



**RELAYS, ELECTROMAGNETIC,
RF SWITCH, LATCHING**

ESCC Generic Specification No. 3603

Issue 2	February 2023
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DCR No.	CHANGE DESCRIPTION
1456	Specification upissued to incorporate changes per DCR.

TABLE OF CONTENTS

1	INTRODUCTION	8
1.1	SCOPE	8
1.2	APPLICABILITY	8
2	APPLICABLE DOCUMENTS	8
2.1	ESCC SPECIFICATIONS	8
2.2	OTHER (REFERENCE) DOCUMENTS	9
2.3	ORDER OF PRECEDENCE	9
3	TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS	9
4	REQUIREMENTS	10
4.1	GENERAL	10
4.1.1	Specifications	10
4.1.2	Conditions and Methods of Test	10
4.1.3	Manufacturer's Responsibility for Performance of Tests and Inspections	10
4.1.4	Inspection Rights	10
4.1.5	Customer Source Inspection	10
4.2	QUALIFICATION AND QUALIFICATION MAINTENANCE REQUIREMENTS ON A MANUFACTURER	11
4.3	DELIVERABLE COMPONENTS	11
4.3.1	ESCC Qualified Components	11
4.3.2	ESCC Components	11
4.3.3	Lot Failure	12
4.4	MARKING	12
4.5	MATERIALS AND FINISHES	12
4.6	COAXIAL CONNECTORS	12
4.6.1	Non-Integral Coaxial Connectors	12
4.6.2	Integral Coaxial Connectors	12
5	PRODUCTION CONTROL	13
5.1	GENERAL	13
5.2	SPECIAL IN-PROCESS CONTROLS	13
5.2.1	Contact Engagement and Separation Forces	13
5.2.2	Internal Visual Inspection	13
5.2.3	Run-in	13
5.2.4	Room Temperature Electrical Measurements	13
5.2.5	External Visual Inspection	13
5.2.6	Dimension Check	13
5.2.7	Weight	13
5.2.8	Documentation	13

6	SCREENING TESTS	14
6.1	GENERAL	14
6.2	FAILURE CRITERIA	14
6.2.1	Environmental and Mechanical Test Failure	14
6.2.2	Parameter Drift Failure	14
6.2.3	Parameter Limit Failure	14
6.2.4	Other Failures	14
6.3	FAILED COMPONENTS	14
6.4	LOT FAILURE	14
6.4.1	Lot Failure During 100% Testing	15
6.5	DOCUMENTATION	15
7	QUALIFICATION, QUALIFICATION MAINTENANCE AND LOT VALIDATION TESTING	15
7.1	QUALIFICATION TESTING	15
7.1.1	General	15
7.1.2	Distribution Within the Qualification Test Lot	15
7.2	QUALIFICATION WITHIN A TECHNOLOGY FLOW	15
7.3	QUALIFICATION MAINTENANCE (PERIODIC TESTING)	16
7.4	LOT VALIDATION TESTING	16
7.5	FAILURE CRITERIA	16
7.5.1	Environmental and Mechanical Test Failures	16
7.5.2	Electrical Failures	16
7.5.3	Other Failures	16
7.6	FAILED COMPONENTS	17
7.7	LOT FAILURE	17
7.8	QUALIFICATION, PERIODIC TESTING AND LOT VALIDATION TESTING SAMPLES	17
7.9	DOCUMENTATION	17
8	TEST METHODS AND PROCEDURES	17
8.1	CONTACT ENGAGEMENT AND SEPARATION FORCES	18
8.2	INTERNAL VISUAL INSPECTION	18
8.3	RUN-IN	18
8.4	ELECTRICAL MEASUREMENTS	18
8.4.1	General	18
8.4.2	Room Temperature Electrical Measurements	20
8.4.3	Parameter Drift Values	20
8.4.4	High and Low Temperatures Electrical Measurements	21
8.4.5	Intermediate and End-Point Electrical Measurements	21
8.4.6	Electrical Measurements at Room Temperature (CHART F4)	21

8.4.7	Electrical Measurements at High and Low Temperatures (CHART F4)	21
8.5	EXTERNAL VISUAL INSPECTION	21
8.6	DIMENSION CHECK	21
8.6.1	Connector Interface Dimension Check	21
8.7	VIBRATION	22
8.7.1	Random Vibration	22
8.7.2	Vibration Scan	23
8.7.3	Sine Vibration	23
8.8	THERMAL CYCLING	24
8.9	COUPLING PROOF TORQUE	24
8.10	MATING AND UNMATING FORCES	24
8.11	MULTIPLICATION	25
8.12	SEAL	25
8.12.1	Seal, Fine Leak	25
8.12.2	Seal, Gross Leak	25
8.13	RESISTANCE TO SOLDERING HEAT	25
8.14	MECHANICAL SHOCK	26
8.15	THERMAL ENDURANCE (OR THERMAL VACUUM)	27
8.16	OPERATING LIFE	28
8.17	CONNECTOR ENDURANCE	29
8.18	POWER HANDLING	29
8.19	ELECTROMAGNETIC COMPATIBILITY	29
8.20	PERMANENCE OF MARKING	29
8.21	SOLDERABILITY	30
8.22	TERMINAL STRENGTH	30
8.23	DESTRUCTIVE PHYSICAL ANALYSIS (DPA)	30
9	DATA DOCUMENTATION	30
9.1	GENERAL	30
9.1.1	Qualification and Qualification Maintenance	30
9.1.2	Component Procurement and Delivery	31
9.1.3	Additional Documentation	31
9.1.4	Data Retention/Data Access	31
9.2	COVER SHEET(S)	31
9.3	LIST OF EQUIPMENT USED	31
9.4	LIST OF TEST REFERENCES	31
9.5	SPECIAL IN-PROCESS CONTROLS DATA (CHART F2)	31
9.6	SCREENING TESTS DATA (CHART F3)	32

9.7	QUALIFICATION, PERIODIC TESTING AND LOT VALIDATION TESTING DATA (CHART F4)	32
9.7.1	Qualification Testing	32
9.7.2	Periodic Testing for Qualification Maintenance	32
9.7.3	Lot Validation Testing	32
9.8	FAILED COMPONENTS LIST AND FAILURE ANALYSIS REPORT	32
9.9	CERTIFICATE OF CONFORMITY	32
10	DELIVERY	33
11	PACKAGING AND DISPATCH	33
12	CHARTS	34
12.1	CHART F1 - GENERAL FLOW FOR PROCUREMENT	34
12.2	CHART F2 - PRODUCTION CONTROL	35
12.3	CHART F3 - SCREENING TESTS	36
12.4	CHART F4 – QUALIFICATION, PERIODIC TESTING AND LOT VALIDATION TESTING	37

1 INTRODUCTION

1.1 SCOPE

This specification defines the general requirements for the qualification, qualification maintenance, procurement, and delivery of Relays, Electromagnetic, RF Switch, Latching, for space applications. This specification contains the appropriate inspection and test schedules and also specifies the data documentation requirements.

The scope of this specification is limited to RF latching relays and switches with coaxial connectors or surface mount technology (SMT) terminations.

1.2 APPLICABILITY

This specification is primarily applicable to the granting of qualification approval to components qualified in accordance with one of the following ESCC methods:

- (a) Qualification of Standard Components per this ESCC Generic Specification and ESCC Basic Specification No. [20100](#).
- (b) Technology Flow Qualification per ESCC Basic Specification No. [25400](#).

It is also primarily applicable to the procurement of components so qualified.

This specification may also be applied to the procurement of unqualified components, recommendations for which are given in ESCC Basic Specification No. [23100](#).

2 APPLICABLE DOCUMENTS

The following documents form part of, and shall be read in conjunction with, this specification. The relevant issues shall be those in effect on the date of starting qualification or placing the Purchase Order.

2.1 ESCC SPECIFICATIONS

- No. [20100](#), Requirements for the Qualification of Standard Electronic Components for Space Application.
- No. [20400](#), Internal Visual Inspection.
- No. [20500](#), External Visual Inspection.
- No. [20600](#), Preservation, Packaging and Dispatch of ESCC Components.
- No. [21001](#), Destructive Physical Analysis of EEE Components.
- No. [21300](#), Terms, Definitions, Abbreviations, Symbols and Units.
- No. [21700](#), General Requirements for the Marking of ESCC Components.
- No. [22600](#), Requirements for the Evaluation of Standard Electronic Components for Space Application.
- No. [22800](#), ESCC Non-Conformance Control System.
- No. [23100](#), Recommendations on the use of the ESCC Specification System for the Evaluation and Procurement of Unqualified Components.
- No. [23500](#), Lead Materials and Finishes for Components for Space Application.
- No. [24600](#), Minimum Quality System Requirements.
- No. [24800](#), Resistance to Solvents of Marking, Materials and Finishes.

