SWITCHES, THERMOSTATIC, BIMETALLIC, HERMETICALLY SEALED

ESCC Generic Specification No. 3702

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DOCUMENTATION CHANGE NOTICE

(Refer to https://escies.org for ESCC DCR content)

DCR No.	CHANGE DESCRIPTION
1120	Specification up issued to incorporate changes per DCR.

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1 INTRODUCTION

1.1 SCOPE

This specification defines the general requirements for the qualification, qualification maintenance, procurement, and delivery of hermetically sealed, bimetallic, thermostatic switches, for space applications. This specification contains the appropriate inspection and test schedules and also specifies the data documentation requirements.

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:

- Qualification of Standard Components per ESCC Basic Specification No. 20100.
- 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. 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

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

- IEC Publication No. 60068 Part 2, Basic Environmental Testing Procedures.

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:

- **Switch with Opening Contact**: a component where the switch contact will open when the temperature rises to a value equal to or greater than the upper of the two switching temperatures; the switch contact will close when the temperature falls to a value equal to or less than the lower of the two switching temperatures.
- **Switch with Closing Contact**: a component where the switch contact will close when the temperature rises to a value equal to or greater than the upper of the two switching temperatures; the switch contact will open when the temperature falls to a value equal to or less than the lower of the two switching temperatures.
- **TF**, functioning temperature: the average value of the actual upper switching temperature measurements, for a particular component, as per Para. 8.2.1.4.
- **TR**, restoring temperature: the average value of the actual lower switching temperature measurements, for a particular component, as per Para. 8.2.1.4.
- **TNF**, nominal functioning temperature: the specified nominal upper switching temperature at which a switch with opening contact should open or a switch with closing contact should close.

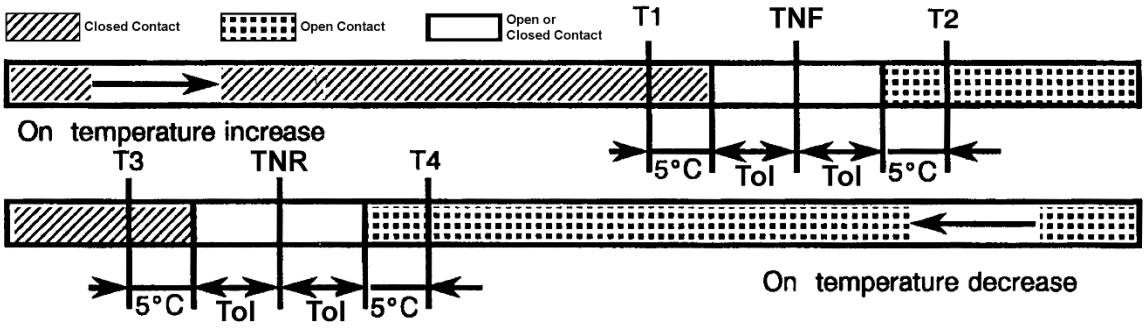
- **TNR**, nominal restoring temperature: the specified nominal lower switching temperature at which a switch with opening contact should close or a switch with closing contact should open.
- **Nom Diff**, nominal temperature differential: the specified difference between the nominal functioning temperature and nominal restoring temperature ($= \mathrm{TNF} - \mathrm{TNR}$).
- **Act Diff**, actual temperature differential: The difference between the functioning temperature and the restoring temperature, for a particular component ($= \mathrm{TF} - \mathrm{TR}$).
- **Tol,** switching temperature tolerance: the specified temperature tolerance of both the upper switching temperature relative to the nominal functional temperature (TNF) and the lower switching temperature relative to the nominal restoring temperature (TNR).

When specified herein, the following test temperature definitions shall apply:

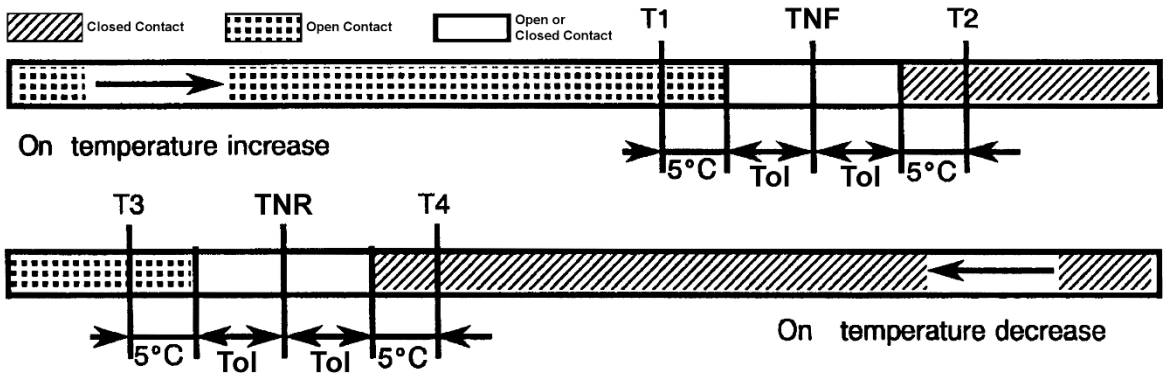
- $\mathrm{T1} = \mathrm{TNF} - \mathrm{Tol} - 5°\mathrm{C}$
- $\mathrm{T2} = \mathrm{TNF} + \mathrm{Tol} + 5°\mathrm{C}$
- $\mathrm{T3} = \mathrm{TNR} - \mathrm{Tol} - 5°\mathrm{C}$
- $\mathrm{T4} = \mathrm{TNR} + \mathrm{Tol} + 5°\mathrm{C}$

i.e.:

For a Switch with Opening Contact:



For a Switch with Closing Contact:



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 encapsulation (e.g. perform 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 prior to delivery at an appropriate point during testing that has been agreed with the Manufacturer (e.g. witness of final Thermal and/or 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.

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.

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 and 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 Internal Visual Inspection
Internal Visual Inspection shall be performed in accordance with Para. 8.1.

5.2.2 Thermal Measurements
Thermal Measurements shall be performed in accordance with Para. 8.2.2.

5.2.3 External Visual Inspection and Dimension Check
External Visual Inspection is optional at the Manufacturer's discretion.

External Visual Inspection shall be performed in accordance with Para. 8.7.

Dimension Check shall be performed in accordance with Para. 8.7 on 3 samples. In the event of any failure a 100% Dimension Check shall be performed.

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

5.2.5 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. Creepage, Seal, External Visual Inspection.

6.2.2 Parameter Drift Failure
The acceptable change limits are shown in Parameter Drift Values in the Detail Specification. A component shall be counted as a parameter drift failure if the changes 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 Thermal Measurements and 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 Para. 6.2, excluding Seal failures, exceeds 10% (rounded upwards to the nearest whole number) or 2 components, whichever is greater, of the components submitted to Rapid Change of Temperature of 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.

6.4.2 Lot Failure during Sample Testing

A lot shall be considered as failed if the number of allowable failures during sample testing as specified in the Detail Specification, is exceeded.

Unless otherwise specified, if a lot failure occurs, a 100% testing may be performed but the cumulative percent defective shall not exceed that specified in Para. 6.4.1.

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 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 components so selected that they adequately represent all of the various mechanical, structural, electrical and thermal peculiarities of that range or series.

In addition, the Qualification Test Lot components shall be selected in accordance with the following provisions:

- 1/3 of the selected components shall have the lowest specified TNF temperature.
- 1/3 of the selected components shall have a mid-range TNF temperature.
- 1/3 of the selected components shall have the highest specified TNF temperature.
- The selected components with the lowest and highest TNF temperatures shall have the narrowest specified nominal temperature differential, Nom Diff, and the narrowest actual temperature differential limits, Act Diff, as specified in the Detail Specification.

The Qualification Test Lot components may be specified by, but in any case shall be agreed with, the ESCC Executive, prior to the commencement of qualification testing and the justification for the selection shall be declared in the qualification test report.

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, unless otherwise specified, the test requirements of Para. 7.1 shall apply.

The samples to be subjected to Periodic Testing shall be so selected that they adequately represent all of the various mechanical, structural, electrical and thermal peculiarities of the specified range or series. The sample selection may be specified by, but in any case shall be agreed with, the ESCC Executive, prior to the commencement of Periodic Testing.

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, Periodic Testing 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, Solderability, Robustness of Terminations, External Visual Inspection, etc.

7.5.2 Thermal or 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 Thermal and 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 Testing and Periodic Testing, 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 INTERNAL VISUAL INSPECTION

ESCC Basic Specification No. 20400.

8.2 THERMAL AND ELECTRICAL MEASUREMENTS

8.2.1 General

Unless otherwise specified in the Detail Specification, the following Thermal and Electrical measurements and methods apply.

8.2.1.1 Voltage Proof

Unless otherwise specified, Voltage Proof shall be tested with the following details:

(a) Voltage Proof Between Terminals

- Applied voltage: 50Hz AC test voltage as specified in the Detail Specification shall be progressively applied between all terminals.
- Test temperature:
  - For Switch with Opening Contact: $T \geq T2$
  - For Switch with Closing Contact: $T \leq T3$
- Duration:
  - During Screening Tests (Chart F3): after 5 minutes minimum at thermal equilibrium at the test temperature, the test voltage shall be applied for 5s minimum.
  - During Qualification, Periodic Testing and Lot Validation Testing (Chart F4): after 5 minutes minimum at thermal equilibrium at the test temperature, the test voltage shall be applied for 60s minimum.

(b) Voltage Proof Between Terminals and Case
Not applicable to components with terminals connected to the case.

