MIL-I-7627E

4 April 1974

SUPERSEDING
MIL-I-7627D
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MILITARY SPECIFICATION

INDICATOR, TURN AND SLIP, 28V DC

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

1. SCOPE

1.1 Scope. This specification covers 28V DC, hermetically sealed turn and slip indicators.

*1.2 Classification. The indicators shall be of the following types as specified (see 6.6):

MS28041-1	4 minute turn, dark ball, fluorescent dial marking
MS28041-1A	4 minute turn, white ball, lusterless white dial marking
MS28041-1B	4 minute turn, dark ball, lusterless white dial marking
MS28041-1C	4 minute turn, dark ball, fluorescent dial marking
MS28041-1D	4 minute turn, dark ball, lusterless white dial marking
MS28041-2	2 minute turn, dark ball, lusterless white dial marking
MS28041-2A	2 minute turn, white ball, fluorescent dial marking
MS28024-2	4 minute turn, white ball, lusterless white dial marking
MS28024-2A	4 minute turn, white ball, fluorescent dial marking
MS28024-3	4 minute turn, dark ball, fluorescent dial marking
MS28024-3A	4 minute turn, dark ball, lusterless white dial marking

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 this specification to the extent specified herein.

SPECIFICATIONS

Federal

L-P-378	Plastic Film (Polyethylene Thin Gauge)
BB-N-411	Nitrogen, Technical
QQ-P-416	Plating, Cadium (Electrodeposited)
PPP-B-636	Box, Fiberboard

Military

MIL-P-116	Preservation, Methods of
MIL-M-3171	Magnesium Alloy, Processes for Pretreatment and Prevention of Corrosion
MIL-N-3336	Nut, Self Locking, Instrument Mounting
MIL-W-5088	Wiring, Aircraft, Installation of
MIL-E-5400	Electronic Equipment, Aircraft, General Specification for
MIL-C-5541	Chemical Films and Chemical Film Materials for Aluminum and Aluminum Alloys
MIL-S-6872	Soldering Process, General Specification for
MIL-S-7742	Screw Threads, Standard, Optimum Selected Series. General Specification for
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-P-23408	Plating, Tin-Cadmium (Electrodeposited)
MIL-P-26514	Polyurethane Foam, Rigid or Plastic, For Packaging
MIL-B-83292	Bearing, Ball, Annular, Instrument, For Precision Rotating Components

STANDARDS

Federal

FED-STD-595	Colors

Military

MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U S Military Property
MIL-STD-461	Electromagnetic Interference Characteristics, Requirements For Equipment
MIL-STD-462	Electromagnetic Interference Characteristics, Measurement of
MIL-STD-704	Electric Power, Aircraft, Characteristics and Utilization of

MIL-STD-749	Preparation and Submission of Data for Approval of Nonstandard Electronic Parts
MIL-STD-781	Reliability Tests, Exponential Distribution
MIL-STD-794	Part and Equipment, Procedures for Packaging and Packing of
MIL-STD-810	Environmental Test Methods
MIL-STD-831	Test Reports, Preparation of
MIL-STD-889	Dissimilar Metals
MS28024	Indicators, Turn and Slip, 4-Minute Turn
MS28041	Indicator, Turn and Slip, 28V DC, 1-7/8 Inch Dial
MS33558	Numerals and Letters, Aircraft Instrument Dial, Standard Form of

(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 First article inspection. This specification makes provisions for first article inspection.

*3.2 Parts and materials. In the selection of parts and materials, fulfillment of major design objectives shall be the prime consideration. In so doing, the following shall govern:

(a) Parts and materials requirements shall conform to MIL-E-5400.

(b) Nonrepairable subassemblies, as outlined in MIL-E-5400, shall be used when practicable. The general size of subassembly and the amount of circuitry to be included therein shall be approved by the procuring activity. Nonrepairable subassemblies must be reliable (see 6.4).

(c) Bearing selection will conform to MIL-B-83292.

*3.2.1 Nonstandard parts and materials approval. Approval for the use of nonstandard parts and materials shall be obtained as outlined in MIL-STD-749.

3.3 Design and construction. The indicator shall conform with all applicable requirements of MIL-E-5400 for design, construction, and workmanship, except as otherwise specified herein.

*3.3.1 Total weight. The total weight of the indicator, less mounting screws, shall be a minimum consistent with good design and shall not exceed 2.0 pounds.

3.3.2 Reliability.

*3.3.2.1 Operational stability. The stability of the indicator shall be such that the mean time between unsatisfactory operation, which cannot be corrected by adjustment of a control easily accessible to the operator during normal operation shall be a minimum of 2500 operating hours. The indicator shall be capable of meeting this requirement under conditions of both continuous and intermittent operation.

*3.3.2.2 Operating life. The indicator shall have a minimum total operating life of 25,000 hours with reasonable servicing and replacement of parts. Parts requiring scheduled replacement due to wear during the life of the indicator, and the wearout life of such parts, shall be determined by the contractor and submitted to the procuring activity.

*3.3.2.3 Reliability in Mean Time Between Failures (MTBF). For the test program under 4.6.27, the specified mean operating time between failures shall be 2000 hours. For this test program, a failure shall be considered to have occurred whenever the performance characteristics fall below the acceptance requirements (4.6.27.5) irrespective of whether or not the condition can be corrected by adjustment of operator controls.

3.3.3. Cabling and connections.

3.3.3.1 Cables and connectors. The indicator shall provide for the use of cables and connectors in accordance with MIL-E-5400.

3.3.3.2 Interconnection cabling. The indicator shall be capable of satisfactory operation using external wiring in accordance with the application requirements of MIL-W-5088. The external wiring shall be unshielded, except that a minimum number of the individual wires may be shielded when demonstrated as necessary to meet interference control requirements and provided the assembly of the cable to its plugs may be easily accomplished. External cables and that portion of the connectors attached to the cables shall not be supplied as part of the indicator.

3.3.4 Interchangeability. The indicator shall meet the interchangeability requirements as defined in MIL-E-5400.

*3.3.5 Electromagnetic interference. The indicator shall meet the electromagnetic interference requirements of MIL-STD-461 measured per MIL-STD-462.

3.3.6 Maintenance provisions and field testing. Provisions for maintenance shall be as specified in MIL-E-5400. Specific test points and test facilities shall be provided to the greatest extent practicable for ease of field testing and maintenance.