- No. [25400](#), Requirements for the Technology Flow Qualification of Electronic Components for Space Application.
- [REP005](#), Qualified Parts List.
- [REP006](#), Qualified Manufacturers List.

For qualification and qualification maintenance or procurement of qualified components, with the exception of ESCC Basic Specifications Nos. [20100](#), [21700](#), [22800](#), [24600](#) and [25400](#), where Manufacturers' specifications are equivalent to, or more stringent than, the ESCC Basic Specifications listed above, they may be used in place of the latter, subject to the approval of the ESCC Executive.

Such replacements shall be clearly identified in the applicable Process Identification Document (PID).

For procurement of unqualified components, where Manufacturers' specifications are equivalent to or more stringent than the ESCC Basic Specifications listed above, they may be used in place of the latter subject to the approval of the Orderer.

Such replacements may be listed in an appendix to the appropriate Detail Specification at the request of the Manufacturer or Orderer, subject to the approval of the ESCC Executive.

Unless otherwise stated herein, references within the text of this specification to "the Detail Specification" shall mean the relevant ESCC Detail Specification.

2.2 OTHER (REFERENCE) DOCUMENTS

- ECSS-Q-ST-70-37, Determination of the Susceptibility of Metals to Stress-corrosion Cracking.
- ECSS-E-ST-20-01, Multipaction Design and Test.
- [MIL-STD-202](#), Test Method Standard - Electronic and Electrical Component Parts.
- [MIL-STD-461](#), Requirements for The Control of Electromagnetic Interference Characteristics of Subsystems and Equipment.
- [MIL-STD-883](#), Test Methods and Procedures for Micro-electronics.

2.3 ORDER OF PRECEDENCE

For the purpose of interpretation and in case of conflict with regard to documentation, the following order of precedence shall apply:

- (a) ESCC Detail Specification.
- (b) ESCC Generic Specification.
- (c) ESCC Basic Specification.
- (d) Other documents, if referenced herein.

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 shall apply:

Non-integral coaxial connector: A discrete coaxial connector component mounted on the relay/switch.

Integral coaxial connector: A built-in coaxial connector interface manufactured with piece parts.

4 REQUIREMENTS

4.1 GENERAL

The requirements for the qualification of a component shall be in accordance with ESCC Basic Specification No. 20100.

The requirements for Technology Flow Qualification and the listing of qualified component types shall be in accordance with ESCC Basic Specification No. 25400.

The test requirements for procurement of both qualified and unqualified components (see CHART F1) shall comprise:

- Special In-Process Controls.
- Screening Tests.
- Periodic Testing (for qualified components only).
- Lot Validation Testing, if stipulated in the Purchase Order.

4.1.1 Specifications

For qualification, qualification maintenance, procurement and delivery of components in conformity with this specification, the applicable specifications listed in Section 2 of this document shall apply in total unless otherwise specified herein or in the Detail Specification.

4.1.2 Conditions and Methods of Test

The conditions and methods of test shall be in accordance with this specification, the ESCC Basic Specifications referenced herein and the Detail Specification.

4.1.3 Manufacturer's Responsibility for Performance of Tests and Inspections

The Manufacturer shall be responsible for the performance of tests and inspections required by the applicable specifications. These tests and inspections shall be performed at the plant of the Manufacturer of the components unless it is agreed by the ESCC Executive (for qualification, qualification maintenance, or procurement of qualified components) or the Orderer (for procurement of unqualified components), to use an approved external facility.

4.1.4 Inspection Rights

The ESCC Executive (for qualification, qualification maintenance, or procurement of qualified components) or the Orderer (for procurement of unqualified components if stipulated in the Purchase Order) reserves the right to monitor any of the tests and inspections scheduled in the applicable specifications.

4.1.5 Customer Source Inspection

4.1.5.1 *Pre-Encapsulation Customer Source Inspection*

If stipulated in the Purchase Order, the Orderer may perform a source inspection at the Manufacturer's facility prior to assembly/encapsulation (including, for example, performance of Internal Visual Inspection). Details of the inspections to be performed or witnessed and the required period of notification shall be as stipulated in the Purchase Order.

4.1.5.2 *Final Customer Source Inspection*

If stipulated in the Purchase Order, the Orderer may perform a source inspection at the Manufacturer's facility at the end of Screening or during Lot Validation Testing, if applicable, (including, for example, witness of final Room Temperature Electrical Measurements, performance of External Visual Inspection and Dimension Check, review of the data documentation package). Details of the inspections to be performed or witnessed and the required period of notification shall be as stipulated in the Purchase Order.

4.2 QUALIFICATION AND QUALIFICATION MAINTENANCE REQUIREMENTS ON A MANUFACTURER

To obtain and maintain the qualification of a component, or family of components, a Manufacturer shall satisfy the requirements of ESCC Basic Specification No. [20100](#).

To obtain and maintain the qualification of a component produced using a qualified Technology Flow, a Manufacturer shall satisfy the requirements of ESCC Basic Specification No. [25400](#).

4.3 DELIVERABLE COMPONENTS

4.3.1 ESCC Qualified Components

Components delivered to this specification shall be processed and inspected in accordance with the relevant Process Identification Document (PID).

4.3.2 ESCC Components

Each component, irrespective of qualification status, identified with an ESCC component number and delivered to this specification shall:

- be traceable to its production lot.
- have satisfactorily completed all the tests required by the relevant issues of the applicable specifications.
- be produced from lots that are considered by the Manufacturer to be capable of passing all applicable tests, and sequences of tests, that are defined in CHART F4. The Manufacturer shall not knowingly supply components that cannot meet this requirement. In the event that, subsequent to delivery and prior to operational use, a component is found to be in a condition such that, demonstrably, it could not have passed these tests at the time of manufacture, this shall be grounds for rejection of the delivered lot.

4.3.3 Lot Failure

Lot failure may occur during Screening Tests (CHART F3) or Qualification, Periodic Testing and Lot Validation Testing (CHART F4).

Should such failure occur during qualification, qualification maintenance or procurement of qualified components, the Manufacturer shall initiate the non-conformance procedure in accordance with ESCC Basic Specification No. [22800](#). The Manufacturer shall notify the Orderer and the ESCC Executive by any appropriate written means, within 5 working days, giving details of the number and mode of failure and the suspected cause. No further testing or analysis shall be performed on the failed components until so instructed by the ESCC Executive.

Should such failure occur during procurement of unqualified components the Manufacturer shall notify the Orderer by any appropriate written means within 5 working days, giving details of the number and mode of failure and the suspected cause. No further testing or analysis shall be performed on the failed components until so instructed by the Orderer. The Orderer shall inform the Manufacturer within 5 working days of receipt of notification what action shall be taken.

4.4 MARKING

All components procured and delivered to this specification shall be marked in accordance with ESCC Basic Specification No. [21700](#).

4.5 MATERIALS AND FINISHES

Specific requirements for materials and finishes are specified in the Detail Specification. Where a definite material or finish is not specified a material or finish shall be used so as to ensure that the component meets the performance requirements of this specification and the Detail Specification. Acceptance or approval of any constituent material or finish does not guarantee acceptance of the finished product.

Unless otherwise specified in the Detail Specification the component shall be hermetically sealed.

All materials and finishes of the components specified in the Detail Specification shall comply with the restrictions on materials specified in ESCC Basic Specification No. [22600](#).

All metallic materials shall meet stress-corrosion resistance Class 1 or Class 2 of ECSS-Q-ST-70-37.

4.6 COAXIAL CONNECTORS

4.6.1 Non-Integral Coaxial Connectors

All non-integral coaxial connectors (and contacts) shall be as specified in the applicable connector ESCC Detail Specification as referenced in the relay/switch ESCC Detail Specification. Non-integral coaxial connectors shall be ESCC Qualified as evidenced by a listing in the current ESCC Qualified Parts List [REP005](#) or ESCC Qualified Manufacturers List [REP006](#).

4.6.2 Integral Coaxial Connectors

Integral coaxial connectors (including piece parts and contacts) shall meet all the materials, interface, performance, inspection and test requirements of the ESCC Detail Specification for the equivalent non-integral ESCC qualified coaxial connector.

