BS ISO/IEC 18047-6:2017

BSI Standards Publication

Information technology — Radio frequency identification device conformance test methods

Part 6: Test methods for air interface communications at 860 MHz to 960 MHz

Documents
Document Sharing Hub

Full document details: BS ISO/IEC 18047-6:2017

National foreword

This British Standard is the UK implementation of ISO/IEC 18047-6:2017. It supersedes BS ISO/IEC 18047-6:2012, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee IST/34, Automatic identification and data capture techniques.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2017
Published by BSI Standards Limited 2017

ISBN 978 0 580 88590 7

ICS 35.040.50

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 October 2017.

Amendments/corrigenda issued since publication

Date	Text affected

Documents
Document Sharing Hub

Full document details: BS ISO/IEC 18047-6:2017

INTERNATIONAL STANDARD

ISO/IEC 18047-6

Second edition
2017-10

Information technology — Radio frequency identification device conformance test methods —

Part 6: Test methods for air interface communications at 860 MHz to 960 MHz

Technologies de l'information — Méthodes d'essai de conformité du dispositif d'identification de radiofréquence —

Partie 6: Méthodes d'essai pour des communications d'une interface d'air à 860 MHz et jusqu'à 960 MHz

Reference number
ISO/IEC 18047-6:2017(E)

AVA Documents
Document Sharing Hub

© ISO/IEC 2017

Full document details: BS ISO/IEC 18047-6:2017

COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2017, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

© ISO/IEC 2017 – All rights reserved

Documents
Document Sharing Hub

Full document details: BS ISO/IEC 18047-6:2017

Contents

Page

Foreword ... **vi**

Introduction ... **vii**

1 Scope ... **1**

2 Normative references ... **1**

3 Terms, definitions, symbols and abbreviated terms ... **2**

4 Default conditions applicable to the test methods ... **3**
4.1 Test environment ... 3
4.2 Pre-conditioning ... 3
4.2.1 General ... 3
4.2.2 Default tolerance ... 3
4.2.3 Noise floor at test location ... 3
4.2.4 Total measurement uncertainty ... 3

5 Setup of test equipment ... **4**
5.1 Setup of test equipment for interrogator tests ... 4
5.1.1 General ... 4
5.1.2 Sense antenna ... 4
5.1.3 Test apparatus and test circuits for ISO/IEC 18000-61, ISO/IEC 18000-62 and ISO/IEC 18000-63 interrogator ... 4
5.2 Setup of test equipment for tag tests ... 5
5.2.1 General ... 5
5.2.2 Test apparatus and test circuits for ISO/IEC 18000-61, ISO/IEC 18000-62, ISO/IEC 18000-63 and ISO/IEC 18000-64 tags ... 5

6 Conformance tests for ISO/IEC 18000-61 ... **6**
6.1 Functional tests of interrogator ... 6
6.1.1 Interrogator modulation test ... 6
6.1.2 Interrogator demodulation and turn-around time ... 7
6.2 Functional tests of tag ... 8
6.2.1 Tag demodulation and turn-around time ... 8
6.2.2 Tag backscatter ... 8
6.2.3 Tag response time ... 9
6.2.4 Tag bit rate ... 10
6.2.5 Tag state storage time ... 10

7 Conformance tests for ISO/IEC 18000-62 ... **11**
7.1 Functional tests of interrogator ... 11
7.1.1 Interrogator modulation test ... 11
7.1.2 Interrogator demodulation and turn-around time ... 12
7.2 Functional tests of tag ... 12
7.2.1 Tag demodulation and turn-around time ... 12
7.2.2 Tag backscatter ... 13
7.2.3 Tag response time ... 14
7.2.4 Tag bit rate ... 15
7.2.5 Tag state storage time ... 15

8 Conformance tests for ISO/IEC 18000-63 ... **16**
8.1 Functional tests of interrogator ... 16
8.1.1 Interrogator data encoding ... 16
8.1.2 Interrogator RF envelope parameters ... 17
8.1.3 Interrogator RF power-up and power-down parameters ... 18
8.1.4 Interrogator preamble parameters ... 19
8.1.5 Interrogator link timing T2 ... 20
8.1.6 Interrogator link timing T3 ... 21
8.1.7 Interrogator link timing T4 ... 22

AVA Documents
Document Sharing Hub

© ISO/IEC 2017 – All rights reserved

Full document details: BS ISO/IEC 18047-6:2017

8.2 Functional tests of tag ... 23
8.2.1 Tag frequency range ... 23
8.2.2 Tag demodulation capability ... 24
8.2.3 Tag duty cycle ... 25
8.2.4 Tag preamble ... 26
8.2.5 Tag link frequency tolerance and variation ... 28
8.2.6 Tag link timing T1 ... 29
8.2.7 Tag link timing T2 ... 30
8.2.8 Tag link timing T5 ... 31
8.2.9 Tag link timing T6 ... 32
8.2.10 Tag link timing T7 ... 33
8.2.11 Tag state diagram ... 34
8.2.12 Tag backscatter (optional) ... 36
8.3 Additional protocol related tests ... 37
8.3.1 Memory overruns ... 37
8.3.2 Kill command ... 38
8.3.3 Unauthorized Write command ... 38
8.3.4 Optional commands and features ... 39

9 Conformance tests for ISO/IEC 18000-64 ... 42
9.1 Functional tests of interrogator ... 42
9.1.1 Interrogator modulation test ... 42
9.1.2 Interrogator demodulation and data decoding ... 42
9.2 Functional tests of tag ... 44
9.2.1 General ... 44
9.2.2 Data encoding ... 45
9.2.3 Link bits ... 46
9.2.4 Tag timing parameters ... 46
9.2.5 Tag bit rate ... 47
9.2.6 Tag multi-page timing ... 48
9.2.7 Tag LBT ... 48

10 Conformance tests for ISO/IEC 18000-63 battery-assisted passive (BAP) ... 49
10.1 Tag functional tests ... 49
10.1.1 Battery-assisted passive tag persistence time test ... 49

