



ESCC System

Short Course and Guidelines

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1	INTRODUCTION	4
2	GLOSSARY OF TERMS	5
3	OVERVIEW OF THE ESCC SYSTEM.....	6
3.1	Brief presentation of the ESCC System.....	6
3.2	The associated information exchange system.....	6
4	ESCC SPECIFICATION SYSTEM.....	7
4.1	Related Documents	7
4.2	Architecture.....	7
4.3	List of Basic Specifications by purpose.....	9
4.4	Generic Specifications by family	10
4.5	Information sources	11
4.6	Adding or changing specifications.....	11
5	ESCC QUALIFICATION	12
5.1	Related documents	12
5.2	Component Qualification	12
5.2.1	Evaluation of the Manufacturer (Quality Management System and Line Audit) 13	
5.2.2	Evaluation of the component	13
5.2.3	Qualification Testing phase	14
5.2.4	Entry into the ESCC QPL.....	15
5.2.5	Maintenance of qualification	15
5.3	Capability Approval	15
5.4	Technology flow qualification.....	16
5.5	Quality conformance requirements.....	16
5.5.1	Certificate of Conformity.....	16
5.5.2	Records	17
5.5.3	Quality Management System.....	17
5.6	Significance of the ESA logo	17



6	MINIMUM QUALITY MANAGEMENT REQUIREMENTS	18
6.1	Related documents	18
6.2	Quality management system	18
6.3	PID.....	19
6.3.1	Purpose.....	19
6.3.2	Requirements	19
6.3.3	PID updating	19
6.3.4	Access to the PID.....	19
6.3.5	General structure of a PID	20
7	CONTROL OF NON-CONFORMING PRODUCT.....	21
7.1.1	Definition and classification of non-conformances	21
7.1.2	Non-Conformance procedure.....	21
7.1.3	Non-Conformance documentation.....	22
8	THE CHIEF INSPECTOR	23
8.1	Definition	23
8.2	Responsibilities of a Chief Inspector	23



1 INTRODUCTION

The ESCC (European Space Component Coordination) System is an international system for the specification, qualification and procurement of electronic, electrical and electromechanical components for use in Space programmes. It is operated under the direction of the Space Components Steering Board (SCSB) with ESA fulfilling the roles of Documentation Custodian and Qualification Authority.

The vast number of highly complex electronic components that on-board equipments contain, must be manufactured and tested to demonstrate a very high degree of operational integrity and to be able to withstand the constraints of a space environment. An essential element for the provision of such components is the accurate implementation of an efficient and thorough system of controls at the component manufacturers.

In this frame, the Chief Inspector of a qualified manufacturer is regarded as a key person within the ESCC System, as the one designated person, responsible for all matters relating to inspection and quality assurance, required of his company.

The present short course is not meant to emphasize particular aspects of individual component technologies and their associated inspection processes. Rather, it is intended to teach the scope of the ESCC System, its main principles, rules, procedures and requirements. This will ensure that participants, in using the System within their own specific areas of activity, will be fully conversant with all of its requirements.

This document is intended to be a support for users of the ESCC system and provides the main keys to understand and use it properly and efficiently. Readers will find hereafter:

- a rapid overview of the ESCC system (§ 3)
- a presentation of the specification system, base of the ESCC system (§ 4)
- the different ways to qualification (Component Qualification, Capability Approval ...) (§ 5)
- the minimum quality requirements for a qualified Manufacturer (§ 6)
- the non-conformance system (§ 7)
- the role and duties of the Manufacturer Chief Inspector, corner stone of the system (§ 8)



2 GLOSSARY OF TERMS

CoC	Certificate of Conformity
DCR	Document Change Request
EEE	Electrical, Electronic and Electro-mechanical
EPPL	European Preferred Parts List
ESCC	European Space Component Coordination
ESCIES	European Space Components Information Exchange System
ETP	Evaluation Test Programme
Executive	The ESCC Executive
LAT	Lot Acceptance Testing
NCCS	Non-Conformance Control Sheet
NRB	Non-conformance Review Board
PID	Process Identification Document
PSWG	Policy and Standards Working Group
QML	Qualified Manufacturers List
QPL	Qualified Parts List
SCSB	Space Components Steering Board
TRB	Technology Review Board



3 OVERVIEW OF THE ESCC SYSTEM

3.1 Brief presentation of the ESCC System

The ESCC system exists to assure users that EEE components, manufactured and tested to ESCC requirements, will have the performance and reliability demanded by space applications.

ESA together with National Space Agencies, User Industries, through Eurospace, and representative Component Manufacturers have been working over recent years to improve the European Space sector component (EEE parts) market. On October 8th 2002 a key milestone was achieved, the signing at ESA Headquarters in Paris of the Founding Act of the European Space Components Coordination (ESCC) initiative. One element of the ESCC is the transfer to it of the former ESA/SCC System.

One major result of the coordination activities is the ESCC Specification System. This is a self standing system which provides for:

- the technical specification of EEE parts.
- methodologies for component evaluation and qualification.
- provision of necessary testing methods.
- quality assurance provisions.
- operational provisions.

