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SUPERSEDING
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MILITARY SPECIFICATION

INDICATOR, TEMPERATURE, THERMOCOUPLE, HERMETICALLY SEALED, GENERAL SPECIFICATION FOR

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

1. SCOPE

1.1 This specification covers hermetically sealed temperature indicators of the thermocouple-circuit type.

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

BB-N-411	Nitrogen, Technical
PPP-B-601	Boxes, Wood, Cleated-Plywood
PPP-B-636	Box, Fiberboard
PPP-C-843	Cushioning Material, Cellulosic

Military

MIL-P-116	Preservation, Methods of
MIL-C-675	Coating of Glass Optical Elements (Anti-reflection)
MIL-W-5845	Wire, Electrical, Iron and Constantan, Thermocouple
MIL-W-5846	Wire, Electrical, Chromel and/or Alumel, Thermocouple
MIL-S-7742	Screw Threads, Standard, Optimum Selected Series: General Specification for
MIL-F-22191	Films, Transparent, Flexible, Heat Sealable, for Packaging Applications
MIL-L-25467	Lighting, Integral, Aircraft Instrument, General Specification for
MIL-L-27160	Lighting, Instrument, Integral, White, General Specification for
MIL-B-27497	Bearings, Jewel, Sapphire or Ruby, Synthetic

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MIL-G-81704	Glass, Aircraft Instrument, Lighting Wedge and Cover

STANDARDS

Federal

FED-STD-595	Colors

Military

MIL-STD-100	Engineering Drawing Practices
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of US Military Property
MIL-STD-143	Standards and Specifications, Order of Precedence for the Selection of
MIL-STD-454	Standard General Requirements for Electronic Equipment
MIL-STD-781	Reliability Tests: Exponential Distribution
MIL-STD-810	Environmental Test Methods
MIL-STD-889	Dissimilar Metals
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 Qualification. The indicators furnished under this specification shall be products which are qualified for listing on the applicable Qualified Products List at the time set for opening of bids (see 4.4).

* 3.2 Selection of standards and specifications. Standards and specifications for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-143.

* 3.3 Materials. Materials shall be in accordance with the applicable specifications and as specified herein. When materials are used that are not specifically designated, they shall be of the best quality and suitable for the purpose intended.

* 3.3.1 Metals. Metals shall be of the corrosion-resistant type or suitably treated to resist corrosion due to fuel, salt spray, or atmospheric conditions likely to be met in storage or normal service.

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* 3.3.2 Dissimilar metals. Unless suitably protected against electrolytic corrosion, dissimilar metals as defined in MIL-STD-889 shall not be used in intimate contact with each other.

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

3.3.4 Fungus-proof materials. Materials which are not nutrients for fungi shall be used to the greatest extent practicable. External materials which are nutrients for fungi shall be treated with a fungicidal agent approved by the procuring activity.

* 3.3.5 Corrosive fumes. The materials used in the construction of the indicator shall not liberate deleterious fumes during use, storage, or environmental tests.

3.3.6 Protective treatment. When materials are used in the construction of the indicator that are subject to corrosion in salt air or other atmospheric conditions likely to occur during service usage, they shall be protected against such corrosion in a manner that will in no way prevent compliance with the performance requirements of this specification. The use of any protective coating that will crack, chip, or scale with age or extremes of atmospheric conditions shall be avoided.

3.4 Design and construction. The indicator shall be designed to indicate temperature when used in conjunction with a thermocouple circuit. It shall be constructed to withstand the strains, jars, vibrations, and other conditions incident to shipment, storage, installation, and service.

* 3.4.1 Reliability. When reliability is required, it shall be in accordance with MIL-STD-781 and as specified in the detail specification.

3.4.2 Pivots, bearings, and gears. Pivots, bearings, and gears shall not bind nor shake and shall be as nearly frictionless as practicable.

3.5 Performance. The indicator shall meet all the requirements of the tests specified in section 4.

* 3.6 Part numbering of interchangeable parts. All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The item identification and part number requirements of MIL-STD-100 shall govern the manufacturer's part numbers and changes thereto.

3.7 Case. The case dimensions shall be in accordance with the detail specification. The case shall be hermetically sealed and so designed that the internal mechanism may be removed from the case, replaced, and the case resealed without the use of special tools or fixtures unless they are approved by the procuring activity. Hermetic sealing shall be so accomplished that the seal will not be

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dependent upon materials that would be affected by any atmospheric conditions to which the indicator might be subjected.

* 3.7.1 Filling medium. The filling medium shall be a mixture of 90 ±2 percent nitrogen and 10 ±2 percent helium. The nitrogen shall conform to BB-N-411, type I, class 1, grade C. The filling medium shall contain not more than 0.006 milligram of water vapor per liter (dewpoint -65°C) at the filling pressure. The absolute pressure of the filling medium in the case shall be 12 to 14.7 psi.

* 3.7.2 Case finish. The bezel and that part of the case visible from the cockpit side of the instrument panel shall be finished in lusterless black, color No. 37038 of FED-STD-595. The remainder of the case may be finished in black and shall be adequately protected to satisfactorily withstand the environmental test conditions specified herein.

* 3.8 Integral lighting. Lighting for integrally lighted indicators shall be in accordance with MIL-L-25467 or MIL-L-27160, as applicable.

3.9 Dials and pointers. Integrally lighted dials and pointers shall conform to MIL-L-25467 or MIL-L-27160, as specified in the detail specification. Transilluminated dials and pointers may be made of nonmetallic materials, and floodlighted dials and pointers shall be made of metal.

3.9.1 Dial. The dial shall be securely fastened to the frame of the mechanism in such a manner that it will not turn or loosen under vibration. The dial blank shall be a flat disc of metal, plastic, or other material that will permit compliance with all requirements of this specification.

3.9.1.1 Dial marking. The dial shall be marked as specified in the detail specification. The form of the numerals and letters shall be in accordance with MS33558. Lighted dials shall be marked in white, color No. 37875 of FED-STD-595.

3.9.2 Pointer. The design of the pointer shall be as specified in the detail specification. The pointer shall be as light as practicable and sufficiently rigid to prevent flexing under vibration. Unless otherwise specified, the minimum length of the portion of the pointer that is visible shall be 1/2 inch. Unlighted pointers shall be channeled to provide adequate strength. Lighted pointers shall be white, color No. 37875 of FED-STD-595.

3.9.2.1 Overswing. Pointer stops shall be provided and so located as to permit the pointer to overswing as specified in the detail specification.

3.9.2.2 Overlay. The pointer length shall be such that the pointer tip will extend into the scale a distance equal to one-third to two-thirds of the length of the shortest graduation.

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3.9.2.3 Parallax. To minimize parallax, the clearance between the pointer and the graduated scale shall not exceed 0.10 inch.

3.9.2.4 Pointer marking. The pointer shall be marked as specified in the detail specification.

* 3.10 Cover glass. The cover glass shall be suitable for hermetic sealing and shall comply with the requirements of MIL-G-81704 for type III glass. The cover glass and lighting wedges, if used, shall be provided with a reflection-reducing coating which meets the requirements of MIL-C-675.

3.10.1 Distance from dial to cover glass. The distance between the inside of the cover glass and the dial shall not exceed 0.140 inch.

3.11 Mask. A thin metal mask shall be provided directly behind the cover glass to cover all moving parts of the mechanism except the pointer and to provide for a visible uniform length of pointer regardless of the pointer indication. The mask shall be finished in durable dull black and shall be constructed in accordance with the detail specification.

3.12 Balance. The moving element of the indicator shall be balanced by an approved means (such as threaded lock or split nuts or a wire helix that moves along a crossarm and counterweight arm) with an easily accessible means for re-balancing. Solder, shellac, or similar means for holding the balance weight shall not be used.

3.13 Bearings and pivots. Moving elements shall turn on hardened, accurately ground, and highly polished pivots which shall rotate on synthetic jewel bearings conforming to MIL-B-27497.

3.14 Soldering. Soldering shall be accomplished in accordance with MIL-STD-454.

3.15 Internal wiring. Where practicable, internal wiring shall be tinned flexible stranded wire.

3.16 Cold junction compensation. The indicator shall be so compensated that the indications will be independent of changes in temperature of the combined indicator and cold junction within the tolerances specified in the detail specification.

3.17 Zero adjustment. The indicator shall be provided with a zero adjustment screw which shall be accessible externally from the rear of the case. The zero adjustment shall have sufficient friction that it will not change its position due to vibration encountered in service.

3.18 Screw threads. Unless otherwise specified, the threads of all machine screws shall conform to MIL-S-7742.

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3.19 Identification of product. Equipment, assemblies, and parts shall be marked for identification in accordance with MIL-STD-130.

3.20 Workmanship. The indicator, including all parts and accessories, shall be constructed and finished in a thoroughly workmanlike manner. Particular attention shall be given to neatness and thoroughness of soldering, wiring, marking of parts and assemblies, welding and brazing, painting, riveting, machine screw assemblies, and freedom of parts from burrs and sharp edges.

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

3.20.2 Screw assemblies. Assembly screws and bolts shall be tight. The word tight means that the screw or bolt cannot be appreciably tightened further without damage to the screw or bolt or threads.

3.20.3 Riveting. Riveting operations shall be carefully performed to ensure that the rivets are tight and satisfactorily headed.

3.20.4 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 free from backlash.