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

3.3.8 Standard conditions. The following conditions, unless otherwise specified, shall be used to establish normal performance characteristics under standard conditions and for making laboratory bench tests.

Temperature	Room ambient (25° ± 5°C)
Altitude	Normal ground
Vibration	None
Humidity	Room ambient up to 90 percent relative humidity
Input power voltage	27.5 ± 0.5V DC

*3.3.9 Environmental conditions. The indicator shall be capable of withstanding the following environmental conditions as required in Section IV herein:

(a) Operating Temperature. Continuous operation over a temperature range of -54° C to 71° C.
(b) Exposure Temperature. Exposure temperature from -62° C to 95°C.
(c) Altitude. 0 to 80,000 feet.
(d) Temperature-Shock per MIL-STD-810, Method 503.
(e) Salt Fog. Exposure to a salt laden atmosphere.
(f) Fungus. Fungus growth as encountered in a tropical climate.
(g) Acceleration. MIL-STD-810, Method 513.1, Procedure I.
(h) Vibration. MIL-STD-810, Method 514.1, Equipment Category a , Curve B, Procedure I.

*3.3.10 Primary input power requirements. The indicator shall meet all applicable requirements of MIL-STD-704 and shall give specified performance from a 28V DC, 0.25 amp, Category B power source with characteristics as defined in MIL-STD-704 having limits as specified therein. The power required shall not exceed the specified amounts.

*3.3.10.1 Transient susceptability. The indicator shall meet the requirements of MIL-STD-704, Figures 9 and 17. Degraded performance will be permitted for voltage transients not exceeding 0.5 second during normal electric system operation. Operation shall return to normal with no resulting damage to the indicator.

*3.3.11 Transportability. The indicator shall be so constructed that no parts will work loose in service. It shall be built to withstand the strains, jars, vibration, and other conditions incident to shipment, storage, installation and service use.

3.4 Performance. Unless otherwise specified, values set forth to establish the requirements for satisfactory performance apply to performance under both standard and extreme service conditions. When reduced performance under the extreme conditions is acceptable, tolerances or values setting forth acceptable variations from the performance under the standard conditions will be specified.

3.5 Detail requirements.

3.5.1 Maintenance. The design shall be reasonably simple to facilitate as much as possible disassembly, repair or overhaul, service maintenance, and reassembly using tools and items of maintenance equipment which are normally available as commercial standards.

*3.5.2 Case. The case shall conform to MS28024 for the 2 - 3/4 inch dial indicator and to MS28041 for the 1 - 7/8 inch dial indicator except the length may be 4.92 inches. The case and mounting flange shall be made of nonferrous, low density metal, uniform in texture, having a smooth surface and shall be hermetically sealed. The case shall be finished with a lusterless black material, Color No. 37038 of FED-STD-595. The finishing material shall be of durable type to withstand usage encountered in service.

3.5.2.1 Hermetic sealing. The case shall provide a hermetically sealed enclosure for all of the mechanism. The case shall be so constructed that it may be opened, the mechanism removed and replaced and the case resealed at least three times. This shall be possible without the use of any special tool, jig or fixture, unless such device is specifically approved by the procuring activity. The sealing of the case shall not be dependent upon any material which will be adversely affected by any atmosphere to which the instrument may be subjected in normal use in military aircraft.

3.5.2.2 Filling medium. The filling medium shall be a mixture of 90 percent nitrogen and 10 percent Helium. The nitrogen used shall be in accordance with BB-N-411, type I, class I, grade C. The filling medium shall contain not more than 0.006 milligram of water vapor per liter (dew point -65°C) at the filling pressure. The absolute pressure of the filling medium in the case shall be 1 $\pm$ 0.1 atmosphere.

3.5.2.3 Reinforcement. The inside of the case around each connection shall be of sufficient strength to prevent damage to the case when the connections are tightened during installation of the indicator.

3.5.2.4 Cover glass. The cover glass shall be clear, flat, and free from flaws which interfere with the normal reading of the instrument. The glass shall not be fluorescent when exposed to ultraviolet light or rays in the 365 millimicrons region.

3.5.2.4.1 Dial to cover glass distance. The distance between the indicator dial and the inside of the cover glass shall be held to a minimum and shall not exceed 0.188 inch.

3.5.3 Dial. The dial shall conform to figure 1. All markings shall be durable to withstand the usage encountered in service. The style and proportions of numberals and letters placed on the dial shall conform to MS33558.

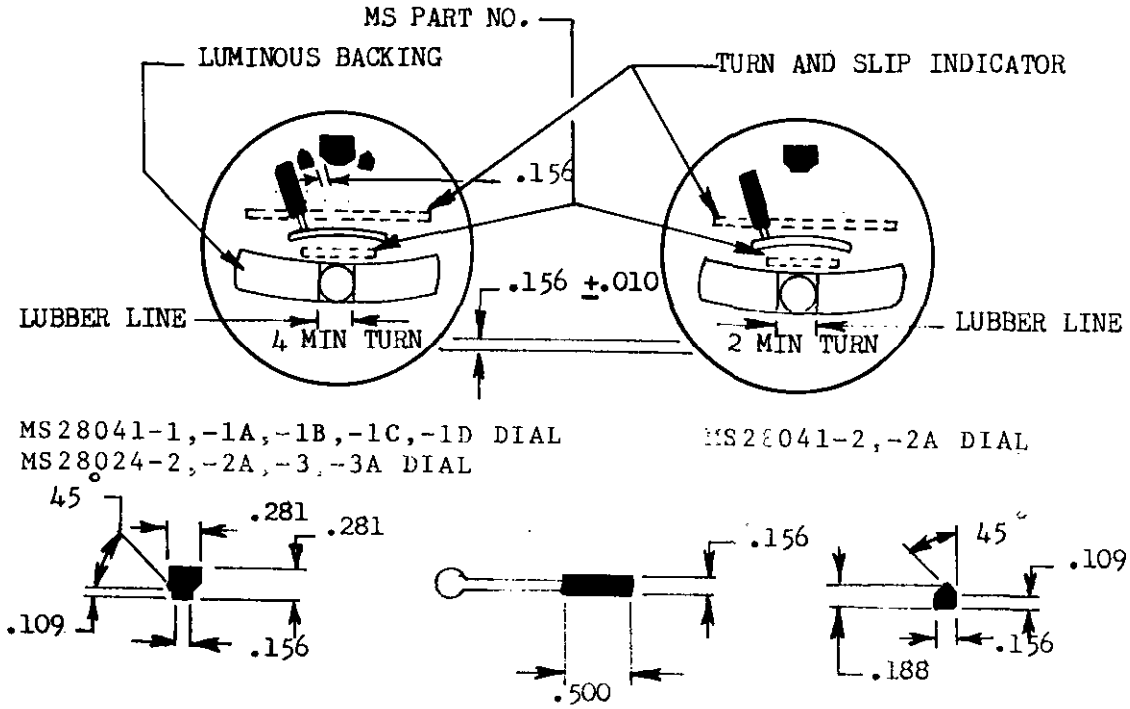
3.5.3.1 Visibility of dial. The pointed, center mark and all other specified markings on the dial shall be visible from any point within the frustum of a cone whose side makes an angle of 30 degrees with a perpendicular to the dial and whose small diameter is the aperature of the case.