- Applied voltage: 50Hz AC test voltage as specified in the Detail Specification shall be progressively applied between all terminals connected together and all other exposed metal parts of the case.
- Test temperature:
  - o For Switch with Opening Contact: T ≥ T2
  - o For Switch with Closing Contact: T ≤ T3
- Duration:
  - o During Screening Tests (Chart F3): after 5 minutes minimum at thermal equilibrium at the test temperature, the test voltage shall be applied for 5s minimum.
  - o During Qualification, Periodic Testing and Lot Validation Testing (Chart F4): after 5 minutes minimum at thermal equilibrium at the test temperature, the test voltage shall be applied for 60s minimum.

- Data Points
  During testing, the component shall be inspected and there shall be no breakdown or flashover. When the test voltage is applied, the current shall be monitored and shall not exceed 500µA.

8.2.1.2 Insulation Resistance
Unless otherwise specified, the measured Insulation Resistance shall be ≥ 500MΩ, which shall be measured with the following details:

(a) Insulation Resistance Between Terminals
- Applied voltage: DC test voltage as specified in the Detail Specification (≤ Rated Voltage) shall be progressively applied between all terminals.
- Test temperature:
  - o For Switch with Opening Contact: T ≥ T2
  - o For Switch with Closing Contact: T ≤ T3
- Duration:
  - o During Screening Tests (Chart F3): after 5 minutes minimum at thermal equilibrium at the test temperature, the test voltage shall be applied for 5s minimum.
  - o During Qualification, Periodic Testing and Lot Validation Testing (Chart F4): after 5 minutes minimum at thermal equilibrium at the test temperature, the test voltage shall be applied for 60s minimum.

(b) Insulation Resistance Between Terminals and Case
Not applicable to components with terminals connected to the case.

- Applied voltage: DC test voltage as specified in the Detail Specification (≤ Rated Voltage) shall be progressively applied between all terminals connected together and all other exposed metal parts of the case.
- Test temperature:
  - o For Switch with Opening Contact: T ≥ T2
  - o For Switch with Closing Contact: T ≤ T3
- Duration:
  - o During Screening Tests (Chart F3): after 5 minutes minimum at thermal equilibrium at the test temperature, the test voltage shall be applied for 5s minimum.
  - o During Qualification, Periodic Testing and Lot Validation Testing (Chart F4): after 5 minutes minimum at thermal equilibrium at the test temperature, the test voltage shall be applied for 60s minimum.

8.2.1.3 Contact Resistance

Unless otherwise specified, Contact Resistance shall be measured with the following details:

- Applied voltage: either 20mV peak AC with f ≤ 50kHz in which case a single measurement shall be made, or ≤ 6V DC with current limited to 100mA maximum in which case one measurement in each direction shall be made and the reading shall be the average of the 2 measurements. No load shall be applied to the contacts during contact transfer.
- Test temperature:
  - For Switch with Opening Contact: T ≤ T3
  - For Switch with Closing Contact: T ≥ T2

8.2.1.4 Functioning Temperature and Restoring Temperature

Unless otherwise specified, functioning temperature, TF, and restoring temperature, TR, shall be determined as follows:

- Test circuit: the component shall be connected to an individual series-connected filament pilot light. When a contact is closed, the current shall be ≤ 60mA (DC or AC).
- Mounting: the component shall be mounted on an appropriate thermally conductive metal block(s), or in a thermal chamber.
- Test sequence: the components shall be subjected to 3 temperature cycles as follows:
  i. Maintain components at T3 for 3 minutes.
  ii. Increase temperature to T2. Record the temperature as the contact switches. The component shall be maintained at T2 for 3 minutes.
  iii. Reduce temperature to T3. Record the temperature as the contact switches back. The component shall be maintained at T3 for 3 minutes.
  iv. Repeat ii and iii for a total of 3 cycles.

- Data Points

  During each temperature cycle, the following requirements shall apply:
  a) Measured upper switching temperature – TNF ≤ Tol
  b) Measured lower switching temperature – TNR ≤ Tol

  On completion of testing, the following requirements shall apply:
  c) TF and TR shall be be calculated as the average of the 3 upper switching temperature measurements and the 3 lower switching temperature measurements, respectively.
  d) Repeatability for both functioning and restoring temperature shall be < 1°C, where repeatability is defined as follows:
     - For functioning temperature, repeatability is the difference between TF and each of the 3 upper switching temperature measurements used to calculate it.
     - For restoring temperature, repeatability is the difference between TR and each of the 3 lower switching temperature measurements used to calculate it.

8.2.2 Thermal Measurements (during Special In-Process Controls and Screening Tests)

At each of the relevant data points during Special In-Process Controls (Chart F2) and Screening Tests (Chart F3), Thermal Measurements shall be performed as specified in the Detail Specification. All values obtained shall be recorded against serial numbers.

8.2.3 Electrical Measurements (during Screening Tests)

At each of the relevant data points during Screening Tests (Chart F3), Electrical Measurements shall be performed as specified in the Detail Specification. All values obtained shall be recorded against serial numbers.

8.2.4 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.

8.2.5 Intermediate and End-Point Thermal and Electrical Measurements

At each of the relevant data points during Qualification, Periodic Testing and Lot Validation Testing (Chart F4), Intermediate and End-Point Thermal and 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.