11 Conformance tests for ISO/IEC 18000-63 Manchester mode battery-assisted passive (BAP) ... 50
11.1 Functional tests of interrogator ... 50
11.1.1 Interrogator RF envelope parameters ... 50
11.1.2 Interrogator activation minimum dwell time, T_A ... 51
11.1.3 Interrogator link timing T2 ... 52
11.1.4 Interrogator link timing T3 ... 54
11.1.5 Interrogator link timing T4 ... 55
11.2 Functional tests of tag ... 56
11.2.1 Tag demodulation capability ... 56
11.2.2 Tag link frequency tolerance and variation ... 57
11.2.3 Tag link timing T1 ... 58
11.2.4 Tag link timing T2 ... 59
11.2.5 Tag activation time maximum, T_A ... 60
11.2.6 Tag stateful hibernate timer ... 61

12 Conformance tests for ISO/IEC 18000-63 Sensor support ... 63
12.1 Tag functional tests ... 63
12.1.1 Simple sensor test ... 63

13 Full-function sensor test ... 64
13.1 Purpose ... 64
13.2 Procedure ... 64
13.2.1 General ... 64

© ISO/IEC 2017 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

Annex A (informative) **Test measurement site** **65**
Annex B (normative) **Command coding for conformance tests for the different types of ISO/IEC 18000-6** **77**
Annex C (normative) **Technical performance of the generic electronic test instruments** **78**
Annex D (normative) **Tag emulator** **79**
Annex E (informative) **Measurement examples** **81**
Bibliography **82**

© ISO/IEC 2017 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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

This second edition cancels and replaces the first edition (ISO/IEC 18047-6:2012), which has been technically revised.

The main changes compared to the previous edition are as follows:

— Tag demodulation test setup now includes a monostatic setup with the use of a circulator;

— new tests for Tag link timings T5, T6 and T7 (defined in ISO/IEC 18000-63:2015 and related to delayed and in-process tag reply); and

— new tests related to ISO/IEC 18000-63:2015 like Tag memory overruns, Kill command, unauthorized write commands and optional commands that involve C-flag, ResponseBuffer, security features and untraceability.

© ISO/IEC 2017 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

Introduction

ISO/IEC 18000 series defines the air interfaces for radio frequency identification (RFID) devices used in item management applications. ISO/IEC 18000-61, ISO/IEC 18000-62, ISO/IEC 18000-63 and ISO/IEC 18000-64 define the air interface for these devices operating at frequencies from 860 MHz to 960 MHz.

ISO/IEC 18047 series provides test methods for conformance with the various parts of the ISO/IEC 18000 series.

Each part of ISO/IEC 18047 contains all measurements required to be made on a product in order to establish whether it conforms to the corresponding part of ISO/IEC 18000. For this document, each interrogator and each tag needs to support at least one of the types A or B or C or D.

NOTE Test methods for interrogator and tag performance are covered by ISO/IEC 18046 series.

Clause 5 describes all necessary conformance tests for ISO/IEC 18000-61.

Clause 6 describes all necessary conformance tests for ISO/IEC 18000-62.

Clause 7 describes all necessary conformance tests for ISO/IEC 18000-63.

Clause 8 describes all necessary conformance tests for ISO/IEC 18000-64.

Clause 9 describes all necessary conformance tests for ISO/IEC 18000-63:2015, Clause 7.

Clause 10 describes all necessary conformance tests for ISO/IEC 18000-63:2015, 7.5.

© ISO/IEC 2017 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

Information technology — Radio frequency identification device conformance test methods —

Part 6: Test methods for air interface communications at 860 MHz to 960 MHz

1 Scope

This document defines test methods for determining the conformance of radio frequency identification (RFID) devices (tags and interrogators) for item management with the specifications given in ISO/IEC 18000-61, ISO/IEC 18000-62, ISO/IEC 18000-63 and ISO/IEC 18000-64, but does not apply to the testing of conformity with regulatory or similar requirements.

The test methods require only that the mandatory functions, and any optional functions which are implemented, are verified. This can, in appropriate circumstances, be supplemented by further, application-specific functionality criteria that are not available in the general case.

The interrogator and tag conformance parameters in this document are the following:

— type-specific conformance parameters including nominal values and tolerances;

— parameters that apply directly affecting system functionality and inter-operability.

Parameters that are already included in regulatory test requirements are not included in this document.

Unless otherwise specified, the tests in this document are intended to be applied exclusively to RFID tags and interrogators defined in ISO/IEC 18000-61, ISO/IEC 18000-62, ISO/IEC 18000-63 and ISO/IEC 18000-64.

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.

ISO/IEC 18000-61:2012, *Information technology — Radio frequency identification for item management — Part 61: Parameters for air interface communications at 860 MHz to 960 MHz Type A*

ISO/IEC 18000-62:2012, *Information technology — Radio frequency identification for item management — Part 62: Parameters for air interface communications at 860 MHz to 960 MHz Type B*

ISO/IEC 18000-63:2015, *Information technology — Radio frequency identification for item management — Part 63: Parameters for air interface communications at 860 MHz to 960 MHz Type C*

ISO/IEC 18000-64, *Information technology — Radio frequency identification for item management — Part 64: Parameters for air interface communications at 860 MHz to 960 MHz Type D*

ISO/IEC 19762, *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary*

© ISO/IEC 2017 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 19762 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.2 Symbols

For the purposes of this document, the symbols given in ISO/IEC 19762 and the following apply.

D	modulation depth of data coding pulse
d_1	distance between the interrogator and test antenna
d_2	distance between test antenna and DUT tag
d_s	distance between the interrogator antenna and sense antenna
$d_{T,IA}$	interrogator antenna to tag distance
$d_{T,MA}$	measurement antenna to tag distance
d_{TE}	distance between the interrogator antenna and tag emulator
G_{IA}	gain of interrogator antenna
G_{MA}	gain of measurement antenna
Icir	isolation of a circulator
K	calibration factor
L	maximum interrogator antenna dimension
M	modulation index
P_I	delivered power at the carrier frequency
P_M	measured power at the carrier frequency
T_f	fall time
T_r	rise time

© ISO/IEC 2017 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

3.3 Abbreviated terms

For the purposes of this document, the abbreviated terms given in ISO/IEC 19762 and the following apply.

BLF	backscatter-link frequency (BLF = $1/T_{pri}$ = DR/TRcal)
DUT	device under test
RCS	radar cross-section
ΔRCS	change in radar cross-section
RBW	resolution bandwidth
VBW	video bandwidth

4 Default conditions applicable to the test methods

4.1 Test environment

Unless otherwise specified, testing shall take place in an environment of temperature (23 ± 3) °C and of non-condensing humidity from 40 % to 60 %.

