SURFACE VEHICLE RECOMMENDED PRACTICE

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Air Dryer Test Procedure

RATIONALE

Minor changes have been made in this Five-Year Review. The cut-out and cut-in pressures have been raised to align with the current pressure settings usage available in the market.

1. SCOPE

This SAE Recommended Practice establishes uniform test procedures for desiccant air dryers used in vehicles with compressed air systems per SAE J2383. Continuous flow desiccant air dryers are excluded from the scope of this document.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J2383 Air Dryer Installation Procedure

SAE J2721 Recommended Corrosion Test Methods for Commercial Vehicle Components

2.1.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org

ASTM B117 Standard Test Method of Salt Spray (Fog) Testing

3. DEFINITIONS

Refer to SAE J2383.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: http://www.sae.org

For more information on this standard, visit
https://www.sae.org/standards/content/J2384_202008

4. INSTRUMENTATION AND EQUIPMENT

4.1 Devices to measure temperature, ±1.8 °C (3 °F).

4.2 Devices to measure pressure, ±2% of indicated value.

4.3 A device to measure flow rate, ±2% of indicated value.

4.4 A device to measure time, ±0.5 second.

4.5 A device to measure voltage, ±2% of indicated value.

4.6 A device to measure amperage, ±2% of indicated value.

4.7 A device to control ambient temperature, ±1.8 °C (3 °F).

4.8 A device(s) to heat and saturate air.

4.9 A device to measure dew point temperatures, ±0.6 °C (1 °F).

4.10 A device to measure air leakage, ±2% of indicated value.

4.11 A device to record or count cycles.

4.12 A 1/2 inch NPT pipe plug with a 1.5 mm ± 0.1 mm (0.06 inch ± 0.004 inch) orifice or equivalent.

4.13 Pressure reservoirs of 32.8 L, 49.2 L, and 65.6 L ± 2 L (2000 in^3, 3000 in^3, and 4000 in^3 ± 120 in^3).

4.14 A salt spray test unit capable of ASTM B117.

4.15 A vibration test unit capable of controlling frequency sweeps and g loading.

5. AIR DRYER TEST PROCEDURES

5.1 Air Dryer Operation

5.1.1 Test Conditions

Unless otherwise stated, test parameters will be as follows:

a. Ambient temp: 19 to 25 °C (67 to 77 °F)

b. Mounting: As in service

c. Ambient air flow: None

d. System pressure: 9.0 to 9.7 bar (130 to 140 psig)

e. Flow rate: 455 to 510 slpm (16 to 18 scfm)

5.1.2 Pressure Relief Operation

With the outlet port plugged and no pressure at the control port, apply increasing pressure to the inlet port at 0.7 to 1 bar/s (10 to 15 psi/s). Record the pressure at which the inlet port pressure is relieved. Decrease the pressure at the inlet port at the rate of 0.7 to 1 bar/s (10 to 15 psi/s). Record the inlet port pressure at which the relief function closes (if provided).

5.1.3 Turbo Cut-off Valve Operation

With the outlet port plugged and system pressure at the control port, increase the pressure at the inlet port from zero to system pressure in 1 bar (15 psi) increments. Record the pressure at which the inlet port air leakage exceeds 100 sccm.

5.1.4 Regeneration Valve Operation (for System Purge Dryers Only)

With the dryer outlet port piped to a 65 L ± 1 L (4000 in^3 ± 60 in^3) reservoir, increase the pressure at the dryer inlet port to system pressure. Apply system pressure to the control port and record the pressure drop in the reservoir. Repeat with a 50 L ± 1 L (3000 in^3 ± 60 in^3) reservoir in place of the 65 L reservoir.

5.1.5 Heater and Thermostat Operation

With the manufacturers specified voltage ±1 V applied to the heater connection, record the heater wattage draw versus ambient temperature in 10 °C (18 °F) decreasing increments over the full range of the heater performance. Repeat for increasing temperature increments.

5.2 Dryer Performance

5.2.1 Pressure Drop During Charge

With air flowing at 140 slpm, 280 slpm, and 420 slpm ± 10 slpm (5 scfm, 10 scfm, and 15 scfm ± 0.3 scfm) through the dryer and 8.3 bar ± 0.1 bar (120 psig ± 2 psig) maintained at the outlet port, record the difference in pressure between the Inlet and outlet ports.

5.2.2 Flow Capacity

With 1.4 bar ± 0.1 bar (20 psig ± 1 psig) applied at the inlet port and the outlet port open, record the flow rate of air through the dryer.

5.2.3 Dryer Capacity

Supply the dryer with air at 71 °C ± 2 °C (160 °F ± 3 °F), 340 slpm ± 10 slpm (12 scfm ± 0.3 scfm), and 97 to 100% RH. Connect the dryer outlet port to a test system as described in Figure 1 or equivalent. Cycle the air pressure in the test system through a 1.4 bar ± 0.1 bar (20 psig ± 1 psig) range at pressures between 7.4 to 9.1 bar (108 to 132 psig). The unload cycle time is to be two times greater than the load cycle time ±1 second, for a 33% duty cycle. Cycle until the dew point temperature of the air in the reservoirs has stabilized. Record the test system reservoir volume and the reservoir air DPD22, where DPD22 is the dew point depression assuming the ambient temperature is 22 °C (72 °F). This assumption ignores the minor error that will occur due to the actual ambient which is to be controlled between 19 to 25 °C (67 to 77 °F). Then increase the reservoir volume and repeat. Continue to increase the reservoir volume and repeat until the reservoir DPD22 is less than 17 °C (30 °F). Calculate the volume of air treated per cycle at which the reservoir air is at 17 °C (30 °F) DPD22. Then, for system purge air dryers, subtract the purge volume. The resulting volume is the dryer capacity, expressed as standard liters (scf).