8.2.6 Thermal and Electrical Measurements (during Qualification, Periodic Testing and Lot Validation Testing)

At each of the relevant data points during Qualification, Periodic Testing and Lot Validation Testing (Chart F4), Thermal and Electrical Measurements shall be performed as specified in Intermediate and End Point Thermal and Electrical Measurements in the Detail Specification. All values obtained shall be recorded against serial numbers and the parameter drift calculated, if specified, referred to the initial measurements for the same subgroup.

8.3 RAPID CHANGE OF TEMPERATURE

8.3.1 During Screening Tests (Chart F3)

Components shall be subjected to Test Na of IEC Publication No. 60068-2-14.

Unless otherwise specified, the following details shall apply:

- Test Conditions:
  (a) Low temperature: minimum storage temperature rating as specified in the Detail Specification.
  (b) High temperature: maximum storage temperature rating as specified in the Detail Specification.
  (c) Number of cycles: 5
  (d) Exposure time (each cycle, each temperature): 30 minutes
  (e) Recovery period after test: 1 to 2 hours.

8.3.2 During Qualification, Periodic Testing and Lot Validation Testing (Chart F4)
Components shall be subjected to Test Na of IEC Publication No. 60068-2-14.

Unless otherwise specified, the following details shall apply:

- Test Conditions:
  (a) Low temperature: minimum storage temperature rating as specified in the Detail Specification.
  (b) High temperature: maximum storage temperature rating as specified in the Detail Specification.
  (c) Number of cycles: 10
  (d) Exposure time (each cycle, each temperature): 30 minutes

- Data Points:
  Prior to the test, functioning temperature, TF, and restoring temperature, TR, shall be measured as specified in Intermediate and End-Point Thermal and Electrical Measurements in the Detail Specification. Final measurements from Thermal Measurements in Chart F3 may be used as initial measurements.

  On completion of testing and after a recovery period of 1 to 2 hours, the components shall be visually examined and there shall be no evidence of damage.

8.4 RUN-IN
Unless otherwise specified, the following details shall apply:

- Test circuit: the component shall be connected to an individual series-connected filament pilot light. When a contact is closed, the current shall be ≤ 60mA (DC or AC).
- Mounting: the component shall be mounted on an appropriate thermally conductive metal block, or in a thermal chamber.
- Test sequence: the components shall be subjected to 500 $T3 \rightarrow T2 \rightarrow T3$ temperature cycles.

- Data Points
  During each temperature cycle, the component shall be monitored for correct switching of contacts.

8.5 CREEPAGE

For components with snap action switching.

Creepage is defined as the time-gap between the mechanical action of the switch snap and the resulting electrical action.

Unless otherwise specified, the following details shall apply:

- Test circuit: the component shall be connected to an individual series-connected filament lamp via a 6V power supply and series resistor. When a contact is closed, the current shall be ≤ 100mA. The test equipment shall include a milliammeter with a microphone, amplifier and loudspeaker to monitor the audible snap of the contacts, and an undamped ohmmeter.
- Mounting: the component shall be mounted on an appropriate thermally conductive metal block(s), or in a thermal chamber.
- Test sequence: the components shall be subjected to 3 temperature cycles as follows:

  i. Maintain components at T1 for 3 minutes.
  ii. Increase temperature to T2. Check for Creepage as the contact switches.
  iii. Reduce temperature to T4 and maintain the component at T4 for 3 minutes.
  iv. Reduce temperature to T3. Check for Creepage as the contact switches.
  v. Repeat i, ii, iii and iv for a total of 3 cycles.

- Data Points

  During testing, there shall be no Creepage; the opening and closing of the switch contacts shall occur simultaneously with and as a results of the switch snap. The following requirements shall apply at each contact switching during temperature cycling:

  a) The lamp: the lamp shall light or extinguish instantly without hesitation.
  b) The ohmmeter: the needle shall actuate instantly, without hesitation or interrupted action.
  c) The loudspeaker and milliammeter equipment: the audible snap of the switch shall occur simultaneously with the actuation of the meter, and the meter needle shall actuate instantly, without hesitation or interruption of its swing.

8.6 SEAL (FINE AND GROSS LEAK)

Components shall be subjected to a seal (fine and gross leak) test in accordance with with IEC Publication No. 60068-02-17.

Unless otherwise specified, the following details shall apply:

- Test Conditions:

  (a) Fine leak: Test Qk, sealing tracer gas method with mass spectrometer:
  - Test method 1
  - Tracer gas: Helium with purity ≥ 90%
  - Severity: 1000 hours
  - Maximum immersion pressure: 300kPa

  (b) Gross leak: Test Qc, container sealing, gas leakage:
  - Test method 2
  - Test liquid temperature: +125 ±5°C. Recommended liquid: fluorocarbon liquid FC40 or FC43.

8.7 EXTERNAL VISUAL INSPECTION AND DIMENSION CHECK

External Visual Inspection shall be performed in accordance with ESCC Basic Specification No. 20500.