4.2 Pre-conditioning

4.2.1 General

The interrogators and tags to be tested shall be conditioned to the test environment for a period of 24 h before testing.

4.2.2 Default tolerance

Unless otherwise specified, a default tolerance of ±5 % shall be applied to the quantity values given to specify the characteristics of the test equipment (e.g. linear dimensions) and the test method procedures (e.g. test equipment adjustments).

4.2.3 Noise floor at test location

Noise floor at test location shall be measured for at least 1 min with the spectrum analyser using the same conditions as for the measurement of the DUT.

The maximum of the measured noise amplitude measured in a 10 kHz bandwidth shall be −60 dB from 0,5 GHz to 2 GHz and −90 dBm around the frequency of the main signal of the tag backscatter signal.

Special attention has to be given to spurious emissions, e.g. insufficiently shielded computer monitors. The electromagnetic test conditions of the measurements shall be checked by performing the measurements with and without a tag in the field.

4.2.4 Total measurement uncertainty

The total measurement uncertainty for each quantity determined by these test methods shall be stated in the test report.

NOTE Basic information is given in ISO/IEC Guide 98-3.

© ISO/IEC 2017 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

5 Setup of test equipment

5.1 Setup of test equipment for interrogator tests

5.1.1 General

The DUT shall be an interrogator including an antenna.

All conformance measurements and setups shall be done in an anechoic chamber as defined in Annex A.

All measurements shall be done at one of the test frequencies in Table 1.

Table 1 — Test frequencies

Test carrier frequency	Comment
866 MHz	Recommended for tests under European regulations
915 MHz	Recommended for tests under Japan, Korean, Australian or US regulations

NOTE With the test frequencies specified in Table 1, all frequencies of the entire band from 860 MHz to 930 MHz are within ±2,9 % of one of the test frequencies. All practically used frequencies in the frequency bands 860 MHz to 870 MHz, 900 MHz to 930 MHz are within ±1,7 % of the test frequencies.

5.1.2 Sense antenna

Where applicable, tests shall be carried out using a sense antenna, which shall be a substantially non-reactive, non-radiating load of 50 Ω equipped with an antenna connector. The voltage standing wave ratio (VSWR) at the 50 Ω connector shall not be greater than 2 : 1 over the frequency range of the measurement.

5.1.3 Test apparatus and test circuits for ISO/IEC 18000-61, ISO/IEC 18000-62 and ISO/IEC 18000-63 interrogator

5.1.3.1 Interrogator modulation test setup

For this test, the sense antenna shall always be placed and orientated for optimum field strength reception in the direction of the major power radiation of the DUT interrogator antenna according to Figure 1 at a distance, d_S, of 0,8 m to 1,1 m.

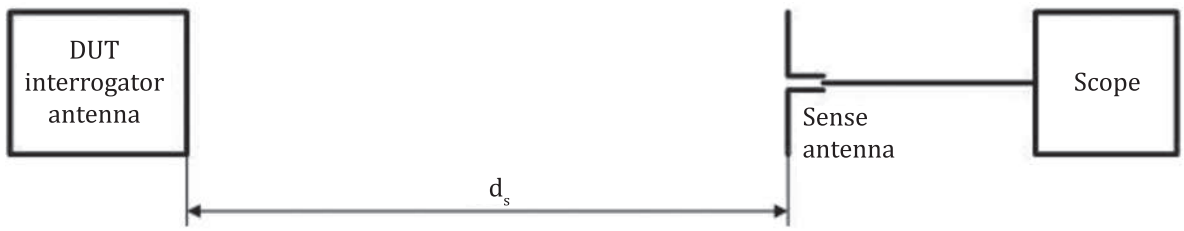


Figure 1 — Interrogator modulation test setup

5.1.3.2 Interrogator demodulation and turn-around time test setup

For this test, the tag emulator as defined in Annex D shall be placed and orientated for optimum field strength reception in the direction of the major power radiation of the DUT interrogator antenna according to Figure 2 at a distance, d_{TE}, of 0,8 m to 1,1 m.

© ISO/IEC 2017 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

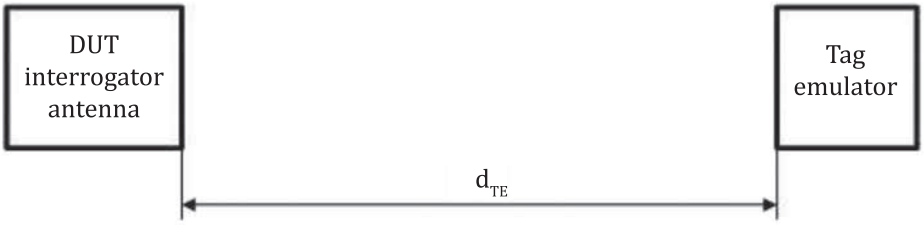


Figure 2 — Interrogator demodulation and turn-around test setup

5.2 Setup of test equipment for tag tests

5.2.1 General

The DUT shall be a tag including all means in order to be capable to communicate with an interrogator.

When tests require use of an interrogator, this shall be a measurement equipment that fulfills the requirements in order to act as interrogator and in particular it shall support the minimum tag response to interrogator command turn-around time.

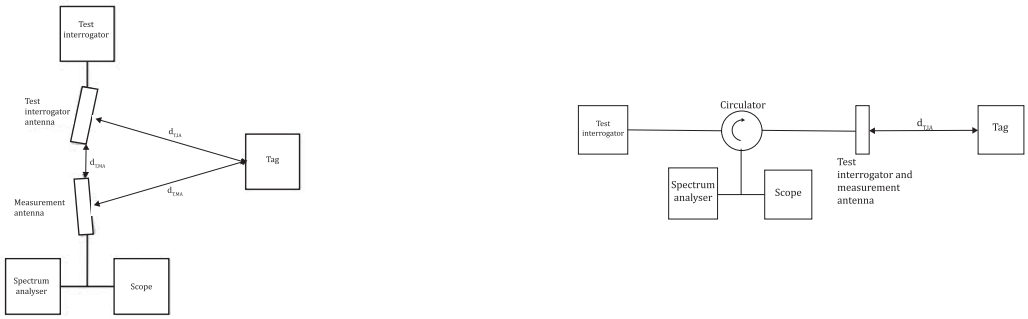
All conformance measurements and setups shall be done in an anechoic chamber as defined in Annex A.

All measurements shall be done at one of the test frequencies in Table 1.

