

TECHNICAL SPECIFICATION



**Radio frequency connectors –
Part 1-51: Technical specification of electrical tests – Uncertainty specification
of frequency domain test for return loss**



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2020 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

Preview generated by EVS

TECHNICAL SPECIFICATION



**Radio frequency connectors –
Part 1-51: Technical specification of electrical tests – Uncertainty specification
of frequency domain test for return loss**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.120.30

ISBN 978-2-8322-8928-0

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references	6
3 Terms and definitions	7
4 Units, symbols and dimensions.....	7
4.1 Units and symbols.....	7
5 Report characteristics.....	7
6 Return loss in frequency domain tests	7
6.1 Parameters	7
6.2 General considerations	7
6.3 Test equipment.....	8
6.3.1 General requirement.....	8
6.3.2 VNA calibration uncertainty.....	8
6.3.3 Terminating load specification	9
6.3.4 Other test conditions.....	10
6.3.5 Total test uncertainty	10
Annex A (informative) Estimation of VNA uncertainty specifications from commercial standard devices.....	11
A.1 Estimation from calibration certificate.....	11
A.2 Estimation from data/specification sheet	11
Bibliography.....	13
Figure 1 – Graphical symbols.....	8
Figure 2 – Graphical principle	8
Figure 3 – VNA measurement model.....	8

Draft under review generated by EVS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

RADIO FREQUENCY CONNECTORS –**Part 1-51: Technical specification of electrical tests –
Uncertainty specification of frequency domain test for return loss**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a Technical Specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical Specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 61169-1-51, which is a Technical Specification, has been prepared by subcommittee 46F: RF and microwave passive components, of IEC technical committee 46: Cables, wires, waveguides, RF connectors, RF and microwave passive components and accessories.

The text of this Technical Specification is based on the following documents:

Draft TS	Report on voting
46F/488/DTS	46F/495/RVDTS

Full information on the voting for the approval of this Technical Specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61169 series, published under the general title *Radio frequency connectors*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

This document relates to technical requirements for electrical tests for radio frequency connectors. In IEC 61169-1:2013, a frequency domain test method has been described. However, the document does not contain the quantitative uncertainty specification for measurement instruments, i.e. vector network analysers and terminations, for return loss. This document shows quantitative uncertainty specifications of electrical tests for return loss of radio frequency connectors. In addition, the document includes a brief analysis of vector network analyser measurement uncertainty for return loss measurements of radio frequency connectors.

This document is a preview generated by EVS

RADIO FREQUENCY CONNECTORS –

Part 1-51: Technical specification of electrical tests – Uncertainty specification of frequency domain test for return loss

1 Scope

This part of IEC 61169, which is a Technical Specification, relates to radio frequency connectors for RF transmission lines for use in telecommunications, electronics and similar equipment.

It provides the technical report for the uncertainty specifications for return loss measurements, which apply to individual connector types, by vector network analysers (VNAs). It is intended to establish concepts and procedures considering:

- testing and measuring procedures concerning frequency domain electrical properties;
- uncertainty specifications of VNAs measurements for return loss of RF connectors.

The test methods and procedures of this document are intended for acceptance and type approval testing.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60027, *Letter symbols to be used in electrical technology*

IEC 60050, *International Electrotechnical Vocabulary*
(available from: <http://www.electropedia.org>)

IEC 60617, *Graphical symbols for diagrams*

IEC 61169-1:2013, *Radio frequency connectors – Part 1: Generic specification – General requirements and measuring methods*

ISO/IEC 17025:2017, *General requirements for the competence of testing and calibration laboratories*

ISO/IEC Guide 98-1, *Uncertainty of measurement – Part 1: Introduction to the expression of uncertainty in measurement*

ISO 1000:1992¹, *SI units and recommendations for the use of their multiples and of certain other units*

¹ Withdrawn in 2009, revised by ISO 80000-1:2009.