Dimension Check shall be performed in accordance with ESCC Basic Specification No. 20500.

8.8 VIBRATION

Components shall be subjected to Test Fc of IEC Publication No. 60068-2-6.

Unless otherwise specified, the following details shall apply:

- Test Conditions:
  (a) Temperature: 50% of the components at T ≥ T2; remaining 50% at T ≤ T3.
  (b) Frequency Range: 10Hz to 3000Hz, by sweeping.
  (c) Amplitude:
    - 10Hz to 2000Hz: 1.5mm or 500m/s^2 (50g) whichever is the less severe.
    - 2000Hz to 3000Hz: 300m/s^2 (30g)
  (d) Duration: 1 hour minimum in each of the three mutually perpendicular axes chosen so that faults are likely to be revealed.

- Data Points
  During testing, the contacts, loaded with 28Vdc open circuit voltage and ≤ 60mAdc closed circuit current, shall be monitored to determine intermittent contacts of ≥ 1ms, or improper open or short circuit.

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

8.9 MECHANICAL SHOCK

Components shall be subjected to Test Ea of IEC Publication No. 60068-2-27.

Unless otherwise specified, the following details shall apply:

- Test Conditions
  (a) Temperature: 50% of the components at T ≥ T2; remaining 50% at T ≤ T3.
  (b) Pulse shape: half-sine.
  (c) Peak acceleration: 5000m/s^2 (500g).
  (d) Pulse duration: 1ms.
  (e) Shock application: 3 in each direction of the three mutually perpendicular axes chosen so that faults are likely to be revealed (18 total).

- Data Points
  During testing, the contacts, loaded with 28Vdc open circuit voltage and ≤ 60mAdc closed circuit current, shall be monitored to determine intermittent contacts of ≥ 1ms, or improper open or short circuit.

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

8.10 RESISTANCE TO SOLDERING HEAT

Components shall be subjected to Test Tb of IEC Publication No. 60068-2-20.

Unless otherwise specified, the following details shall apply:

- Test Conditions:
  (a) Test method: 1A (solder bath at +260 ±5°C) or 2 (soldering iron size A or B at +350 ±10°C)
  (b) Immersion depth/test area distance: minimum soldering distance as specified in the Detail Specification.
  (c) Immersion time (test method 1A): maximum soldering time as specified in the Detail Specification.

- Data Points:
  Prior to the test, functioning temperature, TF, and restoring temperature, TR, shall be measured as specified in Intermediate and End-Point Thermal and Electrical Measurements in the Detail Specification. Final measurements from Thermal Measurements in Chart F3 may be used as initial measurements.

  On completion of testing and after a recovery period of 30 minutes minimum, the components shall be visually examined and there shall be no evidence of damage (including cracked glass seals around terminals), and the marking shall be legible.

8.11 DAMP HEAT, STEADY STATE

Components shall be subjected to Test Cab of IEC Publication No. 60068-2-78.

Unless otherwise specified, the following details shall apply:

- Test Conditions
  (a) Temperature: +40 ±2°C.
  (b) Relative humidity: 93 ±3%.
  (c) Duration: 10 days.
  (d) Operating condition: No load.

- Data Points
  On completion of testing and after a recovery period of 1 to 2 hours, the components shall be visually examined and there shall be no evidence of damage.

8.12 RESPONSE TIME

Unless otherwise specified, Response Time, trp, shall be verified using three temperature controlled, thermally conductive metal blocks B0, B1 and B2. Each block shall have a minimum volume of 250cm^3 (e.g. a metal plate of dimensions 10 x 10 x 2.5cm). Block B2 shall be suitable for fast mounting of the component and feature an accurate timer to measure the duration of thermal contact with the component under test.

The blocks shall be maintained at the following temperatures:

- B0: Temperature = T3 -10 (+0 -5)°C
- B1: Temperature = TF -10 ±3°C
- B2: Temperature = TF +10 (+5 -0)°C

Where:

o TF = the functioning temperature of the individual component under test as measured at the beginning of the test.

The following test steps shall apply:

(a) Functioning temperature, TF, of the component under test shall be measured as specified in Intermediate and End-Point Thermal and Electrical Measurements in the Detail Specification. The final measurement from Thermal Measurements in Chart F3 may be used as the initial measurement.

(b) Mount the component under test on block B0 for 1 minute minimum so that the component drops below its lower switching temperature.

(c) Mount the component under test on block B1 for 10 minutes.

(d) Mount the component under test on block B2. The time taken for the component under test to switch shall be measured from the precise moment the component comes in contact with the block. This Response Time (trp) shall meet the limit specified in the Detail Specification.

(e) Once the component has switched, the component shall be mounted on block B0 for 1 minute minimum so the the component drops below its lower switching temperature.

(f) Repeat steps (c), (d) and (e) for a total of 3 cycles.