5.2.2 Test apparatus and test circuits for ISO/IEC 18000-61, ISO/IEC 18000-62, ISO/IEC 18000-63 and ISO/IEC 18000-64 tags

5.2.2.1 Tag demodulation and turn-around time test setup

For this test, the tag shall be placed and oriented for optimum field strength reception in the direction of the major power radiation of the interrogator.



a) Bistatic setup **b) Monostatic setup**

Figure 3 — Tag demodulation test setup

5.2.2.2 Tag backscatter test setup

For this test, two different setups may be used.

In a first one [see Figure 3 a)], the test interrogator antenna setup (the interrogator may alternately also be realized with a signal generator according Annex C) shall consist of a set of two mechanically assembled antennas specifically designed to reduce the signal coupling between each other. One shall be used as interrogator antenna while the second shall be used as measurement antenna and shall be

© ISO/IEC 2017 – All rights reserved

AVA Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

connected either to a spectrum analyser or to an oscilloscope as specified in Annex C. The tag under test shall be placed at this focal point and oriented for optimum field strength reception. The distances between the tag and the antennas are $d_{T,IA}$ and $d_{T,MA}$, respectively [see Figure 3 a)].

The tag backscatter test setup parameters are defined in Table 2.

Table 2 — Tag backscatter setup parameters

Symbol	Name	Description
$d_{T,IA}$	Interrogator antenna to tag distance	0,8 m to 1,1 m
$d_{T,MA}$	Measurement antenna to tag distance	0,8 m to 1,1 m
G_{IA}	Gain of interrogator antenna	The maximum 3 dB beam width shall be ±35°
G_{MA}	Gain of measurement antenna	The maximum 3 dB beam width shall be ±35°
Icir	Isolation of the circulator	The minimum isolation of the circulator shall be 20 dB

In a second one [see Figure 3 b)], the test interrogator antenna setup (the interrogator may alternately also be realized with a signal generator according Annex C) shall consist of a single antenna specifically designed to transmit the signal from the interrogator and to receive the signal backscattered from the tag under test. This antenna shall be connected to the interrogator and to either a spectrum analyser or an oscilloscope as specified in Annex C via a circulator. The tag under test shall be oriented for optimum field strength reception. The distance between the tag and the antenna is $d_{T,IA}$ [see Figure 3 b)].

The tag backscatter test setup parameters are defined in Table 2.

5.2.2.3 Tag response time

The setup for this test shall be as described in 5.2.2.1.

5.2.2.4 Tag bit rate accuracy test setup

The setup for this test shall be as described in 5.2.2.1.

5.2.2.5 Tag state storage time test setup

The setup for this test shall be as described in 5.2.2.1.

6 Conformance tests for ISO/IEC 18000-61

6.1 Functional tests of interrogator

6.1.1 Interrogator modulation test

6.1.1.1 Test objective

The objective of this test is to verify that the interrogator provides the appropriate modulation waveform required for operation of tags.

6.1.1.2 Test procedure

The interrogator shall transmit an **Init_round_all** command at the maximum power of the selected carrier frequency for testing.

In case the interrogator is intended for operation of non-overlapping RF bands, then this test shall be done for each RF band.

© ISO/IEC 2017 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

A digital oscilloscope as specified in Annex C and the sense antenna shall be used to record the waveform provided by the interrogator.

6.1.1.3 Test report

The test report shall give the measured values of the parameters according to Table 3. The pass/fail condition is determined whether the measured values are within the requirements as specified in ISO/IEC 18000-61. Furthermore, the DUT and the sense antenna orientation and position, as well as the used interrogator output power, and the used operation frequency shall be recorded.

Table 3 — Measurements to be made

Parameter	Conditions
D	Default modulation operation mode
T_{apr}	Default modulation operation mode
T_{apf}	Default modulation operation mode

6.1.2 Interrogator demodulation and turn-around time

6.1.2.1 Test objective

The objectives of this test are to verify whether the interrogator is capable of

— demodulating signals from the tags, and

— receiving the data transmitted by the tag emulator after the minimum specified turn-around time.

6.1.2.2 Test procedure

The interrogator shall transmit an **Init_round_all** command (see B.1.1) at the maximum power of the selected carrier frequency for testing.

After the command provided by the interrogator has been sent and after the minimum turn-around time, a tag emulator as specified in Annex D shall transmit a typical response to the **Init_round_all** command at a minimum ΔRCS specified in ISO/IEC 18000-61. The tag emulator does not need to demodulate the command, but shall only detect its end to respond after the minimum turn-around time.

When the interrogator is intended for operation of non-overlapping RF bands, this test shall be done for each RF band.

Measurements shall be done for both the minimum and maximum tag response data rate, i.e. the turn-around time from interrogator command to tag response.

In case the interrogator is designed for shorter communication distances, then the distance d_{TE} may be decreased and the actual used value shall be mentioned in test report.

The interrogator (digital) demodulator shall accept the tag response including verification of the CRC.

6.1.2.3 Test report

The test report shall contain the tag emulator distance to the interrogator and the ΔRCS value setup in the tag emulator. Furthermore, also the set up turn-around time from the tag emulator, the DUT and the tag emulator orientation and position, as well as the used interrogator output power and the used operation frequency shall be recorded.

© ISO/IEC 2017 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

6.2 Functional tests of tag

6.2.1 Tag demodulation and turn-around time

6.2.1.1 Test objective

The objectives of this test are to verify whether the tag is capable of

— demodulating signals from the interrogator, and

— receiving the data transmitted by the interrogator after the minimum specified response to command turn-around time.

6.2.1.2 Test procedure

The test interrogator shall transmit an **Init_round_all** (see B.1.1) command.

The tag (DUT) shall receive the command provided by the interrogator and shall provide an appropriate response. After complete reception of the tag response, the interrogator shall generate a **Next_slot** command within the minimum specified turn-around time between tag response and interrogator command.

Measurements shall be done by verifying that the tag detects the command appropriately by means of evaluation of its response. Measurements shall be done at $P_I = 1{,}2\ P_{I,min}$.

In case the interrogator is designed for shorter communication distances, then the distance d_{TE} may be decreased and the actual used value shall be mentioned in test report.

The test shall be seen as successful when it could be shown that the tag sent the correct response for both commands including verification of the CRC.

The interrogator waveform shall contain the setup of the waveform for the respective types according to Table 4.