The operational provisions result in the system being available freely for use in a supplier/customer relationship on a world wide basis. The evaluation and qualification provisions are applicable to components of European manufacture and the results are reflected in a published QPL and QML.

The technical specifications represent Space user requirements and are not component vendor specific. There are sometimes multiple qualified sources for a component specified in a particular ESCC specification.

3.2 The associated information exchange system

An objective of the ESCC, as stated in the Charter, is *“to establish an information exchange system with component data provided on a voluntary basis by the Participating Organisations and with access for Industry”*.

To this end, ESCIES is implemented as an on-line system utilizing an internet server which is accessed as a web site with the URL:

<https://escies.org>

By means of this server, members of the European space community can share EEE component information in a controlled and secure environment. ESCIES is thus intended to improve competitiveness and provide support to European Industry involved in space projects.



4 ESCC SPECIFICATION SYSTEM

4.1 Related Documents

ESCC 20000	Using the ESCC Specification System
ESCC 20800	Document Change Request Procedure
ESCC 23600	Complaints and Appeals

4.2 Architecture

The ESCC Documentation System comprises Documents and Specifications organised in five levels, 0 to 4.

Documents in levels 0 (Policy) and 1 (organization and support documents) outline the ESCC System and its operation. Users of the Specification System do not need to refer to level 0 and 1 Documents, however they are made publicly available for information purposes.

Specifications in levels 2 (Basic specifications), 3 (Generic specifications) and 4 (Detail specifications) provide the technical information necessary to qualify and procure components.:

- The **Basic Specifications** provide test methods, qualification methodology and general requirements applicable to all ESCC components (see § 4.3) .
- The **Generic Specifications** provide the requirements for screening, periodic or lot acceptance testing and qualification testing for individual families of components (see § 4.4).
- The **Detail Specifications** provide the performance requirements for individual or ranges of particular components (basically, detail specifications are comprehensive data sheets).

A set of specifications for a component comprises:

- One Generic Specification.
- Relevant Basic Specifications.
- Sectional Basic Specifications (internal and external visual inspection, x-ray inspection, terms, definitions, etc.)
- Applicable Detail Specifications.

Specifications are not restricted to either ESCC qualified manufacturers or to European components. Users of the System may prepare new ESCC specifications for components of interest to the Space community. Users may also influence the ESCC System's content by utilizing the formal documentation change request (DCR) system.

The ESCC documentation architecture is illustrated on *figure 1*.

