



estec

European Space Research
and Technology Centre
Keplerlaan 1
2201 AZ Noordwijk
The Netherlands
T +31 (0)71 565 6565
F +31 (0)71 565 6040
www.esa.int

MATRIX / COMPLIANCE

Checklist for ENIG, ENEPIG, ENIPIG surface finish on PCBs

Prepared by	Stan Heltzel
Reference	TEC-MSP
Issue/Revision	ESA-TECMSP-MX-011320
Date of Issue	1.0
Status	11/01/2019
	Approved



APPROVAL

Title Checklist for ENIG, ENEPIG, ENIPIG surface finish on PCBs	
Issue Number 1	Revision Number 0
Author Stan Heltzel	Date 11/01/2019
Approved By	Date of Approval
Thomas Rohr	

CHANGE LOG

Reason for change	Issue Nr.	Revision Number	Date

CHANGE RECORD

Issue Number 1	Revision Number 0		
Reason for change	Date	Pages	Paragraph(s)

DISTRIBUTION

Name/Organisational Unit	
PCB/SMT WG CNES, A Bonzi ACB, M Van de Slyeke Ciretec, P Audoux Invotec, H Swarbrick Systronic, X Mougnot TESAT, T Bartscherer	Airbus DS, P E Goutorbe KDA, S Lerdahl, T Lund Leonardo, D Gallibariggio OHB, A Hannes RUAG, M Soderholm Sodern, F Laporte; TAS, J-M Guiraud, L Sollecchia



Table of contents:

1	SCOPE AND PURPOSE.....	4
2	ABBREVIATIONS	4
3	APPLICABLE DOCUMENTS	5
4	ANNEXES	5
5	INSTRUCTIONS FOR COMPLETING THE AUDIT CHECKLIST	6
6	CHECKLIST	7



1 SCOPE AND PURPOSE

This checklist provides guidelines for the verification of applicable standards for the following surface finishes on printed circuit boards (PCB):

- ENIG (electroless nickel, immersion gold)
- ENEPIG (electroless nickel, electroless palladium, immersion gold)
- ENIPIG (electroless nickel, immersion palladium, immersion gold)

This checklist is expected to contribute to the success of the audit by ensuring a consistent assessment approach, and that both audit scope and objectives are being followed.

The checklist is intended for:

- a) the audited organisation to self-assess compliance with the requirements and recommendations from the applicable standards;
- b) the auditor(s) performing the assessment to identify the resources required by the applicable documents;
- c) both the auditor(s) and the audited organisation to use as a guide during the assessment process.

The checklists provide references to requirements and recommendations from ECSS-Q-ST-70-60, IPC-4552A and its Amendment 1 and IPC-4556.

This checklist is not a script for the audit, and it shall not be followed blindly during the audit execution. The auditor(s) may often collect and evaluate audit evidence by following audit trails which are not identified in this checklist.

2 ABBREVIATIONS

AD	Applicable Document
Am1	Amendment 1 (of IPC-4552A)
C	Compliant
ECSS	European Cooperation for Space Standardisation
ENEPIG	electroless nickel, electroless palladium, immersion gold
ENIG	electroless nickel, immersion gold
ENIPIG	electroless nickel, immersion palladium, immersion gold
ESA	European Space Agency
IPC	Association connecting electronics industry (originally: Institute for Printed Circuits)
NA	Not applicable
NC	Non-compliant
PC	Partial compliant
PCB	Printed Circuit Board
QA	Quality Assurance
RD	Reference Document

3 APPLICABLE DOCUMENTS

No	Reference	Document Title
AD01	ECSS-Q-ST-70-60C	Space Product Assurance – Qualification and procurement of PCBs
AD02	IPC-4552A	Performance Specification for Electroless Nickel / Immersion Gold (ENIG) Plating for Printed Boards
AD03	Am1 to IPC-4552A	Amendment 1 to IPC-4552A (final draft)
AD04	IPC-4556	Specification for Electroless Nickel / Electroless Palladium / Immersion Gold (ENEPIG) Plating for Printed Circuit Boards

4 ANNEXES

No	Annex Title
Annex 1	ENIG ENEPIG ENIPIG checklist

5 INSTRUCTIONS FOR COMPLETING THE AUDIT CHECKLIST

The audit checklist is provided to the audited organisation in an editable excel format in Annex 1, to complete the self-assessment and to provide the response. The management of the organisation is responsible for the correctness and completeness of the response. The auditor(s) reserves the right to use the information provided by the audited organisation to support the audit execution, and to complement the audit checklist with their assessment where relevant.

The checklist contains 115 line items to be verified. Some of the line items are relevant to ENIG, some to ENEPIG/ENIPIG and some to both. This is indicated in column D “Applicability for ENIG” and column F “Applicability for ENEPIG/ENIPIG”, using the following designations:

- **A** Clause is Applicable.
Used for requirements and recommendations from the applicable standard.
- **R** Clause is from a standard that is provided for Reference.
Used for requirements and recommendations from a standard that is not applicable, but that is considered to provide more complete information (than the applicable standard) for which compliance is requested to be evaluated as part of this checklist.
- **NA** Clause is Not Applicable.

To provide the relevant line items for a given surface finish, these columns may be filtered including A and R and excluding NA. Requirements are indicated by including the word “shall”. Other line items are recommendations for which compliance is requested to be evaluated as part of this checklist.

An important example of reference line items (R) are the provision for hypercorrosion and phosphorous content that is applicable for ENIG but not described in IPC-4556 for ENEPIG/ENIPIG. In the absence of other corrosion provisions for ENEPIG/ENIPIG, it is proposed to use the provisions from IPC-4552A as reference. Another important example is line item 87 for the frequency of solderability testing for lot conformance which is clearly specified for ENEPIG/ENIPIG but omitted in IPC-4552A (and its Am1) for ENIG.

ENIPIG suppliers have confirmed the applicability of IPC-4556, even though the title of this standard only includes ENEPIG. The only exception is the thickness of the palladium, which is included as a note in line item 29.

This checklist does not provide a disposition on acceptability or non-acceptability of the line items, apart from simply referencing to the applicable documents. Acceptability (for instance, of a certain level of hypercorrosion) may be within the scope of (future) ECSS standards, but it is not within the scope of this checklist.



Clause 5.9 from ECSS-Q-ST-70-60 specifies the following requirements to this checklist and its use:

- 5.9d. The qualification authority shall submit to the PCB manufacturer an audit checklist that verifies the requirements from ECSS-Q-ST-70-60 and its normative references one month prior to the date of the audit.
- 5.9e. The PCB manufacturer shall provide the response to the audit checklist to the qualification authority at least one week prior to the date of the audit.
- 5.9f. The response from the PCB manufacturer in the audit checklist shall include the following:
 - 1. compliance level as follows:
 - (a) “compliant” or
 - (b) “non-compliant” or
 - (c) “partial compliant” or
 - (d) “not applicable”,
 - 2. a comment explaining any non-compliance, partial compliance or non-applicability,
 - 3. references to work instructions that specify the verified requirement.

6 CHECKLIST

See Annex 1 for editable excel format of the checklist.