Table 4 — Setup of waveforms

Setup number	Setup description	Parameter setting
A-1	Minimum modulation depth	$D = D_{min}$
A-2	Medium modulation depth	$D = (D_{max} + D_{min})/2$
A-3	Maximum modulation depth	$D = D_{max}$

6.2.1.3 Test report

The test result shall be recorded as successful or unsuccessful. The test report shall contain the tag distance to the interrogator. Furthermore, also the setup turn-around time from the tag response to interrogator command, the DUT and the interrogator orientation and position, as well as the used interrogator output power and the used operation frequency shall be recorded.

6.2.2 Tag backscatter

6.2.2.1 Test objective

The objective of this test is to verify that the tag provides the appropriate modulation waveform and backscatter strength required to be successfully detected and received by the interrogator.

Measurements are carried out in an anechoic chamber either in bistatic antennas configuration as shown in Figure 3 a) with the tag positioned in the far field of the transmit antenna or in monostatic antenna configuration [see Figure 3 b)].

© ISO/IEC 2017 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

6.2.2.2 Test procedure

Measurements shall be done with power $P_{I,min}$, where $P_{I,min}$ is the minimum power allowing the DUT tag activation.

A vector signal analyser as specified in Annex C shall be used to record the quadrature baseband voltages I and Q versus time.

Test setup shall be calibrated to determine antennas gain and mismatch, circulator isolation and insertion loss and also cables loss, to be taken into account for all power measurements.

The delta radar cross-section measurement procedure is as follows.

1) The signal generator shall be set to the required test frequency.

2) The signal generator amplitude shall be set to a value that allows the DUT tag activation.

3) Using the power meter, determine the power at the entrance of the transmit antenna, P_e, which is defined as the average power measured over at least 100 µs period during the continuous wave signal following the signal generator command.

4) The signal analyser shall be set to measure the quadrature baseband I and Q power versus time with a sampling rate of at least 5 Msps.

5) With the tag placed in the anechoic chamber, the analyser shall be set to capture the complex IQ power for at least during 10 symbols of tag reply.

6) Calculate the difference of power from the DUT tag backscattering according to Formula (1):

$$\Delta P_{\text{tag}}(\text{rms}) = \frac{1}{2Z_0} \cdot \left(\left(I_{r,1} - I_{r,0} \right)^2 + \left(Q_{r,1} - Q_{r,0} \right)^2 \right) \tag{1}$$

where

Z_0 is the wave resistance of the measurement equipment and is usually 50 Ω.

7) Calculate the ΔRCS of the DUT tag using Formula (2):

$$\Delta\text{RCS} = \frac{\Delta P_{\text{tag}}}{P_{\text{e}}} \frac{4\pi d^4}{G_{0t} \cdot G_{0r}} \left(\frac{4\pi}{\lambda} \right)^2 \tag{2}$$

6.2.2.3 Test report

The test report shall give the measured values of ΔRCS. The pass/fail condition is determined whether the measured values are within the requirements as specified in ISO/IEC 18000-61 and the evaluated ΔRCS is at least above the value from ISO/IEC 18000-61. Furthermore, the DUT and the interrogator orientation and position, as well as the used interrogator output power and the used operation frequency shall be recorded.

6.2.3 Tag response time

6.2.3.1 Test purpose

The objective of this test is to verify the tag response time, T_{rs}, referencing the parameters in ISO/IEC 18000-61.

© ISO/IEC 2017 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

6.2.3.2 Test procedure

The interrogator shall transmit a **Init_round_all** command (see B.1.1) at the maximum power of the selected carrier frequency for testing.

The measurements shall be done using the tag backscatter test setup.

The response time shall be measured by an oscilloscope as specified in Annex C.

NOTE An example for the measurements is given in E.1.

6.2.3.3 Test report

The test report shall give the measured values of turn-around time. The pass/fail condition is determined whether the measured values are within the requirements for the response time specified for ISO/IEC 18000-61.

6.2.4 Tag bit rate

6.2.4.1 Test objective

The objective of this test is to verify the bit rate accuracy and data rate of the return link by verification of the T_{rlb} parameter.

6.2.4.2 Test procedure

The interrogator shall transmit a **Init_round_all** command (see B.1.1) at the maximum power of the selected carrier frequency for testing.

The tag response waveform shall be recorded by an oscilloscope as specified in Annex C using the tag backscatter test setup.

The bit rate accuracy shall be measured on the preamble of the tag response.

The average on the first seven bits of preamble shall be used to measure the bite rate accuracy.

6.2.4.3 Test report

The test report shall give the measured values of bit rate calculated according to Formula (3) and Formula (4):

$$T_{B7} = 7 \times T_{rlb} \tag{3}$$

$$\text{bit rate} = \frac{7}{T_{B7}} \tag{4}$$

The pass/fail condition is determined whether the measured values are within the requirements as specified in ISO/IEC 18000-61.

6.2.5 Tag state storage time

6.2.5.1 Test objective

The objective of this test is to verify the state storage time of the tag if the energizing field is absent or insufficient.

© ISO/IEC 2017 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

6.2.5.2 Test procedure

The interrogator shall transmit a **Init_round_all** command (see B.1.1) at the maximum power of the selected carrier frequency for testing.

After the end of mandatory command sent by the interrogator, the field shall be shut down for a specified time during two tag states.

For ISO/IEC 18000-61, the following shall be done:

a) Quiet state

The test shall be executed for shutoff time equal to the lower limit value of time defined in ISO/IEC 18000-61 on which the tag has to keep the Quiet state.

b) Other states

The test shall be executed for shutoff time equal to the lower limit value of time defined in ISO/IEC 18000-61 during which the tag has to retain its state.

NOTE An example for the measurements is given in E.2.

6.2.5.3 Test report

The test report shall give the tested values of limit storage state time. The pass/fail condition is determined whether the measured values are within the requirements in the ISO/IEC 18000-61:2012, 6.5.2.

7 Conformance tests for ISO/IEC 18000-62

7.1 Functional tests of interrogator

7.1.1 Interrogator modulation test

7.1.1.1 Test objective

The objective of this test is to verify that the interrogator provides the appropriate modulation waveform required for operation of tags.

7.1.1.2 Test procedure

The interrogator shall transmit a **GROUP_SELECT_EQ** command (see B.2.1) at the maximum power of the selected carrier frequency for testing.