European Space Components Coordination (ESCC) Documentation Architecture

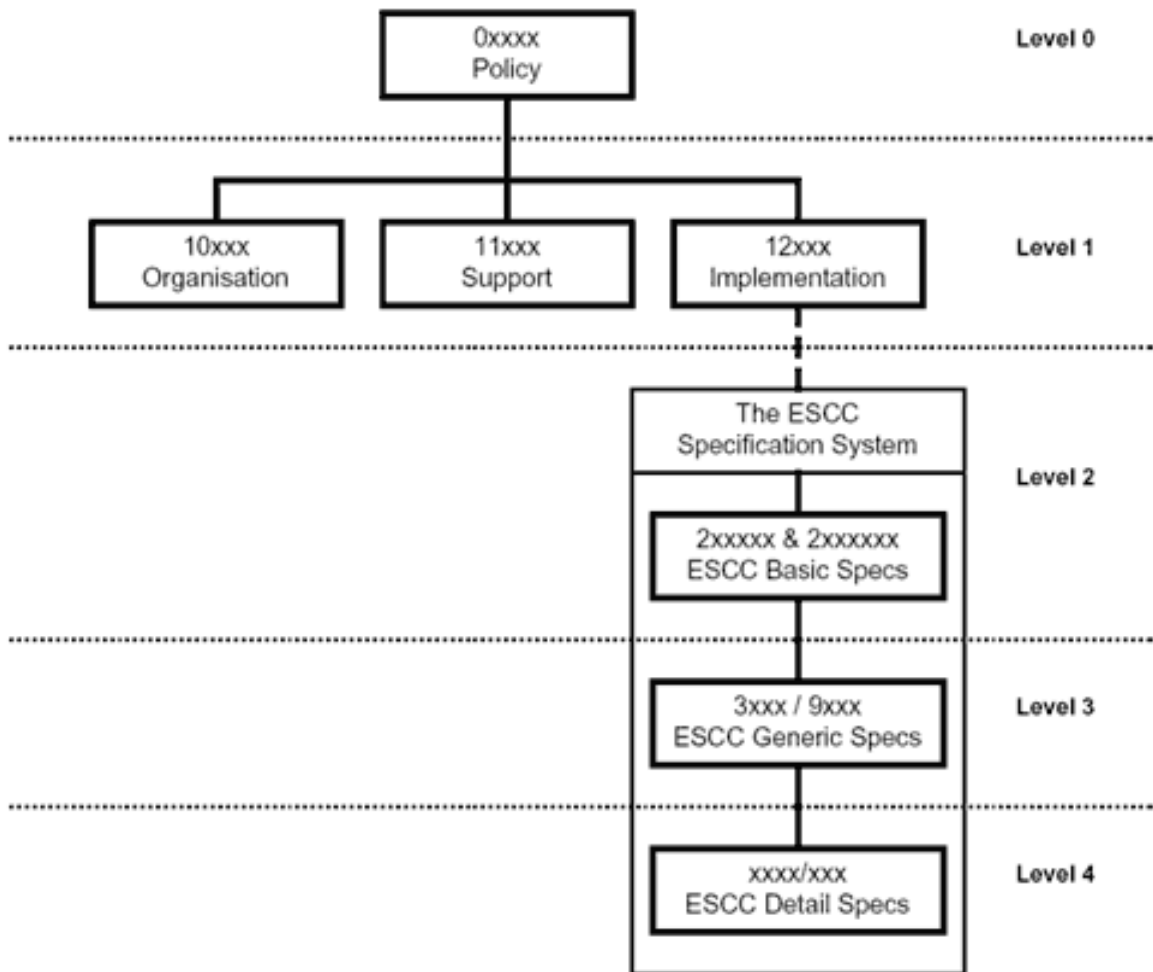


Figure 1



4.3 List of Basic Specifications by purpose

Purpose	Spec. No.	Title (link to Basic Spec. page on ESCIES: click here)
General and Quality Requirements	21500	Calibration System Requirements
	21700	General Requirements for the Marking of SCC Components
	22700	Requirements and Guidelines for the "Process Identification Document" (PID)
	22800	ESCC NonConformance Control System
	24600	Minimum Quality System Requirements
Qualification Methodologies	20100	Requirements for Qualification of Standard Electronic Components for Space Application
	20200	Component Manufacturer Evaluation
	22600	Requirements for the Evaluation of Standard Electronic Components for Space Application
	23000	Requirements for the Extension of Qualification Approval of Standard Electronic Components for Space Application
	24300	Requirements for the Capability Approval of Electronic Component Technologies for Space Application
	25400	Requirement for the Technology Flow Qualification of Electronic Components for Space Application
Test Methods and Technical Requirements	20400	Internal Visual Inspection
	20500	External Visual Inspection
	20600	Preservation Packaging and Despatch of SCC Electronic Components
	20900	Radiographic Inspection of Electronic Components
	21400	Scanning Electron Microscope (SEM) Inspection of Semiconductor Dice
	22900	Total Dose Steady-State Irradiation Test Method
	23400	Microsection Examination Preparation and Evaluation of Capacitors Fixed Ceramic Leaded and Chips
	23500	Requirements for Lead Materials and Finishes for Components for Space Application
	23800	Electrostatic Discharge Sensitivity Test Method
	24400	Measurement of Insertion Loss for E.M.I Suppression Filters
	24700	Cross Reference of ESCC, US-MIL and IEC Test Methods
	24800	Resistance to Solvents of Marking Materials and Finishes
	24900	Minimum Requirements for Controlling Environmental Contamination of Components
	25000	Basic Specification for Electro-Optical Test Methods for Charge Coupled Devices
	25100	Single Event Effects Test Method and Guidelines
Specification System	20800	Document Change Request Procedure
	21300	Terms Definitions Abbreviations Symbols and Units
	23600	Complaints and Appeals
Procurement	23100	ESA/SCC Recommendations for the Evaluation and Procurement of Non-Standard Electronic Components for Space Application

4.4 Generic Specifications by family

Generic Spec. No.	Generic Specification for : (link to ESCIES: click here)
3001	Capacitors Fixed Ceramic Dielectric Types I and II
3002	Capacitors Fixed Tantalum Solid Electrolyte
3003	Capacitors Fixed Tantalum Non-Solid Electrolyte
3004	Capacitors Fixed Glass Dielectric
3006	Capacitors Fixed Film Dielectric
3007	Capacitors Fixed Mica Dielectric
3008	Capacitors and Capacitor Filters Feedthrough
3009	Capacitors Fixed Chips Ceramic Dielectric Types I and II
3010	Capacitors Variable Concentric Trimmer
3011	Capacitors Chip Tantalum Solid Electrolyte
3012	Capacitors Leadless Surface Mounted Tantalum Solid Electrolyte Enclosed Anode Connection
3102	Waveguide Filters and Multiplexers with Waveguide and Coaxial Interfaces
3201	R.F. Coils Fixed
3202	Ferrite Microwave Components Isolators and Circulators
3401	Connectors Electrical Non-Filtered Circular and Rectangular
3402	Connectors RF Coaxial
3403	Attenuators and Loads RF Coaxial Fixed
3404	Power Dividers Couplers RF Coaxial
3405	Connectors Electrical Filtered Circular & Rectangular
3501	Quartz Crystal Units
3502	Surface Acoustic Wave (SAW) Devices (Filters)
3601	Relays Electromagnetic Non-Latching
3602	Relays Electromagnetic Latching
3603	Relays Electromagnetic RF Coaxial Switch Latching
3701	Electromechanical Switches
3702	Switches Thermostatic Bimetallic Hermetically Sealed.
3901	Wires and Cables Electrical 600V Low Frequency
3902	Cables Coaxial Radio Frequency Flexible
3903	Solid Wires Electrical 350 Volts for Wire Wrapping
4001	Resistors Fixed Film
4002	Resistors Fixed Wirewound
4003	Resistors Fixed Wirewound (Power-Type Chassis-Mounted)
4005	Resistors Network Thick Film
4006	Thermistors (Resistors Thermally Sensitive)
4009	Resistors Heaters Flexible
5000	Discrete Semiconductor Components
5010	Discrete Microwave Semiconductor Components
9000	Integrated Circuits Monolithic
9010	Microwave Monolithic Integrated Circuits
9020	Charge Coupled Devices Silicon Photosensitive



4.5 Information sources

All ESCC Specifications are freely available from the ESCIES web site.