3.20.5 Cleaning. Care should be taken throughout various stages of assembly to thoroughly clean off loose, spattered, or excess solder, metal chips, and other foreign material. Burrs and sharp edges as well as resin flash that may crumble shall be removed.

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 tests. The inspection and testing of indicators shall be classified as follows:

a. Qualification tests

b. Quality conformance tests.

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c. Position error

d. Friction

e. Zero adjustment

f. Individual tests of MIL-L-27160 or MIL-L-25467, as applicable (integrally lighted indicators only)

g. Sealing

h. Insulation resistance.

4.5.2 Sampling tests

* 4.5.2.1 Sampling plan A. One indicator shall be selected at random from each 100 or less produced on the contract or order and subjected to the following tests as described under 4.6 and in the applicable lighting specification. For small contracts, those of 50 units or less, the following tests shall be performed on one indicator selected at random from each 50 produced since sampling plan A tests were last performed. If some quantity of the indicators has not been produced within 4 months of the present contract or order, sampling A tests shall be conducted on at least one of the units produced on the present contract. In the event several contracts or orders are filled simultaneously, one indicator from each 50 of the total quantity shall be subjected to the sampling A tests and the test results shall apply to the total quantity.

a. Individual tests

b. Scale error at low temperature

c. Scale error at high temperature

d. Magnetic effect

e. Vibration error

f. Pointer oscillation

g. Pointer variation

h. Vibration failure

i. Resistance

j. Sampling plan A tests of MIL-L-27160 or MIL-L-25467, as applicable (integrally lighted indicators only)

k. Fogging.

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All indicators subjected to sampling plan A testing may not be delivered on contract unless the indicator is completely refurbished (see 6.3.4) after sampling plan A tests.

* 4.5.2.2 Sampling plan B. Three indicators shall be selected at random from the first 15 or less produced on the contract or order and subjected to the following tests as described under 4.6 and in the applicable lighting specification. Unless so specified by the procuring activity (see 6.2), those sources listed on the applicable Qualified Products List will not be required to conduct these tests.

a. Sampling plan A tests

b. Cold junction compensator lag

c. Extreme low temperature exposure

d. High temperature exposure

e. Shock

f. Thermal shock

g. Salt fog

h. Sampling plan B tests of MIL-L-27160 or MIL-L-25467, as applicable (integrally lighted indicators only)

i. Detail examination.

* 4.5.3 Rejection and retest. When one item selected from a production run fails to meet the specification, no items still on hand or later produced shall be accepted until the extent and cause of failure are determined.

* 4.5.3.1 Individual tests may continue. For operational reasons, individual tests may be continued pending the investigation of a sampling test failure. But final acceptance of items on hand or later produced shall not be made until it is determined that all items meet all the requirements of the specification.

4.6 Test methods

4.6.1 Examination of product. The indicator shall be inspected to determine compliance with the requirements specified herein with respect to materials, case diameter, dimensions, marking, and workmanship.

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* 4.6.2 Scale error at room temperature. The indicator shall be subjected to a constant room temperature for not less than 2 hours. The voltages specified in table I or table II, as applicable, for the reference junction test temperature shall be the nominal and shall be used for error determination. The indicator pointer shall be positioned in the center of the graduation at the test points specified in the detail specification. The difference between the input voltage and the nominal voltage at a test point shall be the voltage error. For interpolation, 0.04 mv or 0.000040v for chromel/alumel and .05 mv or 0.000050v for iron/constantan shall be used and for the purpose of this test shall be equivalent to 1.0°C. Alternately, the prescribed millivoltages for test points may be applied to the indicator under test and the error determined as the difference between the reading of the indicator and the value corresponding to the prescribed millivoltage.

* 4.6.3 Position error. The thermocouple input signal shall be adjusted to produce a reading at an indicia at approximately midscale, with the indicator in the normal operating position. The reading of the indicator shall be noted at this position. The indicator shall then be rotated so that there are at least six test positions spaced 45° apart about each of the horizontal axes of the indicator. The reading shall be noted in these positions while the indicator is being lightly tapped. The maximum change in reading shall not exceed the tolerance specified in the detail specification.

4.6.4 Friction. The friction test may be conducted in conjunction with the scale error test. The applied voltage shall be slowly increased to produce each test point reading specified in the detail specification. The indicator reading shall be noted before and after the indicator is lightly tapped and the friction shall not exceed the tolerances specified in the detail specification. The procedure shall be repeated for decreasing voltages. The movement of the pointer shall be smooth when the applied voltage is varied uniformly.

4.6.5 Zero adjustment. Unless otherwise specified in the detail specification, the indicator shall be tested on open circuit. The zero adjuster shall be operated throughout its entire range and the extreme readings observed. The resulting readings shall not exceed the tolerance specified in the detail specification. Following this test, the pointer shall be set to its initial position.

* 4.6.6 Sealing. The indicator shall be immersed in a suitable liquid, such as water. The absolute pressure of the air above the liquid shall then be reduced to approximately 1 inch Hg and maintained for 1 minute, or until air bubbles substantially cease to be given off by the liquid, whichever is longer. The absolute pressure shall then be increased to 2-1/2 inches Hg. Any bubbles coming from within the indicator case shall be considered as leakage and shall be cause for rejection. Bubbles which are the result of entrapped air on the various exterior parts of the case shall not be considered as a leak. A helium leak detector or other means of test equal or superior in sensitivity to the immersion method may be used upon approval by the procuring activity. Where a leak detector is employed for conducting this test, the leak rate of the indicator shall not exceed 0.1 micron-cubic foot per hour at a pressure differential of 12 to 14.7 psi.

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TABLE I. Electromotive Force (EMF) in Millivolts Applied for Calibration of Thermocouple Thermometer Indicators (Chromel-Alumel)

Reference Junction Temp °C	Indicator Reading (°C)										
	0	50	100	150	200	250	300	350	400	450	500
-65	2.38	4.40	6.48	8.51	10.51	12.53	14.59	16.67	18.77	20.88	23.02
-64	2.35	4.37	6.44	8.48	10.48	12.50	14.56	16.64	18.74	20.85	22.99
-63	2.31	4.33	6.41	8.44	10.44	12.46	14.52	16.60	18.70	20.81	22.95
-62	2.28	4.30	6.37	8.41	10.41	12.43	14.49	16.57	18.67	20.78	22.92
-61	2.24	4.26	6.34	8.37	10.38	12.39	14.45	16.53	18.63	20.74	22.88
-60	2.21	4.23	6.31	8.34	10.34	12.36	14.42	16.50	18.60	20.71	22.85
-59	2.18	4.20	6.27	8.30	10.31	12.32	14.38	16.46	18.56	20.68	22.82
-58	2.14	4.16	6.24	8.27	10.27	12.29	14.35	16.43	18.53	20.64	22.78
-57	2.10	4.12	6.20	8.24	10.24	12.26	14.32	16.40	18.50	20.60	22.74
-56	2.07	4.09	6.17	8.20	10.20	12.22	14.28	16.36	18.46	20.57	22.71
-55	2.04	4.06	6.13	8.16	10.17	12.18	14.24	16.32	18.42	20.54	22.68
-54	2.00	4.02	6.10	8.13	10.13	12.15	14.21	16.29	18.39	20.50	22.64
-53	1.96	3.98	6.06	8.10	10.10	12.12	14.18	16.26	18.36	20.46	22.60
-52	1.93	3.95	6.03	8.06	10.06	12.08	14.14	16.22	18.32	20.43	22.57
-51	1.90	3.92	5.99	8.02	10.03	12.04	14.10	16.18	18.28	20.40	22.54
-50	1.86	3.88	5.96	7.99	9.99	12.01	14.07	16.15	18.25	20.36	22.50
-49	1.82	3.84	5.92	7.95	9.96	11.97	14.03	16.11	18.21	20.32	22.46
-48	1.79	3.81	5.89	7.92	9.92	11.94	14.00	16.08	18.18	20.29	22.43
-47	1.75	3.77	5.85	7.88	9.88	11.90	13.96	16.04	18.14	20.25	22.39
-46	1.72	3.74	5.82	7.85	9.85	11.87	13.93	16.01	18.11	20.22	22.36
-45	1.68	3.70	5.78	7.81	9.81	11.83	13.89	15.97	18.07	20.18	22.32
-44	1.64	3.66	5.74	7.77	9.78	11.79	13.85	15.93	18.03	20.14	22.28
-43	1.61	3.63	5.71	7.74	9.74	11.76	13.82	15.90	18.00	20.11	22.25
-42	1.57	3.59	5.67	7.70	9.70	11.72	13.78	15.86	17.96	20.07	22.21
-41	1.54	3.56	5.64	7.67	9.67	11.69	13.75	15.83	17.93	20.04	22.18
-40	1.50	3.52	5.60	7.63	9.63	11.65	13.71	15.79	17.89	20.00	22.14
-39	1.46	3.48	5.56	7.59	9.60	11.61	13.67	15.75	17.85	19.96	22.10
-38	1.43	3.45	5.53	7.56	9.56	11.58	13.64	15.72	17.82	19.93	22.07
-37	1.39	3.41	5.49	7.52	9.52	11.54	13.60	15.68	17.78	19.89	22.03
-36	1.36	3.38	5.46	7.49	9.49	11.51	13.57	15.65	17.75	19.86	22.00
-35	1.32	3.34	5.42	7.45	9.45	11.47	13.53	15.61	17.71	19.82	21.96
-34	1.28	3.30	5.38	7.41	9.42	11.43	13.49	15.57	17.67	19.78	21.92
-33	1.25	3.27	5.35	7.38	9.38	11.40	13.46	15.54	17.64	19.75	21.89
-32	1.21	3.23	5.31	7.34	9.34	11.36	13.42	15.50	17.60	19.71	21.85