A digital oscilloscope as specified in Annex C and the sense antenna shall be used to record the waveform provided by the interrogator.

7.1.1.3 Test report

The test report shall give the measured values of the parameters according to Table 5. The pass/fail condition is determined if the measured values are within the requirements as specified in ISO/IEC 18000-62. Furthermore, the DUT and the sense antenna orientation and position, as well as the used interrogator output power and the used operation frequency shall be recorded.

© ISO/IEC 2017 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

Table 5 — Measurements to be made

Parameter	Conditions
M	Low index interrogator modulation mode
T_r	Low index interrogator modulation mode
T_f	Low index interrogator modulation mode
M	High index interrogator modulation mode
T_r	High index interrogator modulation mode
T_f	High index interrogator modulation mode

7.1.2 Interrogator demodulation and turn-around time

7.1.2.1 Test objective

The objectives of this test are to verify whether the interrogator is capable of

— demodulating signals from the tags, and

— receiving the data transmitted by the tag emulator after the minimum specified turn-around time.

7.1.2.2 Test procedure

The interrogator shall transmit a **GROUP_SELECT_EQ** command (see B.2.1) at the maximum power of the selected carrier frequency for testing.

After the command provided by the interrogator has been sent and after the minimum turn-around time, a tag emulator as specified in Annex D shall transmit a typical response to the **GROUP_SELECT_EQ** command at a minimum ΔRCS specified in ISO/IEC 18000-62. The tag emulator does not need to demodulate the command, but shall only detect its end to respond after the minimum turn-around time.

Measurements shall be done for both the minimum and maximum tag response data rate, i.e. the turn-around time from interrogator command to tag response.

In case the interrogator is designed for shorter communication distances, then the distance d_{TE} may be decreased and the actual used value shall be mentioned in test report.

The interrogator (digital) demodulator shall accept the tag response including verification of the CRC.

7.1.2.3 Test report

The test report shall contain the tag emulator distance to the interrogator and the ΔRCS value setup in the tag emulator. Furthermore, the set up turn-around time from the tag emulator, the DUT and the tag emulator orientation and position, as well as the used interrogator output power and the used operation frequency shall be recorded.

7.2 Functional tests of tag

7.2.1 Tag demodulation and turn-around time

7.2.1.1 Test objective

The objectives of this test are to verify whether the tag is capable of

— demodulating signals from the interrogator, and

— receiving the data transmitted by the interrogator after the minimum specified response to command turn-around time.

© ISO/IEC 2017 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

7.2.1.2 Test procedure

The test interrogator shall transmit a **GROUP_SELECT_EQ** command (see B.2.1).

The tag (DUT) shall receive the command provided by the interrogator and shall provide an appropriate response. After complete reception of the tag response, the interrogator shall generate a new **GROUP_SELECT_EQ** command within the minimum specified turn-around time between tag response and interrogator command.

Measurements shall be done by verifying that the tag detects the command appropriately by means of evaluation of its response. Measurements shall be done at $P_I = 1{,}2\ P_{I,min}$.

In case the interrogator is designed for shorter communication distances, then the distance d_{TE} may be decreased and the actual used value shall be mentioned in test report.

The test shall be seen as successful when it can be shown that the tag sent the correct response for both commands including verification of the CRC.

The interrogator waveform shall contain the setup of the waveform for the respective types according to Table 6.

Table 6 — Setup of waveforms

Setup number	Setup description	Parameter setting
B-1	Minimum modulation index for low modulation index operation mode	$M = M_{min}$
B-2	Maximum modulation index for low modulation index operation mode	$M = M_{max}$
B-3	Minimum modulation index for high modulation index operation mode	$M = M_{min}$
B-4	Maximum modulation index for high modulation index operation mode	$M \approx 99\ \% * M_{max}$

7.2.1.3 Test report

The test result shall be recorded as successful or unsuccessful. The test report shall contain the tag distance to the interrogator. Furthermore, the set up turn-around time from the tag response to interrogator command, the DUT and the interrogator orientation and position, as well as the used interrogator output power and the used operation frequency shall be recorded.

7.2.2 Tag backscatter

7.2.2.1 Test objective

The objective of this test is to verify that the tag provides the appropriate modulation waveform and backscatter strength required to be successfully detected and received by the interrogator.

Measurements are carried out in an anechoic chamber in either bistatic antennas configuration as shown in Figure 3 a) with the tag positioned in the far field of the transmit antenna or in monostatic configuration [see Figure 3 b)].

7.2.2.2 Test procedure

Measurements shall be done with power $P_{I,min}$, where $P_{I,min}$ is the minimum power allowing the DUT tag activation.

A vector signal analyser as specified in Annex C shall be used to record the quadrature baseband voltages I and Q versus time.

© ISO/IEC 2017 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

Test setup shall be calibrated to determine antennas gain and mismatch, circulator isolation and insertion loss and also cables loss, to be taken into account for all power measurements.

The delta radar cross-section measurement procedure is as follows.

1) The signal generator shall be set to the required test frequency.

2) The signal generator amplitude shall be set to a value that allows the DUT tag activation.

3) Using the power meter, determine the power at the entrance of the transmit antenna, P_e, which is defined as the average power measured over at least 100 µs period during the continuous wave signal following the signal generator command.

4) The signal analyser shall be set to measure the quadrature baseband I and Q power versus time with a sampling rate of at least 5 Msps.

5) With the tag placed in the anechoic chamber, the analyser shall be set to capture the complex IQ power for at least during 10 symbols of tag reply.

6) Calculate the difference of power from the DUT tag backscattering according to Formula (5):

$$\Delta P_{\text{tag}}(\text{rms}) = \frac{1}{2Z_0} \cdot \left(\left(I_{r,1} - I_{r,0} \right)^2 + \left(Q_{r,1} - Q_{r,0} \right)^2 \right) \tag{5}$$

where

Z_0 is the wave resistance of the measurement equipment and is usually 50 Ω.

7) Calculate the ΔRCS of the DUT tag using Formula (6):

$$\Delta\text{RCS} = \frac{\Delta P_{\text{tag}}}{P_{\text{e}}} \frac{4\pi d^4}{G_{0t} \cdot G_{0r}} \left(\frac{4\pi}{\lambda} \right)^2 \tag{6}$$

7.2.2.3 Test report

The test report shall give the measured values of ΔRCS. The pass/fail condition is determined whether the measured values are within the requirements as specified in ISO/IEC 18000-62 and the evaluated ΔRCS is at least above the value given in ISO/IEC 18000-62. Furthermore, the DUT and the interrogator orientation and position, as well as the used interrogator output power and the used operation frequency shall be recorded.