3.5.4 Slip indicator.

*3.5.4.1 Indicator tube glass. The glass of the slip indicator tube shall be made of clear annealed glass tubing free from any flaws that will seriously affect the readability of the inclinometer. The wall thickness shall be not less than 3/64 inch. The inside of the tube shall be smooth and uniform in order that the ball will roll smoothly when the indicator is slowly tipped to either side of the vertical plane of the dial while being tapped gently. The tube shall not leak when held at 71°C for one hour.

*3.5.4.2 Indicator ball. When slip indicators with dark balls are specified, the ball shall be of black glass, Color No. 17038, or dark blue glass, Color No. 15044, in accordance with FED-STD-595. When slip indicators with white balls are specified, the ball shall be of white glass. The white color shall be in accordance with the following color notation following Munsell System color notations. The color shall be neutral not less than 9.0 value and no greater than 0.5 chroma. The ball shall be a highly polished accurate sphere and shall be 3/8 ± 1/16 inch in diameter for the 1-7/8 inch dial indicator or 7/16 ± 1/64 inch in diameter for the 2-3/4 inch dial indicator.

LUBBER LINE SPACING	
2 INCH INDICATOR	.406 ± .031
3 INCH INDICATOR	.468 ± .031



MARKING	HEIGHT OR LENGTH	WIDTH OF LINE OR GRADUATION ± .005	MATERIAL OR FINISH
CENTER MARK	AS SHOWN ON FIGURE	AS SHOWN ON FIGURE	FLUORESCENT LUMINESCENT OR LUSTERLESS WHITE COLOR NO. 37875 OF FED-STD-595
TWO NEEDLE-WIDTH DEFLECTION MARKS			
SHADED PORTION OF POINTER			
REAR HALF AND BOTTOM OF INDICATOR TUBE FOR DARK BALL			
VISIBLE PART OF TWO WIRES ON FRONT AND TOP OF INCLINOMETER			
ONE WIRE ON EACH SIDE OF INCLINOMETER BALL IN ZERO POSITION			
LETTERING, 4 MIN TURN, 2 MIN TURN			
LETTERING, TURN AND SLIP INDICATOR	.047	.016	LUSTERLESS BLACK COLOR NO. 37038 OF FED-STD-595
MS PART NUMBER			
DIAL BACKGROUND			
REAR HALF AND BOTTOM OF INDICATOR TUBE FOR WHITE BALL			

FIGURE 1 Markings, dial and pointer

*3.5.4.3 Damping liquid. The damping liquid used in the slip indicators shall be sufficiently colorless to preclude interference with visibility of the ball under daylight and night lighting conditions and under normal temperature and temperature extremes. Damping shall be such that when the indicator is inclined to the horizontal at an angle of 24 degrees, the time for the ball to roll from the zero mark to the end of the tube shall be not less than 0.2 second.

*3.5.4.4 Slip indicator zero position and sensitivity. When the indicator is in the normal horizontal position, the ball shall rest at the zero mark within 1/32 inch. With the dial vertical, when the indicator is rotated about the longitudal axis until the ball is just short of its limit, the angle of rotation shall be 8 $\pm$ 2 degrees for the MS28041 indicator and 10 $\pm$ 2 degrees for the MS28024 indicator. The ball shall not stick at the high end of the tube.

3.5.5 Turn indicator.

3.5.5.1 Sensitivity element. The sensitive element of the turn indicators shall be operated on 28 V DC. The element shall be so mounted that it reacts only to turns about the vertical axis. The indication shall be proportional to the rate of turn about the vertical axis.

*3.5.5.2 Pointer. The pointer shall be as shown on figure 1. It shall be as light as practicable and sufficiently rigid to prevent oscillation under vibration. It shall be firmly attached to the mechanism and yet be readily adjustable. During static or dynamic balance, the deviation of the pointer from zero shall not exceed 0.010 inch for any stationary position.

3.5.5.3 Mechanism adjustment. Means shall be provided to adjust or correct the sensitivity of the indications and, if necessary, the damping of the indications. The adjusting means shall be set in the neutral position, within an amount of one-quarter part of the total range of adjustment, in order that a sufficiently large range of adjustment in each direction will be available. This means of adjustment shall be reasonably simple to manipulate and of a nature that adjustment can be accomplished with tools ordinarily possessed by an instrument repairman.

3.5.6 Screw threads. Screw threads 0.060 inch in diameter or larger shall be in accordance with MIL-S-7742.

3.5.7 Electrical requirements.

3.5.7.1 Insulation. The complete electrical system shall be so insulated from the indicator cases that they will be capable of withstanding a voltage of 500 V DC for a period of 1 minute.

3.5.7.2 Case markings. The following markings, in durable dull white or natural metal finish, shall be permanently and legibly marked on the back of the indicator cases beside the electrical receptacle to identify the electrical connector pins with which they shall be radially aligned:

Pin	Markings
A	+28V DC Power
B	Power Return

*3.5.7.3 Electric connector. The electric connector shall be a sealed connector and shall be as shown on MS28041 or MS28024.

*3.5.7.4 Voltage variation. The indicators shall operate satisfactorily with a power source ranging from 26 to 30V DC. The indicator motor shall start and come up to a useful speed with 23 volts applied.

3.5.7.5 Wiring. Internal wiring shall be color coded, neat and accomplished in such a manner that individual wires may be easily traced. The wiring shall be insulated from the instrument case.