5 PRODUCTION CONTROL

5.1 GENERAL

Unless otherwise specified herein or in the Detail Specification all lots of components used for qualification and qualification maintenance, Lot Validation Testing and for delivery shall be subject to tests and inspections in accordance with CHART F2 in the sequence shown.

All components shall be serialised after encapsulation, prior to the subsequent tests and inspections.

Any components which do not meet these requirements shall be removed from the lot and at no future time be resubmitted to the requirements of this specification.

The applicable test requirements are detailed in the paragraphs referenced in CHART F2 .

For qualified components the full production control provisions are defined in the PID.

5.2 SPECIAL IN-PROCESS CONTROLS

5.2.1 Contact Engagement and Separation Forces

Only applicable to components with integral coaxial connectors with female contacts.

A sample of 13 female centre contacts shall be tested for Contact Engagement and Separation Forces as specified in Para. 8.1. If any failure occurs, the lot of contacts shall be rejected.

5.2.2 Internal Visual Inspection

Internal Visual Inspection shall be performed in accordance with Para. 8.2.

5.2.3 Run-in

Run-in shall be performed in accordance with Para. 8.3.

5.2.4 Room Temperature Electrical Measurements

Room Temperature Electrical Measurements shall be performed in accordance with Para. 8.4.2.

5.2.5 External Visual Inspection

External Visual Inspection may be performed in accordance with Para. 8.5 at the Manufacturer's discretion.

5.2.6 Dimension Check

Dimension Check shall be performed in accordance with Para. 8.6 on 1 sample only.

In the event of any failure a 100% Dimension Check shall be performed.

5.2.7 Weight

The maximum weight of the component, specified in the Detail Specification shall be guaranteed but not tested.

5.2.8 Documentation

Documentation of Special In-Process Controls shall be in accordance with Para. 9.5.

6 SCREENING TESTS

6.1 GENERAL

Unless otherwise specified herein or in the Detail Specification, all lots of components used for qualification and qualification maintenance, Lot Validation Testing, and for delivery, shall be subjected to tests and inspections in accordance with CHART F3 in the sequence shown.

Any components which do not meet these requirements shall be removed from the lot and at no future time be resubmitted to the requirements of this specification.

The applicable test methods and conditions are specified in the paragraphs referenced in CHART F3.

6.2 FAILURE CRITERIA

6.2.1 Environmental and Mechanical Test Failure

The following shall be counted as component failures: components which fail during tests for which the pass/fail criteria are inherent in the test method, e.g., External Visual Inspection, Random Vibration, Run-in, Thermal Cycling.

6.2.2 Parameter Drift Failure

The acceptable change limits are shown in Parameter Drift Values in the Detail Specification (if applicable). A component shall be counted as a parameter drift failure if the changes after Random Vibration, Run-in and Thermal Cycling (as applicable) are larger than the drift values (Δ) specified.

6.2.3 Parameter Limit Failure

A component shall be counted as a limit failure if one or more parameters exceed the limits shown in Room Temperature Electrical Measurements or High and Low Temperatures Electrical Measurements in the Detail Specification.

6.2.4 Other Failures

A component shall be counted as a failure in any of the following cases:

- Visual failure.
- Mechanical failure.
- Handling failure.
- Lost component.

6.3 FAILED COMPONENTS

A component shall be considered as a failed component if it exhibits one or more of the failure modes described in Para. 6.2.

6.4 LOT FAILURE

In the case of lot failure, the Manufacturer shall act in accordance with Para. 4.3.3.

6.4.1 Lot Failure During 100% Testing

If the number of components failed on the basis of the failure criteria specified in Paras. 6.2.2 and 6.2.3 exceeds 10% (rounded upwards to the nearest whole number) of the components submitted to CHART F3, the lot shall be considered as failed.

If a lot is composed of groups of components of one family defined in one ESCC Detail Specification, but separately identifiable for any reason, then the lot failure criteria shall apply separately to each identifiable group.

6.5 DOCUMENTATION

Documentation of Screening Tests shall be in accordance with Para. 9.6.

7 QUALIFICATION, QUALIFICATION MAINTENANCE AND LOT VALIDATION TESTING

The requirements of this paragraph are applicable to the tests performed on components or test structures as part of qualification or qualification maintenance in accordance with either ESCC Basic Specification No. 20100 or 25400 as applicable. They are also applicable to Lot Validation Testing as part of the procurement of qualified or unqualified components.

7.1 QUALIFICATION TESTING

7.1.1 General

Qualification testing shall be in accordance with the requirements specified in CHART F4. The tests of CHART F4 shall be performed on the specified sample, chosen at random from components which have successfully passed the tests in CHART F3. This sample constitutes the Qualification Test Lot.

The Qualification Test Lot is divided into subgroups of tests and all components assigned to a subgroup shall be subjected to all of the tests in that subgroup, in the sequence shown. The applicable test requirements are detailed in the paragraphs referenced in CHART F4.

The conditions governing qualification testing are specified in ESCC Basic Specification No. 20100.

7.1.2 Distribution Within the Qualification Test Lot

Where a Detail Specification covers a range, or series of components that are considered similar, then the Qualification Test Lot shall be comprised of component types so selected that they adequately represent all of the various mechanical, structural and electrical peculiarities of that range or series.

The distribution shall be as specified by, or agreed with, the ESCC Executive.

7.2 QUALIFICATION WITHIN A TECHNOLOGY FLOW

The qualification of a component produced using a qualified Technology Flow shall be in accordance with ESCC Basic Specification No. 25400.

7.3 QUALIFICATION MAINTENANCE (PERIODIC TESTING)

Qualification is maintained through periodic testing and the test requirements of Para. 7.1 shall apply. For each subgroup the sample size and the period between successive subgroup testing shall be as specified in CHART F4. The conditions governing qualification maintenance are specified in ESCC Basic Specification No. [20100](#).

Qualification of a component, produced using a qualified Technology Flow, is maintained by the maintenance of the Technology Flow Qualification itself in accordance with ESCC Basic Specification No. [25400](#).

7.4 LOT VALIDATION TESTING

For procurement of qualified components, Lot Validation Testing is not required and shall only be performed if specifically stipulated in the Purchase Order.

For procurement of unqualified components, the need for Lot Validation Testing shall be determined by the Orderer (ref. ESCC Basic Specification No. [23100](#)).

When Lot Validation Testing is required, it shall consist of the performance of one or more of the tests or subgroup test sequences of CHART F4. The testing to be performed and the sample size shall be as stipulated in the Purchase Order.

When procurement of more than one component type is involved from a family, range or series, the selection of representative samples shall also be stipulated in the Purchase Order.

7.5 FAILURE CRITERIA

The following criteria shall apply to qualification, qualification maintenance and Lot Validation Testing.

7.5.1 Environmental and Mechanical Test Failures

The following shall be counted as component failures:

Components which fail during tests for which the pass/fail criteria are inherent in the test method, e.g., Seal, etc.

7.5.2 Electrical Failures

The following shall be counted as component failures:

Components which fail one or more of the applicable limits at each of the relevant data points specified for environmental, mechanical and endurance testing in Intermediate and End-Point Electrical Measurements in the Detail Specification.

7.5.3 Other Failures

A component shall be counted as a failure in any of the following cases:

- Visual failure.
- Mechanical failure.
- Handling failure.
- Lost component.

7.6 FAILED COMPONENTS

A component shall be considered as failed if it exhibits one or more of the failure modes detailed in Para.7.5.

When requested by the ESCC Executive (for qualification, qualification maintenance or procurement of qualified components) or the Orderer (for procurement of qualified or unqualified components), failure analysis of failed components shall be performed under the responsibility of the Manufacturer and the results provided.

Failed components shall be retained at the Manufacturer's plant until the final disposition has been agreed and certified.

7.7 LOT FAILURE

For qualification and qualification maintenance, the lot shall be considered as failed if one component in any subgroup of CHART F4 is a failed component based on the criteria specified in Para. 7.5.

For procurement, the lot shall be considered as failed if one component in any test specified for Lot Validation Testing is a failed component based on the criteria specified in Para. 7.5.

In the case of lot failure, the Manufacturer shall act in accordance with Para. 4.3.3.

7.8 QUALIFICATION, PERIODIC TESTING AND LOT VALIDATION TESTING SAMPLES

All tests of CHART F4 are considered to be destructive and therefore components so tested shall not form part of the delivery lot.

7.9 DOCUMENTATION

Documentation of Qualification, Periodic Testing and Lot Validation Testing shall be in accordance with Para. 9.7.

