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MIL-I-5099B
13 December 1968
SUPERSEDING
MIL-I-5099A
12 August 1952

MILITARY SPECIFICATION

INDICATOR, CABIN AIR PRESSURE, 1-7/8 INCH DIAL, TYPE MA-1

This specification is mandatory for use by all Departments and Agencies of the Department of Defense.

* 1. SCOPE

1.1 Scope - This specification covers design and performance requirements for one type of pressure altitude indicator having a range of 0 to 50,000 feet.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of the specification to extent specified herein.

* SPECIFICATIONS

Federal

DD-G-451	Glass, Flat and Corrugated, for Glazing, Mirrors, and Other Uses
QQ-P-416	Plating, Cadmium (Electrodeposited)

Military

MIL-P-116	Preservation, Methods of
MIL-D-1000/1	Drawings, Engineering and Associated Data
MIL-E-5272	Environmental Testing, Aeronautical and Associated Equipment, General Specification for
MIL-C-5541	Chemical Films and Chemical Film Materials for Aluminum and Aluminum Alloys

FSC 6685

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SPECIFICATIONS

Military (Continued)

MIL-S-7742	Screw Threads, Standard, Optimum Selected Series, General Specification for
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys

STANDARDS

Federal

FED-STD-595	Colors

Military

MIL-STD-130	Identification Marking of U. S. Military Property
MIL-STD-143	Specifications and Standards, Order of Precedence for the Selection of
MIL-STD-454	Standard General Requirements for Electronic Equipment
MIL-STD-781	Reliability Tests Exponential Distribution
MIL-STD-785	Requirements for Reliability Program (for Systems and Equipments)
MIL-STD-794	Parts and Equipment, Procedures for Packaging and Packing of
MIL-STD-859	Standard Calibration Table for Aeronautical Pressure Measuring Equipment
MS28105	Window, Dial-Aircraft Instrument Cover, Glass
MS33558	Numerals and Letters, Aircraft Instrument Dial, Standard Form of
MS33585	Pointers, Dial, Standard Design of Aircraft Instrument
MS33586	Metals, Definition of Dissimilar

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STANDARDS

Military (Continued)

MS33638	Cases, Instrument, Flange-Mounted, Aircraft
MS33649	Bosses, Fluid Connection - Internal Straight Thread
MS33737	Nuts, Self-Locking, Clip-in Type, Instrument Mounting

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

* 3. REQUIREMENTS

* 3.1 Qualification - The indicator furnished under this specification shall be a product, samples of which have been tested, which meets the Quality Assurance Provisions specified herein, and has been listed on or approved for listing on the applicable qualified products list.

* 3.2 Selection of Government documents - Except as provided in 3.2.1 and 3.2.2, specifications and standards for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-143.

* 3.2.1 Standard parts - With the exception of 3.2.2, MS and AN standard parts shall be used where they suit the purpose. They shall be identified on the drawings by their part numbers.

* 3.2.2 Commercial parts - Commercial parts having suitable properties shall be used, when on the date of invitations for bids, there are no suitable standard parts. In any case, commercial parts such as screws, bolts, nuts, and cotter pins having suitable properties may be used provided:

(a) They can be replaced by the standard parts (MS or AN) without alteration.

(b) The corresponding standard part numbers are referenced in the parts list and, if practicable, on the contractor's drawings.

3.3 Materials - Materials shall conform to applicable specifications and shall be as specified herein. Materials for which there are no applicable specifications, or which are not specifically described herein, shall be of the best quality of the lightest practicable weight suitable for the purpose intended.

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3.3.1 Critical materials - Noncritical materials shall be used where practicable. Where the use of a critical material is essential to meet specification requirements, the material used shall be the least critical of those which are adequate for the purpose.

3.3.2 Nonmagnetic materials - Nonmagnetic materials shall be used for all parts of the indicator except where magnetic materials are essential.

3.3.3 Metals - Metals shall be of the corrosion-resistant type, or shall be suitably protected as specified herein to resist corrosion due to fuels, salt spray, or atmospheric conditions to which the indicator may be subjected when in storage or during normal service life.

* 3.3.3.1 Dissimilar metals - Dissimilar metals as defined in MS33586 shall not be used in intimate contact with each other, unless protection against electrolytic corrosion is provided.

* 3.3.3.2 Aluminum alloy parts - Unless otherwise specified, aluminum alloy parts shall be covered with an anodic film conforming to MIL-A-8625. The dial, small holes, threads, and case inserts need not be anodized. Aluminum alloys which do not anodize satisfactorily shall be coated with a chemical film in accordance with MIL-C-5541.

