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MILITARY SPECIFICATION

TEST SETS, ARMATURE AND STATOR

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

1. SCOPE

1.1 Scope. This specification covers the Test Sets (growlers) for locating defective circuits in armatures or stators in rotating electrical machines.

1.2 Classification. Test Sets shall be of the following types, as specified (see 6.1 and 6.2):

- Type A - External Test Set for armatures from 1/2 to 4 inches in diameter.
- Type B - External Test Set for armatures from 2-1/2 to 6 inches in diameter.
- Type C - External/internal Test Set for armatures 6 to 12 inches in diameter and stators from 2-1/2 to 12 inches in diameter.
- Type D - External/internal Test Set for armatures 2 inches and larger in diameter and stators 6 inches and larger in diameter.

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 the extent specified herein.

SPECIFICATIONS

FEDERAL

- J-C-175 - Cable Assembly, Power, Electrical (3-wire, 3-prong, Grounding Plug Connector, for 125-Volt Equipment).
- QQ-B-650 - Brazing Alloy, Copper, Copper-Zinc and Copper-Phosphorus.
- QQ-B-654 - Brazing Alloy, Silver.
- QQ-S-571 - Solder: Tin Alloy, Lead-Tin Alloy and Lead Alloy.

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- MIL-M-14 - Molding Plastics and Molded Plastic Parts, Thermosetting.
- MIL-C-915/6 - Cable, Electrical, 600 Volts, Types SHOF, DHOF, THOF and PHOF.
- MIL-E-917 - Electric Power Equipment, Basic Requirements (Naval Shipboard Use).
- MIL-C-3432 - Cable and Wire, Electrical (Power and Control, Flexible, and Extra Flexible, 300 and 600 Volts).
- MIL-C-3767/12 - Connector, Plug, Electrical (Power, Three-Wire, Polarized, Spring-Loaded, Pivoted Grounding Type) Type UP131M.
- MIL-P-6906 - Plates, Identification, Aircraft.
- MIL-M-10304 - Meters, Electrical Indicating, Panel Type, Ruggedized, General Specification for.
- MIL-P-15024 - Plates, Tags and Bands for Identification of Equipment.
- MIL-P-15024/5 - Plates, Identification.
- MIL-E-17555 - Electronic and Electrical Equipment, Accessories and Repair Parts, Packing and Packaging of.

STANDARDS

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- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-143 - Standards and Specifications Order of Precedence for the Selection of.
- MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.
- MIL-STD-278 - Fabrication Welding and Inspection; and Casting Inspection and Repair for Machinery, Piping and Pressure Vessels in Ships of the United States Navy.
- MIL-STD-414 - Sampling Procedures and Tables For Inspection by Variables For Percent Defective.
- MS27603 - Cable Assemblies, Power, Electronic Test Equipment, 10 Amps Max.

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(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.)

2.2 Other publications. The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

NATIONAL BUREAU OF STANDARDS
Handbook H28 - Screw-Thread Standards For Federal Services.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.)

3. REQUIREMENTS

3.1 Material. The material for each part shall be as specified herein. When a definite material is not specified, a material shall be used which will meet the performance requirements of this specification. Material selection shall be in accordance with MIL-STD-143.

3.1.1 Prohibited materials. Prohibited materials, as defined in MIL-E-917, shall not be used.

3.1.2 Metal parts. External metal parts shall be of corrosion-resisting materials, or material treated to resist corrosion. Internal metal parts shall be treated for corrosion resistance. The corrosion resistant materials and corrosion-resistance treatment shall be in accordance with MIL-E-917. Malleable iron castings or nodular graphitic iron castings shall not be used.

3.1.3 Plastics. Plastics which serve as electrical insulation shall be in accordance with MIL-E-917. Plastics that do not serve as electrical insulation (structural parts, and so forth) shall meet all physical and mechanical properties required for plastic insulation materials, including non-flammability and non-toxicity; however, these plastics need not meet the arcing and tracking resistance requirements. Molding thermosetting plastic material shall conform to MIL-M-14.