The web address is <https://escies.org>.



In this, registered companies and organisations contribute data to create a total data resource for all registered users.

As a part of this data collection and available publicly, the issued ESCC Specifications are published together with the QPL and QML and a catalogue of issued specifications, REP001, which is suitable for download and printing.

4.6 Adding or changing specifications

When a user sees the need for a new specification or for a change to a published, the method to be followed is provided in **ESCC Basic Specification 20800**.

This specification defines the requirements to be met in originating a new ESCC Specification or in originating a proposed change to a specification. The purpose is to inform originators on how to proceed and subsequently how to obtain information on the progress and results of their proposed specifications and specification change requests.

Prospective authors are advised to register any Detail Specification preparation activity with **the Executive Secretariat**, through the ESCIES web site, by using the Application for Code Assignment form, before commencing. The secretariat will advise on whether a drafting activity for the component in question is already in progress, will suggest an existing specification to base the new one on and will advise as to whether or not the proposed specification is suitable for the ESCC System.

A Manufacturer, unfamiliar with the ESCC Specification System, is advised to contact the Executive Secretariat prior to preparing a specification (e.g. a Detail Specification).



5 ESCC QUALIFICATION

The ESCC System provides for three equivalent approaches to qualifying individual components of European manufacture:

- component qualification (ESCC 20100)
- capability approval. (ESCC 24300)
- technology flow qualification. (ESCC 25400).

All three approaches involve an extensive evaluation phase and a subsequent qualification testing phase. Which approach is the most appropriate depends on the nature and range of the components being considered for qualification.

5.1 Related documents

ESCC 20100	Requirements for Qualification of Standard Electronic Components for Space Application
ESCC 20200	Component Manufacturer Evaluation
ESCC 22600	Requirements for the Evaluation of Standard Electronic Components for Space Application
ESCC 22700	Requirements and Guidelines for the "Process Identification Document" (PID)
ESCC 23000	Requirements for the Extension of Qualification Approval of Standard Electronic Components for Space Application
ESCC 24300	Requirements for the Capability Approval of Electronic Component Technologies for Space Application
ESCC 25400	Requirement for the Technology Flow Qualification of Electronic Components for Space Application

5.2 Component Qualification

ESCC qualification approval is a status given to electronic components which are manufactured, under controlled conditions, by an individual Manufacturer and which have been shown to meet all the requirements of this specification and the relevant ESCC Generic and Detail specifications.

The formal qualification procedure consists essentially of three phases:

- the evaluation of the Manufacturer
- the evaluation of the component
- qualification testing of the component.

The procedure is performed in the above order and supervised throughout by an ESCC Executive. The completion of any phase carries no guarantee that a subsequent phase, or procurement, will be initiated.

An European component manufacturer may apply to be qualified. The application may be submitted to the ESCC Executive who will, in turn, process the application. ESCC will reach a decision as to whether or not there is sufficient user interest to justify the commitment of Executive resources to support the qualification programme and the subsequent maintenance. When the ESCC deliberations are completed the Executive will advise the applicant manufacturer of the decision.

Application requirements may be found in the pertinent Basic Specification for the qualification approach to be proposed. (An applicant manufacturer, unfamiliar with the ESCC



Specification System, is advised to contact the Executive Secretariat prior to preparing an application.)

5.2.1 Evaluation of the Manufacturer (Quality Management System and Line Audit)

The purpose of the evaluation of a Manufacturer is to assess the capability and the adequacy of the organisation, plant and facilities and to ascertain the Manufacturer's ability to supply EEE components to the appropriate ESCC specifications.

This evaluation phase shall include, but not necessarily be limited to, a survey of:

- (a) The overall manufacturing facility and its organisation and management.
- (b) The Manufacturer's system for inspection and manufacturing control.
- (c) The production line used for the component to be qualified.

The manufacturer is required to provide the audit team with all the documentation relevant to, and give a satisfactory demonstration of, the organization and management applicable, at least, to:

- the quality management system and documentation
- how are managed the non-conformances
- traceability
- management of sub-contractors and suppliers
- incoming and storage of raw material and piece parts, related controls
- maintenance and calibration
- production line and associated inspections
- training

The Manufacturer Evaluation is managed by the Executive. The main assessment comprises one or more formal audits conducted by an ESCC audit team appointed by the Executive Manager.

The evaluation of a Manufacturer shall be performed by ESCC Executive in accordance with the requirements of **ESCC 20200**.

5.2.2 Evaluation of the component

The purpose of the evaluation of a component is to decide in the most cost-effective manner, if there is sufficient justification to proceed to qualification testing of the component for space application, with a high level of confidence in the result.

The evaluation of a component shall be performed in accordance with **ESCC 22600**. For an ESCC qualification, the evaluating authority will be the ESCC Executive.