8.13 OPERATING LIFE

Unless otherwise specified, the following details shall apply:

- Test circuit: the contacts shall be resistive loaded with Rated Current (and associated maximum voltage) as specified in Maximum Ratings in the Detail Specification.
- Mounting: the component shall be mounted on an appropriate thermally conductive metal block, or in a thermal chamber.
- Test sequence: the components shall be subjected to 100000 $T_{low} \rightarrow T_{high} \rightarrow T_{low}$ temperature cycles at a maximum rate of 6 cycles/minute, where:
  - $T_{low} \leq T3$
  - $T_{high} \geq T2$
- Data Points

  Prior to the test, measurements as specified in Intermediate and End-Point Thermal and Electrical Measurements in the Detail Specification shall be performed. Final measurements from Thermal Measurements and Electrical Measurements in Chart F3 may be used as initial measurements.

  During each temperature cycle, the component shall be monitored for correct switching of contacts. During switch closure, the voltage shall be monitored for at least 50% of the closure period.

  During and on completion of testing, after 25000, 50000 and 100000 cycles, after a recovery period of 1 to 2 hours, the components shall be visually examined and there shall be no evidence of damage. Measurements as specified in Intermediate and End-Point Thermal and Electrical Measurements in the Detail Specification shall be performed. When specified, parameter drift shall be related to the initial measurements.

8.14 OVERLOAD

Unless otherwise specified, the following details shall apply:

- Test circuit: the contacts shall be resistive loaded with Overload Current (and associated maximum voltage) as specified in Maximum Ratings in the Detail Specification (≥ 1.5 x Rated Current).
- Mounting: the component shall be mounted on an appropriate thermally conductive metal block, or in a thermal chamber.
- Test sequence: the components shall be subjected to 50 $T_{low} \rightarrow T_{high} \rightarrow T_{low}$ Temperature cycles at a maximum rate of 6 cycles/minute, where:
  - $T_{low} \leq T3$
  - $T_{high} \geq T2$
- Data Points

  Prior to the test, measurements as specified in Intermediate and End-Point Thermal and Electrical Measurements in the Detail Specification shall be performed. Final measurements from Thermal Measurements and Electrical Measurements in Chart F3 may be used as initial measurements

  On completion of testing and after a recovery period of 1 to 2 hours, the components shall be visually examined and there shall be no evidence of damage.

8.15 HIGH AND LOW TEMPERATURE STORAGE

Components shall be subjected to high temperature storage followed by low temperature storage as follows:

(a) High Temperature Storage:
Components shall be subjected to Test Ba of IEC Publication No. 60068-2-2.

Unless otherwise specified, the following details shall apply:

- Test Conditions:
  (a) Test temperature: maximum storage temperature rating as specified in the Detail Specification.
  (b) Duration: 1000 hours.
  (c) Operating condition: No load.

On completion of testing, the components shall be subjected to standard atmospheric conditions for recovery, for 1 to 2 hours before being subjected to Low Temperature Storage.

(b) Low Temperature Storage:
Components shall be subjected to Test Aa of IEC Publication No. 60068-2-1.

Unless otherwise specified, the following details shall apply:

- Test Conditions:
  (a) Test temperature: minimum storage temperature rating as specified in the Detail Specification.
  (b) Duration: 1000 hours.
  (c) Operating condition: No load.

- Data Points:
  Prior to the tests, measurements as specified in Intermediate and End-Point Thermal and Electrical Measurements in the Detail Specification shall be performed. Final measurements from Thermal Measurements and Electrical Measurements in Chart F3 may be used as initial measurements.

  On completion of testing and after a recovery period of 1 to 2 hours, the components shall be visually examined and there shall be no evidence of damage.

8.16 SOLDERABILITY

The components shall be subjected to Test Ta of IEC Publication No. 60068-2-20.

Unless otherwise specified, the following details shall apply:

- Test Conditions:
  (a) Test method: 1 (solder bath at +235 ±5°C) or 2 (soldering iron size A or B at +350 ±10°C)
  (b) Immersion depth/test area distance: minimum soldering distance as specified in the Detail Specification.

- Final Inspection:
  On completion of testing, the components shall be visually examined. There shall be no evidence of damage (including cracked glass seals around terminals), and the marking shall be legible.

8.17 PERMANENCE OF MARKING
ESCC Basic Specification No. 24800.

8.18 ROBUSTNESS OF TERMINATIONS
Components shall be subjected to tests Ua_1 (tensile), Ub (bending) and/or Ud (torque) of IEC Publication No. 60068-2-21 as applicable and as specified in the Detail Specification. Test Ub shall not be performed if the Detail Specification describes the terminals as rigid.

Unless otherwise specified, the following details shall apply:

- Test Conditions: as specified in the Detail Specification.

- Data Points:
  On completion of testing, the components shall be visually examined. There shall be no evidence of damage to, or loosening or breaking of the terminals.

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 5 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.
(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 thermal 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 thermal or 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 thermal or 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 thermal or 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.

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 thermal or 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.