*3.5.7.6 Motor. The indicator shall utilize an AC motor which does not incorporate slip ring, contacts, brushes, or other similar elements.

*3.5.7.7 Inverter. An inverter assembly shall be incorporated.

3.5.8 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 and suitable for the purpose intended.

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

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

3.5.8.3 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 instrument may be subjected when in storage or during normal service life.

3.5.8.3.1 Dissimilar metals. Dissimilar metals as defined in MIL-STD-889 shall not be used in intimate contact with each other, unless suitably protected against electrolytic corrosion by means of protective coatings.

3.5.8.3.2 Magnesium alloy parts. Magnesium alloy parts shall be treated in accordance with MIL-M-3171. Where abrasion resistance is a factor, an anodic treatment approved by the procuring activity shall be used.

3.5.8.3.3 Aluminum alloy parts. When practicable, aluminum alloy parts shall be covered with an anodic film conforming to MIL-A-8625. Small holes, pipe 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.

3.5.8.3.4 Iron and steel parts. Iron and steel parts which are in hermetically sealed cases shall be cadium plated in accordance with QQ-P-416. Parts in a confined space in the presence of organic material shall be tin-cadium plated in accordance with MIL-P-23408. The class and type of plating shall conform to 3.5.8.4.

3.5.8.4 Protective treatment. Where 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.

3.5.8.5 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 used in a hermetically sealed enclosure, fungicidal treatment shall not be necessary.

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

3.5.9 Mounting hardware. The contractor shall furnish removable spring nuts conforming to MIL-N-3336 in sufficient quantity to install the instrument. The contractor shall furnish sufficient mounting hardware to install the indicator. The screws shall be round head brass machine screws having a durable, lusterless black, oxidized or nickel finish. The length shall be sufficient to mount the instrument on panels up to 3/8 inch thick.

3.5.9.1 Envelope. An envelope furnished by the contractor shall be packaged with each indicator, shall contain the mounting hardware, and shall be marked as follows:

IMPORTANT
THIS ENVELOPE CONTAINS
MOUNTING HARDWARE

3.5.10 Workmanship. The indicator, including all parts and accessories shall be so constructed and finished that it will be free from all defects which may affect proper functioning in service. Particular attention shall be given to neatness and thoroughness of soldering, wiring, impregnation of coils, marking of parts and assemblies, welding and brazing, plating, riveting, machine screw assemblies, and freedom of parts from burrs and sharp edges.

3.5.10.1 Dimensions. Dimensions and tolerances not specified shall be as close as is consistent with the best shop practices. When dimensions and tolerances affect the interchangeability, operation, or performance of the indicator, they shall be held or limited accordingly.

3.5.10.2 Fabrication. Machining, drilling, and forming shall be done with the use of accurate templates, jigs or gages.

3.5.10.3 Screw assemblies. Assembly screws shall be tight. The word tight means that the screws cannot be tightened appreciably without damage or injury to the screw threads or heads.

3.5.10.4 Gears. Gear assemblies shall be properly aligned and meshed and shall be operable without interference, tight spots, loose spots or other irregularities. Where required for accurate adjustments, gear assemblies shall be as free as possible from backlash.

3.5.10.5 Cleanup. The indicator shall be thoroughly cleaned for loose, spattered or excess solder, metal chips and other foreign matter after final assembly. Burrs and sharp edges, as well as rosin flash which might crumble, shall be removed.

3.5.10.6 Soldering. Soldering shall be performed in accordance with MIL-S-6872.

*3.5.11 Magnetic property. When held in various positions around a free magnet at a distance of 5-1/2 inches in a magnetic field having a horizontal intensity of 0.18 ± 0.01 oersted, the deflection of the magnet shall not exceed 5 degrees with and without power applied.

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 inspections. The inspection requirements specified herein are classified as follows:

(a) First Article Inspection (see 4.4)

(b) Quality Conformance Inspection (see 4.5)

4.3 Test conditions. The test conditions are described under the individual tests to which they apply.

4.4 First article inspection.

*4.4.1 Test sample. Unless otherwise specified, the test samples shall consist of three indicators. The samples shall be identical to the production equipment. The samples shall be identified with the manufacturer's part number and such other information as required by the procuring activity. For First Article Reliability Tests the sample size shall be a minimum of six and a maximum of nine.

*4.4.2 Test report. After completion of the first article tests the contractor shall prepare a test report and furnish three copies to the procuring activity for approval.

*4.4.3 First article tests. The test samples shall be subjected to all the tests described under paragraph 4.6, Test Methods.

*4.4.4 Government tests. When specified by the procuring activity, the samples that were subjected by the contractor to first article tests and an untested sample shall be delivered at the contractor's expense to a specified government laboratory for additional testing (see 6.6.1).

*4.4.4.1 Data to accompany test samples. When it is required that test samples be furnished to the procuring activity, it shall be accompanied by the following data:

(a) Brief operating data to enable test personnel to correctly operate the equipment.

(b) Engineering data in the form of assembly drawings (2 sets) and calibration test of the indicators.

*4.5 Quality conformance tests. Quality conformance tests shall consist of:

(a) Individual Tests (see 4.5.1)

(b) Sampling Tests (see 4.5.2, 4.5.3, 4.5.4)

*4.5.1 Individual tests. Each indicator shall be subjected to the following tests as described under 4.6.

(a) Examination of product
(b) Low voltage operation
(c) Manufacturing run-in test
(d) Turn indicator static balance
(e) Turn indicator dynamic balance
(f) Turn indicator sensitivity
(g) Turn indicator damping
(h) Slip indicator visibility
(i) Slip indicator filling
(j) Slip indicator zero position
(k) Slip indicator friction
(l) Slip indicator damping
(m) Slip indicator sensitivity
(n) Seal

*4.5.2 Sampling Plan A. Indicators shall be selected at random in accordance with the following schedule and subjected to the following tests as described under 4.6:

PRODUCTION QUANTITY	TOTAL NUMBER OF SAMPLES
1-10	1
11-60	2
61-135	3
136-235	4

Each additional 200 or fraction thereof: 1

(a) Individual tests

(b) Magnetic effect

(c) Current

(d) Voltage variation

(e) Slip Indicator leak

(f) Transient Susceptability

*4.5.3 Sampling Plan B. Three indicators selected at random from the first 20 on contract or order shall be subjected to the following tests as described under 4.6:

(a) Individual tests
(b) Vibration resonance
(c) Low temperature operation
(d) High temperature operation
(e) Altitude
(f) Low temperature exposure
(g) High temperature exposure
(h) Acceleration
(i) Vibration
(j) Salt Spray
(k) Mounting lug pull
(l) Temperature shock
(m) EMI
(n) Helium test
(o) Internal examination

*4.5.4 Sampling Plan C. A minimum of 6 and a maximum of 9 indicators shall be selected at random from the first 20 on contract or order and shall be subjected to the following tests as described under 4.6:

(a) Individual tests

(b) Reliability

*4.6 Test methods.

