Designation: B 78 – 90 (Reapproved 2001)

Standard Test Method of Accelerated Life of Iron-Chromium-Aluminum Alloys for Electrical Heating [1]

This standard is issued under the fixed designation B 78; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the determination of the resistance to oxidation of iron-chromium-aluminum electrical heating alloys at elevated temperatures under intermittent heating using a constant-temperature cycle test. This test is used for internal comparative purposes only.

1.2 The values stated in inch-pound units are to be regarded as the standard. The metric equivalents of inch-pound units may be approximate.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Significance and Use

2.1 This test method is used by producers of electrical heating alloys to measure the cyclic oxidation resistance of these alloys.

2.2 Because of the effect of environment, design and use, the life values obtained from this test method may not correlate with that of an appliance or industrial heating unit.

3. Test Panel

3.1 *Size and Location*—The dimensions of the test panel shall be similar to those shown in Fig. 1. The test panel shall be located in a position free from drafts of air.

3.1.1 The enclosure shall fit tightly on the panel and the glass slide shall fit snugly to prevent leakage of air at this point during the operation of the test, as even a slight draft of air in contact with the specimen will cause excessive variation in length of life. A screen of 40 wire mesh, 0.010-in. (0.025 mm) wire diameter, market grade, may be used as a cover over the individual stations.

3.2 *Terminals*—The two terminals shall be spaced 2 in. (50.8 mm) apart, center to center and shall be so positioned that the wire specimen when secured therein shall be in a U-shaped pattern as described in Section 5. The specimen terminal junctions shall be 3 in. (76.2 mm) lower than the plane of the top of the enclosure.

4. Apparatus

4.1 The apparatus shall be similar to the requirements specified in 4.2 to 4.8, inclusive, and shall be connected as shown in Fig. 2.

4.2 *Power Supply*—The transformer or motor generator set shall be capable of delivering a controlled voltage of from 10 to 35 V to the circuit. It shall have a continuous current capacity of at least 20 A/specimen.

4.3 *Voltage Control*—The automatic voltage control shall be capable of maintaining across the bus bars a constant voltage within ±0.5 %.

NOTE 1—It has been found impossible to make accurate tests without voltage control, as changes in line voltage are sufficient to cause considerable variation in the results obtained (see Annex A1).

4.4 *Variable Transformer*—The variable transformer shall be capable of adjusting the voltage across the specimen to within approximately 0.25 % of any desired value within the working range and shall have a continuous current rating of approximately 25 A.

NOTE 2—A variable transformer having a working range of adjustability from approximately 0 to 20 V, provides for testing wires within a considerable range of size and resistivity.

4.5 *Ammeter and Voltmeter*—The ammeter and voltmeter shall have an accuracy of 1 % of normal test deflection (approximately 15 A and 15 V respectively). For alternating current the range shall be such as to give a reading above the lower fifth of the scale range. The ammeter has appreciable resistance. A compensating resistance shall be cut into the circuit to replace the resistance of the ammeter so that the over-all resistance of the circuit is not changed. This resistance shall be inserted in series with the contact of the upper switch shown in Fig. 2.

4.6 *Optical Pyrometer* or *Infrared Thermometer*—The optical system shall be such as to provide a magnification of at least four diameters. This may be accomplished by means of a special lens or combination of two standard lenses in the

