



## DOCUMENT CHANGE REQUEST

DCR number 673 Changes required for: General

Date: 2013/12/05

Date sent: 2011/08/02

Originator: Steve Thacker

Organisation: ESCC Executive  
Secretariat

Status: IMPLEMENTED

Title: Generic Specification for Relays Electromagnetic Latching

Number: 3602 Issue: 2

Other documents affected:

Page:

all pages

Paragraph:

all paras

Original wording:

Total reformat/re-write of ESCC Generic Specification 3602 issue 2 as part of the ongoing conversion to the latest ESCC format.

Proposed wording:

The Generic Specification is proposed to be extensively amended to incorporate various policy, technical & editorial amendments & corrections in order to bring it in line with other ESCC Generic Specifications that have already been converted to the new ESCC format, as well as reflect the latest technical baseline ESCC generic specification requirements for latching relays.

The layout, format and general structure, and editorial content of 3602 issue 3 draft C are based closely on ESCC 5000 issue 6 per DCRs 149, 236, 286, 313 & 399 (all approved).

The proposed technical content of ESCC3602 draft 3C is based on the current content of ESCC3602 issue 2 plus amendments, discussed and agreed by ESA, CNES and various relay manufacturers since 2006, as were included within various other open DCRs. This DCR effectively replaces all those other DCRs (DCRs 287/ 345/ 346/ 347/ 350/ 352/ 354/ 356/ 358/ 359/ 360) which shall now be withdrawn.

This DCR summarises all the amendments to 3602 issue 2, plus identifies the additional editorial & technical changes to ESCC 3602 issue 2 not already generally detailed and justified by approved DCRs 149/236/286/313/399.

For full details of the proposed contents of ESCC 3602 issue 3 see the attached draft Generic specification ESCC 3602 issue 3 draft C.

Change Details:

A) Main General Changes (similar to those already incorporated into ESCC5000 issue 6):

1) The SCC testing level B has been deleted; there is still only a single ESCC testing level, equivalent to old SCC level B,



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but it is not given a specific designation.

2) Qualification and Lot Acceptance Testing charts have been incorporated, with some modifications, into a single Chart F4, Qualification and Periodic Tests. Modifications include:

- Periodic testing is mandatory for ESCC qualified components with a defined testing schedule.
- Lot Acceptance Testing has been deleted but an Orderer option for similar Lot Validation Testing, for procurement, has been added. Lot Validation Testing is not mandatory and will only be done if specifically stipulated by the Orderer in their PO. The requirement for LAT level 3 as a minimum for non-qualified component procurement is removed.
- No failures are allowed during Chart F4 testing.

3) Introduction of Technology Flow Qualification per ESCC No. 25400 to the Generic spec.

4) Introduction of ESCC 23100 (ESCC Recommendations on the use of the ESCC Specification System for the Evaluation and Procurement of Unqualified Components) to the generic spec.

5) The Generic Specification has been made applicable and fully usable for procurement of unqualified components as well as for ESCC Qualified components.

6) Clarification that the term PID is specific only to ESCC qualified components.

7) The minimum required delivered documentation to the customer for procurement is a Certificate of Conformity & a Cover sheet.

8) Clarification of Customer Source inspection options for Pre-encapsulation CSI (Pre-Cap) & Final CSI (Buy-Off), where the Customer & Manufacturer mutually agree what is to be performed and how much notification is required.

9) The maximum allowed delay for Lot failure notification (provided by the Manufacturer) is now 5 working days (was 2).

10) Para 5 & Chart F2, Production Control/Special In-Process Controls, replaces Paras 5 & 6 and Chart II.

11) The General Flow Chart I is replaced by Chart F1; It clarifies the flow of components for Procurement.

12) Chart II Screening and Electrical Measurements, has been replaced by Chart F3, Screening Tests.

13) When using the ESCC System to procure components from an unqualified source and marking the parts with the ESCC component number, the Manufacturer should possess a manufacturing and quality assurance system that is compatible with space application. As such, the user expectation should be that parts would be compatible with passing the testing requirements of Chart F4. Accordingly the requirement placed on qualified sources to not knowingly supply components that cannot meet the Chart F4 testing is extended to unqualified sources.

