

Test procedures for the Hydrogen System Relief Valves

Testing HA-RV-06

Ensure that:

- 1) PV-08 is closed to isolate the buffer volume from the vent to air.
- 2) the two DN25 outlets from the buffer tank to the absorber volume are closed off.
- 3) PV-01, PV-14, PV-17, and PV-18 are closed.
- 4) PV-02, PV-03, and CV-04 are fully open.
- 5) PV-05 and PV-07 are open to avoid differential pressure across RV-06.

Pump out the buffer tank using pump HA-VP-1 through opened valve PV-19.

Close PV-19 at vacuum.

Close PV-02 and PV-07.

Check that PV-05 is open.

Put helium gas into the buffer volume through PV-18 (PV-03 and CV-04 already open)

Monitor the flow using HA-FM-2 (between PV-03 and CV-04).

Monitor and record the pressure in the buffer tank (PG-2) and the pressure on the downstream side of RV-06 (PG-1).

The difference (PG-2 minus PG-1) will show the initial cracking pressure (when PG-1 begins to rise from zero) and the final re-seating pressure (when PG-1 stops rising). When PG-2 shows a pressure of around five hundred mbar, close the gas supply valve PV-18 and monitor the pressure.

Close PV-03 and open PV-02 to pump the gas out via PV-19. Close PV-02 and monitor new pressure differences across RV-06. Repeat several times and there should be consistent results.

Testing HA-RV-10

Ensure that:

- 1) the two DN25 outlets from the buffer tank to the absorber volume are closed off.
- 2) PV-01, PV-08, PV-17, and PV-18 are closed.
- 3) PV-02, PV-03, and CV-04 are fully open.
- 4) PV-05 and PV-07 are open to avoid differential pressure across RV-06.
- 5) PV-14 is closed.

Pump out the buffer tank using pump HA-VP-1 through open valve PV-19.

Close PV-19 at vacuum.

Put helium gas into the buffer volume through PV-18, PV-03, and CV-04.

Monitor the flow using HA-FM-2 (between PV-03 and CV-04).

Monitor the incoming pressure using PG-1 (temporarily close PV-03), and the pressure in the buffer tank using PG-2

Fill the buffer tank to a pressure greater than 1.5 bar absolute, but NOT greater than 1.7 bar absolute which might activate the burst disc (which operates at nominal 1.9 bar absolute).

Close the gas supply valve PV-18 and monitor the pressure and flow rate. The pressure should fall to 1.5 bar absolute and stay there, giving the re-seat pressure.

Apply more pressure to re-crack the valve and obtain second measurement of the re-seat pressure.

Open PV-08 to vent excess pressure from the buffer tank down to atmospheric pressure.

Testing HA-NR-26

Ensure that:

- 1) the gas line to the transfer tube is closed.
- 2) the outlet of the line to the jacket of the hydrogen pipe is closed.
- 3) HX-HV-15 is closed at the outlet of the regulator on the nitrogen gas cylinder.

Open the bottle valve BV-33 and check pressures at inlet and outlet of the regulator PR-35.

Open HV-15 to supply nitrogen gas to the following regulator PR-37.

Check flow at FM-4 at the vent.

If there is non-zero flow, either:

- a) Adjust regulator downwards until flow is zero, or
- b) Close bottle valve and monitor pressure at outlet of regulator PR-37

The pressure in the supply line should stabilise at the required value.

Testing HA-NR-26

This is on the exhaust from the burst disc BD-09 and protects the system from suck-back of air after the burst disc has broken.

The only way of testing this is to dismantle the pipework here, which is not something to be recommended.

Testing HA-RV-44

Remove and test off-line.

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