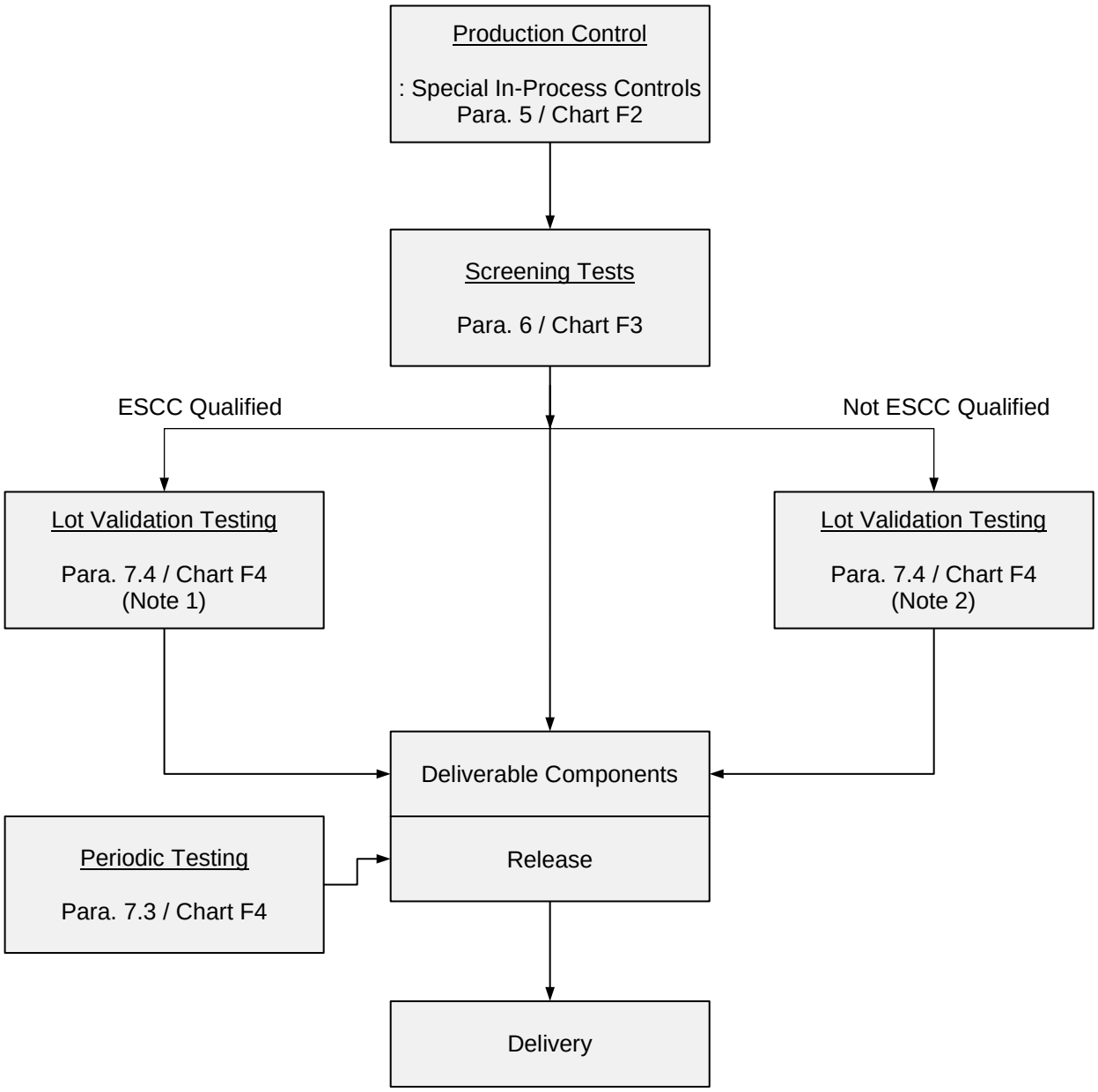
For qualification or qualification maintenance, the disposition of the Qualification Test Lot and its related documentation shall be as specified in ESCC Basic Specification No. 20100 or 25400 and the relevant paragraphs of Section 9 of this specification.

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 OF 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	Internal Visual Inspection
-	Encapsulation
Para. 5.1	Serialisation
Para. 5.2.2	Thermal Measurements
Para. 5.2.3	External Visual Inspection (1) and Dimension Check (2)
Para. 5.2.4	Weight (3)
TO CHART F3 – SCREENING TESTS	

NOTES:
1. Optional at the Manufacturer's discretion.
2. Performed on a sample basis.
3. Guaranteed but not tested.