TABLE I. (Continued)

Reference Junction Temp °C	Indicator Reading (°C)										
	0	50	100	150	200	250	300	350	400	450	500
-31	1.18	3.20	5.28	7.31	9.31	11.33	13.39	15.47	17.57	19.68	21.82
-30	1.14	3.16	5.24	7.27	9.27	11.29	13.35	15.43	17.53	19.64	21.78
-29	1.10	3.12	5.20	7.23	9.23	11.25	13.31	15.39	17.49	19.60	21.74
-28	1.07	3.09	5.17	7.20	9.20	11.22	13.28	15.36	17.46	19.57	21.71
-27	1.03	3.05	5.13	7.16	9.16	11.18	13.24	15.32	17.42	19.53	21.67
-26	0.99	3.01	5.09	7.12	9.12	11.14	13.20	15.28	17.38	19.49	21.63
-25	0.96	2.98	5.06	7.08	9.09	11.10	13.16	15.24	17.34	19.46	21.60
-24	0.92	2.94	5.02	7.05	9.05	11.07	13.13	15.21	17.31	19.42	21.56
-23	0.88	2.90	4.98	7.01	9.01	11.03	13.09	15.17	17.27	19.38	21.52
-22	0.84	2.86	4.94	6.97	8.98	10.99	13.05	15.13	17.23	19.34	21.48
-21	0.81	2.83	4.91	6.94	8.94	10.96	13.02	15.10	17.20	19.31	21.45
-20	0.77	2.79	4.87	6.90	8.90	10.92	12.98	15.06	17.16	19.27	21.41
-19	0.73	2.75	4.83	6.86	8.86	10.88	12.94	15.02	17.12	19.23	21.37
-18	0.69	2.71	4.79	6.82	8.82	10.84	12.90	14.98	17.08	19.19	21.33
-17	0.66	2.68	4.76	6.79	8.79	10.81	12.87	14.95	17.05	19.16	21.30
-16	0.62	2.64	4.72	6.75	8.75	10.77	12.83	14.91	17.01	19.12	21.26
-15	0.58	2.60	4.68	6.71	8.71	10.73	12.79	14.87	16.97	19.08	21.22
-14	0.54	2.56	4.64	6.67	8.67	10.69	12.75	14.83	16.93	19.04	21.18
-13	0.50	2.52	4.60	6.63	8.64	10.65	12.71	14.79	16.89	19.00	21.14
-12	0.47	2.49	4.57	6.60	8.60	10.62	12.68	14.76	16.86	18.97	21.11
-11	0.43	2.45	4.53	6.56	8.56	10.58	12.64	14.72	16.82	18.93	21.07
-10	0.39	2.41	4.49	6.52	8.52	10.54	12.60	14.68	16.78	18.89	21.03
-9	0.35	2.37	4.45	6.48	8.48	10.50	12.56	14.64	16.74	18.85	20.99
-8	0.31	2.33	4.41	6.44	8.44	10.46	12.52	14.60	16.70	18.81	20.95
-7	0.27	2.29	4.37	6.40	8.40	10.42	12.48	14.56	16.66	18.77	20.91
-6	0.23	2.25	4.33	6.36	8.36	10.38	12.44	14.52	16.62	18.73	20.87
-5	0.20	2.22	4.30	6.32	8.32	10.34	12.40	14.48	16.58	18.70	20.84
-4	0.16	2.18	4.26	6.29	8.29	10.31	12.37	14.45	16.55	18.66	20.80
-3	0.12	2.14	4.22	6.25	8.25	10.27	12.33	14.41	16.51	18.62	20.76
-2	0.08	2.10	4.18	6.21	8.21	10.23	12.29	14.37	16.47	18.58	20.72
-1	0.04	2.06	4.14	6.17	8.17	10.19	12.25	14.33	16.43	18.54	20.68
0	0.00	2.02	4.10	6.13	8.13	10.15	12.21	14.29	16.39	18.50	20.64
1	-0.04	1.98	4.06	6.09	8.09	10.11	12.17	14.25	16.35	18.46	20.60
2	-0.08	1.94	4.02	6.05	8.05	10.07	12.13	14.21	16.31	18.42	20.56
3	-0.12	1.90	3.98	6.01	8.01	10.03	12.09	14.17	16.27	18.38	20.52
4	-0.16	1.86	3.94	5.97	7.97	9.99	12.05	14.13	16.23	18.34	20.48

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TABLE I. (Continued)

Reference Junction Temp °C	Indicator Reading (°C)										
	0	50	100	150	200	250	300	350	400	450	500
5	-0.20	1.82	3.90	5.93	7.93	9.95	12.01	14.09	16.19	18.30	20.44
6	-0.24	1.78	3.86	5.89	7.89	9.91	11.97	14.05	16.15	18.26	20.40
7	-0.28	1.74	3.82	5.85	7.85	9.87	11.93	14.01	16.11	18.22	20.36
8	-0.32	1.70	3.78	5.81	7.81	9.83	11.89	13.97	16.07	18.18	20.32
9	-0.36	1.66	3.74	5.77	7.77	9.79	11.85	13.93	16.03	18.14	20.28
10	-0.40	1.62	3.70	5.73	7.73	9.75	11.81	13.89	15.99	18.10	20.24
11	-0.44	1.58	3.66	5.69	7.69	9.71	11.77	13.85	15.95	18.06	20.20
12	-0.48	1.54	3.62	5.65	7.65	9.67	11.73	13.81	15.91	18.02	20.16
13	-0.52	1.50	3.58	5.61	7.61	9.63	11.69	13.77	15.87	17.98	20.12
14	-0.56	1.46	3.54	5.57	7.57	9.59	11.65	13.73	15.83	17.94	20.08
15	-0.60	1.42	3.50	5.53	7.53	9.55	11.61	13.69	15.79	17.90	20.04
16	-0.64	1.38	3.46	5.49	7.49	9.51	11.57	13.65	15.75	17.86	20.00
17	-0.68	1.34	3.42	5.45	7.45	9.47	11.53	13.61	15.71	17.82	19.96
18	-0.72	1.30	3.38	5.41	7.41	9.43	11.49	13.57	15.67	17.78	19.92
19	-0.76	1.26	3.34	5.37	7.37	9.39	11.45	13.53	15.63	17.74	19.88
20	-0.80	1.22	3.30	5.33	7.33	9.35	11.41	13.49	15.59	17.70	19.84
21	-0.84	1.18	3.26	5.29	7.29	9.31	11.37	13.45	15.55	17.66	19.80
22	-0.88	1.14	3.22	5.25	7.25	9.27	11.33	13.41	15.51	17.62	19.76
23	-0.92	1.10	3.18	5.21	7.21	9.23	11.29	13.37	15.47	17.58	19.72
24	-0.96	1.06	3.14	5.17	7.17	9.19	11.25	13.33	15.43	17.54	19.68
25	-1.00	1.02	3.10	5.13	7.13	9.15	11.21	13.29	15.39	17.50	19.64
26	-1.04	0.98	3.06	5.09	7.09	9.11	11.17	13.25	15.35	17.46	19.60
27	-1.08	0.94	3.02	5.05	7.05	9.07	11.13	13.21	15.31	17.42	19.56
28	-1.12	0.90	2.98	5.01	7.01	9.03	11.09	13.17	15.27	17.38	19.52
29	-1.16	0.86	2.94	4.97	6.97	8.99	11.05	13.13	15.23	17.34	19.48
30	-1.20	0.82	2.90	4.93	6.93	8.95	11.01	13.09	15.19	17.30	19.44
31	-1.24	0.78	2.86	4.89	6.89	8.91	10.97	13.05	15.15	17.26	19.40
32	-1.28	0.74	2.82	4.85	6.85	8.87	10.93	13.01	15.11	17.22	19.36
33	-1.32	0.70	2.78	4.81	6.81	8.83	10.89	12.97	15.07	17.18	19.32
34	-1.36	0.66	2.74	4.77	6.77	8.79	10.85	12.93	15.03	17.14	19.28
35	-1.40	0.62	2.70	4.72	6.72	8.74	10.80	12.88	14.98	17.10	19.24
36	-1.45	0.57	2.65	4.68	6.68	8.70	10.76	12.84	14.94	17.05	19.19
37	-1.49	0.53	2.61	4.64	6.64	8.66	10.72	12.80	14.90	17.01	19.15
38	-1.53	0.49	2.57	4.60	6.60	8.62	10.68	12.76	14.86	16.97	19.11
39	-1.57	0.45	2.53	4.56	6.56	8.58	10.64	12.72	14.82	16.93	19.07
40	-1.61	0.41	2.49	4.52	6.52	8.54	10.60	12.68	14.78	16.89	19.03

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TABLE I. (Continued)