8 TEST METHODS AND PROCEDURES

If a Manufacturer elects to eliminate or modify a test method or procedure, the Manufacturer is still responsible for delivering components that meet all of the performance, quality and reliability requirements defined in this specification and the Detail Specification.

For a qualified component, documentation supporting the change shall be approved by the ESCC Executive and retained by the Manufacturer. It shall be copied, when requested, to the ESCC Executive. The change shall be specified in an appendix to the Detail Specification and in the PID.

For an unqualified component the change shall be approved by the Orderer. The change may be specified in an appendix to the Detail Specification at the request of the Manufacturer or Orderer, subject to the approval of the ESCC Executive.

8.1 CONTACT ENGAGEMENT AND SEPARATION FORCES

Only applicable to components with integral coaxial connectors with female contacts.

The female centre contacts shall be tested as follows:

- A force which is gradually increased shall be applied with force speed not exceeding 1mm/s until the steel test pin properly engages with, or separates from, the female contact. The polished steel test pins shall be as specified in the ESCC Detail Specification for the equivalent non-integral coaxial connector. The oversize test pin shall be engaged and separated from each female contact 3 times and then the Engagement Force shall be measured with the maximum diameter test pin. Subsequently, the minimum diameter test pin shall be engaged and separated once to measure the Separation Force. The Engagement Force and the Separation Force shall meet the limits specified in the ESCC Detail Specification for the equivalent non-integral coaxial connector.

8.2 INTERNAL VISUAL INSPECTION

ESCC Basic Specification No. [20400](#).

8.3 RUN-IN

For components with coaxial connectors (integral or non-integral), ESCC qualified connector savers may be used.

[MIL-STD-202, Test Method 311](#) with the following details unless otherwise specified in the Detail specification:

- Test Temperature(s): $T_{amb} = +22 \pm 3^{\circ}\text{C}$.
- Number of Activations: 2500 make and break activations for each contact pair.
- Activation Pulse Duty Cycle:
 - For components with coaxial connectors (integral or non-integral): 2.5% maximum unless otherwise specified, using an activation pulse as specified in the Detail Specification.
 - For components with SMT terminations: 10% maximum unless otherwise specified, using an activation pulse as specified in the Detail Specification.
- Number of Misses Allowed: 0
- Data Points:

Only applicable for Run-in during Screening Tests (CHART F3).
During testing, RF Contact Resistance shall be measured after each 100 activations, as specified in Room Temperature Electrical Measurements in the Detail Specification.

8.4 ELECTRICAL MEASUREMENTS

8.4.1 General

DC and RF electrical measurements and methods shall be as follows:

- RF Operating Frequency Range, Nominal, Maximum and Minimum Rated Coil Voltage applied during testing shall be as specified in the Detail Specification.
- For components with coaxial connectors (integral or non-integral), ESCC qualified connector savers may be used for performance of electrical tests to minimise the number of mating and unmating cycles. The effect of the savers on the measurements shall be taken into account.

8.4.1.1 *RF Contact Resistance*

[MIL-STD-202, Method 307](#). All RF contact pairs shall be measured with the following details:

- RF Contact Test Current: As specified in the Detail Specification. No load shall be applied to the contacts during contact transfer.
- Coil Activation Voltage: As specified in the Detail Specification. Coils shall not be energised during measurement.
- Number of Activations prior to Measurement: None.
- Number of Test Activations: 10 for each coil (see Para. 8.3 for Activation Pulse Duty Cycle).
- Number of Measurements per Activation: 1 for each contact pair.

8.4.1.2 *Coil Resistance*

[MIL-STD-202, Method 303](#). All coils shall be measured with the following details:

- Coil Test Voltage: As specified in the Detail Specification.
- Coil Activation Voltage: As specified in the Detail Specification.
- Number of Test Activations: 3 for each coil (see Para. 8.3 for Activation Pulse Duty Cycle).
- Number of Measurements per Activation: 1 for each coil.

8.4.1.3 *Voltage Proof*

[MIL-STD-202, Test Method 301](#) with the following details:

- Test Voltage: As specified in the Detail Specification.
- Maximum Leakage Current: 1mA.
- Duration of Application: 5s.
- Points of Application:
 - Between open contact pairs for each contact position.
 - Between contacts and case.
 - Between coils and case.
 - Between coils and contacts.
 - Between coils.
 - Between the centre contact and the shell for each coaxial connector (as applicable).

8.4.1.4 *Insulation Resistance*

[MIL-STD-202, Test Method 302](#) with the following details:

- Test Condition: B (500Vdc).
- Points of Measurement: as per Para. 8.4.1.3 Voltage Proof.

8.4.1.5 *Pick-up Voltage*

The voltage applied to the coil shall be gradually increased from zero until the component activates. The pick-up voltage shall be read when all contacts have transferred. Suitable means shall be provided for the monitoring of make and break of contacts. When pick-up voltage has been read, the voltage shall be increased to the Maximum Rated Coil Voltage before any other measurement is made. This measurement shall be repeated for each relay/switch position.

8.4.1.6 *Switching Time, Breaking Time, Switching Type*

Times shall be measured on all RF contact pairs using an oscilloscope or any suitable equipment. The specified component switching type shall be verified during the measurements e.g., Break-Before-Make (BBM), Make-Before-Break (MBB) or otherwise as specified in the Detail specification.

The following details shall apply:

- RF Contact Test Current and Voltage: As specified in the Detail Specification.
- Coil Activation Voltage: As specified in the Detail Specification.
- Number of Test Activations: 3 for each coil (see Para. 8.3 for Activation Pulse Duty Cycle).
- Number of Measurements per Activation: 1 for each contact pair.
- Switching Time shall include any contact bouncing.

8.4.1.7 *Insertion Loss*

Insertion Loss shall be measured for each RF path using an appropriate test method employing a suitable RF test set-up, across the full frequency range either by a swept frequency technique or, alternatively, at a minimum of 7 fixed frequencies equally spaced across the frequency range. The following conditions shall apply:

- Applied Power: As specified in the Detail Specification.
- Operating Frequency: Over the full RF Operating Frequency Range.
- Insertion Loss shall meet the limits specified in the Detail Specification.

8.4.1.8 *Voltage Standing Wave Ratio (VSWR)*

VSWR shall be measured for each RF path at all RF ports (i.e., for each path, at both the respective input and output) using an appropriate test method employing a suitable RF test set-up, across the full frequency range either by a swept frequency technique or, alternatively, at a minimum of 7 fixed frequencies equally spaced across the frequency range. The following conditions shall apply:

- Applied Power: As specified in the Detail Specification.
- Operating Frequency: Over the full RF Operating Frequency Range.
- VSWR shall meet the limits specified in the Detail Specification.

8.4.1.9 *Isolation*

Isolation shall be measured for each RF path using an appropriate test method employing a suitable RF test set-up, across the full frequency range either by a swept frequency technique or, alternatively, at a minimum of 7 fixed frequencies equally spaced across the frequency range. The following conditions shall apply:

- Applied Power: As specified in the Detail Specification.
- Operating Frequency: Over the full RF Operating Frequency Range.
- Isolation shall meet the limits specified in the Detail Specification.

8.4.2 Room Temperature Electrical Measurements

At each of the relevant data points during Special In-Process Controls (CHART F4) and Screening Tests (CHART F3), Room Temperature Electrical Measurements shall be performed as specified in the Detail Specification. All values obtained shall be recorded against serial numbers.

8.4.3 Parameter Drift Values

At each of the relevant data points during Screening Tests (CHART F3), Parameter Drift Values shall be measured as specified in the Detail Specification. All values obtained shall be recorded against serial numbers and the parameter drift calculated.