This evaluation shall include, but not necessarily be limited to:

- (a) A Construction Analysis, on random sample taken from the current production, performed by the Evaluation Authority
- (b) The establishment, in conjunction with the manufacturer and the ESCC Executive, of an Evaluation Test Programme (ETP) for the component.

The E.T.P. shall be performed on a sample representative of the variations of size, technology, material and, if appropriate, the constructional techniques employed in the manufacture of the component family.



The E.T.P. shall include step-stress and steady state stress testing designed to determine failure modes and to establish the margins between strength and the specified conditions for use.

The E.T.P. shall include a D.P.A. of components representative of all the materials and constructional techniques employed.

Ancillary specifications (**ESCC 226xxx**) dedicated to a specific component family have been issued and describe the procedure and requirements to create and perform an ETP for the related family.

(c) Evaluation testing of the component.

(d) Definition of any corrective actions that may be required and their implementation.

(e) A documentation review and the finalisation of information to be contained

- in a Process Identification Document (PID) and
- in the associated Detail Specification (if necessary).

Process Identification Document

A PID for the component to be qualified shall be prepared by the Manufacturer. The purpose of the PID is to ensure that a precise reference is established for an electronic component qualified in accordance with the ESCC System. In terms of content, layout, configuration control, etc., the PID shall be in accordance with the requirements of **ESCC 22700**.

This reference shall comprise the component's design configuration, materials used in manufacture, manufacturing processes and controls, and completely define all inspections and tests to be carried out during and after manufacture. The document shall enable the ESCC Executive to control the component's manufacture and ensure that all future components or capability approved products supplied by the Manufacturer will be identical to those for which approval was originally granted.

A more detailed description of what is and what includes a PID is provided in section XXX of this course.

Detail Specification

Where the specific component to be qualified is not already described by a Detail Specification, or where the existing specification requires updating, the method to follow is provided in **ESCC 20800**.

5.2.3 Qualification Testing phase

The Qualification Testing Phase do not commence until successful completion of the Evaluation Phase and an explicit written authorization by the ESCC Executive.

Prior to commencing this Qualification testing Phase:

- the PID, prepared in accordance with the requirements of ESCC 22700, has to be reviewed and approved by ESCC Executive
- the manufacturer is required to compile a production and test schedule with dates and duration for major processing operations
- A Production Flow Chart, Process Schedules and Inspection Procedures shall be provided in accordance with the requirements of ESCC 20200.

The components required for qualification testing must be produced strictly in accordance with the PID.

See <https://escies.org>



Qualification testing of the component must be in accordance with the requirements of the relevant ESCC Generic Specification.

The Qualification Phase is considered complete after the delivery of the fully tested samples together with acceptance by ESA of the Qualification Test Report.

5.2.4 Entry into the ESCC QPL

On completion of the qualification testing and satisfactory review of the qualification report, the component is recommended to be entered into the ESCC QPL. Once the approval granted, a Qualification Certificate is issued to the manufacturer.

5.2.5 Maintenance of qualification

The maintenance of the validity of a qualification is the responsibility of the Manufacturer. Requirements are described **ESCC 20100**.

A qualification, once established in accordance with the foregoing procedures, shall be valid for two years from the date of formal certification of approval, or such period as may be determined by the ESCC Executive.

In the case where a qualification may lapse during production and testing for an order, the ESCC Executive will determine the procedure to be followed and advise the Manufacturer accordingly.

The conditions for maintenance of a valid qualification are as follows:

(a) The manufacture of components to ESCC requirements shall be strictly in accordance with the production and control documentation approved by the ESCC Executive's acceptance of the PID. In the event of specification changes occurring during the validity period of a qualification, the ESCC Executive and the Manufacturer shall jointly agree any additional work necessary to maintain compliance with these amended specifications.

(b) Detailed records of each production lot of the qualified component shall be readily available to the ESCC Executive.

(c) On receipt of an "Alert" from the ESCC Executive concerning his qualified product, a Manufacturer shall, as a matter of urgency, carry out the necessary investigation and inform the ESCC Executive of his findings and suggested corrective actions (see Non-Conformance Control in section 6.3 of this course).

5.3 Capability Approval

Capability Approval is an alternative way to achieve qualification status but does not replace *Component Qualification*.

Capability Approval is the ESCC quality assessment technique designed to certify that a manufacturing capability within a specified technology domain is of appropriate performance for use in space applications. The system is applicable to components manufactured in relatively small quantities for use in unique applications where manufacturers technology, materials and processes are used to fabricate components customised to specific user requirements.

Specialised and high complexity components, such as VLSI circuits and ASICs are now widely spread in space electronic equipments. The efficiency of tests performed on finished

See <https://escies.org>



products decreases significantly on these kind of highly complex products whereas, in the same time, the test pattern generation and the test time become prohibitive.

The Capability Approval philosophy is based on tests performed on dedicated test vehicles designed to fully cover the area of competence, the capability domain and its limits. The Capability domain is a set of technologies subjected to capability approval review and limited by the capability boundaries.

Basic specification **ESCC 24300** defines, in a comprehensive manner, the principles for Capability Approval for all component types addressed within the ESCC system. The component group specific implementation requirements are defined in ESCC 243XXXX.