Reference Junction Temp °C	Indicator Reading(°C)										
	0	50	100	150	200	250	300	350	400	450	500
41	-1.65	0.37	2.45	4.48	6.48	8.50	10.56	12.64	14.74	16.85	18.99
42	-1.69	0.33	2.41	4.44	6.44	8.46	10.52	12.60	14.70	16.81	18.95
43	-1.73	0.29	2.37	4.40	6.40	8.42	10.48	12.56	14.66	16.77	18.91
44	-1.77	0.25	2.33	4.36	6.36	8.38	10.44	12.52	14.62	16.73	18.87
45	-1.82	0.20	2.28	4.32	6.32	8.34	10.40	12.48	14.58	16.68	18.82
46	-1.86	0.16	2.24	4.27	6.27	8.29	10.35	12.43	14.53	16.64	18.78
47	-1.90	0.12	2.20	4.23	6.23	8.25	10.31	12.39	14.49	16.60	18.74
48	-1.94	0.08	2.16	4.19	6.19	8.21	10.27	12.35	14.45	16.56	18.70
49	-1.98	0.04	2.12	4.15	6.15	8.17	10.23	12.31	14.41	16.52	18.66
50	-2.02	0.00	2.08	4.11	6.11	8.13	10.19	12.27	14.37	16.48	18.62
51	-2.06	-0.04	2.04	4.07	6.07	8.09	10.15	12.23	14.33	16.44	18.58
52	-2.10	-0.08	2.00	4.03	6.03	8.05	10.11	12.19	14.29	16.40	18.54
53	-2.14	-0.12	1.96	3.99	5.99	8.01	10.07	12.15	14.25	16.36	18.50
54	-2.18	-0.16	1.92	3.95	5.95	7.97	10.03	12.11	14.21	16.32	18.46
55	-2.22	-0.20	1.88	3.90	5.90	7.92	9.98	12.06	14.16	16.28	18.42
56	-2.27	-0.25	1.83	3.86	5.86	7.88	9.94	12.02	14.12	16.23	18.37
57	-2.31	-0.29	1.79	3.82	5.82	7.84	9.90	11.98	14.08	16.19	18.33
58	-2.35	-0.33	1.75	3.78	5.78	7.80	9.86	11.94	14.04	16.15	18.29
59	-2.39	-0.37	1.71	3.74	5.74	7.76	9.82	11.90	14.00	16.11	18.25
60	-2.43	-0.41	1.67	3.70	5.70	7.72	9.78	11.86	13.96	16.07	18.21
61	-2.47	-0.45	1.63	3.66	5.66	7.68	9.74	11.82	13.92	16.03	18.17
62	-2.51	-0.49	1.59	3.62	5.62	7.64	9.70	11.78	13.88	15.99	18.13
63	-2.56	-0.54	1.54	3.57	5.57	7.59	9.65	11.73	13.83	15.94	18.08
64	-2.60	-0.58	1.50	3.53	5.53	7.55	9.61	11.69	13.79	15.90	18.04
65	-2.64	-0.62	1.46	3.49	5.49	7.51	9.57	11.65	13.75	15.86	18.00
66	-2.68	-0.66	1.42	3.45	5.45	7.47	9.53	11.61	13.71	15.82	17.96
67	-2.72	-0.70	1.38	3.41	5.41	7.43	9.49	11.57	13.67	15.78	17.92
68	-2.77	-0.75	1.33	3.36	5.36	7.38	9.44	11.52	13.62	15.73	17.87
69	-2.81	-0.79	1.29	3.32	5.32	7.34	9.40	11.48	13.58	15.69	17.83
70	-2.85	-0.83	1.25	3.28	5.28	7.30	9.36	11.44	13.54	15.65	17.79
71	-2.89	-0.87	1.21	3.24	5.24	7.26	9.32	11.40	13.50	15.61	17.75
72	-2.93	-0.91	1.17	3.20	5.20	7.22	9.28	11.36	13.46	15.57	17.71
73	-2.97	-0.95	1.13	3.16	5.16	7.18	9.24	11.32	13.42	15.53	17.67
74	-3.01	-0.99	1.09	3.12	5.12	7.14	9.20	11.28	13.38	15.49	17.63
75	-3.06	-1.04	1.04	3.08	5.08	7.10	9.16	11.24	13.34	15.44	17.58

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TABLE I. (Continued)

Reference Junction Temp °C	Indicator Reading (°C)									
	550	600	650	700	750	800	850	900	950	1000
-65	25.15	27.28	29.41	31.52	33.61	35.69	37.73	39.74	41.72	43.68
-64	25.13	27.25	29.38	31.49	33.58	35.65	37.70	39.71	41.69	43.65
-63	25.08	27.21	29.34	31.45	33.54	35.62	37.66	39.67	41.65	43.61
-62	25.05	27.18	29.31	31.42	33.51	35.59	37.63	39.64	41.62	43.58
-61	25.01	27.14	29.27	31.38	33.47	35.55	37.59	39.60	41.58	43.54
-60	24.98	27.11	29.24	31.35	33.44	35.52	37.56	39.57	41.55	43.51
-59	24.94	27.08	29.20	31.32	33.40	35.48	37.52	39.54	41.52	43.48
-58	24.91	27.04	29.17	31.28	33.37	35.45	37.49	39.50	41.48	43.44
-57	24.88	27.00	29.14	31.24	33.34	35.42	37.46	39.46	41.44	43.40
-56	24.84	26.97	29.10	31.21	33.30	35.38	37.42	39.43	41.41	43.37
-55	24.80	26.94	29.06	31.18	33.26	35.34	37.38	39.40	41.38	43.34
-54	24.77	26.90	29.03	31.14	33.23	35.31	37.35	39.36	41.34	43.30
-53	24.74	26.86	29.00	31.10	33.20	35.28	37.32	39.32	41.30	43.26
-52	24.70	26.83	28.96	31.07	33.16	35.24	37.28	39.29	41.27	43.23
-51	24.66	26.80	28.92	31.04	33.12	35.20	37.24	39.26	41.24	43.20
-50	24.63	26.76	28.89	31.00	33.09	35.17	37.21	39.22	41.20	43.16
-49	24.59	26.72	28.85	30.96	33.05	35.13	37.17	39.18	41.16	43.12
-48	24.56	26.69	28.82	30.93	33.02	35.10	37.14	39.15	41.13	43.09
-47	24.52	26.65	28.78	30.89	32.98	35.06	37.10	39.11	41.09	43.05
-46	24.49	26.62	28.75	30.86	32.95	35.03	37.07	39.08	41.06	43.02
-45	24.45	26.58	28.71	30.82	32.91	34.99	37.03	39.04	41.02	42.98
-44	24.41	26.54	28.67	30.78	32.87	34.95	36.99	39.00	40.98	42.94
-43	24.38	26.51	28.64	30.75	32.84	34.92	36.96	38.97	40.95	42.91
-42	24.34	26.47	28.60	30.71	32.80	34.88	36.92	38.93	40.91	42.87
-41	24.31	26.44	28.57	30.68	32.77	34.85	36.89	38.90	40.88	42.84
-40	24.27	26.40	28.53	30.64	32.73	34.81	36.85	38.86	40.84	42.80
-39	24.23	26.36	28.49	30.60	32.69	34.77	36.81	38.82	40.80	42.76
-38	24.20	26.33	28.46	30.57	32.66	34.74	36.78	38.79	40.77	42.73
-37	24.16	26.29	28.42	30.53	32.62	34.70	36.74	38.75	40.73	42.69
-36	24.13	26.26	28.39	30.50	32.59	34.67	36.71	38.72	40.70	42.66
-35	24.09	26.22	28.35	30.46	32.55	34.63	36.67	38.68	40.66	42.62
-34	24.05	26.18	28.31	30.42	32.51	34.59	36.63	38.64	40.62	42.58
-33	24.02	26.15	28.29	30.39	32.48	34.56	36.60	38.61	40.59	42.55
-32	23.98	26.11	28.24	30.35	32.44	34.52	36.56	38.57	40.55	42.51
-31	23.95	26.08	28.21	30.32	32.41	34.49	36.53	38.54	40.52	42.49
-30	23.91	26.04	28.17	30.28	32.37	34.45	36.49	38.50	40.48	42.45

TABLE I. (Continued)

