



APPLICATION FOR EXTENSION OF ESCC PROCESS CAPABILITY APPROVAL

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Appl. No.

341 E

CAPABILITY DOMAIN: Microwave Hybrid Integrated Circuits (MHIC) and High Density Integrated (HDI) RF Systems in Package (RF-SiP) using LTCC multilayer

Executive Member: German Space Agency at DLR Date: 27.04.2026

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The undersigned hereby certifies on behalf of the ESCC Executive, that the above information is correct; that the appropriate documentation has been evaluated; that full compliance to all ESCC requirements is evidenced except as stated in box 13; that the reports and data are available at the ESCC Executive and therefore applies for ESCC Capability Approval status to be given to the capability domain defined herein.

Date: 27.04.2026

Digital signiert von Burak Gökgöz
DN: C=DE, CN=Burak Gökgöz, O=Deutsches Zentrum fuer Luft- und Raumfahrt e. V. (DLR), ST=Nordrhein-Westfalen, E=burak.goekgoez@dlr.de, postalCode=51147, street=Linder Höhe
Grund: Ich bin der Verfasser dieses Dokuments
Ort: Bonn
Datum: 2026.04.28 10:51:11+02'00'

i.A. Burak Gökgöz
(Signature of the ESCC Executive Coordinator)

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Continuation of Boxes above:

PID Changes since start of Process Capability Approval - continuation of Box 7:

Change Log History – Approved by Audits

Issue	Detail of Change	Date
A	Initial issue	2002-11-05
B	see change record issue B	2003-12-11
C	see change record issue C	2006-02-23
C1	Intermediate issue	
D	see change record issue D	2008-11-07
E	see change record issue E	2009-12-01
F	see change record issue F	2012-04-16
G	see change record issue G	2014-03-03

Issue H / 02.06.2016

Major: LTCC included
Minor: Editorial changes

Issue I / 29.06.2018

Major: MHIC: Plasma Cleaning included
Major: LTCC reorganized
Minor: Editorial changes, restructuring of document.

Issue J / 28.04.2020

Major: Production of ring-base MHIC change to production line of LTCC
Minor: Editorial changes, update of organisational information, inventory list, issues of documents and Flight Project information for Nov. 2017- Jan. 2020.

Issue K / 30.04.2021

Major: Consolidation of MHICs lines (ring-base & LTCC) and relocation to new building
Minor: Complete restructuring of the PID accordingly to ring-base and LTCC content. Consolidation of procurement specification list, manufacturing specification list, test specification list and equipment list.
Updating of produced MHIC list.

Issue L / 27.10.2023

Major: Extension of capability domain, as per Delta Qualification report 63.1546.023.72QPR102 Iss. A, 29.02.2024
Minor: Update of organization chart and information
Update list of produced lots since last MoQ
Exceptions as agreed during the audit in July 2022 (exception for Chip-User LAT, exception for high/low Temperature test)

Issue M / 27.08.2024

Minor: Update of Process Capability abstract, organization chart, description of role of ESCC Chief Inspector and non-conformance treatment added, SEC sample selection, notes related to x-ray inspection, PIND testing and wire bond size (changes as agreed during audit)

Issue N1 (including interim Draft Issue N) / 10.04.2026

- Minor: Update of Organisation information , Chapter 3.3.3.3.2 adapted to Laser Equipment LS9200MS, Chapter 5.1.4.4 corrected accordingly to Process Capability Approval testing, Chapter 7.2.1 Updated with new modules Produced within the capability domain, Chapter 8 Updated with lots produced since last maintenance
- Major: Chapter 3 Updated with new clean room layout including further particle sensors, Chapter 3.2.3 Fig. 3-4 Test Flow more detailed, Chapter 4.1.2 Introduction of PVD plating

Continuation of Box 5:

Doc. No. TD02279969: Maintenance of Process Capability Approval (Hybrid Line) 2025-2026, Documented evidences for an example lot (551935000810)

Confidential: Doc. Maintenance-Hybrid-Line (2025), Produced MHIC lots since last maintenance, 22.04.2026

Doc. No. 63.1546.015.93PRT418, Iss. A, Approval Report Test and Production Facilities, covering the relocation of PIND Test Equipment