14) Material outgassing reference document is corrected to be ECSS-Q-ST-70-02.

15) Para 9.23 & Chart II, Dimension Check is performed on 3 samples instead of 5.

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## B) Other Editorial and/or Technical Changes (specific to ESCC3602):

16) Para 2.2, Reference documents that are not actually referenced in 3602 are removed.

i.e. MIL-STD-105, MIL-STD-414

17) Para 7.2.1, Parameter Drift Values during Screening

The requirement for testing of Parameter Drift Values (over Run-in) during screening is added but only when specified as being applicable to a particular component in the relevant detail specification; otherwise they should be considered as not required. When they are applicable, Parameter Drift Values failures shall not count towards Lot Failure.

Paras affected in 3602 draft 3C:

6.2.2, 8.3.2, Chart F3

18) Para 8.1.2 and Chart IV & Chart V

The sample size and test requirements for Qualification Testing and Lot Acceptance testing has been changed (See 3602 draft 3C Chart F4 for details). Specific changes include the following details:

- The various test sequences of charts IV & V have been amended to form specific test subgroups in Chart F4.  
i.e. an Environmental/Mechanical Subgroup, two Endurance Subgroups and an Assembly Capability Subgroup.
- Additional tests have been incorporated into Chart F4 Environmental/Mechanical Subgroup.  
i.e. Random Vibration (for Relays <5A), High Level Sine Vibration, High Level Mechanical Shock (see also the attached 3602 draft 3C Paras 8.8.2, 8.8.3 & 8.9.2 for full details):
- Additional test, i.e. Coil Life, has been incorporated into Chart F4 Endurance Subgroup (see also the attached 3602 draft 3B Para 8.12 for full details):

19) Para 9.2 & Chart II, Thermal Cycling is renamed as Thermal Shock.

20) Para 9.3, Electrical Measurements

Add a caution that delivery lot relays shall not switch anything greater than 6V, 10mA during any testing prior to delivery (see the attached 3602 draft 3C Para 8.3.1 for full details)

21) Para 9.3.1, Latch Voltage

Amend 1st sentence to read as follows (see the attached 3602 draft 3C Para 8.3.1.1 for full details)::

The voltage applied to the latch coil shall be gradually increased from zero until the relay switches.

21) Para 9.3.2, Reset Voltage

Amend 1st sentence to read as follows (see the attached 3602 draft 3C Para 8.3.1.2 for full details)::

The voltage applied to the reset coil shall be gradually increased from zero until the relay switches.

22) Para 9.3.3, Contact Resistance.

Test method is amended including the following main changes (see the attached 3602 draft 3C Para 8.3.1.3 for full details):

- Amend title of Para to be: Contact Voltage Drop (Contact Resistance)

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- Delete AC method option.
- Amend test current to be as specified in the detail specification (within specified limits)
- Amend Test voltage to be a maximum value (6V max)

## 23) Para 9.3.4, Latch, Reset and Bounce Times

Test method is amended (see the attached 3602 draft 3C Para 8.3.1.4 for full details). Definition of Contact Bounce is added

Delete figure I

## 24) Para 9.4.1, Seal Test Gross Leak

Test method is amended including the following main changes (see the attached 3602 draft 3C Para 8.4.2 for full details):

- Test condition D is added as an option
- For test condition B, Water temperature and pressure values are specified (25C & <8465Pa, respectively)

## 25) Para 9.4.2, Seal Test Fine Leak

Test method is amended including the following main changes (see the attached 3602 draft 3C Para 8.4.1 for full details):

- Pressure value is specified (400kPa)
- During Charts F2 & F3 testing, duration of pressurisation and recovery is amended to be 2 hours and 30 minutes respectively.
- During Chart F4 testing, the measured leak rate shall be recorded against component serial number.

## 26) Para 9.6, Vibration Scan

Test method is amended including the following main changes (see the attached 3602 draft 3C Para 8.6 for full details):

- Maximum vibration frequency is amended to be 3000Hz.

## 27) Para 9.7, Electrical Measurements at High & Low temperatures

The specific 1 hour soak requirement before measurements is amended to be a general requirement for stabilisation.