Reference Junction Temp °C	Indicator Reading (°C)									
	550	600	650	700	750	800	850	900	950	1000
-29	23.87	26.00	28.13	30.24	32.33	34.41	36.45	38.46	40.44	42.41
-28	23.84	25.97	28.10	30.21	32.30	34.38	36.42	38.43	40.41	42.38
-27	23.80	25.93	28.06	30.17	32.26	34.34	36.38	38.39	40.37	42.34
-26	23.76	25.89	28.02	30.13	32.22	34.30	36.34	38.35	40.33	42.30
-25	23.72	25.86	27.98	30.10	32.18	34.26	36.30	38.32	40.30	42.26
-24	23.69	25.82	27.95	30.06	32.15	34.23	36.27	38.28	40.26	42.23
-23	23.65	25.78	27.91	30.02	32.11	34.19	36.23	38.24	40.22	42.19
-22	23.61	25.74	27.87	29.98	32.07	34.15	36.19	38.20	40.18	42.15
-21	23.58	25.71	27.84	29.95	32.04	34.12	36.16	38.17	40.15	42.12
-20	23.54	25.67	27.80	29.91	32.00	34.08	36.12	38.13	40.11	42.08
-19	23.50	25.63	27.76	29.87	31.96	34.04	36.08	38.09	40.07	42.04
-18	23.46	25.59	27.72	29.83	31.92	34.00	36.04	38.05	40.03	42.00
-17	23.43	25.56	27.69	29.80	31.89	33.97	36.01	38.02	40.00	41.97
-16	23.39	25.52	27.65	29.76	31.85	33.93	35.97	37.98	39.96	41.93
-15	23.35	25.48	27.61	29.72	31.81	33.89	35.93	37.94	39.92	41.89
-14	23.31	25.44	27.57	29.68	31.77	33.85	35.89	37.90	39.88	41.85
-13	23.27	25.40	27.53	29.64	31.73	33.81	35.85	37.86	39.84	41.81
-12	23.24	25.37	27.50	29.61	31.70	33.78	35.82	37.83	39.81	41.78
-11	23.20	25.33	27.46	29.57	31.66	33.74	35.78	37.79	39.77	41.74
-10	23.16	25.29	27.42	29.53	31.62	33.70	35.74	37.75	39.73	41.70
-9	23.12	25.25	27.38	29.49	31.58	33.66	35.70	37.71	39.69	41.66
-8	23.08	25.21	27.34	29.45	31.54	33.62	35.66	37.67	39.65	41.62
-7	23.04	25.17	27.30	29.41	31.50	33.58	35.62	37.63	39.61	41.58
-6	23.00	25.13	27.26	29.37	31.46	33.54	35.58	37.59	39.57	41.54
-5	22.96	25.10	27.22	29.34	31.42	33.50	35.54	37.56	39.54	41.50
-4	22.93	25.06	27.19	29.30	31.39	33.47	35.51	37.52	39.51	41.47
-3	22.89	25.02	27.15	29.26	31.35	33.43	35.47	37.48	39.47	41.43
-2	22.85	24.98	27.11	29.22	31.31	33.39	35.43	37.44	39.43	41.39
-1	22.81	24.94	27.07	29.18	31.27	33.35	35.39	37.40	39.39	41.35
0	22.77	24.90	27.03	29.14	31.23	33.31	35.35	37.36	39.35	41.31
1	22.73	24.86	26.99	29.10	31.19	33.27	35.31	37.32	39.31	41.27
2	22.69	24.82	26.95	29.06	31.15	33.23	35.27	37.28	39.27	41.23
3	22.65	24.78	26.91	29.02	31.11	33.19	35.23	37.24	39.23	41.19
4	22.61	24.74	26.87	28.98	31.07	33.15	35.19	37.20	39.19	41.15
5	22.57	24.70	26.83	28.94	31.03	33.11	35.15	37.16	39.15	41.11
6	22.53	24.66	26.79	28.90	30.99	33.07	35.11	37.12	39.11	41.07

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TABLE I. (Continued)

Reference Junction Temp °C	Indicator Reading (°C)									
	550	600	650	700	750	800	850	900	950	1000
7	22.49	24.62	26.75	28.86	30.95	33.03	35.07	37.08	39.07	41.03
8	22.45	24.58	26.71	28.82	30.91	32.99	35.03	37.04	39.03	40.99
9	22.41	24.54	26.67	28.78	30.87	32.95	34.99	37.00	38.99	40.95
10	22.37	24.50	26.63	28.74	30.83	32.91	34.95	36.96	38.95	40.91
11	22.33	24.46	26.59	28.70	30.79	32.87	34.91	36.92	38.91	40.87
12	22.29	24.42	26.55	28.66	30.75	32.83	34.87	36.88	38.87	40.83
13	22.25	24.38	26.51	28.62	30.71	32.79	34.83	36.84	38.83	40.79
14	22.21	24.34	26.47	28.58	30.67	32.75	34.79	36.80	38.79	40.75
15	22.17	24.30	26.43	28.54	30.63	32.71	34.75	36.76	38.75	40.71
16	22.13	24.26	26.39	28.50	30.59	32.67	34.71	36.72	38.71	40.67
17	22.09	24.22	26.35	28.46	30.55	32.63	34.67	36.68	38.67	40.63
18	22.05	24.18	26.31	28.42	30.51	32.59	34.63	36.64	38.63	40.59
19	22.01	24.14	26.27	28.38	30.47	32.55	34.59	36.60	38.59	40.55
20	21.97	24.10	26.23	28.34	30.43	32.51	34.55	36.56	38.55	40.51
21	21.93	24.06	26.19	28.30	30.39	32.47	34.51	36.52	38.51	40.47
22	21.89	24.02	26.15	28.26	30.35	32.43	34.47	36.48	38.47	40.43
23	21.85	23.98	26.11	28.22	30.31	32.39	34.43	36.44	38.43	40.39
24	21.81	23.94	26.07	28.18	30.27	32.35	34.39	36.40	38.39	40.35
25	21.77	23.90	26.03	28.14	30.23	32.31	34.35	36.36	38.35	40.31
26	21.73	23.86	25.99	28.10	30.19	32.27	34.31	36.32	38.31	40.27
27	21.69	23.82	25.95	28.06	30.15	32.23	34.27	36.28	38.27	40.23
28	21.65	23.78	25.91	28.02	30.11	32.19	34.23	36.24	38.23	40.19
29	21.61	23.74	25.87	27.98	30.07	32.15	34.19	36.20	38.19	40.15
30	21.57	23.70	25.83	27.94	30.03	32.11	34.15	36.16	38.15	40.11
31	21.53	23.66	25.79	27.90	29.99	32.07	34.11	36.12	38.11	40.07
32	21.49	23.62	25.75	27.86	29.95	32.03	34.07	36.08	38.07	40.03
33	21.45	23.58	25.71	27.82	29.91	31.99	34.03	36.04	38.03	39.99
34	21.41	23.54	25.67	27.78	29.87	31.95	33.99	36.00	37.99	39.95
35	21.36	23.50	25.62	27.74	29.82	31.90	33.94	35.96	37.94	39.90
36	21.32	23.45	25.58	27.69	29.78	31.86	33.90	35.91	37.90	39.86
37	21.28	23.41	25.54	27.65	29.74	31.82	33.86	35.87	37.86	39.82
38	21.24	23.37	25.50	27.61	29.70	31.78	33.82	35.83	37.82	39.78
39	21.20	23.33	25.46	27.57	29.66	31.74	33.78	35.79	37.78	39.74
40	21.16	23.29	25.42	27.53	29.62	31.70	33.74	35.75	37.74	39.70
41	21.12	23.25	25.38	27.49	29.58	31.66	33.70	35.71	37.70	39.66
42	21.08	23.21	25.34	27.45	29.54	31.62	33.66	35.67	37.66	39.62
43	21.04	23.17	25.30	27.41	29.50	31.58	33.62	35.63	37.62	39.58

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TABLE I. (Continued)

Reference Junction Temp °C	Indicator Reading (°C)									
	550	600	650	700	750	800	850	900	950	1000
44	21.00	23.13	25.26	27.37	29.46	31.54	33.58	35.59	37.58	39.54
45	20.96	23.08	25.22	27.32	29.42	31.50	33.54	35.54	37.54	39.50
46	20.91	23.04	25.17	27.28	29.37	31.45	33.49	35.50	37.49	39.45
47	20.87	23.00	25.13	27.24	29.33	31.41	33.45	35.46	37.45	39.41
48	20.83	22.96	25.09	27.20	29.29	31.37	33.41	35.42	37.41	39.37
49	20.79	22.92	25.05	27.16	29.25	31.33	33.37	35.38	37.37	39.33
50	20.75	22.88	25.01	27.12	29.21	31.29	33.33	35.34	37.33	39.29
51	20.71	22.84	24.97	27.08	29.17	31.25	33.29	35.30	37.29	39.25
52	20.67	22.80	24.93	27.04	29.13	31.21	33.25	35.26	37.25	39.21
53	20.63	22.76	24.89	27.00	29.09	31.17	33.21	35.22	37.21	39.17
54	20.59	22.72	24.85	26.96	29.05	31.13	33.17	35.18	37.17	39.13
55	20.54	22.68	24.80	26.92	29.00	31.08	33.12	35.14	37.12	39.08
56	20.50	22.63	24.76	26.87	28.96	31.04	33.08	35.09	37.08	39.04
57	20.46	22.59	24.72	26.83	28.92	31.00	33.04	35.05	37.04	39.00
58	20.42	22.55	24.68	26.79	28.88	30.96	33.00	35.01	37.00	38.96
59	20.38	22.51	24.64	26.75	28.84	30.92	32.96	34.97	36.96	38.91
60	20.34	22.47	24.60	26.71	28.80	30.88	32.92	34.93	36.92	38.88
61	20.30	22.43	24.56	26.67	28.76	30.84	32.88	34.89	36.88	38.84
62	20.26	22.39	24.52	26.63	28.72	30.80	32.84	34.85	36.84	38.80
63	20.21	22.34	24.47	26.58	28.67	30.75	32.79	34.80	36.79	38.75
64	20.17	22.30	24.43	26.54	28.63	30.71	32.75	34.76	36.75	38.71
65	20.13	22.26	24.39	26.50	28.59	30.67	32.71	34.72	36.71	38.67
66	20.09	22.22	24.35	26.46	28.55	30.63	32.67	34.68	36.67	38.63
67	20.05	22.18	24.31	26.42	28.51	30.59	32.63	34.64	36.63	38.59
68	20.00	22.13	24.26	26.37	28.46	30.54	32.58	34.59	36.58	38.54
69	19.96	22.09	24.22	26.33	28.42	30.50	32.54	34.55	36.54	38.50
70	19.92	22.05	24.18	26.29	28.38	30.46	32.50	34.51	36.50	38.46
71	19.88	22.01	24.14	26.25	28.34	30.42	32.46	34.47	36.46	38.42
72	19.84	21.97	24.10	26.21	28.30	30.38	32.42	34.43	36.42	38.38
73	19.80	21.93	24.06	26.18	28.26	30.34	32.38	34.39	36.38	38.34
74	19.76	21.89	24.02	26.13	28.22	30.30	32.34	34.35	36.34	38.30
75	19.72	21.84	23.98	26.08	28.18	30.26	32.30	34.30	36.30	38.26