3.3.3.3 Steel parts - Steel parts shall be cadmium-plated where practicable in accordance with QQ-P-416.

* 3.3.4 Protective treatment - When materials are used in the construction of the indicator that are subject to atmospheric or environmental conditions likely to cause corrosion in normal service life, they shall be protected against corrosion in a manner that will in no way prevent compliance with the performance requirements of this specification. Finishes and protective coatings which will crack, chip, or scale during normal service life or are affected by extremes of atmospheric or environmental conditions, shall not be used.

* 3.3.5 Fungus-proof materials - Materials which are nutrients for fungi shall not be used where it is practicable to avoid them. Where used, they shall be treated with a fungicidal agent acceptable to the procuring activity. If the materials are used in a hermetically sealed enclosure, fungicidal treatment will not be necessary.

* 3.3.6 Fumes and vapors - Materials used in the construction of the indicator shall not produce corrosive, deleterious, toxic fumes or vapors under the conditions specified herein.

3.4 Design and construction - The design of the indicator shall provide a pressure actuated mechanism. The indicator shall be so constructed that no parts will work loose in service, and it will withstand the normal shocks, vibrations,

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and such other conditions as are incident to service, shipping, storage, and installation without a failure.

* 3.4.1 Maintenance - The design shall be such as to facilitate as much as possible disassembly, repair or overhaul, service maintenance, and reassembly using those tools and items of maintenance equipment which are normally available as commercial standards.

* 3.4.2 Case - The case shall consist of a body, a mounting flange and bezel ring conforming to MS 33638 for the 2-inch nominal size with an overall length of 1-3/4 ±1/8 inches. The case shall be made of nonferrous low density metal, uniform in texture and finished with lusterless black material, Color No. 37038 of FED-STD-595. The finishing materials shall be of a durable type to withstand usage encountered in service.

* 3.4.2.1 Pressure boss - The case shall have a metal boss in accordance with MS33649-4 located on the rear within 1/4 inch of the vertical and horizontal centerlines and not protrude more than 1/4 inch from the rear of the case. A 150-wire mesh corrosion resistant filter screen shall be firmly installed.

* 3.4.2.2 Reinforcement - The case around the pressure boss shall be of sufficient strength to prevent damage to the case when the connection is tightened during installation of the indicator.

* 3.4.2.3 Bezel ring - The bezel ring shall be held in place by means of screws properly secured with lockwashers. Provision shall be made for the replacement of the cover glass by removal of the bezel ring.

3.4.3 Weight - The weight of the completely assembled indicator shall not exceed 0.5 pound.

3.4.4 Screw threads - Screw threads shall be in accordance with MIL-S-7742.

3.5 Dial and pointer -

* 3.5.1 Dial - The dial shall be securely mounted in such a manner that it will not loosen or slip when the indicator is vibrated. If screws are used, they shall be so located that they will not interfere with the proper location of any dial marking.

* 3.5.1.1 Visibility of dial - The pointer, numerals, at least 1/32 inch of the shortest graduations, and all other specified markings on the dial shall be visible from any point within the frustum of a cone whose side makes an angle of 30 degrees with a perpendicular to the dial and whose small diameter is the aperture of the case.

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3.5.1.2 Dial marking - The dial shall be marked and finished as shown in Figure 1. The colors shall not change as a result of service use or subjecting the indicator to the inspections specified herein. The form of the numerals and letters shall be in accordance with MS33558. Numerals shall distinctly indicate the graduation to which each applies. If practicable, each numeral shall be placed so that the center of area of the numeral(s) is on the radial line joining the appropriate graduation and the center of the dial. Any confusion resulting in doubt as to the graduation to which the numeral applies shall be cause for rejection. When several numerals are used in one group, the space between the numerals shall be not less than 1/64 inch.

* 3.5.2 Pointer - The pointer of the indicator shall be firmly attached to the mechanism but also shall be readily removable during servicing or overhaul. The pointer shall conform to MS33585-1, and shall be finished in accordance with Figure 1.

* 3.6 Cover glass - The quality of the cover glass shall be in accordance with DD-G-451, Type II, Quality AA. Any flaws permitted by DD-G-451 shall not interfere with reading of the dial. The dimensions of the cover glass shall be in accordance with MS28105.

3.6.1 Cover glass mounting - The distance from the inner surface of the cover glass to the surface of the dial on which the marking is applied shall not exceed 0.125 inch.

3.7 Performance - The indicator shall perform satisfactorily when subjected to the tests specified in Section 4 of this specification.

* 3.7.1 Reliability program - The supplier shall establish a reliability assurance program in accordance with MIL-STD-785.