*4.6.1 Examination of product. Each indicator shall be examined carefully to determine that the material and workmanship requirements have been met. This examination must be performed prior to hermetic sealing and must be verified by a government inspector.

*4.6.2 Low voltage operation. The electrical power, with the voltage reduced to 23 volts, shall be applied to the indicator. The indicator motor shall start and come up to a useful speed.

*4.6.3 Manufacturing run-in test. Each indicator shall be operated under the conditions specified herein for a period of 6 hours without failure. A failure shall be defined as anything which causes malfunctioning of the indicator. Only those adjustments will be permitted which can be made by using such controls and adjustments that are acceptable to the operator during the normal use of the indicator.

Temperature, ambient room
Humidity, ambient room
Vibration: Any selected frequency within the range of 20 to 30 Hz (excluding resonant points) and a minimum amplitude of ± 3g's

The indicator shall be vibrated (without vibration isolators) for a period of 10 minutes prior to the beginning of the 6-hour period of operation. Where feasible, the indicator shall be operated during this vibration period for the purpose of detecting flaws and imperfect workmanship. Operation within the specified limits of satisfactory performance is not necessarily required during the vibration period. The direction of vibration should be vertical to the normal mounting plane for 5 minutes and lateral to that plane for 5 minutes. Where it is not feasible to vibrate the indicator in 2 directions the vertical direction shall be used. During the 6-hour period of operation following the 10-minute vibration period, the indicator shall be mechanically cycled periodically through its various phases of operation. Should a failure occur, it should be repaired and the test started over, except that the 10-minute vibration period need not be repeated when it is certain the failure was not a result of the vibration. Should repetitive failures occur, corrective action shall be taken to eliminate this defect from future indicators. A record shall be kept of all failures. The 6-hour period specified above may be composed of two 3-hour periods to conform with standard working hours.

*4.6.4 Turn indicator static balance. The indicator shall be placed in a stationary position and the pointer checked with no power applied. The deviation of the pointer from zero shall not exceed 0.010 inch for any stationary position.

*4.6.5 Turn indicator dynamic balance. The indicator shall be placed in the normal stationary position and the pointer position checked with the gyro operated on 28V DC. The deviation of the pointer from zero shall not exceed 0.010 inch for any stationary position.

*4.6.6 Turn indicator sensitivity. The indicator shall be placed in the normal position and operated on 28V DC. The instrument shall be turned about the vertical axis at the rates specified below. The deflection of the pointer also shall conform to the tolerances specified in Table I. This test shall be made after the power has been applied for a period of not more than 3 minutes. The rates of turning may be measured with a timer, or one indicator may be accurately checked against a timer and then used as a standard for testing other indicators. The movement of the pointer shall be smooth throughout its range.

TABLE I. Pointer Deflection

Rate of turning in degrees per minute	Deflection of pointer tips in inches	
	MS28041-1,-1A,-1B,-1C, -1D MS28024-2,-2A,-3,-3A	MS28041-2,-2A
36	1/16 ± 1/64	- -
90	5/32 ± 1/32	5/64 ± 1/32
180	5/16 ± 1/16	5/32 ± 1/32
360	5/8 ± 1/16	5/16 ± 1/16

*4.6.7 Turn indicator damping. The indicator shall be placed in the normal operating position on a rate table and operated for 5 minutes. The indicator shall then be rotated about its vertical axis at a rate which causes full scale deflection of the pointer and then the rotation shall be stopped suddenly. The motion of the pointer shall be so damped that the pointer returns to the zero mark without crossing it in not less than one second, and not more than 3 seconds, and without oscillation or noise other than that encountered in normal operation.

*4.6.8 Slip indicator visibility. The indicator shall be so tipped that the ball is at rest at either end of the tube. No less than one-half of the ball shall be visible when the ball is viewed from a position 12 inches directly in front of the zero mark of the slip indicator.

*4.6.9 Slip indicator filling. The indicator shall be so tipped that all the air in the tube is trapped in the expansion chamber end of the tube. The position of the mounting lugs of the indicator shall be in a vertical plane with the line joining the centers of the two lower mounting holes in a horizontal plane. No part of the air bubble shall be visible when the indicator is viewed from a position 12 inches directly in front of the zero mark of the slip indicator.

*4.6.10 Slip indicator zero position. The two lower adjoining mounting holes of the indicator shall be placed in the normal horizontal position, and the indicator shall be gently tapped. The glass ball shall rest at the zero mark of the slip indicator within 1/32 inch.

*4.6.11 Slip indicator friction. The indicator shall be slowly tipped to either side of the vertical plane of the dial. The ball shall roll smoothly when the indicator is gently tapped.

*4.6.12 Slip indicator damping. The plane of the mounting lugs of the indicator shall be placed in a vertical position with the line joining the centers of the two lower or two upper mounting holes inclined to the horizontal at an angle of 24 degrees, in order that the ball will roll to the opposite end of the tube. The time of roll of the ball from the zero mark of the indicator to the end of the tube shall be not less than 0.2 second.

*4.6.13 Slip indicator sensitivity. With the dial vertical, the indicator shall be rotated about the longitudinal axis to the right until the ball is just short of its limit. The angle of rotation shall be 8 $\pm$ 2 degrees for MS28041 and 10 $\pm$ 2 degrees for MS28024. The test shall be repeated rotating the instrument to the left. The same tolerances shall apply. The ball shall not stick at the high end of the tube.

