AEROSPACE STANDARD

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Superseding AS1297A

Reducers, Pneumatic Pressure, Missile

RATIONALE

This document has been determined to contain basic design guidelines and quality assurance provisions which are not dynamic in nature. If used for new design, the design authority shall review and tailor the document to current practices.

STABILIZED NOTICE

This document has been declared "Stabilized" by the SAE A-6C5 Components Committee and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

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1. GENERAL:

1.1 Scope:

The complete specification for a pneumatic pressure reducer for high pressure pneumatic systems used in missiles comprises: (1) this standard, which includes many of the general performance requirements, (2) a detailed procurement specification describing envelope and operating conditions, and (3) the "Pneumatic Components, Aeronautical - General Specification For - MIL-P-8564" which covers general requirements common to all components for use in high pressure pneumatic systems.

1.2 Definition:

A pressure reducer, within the meaning of this standard, is a device which is supplied with gas at a high pressure and delivers gas at a controlled lower pressure.

2. APPLICABLE DOCUMENTS:

2.1 Specifications, Standards, and Publications:

The following specifications, drawings, and publications of the issue in effect on the date of invitation to bid, form a part of this standard to the extent specified herein.

2.1.1 Specifications:

Federal:

BB-N-411 - Nitrogen, Technical
BB-H-001168 - Helium, Technical
PPP-B-636 - Boxes, Fiberboard
QQ-S-571 - Solder, Lead Alloy, Tin Lead Alloy, and Tin Alloy, Flux Cored Ribbon and Wire, and Solid Form
TT-C-490 - Iron Phosphate

Military:

MIL-G-4343 - Grease, Pneumatic
MIL-C-5501 - Caps and Plugs, Protective Dust and Moisture Seal
MIL-P-5517 - Plastic Parts in Aircraft Hydraulic Equipment, General Tests for
MIL-C-5541 - Anodize Coating (Aluminum)
MIL-N-6011 - Nitrogen, Liquid and Gas
MIL-I-8500 - Interchangeability and Replaceability of Component Parts for Aircraft and Missiles
MIL-P-8564 - Pneumatic System Components, Aeronautical, General Specification For
MIL-A-8625 - Anodic Coating (Aluminum)
MIL-Q-9858 - Quality Program Requirements
MIL-C-26074 - Coating, Electroless Nickel, Requirements for
MIL-S-38130 - Safety Engineering of Systems and Associated Subsystems and Equipment, General Requirements for
MIL-C-45662 - Calibration System Requirements

2.1.2 Standards:

Military:

MIL-STD-9 - Threads
MIL-STD-105 - Sampling Procedures and Table for Inspection by Attributes
MIL-STD-109 - Quality Assurance Definitions
MIL-STD-129 - Marking for Shipment and Storage
MIL-STD-143 - Specifications and Standards, Order of Precedence for the Selection of
MIL-STD-171 - Finishing of Metal and Wood Surfaces
MIL-STD-210 - Climatic Extremes for Military Equipment
MIL-STD-414 - Sampling Procedures and Tables for Inspection by Variables for Percent Defective
MIL-STD-794 - Parts and Equipment, Procedure for Packaging and Packing of
MIL-STD-810 - Environmental Test Methods for Aerospace and Ground Equipment

3. REQUIREMENTS:

3.1 General:

The requirements listed in Section 3 of Specification MIL-P-8564 (ASG) for Type I components are applicable to this specification. The detail specification shall contain the requirements presently associated with Type I components, unless system operating conditions indicate that higher temperature design criteria should apply.

3.2 Structural Characteristics:

All portions of the pressure reducers shall possess sufficient strength, rigidity, and the other necessary physical characteristics to survive the environmental conditions specified herein, and shall survive these conditions in a manner that will not impair the ability of the pressure reducer to perform its function nor will personnel be endangered.

3.2.1 Materials: The use of AMS 5620, 5621, 5630, 5631, and 5632 or equivalent heat-treatable, corrosion-resistant steels is prohibited, unless otherwise stated in detail specification.

3.2.2 Yield Strength: All portions of the pressure reducer shall be designed for sufficient strength to withstand the yield loads and accompanying environmental phenomena without experiencing excessive elastic or plastic deformations, i.e. deformations which result in component interference or permanent sets greater than 0.2 percent strain, unless such deformations are demonstrated to be nondetrimental to the successful performance of the pressure reducer.

