

INTERNATIONAL  
STANDARD

ISO/IEC  
18046-1

First edition  
2011-10-15

---

---

---

**Information technology — Radio  
frequency identification device  
performance test methods —**

**Part 1:  
Test methods for system performance**

*Technologies de l'information — Méthodes d'essai des performances  
du dispositif d'identification par radiofréquence —*

*Partie 1: Méthodes d'essai des performances du système*

---

---

---

Reference number  
ISO/IEC 18046-1:2011(E)



© ISO/IEC 2011



## COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2011

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 ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

## Contents

	Page
<b>Foreword .....</b>	iv
<b>Introduction .....</b>	v
<b>1 Scope .....</b>	1
<b>2 Normative references .....</b>	1
<b>3 Terms and definitions .....</b>	1
<b>4 Abbreviated terms .....</b>	2
<b>5 Conditions applicable to the test methods .....</b>	2
<b>5.1 Selection of the tests .....</b>	2
<b>5.2 Selection of the devices to be tested .....</b>	2
<b>5.3 Test environment .....</b>	2
<b>5.4 RF environment .....</b>	2
<b>5.5 Pre-conditioning .....</b>	3
<b>5.6 Default tolerance .....</b>	3
<b>5.7 Total measurement uncertainty .....</b>	3
<b>5.8 Test Read and Write .....</b>	3
<b>5.9 Test speed motion .....</b>	3
<b>5.10 Test mounting material .....</b>	3
<b>5.11 Test communication parameters .....</b>	3
<b>5.12 Test equipment limits .....</b>	3
<b>5.13 Human exposure to EMF .....</b>	4
<b>5.14 Test result reporting .....</b>	4
<b>5.15 Tag arrangement .....</b>	4
<b>6 Inductive systems .....</b>	5
<b>6.1 Portable Interrogator .....</b>	5
<b>6.2 Interrogator with one side antenna(s) configuration .....</b>	10
<b>6.3 Interrogator gate antenna configuration .....</b>	19
<b>6.4 Interrogator 3 dimension antenna configuration (tunnel) .....</b>	25
<b>7 Propagative system according ISO/IEC 18000-6 .....</b>	31
<b>7.1 Portable Interrogator .....</b>	31
<b>7.2 Interrogator with one side antenna(s) configuration .....</b>	36
<b>7.3 Interrogator gate antenna configuration .....</b>	47
<b>7.4 Interrogator 3 dimension antenna configuration (tunnel) .....</b>	52
<b>8 Propagative System according ISO/IEC 18000-7 .....</b>	61
<b>8.1 Fixed Interrogator .....</b>	61
<b>Annex A (Normative) Table of general parameters for the test report .....</b>	64
<b>Bibliography .....</b>	65

## Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 18046-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 31, *Automatic identification and data capture techniques*.

This first edition (ISO/IEC 18046-1) cancels and replaces the first edition (ISO/IEC 18046:2006).

ISO/IEC 18046 consists of the following parts, under the general title *Information technology — Radio frequency identification device performance test methods*:

- *Part 1: Test methods for system performance*
- *Part 2: Test methods for interrogator performance*
- *Part 3: Test methods for tag performance*

## Introduction

RFID technology has broad applicability to the Automatic Identification and Data Capture (AIDC) industry in item management. As a wireless communication technique based on Radio Frequency technology the applications cover multiple levels of the industrial, commercial and retail supply chains. These can include:

- freight containers,
- returnable Transport Items (RTI),
- transport units,
- product packaging, and
- product tagging.

Performance tests define test methods that deliver results that allow the comparison of different RFID systems, interrogator and tags in order to select among them for use in a particular application.

The performance characteristics of devices (tags and interrogation equipment) can vary drastically due to application factors as well as the particular RFID air interface (frequency, modulation, protocol, etc.) being supported. Of key concern is the matching of the various performance characteristics to the user application. Additionally, in an open environment users of such technology demand multiple sources for these devices from technology providers. A key challenge is a method of evaluating the differences between various technology providers' products in a consistent and equitable manner.

This part of ISO/IEC 18046 provides a framework for meeting the above noted concern and challenges. To this end, clear definitions of performance as related to user application of RFID technology in the supply chain are provided. Based on such application-based definitions, test methods are defined with attention to the test parameters required for a consistent evaluation of RFID devices.

Of particular significance, these tests are defined for RFID devices having one antenna. It is common practice to have products with both single and multiple antennas to define an RFID transaction zone sufficient for the application. The defined methods can easily be extended from equipment with a single antenna to apply to equipment with multiple antennas, in order to evaluate performance under conditions more closely matching those of a particular application.

# Information technology — Radio frequency identification device performance test methods —

## Part 1: Test methods for system performance

### 1 Scope

This part of ISO/IEC 18046 defines test methods for performance characteristics of RFID systems for item management, and specifies the general requirements and test requirements for systems which are applicable to the selection of devices for an application. It does not apply to testing in relation to regulatory or similar requirements.

### 2 Normative references

The following referenced documents are indispensable for the application 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.

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 2859-4, *Sampling procedures for inspection by attributes — Part 4: Procedures for assessment of declared quality levels*

ISO 2859-10, *Sampling procedures for inspection by attributes — Part 10: Introduction to the ISO 2859 series of standards for sampling for inspection by attributes*

ISO/IEC 19762-3, *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary — Part 3: Radio frequency identification (RFID)*