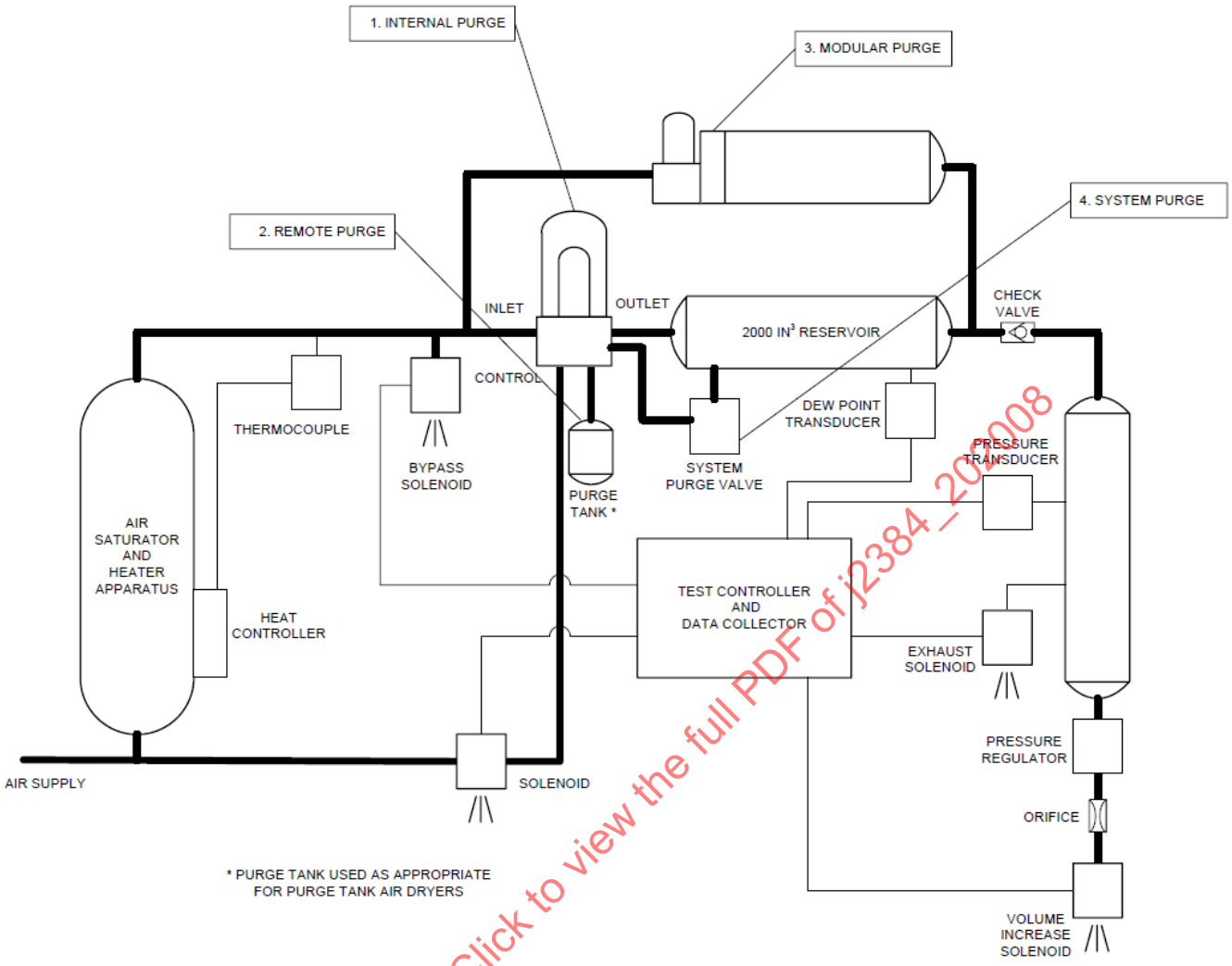

Figure 1 - Test system

Note that in the test system of Figure 1, the purpose of the “bypass solenoid” is to permit the continual flow of supply air to help maintain near constant dryer inlet temperatures. During the load cycle, the “bypass solenoid” is closed and supply air flows through the dryer. During the unload cycle, the “bypass solenoid” is open and the supply air flows out to atmosphere. The purpose of the “volume increase solenoid” is to permit a controlled leak from the reservoir during the load cycle to simulate a larger reservoir.

Note that the 32.8 L (2000 in^3) reservoir volume in the test system of Figure 1 is important in determining the purge volume of system purge air dryers. For system purge air dryers, the dryer capacity test may also be run with a larger reservoir in place of the 32.8 L reservoir, as long as the reservoir size used for the test is reported with the dryer capacity result.

Note that fresh desiccant may perform abnormally during initial testing. To avoid this temporary condition, capacity testing should be repeated until the results are stable.

5.2.4 Reserve Capacity

Continue the testing in 5.2.3, further increasing the reservoir volume until the stabilized DPD22 is less than 5 °C (9 °F). Calculate the volume of air treated per cycle at which the reservoir air is at 5 °C (9 °F) DPD22. Then, for system purge air dryers, subtract the purge volume. Then subtract the dryer capacity. The resulting volume is the reserve capacity, expressed in standard liters (scf).

Note that fresh desiccant may perform abnormally during initial testing. To avoid this temporary condition, reserve capacity testing should be repeated until the results are stable.