3.2.3 Ultimate Strength: All portions of the pressure reducer shall be designed to withstand the structural ultimate loads and accompanying environmental phenomena without failure. Failure is defined as structural collapse, rupture, or other inability to sustain ultimate loads. Component undergoing preproduction test must function properly during and after exposure to the component operational ultimate load. The component is not required to function during or after exposure to structural ultimate levels.

3.3 Design and Construction:

The pressure reducer shall conform in every respect to the applicable detail specification and related drawings. The performance requirements to be included in the detail specifications are indicated by the tests and limits indicated in Section 4.

3.3.1 Long-Term Storage: The pressure reducer shall be capable of operating as specified after storage for a period of 5 years, or longer if indicated by the detail specification, at a combination of ambient temperature, and humidity defined in the detail specification.

The detail specification shall include statements regarding the number of hours of exposure to temperatures near the minimum and maximum ambient conditions anticipated during the total storage period.

3.4 Filtration:

Since the pneumatic pressure reducer is usually a critical element in the performance of any high pressure gas system in which it is installed, it is important that it be protected from contamination, even after installation in the system. The detail specification should describe the filtration provided upstream of the pressure reducer or the level of contamination under which the unit must operate. Where filtration is not provided upstream of the pressure reducer, requirement for full-flow filtration or screening, as necessary, should be a part of the detail specification.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Classification of Tests:

The provisions contained in Section 4 of Specification MIL-P-8564 are applicable to the missile units covered by this specification. The tests which follow are to be included in the detail specification.

4.1.1 Preproduction Tests: Shall be conducted with 2 test specimens and in the order shown below. Test specimens shall have passed acceptance tests per 4.1.2.

Test Description	Test Unit Number
1. Examination of Product	1, 2
2. Immersion of Plastic Parts	1, 2
3. Humidity	2
4. Salt Spray	2
5. Proof Pressure	1, 2
6. Pressure Regulation	1, 2
7. External Leakage	1, 2
8. Low Flow Regulation	1, 2
9. Response	1, 2
10. Relief Cracking Pressure (if applicable)	1, 2
11. Relief Capacity (if applicable)	1, 2
12. Relief Reseat Pressure (if applicable)	1, 2
13. Extreme Temperature	1
14. Endurance	1
15. Relief Endurance (if applicable)	1
16. Vibration	2
17. Acceleration and Shock	1, 2
18. Inspection of Parts	1, 2
19. Burst	1, 2

4.1.2 Acceptance Tests: Shall be conducted with each unit to be delivered under contract and in the order shown below:

1. Examination of Product
2. Proof Pressure Test for Acceptance
3. Pressure Regulation Test for Acceptance
4. External Leakage
5. Low Flow Regulation Test for Acceptance
6. Relief Reseat Pressure Test (if applicable)

4.2 Examination of Product:

Each pressure reducer shall be subject to a careful visual examination and shall comply with the detail specification and applicable drawings and specification with respect to markings, finishes, materials, identification, and quality of workmanship.

4.3 Immersion of Plastic Parts:

If the pressure reducer contains any plastic parts, other than AN or MS standard parts, it shall be tested for conformance to Specification MIL-P-5517, except that all tests shall be accomplished using water in lieu of hydraulic fluid as the immersion medium.

4.4 Humidity Test:

The pressure reducer shall be exposed to a relative humidity of 95%, including condensation, as a result of which the component shall not be damaged nor shall performance be impaired. (MIL-STD-810, Method 507.1, Procedure I.)

4.5 Salt Spray Test:

The detail specification may omit the salt spray test if the missile itself is protected from salt spray or the pressure reducer is located in a compartment which is protected from salt spray. If the pressure reducer is exposed to any salt spray in service, the detail specification shall call for a test to establish that performance is not impaired nor is the component damaged after exposure to salt spray. (MIL-STD-810, Method 509.1, Procedure I.)

4.6 Proof Pressure Test:

Apply a pneumatic pressure of 150% of the maximum specified inlet pressure to the inlet port, while simultaneously applying 150% of the maximum relief pressure to the outlet port. Blocking of the relief port or other suitable means acceptable to the procuring agency may be used for obtaining the required outlet port pressure. Pressure shall be maintained for 5 minutes minimum. There shall be no evidence of impaired performance nor damage to the component during or after this test.