*4.6.14 Seal. The indicator shall be tested for leaks by means of a mass spectrometer type of helium leak detector and the differential pressure existing when the test is conducted shall be the same as that to which the instrument is filled, approximately 1 atmosphere. The leak rate shall be based on a 1-atmosphere differential pressure with pure helium as the filling medium. Under these conditions, (1 atmosphere differential pressure with pure helium as the filling medium) the leak rate shall not exceed 0.10 micron cubic foot per hour. Equivalent helium leak rates for the same hole size at other differential pressures and helium-nitrogen mixtures, or both, shall be calculated by the manufacturer. The leak test shall be conducted either with the instrument evacuated and surrounded by helium, or after instrument has been filled. As an alternate test, an immersion leak test may be performed in accordance with Procedure 1, Method 512, of MIL-STD-810.

*4.6.15 Magnetic effect. The indicator shall be tested with no power applied. The indicator shall be revolved about a short bar magnet compass with the nearest part of the indicator 5-1/2 inches from the bar magnet. The compass shall have its compensating magnets removed and shall be set up in a uniform magnetic field whose horizontal intensity is between 0.17 and 0.19 oersted. The indicator shall be revolved in a horizontal plane which is perpendicular to the axis of the bar magnet. The indicator shall be held in position 0, 45, 90, 135, 180, 225, 270, and 315 degrees. At each of these positions the indicator shall be rotated 360 degrees about its horizontal axis. The deflection of the compass at any of the specified positions shall not exceed 5 degrees. This test shall be repeated with power applied to the indicator. The same tolerance shall apply.

*4.6.16 Vibration. The indicator shall be tested in accordance with Method 514.1, Equipment Category a, Curve B, Procedure I of MIL-STD-810. Throughout this frequency range, the maximum magnitude of pointer vibration shall not exceed 1/32 inch double amplitude, and the slip indicator ball shall not differ from its zero position by more than 1/16 inch.

*4.6.16.1 The indicator shall also be subjected to an angular oscillation about the vertical axis: i.e., the input axis. The peak-to-peak amplitude of oscillation shall be .008 radians with a frequency range of 4 to 7 Hz. Under these conditions, the vibration of the pointer shall not exceed .020 inches single or .040 inches double amplitude.

*4.6.17 Low temperature operation. (This test may be combined with the low temperature exposure test at the discretion of the testing agency.) The indicator shall be properly connected except that no power shall be applied. The indicator shall then be subject to an ambient temperature of -54°C (-65°F) for a period of 4 hours. At the end of the 4-hour period and with the temperature maintained at -54°C (-65°F), the indicator shall be subjected to and shall meet the requirements specified in the turn indicator sensitivity (low temperature) test and the slip indicator damping (low temperature) test. There shall be no slip indicator leakage as a result of these tests.

*4.6.18 Turn indicator sensitivity (low temperature). The indicator shall be mounted in the normal operating position on a rate table and operated for 10 minutes maximum. The indicator shall then be rotated about the vertical axis at 180 degrees per minute for MS28041-1, MS28041-1A, MS28041-1B, MS28041-1C, MS28041-1D, MS28024-2, MS28024-2A, MS28024-3, MS28024-3A, and 360 degrees per minute for MS28041-2 and MS28041-2A. The pointer deflection shall be 5/16 $\pm$ 1/16 inch. The rotation shall then be stopped and the pointer shall return smoothly without oscillation to the zero position within 0 $\pm$ 1/64 inch. The test shall be performed in both directions of rotation.

*4.6.19 Slip indicator damping (low temperature). The slip indicator damping test shall be repeated and the time for the ball to travel from the zero mark to the extreme end of the tube shall be not greater than 4 seconds.

*4.6.20 High temperature operation. (This test may be combined with the high temperature exposure test at the discretion of the testing agency.) The indicator shall be properly connected and power shall be applied. The indicator shall then be subjected to an ambient temperature of 71°C (160°F) for a period of 4 hours. At the end of the 4-hour period, and with the temperature maintained at 71°C (160°F), the indicator shall be subjected to and shall meet the requirements specified in the turn indicator sensitivity (high temperature) test. There shall be no slip indicator leakage as a result of these tests.

*4.6.21 Turn indicator sensitivity (high temperature). The indicator shall be mounted in the normal operating position on a rate table and operated for 10 minutes maximum. The indicator shall then be rotated about the vertical axis at 180 degrees per minute for MS28041-1, MS28041-1A, MS28041-1B, MS28041-1C, MS28041-1D, MS28024-2, MS28024-2A, MS28024-3, MS28024-3A, and 360 degrees per minute for MS28041-2 and MS28041-2A.

The pointer deflection shall be 5/16 ± 1/16 inch. The rotation shall then be stopped and the pointer shall return smoothly without oscillation to the zero position within 1/32 of an inch. The test shall be performed in both directions of rotation.

*4.6.22 Altitude. (This test may be combined with the low temperature exposure test at the discretion of the testing agency.) The indicator properly connected with no power applied shall be tested in accordance with Method 500, Procedure II of MIL-STD-810. During the last 15 minutes of the 1-hour period, power shall be applied to the indicator. At the end of 1-hour period, with the temperature and pressure maintained as specified, the indicator shall be subjected to and shall meet the requirements of the turn indicator sensitivity (low temperature) test.

*4.6.23 Current. A DC ammeter shall be connected in the 28V DC line between the indicator and the source of power. The current consumption at starting shall not exceed 1.1 amperes. After a period of 3 minutes running time, the current required shall not exceed 0.25 ampere.

*4.6.24 Voltage variation. The indicator shall be subjected to and shall satisfactorily pass the turn indicator sensitivity test when operated on an electrical potential of 26V DC and on 30V DC.

*4.6.25 Slip indicator leak. The size of the air bubbles in the tube shall be determined with the indicator at room temperature. The indicator shall then be maintained at a temperature of 71° ± 2°C for a period of not less than 1 hour. The size of the air bubble shall then be determined with the indicator at room temperature. There shall be no appreciable change in the size of the air bubble before and after the indicator has been subjected to the high temperature. This test may be combined with the test specified in 4.6.21.

*4.6.26 Power requirements. Power requirement shall be for category B equipment. The DC transient levels for transient susceptibility test shall be as follows:

SURGE VOLTAGE
MIL-STD-704A Figure 9
ASSL

(1) With 30 volts applied to the indicator, apply a transient up to the 80 volt level for 50 millisecond.

(2) Repeat the transient pulses 15 times.

(3) Apply a transient up to the 73 volt level for 200 millisecond.