* 3.7.2 Reliability in mean-time-between-failures - The indicator shall have 2,000 hours of mean (operating) time between failures when tested and accepted as outlined under the requirements of 4.4.3.

3.8 Nameplate - A nameplate shall be securely attached to the exterior of the case and shall be marked in accordance with the requirements of MIL-STD-130 except that the FSN shall be omitted.

* 3.8.1 Manufacturer's part number - The manufacturer's part number on the nameplate shall be identical with the manufacturer's engineering production drawing number including applicable dash numbers if the drawing is tabulated and covers more than one part.

* 3.9 Interchangeability - All parts having the same manufacturer's part number shall be directly and completely interchangeable with each other with respect to installation and performance. Changes in manufacturer's part numbers shall be governed by the drawing number requirements of MIL-D-1000/1.

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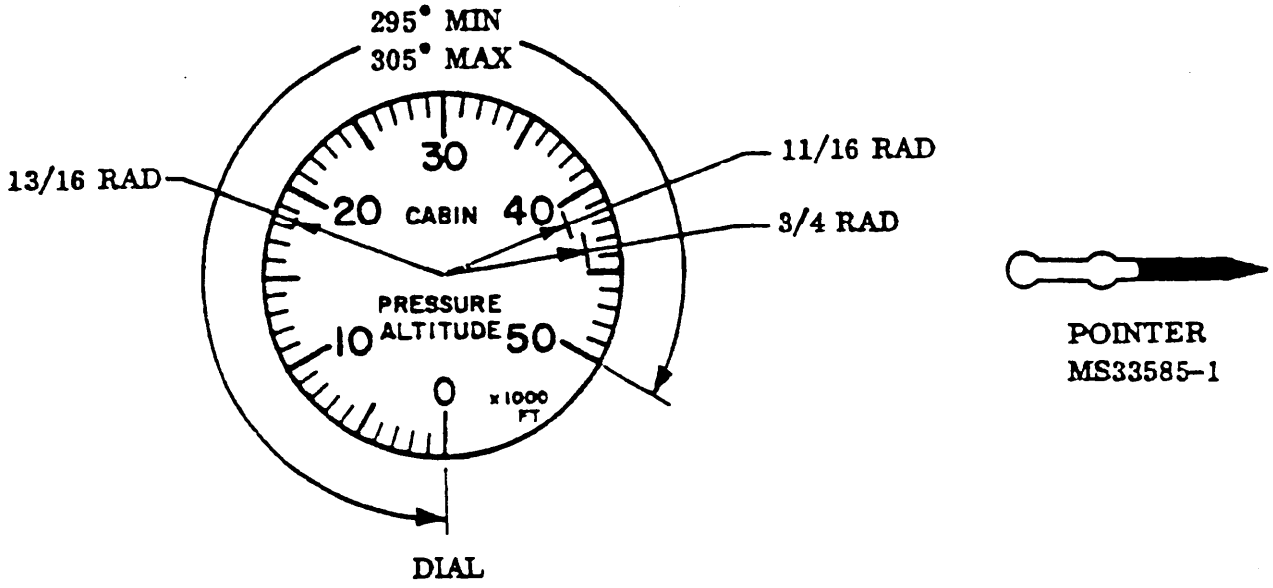

ALL GRADUATIONS ARE PARTIAL RADIAL LINES.
DIMENSIONS IN INCHES.
UNLESS OTHERWISE SPECIFIED, TOLERANCE: FRACTION ±1/64

MARKING	HEIGHT OR LENGTH (±.010)	WIDTH OF LINE OR GRADUATION (+.005, -.000)	MATERIAL OR FINISH
Numerals 0, 10, 20, 30, 40, 50	.156	.020	Lusterless White Color No. 37875 of FED-STD-595.
Graduations corresponding to "0" and each subsequent 5,000-foot graduation	As shown in figure	.020	
All other graduations	As shown in figure	.012	
Shaded portion of pointer	----	----	
Lettering "CABIN PRESSURE ALTITUDE"	.093	.015	
Lettering "X 1000 FT"	.062	.010	
Unshaded portion of pointer	----	----	Lusterless Black Color No. 37038 of FED-STD-595.
Background of dial	----	----	

* Figure 1. Dial Markings

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* 3.10 Mounting hardware - The mounting flange shall be capable of retaining clip-in lock nuts conforming to MS33737-11.

* 3.10.1 Mounting lugs - Mounting lugs of the complete assembled case shall each withstand for 1 minute without fracture a load of 175 pounds applied along the mounting hole axis and toward the front of the instrument.

