



estec

European Space Research
and Technology Centre
Keplerlaan 1
2201 AZ Noordwijk
The Netherlands
Tel. (31) 71 5656565
Fax (31) 71 5656040
www.esa.int

MEMO

Date 02 April 2010

Ref TEC-QT/2010/18

From M. Nikulainen

Visa

To ESA PA managers, ESCC M&P WG, Industry, PCB manufacturers
Copy TEC-Q: W. Veith,
TEC-QTM: S. Heltzel, C. Villette, A. de Rooij,
CNES: J-L Lortal

Subject: Procedure for ESA qualification of PCB manufacturers

The scope of this memo is to lay out the procedure to follow when a Printed Circuit Board (PCB) manufacturer requests ESA qualification in accordance with ECSS-Q-ST-70-10C.

The process for ESA qualification contains four stages:

1. Send request for qualification and associated **documentation**
2. **Evaluation** of a technology sample by ESTEC
3. **Audit** of the manufacturing plant
4. **Qualification** programme in accordance with ECSS-Q-ST-70-10C

Initiation of qualification activities shall only be approved if supported by ESA projects, complemented by a healthy business plan in the context of space market. At any point during the qualification process ESA may cease continuation of qualification activities with the PCB manufacturer for technical reasons. When all stages are completed successfully the PCB manufacturer is considered ESA qualified and a qualification letter will be issued. Maintenance of ESA qualification is described in ECSS-Q-ST-70-10C.



1. Documentation

The PCB manufacturer shall:

- 1A. Send a **formal request** to ESA for qualification in accordance with ECSS-Q-ST-70-10C.
- 1B. Include **company profile**, indicating:
 - a description of the **capabilities**,
 - a **business plan** including basic financial figures for sales and R&D (demonstrating a healthy economical business and a strong commitment to quality assurance for space products).
- 1C. Include the **heritage** on the PCB technologies for which ESA qualification is requested, in particular for surface finish tin-lead fused by hot oil reflow. Provide the following:
 - the types of technology and quantity of PCBs produced for generic customers,
 - the types of technology and quantity of PCBs produced for industrial space customers,
 - the types of technology and quantity of PCBs produced for ESA projects.
- 1D. Provide evidence that the PCB manufacturer's space customers and projects are supporting the possible ESA qualification, by including
 - a **letter of recommendation** from the main industrial space customers (and the PCB technologies that are provided to them).
 - concrete evidence that **ESA projects are supporting** the possible qualification of the PCB manufacturer.
- 1E. Include a preliminary **strategic planning**, indicating:
 - the **ESA projects** for which qualified PCBs are foreseen to be provided,
 - which **current customers** would benefit from possible ESA qualification,
 - which **new customers or orders** would be gained in case ESA qualification is achieved,
 - what **technologies** are foreseen to qualify initially and in the medium and longer term.
 - the internal **resource estimate** for achieving ESA qualification,
 - a target **schedule** for all activities related to achieving ESA qualification.

Note: A maximum period of 12 months shall be implemented between initiation of the qualification process (step 1A) and successful evaluation (step 2B).



2. Evaluation

The PCB manufacturer shall:

- 2A. **Propose samples for evaluation.** Samples shall have the highest technological complexity for which qualification is requested. Samples shall meet all requirements according to ECSS-Q-ST-70-10C.

Provide the following:

- lay-out,
- build-up,
- surface finish,
- laminate and prepreg type,
- dimensional features,
- specific design features.

- 2B. After the design has been agreed, **provide samples to ESA for evaluation.** ESA will issue a report with microsections evaluating all important features according to ECSS requirements, as received, after thermal stress, rework simulation, solderability test, etc. This is a subset of the test programme described in the ECSS-Q-ST-70-10C.

The evaluation phase is intended as a rather fast assessment of the quality to gain confidence in the product before initiating the full qualification programme. It is the intention **to perform a PCB evaluation only once.** In case the first attempt fails, a second final opportunity for passing the evaluation successfully may be offered. The qualification process shall be discontinued in case the evaluation fails or in case the schedule as agreed in the strategic planning is exceeded.

It is suggested to prepare for this evaluation stage by performing an external assessment of the PCB at an ESA accredited inspection laboratory.

- 2C. Following successful evaluation of the technology samples, ESA may approve the PCB manufacturer to continue to the qualification stage. Approval or rejection for **initiating ESA qualification will be confirmed in a letter.**



3. Audit

- 3A. After successful evaluation, ESA will **audit** the PCB manufacturer.
- 3B. During audit the **qualification programme** will be reviewed.
- 3C. The audit is a process audit. All processes that are used for the manufacture of the PCB technology to be qualified, shall be described in a **Product Identification Document (PID)**. This PID, among others, shall be presented and reviewed during the audit.

4. Qualification

The PCB manufacturer shall:

- 4A. After successful audit, organise the **full qualification programme** as approved by ESA and as described in the ECSS-Q-ST-70-10C.
- 4B. Submit the **qualification report** to ESA for review.
- 4C. Provide an **additional qualification PCB for assessment** at ESTEC laboratories, if so requested by ESA.
- 4D. After successful audit and qualification, the PCB manufacturer is considered ESA qualified. This will be **confirmed by a letter** describing the qualified technology and by publication of the qualification status on the websites mentioned below. The qualification is associated to the production processes, materials, design features, manufacturing plant and key personnel. The qualification is valid for a maximum period of two years, after which a qualification renewal shall be performed. Maintenance of qualification is described in the ECSS-Q-ST-70-10C.



Resources:

- Applicable documents:
 - ECSS-Q-ST-70-10C describes the qualification of PCBs, the test programme and requirements.
 - ECSS-Q-ST-70-11C describes the procurement of PCBs.
- The list of qualified PCB manufacturers and technologies, as well as the applicable ECSS standards may be consulted on:
 - <https://escies.org/>
(technologies/printed circuit boards/ESA Qualification Status of PCBs)
(technologies/printed circuit boards)
 - <http://www.esmat.esa.int/>
(databases/ PCB Qualification status)
(specifications)
- The request for ESA qualification and any queries regarding PCB qualification may be sent to:

Stan Heltzel
e-mail: stan.heltzel@esa.int
Tel. +31 (0)71 565 3675
Fax. +31 (0)71 565 4992

European Space Agency ESA/ESTEC
Materials Technology Section TEC-QTM
Keplerlaan 1, 2201AZ
PO Box 299, 2200AG
Noordwijk, The Netherlands

Implementation:

The qualification process, outlined in the present memo, takes immediate effect and is covering all new qualification requests as well as all ongoing qualification activities, as applicable.

A handwritten signature in blue ink, appearing to read 'M. Nikulainen', with a horizontal line extending to the right.

M. Nikulainen
Head of Materials Technology Division