3.2 General. The Test Sets shall consist essentially of the primary coil and the primary portion of the iron core of a transformer. The magnetic circuit shall be completed by the iron of the armature or stator being tested. The Test Sets shall be simple in construction, reliable in operation, and the parts readily accessible for inspection, adjustment or replacement.

3.2.1 Iron core. The laminations of the iron core shall be insulated from each other. In the assembly of the iron core, care shall be taken to remove all burrs or projecting laminations which might result in injury to the coils or object under test. The laminations shall be clamped together in such a manner as to insure a tight core. During the process of manufacture the assembled core shall be given a varnish dip and baked (see 3.2.9).

3.2.2 Voltage and current. The Test Sets shall be rated 115 volts (V), single phase, 60 Hertz (Hz) alternating current (ac).

3.2.3 Windings. The windings shall be so supported that mechanical or electro-mechanical stresses resulting from normal operation of the Test Set, including those from short-circuits in the item under test and shocks in handling, shall not cause weakening of the set, permanent deformation in any of the parts, including the windings, or any other mechanical or electrical damage which may affect the operation.

3.2.4 Soldering, brazing and welding.

3.2.4.1 Soldering. The soldering process shall be such as to minimize the spattering of solder and flux onto surrounding surfaces. Only noncorrosive fluxes shall be used. All soldered connections shall be of such character and quality that the bonding between the soldered items may be determined by visual examination. There shall be no evidence of "cold soldering". Solder for electrical connections shall be composition SN60 and SN63 of QQ-S-571.

3.2.4.2 Brazing. Brazing alloys for electrical connections shall conform to QQ-B-650 or QQ-B-654.

3.2.4.3 Welding. Welding and allied processes shall be in accordance with MIL-STD-278.

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3.2.4.4 Electrical connections. Electrical connections shall be mechanically secured before being soldered, or brazed, to avoid the possibility of their becoming loose when subjected to severe vibration.

3.2.5 Dielectric withstanding voltage. The Test Set shall be capable of withstanding, at $25^{\circ} + 2$ degrees Celsius ($^{\circ}\text{C}$.) ambient temperature, an ac potential of 1200 volts root-mean-square (rms) between the frame and the current carrying parts at a nominal frequency of 60 Hz for a period of not less than 60 seconds. As a result of this test, there shall be no evidence of arcing, flashover, or punctured insulation.

3.2.6 Insulation resistance. The Test Set shall have insulation resistance not less than 10 megohms when tested at ambient temperatures of $25^{\circ} + 2^{\circ}\text{C}$.

3.2.7 Safety. The Test Sets shall be designed and constructed in a way that will ensure safety to operating and maintenance personnel. Operating personnel shall not receive an electric shock even though an internal fault between any two circuits or between any circuit and Test Set enclosure should develop. Current-carrying parts shall be adequately insulated to prevent grounding through the frame or any other part of conducting material which may come into contact with the operator. Sharp corners and projections which may cause injury or on which clothing may catch or, which may puncture insulation shall be avoided.

3.2.7.1 Ground connection personnel safety. The grounding conductor of the Test Set input power cable shall be connected to the Test Set enclosure. The potential drop of the grounding conductor shall not exceed 3 volts, and no arcing or burning in the grounding conductor shall be evident when tested as specified in 4.7.4.

3.2.8 Interchangeability. All parts, subassemblies and assemblies which are removable shall be interchangeable with corresponding items from a similar Test Set, from stock or, from production without the necessity for re-forming (for example, drillings, bending, filing) or the use of undue force and, without the necessity for individual selection of parts.

3.2.9 Varnish treatment. All coils and windings shall be given a minimum of three treatments of clear baking varnish. The treatment shall be applied to exclude air and moisture from the coil by filling of all interstices with varnish and shall be applied by one of the following methods, using the typical treatment schedule of MIL-E-917:

- (a) Vacuum-pressure
- (b) Immersion
- (c) Centrifugal
- (d) Pulsating-pressure

3.2.10 Threaded parts. All threaded parts shall be in accordance with Handbook H28. All threads shall be in conformance with the coarse thread series except that fine thread series may be used only for applications that might show a definite advantage through their use. Where a special diameter-pitch combination is required, the thread shall be of American National form.