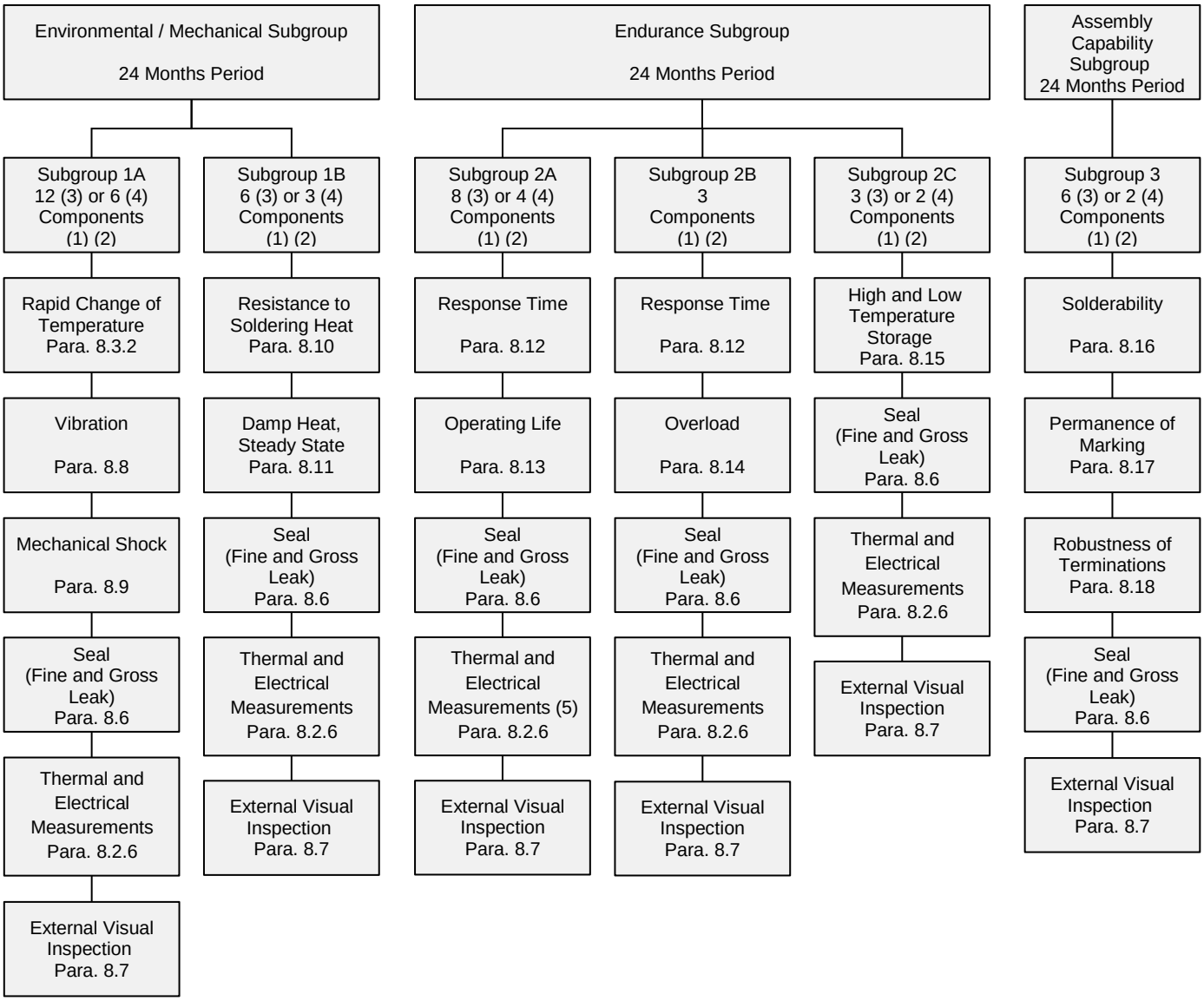
12.3 CHART F3 – SCREENING TESTS

COMPONENTS FROM PRODUCTION CONTROL	
Para. 8.2.4	Parameter Drift Values (Initial Measurements) (1)
Para. 8.3.1	Rapid Change of Temperature (2)
Para. 8.4	Run-in (2)
Para. 8.2.4	Parameter Drift Values (Final Measurements) (2)
Para. 8.2.2	Thermal Measurements (2) (3)
Para. 8.5	Creepage (2)
Para. 8.2.3	Electrical Measurements (2) (3)
Para. 8.6	Seal (Fine and Gross Leak) (4)
Para. 8.7	External Visual Inspection (2)
Para. 6.4	Check for Lot Failure (4)
TO CHART F4 WHEN APPLICABLE	

NOTES:

1. Thermal Measurements, from Chart F2, Para. 5.2.2 prior to this test, may be used for initial Parameter Drift Values (if available).
2. The lot failure criteria of Para. 6.4 apply to this test.
3. Measurements of Parameter Drift Values need not be repeated in Thermal Measurements and Electrical Measurements.
4. Check for Lot Failure shall take into account all failures that may occur during Screening Tests subsequent to initial measurements of Parameter Drift Values except for Seal failures which shall not count for lot failure.

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



NOTES:

1. For distribution within the subgroups, see Para. 7.1.2 for Qualification Testing, Para. 7.3 for Periodic Testing, and Para. 7.4 for Lot Validation Testing.
2. No failures are permitted.
3. Applicable to Qualification Testing, and to Periodic Testing for renewal of qualification after lapse.
4. Applicable to Periodic Testing for extension of qualification.
5. Optional at the Manufacturer's discretion.