- 8.4.4 High and Low Temperatures Electrical Measurements
At each of the relevant data points during Screening Tests (CHART F3), High and Low Temperatures Electrical Measurements shall be performed as specified in the Detail Specification. All values obtained shall be recorded against serial numbers.
- 8.4.5 Intermediate and End-Point Electrical Measurements
At each of the relevant data points during Qualification, Periodic Testing and Lot Validation Testing (CHART F4), Intermediate and End-Point Electrical Measurements shall be performed as specified in the Detail Specification. All values obtained shall be recorded against serial numbers and the parameter drift calculated, if specified.
- 8.4.6 Electrical Measurements at Room Temperature (CHART F4)
At each of the relevant data points during Qualification, Periodic Testing and Lot Validation Testing (CHART F4), unless otherwise specified, RF Contact Resistance, Coil Resistance, Pick-up Voltage, Switching Time, Breaking Time, Voltage Proof, Insulation Resistance, Insertion Loss, VSWR and Isolation shall be measured as specified in Intermediate and End-Point Electrical Measurements in the Detail Specification. All values obtained shall be recorded against serial numbers.
- 8.4.7 Electrical Measurements at High and Low Temperatures (CHART F4)
At each of the relevant data points during Qualification, Periodic Testing and Lot Validation Testing (CHART F4), unless otherwise specified, RF Contact Resistance, Coil Resistance, Pick-up Voltage, Switching Time, Breaking Time, Voltage Proof, Insulation Resistance, Insertion Loss, VSWR and Isolation shall be measured as specified in Intermediate and End-Point Electrical Measurements in the Detail Specification. All values obtained shall be recorded against serial numbers.
- 8.5 EXTERNAL VISUAL INSPECTION
External Visual Inspection shall be performed in accordance with ESCC Basic Specification No. [20500](#).
- 8.6 DIMENSION CHECK
Dimension Check shall be performed in accordance with ESCC Basic Specification No. [20500](#) and the Detail Specification.
- 8.6.1 Connector Interface Dimension Check
Only applicable to components with integral coaxial connectors.
- The relative position of the contact and the insert to the reference plane shall be checked in accordance with ESCC Basic Specification No. [20500](#) and the ESCC Detail Specification for the equivalent non-integral coaxial connector.

8.7 VIBRATION

For components with coaxial connectors (integral or non-integral), ESCC qualified connector savers may be used.

8.7.1 Random Vibration

8.7.1.1 *Random Vibration During Screening Tests (CHART F3)*

[MIL-STD-202, Test Method 214](#) with the following details:

- Random Vibration Test Curve:
 - 36grms overall
 - 10 to 50Hz: +3dB/octave
 - 50 to 1000Hz: 0.8g²/Hz
 - 1000 to 2000Hz: -3dB/octave
- Method of Mounting: The components shall be mounted rigidly by normal mounting means.
- Duration: 60s in each of the 3 mutually perpendicular axes.
- Operating Condition: Non-operating with no coil voltage applied. Any additional conditions shall be as specified in the Detail Specification.
- Data Points:

On completion of testing, the components shall be visually examined and there shall be no evidence of damage or loosening of parts.

RF Contact Resistance, Coil Resistance, Pick-up Voltage, Switching Time and Breaking Time shall be measured as specified in Room Temperature Electrical Measurements in the Detail Specification.

8.7.1.2 *Random Vibration During Qualification, Periodic Testing and Lot Validation Testing (CHART F4)*

[MIL-STD-202, Test Method 214](#) with the following details:

- Random Vibration Test Curve:
 - 50grms overall
 - 10 to 50Hz: +3dB/octave
 - 50 to 1000Hz: 1.5g²/Hz
 - 1000 to 2000Hz: -3dB/octave
- Method of Mounting: The components shall be mounted rigidly by normal mounting means.
- Duration: 180s in each of the 3 mutually perpendicular axes.
- Operating Condition: Non-operating with no coil voltage applied. Contacts shall be monitored for any change in position. Any additional conditions shall be as specified in the Detail Specification.
- Data Points:

On completion of testing, the components shall be visually examined and there shall be no evidence of damage or loosening of parts.

If a change in contact position has occurred during testing, the component shall be tested to confirm correct activation with the first application of a nominal activation pulse as specified in the Detail Specification.

RF Contact Resistance, Coil Resistance, Pick-up Voltage, Switching Time and Breaking Time shall be measured as specified in Intermediate and End-Point Electrical Measurements in the Detail Specification. If drift values are specified, the drift shall always be related to the measurement immediately prior to the test.

8.7.2 Vibration Scan

[MIL-STD-202, Test Method 204](#). Any mechanical resonance(s) shall be identified and recorded using the following details:

- Vibration Amplitude: 1.5mm (maximum total excursion) or 1 g (peak), whichever is less.
- Method of Mounting: The components shall be mounted rigidly by normal mounting means.
- Sweep and Duration: The frequency range of 10 to 2000Hz shall be traversed at a rate of 2 octaves/minute. This sweep shall be performed once in each of 3 mutually perpendicular axes.
- Operating Condition: Non-operating with no coil voltage applied.
- Data Points:
During testing, the frequency and amplitude of any mechanical resonances shall be recorded against serial number.

During the final test, there shall be no change in the resonance(s) from each resonance measured during the initial test as follows:

- Change in resonance frequency: $\leq 10\%$
- Change in resonance amplitude: $\leq 6\text{dB}$

On completion of testing, the components shall be visually examined and there shall be no evidence of damage or loosening of parts.

8.7.3 Sine Vibration

[MIL-STD-202, Test Method 204](#) with the following details:

- Test Condition: G (30g peak)
- Method of Mounting: The components shall be mounted rigidly by normal mounting means.
- Sweep and Duration: The frequency range of 10 to 2000Hz shall be traversed at a rate of 4 octaves/minute. This sweep shall be performed once in each of 3 mutually perpendicular axes.
- Operating Condition: Non-operating with no coil voltage applied. Contacts shall be monitored for any change in position. Any additional conditions shall be as specified in the Detail Specification.
- Data Points:
On completion of testing, the components shall be visually examined and there shall be no evidence of damage or loosening of parts.

If a change in contact position has occurred during testing, the component shall be tested to confirm correct activation with the first application of a nominal activation pulse as specified in the Detail Specification.

8.8 THERMAL CYCLING

For components with coaxial connectors (integral or non-integral), ESCC qualified connector savers may be used.

[MIL-STD-202, Test Condition 107](#) with the following details:

- Temperature Cycles: Components shall be subject to 5 cycles as follows:
 - Cycle 1: Minimum Storage Temperature specified in the Detail Specification for a duration of 30 minutes after temperature stabilisation (such that the component's temperature does not vary more than $\pm 3^{\circ}\text{C}$ within 15 minutes), followed by Maximum Storage Temperature specified in the Detail Specification for a duration of 30 minutes after temperature stabilisation.
 - Cycles 2 to 5: Minimum Operating Temperature specified in the Detail Specification for a duration of 30 minutes after temperature stabilisation (such that the component's temperature does not vary more than $\pm 3^{\circ}\text{C}$ within 15 minutes), followed by Maximum Operating Temperature specified in the Detail Specification for a duration of 30 minutes after temperature stabilisation.
- Rate of Change of Temperature: $3^{\circ}\text{C}/\text{minute}$ maximum.
- Data Points:

Prior to Cycle 1 and at the end of Cycle 5, RF Contact Resistance, Coil Resistance, Pick-up Voltage, Switching Time and Breaking Time shall be measured at $T_{\text{amb}} = +22 \pm 3^{\circ}\text{C}$ as specified in Room Temperature Electrical Measurements in the Detail Specification.

During Cycle 5, at the end of the exposure at each temperature extreme, RF Contact Resistance, Coil Resistance, Pick-up Voltage, Switching Time and Breaking Time shall be measured as specified in High and Low Temperatures Electrical Measurements in the Detail Specification.

8.9 COUPLING PROOF TORQUE

Only applicable to components with integral coaxial connectors.

The component under test shall be engaged with the applicable mating gauge as specified in the ESCC Detail Specification for the equivalent non-integral coaxial connector, and the coupling nut shall be tightened to the torque specified in the ESCC Detail Specification for the equivalent non-integral coaxial connector. After 1 minute, the connected pair shall be disconnected.

- Data Points:

On completion of testing, the component shall be visually inspected. The coupling mechanism shall not be dislodged and the interface dimensions of the component shall remain as specified in the ESCC Detail Specification for the equivalent non-integral coaxial connector.

8.10 MATING AND UNMATING FORCES

Only applicable to components with coaxial connectors (integral or non-integral).

The component under test shall be mated with its mating gauge as specified in the ESCC Detail Specification for the equivalent non-integral coaxial connector. During the entire mating/unmating cycle (until the component is fully mated or unmated), the necessary torque shall not exceed the value specified in the ESCC Detail Specification for the equivalent non-integral coaxial connector.

During Qualification, Periodic Testing and Lot Validation Testing (CHART F4): Unless otherwise specified, the number of mating/unmating cycles shall be 50.

8.11 MULTIPLICATION

Only applicable for high power components and if specified in the Detail Specification.

During Screening Tests (CHART F3), only applicable to components with coaxial connectors (integral or non-integral).

Verification with respect to multiplication shall be performed in accordance with ECSS-E-ST-20-01. The multiplication classification type shall be as specified in the Detail Specification.