The programme for qualification, very similar the Component Qualification programme, includes four phases:

(a) Evaluation of the Manufacturer per ESCC 20200

Same procedure than described in § 5.2.1

(b) Definition of the capability domain and its boundaries

Preparation of a PID for the capability domain

(c) Evaluation of the Capability Domain

Establishment and performing of the ETP

(d) Capability approval testing of test structures

It should be stressed that Capability Approval is only implemented for monolithic microcircuits and monolithic microwave components.

5.4 Technology flow qualification

Technology Flow Qualification is the ESCC quality assessment technique developed to ensuring the reliability and performance of space components whilst maximising the benefits of the manufacturers best practices.

The Technology Flow Qualification system is designed for component manufacturing technology flows that combine effective quality management techniques with stable and reliable technologies that are supported by quality improvement and Technical Review Board (TRB) principles. Technology Flow Qualification is suitable for both standard continuous lot by lot production components and non standard components that have design features customised to specific user requirements.

Basic specification **ESCC 25400** defines, in a comprehensive manner, the principles for technology Flow Qualification for all component types addressed within the ESCC system.

5.5 Quality conformance requirements

5.5.1 Certificate of Conformity

A CoC has to be completed for, and accompany, each delivery or part-delivery of ESCC components.

See <https://escies.org>



This CoC is a verification by the Chief Inspector, on behalf of the Manufacturer, that all Quality Assurance requirements have been met satisfactorily.

5.5.2 Records

The manufacturer is required to maintain detailed records of each production lot of a qualified component and/or test structure and these have to be readily available to ESCC Executive.



A record of all components found to be defective during testing by the Manufacturer has to be maintained.

When requested by an ESCC Executive or a Customer, the Manufacturer performs failure analysis to the depth necessary to identify such defects as due to design, workmanship, mishandling or misuse etc.

Any repetitive defect occurring during manufacture has to be brought immediately to the attention of the ESCC Executive.

5.5.3 Quality Management System

Irrespective of the approach or the technology involved a manufacturer must have, or put in place during the evaluation phase, an appropriate infrastructure. This means that from raw materials and piece part procurement through to the packing and shipping of the qualified component there must be a quality management system in place. The requirements for this are described in Basic Specification No. 24600 supported by Basic Specifications Nos. 21500 (for calibration) , 22700 (PID), 22800 (Non-Conformance Control) and 24900 (Environmental Contamination).

These minimum quality requirements are described in section 6 of this course.

5.6 Significance of the ESA logo

Only components procured from a qualified source, whose qualification status is valid at the time of delivery, are marked with the ESA logo to signify their conformance to the ESCC System qualification requirements and full compliance with the relevant ESCC generic and detail specifications.

Any components, either from a qualified or unqualified source, which fail to meet an inspection or test requirements, or are non-conforming in any manner to the ESCC requirements:



- must not be marked with ESCC marking
- must have the marking removed or permanently obliterated.



6 MINIMUM QUALITY MANAGEMENT REQUIREMENTS

6.1 Related documents

ESCC 22700 Requirements and Guidelines for the "Process Identification Document" (PID)
ESCC 22800 Non-Conformance Control System
ESCC 24600 Minimum Quality Management System Requirements.

6.2 Quality management system

As a minimum, the Manufacturer quality management plan must address the **ESCC 24600** requirements. The Manufacturer quality management system has to include and demonstrate the application of all these requirements, especially concerning the following elements:

- A **Chief Inspector** has to be appointed by the Manufacturer with clearly defined authority and responsibility for ensuring that the requirements of ESCC 24600 are implemented and maintained. The chief Inspector acts as the Manufacturer's point of contact for all matters relating to quality for ESCC.

(His/her role and duties are detailed in section 8 of this course).

- The Manufacturer shall ensure that his **non-conformance procedures** invoke the requirements of **ESCC 22800** for any non-conformance to an ESCC requirement. Once invoked the requirements of 22800 shall replace the Manufacturer's internal procedures.

(the procedure to follow in case of non-conformance is detailed in section 6.3 of this course)

- A **quality and control documentation** including:

- A quality manual, or equivalent, clearly identifying as an objective the conformance of the documented quality management system to the requirements of ESCC 24600.

- Document Control procedures applied to all documents that relate to the suppliers/ sub-contractors Quality Management System and to the manufacture of an ESCC component

- A maintained **PID** (for each type of ESCC qualified component), see section 6.3

- A clear requirement in change control procedures for an adequate engineering and product assurance evaluation and review of changes before their approval and implementation.

- **Traceability** of ESCC products has to be maintained at all stages of manufacture and test. Lot traceability has to be maintained through all processes and to the operators and process equipment used. Traceability of test data, test equipment and test operators shall be similarly maintained. **Quality records** shall be retained for a minimum period of **five years**. A record of all components found to be defective has to be maintained.

- **Training and suitability** of personnel used for the manufacture, test and inspection of ESCC qualified components have to be assessed. A record of this assessment has to be maintained and unsuitably qualified/experienced personnel shall not be utilised without appropriate training and successful assessment. The training of personnel has to include a periodic reassessment.

