

### Critical Items List (CIL) Sheet

**Critical Item:** Check Valve **B/L:** 005.00

**Total Quantity:** 1 **System:** PVD

**Find Number:** S0517CV2

**Criticality Category:** 1S

**FMEA/CIL No:** STS85-0205A **System/Area:** MPS

**NASA PMN/** S70-0517

**Part No:** None **Name:** LH2 T-0 Umbilical

**Mfg/** Circle Seal Controls, Inc. **Drawing/**  
**Part No:** 259T-4BB **Sheet No:** GW70-580517

**Function:** Provide monodirectional flow of He from 8-inch main LH2 fill and drain purge can torque box into the QD shroud area.

**Critical Failure Mode/Failure Mode No:** Stuck closed (loss of purge)/STS88-0205.003

**Failure Cause:** Mechanical shock, contamination, mechanical failure

**Failure Effect:**

- (A) **End Item:** During fuel flow operations, H2 gas may accumulate and escape from shroud area; possible fire; damage to carrier plate, purge seals, fill and drain line.
- (B) **Interfacing Subsystem:** Possible damage to ground LH2 system if leaking H2 ignites.
- (C) **Orbiter:** Loss of orbiter due to possible damage to orbiter exterior due to fire/explosion if leaking H2 is ignited.
- (D) **Personnel:** Loss of crew life due to potential fire/explosion.

### ACCEPTANCE RATIONALE

**Design:**

The relaxed state of the check valve is closed due to a spring force. It is designed such that increased backflow pressure increases sealing efficiency because of a metal-to-metal seat contact. The body is made of 303 CRES; the spring is 302 CRES, and the O-rings are of Buna N. It may be mounted in any position; it is designed for most gases and is quiet when switching open or closed. The design features a positive stop in both fully open and fully closed positions. This ensures no failure in the open and closed positions and eliminates spring and seal fatigue. The Buna N O-ring is situated to absorb any mechanical shock waves during operation. It is designed to operate in the -40 degrees F to +250 degrees F temperature range (temperature during operation -20 degrees F to 100 degrees F) and 0-3000 psig rated operating pressure. Proof is 1 1/2 times

rated operating pressure and burst is 2 1/2 times rated operating pressure.  
Actual operating pressure is 750 psig.

**Test:**

**Acceptance tests:** Tests per Circle Seal control part specification include: proof pressure, burst pressure, leakage, spring strength. Check valve shall be pressurized to 4,500 psig, held for two minutes. There shall be no deformation or leakage failure. Test will be observed and verified by inspection.

**Check out tests:** The check out test is performed at the T-0 Umbilical Carrier Plate final assembly level.

**Certification or Qualification tests:** The check valve is certified per Rockwell CR No. 33-580529-001E. Re-certification is performed per OMRSD File VI. This tests for 100A cleanliness and cracking pressure of 1.0 PSI max.

**Inspection:**

Items are inspected for identification and damage. The check valve must meet the same cleanliness requirements as tube assemblies. The valves are disassembled for cleaning, and O-rings replaced as necessary prior to reassembly and pressure test. Despite the device's simplicity, it has a repair kit so that consistent operation is maintained.

**Failure History:**

Current data on test failures, unexplained anomalies, and failures experienced during ground processing activities can be found in the PRACA database. The PRACA database was researched; this item had no failures in the critical failure mode.

The GIDEP failure data interchange system has been researched and no failure data was found on this component in the critical failure mode.

**Operational Use:**

When a leak is detected, flow of liquid hydrogen through carrier plate is cutoff to preclude leakage, icing. Securing of LH2 system per S1014

**-Correcting Action:**

If the check valve fails closed, the loss of purge can be detected by the HGDS and fueling operations halted until the valve can be repaired or replaced.

-Timeframe:

Varies depending on the presence of an H<sub>2</sub> leak, the size of the leak and the potential for an ignition source to be present at the same time.