* 3.11 Shipping plug - A suitable shipping plug shall be screwed in the pressure insert for shipping purposes. The plug shall incorporate a vent consisting of a hole 1/16 ±1/64 inch in diameter.

* 3.12 Mechanism adjustment - The mechanism shall be provided with means of adjusting or correcting the indications to conform to the performance required herein, in case this becomes necessary during the life of the indicator. The calibration adjustment shall not affect the temperature performance of the instrument. This means of adjustment shall be reasonably simple to manipulate and of such nature that adjustment can be accomplished by tools ordinarily possessed by an instrument repair technician.

* 3.13 General requirements - The indicator shall conform to the applicable general requirements of MIL-STD-454.

* 3.14 Data - No data is required by this specification (other than reports accompanying samples submitted for qualification testing), or by applicable documents referenced in Section 2, unless specified in the contract or order. (See 6.3.)

* 4. QUALITY ASSURANCE PROVISIONS

* 4.1 Responsibility for inspection - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

* 4.2 Classification of inspection - Inspection of the indicator shall be classified as follows:

(a) Qualification inspection: Qualification inspection consists of examinations and tests performed on sample indicators submitted for approval as a qualified product.

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(b) Quality conformance inspection: Quality conformance inspection consists of examinations and tests performed on indicators manufactured and submitted for acceptance under contract.

4.3 Qualification inspection - The qualification inspection of the indicator shall consist of all the examinations and tests of this specification, performed in the order specified under the paragraph headed Test Methods. Samples submitted for qualification shall be accompanied by the supplier's quantitative test data and analysis report showing that the reliability test for the Reliability Qualification Phase has been satisfactorily met on other samples of the same equipment.

4.3.1 Qualification inspection sample - Qualification inspection samples shall consist of three indicators manufactured in accordance with this specification. The indicators submitted for qualification inspection shall have been previously subjected only to the Individual and Sampling Plan A Inspections. The samples shall be forwarded at the supplier's expense, to the laboratory designated in the Letter of Authorization.

4.3.1.1 Qualification inspection sample identification - The qualification inspection samples shall be plainly identified by durable tags, securely attached, and marked with the following information:

Sample for Qualification Inspection
INDICATOR, CABIN AIR PRESSURE, 1-7/8 INCH DIAL, TYPE MA-1
Submitted by (Manufacturer's name, date and part number) for Qualification Inspection in accordance with Specification MIL-I-5099B under authorization (reference letter authorizing tests)

4.4 Quality conformance inspection - The Quality conformance inspection shall consist of the Individual Inspection, the Sampling Plans, and the Reliability assurance tests of this specification. The contractor shall furnish all samples and shall be responsible for accomplishing all the inspections. Sampling Plan B Inspections shall be conducted at a Government laboratory designated by the procuring activity. Quality conformance inspection, except for Sampling Plan B, shall be under the supervision of the Government quality control representative. The contractor shall furnish test reports showing quantitative results for all tests required by this specification, signed by an authorized representative of the contractor or laboratory as applicable. Acceptance or approval of material during the course of manufacture shall in no case be construed as a guarantee of the acceptance of the finished product.

4.4.1 Individual Inspection - Each indicator submitted for acceptance shall be subjected to the Individual Inspection. This inspection shall determine compliance with the requirements of material, workmanship, and operational accuracy. As a minimum, each indicator accepted shall have passed the following tests:

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Examination of product
Case leakage
Scale error (Room temperature)
Hysteresis
After effect
Position error
Friction

4.4.2 Sampling Plans - The Sampling Plans shall consist of Sampling Plan A and Sampling Plan B Inspections. The inspection samples selected for sampling tests shall first have passed the Individual Inspections. The inspection samples which have been subjected to Sampling Plan A Inspection shall not be delivered on contract until they have been refurbished and resubmitted and passed all the Individual Inspections. Inspection samples which have been subjected to the Sampling Plan B Inspection shall not be delivered on contract.

4.4.2.1 Sampling Plan A sample selection - Sampling Plan A samples shall be selected at random in accordance with the following schedule:

Quantity Offered for Acceptance	Quantity to be Selected for Inspection (See Note)
First 15	1
Next 50	1
Next 75	1
Next 100	1
Each additional 200 or fraction thereof	1

NOTE: When Sampling Plan B is invoked, the quantity shall be zero. When Sampling Plan B is to be omitted, the quantity shall be one.

When a defective indicator occurs, no items from those still on hand or later produced shall be accepted until the extent and cause of failure have been determined and appropriately corrected. In addition, when a failure occurs, shift to one sample out of fifteen (when Sampling Plan B is omitted) and proceed as indicated.