Unless otherwise specified, the following conditions shall apply:

- Test Pressure: < 1.3mPa.
- Test Temperature: Maximum Operating Temperature specified in the Detail Specification.
- Operating Conditions: As specified in the Detail Specification.

8.12 SEAL

Only applicable to components with Hermetic Packages as specified in the Detail Specification.

8.12.1 Seal, Fine Leak

[MIL-STD-202, Test Method 112](#), Test Condition C, Procedure IIIa with the following details:

- Measured Leak Rate (Reject limit R1): 1×10^{-8} atm.cm³/s He maximum.
- Duration of Pressurisation: 12 hours minimum at a pressure of 400kPa.
- Recovery Time: 2 hours minimum at room ambient conditions.
- The measured leak rate for each component shall be recorded against serial number.

8.12.2 Seal, Gross Leak

[MIL-STD-202, Test Method 112](#), Test Condition B or D with the following details.

- For test condition B, de-ionised water shall be used instead of silicone oil. De-ionised water shall be maintained at +25°C in an absolute pressure of not greater than 8465Pa.
- No bubbles shall emanate from the component case or header.

8.13 RESISTANCE TO SOLDERING HEAT

Only applicable to components with SMT terminations.

[MIL-STD-202, Test Method 210](#), Test Condition A, B or D (as applicable) with the following details. All solder terminals shall be tested:

- Data Points:
On completion of testing, the components shall be visually examined and there shall be no evidence of damage or loosening of parts.

8.14 MECHANICAL SHOCK

For components with coaxial connectors (integral or non-integral), ESCC qualified connector savers may be used.

[MIL-STD-202 method 213](#) with the following details:

- Shape of shock pulse: Half-sine.
- Peak acceleration: 1500g.
- Duration of pulse: 0.3ms.
- Number of shocks: 18 (3 shocks in each direction along the 3 perpendicular axes of the test specimen).
- Method of Mounting: The components shall be mounted rigidly by normal mounting means.
- Operating Condition: Non-operating with no coil voltage applied. Contacts shall be monitored for any change in position. Any additional conditions shall be as specified in the Detail Specification.
- Data Points:

On completion of testing, the components shall be visually examined and there shall be no evidence of damage or loosening of parts.

If a change in contact position has occurred during testing, the component shall be tested to confirm correct activation with the first application of a nominal activation pulse as specified in the Detail Specification.

RF Contact Resistance, Coil Resistance, Pick-up Voltage, Switching Time and Breaking Time shall be measured as specified in Intermediate and End-Point Electrical Measurements in the Detail Specification. If drift values are specified, the drift shall always be related to the measurement immediately prior to the test.

8.15 THERMAL ENDURANCE (OR THERMAL VACUUM)

For components with coaxial connectors (integral or non-integral), ESCC qualified connector savers may be used.

This test shall only be performed under vacuum for high power components and if specified in the Detail Specification; otherwise, this test shall be performed at room ambient pressure.

The components shall be subjected to a test (non-operating) in accordance with the following details:

- Test Pressure: Vacuum < 1.3mPa (from room ambient condition), or room ambient (as applicable).
- Temperature Cycles: Whilst under vacuum (if applicable), the components shall be subject to 2 steps of temperature cycling as follows:
 - Step 1:
Number of Cycles: 25, where one cycle is: Minimum Storage Temperature specified in the Detail Specification for a duration of 30 minutes after temperature stabilisation (such that the component's temperature does not vary more than $\pm 3^{\circ}\text{C}$ within 15 minutes), followed by Maximum Storage Temperature specified in the Detail Specification for a duration of 30 minutes after temperature stabilisation.
 - Step 2:
Number of Cycles: 11, where one cycle is: Minimum Operating Temperature specified in the Detail Specification for a duration of 30 minutes after temperature stabilisation (such that the component's temperature does not vary more than $\pm 3^{\circ}\text{C}$ within 15 minutes), followed by Maximum Operating Temperature specified in the Detail Specification for a duration of 30 minutes after temperature stabilisation.
- Rate of Change of Temperature: $3^{\circ}\text{C}/\text{minute}$ maximum.
- Data Points:
Before and after completion of both Step 1 and Step 2, RF Contact Resistance, Coil Resistance, Pick-up Voltage, Switching Time and Breaking Time shall be measured at $T_{\text{amb}} = +22 \pm 3^{\circ}\text{C}$, as specified in Intermediate and End-Point Electrical Measurements in the Detail Specification. If drift values are specified, the drift shall always be related to the measurement immediately prior to the test.

During Step 2, at the end of each exposure, at each temperature extreme, RF Contact Resistance, Coil Resistance, Pick-up Voltage, Switching Time and Breaking Time shall be measured as specified in Intermediate and End-Point Electrical Measurements in the Detail Specification.

During the last cycle of Step 2, at each temperature extreme, the components shall be activated 10 times, without contact load, using Minimum Rated Coil Voltage specified in the Detail Specification. No failure to switch shall occur.

8.16 OPERATING LIFE

For components with coaxial connectors (integral or non-integral), ESCC qualified connector savers may be used.

The components shall be activated without contacts being loaded, during temperature cycling, in accordance with the following details unless otherwise specified in the detail Specification:

- Total Number of Activations: 1000000 make and break activations for each contact pair.
- Activation Pulse Duty Cycle:
 - For components with coaxial connectors (integral or non-integral): 2.5% maximum unless otherwise specified, using an activation pulse as specified in the Detail Specification.
 - For components with SMT terminations: 10% maximum unless otherwise specified, using an activation pulse as specified in the Detail Specification.
- Temperature Cycles: Components shall be subject to 2 temperature cycles as follows:
 - Cycle 1: 250000 activations using Maximum Rated Coil Voltage at Maximum Operating Temperature, both as specified in the Detail Specification, followed by 250000 activations using Nominal Rated Coil Voltage at Minimum Operating Temperature, both as specified in the Detail Specification.
 - Cycle 2: 250000 activations using Nominal Rated Coil Voltage at Maximum Operating Temperature, both as specified in the Detail Specification, followed by 250000 activations using Minimum Rated Coil Voltage at Minimum Operating Temperature, both as specified in the Detail Specification.
- Rate of Change of Temperature: 3°C/minute maximum.
- Data Points:

During Cycles 1 and 2, at each temperature extreme, RF Contact Resistance shall be measured for each activation, as specified in Intermediate and End-Point Electrical Measurements in the Detail Specification.

During Cycles 1 and 2, at the end of each set of operating cycles, at each temperature extreme, Coil Resistance, Pick-up Voltage, Switching Time and Breaking Time shall be measured as specified in Intermediate and End-Point Electrical Measurements in the Detail Specification.

After completion of Cycle 2, RF Contact Resistance, Coil Resistance, Pick-up Voltage, Switching Time and Breaking Time shall be measured at $T_{amb} = +22 \pm 3^{\circ}\text{C}$, as specified in Intermediate and End-Point Electrical Measurements in the Detail Specification. If drift values are specified, the drift shall always be related to the measurement immediately prior to the test.

8.17 CONNECTOR ENDURANCE

Only applicable to components with integral coaxial connectors.

The components shall be subjected to a specified number of mating and unmating cycles at a specified rate using a suitable mating connector of the same type.

Unless otherwise specified, the number of cycles shall be 50 and the rate shall be no more than 12 cycles per minute. During each cycle the components shall be fully mated to the specified torque as specified in the applicable ESCC Detail Specification for the coaxial connector, and then fully unmated.

Unless otherwise specified, the threads of rotational parts shall not be lubricated before or during endurance testing. Solvents and tools shall not be used for cleaning.

- **Data Points:**
On completion of testing, Mating and Unmating Forces shall be measured in accordance with Para. 8.10. The components shall be visually inspected and there shall be no evidence of physical damage. Any wear to the contacts or threads as a result of the endurance testing shall not be considered as physical damage.

8.18 POWER HANDLING

For components with coaxial connectors (integral or non-integral), ESCC qualified connector savers may be used.

Only applicable for high power components and if specified in the Detail Specification.

The components shall be operated in accordance with the following details:

- **Test Pressure:** < 1.3mPa.
- **Test Temperature:** Maximum Operating Temperature specified in the Detail Specification.
- **Operating Conditions:** As specified in the Detail Specification. Components shall be stabilised for a minimum of 24 hours at the test pressure and temperature before being operated.
- **Data Points:**
On completion of testing, RF Contact Resistance, Coil Resistance, Pick-up Voltage, Switching Time and Breaking Time shall be measured as specified in Intermediate and End-Point Electrical Measurements in the Detail Specification. If drift values are specified, the drift shall always be related to the measurement immediately prior to the test.