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TABLE II. EMF in Millivolts Applied for Calibration of Thermocouple Thermometer Indicators (Iron - Constantan)

Reference Junction Temp °C	Indicator Reading (°C)								
	-50	0	50	100	150	200	250	300	350
-65	0.72	3.24	5.89	8.63	11.42	14.22	17.02	19.79	22.55
-64	0.67	3.19	5.85	8.59	11.38	14.18	16.98	19.75	22.51
-63	0.62	3.14	5.80	8.54	11.33	14.13	16.93	19.70	22.46
-62	0.57	3.09	5.75	8.49	11.28	14.08	16.88	19.65	22.41
-61	0.53	3.05	5.71	8.45	11.24	14.04	16.84	19.61	22.37
-60	0.48	3.00	5.66	8.40	11.19	13.99	16.79	19.56	22.32
-59	0.43	2.95	5.61	8.35	11.14	13.94	16.74	19.51	22.27
-58	0.38	2.90	5.56	8.30	11.09	13.89	16.69	19.46	22.22
-57	0.34	2.86	5.52	8.26	11.05	13.85	16.65	19.42	22.18
-56	0.29	2.81	5.47	8.21	11.00	13.80	16.60	19.37	22.13
-55	0.24	2.76	5.42	8.16	10.95	13.75	16.55	19.32	22.08
-54	0.19	2.71	5.37	8.11	10.90	13.70	16.50	19.27	22.03
-53	0.14	2.66	5.32	8.06	10.85	13.65	16.45	19.22	21.98
-52	0.10	2.62	5.28	8.02	10.81	13.61	16.41	19.18	21.94
-51	0.05	2.57	5.23	7.97	10.76	13.56	16.36	19.13	21.89
-50	0.00	2.52	5.18	7.92	10.71	13.51	16.31	19.08	21.84
-49	-0.05	2.47	5.13	7.87	10.66	13.46	16.26	19.03	21.79
-48	-0.10	2.42	5.08	7.82	10.61	13.41	16.21	18.98	21.74
-47	-0.15	2.37	5.03	7.77	10.56	13.36	16.16	18.93	21.69
-46	-0.20	2.32	4.98	7.72	10.51	13.31	16.11	18.88	21.64
-45	-0.24	2.28	4.94	7.68	10.47	13.27	16.07	18.84	21.60
-44	-0.29	2.23	4.89	7.63	10.42	13.22	16.02	18.79	21.55
-43	-0.34	2.18	4.84	7.58	10.37	13.17	15.97	18.74	21.50
-42	-0.39	2.13	4.79	7.53	10.32	13.12	15.92	18.69	21.45
-41	-0.44	2.08	4.74	7.48	10.27	13.07	15.87	18.64	21.40
-40	-0.49	2.03	4.69	7.43	10.22	13.02	15.82	18.59	21.35
-39	-0.54	1.98	4.64	7.38	10.17	12.97	15.77	18.54	21.30
-38	-0.59	1.93	4.59	7.33	10.12	12.92	15.72	18.49	21.25
-37	-0.64	1.88	4.54	7.28	10.07	12.87	15.67	18.44	21.20
-36	-0.69	1.83	4.49	7.23	10.02	12.82	15.62	18.39	21.15
-35	-0.74	1.78	4.44	7.18	9.97	12.77	15.57	18.34	21.10
-34	-0.79	1.73	4.39	7.13	9.92	12.72	15.52	18.29	21.05
-33	-0.84	1.68	4.34	7.08	9.87	12.67	15.47	18.24	21.00
-32	-0.89	1.63	4.29	7.03	9.82	12.62	15.42	18.19	20.95
-31	-0.94	1.58	4.24	6.98	9.77	12.57	15.37	18.14	20.90
-30	-0.99	1.53	4.19	6.93	9.72	12.52	15.32	18.09	20.85
-29	-1.04	1.48	4.14	6.88	9.67	12.47	15.27	18.04	20.80
-28	-1.09	1.43	4.09	6.83	9.62	12.42	15.22	17.99	20.75
-27	-1.14	1.38	4.04	6.78	9.57	12.37	15.17	17.94	20.70
-26	-1.19	1.33	3.99	6.73	9.52	12.32	15.12	17.89	20.65
-25	-1.24	1.28	3.94	6.68	9.47	12.27	15.07	17.84	20.60
-24	-1.29	1.23	3.89	6.63	9.42	12.22	15.02	17.79	20.55
-23	-1.34	1.18	3.84	6.58	9.37	12.17	14.97	17.74	20.50
-22	-1.39	1.13	3.78	6.52	9.31	12.11	14.91	17.68	20.44
-21	-1.44	1.08	3.73	6.47	9.26	12.06	14.86	17.63	20.39
-20	-1.49	1.03	3.68	6.42	9.21	12.01	14.81	17.58	20.34

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TABLE II. (Continued)

Reference Junction Temp °C	Indicator Reading (°C)								
	-50	0	50	100	150	200	250	300	350
-19	-1.54	0.98	3.63	6.37	9.16	11.96	14.76	17.53	20.29
-18	-1.59	0.93	3.58	6.32	9.11	11.91	14.71	17.48	20.24
-17	-1.64	0.88	3.53	6.27	9.06	11.86	14.66	17.43	20.19
-16	-1.69	0.83	3.48	6.22	9.01	11.81	14.61	17.38	20.14
-15	-1.74	0.78	3.43	6.17	8.96	11.76	14.56	17.33	20.09
-14	-1.80	0.72	3.38	6.12	8.91	11.71	14.51	17.28	20.04
-13	-1.85	0.67	3.33	6.07	8.86	11.66	14.46	17.23	19.99
-12	-1.90	0.62	3.27	6.01	8.80	11.60	14.40	17.17	19.93
-11	-1.95	0.57	3.22	5.96	8.75	11.55	14.35	17.12	19.88
-10	-2.00	0.52	3.17	5.91	8.70	11.50	14.30	17.07	19.83
-9	-2.05	0.47	3.12	5.86	8.65	11.45	14.25	17.02	19.78
-8	-2.10	0.42	3.07	5.81	8.60	11.40	14.20	16.97	19.73
-7	-2.16	0.36	3.02	5.76	8.55	11.35	14.15	16.92	19.68
-6	-2.21	0.31	2.97	5.71	8.50	11.30	14.10	16.87	19.63
-5	-2.26	0.26	2.92	5.66	8.45	11.25	14.05	16.82	19.58
-4	-2.31	0.21	2.87	5.61	8.40	11.20	14.00	16.77	19.53
-3	-2.36	0.16	2.82	5.56	8.35	11.15	13.95	16.72	19.48
-2	-2.42	0.10	2.76	5.50	8.29	11.09	13.89	16.66	19.42
-1	-2.47	0.05	2.71	5.45	8.24	11.04	13.84	16.61	19.37
0	-2.52	0.00	2.66	5.40	8.19	10.99	13.79	16.56	19.32
1	-2.57	-0.05	2.61	5.35	8.14	10.94	13.74	16.51	19.27
2	-2.62	-0.10	2.56	5.30	8.09	10.89	13.69	16.46	19.22
3	-2.68	-0.16	2.50	5.24	8.03	10.83	13.63	16.40	19.16
4	-2.73	-0.21	2.45	5.19	7.98	10.78	13.58	16.35	19.11
5	-2.78	-0.26	2.40	5.14	7.93	10.73	13.53	16.30	19.06
6	-2.83	-0.31	2.35	5.09	7.88	10.68	13.48	16.25	19.01
7	-2.88	-0.36	2.30	5.04	7.83	10.63	13.43	16.20	18.96
8	-2.94	-0.42	2.24	4.98	7.77	10.57	13.37	16.14	18.90
9	-2.99	-0.47	2.19	4.93	7.72	10.52	13.32	16.09	18.85
10	-3.04	-0.52	2.14	4.88	7.67	10.47	13.27	16.04	18.80
11	-3.09	-0.57	2.09	4.83	7.62	10.42	13.22	15.99	18.75
12	-3.15	-0.63	2.03	4.77	7.56	10.36	13.16	15.93	18.69
13	-3.20	-0.68	1.98	4.72	7.51	10.31	13.11	15.88	18.64
14	-3.25	-0.73	1.93	4.67	7.46	10.26	13.06	15.83	18.59
15	-3.30	-0.78	1.88	4.62	7.41	10.21	13.01	15.78	18.54
16	-3.36	-0.84	1.82	4.56	7.35	10.15	12.95	15.72	18.48
17	-3.41	-0.89	1.77	4.51	7.30	10.10	12.90	15.67	18.43
18	-3.46	-0.94	1.72	4.46	7.25	10.05	12.85	15.62	18.38
19	-3.52	-1.00	1.66	4.40	7.19	9.99	12.79	15.56	18.32
20	-3.57	-1.05	1.61	4.35	7.14	9.94	12.74	15.51	18.27
21	-3.62	-1.10	1.56	4.30	7.09	9.88	12.69	15.46	18.22
22	-3.68	-1.16	1.50	4.24	7.03	9.83	12.63	15.40	18.16
23	-3.73	-1.21	1.45	4.19	6.98	9.78	12.58	15.35	18.11
24	-3.78	-1.26	1.40	4.14	6.93	9.73	12.53	15.30	18.06
25	-3.84	-1.32	1.35	4.09	6.88	9.68	12.48	15.25	18.01
26	-3.89	-1.37	1.29	4.03	6.82	9.62	12.42	15.19	17.95
27	-3.94	-1.42	1.24	3.98	6.77	9.57	12.37	15.14	17.90
28	-3.99	-1.47	1.19	3.93	6.72	9.52	12.32	15.09	17.85
29	-4.05	-1.53	1.13	3.87	6.66	9.46	12.26	15.03	17.79
30	-4.10	-1.58	1.08	3.82	6.61	9.41	12.21	14.98	17.74