4.4.2.1.1 Sampling Plan A Inspection - Each sample selected for Sampling Plan A inspection shall be subjected to the following tests in the order listed:

Scale error (-55° C)
High temperature characteristics
Vibration error
Overpressure
Magnetic effect

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* 4.4.2.2 Sampling Plan B instructions - Two indicators shall be selected at random from the first 15 produced on contract and submitted within 10 days after manufacture. These samples shall be forwarded, at the contractor's expense, to a Government laboratory designated by the procuring activity. Each sample shall be plainly identified by a durable tag, securely attached and marked with the following information:

INDICATOR, CABIN AIR PRESSURE, 1-7/8 INCH DIAL, TYPE MA-1
Submitted by (Manufacturer's name, date) for Production Acceptance Sampling Plan B inspection, in accordance with MIL-I-5099B and Contract/Order No._____
Manufacturer's part number_____

* 4.4.2.2.1 Sampling Plan B approval - Approval of Sampling Plan B indicators shall be by the procuring activity upon satisfactory completion of the designated tests. Any design, material or performance defect made evident during this test shall be corrected by the contractor to the satisfaction of the procuring activity. Failure of the sample units to pass any of the tests shall be cause for deliveries of equipment under the contract to cease until proper corrective action is approved and accomplished.

* 4.4.2.2.2 Sampling Plan B Inspection - Each indicator selected for Sampling Plan B Inspection shall be subjected to the following tests, conducted in the order listed:

Sampling Plan A tests
Vibration endurance
High altitude-Low temperature
Humidity
Fungus resistance
Salt spray
Mounting lugs
Internal examination

* 4.4.3 Reliability assurance tests shall be conducted under MIL-STD-781 for the Qualification Phase and the Sampling Phase Tests using Test Level E, except as specified herein. Each indicator selected for Reliability assurance tests shall pass the Individual Inspection before demonstrating an acceptable MTBF of 2000 hours. A performance log shall be maintained and readily available.

* 4.4.3.1 Reliability Qualification Phase - Prior to the acceptance of indicators under the contract or order, between 3 and 6 indicators shall be tested as outlined in MIL-STD-781 under the section entitled "Qualification Phase of Production Reliability Tests" using Test Plan I, except as specified herein.

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* 4.4.3.2 Reliability Sampling Phase tests - The indicator samples shall be tested as outlined in MIL-STD-781 under the section entitled "Sampling Phase of Production Reliability Tests" using Test Plan II, except as specified herein.

* 4.4.3.2.1 Lot size for Sampling Phase - All indicators offered for acceptance during each 3-month period (with the exception of those indicators used in the Qualification Phase) shall be considered as one lot. This test program shall start the first month after the Qualification Phase tests have been successfully completed. The test results shall be summarized monthly for the procuring activity. The procuring activity reserves the right to stop acceptance of indicators at any time after one or more reject decisions have been reached, pending a review of the contractor's efforts to improve the indicator, parts and quality control.

* 4.4.3.3 Duty cycle of Test Level E of MIL-STD-781 shall consist of 2 hours at the low temperature in addition to the 2 hours at the high temperature. During each hour of duty cycling, the indicator pressure altitude shall be changed from zero to 50,000 feet and returned to zero within 15 minutes at a rate of 4 exercise cycles per hour.

* 4.4.3.3.1 Performance characteristics to be measured - After every 200 hours of duty cycling, each indicator shall meet the Individual Tests, the Scale error (-55° C) test and the Friction test. Upon completion of the Reliability Qualification Phase or the Reliability Sampling Phase tests, each indicator tested shall meet all the tests under "Test Methods" except that the Sampling Plan B Inspection shall not be performed.

* 4.4.3.3.2 No preventive maintenance shall be performed on the indicators during the Reliability Tests.

* 4.4.3.3.3 Disposition of samples upon completion of tests - Any sample tested, other than those tested under the Reliability Qualification Phase, may be delivered on contract provided it is representative of production indicators currently being accepted, and it is in "good as new" condition or has been refurbished.

* 4.5 Inspection conditions -

* 4.5.1 Standard conditions - Unless otherwise specified, all inspections required by this specification shall be made under the following conditions:

Temperature	Room ambient 25 ±5° C.
Pressure	Normal atmospheric (approximately 29.92 inches Hg). When tests are made with atmospheric pressure substantially different from the above values, proper allowance for change in indicator reading shall be made for the difference from the specified conditions.

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Humidity	Room ambient 40 to 90 percent relative humidity.