## 28) Para 9.8 & Chart III, Low Level Test

The Low Level Test performed at High, Low and Room temperatures is renamed as Run-in and the test temperature(s) is as specified in the applicable Detail specifications. The maximum contact resistance allowed during the test is fixed at 100ohm, unless otherwise specified in the Detail Specification.

## 29) Para 9.9 & Chart III, Internal Moisture test is deleted.

## 30) Para 9.10, Vibration

Test method is amended including the following main changes (see the attached 3602 draft 3C Para 8.8.1 for full details):

- test is renamed as Low Level Sine Vibration
- Maximum vibration frequency is amended to be 3000Hz.
- After the test electrical measurements shall be performed as specified in the detail specification including the drift values if specified.

## 31) Para 9.11, Mechanical Shock

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Test method is amended including the following main changes (see the attached 3602 draft 3C Para 8.9.1 for full details):

- test is renamed as Low Level Mechanical Shock
- Test condition is fixed at test condition C (100g, 6ms half-sine) (was as specified in the detail specification)
- After the test electrical measurements shall be performed as specified in the detail specification including the drift values if specified.

#### 32) Para 9.12.1, Overload (for Relays <5A)

Test method is amended including the following main changes (see the attached 3602 draft 3C Para 8.16.1 for full details):

- Contact overload current shall be as specified in the detail specification (was fixed at 2xRated Resistive Current).
- The Voltage Drop across closed contacts shall be as specified in the Detail Specification (was 5% of applied voltage)
- The Voltage Drop shall be monitored for 40% minimum of each ON and OFF period during the switching cycle (was 50%)
- Reference to Normally Closed and Normally Open contacts is deleted.

#### 33) Para 9.12.2, Overload (for Relays 5A to 20A)

Test method is amended including the following main changes (see the attached 3602 draft 3C Para 8.16.2 for full details):

- Contact overload current shall be as specified in the detail specification (was fixed at 4xRated Resistive Current).
- The Voltage Drop across closed contacts shall be as specified in the Detail Specification (was 10% of applied voltage)
- Reference to Normally Closed and Normally Open contacts is deleted.

#### 34) Para 9.12.3, Overload (for Relays >20A)

Test method is amended including the following main changes (see the attached 3602 draft 3C Para 8.16.3 for full details):

- Contact overload current shall be as specified in the detail specification (was fixed at 2xRated Resistive Current).
- The Voltage Drop across closed contacts shall be as specified in the Detail Specification (was 10% of applied voltage)
- The Voltage Drop shall be monitored for 40% minimum of each ON and OFF period during the switching cycle (was 50%)
- Reference to Normally Closed and Normally Open contacts is deleted.

#### 35) Para 9.13, Thermal Shock

Measurement of Insulation resistance during the 5th cycle (at each temperature extreme) is deleted. Final electrical measurements as specified in the detail specification are added.

#### 36) Para 9.16.1, Intermediate Current (for Relays <5A)

Test method is amended including the following main changes (see the attached 3602 draft 3C Para 8.13.1 for full details):

- The Voltage Drop across closed contacts shall be as specified in the Detail Specification (was 300mV maximum)

#### 37) Para 9.16.2, Intermediate Current (for Relays 5A to 20A)

Test method is amended including the following main changes (see the attached 3602 draft 3C Para 8.13.2 for full details):

- The Voltage Drop across closed contacts shall be as specified in the Detail Specification (was per Table in Para 9.16.2)
- The number of cycles of operation applied during the test shall be 5000 (was 50000)
- Reference to Normally Closed and Normally Open contacts is deleted. Contacts loads are applied equally to all contacts.

#### 38) Para 9.16.3, Intermediate Current (for Relays >20A)

Test method is amended including the following main changes (see the attached 3602 draft 3C Para 8.13.3 for full details):

- The Voltage Drop across closed contacts shall be as specified in the Detail Specification (was 200mV maximum)



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- The number of cycles of operation applied during the test shall be 5000 (was 50000)
- Reference to Normally Closed and Normally Open contacts is deleted. Contacts loads are applied equally to all contacts.