8.19 ELECTROMAGNETIC COMPATIBILITY

[MIL-STD-461](#) with the following details:

- **Operating Frequency:** Over the full RF Operating Frequency Range in the Detail Specification.
- Components shall be mounted on a suitable test fixture. Shielding glue may be applied to the test fixture to limit its interference in the measurement. Unused RF Ports shall be terminated with matched shielded loads.
- **Data Points:**
During testing, the RF Leakage shall be measured as specified in Intermediate and End-Point Electrical Measurements in the Detail Specification.

8.20 PERMANENCE OF MARKING

ESCC Basic Specification No. [24800](#).

8.21 SOLDERABILITY

Only applicable for components with coaxial connectors (integral or non-integral).

NOTE: Not required for components with SMT terminations that have already been subjected to Para. 8.13 Resistance to Soldering Heat.

[MIL-STD-202, Test Method 208](#). All solder terminals shall be tested.

8.22 TERMINAL STRENGTH

[MIL-STD-202, Test Method 211](#) or [MIL-STD-883, Test Method 2004](#) with appropriate Test Condition, as specified in the Detail Specification.

8.23 DESTRUCTIVE PHYSICAL ANALYSIS (DPA)

ESCC Basic Specification No. [21001](#).

9 DATA DOCUMENTATION

9.1 GENERAL

For the qualification, qualification maintenance and procurement for each lot, a data documentation package shall exist in a printed or electronic form.

This package shall be compiled from:

- (a) Cover sheet (or sheets).
- (b) List of equipment (testing and measuring).
- (c) List of test references.
- (d) Special In-Process Controls data (CHART F2).
- (e) Screening Tests data (CHART F3).
- (f) Qualification, Periodic Testing, and Lot Validation Testing (when applicable) data (CHART F4).
- (g) Failed components list and failure analysis report (when applicable).
- (h) Certificate of Conformity.

Items (a) to (h) inclusive shall be grouped, preferably as sub-packages and, for identification purposes, each page shall include the following information:

- ESCC Component Number.
- Manufacturer's name.
- Lot identification.
- Date of establishment of the document.
- Page number.

Whenever possible, documentation should preferably be available in electronic format suitable for reading using a compatible PC. The format supplied shall be legible, durable and indexed. The preferred storage medium is CD-ROM and the preferred file format is PDF.

9.1.1 Qualification and Qualification Maintenance

In the case of qualification or qualification maintenance, the items listed in Para. 9.1(a) to (h) are required.

9.1.2 Component Procurement and Delivery

For all deliveries of components procured to this specification, the following documentation shall be supplied:

- (a) Cover sheet (if all of the information is not included on the Certificate of Conformity).
- (b) Certificate of Conformity (including range of delivered serial numbers).

9.1.3 Additional Documentation

The Manufacturer shall deliver additional documentation containing data and reports to the Orderer, if stipulated in the Purchase Order.

9.1.4 Data Retention/Data Access

If not delivered, all data shall be retained by the Manufacturer for a minimum of 10 years during which time it shall be available for review, if requested, by the Orderer or the ESCC Executive (for qualified components).

9.2 COVER SHEET(S)

The cover sheet(s) of the data documentation package shall include as a minimum:

- (a) Reference to the Detail Specification, including issue and date.
- (b) Reference to the applicable ESCC Generic Specification, including issue and date.
- (c) ESCC Component Number and the Manufacturer's part type number.
- (d) Lot identification.
- (e) Range of delivered serial numbers.
- (f) Number of the Purchase Order.
- (g) Information relative to any additions to this specification and/or the Detail Specification.
- (h) Manufacturer's name and address.
- (i) Location of the manufacturing plant (specify place of assembly and test).
- (j) Signature on behalf of Manufacturer.
- (k) Total number of pages of the data package.

9.3 LIST OF EQUIPMENT USED

A list of equipment used for tests and measurements shall be prepared. Where applicable, this list shall contain inventory number, Manufacturer's type number, serial number, etc. This list shall indicate for which tests such equipment was used.

9.4 LIST OF TEST REFERENCES

This list shall include all Manufacturer's references or codes which are necessary to correlate the test data provided with the applicable tests specified in the tables of the Detail Specification.

9.5 SPECIAL IN-PROCESS CONTROLS DATA (CHART F2)

A test result summary shall be compiled showing the total number of components submitted to, and the total number rejected after each of the tests. For each test requiring electrical measurements the results shall be recorded against component serial number.

9.6 SCREENING TESTS DATA (CHART F3)

A test result summary shall be compiled showing the total number of components submitted to and the total number rejected after each of the tests. For each test requiring electrical measurements the results shall be recorded against component serial number. Component drift calculations shall be recorded for each specified test against component serial number.

9.7 QUALIFICATION, PERIODIC TESTING AND LOT VALIDATION TESTING DATA (CHART F4)

9.7.1 Qualification Testing

A test result summary shall be compiled showing the components submitted to, and the number rejected after each test in each subgroup. Component serial numbers for each subgroup shall be identified. For each test requiring electrical measurements, the results shall be recorded against component serial number. Where a drift value is specified during a test, the drift calculation shall be recorded against component serial number.

9.7.2 Periodic Testing for Qualification Maintenance

A test result summary shall be compiled showing the components submitted to and the number rejected after each test in each subgroup. Component serial numbers for each subgroup shall be identified. For each test requiring electrical measurements the results shall be recorded against component serial number. Where a drift value is specified during a test the drift calculation shall be recorded against component serial number. Measurement of leak rate during Seal Fine Leak testing shall be recorded against component serial number.

In addition to the full test data a report shall be compiled for each subgroup of CHART F4 to act as the most recent Periodic Testing summary. These reports shall include a list of all tests performed in each subgroup, the ESCC Component Numbers and quantities of components tested, a statement confirming all the results were satisfactory, the date the tests were performed and a reference to the full test data.

9.7.3 Lot Validation Testing

A test result summary shall be compiled showing the components submitted to and the number rejected after each test in each subgroup (as applicable). Component serial numbers for each subgroup shall be identified. For each test requiring electrical measurements the results shall be recorded against component serial number. Where a drift value is specified during a test the drift calculation shall be recorded against component serial number.

9.8 FAILED COMPONENTS LIST AND FAILURE ANALYSIS REPORT

The failed components list and failure analysis report shall provide full details of:

- (a) The reference and description of the test or measurement performed as defined in this specification and/or the Detail Specification during Special In-Process Controls, Screening Tests, and Qualification Periodic Testing and Lot Validation Testing.
- (b) Traceability information including serial number (if applicable) of the failed component.
- (c) The failed parameter and the failure mode of the component.
- (d) Detailed failure analysis (if requested by the ESCC Executive or Orderer).

9.9 CERTIFICATE OF CONFORMITY

A Certificate of Conformity shall be established in accordance with the requirements of ESCC Basic Specification Nos. [20100](#) or [25400](#).

10 **DELIVERY**

For procurement, for each order, the items forming the delivery are:

- (a) The delivery lot.
- (b) The components used for Lot Validation Testing (as applicable), but not forming part of the delivery lot, if stipulated in the Purchase Order.
- (c) The relevant documentation in accordance with the requirements of Paras. 9.1.2 and 9.1.3.

In the case of a component for which a valid qualification is in force, all data of all components submitted to Lot Validation Testing shall also be copied, when requested, to the ESCC Executive.