7.2.3 Tag response time

7.2.3.1 Test objective

The objective of this test is to verify the tag response time Quiet referencing the parameters in ISO/IEC 18000-62.

7.2.3.2 Test procedure

The interrogator shall transmit a **GROUP_SELECT_EQ** command (see B.2.1) at the maximum power of the selected carrier frequency for testing.

The measurements shall be done using the tag backscatter test setup, the tag positioned $d_{T,IA}$ = 3 λ and $d_{T,MA}$ = 3 λ away from the test interrogator antennas.

The response time shall be measured by an oscilloscope as specified in Annex C.

NOTE An example for the measurements is given in E.1.

© ISO/IEC 2017 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

7.2.3.3 Test report

The test report shall give the measured values of turn-around time. The pass/fail condition is determined whether the measured values are within the requirements for the response time specified to the respective type.

7.2.4 Tag bit rate

7.2.4.1 Test objective

The objective of this test is to verify the bit rate accuracy and data rate of the return link by verification of the T_{rlb} parameter.

7.2.4.2 Test procedure

The interrogator shall transmit a **GROUP_SELECT_EQ** command (see B.2.1) at the maximum power of the selected carrier frequency for testing.

The tag response waveform shall be recorded by an oscilloscope as specified in Annex C using the tag backscatter test setup.

The bit rate accuracy shall be measured on the preamble of the tag response for each type, respectively.

The average on the first seven bits of preamble shall be used to measure the bite rate accuracy.

7.2.4.3 Test report

The test report shall give the measured values of bit rate calculated according to Formula (7) and Formula (8) (see Annex E):

$$T_{\text{rlb_average}} = \frac{\sum_{1}^{7} T_{\text{rlb}_n}}{7} \tag{7}$$

$$\text{bit rate} = \frac{1}{T_{\text{rlb_average}}} \tag{8}$$

The pass/fail condition is determined whether the measured values are within the requirements as specified in ISO/IEC 18000-62.

7.2.5 Tag state storage time

7.2.5.1 Test objective

The objective of this test is to verify the state storage time of the tag if the energizing field is absent or insufficient.

7.2.5.2 Test procedure

The interrogator shall transmit a **READ** command at the maximum power of the selected carrier frequency for testing.

After the end of mandatory command sent by the generator, the field shall be shut down for a specified time during two tag states.

The test shall be executed for a shutoff time of t_{DF_SB} defined in ISO/IEC 18000-62 and the flag DE_SB shall still be set when verified.

NOTE An example for the measurements is given in E.2.

© ISO/IEC 2017 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

7.2.5.3 Test report

The test report shall give the tested values of limit storage state time. The pass/fail condition is determined whether the measured values are within the requirements in the ISO/IEC 18000-62:2012, 6.3.1.3.2.

8 Conformance tests for ISO/IEC 18000-63

8.1 Functional tests of interrogator

8.1.1 Interrogator data encoding

8.1.1.1 Purpose

The purpose of this test is to verify that the tolerance on all interrogator data encoding parameters shall be ±1 % as described in ISO/IEC 18000-63.

8.1.1.2 Procedure

The interrogator data encoding measurement procedure is as follows.

1) The DUT interrogator shall be configured for transmitting at the maximum power with the first supported frequency and modulation type.

2) The DUT interrogator shall be set with all parameters defined in Table 7 and with the first test case parameters defined in Table 8 for variable parameters.

3) The DUT interrogator shall be set to send a **QUERY** command followed by the continuous wave.

4) The signal analyser shall be set to power versus time mode.

5) Wait until signal analyser is triggered, capture all the demodulated trace power versus time.

6) Measure data-0 and data-1 durations from interrogator preamble trace.

7) Steps 2) to 6) shall be repeated for all the test cases that are supported by the DUT interrogator.

8) Steps 2) to 7) shall be repeated for all DUT interrogator-supported frequencies and modulations.

Table 7 — Interrogator data encoding test parameters

TEST: Interrogator data encoding				
RF PARAMETERS				
Power EIRP (dBm): **max power authorized**			Frequency (MHz): **Interrogator supported frequencies**	
Modulation type: **Interrogator supported modulations**			Modulation index : **Variable**	
PROTOCOL SETTINGS				
Command: **Query**				
Parameters	DR: **64/3**	M: **1**	Trext: **1**	
Timings	Tari (µs): **Variables**	PW (µs): **0,5* Tari**	RTcal (µs): **A fixed number of times of Tari**	TRcal (µs): **Variable**

© ISO/IEC 2017 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

Table 8 — Interrogator data encoding test cases

	Tari (µs) **= data_0**	**RTcal** (µs)	**Modulation index** (%)
1	6,25	2,5*Tari	80
2		(data_1= 9,375 µs)	100
3		3*Tari	80
4		(data_1= 12,5 µs)	100
5	12,5	2,5*Tari	80
6		(data_1= 18,75 µs)	100
7		3*Tari	80
8		(data_1= 25 µs)	100
9	25	2,5*Tari	80
10		(data_1= 37,5 µs)	100
11		3*Tari	80
12		(data_1= 50 µs)	100

8.1.1.3 Test report

The test report shall give for each test case all communication parameters and the test verdict pass or fail; the pass condition for each point is obtained if the tolerance for the duration of data-0 and data-1 are lower than 1 % for all the test conditions.

8.1.2 Interrogator RF envelope parameters

8.1.2.1 Purpose

The purpose of this test is to verify all the parameters pulse modulation depth, rise time, fall time and PW, and shall be the same for a data-0 and a data-1 as described in ISO/IEC 18000-63.

8.1.2.2 Procedure

The interrogator RF envelope parameters measurement procedure is as follows.

1) The DUT interrogator shall be configured for transmitting at the maximum power, at the first supported frequency and modulation type.

2) The DUT interrogator shall be set with all parameters defined in Table 9 and with the first test case parameters defined in Table 10 for variable test parameters.

3) The DUT interrogator shall be set to send a **QUERY** command followed by the continuous wave.

4) The signal analyser shall be set to power versus time mode.

5) Wait until signal analyser is triggered, capture all the demodulated trace power versus time.