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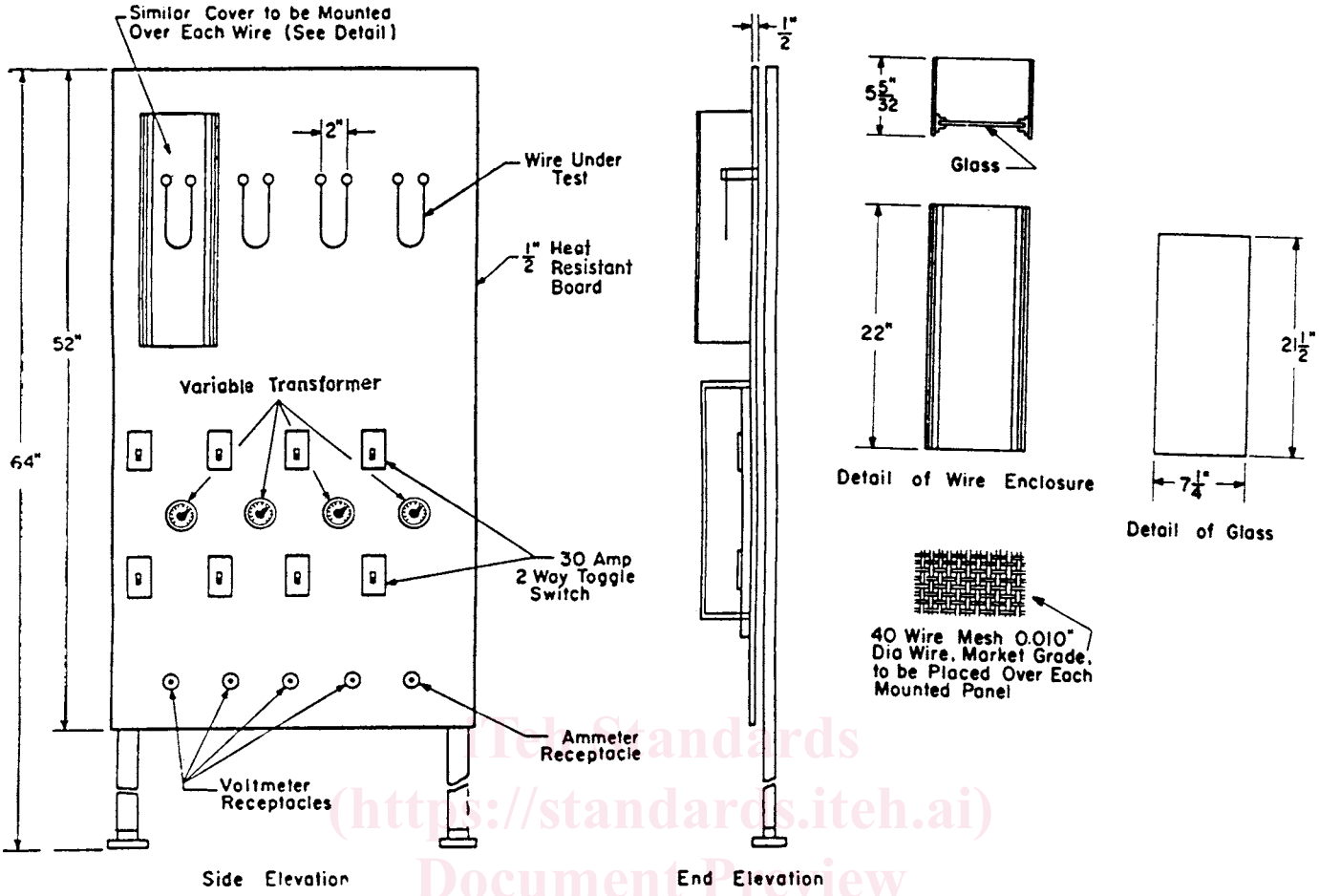

Metric Equivalents

in.	mm
½	12.7
5⁵⁄₃₂	131.0
7¼	184.2
21½	546
22	559
52	1321
64	1626

FIG. 1 Test Panel

objective to provide a short focal length and the desired magnification (see Annex A1). These instruments must have an accuracy of ±10°F (5.5°C) and UBS traceability.

NOTE 3—It is highly important that the temperatures of the test specimen be adjusted as accurately as possible, as small variations in temperature result in considerable variation in length of life. Optical pyrometer or infrared pycnometer makes it possible to determine the temperature at any particular point on the wire, and with the arrangement described, the temperature of a comparatively small wire may be taken quite readily.

4.7 *Interrupter*—Some form of apparatus shall be used as an interrupter to open and close the circuit.

4.8 *Apparatus for Recording Time of Burnout*—If no apparatus is available for recording the time of burnout, arrangements shall be made for hourly observations for burnouts.

5. Test Specimen

5.1 The test specimen shall be 0.0254 in. (0.645 mm) in diameter. The length of the wire selected for test shall be such as to give a test length of approximately 10 in. (254 mm).

5.2 The test specimen shall be representative with regard to the surface of the average of the coil or spool of wire which has been selected for test. Particular care shall be taken to see that the specimen selected is free from kinks. This precaution is necessary, since a kink, even though later removed may cause burnout at that point.

NOTE 4—It is also very desirable to select and keep as a reference standard for comparison, a spool or coil of wire that is uniform in cross section from one end to the other. Tests may then be made at any time on the reference standard, and if conditions have changed they will be noted