3.2.11 Locking of screw-thread assemblies. Split-type lockwashers or equivalent means shall be provided under all nuts.

3.2.12 Technical manual. Technical manual shall be prepared as specified (see 6.2.2).

3.2.13 Identification plate (Army and Navy). For Army and Navy use, an identification plate shall be furnished for each Test Set in accordance with MIL-P-15024. The identification plate for Navy shall also be designed for normal service in accordance with MIL-P-15024/5.

3.2.14 Identification plate (Air Force). For Air Force use, the identification plate shall conform to MIL-P-6906.

3.2.15 Ambient temperature. The Test Sets shall be designed to operate to meet all requirements specified herein in an ambient temperature range of 0° to 50°C .

3.3 Type A.

3.3.1 General. Type A Test Sets shall be used for locating short circuits, open circuits and grounds in armatures from 1/2 to 4 inches in diameter. The sets shall be compact, self-contained, bench type test equipment.

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3.3.2 Switch. A switch shall be provided to permit energizing the Test Set. The switch shall be mounted on the enclosure of the Test Set so as not to interfere with the operation. The switch shall have "on" and "off" positions.

3.3.3 Ammeter. An ammeter, type MR26W010ACAAR in accordance with MIL-M-10304, shall be furnished with each Test Set. The ammeter shall be mounted adjacent to the switch (see 3.3.2).

3.3.4 Leads and prods. The Test Set shall have attached, two test prods complete with cord and terminals for use in testing for grounds and open circuits. The prods shall be connected to at least 3 feet of cord outside of the Test Set. The cords shall conform to type SHOF-3 of MIL-C-915/6. Provision shall be made for securely fastening prods and prod cords to the test set when not in use. Each lead shall terminate at one end in a sharp-pointed test prod with an insulated handle. The test prods shall be completely insulated except for that portion which measures approximately 1/2 inch from the pointed tip. One of the insulated prod handles shall be red and the other black.

3.3.5 Indicating light. An indicating light shall be provided and mounted adjacent to the switch (see 3.3.2).

3.3.6 Circuit connections and operation. The test set connections and operation for locating short circuits, open circuits and ground shall be as follows:

- (a) Short circuit test. The switch shall be turned to the "ON" position and the test set winding shall be energized to set up magnetic flux linking the Test Set and the armature being tested. By placing a thin ferrous-metal feeler (such as a hack-saw blade) approximately 1/4-inch above the top slot of the armature and with the armature being slowly rotated by hand, the feeler shall stick and vibrate if the armature coil is short circuited.
- (b) Open circuit test. The switch shall be turned to the "ON" position and the Test Set winding shall be energized to set up magnetic flux linking the Test Set and the armature being tested. The Test Set ammeter and test prods shall be so connected that as each coil of the armature being tested comes in position between the Test Set pole pieces, the ammeter shall have indication when the corresponding commutator bar is touched by one test prod and the adjacent bar is touched by the other test prod. No reading on the ammeter shall indicate open winding.
- (c) Ground test. The switch shall be turned to the "ON" position. The Test Set winding and indicating light shall be so connected so that the indicating light will be energized to indicate a grounded coil or grounded commutator bar of the armature being tested when one test prod is placed on the armature shaft and the other test prod is placed on any commutator bar of the armature.

3.3.7 Input power cable and plug.

3.3.7.1 Air Force. The cable shall be in accordance with MS27603-1 of MS27603.

3.3.7.2 Navy Shipboard. The Test Set shall be provided with a cable assembly and grounding provisions in accordance with J-C-175, except that the length of cable shall be 8 feet.

3.3.8 Enclosure. A metal enclosure, protected against corrosion (see 3.1.2), shall be provided to form a bench type tester. On this enclosure shall be mounted the ammeter, switch, indicating light and the core. Windings and mechanisms shall be mounted within the enclosure.

3.3.9 Limiting dimensions. The overall dimensions shall not exceed the following:

Width - 6 inches.
Length - 10 inches.
Height - 6 inches.