* 4.5.2 Test readings - Unless otherwise specified, before a test reading is taken, the indicator shall be tapped using a vibrator set at 60 cps with a maximum double amplitude of 0.002 inch.

* 4.5.3 Attitude - Unless otherwise specified, the indicator shall be tested in its normal operating position.

* 4.6 Test methods -

4.6.1 Examination of product - Each indicator shall be examined externally to determine conformance with the applicable drawings and with all the requirements of this specification not covered by tests.

4.6.2 Case leakage - A vacuum, sufficient to produce a change of reading of the pointer of approximately 18,000 feet, shall be slowly applied to the static pressure connection of the indicator at which point the connection tubing shall be pinched off or otherwise completely sealed. Pressure changes in one minute shall not exceed 100 feet.

* 4.6.3 Scale error (Room temperature) - The indicator shall be subjected successively to the pressures specified in Table I. The reduction in pressure, as indicated by a standard mercurial barometer during the interval between test points, shall be made at a rate corresponding to an increase in altitude of approximately 3,000 feet per minute. The indicator shall remain at the pressure corresponding to each point for at least 1 minute, but not more than 10 minutes, before a test reading is taken. The scale errors shall be tabulated. Movement of the pointer shall be free from backlash and any irregular motion when the pressure is varied uniformly. The scale error at any point shall not exceed the tolerance listed in Table I. The aeronautical pressure equivalents are listed from MIL-STD-859. The test shall be repeated while decreasing the altitude.

4.6.4 Hysteresis - Not more than 15 minutes after the indicator has been first subjected to the pressure corresponding to the upper limit of the scale in the Scale Error test, the pressure shall be increased at a rate corresponding to a decrease in altitude of approximately 3,000 feet per minute until the pressure corresponding to the first test point given in Table II is reached. The indicator shall remain at this pressure for at least 5 minutes but for not more than 15 minutes, before the test reading is taken. After the reading has been taken the pressure shall be further increased at the above rate until the pressure corresponding to the second test point given in Table II is reached. The indicator shall remain at this pressure for at least 1 minute but for not more than 10 minutes before the test reading is taken. After the reading has been taken, the pressure shall be further increased at the above

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rate until atmospheric pressure is reached. The reading of the indicator at either of the two test points shall not differ from the reading of the indicator for the corresponding altitude in the Scale Error test by more than the tolerance given in Table II.

TABLE I

SCALE ERRORS

Standard Altitudes	Equivalent Atmospheric Pressure	Room Temperature (Variation from Standard Altitude)	-55 ±2° C (Variation from Room Temperature Reading)
Feet	Inches of Mercury (Hg)	± Feet	± Feet
0	29.921	200	300
5,000	24.896	300	300
10,000	20.577	400	400
15,000	16.886	500	500
20,000	13.750	600	600
25,000	11.103	700	700
30,000	8.885	800	800
35,000	7.041	900	900
40,000	5.538	1,000	1,000
45,000	4.355	1,100	1,100
50,000	3.425	1,200	1,200

TABLE II

HYSTERESIS

Test Points	Standard Altitude Feet	Equivalent Atmospheric Pressure In. Hg	Permissible Variation ± Feet
First point	25,000	11.103	300
Second point	20,000	13.750	300
Third point	-	Ground level	150

* 4.6.4.1 After effect - Not less than 1 minute and not more than 5 minutes after the completion of the Hysteresis test, the pointer shall have returned to its original reading, corrected for any change in atmospheric pressure, within the tolerance given in Table II at the third test point.

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* 4.6.5 Position error - At normal atmospheric pressure, the indicator shall be held in the normal operating position, tapped in accordance with 4.5.2, and a reading taken. The procedure shall be repeated at 90-degree increments as the indicator is rotated 360 degrees about each horizontal axis. The maximum deviation of the latter readings from the original reading shall not exceed 200 feet.

4.6.6 Friction - The indicator shall be tested for friction at each of the test points listed in Table III. The pressure shall be decreased to bring the pointer approximately to the desired reading, then held constant while two readings are taken; the first before the indicator is tapped and the second after being tapped. The difference of any two such readings shall be recorded as friction and shall not exceed the tolerances specified in Table III. This test may be combined with the test for scale error at room temperature. At the option of the Government inspector, any other points may be tested for compliance with the above test.