- An **inspection and control** programme to ensure that no ESCC component shall be delivered by the Manufacturer that has not been satisfactorily subjected to inspections and tests specified in the PID (including those performed by suppliers/sub-contractors). This programme has to include at a minimum:



- Incoming inspection and testing of purchased product
 - Applicable ESCC in-process monitoring and control and back-end tests (screening, periodic tests and/or LAT).
- A **calibration** programme, following the requirements of ESCC 21500, for control of monitoring and measuring devices has to be set up.
- An appropriate **failure analysis capability** has to be established with documented procedures for the application of the techniques and the generation of reports. This capability may include the use of appropriate external facilities.

6.3 PID

6.3.1 Purpose

The purpose of the PID is to ensure that a precise reference is established for an electronic component qualified or capability approved in accordance with the ESCC System. This reference comprises the component's design configuration, materials used in manufacture, manufacturing processes and controls, and completely define all inspections and tests to be carried out during and after manufacture. The document enables the ESCC Executive to control the component's manufacture and ensure that all future components or capability approved products supplied by the Manufacturer will be identical to those for which approval was originally granted. The PID also provides a standard reference against which any anomalies occurring after qualification approval can be examined and resolved.

These elements are fully described in the associated **ESCC 22700**.

6.3.2 Requirements

Formal approval of the PID is granted by the ESCC Executive and they sign the document as approved.

The ESCC Executive identify the items in the PID that are to be maintained under Manufacturer's configuration control (e.g. Manufacturer's in-house inspection procedures) and specify those it wishes to hold in the PID as a part thereof.

The Manufacturer has to prepare the PID as required by the relevant qualification dedicated Basic Specification (ESCC 20100 / 24300 / 25400).

6.3.3 PID updating

A PID must represent the currently accepted manufacturing controls and inspection procedures. For this reason, the PID must be updated each time the ESCC Executive has approved the modification of a particular item in the document.

Any intended modification of the PID or referenced documents held under the Manufacturer's configuration control, together with any quality and reliability implications, shall be brought to the attention of the ESCC Executive for review and approval before implementation. Such modifications shall require a reissue of the PID and the relevant referenced documents.

6.3.4 Access to the PID

Members of ESCC Executive involved with the component or product under qualification or capability approval shall have access to the PID at all times. Any Users may have access to the PID at the Manufacturer's plant.

See <https://escies.org>





6.3.5 General structure of a PID

The PID is written, as closely as practicable, in the Manufacturer's standard format for documents and has to meet the Document Control requirements of ESCC 24600.

All information to be recorded in the PID shall be grouped into appropriate sections. As a minimum these sections should include:

- A general presentation comprising the title page(s), revision or amendment record sheet and the list of contents of the PID. In addition to a suitable title, fully referencing the component, series of components or capability domain and its boundaries.
- An organigram of the manufacturing plant in relation to management, engineering, production, quality assurance and marketing as applicable to subject of the PID
- Concise details of the appropriate manufacture and testing areas including a flow chart showing how applicable purchase orders are processed and a specimen of each route sheet or traveller used during manufacture and testing.
- All the information necessary to fully define:
 - the component and its construction or
 - the capability domain and its boundaries.

It has to include an outline of the technologies involved, piece part composition and construction details. Drawings or photographs detailing the component or the test structures and each of its constituent elements shall be included.

- A control documentation with:
 - A list of specifications and procedures used for each process step, control inspection and test given in the production flow chart
 - A production flow chart identifying all piece parts and all process, assembly, inspection and test operations applicable to production of the component
 - A Wafer Lot Acceptance (WLA) procedure for semiconductor manufacturers
- A list of all inspection, test and measuring equipment used for the manufacture and testing of the component
- Qualification approval by similarity, this section is only applicable when one or more components have been granted qualification approval on the basis of its/their similarity to a component to which qualification approval has been granted after a full test programme and which is the major subject of the PID.
- Components type for capability approval.



7 CONTROL OF NON-CONFORMING PRODUCT



It is mandatory for any Qualified Manufacturer to follow the **ESCC 22800** requirements when a Non-Conformance is brought to the Manufacturer's ESCC Chief Inspector attention. The integrity of the Non-Conformance System is a key element in maintaining the validity of a manufacturer's qualified status.

In using the ESCC system for procurement, there is a moral obligation on the procurer to raise problems with received components formally with the system. Thus for a customer in receipt of non-conforming qualified components the use of ESCC 22800 is advised.

7.1.1 Definition and classification of non-conformances

All Non-Conformances (NCs) are classified according to their severity as either Minor or Major. The initial classification is performed by the Chief Inspector.

Any departure of a characteristic from the specified requirements which can be remedied by a corrective action and does not contravene the applicable ESCC documentation (PID, relevant specifications ...) is deemed to be a Minor NC and is dealt with by a Level 1 NRB (or Local NRB).

All other deviations are deemed Major NCs and are dealt with by a Level 2 NRB (or ESCC NRB), especially if appears:

- A necessity of repair or scrap of all or part of the failed component lot
- A required ESCC specification change that goes beyond the correction of an error
- A residual doubt after completion of corrective actions over the quality / reliability of a component lot

The Executive or the NRB may modify the initial NC classification by Chief Inspector.