3.3.10 Weight. The maximum weight including input power cable, plug, test prods and test cord shall not exceed 13 pounds.

3.4 Type B.

3.4.1 General. Type B Test Sets shall be constructed to withstand severe jolting when transported by military trucks, and shall be used for locating short circuits, open circuits, and grounds in engine starting motor armatures and in battery charging generator armatures, from 2-1/2 to 6 inches in diameter.

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3.4.2 Parts, operation and circuit connections. The Test Set shall have parts, operation and circuit connections as specified for type A, (see 3.3.2, 3.3.3, 3.3.4, 3.3.6, and 3.3.8) except the winding, indicating light, input power cable and plug, dimensions and weight shall be as specified in 3.4.2.1 through 3.4.2.5.

3.4.2.1 Double winding feature. Each Test Set shall be equipped with a heavy duty double winding. One winding shall be for testing generator armatures and the other winding shall be for testing starting motor armatures. A switch shall be provided to change from one winding to the other. This feature and the switch are not required where other designs are adequate for testing generator and starter armatures.

3.4.2.2 Indicating light. An indicating light shall be provided and mounted on one of the test prods. The indicating light may be used, as substitution of the ammeter, for open circuit test.

3.4.2.3 Input power cable and plug.

3.4.2.3.1 Army. Unless otherwise specified (see 6.2.1), each test set shall be furnished with not less than 8 feet of three-wire cable, of the correct current carrying capacity, in accordance with the requirements of MIL-C-3432. The free or input end of the cable shall terminate in a three prong slug as specified in MIL-C-3767/12. The cable shall be protected and captivated at the point of entry into the test set. The cable's green wire shall be utilized as the test set/plug grounding blade conductor, the black wire as electrical ground, attached to the plug's large blade, the white wire as the system "hot" conductor interconnecting the test set's high side to the plug's small blade.

3.4.2.3.2 Navy. The cable and plug shall be as specified in 3.3.7.2.

3.4.2.3.3 Air Force. The cable and plug shall be as specified in 3.3.7.1.

3.4.2.4 Limiting dimensions. The overall dimensions shall not exceed the following:

Width - 10 inches.
Length - 15 inches.
Height - 12 inches.

3.4.2.5 Weight. The net weight of the Test Set including input power cable, plug, test prods, and test cord shall not exceed 24 pounds.

3.5 Type C.

3.5.1 General. Type C Test Sets shall be used for locating short circuits and open circuits in armatures from 6 to 12 inches in diameter and stators from 2-1/2 to 12 inches in diameter.

3.5.2 Core. The core shall be adjustable to accommodate the sizes of armatures and stators specified in 3.5.1.

3.5.3 Enclosure. A metal enclosure, protected against corrosion (see 3.1.2), shall be provided. On this enclosure shall be mounted a switch (see 3.5.4) and the core (see 3.5.2). Windings and mechanisms shall be mounted within the enclosure. The Test Set shall be a hand-held tester having a handle attached to the enclosure. The handle shall be of a size to permit ease of handling by the operator. Provision shall be made in the handle for internal holding and fastening of the input power cable (see 3.5.6) in such a manner as not to interfere with the operation of the Test Set.

3.5.4 Switch. The Test Set shall have a switch to permit energizing the windings. The switch shall be conveniently located in such a manner as not to interfere with the operation of the set. The switch shall have "ON" and "OFF" positions.

3.5.5 Circuit connections and operation. The Test Set connections and operation for locating short circuits and open circuits shall be as follows:

- (a) Short circuit test. The switch shall be turned to the "ON" position and the Test Set winding shall be energized. By placing the Test Set against the armature (or stator) being tested, magnetic flux shall link the Test Set and the armature (or stator). When a thin ferrous-metal feeler (such as hack-saw blade) is held approximately 1/4-inch above the slot containing the other side of the same coil which is spanned by the Test Set, the feeler shall stick and vibrate if the coil is short circuited.

