogen Industry Technology & Testing EGBC Permit to Practice: 1002531
Date signed: 2025-05-16	Date signed: 2025-05-16

Revision	Description of changes	Date
0	Initial issue	2025-05-16

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Andre Fregeau

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Date: 2025.05.16 15:48:35 -08'00'