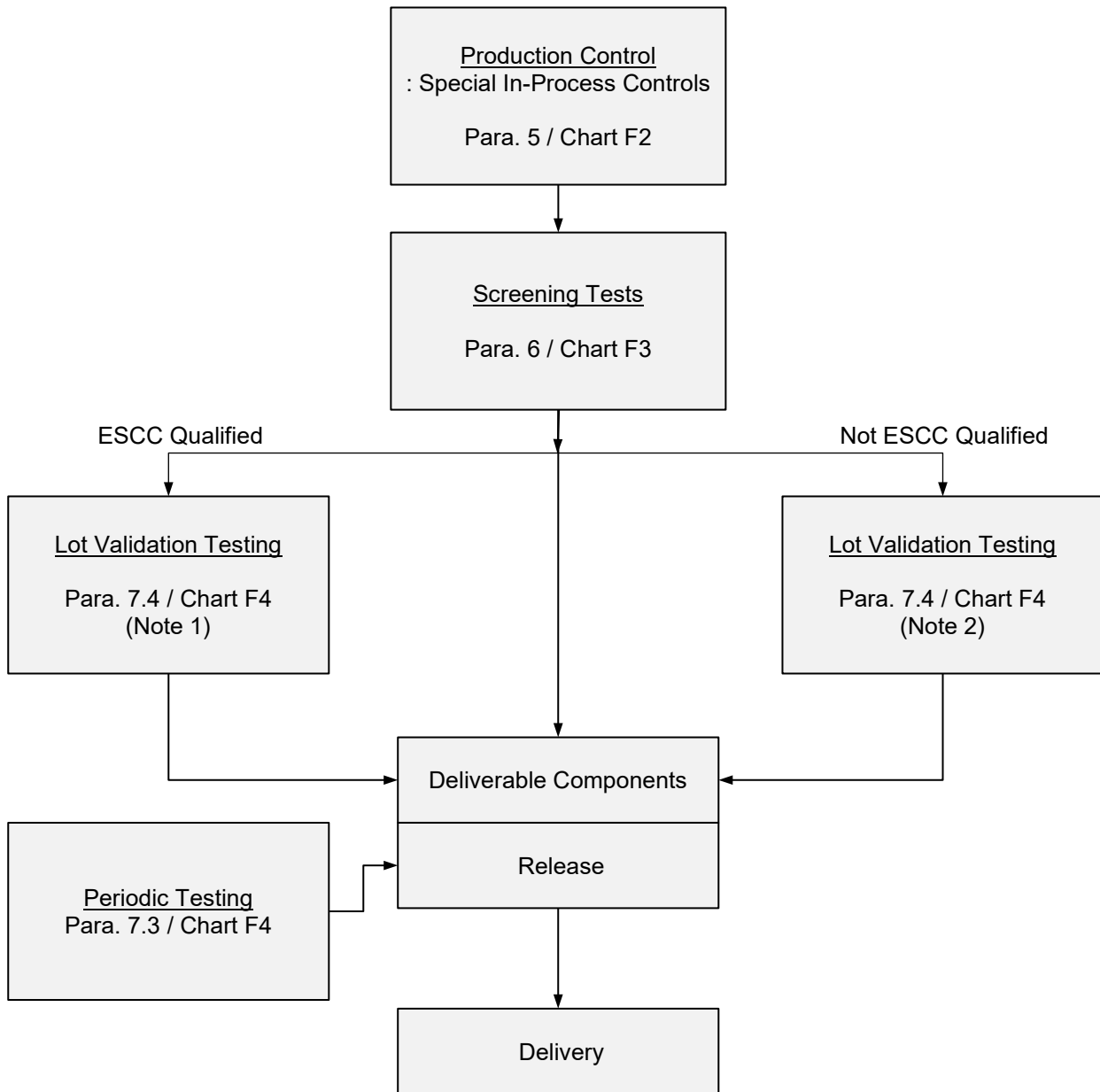
For qualification or qualification maintenance, the disposition of the Qualification Test Lot and its related documentation shall be as specified in ESCC Basic Specification Nos. [20100](#) or [25400](#) and the relevant paragraphs of Section 9 of this specification.

11 **PACKAGING AND DISPATCH**

The packaging and dispatch of components to this specification shall be in accordance with the requirements of ESCC Basic Specification No. [20600](#).

12 CHARTS

12.1 CHART F1 - GENERAL FLOW FOR PROCUREMENT



NOTES:

1. Lot Validation Testing is not required for qualified components unless specifically stipulated in the Purchase Order.
2. For unqualified components, the need for Lot Validation Testing shall be determined by the Orderer and the required testing shall be as stipulated in the Purchase Order (ref. ESCC Basic Specification No. [23100](#)).

12.2 CHART F2 - PRODUCTION CONTROL

COMPONENT LOT MANUFACTURING	
SPECIAL IN-PROCESS CONTROLS	
Para. 5.2.1	Contact Engagement and Separation Forces (1) (2) (3)
Para. 5.2.2	Internal Visual Inspection
-	Assembly/Encapsulation
-	Serialisation
Para. 5.2.3	Run-in
Para. 5.2.4	Room Temperature Electrical Measurements
Para. 5.2.5	External Visual Inspection
Para. 5.2.6	Dimension Check (1)
Para. 5.2.7	Weight (4)
TO CHART F3 – SCREENING TESTS	

NOTES:

1. Performed on a sample basis.
2. Test may be performed at any point prior to Pre-Assembly Inspection.
3. Only applicable to components with integral coaxial connectors with female contacts.
4. Guaranteed but not tested.

12.3 CHART F3 - SCREENING TESTS

COMPONENTS FROM PRODUCTION CONTROL	
Para. 8.4.3	Parameter Drift Values (1)
Para. 8.7.1.1	Random Vibration
Para. 8.8	Thermal Cycling
Para. 8.4.3	Parameter Drift Values (2)
Para. 8.9	Coupling Proof Torque (3)
Para. 8.10	Mating and Unmating Forces (4)
Para. 8.6.1	Connector Interface Dimensions Check (3)
Para. 8.3	Run-in
Para. 8.4.3	Parameter Drift Values (2)
Para. 8.4.3	Parameter Drift Values (Final Measurements) (2) (5)
Para. 8.4.4	High and Low Temperatures Electrical Measurements (2)
Para. 8.4.2	Room Temperature Electrical Measurements (2) (6)
Para. 8.11	Multipaction (4) (7)
Para. 6.4.1	Check for Lot Failure (8)
Para. 8.12	Seal (Fine and Gross Leak) (9)
Para. 8.5	External Visual Inspection
TO CHART F4 WHEN APPLICABLE	

NOTES:

1. Electrical measurements from CHART F2 may be used.
2. The lot failure criteria of Para. 6.4.1 apply to this test.
3. Only applicable to components with integral coaxial connectors.
4. Only applicable to components with coaxial connectors (integral or non-integral).
5. May be performed during Room Temperature Electrical Measurements.
6. Measurements of Parameter Drift Values need not be repeated in Room Temperature Electrical Measurements.
7. Only for high power components and if specified in the Detail Specification. No failures are permitted.
8. Check for Lot Failure shall take into account all electrical parameter failures that may occur during Screening Tests in accordance with Paras. 8.4.2, 8.4.3 and 8.4.4.
9. Only applicable to components with Hermetic Packages.

12.4 CHART F4 – QUALIFICATION, PERIODIC TESTING AND LOT VALIDATION TESTING

Environmental / Mechanical / Endurance Subgroup 24 Months Period	
3 Components (1) (2)	
Para. 8.10	Mating and Unmating Forces (3)
Para. 8.13	Resistance to Soldering Heat (4)
Para. 8.12	Seal (Fine and Gross Leak) (5)
Para. 8.4.6	Electrical Measurements at Room Temperature (initial)
Para. 8.7.2	Vibration Scan (initial)
Para. 8.7.3	Sine Vibration
Para. 8.7.1.2	Random Vibration
Para. 8.14	Mechanical Shock
Para. 8.7.2	Vibration Scan (final)
Para. 8.15	Thermal Endurance (or Thermal Vacuum) (6)
Para. 8.16	Operating Life
Para. 8.17	Connector Endurance (7)
Para. 8.18	Power Handling (8)
Para. 8.11	Multipaction (8)
Para. 8.19	Electromagnetic Compatibility
Para. 8.4.7	Electrical Measurements at High and Low Temperatures
Para. 8.4.6	Electrical Measurements at Room Temperature (final)
Para. 8.5	External Visual Inspection
Para. 8.20	Permanence of Marking (9)
Para. 8.21	Solderability (3)
Para. 8.22	Terminal Strength (9)
Para. 8.23	Destructive Physical Analysis (9) (10)

NOTES:

1. For distribution within the subgroups, see Para. 7.1.2 for qualification and qualification maintenance and Para. 7.4 for Lot Validation Testing.
2. No failures are permitted.
3. Only applicable to components with coaxial connectors (integral or non-integral).
4. Only applicable to components with SMT terminations.
5. Only applicable to components with Hermetic Packages.

6. This test shall only be performed under vacuum for high power components and if specified in the Detail Specification; otherwise, Thermal Endurance shall be performed at room ambient pressure.
7. Only applicable to components with integral coaxial connectors.
8. Only for high power components and if specified in the Detail Specification.
9. Test performed on only 1 of the 3 components.
10. Not required for Periodic Testing for extension of qualification. Required only for Qualification Testing and for Periodic Testing for renewal of qualification after lapse.