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- (b) Open circuit test. The switch shall be turned to the "ON" position and the Test Set winding shall be energized. By placing the Test Set against the armature (or stator) being tested, magnetic flux shall link the Test Set and the armature (or stator). Open circuits shall be detected by shorting the adjacent commutator bars of the coils spanned by the Test Set (for a stator, adjacent lead wires are shorted) with a screwdriver, a jumper wire or any piece of metal. A good coil shall produce sparks as the bars (or lead wires of a stator) are shorted; an open coil shall not.

3.5.6 Input power cable and plug.

3.5.6.1 Navy. The cable and plug shall be as specified in 3.3.7.2. Requirements as specified in 3.3.7.2 pertaining to grounding the enclosure shall apply to the enclosure handle.

3.5.6.2. Air Force. The cable and plug shall be as specified in 3.3.7.1.

3.5.7 Weight. The net weight of the Test Set including input power cable and plug shall not exceed 6 pounds.

3.6 Type D.

3.6.1 General. Type D Test Sets shall be used for locating short circuits and open circuits in armatures 2 inches in diameter and larger and stators 6 inches in diameter and larger.

3.6.2 Core. The core shall be in two pieces, with provision for adjustment and shall remain magnetically as one piece at all angles.

3.6.3 Enclosure. The enclosure with the handle shall be as specified in 3.5.3.

3.6.4 Switch. The switch shall be as specified in 3.5.4.

3.6.5 Circuit connections and operation. The circuit connections and operation shall be as specified in 3.5.5.

3.6.6 Input power cable and plug.

3.6.6.1 Navy. The cable and plug shall be as specified in 3.3.7.2. Requirements as specified in 3.3.7.2 pertaining to grounding the enclosure shall apply to the enclosure handle.

3.6.6.2 Air Force. The cable and plug shall be as specified in 3.3.7.1.

3.6.7 Weight. The weight of the Test Set including cable and plug shall not exceed 20 pounds.

3.7 Workmanship. The Test Sets shall be manufactured and processed in a careful and workmanlike manner, in accordance with good design and sound practice.

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 First article inspection. One sample Test Set of each type shall be subjected to the visual and mechanical examination of 4.5 and the tests of 4.7.

4.2.1 First article inspection report. The supplier shall submit to the procuring activity, for approval, a complete report of all the first article inspection conducted. Reports shall show quantitative results of all tests required by this specification. Test reports shall be in triplicate.

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4.3 Sampling for quality conformance inspection.

4.3.1 Lot. For purposes of sampling, a lot shall consist of all Test Sets of the same type offered for delivery at one time.

4.3.2 Sampling for group A tests. A random sample of Test Sets shall be selected from each lot in accordance with inspection level II of MIL-STD-105. The AQL shall be equal to 1.0 percent defective and subjected to each of the Group A tests specified in 4.4.1. The special reservation for critical defects specified in MIL-STD-105 shall apply to the grounding circuit test (see 4.7.4) and to the critical defects enumerated in table IV.

4.3.3 Sampling for group B tests. A random sample of Test Sets shall be selected from each inspection lot in accordance with table I and shall be subjected to each of the group B tests specified in 4.4.2.

Table I - Sampling for group B tests.

Number of Test Sets in inspection lot	Number of Test Sets in sample	Number of equipments non-conforming on any group B tests	
		Acceptance number	Rejection number
15 and under	3	0	1
16 to 50	5	0	1
51 to 90	8	0	1
91 to 280	13	0	1
Over 280	20	1	2

4.4 Quality conformance inspection. Quality conformance inspection shall consist of the tests of 4.4.1 and 4.4.2.

4.4.1 Group A tests. Each of the sample Test Sets selected in accordance with 4.3.2 shall be subjected to the examination and tests specified in table II and the results, of each test compared with the requirements of this specification. Failure to conform to the requirements of this specification for any group A test shall be counted as a defect and the Test Set shall be rejected. If the number of such nonconforming Test Sets in any sample exceeds the acceptance number for that sample, the lot represented by the sample shall be rejected. The measurements of insulation resistance shall be used as shown in MIL-STD-414, Section B, for A.Q.L. = 2.5 percent against lower and upper limits established at two times the standard deviation below and above the mean value in each test.

Table II - Group A tests.