(4) Repeat this 200 millisecond pulse 15 times.

(5) With 28.5 volts applied to the indicator apply 15 pulses (-6 volts). Hold the last 22.5 level for 35 seconds.

NOTE: For the preceding ASSL testing, use a 1 to 5 second interval between pulses.

ESSL

(1) With 22.5 volts applied to the indicator, turn off the power for 7 seconds and then back to 22.5 volts for 10 seconds. Repeat 15 times.

(2) With 28.5 volts applied to the indicator, drop the voltage to 16.5 volts for 2 minutes and then increase to 28.5 volts. Repeat 15 times.

SPIKE VOLTAGE
MIL-STD-704A Figure 17
NSSL

(1) With 28.5 volts applied to the indicator, apply a spike up to the +600 volt level for 10 microseconds. Apply 25 of these spikes 1 to 2 seconds apart.

(2) Repeat the above procedure with -600 volt pulses.

(3) With 28.5 volts applied to indicator, apply a +160 volt pulse for 100 microseconds. Repeat 25 times.

(4) With 28.5 volts applied to the indicator, apply a -120 volt pulse for 100 microseconds. Repeat 25 times.

NOTE: During Transient Susceptability Tests, paragraphs 6.3, 6.4, and 6.5 of MIL-STD-704 will apply. During these tests, the indicator will be turned about the vertical axis at 180° per minute to check for normal pointer deflection. Between pulses pointer deflection should be 5/16 inches $\pm$ 1/16 inches. This applies to all transients tests except at the 22.5 volt level, deflection may be 5/16 inches $\pm$ 1/8 inches. The indicator current consumption will be monitored during all of the tests and any change in current exceeding 10% is considered a failure. Loss of pointer deflection or abnormal deflection is considered a failure.

*4.6.27 Reliability assurance tests. Reliability assurance tests shall be conducted as required by MIL-STD-781. Indicators selected for reliability assurance tests shall first have passed the individual tests.

*4.6.27.1 Reliability procedures. Paragraphs titled Qualification (Demonstration) Phase of Production Reliability Tests and Production Acceptance (Sampling) Phase of Production Reliability Tests of MIL-STD-781 shall be applicable.

*4.6.27.2 Test level. The test level shall be F of TABLE I of MIL-STD-781. It shall be established that the indicators under test operate at room temperature. Each indicator shall then be subjected to a low temperature and high temperature test, in that order. The low temperature test shall be conducted in accordance with 4.6.17 and the high temperature test in accordance with 4.6.20. If a particular indicator has already been subjected to tests of 4.6.17 and 4.6.20, the tests need not be repeated but each indicator to be tested under 4.6.27.1 must already have passed the tests of 4.6.17 and 4.6.20. The indicators shall be subjected to the same angular motions as used in the life tests throughout the reliability tests.

*4.6.27.3 Duty cycle. The indicator shall operate for a period of 2-1/2 hours and be off for a period of 1/2 hour.

*4.6.27.4 Accept-Reject criteria. Paragraphs titled (Accept-Reject Criteria) and (Accept-Reject Criteria for Test Plan II) of MIL-STD-781 shall be used to determine the accept-reject criteria.

*4.6.27.5 Performance characteristics to be measured. At least once each week the indicator shall be subjected to and meet the requirements of the following tests:

Turn indicator static balance (4.6.4)
Turn indicator dynamic balance (4.6.5)
Turn indicator sensitivity (4.6.6)
Slip indicator zero position (4.6.7)
Slip indicator friction (4.6.11)
Slip indicator sensitivity (4.6.13)

A daily observation (on each workday) shall be made of each indicator in order to detect obvious failures.

*4.6.27.6 Failure criteria. In addition to the requirements of MIL-STD-781 the following requirements shall be used to determine when a failure has occurred during the test.

Whenever performance characteristics fall below the acceptance requirement (4.6.27.5) at least one failure has occurred. If subsequent analysis reveals that several parts have deteriorated, each shall be counted a failure, unless one caused the other to fail.

*4.6.27.7 Preventive maintenance. During the period of the tests no preventive maintenance measures may be performed upon the indicator.

*4.6.27.8 Length of tests. Each indicator under test shall be operated until either a failure has occurred or an accept-reject decision has been reached. In the event an indicator fails during the test, it shall either be returned to a serviceable condition and again be placed on test or a replacement test indicator shall be placed on test in order that the test sample size shall remain constant throughout the test.

*4.6.27.9 Disposition of equipment. Inidcators that have been subjected to the reliability tests shall not be delivered on contract until they have been refurbished, resubmitted and passed all the individual tests.

*4.6.28 Low temperature exposure. The indicator shall be tested in accordance with Method 502 of MIL-STD-810. At the end of the exposure period, the indicator shall be subjected to and shall meet the requirements of the turn indicator sensitivity (low temperature) test. The indicator shall then be returned to room temperature and allowed to saturate for a minimum period of 4 hours. It shall then be subjected to and shall meet the requirements specified in the individual tests.

*4.6.29 High temperature exposure. The indicator shall be tested in accordance with Method 501, Procedure I, of MIL-STD-810. At the end of the exposure period, the indicator shall be subjected and shall meet the requirements of the turn indicator sensitivity (high temperature) test. The indicator shall then be returned to room temperature and allowed to saturate for a minimum of 4 hours. It shall then be subjected to and shall meet the requirements specified in the individual tests.

*4.6.30 Acceleration: Procedure I. The indicator, not operating, shall be mounted and accelerated, first in its vertical axis, and then in each of two axes that are perpendicular to the vertical axis and to each other. The indicator shall be subjected to an acceleration of 20g's in each of the above axes for a period of 30 seconds. At the end of this acceleration, the indicator shall meet the requirements specified for turn indicator sensitivity. No damage to the indicator shall result from the test.

*4.6.31 Salt spray. The indicator, with the gyro not operating but with the external connections made to simulate installed conditions, shall be tested in accordance with Method 509 of MIL-STD-810. At the conslusion of the test, the indicator shall be subjected to and shall meet the requirements specified in the following tests:

Low voltage operation
Turn indicator static
Turn indicator dynamic balance
Turn indicator sensitivity
Turn indicator damping

*4.6.32 Mounting lugs. The indicator case shall be mounted face downward on the removable 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 a pull strap in the stationary head of the machine. A load of 175 pounds shall be applied for 1 minute to each lug in a direction toward the front of the case. The lugs shall withstand the applied load without fracture, and there shall be no damage to any part of the indicator. The indicator shall then be subjected to and shall meet the requirements specified in the seal test.