4.6.1 Proof Pressure Test for Acceptance: This test shall be the same as the proof pressure preproduction test except that the pressure shall be held for a period of not less than 60 seconds.

4.7 Pressure Regulation Test:

The detail specification shall include test requirements describing the envelope of flow and inlet pressure magnitude, established for measurements made during both increasing and decreasing flow conditions, for which the subject pressure reducer shall be capable of regulation. In addition, the detail specification shall include a similar envelope of flow and inlet pressure conditions for which the discharge pressure must be maintained within specific limits.

4.7.1 Pressure Regulation Test for Acceptance: This test can be simplified to include only those test conditions which are shown to be critical during preproduction and development testing.

4.8 External Leakage Test:

The detail specification shall include test requirements describing the procedure and limits related to the highest inlet pressure and lowest flow condition at which total leakage, other than the internal flow, is measured. If a relief section is included in the reducer, the relief leakage shall be separately identified and limits applied.

4.9 Low Flow Regulation Test:

The detail specification shall include a test requirement and limits associated with the acceptable outlet pressure of the reducer when the flow is reduced to the level allowable as maximum internal leakage. This test is usually referred to as the "lockup" or "reseat" test. The downstream volume and measurement time must be carefully specified.

For many missile systems the "reseat" requirement is replaced by a procedure and limits associated with the maximum discharge pressure permissable at maximum inlet pressure and a flow of approximately 1% of the maximum flow required for the component by the detail specification. Time must be allowed for conditions to stabilize.

4.9.1 Low Flow Regulation Test for Acceptance: This test can be simplified to include only the room temperature test at maximum inlet pressure.

4.10 Response:

The detail specification shall include a procedure and limits associated with a test to establish that the pressure reducer outlet pressure returns to within 90% of its regulation range, as specified elsewhere in the detail specification, within the required number of milliseconds after a 20% step-function change in flow.

The test shall be conducted at several inlet pressure conditions and for cyclic reversals of the step-function flow change. A simulated load shall be used during tests, to establish that the pressure reducer is stable.

4.11 Relief Cracking Pressure Test:

For a pressure reducer which incorporates a relief valve or a relief valve function, the detail specification shall include a procedure and limits associated with the relief cracking pressure test. For an aircraft pressure reducer, the relief cracking pressure is usually defined as the reducer outlet pressure at which the flow through the relief valve is between 0.1 and 0.2 percent of the rated capacity of the reducer.

For missile system components, the relief cracking pressure test is related to a maximum pressure at which the flow through the relief valve reaches approximately 0.2 percent of the maximum flow specified in the detail specification.

4.12 Relief Capacity Test:

If a relief section is incorporated, the detail specification shall include a procedure and limits to establish that the relief section is capable of flowing a given percentage of the maximum flow specified for the reducer without causing the inlet pressure to the relief valve to exceed the level indicated in the detail specification.

4.13 Relief Reseat Pressure:

The detail specification shall include a procedure and limits to establish that when the flow through the relief section has decreased to the level used to define relief cracking pressure, the inlet pressure to the relief valve shall not be below a specified value. This reseat pressure shall be established by the detail specification at some level above the maximum permissible outlet pressure of the reducer itself.

4.14 Extreme Temperature Test:

The detail specification shall include the following temperature tests:

4.14.1 Operating: To establish that performance is not impaired nor is the component damaged during operation at ambient temperatures, ranging from the minimum temperature specified for pressure reducer operation to the maximum temperature specified. (MIL-STD-180, Methods 501 and 502, Procedure I.)

4.14.2 Non-Operating: To establish that performance is not impaired nor is the component damaged after storage or transportation at temperatures ranging from the minimum to maximum storage temperatures specified. (MIL-STD-810, Method 501, Procedure I; Method 502, Procedure I.)

4.14.3 Temperature Shock Test: To establish that performance is not impaired nor is the component damaged after exposure to a temperature shock from maximum to minimum to maximum ambient temperature in a specified period of time. (MIL-STD-810, Method 503.1, Procedure I.)