Tests	Requirement paragraph	Test paragraph
Visual examination	---	4.5
Dielectric test	3.2.5	4.7.1
Insulation resistance test	3.2.6	4.7.2
Grounding circuit test	3.2.7.1	4.7.4

4.4.2 Group B tests. Each of the sample Test Sets selected in accordance with 4.3.3 shall be subjected to each of the tests specified in table III and the results of each test compared with the requirements of this specification. Failure to conform to the requirements of this specification for any group B test shall be counted as a defect and the Test Set shall be rejected. If the number of such nonconforming Test Sets in any sample exceeds the acceptance number for that sample, the lot represented by the sample shall be rejected.

Table III - Group B tests.

Tests	Requirement paragraph	Test paragraph
Operation		
Type A set	3.3.6	4.7.3.1
Type B set	3.4.2	4.7.3.2
Type C set	3.5.5	4.7.3.3
Type D set	3.6.5	4.7.3.4

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4.5 Visual and mechanical examination. Test Sets selected in accordance with 4.3 shall be visually and mechanically examined to ascertain that the material, dimensions, workmanship, and design are in conformance with this specification. The fit of parts, shall be observed with particular reference to the interchangeability of such parts as are likely to require replacement during the normal service life of the equipment. Defects for each applicable type are classified as shown in table IV.

Table IV - Classification of defects.

Critical defects	
Types A, B, C, and D	
1.	Conductor material is exposed; may be touched by the operator.
2.	The coils, windings, and assembled iron core have not been given a varnish treatment.
Major defects	
Type A	
101.	Iron cores do not accommodate the specific size armature to be tested.
102.	Ammeter is not provided as specified.
103.	Indicating light is not provided and not mounted as specified.
104.	Two test prods are not constructed and connected as specified; not securely fastened to the test set; not colored as specified.
105.	Input power cable is not as specified.
106.	Switch is not provided and not mounted as specified.
107.	Metal enclosure is not protected against corrosion.
108.	Length, overall, exceeds 10-inches.
109.	Width, overall, exceeds 6-inches.
110.	Height, overall, exceeds 6-inches.
111.	Weight exceeds 13 pounds.
Type B	
101.	Iron cores do not accommodate the specific size armature to be tested.
102.	Ammeter is not provided as specified.
103.	Indicating light not provided and not mounted as specified.
104.	Separate windings are not provided for testing - (a) Generator armatures (b) Engine starting motor armatures.
105.	Switch is not provided as specified.
106.	Test prods are not constructed and connected as specified; not colored as specified.
107.	Input power cable is not as specified.
108.	Metal enclosure is not protected against corrosion.
109.	Width, overall, exceeds 10-inches.
110.	Length, overall, exceeds 15-inches.
111.	Height, overall, exceeds 12-inches.
112.	Weight exceeds 24 pounds.
Type C	
101.	Iron cores do not accommodate the specific size armature to be tested.
102.	The laminated core of the winding does not accommodate the specified sizes of structure to be tested.
103.	Metal enclosure is not protected against corrosion.
104.	Handle is not provided as specified; does not include the input power cable.
105.	Switch is not provided; not conveniently located.
106.	Input power cable is not as specified.
107.	Weight exceeds 6 pounds.
Type D	
101.	Iron cores do not accommodate the specific size armature to be tested.
102.	The laminated core of the winding is not made in two pieces.
103.	Metal enclosure is not protected against corrosion.
104.	Handle is not as specified.
105.	Switch is not provided as specified.
106.	Input power cable is not as specified.
107.	Weight exceeds 20 pounds.

Table IV - Classification of defects (cont'd.).

Minor defects	
Types A, B, C, and D	
201.	Identification plate is not provided; does not conform to MIL-P-15024, MIL-P-15024/5, or MIL-P-6906 as applicable; data incorrect, incomplete, or not legible.
202.	Workmanship.