*4.6.33 Temperature shock. The indicator shall be tested in accordance with Method 503 of MIL-STD-810. At the end of this test, the indicator shall be subjected to and shall meet the requirements of the seal test.

*4.6.34 Radio noise interference. The electrical system of the indicator shall be tested for conducted and radiated radio noise interference in accordance with MIL-STD-461 and MIL-STD-462.

*4.6.35 Test for helium. The indicator case shall be punctured, or the filling tube cut, and the indicator subjected to the test for helium by means of mass spectrometer type helium detector. Failure to detect helium shall be cause for rejection.

*4.6.36 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 or maintenance requirements during service life shall be cause for rejection.

*4.7 Presubmission testing. No items, part, or complete indicator shall be submitted by the contractor until it has been previously tested and inspected by the contractor and found to comply, to the best of his knowledge and belief, with all applicable requirements.

*4.8 Rejection and retest. Indicators which have been rejected may be reworked or have parts replaced to correct the defects and resubmitted for acceptance. Before resubmitting, full particulars concerning previous rejection and the action taken to correct the defects found in the original shall be furnished the Government Inspector.

*4.9 Inspection and test. Tests of Methods of Preservation and Packaging shall be accomplished in accordance with Section 4 of MIL-P-116 to insure compliance with Section 5 of this specification.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging. Each indicator to be preserved and packaged in quantity unit packs of one each in accordance with Method 1C1 of MIL-P-116. Each indicator to be wrapped with a poly-film, L-P-378 or equal prior to performing method of preservation. Cushion with MIL-P-26514, Class 2 polyurethane in thickness and density required to insure physical and mechanical protection when the completed pack is subjected to rough handling drop tests referenced in MIL-P-116. Unit container constructed in accordance with PPP-B-636 shall be of sufficient size to accomodate the completed pack. The above requirements apply unless otherwise specified in the contract or order or by the procuring activity.

5.2 Packing. Each indicator shall be packed in accordance with Level B requirements for Air Force stock as defined in MIL-STD-794, unless otherwise specified in the contract or order or by the procuring activity.

5.3 Marking. Each unit, intermediate and exterior container shall be marked in accordance with MIL-STD-129.

5.3.1 Precautionary marking. The following precautionary marking shall appear on two opposite sides of each interior package and shipping container whenever practicable.

FRAGILE
DELICATE INSTRUMENTS
HANDLE WITH CARE

6. NOTES.

6.1 Intended use. The turn and slip indicator is intended for use in aircraft to indicate the rates of rotation of the aircraft about its vertical axis and the lateral attitude of the aircraft relative to the apparent vertical.

*6.2 Test values. Normal and limiting values of performance data should be determined at input voltages of 27.5 ± 0.5V DC. These data are to be used in testing the equipment at installation points for compliance with minimum acceptable standard of performance.

6.3 Performance objectives. Minimum size and weight, simplicity of operation, ease of maintenance, and an improvement in the performance and reliability of the specific functions beyond the requirements of this specification are objectives to be considered in the production of this equipment. Where it appears a substantial reduction in size and weight or improvement in simplicity of design, performance, ease of maintenance or reliability will result from the use of materials, parts and processes other than those specified in MIL-E-5400, it is desired their use be investigated. When investigation shows advantages can be realized, a request for approval should be submitted to the procuring activity for consideration. Each request should be accompanied by complete supporting information.

*6.4 Nonrepairable subassemblies. As a general rule, nonrepairable subassemblies should be encapsulated or hermetically sealed. The number of connections internal to the subassembly should be held to a minimum. Detail parts of tolerances and ratings should be so selected that the life of the subassembly is greater than that of a similar repairable one. With few exceptions (such as high voltage power supplies), the nonrepairable subassembly should evidence a MTBF greater than 5,000 hours, and for many applications this figure must be nearer 50,000 hours.

6.5 Precedence of documents. When the requirements of the contract, this specification, or applicable subsidiary specifications are in conflict, the following precedence will apply:

(a) Contract: The contract will have precedence over any specification.

(b) This specification: This specification will have precedence over all applicable subsidiary specifications.

Any deviation from this specification, or from subsidiary specifications where applicable, must be specifically approved in writing by the procuring activity.

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

*6.6 Ordering data. Procurement documents should specify:

*6.6.1 Procurement requirements.

(a) Title, number, and date of this specification.
(b) The quantity, and MS part number of the instrument desired.
(c) Levels of packaging (see 5.1) and packing (see 5.2) desired.
(d) Method of preservation, if other than Method 1C1 (see 5.1).
(e) Whether government tests are required and if required, the laboratory at which government tests are to be conducted. (see 4.4.4).

*6.6.2 Contract data requirements. Data conforming to Data Item Descriptions DI-T-3709/T-109-2 and DI-T-3718/T-119-2 will usually be required for delivery in connection with this specification. When so required, such data will be specified for delivery on a DD Form 1423 included in the contract. (see 4.4.2).

6.7 Definition of hermetic seal. A hermetic seal is defined as a perfectly closed and airtight seal made between metallic and metallic or between metallic and vetric materials. A hermetic seal is not intended to include seals accomplished by gaskets.

6.8 International standardization. Certain provisions (see 1.1, 3.5.5.1, and figure 1) of this specification are the subject of international standardization agreement (ASCC Air Std 10/5) and STANAG 3322. When amendment, revision, or cancellation of this specification is proposed which will effect or violate the international agreement concerned, the preparing acitivity will take appropriate reconciliation action through international standardization offices, if required.

NOTE: The margins of this specification are marked with an asterisk to indicate where changes (additions, modification, corrections, deletions) from the previous issue were made. This was 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 irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
Army - AV
Navy - AS
Air Force - 71

Reviewing Activities:
Army - AV
Navy - AS
Air Force - 71

Preparing Activity:
Air Force - 71

Project Number:
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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

OMB Approval
No. 22-R255

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MATERIAL PROCURED UNDER A

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1. HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

2. COMMENTS ON ANY DOCUMENT REQUIREMENT CONSIDERED TOO RIGID

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☐ YES ☐ NO *(If "Yes", in what way?)*

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