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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
for
BASIC ENVIRONMENTAL TESTING PROCEDURES FOR
ELECTROTECHNOLOGY

PART 3—BACKGROUND INFORMATION

SECTION 4. TEST T: SOLDERING

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OF AUSTRALIA

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This standard shall be read in conjunction with AS 1099.1, General and AS 1099.2T, Soldering.

4.1 SCOPE AND OBJECT. This Section provides background information to the tests on soldering in Part 2. The need has arisen for precise and objective methods of assessing the ability of component terminations to be soldered satisfactorily, in times and temperatures suitably related to those employed in practice.

There is also a need for precise methods of subjecting components to such thermal stresses as would occur in soldering, prior to testing the components for damage which could be attributed to these thermal stresses.

To be realistic, all such tests must depend on the application under controlled conditions of specified solders and fluxes to the components under test. Solderability tests hitherto available have required the results to be expressed in terms of qualitative, and largely subjective, assessments of the condition of the soldered surface. They vary from the purely subjective classification into 'good' or 'bad', to the partly subjective comparison with standards somewhat arbitrarily classified as either 'perfect' or one of several degrees of 'imperfect'. Such tests depend on the operator's judgement, which is rarely a stable factor; some require expensive optical equipment; and all classify the results as 'acceptable' or 'unacceptable' regardless of the nature of the components or the conditions under which they will be employed. It is preferable to have tests the results of which are quantitative, and leave it to the relevant component specification to state which values of these quantities are acceptable. This ideal has been only partially achieved in the revised version of Test T; where qualitative assessments have been described, their limitations should be borne in mind. For qualitative assessments, the employment of experienced operators is advisable.

It must be emphasized that there can be no direct and simple correlation between the results of the various solderability and thermal stress tests that is valid for all types of components, nor can these tests match all the varieties of production conditions exactly. It is the task of the component specification writer to correlate test results with the desired performance for each component and specify acceptance levels accordingly.

4.2 SOLDERABILITY.

4.2.1 Basic Considerations. A soldered joint between two or more workpieces is made by allowing molten soft solder, aided by a flux, to flow into the space between the workpiece surfaces which permits the formation of a good bond with a specified soft solder alloy in the presence of a specified flux and at a specified temperature.

The word 'solderability' is commonly used in two senses, both of which are covered by the definition just given. First, it may mean the ability to allow formation of a joint between two workpiece surfaces. This property is described here as 'joint quality' and methods of measuring it are mentioned in Clause 4.4. Joint quality depends on choices made at the design stage. Second, it may mean the time needed for such a joint to be formed. This property is described here as 'soldering time'. It is usually measured in terms of the time required to achieve a desired degree of wetting under specified conditions.

Soldering time measurements can only be made on surfaces on which the increase in temperature is unlikely to give rise to side effects liable to make the measurements lose all significance. In particular, the soldering time of plated metals can only be measured if the plating adheres to the base metal. Clause 4.4 enumerates the means of detecting adhesion faults.

4.2.2 Choice of Solder. Because most soldered joints in electrical and electronic equipment are made using solder containing nominally 60 percent tin and 40 percent lead, this alloy has been chosen for all tests. Experience has shown that impurities up to the maximum listed in Appendix B of AS 1099.2T do not affect the wetting power of this alloy (see also AS 1834, Tin-lead and other Tin-based Solder Alloys).

4.2.3 Choice of Flux. The majority of soldered joints in electrical and electronic equipments are made using a flux consisting of colophony (modified or natural), usually with additions of activators, which improve the wetting power of the molten flux or increase the rate at which it dissolves metal oxides. Activated fluxes are generally proprietary materials of unrevealed composition, which may produce very short soldering times. In order to avoid specification