TABLE III

FRICTION

Altitude Feet	Tolerance ±Feet
1,000	200
2,000	200
3,000	200
5,000	200
10,000	200
15,000	200
20,000	300
25,000	300
30,000	300
35,000	400
40,000	500
50,000	700

4.6.7 Scale error (-55° C) - For a period of not less than 12 hours prior to this test, the indicator shall not have been subjected to any test involving operation at other than atmospheric pressures. The Scale Error (Room Temperature) test shall be repeated with the difference that the temperature of the indicator having been maintained for a 3-hour period prior and during the test at -55° C. The test points shall be those given in Table I. The change in scale errors of this test from corresponding scale errors in the room temperature test shall not exceed the tolerance specified in Table I.

* 4.6.8 High temperature characteristics - The indicator shall be subjected to a temperature of +70 ±2° C for a period of 3 hours. It shall then be allowed

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to cool to a normal temperature, after which it shall be subjected to and meet the requirements specified for Scale Error (Room Temperature) and Case Leakage tests.

* 4.6.9 Vibration error - The indicator shall be tested in accordance with Procedure XIII of MIL-E-5272. While the indicator is being vibrated at frequencies from 10 to 40 cycles per second the range of the pointer oscillation shall not exceed 250 feet and the pointer variation from its original position shall not exceed 250 feet. While the indicator is being vibrated at frequencies from 40 to 500 cycles per second, the range of pointer oscillation shall not exceed 400 feet and the pointer variation from its original position shall not exceed 400 feet.

4.6.10 Overpressure - The indicator shall be subjected to an absolute pressure of 50 inches of mercury for a period of 1 hour, and then to atmospheric pressure for the next 6 hours. Immediately following the 6 hours at atmospheric pressure, the Scale Error test shall be performed at room temperature. The scale errors shall not vary from the previously noted scale errors by more than the tolerances listed in Table IV.

TABLE IV

VARIATION FROM ORIGINAL SCALE ERRORS AFTER SUBJECTION TO 50 INCHES OF MERCURY PRESSURE

Standard Altitude Feet	Variation ±Feet
0	200
5,000	200
10,000	200
20,000	200
25,000	200
30,000	200
35,000	300
40,000	300
45,000	400
50,000	400

* 4.6.11 Magnetic effect - The indicator shall be placed with its nearest part 6 inches from the center of an uncompensated short bar magnet compass in a horizontal magnetic field of 0.17 to 0.19 oersted intensity. When the indicator is rotated 360 degrees about its two horizontal axes at each of the six 90 degree positions about the compass, the compass deflection shall not exceed 1 degree from its reference position.

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* 4.6.12 Vibration endurance - The scale error shall be noted at the existing atmospheric pressure. The instrument shall be subjected to Vibration Cycling Procedure XIII of MIL-E-5272 for a 3-hour period. At the end of the vibration period the scale error at atmospheric pressure shall be again noted. The difference between the reading determined before and that determined after vibration, after correction for any changes in atmospheric pressure, shall not exceed 100 feet.

4.6.13 High altitude - Low temperature - The indicator shall be placed in a chamber and maintained at a temperature of approximately -65° C and a pressure equivalent to 50,000 feet for 4 hours. The indicator shall then be returned to atmospheric pressure and maintained at a temperature of -65 ±2° C for an additional period of 44 hours. There shall be no damage which would affect subsequent operation. Upon return to room temperature the indicator shall be subjected to and meet the requirements of the Individual Inspection.

* 4.6.14 Humidity - The indicator mounted with the dial face up shall be tested in accordance with Humidity Procedure I of MIL-E-5272. Within 24 hours after completion of the test, the indicator shall be subjected to and shall meet the requirements of the Individual Inspection.

* 4.6.15 Fungus resistance - The indicator shall be tested in accordance with Fungus Procedure I of MIL-E-5272 except that the test period shall be 14 days. Any evidence of fungi growth shall be cause for rejection.

* 4.6.16 Salt spray - The indicator shall be tested in accordance with Salt Spray Procedure I of MIL-E-5272. Upon completion of the test, the indicator shall be subjected to and meet the requirements of the Individual Inspection.

4.6.17 Mounting lugs - The indicator case, with mechanism removed, shall be mounted face downward on the movable head of a suitable testing machine with the face of the case in a horizontal plane so that the mounting lugs receive no added support. A suitable pin shall be inserted through the hole in the mounting lug and attached to the pull strap. A load of 175 pounds shall be applied along the mounting hole axis toward the front of the case for a period of 1 minute. There shall be no fracture.

* 4.6.18 Internal examination - The case of the indicator shall be opened and the internal mechanism examined. Any deterioration or damage which could in any manner prevent the indicator from meeting functional operation during service life shall be cause for rejection.