Composition and responsibilities of both NRB types are thoroughly described in ESCC 22800.

7.1.2 Non-Conformance procedure

The Non-Conformance System purpose is to ensure that once a NC is detected, it shall be properly identified, adequate investigations shall be performed, subsequent corrective and/or preventive actions shall be achieved and records of the NCs shall be correctly maintained and diffused.

The Non-Conformance System may be invoked by any person having detected a NC, but the Chief Inspector shall be responsible for the correct initiation of the system in any case.

On the occurrence of both level 1 and 2 NC, ESCC Executive Secretariat and the concerned National Space Agency shall be notified by the Chief Inspector within two working days.

All NCs shall be notified by means of a NCCS (Non-Conformance Control Sheet available on the ESCIES web site <https://escies.org>) to the appropriate NRB whose competencies and responsibilities include:

- the disposition of affected items
- the determination of corrective and preventive actions to rectify the causes(s) of NC and prevent the recurrence
- the proposal of changes of specifications, drawings or procedures as appropriate.

See <https://escies.org>



As soon as a NC is initiated, the Chief Inspector shall take all practicable steps to identify and quarantine the affected component lots.



No action, analyse or test are allowed to be performed, with any affected components, which may subsequently modify any failing element or failure cause and prevent the appointed NRB from specifying alternative investigations.

The manufacturer is not allowed to perform rework which is not documented in the agreed PID unless directed to do so by an ESCC NRB.

ESCC qualified components may not be produced under a concession. A concession from the Orderer shall be considered as a regrading for an alternative application.

Regrading, rejection or scrapping shall be associated with the obliteration or removal of all of the ESCC marking.

7.1.3 Non-Conformance documentation

Non-Conformance Documentation shall comprise:

- The NCCS in which are described, initially, the details of the NC and, later, the failure analysis, the NRB's decision and conformation that all necessary actions have been carried to their conclusion.
- Any additional relevant document such as failure analysis reports or minutes of related meetings.

Each Manufacturer is required to maintain a record of all its NCs. These records shall be maintained 10 years.



8 THE CHIEF INSPECTOR

8.1 Definition

The Chief Inspector is (ESCC 24600):

A person nominated by the manufacturer who, irrespective of other responsibilities, shall have defined authority and responsibility for ensuring that ESCC requirements are implemented and maintained. The Chief Inspector shall act as the manufacturer's point of contact for all matters relating to quality for ESCC and for orderers of ESCC components. The Chief Inspector shall be acceptable to ESCC. The manufacturer may also propose up to a maximum of two deputies who shall be acceptable to ESCC and may act in the Chief Inspector's absence. The Chief Inspector may, or may not, be the management representative required by ISO 9001.

If any relevant ESCC specifications require the Manufacturer to have a Technology Review Board or TRB (e.g. for Technology Flow Qualification), the Chief Inspector must be a TRB member and be a contact person on the TRB.

8.2 Responsibilities of a Chief Inspector

(1) Acquire and maintain a thorough working knowledge of the requirements of the ESCC System as they apply to his/her company's ESCC qualified products.

(2) Act as a primary contact between his/her company and ESCC.

(3) Sign the certificates of conformity for any deliveries of ESCC qualified components ensuring that both the components and the data documentation package are in full conformance to the ESCC requirements.

(4) Initiate the ESCC Non-Conformance System (per ESCC No. 22800) for any non-conformance brought to his/her attention, which contravenes an ESCC requirement.

(5) Convene and chair Level 1 NRBS (Non-Conformance Review Boards) and convene and attend Level 2 NRBS.

(6) Ensure that his/her company's quality assurance programme is accurately and adequately documented (e.g. in a Quality Manual) and reflects the necessary ESCC requirements (per ESCC No. 24600).

(7) Ensure that the PID is appropriately produced and following approval by ESCC, that any changes are properly notified to and approved by ESCC.

(8) Advise ESCC directly of any occurrence likely to affect the validity of the qualification or result in its lapse or loss.

(9) Be responsible for all quality assurance and inspection activities associated with the production of ESCC qualified components even when a task is performed by another individual within the company.

(10) Ensure that all company staff involved in the production (manufacture, testing and inspection) of ESCC qualified components are appropriately trained and have the necessary knowledge of the pertinent ESCC requirements.

(11) Verify (e.g. by internal audit) that his/her company's quality system and the manufacturing line for ESCC qualified components meet or exceed ESCC requirements.



(12) Host an ESCC audit when so requested by ESCC and provide a statement of readiness in advance of the audit.

(13) Be available to an ESCC inspector, involved in the supervision of qualification or capability approval activities or their maintenance, to resolve any difficulties occurring and to initiate the non-conformance procedure (per ESCC Basic Specification No. 22800) if appropriate.

(14) Be available to any source inspector involved in the procurement of ESCC qualified components to resolve any difficulties occurring and to initiate the non-conformance procedure (per ESCC No. 22800) if appropriate.

(15) Ensure that components delivered against any order for ESCC qualified product with specification amendments required on the customer's purchase order are only marked with the ESCC part number and ESA logo if the amendments do not affect the compliance of the components to all ESCC requirements