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EXTERNAL VISUAL INSPECTION

ESCC Basic Specification No. 20500

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1 **SCOPE**

This specification defines the minimum acceptable external visual inspection criteria for electrical, electronic and electro-mechanical components suitable for space application.

1.1 **PURPOSE**

The purpose of this specification is to describe the inspection procedures to be used to check the external aspects of materials, design, construction and workmanship of electrical, electronic and electromechanical components.

This specification covers the overall requirements for all components. Specific requirements, for individual families of components, are detailed in Ancillary Specifications numbered in the 20500 series.

Each of these must be read in conjunction with this specification.

1.2 **ALTERNATIVE STANDARDS**

Where the configuration of a particular component is not in accordance with the requirements shown in a 20500 series specification, or where current in-house inspection drawings or standards (accepted in the PID) are to be used, it shall be the manufacturer's responsibility to obtain the formal interpretation of the ESCC Executive, concerning any deviation.

2 **APPLICABLE DOCUMENTS**

The following document forms part of this specification. The relevant issue shall be that in effect on the date of placing the purchase order.

- IEC Publication No. 410, Sampling Plans and Procedures for Inspection by Attributes.

3 **TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS**

The terms, definitions, abbreviations, symbols and units specified in ESCC Basic Specification No. 21300 shall apply.

In addition, the following definitions apply in this specification:

- Lead Width: The major dimension.
- Lead Thickness: The minor dimension.
- Case or Package: The outer envelope of a component, excluding leads and seals, however fabricated, e.g. welded can, epoxy mould, etc.

Where necessary, other specific definitions will be contained within the relevant Ancillary Specification.

4 REQUIREMENTS

A lot or subplot being examined at any one time shall be drawn from the same production lot. Evidence that this is not so shall be cause for rejection of the total lot in question.

4.1 EQUIPMENT REQUIRED

Optical equipment, visual standards and any other equipment, subject to the alternative standards paragraph, required for the performance of the inspections, will be detailed in the appropriate 20500 series specification. All equipment shall be subject to periodic calibration or certifications as appropriate.

4.2 ILLUMINATION

Components undergoing inspection with optical equipment shall be illuminated such that a particle or blemish which has a size of 0.0125mm in the major dimension can be detected at a magnification power of 20.

4.3 MATERIAL AND EXTERNAL CONSTRUCTION

The material and external construction shall be in accordance with the appropriate ESCC Detail Specification.

4.4 EXTERNAL SURFACES

All external surfaces shall be free of foreign particles and contamination. There shall be no evidence of corrosion, peeling of finish or plating nor of any holes or cracks.

Surfaces shall not show any colour change unless explained by, and authorised in, the relevant PID except for the instances given below:

- (a) Discoloration of tinned surfaces due to oxidisation after exposure to endurance and storage testing at elevated temperature.
- (b) Even discoloration of the body and/or metal surfaces after exposure to endurance testing or high temperature storage testing.

Where components have been subjected to robustness of terminations (terminal strength) testing, degradation of the leads or terminations due to the mechanical action of clamping or probing instruments shall not be cause for rejection.

4.5 DIMENSION CHECK

Dimension check shall apply only to final production test. Unless otherwise specified in the relevant ESCC Detail Specification, inspection shall be to Inspection Level 2 and to an AQL of 1.0.

All dimensions specified for the component in the relevant ESCC Detail Specification shall be checked to ensure that they comply with the detailed requirements. At final production test, the same sample may be used for marking.

4.6 MARKING

Unless otherwise specified in the relevant ESCC Detail Specification, inspection shall be to Inspection Level 2 and to an AQL of 1.0. The marking on the component shall be inspected to ensure that it complies with the detailed requirements specified in the relevant ESCC Generic and Detail Specifications and that it is legible and shows no signs of damage or degradation.

4.7 SOLDER JOINTS

Any solder joint exhibiting one or more of the following defects shall be cause for rejection:

- (a) Surface of the solder not smooth or clean;
- (b) Evidence of cracks, voids or holes;
- (c) Structure of the soldered part not visible;
- (d) Incomplete solder flow or coverage;
- (e) Balling or spherical appearance of the solder;
- (f) Evidence of foreign materials encapsulated in the solder.

5 ANCILLARY SPECIFICATIONS

The following Ancillary Specifications in the [20500](#) series have been issued:

2053000	External Visual Inspection of Capacitors.
2053102	External Visual Inspection of Waveguide Devices.
2053400	External Visual Inspection of Electrical Connectors.
2053501	External Visual Inspection of Quartz Crystal Units.
2053502	External Visual Inspection of Surface Acoustic Wave (SAW) Devices.
2053600	External Visual Inspection of Electromagnetic Relays.
2053701	External Visual Inspection of Electromechanical Switches.
2054000	External Visual Inspection of Resistors.
2054009	External Visual Inspection of Flexible Heaters.
2055000	External Visual Inspection of Discrete Semiconductor Devices (1).

NOTES

1. For Discrete Microwave Semiconductor Devices (ESCC Generic Specification No. [5010](#)), no individual ancillary specification for External Visual Inspection exists. ESCC [2055000](#) should be used to the extent applicable.
2. For Photosensitive Charge Coupled Devices and Active Pixel Sensors with Hermetic and Non-Hermetic Packages (ESCC Generic Specification No. [9020](#)), no individual ancillary specification for External Visual Inspection exists. [MIL-STD-883, Test Method 2009, 2016](#), as applicable, should be used to the extent applicable.