4.6 Tests condition. All tests shall be conducted at ambient temperature of 25°C. ± 2°C.

4.7 Test methods.

4.7.1 Dielectric withstanding voltage test. Dielectric withstanding voltage tests shall be conducted in accordance with method 301 of MIL-STD-202. Test conditions shall be as follows:

- (a) Magnitude of test voltage: 1200 volts rms.
- (b) Nature of the test voltage: The test voltage shall be approximately a true sine wave of a nominal frequency of 60 Hz.
- (c) Points of application: The test voltage shall be successively applied between each electrically isolated circuit and all other circuits and ground.
- (d) Duration of test (60 seconds minimum): The test voltage shall be removed by adjustment of its value to zero - not by sudden interruption.
- (e) Definition of failure: Any evidence of arcing, flashover or punctured insulation shall be interpreted as a failure of the test. Corona (visible, odorous, or audible) shall not be considered as failure.
- (f) Dielectric withstanding voltage tests shall be conducted after all other equipment tests have been completed.

4.7.1.1 Electrically isolated circuits shall be determined by application of the following criteria:

- (a) Circuits whose only connection to each other is by electromagnetic coupling through a magnetic core which is shared in common by the circuits, shall be considered to be electrically isolated from each other.
- (b) Circuits whose only connection to each other is through a capacitor shall not be considered to be electrically isolated from each other. When the purpose is to test circuits internal to the set, and only then, such circuits shall be temporarily interconnected with a jumper wire, or test lead, during the test.
- (c) Circuits having only capacitors to ground as is sometimes the case for electromagnetic interference suppression in otherwise ungrounded circuits, shall be considered to be electrically isolated from ground.

4.7.2 Insulation resistance tests. Insulation resistance tests shall be conducted in accordance with method 302 of MIL-STD-202. Test conditions shall be as follows:

- (a) Test potential: Test condition B (High internal impedance).
- (b) Points of measurement: Between each electrically isolated circuit (see 4.7.1.1) and all other circuits and ground.
- (c) Electrification time: 60 seconds minimum.

4.7.3 Operation test.

4.7.3.1 Type A test set. An armature of 1/2- to 4-inches in diameter shall be placed on the test set and the test set shall be energized by 115 volts, 60 Hz power. The following tests shall be performed:

- (a) Short circuit test. A thin ferrous-metal feeler (such as hack-saw blade) shall be placed approximately 1/4 inch above the top slot of the armature and the armature shall be slowly rotated by hand. Any vibration or adhesion of the feeler to the armature shall be considered as failure of this test. This test shall be repeated with an armature having one or more short-circuited coils. No vibration or adhesion of the feeler to the armature shall be considered as failure.
- (b) Open circuit test. One coil of the armature being tested shall be located between the test set pole pieces and the two adjacent commutator bars which are connected to this coil, shall be touched by the test set test

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prods. No ammeter indication shall be considered as failure of this test. This test shall be repeated with an armature having an open armature coil. Any ammeter indication shall be considered as failure.

- (c) Ground test. One test prod shall be placed on the armature shaft and the test prod shall be replaced on any commutator bar of the armature being tested. Indication of the ground light shall be considered as failure of this test. This test shall be repeated with an armature having one coil shorted to the armature shaft. No indication of the ground light shall be considered as failure.

4.7.3.2 Type B test set. Operation test for Type B test set shall be the same as specified for type A test set (see 4.7.3.1) except that an armature of 2-1/2- to 6-inches in diameter shall be used.

4.7.3.3 Type C test set. The test set shall be energized by 115 volts, 60 Hz power and placed against an armature (or stator) of 2-1/2- to 6 inches in diameter. The following tests shall be performed:

- (a) Short circuit test. A thin ferrous-metal feeler shall be held approximately 1/4 inch above the armature or stator slot containing the other side of the same coil which is spanned by the test set. Any vibration or adhesion of the feeler to the armature or stator shall be considered as failure of this test. This test shall be repeated with an armature (or stator) having a short-circuited coil. No vibration or adhesion of the feeler to the armature or stator shall be considered as failure.
- (b) Open circuit test. The adjacent commutator bars of the armature coils (or adjacent lead wires of the stator) which are spanned by the test set, shall be shorted by a jumper wire. No sparks produced by the jumper wire shall be considered as failure of this test. This test shall be repeated with an armature (or stator) having open-circuited coil. Any sparks produced by the jumper wire shall be considered as failure.