6) Measure the DUT interrogator PW and envelope rise and fall time as described in ISO/IEC 18000-63. The parameter pulse modulation depth shall be measured.

7) Steps 2) to 6) shall be repeated for all the test cases that are supported by the DUT interrogator.

8) Steps 2) to 7) shall be repeated for all DUT interrogator-supported frequencies and modulations.

© ISO/IEC 2017 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

Table 9 — Interrogator RF envelope test parameters

TEST: Interrogator RF envelope parameters				
RF PARAMETERS				
Power EIRP (dBm): **max power authorized**			Frequency (MHz): **Interrogator supported frequencies**	
Modulation type: **Interrogator supported modulations**			Modulation index: Variable	
PROTOCOL SETTINGS				
Command: **Query**				
Parameters	DR: **64/3**	M: **1**	Trext: **1**	
Timings	Tari (µs): **Variables**	PW (µs): **Variable**	RTcal (µs): **A fixed number times of Tari**	TRcal (µs): **Variable**

Table 10 — Interrogator RF envelope test cases

	Tari (µs) **= data_0**	**PW** (µs)	**Modulation index** (%)
1	6,25	2 (PW min)	80
2			100
3		0,525*Tari (PW max)	80
4			100
5	12,5	0,256*Tari (PW min)	80
6			100
7		0,525*Tari (PW max)	80
8			100
9	25	0,256*Tari (PW min)	80
10			100
11		0,525*Tari (PW max)	80
12			100

8.1.2.3 Test report

The test report shall give for each test case all communication parameters and the test verdict pass or fail; the pass condition for each point is obtained if the value of the parameters shall be in the limit maximum and minimum as specified in ISO/IEC 18000-63.

8.1.3 Interrogator RF power-up and power-down parameters

8.1.3.1 Purpose

The purpose of this test is to verify that the interrogator power-up and power down RF envelopes shall comply with RF envelope specified in ISO/IEC 18000-63.

8.1.3.2 Procedure

The interrogator RF power-up and power-down measurement procedure is as follows.:

1) The DUT interrogator shall be configured for transmitting at the maximum power, at the first supported frequency and modulation type.

2) The DUT interrogator under test shall be set to be powered on to transmit a CW and then powered off.

3) The signal analyser shall capture all the interrogator signal trace.

© ISO/IEC 2017 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

4) Measure the interrogator rise time, fall time, settling time, signal level when off, undershoot and overshoot as described in ISO/IEC 18000-63.

5) In the interrogator power-up trace, verify that once the carrier level has risen above the 10 % level, the power-up envelope shall rise monotonically until at least the ripple limit, Ml, and that the RF envelope shall not fall below the 90 % point during interval, Ts.

6) In the interrogator power-down trace, verify that once the carrier level has fallen below the 90 % level, the power-down envelope shall fall monotonically until the power limit Ms.

7) Steps 2) to 6) shall be repeated for all DUT interrogator-supported frequencies and modulations.

8.1.3.3 Test report

The test report shall give for each test case all communication parameters and the test verdict pass or fail; the pass condition is obtained if the value of the parameters shall be in the limit maximum and minimum specified in ISO/IEC 18000-63. Monotonicity shall be as required for the power-up and power-down of the RF waveform

8.1.4 Interrogator preamble parameters

8.1.4.1 Purpose

The purpose of this test case is to verify that the preamble shall comprise a fixed-length start delimiter, a data-0 symbol, a R ≥ T calibration (RTcal) symbol and a T ≤ R calibration (TRcal) symbol as described in ISO/IEC 18000-63.

8.1.4.2 Procedure

The interrogator preamble parameters measurement procedure is as follows.

1) The DUT interrogator shall be configured for transmitting at the maximum power, at the first supported frequency and modulation type.

2) The DUT interrogator shall be set with all parameters defined in Table 11 and with the first test case parameters defined in Table 12 for variable test parameters.

3) The DUT interrogator shall be set to send a **QUERY** command followed by the continuous wave.

4) The signal analyser shall capture all the interrogator signal traces.

5) Measure the interrogator delimiter duration, data-0 duration, RTcal and TRcal timings as defined in ISO/IEC 18000-63.

6) Steps 2) to 5) shall be repeated for all the test cases that are supported by the DUT interrogator.

7) steps 3) to 6) shall be repeated for all DUT interrogator-supported frequencies and modulations.

© ISO/IEC 2017 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017

Table 11 — Interrogator preamble test parameters

TEST: Interrogator preamble parameters				
RF PARAMETERS				
Power EIRP (dBm): **maximum power authorized**			Frequency (MHz): **Interrogator supported frequencies**	
Modulation type: **Interrogator supported modulations**			Modulation index: **90 %**	
PROTOCOL SETTINGS				
Command : **Query**				
Parameters	DR: **64/3**	M: **1**	Trext: **1**	
Timings	Tari (µs): **Variable**	PW (µs): **0,5*Tari**	RTcal (µs): **Variable**	TRcal (µs): **Variable**

Table 12 — Interrogator preamble test cases

	Tari (µs)	**RTcal** (µs)	**TRcal** (µs)
1	6,25	2,5*Tari	1,1*RTcal
2			3*RTcal
3		3*Tari	1,1*RTcal
4			3*RTcal
5	12,5	2,5*Tari	1,1*RTcal
6			3*RTcal
7		3*Tari	1,1*RTcal
8			3*RTcal
9	25	2,5*Tari	1,1*RTcal
10			3*RTcal
11		3*Tari	1,1*RTcal
12			3*RTcal

8.1.4.3 Test report

The test report shall give for each test case all communication parameters and the test verdict pass or fail; the pass condition is obtained for each test point if the tolerance for the duration of data-0, RTcal and TRcal shall be lower than 1 % for all the test conditions and the delimiter shall be 12,5 µs ± 5 %.

8.1.5 Interrogator link timing T2

8.1.5.1 Purpose

The purpose of this test is to verify that the DUT interrogator meets the timing parameter T2.

8.1.5.2 Procedure

The interrogator link timing T2 measurement procedure is as follows.

1) The DUT interrogator shall be configured for transmitting at the maximum power, at the first supported frequency and modulation type.

2) The DUT interrogator shall be set with all parameters defined in Table 13 and with the first test case parameters defined in Table 14 for variable test parameters.

3) The DUT interrogator shall be set to send a **QUERY** command followed by the continuous wave.

© ISO/IEC 2017 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO/IEC 18047-6:2017