* 5. PREPARATION FOR DELIVERY

5.1 Packaging - The indicator shall be packaged in accordance with MIL-STD-794, Level A or C as specified in contract or order (see 6.2). For Level A

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packaging the method of preservation shall be in accordance with MIL-P-116 Method 1A-5, without preservative compound (using metal reusable containers).

* 5.2 Packing - The indicator shall be packed in accordance with MIL-STD-794, Level A, B, or C as specified in contract or order (see 6.2).

* 5.3 Marking - The interior and exterior containers shall be marked as specified in MIL-STD-794.

* 5.3.1 Precautionary marking - The following precautionary markings shall appear conspicuously on two opposite sides of each interior package and shipping container wherever practicable.

FRAGILE

DELICATE INSTRUMENTS

HANDLE WITH CARE

* 6. NOTES

6.1 Intended use - The indicator covered by this specification is intended for use in aircraft equipped with pressurized cabins to indicate the air pressure altitude in the cabins.

* 6.2 Ordering data - Procurement documents should specify the following:

(a) Title, number and date of this specification.

(b) Quantity desired.

(c) Levels of packaging (see 5.1) and packing (see 5.2) desired.

(d) The laboratory that shall conduct tests (see 4.4, 4.4.4.2).

(e) Items of data required (see 3.14 and 6.3).

(f) Mounting hardware (if required).

* 6.3 Data - For the information of Contractors and Contracting Officers, any of the data specified in (a) subparagraphs below, (b) applicable documents listed in Section 2 of this specification, or (c) referenced lower tier documents need not be prepared for the Government and shall not be furnished to the Government unless specified in the contract or order. The data to be furnished shall be listed on DD

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Form 1423 (Contractor Data Requirements List) which shall be attached to and made a part of the contract or order. For Navy contracts NavWeps Form 4200/15 (Drawings, Lists, and Specifications Required) shall be attached where applicable.

* 6.3.1 Reliability - (See 4.4 and 4.4.3.)

* 6.3.2 Test reports - (See 4.4.)

* 6.4 Definitions -

* 6.4.1 Amplitude - Whenever the word "amplitude" is used, it shall mean the extent of motion as measured from the mean position to one extreme position.

* 6.4.2 Good as new - "Good as new" shall mean indicators operated less than 10 percent of specified MTBF operation.

* 6.4.3 Refurbished - "Refurbished" shall mean the indicator has been completely overhauled with all component parts meeting current parts standards; and the indicator shall have been subjected to, and met, all the requirements of a new indicator.

* 6.5 Qualification - With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of the supplier is directed to provisions governing qualification, and are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Air Systems Command, Department of the Navy, Washington, D. C. 20360, and information pertaining to qualification of products may be obtained from that activity. An information copy of the request should be forwarded to the Commander, Air Force Systems Command, Aeronautical Systems Division (ASNPS), Wright-Patterson AFB, Ohio 45433.

* 6.6 Precedence of documents - When the requirements of the contract, this specification, or applicable subsidiary specification are in conflict, the following precedence shall apply:

(a) Contract - The contract shall have precedence over any specification.

(b) This specification - This specification shall have precedence over all applicable subsidiary specifications. Any deviation from this specification, or from subsidiary specifications where applicable, shall be specifically approved in writing by the procuring activity.

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(c) Referenced specifications - Any referenced specification shall have precedence over all applicable subsidiary specifications referenced therein. All referenced specifications shall apply to the extent specified.

* 6.7 Asterisk - In specification revisions and superseding amendments an asterisk "*" preceding a paragraph number denotes paragraphs in which changes have been made from the previous issue. This has been done as a convenience only and the government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content as written, irrespective of the asterisk notations and relationship to the last previous issue.

Custodians:
Army - AV
Navy - AS
Air Force - 11

Review activities:
Army - AV
Navy - AS
Air Force - 11, 82

User activities:
Navy - CG

Preparing activity:
Navy - AS
Project No. 6685-0114

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DEPARTMENT OF THE NAVY
Naval Air Engineering Center
Philadelphia, Pennsylvania 19112

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SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity *(as indicated on reverse hereof)*.

SPECIFICATION: MIL-I-5099B — INDICATOR, CABIN AIR PRESSURE, 1-7/8 INCH DIAL, TYPE MA-1

ORGANIZATION *(Of submitter)*		CITY AND STATE
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?
   A. GIVE PARAGRAPH NUMBER AND WORDING.

   B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

   ☐ YES ☐ NO IF "YES", IN WHAT WAY?

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

SUBMITTED *(Printed or typed name and activity)*	DATE

DD FORM 1 NOV 64 1426 REPLACES NAVSHIPS FORM 4843, WHICH IS OBSOLETE C-8279