Executive Member: German Space Agency at DLR **Date:** 27.04.2026

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Ali Zadeh

A. Zadeh: Head of the Avionics and EEE Division

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NOTES ON THE COMPLETION OF THE APPLICATION FORM FOR ESCC CAPABILITY APPROVAL [or its EXTENSION, see BOX 12 below]		
GENERAL	Whenever possible, all entries should be typed and in any case be suitable for legible reproduction by normal means.	
ENTRIES Form heading	shall indicate: - the title of the capability domain or the technology as given in the Capability Abstract - the Executive Member; - the entering date; - the serial number and the suffix of the form.	
Box 1	shall provide under capability domain description the full name or a description statement of the capability domain – the number of the Capability Abstract document – the basic technology used for capability approval – the test structures specification numbers or identification numbers – the components which successfully passed component approval test and are proposed for qualification within the domain. N.B. The capability abstract shall be attached as an Appendix.	
Box 2 and 3	Manufacturer's name and location of the plant(s) where the capability domain is situated.	
Box 4	The ESCC Generic and Detail specifications (including issue number and date) used during Capability Approval.	
Box 5	Reference to test report(s) submitted in support of the application for capability approval and components proposed for qualification.	
Box 6	Enter details to identify the PID that was applicable at the time of manufacturing of samples for capability approval testing.	
Box 7	If the PID has been changed during or after capability approval testing, adequate details shall be provided together with the reasons for change. Major changes shall be clearly identified.	
Box 8	The box serves to identify the current PID and the Executive Representative that has verified it together with the date of this verification.	
Box 9	The box can be completed only after a physical visit to the plant to confirm that the practices, procedures, material, etc. used in manufacturing the components are as described in the PID. This audit shall be carried out in accordance with the requirements of ESCC Basic Specification No. 20200 and the results shall be formally recorded. The report number shall be referenced.	
Box 10	Details entered shall be sufficient to evidenced that an evaluation programme according to ESCC Basic Specification No. 24300 has been performed and that the results thereof are summarised in the audit and test reports. If the evaluation programme has not been carried out according to established ESCC Specifications, the applicant Executive Member shall provide alternative data and declare the assessed degree of satisfactory compliance with the ESCC requirements. Reference shall be made to the reports on Destructive Physical Analysis (DPA), Failure Analysis reports as well as any Non Conformance (NCCS) issued during the Evaluation and/or capability approval testing.	
Box 11	Enter the name of the Executive Member (i.e., CNES, DLR, ESTEC, etc.) and the signature and date of the responsible Executive Coordinator.	
Box 12	To be used when there is a need to expand any of the boxes from 1 through 10. Identify the Box affected and reference Box 12 in the relevant Box. Box 12 can be broken into 12a, 12b, etc. if several boxes have to be expanded. In the case of Application for the Extension of Capability Approval, the Box 12 may be used to provide a summary of lots of component types (types, date codes, quantity) manufactured and tested within the capability domain. Refer to ESCC 24300, paragraph 9.4.3 for complete requirements.	
Box 13	State noncompliance with reference to specification(s) and paragraph(s). To simplify reference in Box 14 each nonconformance shall be sequentially numbered. If relevant state 'None'.	
Box 14	Any additional action deemed necessary by the Executive Member to bring the submitted data to a standard likely to be accepted by the ESCC Executive should be listed herein or the reason(s) to accept the noncompliance.	
Box 15	All Executive Manager recommendations on the application itself, special conditions or restrictions, modifications of the ESCC QPL entry, letters to the manufacturer, etc. shall be entered clearly in Box 15, signed by the representative for ESA, and dated.	

Appendix : Process Capability Abstract (1 / 1) :

The Process Capability Approval (PCA) of the Hybrid Line of Microwave Hybrid Integrated Circuits

TESAT's microwave hybrid manufacturing line capabilities are defined within the associated Process Identification Document (PID) 63.0200.005.00PID, Issue N1.

This PID describes hybrid assembly, packaging, production screening, test and quality assurance processes for Microwave Hybrid Integrated Circuits (MHIC) and for High Density Integrated (HDI) RF-Systems in Package (RF-SiP) using LTCC mul-tilayer technology. The manufacturing and screening lines are highly automated and provide up to man-less 24/7 operation mode.

The TESAT buried microwave technology offers the highest possible degree of circuit integration at extreme electromagnetic shielding levels.

The packaging standard is hermetic sealing but non-hermetic packaging has also been evaluated. Sealed packages are metal-ceramic based and apply thin-film, or LTCC technology. Such hybrids are applied in various TESAT space equipment like linearizers, channel amplifiers, frequency converters, low noise amplifiers, SSPAs, modulators, data link electronics, DC-controllers and optical communication systems (likely the hermetic variants) but also in commercial terrestrial applications (non-hermetic variants). The frequency range reaches up to V-band.

TESAT hybrids are suited for radar applications (T/R-modules, TRX-modules for satellite constellations or high throughput satellites) or SSPA building blocks for beam-forming antennas.

TESAT's microwave hybrid manufacturing services are offered in-house and also externally. (<https://www.tesat.de/services>).

All space modules are screened according to ECSS-Q-ST-60-05C including burn-in tests apart from high and low temperature tests, which are not carried out by default.