### 39) Para 9.19.1, Resistive Life

Test method is amended including the following main changes (see the attached 3602 draft 3C Para 8.11.3 for full details):

- The test current (Contact Load) condition is fixed at Rated Resistive Load Contact Current as specified in the Detail Specification (reference to Table 5(b) is deleted)
- The Voltage Drop across closed contacts shall be as specified in the Detail Specification (was 10% of applied voltage)

### 40) Para 9.19.2, Low Level Load and Mechanical Life (Relays <5A)

Test method is amended including the following main changes (see the attached 3602 draft 3C Para 8.11.1 for full details):

- Test is renamed Low Level Life
- The test temperature shall be room ambient (was a mixture of both Maximum Operating temperature and room ambient temperature).

### 41) Para 9.19.3, Inductive Life (Relays $\geq 5A$ )

Test method is amended including the following main changes (see the attached 3602 draft 3C Para 8.11.2 for full details):

- The Voltage Drop across closed contacts shall be as specified in the Detail Specification (was 10% of applied voltage)

### 43) Para 9.22, Encapsulation is deleted.

### 44) Para 10.8 & 10.9, Data for Qualification Tests & LAT

The measured leak rate results from Chart F4 tests shall be recorded against component serial number and provided (see the attached 3602 draft 3C Paras 9.7.1, 9.7.2 & 9.7.3 for details).

### 45) Para 7.4.1 Lot Failure During 100% Testing

Only electrical parameter limit failures during Room Temperature Electrical Measurements & High and Low Temperatures Electrical Measurements during Screening Tests shall count towards percent defective lot failure (i.e. excluding other failures per Para 7.2.3).

### 46) Para 10.6. Final Production Test Data (Chart II)

Room Temperature Electrical Measurements (during Special In-Process Controls in 3602 issue 3 draft C Chart F2), shall be read & record against serial number.

### Justification:

All changes have been defined and included to serve the purposes of technical improvement, clarification, accuracy, completeness, simplification, harmonisation and consistency. The aim is to simplify and improve the content and interpretation of the specification and its requirements whilst maintaining an efficient and acceptable technical baseline.

Additional mechanical tests (i.e. Random Vibration, High Level Sine Vibration, High Level Mechanical Shock) have been introduced into Chart F4 to answer the requirements of new space launchers.



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All technical changes have been defined and agreed by ESA & CNES.

ESCC 3602 draft 3C is written to closely follow the layout, format and content of the latest ESCC 5000 issue 6. The justifications for the related policy and editorial changes given in all other previous DCRs related to ESCC 5000 issue 6 (i.e. DCRs 149, 236, 286, 313, 399) also apply to this DCR.

Note – All ESCC Detail specifications for non-latching relays (3602/xxx) will need to be converted to make them consistent with the contents of ESCC Generic Specification 3602 issue 3 per this DCR. The main technical changes to be implemented into each Detail specification resulting from the changes in this DCR are as follows:

- Implementation of 'Run-in' (replacing 'Miss Test'); affecting Table 4 & Table 5(a).
- Implementation of Drift Parameters during Screening (over 'Run-in')(i.e. Latch Voltage & Reset Voltage drift values), as applicable to each Detail Spec; affecting Table 4.
- Specification of test current for measurement of contact resistance; affecting Table 2.
- Implementation of addition environmental & Mechanical test requirements (i.e. Random Vibration, High Level Sine Vibration & High Level Mechanical Shock); affecting Table 6.
- Implementation of Drift Parameters during Qualification and Periodic tests (i.e. Latch Voltage & Reset Voltage drift values) for the following tests, as applicable to each Detail Spec:
  - o Vibration
  - o Mechanical Shock
  - o Overload
  - o Intermediate Current
  - o Operating Life Resistive (= Resistive Life)
  - o Operating Life Low Level Load and Mechanical Shock (= Low Level Life)
  - o Random Vibration (new test)
  - o High Level Sine Vibration (new test)
  - o High Level Mechanical Shock (new test)

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|----------------------------------------------------------------------------------|
| Attachments:                                                                     |
| 3602_draft_3d_for_final_review.pdf, 3602_draft_3c.pdf, null                      |
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| N/A                                                                              |
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