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TABLE II. (Continued)

Reference Junction Temp °C	Indicator Reading (°C)								
	-50	0	50	100	150	200	250	300	350
31	-4.15	-1.63	1.03	3.77	6.56	9.36	12.16	14.93	17.69
32	-4.21	-1.69	0.97	3.71	6.50	9.30	12.10	14.87	17.63
33	-4.26	-1.74	0.92	3.66	6.45	9.25	12.05	14.82	17.58
34	-4.32	-1.80	0.86	3.60	6.39	9.19	11.99	14.76	17.52
35	-4.37	-1.85	0.81	3.55	6.34	9.14	11.94	14.71	17.47
36	-4.42	-1.90	0.76	3.50	6.29	9.09	11.89	14.66	17.42
37	-4.48	-1.96	0.70	3.44	6.23	9.03	11.83	14.60	17.36
38	-4.53	-2.01	0.65	3.39	6.18	8.98	11.78	14.55	17.31
39	-4.59	-2.07	0.59	3.33	6.12	8.92	11.72	14.49	17.25
40	-4.64	-2.12	0.54	3.28	6.07	8.87	11.67	14.44	17.20
41	-4.69	-2.17	0.49	3.23	6.02	8.82	11.62	14.39	17.15
42	-4.75	-2.23	0.43	3.17	5.96	8.76	11.56	14.33	17.09
43	-4.80	-2.28	0.38	3.12	5.91	8.71	11.51	14.28	17.04
44	-4.86	-2.34	0.32	3.06	5.85	8.65	11.45	14.22	16.98
45	-4.91	-2.39	0.27	3.01	5.80	8.60	11.40	14.17	16.93
46	-4.96	-2.44	0.22	2.96	5.75	8.55	11.35	14.12	16.88
47	-5.02	-2.50	0.16	2.90	5.69	8.49	11.29	14.06	16.82
48	-5.07	-2.55	0.11	2.85	5.64	8.44	11.24	14.01	16.77
49	-5.13	-2.61	0.05	2.79	5.58	8.38	11.18	13.95	16.71
50	-5.18	-2.66	0.00	2.74	5.53	8.33	11.13	13.90	16.66
51	-5.23	-2.71	-0.05	2.69	5.48	8.28	11.08	13.85	16.61
52	-5.29	-2.77	-0.11	2.63	5.42	8.22	11.02	13.79	16.55
53	-5.34	-2.82	-0.16	2.58	5.37	8.17	10.97	13.74	16.50
54	-5.40	-2.88	-0.22	2.52	5.31	8.11	10.91	13.68	16.44
55	-5.45	-2.93	-0.27	2.47	5.26	8.06	10.86	13.63	16.39
56	-5.50	-2.98	-0.32	2.42	5.21	8.00	10.81	13.58	16.34
57	-5.56	-3.04	-0.38	2.36	5.15	7.95	10.75	13.52	16.28
58	-5.61	-3.09	-0.43	2.31	5.10	7.90	10.70	13.47	16.23
59	-5.67	-3.15	-0.49	2.25	5.04	7.84	10.64	13.41	16.17
60	-5.72	-3.20	-0.54	2.20	4.99	7.79	10.59	13.36	16.12
61	-5.78	-3.26	-0.60	2.15	4.94	7.74	10.54	13.31	16.07
62	-5.83	-3.31	-0.65	2.09	4.88	7.68	10.48	13.25	16.01
63	-5.88	-3.36	-0.70	2.04	4.83	7.63	10.43	13.20	15.96
64	-5.94	-3.42	-0.76	1.98	4.77	7.57	10.37	13.14	15.90
65	-6.00	-3.48	-0.82	1.93	4.72	7.52	10.32	13.09	15.85
66	-6.05	-3.53	-0.87	1.87	4.66	7.46	10.26	13.03	15.79
67	-6.10	-3.58	-0.93	1.82	4.61	7.41	10.21	12.98	15.74
68	-6.16	-3.64	-0.98	1.76	4.55	7.35	10.15	12.92	15.68
69	-6.22	-3.70	-1.04	1.71	4.50	7.30	10.10	12.87	15.62
70	-6.27	-3.75	-1.09	1.65	4.44	7.24	10.04	12.81	15.57
71	-6.32	-3.80	-1.14	1.60	4.38	7.18	9.98	12.76	15.52
72	-6.38	-3.86	-1.20	1.54	4.33	7.13	9.93	12.70	15.46
73	-6.44	-3.92	-1.26	1.48	4.28	7.08	9.88	12.64	15.40
74	-6.49	-3.97	-1.31	1.43	4.22	7.02	9.82	12.59	15.35
75	-6.54	-4.02	-1.36	1.38	4.16	6.96	9.76	12.54	15.30

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* 4.6.7 Insulation resistance. A potential of 150V dc shall be applied between each terminal stud or pin and the shell, shielding, or any metal part of the indicator case. The insulation resistance measured between each terminal stud and the shell, shielding, or any metal part of the indicator case shall be as specified in the detail specification.

4.6.8 Scale error at low temperature. The indicator shall be subjected to a temperature of -55° ±2°C for 4 hours. At the end of this period and while still at the low temperature, the indicator shall be subjected to the scale error at room temperature test. The scale errors at low temperature shall not exceed the tolerances specified in the detail specification.

4.6.9 Scale error at high temperature. The indicator shall be subjected to a temperature of 70° ±2°C for 4 hours. At the end of this period and while still at the high temperature, the indicator shall be subjected to the scale error at room temperature test. The scale errors at high temperature shall not exceed the tolerances specified in the detail specification.

4.6.10 Magnetic effect. The indicator, first on open circuit and then operating on rated voltage, shall be revolved in a vertical plane about a short bar magnetic compass with the nearest part of the indicator 5-1/2 inches from and magnetically east or west of the center of the compass. Starting directly under the compass, the indicator shall be held in positions 0°, 45°, 90°, 135°, 180°, 225°, 270°, and 315° from the initial position. At each of these positions, the indicator shall be rotated on its horizontal axis until it is in its normal operating position. The horizontal magnetic field intensity shall be 0.17 to 0.19 oersted. The deflection of the compass at any of the specified positions shall not exceed the tolerance specified in the detail specification.

* 4.6.11 Vibration error. The indicator shall be mounted on the vibration stand in its normal operating position. Voltage shall be applied to the indicator through the applicable resistance in series to provide a reading. Vibration shall be applied along each of the three mutually perpendicular axes of the test indicator as specified for equipment category (a) of MIL-STD-810, method 514 for cycling tests. The vibration shall be varied from 5 to 50 Hz at an acceleration level of 1.5g. Only one cycle shall be performed for vibration along each axis.

4.6.11.1 Pointer oscillation. The maximum total amplitude of pointer oscillation throughout the frequency range shall be noted and shall not exceed the value specified in the detail specification.

4.6.11.2 Pointer variation. The maximum variation of the pointer during vibration from its original position before vibration throughout the frequency range shall be noted and shall not exceed the value specified in the detail specification.

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4.6.11.3 The pointer oscillation and variation tests may be conducted at any indication at the discretion of the procuring activity.

* 4.6.12 Vibration failure. The indicator shall be mounted on the vibration stand in its normal operating position. Voltage shall be applied to the indicator through the applicable resistance in series to provide a reading. The indicator shall be subjected to vibration along each of three mutually perpendicular axes as specified in MIL-STD-810, method 514 for cycling tests. The vibration shall be as specified for equipment category (a), curve B. After the vibration test, the indicator shall be subjected to the test specified in 4.6.2. The scale errors at room temperature after vibration shall not exceed the tolerances specified in the detail specification. No parts or assemblies shall loosen in the mechanism and no damage to any part of the indicator shall result from the vibration.

4.6.13 Resistance. The resistance of the indicator shall be measured by any convenient method satisfactory to the procuring activity. Care shall be exercised in the performance of this test not to damage the indicator by high voltage application. The resistance shall be within the limits specified in the detail specification.