4.7.3.4 Type D test set. Operation test for Type D test set shall be the same as specified for Type C test set (see 4.7.3.3) except that armature (or stator) of 6-inches in diameter or larger shall be used.

4.7.4 Ground connection test. The grounding conductor of the Test Set shall be tested by applying a 60 Hz a.c. current of 9 + 1 amperes through the grounding conductor for a period of not less than 1 minute to determine compliance with 3.2.7.1. The test shall be done with the Test Set insulated from the ground. The ground terminal of the Test Set input power cable receptacle connector mated with a plug shall be connected to one line of a 60 Hz power source and the exposed metal enclosure of the Test Set shall be connected by means of a test clip to the other line of the 60 Hz power source. Series resistance or stepdown transformer may be inserted to the power source to limit the current to the Test Set grounding circuit to 9 + 1 amperes. The potential drop of the Test Set grounding conductor shall be measured by means of a voltmeter having a full scale deflection of not more than 15 volts, connected between the Test Set metal enclosure and the ground terminal of the receptacle mated with the Test Set input power cable plug.

4.8 Inspection of preparation for delivery. Sample packages and packs and the inspection of the preservation and packaging, packing and marking for shipment and storage shall be in accordance with the requirements of section 5.

5. PREPARATION FOR DELIVERY

(The preparation for delivery requirements specified herein apply only for direct Government procurements. For the extent of applicability of the preparation for delivery requirements of referenced documents listed in section 2, see 6.4.)

5.1 Preservation-packaging, packing and marking. Test Sets shall be individually preserved-packaged level A or C, packed level A, B or C as specified (see 6.2.1) and marked in accordance with MIL-E-17555.

6. NOTES

6.1 Intended use. The test sets covered by the specification are intended for use in sheltered military environments, onboard ships and at land based installations. The individual test sets limitations is established by its type classification (see 1.2) as follows:

- (a) Type A - For use in locating short circuits, open circuits, and ground in light duty, small armatures of rotating electrical machinery.

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- (b) Type B - For use in locating short circuits, open circuits, and ground in heavy duty, small armatures, including engine starting motor armatures and battery charging generator armatures of rotating electrical machinery.
- (c) Type C - For use in locating short circuits, and open circuits in medium size armatures and stators of rotating electrical machinery.
- (d) Type D - For use in locating short circuits and open circuits in large size armatures and stators of rotating electrical machinery.

6.2 Ordering data.

6.2.1 Procurement requirements. Procurement document should specify the following:

- (a) Title, number, and date of this specification.
- (b) Type required (see 1.2).
- (c) Cable and plug, if other than as specified (see 3.4.2.3.1) and correct capacity of the cord.
- (d) Level of packaging and packing required (see 5.1).

6.2.2 Contract data requirements. When this specification is used in a procurement invoking the provisions of the contract data requirements clause of the Armed Services Procurement Regulations (ASPR), and which incorporates a Contract Data Requirements List (CDRL) DD Form 1423, the following data requirements should be specified for delivery on the DD Form 1423 when required by the procuring activity. When the ASPR provisions are not invoked, the following data should be specified for delivery in the contract or order when required by the procuring activity:

<u>Specification paragraph</u>	<u>Data requirement</u>	<u>Service</u>	<u>Applicable DID</u>	<u>Options</u>
3.2.12	Technical manuals	SH	UDI-23455	Type I of MIL-M-15071
4.2	First article inspection reports	SH	UDI-23450	-----

(Copies of DID's required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

6.3 First article inspection.

6.3.1 Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection as to those bidders offering a product which has been previously procured or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending procurement.

6.4 Sub-contracted material and parts. The preparation for delivery requirements of referenced documents listed in section 2 do not apply when material and parts are procured by the supplier for incorporation into the equipment and lose their separate identity when the equipment is shipped.

Custodians:

Army - EL
Navy - SH
Air Force - 82

User interests:

Army - AT, ME
Navy - MC, CG

Preparing activity:

Navy - SH
(Project 6625-0553)

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