4.6.14 Cold junction compensator lag

* 4.6.14.1 Decreasing temperature. The indicator shall be electrically connected as specified in the detail specification and placed in a temperature chamber at room temperature. After temperature stabilization has been attained, the reading of the indicator shall be noted. The temperature of the test chamber shall then be reduced from room temperature to -55° ±2°C at a rate of approximately 5°C per minute and then held at -55°C for 1 hour. The reading of the indicator shall be noted throughout the test. The readings and the greatest variation shall be recorded at 5-minute intervals. The variation in reading of the indicator shall not exceed the tolerance specified in the detail specification.

4.6.14.2 Increasing temperature. The test procedure specified in 4.6.14.1 shall be repeated, except that the temperature of the test chamber shall be raised from room temperature to 70° ±2°C at a rate of approximately 5°C per minute. The variation in reading of the indicator shall not exceed the tolerance specified in the detail specification.

4.6.15 Extreme low temperature exposure. The indicator shall be subjected to a temperature of -65° ±2°C for 48 hours. The temperature shall then be raised to -55° ±2°C for 24 hours. During the last 4 hours of the 24-hour period at -55°C the pressure shall be reduced to 0.82 inch Hg absolute, or less. Upon completion of the 48-hour period, and again at the completion of the 24-hour period, while at the temperature and pressure specified above, the indicator shall be operated throughout its range without exhibiting sticking or erratic characteristics. Upon completion of the 24-hour period, while at -55°C but at

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atmospheric pressure, the indicator shall then be subjected to the test specified herein for scale error at low temperature (4.6.8) and the scale error at the test points shall not exceed the tolerances specified in the detail specification. The indicator shall then be returned to room temperature for a minimum of 4 hours and then subjected to the test specified in 4.6.2. The scale errors at the test points shall not exceed the tolerances specified in the detail specification.

4.6.16 High temperature exposure. The indicator shall be placed within a chamber and the internal temperature of the chamber raised to 70° ±2°C with an internal relative humidity of not more than 5 percent. The source of heat for the chamber shall be arranged in such a manner that radiant heat will not fall upon the test specimen. The total volume occupied by a single item of equipment or by several items shall not exceed 50 percent of the internal volume of the test chamber. The indicator shall be maintained at 70° ±2°C for 24 hours. While still at this temperature, the indicator shall be operated throughout its range without exhibiting sticking or erratic characteristics. The indicator shall then be returned to room temperature for a minimum of 4 hours and then subjected to the test specified in 4.6.2. The scale errors at the test points shall not exceed the tolerances specified in the detail specification.

* 4.6.17 Shock. The indicator shall be subjected to the shock test, procedure I, method 516 of MIL-STD-810. The indicator shall be functionally operating and indicating approximately 60 percent of full scale. The shock pulse shape shall be in accordance with figure 516.1-2, parameters (a) and (c). Following this test, the scale and friction errors shall not exceed the tolerance specified in the detail specification. No screws or other parts shall become loosened or damaged as a result of this test.

4.6.18 Thermal shock. The indicator shall be subjected to eight cycles of exposure to water at 85° ±2°C and 5° ±2°C without evidence of moisture penetration or damage to coating or enclosure. Each cycle of the test shall consist of immersing the indicator in water at 85°C for 30 minutes and then within 5 seconds of removal from the bath, immersing it 30 minutes in the other bath maintained at 5°C. This cycle shall be repeated continuously, one cycle following the other until eight cycles have been completed. Following this test, the indicator shall be subjected to the sealing test. No leakage shall be detected nor shall there be any damage to the indicator as a result of this test.

4.6.19 Fogging. The indicator shall be placed in a 71° ±2°C controlled ambient temperature for a minimum of 1 hour. After this period, and while still at this temperature, an ice cube shall be rubbed on the cover glass for a period of 1 to 2 minutes. The glass shall be wiped dry (do not use compressed air) and the indicator inspected for evidence of water or oil fog or condensate inside the cover glass. Evidence of fogging or condensate shall be cause for rejection.

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4.6.20 Salt fog. The salt fog test shall be in accordance with MIL-STD-810, method 509, procedure I for 50 hours. The indicator shall be examined and there shall be no evidence of external corrosion or deterioration. The indicator shall be resubjected to the test specified in 4.6.7 and the measured resistance shall be as specified therein. The indicator shall then be subjected to the test specified in 4.6.6. No indicator leakage shall result from this test. The external surface of the indicator may be washed with distilled water and air dried prior to performing the insulation resistance test.

* 4.6.21 Test for helium. The indicator case shall be punctured or the filling tube cut and the indicator subjected to a test for detection of helium by means of a mass spectrometer-type helium detector. Alternately, the sealed indicator can be subjected to a mass-spectrometer-type helium leak detector and the leak rate noted. Failure to detect helium shall be cause for rejection.

4.6.22 Detail examination. The indicator shall be critically examined to determine full compliance with regard to weight, physical dimensions, dial composition, and similar detail requirements. The indicator shall be examined internally for evidence of corrosion or deterioration resulting from the tests specified herein. There shall be no evidence of corrosion or deterioration.

* 4.7 Preparation for delivery. Preservation, packaging, packing, and marking shall be examined for conformance to section 5.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging. Preservation and packaging shall be level A or C, as specified by the procuring activity (see 6.2).

5.1.1 Level A. Each indicator shall be packaged in accordance with method III of MIL-P-116. Each unit, appropriately cleaned, shall be placed within a loosely fitting, transparent plastic film bag, material conforming to type III of MIL-F-22191, minimum thickness 0.003 inch. The air within the bag shall be exhausted to the extent practical prior to accomplishing the bag closure. Each indicator shall be wrapped within a minimum of 1 inch thickness of cellulose cushioning material conforming to PPP-C-843 and then placed within an individual snug-fitting carton conforming to PPP-B-636, type CF, class domestic. Alternate cushioning material of equivalent protective quality may be substituted. The continuous line marking requirement of MIL-F-22191 is not mandatory.

5.1.2 Level C. Each indicator shall be packaged in a manner that will afford the item the degree of protection required to prevent chemical corrosion and physical deterioration during shipment from the supply source to the first receiving activity. The supplier's commercial practice may be utilized when it conforms to the requirements of this level.

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5.2 Packing. Packing shall be level A, B, or C, as specified by the procuring activity (see 6.2).

* 5.2.1 Level A. Twenty-four or 36 indicators, packaged as specified in 5.1.1, shall be packed for shipment in containers conforming to type CF or SF, weather-resistant class V3s of PPP-B-636. The weight and dimension limitation criteria of table II shall apply. When specified (see 6.2), indicators shall be packed in containers conforming to PPP-B-601, overseas type. Insofar as practicable, exterior containers shall be of uniform shape and size and of minimum tare and cube consistent with the protection required.

* 5.2.2 Level B. Indicators packaged as specified in 5.1.1 shall be packed for shipment in containers conforming to PPP-B-636 as indicated in 5.2.1, except that the shipping containers shall be domestic service grade, domestic class. Dimension and weight limitation criteria shall be as stated in table I of the specification. The sealing requirements shall not apply.

5.2.3 Level C. Indicators packaged as specified shall be packed for shipment in a manner that will afford adequate protection during shipment from the supply source to the first receiving activity. This level shall conform to the applicable carrier rules and regulations. The supplier's commercial practice may be utilized when such meets the requirements specified herein.

5.3 Marking of shipments. Interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129. The nomenclature shall be as specified in the detail specification.

5.3.1 In addition to the standard marking, all containers shall be marked with the following cautionary warning:

GLASS - FRAGILE INSTRUMENT - HANDLE WITH CARE

6. NOTES

6.1 Intended use. The indicators covered by this specification are intended for use on aircraft to indicate various temperature functions, such as engine bearing and exhaust temperatures.

* 6.2 Ordering data. Procurement documents should specify:

a. Title, number, and date of this specification

b. When sampling plan B tests are to be conducted (see 4.5.2.2)

c. Levels of packaging and packing required (see section 5). PPP-B-601 boxes should be used only when specified in the contract or order (see 5.2.1).

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6.3 Definitions

6.3.1 Amplitude. Whenever the word "amplitude" is specified, it shall mean the extent of motion as measured from one extreme to the opposite extreme.

6.3.2 Hermetic seal. A hermetic seal is defined as a perfectly closed and airtight seal made between vitric, vitric and metallic, or metallic materials. A hermetic seal is not intended to include seals accomplished by gaskets or O rings.

* 6.3.3 Corrosion resistant. Corrosion resistant or suitably treated to resist corrosion is defined as any material or treatment which exhibits no visual evidence of corrosion subsequent to exposure to the salt-fog test as specified in 4.6.20. For the purpose of selecting corrosion-resistant materials or adequacy of treatment, the material or treated surface shall have been cleaned by ultrasonic methods or the equivalent prior to exposure to the salt-fog test.

* 6.3.4 Refurbished. Refurbished means that the unit has been completely overhauled with all component parts meeting new parts standards and the unit has been subjected to and meets all the requirements for a new unit.

* 6.4 International standardization. Certain provisions (3.9.1.1) of this specification are the subject of international standardization agreements ASCCAS 10/6 and STANAG 3329. When amendment, revision, or cancellation of this specification is proposed which will affect or violate the international agreement concerned, the preparing activity will take appropriate reconciliation action through international standardization channels including departmental offices, if required.

6.5 Marginal indicia. The margins of this specification are marked to indicate where changes, deletions, or additions to the previous issue have been made. This is done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content as written, irrespective of the marginal notations and relationship to the last previous issue.

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